Commissioning | EN

# Inverter

i510 protec frequency inverter

Lenze

## Contents



# 1 About this document

**⚠WARNING!**

Read this documentation carefully before starting any work.

▸ Please observe the safety instructions!

## 1.1 Document description

This documentation is valid up to firmware version:

| Firmware version | Software data version | Date |
|---|---|---|
| 06.02.00.00 | V0006 | 2020-09-14 |

## 1.2 Further documents

For certain tasks, information is available in additional documents.

| Document | Contents/topics |
|---|---|
| Configuration document | Basic information on configuring and ordering the product |
| Mounting and switch-on instructions | Basic information on mounting and initial switch-on of the product<br>• Is supplied with each component. |

**More information**

For certain tasks, information is available in other media.

| Medium | Contents/topics |
|---|---|
| Engineering Tools | For commissioning |
| AKB articles | Additional technical information for users in the Application Knowledge Base |
| CAD data | Download in different formats from the EASY Product Finder |
| EPLAN macros | Project planning, documentation and management of projects for EPLAN P8. |
| Device descriptions | Standardized files for network configuration |

Information and tools with regard to the Lenze products can be found on the Internet:
www.Lenze.com → Downloads

## 1.3 Notations and conventions

Conventions are used in this document to distinguish between different types of information.

| | | |
|---|---|---|
| Numeric notation | | |
| Decimal separator | Point | Generally shown as a decimal point.<br>Example: 1 234.56 |
| Warnings | | |
| UL Warnings | UL | Are used in English and French. |
| UR warnings | UR | |
| Text | | |
| Engineering Tools | " " | Software<br>Example: "Engineer", "EASY Starter" |
| Icons | | |
| Page reference | 🕮 | Reference to another page with additional information.<br>Example: 🕮 16 = see page 16 |
| Documentation reference | ⊚ | Reference to other documentation with additional information.<br>Example: ⊚ EDKxxx = see documentation EDKxxx |

**Layout of the safety instructions**

**⚠ DANGER!**

Indicates an extremely hazardous situation. Failure to comply with this instruction will result in severe irreparable injury and even death.

**⚠ WARNING!**

Indicates an extremely hazardous situation. Failure to comply with this instruction may result in severe irreparable injury and even death.

**⚠ CAUTION!**

Indicates a hazardous situation. Failure to comply with this instruction may result in slight to medium injury.

**NOTICE**

Indicates a material hazard. Failure to comply with this instruction may result in material damage.



# 2 Safety instructions

Disregarding the following basic safety measures and safety information may lead to severe personal injury and damage to property!

Observe all specifications of the corresponding documentation supplied. This is the precondition for safe and trouble-free operation and for obtaining the product features specified.

Please observe the specific safety information in the other sections!

## 2.1 Basic safety instructions

**⚠ DANGER!**

Dangerous electrical voltage

Possible consequences: Death or severe injuries from electric shock

- ▶ Any work on the device must only be carried out in a deenergized state.
- ▶ After switching off the mains voltage, observe the signs on the product.

**Product**

- The product must only be used as directed.
- Never commission the product in the event of visible damage.
- The product must never be technically modified.
- Never commission the product before assembly has been completed.
- The product must never be operated without required covers.
- Connect/disconnect all pluggable terminals only in de-energized condition.
- Only remove the product from the installation in the de-energized state.

**Personnel**

Only qualified and skilled personnel are allowed to work with the product. IEC 60364 and/or CENELEC HD 384 define the qualifications of these persons as follows:

- They are familiar with the installation, mounting, commissioning, and operation of the product.
- They possess the appropriate qualifications for their tasks.
- They are familiar with all regulations for the prevention of accidents, directives, and laws applicable at the location and are able to apply them.

**Process engineering**

The procedural notes and circuit details described are only proposals. It is up to the user to check whether they can be adapted to the particular applications. Lenze does not take any responsibility for the suitability of the procedures and circuit proposals described.

**Device protection**

- The maximum test voltage for insulation tests between a control potential of 24 V and PE must not exceed 110 V DC (EN 61800−5−1).

## 2.2 Application as directed

- The product serves to control three-phase AC motors and servo motors.
- The product must only be actuated with motors that are suitable for the operation with inverters.
- The product is not a household appliance, but is only designed as a component for commercial or professional use in terms of EN 61000−3−2.
- Depending on the degree of protection, the product can be mounted inside and outside control cabinets.
- The product must only be actuated under the operating conditions and power limits specified in this documentation.
- The product meets the protection requirements of 2014/35/EU: Low-Voltage Directive.
- The product is not a machine in terms of 2006/42/EU: Machinery Directive.
- Commissioning or starting the operation as directed of a machine with the product is not permitted until it has been ensured that the machine meets the regulations of the EC Directive 2006/42/EU: Machinery Directive; observe EN 60204−1.
- Commissioning or starting operation as directed is only permissible if the EMC Directive 2014/30/EU is complied with.
- In residential areas, the product may cause EMC interferences. The operator is responsible for taking interference suppression measures.



## 2.3 Residual hazards

Even if notes given are taken into consideration and protective measures are implemented, the occurrence of residual risks cannot be fully prevented.

The user must take the residual hazards mentioned into consideration in the risk assessment for his/her machine/system.

If the above is disregarded, this can lead to severe injuries to persons and damage to property!

**⚠ DANGER!**

Danger to life due to electrical voltage!

The product's power connections can still be carrying voltage when the mains supply has been switched off.

Possible consequences: Death, severe injury, or burns

- ▶ Do not touch the power connections immediately.
- ▶ Take note of the corresponding warning plates on the product.
- ▶ Check power terminals for isolation from supply.

### Product

Observe the warning labels on the product!

**Dangerous electrical voltage:**
Before working on the product, make sure there is no voltage applied to the power terminals!
After mains disconnection, the power terminals will still carry the hazardous electrical voltage for the time given next to the symbol!

**Electrostatic sensitive devices:**
Before working on the product, the staff must ensure to be free of electrostatic charge!

**High leakage current:**
Carry out fixed installation and PE connection in compliance with:
EN 61800−5−1 / EN 60204−1

**Hot surface:**
Use personal protective equipment or wait until the device has cooled down!

### Degree of protection - protection of persons and device protection

- Information applies to the mounted and ready-for-use state.

### Motor protection

With some settings of the inverter, the connected motor can be overheated.

- E. g. by longer operation of self-ventilated motors at low speed.
- E. g. by longer operation of DC-injection braking.

### Protection of the machine/system

Drives can reach dangerous overspeeds.

- E. g. by setting high output frequencies in connection with motors and machines not suitable for this purpose.
- The inverters do not provide protection against such operating conditions. For this purpose, use additional components.

Switch contactors in the motor cable only if the controller is inhibited.

- Switching while the inverter is enabled is only permissible if no monitoring functions are activated.

**Motor**

If there is a short circuit of two power transistors, a residual movement of up to 180°/number of pole pairs can occur at the motor! (e. g. 4-pole motor: residual movement max. 180°/2 = 90°).



# 3 Product information

## 3.1 Identification of the products

In tables, the first 9 digits of the corresponding product code are used to identify the products:

**Product code**

| | | | I | 5 | 1 | A | P | □□□ | □ | □ | □ | □ | □ | □ | □ | □□□ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Product type | Inverter | | I | | | | | | | | | | | | | |
| Product family | i500 | | | 5 | | | | | | | | | | | | |
| Product | i510 | | | | 1 | | | | | | | | | | | |
| Product generation | Generation 1 | | | | | A | | | | | | | | | | |
| Mounting type | Wall mounting | | | | | | P | | | | | | | | | |
| Rated power [kW] (Examples) | 0.25 kW | 0.5 HP | | | | | | 137 | | | | | | | | |
| | 0.55 kW | 1.0 HP | | | | | | 155 | | | | | | | | |
| | 2.2 kW | 3.0 HP | | | | | | 222 | | | | | | | | |
| Mains voltage and connection type | 1/N/PE AC 120 V | | | | | | | | A | | | | | | | |
| | 1/N/PE AC 230/240 V | | | | | | | | B | | | | | | | |
| | 3/PE AC 230/240 V | | | | | | | | C | | | | | | | |
| | 1/N/PE AC 230/240 V<br>3/PE AC 230/240 V | | | | | | | | D | | | | | | | |
| | 3/PE AC 400 V<br>3/PE AC 480 V | | | | | | | | F | | | | | | | |
| Product variant | Standard | | | | | | | | | 0 | | | | | | |
| Integrated functional safety | Without safety function | | | | | | | | | | 0 | | | | | |
| Degree of protection | NEMA 1 (IP20), uncoated | | | | | | | | | | | 0 | | | | |
| Interference suppression | Without | | | | | | | | | | | | 0 | | | |
| Application | Default parameter setting: Region EU (50-Hz networks) | | | | | | | | | | | | | 0 | | |
| | Default parameter setting: Region US (60-Hz networks) | | | | | | | | | | | | | 1 | | |
| Product extension | Standard I/O ... | | | | | | | | | | | | | | 0 | |
| | Keypad-module with Standard I/O ... | | | | | | | | | | | | | | K | |
| | WLAN module with Standard I/O ... | | | | | | | | | | | | | | W | |
| | | ... without network | | | | | | | | | | | | | | 00S |
| | | ... with CANopen | | | | | | | | | | | | | | 02S |
| | | ... with Modbus RTU | | | | | | | | | | | | | | 03S |

# 4 Commissioning

The purpose of commissioning is to adapt the inverter as part of a machine with a variable-speed drive system to its drive task.

## 4.1 Important notes

**⚠ DANGER!**

Incorrect wiring can cause unexpected states during the commissioning phase.

Possible consequences: death, severe injuries or damage to property

Ensure the following before switching on the mains voltage:

- Wiring must be complete and correct.
- Wiring must be free of short circuits and earth faults.
- The motor circuit configuration (star/delta) must be adapted to the inverter output voltage.
- The motor must be connected in-phase (direction of rotation).
- The "emergency off" function of the overall system must operate correctly.

**⚠ DANGER!**

Incorrect settings during commissioning may cause unexpected and dangerous motor and system movements.

Possible consequences: death, severe injuries or damage to property

- Clear hazardous area.
- Observe safety instructions and safety clearances.

## 4.2 Initial switch-on and functional test

**Drive behaviour by default**

By default, the V/f characteristic control with a linear characteristic is preset as motor control for asynchronous motors. The V/f characteristic control is a motor control for conventional frequency inverter applications. It is based on a simple and robust control mode for the operation of asynchronous motors with a linear or square-law load torque characteristic (e.g. fan). Because of the minimal parameterisation effort, such applications can be commissioned easily and quickly.

**The default settings of the parameters ensure that the inverter is ready for operation immediately and the motor works adequately without further parameterisation if an inverter and an asynchronous motor* Hz asynchronous machine with matching performances are assigned to each other.**

* Depending on the device/mains frequency either 50-Hz asynchronous motor or 60-Hz asynchronous motor.

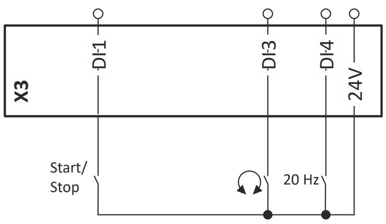
**Functional test**

Target: the motor connected to the inverter should rotate as quickly as possible.

Requirements:

- The connected motor matches the inverter in terms of power.
- The parameter settings correspond to the state upon delivery.

1. **Preparation**
   1. Wire the power connections. See the mounting and switch-on instruction for more details.
   2. Wire digital inputs X3/DI1 (start/stop), X3/DI3 (reversal) and X3/DI4 (frequency preset 20 Hz).
   3. Do not connect terminal X3/AI1 (analog setpoint selection) or connect it to GND.




2. **Switch on mains and check readiness for operation**
   1. Switch on mains voltage.
   2. Observe LED status displays "RDY" and "ERR" on the front of the inverter:
      a) If the blue "RDY" LED is blinking and the red "ERR" LED does not light up, the inverter is ready for operation. The controller is inhibited.
      You can now start the drive.
      b) If the red "ERR" LED is lit permanently, a fault is pending.
      Eliminate the fault before you carry on with the functional test.

**Carry out functional test**

1. **Start drive**
   1. Start inverter: X3/DI1 = HIGH.
   2. Activate frequency preset 1 (20 Hz) as speed setpoint: X3/DI4 = HIGH.
      The drive rotates with 20 Hz.
   3. Optional: Activate reversal
      a) X3/DI3 = HIGH.
         The drive rotates at 20 Hz in the opposite direction.
      b) Deactivate reversal again: X3/DI3 = LOW.

      Speed characteristic (example)
2. **Stop drive**
   1. Deactivate frequency preset 1 again: X3/DI4 = LOW.
   2. Stop inverter again: X3/DI1 = LOW.

The functional test has been completed.

**Related topics**

▸ Function assignment of the inputs and outputs (default setting) 🕮 44

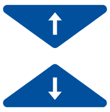
▸ LED status display 🕮 439

▸ Error codes, causes and remedies 🕮 461

## 4.3 Operating interfaces

### 4.3.1 Keypad

The keypad is an easy means for the local operation, parameterisation, and diagnostics of the inverter.


| Function of keypad keys in operating mode | | | |
|---|---|---|---|
| **Key** | **Actuation** | **Condition** | **Action** |
|  | Briefly | Local keypad control active.<br>Display "LOC" | Run motor. |
| | | Remote control active<br>Display "REM"<br>Display "KSTOP" | Deactivate keypad triggered stop.<br>The motor remains at standstill.<br>Display changes from "KSTOP" to "STOP". |
|  | Briefly | No Jog operation | Stop motor.<br>Display "KSTOP" |
|  | Briefly | Operating mode | Change to parameterisation mode.<br>▸ Keypad parameterisation mode 🕮 403 |
| | Longer than 3 s | None (anytime possible) | Save parameter settings in the user memory of the memory module. |
|  | Briefly | During operation | Scroll through information in the above status line. |
|  | Briefly | Manual setpoint selection via keypad active.<br>Display "MAN" | Change frequency setpoint. |
|  | Briefly | Operating mode | Activate full keypad control<br>Display "ON?" → Confirm with ↵<br>Control and setpoint selection can now only be carried out via keypad.<br>Renewed clicking: Exit full keypad control.<br>Display "OFF?" → Confirm with ↵<br>▸ Keypad full control 🕮 53 |
|  | Briefly | Local keypad control active.<br>Display "LOC" | Reversal of rotation direction.<br>Display "REV?" → Confirm with ↵<br>▸ Configure R/F and CTRL keys 🕮 426 |

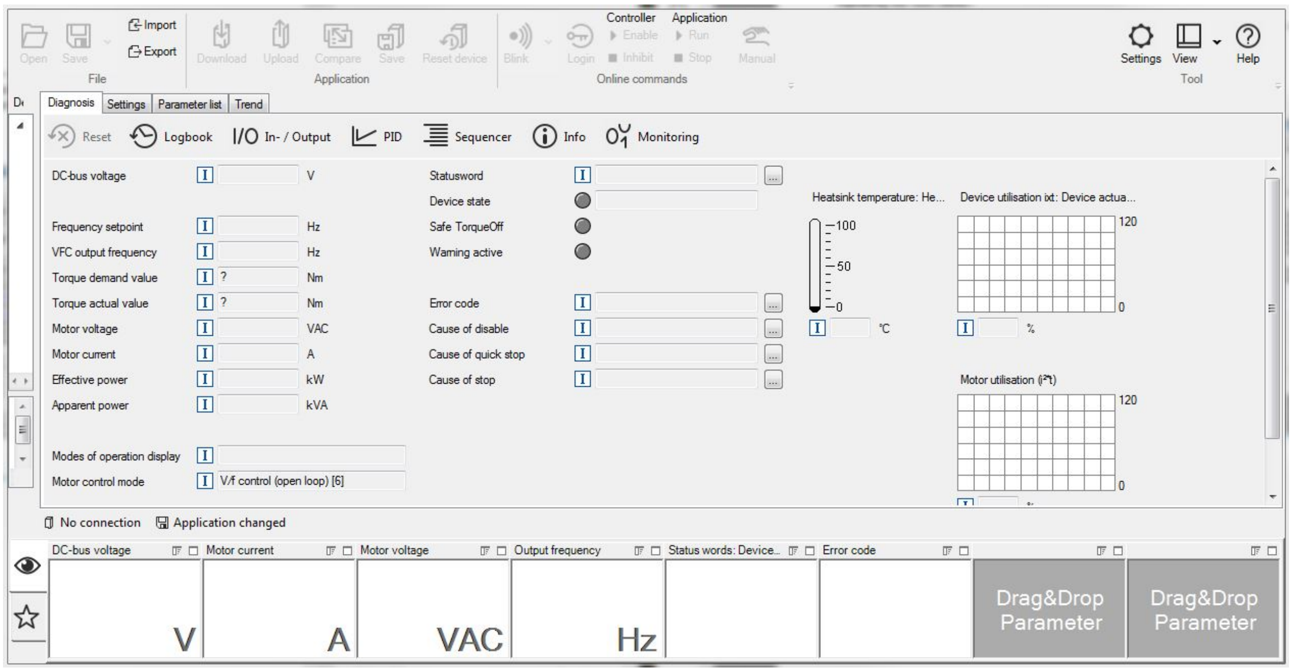
Detailed information on the keypad can be found in the Chapter "Using accessories".
▸ Keypad 🕮 399

### 4.3.2 Engineering tool »EASY Starter«

The »EASY Starter« is a PC software that is especially designed for the commissioning and diagnostics of the inverter.

- »EASY Starter« Download

Screenshot:



### 4.3.2.1 Generate a connection between inverter and »EASY Starter«

For commissioning the inverter with the »EASY Starter«, a communication link with the inverter is required. This can be established in a wired or wireless manner via WLAN.

**Preconditions**

- A USB module and a USB 2.0 cable (A plug on Micro-B plug) are required for wired communication.


- A WLAN module is required for wireless communication with the inverter. In addition the PC on which the »EASY Starter« is installed must be wireless-enabled.

**Details**

The following instructions describe how to establish a connection via the USB module.

The USB interface must only be used temporarily for the diagnostics and parameterization of the inverter. It is recommended to always keep the inverter and the diagnostic device on the same earth potential or separate the diagnostic device from the mains.

- Parameterising without motor operation does not require a mains voltage. If you connect the inverter directly to the PC without a hub, the USB interface of the PC is sufficient for the voltage supply.
- Instructions for the establishing a connection via the WLAN module can be found in the chapter "Using accessories: WLAN module". 428

How to establish a communication to the inverter via USB:

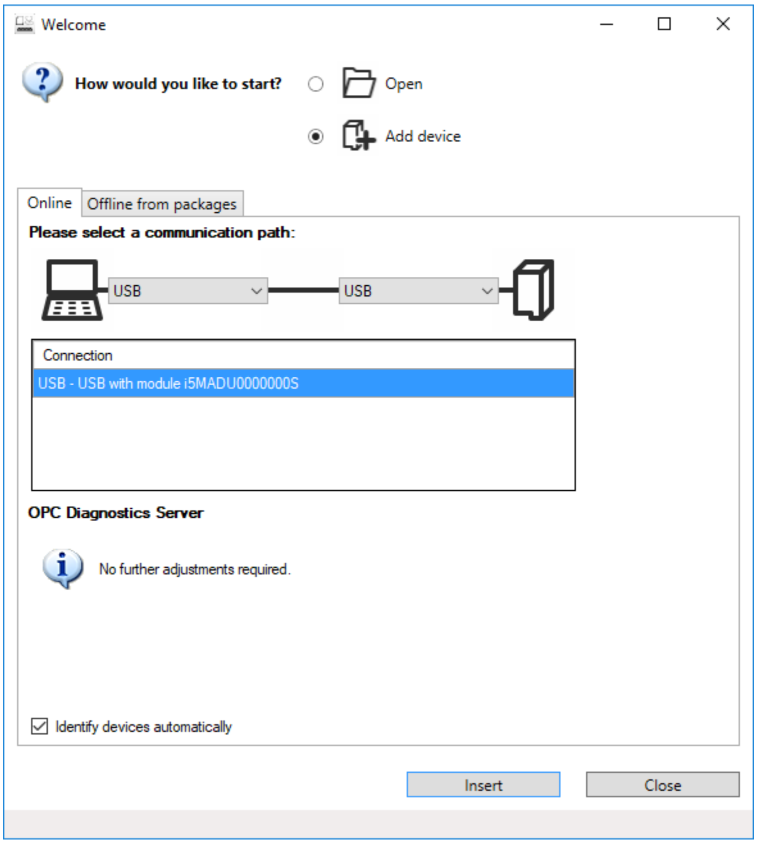
Preconditions for commissioning:

- The functional test described in the mounting and switch-on instructions has been completed successfully (without any errors or faults).
- The inverter is ready for operation. The mains voltage is switched on.

Accessories required for commissioning:

- The USB module
- The USB 2.0 cable (A-plug on micro B-plug)
- The PC with installed »EASY Starter« software

1. Plug the USB module into the front of the inverter (interface X16).
2. Use a USB cable to connect the inverter to the PC on which »EASY Starter« is installed:
   a) Plug the micro B plug of the USB cable into the socket of the USB module.
   b) Plug the other end into a free USB type A-socket of the PC.
3. Start »EASY Starter«.
   The "Add devices" dialog is shown.
4. Select the "USB - USB with module i5MADU0000000S" connection:



5. Click the **Insert** button.

»EASY Starter« searches for connected devices via the communication path selected. When the connection has been established successfully, the inverter is displayed in the device list of »EASY Starter«. The inverter parameters can now be accessed via the tabs of »EASY Starter«.

### 4.3.3 SMART Keypad App

The Lenze »SMART Keypad App« for Android or iOS allows you to diagnose and parameterize an inverter. A WLAN module on the inverter is required for communication.

- Ideal for the parameterization of simple applications such as a conveyor belt.
- Ideal for the diagnostics of the inverter.

The app can be found in the Google Play Store or in the Apple App Store.


Android

iOS

## 4.4 General information on parameter setting

As a part of a machine with a speed-variable drive system, the inverter must be adapted to its drive task. The adaptation process of the inverter is carried out by changing parameters. These parameters can be accessed by means of the keypad or »EASY Starter«. If the inverter is provided with a network option, access can also be effected by a higher-level controller via the corresponding network.

Certain device commands or settings which might cause a critical state of the drive behavior can only be carried out when the device is disabled.

### 4.4.1 Addressing of the parameters

Each parameter features a 16-bit index as its address. Under this address, the parameter is stored in the object directory of the device.

- Parameters that belong together functionally are combined in a data set. These parameters are additionally provided with an 8-bit subindex.
- The colon is used as a separator between the index and subindex Example: "0x2540:001"
- There are parameter settings that can be changed, and (diagnostic) parameters that can only be read.

**Parameterisation using the keypad**

- All parameters which can also be accessed by means of the keypad have a "Display code", with the first digit of the display code specifying the group in which the parameter can be found on the keypad.
- In the documentation, the display code is specified in brackets behind the address. Example: "0x2915 (P210.00)".

### 4.4.2 Structure of the parameter descriptions

- The parameter descriptions in this documentation are structured in table form.
- The representation distinguishes parameters with a setting range, text, selection list, and bit-coded display.
- The default setting of parameters with a write access feature is shown in **bold**.
- The display code as well as the short keypad designation of the parameter, which is limited to 16 characters, are shown in brackets.

**Example: parameters with a setting range**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| Index:Subindex<br>(display code) | Parameter designation<br>(abbreviated keypad designation)<br>Minimum value ... [**default setting**] ... maximum value<br>• Optional information with regard to the parameter. | Explanations and notes with regard to the parameter. |

**Example: parameters with a selection list**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| Index:Subindex<br>(display code) | Parameter designation<br>(abbreviated keypad designation)<br>• Optional information with regard to the parameter. | | Explanations and notes with regard to the parameter.<br>**Note:** The corresponding selection number (here 0, 1, or 2) must be set. Other values are not permissible. |
| | **0** | **Designation of selection 0** | Optionally: explanations and notes with regard to the corresponding selection.<br>The default selection is shown in **bold**. |
| | 1 | Designation of selection 1 | |
| | 2 | Designation of selection 2 | |

**Example: parameters with a bit-coded display**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| Index:Subindex<br>(display code) | Parameter designation<br>(abbreviated keypad designation)<br>• Optional information with regard to the parameter. | | Explanations and notes with regard to the parameter. |
| | Bit 0 | Designation of bit 0 | Optionally: explanations and notes with regard to the corresponding bit. |
| | Bit 1 | Designation of bit 1 | |
| | Bit 2 | Designation of bit 2 | |
| | ... | ... | |
| | Bit 15 | Designation of bit 15 | |

### 4.4.3 Parameter overview lists

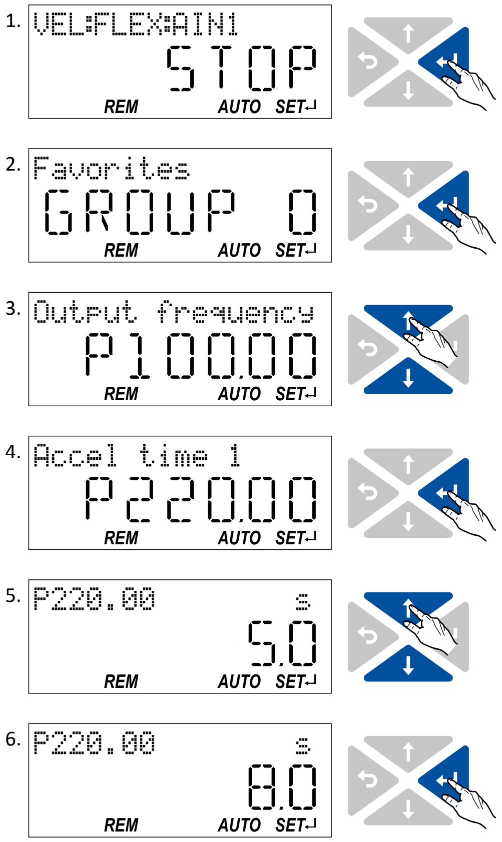
- Keypad parameter list: for the parameterisation using the keypad, contains a list of all parameters which can also be accessed by means of the keypad. 📖 407
- Parameter attribute list: contains a list of all inverter parameters. This list in particular includes some information that is relevant for the reading and writing of parameters via the network. 📖 480

### 4.4.4 Favorites

In order to gain quick access using »EASY Starter« or the keypad, frequently used parameters of the inverter can be defined as "Favorites".

- The *Favorites* tab in »EASY Starter« is used to quickly access the favorites.
- On the keypad, the "Favorites" can be found in group 0.

#### 4.4.4.1 Accessing the "Favorites" with the keypad




1. Use the ↵ key in the operating mode to navigate to the parameterisation mode one level below.
   You are now in the group level. All parameters of the inverter are divided into different groups according to their function.
   Group 0 contains the "Favorites".
   Note: By using the ⮌ key you can navigate one level upwards again anytime.
2. Use the ↵ key to navigate to one level below.
   You are now in the parameter level of the group selected.
3. Use the ↑ and ↓ navigation keys to select the desired parameter.
4. Use the ↵ key to navigate to one level below.
   You are now in the editing mode.
5. Set the desired value using the ↑ and ↓ navigation keys.
6. Use the ↵ key to accept the changed setting.
   The editing mode is exited.
   Note: By using the ⮌ key you can exit the editing mode without accepting the new setting (abort).

### 4.4.4.2 Favorites parameter list (default setting)

In the default setting, parameters for resolving typical applications are defined as "Favorites”.

| No. | Display code | Name | Default setting | Setting range | Information |
|---|---|---|---|---|---|
| 1 | P100.00 | Inv. outp. freq. | x.x Hz | - (Read only) | 0x2DDD |
| 2 | P103.00 | Actual current | x.x % | - (Read only) | 0x6078 |
| 3 | P106.00 | Motor voltage | x VAC | - (Read only) | 0x2D89 |
| 4 | P150.00 | Error code | - | - (Read only) | 0x603F |
| 5 | P200.00 | Control select. | **Flexible I/O [0]** | Selection list | 0x2824 |
| 6 | P201.01 | Freq. setp. src. | **Analog input 1 [2]** | Selection list | 0x2860:001 |
| 7 | P203.01 | Start method | **Normal [0]** | Selection list | 0x2838:001 |
| 8 | P203.03 | Stop method | **Standard ramp [1]** | Selection list | 0x2838:003 |
| 9 | P208.01 | Mains voltage | **230 Veff [0]** | Selection list | 0x2540:001 |
| 10 | P210.00 | Min. frequency | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x2915 |
| 11 | P211.00 | Max. frequency | **50.0 Hz* \| 60.0 Hz**** | 0.0 ... 599.0 Hz | 0x2916 |
| 12 | P220.00 | Accelerat.time 1 | **5.0 s** | 0.0 ... 3600.0 s | 0x2917 |
| 13 | P221.00 | Decelerat.time 1 | **5.0 s** | 0.0 ... 3600.0 s | 0x2918 |
| 14 | P300.00 | Motor ctrl mode | **VFC open loop [6]** | Selection list | 0x2C00 |
| 15 | P302.00 | V/f charac.shape | **Linear [0]** | Selection list | 0x2B00 |
| 16 | P303.01 | Base voltage | **230 V** | 0 ... 5000 V | 0x2B01:001 |
| 17 | P303.02 | Base frequency | **50 Hz* \| 60 Hz**** | 0 ... 1500 Hz | 0x2B01:002 |
| 18 | P304.00 | Limit. rotation | **Both rot. direct [1]** | Selection list | 0x283A |
| 19 | P305.00 | Switching freq. | **0** | 1 ... 33 | 0x2939 |
| 20 | P306.01 | Duty selection | **Heavy Duty [0]** | Selection list | 0x2D43:001 |
| 21 | P308.01 | Max.load.for 60s | **150 %** | 30 ... 200 % | 0x2D4B:001 |
| 22 | P316.01 | Fixed V/f boost | **2.5 %** | 0.0 ... 20.0 % | 0x2B12:001 |
| 23 | P323.00 | Rated mot.curr. | **1.700 A** | 0.001 ... 500.000 A | 0x6075 |
| 24 | P324.00 | Max. current | **200.0 %** | 0.0 ... 3000.0 % | 0x6073 |
| 25 | P400.01 | Enable inverter | **TRUE [1]** | Trigger list 59 | 0x2631:001 |
| 26 | P400.02 | Run | **Digital input 1 [11]** | Trigger list 59 | 0x2631:002 |
| 27 | P400.03 | Quick stop | **Not connected [0]** | Trigger list 59 | 0x2631:003 |
| 28 | P400.04 | Reset fault | **Digital input 2 [12]** | Trigger list 59 | 0x2631:004 |
| 29 | P400.05 | DC braking | **Not connected [0]** | Trigger list 59 | 0x2631:005 |
| 30 | P400.06 | Start forward | **Not connected [0]** | Trigger list 59 | 0x2631:006 |
| 31 | P400.07 | Start reverse | **Not connected [0]** | Trigger list 59 | 0x2631:007 |
| 32 | P400.08 | Run forward | **Not connected [0]** | Trigger list 59 | 0x2631:008 |
| 33 | P400.09 | Run reverse | **Not connected [0]** | Trigger list 59 | 0x2631:009 |
| 34 | P400.13 | Reverse rot.dir. | **Digital input 3 [13]** | Trigger list 59 | 0x2631:013 |
| 35 | P400.18 | Setp: Preset b0 | **Digital input 4 [14]** | Trigger list 59 | 0x2631:018 |
| 36 | P400.19 | Setp: Preset b1 | **Digital input 5 [15]** | Trigger list 59 | 0x2631:019 |
| 37 | P400.20 | Setp: Preset b2 | **Not connected [0]** | Trigger list 59 | 0x2631:020 |
| 38 | P420.01 | Relay function | **Rdy for operat. [51]** | Selection list | 0x2634:001 |
| 39 | P420.02 | DO1 function | **Release brake [115]** | Selection list | 0x2634:002 |
| 40 | P430.01 | AI1 input range | **0 ... 10 VDC [0]** | Selection list | 0x2636:001 |
| 41 | P430.02 | AI1 freq @ min | **0.0 Hz** | -1000.0 ... 1000.0 Hz | 0x2636:002 |
| 42 | P430.03 | AI1 freq @ max | **50.0 Hz* \| 60.0 Hz**** | -1000.0 ... 1000.0 Hz | 0x2636:003 |
| 43 | P440.01 | AO1 outp. range | **0 ... 10 VDC [1]** | Selection list | 0x2639:001 |
| 44 | P440.02 | AO1 function | **Outp. frequency [1]** | Selection list | 0x2639:002 |
| 45 | P440.03 | AO1 min. signal | **0** | -2147483648 ... 2147483647 | 0x2639:003 |
| 46 | P440.04 | AO1 max. signal | **1000** | -2147483648 ... 2147483647 | 0x2639:004 |
| 47 | P450.01 | Freq. preset 1 | **20.0 Hz** | 0.0 ... 599.0 Hz | 0x2911:001 |
| 48 | P450.02 | Freq. preset 2 | **40.0 Hz** | 0.0 ... 599.0 Hz | 0x2911:002 |
| 49 | P450.03 | Freq. preset 3 | **50.0 Hz* \| 60.0 Hz**** | 0.0 ... 599.0 Hz | 0x2911:003 |
| 50 | P450.04 | Freq. preset 4 | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x2911:004 |
| * Device for 50-Hz mains ** Device for 60-Hz mains | | | | | |

### 4.4.4.3 Configuring the "Favorites"

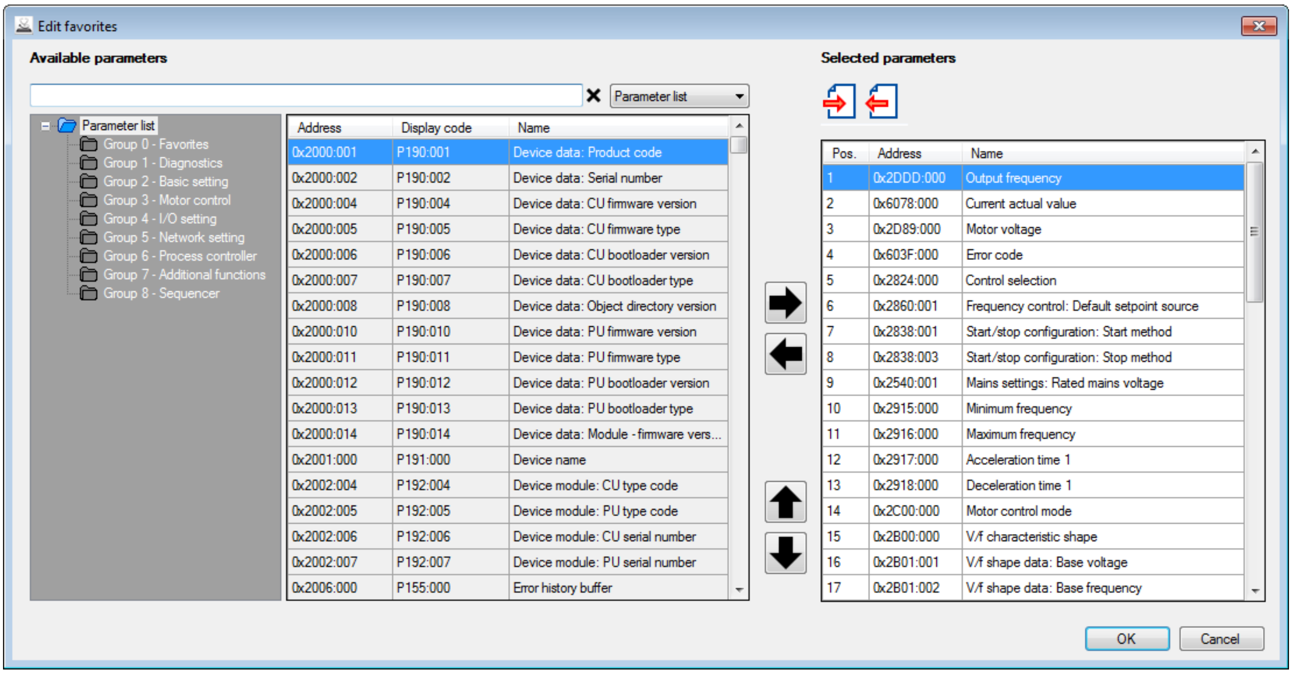
The "Favorites" can be configured by the user.

**Details**

A maximum number of 50 parameters can be defined as "Favorites".

The easiest way to process the selection of the favorites is via the parameterisation dialog in the »EASY Starter«:

1. Change to the "Parameter list" tab.
2. Select group 0 - Favorites.
3. Click the button.
4. Process favorites:




The default favorites can be modified using the keypad or via the network with the following parameters:

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x261C:001<br>(P740.01) | Favorites settings: Parameter 1<br>(Favorites sett.: Parameter 1)<br>0x00000000 ... **[0x2DDD0000]** ... 0xFFFFFF00 | Definition of the "Favorites" parameters.<br>• Format: 0xiiiiss00 (iiii = hexadecimal index, ss = hexadecimal subindex)<br>• The lowest byte is always 0x00.<br>• The keypad can be used to select the desired parameter from a list. |
| 0x261C:002<br>(P740.02) | Favorites settings: Parameter 2<br>(Favorites sett.: Parameter 2)<br>0x00000000 ... **[0x60780000]** ... 0xFFFFFF00 | |
| 0x261C:003<br>(P740.03) | Favorites settings: Parameter 3<br>(Favorites sett.: Parameter 3)<br>0x00000000 ... **[0x2D890000]** ... 0xFFFFFF00 | |
| 0x261C:004<br>(P740.04) | Favorites settings: Parameter 4<br>(Favorites sett.: Parameter 4)<br>0x00000000 ... **[0x603F0000]** ... 0xFFFFFF00 | |
| 0x261C:005<br>(P740.05) | Favorites settings: Parameter 5<br>(Favorites sett.: Parameter 5)<br>0x00000000 ... **[0x28240000]** ... 0xFFFFFF00 | |
| 0x261C:006<br>(P740.06) | Favorites settings: Parameter 6<br>(Favorites sett.: Parameter 6)<br>0x00000000 ... **[0x28600100]** ... 0xFFFFFF00 | |
| 0x261C:007<br>(P740.07) | Favorites settings: Parameter 7<br>(Favorites sett.: Parameter 7)<br>0x00000000 ... **[0x28380100]** ... 0xFFFFFF00 | |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x261C:008<br>(P740.08) | Favorites settings: Parameter 8<br>(Favorites sett.: Parameter 8)<br>0x00000000 ... [**0x28380300**] ... 0xFFFFFF00 | |
| 0x261C:009<br>(P740.09) | Favorites settings: Parameter 9<br>(Favorites sett.: Parameter 9)<br>0x00000000 ... [**0x25400100**] ... 0xFFFFFF00 | |
| 0x261C:010<br>(P740.10) | Favorites settings: Parameter 10<br>(Favorites sett.: Parameter 10)<br>0x00000000 ... [**0x29150000**] ... 0xFFFFFF00 | |
| 0x261C:011<br>(P740.11) | Favorites settings: Parameter 11<br>(Favorites sett.: Parameter 11)<br>0x00000000 ... [**0x29160000**] ... 0xFFFFFF00 | |
| 0x261C:012<br>(P740.12) | Favorites settings: Parameter 12<br>(Favorites sett.: Parameter 12)<br>0x00000000 ... [**0x29170000**] ... 0xFFFFFF00 | |
| 0x261C:013<br>(P740.13) | Favorites settings: Parameter 13<br>(Favorites sett.: Parameter 13)<br>0x00000000 ... [**0x29180000**] ... 0xFFFFFF00 | |
| 0x261C:014<br>(P740.14) | Favorites settings: Parameter 14<br>(Favorites sett.: Parameter 14)<br>0x00000000 ... [**0x2C000000**] ... 0xFFFFFF00 | |
| 0x261C:015<br>(P740.15) | Favorites settings: Parameter 15<br>(Favorites sett.: Parameter 15)<br>0x00000000 ... [**0x2B000000**] ... 0xFFFFFF00 | |
| 0x261C:016<br>(P740.16) | Favorites settings: Parameter 16<br>(Favorites sett.: Parameter 16)<br>0x00000000 ... [**0x2B010100**] ... 0xFFFFFF00 | |
| 0x261C:017<br>(P740.17) | Favorites settings: Parameter 17<br>(Favorites sett.: Parameter 17)<br>0x00000000 ... [**0x2B010200**] ... 0xFFFFFF00 | |
| 0x261C:018<br>(P740.18) | Favorites settings: Parameter 18<br>(Favorites sett.: Parameter 18)<br>0x00000000 ... [**0x283A0000**] ... 0xFFFFFF00 | |
| 0x261C:019<br>(P740.19) | Favorites settings: Parameter 19<br>(Favorites sett.: Parameter 19)<br>0x00000000 ... [**0x29390000**] ... 0xFFFFFF00 | |
| 0x261C:020<br>(P740.20) | Favorites settings: Parameter 20<br>(Favorites sett.: Parameter 20)<br>0x00000000 ... [**0x2D430100**] ... 0xFFFFFF00 | |
| 0x261C:021<br>(P740.21) | Favorites settings: Parameter 21<br>(Favorites sett.: Parameter 21)<br>0x00000000 ... [**0x2D4B0100**] ... 0xFFFFFF00 | |
| 0x261C:022<br>(P740.22) | Favorites settings: Parameter 22<br>(Favorites sett.: Parameter 22)<br>0x00000000 ... [**0x2B120100**] ... 0xFFFFFF00 | |
| 0x261C:023<br>(P740.23) | Favorites settings: Parameter 23<br>(Favorites sett.: Parameter 23)<br>0x00000000 ... [**0x60750000**] ... 0xFFFFFF00 | |
| 0x261C:024<br>(P740.24) | Favorites settings: Parameter 24<br>(Favorites sett.: Parameter 24)<br>0x00000000 ... [**0x60730000**] ... 0xFFFFFF00 | |
| 0x261C:025<br>(P740.25) | Favorites settings: Parameter 25<br>(Favorites sett.: Parameter 25)<br>0x00000000 ... [**0x26310100**] ... 0xFFFFFF00 | |
| 0x261C:026<br>(P740.26) | Favorites settings: Parameter 26<br>(Favorites sett.: Parameter 26)<br>0x00000000 ... [**0x26310200**] ... 0xFFFFFF00 | |
| 0x261C:027<br>(P740.27) | Favorites settings: Parameter 27<br>(Favorites sett.: Parameter 27)<br>0x00000000 ... [**0x26310300**] ... 0xFFFFFF00 | |
| 0x261C:028<br>(P740.28) | Favorites settings: Parameter 28<br>(Favorites sett.: Parameter 28)<br>0x00000000 ... [**0x26310400**] ... 0xFFFFFF00 | |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x261C:029<br>(P740.29) | Favorites settings: Parameter 29<br>(Favorites sett.: Parameter 29)<br>0x00000000 ... [**0x26310500**] ... 0xFFFFFF00 | |
| 0x261C:030<br>(P740.30) | Favorites settings: Parameter 30<br>(Favorites sett.: Parameter 30)<br>0x00000000 ... [**0x26310600**] ... 0xFFFFFF00 | |
| 0x261C:031<br>(P740.31) | Favorites settings: Parameter 31<br>(Favorites sett.: Parameter 31)<br>0x00000000 ... [**0x26310700**] ... 0xFFFFFF00 | |
| 0x261C:032<br>(P740.32) | Favorites settings: Parameter 32<br>(Favorites sett.: Parameter 32)<br>0x00000000 ... [**0x26310800**] ... 0xFFFFFF00 | |
| 0x261C:033<br>(P740.33) | Favorites settings: Parameter 33<br>(Favorites sett.: Parameter 33)<br>0x00000000 ... [**0x26310900**] ... 0xFFFFFF00 | |
| 0x261C:034<br>(P740.34) | Favorites settings: Parameter 34<br>(Favorites sett.: Parameter 34)<br>0x00000000 ... [**0x26310D00**] ... 0xFFFFFF00 | |
| 0x261C:035<br>(P740.35) | Favorites settings: Parameter 35<br>(Favorites sett.: Parameter 35)<br>0x00000000 ... [**0x26311200**] ... 0xFFFFFF00 | |
| 0x261C:036<br>(P740.36) | Favorites settings: Parameter 36<br>(Favorites sett.: Parameter 36)<br>0x00000000 ... [**0x26311300**] ... 0xFFFFFF00 | |
| 0x261C:037<br>(P740.37) | Favorites settings: Parameter 37<br>(Favorites sett.: Parameter 37)<br>0x00000000 ... [**0x26311400**] ... 0xFFFFFF00 | |
| 0x261C:038<br>(P740.38) | Favorites settings: Parameter 38<br>(Favorites sett.: Parameter 38)<br>0x00000000 ... [**0x26340100**] ... 0xFFFFFF00 | |
| 0x261C:039<br>(P740.39) | Favorites settings: Parameter 39<br>(Favorites sett.: Parameter 39)<br>0x00000000 ... [**0x26340200**] ... 0xFFFFFF00 | |
| 0x261C:040<br>(P740.40) | Favorites settings: Parameter 40<br>(Favorites sett.: Parameter 40)<br>0x00000000 ... [**0x26360100**] ... 0xFFFFFF00 | |
| 0x261C:041<br>(P740.41) | Favorites settings: Parameter 41<br>(Favorites sett.: Parameter 41)<br>0x00000000 ... [**0x26360200**] ... 0xFFFFFF00 | |
| 0x261C:042<br>(P740.42) | Favorites settings: Parameter 42<br>(Favorites sett.: Parameter 42)<br>0x00000000 ... [**0x26360300**] ... 0xFFFFFF00 | |
| 0x261C:043<br>(P740.43) | Favorites settings: Parameter 43<br>(Favorites sett.: Parameter 43)<br>0x00000000 ... [**0x26390100**] ... 0xFFFFFF00 | |
| 0x261C:044<br>(P740.44) | Favorites settings: Parameter 44<br>(Favorites sett.: Parameter 44)<br>0x00000000 ... [**0x26390200**] ... 0xFFFFFF00 | |
| 0x261C:045<br>(P740.45) | Favorites settings: Parameter 45<br>(Favorites sett.: Parameter 45)<br>0x00000000 ... [**0x26390300**] ... 0xFFFFFF00 | |
| 0x261C:046<br>(P740.46) | Favorites settings: Parameter 46<br>(Favorites sett.: Parameter 46)<br>0x00000000 ... [**0x26390400**] ... 0xFFFFFF00 | |
| 0x261C:047<br>(P740.47) | Favorites settings: Parameter 47<br>(Favorites sett.: Parameter 47)<br>0x00000000 ... [**0x29110100**] ... 0xFFFFFF00 | |
| 0x261C:048<br>(P740.48) | Favorites settings: Parameter 48<br>(Favorites sett.: Parameter 48)<br>0x00000000 ... [**0x29110200**] ... 0xFFFFFF00 | |
| 0x261C:049<br>(P740.49) | Favorites settings: Parameter 49<br>(Favorites sett.: Parameter 49)<br>0x00000000 ... [**0x29110300**] ... 0xFFFFFF00 | |



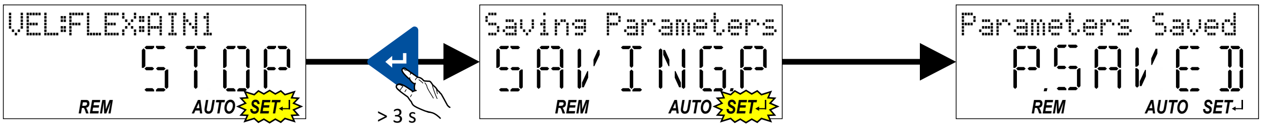
| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x261C:050<br>(P740.50) | Favorites settings: Parameter 50<br>(Favorites sett.: Parameter 50)<br>0x00000000 ... [**0x29110400**] ... 0xFFFFFF00 | |

## 4.5 Saving the parameter settings

### 4.5.1 Save parameter settings with keypad

If one parameter setting has been changed with the keypad but has not been saved in the memory module with mains failure protection, the SET display is blinking.

In order to save parameter settings in the user memory of the memory module, press and hold the enter key for longer than 3 s.




### 4.5.2 Save parameter settings with »EASY Starter«

If a parameter setting has been changed with the »EASY Starter« but not yet saved in the memory medium with mains failure protection, the status line of the »EASY Starter« displays the note "The parameter set was changed".

There are 3 options to save the parameter settings in the user memory of the storage medium

- Click the button in the toolbar of the »EASY Starter« .
- Press the function key **F6**.
- Execute the device command "Save user data": 0x2022:003 (P700.03) = "On / start [1]".

### 4.5.3 Saving the settings

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2829<br>(P732.00) | Automatic storage in the memory module<br>(Auto-Save EPM) | | 1 = Activate automatic saving of parameters in the memory module. Saving is undertaken to a parameter stored on the memory module with each write cycle. An excessively high number of write cycles reduces the service life of the memory module.<br>• With the setting 0, the "Save user data" 0x2022:003 (P700.03) device command must be explicitly executed, or the enter key must be pressed and held for longer than 3 s to save the current parameter settings in the memory module of the inverter with mains failure protection.<br>**Warning**<br>The "Automatic saving" function must not be used together with cyclical writing of parameters via PDO. |
| | **0** | **Inhibit** | |
| | 1 | Enable | |

# 5 Basic setting

## 5.1 Device name

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2001<br>(P191.00) | Device name<br>(Device name)<br>["**My Device**"] | Any device name can be set in this object for the purpose of device identification. |

## 5.2 Mains voltage

The rated mains voltage set for the inverter has an impact on the operating range of the inverter.

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2540:001<br>(P208.01) | Mains settings: Rated mains voltage<br>(Mains settings: Mains voltage)<br>• Setting can only be changed if the inverter is disabled. | | Selection of the mains voltage for actuating the inverter. |
| | **0** | **230 Veff** | |
| | 1 | 400 Veff | |
| | 2 | 480 Veff | |
| | 3 | 120 Veff | |
| | 5 | 480 Veff (600 V devices) | |
| | 6 | 600 Veff | |
| | 10 | 230 Veff/reduced LU level | |
| 0x2540:002<br>(P208.02) | Mains settings: Undervoltage warning threshold<br>(Mains settings: LU warn. thresh.)<br>0 ... [**0**]* ... 1000 V<br>* Default setting dependent on the model. | | Monitoring for undervoltage (LU) in the DC bus: Setting of the warning threshold.<br>• If the DC voltage in the DC bus falls below the threshold set, the inverter outputs a warning.<br>• The warning is reset with a hysteresis of 10 V. |
| 0x2540:003<br>(P208.03) | Mains settings: Undervoltage error threshold<br>(Mains settings: LU error thresh.)<br>• Read only: x V | | Monitoring for undervoltage (LU) in the DC bus: Display of the fixed threshold.<br>• If the DC voltage in the DC bus falls below the threshold displayed, the error"" response is triggered. |
| 0x2540:004<br>(P208.04) | Mains settings: Undervoltage reset threshold<br>(Mains settings: LU reset thresh.)<br>• Read only: x V | | Display of the fixed reset threshold for monitoring DC bus undervoltage. |
| 0x2540:005<br>(P208.05) | Mains settings: Overvoltage warning threshold<br>(Mains settings: OU warn. thresh.)<br>0 ... [**0**]* ... 1000 V<br>* Default setting dependent on the model. | | Monitoring for overvoltage (OU) in the DC bus: Setting of the warning threshold.<br>• If the DC bus voltage exceeds the threshold set, the inverter outputs a warning.<br>• The warning is reset with a hysteresis of 10 V. |
| 0x2540:006<br>(P208.06) | Mains settings: Overvoltage error threshold<br>(Mains settings: OU error thresh.)<br>• Read only: x V | | Monitoring for overvoltage (OU) in the DC bus: Display of the fixed threshold.<br>• If the DC-bus voltage exceeds the threshold displayed, the "Fault" response is triggered. |
| 0x2540:007<br>(P208.07) | Mains settings: Overvoltage reset threshold<br>(Mains settings: OU reset thresh.)<br>• Read only: x V | | Display of the fixed reset threshold for monitoring DC bus overvoltage. |

## 5.3 Dual rating

The inverter has two different load characteristics: "Light Duty" and "Heavy Duty". The load characteristic "Light Duty" enables a higher output current with restrictions regarding overload capacity, ambient temperature and switching frequency. As a result, the motor can be driven by a less powerful inverter. The selected load characteristic depends on the application.

**NOTICE**

Load characteristic "Light Duty"

In order to avoid irreversible damage to the inverter/motor:

- Based on the configuration document, check whether the inverter can be operated with the load characteristic "Light Duty".
- Comply with all data in the configuration document for this load characteristic and the corresponding mains voltage range. Among other things, this includes information on the type of installation and required fuses, cable cross-sections, mains chokes and filters.
- Set the parameters only in accordance with the following specifications .

### Details

The following table compares the two load characteristics:

| | **Duty selection**0x2D43:001 (P306.01) | |
|---|---|---|
| | **"Heavy Duty [0]"** | **"Light Duty [1]"** |
| Characteristics | High dynamic requirements | Low dynamic requirements |
| Typical applications | Main tool drives, travelling drives, hoist drives, winders, forming drives, and conveyors. | Centrifugal pumps, fans, general horizontal materials handling technology, line drives and centrifugal pumps. |
| Overload capacity | 3 s/200 %, 60 s/150 %<br>For details see configuration document | Reduced overload<br>For details see configuration document |

If the inverter is reset to the default setting, the load characteristic is set to "Heavy Duty [0]".

### Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2D43:001<br>(P306.01) | Inverter load characteristic: Duty selection<br>(Inv. load char.: Duty selection)<br>• Setting can only be changed if the inverter is disabled. | | Selection of the load characteristic.<br>Further required settings:<br>• Set the data of the motor used.<br>• Set application-specific parameters such as current limits. |
| | **0** | **Heavy Duty** | Load characteristic for high dynamic requirements. |
| | 1 | Light Duty | Load characteristic for low dynamic requirements.<br>• The device overload monitoring (i*t) is adapted.<br>CAUTION!<br>Observe the information in the configuration document for this load characteristic. |

### Related topics


- Motor data 45
- Maximum overload current of the inverter 233

## 5.4 Frequency limits

The frequency range can be limited by setting a minimum and maximum frequency.

**Parameter**

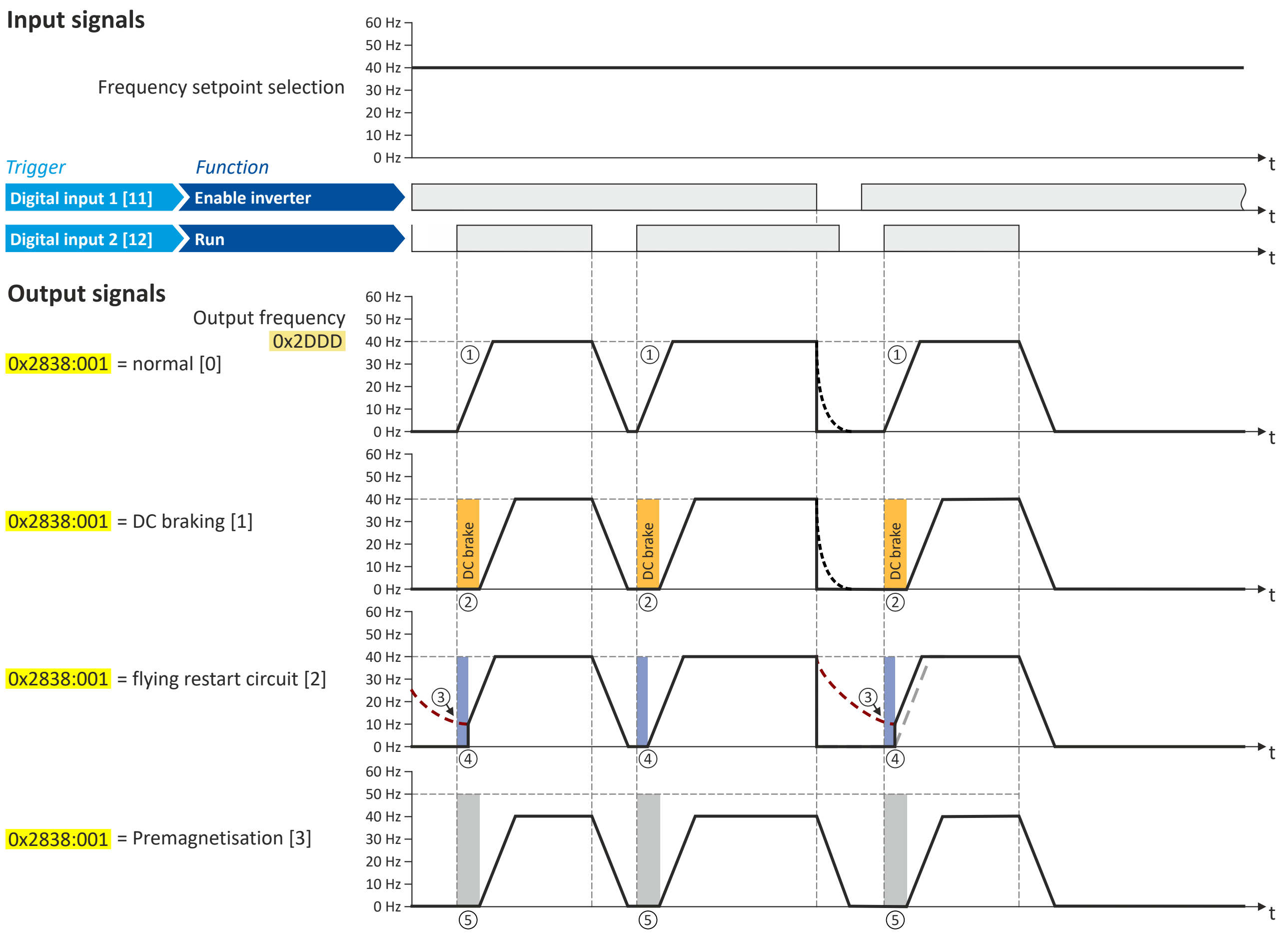
| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2915<br>(P210.00) | Minimum frequency<br>(Min. frequency)<br>0.0 ... [**0.0**] ... 599.0 Hz | Lower limit value for all frequency setpoints. |
| 0x2916<br>(P211.00) | Maximum frequency<br>(Max. frequency)<br>Device for 50-Hz mains: 0.0 ... [**50.0**] ... 599.0 Hz<br>Device for 60-Hz mains: 0.0 ... [**60.0**] ... 599.0 Hz | Upper limit value for all frequency setpoints. |

## 5.5 Start behavior

The start can be optionally made with DC braking or flying restart circuit. Moreover, an automatic start can be activated after switch-on.

### Details

The start method can be selected in 0x2838:001 (P203.01). The following diagram demonstrates the different start methods:




① Start method = "Normal [0]": After the start command, the motor is accelerated to the setpoint with the set acceleration time.

② Start method = "DC braking [1]": After the start command, the "DC braking" function is active. Only after the hold time set in 0x2B84:002 (P704.02) has elapsed is the motor accelerated to the setpoint with the set acceleration time.
▸ DC braking 190

③ For demonstrating the flying restart circuit: At the time of the start command, the motor is not at a standstill (for instance due to loads with high inertia such as fans or flywheels).

④ Start method = "Flying restart circuit [2]": After the start command, the flying restart circuit is active. The flying restart circuit serves to restart a coasting motor on the fly during operation without speed feedback. The synchronicity between inverter and motor is coordinated so that the transition to the rotating motor is effected without jerk at the time of connection.
▸ Flying restart circuit 182

⑤ Start method = "Pre-magnetisation [3]": normal start and premagnetisation - this setting corresponds to the setting [0] normal, but adds the premagnetisation of the motor before the motor rotation begins. The premagnetisation property is generally relevant when operating in V/f motor control modes.
Some asynchronous motors which have a lower stator resistance can experience high amperages when accelerating from a stopped/deactivated state. The premagnetisation property can reduce the motor current during the acceleration and is able to generate a more even acceleration curve with this motor. A property of the start method is a slight delay before the motor acceleration begins.

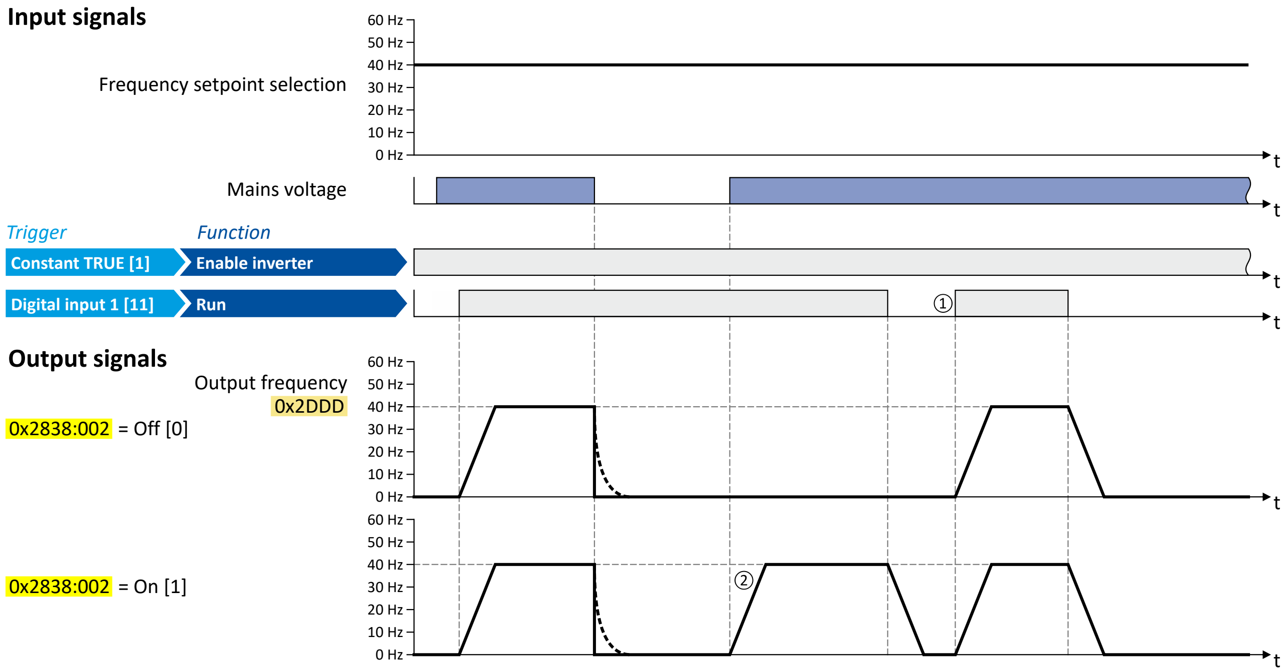
### Automatic start after switching on the mains voltage

The automatic start can be activated in 0x2838:002 (P203.02).

Preconditions for the automatic start:

- The flexible I/O configuration is selected: 0x2824 (P200.00) = "Flexible I/O configuration [0]"
- For the start command, a digital input has been configured. (In case of keypad or activated network control, an automatic start is not possible.)

The following diagram demonstrates the function:




① Start at power-up = "Off [0]": After switching on the mains voltage, a renewed start command is required to start the motor.

② Start at power-up = "On [1]": After switching on the mains voltage, the motor starts automatically if a start command is present.

## Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2838:001 (P203.01) | Start/stop configuration: Start method (Start/stop confg: Start method)<br>• Setting can only be changed if the inverter is disabled. | | Response after starting command. |
| | **0** | **Normal** | After start command, the standard ramps are active.<br>• Acceleration time 1 can be set in 0x2917 (P220.00).<br>• Deceleration time 1 can be set in 0x2918 (P221.00). |
| | 1 | DC braking | After start command, the "DC braking" function is active for the time set in 0x2B84:002 (P704.02).<br>▸ DC braking 190<br>⚠ CAUTION!<br>Deactivate automatic DC braking, if a holding brake is used. |
| | 2 | Flying restart circuit | After the start command, the flying restart circuit is active.<br>The flying restart function makes it possible to restart a coasting motor during operation without speed feedback. The course between the inverter and motor is coordinated so that the transition to the rotating motor is effected without jerk at the time of connection.<br>▸ Flying restart circuit 182 |
| | 3 | Pre-magnetisation (from version 05.03) | This setting corresponds to the setting [0] Normal, but adds the premagnetisation of the motor before the rotation/acceleration begins. The premagnetisation can reduce the motor current during the acceleration and generate a more even acceleration curve (by avoiding overcurrent situations).<br>The premagnetisation function is relevant when operating in V/f motor control modes. The premagnetisation causes a slight delay before the motor acceleration begins (typically 50-200 ms, depending on motor characteristic). |
| 0x2838:002 (P203.02) | Start/stop configuration: Start at power-up (Start/stop confg: Start at powerup) | | Start behavior after switching on the mains voltage. |
| | **0** | **Off** | No automatic start after switching on mains voltage. In addition to the inverter enable, a renewed start command is always required to start the motor. |
| | 1 | On | Automatic start of the motor after switching on the mains voltage if the inverter is enabled and a start command exists. |

## Related topics

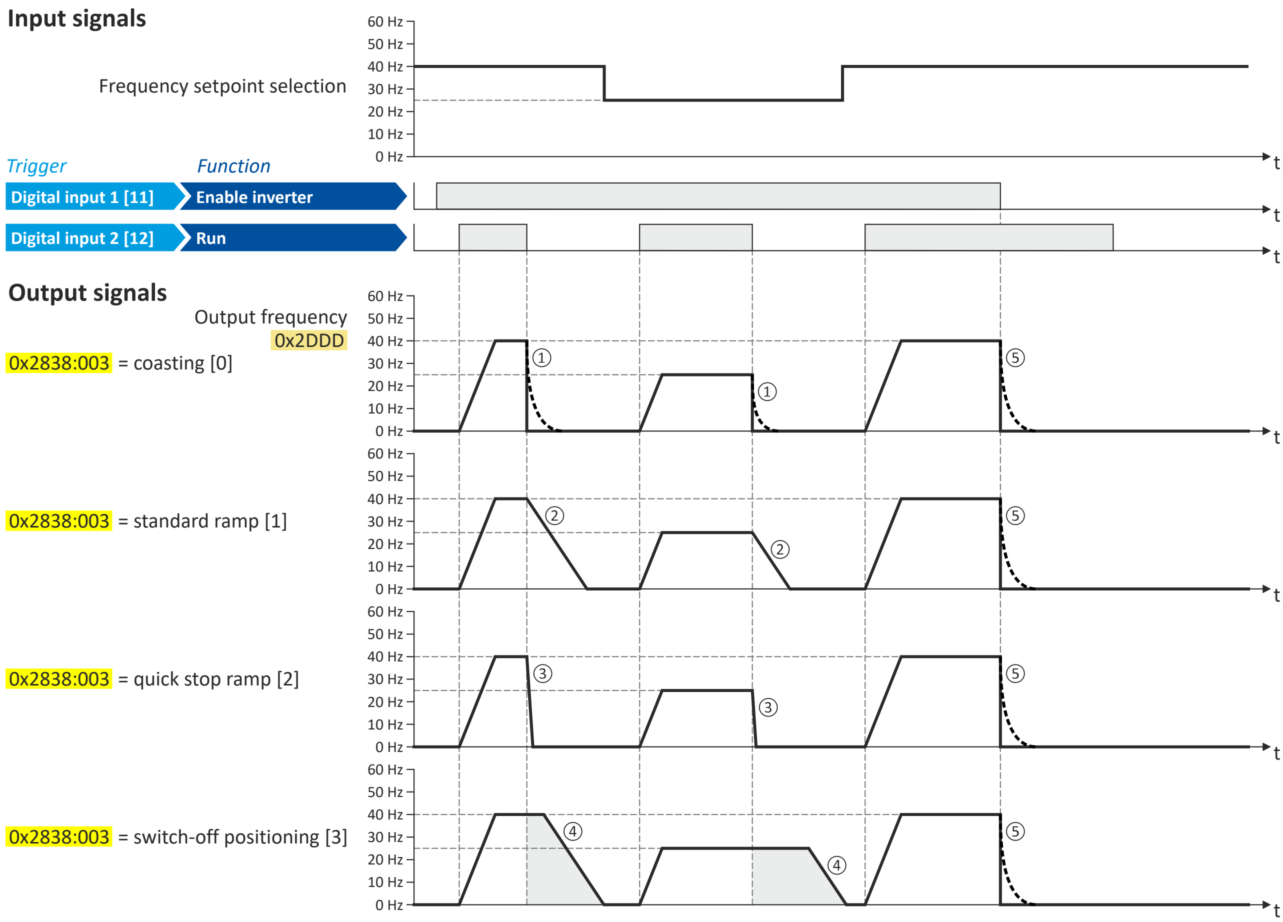

▸ Start, stop and rotating direction commands 49

## 5.6 Stop behavior

In the default setting, the motor is brought to a standstill after a stop command with standard ramp. Alternatively, coasting, ramping down with quick stop ramp or a switch-off positioning can be selected.

### Details

The stop method can be selected in 0x2838:003 (P203.03). The following diagram demonstrates the different stop methods:




① Stop method = "Coasting [0]": The motor coasts down.

② Stop method = "Standard ramp [1]": The motor is brought to standstill with a deceleration time 1 (here: 10 s).

③ Stop method = "Quick stop ramp [2]": The motor is brought to a standstill with the deceleration time for quick stop (here: 1 s).

④ Stop method = "Switch-off positioning [3]": this method is similar to the stop method "Standard ramp". Depending on the current output frequency, however, the inverter delays the beginning of the down-ramping so that the number of motor revolutions until a standstill is reached and thus the stopping position is always relatively constant.

⑤ If "Enable inverter" is set to FALSE, the inverter is disabled. The motor has no torque and coasts to standstill depending on the mass inertia of the machine (irrespective of the set stop method).

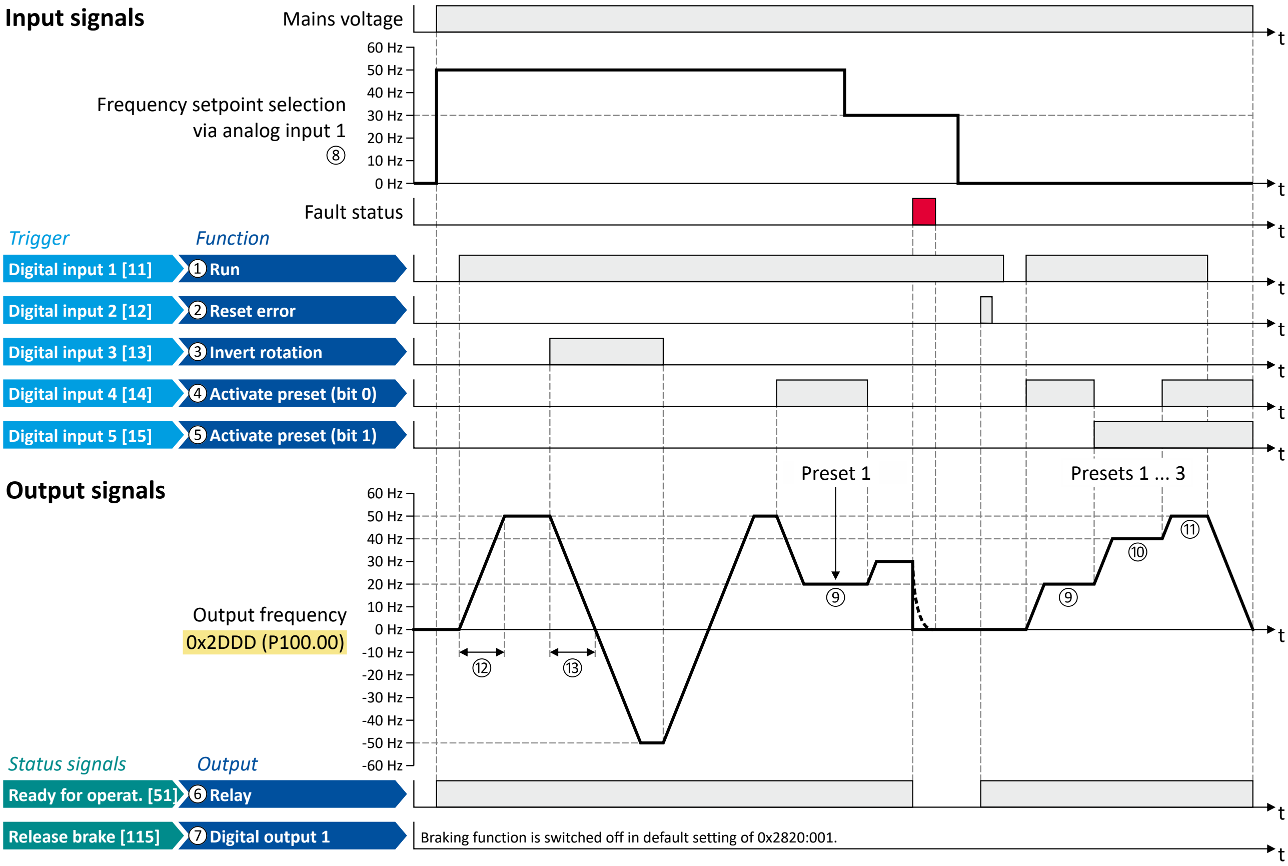


**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2838:003<br>(P203.03) | Start/stop configuration: Stop method<br>(Start/stop confg: Stop method) | | Response after stop command. |
| | 0 | Coasting | The motor has no torque (coasts down to standstill). |
| | **1** | **Standard ramp** | The motor is brought to a standstill with deceleration time 1 (or deceleration time 2, if activated).<br>• Deceleration time 1 can be set in 0x2918 (P221.00).<br>• Deceleration time 2 can be set in 0x291A (P223.00).<br>▸ Ramp times 📖 80 |
| | 2 | Quick stop ramp | The motor is brought to a standstill with the deceleration time set for the "Quick stop" function.<br>• Deceleration time for quick stop can be set in 0x291C (P225.00).<br>• The "quick stop" function can also be activated manually, for instance via a digital input. ▸ Flexible I/O configuration of the start, stop and rotating direction commands 📖 54 |
| | 3 | Switch-off positioning (from version 05.01) | Is similar to the stop method "Standard ramp [1]". Depending on the current output frequency, however, the inverter delays the beginning of the down-ramping so that the number of motor revolutions until a standstill and thus the stopping position is always relatively constant.<br>▸ "Switch-off positioning" stop mode 📖 141 |

## 5.7 Function assignment of the inputs and outputs (default setting)

By default, the inverter can be controlled via the I/O terminals as follows:




| Parameter | | | Designation | Default setting |
|---|---|---|---|---|
| Control functions | | | | |
| ① | 0x2631:002 | (P400.02) | Run | Digital input 1 [11] |
| ② | 0x2631:004 | (P400.04) | Reset fault | Digital input 2 [12] |
| ③ | 0x2631:013 | (P400.13) | Reverse rotational direction | Digital input 3 [13] |
| ④ | 0x2631:018 | (P400.18) | Activate preset (bit 0) | Digital input 4 [14] |
| ⑤ | 0x2631:019 | (P400.19) | Activate preset (bit 1) | Digital input 5 [15] |
| Configuration of digital outputs | | | | |
| ⑥ | 0x2634:001 | (P420.01) | Relay | Ready for operation [51] |
| ⑦ | 0x2634:002 | (P420.02) | Digital output 1 | Release holding brake [115] |
| Settings for the frequency setpoint | | | | |
| ⑧ | 0x2860:001 | (P201.01) | Frequency control: Default setpoint source | Analog input 1 [2] |
| ⑨ | 0x2911:001 | (P450.01) | Frequency setpoint presets: Preset 1 | 20 Hz |
| ⑩ | 0x2911:002 | (P450.02) | Frequency setpoint presets: Preset 2 | 40 Hz |
| ⑪ | 0x2911:003 | (P450.03) | Frequency setpoint presets: Preset 3 | 50 Hz |
| ⑫ | 0x2917 | (P220.00) | Acceleration time 1 | 5.0 s |
| ⑬ | 0x2918 | (P221.00) | Deceleration time 1 | 5.0 s |

All functional possible settings for controlling the inverter are described in the "Start, stop and rotating direction commands" chapter. 📖 49



## 5.8 Motor data

The term "motor data" comprises all parameters only depending on the motor and only characterising the electrical behaviour of the motor. Motor data are independent of the application in which the inverter and the motor are used.

**Preconditions**

The equivalent circuit data ("Settings" tab, path: "Basic setting\motor", parameterisation dialog "Derived motor properties and equivalent circuit") apply to a motor in star connection. In case of a motor in delta connection, the delta values must be converted into equivalent star values.

**Possible settings**

If a Lenze motor is connected to the inverter, you can select the motor in the engineering tool from the "motor catalogue".

- For details see chapter "Select motor from motor catalog". 46

Otherwise the motor data must be set manually (for details see chapter "Manual setting of the motor data“). 47

### 5.8.1 Select motor from motor catalog

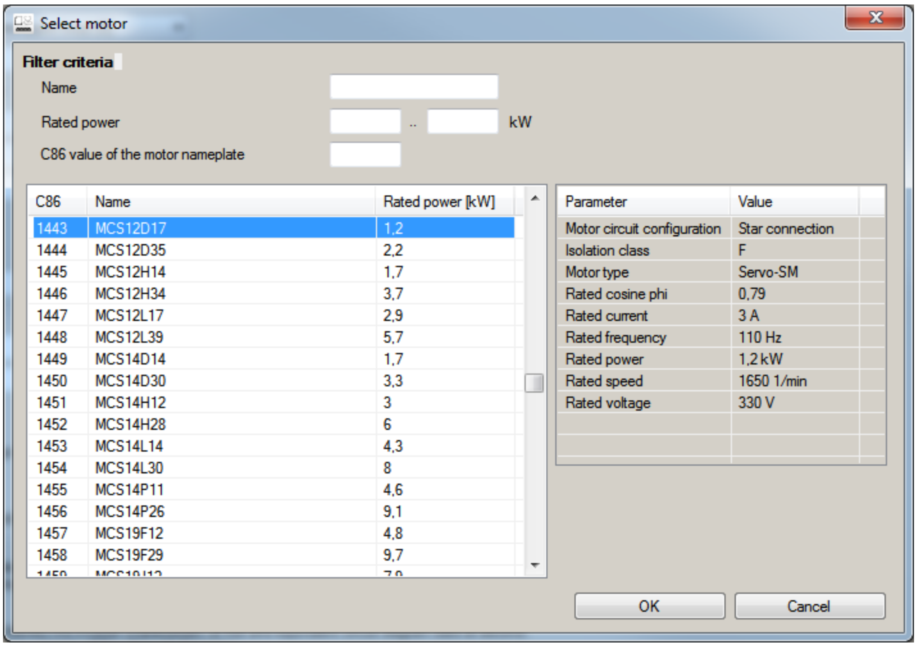
The following describes how to parameterise your drive system by selecting a Lenze motor from the motor catalogue. Several processes are started invisibly in the background to load/ calculate the settings for the relevant parameters.

**Preconditions**

- Access to a Lenze engineering tool (e. g. »EASY Starter«).
- Parameters can be set online or offline (with or without connected motor).

**Required steps**

1. Open the Lenze engineering tool that provides for the functionality of a “Motor catalog".
2. Click the **Select motor...** button. In case of the »EASY Starter«, you find the **Select motor...** button on the "settings". tab.
3. Select the motor used in the "Select motor" dialog:




By entering filter criteria, you can restrict the selection.

Name (e. g. "MCS..."), rated power and C86 value can be found on the motor nameplate.

4. Press the **Please select** button to select the thermal sensor.

   This is not required for all motors. For older motors, such as MDSKA056-22 (C86=10), a thermal sensor **CANNOT** be selected.

Observe the notes on the **?** button.

5. Click the **OK** button to start the optimisation.



**Parameterisation sequence**

As soon as the parameterisation has been started, the following steps are initiated by the engineering tool:

1. The motor rating data and the motor equivalent circuit diagram data are loaded from the motor catalogue.
2. The motor controller settings and the speed controller settings are automatically calculated based on the previously loaded data.

Notes:

- The data involved in this parameterisation are provided be the motor catalog alone. Further user data is not required.
- The inverter characteristic is not changed by this optimisation.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2C01:010 | Motor parameters: Motor name | The name (e.g. " 1") can be freely selected by the user.<br>If the motor in the engineering tool has been selected from the "motor catalog", the respective motor name is automatically entered here (example: "MDSKA080-22, 70"). |

### 5.8.2 Manual setting of the motor data

Manually set the motor data in accordance with the manufacturer's information / motor data sheet in the following parameters, provided that a third party motor is connected to the inverter.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2910:001<br>(P335.01) | Inertia settings: Motor moment of inertia<br>(Moment of inert.: Motor inertia)<br>0.00 ... [**3.70**]* ... 20000000.00 kg cm²<br>* Default setting dependent on the model. | Setting of the moment of inertia of the motor, relating to the motor. |
| 0x2C01:001 | Motor parameters: Number of pole pairs<br>• Read only | Display of the number of pole pairs calculated from the rated speed and rated frequency. |
| 0x2C01:002 | Motor parameters: Stator resistance<br>0.0000 ... [**10.1565**]* ... 125.0000 Ω<br>* Default setting dependent on the model. | General motor data.<br>Carry out settings as specified by manufacturer data/motor data sheet.<br><br>Note!<br>When you enter the motor nameplate data, take into account the phase connection implemented for the motor (star or delta connection). Only enter the data applying to the connection type selected. |
| 0x2C01:003 | Motor parameters: Stator leakage inductance<br>0.000 ... [**23.566**]* ... 500.000 mH<br>* Default setting dependent on the model. | |
| 0x2C01:004<br>(P320.04) | Motor parameters: Rated speed<br>(Motor parameters: Rated speed)<br>Device for 50-Hz mains: 50 ... [**1450**] ... 50000 rpm<br>Device for 60-Hz mains: 50 ... [**1750**] ... 50000 rpm | General motor data.<br>Carry out settings as specified by motor nameplate data.<br><br>Note!<br>When you enter the motor nameplate data, take into account the phase connection implemented for the motor (star or delta connection). Only enter the data applying to the connection type selected. |
| 0x2C01:005<br>(P320.05) | Motor parameters: Rated frequency<br>(Motor parameters: Rated frequency)<br>Device for 50-Hz mains: 1.0 ... [**50.0**] ... 1000.0 Hz<br>Device for 60-Hz mains: 1.0 ... [**60.0**] ... 1000.0 Hz | |
| 0x2C01:006<br>(P320.06) | Motor parameters: Rated power<br>(Motor parameters: Rated power)<br>0.00 ... [**0.25**]* ... 655.35 kW<br>* Default setting dependent on the model. | |
| 0x2C01:007<br>(P320.07) | Motor parameters: Rated voltage<br>(Motor parameters: Rated voltage)<br>0 ... [**230**]* ... 65535 V<br>* Default setting dependent on the model. | |
| 0x2C01:008<br>(P320.08) | Motor parameters: Cosine phi<br>(Motor parameters: Cosine phi)<br>0.00 ... [**0.80**] ... 1.00 | |
| 0x2C02:003<br>(P351.03) | Motor parameter (ASM): Magnetising current<br>(ASM motor par.: Magn. current)<br>0.00 ... [**0.96**]* ... 500.00 A<br>* Default setting dependent on the model. | Equivalent circuit data required for the motor model of the asynchronous machine. |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2C03:001<br>(P352.01) | Motor parameter (PSM): Back EMF constant<br>(PSM motor par.: BEMF constant)<br>0.0 ... [**41.8**] ... 100000.0 V/1000rpm<br>• From version 02.00 | Voltage induced by the motor (rotor voltage / 1000 rpm).<br>For permanently excited synchronous motors, the e.m.f. constant describes the r.m.s. value of the line-to-line voltage (phase voltage) induced in idle state by the motor (reference: 1000 rpm, 20 °C).<br>Measured: Line to Line (L - L) |
| 0x6075<br>(P323.00) | Rated motor current<br>(Rated mot.curr.)<br>0.001 ... [**1.700**]* ... 500.000 A<br>* Default setting dependent on the model.<br>• Setting can only be changed if the inverter is disabled. | The rated motor current that needs to be set here serves as a reference value for different parameters that involve a setting for/display of a current value in percent.<br>Example:<br>• Rated motor current = 1.7 A<br>• Max. current 0x6073 (P324.00) = 200 %<br>Rated motor current = 3.4 A |
| 0x6076<br>(P325.00) | Rated motor torque<br>(Rated mot torque)<br>0.001 ... [**1.650**]* ... 4294967.295 Nm<br>* Default setting dependent on the model.<br>• Setting can only be changed if the inverter is disabled. | The rated motor torque to be set here serves as a reference value for different parameters with a setting/display of a torque value in percent.<br>Example:<br>• Rated motor torque = 1.65 Nm<br>• Max. torque 0x6072 (P326.00) = 250 % Rated motor torque = 4.125 Nm |
| 0x6080<br>(P322.00) | Max. motor speed<br>(Max. motor speed)<br>0 ... [**6075**] ... 480000 rpm | Limitation of the max. motor speed. Depending on the parameter setting of 0x2D44:001 (P350.01) (Overspeed monitoring: threshold), the speed limitation (0x6080 / Max. motor speed) may become active before speed monitoring. |

## 5.9 Motor control mode

The inverter supports different modes for closed-loop/open-loop motor control.

### Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2C00<br>(P300.00) | Motor control mode<br>(Motor ctrl mode)<br>• Setting can only be changed if the inverter is disabled. | | Selection of the motor control type. |
| | 3 | Sensorless control (SL PSM) (from version 02.00) | This control type is used for the sensorless control of a synchronous motor.<br>▸ Sensorless control for synchronous motor (SL-PSM) 162 |
| | 4 | Sensorless vector control (SLVC) | This control type is used for sensorless vector control of an asynchronous motor.<br>▸ Sensorless vector control (SLVC) 165 |
| | **6** | **V/f characteristic control (VFC open loop)** | This control mode is used for the speed control of an asynchronous motor via a V/f characteristic and is the simplest control mode.<br>▸ V/f characteristic control for asynchronous motor (VFC open loop) 167 |
| | 8 | Sensorless control for synchronous motors (SLSM-PSM) (from version 05.05) | This control type is used for the sensorless control of a synchronous motor.<br>Compared to the sensorless "SL-PSM" control, the "SLSM-PSM" control offers the following advantages:<br>• Lower power consumption and more torque through HF injection in the lower speed range<br>• Easier commissioning due to support for automatic identification of the motor<br>▸ Sensorless control for synchronous motor (SLSM-PSM) 185 |

The detailed description of each motor control type can be found in the chapter "Configuring the motor control". 160



# 6 Start, stop and rotating direction commands

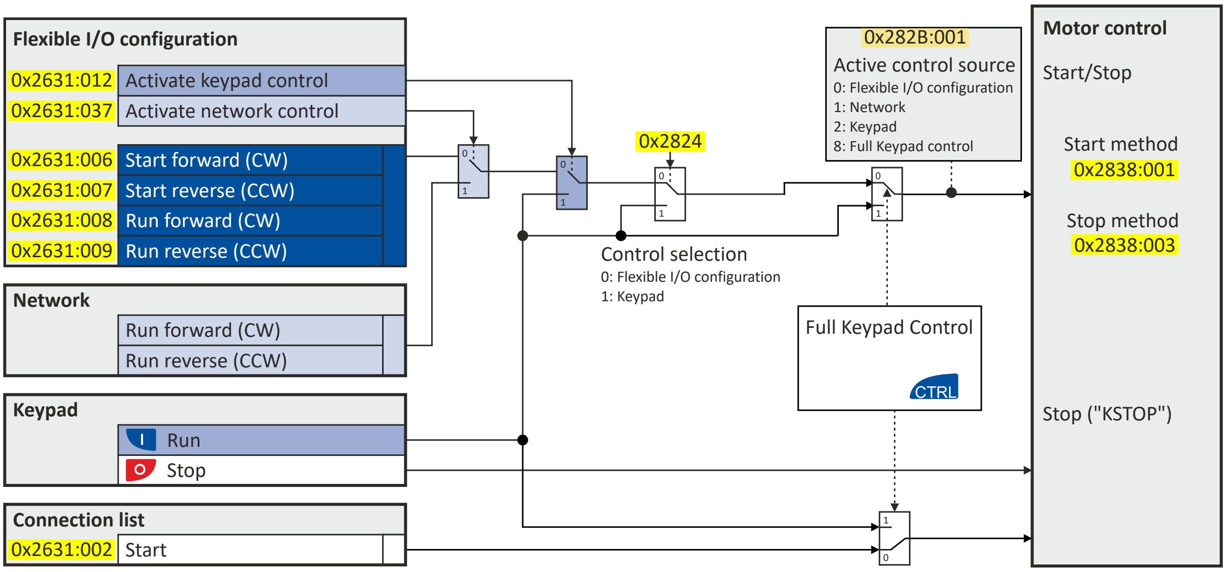
## 6.1 Control selection

The selected "control source" serves to provide the inverter with its start, stop, and reversal commands.

Possible control sources:

- Digital inputs
- Keypad
- Network

The following signal flow shows the internal control logics:




## NOTICE

Stop commands are always active from any connected source, regardless of which control source is selected!

If, for example, the network control is activated and a keypad is plugged in for diagnostic purposes, the motor is also stopped when the keypad key is pressed.

▸ **Exception:** A stop command has no effect in jog operation.

In order to control the inverter from the network, the network share 0x2631:037 (P400.37) must be configured.

In case of an activated network control, the following functions are still active:

- 0x2631:001 (P400.01): Enable inverter
- 0x2631:002 (P400.02): Run
- 0x2631:003 (P400.03): Activate quick stop
- 0x2631:004 (P400.04): Reset error
- 0x2631:005 (P400.05): DC braking
- 0x2631:010 (P400.10): Jog forward (CW)
- 0x2631:011 (P400.11): Jog reverse (CCW)*
- 0x2631:012 (P400.12): Activate keypad control*
- 0x2631:037 (P400.37): Activate network control*
- 0x2631:043 (P400.43): Activate fault 1
- 0x2631:044 (P400.44): Activate fault 2
- 0x2631:054 (P400.54): Reset position counter

(*Not active in case of network operation in CiA402 mode ).

In case of an activated network control, the following functions are also still active if they are not configured in the NetWordIN1 bit functionality:

- 0x2631:048 (P400.48): Activate PID influence ramp
- 0x2631:041 (P400.41): Select parameter set (bit 0)
- 0x2631:042 (P400.42): Select parameter set (bit 1)

All other functions configurable via 0x2631:xx (P400.xx) are deactivated in case of network control.

### Details

- The default setting "Flexible I/O configuration [0]" in 0x2824 (P200.00) enables a flexible control of the inverter via digital inputs, network and keypad. The control of the inverter via the digital inputs is preconfigured. For details see the subchapter "Flexible I/O configuration". 51
- For details of the network control of the inverter, see the chapter "Control the inverter via network". 258
- If the keypad is to be used as the control source for the application, set "Keypad [1]" in 0x2824 (P200.00). For details, see subchapter "Keypad control". 52
- The control source that is currently active is displayed in 0x282B:001 (P125.01).

### Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2824<br>(P200.00) | Control selection<br>(Control select.) | | Selection of the type of inverter control. |
| | **0** | **Flexible I/O configuration** | This selection enables a flexible assignment of the start, stop, and rotating direction commands with digital signal sources.<br>• Digital signal sources can be digital inputs, network and keypad.<br>• The I/O configuration is made via the parameters 0x2631:xx (P400.xx). |
| | 1 | Keypad | This selection enables the motor to be started exclusively via the start key of the keypad. Other signal sources for starting the motor are ignored.<br>I Start motor O Stop motor<br><br>Note!<br>• The functions "Enable inverter" 0x2631:001 (P400.01) and "Run" 0x2631:002 (P400.02) must be set to TRUE to start the motor.<br>• If jog operation is active, the motor cannot be stopped via the O keypad key. |



### 6.1.1 Flexible I/O configuration

Use parameters 0x2631:xx (P400.xx) to individually adapt the inverter control to the respective application. This is basically effected by assigning digital control sources ("triggers") to functions of the inverter.

**NOTICE**

A digital signal source can be assigned to several functions.

Possible consequence: unforeseeable behaviour of the drive in case of incorrect assignment

▶ Carry out assignment of a digital signal source to several functions with greater care.

**Details**

- The flexible I/O configuration is active if the selection "Flexible I/O configuration [0]" (default) is set in 0x2824 (P200.00).
- Each subcode of 0x2631 (P400) is permanently assigned to a specific function. Functions are for example "Enable inverter", "Activate quick stop" or "Start forward (CW)".
- For a function, exactly one (digital) trigger can be set:

| *Trigger* | *Function* |
|---|---|
| Digital input 1 | Run |

- Possible triggers to be selected are for example the digital input and internal status signals of the inverter.
- A list of all available triggers can be found in the "Trigger list". 59
- The corresponding function is executed if the trigger condition is fulfilled.

**Example: changing the function assignment of a digital input**

Task for this example:

1. The preset assignment of the digital input 3 for the function "Reverse rotational direction" is to be cancelled.
2. Instead, the digital input 3 is to be assigned to the "Activate DC braking" function.

   For this purpose, the following two settings are required:

| | Function | | *Trigger* | *Function* |
|---|---|---|---|---|
| Default: | 0x2631:013 | = | Digital input 3 [13] | Invert rotation |
| New: 1. | 0x2631:013 | = | Not connected [0] | Invert rotation |
| 2. | 0x2631:005 | = | Digital input 3 [13] | Activate DC braking |

**Related topics**

▶ Flexible I/O configuration of the start, stop and rotating direction commands 54

### 6.1.2 Keypad control

The "Keypad" control selection enables the motor to be started exclusively via the start key of the keypad. Other signal sources for starting the motor are ignored.

**Details**

If the keypad is to be used as the sole control source for the application, set 0x2824 (P200.00) to "Keypad [1]".

If the local keypad control is active, "LOC" is displayed in the lower status row of the keypad. The keys on the keypad then have the following function:

| Function of keypad keys in operating mode | | | |
|---|---|---|---|
| **Key** | **Actuation** | **Condition** | **Action** |
| I | Briefly | Local keypad control active.<br>Display "LOC" | Run motor. |
| O | Briefly | No Jog operation | Stop motor.<br>Display "KSTOP" |
| ↵ | Briefly | Operating mode | Change to parameterization mode.<br>▸ Keypad parameterisation mode 403 |
| | Longer than 3 s | None (anytime possible) | Save parameter settings in the user memory of the memory module. |
| ↺ | Briefly | During operation | Scroll through information in the above status line. |
| CTRL | Briefly | Operating mode | Activate full keypad control.<br>Display "ON?" → Confirm with ↵<br>Control and setpoint selection can now only be carried out via keypad.<br>Renewed clicking: Exit full keypad control.<br>Display "OFF?" → Confirm with ↵<br>▸ Keypad full control 53 |
| R F | Briefly | Local keypad control active.<br>Display "LOC" | Reversal of rotation direction.<br>Display "REV?" → Confirm with ↵<br>▸ Configure R/F and CTRL keys 426 |

- In case of keypad control, the following functions continue to be active:
  - 0x2631:001 (P400.01): Enable inverter
  - 0x2631:003 (P400.03): Activate quick stop
  - 0x2631:004 (P400.04): Reset fault
  - 0x2631:005 (P400.05): Activate DC braking
  - 0x2631:010 (P400.10): Jog foward (CW)
  - 0x2631:011 (P400.11): Jog reverse (CCW)
  - All other functions of 0x2631:012 (P400.12) - 0x2631:055 (P400.55)

**Related topics**

▸ Keypad 399

### 6.1.3 Keypad full control

The "Keypad Full Control" control mode can be activated with the keypad key “CTRL”. Both the control and the setpoint selection are then made via the keypad. This special control mode can be, for instance, used during the commissioning phase if external control and setpoint sources are not ready to use yet.

**⚠CAUTION!**

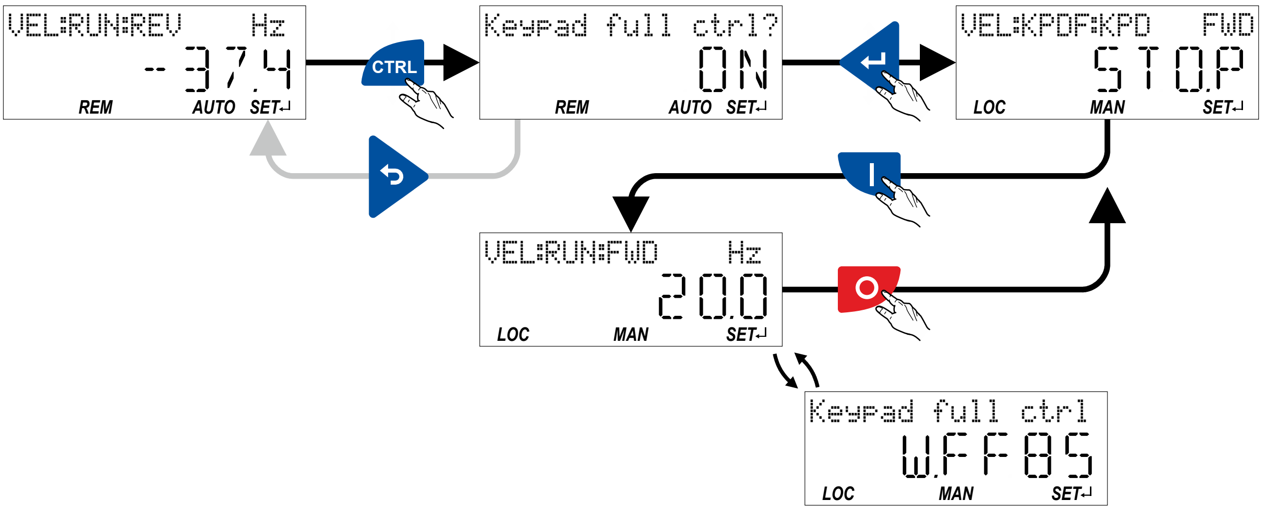
If the "Keypad Full Control" control mode is active, the "Run" 0x2631:002 (P400.02) function is internally set to TRUE.

In this case, the motor cannot be stopped via this function.

- For stopping the motor, use the O keypad key, deactivate the inverter enable or activate the "quick stop" function.

#### Details

- After the "CTRL" key has been pressed, the activation of the control mode must be confirmed with the ↵ key. (The ↶ key serves to cancel the action.)
- When the control mode is changed over, the motor is first stopped and the "Forward" direction of rotation is set. Then, the motor can be started and stopped via the keypad.




If the "Keypad Full Control" control mode is active,

- the keypad shows the warning "Keypad full ctrl" alternately with the status display.
- the set standard setpoint sources are ignored.
- a changeover to other setpoint sources is not possible.
- a changeover to network control is not possible.

In case of keypad control, the following functions continue to be active:

- 0x2631:001 (P400.01): Enable inverter
- 0x2631:003 (P400.03): Activate quick stop
- 0x2631:004 (P400.04): Reset fault
- 0x2631:005 (P400.05): Activate DC braking
- 0x2631:010 (P400.10): Jog foward (CW)
- 0x2631:011 (P400.11): Jog reverse (CCW)
- All other functions of 0x2631:012 (P400.12) - 0x2631:055 (P400.55)

The control mode can be terminated again if the "CTRL" keypad key is pressed again.

#### Related topics

▸ Configure R/F and CTRL keys 📖 426

## 6.2 Flexible I/O configuration of the start, stop and rotating direction commands

Configuration of the triggers for the basic functions for controlling the motor.

### Details

The following table contains a short overview of the basic functions. For more details see the following parameter descriptions.

| Function | Info |
|---|---|
| Enable inverter<br>0x2631:001 (P400.01) | Enable/disable operation.<br>• The function must be set to TRUE to start the motor. Either via a digital input or the default setting "Constant TRUE [1]".<br>• If the function is set to FALSE, the inverter is disabled. The motor has no torque (coasts).<br>▸ Example: Enable inverter 68 |
| Run<br>0x2631:002 (P400.02) | Function 1: Start / stop motor (default setting)<br>• Function 1 is active if no further start commands (start forward/start reverse) have been connected to triggers, no keypad control is active and no network control is active.<br>TRUE: Let motor rotate forward (CW).<br>FALSE: Stop the motor.<br>▸ Example: Start/stop (1 signal) and reversal 62 |
| | Function 2: Start enable/stop motor<br>• Function 2 is active if further start commands have been connected to triggers, the keypad control is active or the network control is active.<br>TRUE: Start commands of the active control source are enabled.<br>FALSE: Stop the motor.<br>▸ Example: Start forward/start reverse/stop (edge-controlled) 63<br>▸ Example: Run forward/Run reverse/stop (status-controlled) 65 |
| Activate quick stop<br>0x2631:003 (P400.03) | Bring the motor to a standstill in best time.<br>▸ Example: Quick stop 67 |
| Start forward (CW)<br>0x2631:006 (P400.06)<br>Start reverse (CCW)<br>0x2631:007 (P400.07) | Start the motor edge-controlled.<br>• In order to be able to start the motor, the "Run" function must be set to TRUE.<br>• The motor is stopped by resetting the "Run" function to FALSE.<br>• The functions are deactivated in case of keypad or network control.<br>▸ Example: Start forward/start reverse/stop (edge-controlled) 63 |
| Run forward (CW)<br>0x2631:008 (P400.08)<br>Run reverse (CCW)<br>0x2631:009 (P400.09) | Let the motor rotate in a status-controlled way.<br>• In order to be able to start the motor, the "Run" function must be set to TRUE.<br>• The functions are deactivated in the case of keypad or network control.<br>▸ Example: Run forward/Run reverse/stop (status-controlled) 65 |
| Jog foward (CW)<br>0x2631:010 (P400.10)<br>Jog reverse (CCW)<br>0x2631:011 (P400.11) | Jog operation: Let the motor rotate in a status-controlled way with setpoint preset.<br>⚠ CAUTION!<br>The jog operation has a higher priority than the "Run" function, all other start commands and the keypad key .<br>• If the jog operation is active, the motor cannot be stopped with the previously mentioned functions!<br>• However, jog operation can be interrupted by the "Quick stop" function.<br>• Jog operation can always be activated, even in case of keypad or network control.<br>▸ Example: Jog forward/Jog reverse 69 |
| Reverse rotational direction<br>0x2631:013 (P400.13) | Invert the frequency setpoint.<br>• The function can be used in combination with all start commands.<br>• The function is deactivated in the case of network control.<br>▸ Example: Start/stop (1 signal) and reversal 62 |

### Assignment guidelines

The error message "Trigger/functions connected incorrectly" (error code 25216 | 0x6280) is output if one of the following assignment guidelines is not observed:

- If the "flexible I/O configuration" is active as control source, the "Enable inverter" or "Run" function must be connected to a digital input in order that the motor can be stopped again any time!
- With keypad or network control, the two functions "Enable inverter" and "Run" can also be set to "Constant TRUE [1]" to start the motor.
- The use of the "Start forward (CW)" and "Start reverse (CCW)" functions excludes the use of the "Run forward (CW)" and "Run reverse (CCW)" functions, and vice versa.



**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2631:001<br>(P400.01) | Function list: Enable inverter<br>(Function list: Enable inverter)<br>• Setting can only be changed if the inverter is disabled.<br>• Further possible settings: ▸ Trigger list 🕮 59 | Assignment of a trigger for the "Enable inverter" function.<br>Trigger = TRUE: The inverter is enabled (unless there is another cause for inverter disable).<br>Trigger = FALSE: The inverter is disabled.<br>Notes:<br>• This function must be set to TRUE to start the motor. The signal TRUE is activated either via an assigned digital input or the default setting "Constant TRUE [1]".<br>• Changing to the inhibited state causes an immediate stop of the motor, regardless of the stop method set in 0x2838:003 (P203.03). The motor has no torque and coasts down.<br>• The cause(s) for the inhibited state are shown in 0x282A:001 (P126.01).<br>▸ Example: Enable inverter 🕮 68 |
| | **1** **Constant TRUE** | Trigger is constantly TRUE. |
| 0x2631:002<br>(P400.02) | Function list: Run<br>(Function list: Run)<br>• Setting can only be changed if the inverter is disabled.<br>• Further possible settings: ▸ Trigger list 🕮 59 | Assignment of a trigger to the "Run" function.<br><br>**Function 1: Start / stop motor (default setting)**<br>Function 1 is active if no further starting commands (start forward/start reverse) have been connected to triggers, no keypad control is active and no network control is active.<br>Trigger = TRUE: Let motor rotate forward (CW).<br>Trigger = FALSE: Stop motor.<br>Notes to function 1:<br>• If "Enable inverter" 0x2631:001 (P400.01) is set = "Constant TRUE [1]", the only permissible trigger for this function is a digital input in order that the motor can be stopped again any time.<br>• The stop method can be selected in 0x2838:003 (P203.03).<br>• The function also serves to realize an automatic start after switch-on. ▸ Start behavior 🕮 39<br>▸ Example: Start/stop (1 signal) and reversal 🕮 62<br><br>**Function 2: Start enable/stop motor**<br>Function 2 is active if further starting commands have been connected to triggers, keypad control is active or network control is active.<br>Trigger = TRUE: Startbefehle der aktiven Steuerquelle sind freigeben.<br>Trigger = FALSE: Stop motor.<br>Notes to function 2:<br>• If no separate start enable is required for the application, the trigger "Constant TRUE [1]" must be set.<br>• The stop method can be selected in 0x2838:003 (P203.03).<br>▸ Example: Start forward/start reverse/stop (edge-controlled) 🕮 63<br>▸ Example: Run forward/Run reverse/stop (status-controlled) 🕮 65 |
| | **11** **Digital input 1** | State of X3/DI1, taking an inversion set in 0x2632:001 (P411.01) into consideration. |
| 0x2631:003<br>(P400.03) | Function list: Activate quick stop<br>(Function list: Quick stop)<br>• Setting can only be changed if the inverter is disabled.<br>• Further possible settings: ▸ Trigger list 🕮 59 | Assignment of a trigger for the "Activate quick stop" function.<br>Trigger = TRUE: Activate quick stop.<br>Trigger = FALSE: Deactivate quick stop.<br>Notes:<br>• The "Quick stop" function brings the motor to a standstill within the deceleration time set in 0x291C (P225.00).<br>▸ Example: Quick stop 🕮 67 |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2631:006<br>(P400.06) | Function list: Start forward (CW)<br>(Function list: Start forward)<br>• Setting can only be changed if the inverter is disabled.<br>• Further possible settings: ▸ Trigger list 📖 59 | Assignment of a trigger for the "Start forward (CW)" function.<br>Trigger = FALSE↗TRUE (edge): Let motor rotate forward.<br>Trigger = TRUE↘FALSE (edge): No action.<br>Notes:<br>• In order to start the motor, "Enable inverter" 0x2631:001 (P400.01) and "Run" 0x2631:002 (P400.02) must be set to TRUE.<br>• After the start, the motor runs until "Run" is set to FALSE, another stop command is given or the inverter is disabled.<br>• In the case of a bipolar setpoint selection (e.g. ±10 V), the function is executed independent of the direction of rotation. The rotating direction is determined by the sign of the setpoint.<br>▸ Example: Start forward/start reverse/stop (edge-controlled) 📖 63 |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:007<br>(P400.07) | Function list: Start reverse (CCW)<br>(Function list: Start reverse)<br>• Setting can only be changed if the inverter is disabled.<br>• Further possible settings: ▸ Trigger list 📖 59 | Assignment of a trigger for the "Start reverse (CCW)" function<br>Trigger = FALSE↗TRUE (edge): Let motor rotate backward.<br>Trigger = TRUE↘FALSE (edge): No action.<br>Notes:<br>• In order to start the motor, "Enable inverter" 0x2631:001 (P400.01) and "Run" 0x2631:002 (P400.02) must be set to TRUE.<br>• After the start, the motor runs until "Run" is set to FALSE, another stop command is given or the inverter is disabled.<br>• In the case of a bipolar setpoint selection (e.g. ±10 V), the function is executed independent of the direction of rotation. The rotating direction is determined by the sign of the setpoint.<br>▸ Example: Start forward/start reverse/stop (edge-controlled) 📖 63 |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:008<br>(P400.08) | Function list: Run forward (CW)<br>(Function list: Run forward)<br>• Setting can only be changed if the inverter is disabled.<br>• Further possible settings: ▸ Trigger list 📖 59 | Assignment of a trigger for the "Run forward (CW)" function.<br>Trigger = TRUE: Let motor rotate forward.<br>Trigger = FALSE: Stop motor.<br>Notes:<br>• In order to start the motor, "Enable inverter" 0x2631:001 (P400.01) and "Run" 0x2631:002 (P400.02) must be set to TRUE.<br>• The inverter always responds to the run command detected last. A start enable must exist.<br>• The stop method can be selected in 0x2838:003 (P203.03).<br>• In the case of a bipolar setpoint selection (e.g. ±10 V), the function is executed independent of the direction of rotation. The rotating direction is determined by the sign of the setpoint.<br>• The "Run forward (CW)" function also serves to realise an automatic start after switch-on. ▸ Start behavior 📖 39<br>▸ Example: Run forward/Run reverse/stop (status-controlled) 📖 65 |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:009<br>(P400.09) | Function list: Run reverse (CCW)<br>(Function list: Run reverse)<br>• Setting can only be changed if the inverter is disabled.<br>• Further possible settings: ▸ Trigger list 📖 59 | Assignment of a trigger for the "Run reverse (CCW)" function.<br>Trigger = TRUE: Let motor rotate backward.<br>Trigger = FALSE: Stop motor.<br>Notes:<br>• In order to start the motor, "Enable inverter" 0x2631:001 (P400.01) and "Run" 0x2631:002 (P400.02) must be set to TRUE.<br>• The inverter always responds to the run command detected last. A start enable must exist.<br>• The stop method can be selected in 0x2838:003 (P203.03).<br>• In the case of a bipolar setpoint selection (e.g. ±10 V), the function is executed independent of the direction of rotation. The rotating direction is determined by the sign of the setpoint.<br>• The "Run reverse (CCW)" function also serves to realise an automatic start after switch-on. ▸ Start behavior 📖 39<br>▸ Example: Run forward/Run reverse/stop (status-controlled) 📖 65 |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |



| Address | Name / setting range / [default setting] | | Information |
| --- | --- | --- | --- |
| 0x2631:010<br>(P400.10) | Function list: Jog foward (CW)<br>(Function list: Jog foward)<br>• Setting can only be changed if the inverter is disabled. | | Assignment of a trigger for the "Jog foward (CW)" function.<br>Trigger = TRUE: Let motor rotate forward with preset 5.<br>Trigger = FALSE: Stop motor.<br>CAUTION!<br>The jog operation has a higher priority than the "Run" function, all other start commands and the keypad key .<br>• If jog operation is active, the motor cannot be stopped with the previously mentioned functions!<br>• However, jog operation can be interrupted by the "Quick stop" function.<br>Notes:<br>• The preset 5 can be set in 0x2911:005 (P450.05).<br>• The stop method can be selected in 0x2838:003 (P203.03).<br>• If "Jog foward (CW)" and "Jog reverse (CCW)" are activated at the same time, the motor is stopped using the set stop method and jog operation must be triggered again.<br>• Jog operation cannot be started automatically. The "Start at power-up" option in 0x2838:002 (P203.02) does not apply to jog operation.<br>Example: Jog forward/Jog reverse 69 |
| | 0 | **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| | 11 | Digital input 1 | State of X3/DI1, taking an inversion set in 0x2632:001 (P411.01) into consideration. |
| | 12 | Digital input 2 | State of X3/DI2, taking an inversion set in 0x2632:002 (P411.02) into consideration. |
| | 13 | Digital input 3 | State of X3/DI3, taking an inversion set in 0x2632:003 (P411.03) into consideration. |
| | 14 | Digital input 4 | State of X3/DI4, taking an inversion set in 0x2632:004 (P411.04) into consideration. |
| | 15 | Digital input 5 | State of X3/DI5, taking an inversion set in 0x2632:005 (P411.05) into consideration. |
| | 16 | Digital input 6 | State of X3/DI6, taking an inversion set in 0x2632:006 (P411.06) into consideration. |
| | 17 | Digital input 7 | State of X3/DI7, taking an inversion set in 0x2632:007 (P411.07) into consideration. |
| | 50 | Running | TRUE if inverter and start are enabled and output frequency > 0 Hz. Otherwise FALSE.<br>Exception, quick stop mode: TRUE if inverter and start are enabled and output frequency > 0.2 Hz. Otherwise FALSE. |
| | 51 | Ready for operation | TRUE, wenn Inverter betriebsbereit (kein Fehler aktiv und Zwischenkreisspannung ok). Sonst FALSE. |
| | 53 | Stop active | TRUE if inverter is enabled and motor is not started and output frequency = 0. |
| | 54 | Quick stop active | TRUE if quick stop is active. Otherwise FALSE. |
| | 58 | Device warning active | TRUE if warning is active. Otherwise FALSE.<br>• A warning has no impact on the operating status of the inverter.<br>• A warning is reset automatically if the cause has been eliminated. |
| | 59 | Device trouble active | TRUE if a fault is active. Otherwise FALSE.<br>• In the event of a fault, the motor is brought to a standstill with the quick stop ramp. The inverter is then disabled.<br>• Exception: In case of a serious fault, the inverter is disabled immediately. The motor has no torque (coasts).<br>• The error state will be left automatically if the error condition is not active anymore.<br>• The restart behaviour after trouble can be configured. Automatic restart after a fault 361 |
| | 60 | Heatsink temperature warning active | TRUE if current heatsink temperature > warning threshold for temperature monitoring. Otherwise FALSE.<br>• Display of the current heatsink temperature in 0x2D84:001 (P117.01).<br>• Setting of the warning threshold in 0x2D84:002. |
| | 68 | Stop command active | TRUE if delay to standstill active. Otherwise FALSE. |
| | 69 | Rotational direction reversed | TRUE if output frequency is negative. Otherwise FALSE. |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| | 70 Frequency threshold exceeded | TRUE if current output frequency > frequency threshold. Otherwise FALSE.<br>• Display of the current output frequency in 0x2DDD (P100.00).<br>• Setting Frequency threshold in 0x4005 (P412.00).<br>▸ Trigger action if a frequency threshold is exceeded 381 |
| | 71 Actual speed = 0 | TRUE if actual output frequency = 0 Hz (± 0.3 Hz), irrespective of the operating mode. Otherwise FALSE.<br>• Display of the current output frequency in 0x2DDD (P100.00). |
| | 78 Current limit reached | TRUE if current motor current ≥ maximum current. Otherwise FALSE.<br>• Display of the present motor current in 0x2D88 (P104.00).<br>• Setting for the maximum current in 0x6073 (P324.00). |
| | 79 Torque limit reached (from version 02.00) | TRUE if torque limit has been reached or exceeded. Otherwise FALSE.<br>• Setting "Actual positive torque limit" in 0x2949:003 (P337.03).<br>• Setting Actual negative torque limit in 0x2949:004 (P337.04).<br>▸ Motor torque monitoring 231 |
| | 81 Error of analog input 1 active | TRUE if the monitoring of the input signal at the analog input 1 has responded. Otherwise FALSE.<br>This trigger is set as a function of the following settings:<br>• Monitoring threshold0x2636:008 (P430.08)<br>• Monitoring condition0x2636:009 (P430.09)<br>The setting of the Error response in 0x2636:010 (P430.10) has no effect on this trigger.<br>▸ Analog input 1 240 |
| | 82 Error of analog input 2 active | TRUE if the monitoring of the input signal at the analog input 2 has responded. Otherwise FALSE.<br>This trigger is set as a function of the following settings:<br>• Monitoring threshold0x2637:008 (P431.08)<br>• Monitoring condition0x2637:009 (P431.09)<br>The setting of the Error response in 0x2637:010 (P431.10) has no effect on this trigger.<br>▸ Analog input 2 244 |
| | 83 Load loss detected | TRUE if actual motor current < threshold for load loss detection after delay time of the load loss detection has elapsed. Otherwise FALSE.<br>• Display of the actual current in 0x6078 (P103.00).<br>• Setting Threshold in 0x4006:001 (P710.01).<br>• Setting Delay time in 0x4006:002 (P710.02).<br>▸ Load loss detection 206 |
| | 84 Heavy load monitoring | TRUE if the actual apparent current of the motor exceeds the threshold for longer than the delay time.<br>FALSE if the actual apparent current of the motor falls below the threshold value minus 5 % (hysteresis).<br>▸ Heavy load monitoring 235 |
| | 102 Sequence suspended (from version 03.00) | Status signal of the "sequencer" function:<br>TRUE if the sequence is currently suspended.<br>▸ Sequencer 87 |
| | 103 Sequence done (from version 03.00) | Status signal of the "sequencer" function:<br>TRUE if the sequence is completed (final segment has been passed through).<br>▸ Sequencer 87 |
| | 104 Local control active | TRUE if local keypad control ("LOC") active. Otherwise FALSE. |
| | 105 Remote control active | TRUE if remote control ("REM") via terminals, network, etc. active. Otherwise FALSE. |
| | 106 Manual setpoint selection active | TRUE if manual setpoint selection ("MAN") via keypad active. Otherwise FALSE.<br>• Selection of the trigger for the "Activate keypad setpoint" function in 0x2631:016 (P400.16). |
| | 107 Automatic setpoint selection active | TRUE if automatic setpoint selection ("AUTO") via terminals, network, etc. active. Otherwise FALSE. |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| | 201 Internal value (from version 05.00) | Internal values of the manufacturer. |
| | 202 Internal value (from version 05.00) | |
| | 203 Internal value (from version 05.00) | |
| | 204 Internal value (from version 05.00) | |
| | 205 Internal value (from version 05.00) | |
| | 206 Internal value (from version 05.00) | |
| 0x2631:011<br>(P400.11) | Function list: Jog reverse (CCW)<br>(Function list: Jog reverse)<br>• Setting can only be changed if the inverter is disabled.<br>• For further possible settings, see parameter 0x2631:010 (P400.10). 57 | Assignment of a trigger for the "Jog reverse (CCW)" function.<br>Trigger = TRUE: Let motor rotate backward with preset 6.<br>Trigger = FALSE: Stop motor.<br>CAUTION!<br>The jog operation has a higher priority than the "Run" function, all other start commands and the keypad key .<br>• If jog operation is active, the motor cannot be stopped with the previously mentioned functions!<br>• However, jog operation can be interrupted by the "Quick stop" function.<br>Notes:<br>• The preset 6 can be set in 0x2911:006 (P450.06).<br>• The stop method can be selected in 0x2838:003 (P203.03).<br>• If "Jog foward (CW)" and "Jog reverse (CCW)" are activated at the same time, the motor is stopped using the set stop method and jog operation must be triggered again.<br>• Jog operation cannot be started automatically. The "Start at power-up" option in 0x2838:002 (P203.02) does not apply to jog operation.<br>▶ Example: Jog forward/Jog reverse 69 |
| | **0 Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:013<br>(P400.13) | Function list: Reverse rotational direction<br>(Function list: Reverse rot.dir.)<br>• Setting can only be changed if the inverter is disabled.<br>• Further possible settings: ▶ Trigger list 59 | Assignment of a trigger for the "Reverse rotational direction" function.<br>Trigger = TRUE: the setpoint specified is inverted (i. e. the sign is inverted).<br>Trigger = FALSE: no action / deactivate function again.<br>▶ Example: Start/stop (1 signal) and reversal 62 |
| | **13 Digital input 3** | State of X3/DI3, taking an inversion set in 0x2632:003 (P411.03) into consideration. |

### 6.2.1 Trigger list

The trigger list lists all selection options (triggers) for the functions which can be configured using the parameters 0x2631:xx (P400.xx).

| Selection | | Information |
|---|---|---|
| 0 | Not connected | No trigger assigned (trigger is constantly FALSE). |
| 1 | Constant TRUE | Trigger is constantly TRUE. |
| 11 | Digital input 1 | State of X3/DI1, taking an inversion set in 0x2632:001 (P411.01) into consideration. |
| 12 | Digital input 2 | State of X3/DI2, taking an inversion set in 0x2632:002 (P411.02) into consideration. |
| 13 | Digital input 3 | State of X3/DI3, taking an inversion set in 0x2632:003 (P411.03) into consideration. |
| 14 | Digital input 4 | State of X3/DI4, taking an inversion set in 0x2632:004 (P411.04) into consideration. |
| 15 | Digital input 5 | State of X3/DI5, taking an inversion set in 0x2632:005 (P411.05) into consideration. |
| 16 | Digital input 6 | State of X3/DI6, taking an inversion set in 0x2632:006 (P411.06) into consideration. |
| 17 | Digital input 7 | State of X3/DI7, taking an inversion set in 0x2632:007 (P411.07) into consideration. |
| 50 | Running | TRUE if inverter and start are enabled and output frequency > 0 Hz. Otherwise FALSE.<br>Exception, quick stop mode: TRUE if inverter and start are enabled and output frequency > 0.2 Hz. Otherwise FALSE. |

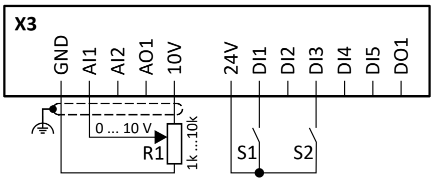
| Selection | | Information |
| --- | --- | --- |
| 51 | Ready for operation | TRUE, wenn Inverter betriebsbereit (kein Fehler aktiv und Zwischenkreisspannung ok). Sonst FALSE. |
| 53 | Stop active | TRUE if inverter is enabled and motor is not started and output frequency = 0. |
| 54 | Quick stop active | TRUE if quick stop is active. Otherwise FALSE. |
| 58 | Device warning active | TRUE if warning is active. Otherwise FALSE.<br>• A warning has no impact on the operating status of the inverter.<br>• A warning is reset automatically if the cause has been eliminated. |
| 59 | Device trouble active | TRUE if a fault is active. Otherwise FALSE.<br>• In the event of a fault, the motor is brought to a standstill with the quick stop ramp. The inverter is then disabled.<br>• Exception: In case of a serious fault, the inverter is disabled immediately. The motor has no torque (coasts).<br>• The error state will be left automatically if the error condition is not active anymore.<br>• The restart behaviour after trouble can be configured. ▸ Automatic restart after a fault 📖 361 |
| 60 | Heatsink temperature warning active | TRUE if current heatsink temperature > warning threshold for temperature monitoring. Otherwise FALSE.<br>• Display of the current heatsink temperature in 0x2D84:001 (P117.01).<br>• Setting of the warning threshold in 0x2D84:002. |
| 68 | Stop command active | TRUE if delay to standstill active. Otherwise FALSE. |
| 69 | Rotational direction reversed | TRUE if output frequency is negative. Otherwise FALSE. |
| 70 | Frequency threshold exceeded | TRUE if current output frequency > frequency threshold. Otherwise FALSE.<br>• Display of the current output frequency in 0x2DDD (P100.00).<br>• Setting Frequency threshold in 0x4005 (P412.00).<br>▸ Trigger action if a frequency threshold is exceeded 📖 381 |
| 71 | Actual speed = 0 | TRUE if actual output frequency = 0 Hz (± 0.3 Hz), irrespective of the operating mode. Otherwise FALSE.<br>• Display of the current output frequency in 0x2DDD (P100.00). |
| 78 | Current limit reached | TRUE if current motor current ≥ maximum current. Otherwise FALSE.<br>• Display of the present motor current in 0x2D88 (P104.00).<br>• Setting for the maximum current in 0x6073 (P324.00). |
| 79 | Torque limit reached (from version 02.00) | TRUE if torque limit has been reached or exceeded. Otherwise FALSE.<br>• Setting "Actual positive torque limit" in 0x2949:003 (P337.03).<br>• Setting Actual negative torque limit in 0x2949:004 (P337.04).<br>▸ Motor torque monitoring 📖 231 |
| 81 | Error of analog input 1 active | TRUE if the monitoring of the input signal at the analog input 1 has responded. Otherwise FALSE.<br>This trigger is set as a function of the following settings:<br>• Monitoring threshold0x2636:008 (P430.08)<br>• Monitoring condition0x2636:009 (P430.09)<br>The setting of the Error response in 0x2636:010 (P430.10) has no effect on this trigger.<br>▸ Analog input 1📖 240 |
| 82 | Error of analog input 2 active | TRUE if the monitoring of the input signal at the analog input 2 has responded. Otherwise FALSE.<br>This trigger is set as a function of the following settings:<br>• Monitoring threshold0x2637:008 (P431.08)<br>• Monitoring condition0x2637:009 (P431.09)<br>The setting of the Error response in 0x2637:010 (P431.10) has no effect on this trigger.<br>▸ Analog input 2📖 244 |
| 83 | Load loss detected | TRUE if actual motor current < threshold for load loss detection after delay time of the load loss detection has elapsed. Otherwise FALSE.<br>• Display of the actual current in 0x6078 (P103.00).<br>• Setting Threshold in 0x4006:001 (P710.01).<br>• Setting Delay time in 0x4006:002 (P710.02).<br>▸ Load loss detection 📖 206 |

| Selection | | Information |
|---|---|---|
| 84 | Heavy load monitoring | TRUE if the actual apparent current of the motor exceeds the threshold for longer than the delay time.<br>FALSE if the actual apparent current of the motor falls below the threshold value minus 5 % (hysteresis).<br>▶ Heavy load monitoring 📖 235 |
| 102 | Sequence suspended (from version 03.00) | Status signal of the "sequencer" function:<br>TRUE if the sequence is currently suspended.<br>▶ Sequencer 📖 87 |
| 103 | Sequence done (from version 03.00) | Status signal of the "sequencer" function:<br>TRUE if the sequence is completed (final segment has been passed through).<br>▶ Sequencer 📖 87 |
| 104 | Local control active | TRUE if local keypad control ("LOC") active. Otherwise FALSE. |
| 105 | Remote control active | TRUE if remote control ("REM") via terminals, network, etc. active. Otherwise FALSE. |
| 106 | Manual setpoint selection active | TRUE if manual setpoint selection ("MAN") via keypad active. Otherwise FALSE.<br>• Selection of the trigger for the "Activate keypad setpoint" function in 0x2631:016 (P400.16). |
| 107 | Automatic setpoint selection active | TRUE if automatic setpoint selection ("AUTO") via terminals, network, etc. active. Otherwise FALSE. |
| 201 | Internal value (from version 05.00) | Internal values of the manufacturer. |
| 202 | Internal value (from version 05.00) | |
| 203 | Internal value (from version 05.00) | |
| 204 | Internal value (from version 05.00) | |
| 205 | Internal value (from version 05.00) | |
| 206 | Internal value (from version 05.00) | |

### 6.2.2 Example: Start/stop (1 signal) and reversal

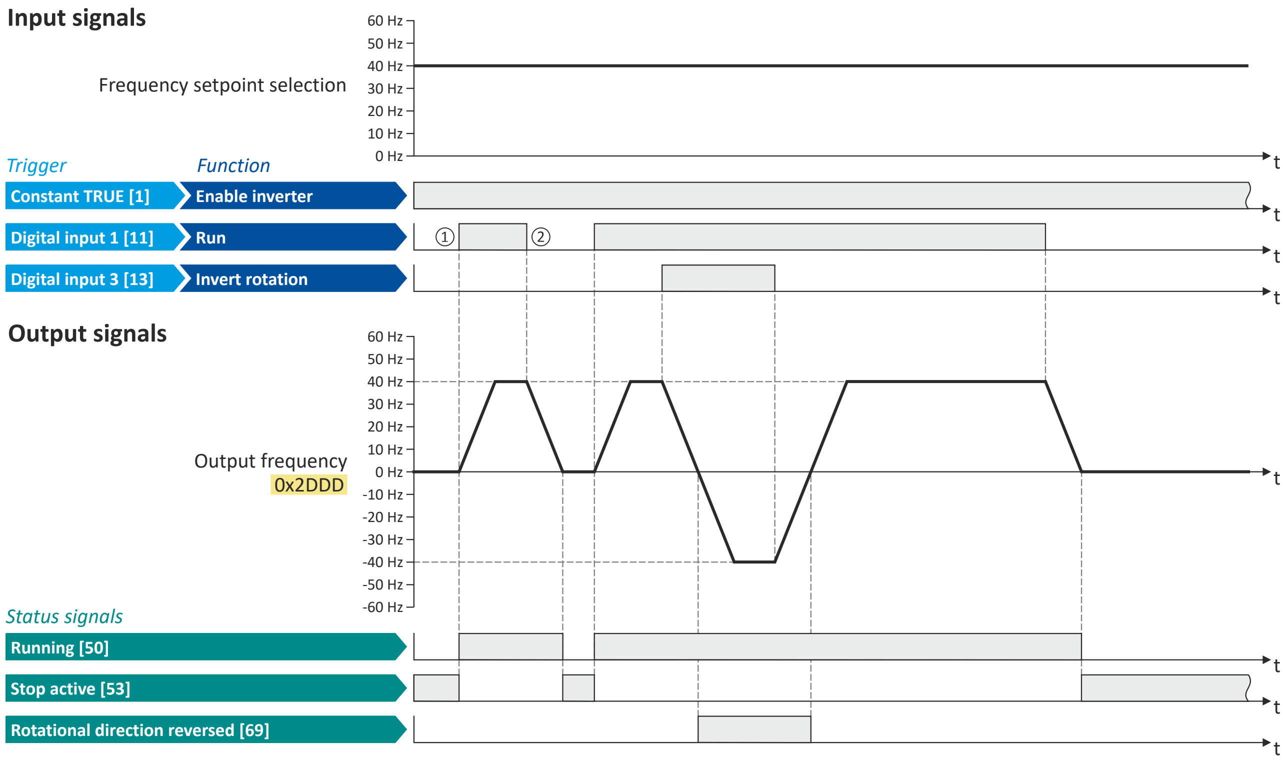
This example shows a simple control option via two switches which should be sufficient for many applications:

- The switch S1 starts the motor in forward rotating direction. The switch S1 in the initial position stops the motor again.
- <the switch S2 switches the direction of rotation.

| Connection plan | Function | |
|---|---|---|
|  | Potentiometer R1 | Frequency setpoint selection |
| | Switch S1 | Run |
| | Switch S2 | Reverse rotational direction |

The example uses the preset I/O configuration of the inverter:

| Parameter | Designation | Setting for this example (corresponds to default setting) |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2631:013 (P400.13) | Reverse rotational direction | Digital input 3 [13] |




The status signals can be assigned to digital outputs. ▶ Configure digital outputs 📖 247

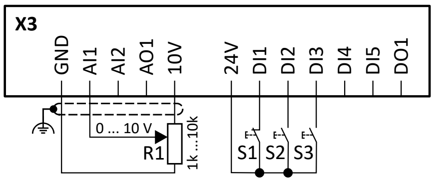
① If the inverter is enabled and no error is active, the motor can be started with the "Run" function in forward rotating direction.
② If "Run" is set to FALSE, the motor is stopped with the stop method set in 0x2838:003 (P203.03). In the example: Stop with standard ramp.

### 6.2.3 Example: Start forward/start reverse/stop (edge-controlled)

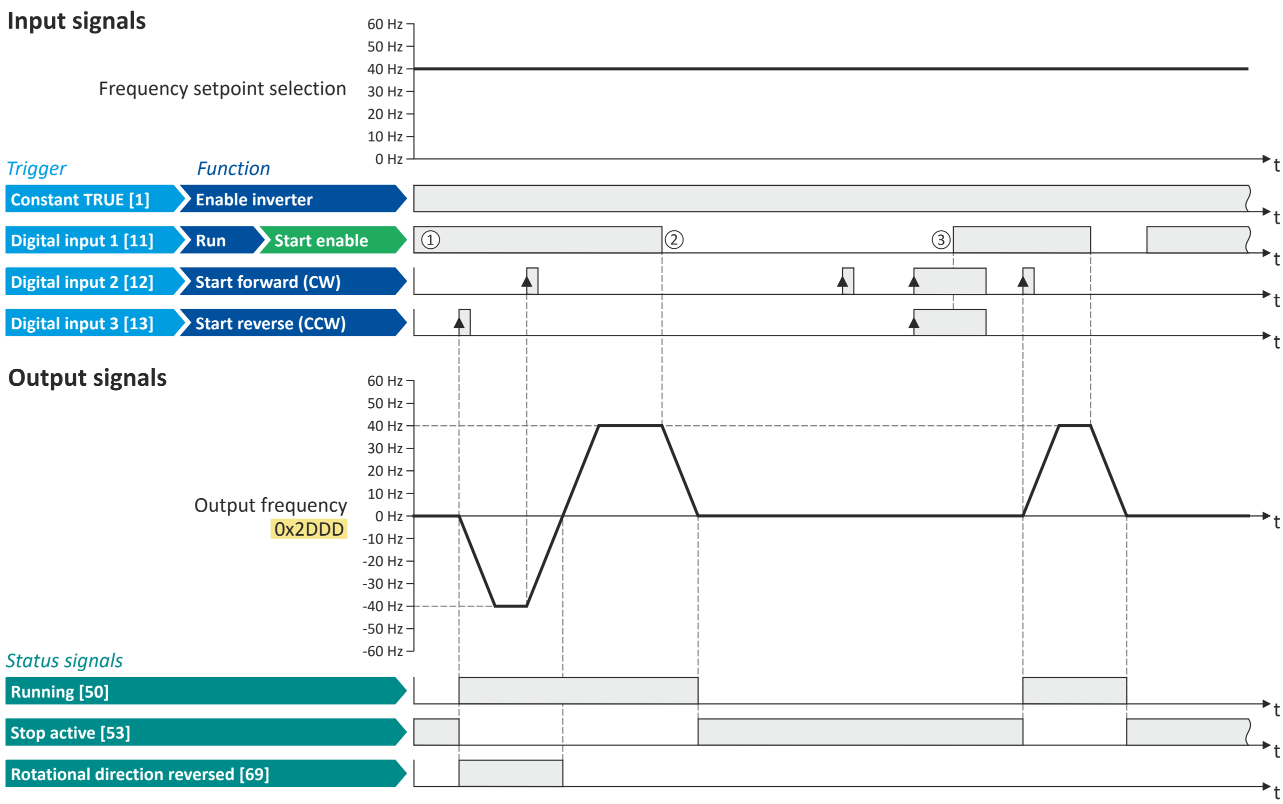
The "Run" function automatically becomes a "start enable" if the functions "Start forward (CW)"/ "Start reverse (CCW)" are connected to triggers.

This example shows an edge-controlled start/stop via three buttons:

- In the non-operating state of button S1 (normally-closed contact), there is already a start enable.
- Button S2 starts the motor in forward rotating direction.
- Button S3 starts the motor in backward rotating direction.
- Button S1 (normally-closed contact) stops the motor by (short-time) cancellation of the start command. The inverter then waits for the next start command via button S2/S3.

| Connection plan | Function | |
|---|---|---|
|   | Potentiometer R1 | Frequency setpoint selection |
| | Button S1 | Stopping |
| | Button S2 | Start forward (CW) |
| | Button S3 | Start reverse (CCW) |

| Parameter | Name | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2631:004 (P400.04) | Reset fault | Not connected [0] |
| 0x2631:006 (P400.06) | Start forward (CW) | Digital input 2 [12] |
| 0x2631:007 (P400.07) | Start reverse (CCW) | Digital input 3 [13] |
| 0x2631:013 (P400.13) | Reverse rotational direction | Not connected [0] |




The status signals can be assigned to digital outputs. ▸ Configure digital outputs 📖 247

① The "Run" function serves as start enable for the functions "Start forward (CW)" and "Start reverse (CCW)". Without start enable, the motor cannot be started.

② If the start command is cancelled, the motor is stopped with the stop method set in 0x2838:003 (P203.03). In the example: Stop with standard ramp.

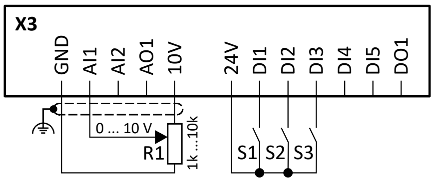
③ If, at start enable, "Start forward (CW)" and "Start reverse (CCW)" are already set to TRUE, the motor remains stopped and the inverter waits for the next valid start edge.

### 6.2.4 Example: Run forward/Run reverse/stop (status-controlled)

The "Run" function automatically becomes a "start enable" if the functions "Run forward (CW)"/"Run reverse (CCW)" are connected to triggers.

This example shows a status-controlled start/stop via three switches:

- Switch S1 enables the start. Without start enable, the motor cannot be started.
- Switch S2 starts the motor in forward direction of rotation.
- Switch S3 starts the motor in backward direction of rotation.
- The motor is stopped by cancelling the run commands (switches S2 and S3 open) or by cancelling the start enable (switch S1 open).

| Connection plan | Function | |
|---|---|---|
|  | Potentiometer R1 | Frequency setpoint selection |
| | Switch S1 | Start enable |
| | Switch S2 | Run forward (CW) |
| | Switch S3 | Run reverse (CCW) |

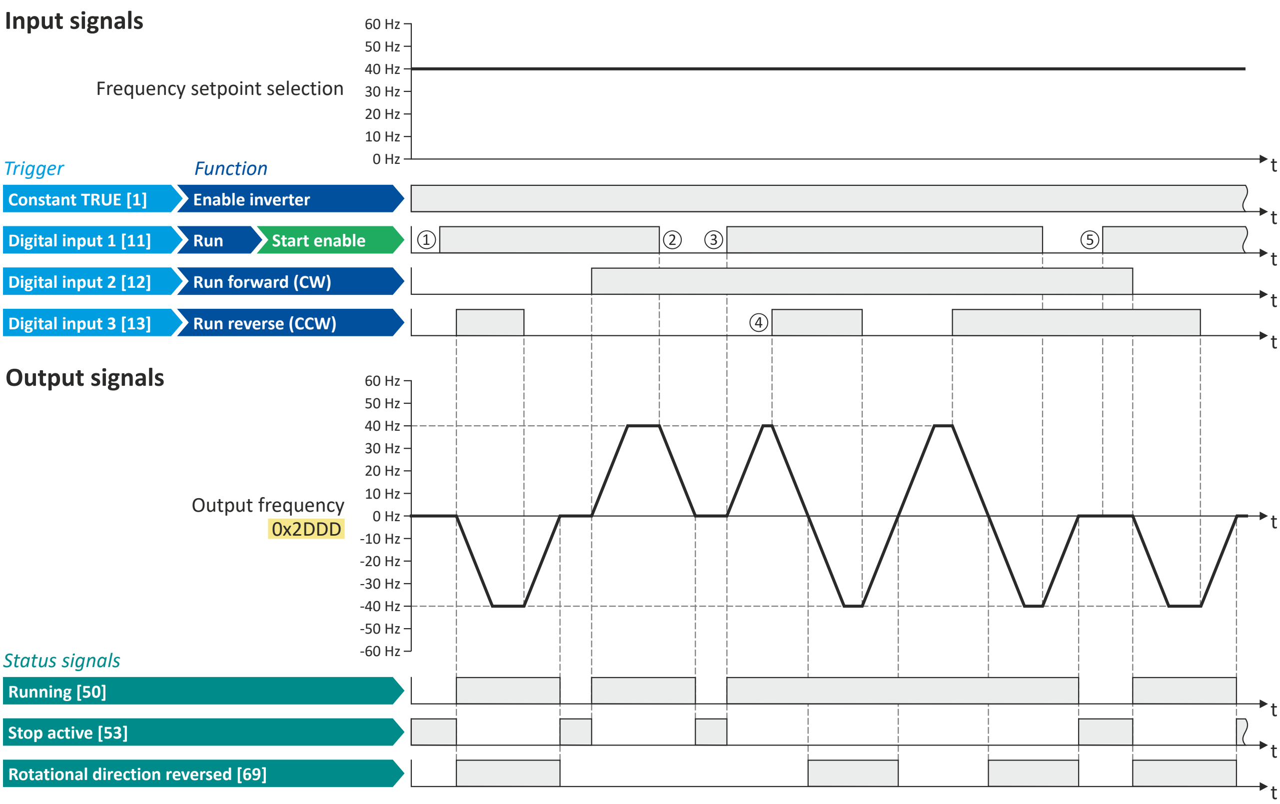


| Parameter | Designation | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2631:004 (P400.04) | Reset fault | Not connected [0] |
| 0x2631:008 (P400.08) | Run forward (CW) | Digital input 2 [12] |
| 0x2631:009 (P400.09) | Run reverse (CCW) | Digital input 3 [13] |
| 0x2631:013 (P400.13) | Reverse rotational direction | Not connected [0] |

## Start, stop and rotating direction commands

Flexible I/O configuration of the start, stop and rotating direction commands

Example: Run forward/Run reverse/stop (status-controlled)




The status signals can be assigned to digital outputs. ▶ Configure digital outputs 📖 247

| | |
|---|---|
| ① | The "Run" function serves as start enable for the functions "Run forward (CW)" and "Run reverse (CCW)".<br>Without start enable, the motor cannot be started. |
| ② | If the start command is cancelled, the motor is stopped with the stop method set in 0x2838:003 (P203.03). In the example: Stop with standard ramp.<br>After a renewed start enable, the inverter waits for the next run command. |
| ③ | If, at start enable, either "Run forward (CW)" or "Run reverse (CCW)" is set to TRUE, the motor starts in the triggered direction. |
| ④ | The inverter always responds to the run command detected last (if start enable is available).<br>In the example, the "Run reverse (CCW)" command replaces the still active "Run forward (CW)" command. |
| ⑤ | If, at start enable, both run commands are set to TRUE, the motor remains stopped until only one valid run command is available. |

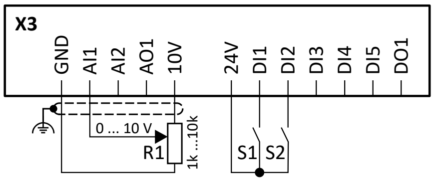


### 6.2.5 Example: Quick stop

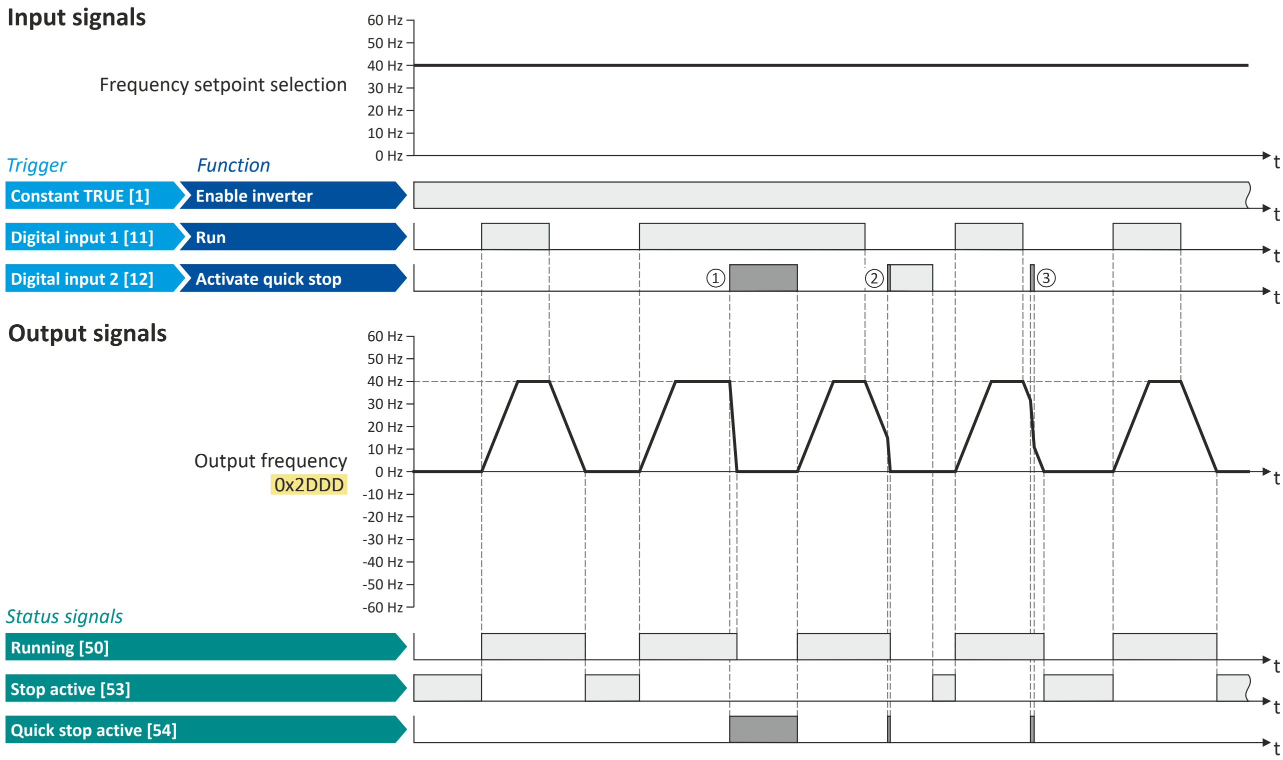
This example illustrates the "quick stop" function. If a quick stop is activated, the motor is brought to a standstill within the deceleration time set in 0x291C (P225.00).

- The switch S1 starts the motor in forward rotating direction. The switch S1 in the initial position stops the motor again.
- The switch S2 activates the "quick stop" function.

Cancelling the quick stop causes a restart of the motor if the "Run" function is still active (switch S1 closed)!

| Connection plan | Function | |
|---|---|---|
|   | Potentiometer R1 | Frequency setpoint selection |
| | Switch S1 | Run |
| | Switch S2 | Activate quick stop |

| Parameter | Name | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2631:003 (P400.03) | Activate quick stop | Digital input 2 [12] |
| 0x2631:004 (P400.04) | Reset fault | Not connected [0] |
| 0x2917 (P220.00) | Acceleration time 1 | 3.0 s |
| 0x2918 (P221.00) | Deceleration time 1 | 3.0 s |
| 0x291C (P225.00) | Quick stop deceleration time | 1.0 s |




The status signals can be assigned to digital outputs. ▶ Configure digital outputs 📖 247

① If a quick stop is activated, the motor is decelerated to the frequency setpoint 0 Hz within a short period of time. The "Quick stop active [54]" status is set as long as quick stop is activated. The "Stop active [53]" status is not set.

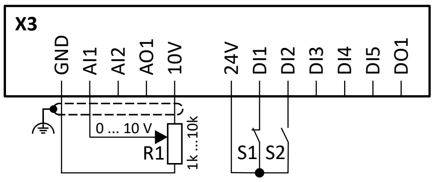
② An active stop command is interrupted by a quick stop.

③ If quick stop is cancelled again before standstill is reached, stopping is continued with the stop method set in 0x2838:003 (P203.03). In the example: Stop with standard ramp.

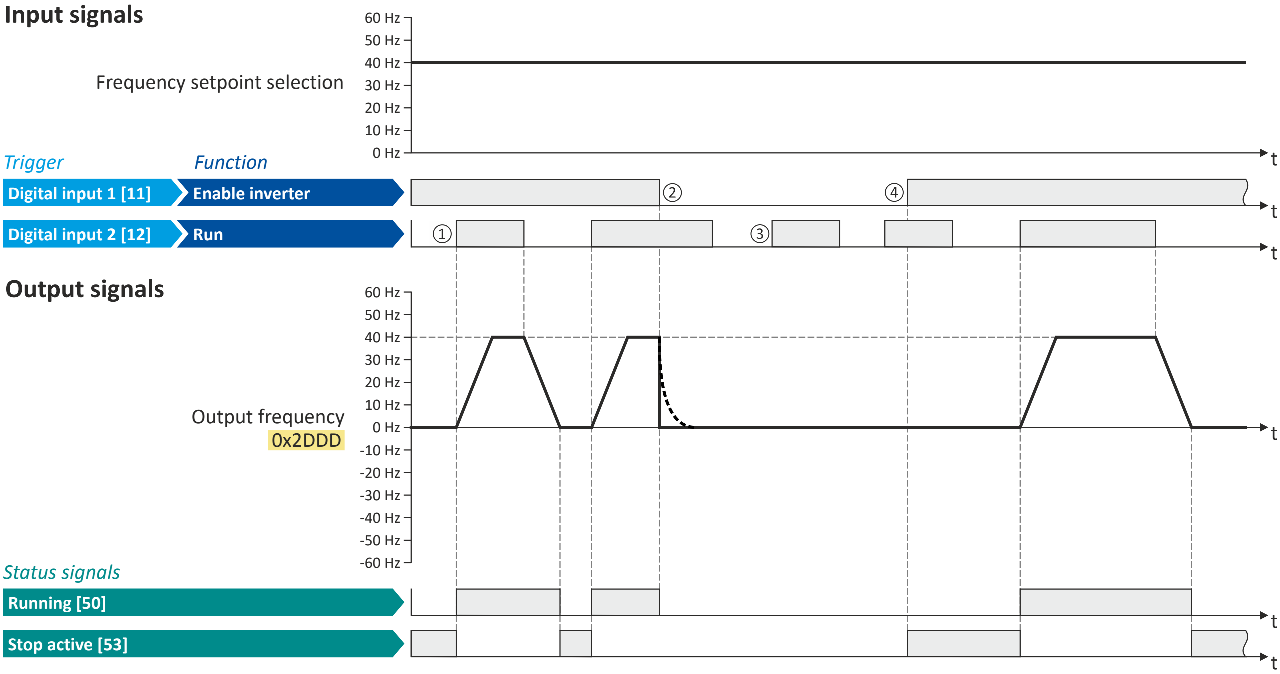
### 6.2.6 Example: Enable inverter

This example shows how to use the "Inverter enable" function for a separate enable input.

- In sleep mode of switch S1 (normally-closed contact), "Inverter enable" is already available.
- Switch S2 starts the motor in forward rotating direction (if switch S1 is closed). Switch S2 in initial position stops the motor again.
- Switch S1 disables the inverter. The motor becomes torqueless (coasts).

| Connection plan | Function | |
|---|---|---|
|   | Potentiometer R1 | Frequency setpoint selection |
| | Switch S1 | Disable inverter |
| | Switch S2 | Run |

| Parameter | Name | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Digital input 1 [11]) |
| 0x2631:002 (P400.02) | Run | Digital input 2 [12] |
| 0x2631:004 (P400.04) | Reset fault | Not connected [0] |




The status signals can be assigned to digital outputs. ▶ Configure digital outputs 📖 247

① If the inverter is enabled and no error is active, the motor can be started with the "Run" function in forward rotating direction.

② If "Inverter enable" is set to FALSE, the inverter is disabled. The motor becomes torqueless and coasts to standstill as a function of the mass inertia of the machine.

③ Without "Inverter enable", the motor cannot be started.

④ In the default setting, the motor does not start if the "Run" function is set to TRUE during "Inverter enable". "Start" has to be triggered again after "Inverter enable" to start the motor.
▶ Start behavior 📖 39



### 6.2.7 Example: Jog forward/Jog reverse

This example shows the functions "Jog forward (CW)" and "Jog reverse (CCW)" for Jog operation.

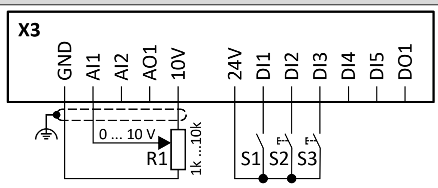
- The switch S1 starts the motor in forward rotating direction. The switch S1 in the initial position stops the motor again.
- The button S2 starts the motor in the forward direction of rotation with frequency preset 5.
- The button S3 starts the motor in the backward direction of rotation with frequency preset 6.
- The motor rotates in jog operation as long as the respective button is pressed. If both buttons are pressed at the same time, the motor is stopped.

**⚠CAUTION!**

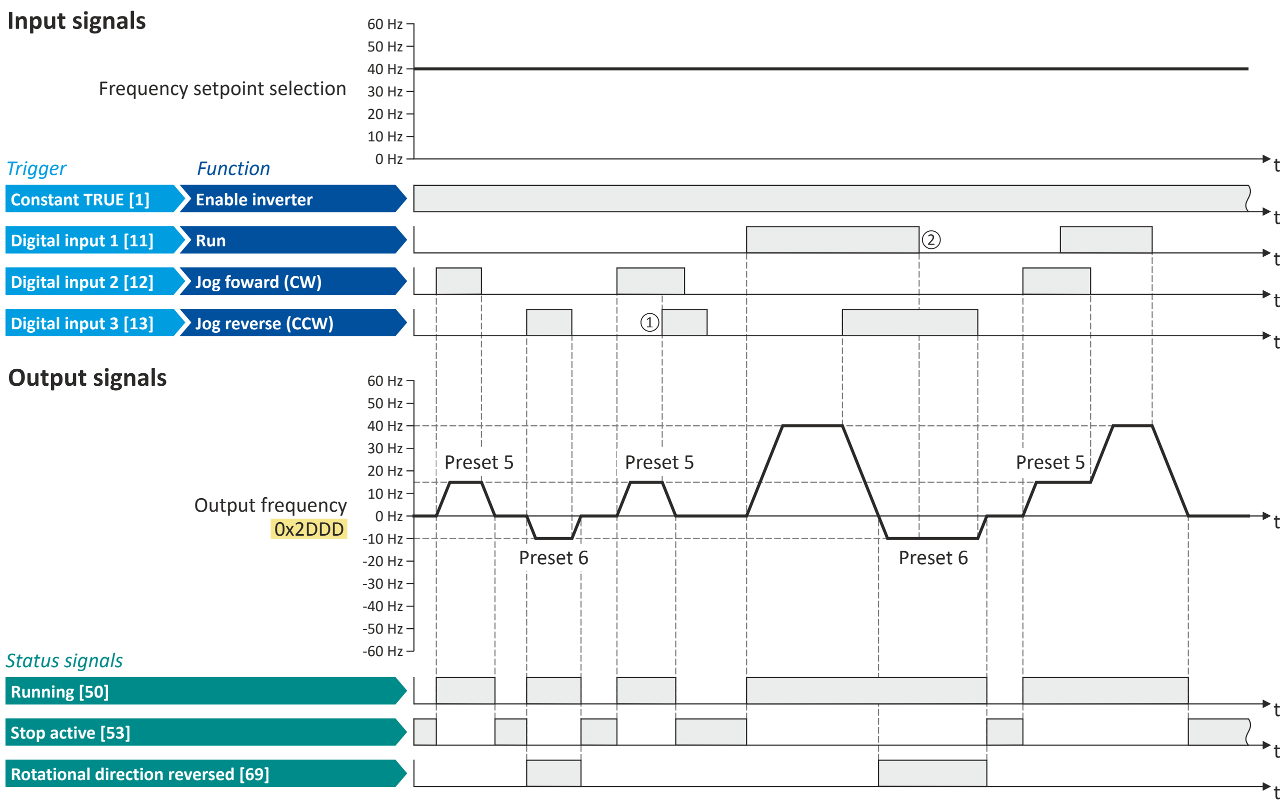
The jog operation has a higher priority than the "Run" function, all other start commands and the keypad key .

If jog operation is active, the motor cannot be stopped with the previously mentioned functions!

- ▶ The jog operation is stopped by cancelling the functions "Jog foward (CW)"/"Jog reverse (CCW)".
- ▶ The jog operation can be interrupted with the "Activate quick stop" 0x2631:003 (P400.03)function.

| Connection plan | Function | |
|---|---|---|
|   | Potentiometer R1 | Frequency setpoint selection |
| | Switch S1 | Run |
| | Button S2 | Jog foward (CW) |
| | Button S3 | Jog reverse (CCW) |

| Parameter | Name | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2631:004 (P400.04) | Reset fault | Not connected [0] |
| 0x2631:010 (P400.10) | Jog foward (CW) | Digital input 2 [12] |
| 0x2631:011 (P400.11) | Jog reverse (CCW) | Digital input 3 [13] |
| 0x2631:013 (P400.13) | Reverse rotational direction | Not connected [0] |
| 0x2911:005 (P450.05) | Frequency setpoint presets: Preset 5 | 15 Hz (is used for jog forward) |
| 0x2911:006 (P450.06) | Frequency setpoint presets: Preset 6 | 10 Hz (is used for jog reverse) |




The status signals can be assigned to digital outputs. ▶ Configure digital outputs 🕮 247

① If "Jog foward (CW)" and "Jog reverse (CCW)" are activated at the same time, the motor is stopped with the stop method set in 0x2838:003 (P203.03) and the jog operation must be triggered again.

② The jog operation cannot be terminated with the "Run" function but only by cancelling the jog command.

## 6.3 Control/restrict direction of rotation of the motor

In the default setting, both directions of motor rotation are enabled. Optionally, the direction of rotation can be restricted so that only a clockwise rotation (CW) of the motor is possible.

**Preconditions**

Wiring of the motor phases must be carried out correctly with regard to the direction of motor rotation.

In the documentation and the parameter selection texts, the following terms are used for the direction of rotation:

- Forward = clockwise direction of rotation (CW)
- Reverse = counter-clockwise direction of rotation (CCW)

**Details**

The direction of rotation of the motor can be controlled in various ways:

- Via the function "Reverse rotational direction". Possible triggers for the function "Reverse rotational direction" are available for selection in 0x2631:013 (P400.13), e.g.the digital inputs and internal status signals of the inverter.
- Via the network. The definition of the direction of rotation is possible via the mappable NetWordIN1 data word or oneof the predefined process data words.
- By specifying a bipolar setpoint value via an analog input. Either via a bipolar input range (-10 ... +10 V) or the configuration of a bipolar setting range.

If a reversal of rotation is not required, the direction of rotation can be restricted in 0x283A (P304.00) to "Only clockwise (CW) [0]".

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x283A (P304.00) | Limitation of rotation (Limit. rotation) | | Optional restriction of the rotating direction. |
| | 0 | Only clockwise (CW) | The motor can only be rotated clockwise (CW). The transfer of negative frequency and PID setpoints to the motor control is prevented.<br>• This function takes effect after the "Reverse rotational direction" function (0x2631:013 (P400.13)).<br>• Since this function only prevents negative setpoints, counter-clockwise rotation (CCW) is possible if the motor has been wired for this rotating direction. |
| | **1** | **Both rotational directions** | Both directions of motor rotation are enabled. |

**Related topics**


▶ Example: Start/stop (1 signal) and reversal 📖 62

## 6.4 Changing the control source during operation

The term "control sources" in this connection refers to the digital signal sources from which the inverter receives its start, stop, and reversal commands.

Possible control sources:

- Digital inputs
- Keypad
- Network

### Details

First, select in 0x2824 (P200.00) whether the start of the motor is to be configured flexibly (default setting) or exclusively via the keypad. ▸ Control selection 📖 49

If "Flexible I/O configuration" is set, a change-over from one control source to another can be effected during operation via the functions listed in the following table. The inverter not only supports such a change-over via its digital inputs, but also as a function of internal inverter states.

| Activate keypad control<br>0x2631:012 (P400.12) | Activate network control<br>0x2631:037 (P400.37) | Active control source |
|---|---|---|
| FALSE / Not connected | FALSE / Not connected | Flexible I/O configuration (default setting)<br>• The motor is controlled via the digital inputs.<br>• For preconfigured assignment of the digital inputs, see chapter "Function assignment of the inputs and outputs (default setting)". 📖 44<br>• For description of the basic functions for controlling the motor, see chapter "Flexible I/O configuration of the start, stop and rotating direction commands". 📖 54 |
| FALSE / Not connected | TRUE | Network<br>• Starting the motor is only possible via the network control word.<br>• Exception: jog operation; see chapter "Flexible I/O configuration of the start, stop and rotating direction commands". 📖 54<br>▸ Example: Change-over from terminal control to network control 📖 77 |
| TRUE | Any | Keypad<br>• Starting the motor is only possible via the I keypad key.<br>• Exception: jog operation; see chapter "Flexible I/O configuration of the start, stop and rotating direction commands". 📖 54<br>▸ Example: Change-over from terminal control to keypad control 📖 75 |

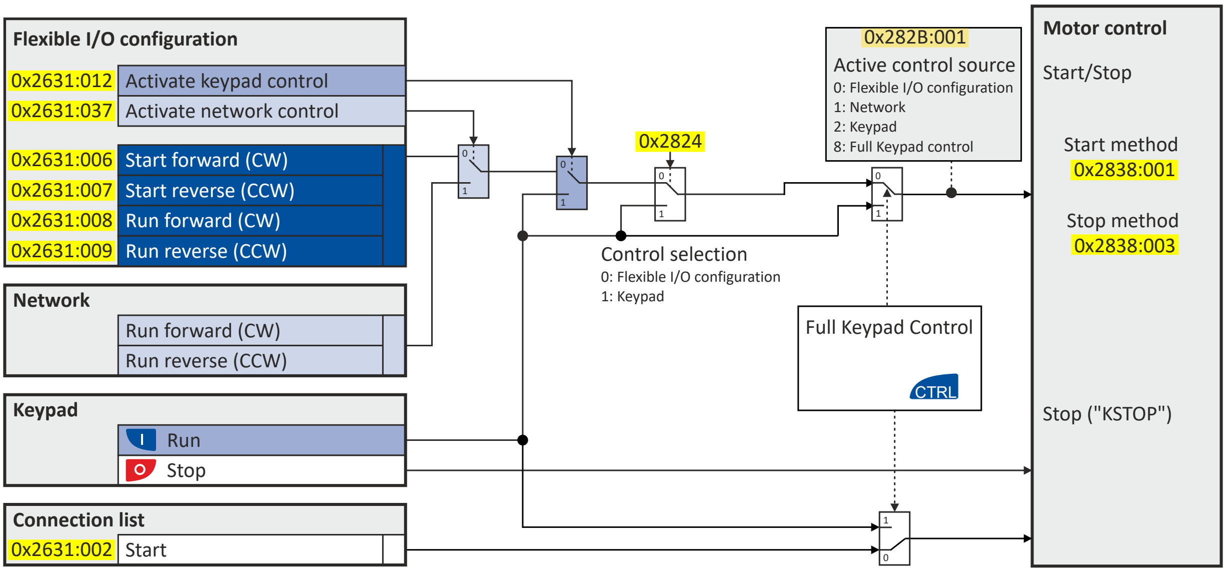
### Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2631:012<br>(P400.12) | Function list: Activate keypad control<br>(Function list: Keypad control)<br>• Further possible settings: ▸ Trigger list 📖 59 | | Assignment of a trigger for the "Activate keypad control" function.<br>Trigger = TRUE: activate keypad as control source.<br>Trigger = FALSE: no action / deactivate keypad as control source again. |
| | **0** | **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:037<br>(P400.37) | Function list: Activate network control<br>(Function list: Network control)<br>• Further possible settings: ▸ Trigger list 📖 59 | | Assignment of a trigger for the "Activate network control" function.<br>Trigger = TRUE: Activate network control.<br>Trigger = FALSE: no action / deactivate network control again. |
| | **0** | **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| | 114 | Network control active (from version 02.00) | TRUE if the network control is requested via bit 5 of the AC drive control word 0x400B:001 (P592.01). Otherwise FALSE.<br>Notes:<br>• Set this selection if the network control is to be activated via bit 5 of the AC drive control word.<br>• The AC drive control word can be used with any communication protocol.<br>▸ AC drive control word 📖 305 |



**Internal control logic**

The following signal flow shows the internal control logic:




Notes:

In case of an activated **keypad or network control**, the "Run" 0x2631:002 (P400.02) function must be set to TRUE to start the motor in addition to the inverter enable, either via digital input or by the "Constant TRUE [1]" setting.

In case of an activated **network control**, the following functions are still active:

- 0x2631:001 (P400.01): Enable inverter
- 0x2631:002 (P400.02): Run
- 0x2631:003 (P400.03): Activate quick stop
- 0x2631:004 (P400.04): Reset error
- 0x2631:005 (P400.05): DC braking
- 0x2631:010 (P400.10): Jog forward (CW)
- 0x2631:011 (P400.11): Jog reverse (CCW)*
- 0x2631:012 (P400.12): Activate keypad control*
- 0x2631:037 (P400.37): Activate network control*
- 0x2631:043 (P400.43): Activate fault 1
- 0x2631:044 (P400.44): Activate fault 2
- 0x2631:054 (P400.54): Reset position counter

(*Not active in case of network operation in CiA402 mode 0x6060=2).

In case of an activated **network control**, the following functions are also still active if they are not configured in the NetWordIN1 bit functionality:

- 0x2631:048 (P400.48): Activate PID influence ramp
- 0x2631:041 (P400.41): Select parameter set (bit 0)
- 0x2631:042 (P400.42): Select parameter set (bit 1)

All other functions configurable via 0x2631:xx (P400.xx) are deactivated in case of network control.

In case of **keypad control**, the following functions continue to be active:

- 0x2631:001 (P400.01): Enable inverter
- 0x2631:002 (P400.02): Run
- 0x2631:003 (P400.03): Activate quick stop
- 0x2631:004 (P400.04): Reset error
- 0x2631:005 (P400.05): DC braking
- 0x2631:010 (P400.10): Jog forward (CW)
- 0x2631:011 (P400.11): Jog reverse (CCW)*
- All other functions of 0x2631:012 (P400.12) - 0x2631:055 (P400.55)

The functions for setpoint changeover. Changing the setpoint source during operation 125

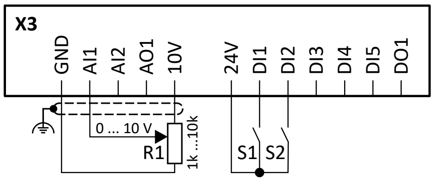
Diagnostic parameters:

- 0x282A:001 (P126.01): Cause of disable
- 0x282A:002 (P126.02): Cause of quick stop
- 0x282A:003 (P126.03): Cause of stop
- 0x282B:001 (P125.01): Active control source

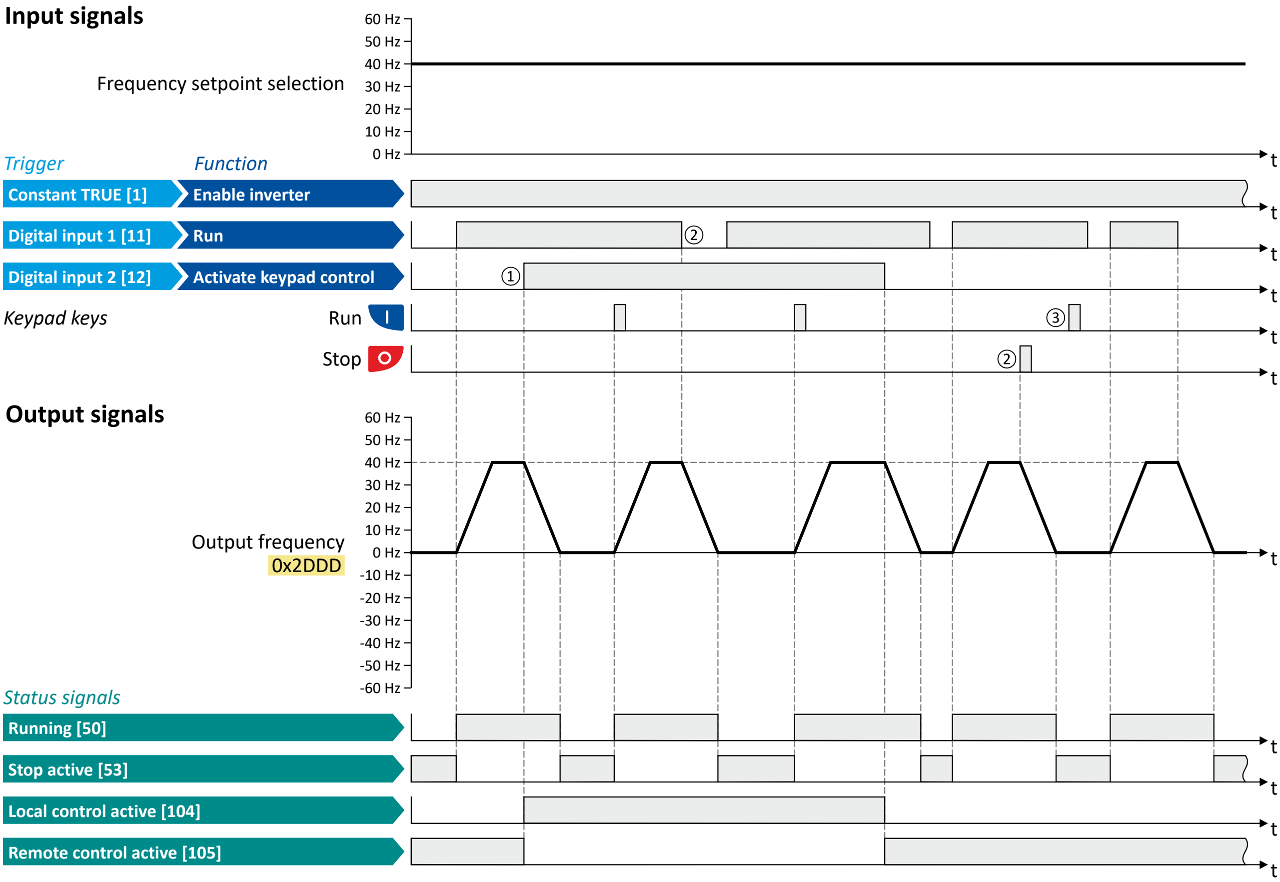


### 6.4.1 Example: Change-over from terminal control to keypad control

- The control is executed primarily via the I/O terminals: Switch S1 serves to start and stop the motor.
- Switch S2 serves to optionally change over to local keypad control. In case of activated keypad control, the motor can only be started via the I keypad key. However, the condition is that switch S1 is closed.
- If switch S1 is opened again or the O keypad key is pressed, the motor is stopped (irrespective of the active control source).
- For details of the keypad control of the inverter, see the chapter "Keypad operating mode". 400

| Connection plan | Function | |
|---|---|---|
|   | Potentiometer R1 | Frequency setpoint selection |
| | Switch S1 | Run |
| | Switch S2 | Activate keypad control |

| Parameter | Designation | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2631:004 (P400.04) | Reset fault | Not connected [0] |
| 0x2631:012 (P400.12) | Activate keypad control | Digital input 2 [12] |
| 0x2824 (P200.00) | Control selection | Flexible I/O configuration [0] |




The status signals can be assigned to digital outputs. ▶ Configure digital outputs 🕮 247

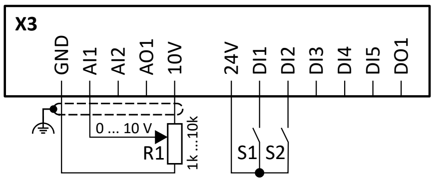
① When changing over to another control source, the motor is first stopped with the stop method set in 0x2838:003 (P203.03).

② The motor will also be stopped if the "Run" function is deactivated or the O keypad key is pressed (irrespective of the active control source).

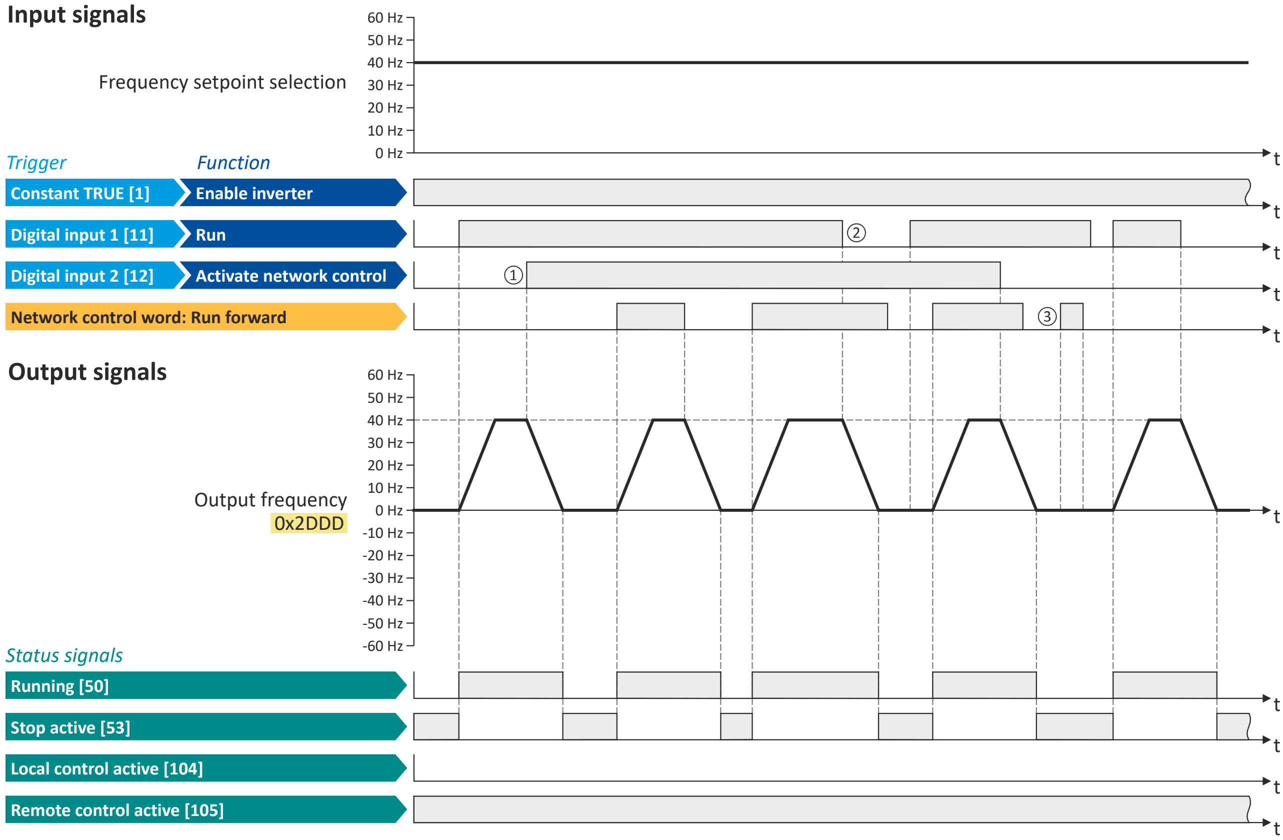
③ After stopping with the O keypad key and before a renewed start command from another control source, the I key on the keypad must be pressed to cancel the keypad stop again ("KSTOP").

### 6.4.2 Example: Change-over from terminal control to network control

- The control is executed primarily via the I/O terminals. The switch S1 serves to start and stop the motor.
- Switch S2 serves to activate the network control. In case of activated keypad control, the motor can only be started via the network control word. However, the condition is that switch S1 is closed.
- If the switch S1 is opened again, the motor is stopped (irrespective of the active control source).

| Connection plan | Function | |
|---|---|---|
|   | Potentiometer R1 | Frequency setpoint selection |
| | Switch S1 | Run |
| | Switch S2 | Activate network control |

| Parameter | Name | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2631:004 (P400.04) | Reset fault | Not connected [0] |
| 0x2631:037 (P400.37) | Activate network control | Digital input 2 [12] |
| 0x2824 (P200.00) | Control selection | Flexible I/O configuration [0] |




The status signals can be assigned to digital outputs. ▶ Configure digital outputs 📖 247

① When changing over to another control source, the motor is first stopped with the stop method set in 0x2838:003 (P203.03).
② The motor will also be stopped if the "Run" function is deactivated (irrespective of the active control source).
③ Commands via the network are ignored if the network control is not active.

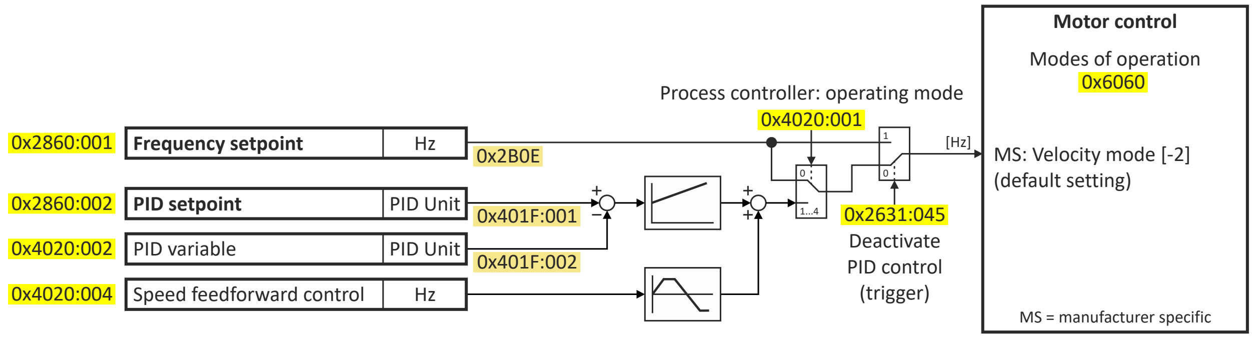
# 7 Configuring the frequency control

## 7.1 Basic setting

In the following, the steps required for configuring the frequency control are described.

1. Set 0x6060 (P301.00) to "MS: Velocity mode [-2]" operating mode (default setting).
2. Select the standard setpoint source for the frequency control in 0x2860:001 (P201.01).
3. Configure the selected standard setpoint source. ▶ Configure setpoint sources 📖 82
4. Adjust the ramp times to the application. ▶ Ramp times 📖 80
5. Optional: Configuring the process controller 📖 112

The following signal flow shows the internal setpoint logics:




The frequency control is now active and the inverter responds to the frequency setpoint given by the selected setpoint source.

### 7.1.1 Standard setpoint source

The selected "setpoint source" serves to provide the inverter with its setpoint. The setpoint source can be selected individually for each operating mode.

Possible setpoint sources are:

- Analog inputs
- Keypad
- Network
- Parameterisable setpoints (presets)
- "Motor potentiometer" function
- "Sequencer" function

**Details**

- For applications only requiring one setpoint, it is sufficient to define the standard setpoint source in 0x2860:001 (P201.01).
- For applications requiring a change-over of the setpoint source during operation, the functions for setpoint change-over have to be configured accordingly. ▶ Changing the setpoint source during operation 📖 125

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2860:001<br>(P201.01) | Frequency control: Default setpoint source<br>(Freq. setp. src.) | | Selection of the standard setpoint source for operating mode "MS: Velocity mode".<br>• The selected standard setpoint source is always active in the operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]" when no setpoint change-over to another setpoint source via corresponding triggers/functions is active.<br>▶ Changing the setpoint source during operation 📖 125 |
| | 1 | Keypad | The setpoint is specified locally by the keypad.<br>• Default setting: 0x2601:001 (P202.01)<br>• Use the ↑ and ↓ navigation keys to change the keypad setpoint (also during running operation). |

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| | **2** | **Analog input 1** | The setpoint is defined as analog signal via the analog input 1.<br>▶ Analog input 1 240 |
| | 3 | Analog input 2 | The setpoint is defined as analog signal via the analog input 2.<br>▶ Analog input 2 244 |
| | 4 | HTL input (from version 04.00) | The digital inputs DI3 and DI4 can be configured as HTL input to use an HTL encoder as setpoint encoder or define the setpoint as a reference frequency ("pulse train"). |
| | 5 | Network | The setpoint is defined as process data object via the network.<br>▶ Define setpoint via network 273 |
| | 11 | Frequency preset 1 | For the setpoint selection, preset values can be parameterised and selected.<br>▶ Setpoint presets 83 |
| | 12 | Frequency preset 2 | |
| | 13 | Frequency preset 3 | |
| | 14 | Frequency preset 4 | |
| | 15 | Frequency preset 5 | |
| | 16 | Frequency preset 6 | |
| | 17 | Frequency preset 7 | |
| | 18 | Frequency preset 8 | |
| | 19 | Frequency preset 9 | |
| | 20 | Frequency preset 10 | |
| | 21 | Frequency preset 11 | |
| | 22 | Frequency preset 12 | |
| | 23 | Frequency preset 13 | |
| | 24 | Frequency preset 14 | |
| | 25 | Frequency preset 15 | |
| | 31 | Segment preset 1 (from version 03.00) | For the setpoint selection, the segment presets parameterised for the "sequencer" function can be selected as well.<br>▶ Sequencer 87 |
| | 32 | Segment preset 2 (from version 03.00) | |
| | 33 | Segment preset 3 (from version 03.00) | |
| | 34 | Segment preset 4 (from version 03.00) | |
| | 35 | Segment preset 5 (from version 03.00) | |
| | 36 | Segment preset 6 (from version 03.00) | |
| | 37 | Segment preset 7 (from version 03.00) | |
| | 38 | Segment preset 8 (from version 03.00) | |
| | 50 | Motor potentiometer | The setpoint is generated by the "motor potentiometer" function. This function can be used as an alternative setpoint control which is controlled via two signals: "MOP setpoint up" and "MOP setpoint down".<br>▶ Motor potentiometer (MOP) 85 |
| | 201 | Internal value (from version 05.00) | Internal values of the manufacturer. |
| | 202 | Internal value (from version 05.00) | |
| | 203 | Internal value (from version 05.00) | |
| | 204 | Internal value (from version 05.00) | |
| | 205 | Internal value (from version 05.00) | |
| | 206 | Internal value (from version 05.00) | |

### 7.1.2 Ramp times

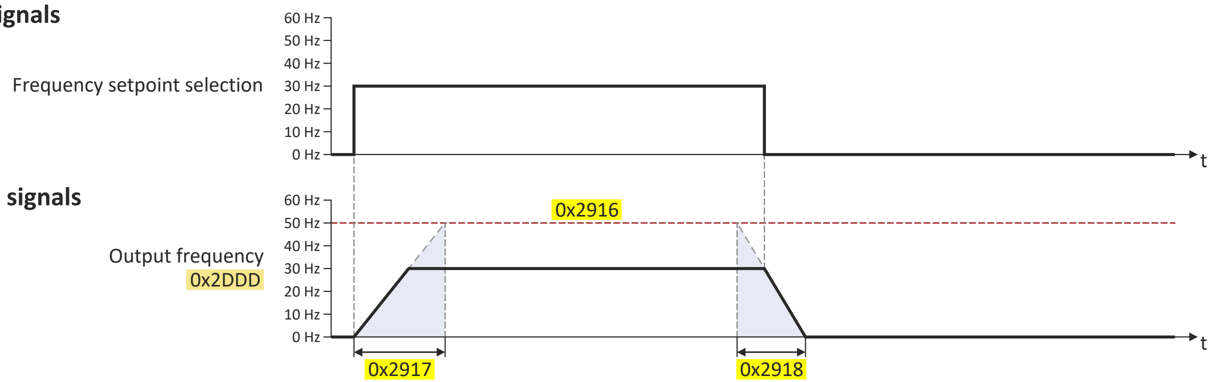
The frequency setpoint is internally guided via a ramp generator. The acceleration time and the deceleration time are independently adjustable.

**Details**

- The acceleration time set in 0x2917 (P220.00) refers to an acceleration from standstill to the maximum frequency set in 0x2916 (P211.00). At a low setpoint selection, the real acceleration time decreases accordingly.
- The deceleration time set in 0x2918 (P221.00) refers to the deceleration of the set maximum frequency to standstill. In case of a lower actual frequency, the actual deceleration time is reduced accordingly.

**Input signals**

**Output signals**

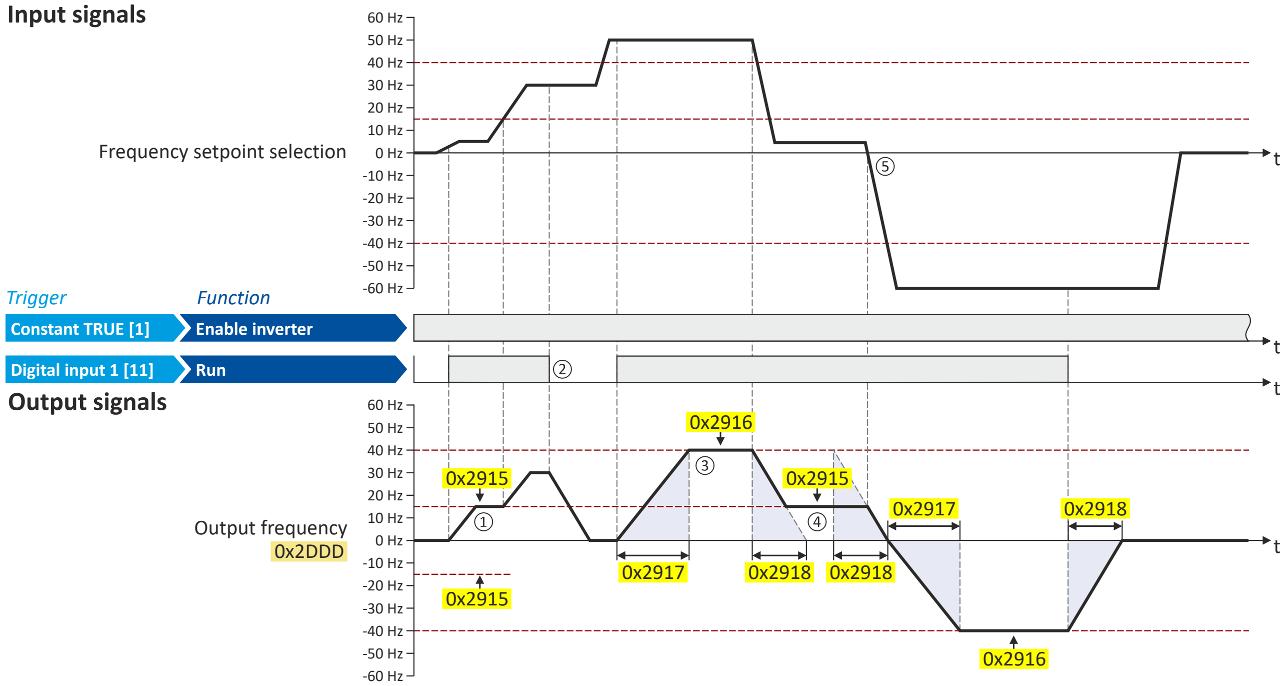



**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2917<br>(P220.00) | Acceleration time 1<br>(Accelerat.time 1)<br>0.0 ... [**5.0**] ... 3600.0 s | Acceleration time 1 for the operating mode "MS: Velocity mode".<br>• The acceleration time set refers to the acceleration from standstill to the maximum frequency set. In the case of a lower setpoint selection, the actual acceleration time is reduced accordingly.<br>• Setting is not effective in the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]". |
| 0x2918<br>(P221.00) | Deceleration time 1<br>(Decelerat.time 1)<br>0.0 ... [**5.0**] ... 3600.0 s | Deceleration time 1 for the operating mode "MS: Velocity mode".<br>• The deceleration time set refers to the deceleration from the maximum frequency set to standstill. In the case of a lower actual frequency, the actual deceleration time is reduced accordingly.<br>• Setting is not effective in the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]". |
| 0x291C<br>(P225.00) | Quick stop deceleration time<br>(QSP dec. time)<br>0.0 ... [**1.0**] ... 3600.0 s | Quick stop deceleration time for the operating mode "MS: Velocity mode".<br>• If the "Quick stop" function is activated, the motor is brought to a standstill within the deceleration time set here.<br>• The deceleration time set refers to the deceleration from the maximum frequency set to standstill. In the case of a lower actual frequency, the actual deceleration time is reduced accordingly.<br>• Setting is not effective in the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]".<br>▸ Example: Quick stop 67 |
| 0x291E:001<br>(P226.01) | S-Ramp characteristic: Smoothing factor<br>(S-ramp char.: Smoothing factor)<br>0.0 ... [**0.0**] ... 100.0 % | Factor for S-rounding of the acceleration/deceleration ramps.<br>• With the setting "0.0", the S-rounding is deactivated and acceleration/deceleration with linear ramps is carried out.<br>• The smoothing factor increases the ramp time as follows:<br>50 % --> 1.5 x configured ramp time<br>100 % --> 2 x configured ramp time |

### Example for operating mode

| Parameter | Name | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2915 (P210.00) | Minimum frequency | 15 Hz |
| 0x2916 (P211.00) | Maximum frequency | 40 Hz |
| 0x2917 (P220.00) | Acceleration time 1 | 4 s |
| 0x2918 (P221.00) | Deceleration time 1 | 3 s |




① After a start command, the motor is accelerated to the minimum frequency. This is also the case if the setpoint selection is = 0 Hz. If the setpoint exceeds the minimum frequency, the ramp generator follows the setpoint.

② If the start command is deactivated again, the motor is stopped with the stop method set in 0x2838:003 (P203.03) (here: Standard ramp).

③ The motor is accelerated to the set maximum frequency.

④ If the setpoint falls below the minimum frequency, it is decelerated up to the minimum frequency.

⑤ In case of a sign reversal of the setpoint, a change of direction of rotation takes place, the minimum and maximum frequency, however, continue to apply.

## 7.2 Configure setpoint sources

The following setpoint sources are described in this chapter:

- Keypad 82
- Setpoint presets 83
- Motor potentiometer (MOP) 85
- Sequencer 87

Setpoint sources described in other chapters:

- Analog input 1 240
- Analog input 2 244
- Network: Define setpoint via network 273

### 7.2.1 Keypad

For the manual setpoint selection via keypad, the following default settings are used:

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2601:001<br>(P202.01) | Keypad setpoints: Frequency setpoint<br>(Keypad setpoints: KP freq.setpoint)<br>0.0 ... [**20.0**] ... 599.0 Hz | Default setting of the keypad setpoint for the operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]". |
| 0x2601:002<br>(P202.02) | Keypad setpoints: Process controller setpoint<br>(Keypad setpoints: KP PID setpoint)<br>-300.00 ... [**0.00**] ... 300.00 PID unit | Default setting of the keypad setpoint for the reference value of the PID control. |

The increment for keypad setpoints can be adapted in 0x2862 (P701.00) by pressing a keypad arrow key once.

A switch-over to the keypad during operation is also possible as an alternative to the standard setpoint source setting.

▶ Example: Change-over from AI1 setpoint to keypad setpoint 131

**Related topics**

▶ Keypad 399

### 7.2.2 Setpoint presets

15 different frequency setpoints (presets) can be parameterised for the frequency control. 8 process controller setpoints (presets) can also be parameterised for the optional PID control.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2911:001<br>(P450.01) | Frequency setpoint presets: Preset 1<br>(Freq. presets: Freq. preset 1)<br>0.0 ... [**20.0**] ... 599.0 Hz | Parameterisable frequency setpoints (presets) for operating mode "MS: Velocity mode". |
| 0x2911:002<br>(P450.02) | Frequency setpoint presets: Preset 2<br>(Freq. presets: Freq. preset 2)<br>0.0 ... [**40.0**] ... 599.0 Hz | |
| 0x2911:003<br>(P450.03) | Frequency setpoint presets: Preset 3<br>(Freq. presets: Freq. preset 3)<br>Device for 50-Hz mains: 0.0 ... [**50.0**] ... 599.0 Hz<br>Device for 60-Hz mains: 0.0 ... [**60.0**] ... 599.0 Hz | |
| 0x2911:004<br>(P450.04) | Frequency setpoint presets: Preset 4<br>(Freq. presets: Freq. preset 4)<br>0.0 ... [**0.0**] ... 599.0 Hz | |
| 0x2911:005<br>(P450.05) | Frequency setpoint presets: Preset 5<br>(Freq. presets: Freq. preset 5)<br>0.0 ... [**0.0**] ... 599.0 Hz | |
| 0x2911:006<br>(P450.06) | Frequency setpoint presets: Preset 6<br>(Freq. presets: Freq. preset 6)<br>0.0 ... [**0.0**] ... 599.0 Hz | |
| 0x2911:007<br>(P450.07) | Frequency setpoint presets: Preset 7<br>(Freq. presets: Freq. preset 7)<br>0.0 ... [**0.0**] ... 599.0 Hz | |
| 0x2911:008<br>(P450.08) | Frequency setpoint presets: Preset 8<br>(Freq. presets: Freq. preset 8)<br>0.0 ... [**0.0**] ... 599.0 Hz | |
| 0x2911:009<br>(P450.09) | Frequency setpoint presets: Preset 9<br>(Freq. presets: Freq. preset 9)<br>0.0 ... [**0.0**] ... 599.0 Hz | |
| 0x2911:010<br>(P450.10) | Frequency setpoint presets: Preset 10<br>(Freq. presets: Freq. preset 10)<br>0.0 ... [**0.0**] ... 599.0 Hz | |
| 0x2911:011<br>(P450.11) | Frequency setpoint presets: Preset 11<br>(Freq. presets: Freq. preset 11)<br>0.0 ... [**0.0**] ... 599.0 Hz | |
| 0x2911:012<br>(P450.12) | Frequency setpoint presets: Preset 12<br>(Freq. presets: Freq. preset 12)<br>0.0 ... [**0.0**] ... 599.0 Hz | |
| 0x2911:013<br>(P450.13) | Frequency setpoint presets: Preset 13<br>(Freq. presets: Freq. preset 13)<br>0.0 ... [**0.0**] ... 599.0 Hz | |
| 0x2911:014<br>(P450.14) | Frequency setpoint presets: Preset 14<br>(Freq. presets: Freq. preset 14)<br>0.0 ... [**0.0**] ... 599.0 Hz | |
| 0x2911:015<br>(P450.15) | Frequency setpoint presets: Preset 15<br>(Freq. presets: Freq. preset 15)<br>0.0 ... [**0.0**] ... 599.0 Hz | |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x4022:001<br>(P451.01) | PID setpoint presets: Preset 1<br>(PID presets: PID preset 1)<br>-300.00 ... [**0.00**] ... 300.00 PID unit | Parameterisable process controller setpoints (presets) for PID control. |
| 0x4022:002<br>(P451.02) | PID setpoint presets: Preset 2<br>(PID presets: PID preset 2)<br>-300.00 ... [**0.00**] ... 300.00 PID unit | |
| 0x4022:003<br>(P451.03) | PID setpoint presets: Preset 3<br>(PID presets: PID preset 3)<br>-300.00 ... [**0.00**] ... 300.00 PID unit | |
| 0x4022:004<br>(P451.04) | PID setpoint presets: Preset 4<br>(PID presets: PID preset 4)<br>-300.00 ... [**0.00**] ... 300.00 PID unit | |
| 0x4022:005<br>(P451.05) | PID setpoint presets: Preset 5<br>(PID presets: PID preset 5)<br>-300.00 ... [**0.00**] ... 300.00 PID unit | |
| 0x4022:006<br>(P451.06) | PID setpoint presets: Preset 6<br>(PID presets: PID preset 6)<br>-300.00 ... [**0.00**] ... 300.00 PID unit | |
| 0x4022:007<br>(P451.07) | PID setpoint presets: Preset 7<br>(PID presets: PID preset 7)<br>-300.00 ... [**0.00**] ... 300.00 PID unit | |
| 0x4022:008<br>(P451.08) | PID setpoint presets: Preset 8<br>(PID presets: PID preset 8)<br>-300.00 ... [**0.00**] ... 300.00 PID unit | |

A switch-over to a preset during operation is also possible as an alternative to the standard setpoint source setting.

▶ Example: Change-over from keypad setpoint to preset 1 ... 7 🕮 133

### 7.2.3 Motor potentiometer (MOP)

The "Motor potentiometer" function can be used as an alternative setpoint control that is controlled via two functions: "MOP setpoint up" and "MOP setpoint down".

**Details**

If the motor potentiometer is active as the setpoint source, the setpoint generated by this function ("MOP value") can be changed according to following the truth table via the triggers assigned to the two functions "MOP setpoint up" and "MOP setpoint down":

| **MOP setpoint up**<br>0x2631:023 (P400.23) | **MOP setpoint down**<br>0x2631:024 (P400.24) | **Response of the function** |
|---|---|---|
| FALSE | FALSE | The last MOP value is maintained. |
| TRUE | FALSE | The MOP value is increased to a maximum of the upper limit value for the respective operating mode with the acceleration time 2.<br>(The motor follows the setpoint change with acceleration time 1.) |
| FALSE | TRUE | The MOP value is increased to a maximum of the lower limit value for the respective operating mode with the deceleration time 2.<br>(The motor follows the setpoint change with deceleration time 1.) |
| TRUE | TRUE | The last MOP value is maintained. |

The start behavior can be selected in 0x4003 (P413.00). In the default setting, the last MOP value is used as the initial value. The last MOP value remains available after switching the mains voltage off and on again. As an alternative, an adjustable initial value or the minimum value can be used for starting.

**Parameter**

| **Address** | **Name / setting range / [default setting]** | **Information** |
|---|---|---|
| 0x2631:023<br>(P400.23) | Function list: MOP setpoint up<br>(Function list: MOP up)<br>• Further possible settings: ▸ Trigger list 📖 59 | Assignment of a trigger for the "MOP setpoint up" function.<br>Trigger = TRUE: setpoint generated by the "Motor potentiometer" function ("MOP value") is maximally increased to the upper range limit with acceleration time 2.<br>Trigger = FALSE: last MOP value is maintained.<br>Notes:<br>• If the "MOP setpoint up" and "MOP setpoint down" functions are active at the same time, the last MOP value is maintained.<br>• Acceleration time 2 can be set in 0x2919 (P222.00). |
| | 0 **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:024<br>(P400.24) | Function list: MOP setpoint down<br>(Function list: MOP down)<br>• Further possible settings: ▸ Trigger list 📖 59 | Assignment of a trigger for the "MOP setpoint down" function.<br>Trigger = TRUE: setpoint generated by the "Motor potentiometer" function ("MOP value") is maximally decreased to the lower range limit with deceleration time 2.<br>Trigger = FALSE: last MOP value is maintained.<br>Notes:<br>• If the "MOP setpoint up" and "MOP setpoint down" functions are active at the same time, the last MOP value is maintained.<br>• Deceleration time 2 can be set in 0x291A (P223.00). |
| | 0 **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x4003<br>(P413.00) | MOP starting mode<br>(MOP startmode) | Selection of the initial value which is used after activation of the function. |
| | 0 **Last value** | The last MOP value is used as initial value. It is still provided after the mains voltage has been switched off and on again.<br>Note: The last MOP value is saved in the internal EEPROM of the inverter. If the memory module is transferred to a compatible device, the last MOP value will therefore not be accepted. |
| | 1 Starting value | The starting value of the corresponding operating mode is used as initial value:<br>• 0x4004:001 (P414.01) for the operating mode "MS: Velocity mode"<br>• 0x4004:002 (P414.02) for PID control<br>• 0x4004:003 (P414.03) for the operating mode "MS: Torque mode" |
| | 2 Minimum value | The minimum value of the corresponding operating mode is used as initial value:<br>• 0x2915 (P210.00) for the operating mode "MS: Velocity mode"<br>• 0x404E:001 (P605.01) for PID control |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x4004:001<br>(P414.01) | MOP starting values: Frequency<br>(MOP start value: Frequency)<br>0.0 ... [**0.0**] ... 599.0 Hz | Starting value for operating mode "MS: Velocity mode".<br>• This value is used as initial value if "Starting value [1]" is set in 0x4003 (P413.00). |
| 0x4004:002<br>(P414.02) | MOP starting values: PID value<br>(MOP start value: PID value)<br>-300.00 ... [**0.00**] ... 300.00 PID unit | Starting value for reference value of the PID control.<br>• This value is used as initial value if "Starting value [1]" is set in 0x4003 (P413.00). |
| 0x4004:003<br>(P414.03) | MOP starting values: Torque<br>(MOP start value: Torque)<br>0.0 ... [**0.0**] ... 1000.0 % | Starting value for operating mode "MS: Torque mode".<br>• This value is used as initial value if "Starting value [1]" is set in 0x4003 (P413.00).<br>• 100 % = motor rated torque (0x6076 (P325.00)). |
| 0x4009:001 | MOP values saved: Frequency<br>• Read only: x.x Hz | Display of the last MOP value saved internally for the operating mode "MS: Velocity mode".<br>• This value is used as initial value if "Last value [0]" is set in 0x4003 (P413.00). |
| 0x4009:002 | MOP values saved: PID value<br>• Read only: x.xx PID unit | Display of the last MOP value saved internally for the reference value of the PID control.<br>• This value is used as initial value if "Last value [0]" is set in 0x4003 (P413.00). |
| 0x4009:003 | MOP values saved: Torque<br>• Read only: x.x % | Display of the last MOP value saved internally for the operating mode "MS: Torque mode".<br>• This value is used as initial value if "Last value [0]" is set in 0x4003 (P413.00).<br>• 100 % = motor rated torque (0x6076 (P325.00)). |

A switch-over to the motor potentiometer during operation is also possible as an alternative to the standard setpoint source setting.

▸ Example: Change-over from AI1 setpoint to MOP setpoint 🕮 136

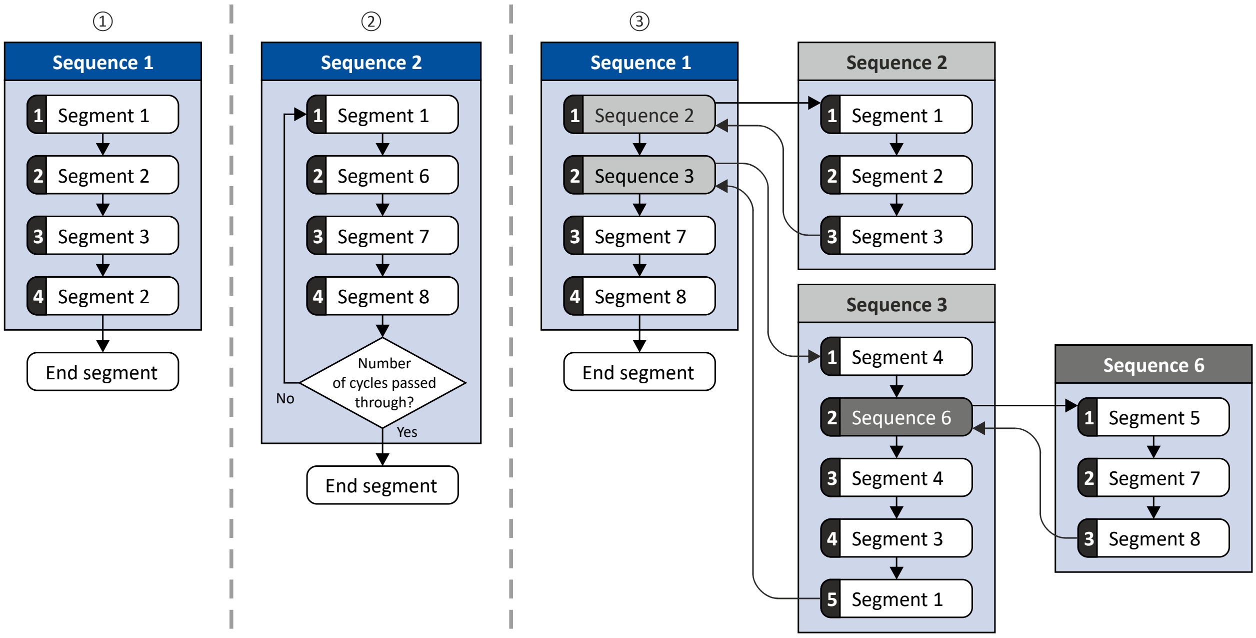
### 7.2.4 Sequencer

The "sequencer" function serves to transfer a programmed sequence of setpoints to the motor control. The switch-over to the next setpoint can be made time-controlled or even-controlled. Optionally, the "sequencer" function can also trigger the digital and analog outputs.

The sequencer only generates setpoints. However, the sequencer does not control the motor operation (does not output any start and stop commands).

**Basics: Sequences, steps and segments**

- Overall, sequences with the numbers 1 to 8 can be configured.
- Each sequence consists of 16 configurable steps.
- Each step of a sequence can call a "segment".
  - A segment contains, among other things  preset setpoints (speed setpoint, PID control value, torque setpoint), a combined acceleration/deceleration for the speed setpoint and optionally a configuration for the digital and analog outputs.
  - 8 different segments and one end segment can be configured.
- Alternatively to calling a single segment, a complete sequence (with a higher number) can also be called from one step. This serves to implement nested sequences or summarize several sequences to one sequence.




① Simple sequence with four steps.

② Simple sequence with four steps that are passed through several times (number of cycles > 1). For each sequence, the number of cycles can be set individually.

③ Nested sequence, in which other (sub) sequences are called by one (main) sequence.

### Commissioning

For commissioning the sequencer, we recommend the following proceeding:

1. Configure segments (including end segment).

   Details: ▶ Segment configuration 📖 89
2. Configure sequences:
   a) Assign the segments to the single steps of a sequence.
   b) Set the number of cycles for the respective sequence.

   Details: ▶ Sequence configuration 📖 99
3. Make the basic setting of the sequencer:
   a) Set the desired operating mode (time and/or step operation).
   b) Optionally adjust the sequence end mode and the sequence start mode.

   Details: ▶ Sequencer basic settings 📖 103
4. Configure the control of the sequencer:
   a) Assign the functions for selecting a sequence to suitable triggers (e. g. digital inputs).
   b) Assign the functions for controlling the sequencer (start, stop, cancel, ...) to suitable triggers.

   Details: ▶ Sequencer control functions 📖 106

### Control

The sequencer can be controlled with the following function. For details, see chapter "Sequencer control functions". 📖 106

| Function | Information |
|---|---|
| Select sequence (bit 0) ... Select sequence (bit 3) | Bit coded selection of the sequence to be started. |
| Start sequence | The selected sequence is started. The start can take place edge or status-controlled depending on the configuration. |
| Next sequence step | Immediate jump to the next step irrespective of the time set for the segment. |
| Pause sequence | The sequencer stops in the current step. The elapsing time set for the segment is stopped. The sequencer setpoint remains active. |
| Suspend sequence | There is a temporary return to the normal setpoint control. The sequence is then continued at the point where it was suspended. |
| Stop sequence | Direct jump to the end segment. The further execution depends on the selected end of sequence mode. |
| Abort sequence | Immediate return to the normal setpoint control. The end segment is not executed anymore. |

### Diagnostics

For diagnosing the sequencer, the diagnostic parameters listed in chapter "Sequencer diagnostics" are available. 📖 110

### Internal status signals

The sequencer provides different internal status signals (see the following table). These status signals can be assigned to the relay, the digital outputs or the status word NetWordOUT1.
▶ Configure digital outputs 📖 247

| Internal status signal | Information |
|---|---|
| "Sequencer controlled [100]" | The control is executed via the sequencer (according to the configuration of the digital outputs for the current segment). |
| "Sequence active [101]" | The sequence is running and is currently not suspended. |
| "Sequence suspended [102]" | The sequence is currently suspended. |
| "Sequence done [103]" | The sequence is completed (end segment was passed through). |

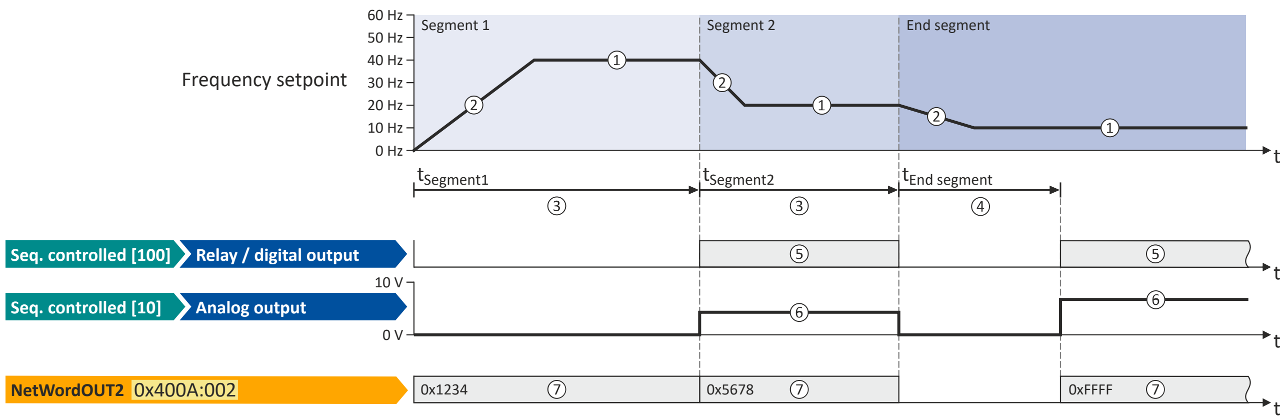
### 7.2.4.1 Segment configuration

Each step of a sequence can call a "segment". A segment contains, among other things preset setpoints (speed setpoint, PID control value, torque setpoint), a combined acceleration/ deceleration for the speed setpoint and optionally a configuration for the digital and analog outputs.

**Details**

As a total, 8 segments and one end segment can be configured.

- The settings are only effective if a sequence is active and the respective segment is executed.
- Only those settings that are relevant for the corresponding operating mode must be made; i.e. if the PID control is not used, no PID setpoint has to be set for the segment.
- The following figure shows the segment settings relevant for the operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".
- The table below provides a brief overview of the possible settings of the different segments.




| Setting | | Info |
|---|---|---|
| Frequency setpoint | ① | Only relevant for the operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]". The direction of rotation is implemented according to the sign. |
| Acceleration/deceleration | ② | Only relevant for the operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]". The set time refers to the acceleration from standstill to the set maximum frequency. The deceleration is effected with the same ramp. |
| Time | ③ | Meaning for segment 1 ... 8:<br>Runtime for the segment after the expiration of which it is switched over to the next step of the sequence. Only relevant for Sequencer mode 0x4025 (P800.00) = "Time operation [1]" or "Time & step operation [3]". |
| | ④ | Meaning for end segment:<br>Delay time for activating the output states configured for the end segment. |
| Digital outputs | ⑤ | Optionally: Set digital outputs to a certain level for the execution time of the segment. |
| Analog outputs | ⑥ | Optionally: Set analog outputs to an adjustable voltage value for the execution time of the segment. |
| PID setpoint | | Only relevant if the PID control in 0x4020:001 (P600.01) is activated.<br>▸ Configuring the process controller 📖 112 |
| Torque setpoint | | Only relevant for the operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]".<br>▸ Configuring the torque control 📖 146 |
| NetWordOUT2 | ⑦ | Optionally: Set the NetWordOUT2 data word to an adjustable value for the execution time of the segment. The NetWordOUT2 data word 0x400A:002 (P591.02) can be mapped to a network register to transfer the set value as process date.<br>▸ Output messages of the "sequencer" function via network 📖 281 |

In the following, all parameters relevant for the segment configuration are given.

If the sequencer is active, write accesses to all parameters are blocked that concern the active segment configuration!

### Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x4026:001<br>(P801.01) | Sequencer segment 1: Frequency setpoint<br>(Segment 1: Frequency setp.)<br>-599.0 ... [**0.0**] ... 599.0 Hz<br>• From version 03.00 | Frequency setpoint for the segment.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".<br>• Direction of rotation according to sign. |
| 0x4026:002<br>(P801.02) | Sequencer segment 1: Acceleration/deceleration<br>(Segment 1: Accel./decel.)<br>0.0 ... [**5.0**] ... 3600.0 s<br>• From version 03.00 | Acceleration/deceleration for the segment.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".<br>• The set time refers to the acceleration from standstill to the set maximum frequency. The deceleration is effected with the same ramp. |
| 0x4026:003<br>(P801.03) | Sequencer segment 1: Time<br>(Segment 1: Time)<br>0.0 ... [**0.0**] ... 100000.0 s<br>• From version 03.00 | Runtime for the segment after the expiry of which it is switched over to the next step of the sequence.<br>• Only relevant for Sequencer mode 0x4025 (P800.00) = "Time operation [1]" or "Time & step operation [3]".<br>• With the setting "0.0", the segment will be skipped. |
| 0x4026:004<br>(P801.04) | Sequencer segment 1: Digital outputs<br>(Segment 1: Digital outp.)<br>0 ... [**0**] ... 255<br>• From version 03.00 | Optionally: Set digital outputs to the level set here for the execution time of the segment.<br>Note!<br>In order that the control of a digital output is executed by the sequencer, the following assignment must be made for the respective digital output:<br>• Relay: 0x2634:001 (P420.01) = "Sequencer controlled [100]"<br>• Digital output 1: 0x2634:002 (P420.02) = "Sequencer controlled [100]" |
| | Bit 0 Relay | 0 = X9/NO-COM open and NC-COM closed.<br>1 = X9/NO-COM closed and NC-COM open.<br>An inversion set in 0x2635:001 (P421.01)is taken into consideration here. |
| | Bit 1 Digital output 1 | 0 = set digital output 1 to LOW level.<br>1 = set digital output 1 to HIGH level.<br>An inversion set in 0x2635:002 (P421.02) is taken into consideration here. |
| | Bit 2 Digital output 2 | Function is not supported in this device. |
| 0x4026:005<br>(P801.05) | Sequencer segment 1: Analog outputs<br>(Segment 1: Analog outp.)<br>0.00 ... [**0.00**] ... 10.00 VDC<br>• From version 03.00 | Optionally: Set analog output to the voltage value set here for the execution time of the segment.<br>Note!<br>In order that the control of the analog output is executed by the sequencer, the following assignment must be made for the analog output:<br>• Analog output 1: 0x2639:002 (P440.02) = "Sequencer controlled [10]" |
| 0x4026:006<br>(P801.06) | Sequencer segment 1: PID setpoint<br>(Segment 1: PID setp.)<br>-300.00 ... [**0.00**] ... 300.00 PID unit<br>• From version 03.00 | PID control value for the segment.<br>• Only relevant if the PID control in 0x4020:001 (P600.01) is activated. |
| 0x4026:007<br>(P801.07) | Sequencer segment 1: Torque setpoint<br>(Segment 1: Torque setp.)<br>-400.0 ... [**100.0**] ... 400.0 %<br>• From version 03.00 | Torque setpoint for the segment.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]". |
| 0x4026:008 | Sequencer segment 1: NetWordOUT2<br>0 ... [**0**] ... 65535<br>• From version 03.00 | Optionally: Set the NetWordOUT2 data word to the value set here for the execution time of the segment.<br>• The NetWordOUT2 data word 0x400A:002 (P591.02) can be mapped to a network register to transfer the set value as process date. |
| 0x4026:009 | Sequencer segment 1: Reserved<br>0 ... [**0**] ... 4294967295.0<br>• From version 03.00 | |
| 0x4027:001<br>(P802.01) | Sequencer segment 2: Frequency setpoint<br>(Segment 2: Frequency setp.)<br>-599.0 ... [**0.0**] ... 599.0 Hz<br>• From version 03.00 | Frequency setpoint for the segment.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".<br>• Direction of rotation according to sign. |
| 0x4027:002<br>(P802.02) | Sequencer segment 2: Acceleration/deceleration<br>(Segment 2: Accel./decel.)<br>0.0 ... [**5.0**] ... 3600.0 s<br>• From version 03.00 | Acceleration/deceleration for the segment.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".<br>• The set time refers to the acceleration from standstill to the set maximum frequency. The deceleration is effected with the same ramp. |



| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x4027:003<br>(P802.03) | Sequencer segment 2: Time<br>(Segment 2: Time)<br>0.0 ... [**0.0**] ... 100000.0 s<br>• From version 03.00 | Runtime for the segment after the expiry of which it is switched over to the next step of the sequence.<br>• Only relevant for Sequencer mode 0x4025 (P800.00) = "Time operation [1]" or "Time & step operation [3]".<br>• With the setting "0.0", the segment will be skipped. |
| 0x4027:004<br>(P802.04) | Sequencer segment 2: Digital outputs<br>(Segment 2: Digital outp.)<br>0 ... [**0**] ... 255<br>• From version 03.00 | Optionally: Set digital outputs to the level set here for the execution time of the segment.<br>Note!<br>In order that the control of a digital output is executed by the sequencer, the following assignment must be made for the respective digital output:<br>• Relay: 0x2634:001 (P420.01) = "Sequencer controlled [100]"<br>• Digital output 1: 0x2634:002 (P420.02) = "Sequencer controlled [100]" |
| | Bit 0 Relay | 0 = X9/NO-COM open and NC-COM closed.<br>1 = X9/NO-COM closed and NC-COM open.<br>An inversion set in 0x2635:001 (P421.01)is taken into consideration here. |
| | Bit 1 Digital output 1 | 0 = set digital output 1 to LOW level.<br>1 = set digital output 1 to HIGH level.<br>An inversion set in 0x2635:002 (P421.02) is taken into consideration here. |
| | Bit 2 Digital output 2 | Function is not supported in this device. |
| 0x4027:005<br>(P802.05) | Sequencer segment 2: Analog outputs<br>(Segment 2: Analog outp.)<br>0.00 ... [**0.00**] ... 10.00 VDC<br>• From version 03.00 | Optionally: Set analog output to the voltage value set here for the execution time of the segment.<br>Note!<br>In order that the control of the analog output is executed by the sequencer, the following assignment must be made for the analog output:<br>• Analog output 1: 0x2639:002 (P440.02) = "Sequencer controlled [10]" |
| 0x4027:006<br>(P802.06) | Sequencer segment 2: PID setpoint<br>(Segment 2: PID setp.)<br>-300.00 ... [**0.00**] ... 300.00 PID unit<br>• From version 03.00 | PID control value for the segment.<br>• Only relevant if the PID control in 0x4020:001 (P600.01) is activated. |
| 0x4027:007<br>(P802.07) | Sequencer segment 2: Torque setpoint<br>(Segment 2: Torque setp.)<br>-400.0 ... [**100.0**] ... 400.0 %<br>• From version 03.00 | Torque setpoint for the segment.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]". |
| 0x4027:008 | Sequencer segment 2: NetWordOUT2<br>0 ... [**0**] ... 65535<br>• From version 03.00 | Optionally: Set the NetWordOUT2 data word to the value set here for the execution time of the segment.<br>• The NetWordOUT2 data word 0x400A:002 (P591.02) can be mapped to a network register to transfer the set value as process date. |
| 0x4027:009 | Sequencer segment 2: Reserved<br>0 ... [**0**] ... 4294967295.0<br>• From version 03.00 | |
| 0x4028:001<br>(P803.01) | Sequencer segment 3: Frequency setpoint<br>(Segment 3: Frequency setp.)<br>-599.0 ... [**0.0**] ... 599.0 Hz<br>• From version 03.00 | Frequency setpoint for the segment.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".<br>• Direction of rotation according to sign. |
| 0x4028:002<br>(P803.02) | Sequencer segment 3: Acceleration/deceleration<br>(Segment 3: Accel./decel.)<br>0.0 ... [**5.0**] ... 3600.0 s<br>• From version 03.00 | Acceleration/deceleration for the segment.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".<br>• The set time refers to the acceleration from standstill to the set maximum frequency. The deceleration is effected with the same ramp. |
| 0x4028:003<br>(P803.03) | Sequencer segment 3: Time<br>(Segment 3: Time)<br>0.0 ... [**0.0**] ... 100000.0 s<br>• From version 03.00 | Runtime for the segment after the expiry of which it is switched over to the next step of the sequence.<br>• Only relevant for Sequencer mode 0x4025 (P800.00) = "Time operation [1]" or "Time & step operation [3]".<br>• With the setting "0.0", the segment will be skipped. |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x4028:004<br>(P803.04) | Sequencer segment 3: Digital outputs<br>(Segment 3: Digital outp.)<br>0 ... **[0]** ... 255<br>• From version 03.00 | Optionally: Set digital outputs to the level set here for the execution time of the segment.<br>Note!<br>In order that the control of a digital output is executed by the sequencer, the following assignment must be made for the respective digital output:<br>• Relay: 0x2634:001 (P420.01) = "Sequencer controlled [100]"<br>• Digital output 1: 0x2634:002 (P420.02) = "Sequencer controlled [100]" |
| | Bit 0 Relay | 0 = X9/NO-COM open and NC-COM closed.<br>1 = X9/NO-COM closed and NC-COM open.<br>An inversion set in 0x2635:001 (P421.01)is taken into consideration here. |
| | Bit 1 Digital output 1 | 0 = set digital output 1 to LOW level.<br>1 = set digital output 1 to HIGH level.<br>An inversion set in 0x2635:002 (P421.02) is taken into consideration here. |
| | Bit 2 Digital output 2 | Function is not supported in this device. |
| 0x4028:005<br>(P803.05) | Sequencer segment 3: Analog outputs<br>(Segment 3: Analog outp.)<br>0.00 ... **[0.00]** ... 10.00 VDC<br>• From version 03.00 | Optionally: Set analog output to the voltage value set here for the execution time of the segment.<br>Note!<br>In order that the control of the analog output is executed by the sequencer, the following assignment must be made for the analog output:<br>• Analog output 1: 0x2639:002 (P440.02) = "Sequencer controlled [10]" |
| 0x4028:006<br>(P803.06) | Sequencer segment 3: PID setpoint<br>(Segment 3: PID setp.)<br>-300.00 ... **[0.00]** ... 300.00 PID unit<br>• From version 03.00 | PID control value for the segment.<br>• Only relevant if the PID control in 0x4020:001 (P600.01) is activated. |
| 0x4028:007<br>(P803.07) | Sequencer segment 3: Torque setpoint<br>(Segment 3: Torque setp.)<br>-400.0 ... **[100.0]** ... 400.0 %<br>• From version 03.00 | Torque setpoint for the segment.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]". |
| 0x4028:008 | Sequencer segment 3: NetWordOUT2<br>0 ... **[0]** ... 65535<br>• From version 03.00 | Optionally: Set the NetWordOUT2 data word to the value set here for the execution time of the segment.<br>• The NetWordOUT2 data word 0x400A:002 (P591.02) can be mapped to a network register to transfer the set value as process date. |
| 0x4028:009 | Sequencer segment 3: Reserved<br>0 ... **[0]** ... 4294967295.0<br>• From version 03.00 | |
| 0x4029:001<br>(P804.01) | Sequencer segment 4: Frequency setpoint<br>(Segment 4: Frequency setp.)<br>-599.0 ... **[0.0]** ... 599.0 Hz<br>• From version 03.00 | Frequency setpoint for the segment.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".<br>• Direction of rotation according to sign. |
| 0x4029:002<br>(P804.02) | Sequencer segment 4: Acceleration/deceleration<br>(Segment 4: Accel./decel.)<br>0.0 ... **[5.0]** ... 3600.0 s<br>• From version 03.00 | Acceleration/deceleration for the segment.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".<br>• The set time refers to the acceleration from standstill to the set maximum frequency. The deceleration is effected with the same ramp. |
| 0x4029:003<br>(P804.03) | Sequencer segment 4: Time<br>(Segment 4: Time)<br>0.0 ... **[0.0]** ... 100000.0 s<br>• From version 03.00 | Runtime for the segment after the expiry of which it is switched over to the next step of the sequence.<br>• Only relevant for Sequencer mode 0x4025 (P800.00) = "Time operation [1]" or "Time & step operation [3]".<br>• With the setting "0.0", the segment will be skipped. |



| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x4029:004<br>(P804.04) | Sequencer segment 4: Digital outputs<br>(Segment 4: Digital outp.)<br>0 ... [**0**] ... 255<br>• From version 03.00 | Optionally: Set digital outputs to the level set here for the execution time of the segment.<br>Note!<br>In order that the control of a digital output is executed by the sequencer, the following assignment must be made for the respective digital output:<br>• Relay: 0x2634:001 (P420.01) = "Sequencer controlled [100]"<br>• Digital output 1: 0x2634:002 (P420.02) = "Sequencer controlled [100]" |
| | Bit 0 Relay | 0 = X9/NO-COM open and NC-COM closed.<br>1 = X9/NO-COM closed and NC-COM open.<br>An inversion set in 0x2635:001 (P421.01)is taken into consideration here. |
| | Bit 1 Digital output 1 | 0 = set digital output 1 to LOW level.<br>1 = set digital output 1 to HIGH level.<br>An inversion set in 0x2635:002 (P421.02) is taken into consideration here. |
| | Bit 2 Digital output 2 | Function is not supported in this device. |
| 0x4029:005<br>(P804.05) | Sequencer segment 4: Analog outputs<br>(Segment 4: Analog outp.)<br>0.00 ... [**0.00**] ... 10.00 VDC<br>• From version 03.00 | Optionally: Set analog output to the voltage value set here for the execution time of the segment.<br>Note!<br>In order that the control of the analog output is executed by the sequencer, the following assignment must be made for the analog output:<br>• Analog output 1: 0x2639:002 (P440.02) = "Sequencer controlled [10]" |
| 0x4029:006<br>(P804.06) | Sequencer segment 4: PID setpoint<br>(Segment 4: PID setp.)<br>-300.00 ... [**0.00**] ... 300.00 PID unit<br>• From version 03.00 | PID control value for the segment.<br>• Only relevant if the PID control in 0x4020:001 (P600.01) is activated. |
| 0x4029:007<br>(P804.07) | Sequencer segment 4: Torque setpoint<br>(Segment 4: Torque setp.)<br>-400.0 ... [**100.0**] ... 400.0 %<br>• From version 03.00 | Torque setpoint for the segment.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]". |
| 0x4029:008 | Sequencer segment 4: NetWordOUT2<br>0 ... [**0**] ... 65535<br>• From version 03.00 | Optionally: Set the NetWordOUT2 data word to the value set here for the execution time of the segment.<br>• The NetWordOUT2 data word 0x400A:002 (P591.02) can be mapped to a network register to transfer the set value as process date. |
| 0x4029:009 | Sequencer segment 4: Reserved<br>0 ... [**0**] ... 4294967295.0<br>• From version 03.00 | |
| 0x402A:001<br>(P805.01) | Sequencer segment 5: Frequency setpoint<br>(Segment 5: Frequency setp.)<br>-599.0 ... [**0.0**] ... 599.0 Hz<br>• From version 03.00 | Frequency setpoint for the segment.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".<br>• Direction of rotation according to sign. |
| 0x402A:002<br>(P805.02) | Sequencer segment 5: Acceleration/deceleration<br>(Segment 5: Accel./decel.)<br>0.0 ... [**5.0**] ... 3600.0 s<br>• From version 03.00 | Acceleration/deceleration for the segment.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".<br>• The set time refers to the acceleration from standstill to the set maximum frequency. The deceleration is effected with the same ramp. |
| 0x402A:003<br>(P805.03) | Sequencer segment 5: Time<br>(Segment 5: Time)<br>0.0 ... [**0.0**] ... 100000.0 s<br>• From version 03.00 | Runtime for the segment after the expiry of which it is switched over to the next step of the sequence.<br>• Only relevant for Sequencer mode 0x4025 (P800.00) = "Time operation [1]" or "Time & step operation [3]".<br>• With the setting "0.0", the segment will be skipped. |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x402A:004<br>(P805.04) | Sequencer segment 5: Digital outputs<br>(Segment 5: Digital outp.)<br>0 ... [**0**] ... 255<br>• From version 03.00 | Optionally: Set digital outputs to the level set here for the execution time of the segment.<br>Note!<br>In order that the control of a digital output is executed by the sequencer, the following assignment must be made for the respective digital output:<br>• Relay: 0x2634:001 (P420.01) = "Sequencer controlled [100]"<br>• Digital output 1: 0x2634:002 (P420.02) = "Sequencer controlled [100]" |
| | Bit 0 \| Relay | 0 = X9/NO-COM open and NC-COM closed.<br>1 = X9/NO-COM closed and NC-COM open.<br>An inversion set in 0x2635:001 (P421.01)is taken into consideration here. |
| | Bit 1 \| Digital output 1 | 0 = set digital output 1 to LOW level.<br>1 = set digital output 1 to HIGH level.<br>An inversion set in 0x2635:002 (P421.02) is taken into consideration here. |
| | Bit 2 \| Digital output 2 | Function is not supported in this device. |
| 0x402A:005<br>(P805.05) | Sequencer segment 5: Analog outputs<br>(Segment 5: Analog outp.)<br>0.00 ... [**0.00**] ... 10.00 VDC<br>• From version 03.00 | Optionally: Set analog output to the voltage value set here for the execution time of the segment.<br>Note!<br>In order that the control of the analog output is executed by the sequencer, the following assignment must be made for the analog output:<br>• Analog output 1: 0x2639:002 (P440.02) = "Sequencer controlled [10]" |
| 0x402A:006<br>(P805.06) | Sequencer segment 5: PID setpoint<br>(Segment 5: PID setp.)<br>-300.00 ... [**0.00**] ... 300.00 PID unit<br>• From version 03.00 | PID control value for the segment.<br>• Only relevant if the PID control in 0x4020:001 (P600.01) is activated. |
| 0x402A:007<br>(P805.07) | Sequencer segment 5: Torque setpoint<br>(Segment 5: Torque setp.)<br>-400.0 ... [**100.0**] ... 400.0 %<br>• From version 03.00 | Torque setpoint for the segment.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]". |
| 0x402A:008 | Sequencer segment 5: NetWordOUT2<br>0 ... [**0**] ... 65535<br>• From version 03.00 | Optionally: Set the NetWordOUT2 data word to the value set here for the execution time of the segment.<br>• The NetWordOUT2 data word 0x400A:002 (P591.02) can be mapped to a network register to transfer the set value as process date. |
| 0x402A:009 | Sequencer segment 5: Reserved<br>0 ... [**0**] ... 4294967295.0<br>• From version 03.00 | |
| 0x402B:001<br>(P806.01) | Sequencer segment 6: Frequency setpoint<br>(Segment 6: Frequency setp.)<br>-599.0 ... [**0.0**] ... 599.0 Hz<br>• From version 03.00 | Frequency setpoint for the segment.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".<br>• Direction of rotation according to sign. |
| 0x402B:002<br>(P806.02) | Sequencer segment 6: Acceleration/deceleration<br>(Segment 6: Accel./decel.)<br>0.0 ... [**5.0**] ... 3600.0 s<br>• From version 03.00 | Acceleration/deceleration for the segment.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".<br>• The set time refers to the acceleration from standstill to the set maximum frequency. The deceleration is effected with the same ramp. |
| 0x402B:003<br>(P806.03) | Sequencer segment 6: Time<br>(Segment 6: Time)<br>0.0 ... [**0.0**] ... 100000.0 s<br>• From version 03.00 | Runtime for the segment after the expiry of which it is switched over to the next step of the sequence.<br>• Only relevant for Sequencer mode 0x4025 (P800.00) = "Time operation [1]" or "Time & step operation [3]".<br>• With the setting "0.0", the segment will be skipped. |



| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x402B:004<br>(P806.04) | Sequencer segment 6: Digital outputs<br>(Segment 6: Digital outp.)<br>0 ... [**0**] ... 255<br>• From version 03.00 | Optionally: Set digital outputs to the level set here for the execution time of the segment.<br>Note!<br>In order that the control of a digital output is executed by the sequencer, the following assignment must be made for the respective digital output:<br>• Relay: 0x2634:001 (P420.01) = "Sequencer controlled [100]"<br>• Digital output 1: 0x2634:002 (P420.02) = "Sequencer controlled [100]" |
| | Bit 0 Relay | 0 = X9/NO-COM open and NC-COM closed.<br>1 = X9/NO-COM closed and NC-COM open.<br>An inversion set in 0x2635:001 (P421.01)is taken into consideration here. |
| | Bit 1 Digital output 1 | 0 = set digital output 1 to LOW level.<br>1 = set digital output 1 to HIGH level.<br>An inversion set in 0x2635:002 (P421.02) is taken into consideration here. |
| | Bit 2 Digital output 2 | Function is not supported in this device. |
| 0x402B:005<br>(P806.05) | Sequencer segment 6: Analog outputs<br>(Segment 6: Analog outp.)<br>0.00 ... [**0.00**] ... 10.00 VDC<br>• From version 03.00 | Optionally: Set analog output to the voltage value set here for the execution time of the segment.<br>Note!<br>In order that the control of the analog output is executed by the sequencer, the following assignment must be made for the analog output:<br>• Analog output 1: 0x2639:002 (P440.02) = "Sequencer controlled [10]" |
| 0x402B:006<br>(P806.06) | Sequencer segment 6: PID setpoint<br>(Segment 6: PID setp.)<br>-300.00 ... [**0.00**] ... 300.00 PID unit<br>• From version 03.00 | PID control value for the segment.<br>• Only relevant if the PID control in 0x4020:001 (P600.01) is activated. |
| 0x402B:007<br>(P806.07) | Sequencer segment 6: Torque setpoint<br>(Segment 6: Torque setp.)<br>-400.0 ... [**100.0**] ... 400.0 %<br>• From version 03.00 | Torque setpoint for the segment.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]". |
| 0x402B:008 | Sequencer segment 6: NetWordOUT2<br>0 ... [**0**] ... 65535<br>• From version 03.00 | Optionally: Set the NetWordOUT2 data word to the value set here for the execution time of the segment.<br>• The NetWordOUT2 data word 0x400A:002 (P591.02) can be mapped to a network register to transfer the set value as process date. |
| 0x402B:009 | Sequencer segment 6: Reserved<br>0 ... [**0**] ... 4294967295.0<br>• From version 03.00 | |
| 0x402C:001<br>(P807.01) | Sequencer segment 7: Frequency setpoint<br>(Segment 7: Frequency setp.)<br>-599.0 ... [**0.0**] ... 599.0 Hz<br>• From version 03.00 | Frequency setpoint for the segment.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".<br>• Direction of rotation according to sign. |
| 0x402C:002<br>(P807.02) | Sequencer segment 7: Acceleration/deceleration<br>(Segment 7: Accel./decel.)<br>0.0 ... [**5.0**] ... 3600.0 s<br>• From version 03.00 | Acceleration/deceleration for the segment.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".<br>• The set time refers to the acceleration from standstill to the set maximum frequency. The deceleration is effected with the same ramp. |
| 0x402C:003<br>(P807.03) | Sequencer segment 7: Time<br>(Segment 7: Time)<br>0.0 ... [**0.0**] ... 100000.0 s<br>• From version 03.00 | Runtime for the segment after the expiry of which it is switched over to the next step of the sequence.<br>• Only relevant for Sequencer mode 0x4025 (P800.00) = "Time operation [1]" or "Time & step operation [3]".<br>• With the setting "0.0", the segment will be skipped. |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x402C:004<br>(P807.04) | Sequencer segment 7: Digital outputs<br>(Segment 7: Digital outp.)<br>0 ... [**0**] ... 255<br>• From version 03.00 | Optionally: Set digital outputs to the level set here for the execution time of the segment.<br>Note!<br>In order that the control of a digital output is executed by the sequencer, the following assignment must be made for the respective digital output:<br>• Relay: 0x2634:001 (P420.01) = "Sequencer controlled [100]"<br>• Digital output 1: 0x2634:002 (P420.02) = "Sequencer controlled [100]" |
| | Bit 0 Relay | 0 = X9/NO-COM open and NC-COM closed.<br>1 = X9/NO-COM closed and NC-COM open.<br>An inversion set in 0x2635:001 (P421.01)is taken into consideration here. |
| | Bit 1 Digital output 1 | 0 = set digital output 1 to LOW level.<br>1 = set digital output 1 to HIGH level.<br>An inversion set in 0x2635:002 (P421.02) is taken into consideration here. |
| | Bit 2 Digital output 2 | Function is not supported in this device. |
| 0x402C:005<br>(P807.05) | Sequencer segment 7: Analog outputs<br>(Segment 7: Analog outp.)<br>0.00 ... [**0.00**] ... 10.00 VDC<br>• From version 03.00 | Optionally: Set analog output to the voltage value set here for the execution time of the segment.<br>Note!<br>In order that the control of the analog output is executed by the sequencer, the following assignment must be made for the analog output:<br>• Analog output 1: 0x2639:002 (P440.02) = "Sequencer controlled [10]" |
| 0x402C:006<br>(P807.06) | Sequencer segment 7: PID setpoint<br>(Segment 7: PID setp.)<br>-300.00 ... [**0.00**] ... 300.00 PID unit<br>• From version 03.00 | PID control value for the segment.<br>• Only relevant if the PID control in 0x4020:001 (P600.01) is activated. |
| 0x402C:007<br>(P807.07) | Sequencer segment 7: Torque setpoint<br>(Segment 7: Torque setp.)<br>-400.0 ... [**100.0**] ... 400.0 %<br>• From version 03.00 | Torque setpoint for the segment.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]". |
| 0x402C:008 | Sequencer segment 7: NetWordOUT2<br>0 ... [**0**] ... 65535<br>• From version 03.00 | Optionally: Set the NetWordOUT2 data word to the value set here for the execution time of the segment.<br>• The NetWordOUT2 data word 0x400A:002 (P591.02) can be mapped to a network register to transfer the set value as process date. |
| 0x402C:009 | Sequencer segment 7: Reserved<br>0 ... [**0**] ... 4294967295.0<br>• From version 03.00 | |
| 0x402D:001<br>(P808.01) | Sequencer segment 8: Frequency setpoint<br>(Segment 8: Frequency setp.)<br>-599.0 ... [**0.0**] ... 599.0 Hz<br>• From version 03.00 | Frequency setpoint for the segment.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".<br>• Direction of rotation according to sign. |
| 0x402D:002<br>(P808.02) | Sequencer segment 8: Acceleration/deceleration<br>(Segment 8: Accel./decel.)<br>0.0 ... [**5.0**] ... 3600.0 s<br>• From version 03.00 | Acceleration/deceleration for the segment.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".<br>• The set time refers to the acceleration from standstill to the set maximum frequency. The deceleration is effected with the same ramp. |
| 0x402D:003<br>(P808.03) | Sequencer segment 8: Time<br>(Segment 8: Time)<br>0.0 ... [**0.0**] ... 100000.0 s<br>• From version 03.00 | Runtime for the segment after the expiry of which it is switched over to the next step of the sequence.<br>• Only relevant for Sequencer mode 0x4025 (P800.00) = "Time operation [1]" or "Time & step operation [3]".<br>• With the setting "0.0", the segment will be skipped. |



| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x402D:004 (P808.04) | Sequencer segment 8: Digital outputs (Segment 8: Digital outp.)<br>0 ... [**0**] ... 255<br>• From version 03.00 | Optionally: Set digital outputs to the level set here for the execution time of the segment.<br>Note!<br>In order that the control of a digital output is executed by the sequencer, the following assignment must be made for the respective digital output:<br>• Relay: 0x2634:001 (P420.01) = "Sequencer controlled [100]"<br>• Digital output 1: 0x2634:002 (P420.02) = "Sequencer controlled [100]" |
| | Bit 0 Relay | 0 = X9/NO-COM open and NC-COM closed.<br>1 = X9/NO-COM closed and NC-COM open.<br>An inversion set in 0x2635:001 (P421.01)is taken into consideration here. |
| | Bit 1 Digital output 1 | 0 = set digital output 1 to LOW level.<br>1 = set digital output 1 to HIGH level.<br>An inversion set in 0x2635:002 (P421.02) is taken into consideration here. |
| | Bit 2 Digital output 2 | Function is not supported in this device. |
| 0x402D:005 (P808.05) | Sequencer segment 8: Analog outputs (Segment 8: Analog outp.)<br>0.00 ... [**0.00**] ... 10.00 VDC<br>• From version 03.00 | Optionally: Set analog output to the voltage value set here for the execution time of the segment.<br>Note!<br>In order that the control of the analog output is executed by the sequencer, the following assignment must be made for the analog output:<br>• Analog output 1: 0x2639:002 (P440.02) = "Sequencer controlled [10]" |
| 0x402D:006 (P808.06) | Sequencer segment 8: PID setpoint (Segment 8: PID setp.)<br>-300.00 ... [**0.00**] ... 300.00 PID unit<br>• From version 03.00 | PID control value for the segment.<br>• Only relevant if the PID control in 0x4020:001 (P600.01) is activated. |
| 0x402D:007 (P808.07) | Sequencer segment 8: Torque setpoint (Segment 8: Torque setp.)<br>-400.0 ... [**100.0**] ... 400.0 %<br>• From version 03.00 | Torque setpoint for the segment.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]". |
| 0x402D:008 | Sequencer segment 8: NetWordOUT2<br>0 ... [**0**] ... 65535<br>• From version 03.00 | Optionally: Set the NetWordOUT2 data word to the value set here for the execution time of the segment.<br>• The NetWordOUT2 data word 0x400A:002 (P591.02) can be mapped to a network register to transfer the set value as process date. |
| 0x402D:009 | Sequencer segment 8: Reserved<br>0 ... [**0**] ... 4294967295.0<br>• From version 03.00 | |
| 0x402E:001 (P822.01) | End segment: Frequency setpoint (End segment: Frequency setp.)<br>-599.0 ... [**0.0**] ... 599.0 Hz<br>• From version 03.00 | Frequency setpoint after the sequence has been completed, i. e., after the steps configured for the sequence have been passed through with the set numbers of cycles.<br>• Only relevant for the operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]" and if end of sequence mode 0x402F (P824.00) = "Keep running [0]".<br>• Direction of rotation according to sign. |
| 0x402E:002 (P822.02) | End segment: Acceleration/deceleration (End segment: Accel./decel.)<br>0.0 ... [**5.0**] ... 3600.0 s<br>• From version 03.00 | If end of sequence mode = "continuous operation" (default setting): Acceleration/deceleration for reaching the frequency setpoint set for the end segment after the sequence has been processed.<br>If end of sequence mode = "Stop" or "Stop and abort": Deceleration for reaching standstill after the sequence has been processed.<br>• Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".<br>• The set time refers to the acceleration from standstill to the set maximum frequency. The deceleration is effected with the same ramp. |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x402E:003<br>(P822.03) | End segment: Time<br>(End segment: Time)<br>0.0 ... [**0.0**] ... 100000.0 s<br>• From version 03.00 | Delay time for activating the output states configured for the end segment.<br>• This parameter has a different meaning than the time settings for the segments 1 ... 8!<br>• The set deceleration time starts when the end segment is started to be processed.<br>After the deceleration time has elapsed:<br>• The digital output is set to the level set in 0x402E:004 (P822.04) (if configured accordingly).<br>• The analog output is set to the voltage value set in 0x402E:005 (P822.05) (if configured accordingly).<br>• The NetWordOUT2 data word is set to the value set in 0x402E:008. |
| 0x402E:004<br>(P822.04) | End segment: Digital outputs<br>(End segment: Digital outp.)<br>0 ... [**0**] ... 255<br>• From version 03.00 | Optionally: Set digital outputs to the levels set here after the time set for the end segment. |
| | Bit 0 Relay | 0 = X9/NO-COM open and NC-COM closed.<br>1 = X9/NO-COM closed and NC-COM open.<br>An inversion set in 0x2635:001 (P421.01)is taken into consideration here. |
| | Bit 1 Digital output 1 | 0 = set digital output 1 to LOW level.<br>1 = set digital output 1 to HIGH level.<br>An inversion set in 0x2635:002 (P421.02) is taken into consideration here. |
| | Bit 2 Digital output 2 | Function is not supported in this device. |
| 0x402E:005<br>(P822.05) | End segment: Analog outputs<br>(End segment: Analog outp.)<br>0.00 ... [**0.00**] ... 10.00 VDC<br>• From version 03.00 | Optionally: Set analog output to the voltage value set here after the time set for the end segment.<br>Note!<br>In order that the control of the analog output is executed by the sequencer, the following assignment must be made for the analog output:<br>• Analog output 1: 0x2639:002 (P440.02) = "Sequencer controlled [10]" |
| 0x402E:006<br>(P822.06) | End segment: PID setpoint<br>(End segment: PID setp.)<br>-300.00 ... [**0.00**] ... 300.00 PID unit<br>• From version 03.00 | PID control value after the sequence has been completed, i. e., after the steps configured for the sequence have been passed through with the set numbers of cycles.<br>• Only relevant if PID control is activated in 0x4020:001 (P600.01) and end of sequence mode 0x402F (P824.00) = "Keep running [0]". |
| 0x402E:007<br>(P822.07) | End segment: Torque setpoint<br>(End segment: Torque setp.)<br>-400.0 ... [**100.0**] ... 400.0 %<br>• From version 03.00 | Torque setpoint after the sequence has been completed, i. e., after the steps configured for the sequence have been passed through with the set numbers of cycles.<br>• Only relevant for the operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]" and if end of sequence mode 0x402F (P824.00) = "Keep running [0]". |
| 0x402E:008 | End segment: NetWordOUT2<br>0 ... [**0**] ... 65535<br>• From version 03.00 | Optionally: Set NetWordOUT2 data word to the value set here after the time set for the end segment.<br>• The NetWordOUT2 data word 0x400A:002 (P591.02) can be mapped to a network register to transfer the set value as process date. |
| 0x402E:009 | End segment: Reserved<br>0 ... [**0**] ... 4294967295.0<br>• From version 03.00 | |



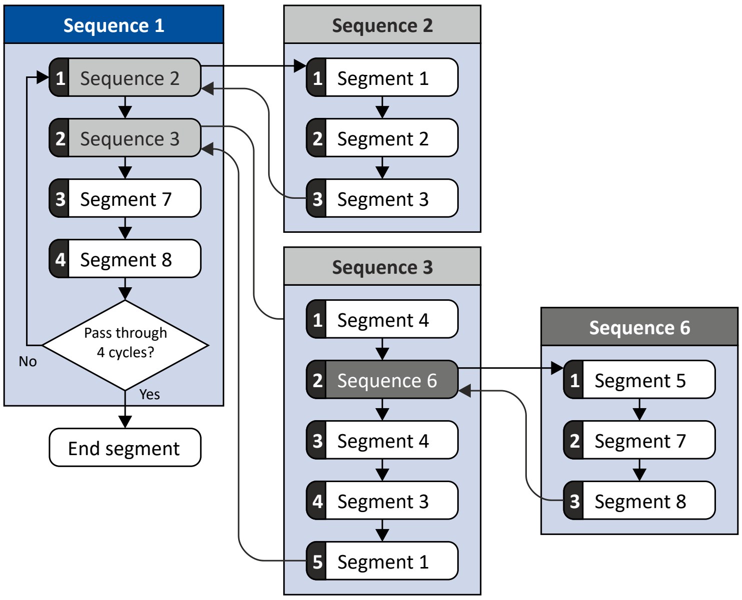
### 7.2.4.2 Sequence configuration

Overall, sequences with the numbers 1 to 8 can be configured. Each sequence consists of 16 configurable steps. Each step of a sequence can call a segment or a complete sequence (with a higher number).

#### Details

The following example shows the configuration based on a nested sequence:

- The sequence 1 is the main sequence which calls further (sub) sequences.
- The main sequence is passed through four times. Afterwards, in the preset "continuous operation" end of sequence mode, the setpoint set for the end segment is continuously transmitted to the motor control until the sequence is aborted.




| Resulting segment order | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 7 | 8 | 4 | 3 | 1 | 7 | 8 | End segment |
| 4 cycles | | | | | | | | | | | | |

Required parameter setting:

| | Sequence 1 | Sequence 2 |
|---|---|---|
| Step 1 | 0x4030:001 (P830.01) = "Sequence 2 [-2]" | 0x4032:001 (P835.01) = "Segment 1 [1]" |
| Step 2 | 0x4030:002 (P830.02) = "Sequence 3 [-3]" | 0x4032:002 (P835.02) = "Segment 2 [2]" |
| Step 3 | 0x4030:003 (P830.03) = "Segment 7 [7]" | 0x4032:003 (P835.03) = "Segment 3 [3]" |
| Step 4 | 0x4030:004 (P830.04) = "Segment 8 [8]" | 0x4032:004 (P835.04) = "Skip step [0]" |
| Step 5 | 0x4030:005 (P830.05) = "Skip step [0]" | ... |
| Step ... | ... | |
| Step 16 | 0x4030:016 (P830.16) = "Skip step [0]" | 0x4032:016 (P835.16) = "Skip step [0]" |
| Number of cycles | 0x4031 (P831.00) = 4 | 0x4033 (P836.00) = 1 |

| | Sequence 3 | Sequence 6 |
|---|---|---|
| Step 1 | 0x4034:001 (P840.01) = "Segment 4 [4]" | 0x403A:001 (P855.01) = "Segment 5 [5]" |
| Step 2 | 0x4034:002 (P840.02) = "Sequence 6 [-6]" | 0x403A:002 (P855.02) = "Segment 7 [7]" |
| Step 3 | 0x4034:003 (P840.03) = "Segment 4 [4]" | 0x403A:003 (P855.03) = "Segment 8 [8]" |
| Step 4 | 0x4034:004 (P840.04) = "Segment 3 [3]" | 0x403A:004 (P855.04) = "Skip step [0]" |
| Step 5 | 0x4034:005 (P840.05) = "Segment 1 [1]" | ... |
| Step 6 | 0x4034:006 (P840.06) = "Skip step [0]" | |
| Step ... | ... | |
| Step 16 | 0x4034:016 (P840.16) = "Skip step [0]" | 0x403A:016 (P855.16) = "Skip step [0]" |
| Number of cycles | 0x4035 (P841.00) = 1 | 0x403B (P856.00) = 1 |

In the following, all parameters relevant for the sequence configuration are given.

If the sequencer is active, write accessed to all parameters are blocked that concern the active sequence configuration!

### Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x4030:001 ...<br>0x4030:016<br>(P830.01 ... 16) | Sequence 1: Step 1 ... Step 16<br>(Sequence 1: Step 1 ... Step 16) | Configuration of the steps 1 ... 16 for sequence 1.<br>• Alternatively to calling a single segment, a complete sequence (with a higher number) can also be called from one step. This, for instance, serves to configure a main sequence from which several subsequences are called successively.<br>• With the setting "0", the respective step is skipped. |
| | -8 Sequence 8 | |
| | -7 Sequence 7 | |
| | -6 Sequence 6 | |
| | -5 Sequence 5 | |
| | -4 Sequence 4 | |
| | -3 Sequence 3 | |
| | -2 Sequence 2 | |
| | **0 Skip step** | |
| | 1 Segment 1 | |
| | 2 Segment 2 | |
| | 3 Segment 3 | |
| | 4 Segment 4 | |
| | 5 Segment 5 | |
| | 6 Segment 6 | |
| | 7 Segment 7 | |
| | 8 Segment 8 | |
| 0x4031<br>(P831.00) | Number of cycles sequence 1<br>(Cycl. sequence 1)<br>1 ... [**1**] ... 65535<br>• From version 03.00 | Definition of how often the sequence 1 is to be passed through.<br>• 1 = one pass, 2 = two passes, ...<br>• 65535 = infinite number of cycles. |
| 0x4032:001 ...<br>0x4032:016<br>(P835.01 ... 16) | Sequence 2: Step 1 ... Step 16<br>(Sequence 2: Step 1 ... Step 16) | Configuration of the steps 1 ... 16 for sequence 2.<br>• Alternatively to calling a single segment, a complete sequence (with a higher number) can also be called from one step. This, for instance, serves to configure a main sequence from which several subsequences are called successively.<br>• With the setting "0", the respective step is skipped. |
| | -8 Sequence 8 | |
| | -7 Sequence 7 | |
| | -6 Sequence 6 | |
| | -5 Sequence 5 | |
| | -4 Sequence 4 | |
| | -3 Sequence 3 | |
| | **0 Skip step** | |
| | 1 Segment 1 | |
| | 2 Segment 2 | |
| | 3 Segment 3 | |
| | 4 Segment 4 | |
| | 5 Segment 5 | |
| | 6 Segment 6 | |
| | 7 Segment 7 | |
| | 8 Segment 8 | |
| 0x4033<br>(P836.00) | Number of cycles sequence 2<br>(Cycl. sequence 2)<br>1 ... [**1**] ... 65535<br>• From version 03.00 | Definition of how often the sequence 2 is to be passed through.<br>• 1 = one pass, 2 = two passes, ...<br>• 65535 = infinite number of cycles. |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x4034:001 ...<br>0x4034:016<br>(P840.01 ... 16) | Sequence 3: Step 1 ... Step 16<br>(Sequence 3: Step 1 ... Step 16)<br>-8 Sequence 8<br>-7 Sequence 7<br>-6 Sequence 6<br>-5 Sequence 5<br>-4 Sequence 4<br>**0 Skip step**<br>1 Segment 1<br>2 Segment 2<br>3 Segment 3<br>4 Segment 4<br>5 Segment 5<br>6 Segment 6<br>7 Segment 7<br>8 Segment 8 | Configuration of the steps 1 ... 16 for sequence 3.<br>• Alternatively to calling a single segment, a complete sequence (with a higher number) can also be called from one step. This, for instance, serves to configure a main sequence from which several subsequences are called successively.<br>• With the setting "0", the respective step is skipped. |
| 0x4035<br>(P841.00) | Number of cycles sequence 3<br>(Cycl. sequence 3)<br>1 ... [**1**] ... 65535<br>• From version 03.00 | Definition of how often the sequence 3 is to be passed through.<br>• 1 = one pass, 2 = two passes, ...<br>• 65535 = infinite number of cycles. |
| 0x4036:001 ...<br>0x4036:016<br>(P845.01 ... 16) | Sequence 4: Step 1 ... Step 16<br>(Sequence 4: Step 1 ... Step 16)<br>-8 Sequence 8<br>-7 Sequence 7<br>-6 Sequence 6<br>-5 Sequence 5<br>**0 Skip step**<br>1 Segment 1<br>2 Segment 2<br>3 Segment 3<br>4 Segment 4<br>5 Segment 5<br>6 Segment 6<br>7 Segment 7<br>8 Segment 8 | Configuration of the steps 1 ... 16 for sequence 4.<br>• Alternatively to calling a single segment, a complete sequence (with a higher number) can also be called from one step. This, for instance, serves to configure a main sequence from which several subsequences are called successively.<br>• With the setting "0", the respective step is skipped. |
| 0x4037<br>(P846.00) | Number of cycles sequence 4<br>(Cycl. sequence 4)<br>1 ... [**1**] ... 65535<br>• From version 03.00 | Definition of how often the sequence 4 is to be passed through.<br>• 1 = one pass, 2 = two passes, ...<br>• 65535 = infinite number of cycles. |
| 0x4038:001 ...<br>0x4038:016<br>(P850.01 ... 16) | Sequence 5: Step 1 ... Step 16<br>(Sequence 5: Step 1 ... Step 16)<br>-8 Sequence 8<br>-7 Sequence 7<br>-6 Sequence 6<br>**0 Skip step**<br>1 Segment 1<br>2 Segment 2<br>3 Segment 3<br>4 Segment 4<br>5 Segment 5<br>6 Segment 6<br>7 Segment 7<br>8 Segment 8 | Configuration of the steps 1 ... 16 for sequence 5.<br>• Alternatively to calling a single segment, a complete sequence (with a higher number) can also be called from one step. This, for instance, serves to configure a main sequence from which several subsequences are called successively.<br>• With the setting "0", the respective step is skipped. |
| 0x4039<br>(P851.00) | Number of cycles sequence 5<br>(Cycl. sequence 5)<br>1 ... [**1**] ... 65535<br>• From version 03.00 | Definition of how often the sequence 5 is to be passed through.<br>• 1 = one pass, 2 = two passes, ...<br>• 65535 = infinite number of cycles. |

| Address | Name / setting range / [default setting] | Information |
| --- | --- | --- |
| 0x403A:001 ...<br>0x403A:016<br>(P855.01 ... 16) | Sequence 6: Step 1 ... Step 16<br>(Sequence 6: Step 1 ... Step 16) | Configuration of the steps 1 ... 16 for sequence 6.<br>• Alternatively to calling a single segment, a complete sequence (with a higher number) can also be called from one step. This, for instance, serves to configure a main sequence from which several subsequences are called successively.<br>• With the setting "0", the respective step is skipped. |
| | -8 Sequence 8 | |
| | -7 Sequence 7 | |
| | **0 Skip step** | |
| | 1 Segment 1 | |
| | 2 Segment 2 | |
| | 3 Segment 3 | |
| | 4 Segment 4 | |
| | 5 Segment 5 | |
| | 6 Segment 6 | |
| | 7 Segment 7 | |
| | 8 Segment 8 | |
| 0x403B<br>(P856.00) | Number of cycles sequence 6<br>(Cycl. sequence 6)<br>1 ... [**1**] ... 65535<br>• From version 03.00 | Definition of how often the sequence 6 is to be passed through.<br>• 1 = one pass, 2 = two passes, ...<br>• 65535 = infinite number of cycles. |
| 0x403C:001 ...<br>0x403C:016<br>(P860.01 ... 16) | Sequence 7: Step 1 ... Step 16<br>(Sequence 7: Step 1 ... Step 16) | Configuration of the steps 1 ... 16 for sequence 7.<br>• Alternatively to calling a single segment, a complete sequence (with a higher number) can also be called from one step. This, for instance, serves to configure a main sequence from which several subsequences are called successively.<br>• With the setting "0", the respective step is skipped. |
| | -8 Sequence 8 | |
| | **0 Skip step** | |
| | 1 Segment 1 | |
| | 2 Segment 2 | |
| | 3 Segment 3 | |
| | 4 Segment 4 | |
| | 5 Segment 5 | |
| | 6 Segment 6 | |
| | 7 Segment 7 | |
| | 8 Segment 8 | |
| 0x403D<br>(P861.00) | Number of cycles sequence 7<br>(Cycl. sequence 7)<br>1 ... [**1**] ... 65535<br>• From version 03.00 | Definition of how often the sequence 7 is to be passed through.<br>• 1 = one pass, 2 = two passes, ...<br>• 65535 = infinite number of cycles. |
| 0x403E:001 ...<br>0x403E:016<br>(P865.01 ... 16) | Sequence 8: Step 1 ... Step 16<br>(Sequence 8: Step 1 ... Step 16) | Configuration of the steps 1 ... 16 for sequence 8.<br>• With the setting "0", the respective step is skipped. |
| | **0 Skip step** | |
| | 1 Segment 1 | |
| | 2 Segment 2 | |
| | 3 Segment 3 | |
| | 4 Segment 4 | |
| | 5 Segment 5 | |
| | 6 Segment 6 | |
| | 7 Segment 7 | |
| | 8 Segment 8 | |
| 0x403F<br>(P866.00) | Number of cycles sequence 8<br>(Cycl. sequence 8)<br>1 ... [**1**] ... 65535<br>• From version 03.00 | Definition of how often the sequence 8 is to be passed through.<br>• 65535 = infinite number of cycles. |



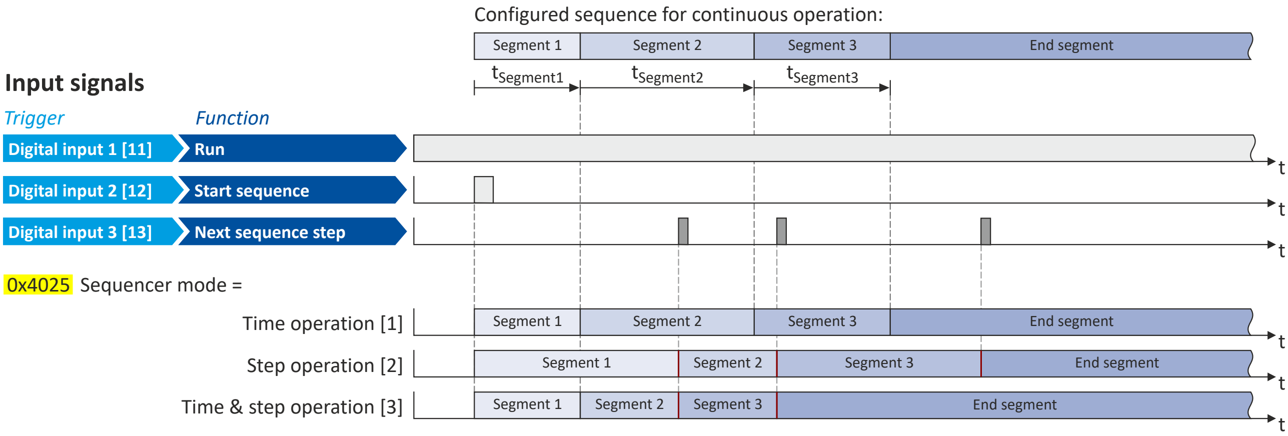
### 7.2.4.3 Sequencer basic settings

The sequencer is inhibited by default. The desired sequencer mode (time, step or time-step mode) must first be selected in order for the sequencer to be enabled. The sequence start mode and the sequence end mode must also be set. There are different modes to choose from here.

**Details**

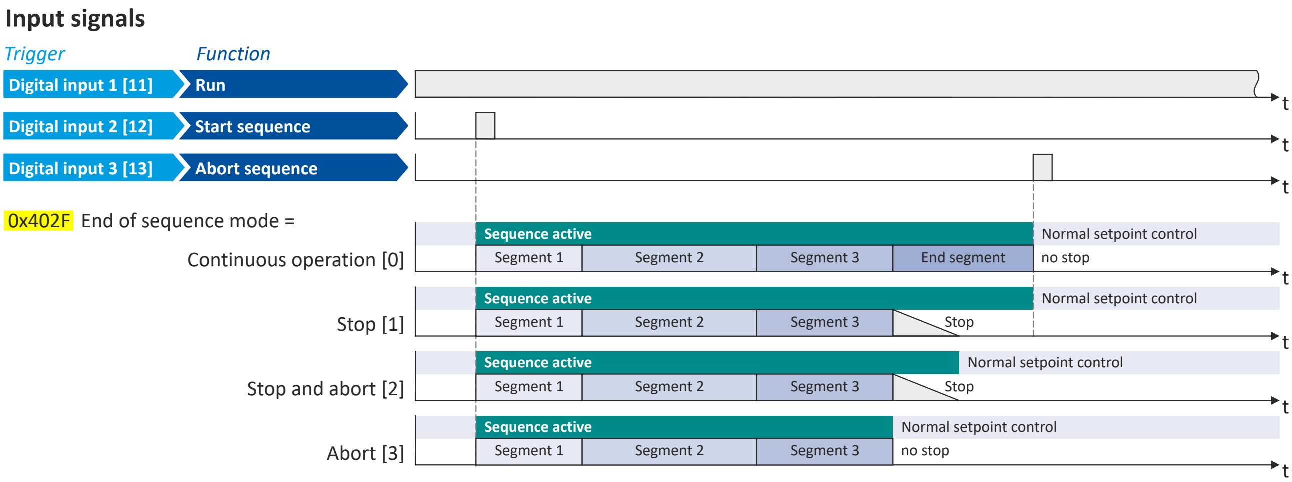
Sequencer mode 0x4025 (P800.00)

- The sequencer can be operated in time, step or time-step operation.
- The following diagram demonstrates the different sequencer modes:



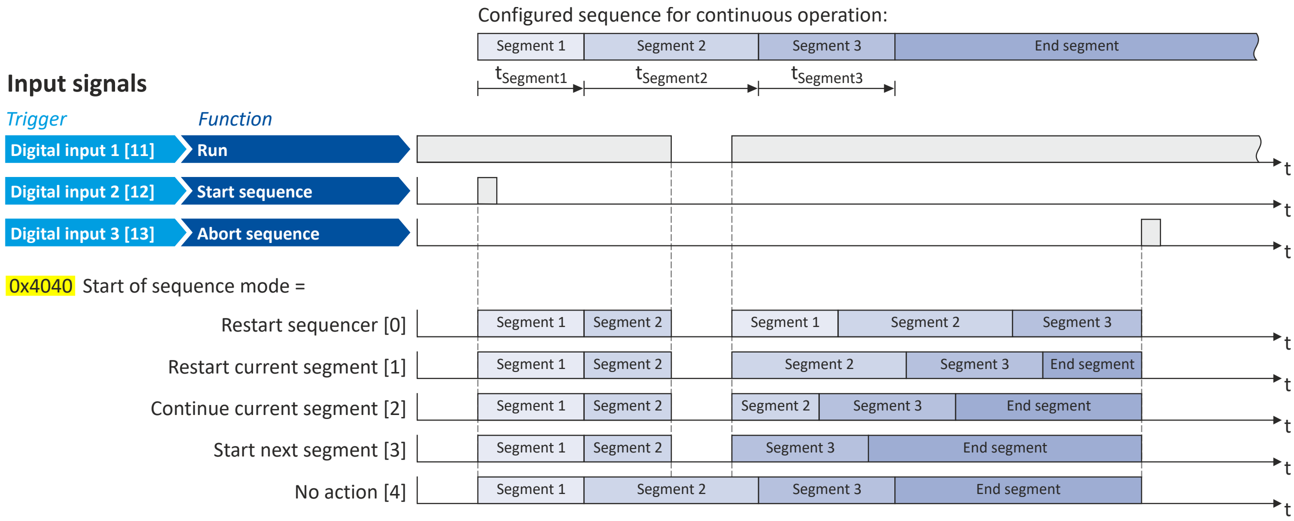

End of sequence mode 0x402F (P824.00)

- The end of sequence mode defines the action after the end of the sequence.
- In the default setting "Keep running [0]", the setpoint set for the end segment is continuously transmitted to the motor control until the sequence is aborted.
- The following diagram demonstrates the different end of sequence modes:



Start of sequence mode 0x4040 (P820.00)

- The start of sequence mode defines the action after the motor is stopped and restarted or after the motor has been restarted after an error occurred.
- In the default setting "Restart sequencer [0]", the currently selected sequence is restarted.
- The following diagram demonstrates the different start of sequence modes:




### Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x4025 (P800.00) | Sequencer mode (Sequencer mode) • From version 02.00 | | Selection of the sequencer mode. |
| | 0 | **Disabled** | |
| | 1 | Time operation (from version 03.00) | The switch-over to the next step of the sequence is made after the time set for the current segment has elapsed. |
| | 2 | Step operation (from version 03.00) | The switch-over to the next step of the sequence is made via the trigger assigned in 0x2631:032 (P400.32) to the "Next sequence step" function. |
| | 3 | Time & step operation (from version 03.00) | The switch-over to the next step of the sequence is made via the trigger assigned in 0x2631:032 (P400.32) to the "Next sequence step" function, but no later than after the time set for the current segment has elapsed. |
| 0x402F (P824.00) | End of sequence mode (End of seq. mode) • From version 03.00 | | Selection of the action after the sequence has been completed, i. e., after the steps configured for the sequence have been passed through with the set numbers of cycles. |
| | 0 | **Keep running** | The setpoint set for the end segment is continuously transmitted to the motor control until the sequence is aborted. |
| | 1 | Stop | The motor is stopped with the stop method set in 0x2838:003 (P203.03). The setpoint is continued to be controlled by the sequencer. In order to return to the normal setpoint control, the sequence must be aborted. Note! After returning to the normal setpoint control, a start command is required to restart the motor. |
| | 2 | Stop and abort | The motor is stopped with the stop method set in 0x2838:003 (P203.03). After standstill is reached, it is automatically returned to the normal setpoint control. Note! After returning to the normal setpoint control, a start command is required to restart the motor. |
| | 3 | Abort | Return to the normal setpoint control without stopping the motor. |

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x4040<br>(P820.00) | Start of sequence mode<br>(StartOfSeq. mode)<br>• From version 03.00 | | Selection of the action after the motor has been stopped and restarted or after the motor has been restarted after an error occurred. |
| | **0** | **Restart sequencer** | The currently selected sequence is restarted. |
| | 1 | Restart current segment | The current segment of the selected sequence is restarted. |
| | 2 | Continue current segment | The current segment of the selected sequence is continued (just like after a break). |
| | 3 | Start next segment | The next segment of the selected sequence is started. |
| | 4 | No action | For debugging purposes: The sequence is continued to be processed (including output states) even if the motor is stopped. |

### 7.2.4.4 Sequencer control functions

The following functions serve to control the sequencer. ▶ Sequencer 📖 87

**Select sequence**

A sequence is selected in a binary-coded fashion via the triggers assigned to the four functions "Select sequence (bit 0)" ... " Select sequence (bit 3)" in compliance with the following truth table:

| Select sequence | | | | Selection |
|---|---|---|---|---|
| Bit 3<br>0x2631:053<br>(P400.53) | Bit 2<br>0x2631:052<br>(P400.52) | Bit 1<br>0x2631:051<br>(P400.51) | Bit 0<br>0x2631:050<br>(P400.50) | |
| FALSE | FALSE | FALSE | FALSE | No sequence selected |
| FALSE | FALSE | FALSE | TRUE | Sequence 1 |
| FALSE | FALSE | TRUE | FALSE | Sequence 2 |
| FALSE | FALSE | TRUE | TRUE | Sequence 3 |
| FALSE | TRUE | FALSE | FALSE | Sequence 4 |
| FALSE | TRUE | FALSE | TRUE | Sequence 5 |
| FALSE | TRUE | TRUE | FALSE | Sequence 6 |
| FALSE | TRUE | TRUE | TRUE | Sequence 7 |
| TRUE | FALSE | FALSE | FALSE | Sequence 8 |
| TRUE | FALSE | FALSE | TRUE | Invalid selection |
| ... | | | | |
| TRUE | TRUE | TRUE | TRUE | |

**Start sequence**

The selected sequence is not started automatically. For starting the sequence, two functions are available:

- 0x2631:030 (P400.30): Run/abort sequence (status-controlled start)
- 0x2631:031 (P400.31): Start sequence (edge-controlled start)

**Further control functions**

The following functions serve to control the started sequence:

- 0x2631:032 (P400.32): Next sequence step
- 0x2631:033 (P400.33): Pause sequence
- 0x2631:034 (P400.34): Suspend sequence
- 0x2631:035 (P400.35): Stop sequence
- 0x2631:036 (P400.36): Abort sequence

For controlling the sequencer via the network, the sequencer control functions can also be assigned to the NetWordIN1 data word 0x4008:001 (P590.01).

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2631:030<br>(P400.30) | Function list: Run/abort sequence<br>(Function list: Seq: Run/abort)<br>• Setting can only be changed if the inverter is disabled.<br>• From version 03.00<br>• Further possible settings: ▶ Trigger list 📖 59 | | Assignment of a trigger for the "Run/abort sequence" function.<br>Trigger = TRUE: Start selected sequence.<br>Trigger = FALSE: Abort sequence.<br>Notes:<br>• The assigned trigger must remain set to TRUE for the duration of the sequence.<br>• If the trigger bit is reset to FALSE, the sequence is aborted. In this case, the standard setpoint or the setpoint source selected via setpoint change-over is active again.<br>• A sequence is selected in a binary-coded fashion via the trigger assigned to the four functions "Select sequence (bit 0)" 0x2631:050 (P400.50) ... "Select sequence (bit 3)" 0x2631:053 (P400.53).<br>• For an edge-controlled start, the function "Start sequence" 0x2631:031 (P400.31) is optionally available. |
| | 0 | **Not connected** | No trigger assigned (trigger is constantly FALSE). |

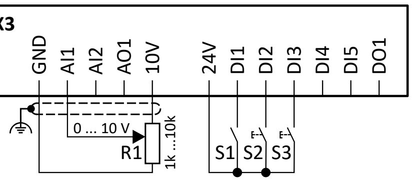
| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2631:031<br>(P400.31) | Function list: Start sequence<br>(Function list: Seq: Start)<br>• Setting can only be changed if the inverter is disabled.<br>• From version 03.00<br>• Further possible settings: ▶ Trigger list 📖 59 | Assignment of a trigger for the "Start sequence" function.<br>Trigger = FALSE↗TRUE (edge): Start selected sequence.<br>Trigger = TRUE↘FALSE (edge): No action.<br>Notes:<br>• After the start, the sequencer remains activated until the function "Stop sequence" 0x2631:035 (P400.35) or the function "Abort sequence" 0x2631:036 (P400.36) is executed. A normal stop command does not reset the start command for the sequencer.<br>• For a status-controlled start, the function "Run/abort sequence" 0x2631:030 (P400.30) is optionally available. |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:032<br>(P400.32) | Function list: Next sequence step<br>(Function list: Seq: Next step)<br>• Setting can only be changed if the inverter is disabled.<br>• From version 03.00<br>• Further possible settings: ▶ Trigger list 📖 59 | Assignment of a trigger for the "Next sequence step" function.<br>Trigger = FALSE↗TRUE (edge): Next sequence step.<br>Trigger = TRUE↘FALSE (edge): No action.<br>Notes:<br>• The execution of the current step is completed even if the time parameterised for the segment has not elapsed yet.<br>• The function is only relevant for Sequencer mode 0x4025 (P800.00) = "Step operation [2]" or "Time & step operation [3]".<br>• A jump to the next sequence step is not possible if the sequence pauses, the sequence is suspended or the final segment is executed. |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:033<br>(P400.33) | Function list: Pause sequence<br>(Function list: Seq: Pause)<br>• Setting can only be changed if the inverter is disabled.<br>• From version 03.00<br>• Further possible settings: ▶ Trigger list 📖 59 | Assignment of a trigger for the "Pause sequence" function.<br>Trigger = TRUE: Pause sequence.<br>Trigger = FALSE: Continue sequence.<br>Notes:<br>• During the pause, the sequence stops in the current step. The expiration of the time set for the segment is stopped.<br>• The sequencer setpoint continues to remain active. |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:034<br>(P400.34) | Function list: Suspend sequence<br>(Function list: Seq: Suspense)<br>• Setting can only be changed if the inverter is disabled.<br>• From version 03.00<br>• Further possible settings: ▶ Trigger list 📖 59 | Assignment of a trigger for the "Suspend sequence" function.<br>Trigger = TRUE: Suspend sequence.<br>Trigger = FALSE: Continue sequence.<br>Notes:<br>• This function serves to temporarily change over to the standard setpoint or the setpoint source selected via setpoint change-over.<br>• The sequence is continued at the point where it was suspended. |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:035<br>(P400.35) | Function list: Stop sequence<br>(Function list: Seq: Stop)<br>• Setting can only be changed if the inverter is disabled.<br>• From version 03.00<br>• Further possible settings: ▶ Trigger list 📖 59 | Assignment of a trigger for the "Stop sequence" function.<br>Trigger = FALSE↗TRUE (edge): Stop sequence.<br>Trigger = TRUE↘FALSE (edge): No action.<br>Notes:<br>• If the sequence is stopped, it is jumped to the final segment.<br>• The further execution depends on the selected End of sequence mode 0x402F (P824.00). |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:036<br>(P400.36) | Function list: Abort sequence<br>(Function list: Seq: Abort)<br>• Setting can only be changed if the inverter is disabled.<br>• From version 03.00<br>• Further possible settings: ▶ Trigger list 📖 59 | Assignment of a trigger for the "Abort sequence" function.<br>Trigger = FALSE↗TRUE (edge): Abort sequence.<br>Trigger = TRUE↘FALSE (edge): No action.<br>Notes:<br>• This function serves to directly stop the sequence without the final segment being executed. In this case, the standard setpoint or the setpoint source selected via setpoint change-over is active again. |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |

| Address | Name / setting range / [default setting] | Information |
| --- | --- | --- |
| 0x2631:050<br>(P400.50) | Function list: Select sequence (bit 0)<br>(Function list: Seq: Select. b0)<br>• Setting can only be changed if the inverter is disabled.<br>• From version 03.00<br>• Further possible settings: ▸ Trigger list 📖 59 | Assignment of a trigger for the "Select sequence (bit 0)" function.<br>Selection bit with the valency $2^0$ for bit coded selection of a sequence.<br>Trigger = FALSE: selection bit = "0".<br>Trigger = TRUE: selection bit = "1".<br>Notes:<br>• The selected sequence is not started automatically.<br>• For a status-controlled start, the function "Run/abort sequence" 0x2631:030 (P400.30) is available.<br>• For an edge-controlled start, the function "Start sequence" 0x2631:031 (P400.31) is available. |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:051<br>(P400.51) | Function list: Select sequence (bit 1)<br>(Function list: Seq: Select. b1)<br>• Setting can only be changed if the inverter is disabled.<br>• From version 03.00<br>• Further possible settings: ▸ Trigger list 📖 59 | Assignment of a trigger for the "Select sequence (bit 1)" function.<br>Selection bit with the valency $2^1$ for the bit-coded selection of a sequence.<br>Trigger = FALSE: selection bit = "0".<br>Trigger = TRUE: selection bit = "1".<br>Notes:<br>• The selected sequence is not started automatically.<br>• For a status-controlled start, the function "Run/abort sequence" 0x2631:030 (P400.30) is available.<br>• For an edge-controlled start, the function "Start sequence" 0x2631:031 (P400.31) is available. |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:052<br>(P400.52) | Function list: Select sequence (bit 2)<br>(Function list: Seq: Select. b2)<br>• Setting can only be changed if the inverter is disabled.<br>• From version 03.00<br>• Further possible settings: ▸ Trigger list 📖 59 | Assignment of a trigger for the "Select sequence (bit 2)" function.<br>Selection bit with the valency $2^2$ for the bit-coded selection of a sequence.<br>Trigger = FALSE: selection bit = "0".<br>Trigger = TRUE: selection bit = "1".<br>Notes:<br>• The selected sequence is not started automatically.<br>• For a status-controlled start, the function "Run/abort sequence" 0x2631:030 (P400.30) is available.<br>• For an edge-controlled start, the function "Start sequence" 0x2631:031 (P400.31) is available. |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:053<br>(P400.53) | Function list: Select sequence (bit 3)<br>(Function list: Seq: Select. b3)<br>• Setting can only be changed if the inverter is disabled.<br>• From version 03.00<br>• Further possible settings: ▸ Trigger list 📖 59 | Assignment of a trigger for the "Select sequence (bit 3)" function.<br>Selection bit with the valency $2^3$ for the bit-coded selection of a sequence.<br>Trigger = FALSE: selection bit = "0".<br>Trigger = TRUE: selection bit = "1".<br>Notes:<br>• The selected sequence is not started automatically.<br>• For a status-controlled start, the function "Run/abort sequence" 0x2631:030 (P400.30) is available.<br>• For an edge-controlled start, the function "Start sequence" 0x2631:031 (P400.31) is available. |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |

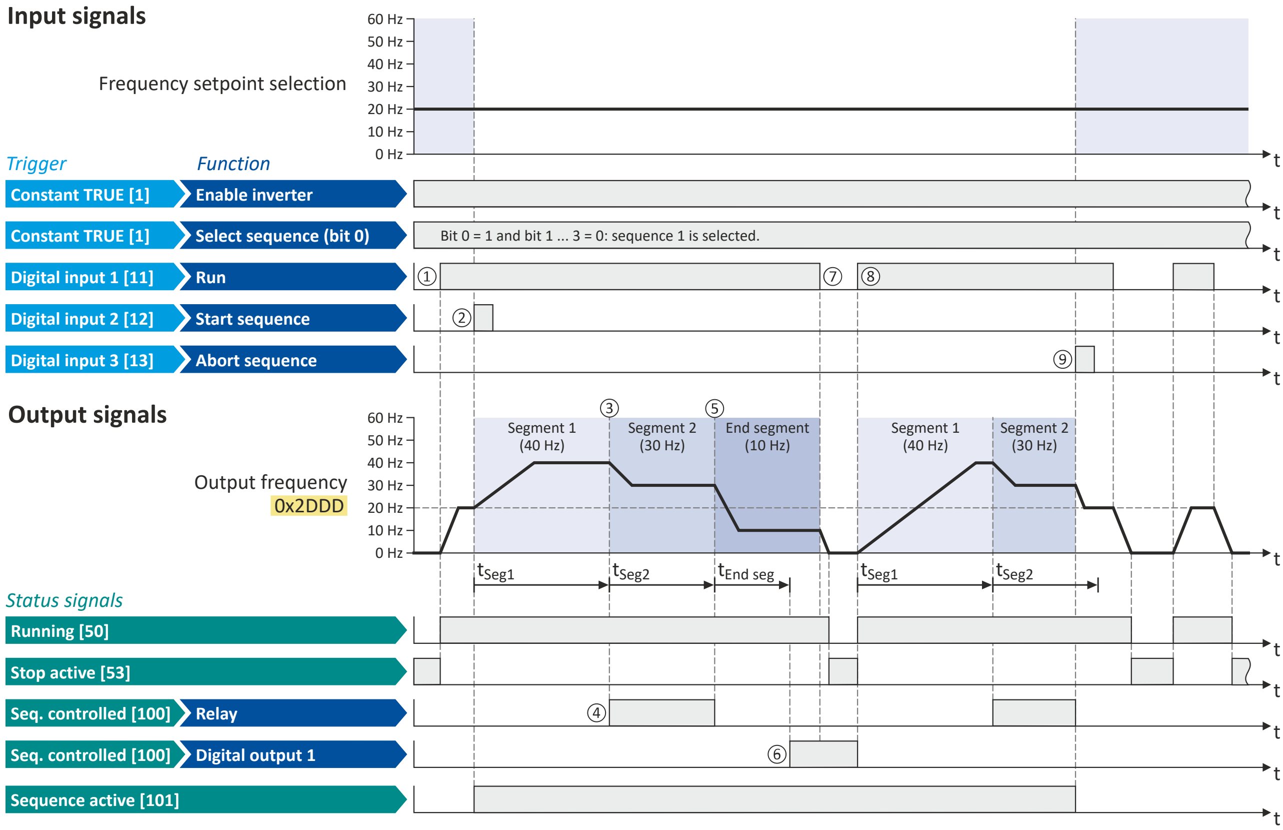
### Example for operating mode

In the following example, the digital inputs 2 and 3 are used for controlling the sequencer.

- The analog input 1 is set as standard setpoint source.
- The switch S1 starts the motor in forward rotating direction. The switch S1 in the initial position stops the motor again.
- The button S2 starts the sequence, the button S3 aborts the sequence. After the abortion, the normal setpoint control is active again.

| Connection plan | Function | |
|---|---|---|
|   | Potentiometer R1 | Frequency setpoint selection |
| | Switch S1 | Run |
| | Button S2 | Start sequence |
| | Button S3 | Abort sequence |

| Parameter | Name | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2631:004 (P400.04) | Reset fault | Not connected [0] |
| 0x2631:013 (P400.13) | Reverse rotational direction | Not connected [0] |
| 0x2631:031 (P400.31) | Start sequence | Digital input 2 [12] |
| 0x2631:036 (P400.36) | Abort sequence | Digital input 3 [13] |
| 0x2631:050 (P400.50) | Select sequence (bit 0) | Constant TRUE [1] |
| 0x2634:001 (P420.01) | Relay | Sequencer controlled [100] |
| 0x2634:002 (P420.02) | Digital output 1 | Sequencer controlled [100] |
| Segment and sequence configuration<br>In this example, only the sequence 1 is used. The sequence consists of two steps (segment 1 and segment 2). | | |
| 0x4026:001 (P801.01) | Sequencer segment 1: Frequency setpoint | 40 Hz |
| 0x4026:002 (P801.02) | Sequencer segment 1: Acceleration/deceleration | 20 s |
| 0x4026:003 (P801.03) | Sequencer segment 1: Time | 18 s |
| 0x4026:004 (P801.04) | Sequencer segment 1: Digital outputs | 0x00 |
| 0x4027:001 (P802.01) | Sequencer segment 2: Frequency setpoint | 30 Hz |
| 0x4027:002 (P802.02) | Sequencer segment 2: Acceleration/deceleration | 15 s |
| 0x4027:003 (P802.03) | Sequencer segment 2: Time | 14 s |
| 0x4027:004 (P802.04) | Sequencer segment 2: Digital outputs | 0x02 (only relay) |
| 0x402E:001 (P822.01) | End segment: Frequency setpoint | 10 Hz |
| 0x402E:002 (P822.02) | End segment: Acceleration/deceleration | 8 s |
| 0x402E:003 (P822.03) | End segment: Time | 10 s |
| 0x402E:004 (P822.04) | End segment: Digital outputs | 0x04 (only digital output 1) |
| 0x4030:001 ... 0x4030:016 (P830.01 ... 16) | Sequence 1: Step 1 | Segment 1 [1] |
| | Sequence 1: Step 2 | Segment 2 [2] |
| | Sequence 1: Step 3 | Skip step [0] |
| | ... | ... |
| | Sequence 1: Step 16 | Skip step [0] |
| Sequencer basic settings | | |
| 0x4025 (P800.00) | Sequencer mode | Time operation [1] |
| 0x402F (P824.00) | End of sequence mode | Keep running [0] |
| 0x4040 (P820.00) | Start of sequence mode | Restart sequencer [0] |




The status signals can be assigned to digital outputs. ▶ Configure digital outputs 📖 247

□ If the inverter is enabled and no error is active, the motor can be started with the "Run" function. As the sequence has not been started yet, first the normal setpoint control is active.

② The "Start sequence" function is used to start the selected sequence in an edge-controlled way.

③ Sequencer mode 0x4025 (P800.00) = "Time operation [1]":
The switch-over to the next step of the sequence is made after the time set for the current segment has elapsed.

④ The segment 2 is configured here in such a way that the relay will be triggered during the time of processing.

⑤ End of sequence mode 0x402F (P824.00) = "Keep running [0]":
After the sequence has been processed, the setpoint set for the end segment is continuously transmitted to the motor control until the sequence is aborted.

⑥ In case of the end segment, the time setting determines the delay after which the configured output states are to become active. Here, the end segment is configured in such a way that the digital output 1 is set after 10 s have expired.

④ If the "Run" function is set to FALSE, the motor is stopped with the stop method set in 0x2838:003 (P203.03). The started sequence, however, remains active and the sequencer-controlled outputs keep their state.

③ Start of sequence mode 0x4040 (P820.00) = "Restart sequencer [0]":
If the "Run" function is set to TRUE again, the (still active) sequence is restarted.

④ The "Abort sequence" function is used to abort the sequence in an edge-controlled way.
In this case, the standard setpoint or the setpoint source selected via setpoint change-over is active again.

## 7.2.4.5 Sequencer diagnostics

The following parameters serve to diagnose the "sequencer" function.

### Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2DAE:001<br>(P140.01) | Sequencer diagnostics: Active step<br>(Sequencer diag: Active Step)<br>• Read only<br>• From version 03.00 | Display of the active step.<br>• 0 = no sequence active. |
| 0x2DAE:002<br>(P140.02) | Sequencer diagnostics: Step time elapsed<br>(Sequencer diag: StepTime elapsed)<br>• Read only: x.x s<br>• From version 03.00 | Display of the time that has passed since the start of the current step. |



| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2DAE:003<br>(P140.03) | Sequencer diagnostics: Step time remaining<br>(Sequencer diag: StepTime remain)<br>• Read only: x.x s<br>• From version 03.00 | Display of the remaining time for the current step. |
| 0x2DAE:004<br>(P140.04) | Sequencer diagnostics: Steps complete<br>(Sequencer diag: Steps complete)<br>• Read only<br>• From version 03.00 | Display of the number of steps that have been made since the start of the sequence. |
| 0x2DAE:005<br>(P140.05) | Sequencer diagnostics: Steps remaining<br>(Sequencer diag: Steps remain)<br>• Read only<br>• From version 03.00 | Display of the remaining number of steps until the current sequence is completed. This includes the current step. |
| 0x2DAE:006<br>(P140.06) | Sequencer diagnostics: Active sequence<br>(Sequencer diag: Active sequence)<br>• Read only<br>• From version 03.00 | Display of the active sequence.<br>• 0 = no sequence active. |
| 0x2DAE:007<br>(P140.07) | Sequencer diagnostics: Active segment<br>(Sequencer diag: Active segment)<br>• Read only<br>• From version 03.00 | Display of the active segment.<br>• 0 = no sequence active.<br>• 255 = final sequence active. |
| 0x2DAE:008<br>(P140.08) | Sequencer diagnostics: Relative sequence time remaining<br>(Sequencer diag: SeqTime remain %)<br>• Read only: x %<br>• From version 03.00 | Display of the remaining time of the sequence in [%]. |
| 0x2DAE:009<br>(P140.09) | Sequencer diagnostics: Absolute sequence time remaining<br>(Sequencer diag: SeqTime remain)<br>• Read only: x.x s<br>• From version 03.00 | Display of the remaining time of the sequence in [s]. |
| 0x2DAE:010 | Sequencer diagnostics: Frequency setpoint<br>• Read only: x.x Hz<br>• From version 03.00 | Display of the current frequency setpoint of the "sequencer" function. |
| 0x2DAE:011 | Sequencer diagnostics: PID setpoint<br>• Read only: x.xx PID unit<br>• From version 03.00 | Display of the current PID control value of the "sequencer" function. |
| 0x2DAE:012 | Sequencer diagnostics: Torque setpoint<br>• Read only: x.x %<br>• From version 03.00 | Display of the current torque setpoints of the "sequencer" function.<br>• 100 % = Rated motor torque0x6076 (P325.00) |

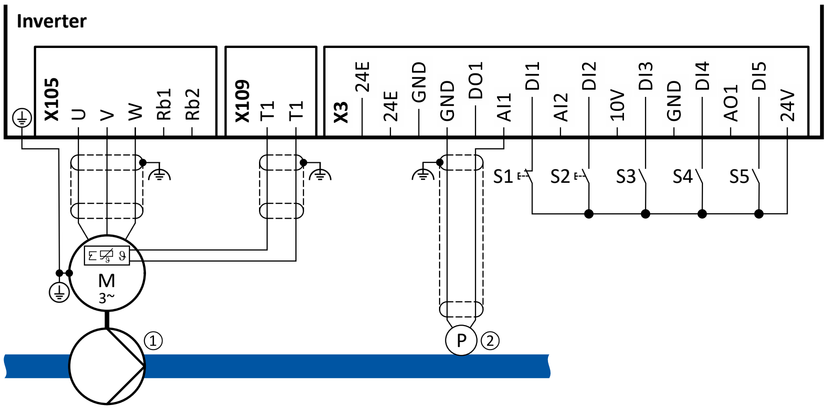
## 7.3 Configuring the process controller

By means of the process controller, a process variable can be regulated, for instance the pressure of a pump. The process controller is also referred to as "PID controller" (PID controller = proportional, integral and differential controller).

The process controller is part of a closed control loop. The variable to be influenced (controlled variable) is measured continuously by means of a sensor and supplied to the inverter as an analog signal (actual value) which, in the inverter, is then compared to the reference value (setpoint). The system deviation resulting therefrom is supplied to the process controller which, on this basis, decelerates or accelerates the motor speed according to the desired dynamic performance of the control loop, so that, for instance, a pump always generates the desired pressure.

**Connection plan (example)**

The following sample connection plan shows the control of a pump ①. The feedback of the variable (here: pressure) takes place via a pressure transducer ② connected to the analog input 1.




The digital inputs can be used to activate functions of the process controller. The specific assignment of the digital inputs and type of the contacts (switches or buttons, normally-closed contacts or normally-open contacts) depends on the application.

**General information on the setting**

- First implement the basic setting of the frequency control. ▶ Basic setting 📖 78
- The basic setting of the process controller is described in the following subchapter.
  ▶ Basic setting 📖 113
- Optionally, the motor can be put into an energy-saving sleep mode if no power is required.
  ▶ Process controller sleep mode 📖 119
- The rinsing function which can be activated in addition accelerates the motor in idle state to a defined speed at regular intervals.The rinsing of a pipe system with a pump that has been in an inactive state for a longer period is a typical application. ▶ Process controller rinse function 📖 121

### 7.3.1 Basic setting

The process controller is set in two steps:

1. Basic settings
2. Fine adjustment of the PID controller for an optimum control mode

**Basic settings**

Based on the default setting, we recommend the following proceeding:

1. Select the standard setpoint source for the frequency control in 0x2860:001 (P201.01).
2. Configure the selected standard setpoint source. ▶ Configure setpoint sources 🕮 82
3. Activate the PID control. Set the desired operating mode (normal or reverse operation) in 0x4020:001 (P600.01).
4. If the feedback of the variable is to take place via analog input 2 instead of analog input 1: Set 0x4020:002 (P600.02) = "analog input 2 [2]".
5. Configure the analog input used:
   - Configure the input range.
   - Configure the setting range for the PID control.
   - Adapt the filter time to minimise the impact of noise on the control variable.
   - Set the monitoring response to "No response [0]".
     ▶ Configure analog inputs 🕮 240
6. If a (temporary) change-over to a speed-controlled operation is to be possible via a digital input:
   - Assign a free digital input to the control function "Deactivate PID controller" in 0x2631:045 (P400.45). As long as the digital input provides a TRUE signal, the PID control is ignored and the motor is driven in a speed-controlled way.
   - Set acceleration time 0x4021:001 (P606.01) and deceleration time 0x4021:002 (P606.02) for speed-controlled drive control.
7. Select the standard setpoint source for the reference value in 0x2860:002 (P201.02).
   - Functions for setpoint change-over can be used as well. ▶ Changing the setpoint source during operation 🕮 125
   - The keypad setpoint can be preset in 0x2601:002 (P202.02).
   - If process controller presets are used, they have to be set in 0x4022:001 (P451.01) ... 0x4022:008 (P451.08).
   - If the analog input is used as setpoint source, it must be configured accordingly.
     ▶ Configure analog inputs 🕮 240
   - If the motor potentiometer is used as setpoint source, this function must be configured accordingly. ▶ Motor potentiometer (MOP) 🕮 85
8. Set the speed range to be controlled in 0x4020:003 (P600.03).
9. If the output value of the process controller is to be limited, adapt the following parameters:
   - 0x4020:005 (P600.05): Min speed limit
   - 0x4020:006 (P600.06): Max speed limit
10. Test the following parameters with the default setting first and only adapt them if required:
    - 0x404B (P604.00): Setpoint ramp
    - 0x404C:001 (P607.01): acceleration time for showing the process controller influence
    - 0x404C:002 (P607.02): deceleration time for hiding the process controller influence
11. Diagnostics: check the current reference value and feedback of the control variable:
    - The current reference value (setpoint) is displayed in 0x401F:001 (P121.01).
    - The current variable (actual value) is displayed in 0x401F:002 (P121.02).

After the basic setting of the process controller has been carried out, a fine adjustment of the PID controller must be executed for optimum control behaviour (see the following section).

**Fine adjustment of the PID controller**

The dynamics of the PID controller are parameterised based on the gain of the P component 0x4048 (P601.00), the reset time for the I component 0x4049 (P602.00) and the gain of the D component 0x404A (P603.00). In the default setting, the process controller operates as a PI controller. The D component is deactivated.

Basics

- If only the P component is used and the system operates in a steady-state status (the reference value is constant and the process variable is controlled to a fixed value), a certain system deviation always continues to exist. This remaining system deviation is also called "stationary deviation".
- The I component prevents a permanent fluctuation around the setpoint. Here, the reset time 0x4049 (P602.00) determines how much the duration of the control deviation influences the control. A high reset time means a lower influence of the I component and vice versa.
- The D component does not respond to the height of the system deviation but to their rate of change only. The D component acts as a "damper" for overshoots. Overshoots may occur if the control tries to respond quickly to changes in the system deviation or the reference value. Thus, the D component reduces the risk of instabilities due to overshoots.

For most applications, the setting of the gain of the P component and the reset time for the I component is sufficient for the fine adjustment. The setting of the gain of the D component may by required for a further stabilisation of the system especially if a quick response to system deviations is to take place.

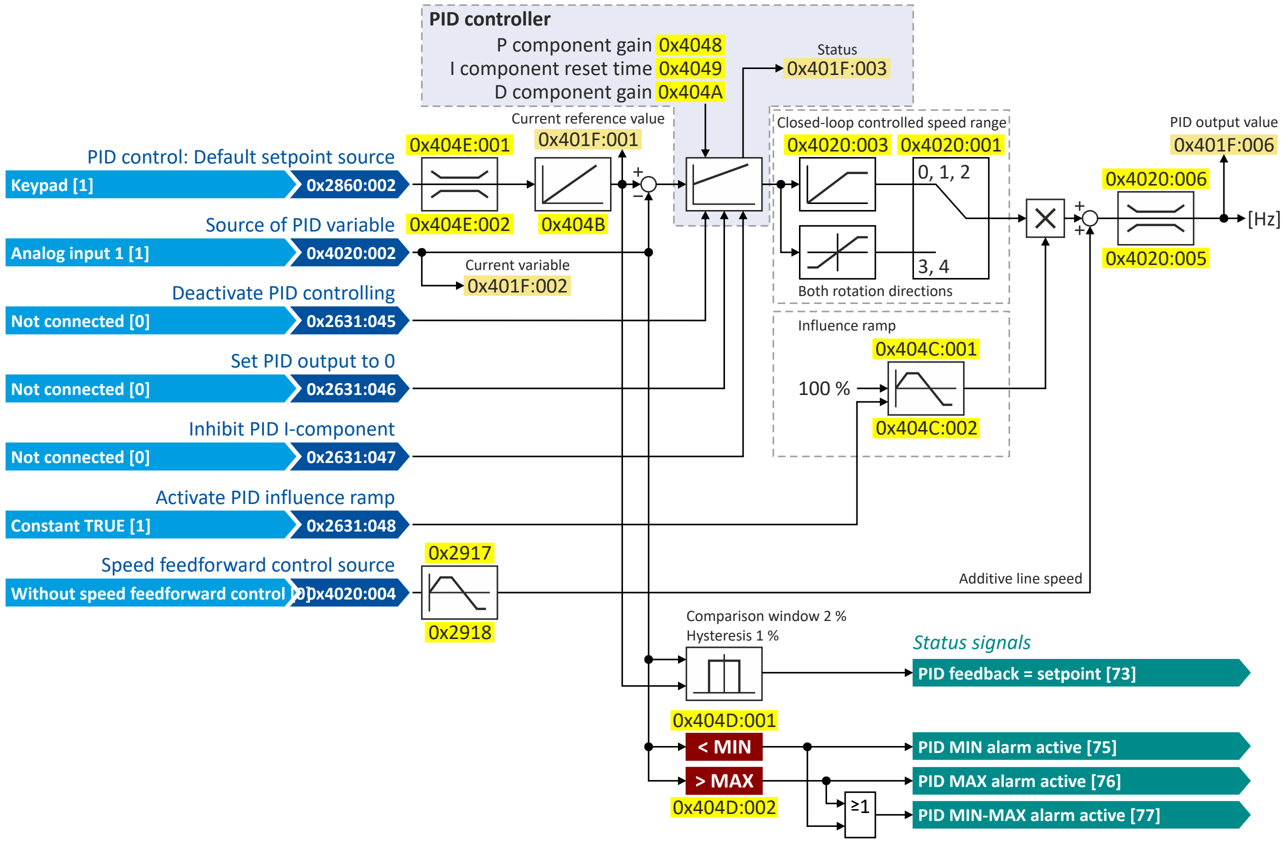
Execute fine adjustment:

1. Set the reset time for the I component to 6000 ms in 0x4049 (P602.00) to deactivate the I component.
   - With this setting and the default setting of 0x404A (P603.00), the process controller operates as P controller.
2. Increase gain of the P component step by step in 0x4048 (P601.00) until the system becomes instable.
3. Reduce the gain again until the system is stable again.
4. Reduce the gain by another 15 %.
5. Set reset time for the I component in 0x4049 (P602.00).
   - With this setting it should be noted that a too low reset time may cause overshoots, especially in case of high steps of the system deviation.
6. Optional: set the gain of the D component in 0x404A (P603.00).
   - With this setting it should be noted that the D component responds very sensitively to electrical disturbance on the feedback as well as digitisation errors.



### Internal signal flow

The following illustration shows the internal signal flow of the process controller (without the additional functions "idle state" and "rinsing function"):




### Control functions

The flexible I/O configuration serves to configure different control functions for the process controller:

- 0x2631:045 (P400.45): Deactivate PID controller
- 0x2631:046 (P400.46): Set process controller output to 0
- 0x2631:047 (P400.47): Inhibit process controller I-component
- 0x2631:048 (P400.48): Activate PID influence ramp

For details see chapter "Process controller function selection". 🕮 121

### Status signals for configurable outputs

The process controller provides different internal status signals. These status signals can be assigned to the relay, the digital outputs or the NetWordOUT1 status word.

For details see chapter "Configure digital outputs". 🕮 247

### Parameter

| Address | | Name / setting range / [default setting] | Information |
|---|---|---|---|
| 0x2860:002<br>(P201.02) | | PID control: Default setpoint source<br>(PID setp. src.) | Selection of the standard setpoint source for the reference value of the PID control.<br>• The selected standard setpoint source is always active with an activated PID control when no setpoint change-over to another setpoint source via corresponding triggers/functions is active. |
| | **1** | **Keypad** | The setpoint is specified locally by the keypad.<br>• Default setting: 0x2601:002 (P202.02)<br>• Use the ↑ and ↓ navigation keys to change the keypad setpoint (also during running operation). |
| | 2 | Analog input 1 | The setpoint is defined as analog signal via the analog input 1.<br>▸ Analog input 1 📖 240 |
| | 3 | Analog input 2 | The setpoint is defined as analog signal via the analog input 2.<br>▸ Analog input 2 📖 244 |
| | 5 | Network | The setpoint is defined as process data object via the network.<br>▸ Define setpoint via network 📖 273 |
| | 11 | PID preset 1 | For the setpoint selection, preset values can be parameterised and selected.<br>▸ Setpoint presets 📖 83 |
| | 12 | PID preset 2 | |
| | 13 | PID preset 3 | |
| | 14 | PID preset 4 | |
| | 15 | PID preset 5 | |
| | 16 | PID preset 6 | |
| | 17 | PID preset 7 | |
| | 18 | PID preset 8 | |
| | 31 | Segment preset 1 (from version 03.00) | For the setpoint selection, the segment presets parameterised for the "sequencer" function can be selected as well.<br>▸ Sequencer 📖 87 |
| | 32 | Segment preset 2 (from version 03.00) | |
| | 33 | Segment preset 3 (from version 03.00) | |
| | 34 | Segment preset 4 (from version 03.00) | |
| | 35 | Segment preset 5 (from version 03.00) | |
| | 36 | Segment preset 6 (from version 03.00) | |
| | 37 | Segment preset 7 (from version 03.00) | |
| | 38 | Segment preset 8 (from version 03.00) | |
| | 50 | Motor potentiometer | The setpoint is generated by the "motor potentiometer" function. This function can be used as an alternative setpoint control which is controlled via two signals: "MOP setpoint up" and "MOP setpoint down".<br>▸ Motor potentiometer (MOP) 📖 85 |
| | 201 | Internal value (from version 05.00) | Internal values of the manufacturer. |
| | 202 | Internal value (from version 05.00) | |
| | 203 | Internal value (from version 05.00) | |
| | 204 | Internal value (from version 05.00) | |
| | 205 | Internal value (from version 05.00) | |
| | 206 | Internal value (from version 05.00) | |
| 0x4020:001<br>(P600.01) | | Process controller setup (PID): Operating mode<br>(PID setup: Operating mode) | Selection of the process controller operating mode. |
| | **0** | **Inhibited** | Process controller deactivated. |
| | 1 | Normal operation | The setpoint is higher than the feedback variable (actual value). If the system deviation increases, the motor speed is increased.<br>Example: pressure-controlled booster pumps (increase in the motor speed produces an increase in pressure.) |
| | 2 | Reverse operation | The setpoint is lower than the feedback variable (actual value). If the system deviation increases, the motor speed is increased.<br>Example: temperature-controlled cooling water pump (increase in motor speed produces decrease in temperature.) |
| | 3 | Normal bi-directional | The direction of rotation corresponds to the sign of the system deviation. If the system deviation increases, the motor speed is increased. |
| | 4 | Reverse bi-directional | A negative system deviation causes a positive direction of rotation. If the system deviation increases, the motor speed is increased. |



| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x4020:002 (P600.02) | Process controller setup (PID): PID process variable (PID setup: PID process var.) | Selection of the source via which the feedback of the controlled variable (actual value) for the process controller is effected. |
| | **1 Analog input 1** | |
| | 2 Analog input 2 | |
| | 3 DC-bus voltage (from version 02.00) | |
| | 4 Motor Current (from version 02.00) | |
| | 5 Network (from version 02.00) | |
| | 6 HTL input (from version 04.00) | Selection is not supported by the inverter i510. |
| | 201 Internal value | Internal values of the manufacturer. |
| | 202 Internal value | |
| | 203 Internal value | |
| | 204 Internal value | |
| | 205 Internal value | |
| | 206 Internal value | |
| 0x4020:003 (P600.03) | Process controller setup (PID): Closed-loop controlled speed range<br>(PID setup: PID speed range)<br>0 ... [**100**] ... 100 % | Setting of the maximum output frequency up to which the process controller carries out regulation.<br>• 100 % = Maximum frequency 0x2916 (P211.00). |
| 0x4020:004 (P600.04) | Process controller setup (PID): Speed feedforward control source<br>(PID setup: PID line speed) | Optional selection of a speed feedforward control source for the process controller.<br>• Is advisable, for instance, for dancer position controls if the motor speed must not fall below line speed (process controller output value = line speed + controlled motor speed).<br>• Standard applications usually do not require a speed feedforward control; therefore it is deactivated in the default setting. |
| | **0 Without speed addition** | |
| | 1 Keypad frequency setpoint | |
| | 2 Analog input 1 | |
| | 3 Analog input 2 | |
| | 4 Frequency preset 1 | |
| | 5 Frequency preset 2 | |
| | 6 Frequency preset 3 | |
| | 7 Frequency preset 4 | |
| | 8 Network | |
| | 9 HTL input | |
| | 201 Internal value | Internal values of the manufacturer. |
| | 202 Internal value | |
| | 203 Internal value | |
| | 204 Internal value | |
| | 205 Internal value | |
| | 206 Internal value | |
| 0x4020:005 (P600.05) | Process controller setup (PID): Min speed limit<br>(PID setup: Min speed lim)<br>-100.0 ... [**-100.0**] ... 100.0 %<br>• From version 03.00 | Configuration of the process controller<br>• 100 % = Maximum frequency 0x2916 (P211.00).<br>• The limitation becomes effective after the line speed has been added.<br>• The value set here also limits the I component of the PID controller (Integrator-Anti-Windup). |
| 0x4020:006 (P600.06) | Process controller setup (PID): Max speed limit<br>(PID setup: Max speed lim)<br>-100.0 ... [**100.0**] ... 100.0 %<br>• From version 03.00 | Maximum output value of the process controller.<br>• 100 % = Maximum frequency 0x2916 (P211.00).<br>• The limitation becomes effective after the line speed has been added.<br>• The value set here also limits the I component of the PID controller (Integrator-Anti-Windup). |
| 0x4021:001 (P606.01) | PID speed operation: Acceleration time<br>(PID speed op.: Accel. time)<br>0.0 ... [**1.0**] ... 3600.0 s | Acceleration time for (temporary) speed-controlled drive control in process controller mode.<br>• The acceleration time takes effect at the output of the process controller. |
| 0x4021:002 (P606.02) | PID speed operation: Deceleration time<br>(PID speed op.: Decel. time)<br>0.0 ... [**1.0**] ... 3600.0 s | Deceleration time for (temporary) speed-controlled drive control in process controller mode.<br>• The deceleration time takes effect at the output of the process controller.<br>• **Exception:** In case of quick stop, the quick stop delay time is effective. |
| 0x4048 (P601.00) | PID P-component<br>(PID P-component)<br>0.0 ... [**5.0**] ... 1000.0 % | Output frequency of the process controller per 1 % system deviation.<br>• 100 % = maximum frequency 0x2916 (P211.00). |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x4049<br>(P602.00) | PID I- component<br>(PID I- component)<br>10 ... [**400**] ... 6000 ms | Reset time for system deviation.<br>• With the setting "6000 ms", the I component is deactivated.<br>• The I component can also be deactivated via the "Inhibit process controller I-component" 0x2631:047 (P400.47) function. |
| 0x404A<br>(P603.00) | PID D-component<br>(PID D-component)<br>0.0 ... [**0.0**] ... 20.0 s | D component, does not respond to the rate of the system deviation, but only to its rate of change. |
| 0x404B<br>(P604.00) | PID setpoint ramp<br>(PID setp.ramp)<br>0.0 ... [**20.0**] ... 100.0 s | Acceleration time and deceleration time for the process controller setpoint, relating to 100 PID units<br>Example: A setpoint increase from 0 PID units to 100 PID units with the default ramp takes 20s. |
| 0x404C:001<br>(P607.01) | PID influence: Acceleration time for activation<br>(PID influence: Activation time)<br>0.0 ... [**5.0**] ... 999.9 s | If the trigger assigned in 0x2631:048 (P400.48) of the "Activate PID influence ramp" function is TRUE, the influence of the process controller is shown by means of a ramp with the acceleration time set here. |
| 0x404C:002<br>(P607.02) | PID influence: Deceleration time for masking out<br>(PID influence: Mask out time)<br>0.0 ... [**5.0**] ... 999.9 s | If the trigger assigned in 0x2631:048 (P400.48) of the "Activate PID influence ramp" function is FALSE, the influence of the process controller is hidden via a ramp with the deceleration time set here. |
| 0x404D:001<br>(P608.01) | PID alarms: MIN alarm threshold<br>(PID alarms: MIN alarm thrsh.)<br>-300.00 ... [**0.00**] ... 300.00 PID unit | Trigger threshold for the status signal "PID MIN alarm active [75]".<br>• The "PID MIN alarm active [75]" status signal is TRUE if the feedback variable (with activated PID control) is lower than the threshold set here.<br>• The status signal can be assigned to the relay or to a digital output. ▸ Configure digital outputs 📖 247<br>• The status signal can be assigned to the NetWordOUT1 status word. ▸ Define your own status word format 📖 269 |
| 0x404D:002<br>(P608.02) | PID alarms: MAX alarm threshold<br>(PID alarms: MAX alarm thrsh.)<br>-300.00 ... [**100.00**] ... 300.00 PID unit | Trigger threshold for the status signal "PID MAX alarm active [76]".<br>• The "PID MAX alarm active [76]" status signal is TRUE if the feedback variable (with activated PID control) is higher than the threshold set here.<br>• The status signal can be assigned to the relay or to a digital output. ▸ Configure digital outputs 📖 247<br>• The status signal can be assigned to the NetWordOUT1 status word. ▸ Define your own status word format 📖 269 |
| 0x404D:003<br>(P608.03) | PID alarms: Monitoring bandwidth PID feedback signal<br>(PID alarms: Bandw. feedback)<br>0.00 ... [**2.00**] ... 100.00 %<br>• From version 04.00 | Hysteresis for status signal "PID feedback = setpoint [73]".<br>• 100 % = configured variable input range<br>• Example: Variable input range 0 ... 10 V: 2 % = 0.2 V<br>• The status signal "PID feedback = setpoint [73]" is TRUE if the controlled variable feedback = process controller setpoint (± hysteresis set here).<br>• The status signal can be assigned to the relay or to a digital output. ▸ Configure digital outputs 📖 247<br>• The status signal can be assigned to the NetWordOUT1 status word. ▸ Define your own status word format 📖 269 |
| 0x404E:001<br>(P605.01) | PID setpoint limits: Minimum setpoint<br>(PID setp. limit: Minimum setpoint)<br>-300.00 ... [**-300.00**] ... 300.00 PID unit | Minimum value of the process controller setpoint. |
| 0x404E:002<br>(P605.02) | PID setpoint limits: Maximum setpoint<br>(PID setp. limit: Maximum setpoint)<br>-300.00 ... [**300.00**] ... 300.00 PID unit | Maximum value of the process controller setpoint. |

### 7.3.2 Process controller sleep mode

If the PID control is activated, this function sets the drive in process controller mode to an energy-saving sleep mode when no power is required.

**Details**

A typical application for this function is a booster pump for water in a high-rise building. If no tenant opens the water tap or uses the shower for a longer period of time, the pump changes to the energy-saving sleep mode. This usually happens at night. Thesleep mode automatically ends as soon as a tenant opens the tap again. The pumps operates normally again until the condition for the sleep mode is pending again.

The conditions for activating and terminating the sleep mode can be set independently of one another in 0x4023:001 (P610.01) and 0x4023:006 (P610.06) (see the following tables).

In 0x4023:005 (P610.05), a delay time can be set for the activation. This is the minimum time the values must fall below or exceed the respective threshold before the sleep mode is activated.

| 0x4023:001 (P610.01) | Condition for activating the sleep mode | | | | | |
|---|---|---|---|---|---|---|
| 0 | Sleep mode deactivated. | | | | | |
| 1 | Frequency setpoint 0x2B0E (P102.00) | < | Frequency threshold 0x4023:003 (P610.03) | ( + | Delay time 0x4023:005 (P610.05) | ) |
| 2 | Frequency setpoint 0x2B0E (P102.00) | < | Frequency threshold 0x4023:003 (P610.03) | ( + | Delay time 0x4023:005 (P610.05) | ) |
| | | OR | | | | |
| | Current process variable 0x401F:002 (P121.02) | > | Feedback threshold 0x4023:004 (P610.04) | ( + | Delay time 0x4023:005 (P610.05) | ) |
| 3 | Frequency setpoint 0x2B0E (P102.00) | < | Frequency threshold 0x4023:003 (P610.03) | ( + | Delay time 0x4023:005 (P610.05) | ) |
| | | OR | | | | |
| | Current process variable 0x401F:002 (P121.02) | < | Feedback threshold 0x4023:004 (P610.04) | ( + | Delay time 0x4023:005 (P610.05) | ) |

| 0x4023:006 (P610.06) | Condition for terminating the sleep mode | | | | | |
|---|---|---|---|---|---|---|
| 0 | Frequency setpoint 0x2B0E (P102.00) | > | Frequency threshold 0x4023:003 (P610.03) | ( + | 2 Hz hysteresis | ) |
| | | OR | | | | |
| | PID error value 0x401F:007 | > | Bandwidth 0x4023:007 (P610.07) | | | |
| 1 | Current process variable 0x401F:002 (P121.02) | < | Recovery threshold 0x4023:008 (P610.08) | | | |
| 2 | Current process variable 0x401F:002 (P121.02) | > | Recovery threshold 0x4023:008 (P610.08) | | | |

## Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x4023:001<br>(P610.01) | PID sleep mode: Activation<br>(PID sleep mode: Activation) | Condition for activating the sleep mode. |
| | **0** **Disabled** | Sleep mode deactivated. |
| | 1 Output frequency < threshold | 0x2B0E (P102.00)<0x4023:003 (P610.03)<br>(+ Delay time 0x4023:005 (P610.05)) |
| | 2 Output frequency < threshold OR process variable > feedback threshold | 0x2B0E (P102.00)<0x4023:003 (P610.03)<br>(+ Delay time 0x4023:005 (P610.05))<br>OR<br>0x401F:002 (P121.02)>0x4023:004 (P610.04)<br>(+ Delay time 0x4023:005 (P610.05)) |
| | 3 Output frequency < threshold OR process variable < feedback threshold | 0x2B0E (P102.00)<0x4023:003 (P610.03)<br>(+ Delay time 0x4023:005 (P610.05))<br>OR<br>0x401F:002 (P121.02)<0x4023:004 (P610.04)<br>(+ Delay time 0x4023:005 (P610.05)) |
| 0x4023:002<br>(P610.02) | PID sleep mode: Stop method<br>(PID sleep mode: Stop method) | Selection of the stop method after activation of the sleep mode. |
| | **0** **Coasting** | The motor has no torque (coasts down to standstill). |
| | 1 Deceleration to standstill | The motor is brought to a standstill with deceleration time 1 (or deceleration time 2, if activated).<br>• Deceleration time 1 can be set in 0x2918 (P221.00).<br>• Deceleration time 2 can be set in 0x291A (P223.00).<br>▶ Ramp times 80 |
| | 2 Stop method set | The stop method set in 0x2838:003 (P203.03) is used. |
| 0x4023:003<br>(P610.03) | PID sleep mode: Frequency threshold<br>(PID sleep mode: Freq. thresh.)<br>0.0 ... [**0.0**] ... 599.0 Hz | Frequency threshold for activating the sleep mode.<br>• For comparing "output frequency < threshold" in case of selection 1 ... 3 in 0x4023:001 (P610.01). |
| 0x4023:004<br>(P610.04) | PID sleep mode: Feedback threshold<br>(PID sleep mode: Feedback thresh.)<br>-300.00 ... [**0.00**] ... 300.00 PID unit | Feedback threshold for activating the sleep mode.<br>• For comparing "variable > feedback threshold" in case of selection 2 in 0x4023:001 (P610.01).<br>• For comparing "variable < feedback threshold" in case of selection 3 in 0x4023:001 (P610.01). |
| 0x4023:005<br>(P610.05) | PID sleep mode: Delay time<br>(PID sleep mode: Delay time)<br>0.0 ... [**0.0**] ... 300.0 s | Minimum time for which the respective threshold must be underrun or exceeded before the sleep mode is activated. |
| 0x4023:006<br>(P610.06) | PID sleep mode: Recovery<br>(PID sleep mode: Recovery) | Condition for terminating the sleep mode. |
| | **0** **Setpoint > threshold OR system deviation > bandwidth** | 0x2B0E (P102.00) > 0x4023:003 (P610.03) (+ 2 Hz hysteresis)<br>OR<br>0x401F:007>0x4023:007 (P610.07) |
| | 1 Process variable < recovery threshold | 0x401F:002 (P121.02) < 0x4023:008 (P610.08) |
| | 2 Process variable > recovery threshold | 0x401F:002 (P121.02)>0x4023:008 (P610.08) |
| 0x4023:007<br>(P610.07) | PID sleep mode: Bandwidth<br>(PID sleep mode: Bandwidth)<br>0.00 ... [**0.00**] ... 300.00 PID unit | Range around the process controller setpoint for ending the sleep mode.<br>• 0.00 = bandwidth deactivated. |
| 0x4023:008<br>(P610.08) | PID sleep mode: Recovery threshold<br>(PID sleep mode: Recovery thresh.)<br>-300.00 ... [**0.00**] ... 300.00 PID unit | Termination threshold for sleep mode. |

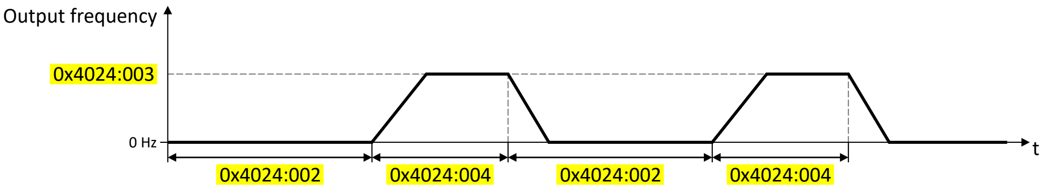
### 7.3.3 Process controller rinse function

This function accelerates the motor in sleep mode of the process controller at regular intervals to a defined speed.

**Details**

A typical application for this function is the rinsing of a pipe system with a pump that has been in an inactive state for a longer period to prevent deposits.

- In order to activate the rinsing function, set the selection "Enabled [1]" in 0x4024:001 (P615.01).
- The following diagram demonstrates the function:




- The rinsing function uses the ramp times set for the "MS: Velocity mode". ▶ Ramp times 80

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x4024:001 (P615.01) | Automatic rinsing: Rinsing in sleep mode (Auto-rinsing: Rinsing in idle) | | 1 = activate automatic rinsing in sleep mode. |
| | **0** | **Inhibited** | |
| | 1 | Enabled | |
| 0x4024:002 (P615.02) | Automatic rinsing: Rinse interval (Auto-rinsing: Rinse interval) 0.0 ... [**30.0**] ... 6000.0 min | | Time interval between two rinsing processes. |
| 0x4024:003 (P615.03) | Automatic rinsing: Rinse speed (Auto-rinsing: Rinse speed) -599.0 ... [**0.0**] ... 599.0 Hz | | Speed setpoint for rinse function. |
| 0x4024:004 (P615.04) | Automatic rinsing: Rinse period (Auto-rinsing: Rinse period) 0.0 ... [**0.0**] ... 6000.0 s | | Duration of a rinsing process. |

### 7.3.4 Process controller function selection

By means of the following functions, the response of the inverter can be controlled when PID control is activated.

**Parameter**

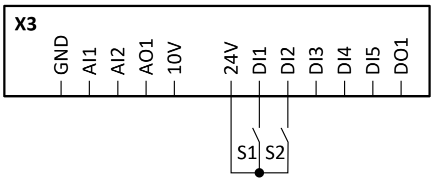
| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2631:045 (P400.45) | Function list: Deactivate PID controller (Function list: PID off)<br>• Further possible settings: ▶ Trigger list 59 | | Assignment of a trigger for the "Deactivate PID controller" function.<br>Trigger = TRUE: If PID control is activated, ignore PID control and drive the motor in speed-controlled manner.<br>Trigger = FALSE: If PID control is activated, drive the motor with PID control.<br>Notes:<br>• The PID control mode can be selected in 0x4020:001 (P600.01). |
| | **0** | **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:046 (P400.46) | Function list: Set process controller output to 0 (Function list: PID output=0)<br>• Further possible settings: ▶ Trigger list 59 | | Assignment of a trigger for the "Set process controller output to 0" function.<br>Trigger = TRUE: If PID control is activated, I component and the output of the PID controller are set to 0 and the internal control algorithm is stopped. The PID control remains active.<br>Trigger = FALSE: no action / deactivate function again. |
| | **0** | **Not connected** | No trigger assigned (trigger is constantly FALSE). |

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2631:047 (P400.47) | Function list: Inhibit process controller I-component (Function list: PID-I inhibited)<br>• Further possible settings: ▶ Trigger list 📖 59 | | Assignment of a trigger for the "Inhibit process controller I-component" function.<br>Trigger = TRUE: If PID control is activated, the I component of the PID controller is set to 0 and the integration process is stopped.<br>Trigger = FALSE: no action / deactivate function again.<br>Notes:<br>• The reset time can be set in 0x4049 (P602.00). |
| | 0 | **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:048 (P400.48) | Function list: Activate PID influence ramp (Function list: PID-Inf ramp on)<br>• Further possible settings: ▶ Trigger list 📖 59 | | Assignment of a trigger for the "Activate PID influence ramp" function.<br>Trigger = TRUE: the influence of the process controller is shown via a ramp.<br>Trigger = FALSE or not connected: the influence of the process controller is hidden via ramp.<br>Notes:<br>• The influence of the process controller is always active (not only when PID control is activated).<br>• Acceleration time for showing the influence of the process controller can be set in 0x404C:001 (P607.01).<br>• Deceleration time for hiding the influence of the process controller can be set in 0x404C:002 (P607.02). |
| | 1 | **Constant TRUE** | Trigger is constantly TRUE. |

### Example for operating mode

In the following example, the "Deactivate PID controller" function is used to deactivate the PID control temporarily:

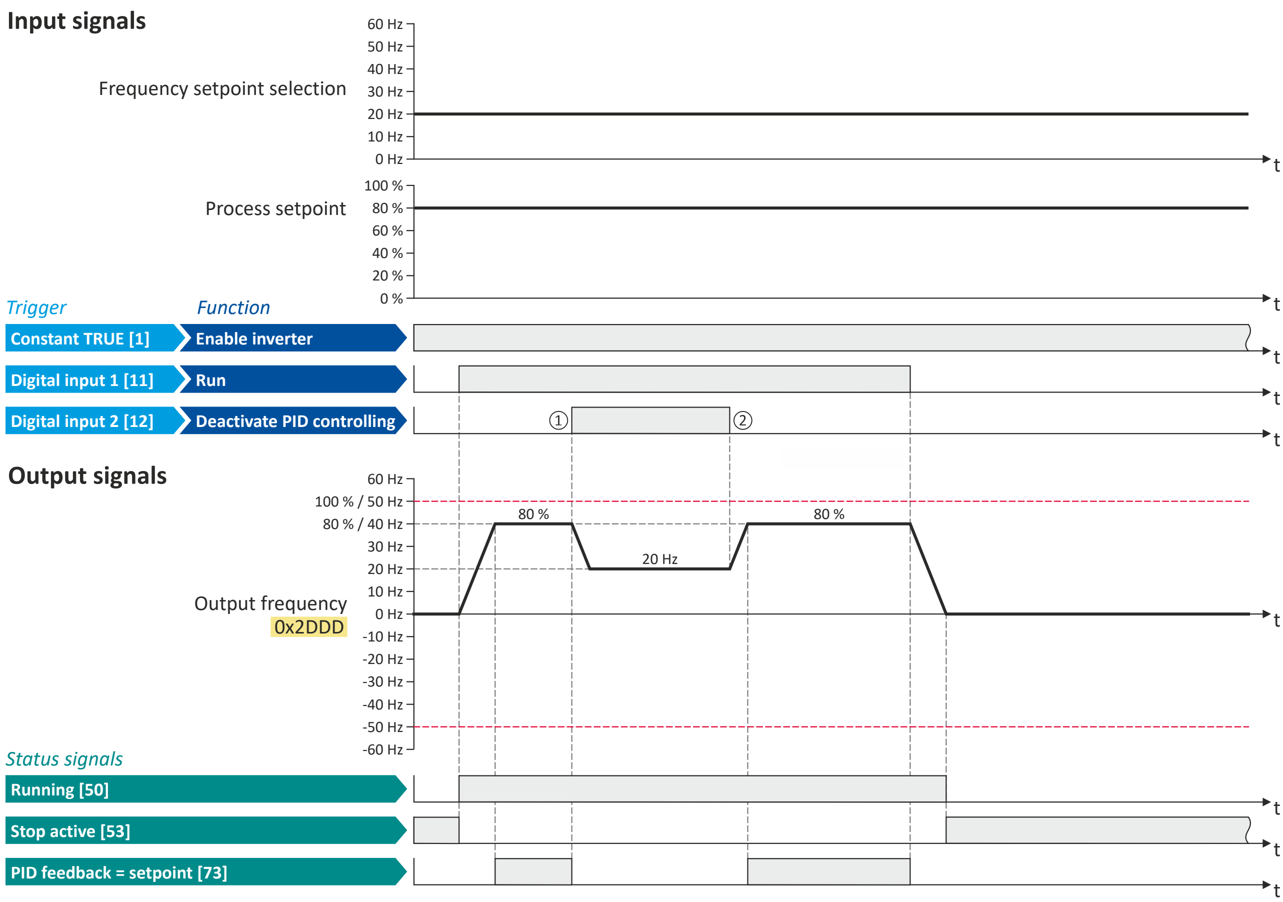
- As standard setpoint source, the frequency preset 1 is set to 20 Hz.
- The switch S1 starts the motor in forward rotating direction. The switch S1 in the initial position stops the motor again.
- The switch S2 deactivates the PID control. The motor is then driven in a speed-controlled way.

| Connection plan | Function | |
|---|---|---|
|   | Switch S1 | Run |
| | Switch S2 | Deactivate PID controller |

| Parameter | Name | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2631:004 (P400.04) | Reset fault | Not connected [0] |
| 0x2631:045 (P400.45) | Deactivate PID controller | Digital input 2 [12] |
| 0x2824 (P200.00) | Control selection | Flexible I/O configuration [0] |
| 0x2838:003 (P203.03) | Stop method | Standard ramp [1] |
| 0x2860:001 (P201.01) | Frequency control: Default setpoint source | Frequency preset 1 [11] |
| 0x2911:001 (P450.01) | Frequency setpoint presets: Preset 1 | 20 Hz |
| 0x2916 (P211.00) | Maximum frequency | 50 Hz |

**i** The example assumes that the process controller has been configured accordingly. ▶ Basic setting 📖 113






The status signals can be assigned to digital outputs. ▶ Configure digital outputs 📖 247

① PID control is deactivated: a change-over is initiated from the configured PID control to speed-controlled operation.
② PID control is activated again: a change-over is initiated from speed-controlled operation back to the configured PID control.

## 7.3.5 Process controller diagnostics

The following parameters serve to diagnose the process controller.

### Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x401F:001<br>(P121.01) | Process controller diagnostics: Current setpoint<br>(PID diagnostics: PID setpoint)<br>• Read only: x.xx PID unit | | Display of the current reference value (setpoint) for the process controller. |
| 0x401F:002<br>(P121.02) | Process controller diagnostics: Current process variable<br>(PID diagnostics: PID process var.)<br>• Read only: x.xx PID unit | | Display of the current controlled feedback variable (actual value) for the process controller. |
| 0x401F:003<br>(P121.03) | Process controller diagnostics: Status<br>(PID diagnostics: PID status)<br>• Read only | | Bit-coded status display of the process controller. |
| | Bit 0 | Process controller off | |
| | Bit 1 | PID output set to 0 | |
| | Bit 2 | PID I-component inhibited | |
| | Bit 3 | PID influence active | |
| | Bit 4 | Setpoint = actual value | |
| | Bit 5 | Sleep mode active | |
| | Bit 6 | Max. alarm | |
| | Bit 7 | Min. alarm | |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x401F:004 | Process controller diagnostics: PID control value<br>• Read only: x.x Hz<br>• From version 03.00 | Display of the output frequency after the PID controller, but without any influencing factor. |
| 0x401F:005 | Process controller diagnostics: PID Feedforward value<br>• Read only: x.x Hz<br>• From version 03.00 | Display of the feedforward control value for the process controller. |
| 0x401F:006 | Process controller diagnostics: PID output value<br>• Read only: x.x Hz<br>• From version 03.00 | Display of the current process controller setpoint that is internally transferred to the motor control (considering the feedforward control value). |
| 0x401F:007 | Process controller diagnostics: PID error value<br>• Read only: x.xx PID unit<br>• From version 03.00 | Display of the difference between reference value (setpoint) and feedback variable (actual value) of the process controller. |

## 7.4 Changing the setpoint source during operation

The inverter receives its setpoint from the selected standard setpoint source. For applications requiring a change-over of the setpoint source during operation, the functions listed below must be configured.

**Details**

For further details and examples, see the following subchapters.

> In case of an activated network control, the functions for setpoint change-over are not active! If in case of network control no setpoint is defined via the network control word, the standard setpoint source is active.

| Function | Info |
|---|---|
| Activate AI1 setpoint<br>0x2631:014 (P400.14) | Activate analog input 1 as setpoint source.<br>▸ Analog input 1 240<br>▸ Example: Change-over from keypad setpoint to AI1/AI2 setpoint 129 |
| Activate AI2 setpoint<br>0x2631:015 (P400.15) | Activate analog input 2 as setpoint source.<br>▸ Analog input 2 244<br>▸ Example: Change-over from keypad setpoint to AI1/AI2 setpoint 129 |
| Activate keypad setpoint<br>0x2631:016 (P400.16) | Activate keypad as setpoint source.<br>• The keypad setpoint can be changed in the operating mode via the navigation keys ↑ and ↓ .<br>▸ Keypad 82<br>▸ Example: Change-over from AI1 setpoint to keypad setpoint 131 |
| Activate network setpoint<br>0x2631:017 (P400.17) | Activate network as setpoint source.<br>▸ Define setpoint via network 273 |
| Activate preset (bit 0)<br>0x2631:018 (P400.18) | Activate parameterizable setpoints (presets) as setpoint source.<br>• 15 frequency setpoints and 8 PID setpoints can be set as presets.<br>• A preset can be selected binary-coded via the four functions "Activate preset (bit 0)" ... "Activate preset (bit 3)".<br>▸ Setpoint presets 83<br>▸ Example: Change-over from keypad setpoint to preset 1 ... 7 133 |
| Activate preset (bit 1)<br>0x2631:019 (P400.19) | |
| Activate preset (bit 2)<br>0x2631:020 (P400.20) | |
| Activate preset (bit 3)<br>0x2631:021 (P400.21) | |
| Activate MOP setpoint<br>0x2631:025 (P400.25) | The "Motor potentiometer" function can be used as an alternative setpoint control that is controlled via two functions: "MOP setpoint up" and "MOP setpoint down".<br>▸ Motor potentiometer (MOP) 85<br>▸ Example: Change-over from AI1 setpoint to MOP setpoint 136 |
| Activate segment setpoint (bit 0)<br>0x2631:026 (P400.26) | Activate parameterizable segment setpoints as setpoint source.<br>• The four functions "Activate segment setpoint (bit 0)" ... " Activate segment setpoint´(bit 3)" enable a setpoint change-over to a segment setpoint parameterized for the "sequencer" function during normal operation.<br>▸ Segment configuration 89 |
| Activate segment setpoint (bit 1)<br>0x2631:027 (P400.27) | |
| Activate segment setpoint (bit 2)<br>0x2631:028 (P400.28) | |
| Activate segment setpoint´(bit 3)<br>0x2631:029 (P400.29) | |

Diagnostic parameters:

- 0x282B:002 (P125.02): Active setpoint source

### Priority of the setpoint sources

Since only one setpoint source can be active at a time, the following priorities apply:

| **Flexible I/O configuration or keypad control active**<br>0x2631:037 (P400.37) = **FALSE** | **Network control active**<br>0x2631:017 (P400.17) = **FALSE**<br>0x2631:037 (P400.37) = **TRUE** |
|---|---|
| Prio 1: Functions for setpoint change-over<br>The priority of the functions results from the assigned triggers (in the order of the selection list):<br>1. Constant TRUE [1]<br>2. Digital input 1 [11]<br>3. Digital input 2 [12]<br>4. Digital input 3 [13]<br>5. ... | Prio 1: Setpoint source selected via network control word<br>▸ Control the inverter via network 📖 258 |
| Prio 2: Set standard setpoint source<br>• 0x2860:001 (P201.01): Frequency control: Default setpoint source<br>• 0x2860:002 (P201.02): PID control: Default setpoint source | Prio 2: Set standard setpoint source<br>• 0x2860:001 (P201.01): Frequency control: Default setpoint source<br>• 0x2860:002 (P201.02): PID control: Default setpoint source |

### Example of allocating priority

| Parameter | Designation | Setting for this example |
|---|---|---|
| 0x2631:014 (P400.14) | Activate AI1 setpoint | Digital input 5 [15] |
| 0x2631:016 (P400.16) | Activate keypad setpoint | Digital input 4 [14] |

| Digital input 4 | Digital input 5 | Active setpoint source |
|---|---|---|
| FALSE | FALSE | Standard setpoint source set in 0x2860:001 (P201.01) |
| FALSE | TRUE | Analog input 1 |
| TRUE | FALSE | Keypad |
| TRUE | TRUE | Keypad (since "Digital input 4" trigger is higher in the selection list than "Digital input 5" trigger) |

### Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2631:014<br>(P400.14) | Function list: Activate AI1 setpoint<br>(Function list: Setp: AI1)<br>• Further possible settings: ▸ Trigger list 📖 59 | | Assignment of a trigger for the "Activate AI1 setpoint" function.<br>Trigger = TRUE: analog input 1 is used as setpoint source (if the trigger assigned has the highest setpoint priority).<br>Trigger = FALSE: no action / deactivate function again. |
| | **0** | **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:015<br>(P400.15) | Function list: Activate AI2 setpoint<br>(Function list: Setp: AI2)<br>• Further possible settings: ▸ Trigger list 📖 59 | | Assignment of a trigger for the "Activate AI2 setpoint" function.<br>Trigger = TRUE: analog input 2 is used as setpoint source (if the trigger assigned has the highest setpoint priority).<br>Trigger = FALSE: no action / deactivate function again. |
| | **0** | **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:016<br>(P400.16) | Function list: Activate keypad setpoint<br>(Function list: Setp: Keypad)<br>• Further possible settings: ▸ Trigger list 📖 59 | | Assignment of a trigger for the "Activate keypad setpoint" function.<br>Trigger = TRUE: the keypad is used as setpoint source (if the trigger assigned has the highest setpoint priority).<br>Trigger = FALSE: no action / deactivate function again.<br>Notes:<br>• The default keypad setpoint can be changed in keypad operating mode via the arrow keys of the keypad. |
| | **0** | **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:017<br>(P400.17) | Function list: Activate network setpoint<br>(Function list: Setp: Network)<br>• From version 02.01<br>• Further possible settings: ▸ Trigger list 📖 59 | | Assignment of a trigger for the "Activate network setpoint" function.<br>Trigger = TRUE: the network is used as setpoint source (if the trigger assigned has the highest setpoint priority).<br>Trigger = FALSE: no action / deactivate function again. |
| | **0** | **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| | 116 | Network setpoint active (from version 02.00) | TRUE if a change-over to network setpoint is requested via bit 6 of the AC drive control word0x400B:001 (P592.01). Otherwise FALSE.<br>Notes:<br>• This setting is used if bit 6 of the AC drive control word is to be used independently of bit 5 AC drive control word.<br>• The AC drive control word can be used with any communication protocol.<br>▸ AC drive control word 📖 305 |



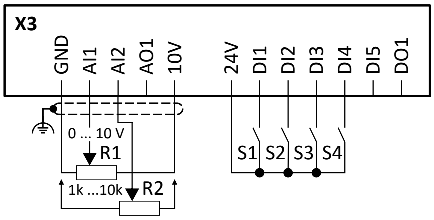
| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2631:018 (P400.18) | Function list: Activate preset (bit 0)<br>(Function list: Setp: Preset b0)<br>• Further possible settings: ▸ Trigger list 59 | Assignment of a trigger for the "Activate preset (bit 0)" function.<br>The bit with the valency $2^0$ for bit-coded selection and the activation of a parameterised setpoint (preset).<br>Trigger = FALSE: bit = "0".<br>Trigger = TRUE: bit = "1". |
| | 14 **Digital input 4** | State of X3/DI4, taking an inversion set in 0x2632:004 (P411.04) into consideration. |
| 0x2631:019 (P400.19) | Function list: Activate preset (bit 1)<br>(Function list: Setp: Preset b1)<br>• Further possible settings: ▸ Trigger list 59 | Assignment of a trigger for the "Activate preset (bit 1)" function.<br>The bit with the valency $2^1$ for bit-coded selection and the activation of a parameterised setpoint (preset).<br>Trigger = FALSE: bit = "0".<br>Trigger = TRUE: bit = "1". |
| | 15 **Digital input 5** | State of X3/DI5, taking an inversion set in 0x2632:005 (P411.05) into consideration. |
| 0x2631:020 (P400.20) | Function list: Activate preset (bit 2)<br>(Function list: Setp: Preset b2)<br>• Further possible settings: ▸ Trigger list 59 | Assignment of a trigger for the "Activate preset (bit 2)" function.<br>The bit with the valency $2^2$ for bit-coded selection and the activation of a parameterised setpoint (preset).<br>Trigger = FALSE: bit = "0".<br>Trigger = TRUE: bit = "1". |
| | 0 **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:021 (P400.21) | Function list: Activate preset (bit 3)<br>(Function list: Setp: Preset b3)<br>• Further possible settings: ▸ Trigger list 59 | Assignment of a trigger for the "Activate preset (bit 3)" function.<br>Selection bit with the valency $2^3$ for the bit-coded selection and activation of a parameterised setpoint (preset value).<br>Trigger = FALSE: selection bit = "0".<br>Trigger = TRUE: selection bit = "1". |
| | 0 **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:025 (P400.25) | Function list: Activate MOP setpoint<br>(Function list: Setp: MOP)<br>• Further possible settings: ▸ Trigger list 59 | Assignment of a trigger for the "Activate MOP setpoint" function.<br>Trigger = TRUE: the "Motor potentiometer" function is used as setpoint source (if the trigger assigned has the highest setpoint priority).<br>Trigger = FALSE: no action / deactivate function again. |
| | 0 **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:026 (P400.26) | Function list: Activate segment setpoint (bit 0)<br>(Function list: Setp: Segment b0)<br>• From version 03.00<br>• Further possible settings: ▸ Trigger list 59 | Assignment of a trigger for the "Activate segment setpoint (bit 0)" function.<br>Selection bit with the valency 20 for the bit-coded selection and activation of a parameterised segment setpoint.<br>Trigger = FALSE: selection bit = "0".<br>Trigger = TRUE: selection bit = "1".<br>Notes:<br>• During normal operation (no active sequence), this function serves to activate the setpoint of a segment (instead of an entire sequence in the sequencer operation).<br>• This function is not intended for the use in the sequencer operation. |
| | 0 **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:027 (P400.27) | Function list: Activate segment setpoint (bit 1)<br>(Function list: Setp: Segment b1)<br>• From version 03.00<br>• Further possible settings: ▸ Trigger list 59 | Assignment of a trigger for the "Activate segment setpoint (bit 1)" function.<br>Selection bit with the valency $2^1$ for the bit-coded selection and activation of a parameterised segment setpoint.<br>Trigger = FALSE: selection bit = "0".<br>Trigger = TRUE: selection bit = "1".<br>Notes:<br>• During normal operation (no active sequence), this function serves to activate the setpoint of a segment (instead of an entire sequence in the sequencer operation).<br>• This function is not intended for the use in the sequencer operation. |
| | 0 **Not connected** | No trigger assigned (trigger is constantly FALSE). |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2631:028<br>(P400.28) | Function list: Activate segment setpoint (bit 2)<br>(Function list: Setp: Segment b2)<br>• From version 03.00<br>• Further possible settings: ▸ Trigger list 🕮 59 | Assignment of a trigger for the "Activate segment setpoint (bit 2)" function.<br>Selection bit with the valency $2^2$ for the bit coded selection and activation of a parameterised segment setpoint.<br>Trigger = FALSE: selection bit = "0".<br>Trigger = TRUE: selection bit = "1".<br>Notes:<br>• During normal operation (no active sequence), this function serves to activate the setpoint of a segment (instead of an entire sequence in the sequencer operation).<br>• This function is not intended for the use in the sequencer operation. |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:029<br>(P400.29) | Function list: Activate segment setpoint´(bit 3)<br>(Function list: Setp: Segment b3)<br>• From version 03.00<br>• Further possible settings: ▸ Trigger list 🕮 59 | Assignment of a trigger for the "Activate segment setpoint´(bit 3)" function.<br>Selection bit with the valency $2^3$ for the bit coded selection and activation of a parameterised segment setpoint.<br>Trigger = FALSE: selection bit = "0".<br>Trigger = TRUE: selection bit = "1".<br>Notes:<br>• During normal operation (no active sequence), this function serves to activate the setpoint of a segment (instead of an entire sequence in the sequencer operation).<br>• This function is not intended for the use in the sequencer operation. |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |

### 7.4.1 Example: Change-over from keypad setpoint to AI1/AI2 setpoint

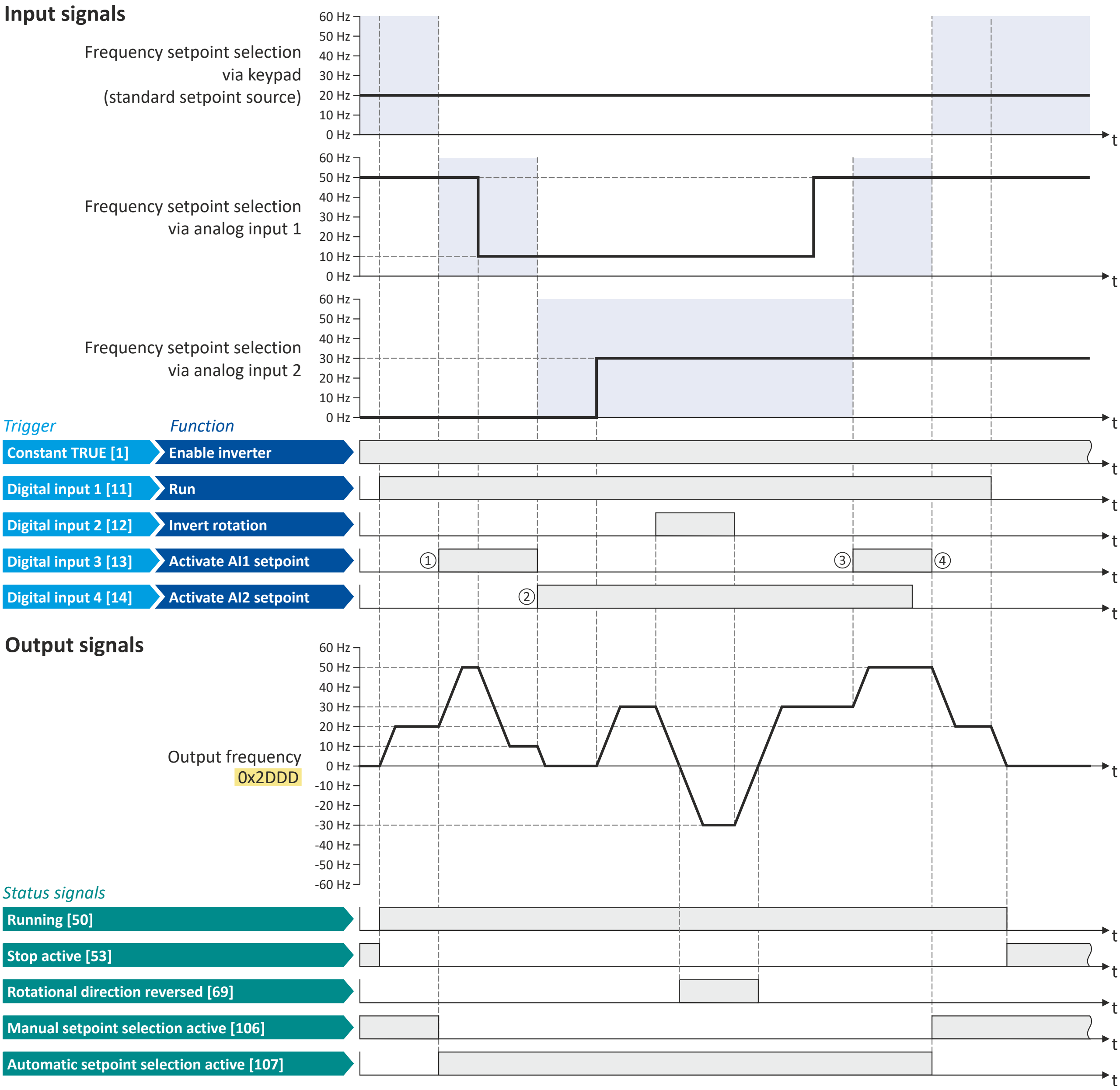
- The keypad is set as standard setpoint source.
- The switch S1 starts the motor in forward rotating direction. The switch S1 in the initial position stops the motor again.
- The switch S2 switches the direction of rotation.
- The switch S3 activates analog input 1 as setpoint source.
- The switch S4 activates analog input 2 as setpoint source.

If S3 and S4 are actuated at the same time, the analogue input 1 is active as setpoint source since the digital input 3 assigned to this function has a higher priority than the digital input 4.




| Connection plan | Function | |
|---|---|---|
| (see diagram above) | Potentiometer R1 | Frequency setpoint selection via AI1 |
| | Potentiometer R2 | Frequency setpoint selection via AI2 |
| | Switch S1 | Run |
| | Switch S2 | Reverse rotational direction |
| | Switch S3 | Activate AI1 setpoint |
| | Switch S4 | Activate AI2 setpoint |

| Parameter | Name | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2631:004 (P400.04) | Reset fault | Not connected [0] |
| 0x2631:013 (P400.13) | Reverse rotational direction | Digital input 2 [12] |
| 0x2631:014 (P400.14) | Activate AI1 setpoint | Digital input 3 [13] |
| 0x2631:015 (P400.15) | Activate AI2 setpoint | Digital input 4 [14] |
| 0x2631:018 (P400.18) | Activate preset (bit 0) | Not connected [0] |
| 0x2824 (P200.00) | Control selection | Flexible I/O configuration [0] |
| 0x2838:003 (P203.03) | Stop method | Standard ramp [1] |
| 0x2860:001 (P201.01) | Frequency control: Default setpoint source | Keypad [1] |

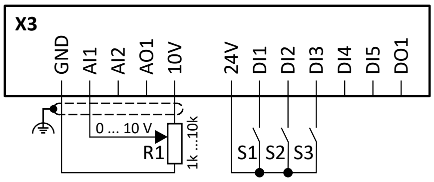



The status signals can be assigned to digital outputs. ▶ Configure digital outputs 🕮 247

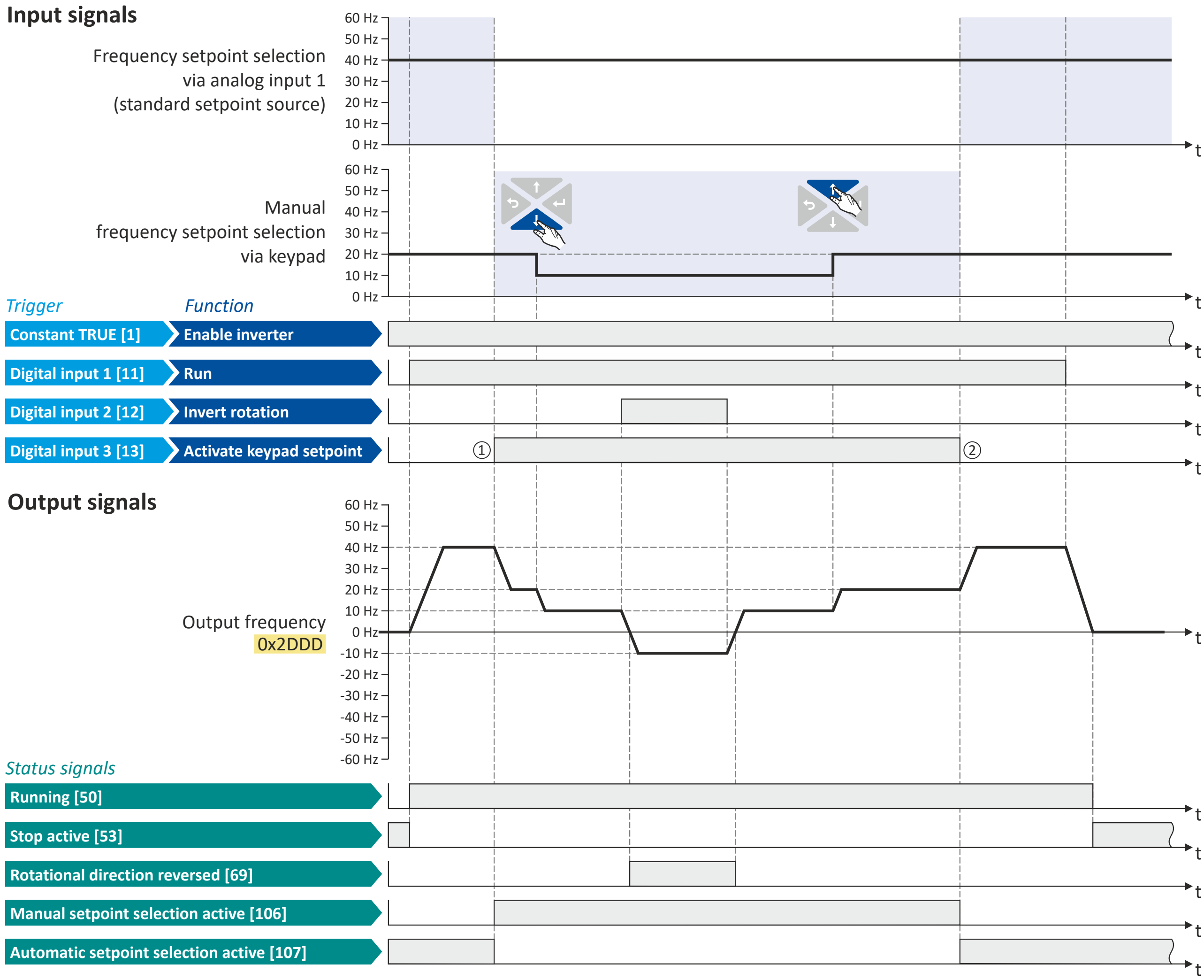
① The change-over is initiated from keypad setpoint (standard setpoint source) to AI1 setpoint.
② The change-over is initiated from AI1 setpoint to AI2 setpoint.
③ The change-over is initiated from AI2 setpoint to AI1 setpoint since the digital input 3 has a higher priority than the digital input 4.
④ The change-over is initiated to keypad setpoint (standard setpoint source).

### 7.4.2 Example: Change-over from AI1 setpoint to keypad setpoint

- The analog input 1 is set as standard setpoint source.
- Switch S1 starts the motor in forward direction of rotation. Switch S1 in initial position stops the motor again.
- Switch S2 switches the direction of rotation.
- Switch S3 activates the keypad as setpoint source. The keypad setpoint can be changed in the operating mode via the navigation keys ↑ and ↓.

| Connection plan | Function | |
|---|---|---|
|   | Potentiometer R1 | Frequency setpoint selection |
| | Switch S1 | Run |
| | Switch S2 | Reverse rotational direction |
| | Switch S3 | Activate keypad setpoint |

| Parameter | Name | Setting for this example |
|---|---|---|
| 0x2601:001 (P202.01) | Keypad setpoints: Frequency setpoint | 20.0 Hz |
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2631:004 (P400.04) | Reset fault | Not connected [0] |
| 0x2631:013 (P400.13) | Reverse rotational direction | Digital input 2 [12] |
| 0x2631:016 (P400.16) | Activate keypad setpoint | Digital input 3 [13] |
| 0x2824 (P200.00) | Control selection | Flexible I/O configuration [0] |
| 0x2838:003 (P203.03) | Stop method | Standard ramp [1] |
| 0x2860:001 (P201.01) | Frequency control: Default setpoint source | Analog input 1 [2] |




The status signals can be assigned to digital outputs. ▶ Configure digital outputs 📖 247

- ① Change-over from analog input 1 (standard setpoint source) to keypad setpoint.
- ② Change-over from keypad setpoint back to analog input 1 (standard setpoint source).

### 7.4.3 Example: Change-over from keypad setpoint to preset 1 ... 7

The four functions "Activate preset (bit 0)" ... " Activate preset (bit 3)" enable change-over of the setpoint to a parameterisable setpoint (preset value).

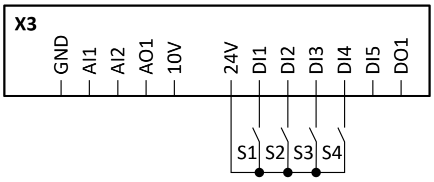
**Details**

A preset is selected in a binary-coded fashion via the triggers assigned to the four functions "Activate preset (Bit 0)" ... " Activate preset (Bit 3)" in compliance with the following truth table:

| Activate preset | | | | Selection | | | |
|---|---|---|---|---|---|---|---|
| Bit 3 0x2631:021 (P400.21) | Bit 2 0x2631:020 (P400.20) | Bit 1 0x2631:019 (P400.19) | Bit 0 0x2631:018 (P400.18) | Preset | Frequency setpoint | PID setpoint | Torque setpoint |
| FALSE | FALSE | FALSE | FALSE | No preset selected | | | |
| FALSE | FALSE | FALSE | TRUE | Preset 1 | 0x2911:001 (P450.01) | 0x4022:001 (P451.01) | 0x2912:001 (P452.01) |
| FALSE | FALSE | TRUE | FALSE | Preset 2 | 0x2911:002 (P450.02) | 0x4022:002 (P451.02) | 0x2912:002 (P452.02) |
| FALSE | FALSE | TRUE | TRUE | Preset 3 | 0x2911:003 (P450.03) | 0x4022:003 (P451.03) | 0x2912:003 (P452.03) |
| FALSE | TRUE | FALSE | FALSE | Preset 4 | 0x2911:004 (P450.04) | 0x4022:004 (P451.04) | 0x2912:004 (P452.04) |
| FALSE | TRUE | FALSE | TRUE | Preset 5 | 0x2911:005 (P450.05) | 0x4022:005 (P451.05) | 0x2912:005 (P452.05) |
| FALSE | TRUE | TRUE | FALSE | Preset 6 | 0x2911:006 (P450.06) | 0x4022:006 (P451.06) | 0x2912:006 (P452.06) |
| FALSE | TRUE | TRUE | TRUE | Preset 7 | 0x2911:007 (P450.07) | 0x4022:007 (P451.07) | 0x2912:007 (P452.07) |
| TRUE | FALSE | FALSE | FALSE | Preset 8 | 0x2911:008 (P450.08) | 0x4022:008 (P451.08) | 0x2912:008 (P452.08) |
| TRUE | FALSE | FALSE | TRUE | Preset 9 | 0x2911:009 (P450.09) | | |
| ... | | | | ... | ... | | |
| TRUE | TRUE | TRUE | TRUE | Preset 15 | 0x2911:015 (P450.15) | | |

### Example for operating mode

- The keypad is set as standard setpoint source.
- Switch S1 starts the motor in forward direction of rotation. Switch S1 in initial position stops the motor again.
- The switches S2 ... S4 serve to switch over to the presets 1 ... 7 (see the following table).

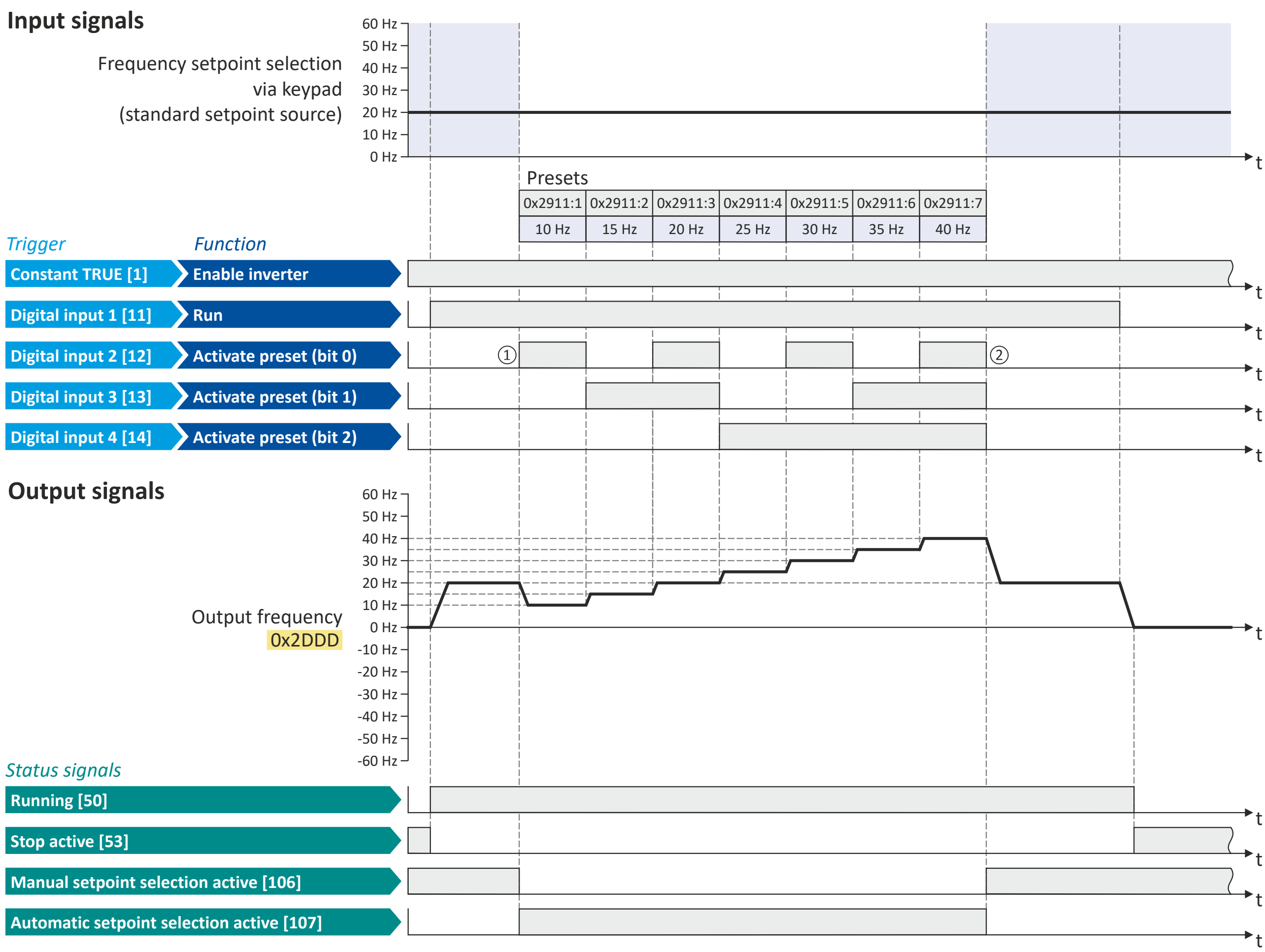
| Connection plan | Function | | | | |
|---|---|---|---|---|---|
|  | Switch S1 | Run | | | |
| | Switches S2 ... S4 | Preset selection: | | | |
| | | **S2** | **S3** | **S4** | |
| | | Off | Off | Off | Keypad setpoint |
| | | On | Off | Off | Preset value 1 |
| | | Off | On | Off | Preset value 2 |
| | | On | On | Off | Preset value 3 |
| | | Off | Off | On | Preset value 4 |
| | | On | Off | On | Preset value 5 |
| | | Off | On | On | Preset value 6 |
| | | On | On | On | Preset value 7 |



| Parameter | Name | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2631:004 (P400.04) | Reset fault | Not connected [0] |
| 0x2631:013 (P400.13) | Reverse rotational direction | Not connected [0] |
| 0x2631:018 (P400.18) | Activate preset (bit 0) | Digital input 2 [12] |
| 0x2631:019 (P400.19) | Activate preset (bit 1) | Digital input 3 [13] |
| 0x2631:020 (P400.20) | Activate preset (bit 2) | Digital input 4 [14] |
| 0x2824 (P200.00) | Control selection | Flexible I/O configuration [0] |
| 0x2838:003 (P203.03) | Stop method | Standard ramp [1] |
| 0x2860:001 (P201.01) | Frequency control: Default setpoint source | Keypad [1] |
| 0x2911:001 (P450.01) | Frequency setpoint presets: Preset 1 | 10 Hz |
| 0x2911:002 (P450.02) | Frequency setpoint presets: Preset 2 | 15 Hz |
| 0x2911:003 (P450.03) | Frequency setpoint presets: Preset 3 | 20 Hz |
| 0x2911:004 (P450.04) | Frequency setpoint presets: Preset 4 | 25 Hz |
| 0x2911:005 (P450.05) | Frequency setpoint presets: Preset 5 | 30 Hz |
| 0x2911:006 (P450.06) | Frequency setpoint presets: Preset 6 | 35 Hz |
| 0x2911:007 (P450.07) | Frequency setpoint presets: Preset 7 | 40 Hz |

If the frequency presets 8 ... 15 are required as well, the digital input 5 must be additionally assigned to the "Activate preset (bit 3)" function and the terminal DI5 must be interconnected accordingly.






The status signals can be assigned to digital outputs. ▶ Configure digital outputs 📖 247

1. Change-over from keypad setpoint (standard setpoint source) to presets (first, preset 1 is selected).
2. Change-over back to keypad setpoint since no preset is selected anymore (digital inputs 2 ... 4 = FALSE).

### 7.4.4 Example: Change-over from AI1 setpoint to MOP setpoint

The "Activate MOP setpoint" function enables a setpoint change-over to the motor potentiometer during operation.

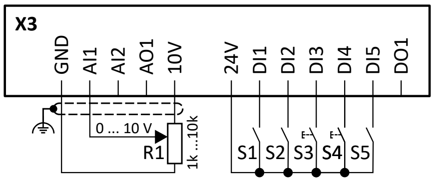
#### Preconditions

A setpoint change-over to the motor potentiometer is only effected if

- no setpoint source with a higher priority has been selected. ▶ Priority of the setpoint sources 126
- no jog operation is active ("Jog foward (CW)" and "Jog reverse (CCW)" functions).

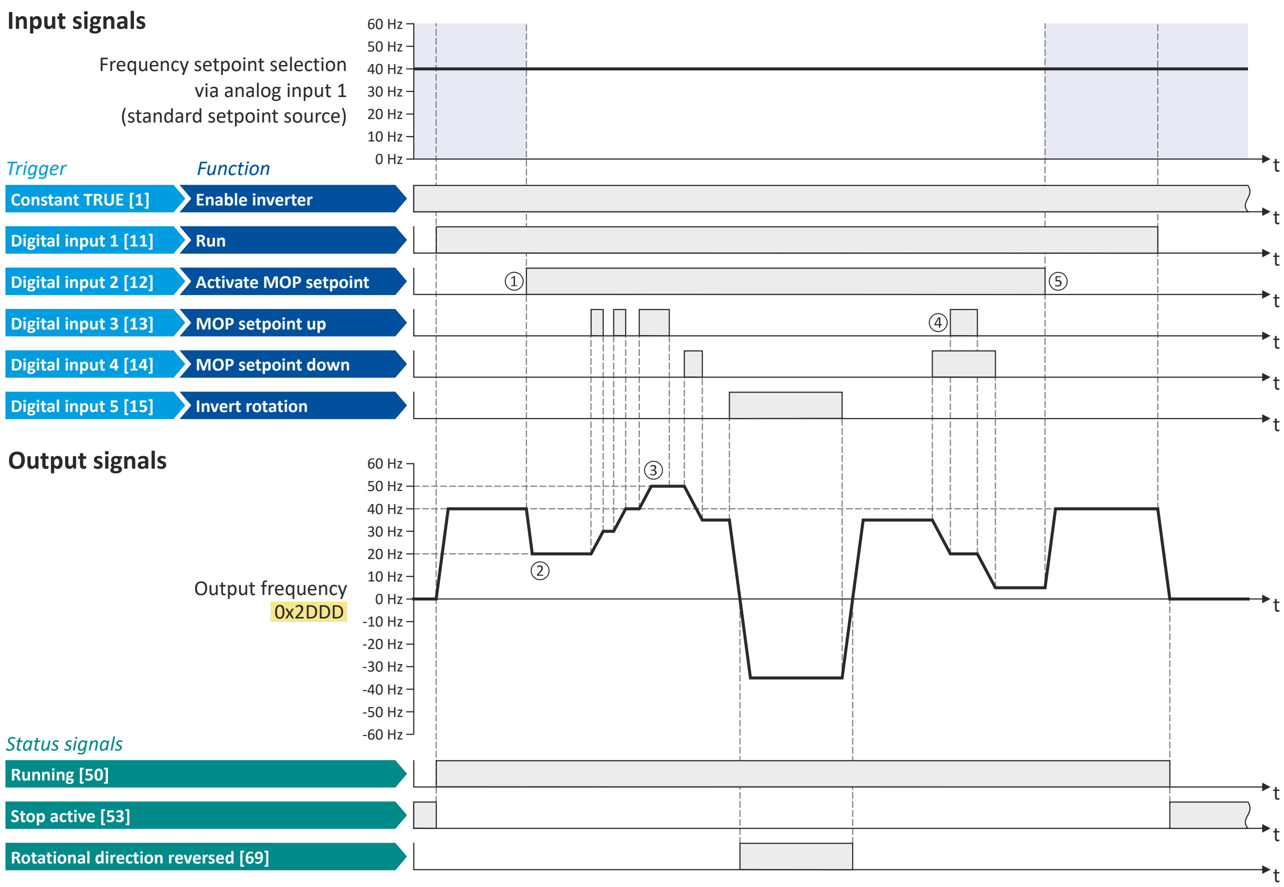
#### Example for operating mode

- The analog input 1 is set as standard setpoint source.
- Switch S1 starts the motor in forward direction of rotation. Switch S1 in initial position stops the motor again.
- Switch S2 activates the motor potentiometer as setpoint source. The MOP setpoint can then be increased via button S3 and reduced via button S4. If both buttons are pressed at the same time, the MOP setpoint remains unchanged.
- Switch S5 switches the direction of rotation.

| Connection plan | Function | |
|---|---|---|
|   | Potentiometer R1 | Frequency setpoint selection |
| | Switch S1 | Run |
| | Switch S2 | Activate MOP setpoint |
| | Button S3 | MOP setpoint up |
| | Button S4 | MOP setpoint down |
| | Switch S5 | Reverse rotational direction |

| Parameter | Name | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2631:025 (P400.25) | Activate MOP setpoint | Digital input 2 [12] |
| 0x2631:023 (P400.23) | MOP setpoint up | Digital input 3 [13] |
| 0x2631:024 (P400.24) | MOP setpoint down | Digital input 4 [14] |
| 0x2631:013 (P400.13) | Reverse rotational direction | Digital input 5 [15] |
| 0x2824 (P200.00) | Control selection | Flexible I/O configuration [0] |
| 0x2838:003 (P203.03) | Stop method | Standard ramp [1] |
| 0x2860:001 (P201.01) | Frequency control: Default setpoint source | Analog input 1 [2] |
| 0x2917 (P220.00) | Acceleration time 1 | 1.0 s |
| 0x2918 (P221.00) | Deceleration time 1 | 1.0 s |
| 0x2919 (P222.00) | Acceleration time 2 | 4.0 s (for MOP setpoint change) |
| 0x291A (P223.00) | Deceleration time 2 | 4.0 s (for MOP setpoint change) |
| 0x4003 (P413.00) | MOP starting mode | Starting value [1] |
| 0x4004:001 (P414.01) | MOP starting values: Frequency | 20 Hz |






The status signals can be assigned to digital outputs. ▶ Configure digital outputs 📖 247

① Change-over from analog input 1 (standard setpoint source) to MOP setpoint.

② The initial value for the motor potentiometer function depends on the setting in 0x4003 (P413.00).
In this example, the "starting value" set in 0x4004:001 (P414.01) is used (here: 20 Hz).

③ The MOP setpoint is maximally increased to the maximum frequency set in 0x2916 (P211.00) (here: 50 Hz).

④ If "MOP setpoint up" and "MOP setpoint down" are requested at the same time, the MOP setpoint remains unchanged.

⑤ Change-over from MOP setpoint back to analog input 1 (standard setpoint source).

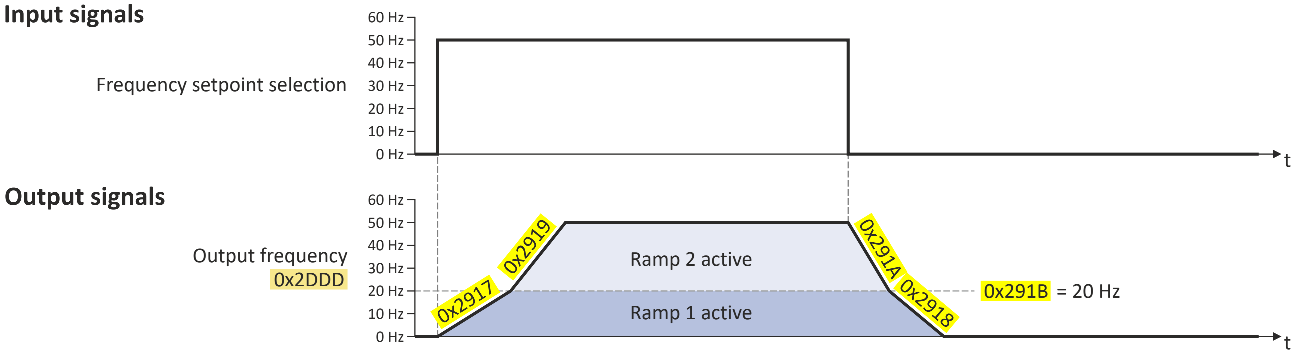
## 7.5 Change over to ramp 2 during operation

Two different ramps can be parameterised for the frequency setpoint. The change-over to the ramp 2 can be initiated manually or automatically.

**Details**

For ramp 2, the acceleration time 2 set in 0x2919 (P222.00) and the deceleration time 2 set in 0x291A (P223.00) apply.

The change-over to ramp 2 is effected automatically if the frequency setpoint (absolute value) ≥ auto-changeover threshold 0x291B (P224.00).




The "Activate ramp 2" 0x2631:039 (P400.39) function is used to manually activate the acceleration time 2 and the deceleration time 2.

**Parameter**

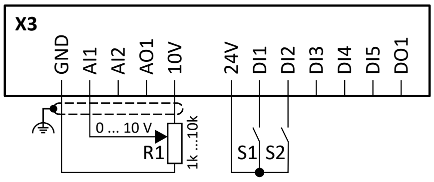
| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2919<br>(P222.00) | Acceleration time 2<br>(Accelerat.time 2)<br>0.0 ... [**5.0**] ... 3600.0 s | Acceleration time 2 for the operating mode "MS: Velocity mode".<br>• The acceleration time set refers to the acceleration from standstill to the maximum frequency set. In the case of a lower setpoint selection, the actual acceleration time is reduced accordingly.<br>• The acceleration time 2 is active if the frequency setpoint (absolute value) ≥ auto switching threshold 0x291B (P224.00) or the trigger assigned to the function "Activate ramp 2" in 0x2631:039 (P400.39) = TRUE.<br>• The acceleration time 2 is also used for changing the MOP setpoint generated by the "motor potentiometer" function.<br>• Setting is not effective in the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]". |
| 0x291A<br>(P223.00) | Deceleration time 2<br>(Decelerat.time 2)<br>0.0 ... [**5.0**] ... 3600.0 s | Deceleration time 2 for the operating mode "MS: Velocity mode".<br>• The deceleration time set refers to the deceleration from the maximum frequency set to standstill. In the case of a lower actual frequency, the actual deceleration time is reduced accordingly.<br>• The deceleration time 2 is active if the frequency setpoint (absolute value) ≥ auto change-over threshold 0x291B (P224.00) or the trigger assigned to the function "Activate ramp 2" in 0x2631:039 (P400.39) = TRUE.<br>• The deceleration time 2 is also used for changing the MOP setpoint generated by the "motor potentiometer" function.<br>• Setting is not effective in the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]". |
| 0x291B<br>(P224.00) | Auto-changeover threshold of ramp 2<br>(Ramp 2 thresh.)<br>0.0 ... [**0.0**] ... 599.0 Hz | Threshold for the automatic change-over to acceleration time 2 and deceleration time 2.<br>• The change-over is effected if the frequency setpoint (absolute value) ≥ auto change-over threshold.<br>• With the setting 0, the automatic change-over function is deactivated. |



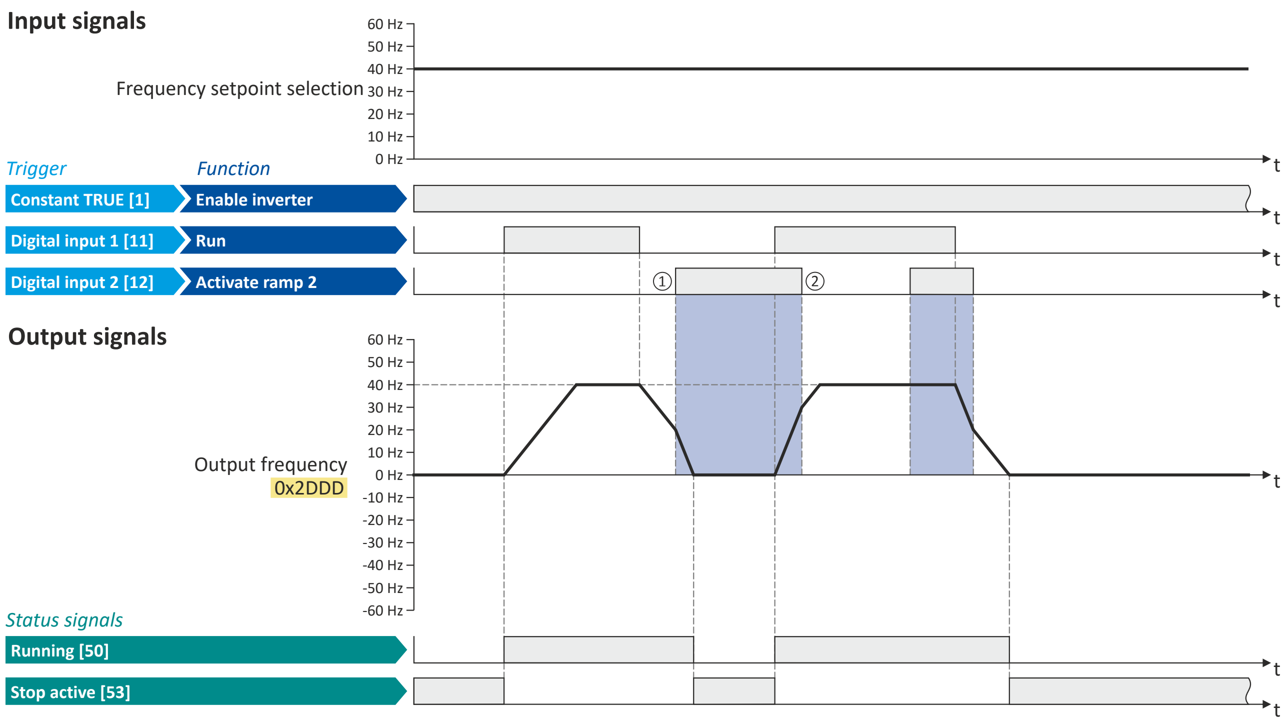
| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2631:039<br>(P400.39) | Function list: Activate ramp 2<br>(Function list: Activ. ramp 2)<br>• Further possible settings: ▸ Trigger list 📖 59 | | Assignment of a trigger for the "Activate ramp 2" function.<br>Trigger = TRUE: activate acceleration time 2 and deceleration time 2 manually.<br>Trigger = FALSE: no action / deactivate function again.<br>Notes:<br>• If the function is used and the assigned trigger = TRUE, the auto change-over threshold 0x291B (P224.00) for ramp 2 is deactivated.<br>• Acceleration time 2 can be set in 0x2919 (P222.00).<br>• Deceleration time 2 can be set in 0x291A (P223.00). |
| | **0** | **Not connected** | No trigger assigned (trigger is constantly FALSE). |

### Example for operating mode

- Switch S1 starts the motor in forward direction of rotation. Switch S1 in initial position stops the motor again.
- Switch S2 activates the acceleration time 2 and deceleration time 2.

| Connection plan | Function | |
|---|---|---|
|   | Potentiometer R1 | Frequency setpoint selection |
| | Switch S1 | Run |
| | Switch S2 | Activate ramp 2 |

| Parameter | Name | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2631:004 (P400.04) | Reset fault | Not connected [0] |
| 0x2631:039 (P400.39) | Activate ramp 2 | Digital input 2 [12] |
| 0x2824 (P200.00) | Control selection | Flexible I/O configuration [0] |
| 0x2838:003 (P203.03) | Stop method | Standard ramp [1] |
| 0x2860:001 (P201.01) | Frequency control: Default setpoint source | Analog input 1 [2] |
| 0x2917 (P220.00) | Acceleration time 1 | 10.0 s |
| 0x2918 (P221.00) | Deceleration time 1 | 10.0 s |
| 0x2919 (P222.00) | Acceleration time 2 | 5.0 s |
| 0x291A (P223.00) | Deceleration time 2 | 5.0 s |




The status signals can be assigned to digital outputs. ▶ Configure digital outputs 📖 247

① Change-over to deceleration time 2 during the deceleration phase.

② Change-over to acceleration time 1 during the acceleration phase.



## 7.6 "Switch-off positioning" stop mode

This stopping method is an extension of the stopping method "Standard ramp". A relatively consistent stop position can be achieved regardless of the current motor speed after a stop command using the "switch-off positioning". In this case, depending on the current output frequency, the inverter delays the beginning of the down-ramping so that the number of motor revolutions is always the same from the stop command to standstill.

### Details

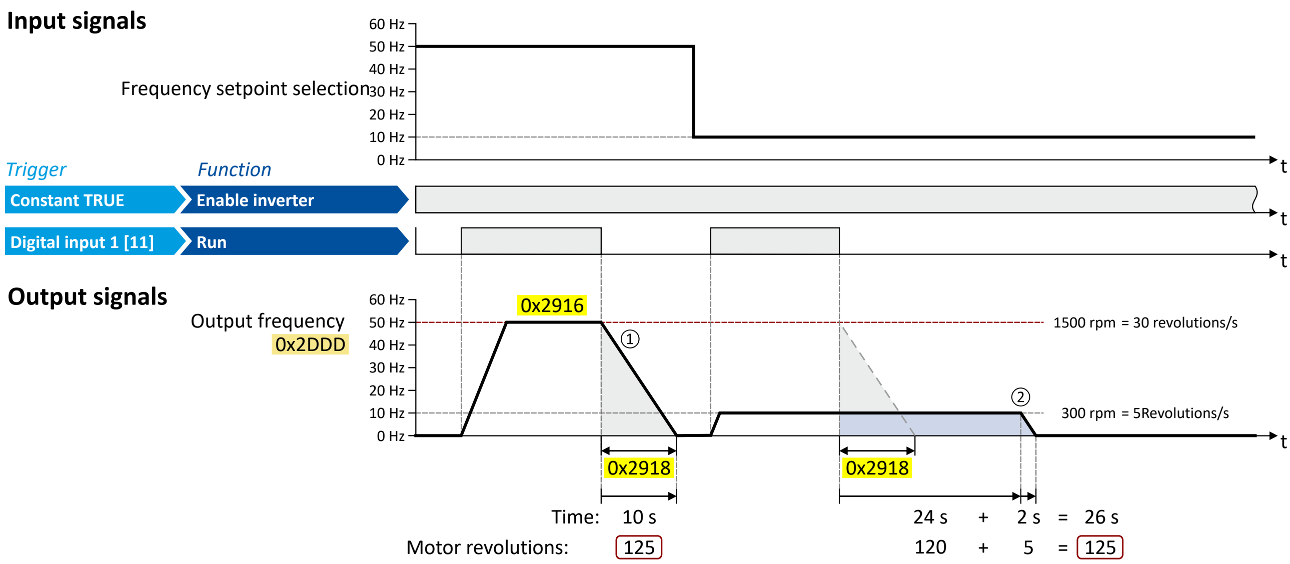
The stop method can be selected in 0x2838:003 (P203.03). ▶ Stop behavior 📖 42

The number of motor revolutions to standstill depends on the rated speed of the motor, the set deceleration time and the set maximum frequency.

Example calculation:

- 4-pole 50 Hz motor with rated speed = 1500 rpm
- Maximum frequency 0x2916 (P211.00) = 50.0 Hz
- Deceleration time 1 0x2918 (P221.00) = 10.0 s

$$\text{motor rotations} = \frac{1500\,[\text{rpm}]}{60\,[\text{s}]} \cdot \frac{\text{delay time}\quad[\text{s}]}{2} = \frac{25}{[\text{s}]} \cdot \frac{10\,[\text{s}]}{2} = 125$$




① The motor is immediately brought to a standstill with the set deceleration time following a stop command if the output frequency corresponds to the set maximum frequency.
In the example, the motor reaches a standstill after 125 revolutions.

② If the current output frequency is less than the maximum frequency, the inverter delays the beginning of the down-ramping in order to reach the same number of motor revolutions before standstill, depending on the actual output frequency.
In the example, the down-ramping is initiated with a delay of 24 seconds in order to reach the number of 125 motor revolutions before standstill.

Notes:

- Two different ramps can be parameterized for the frequency setpoint. The speed compensation calculation is based on the deceleration time active at the time of the stop command, either deceleration time 1 or deceleration time 2.
- No speed compensation is implemented if the deceleration time for the quick stop is active.
- No adjustment is made to the speed compensation if the deceleration is changed from deceleration time 1 0x2918 (P221.00) to deceleration time 2 0x291A (P223.00) – or vice versa – during deceleration. The change-over is ignored.
- The threshold for automatic change-over to acceleration time 2 and deceleration time 2 is ignored during deceleration if this stop method is selected.
- If the motor accelerates or decelerates at the time of the stop command, the speed compensation is calculated based on the output frequency at that time.
- There is a configurable Stop threshold 0x291E:003 (P226.03) that defines the speed range in which the stop function is active and NOT active. The stop threshold can be set from 0.0% to 100.0%. The percentage refers to the maximum frequency 0x2916 (P211.00). The standard setting for the threshold value for the speed compensated stop is 10.0%. The stop function is active when coming to a standstill from a speed greater than or equal to the stop threshold. The stop function is NOT active when coming to a standstill from a speed lower than the stop threshold; in this case, normal deceleration occurs.
- The performance of speed compensation is dependent on several factors: the motor control type, the total capacity of the system mechanics, the mass inertia, the system friction, etc. These factors can influence the calculation of motor revolutions and the consistency. Since the mechanical and physical properties of the system cannot be influenced by the inverter, the system designer has to configure and test the speed compensation for suitability in the actual application.
- The general relative performance can be estimated on the part of the inverter based on the selected motor control type:

**Details**

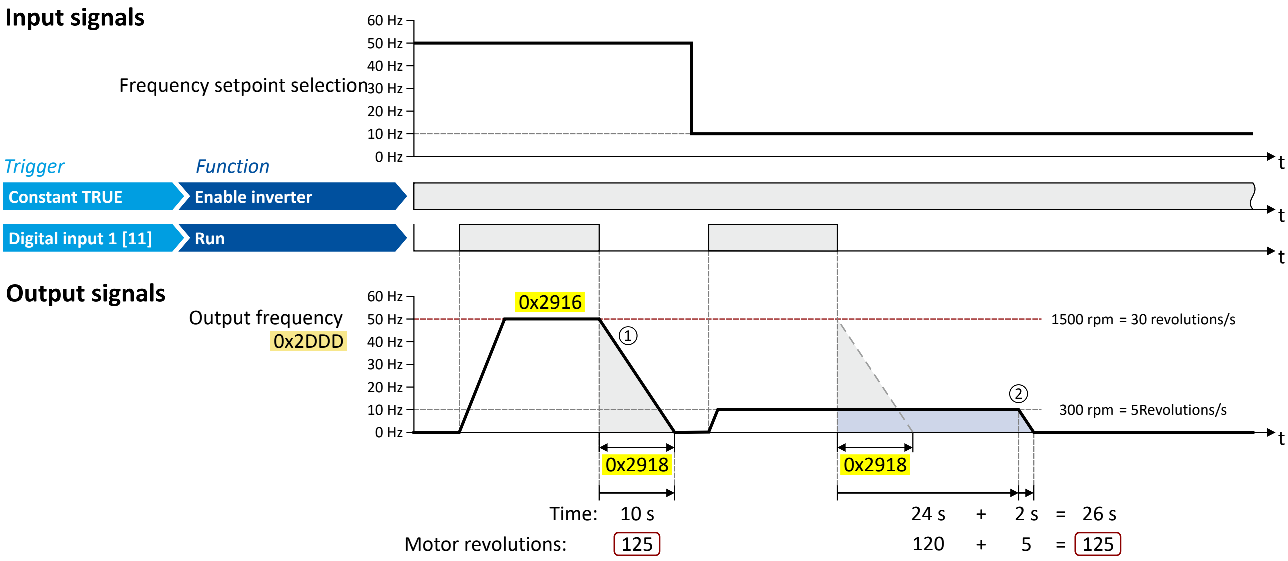
The stop method can be selected in 0x2838:003 (P203.03). ▸ Stop behavior 📖 42

The number of motor revolutions to standstill depends on the rated speed of the motor, the set deceleration time and the set maximum frequency.

Example calculation:

- 4-pole 50 Hz motor with rated speed = 1500 rpm
- Maximum frequency 0x2916 (P211.00) = 50.0 Hz
- Deceleration time 1 0x2918 (P221.00) = 10.0 s

$$\text{motor rotations} = \frac{1500\,[\text{rpm}]}{60\,[\text{s}]} \cdot \frac{\text{delay time}\quad[\text{s}]}{2} = \frac{25}{[\text{s}]} \cdot \frac{10\,[\text{s}]}{2} = 125$$




① The motor is immediately brought to a standstill with the set deceleration time following a stop command if the output frequency corresponds to the set maximum frequency.
In the example, the motor reaches a standstill after 150 revolutions.

② If the actual output frequency is less than the maximum frequency, the inverter delays the beginning of the down-ramping in order to reach the same number of motor revolutions to standstill, depending on the actual output frequency.
In the example, the down-ramping is initiated with a delay of 24 seconds in order to reach the number of 150 motor revolutions to a standstill.

Notes:
- Two different ramps can be parameterized for the frequency setpoint. The calculation of the speed compensation is based on the active delay time at the point of the stop command, either delay time 1 or delay time 2.
- No speed compensation is implemented if the delay time is active for the quick stop.
- No adjustment to the speed compensation takes place if the delay is changed from Deceleration time 10x2918 (P221.00) to delay time 2 0x291A (P223.00) or vice versa during deceleration. The change-over is ignored.
- The threshold for automatic change-over to acceleration time 2 and deceleration time 2 is ignored during deceleration if this stop method is selected.
- If the motor accelerates or decelerates at the time of the stop command, the speed compensation is calculated based on the output frequency at that time.
- There is a configurable stop threshold 0x291E:003 (P226.03) which defines the speed range within which the stop function is active and NOT active. The stop threshold value is configurable from 0.0% to 100.0%. The percentage refers to the maximum frequency 0x2916 (P211.00). The standard setting for the threshold value for the speed-compensated stop is 10.0%.  When stopping from a speed that is greater or equal to the stop threshold value, the stop function is active.  When stopping from a speed that is smaller than the stop threshold value, the stop function is NOT active; normal deceleration takes place.
- The performance of the speed compensation depends on several factors: motor control type, total capacity of the system mechanics, mass inertia, system friction, etc. These factors can influence the calculation of motor revolutions and consistency. Since the mechanical and physical properties of the system cannot be influenced by the inverter, the system designer has to configure and test the speed compensation for suitability in the actual application.
- The general relative performance can be estimated on the part of the inverter based on the selected motor control type:

| **Motor control type** 0x2C00 (P300.00) | | |
|---|---|---|
| V/f characteristic control (VFC open loop) [6] | Sensorless vector control (SLVC) [4] | Sensorless control (SL PSM) [3] |
| Performance | | |

### Parameter

| **Address** | **Name / setting range / [default setting]** | **Information** |
|---|---|---|
| 0x291E:003 (P226.03) | S-Ramp characteristic: Stop threshold (S-ramp char.: Stop threshold) 0.0 ... [**10.0**] ... 100.0 % • From version 05.03 | • Configurable stop threshold value that defines the speed range in which the stop function is active and NOT active. • 100 % = maximum frequency (0x2916 (P211.00)). |

### Related topics

▶ Ramp times 📖 80

▶ Change over to ramp 2 during operation 📖 138

## 7.7 Setpoint diagnostics

The following parameters show the current setpoints of different setpoint sources.

### Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x282B:007 | Inverter diagnostics: Default frequency setpoint<br>• Read only: x.x Hz<br>• From version 03.00 | Display of the frequency setpoint of the standard setpoint source set in 0x2860:001 (P201.01). |
| 0x282B:008 | Inverter diagnostics: Preset frequency setpoint<br>• Read only: x.x Hz<br>• From version 03.00 | Display of the preset frequency setpoint selected via the four functions "Activate preset (bit 0)" ... " Activate preset (bit 3)".<br>▸ Setpoint presets 83 |
| 0x282B:009 | Inverter diagnostics: Actual frequency setpoint<br>• Read only: x.x Hz<br>• From version 03.00 | Display of the currently selected frequency setpoint that is internally transferred to the motor control. |
| 0x282B:010 | Inverter diagnostics: Default PID setpoint<br>• Read only: x.xx PID unit<br>• From version 03.00 | Display of the PID control value of the standard setpoint source set in 0x2860:002 (P201.02). |
| 0x282B:011 | Inverter diagnostics: Preset PID setpoint<br>• Read only: x.xx PID unit<br>• From version 03.00 | Display of the preset PID setpoint selected via the four functions "Activate preset (bit 0)" ... " Activate preset (bit 3)".<br>▸ Setpoint presets 83 |

# 8 Configuring the torque control

In general, the inverter is operated in a mode that controls the motor frequency. Alternatively, the inverter can be configured in such a way that it controls a motor torque within a defined frequency range.

Typical applications for such a torque control with frequency limitation are winders and packaging machines.

**Preconditions**

A torque control is only possible in the motor control type 0x2C00 (P300.00) = "Sensorless vector control (SLVC) [4]". Thus, first this motor control type must be configured. For details see chapter "Sensorless vector control (SLVC)". 📖 165

After configuration, one of the following optimisations must be carried out for torque control that is as precise as possible:

▸ Automatic motor identification (energized) 📖 210

▸ Automatic motor calibration (non-energized) 📖 211

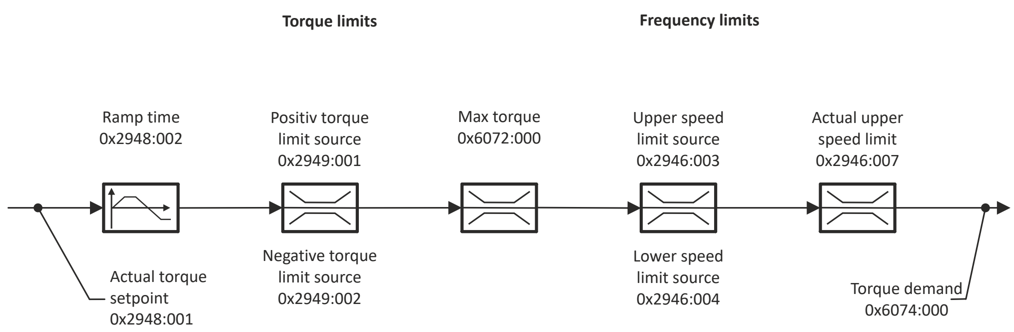
## 8.1 Basic setting

In the following, the steps required for configuring the torque control are described.

1. Select the SLVC motor control type.
2. Carry out motor adjustment. ▸ Configuring the motor control 📖 160

   Set the operating mode "MS: Torque mode [-1]" in 0x6060 (P301.00).
3. Select the standard setpoint source for the torque control in 0x2860:003 (P201.03). 📖 54.
4. Set the rated motor torque in 0x6076 (P325.00).
5. Set the torque limits. ▸ Torque limits 📖 150
6. Set the speed limitation. ▸ Speed limitation 📖 152
7. Configure additional standard setpoint source. ▸ Configure setpoint sources 📖 155
8. Optional: setting of the torque setpoint ramp time 0x2948:002 (P336.02).

The following signal flow shows the internal setpoint logics:




The torque control with frequency limitation is now active and the inverter responds to the torque setpoint given by the selected setpoint source.

### 8.1.1 Standard setpoint source

The selected "setpoint source" serves to provide the inverter with its setpoint. The setpoint source can be selected individually for each operating mode.

Possible setpoint sources are:

- Analog inputs
- Keypad
- Network
- Parameterisable setpoints (presets)
- "Motor potentiometer" function
- "Sequencer" function

**Details**

- For applications only requiring one setpoint, it is sufficient to define the standard setpoint source in 0x2860:003 (P201.03).
- For applications requiring a change-over of the setpoint source during operation, the functions for setpoint change-over have to be configured accordingly. ▶ Changing the setpoint source during operation 125 ▶ Configure setpoint sources 155

## Parameter

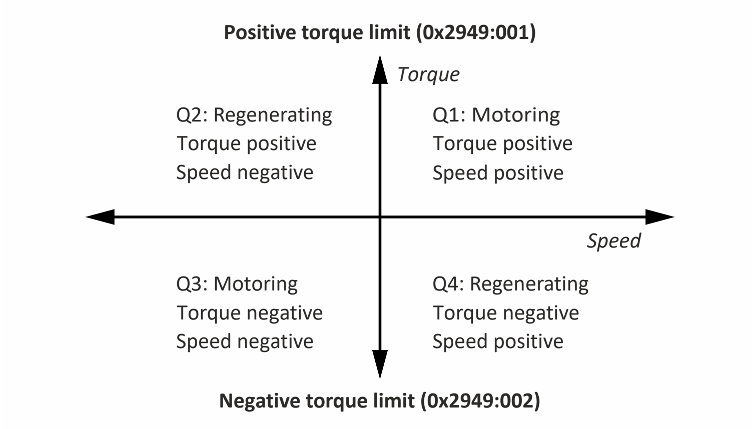
| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2860:003 (P201.03) | Torque control: Default setpoint source (Torque setp.src.)<br>• From version 03.00 | | Selection of the standard setpoint source for operating mode "MS: Torque mode".<br>• The selected standard setpoint source is always active in the operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]" when no setpoint change-over to another setpoint source via corresponding triggers/functions is active. |
| | 1 | Keypad | The setpoint is specified locally by the keypad.<br>• Default setting: 0x2601:003 (P202.03)<br>• Use the ↑ and ↓ navigation keys to change the keypad setpoint (also during running operation). |
| | **2** | **Analog input 1** | The setpoint is defined as analog signal via the analog input 1.<br>▶ Analog input 1 📖 240 |
| | 3 | Analog input 2 | The setpoint is defined as analog signal via the analog input 2.<br>▶ Analog input 2 📖 244 |
| | 5 | Network | The setpoint is defined as process data object via the network.<br>▶ Define setpoint via network 📖 273 |
| | 11 | Torque preset 1 | For the setpoint selection, preset values can be parameterised and selected.<br>▶ Setpoint presets 📖 156 |
| | 12 | Torque preset 2 | |
| | 13 | Torque preset 3 | |
| | 14 | Torque preset 4 | |
| | 15 | Torque preset 5 | |
| | 16 | Torque preset 6 | |
| | 17 | Torque preset 7 | |
| | 18 | Torque preset 8 | |
| | 31 | Segment preset 1 | For the setpoint selection, the segment presets parameterised for the "sequencer" function can be selected as well.<br>▶ Sequencer 📖 87 |
| | 32 | Segment preset 2 | |
| | 33 | Segment preset 3 | |
| | 34 | Segment preset 4 | |
| | 35 | Segment preset 5 | |
| | 36 | Segment preset 6 | |
| | 37 | Segment preset 7 | |
| | 38 | Segment preset 8 | |
| | 50 | Motor potentiometer | The setpoint is generated by the "motor potentiometer" function. This function can be used as an alternative setpoint control which is controlled via two signals: "MOP setpoint up" and "MOP setpoint down".<br>▶ Motor potentiometer (MOP) 📖 156 |
| | 201 | Internal value (from version 05.00) | Internal values of the manufacturer. |
| | 202 | Internal value (from version 05.00) | |
| | 203 | Internal value (from version 05.00) | |
| | 204 | Internal value (from version 05.00) | |
| | 205 | Internal value (from version 05.00) | |
| | 206 | Internal value (from version 05.00) | |

### 8.1.2 Torque limits

The necessary parameterizations can be found in the table.

**Details**

The positive and negative torque limit can be set independently of each other. The torque limit is to be configured to the maximum torque. ▶ 0x6072 (P326.00)




- Display of the current positive torque limit in ▶ 0x2949:004 (P337.04).
- Display of the current negative torque limit in ▶ 0x2949:003 (P337.03).

Regardless of the setting in ▶ 0x2949:001 (P337.01) and ▶ 0x2949:002 (P337.02), the maximum torque does not exceed the value configured in ▶ 0x6072 (P326.00).

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2949:001 (P337.01) | Torque limit source selection: Positive torque limit source (Trq. lim. source: Pos. torqlim src) • From version 03.00 | | Selection of the source for the positive torque limit source. |
| | 0 | **Max torque** | Positive torque limit source = Max. torque 0x6072 (P326.00). |
| | 1 | Fixed Limit 0.0 % | Positive torque limit source = 0.0 %. |
| | 2 | Analog Input 1 | The positive torque limit source is defined as analog signal via the analog input 1. ▶ Analog input 1 📖 240 |
| | 3 | Analog Input 2 | The positive torque limit source is defined as analog signal via the analog input 2. ▶ Analog input 2 📖 244 |
| | 4 | Positive torque limit | Positive torque limit source = Positive torque limit 0x60E0. |
| | 5 | Network target torque | The positive torque limit source is defined as process data object via network. ▶ Mappable parameters for exchanging setpoints and actual values 📖 276 |
| | 201 | Internal value (from version 05.03) | Internal values of the manufacturer. |
| | 202 | Internal value (from version 05.03) | |
| | 203 | Internal value (from version 05.03) | |
| | 204 | Internal value (from version 05.03) | |
| | 205 | Internal value (from version 05.03) | |
| | 206 | Internal value (from version 05.03) | |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2949:002<br>(P337.02) | Torque limit source selection: Negative torque limit source<br>(Trq. lim. source: Neg. torqlim src)<br>• From version 03.00 | Selection of the source for the negative torque limit source. |
| | **0** **(-) Max torque** | Negative torque limit source = (-) Max. torque 0x6072 (P326.00). |
| | 1 Fixed Limit 0.0 % | Negative torque limit source = 0.0 %. |
| | 2 Analog Input 1 | The negative torque limit source is defined as analog signal via the analog input 1.<br>▸ Analog input 1 📖 240 |
| | 3 Analog Input 2 | The negative torque limit source is defined as analog signal via the analog input 2.<br>▸ Analog input 2 📖 244 |
| | 4 Negative torque limit | Negative torque limit source = Negative torque limit 0x60E1. |
| | 5 Network target torque | The negative torque limit source is defined as process data object via network.<br>▸ Mappable parameters for exchanging setpoints and actual values 📖 276 |
| | 201 Internal value (from version 05.03) | Internal values of the manufacturer. |
| | 202 Internal value (from version 05.03) | |
| | 203 Internal value (from version 05.03) | |
| | 204 Internal value (from version 05.03) | |
| | 205 Internal value (from version 05.03) | |
| | 206 Internal value (from version 05.03) | |
| 0x60E0 | Positive torque limit<br>0.0 ... [**250.0**] ... 3276.7 %<br>• From version 02.00 | Positive torque limit source for speed control with torque limitation.<br>• 100 % = Rated motor torque. ▸ 0x6076 (P325.00) |
| 0x60E1 | Negative torque limit<br>0.0 ... [**250.0**] ... 3276.7 %<br>• From version 02.00 | Negative torque limit source for speed control with torque limitation.<br>• 100 % = Rated motor torque ▸ 0x6076 (P325.00) |

### 8.1.3 Speed limitation

The torque control controls the assigned torque setpoint within the set speed limits. The actual speed results from the load conditions of the application. For example, high speeds may occur in a torque control if no counter torque is available (load-free machine).

When the actual speed reaches the set speed limits, it is kept on the respective limit value. This function is also called "speed limitation".

**Details**

The lower and upper speed limit for speed limitation can be set independently of each other. They can also be defined via analog inputs or network.

Required parameter setting:

1. Select the source for the upper speed limit in 0x2946:003 (P340.03).
   - Default setting: Maximum frequency-[0] 0x2916 (P211.00)
   - In case of selection "Analog input 1 [2]": Set the setting range in 0x2636:002 (P430.02) and 0x2636:003 (P430.03).
   - In case of selection "Analog input 2 [3]": Set the setting range in 0x2637:002 (P431.02) and 0x2637:003 (P431.03).
   - In case of selection "Upper frequency limit [4]": Set the upper speed limit in [Hz] in 0x2946:005 (P340.05).
   - In case of selection "Upper speed limit [5]": Set the upper speed limit in [vel. unit] in 0x2946:001 (P340.01).
   - The current upper speed limit is displayed in 0x2946:007 (P340.07).
2. Select the source for the lower speed limit in 0x2946:004 (P340.04).
   - Default setting: (-) Maximum frequency-[0] 0x2916 (P211.00)
   - In case of selection "Analog input 1 [2]": Set the setting range in 0x2636:002 (P430.02) and 0x2636:003 (P430.03).
   - In case of selection "Analog input 2 [3]": Set the setting range in 0x2637:002 (P431.02) and 0x2637:003 (P431.03).
   - In case of selection "Lower frequency limit [4]": Set the lower speed limit in [Hz] in 0x2946:006 (P340.06).
   - In case of selection "Lower speed limit [5]": Set the lower speed limit in [vel. unit] in 0x2946:002 (P340.02).
   - The output frequency is absolutely limited regardless of the setting 0x2946:003 (P340.03) and 0x2946:004 (P340.04) by 0x2916 (P211.00) in the “Torque mode”.
   - The current lower speed limit is displayed in 0x2946:008 (P340.08).

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2946:001<br>(P340.01) | Speed limitation: Upper speed limit<br>(Speed limitation: Upper limit)<br>-2147483647 ... [**0**] ... 2147483647 vel. unit<br>• From version 03.00 | Upper limit for the speed limitation.<br>• Setting is only effective with the selection "Upper speed limit [5]" in 0x2946:003 (P340.03).<br>• Entry via keypad and Lenze Tools is in rpm!<br>• Via RPDO, the unit is vel. unit. and the scaling must be taken into account.<br>• ± 480000 rpm = ±2 ^ 31 [n-unit] |
| 0x2946:002<br>(P340.02) | Speed limitation: Lower speed limit<br>(Speed limitation: Lower limit)<br>-2147483647 ... [**0**] ... 2147483647 vel. unit<br>• From version 03.00 | Lower limit for speed limitation.<br>• Setting is only effective with the selection "Lower speed limit [5]" in 0x2946:004 (P340.04).<br>• Entry via keypad and Lenze Tools is in rpm!<br>• Via RPDO, the unit is vel. unit. and the scaling must be taken into account.<br>• ± 480000 rpm = ±2 ^ 31 [n-unit] |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2946:003<br>(P340.03) | Speed limitation: Upper speed limit source<br>(Speed limitation: Uppspeed lim src)<br>• From version 03.00 | Selection of the source for the upper speed limit. |
| | **0 Maximum frequency** | Upper speed limit = Maximum frequency 0x2916 (P211.00). |
| | 1 Fixed Limit 0.0 Hz | Upper speed limit = 0.0 Hz. |
| | 2 Analog input 1 | The upper speed limit is defined as analog signal via the analog input 1.<br>▸ Analog input 1 📖 240 |
| | 3 Analog input 2 | The upper speed limit is defined as analog signal via the analog input 2.<br>▸ Analog input 2 📖 244 |
| | 4 Upper frequency limit | Upper speed limit = setting in 0x2946:005 (P340.05) in [Hz]. |
| | 5 Upper speed limit | Upper speed limit = setting in 0x2946:001 (P340.01) in [vel. unit]. |
| | 6 Network target velocity | The upper speed limit is defined as process data object via network.<br>▸ Mappable parameters for exchanging setpoints and actual values 📖 276 |
| | 201 Internal value (from version 05.03) | Internal values of the manufacturer. |
| | 202 Internal value (from version 05.03) | |
| | 203 Internal value (from version 05.03) | |
| | 204 Internal value (from version 05.03) | |
| | 205 Internal value (from version 05.03) | |
| | 206 Internal value (from version 05.03) | |
| 0x2946:004<br>(P340.04) | Speed limitation: Lower speed limit source<br>(Speed limitation: Lowspeed lim src)<br>• From version 03.00 | Selection of the source for the lower speed limit. |
| | **0 (-) Maximum frequency** | Lower speed limit = (-) Maximum frequency 0x2916 (P211.00). |
| | 1 Fixed Limit 0.0 Hz | Lower speed limit = 0.0 Hz. |
| | 2 Analog input 1 | The lower speed limit is defined as analog signal via the analog input 1.<br>▸ Analog input 1 📖 240 |
| | 3 Analog input 2 | The lower speed limit is defined as analog signal via the analog input 2.<br>▸ Analog input 2 📖 244 |
| | 4 Lower frequency limit | Lower speed limit = setting in 0x2946:006 (P340.06) in [Hz]. |
| | 5 Lower speed limit | Lower speed limit = setting in 0x2946:002 (P340.02) in [vel. unit]. |
| | 6 Network target velocity | The lower speed limit is defined as process data object via network.<br>▸ Mappable parameters for exchanging setpoints and actual values 📖 276 |
| | 201 Internal value (from version 05.03) | Internal values of the manufacturer. |
| | 202 Internal value (from version 05.03) | |
| | 203 Internal value (from version 05.03) | |
| | 204 Internal value (from version 05.03) | |
| | 205 Internal value (from version 05.03) | |
| | 206 Internal value (from version 05.03) | |
| 0x2946:005<br>(P340.05) | Speed limitation: Upper frequency limit<br>(Speed limitation: Upper freq.limit)<br>Device for 50-Hz mains: -1000.0 ... [**50.0**] ... 1000.0 Hz<br>Device for 60-Hz mains: -1000.0 ... [**60.0**] ... 1000.0 Hz<br>• From version 03.00 | Upper limit for the speed limitation.<br>• Setting is only effective with the selection "Upper frequency limit [4]" in 0x2946:003 (P340.03). |
| 0x2946:006<br>(P340.06) | Speed limitation: Lower frequency limit<br>(Speed limitation: Lower freq.limit)<br>Device for 50-Hz mains: -1000.0 ... [**-50.0**] ... 1000.0 Hz<br>Device for 60-Hz mains: -1000.0 ... [**-60.0**] ... 1000.0 Hz<br>• From version 03.00 | Lower limit for speed limitation.<br>• Setting is only effective with the selection "Lower frequency limit [4]" in 0x2946:004 (P340.04). |
| 0x2946:007<br>(P340.07) | Speed limitation: Actual upper speed limit<br>(Speed limitation: Act uppspeed lim)<br>• Read only: x.x Hz<br>• From version 03.00 | Display of the current upper limit for speed limitation. |
| 0x2946:008<br>(P340.08) | Speed limitation: Actual lower speed limit<br>(Speed limitation: Act lowspeed lim)<br>• Read only: x.x Hz<br>• From version 03.00 | Display of the current lower limit for speed limitation. |

### 8.1.4 Ramp time

#### Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2948:002<br>(P336.02) | Torque setpoint: ramp time<br>(Torque setpoint: Ramp time)<br>0.0 ... [**1.0**] ... 60.0 s<br>• From version 03.00 | Ramp time for operating mode "MS: Torque mode".<br>• The torque setpoint is led via a ramp generator. This provides for a "smooth" switch-over between different setpoint sources.<br>• The ramp time refers to max. torque 0x6072 (P326.00). At a lower setpoint selection, the actual ramp time is reduced accordingly. |

## 8.2 Configure setpoint sources

The standard setpoint source for torque control can be selected in 0x2860:003 (P201.03). This chapter describes the setting options for the various setpoint sources.

- Preset torque setpoint source: Analog input 1. Set the setting range in 0x2636:011 (P430.11) and 0x2636:012 (P430.12) in this selection.
- In case of selection "Analog input 2 [3]": Set setting range in 0x2637:011 (P431.11) and 0x2637:012 (P431.12).
- Except for the network, the torque setpoint must be specified in percent with regard to the rated motor torque configured in 0x6076 (P325.00).
- Via the network, the torque setpoint is specified via the mappable parameter 0x400B:008 (P592.08) in [Nm / $2^{\text{scaling factor}}$]. The scaling factor can be set in 0x400B:009 (P592.09).
- Corresponding functions make it possible to change over to other setpoint sources during operation. More detailed information on this can be found in the chapter "Configuring frequency control": ▸ Changing the setpoint source during operation 🕮 125

The following setpoint sources are described in this chapter:

- Keypad 🕮 155
- Setpoint presets 🕮 156
- Motor potentiometer (MOP) 🕮 156

Setpoint sources described in other chapters:

- Sequencer 🕮 87
- Analog input 1 🕮 240
- Analog input 2 🕮 244
- Network: Define setpoint via network 🕮 273

### 8.2.1 Keypad

For the manual setpoint selection via keypad, the following default settings are used:

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2601:003<br>(P202.03) | Keypad setpoints: Torque setpoint<br>(Keypad setpoints: Torque setp.)<br>-400.0 ... [**100.0**] ... 400.0 %<br>• From version 03.00 | Default setting of the keypad setpoint for the operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]".<br>• 100 % = Rated motor torque 0x6076 (P325.00) |

The increment for keypad setpoints can be adapted in 0x2862 (P701.00) by pressing a keypad arrow key once.

A switch-over to the keypad during operation is also possible as an alternative to the standard setpoint source setting.

▸ Example: Change-over from AI1 setpoint to keypad setpoint 🕮 131

**Related topics**

▸ Keypad 🕮 399

### 8.2.2 Setpoint presets

8 different torque setpoints (presets) can be parameterised for the torque control.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2912:001 (P452.01) | Torque setpoint presets: Preset 1<br>(Torque presets: Torque preset 1)<br>-400.0 ... [**100.0**] ... 400.0 % | Parameterisable torque setpoints (presets) for operating mode "MS: Torque mode".<br>• 100 % = Rated motor torque 0x6076 (P325.00) |
| 0x2912:002 (P452.02) | Torque setpoint presets: Preset 2<br>(Torque presets: Torque preset 2)<br>-400.0 ... [**100.0**] ... 400.0 % | |
| 0x2912:003 (P452.03) | Torque setpoint presets: Preset 3<br>(Torque presets: Torque preset 3)<br>-400.0 ... [**100.0**] ... 400.0 % | |
| 0x2912:004 (P452.04) | Torque setpoint presets: Preset 4<br>(Torque presets: Torque preset 4)<br>-400.0 ... [**100.0**] ... 400.0 % | |
| 0x2912:005 (P452.05) | Torque setpoint presets: Preset 5<br>(Torque presets: Torque preset 5)<br>-400.0 ... [**100.0**] ... 400.0 % | |
| 0x2912:006 (P452.06) | Torque setpoint presets: Preset 6<br>(Torque presets: Torque preset 6)<br>-400.0 ... [**100.0**] ... 400.0 % | |
| 0x2912:007 (P452.07) | Torque setpoint presets: Preset 7<br>(Torque presets: Torque preset 7)<br>-400.0 ... [**100.0**] ... 400.0 % | |
| 0x2912:008 (P452.08) | Torque setpoint presets: Preset 8<br>(Torque presets: Torque preset 8)<br>-400.0 ... [**100.0**] ... 400.0 % | |

A switch-over to a preset during operation is also possible as an alternative to the standard setpoint source setting.

▸ Example: Change-over from keypad setpoint to preset 1 ... 7 📖 133

### 8.2.3 Motor potentiometer (MOP)

The "Motor potentiometer" function can be used as an alternative setpoint control that is controlled via two functions: "MOP setpoint up" and "MOP setpoint down".

**Details**

The "Motor potentiometer (MOP)“ function is described in detail in the chapter "Configuring frequency control". 📖 85

The following parameters of the function are only relevant for torque control.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x4004:003 (P414.03) | MOP starting values: Torque<br>(MOP start value: Torque)<br>0.0 ... [**0.0**] ... 1000.0 % | Starting value for operating mode "MS: Torque mode".<br>• This value is used as initial value if "Starting value [1]" is set in 0x4003 (P413.00).<br>• 100 % = motor rated torque (0x6076 (P325.00)). |
| 0x4009:003 | MOP values saved: Torque<br>• Read only: x.x % | Display of the last MOP value saved internally for the operating mode "MS: Torque mode".<br>• This value is used as initial value if "Last value [0]" is set in 0x4003 (P413.00).<br>• 100 % = motor rated torque (0x6076 (P325.00)). |

A switch-over to the motor potentiometer during operation is also possible as an alternative to the standard setpoint source setting.

▸ Example: Change-over from AI1 setpoint to MOP setpoint 📖 136



## 8.3 Process input data (CiA 402 objects)

This object can be used for the mode 'MS: Torque mode'. The CiA402 mode 'Profile Torque mode' is not supported.

### Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x6060<br>(P301.00) | CiA: Operation mode<br>(Operation mode)<br>• Setting can only be changed if the inverter is disabled. | | CiA: Operation mode |
| | **-2** | **MS: Velocity mode** | Vendor specific velocity mode<br>▸ Configuring the frequency control 78 |
| | -1 | MS: Torque mode (from version 03.00) | Vendor specific torque mode<br>• Only possible in motor control type 0x2C00 (P300.00) = "Sensorless vector control (SLVC) [4]".<br>▸ Configuring the torque control 146 |
| | 0 | No selection | No selection |
| | 2 | CiA: Velocity mode | CiA: Velocity mode<br>▸ CiA 402 device profile 285 |
| 0x6071 | Set torque<br>-3276.8 ... [**0.0**] ... 3276.7 % | | Setting of the setpoint torque for the torque operating modes.<br>• 100 % = Rated motor torque 0x6076 (P325.00)<br>The inverter does not support the CiA 402 torque mode. |

## 8.4 Process output data (CiA 402 objects)

This object can be used for the mode 'MS: Torque mode'. The CiA402 mode 'Profile Torque mode' is not supported.

### Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x6074 | Internal set torque<br>• Read only: x.x %<br>• From version 02.00 | Display of the internal set torque.<br>• 100 % = Rated motor torque 0x6076 (P325.00). |
| 0x6077<br>(P107.00) | Actual torque<br>(Actual torque)<br>• Read only: x.x % | Display of the actual torque.<br>• 100 % = Rated motor torque 0x6076 (P325.00) |

## 8.5 Setpoint diagnostics

The following parameters provide information on the setpoints set for torque control.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x282B:012 | Inverter diagnostics: Default torque setpoint<br>• Read only: x.x %<br>• From version 03.00 | Display of the torque setpoint of the standard setpoint source set in 0x2860:003 (P201.03).<br>• 100 % = Rated motor torque 0x6076 (P325.00) |
| 0x282B:013 | Inverter diagnostics: Preset torque setpoint<br>• Read only: x.x %<br>• From version 03.00 | Display of the preset torque setpoint selected via the four functions "Activate preset (bit 0)" ... " Activate preset (bit 3)".<br>▶ Setpoint presets 156 |
| 0x2948:001 | Torque setpoint: Actual torque setpoint<br>• Read only: x.x %<br>• From version 03.00 | Display of the currently selected torque setpoint that is internally transferred to the motor control.<br>• 100 % = Rated motor torque 0x6076 (P325.00) |
| 0x2949:003<br>(P337.03) | Torque limit source selection: Actual positive torque limit<br>(Trq. lim. source: Act postorqlim)<br>• Read only: x.x %<br>• From version 03.00 | Display of the current positive torque limit.<br>• 100 % = Rated motor torque 0x6076 (P325.00) |
| 0x2949:004<br>(P337.04) | Torque limit source selection: Actual negative torque limit<br>(Trq. lim. source: Act negtorqlim)<br>• Read only: x.x %<br>• From version 03.00 | Display of the current negative torque limit.<br>• 100 % = Rated motor torque 0x6076 (P325.00) |
| 0x2DD5 | Torque setpoint<br>• Read only: x.xx Nm<br>• From version 03.00 | Display of the current torque setpoint. |

# 9 Configuring the feedback system

## 9.1 Synchronous motor: Pole position identification (PPI)

For the control of a permanent-magnet synchronous motor, the pole position – the angle between motor phase U and the field axis of the rotor – must be known.

**Preconditions**

In 0x2C00 (P300.00) the motor control type "Sensorless control (SL PSM) [3]" is selected.

The "Pole position identification (PPI) without movement" function is available for the identification of the pole position for the inverter i5xx. 159

### 9.1.1 Monitoring the pole position identification

If an error occurs during the pole position identification,
- the procedure is stopped without the settings being changed.
- the response set in 0x2C60 is effected.

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2C60 | PPI monitoring: Reaction<br>• From version 04.00 | | Selection of the response triggered by the occurrence of an error during the pole position identification (PLI).<br>Associated error code:<br>• 28961 \| 0x7121 - Fault - Pole position identification |
| | 0 | No response | ▸ Error types 456 |
| | 1 | Warning | |
| | 2 | Trouble | |
| | **3** | **Fault** | |

### 9.1.2 Pole position identification (PPI) without movement

The PLI function can also be used if no motor revolution is possible (holding brake active).

**NOTICE**

With an incorrect parameter setting and dimensioning of the inverter, the maximum permissible motor current may be exceeded during the pole position identification.

Possible consequence: Irreversible damage of the motor.

- ▸ Set the motor data correctly. ▸ Motor data 45
- ▸ Only use an inverter that is performance-matched to the motor.

**Conditions**
- The wiring of the three motor phases and the motor encoder must be carried out according to the specifications from the mounting instructions.
- The inverter is ready for operation (no fault active).
- For the pole position identification (PPI) without movement, the motor must be at standstill.

**Parameter**

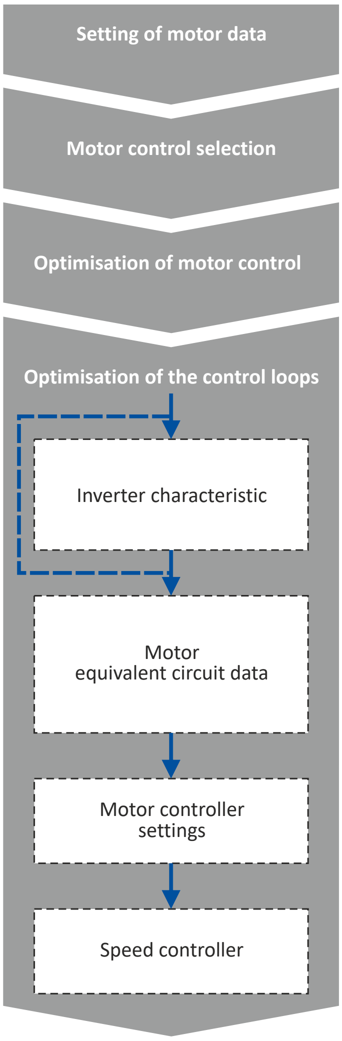
| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2C63:001 | PPI without movement: Execution<br>• Setting can only be changed if the inverter is disabled.<br>• From version 04.00 | | Start behavior (with or without pole position identification before the start). |
| | 0 | Deactivated | No pole position is identified. |
| | **2** | **After each enable** | After every inverter release, the pole position is identified without any movement. |

# 10 Configuring the motor control

This chapter contains all functions and settings relevant for the motor control.

**Basic procedure of commissioning the motor control**
In the first step, the rated data of the motor must be set. The other steps depend on the respective application case.

There are several options for setting the motor data and optimizing the control loops. Basically, you can select between a manual and an automatic process. Whether a setting can be applied or not depends on the motor (Lenze motor yes/no) and the application. If possible, always use the possible setting listed first in the following diagram since this one leads to the most accurate results.




Possible settings:
a) Using data from motor catalogue
b) Entering data manually (e.g. from the nameplate)

Options:
V/f characteristic control (open-loop) (default setting), V/f characteristic control (closed-loop), servo control, sensorless control, sensorless vector control

Parameterisable functions:
V/f voltage boost, skip frequencies, optimisation of the stalling behaviour, slip compensation, oscillation damping

Possible settings:
a) Identifying data automatically (by inverter)
b) Calibrating data automatically (by inverter or engineering tool)
c) Loading preset inverter characteristics

Possible settings:
a) Identifying data automatically (by inverter)
b) Using data from the motor catalogue
c) Calibrating data automatically (by inverter or engineering tool)
d) Entering data manually

Possible settings:
a) Identifying data automatically (by inverter)
b) Entering data manually

Possible settings:
a) Identifying data automatically (by inverter)
b) Entering data manually

**Related topics**

Basic setting ▸ Motor data 📖 45

Basic setting ▸ Motor control mode 📖 48

**Guide for this chapter**

In the following subchapters, each motor control type is described in detail:



This chapter also contains information on the following subjects:

## 10.1 Sensorless control for synchronous motor (SL-PSM)

The sensorless control for synchronous motors is based on a decoupled, separated control of the torque-producing current and the current aligned with the field. In contrast to the servo control, the actual speed value and rotor position are reconstructed via a motor model.

**NOTICE**

In case of this motor control type, an adjustable, constant current is injected in the lower speed range. If this current is higher than the rated motor current, the motor may heat up in the lower speed range. This effect increases if the motor is operated in the lower speed range for a longer period of time.

Possible consequence: Destruction of the motor by overheating

▶ Do not operate the motor for a longer period of time in the lower speed range.

#### Details

The motor model-based speed observer requires a rotating machine. Thus, as a matter of principle, the operational performance of the sensorless control for synchronous motors is divided into two ranges:

1. Low speed range (|setpoint speed| < lower limit 0x2C11:001)
   - In the range of low speeds, the speed of a synchronous motor cannot be observed. In this "Low speed range", controlled operation takes place: During the acceleration phase , the current setpoints of 0x2C12:001 and 0x2C12:002 are added and injected into the motor.
2. High speed range (|setpoint speed| > lower limit 0x2C11:001)
   - In this range, the rotor flux position and the speed are reconstructed by means of observation. The control is executed in a field-oriented way. Only the current required for generating the necessary torque is injected.

Pole position identification (PLI)
- For controlling a permanent-magnet synchronous motor, the pole position - the angle between the motor phase U and the field axis of the rotor - must be known.
- If the drive is at a standstill, the "pole position identification (PLI)" function is immediately activated after the inverter is enabled. ▶ Synchronous motor: Pole position identification (PPI) 📖 159

Flying restart circuit
- From firmware version 4 onwards, a flying restart circuit for the synchronous motor up to speeds lower than half the rated speed is supported.
- If the flying restart circuit is to be used, set the start method "Flying restart circuit [2]" in 0x2838:001 (P203.01). Additional settings are not required for the flying restart circuit in the case of a sensorless control of a synchronous motor.

#### SL-PSM parameters

The parameters for this motor control type are calculated and set automatically while optimising the control loops.

### 10.1.1 Required commissioning steps

1. Activate motor control type: 0x2C00 (P300.00) = "Sensorless control (SL PSM) [3]".
2. Carry out optimization of the control loops.
   - The default setting enables the operation of a power-adapted motor.
   - **An optimum operation of this motor control type requires an optimization of the control loops!**
   - Details: ▸ Options for optimizing the control loops 📖 207
3. Optionally: activate the flying restart circuit: 0x2838:001 (P203.01)
4. Optionally for a speed control with torque limitation in operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]":
   - Select the source in 0x2949:001 (P337.01) for the positive torque limit source and set it accordingly.
   - Select the source in 0x2949:002 (P337.02) for the negative torque limit source and set it accordingly.
5. Optionally for a speed control with torque limitation in operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]":
   - Set the positive torque limit in 0x60E0
   - Set the negative torque limit in 0x60E1.

### 10.1.2 Stalling protection

The stalling monitoring for the sensorless control of synchronous motors (SL-PSM) switches off the drive if the motor is about to "stall". A possible cause may be an overload of the motor.

**Preconditions**

The stalling monitoring only works in the controlled area and if the motor is not operated in the field weakening range.

**Details**

In order to detect the motor stalling, the cosine phi is used.

Example:

- For the cosine phi, the value "0.9" is set in 0x2C01:008 (P320.08) according to the data given on the motor nameplate.
- The limit value for stalling monitoring is set in 0x2C11:006 to "80 %".
- Stalling monitoring is triggered if the current cosine phi is lower than 0.72 (80 % of 0.9).

If stalling monitoring is triggered, the "Trouble" error response takes place. If the operating mode "MS: Velocity mode [-2]" is set in 0x6060 (P301.00), the motor automatically restarts if the trouble does not exist any more.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2C11:006 | High speed range: Stall monitoring limit<br>0 ... **[50]** ... 65535 %<br>• From version 04.00 | The stall monitoring limit refers to the cosine phi of the motor in percent. |

### 10.1.3 Expert settings

The parameters for this motor control type are calculated and set automatically while optimising the control loops.

**Details**

The motor model-based speed observer requires a rotating machine. Thus, the operational performance of the sensorless control for synchronous motors is divided into two ranges:

1. Low speed range (|setpoint speed| < lower limit 0x2C11:001)
   - In the range of low speeds, the speed of a synchronous motor cannot be observed. In this "Low speed range", controlled operation takes place: During the acceleration phase , the current setpoints of 0x2C12:001 and 0x2C12:002 are added and injected into the motor.
2. High speed range (|setpoint speed| > lower limit 0x2C11:001)
   - In this area, the rotor flux position and the speed are reconstructed by means of an observer. The control is executed in a field-oriented way. Only the current required for generating the necessary torque is injected.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2C11:001 | High speed range: Lower limit<br>5 ... [**10**] ... 100 %<br>• From version 02.00 | Definition of the lower limit of the high speed range.<br>• The lower limit has a permanent hysteresis of 5 %. |
| 0x2C11:002 | High speed range: Tracking controller gain<br>0 ... [**200**] ... 65535 %<br>• From version 02.00 | Gain factor for tracking the rotor position in the motor model. |
| 0x2C11:003 | High speed range: Tracking controller reset time<br>0.00 ... [**6.00**] ... 655.35 ms<br>• From version 02.00 | Reset time for tracking the rotor position in the motor model. |
| 0x2C11:004 | High speed range: Tracking controller decouple time<br>0.0 ... [**200.0**] ... 6553.5 ms<br>• From version 02.00 | Temporal hysteresis for the switching back and forth from the open-loop controlled to the closed-loop controlled operation. |
| 0x2C12:001 | SM low speed range: Acceleration current<br>5 ... [**70**] ... 400 %<br>• From version 02.00 | R.m.s. current value for acceleration processes in the lower velocity range.<br>• 100 % = Rated motor current (0x6075 (P323.00))<br>• In the lower speed range and during the acceleration phase, the current setpoints of 0x2C12:001 and 0x2C12:002 are added and injected to the motor. |
| 0x2C12:002 | SM low speed range: Standstill current<br>5 ... [**30**] ... 400 %<br>• From version 02.00 | R.m.s. current value for processes without acceleration (for instance standstill or constant setpoint speed) in the lower velocity range.<br>• 100 % = Rated motor current (0x6075 (P323.00))<br>• In the lower speed range and during the acceleration phase, the current setpoints of 0x2C12:001 and 0x2C12:002 are added and injected to the motor.<br><br>Note!<br>At the "100 %" setting, a motor current flows at standstill and at constant speed. The r.m.s. value of this motor current is greater than the rated motor current by a factor of sqrt(2) at standstill. The reason for this is that a DC current is injected into the synchronous motor at a standstill. The correct rated motor current flows when the motor turns. |

## 10.2 Sensorless vector control (SLVC)

The sensorless (field-oriented) vector control for asynchronous motors is based on a decoupled control for the torque-producing and the field-producing current component. In addition, the actual speed is reconstructed by means of a motor model so that a speed sensor is not required.

**Preconditions**

- Sensorless vector control (SLVC) is only suitable for asynchronous motors.
- Multi-motor operation is not permitted for sensorless vector control (SLVC).

**⚠CAUTION!**

Do not operate with hoisting units!

Operation of the sensorless vector control (SLVC) is **not** permissible for hoists!

▸ Do not operate the vector control with hoisting units.

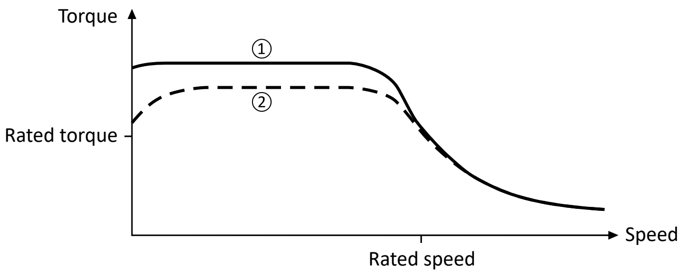
Supported operating modes 0x6060 (P301.00):

- "MS: Velocity mode [-2]"
- "MS: Torque mode [-1]"
- "CiA: Velocity mode [2]"

**Details**

Compared to the V/f characteristics, the sensorless vector control (SLVC) serves to achieve improved drive characteristics thanks to:

- higher torque throughout the entire speed range
- higher speed accuracy and smooth running properties
- higher efficiency




① Sensorless vector control (SLVC)

② V/f characteristic control for asynchronous motor (VFC open loop) 📖 167

### 10.2.1 Required commissioning steps

1. Activate motor control type: 0x2C00 (P300.00) = "Sensorless vector control (SLVC) [4]".
2. Carry out optimisation of the control circuits.
   - **An optimum operation of this motor control type requires an optimisation of the control loops!**
   - Details: ▸ Options for optimizing the control loops 📖 207
3. Optionally for a speed control with torque limitation in operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]":
   - Select the source in 0x2949:001 (P337.01) for the positive torque limit source and set it accordingly.
   - Select the source in 0x2949:002 (P337.02) for the negative torque limit source and set it accordingly.
4. Alternatively, the inverter can be configured in this motor control type in such a way that it controls a motor torque within a defined frequency range. For details, see chapter "Configuring the torque control". 📖 146

### 10.2.2 Expert settings

**Parameter**

| Address | Name / setting range / [default setting] | Information |
| --- | --- | --- |
| 0x2B40:003 | Q-Feedforward<br>0.00 ... [**0.00**] ... 10000.00<br>• From version 03.00 | Feedforward control for the SLVC Q controller. |
| 0x2B40:004 | D-Feedforward<br>0.00 ... [**0.00**] ... 10000.00<br>• From version 03.00 | Feedforward control of the SLVC-D controller. |

## 10.3 V/f characteristic control for asynchronous motor (VFC open loop)

The V/f characteristic control is a motor control for conventional frequency inverter applications. It is based on a simple and robust control mode for the operation of asynchronous motors with a linear or square-law load torque characteristic (e.g. fan). Because of the minimal parameterisation effort, such applications can be commissioned easily and quickly.

**Preconditions**

- The V/f characteristic control is only suitable for asynchronous motors.
- If you want to actuate a drive with a square-law V/f characteristic: Please always check whether the corresponding application is suitable for operation with a square-law V/f characteristic!
- Set the motor data according to the information on the nameplate of the motor. ▸ Motor data 🕮 45

### 10.3.1 Required commissioning steps

1. Activate motor control type: 0x2C00 (P300.00) = "V/f characteristic control (VFC open loop) [6]".
2. Set limiting factors for the V/f characteristic:
   1. Rated mains voltage 0x2540:001 (P208.01)
   2. Minimum frequency 0x2915 (P210.00)
   3. Maximum frequency 0x2916 (P211.00)
3. Set V/f characteristic data:
   1. Base voltage 0x2B01:001 (P303.01)
   2. Base frequency 0x2B01:002 (P303.02)
4. Select a characteristic shape suitable for the application in 0x2B00 (P302.00).
5. Optional settings:
   - Set voltage boost 🕮 175
   - Set slip compensation 🕮 176
   - Set oscillation damping 🕮 178
   - Optimising the stalling behaviour 🕮 179
   - Flying restart circuit 🕮 182
   - Additive voltage impression 🕮 183
6. Optional: carry out optimisation of the control circuits.
   - An optimisation of the control circuits is not mandatory for this motor control type but may lead to better control operation. The control parameters should always be calculated if the motor power does not correspond to the inverter power in order to achieve optimum performance from the slip compensation. (It is sufficient to carry out the "NonEnergized" calculation.)
   - Details: ▸ Options for optimizing the control loops 🕮 207

### 10.3.2 Basic setting

The base voltage and the base frequency define the ratio of the two variables and thus the gradient of the V/f characteristic.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2B01:001<br>(P303.01) | V/f shape data: Base voltage<br>(V/f shape data: Base voltage)<br>0 ... [**230**]* ... 5000 V<br>* Default setting dependent on the model. | Base voltage and base frequency define the V/f ratio and thus the gradient of the V/f characteristic.<br>• The V/f base voltage is usually set to the rated motor voltage.0x2C01:007 (P320.07)<br>• The V/f base frequency is usually set to the rated motor frequency.0x2C01:005 (P320.05) |
| 0x2B01:002<br>(P303.02) | V/f shape data: Base frequency<br>(V/f shape data: Base frequency)<br>Device for 50-Hz mains: 0 ... [**50**]* ... 1500 Hz<br>Device for 60-Hz mains: 0 ... [**60**]* ... 1500 Hz<br>* Default setting dependent on the model. | |

### 10.3.3 Define V/f characteristic shape

Various characteristic shapes are available which are described in detail in the following subchapters.

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2B00<br>(P302.00) | V/f characteristic shape<br>(V/f charac.shape)<br>• Setting can only be changed if the inverter is disabled. | | Selection of the V/f characteristic shape for the adaptation to different load profiles. |
| | **0** | **Linear** | Linear characteristic for drives with constant load torque over the speed.<br>▸ Linear V/f characteristic 📖 169 |
| | 1 | Quadratic | Square-law characteristic for drives with a square-law load torque over the speed.<br>• Square-law V/f characteristics are preferably used for centrifugal pumps and fan drives.<br>• Please always check whether the corresponding application is suitable for operation with a square-law V/f characteristic!<br>• If your pump drive or fan drive is not suitable for operation with a square-law V/f characteristic, use the linear V/f characteristic instead.<br>▸ Square-law V/f characteristic 📖 170 |
| | 2 | Multipoint (from version 03.00) | |
| | 3 | Eco (from version 02.00) | Linear characteristic with energy optimisation in the partial load operational range.<br>▸ Energy-saving V/f characteristic (VFC-Eco) 📖 172 |
| | 4 | Adaptive (from version 05.04) | |

### 10.3.3.1 Linear V/f characteristic

The linear V/f characteristic leads to a constant torque.

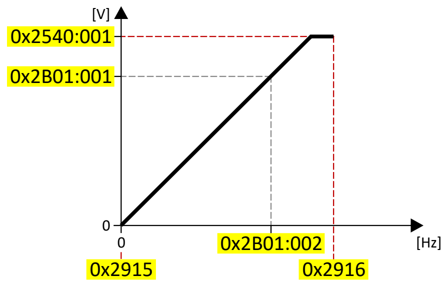
**Details**

Select V/f characteristic control with linear characteristic:

1. Motor control mode 0x2C00 (P300.00) = "V/f characteristic control (VFC open loop) [6]"
2. V/f characteristic shape 0x2B00 (P302.00)= "Linear [0]"

Setting of the V/f characteristic:

- Limiting factors for the V/f characteristic are the rated mains voltage 0x2540:001 (P208.01), the minimum frequency 0x2915 (P210.00) and the maximum frequency 0x2916 (P211.00).
- The base voltage 0x2B01:001 (P303.01) is usually set to the rated motor voltage (motor nameplate data). The base voltage is preset to the rated mains voltage. This in turn is preset according to the product key of the inverter. ▶ Mains voltage 📖 36
- The base frequency 0x2B01:002 (P303.02) is usually set to the rated motor frequency (motor nameplate data).




The actual output frequency can exceed the set maximum frequency if the gain for the slip compensation in 0x2B09:001 (P315.01) is set to a value higher than 0.

**Example**

Mot power

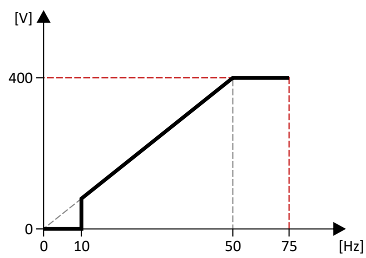
- 400 V/50 Hz

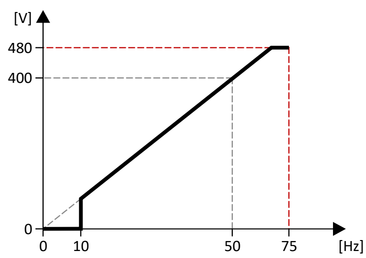
Settings

- Maximum frequency 75 Hz
- Minimum frequency 10 Hz

Explanation

- Graphic on the left: The inverter is operated with a rated mains voltage of 400 V.
- Graphic on the right: The inverter is operated with a rated mains voltage of 480 V. This allows the output voltage to further increase above 50 Hz.




| Parameter | Designation | Setting for this example |
|---|---|---|
| 0x2540:001 (P208.01) | Rated mains voltage | 400 Veff [1] (on the left) / 480 Veff [2] (on the right) |
| 0x2915 (P210.00) | Minimum frequency | 10 Hz |
| 0x2916 (P211.00) | Maximum frequency | 75 Hz |
| 0x2B01:001 (P303.01) | Base voltage | 400 V |
| 0x2B01:002 (P303.02) | Base frequency | 50 Hz |

### 10.3.3.2 Square-law V/f characteristic

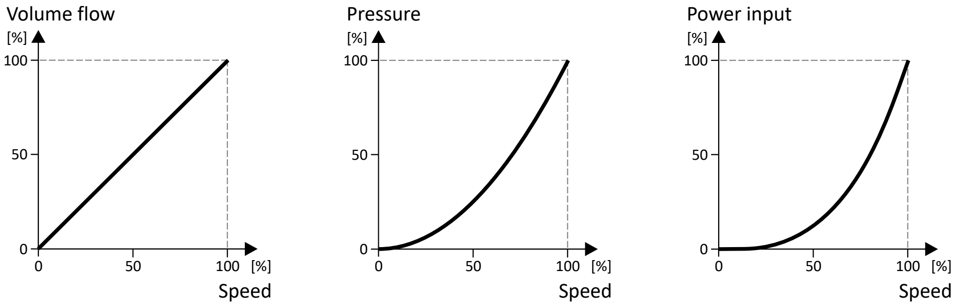
The square-law V/f characteristic is typically used in heating, ventilation and climate applications to control the speed of fans and centrifugal pumps.

**Details**

Each application that is provided with the features according to the affinity laws may possibly benefit from a square-law V/f characteristic.

The affinity laws describe the relation between the speed and other variables:

- The volume flow increases proportionately to the speed.
- The required pressure behaves proportionately to the square of the speed.
- The power input is proportionately to the cube of the speed. This means that already a minimal reduction of the speed may lead to substantial savings in energy consumption.



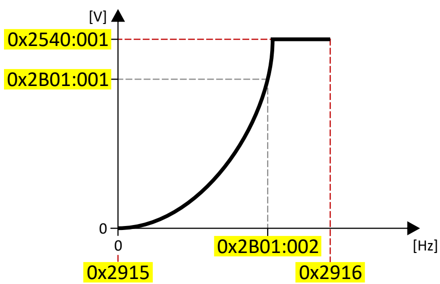

By approximation, the square-law V/f characteristic corresponds to the curve for power input shown above. At low frequencies, the voltage is reduced since due to the type of load a lower voltage is sufficient to generate the required power. All in all, this results in an energy-efficient system.

Select V/f characteristic control with square-law characteristic:

1. Motor control mode 0x2C00 (P300.00) = "V/f characteristic control (VFC open loop) [6]"
2. V/f characteristic shape 0x2B00 (P302.00)= "Quadratic [1]"

Setting of the V/f characteristic:

- Limiting factors for the V/f characteristic are the rated mains voltage 0x2540:001 (P208.01), the minimum frequency 0x2915 (P210.00) and the maximum frequency 0x2916 (P211.00).
- The base voltage 0x2B01:001 (P303.01) is usually set to the rated motor voltage (motor nameplate data). The base voltage is preset to the rated mains voltage. This in turn is preset according to the product key of the inverter. ▶ Mains voltage 📖 36
- The base frequency 0x2B01:002 (P303.02) is usually set to the rated motor frequency (motor nameplate data).




The actual output frequency can exceed the set maximum frequency if the gain for the slip compensation in 0x2B09:001 (P315.01) is set to a value higher than 0.

### 10.3.3.3 Multipoint V/f characteristic

The multipoint V/f characteristic is based on the linear V/f characteristic. An additional characteristic point enables the adaptation to applications with special torque properties.

**Details**

This characteristic shape is suitable for applications that require a higher torque at lower speeds. The additional characteristic point can be configured in such a way that a higher voltage is provided in the lower frequency range of the characteristic. Otherwise, the same limits apply for the Multipoint characteristic as for the linear characteristic.

Select V/f characteristic control with Multipoint characteristic:

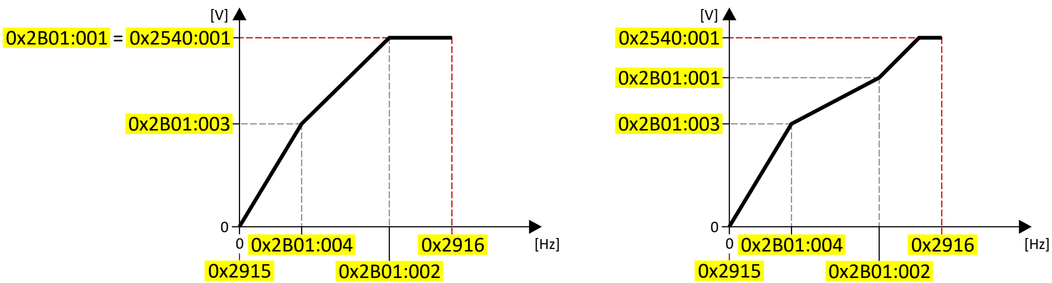
1. Motor control mode 0x2C00 (P300.00) = "V/f characteristic control (VFC open loop) [6]"
2. V/f characteristic shape 0x2B00 (P302.00) = "Multipoint [2]"

Setting of the V/f characteristic:

- Limiting factors for the V/f characteristic:
  - Rated mains voltage 0x2540:001 (P208.01)
  - Minimum frequency 0x2915 (P210.00)
  - Maximum frequency 0x2916 (P211.00)
- The rated mains voltage is set as the base voltage 0x2B01:001 (P303.01). The rated mains voltage corresponds to the product key of the inverter . The base voltage is set to the rated motor voltage (motor nameplate specification).
- The base frequency 0x2B01:002 (P303.02) is set to the rated motor frequency (motor nameplate data).
- The additional characteristic point is defined based on the parameters 0x2B01:003 (P303.03) and 0x2B01:004 (P303.04).

Characteristic examples:

- Graphic on the left: the base voltage is set equal to rated mains voltage.
- Graphic on the right: the base voltage is set lower than the rated mains voltage.




**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2B01:003 (P303.03) | V/f shape data: Midpoint voltage (V/f shape data: Midpoint voltage) 0 ... **[0]** ... 5000 V • From version 03.00 | Definition of the medium characteristic point for user-definable V/f characteristic. • Only relevant if V/f characteristic shape 0x2B00 (P302.00) is set = "Adaptive [2]". |
| 0x2B01:004 (P303.04) | V/f shape data: Midpoint frequency (V/f shape data: Midpoint freq) 0 ... **[0]** ... 1500 Hz • From version 03.00 | |

### 10.3.3.4 Energy-saving V/f characteristic (VFC-Eco)

In the case of the energy-saving V/f characteristic control (VFCEco), the motor voltage of the inverter is ascertained based on a linear characteristic as a function of the rotary field frequency or the motor speed to be generated. In addition, the motor is always operated in the optimum efficiency range by means of a cosφ control and the resulting voltage dip (reduction of copper losses in the asynchronous motor). This is useful for energy efficiency with applications such as conveyors, where the torque and energy requirements are high during acceleration, but lower as soon as the load reaches the stationary speed.

**Details**

Select energy-saving V/f characteristic control with linear characteristic:

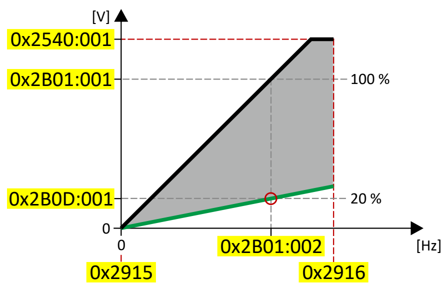
1. Motor control mode 0x2C00 (P300.00) = "V/f characteristic control (VFC open loop) [6]"
2. V/f characteristic shape 0x2B00 (P302.00)= "Eco [3]"

Setting of the V/f characteristic:

- The limiting factors for the V/f characteristic are the rated mains voltage 0x2540:001 (P208.01), the minimum frequency 0x2915 (P210.00) and the maximum frequency 0x2916 (P211.00).
- The base voltage 0x2B01:001 (P303.01) is usually set to the rated motor voltage (motor nameplate data). The base voltage is preset to the rated mains voltage. This in turn is preset according to the product key of the inverter. ▶ Mains voltage 📖 36
- The base frequency 0x2B01:002 (P303.02) is usually set to the rated motor frequency (motor nameplate data).

Eco efficiency range:

- The Eco efficiency range (grey) is between the V/f-standard characteristic (black) and the V/f Eco characteristic (green).
- The V/f Eco characteristic (green) is defined by the operating point that results from the minimum voltage 0x2B0D:001 (P330.01) and the base frequency 0x2B01:002 (P303.02).
- The minimum voltage 0x2B0D:001 (P330.01) has to be set in percent with reference to the base voltage 0x2B01:001 (P303.01).




The actual output frequency can exceed the set maximum frequency if the gain for the slip compensation in 0x2B09:001 (P315.01) is set to a value higher than 0.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2B0D:001<br>(P330.01) | VFC-ECO: Minimum voltage<br>(VFC-ECO: Min. voltage)<br>20 ... [**20**] ... 100 %<br>• From version 02.00 | Defining the operating point of the V/f eco characteristic. The V/f eco characteristic defines the lower limit of the eco efficiency range.<br>• 100 % = Base voltage 0x2B01:001 (P303.01) |
| 0x2B0D:006<br>(P330.06) | VFC-ECO: Cos phi actual value<br>(VFC-ECO: Cos Phi actual)<br>• Read only<br>• From version 02.00 | |

### 10.3.3.5 User-definable V/f characteristic

The "user-definable V/f characteristic" is provided for the individual adjustment of the motor magnetization to the actual application if linear and square-law characteristics are not suitable.

- The characteristic is defined by means of 11 parameterizable grid points (voltage/ frequency values).

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2B02:001 | Frequency grid points (x) user V/f characteristic: x1 = f01<br>-1500 ... [**0**] ... 1500 Hz | Freely parameterizable V/f characteristic (values for X axis). These settings define the adaptive frequency values. |
| 0x2B02:002 | Frequency grid points (x) user V/f characteristic: x2 = f02<br>-1500 ... [**0**] ... 1500 Hz | |
| 0x2B02:003 | Frequency grid points (x) user V/f characteristic: x3 = f03<br>-1500 ... [**0**] ... 1500 Hz | |
| 0x2B02:004 | Frequency grid points (x) user V/f characteristic: x4 = f04<br>-1500 ... [**0**] ... 1500 Hz | |
| 0x2B02:005 | Frequency grid points (x) user V/f characteristic: x5 = f05<br>-1500 ... [**0**] ... 1500 Hz | |
| 0x2B02:006 | Frequency grid points (x) user V/f characteristic: x6 = f06<br>-1500 ... [**0**] ... 1500 Hz | |
| 0x2B02:007 | Frequency grid points (x) user V/f characteristic: x7 = f07<br>-1500 ... [**0**] ... 1500 Hz | |
| 0x2B02:008 | Frequency grid points (x) user V/f characteristic: x8 = f08<br>-1500 ... [**0**] ... 1500 Hz | |
| 0x2B02:009 | Frequency grid points (x) user V/f characteristic: x9 = f09<br>-1500 ... [**0**] ... 1500 Hz | |
| 0x2B02:010 | Frequency grid points (x) user V/f characteristic: x10 = f10<br>-1500 ... [**0**] ... 1500 Hz | |
| 0x2B02:011 | Frequency grid points (x) user V/f characteristic: x11 = f11<br>-1500 ... [**0**] ... 1500 Hz | |

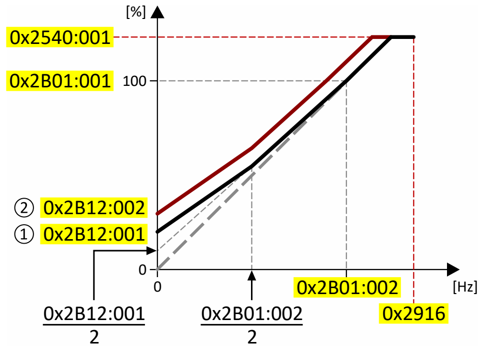
| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2B03:001 | Voltage grid points (y) user V/f characteristic: y1 = U01 (x = f01)<br>0.00 ... [**0.00**] ... 5000.00 V | Freely parameterizable V/f characteristic (values for Y axis). These settings define the adaptive voltage values. |
| 0x2B03:002 | Voltage grid points (y) user V/f characteristic: y2 = U02 (x = f02)<br>0.00 ... [**0.00**] ... 5000.00 V | |
| 0x2B03:003 | Voltage grid points (y) user V/f characteristic: y3 = U03 (x = f03)<br>0.00 ... [**0.00**] ... 5000.00 V | |
| 0x2B03:004 | Voltage grid points (y) user V/f characteristic: y4 = U04 (x = f04)<br>0.00 ... [**0.00**] ... 5000.00 V | |
| 0x2B03:005 | Voltage grid points (y) user V/f characteristic: y5 = U05 (x = f05)<br>0.00 ... [**0.00**] ... 5000.00 V | |
| 0x2B03:006 | Voltage grid points (y) user V/f characteristic: y6 = U06 (x = f06)<br>0.00 ... [**0.00**] ... 5000.00 V | |
| 0x2B03:007 | Voltage grid points (y) user V/f characteristic: y7 = U07 (x = f07)<br>0.00 ... [**0.00**] ... 5000.00 V | |
| 0x2B03:008 | Voltage grid points (y) user V/f characteristic: y8 = U08 (x = f08)<br>0.00 ... [**0.00**] ... 5000.00 V | |
| 0x2B03:009 | Voltage grid points (y) user V/f characteristic: y9 = U09 (x = f09)<br>0.00 ... [**0.00**] ... 5000.00 V | |
| 0x2B03:010 | Voltage grid points (y) user V/f characteristic: y10 = U10 (x = f10)<br>0.00 ... [**0.00**] ... 5000.00 V | |
| 0x2B03:011 | Voltage grid points (y) user V/f characteristic: y11 = U11 (x = f11)<br>0.00 ... [**0.00**] ... 5000.00 V | |

### 10.3.4 Set voltage boost

The parameterisable voltage boost makes it possible to improve the starting performance for applications requiring a high starting torque.

**Details**

- In 0x2B12:001 (P316.01), a permanent voltage boost can be set. ①
- In 0x2B12:002 (P316.02), an additional voltage boost can be set for acceleration processes ②
- Reference for the percentage setting of the voltage boost is the base voltage 0x2B01:001 (P303.01).




**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2B12:001<br>(P316.01) | V/f voltage boost: Fixed boost<br>(V/f boosts: Fixed V/f boost)<br>0.0 ... [**2.5**]* ... 20.0 %<br>* Default setting dependent on the model. | Constant voltage boost for V/f characteristic control without feedback.<br>• 100 % = V/f base voltage 0x2B01:001 (P303.01)<br>• For the purpose of optimizing the start behavior for applications requiring a high starting torque. |
| 0x2B12:002<br>(P316.02) | V/f voltage boost: Boost at acceleration<br>(V/f boosts: Dynam. V/f boost)<br>0.0 ... [**0.0**] ... 20.0 % | Additional voltage boost for V/f characteristic control without feedback.<br>• 100 % = V/f base voltage 0x2B01:001 (P303.01)<br>• This voltage boost is only active while the motor is accelerated. It then acts in addition to the fixed voltage boost set in 0x2B12:001 (P316.01). |

### 10.3.5 Set slip compensation

The speed of an asynchronous motor decreases as load is applied. This load-dependent speed drop is called “slip”. The slip compensation serves to counteract the load-dependent speed loss.

**Preconditions**

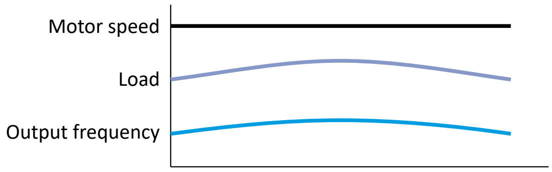
The function is only effective in the motor control type "V/f characteristic control (VFC open loop)".

In order for the function to generate the rated slip correctly the following parameters must be correctly set:

- Rated speed
- Rated frequency
- Number of pole pairs (automatically calculated from Rated speed and Rated frequency)

**Details**

The slip compensation increases or decreases the output frequency as a response to a load change. Thus, the slip is counteracted and the speed is kept constant.




The rated slip required for the slip compensation is calculated by the inverter according to the following formula:

Rated slip [%] = (1 - (rated motor speed [rpm] / (120 * rated motor frequency [Hz] / number of poles))) * 100

Calculation example:

- Rated motor speed = 1750 rpm
- Rated motor frequency = 60 Hz
- Number of poles = 2 * Number of pole pairs = 2 * 2 = 4
- Rated slip = (1 - (1750 / (120 * 60 / 4))) * 100 = 2.77 %

The rated slip represents the reduction of the motor speed due to the motor load. At full speed and full load, the motor given in the example would rotate with 1750 rpm, which means 2.77 % below its synchronous speed of 1800 rpm. In order to compensate for this speed loss, the inverter increases the output frequency by the rated slip multiplied by the rated motor frequency. In the example, there is an increase in the output frequency at full load of 2.77 % * 60 Hz = 1.66 Hz.

In order to take into account load changes, the influence of the rated slip on the output frequency can be adapted in 0x2B09:001 (P315.01). A setting of 100 % corresponds to the rated slip of the motor in the nominal operating point.

With reference to the example above and a setpoint frequency of 60 Hz:

- If 0x2B09:001 (P315.01) = 100 %, the output frequency is = 61.66 Hz (60 Hz + 100 % * 1.66 Hz).
- If 0x2B09:001 (P315.01) = 50 %, the output frequency is = 60.83 Hz (60 Hz + 50 % * 1.66 Hz).

Additionally, the filter time for the slip compensation can be adapted in 0x2B09:002 (P315.02) if required. The preset filter time is adapted to typical motors. If full load or nearly full load oscillations or instabilities occur, we recommend an increase of the filter time.

## Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2B09:001<br>(P315.01) | Slip compensation: Gain<br>(Slip compens.: Slip: gain)<br>-200.00 ... [**100.00**] ... 200.00 % | Adjustment in percent of the slip calculated.<br>• For instance required for deviations of the real motor data from the nameplate data.<br>• A setting of 100 % corresponds to the rated slip of the machine in the nominal operating point. |
| 0x2B09:002<br>(P315.02) | Slip compensation: Filter time<br>(Slip compens.: Filter time)<br>1 ... [**100**] ... 6000 ms | Filter time for the slip compensation.<br>• The preset filter time is adapted to typical motors. |
| 0x2C02:004<br>(P351.04) | Motor parameter (ASM): Slip frequency<br>(ASM motor par.: Slip frequency)<br>• Read only: x.x Hz | Display of the rated slip determined. |

### 10.3.6 Set oscillation damping

The oscillation damping serves to reduce the oscillations during no-load operation which are caused by energy oscillating between the mechanical system (mass inertia) and the electrical system (DC bus). Furthermore, the oscillation damping can also be used to compensate for resonances.

**Preconditions**

The function is only effective in the motor control type "V/f characteristic control (VFC open loop)".

**Restrictions**

Observe the following restrictions:

- Damping is possible only for constant oscillations at a steady-state operating point.
- Oscillations occurring sporadically cannot be damped.
- Oscillation damping is not suitable for oscillations occurring during dynamic processes (e.g. accelerations or load changes).
- Oscillation damping is only active if the setpoint speed is greater than 10 rpm and the DC-bus voltage exceeds a value of 100 V.

**Details**

The determination of the oscillation is based on the active current. In order to obtain the alternating component of the active current, this current is differentiated. This signal is then passed through a PT1 filter.

**Identification of the oscillation**

Before the oscillation damping function can be parameterised, the oscillation has to be identified. One way to do this is to examine the motor current while oscillation damping is switched off (gain = 0 %). At steady-state operation, a constant current flows. If the drive oscillates, these oscillations are also visible on the motor current. It is therefore possible to determine the frequency and the amplitude of the oscillation from the alternating component of the motor current. In the following, this alternating component is referred to as "current oscillation".

**Parameter setting**

Set the gain of the oscillation signal according to the following equation:

0x2B0A:001 (P318.01) = current amplitude * 100 % / ($\sqrt{2}$ * maximum device current)

The default time constant of the PT1 filter is sufficient for most applications. If required, it is only possible to adapt the time constant via »EASY Starter«. Generally, the time constant must be set so that the oscillation is dampened and higher-frequency components are filtered from the signal. The time constant is given by the reciprocal value of double the current oscillation frequency:

0x2B0A:002 (P318.02) = 1 / (2 * oscillation frequency)

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2B0A:001<br>(P318.01) | Oscillation damping: Gain<br>(Oscillat. damp.: Gain)<br>-400 ... [**150**] ... 400 % | Gain of the oscillation signal.<br>• With the setting 0, oscillation damping is deactivated. |
| 0x2B0A:002<br>(P318.02) | Oscillation damping: Filter time<br>(Oscillat. damp.: Filter time)<br>1 ... [**30**] ... 600 ms | Time constant of the PT1 filter. |

### 10.3.7 Optimising the stalling behaviour

If the motor is driven with frequencies above the rated motor frequency, the operating point is shifted to the "field weakening range". In this range, the motor voltage does not increase proportionately to the output frequency anymore. As a consequence, the inverter automatically reduces the maximum current since the full torque is not available anymore at these frequencies.

For special motors which enable an operation in the field weakening range, the behaviour in the field weakening range can be adapted to the motor with 0x2B0C (P319.00).

**⚠ DANGER!**

Danger by incorrect parameterisation.

Possible consequences: damage to material assets and injury to persons

- Only change the default setting (0 Hz) in 0x2B0C (P319.00) after consulting the motor manufacturer!
- Recommendation: Maintain default setting (0 Hz).

**Preconditions**

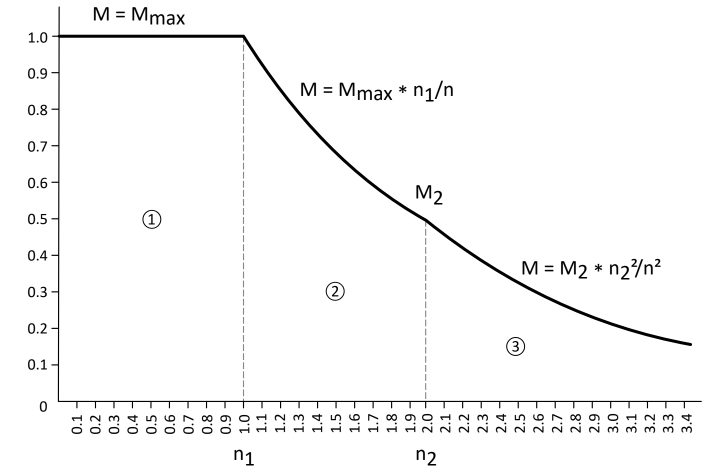
The function is only effective in the motor control type "V/f characteristic control (VFC open loop)".

### Details

The operating range of an asynchronous motor consists of the voltage range ① and the field weakening range. The field weakening range is divided into two ranges:

- In the first range ②, the power can be kept constant without the motor stalling.
- The second field weakening range ③ is characterised by the fact that the maximum permissible stator current is decreased to prevent the motor from stalling .

**Speed/torque curve of the asynchronous motor with two field weakening ranges**




The override point ($n_2$, $M_2$) can be influenced with 0x2B0C (P319.00).

0x2B0C (P319.00) > 0 Hz:

- The maximum current characteristic is shifted to higher field frequencies by the frequency entered.
- The maximum permissible current and the maximum torque increase in the field weakening range.
- The risk of motor stalling increases.

0x2B0C (P319.00) < 0 Hz:

- The maximum current characteristic is shifted to lower field frequencies by the frequency entered.
- The maximum permissible current and the maximum torque are reduced in the field weakening range.
- The risk of motor stalling is reduced.

### Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2B0C<br>(P319.00) | Override field weakening<br>(Field weak thold)<br>-599.0 ... [**0.0**] ... 599.0 Hz | Offset of the override point for field weakening. |
| | Override field weakening<br>(Field weak thold)<br>-599.0 ... [**-40.0**] ... 599.0 Hz | |

### 10.3.8 Torque limitation setting

**Intro**

For torque limitation in VFC mode, a maximum torque can be set for the inverter. If the motor torque exceeds the torque limit, the inverter modifies the output frequency to counteract this exceedance.

The quality of the torque limitation depends on the accuracy of the actual torque calculation.

**Preconditions**

The VFC torque limiter is only effective with the following motor control types:

- V/f control (open loop)

We recommend that you start by identifying the motor/inverter in order to achieve good performance!

▶ Options for optimizing the control loops 📖 207

**Details**

The VFC torque limiter becomes active in V/f operation when the current motor torque exceeds the maximum torque. The limiter modifies the output frequency to counteract the exceedance.

The VFC torque limitation functions in a manner similar to the VFC Imax controller, but instead of the total current, the actual torque is taken into account.

When the maximum torque is exceeded:

- During motor operation, the VFC torque limiter reduces the output frequency.
- During generator operation, the VFC torque limiter increases the output frequency.

▶ Configuring the torque control 📖 146

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2B10:001 | V/f torque limitation: Gain<br>0.00 ... [**0.00**] ... 655.35 % | Gain of the torque limitation.<br>• 0%: torque limitation is deactivated (standard setting)<br>• 100%: same dynamic behaviour as the Imax controller (recommended setting for VFC torque activation) |

### 10.3.9 Flying restart circuit

The flying restart function makes it possible to restart a coasting motor on the fly during operation without speed feedback. Synchronicity between the inverter and the motor is coordinated so that the transition to the rotating drive is effected without jerk at the time of connection.

**Preconditions**

- Drive systems with speed feedback do not need a flying restart circuit because there is always a jerk-free synchronisation to the feedback speed.
- The flying restart circuit operates safely and reliably in case of drives with high centrifugal masses. If several motors with different centrifugal masses are connected to the inverter, the flying restart circuit must not be used.
- The flying restart circuit serves to identify rotating field frequencies of up to ±200 Hz.

Required settings before the flying restart circuit is used:

1. The motor data must be set correctly. ▶ Motor data 📖 45
2. The settings for the current controller and the flying restart controller must be adapted to the motor. The settings are made automatically if one of the following optimizations is carried out:

▶ Select motor from motor catalog 📖 46

▶ Automatic motor identification (energized) 📖 210

▶ Automatic motor calibration (non-energized) 📖 211

**Details**

The inverter determines synchronicity by identifying the synchronous rotating field frequency. The "search" starts in the positive direction.

Duration:

- The flying restart process is determined within approx. 0.5 ... 1.5 seconds.
- The duration is influenced by the start frequency 0x2BA1:001 (P718.01).

Setting the function:

1. As start behavior, set the selection "Flying restart circuit [2]" in 0x2838:001 (P203.01).
   - Thus, every inverter enable causes a synchronisation to the rotating or standing motor.
   - After the inverter has been enabled, the motor can temporarily start or reverse if drives with low friction and low mass inertia are used.
   - If the inverter is operated with the default settings, no further settings are required for most applications.
2. If required, adapt the current 0x2BA1:001 (P718.01) and the start frequency 0x2BA1:002 (P718.02) for the flying restart circuit.
   - Setting notes can be found in the "Info" column for the respective parameter.

For diagnostic purposes, the frequency detected when the motor has been restarted on the fly is displayed in 0x2BA1:008 (P718.08).

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2BA1:001<br>(P718.01) | Flying restart circuit: Current<br>(Flying restart: Current)<br>0 ... **[30]** ... 100 % | The current set here is injected into the motor during the flying restart process for the identification of the rotating field frequency.<br>• 100 % = Rated motor current 0x6075 (P323.00)<br>• Reducing the current causes a reduction of the motor torque during the flying restart process. A short-time starting action or reversing of the motor is prevented with low flying restart currents.<br>• If the current is set too low, the rotating field frequency cannot be identified correctly.<br>• If the current is increased, this improves the robustness of the flying restart circuit. |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2BA1:002<br>(P718.02) | Flying restart circuit: Start frequency<br>(Flying restart: Start frequency)<br>-599.0 ... [**20.0**] ... 599.0 Hz | The frequency set here defines the starting point for the flying restart process.<br>• The search starts in positive direction.<br>• The default setting is adjusted to standard asynchronous motors.<br>• In case of systems with a known search speed (e.g. torque-controlled drive systems that are to synchronise to a defined speed), the start frequency can be adapted for reducing the flying restart time. |
| 0x2BA1:008<br>(P718.08) | Flying restart circuit: Flying restart frequency<br>(Flying restart: Fl.res.frequency)<br>• Read only: x.x Hz | Display of the found frequency at which the motor has been successfully restarted on the fly. |

### 10.3.10 Additive voltage impression

This function serves to boost (or lower) the motor voltage from the process via an additive voltage setpoint in order to realise a load adjustment (for instance in case of winder applications).

**NOTICE**

A too high boost of the motor voltage may cause the motor to heat up strongly due to the resulting current.

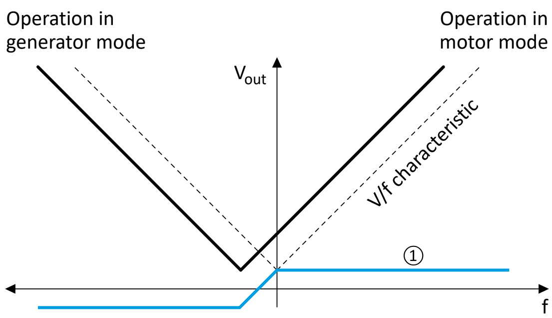
► Avoid a too high boost of the motor voltage!

#### Details

At a constant field frequency, the output voltage of the inverter can be changed within a wide range.

Example: Adaptation of the voltage characteristic in case of V/f characteristic control as a function of the load:

- Clockwise rotation (CW) is operation in motor mode: Boost voltage.
- Counter-clockwise rotation (CCW) is operation in generator mode: Lower voltage.




① Selecting an additive voltage setpoint

#### Parameter

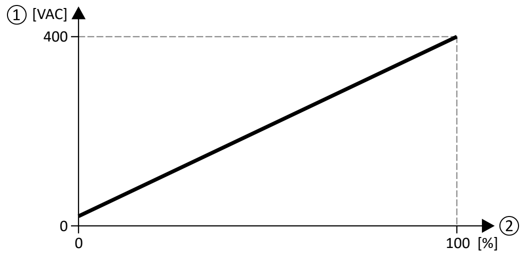
| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2B13:001 | Additive voltage impression: Enable Function<br>• From version 02.00 | | 1 = enable function. |
| | **0** | **Disable** | |
| | 1 | Enable | |

| Address | Name / setting range / [default setting] | Information |
| --- | --- | --- |
| 0x2B13:002 | Additive voltage impression: Setpoint source<br>• From version 02.00 | Selection of the source for specifying the additive voltage setpoint.<br>• 100 % = Rated voltage 0x2C01:007 (P320.07) |
| | 1 **Analog input 1** | |
| | 2 Analog input 2 | |
| | 3 Network | The additive voltage setpoint is defined via the mappable NetWordIN5 0x4008:005 (P590.05)data word. |
| | 201 Internal value (from version 05.03) | Internal values of the manufacturer. |
| | 202 Internal value (from version 05.03) | |
| | 203 Internal value (from version 05.03) | |
| | 204 Internal value (from version 05.03) | |
| | 205 Internal value (from version 05.03) | |
| | 206 Internal value (from version 05.03) | |
| 0x2B13:003 | Additive voltage impression: Actual voltage<br>• Read only: x V<br>• From version 02.00 | Display of the current (boosted or lowered) voltage. |
| 0x2B13:004 | Additive voltage impression: Ramp time<br>0.0 ... [**0.0**] ... 3600.0 s<br>• From version 06.02 | Ramp time for ramping up the required additive voltage setpoint.<br>• The ramp time is effective after each activation of the inverter.<br>• The ramp time refers to the rated voltage 0x2C01:007 (P320.07). |

**Example: Using the function with a 400-V inverter**

With the settings indicated below, the motor is accelerated after the start to 50 Hz. As the base frequency, however, is set very high (here: 599 Hz), the motor voltage at 50 Hz only amounts to 20 VAC.

Now, the analog input 1 serves to change the motor voltage at constant frequency within a wide range:




① Motor voltage

② Selection of an additive voltage setpoint in percent via analog input 1
The setting range (here: 0 ... 100 %) can be adapted via the parameters "Min PID value" and "Max PID value".

| Parameter | Designation | Setting for this example |
| --- | --- | --- |
| 0x2636:004 (P430.04) | Analog input 1: Min PID value | 0 % |
| 0x2636:005 (P430.05) | Analog input 1: Max PID value | 100 % |
| 0x2860:001 (P201.01) | Frequency control: Default setpoint source | Frequency preset 1 [11] |
| 0x2911:001 (P450.01) | Frequency setpoint presets: Preset 1 | 50 Hz |
| 0x2B01:002 (P303.02) | V/f shape data: Base frequency | 599 Hz |
| 0x2B13:001 | Additive voltage impression: Enable Function | Enable [1] |
| 0x2B13:002 | Additive voltage impression: Setpoint source | Analog input 1 [1] |

## 10.4 Sensorless control for synchronous motor (SLSM-PSM)

The sensorless control for synchronous motors is based on a decoupled, separated control of the torque-producing current and the current aligned with the field. In contrast to the servo control with position encoder, the actual speed value and rotor position are reconstructed via a motor model.

Compared to the sensorless "SL-PSM" control, the "SLSM-PSM" control offers the following advantages:

- Lower power consumption and more torque through HF injection in the lower speed range
- Easier commissioning by supporting automatic identification/calibration of the motor

**Details**

The operating behavior of sensorless control for synchronous motors is divided into two areas due to its principle:

- Low speed range: An unobservable range of low speeds.
- High speed range: Range with high speeds in which the rotor position can be calculated for field-oriented control by means of an observer.

The motor model-based approach to control includes two different methods for the low-speed range:

- Low-speed method 0x2C13 = "Carrier based [1]"
  - This method is not suitable for all permanently excited synchronous motors! The position detection requires an anisotropy in the inductors of the motor. From approx. 5 % difference between the inductance Ld (0x2C03:005 (P352.05)) and the inductance Lq (0x2C03:006 (P352.06)) this method can be used.
  - Permanently excited synchronous motors with buried magnets and distributed stator winding are particularly suitable. Permanently excited synchronous motors with concentrated windings tend to be less suitable.
  - With this method, a high-frequency carrier signal is applied in the low-speed range ("HF injection"). With this active method it is possible to detect the rotor position and to operate the motor speed controlled. This results in a higher starting torque with lower power consumption. The control is field oriented.

Motor phase failure detection is deactivated if HF injection is active in the low-speed range.

- Low-speed method 0x2C13 = "i/f based [2]"
  - This method is suitable for all permanently excited synchronous motors.
  - With this method, a controlled start-up occurs in the low-speed range.

Behavior in the high-speed range

- In the high-speed range (setpoint speed| > lower limit 0x2C11:001 or (|actual speed| > 0x2C10:008) the rotor flux position and the speed is reconstructed by means of observation.
- The control is field oriented. Only the current required for generating the necessary torque is injected.

Pole position identification (PPI)

- For controlling a permanent-magnet synchronous motor, the pole position - the angle between the motor phase U and the field axis of the rotor - must be known.
- If the drive is at standstill, the "pole position identification (PPI)" function is immediately activated after the inverter is enabled. ▶ Synchronous motor: Pole position identification (PPI) 🕮 159

Flying restart circuit

- A flying restart circuit for the synchronous motor up to the rated speed is supported.
- If the flying restart circuit is to be used, set the start method "Flying restart circuit [2]" in 0x2838:001 (P203.01). Additional settings are not required for the flying restart circuit in the case of a sensorless control of a synchronous motor.

### 10.4.1 Required commissioning steps

1. Activate motor control type: 0x2C00 (P300.00) = "Sensorless control for synchronous motors (SLSM-PSM) [8]".
2. Automatic motor identification (energized) 🕮 210
   - **Mandatory for this motor control mode in order to determine the equivalent circuit data and calculate the parameters for encoderless operation with HF injection.**
3. Optionally for a speed control with torque limitation in operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]":
   - Select the source in 0x2949:001 (P337.01) for the positive torque limit source and set it accordingly.
   - Select the source in 0x2949:002 (P337.02) for the negative torque limit source and set it accordingly.
4. Optionally for a speed control with torque limitation in operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]":
   - Set the positive torque limit in 0x60E0
   - Set the negative torque limit in 0x60E1.



### 10.4.2 Expert settings

Low-speed method 0x2C13 = "Carrier based [1]"

- In the unobservable range of low speeds (|actual speed| < 0x2C10:008), a high-frequency carrier signal is switched on ("HF injection").
- The amplitude of this carrier signal is set in 0x2C10:001. Larger values lead to better position detection. If the value is set too small, then the amplitude of the carrier signal is automatically increased after controller release. This ensures that HF injection always works regardless of the setting in 0x2C10:001.
- The two parameters 0x2C10:001 and 0x2C10:008 can be identified automatically or set manually. The settings for the two parameters are not provided by the motor catalog!

Low-speed method 0x2C13 = "i/f based [2]"

- A controlled start-up takes place when |setpoint speed| < lower limit 0x2C11:001.
- During the acceleration phase, the 0x2C12:001 and 0x2C12:002 current setpoints are added and impressed on the motor.
- This method is suitable for all permanently excited synchronous motors.

**NOTICE**

With the Low-Speed method 0x2C13 = "i/f based [2]", an adjustable constant current is impressed in the lower speed range. If this current is higher than the rated motor current, the motor may heat up in the lower speed range. This effect increases if the motor is operated in the lower speed range for a longer period of time.

Possible consequence: Destruction of the motor by overheating

- ▶ Do not operate the motor for a longer period of time in the lower speed range.
- ▶ For detecting and monitoring the motor temperature, we recommend a temperature feedback via PTC thermistor or thermal contact.

For the motor model-based approach to control, two different methods are available for the low-speed range in 0x2C13.

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2C13 | SLSM-PSM low speed method<br>• From version 03.00 | | Selection of the method for the lower speed range in sensorless control for synchronous motor (SLSM-PSM). |
| | **1** | **Carrier based** | Encoderless operation with HF injection.<br>Not suitable for MCS motors! |
| | 2 | i/f based | Encoderless operation with controlled start-up.<br>Universally suitable for all motors.<br>Note!<br>With this low-speed method, the set torque limits are only active in the higher speed range (closed-loop mode)! |
| 0x2C10:001 | HF amplitude<br>0.0 ... [**50.0**] ... 400.0 V<br>• From version 02.00 | | Setting of the HF amplitude for low speed method "Carrier based". |
| 0x2C10:008 | HF injection range<br>0.5 ... [**6.0**] ... 50.0 %<br>• From version 05.03 | | Setting of the speed range with HF injection for low speed method "Carrier based". |

## 10.5 Parameterisable motor functions

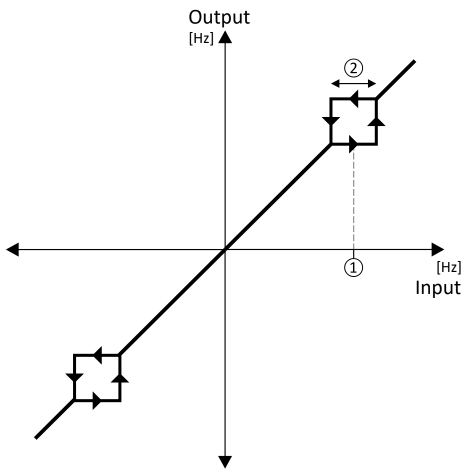
### 10.5.1 Skip frequencies

By means of the three parameterisable skip frequencies, critical frequencies can be suppressed which lead to mechanical resonances in the system.

**Details**

A blocking zone is active as soon as the frequency for this blocking zone is set to a value ≠ "0 Hz".

- The frequency defines the center of the range to be masked out. ①
- The bandwidth defines its total size. ②



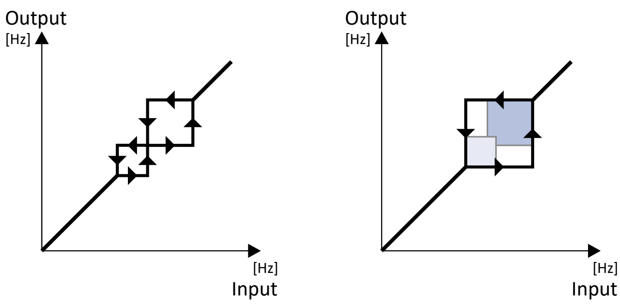

Example: For a blocking zone, the frequency is set to 20 Hz and the bandwidth to 10 Hz. These settings mask out the range from 15 Hz to 25 Hz.

Notes:

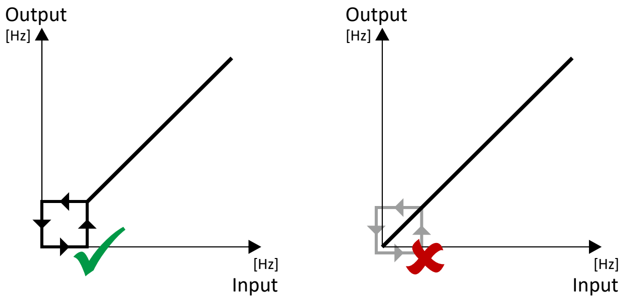
- Skip frequencies are absolute values. With the setting "20 Hz", at the same time also the skip frequency "-20 Hz" is defined.
- The inverter accelerates/decelerates the motor through the range to be masked out. Continuous operation within this range is not possible.
- A blocking zone is not active if its bandwidth is set to "0 Hz".

Adjacent and overlapping areas:

- Example on the left: If the ranges are closely spaced, the ranges are passed through as shown.
- Example on the right: If the ranges overlap, the lowest and highest value form a new range. In the status display 0x291F:016, both ranges are shown as active.



Valid and invalid ranges:
- Example on the left: Skip frequency = 5 Hz, bandwidth = 10 Hz
  → Valid range (starts at ≥ 0)
- Example on the right: Skip frequency = 4 Hz, bandwidth = 10 Hz
  → Invalid range (starts at < 0); is thus ignored.




**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x291F:001<br>(P317.01) | Skip frequencies: Skip frequency 1<br>(Skip frequencies: Skip frequency 1)<br>0.0 ... [**0.0**] ... 599.0 Hz | Center of frequency range 1 which is to be skipped. |
| 0x291F:002<br>(P317.02) | Skip frequencies: Skip bandwidth 1<br>(Skip frequencies: Skip bandwidth 1)<br>0.0 ... [**0.0**] ... 10.0 Hz | Size of frequency range 1 which is to be skipped. |
| 0x291F:003<br>(P317.03) | Skip frequencies: Skip frequency 2<br>(Skip frequencies: Skip frequency 2)<br>0.0 ... [**0.0**] ... 599.0 Hz | Center of frequency range 2 which is to be skipped. |
| 0x291F:004<br>(P317.04) | Skip frequencies: Skip bandwidth 2<br>(Skip frequencies: Skip bandwidth 2)<br>0.0 ... [**0.0**] ... 10.0 Hz | Size of frequency range 2 which is to be skipped. |
| 0x291F:005<br>(P317.05) | Skip frequencies: Skip frequency 3<br>(Skip frequencies: Skip frequency 3)<br>0.0 ... [**0.0**] ... 599.0 Hz | Center of frequency range 3 which is to be skipped. |
| 0x291F:006<br>(P317.06) | Skip frequencies: Skip bandwidth 3<br>(Skip frequencies: Skip bandwidth 3)<br>0.0 ... [**0.0**] ... 10.0 Hz | Size of frequency range 3 which is to be skipped. |
| 0x291F:016 | Skip frequencies: Status<br>• Read only | Bit-coded status display of the skip frequencies. |
| | Bit 0 Blocking zone 1 active | |
| | Bit 1 Blocking zone 2 active | |
| | Bit 2 Blocking zone 3 active | |
| | Bit 4 Frequency above blocking zone 1 | |
| | Bit 5 Frequency above blocking zone 2 | |
| | Bit 6 Frequency above blocking zone 3 | |
| | Bit 8 Blocking zone 1 invalid | |
| | Bit 9 Blocking zone 2 invalid | |
| | Bit 10 Blocking zone 3 invalid | |
| 0x291F:032 | Skip frequencies: Input frequency<br>• Read only: x.xx Hz | Display of the skip filter input frequency. |
| 0x291F:033 | Skip frequencies: Output frequency<br>• Read only: x.xx Hz | Display of the skip filter output frequency. |

### 10.5.2 DC braking

The "DC braking" function generates a braking torque by injecting a DC current into the motor. The function can be used to shorten the braking of a load with high mass inertia. Another application is holding the motor shaft before starting or while stopping.

**NOTICE**

Avoid long-time activation of the "DC braking" function with a high braking current or a high braking voltage!

Possible consequence: thermal motor overload.

- Only use the "DC braking" function with applications in which the load is only occasionally stopped.
- Do not activate the "DC braking" function longer than necessary.

**Preconditions**

The "DC braking" function can only be activated if the inverter is enabled.

This function is not available for the SL-PSM motor control mode 0x2C00 (P300.00).

**Details**

The function can be used as follows:

1. Automatically when the motor is started.
2. Automatically when the motor is stopped.
3. Manually (via the flexible I/O configuration).

The three options can also be combined, for instance automatic DC braking when starting and stopping the motor.

For further details and configuration examples, see the following subchapter:

- Example: Automatic DC braking when starting the motor 191
- Example: Automatic DC braking when stopping the motor 192
- Activating DC braking manually 194
- Migration of Lenze Inverter Drives 8200/8400 196

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2B84:001<br>(P704.01) | DC braking: Current<br>(DC braking: Current)<br>0.0 ... [**0.0**] ... 200.0 % | Braking current for DC braking.<br>• 100 % = Rated motor current 0x6075 (P323.00) |
| 0x2B84:002<br>(P704.02) | DC braking: Automatic hold time<br>(DC braking: Hold time autom.)<br>0.0 ... [**0.0**] ... 1000.0 s | Hold time for automatic DC braking.<br>• The "Automatic DC braking" function is active for the time set here.<br>• 1000.0 = infinite<br>Note!<br>Do not set this parameter to the value "1000.0" (infinite) if the DC braking is used during the start. The "Infinite" setting can be used to lock the rotor for an indefinite time while a stop is active. However, ensure here that the longer DC braking does not cause a thermal overload of the motor! |
| 0x2B84:003<br>(P704.03) | DC braking: Automatic operating threshold<br>(DC braking: Threshold autom.)<br>0.0 ... [**0.0**] ... 599.0 Hz | Operating threshold for automatic DC braking.<br>• With the setting 0, the "Automatic DC braking" function is deactivated. |
| 0x2B84:004<br>(P704.04) | DC braking: Demagnetization time<br>(DC braking: Demagnet. time)<br>0 ... [**100**] ... 150 %<br>• From version 04.00 | In the default setting, the DC braking is activated after the standard demagnetising time has elapsed. This parameter can be used to adapt the time.<br>• 100 % = Default demagnetization time 0x2B84:005 (P704.05)<br>Note!<br>A too short demagnetising time can cause an overcurrent error! |
| 0x2B84:005<br>(P704.05) | DC braking: Default demagnetization time<br>(DC braking: Def. demag. time)<br>• Read only: x ms<br>• From version 04.00 | Display of the standard demagnetising time as a setting help for the user.<br>• This time is calculated by the inverter:<br>Demagnetising time = 7 * rotor time constant |

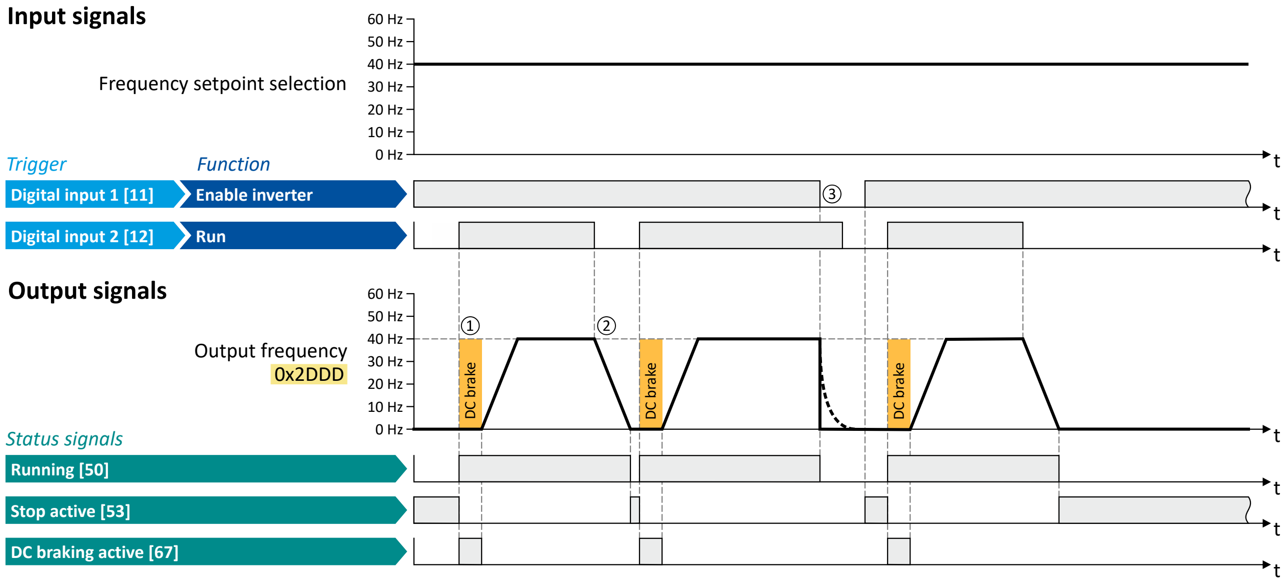
| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2B84:006 (P704.06) | DC braking: Inverter disable (DC braking: Inverter disable) | | 1 = behaviour in case of automatic DC braking as with the Lenze Inverter Drives 8200/8400. The behaviour of the Lenze Inverter Drives 8200/8400 in case of automatic DC braking is different: In case of these inverters, after the auto DCB hold time has elapsed, the motor is deenergised (by means of pulse inhibit) until the setpoint exceeds th auto DCB operating threshold. In order to make a migration to the i500 inverter series easier, the setting "1" serves to activate the same behaviour in the i500. |
| | **0** | **Deactivated** | |
| | 1 | Activated | |

### 10.5.2.1 Example: Automatic DC braking when starting the motor

In order that the DC braking is automatically active when the motor is started, the start method "DC braking [1]" must be set in 0x2838:001 (P203.01).

- The DC braking is carried out with the braking current set in 0x2B84:001 (P704.01).
- Only after the hold time 0x2B84:002 (P704.02) has elapsed, the motor is accelerated to the setpoint.

| Parameter | Designation | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Digital input 1 [11] |
| 0x2631:002 (P400.02) | Run | Digital input 2 [12] |
| 0x2631:004 (P400.04) | Reset fault | Not connected [0] |
| 0x2838:001 (P203.01) | Start method | DC braking [1] |
| 0x2860:001 (P201.01) | Frequency control: Default setpoint source | Frequency preset 1 [11] |
| 0x2911:001 (P450.01) | Frequency setpoint presets: Preset 1 | 40 Hz |
| 0x2B84:001 (P704.01) | Current | 50 % |
| 0x2B84:002 (P704.02) | Automatic hold time | 10 s |




The status signals can be assigned to digital outputs. ▶ Configure digital outputs 247

① After the start command, the DC braking is active. Only after the hold time 0x2B84:002 (P704.02) has elapsed, the motor is accelerated to the setpoint.

② The motor is stopped with the stop method set in 0x2838:003 (P203.03). In the example: Stop with standard ramp.

③ If the inverter is disabled, the motor coasts.

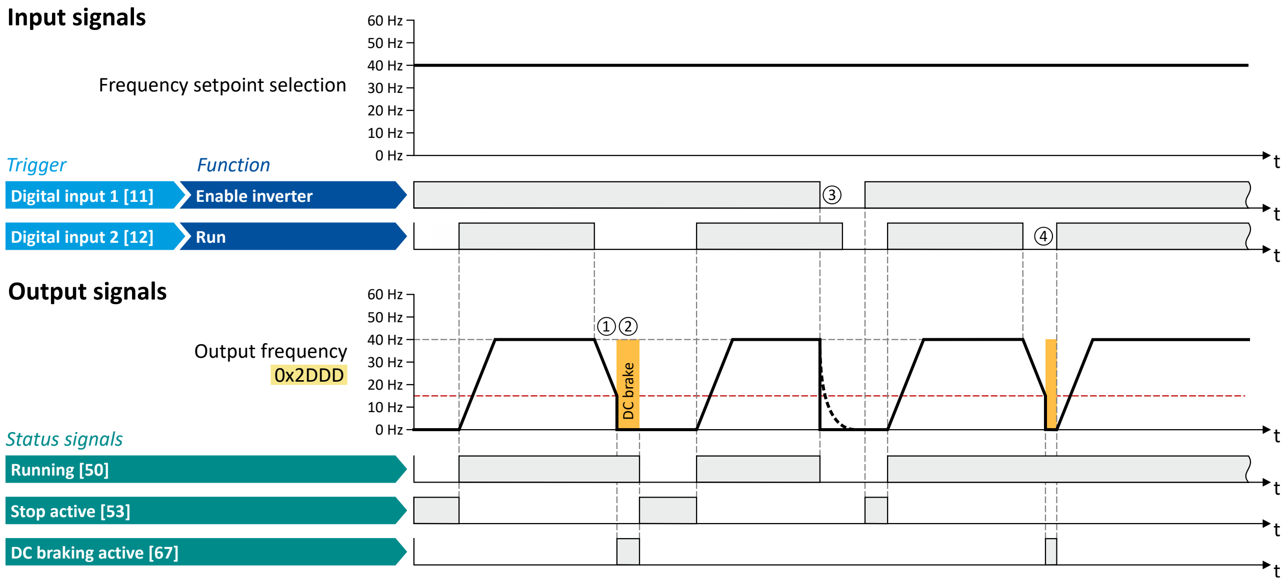
### 10.5.2.2 Example: Automatic DC braking when stopping the motor

In order that the DC braking is automatically active when the motor is stopped, the corresponding operating threshold must be set in 0x2B84:003 (P704.03).

- After a stop command, the motor is first decelerated as set. Once the output frequency falls below the set operating threshold, the inverter stops the deceleration and activates DC braking.
- DC braking is carried out with the braking current set in 0x2B84:001 (P704.01) for the hold time set in 0x2B84:002 (P704.02).
- The exact behaviour depends on the stop method set in 0x2838:003 (P203.03).

**Stop method = "Standard ramp [1]"**

| Parameter | Designation | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Digital input 1 [11] |
| 0x2631:002 (P400.02) | Run | Digital input 2 [12] |
| 0x2631:004 (P400.04) | Reset fault | Not connected [0] |
| 0x2838:003 (P203.03) | Stop method | Standard ramp [1] |
| 0x2860:001 (P201.01) | Frequency control: Default setpoint source | Frequency preset 1 [11] |
| 0x2911:001 (P450.01) | Frequency setpoint presets: Preset 1 | 40 Hz |
| 0x2B84:001 (P704.01) | Current | 50 % |
| 0x2B84:002 (P704.02) | Automatic hold time | 10 s |
| 0x2B84:003 (P704.03) | Automatic operating threshold | 15 Hz |




The status signals can be assigned to digital outputs. ▶ Configure digital outputs 📖 247

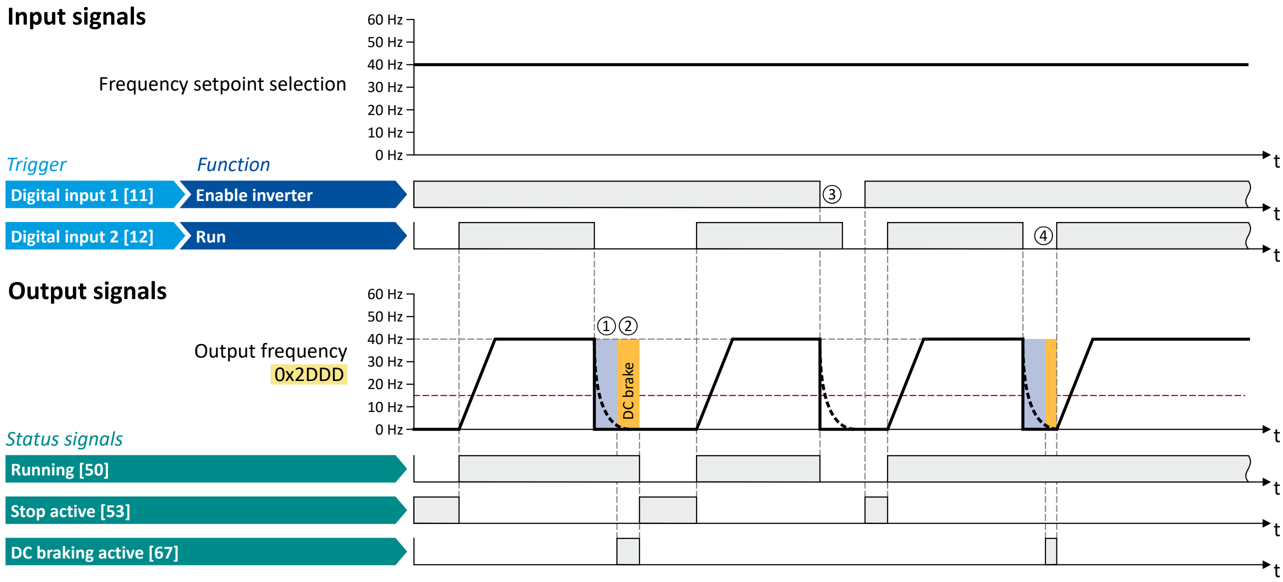
① With the stop method "Standard ramp [1]", the motor is first decelerated normally until the value falls below the operating threshold set in 0x2B84:003 (P704.03).
② The DC braking becomes active for the hold time set in 0x2B84:002 (P704.02).
③ If the inverter is disabled, the motor coasts. (DC braking is only possible if the inverter is enabled.)
④ If there is a new start command within the hold time, the DC braking is cancelled. The motor is accelerated to the setpoint again.

**Stop method = "Quick stop ramp [2]"**

Same behaviour as with the stop method "Standard ramp [1]", except that the motor is decelerated with the quick stop ramp instead of the standard ramp.

### Stop method = "Coasting [0]"

| Parameter | Designation | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Digital input 1 [11] |
| 0x2631:002 (P400.02) | Run | Digital input 2 [12] |
| 0x2838:003 (P203.03) | Stop method | Coasting [0] |
| 0x2860:001 (P201.01) | Frequency control: Default setpoint source | Frequency preset 1 [11] |
| 0x2911:001 (P450.01) | Frequency setpoint presets: Preset 1 | 40 Hz |
| 0x2B84:001 (P704.01) | Current | 50 % |
| 0x2B84:002 (P704.02) | Automatic hold time | 10 s |
| 0x2B84:003 (P704.03) | Automatic operating threshold | 15 Hz |




The status signals can be assigned to digital outputs. ▶ Configure digital outputs 📖 247

① With the stop method "Coasting [0]", the motor first coasts down for a specified time. This "demagnetising time" serves to reduce the induced voltage.

② The DC braking becomes active for the hold time set in 0x2B84:002 (P704.02).

③ If the inverter is disabled, the motor coasts. (DC braking is only possible if the inverter is enabled.)

④ If there is a new start command within the hold time, the DC braking is cancelled. The motor is accelerated to the setpoint again.

### 10.5.2.3 Activating DC braking manually

By means of the "Activate DC braking" function, DC braking can be activated manually.

**Preconditions**

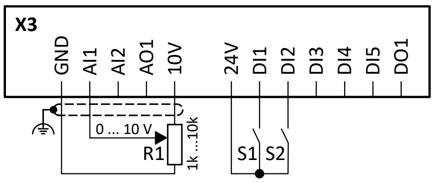
The current for DC braking must be set > 0 % so that the function can be executed.

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2631:005<br>(P400.05) | Function list: Activate DC braking<br>(Function list: DC braking)<br>• Further possible settings: ▸ Trigger list 📖 59 | | Assignment of a trigger for the "Activate DC braking" function.<br>Trigger = TRUE: Activate DC braking.<br>Trigger = FALSE: Deactivate DC braking.<br>⚠ CAUTION!<br>DC braking remains active as long as the trigger is set to TRUE.<br>▸ DC braking 📖 190 |
| | **0** | **Not connected** | No trigger assigned (trigger is constantly FALSE). |

**Example for operating mode**

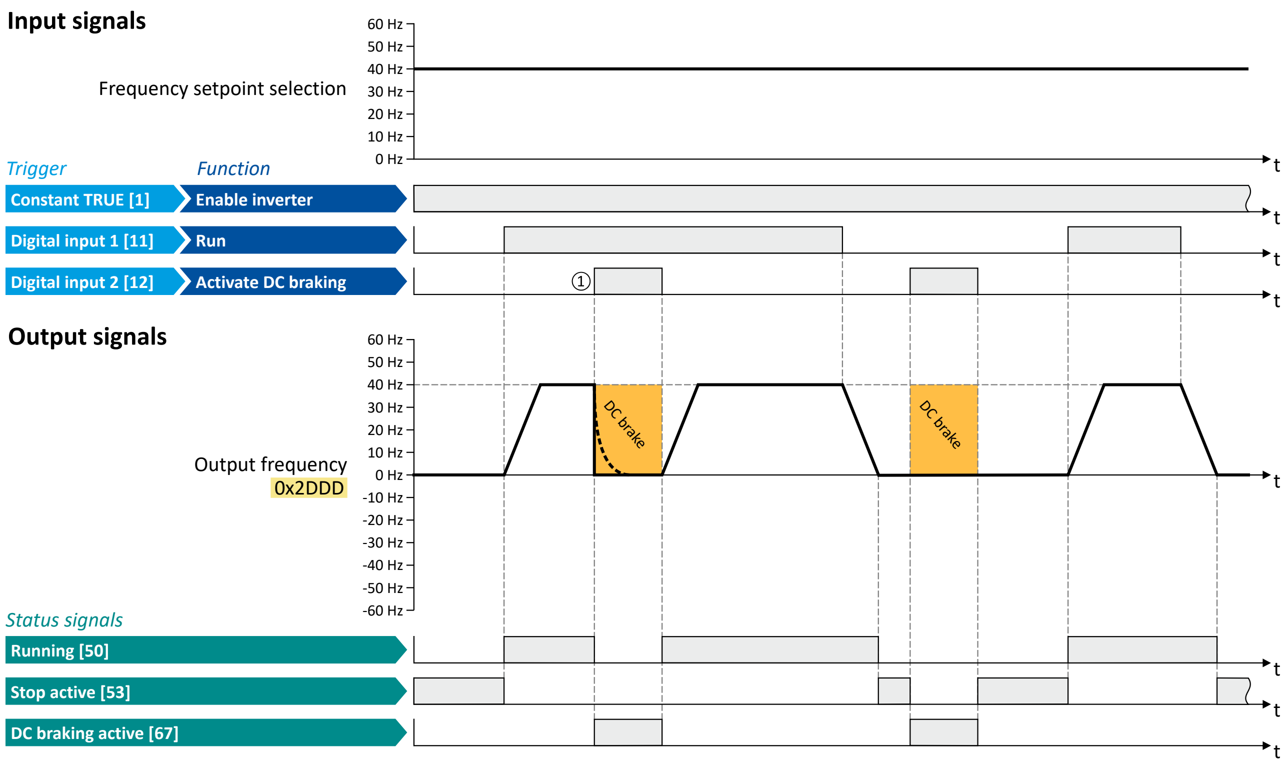
- Switch S1 starts the motor in forward direction of rotation. De-asserting switch S1 stops the motor again.
- Switch S2 activates DC braking.

| Connection plan | Function | |
|---|---|---|
|  | Potentiometer R1 | Frequency setpoint selection |
| | Switch S1 | Run |
| | Switch S2 | Activate DC braking |



| Parameter | Designation | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2631:004 (P400.04) | Reset fault | Not connected [0] |
| 0x2631:005 (P400.05) | Activate DC braking | Digital input 2 [12] |
| 0x2824 (P200.00) | Control selection | Flexible I/O configuration [0] |
| 0x2838:003 (P203.03) | Stop method | Standard ramp [1] |
| 0x2860:001 (P201.01) | Frequency control: Default setpoint source | Analog input 1 [2] |
| 0x2B84:001 (P704.01) | DC braking: Current | 10 % |






The status signals can be assigned to digital outputs. ▶ Configure digital outputs 247

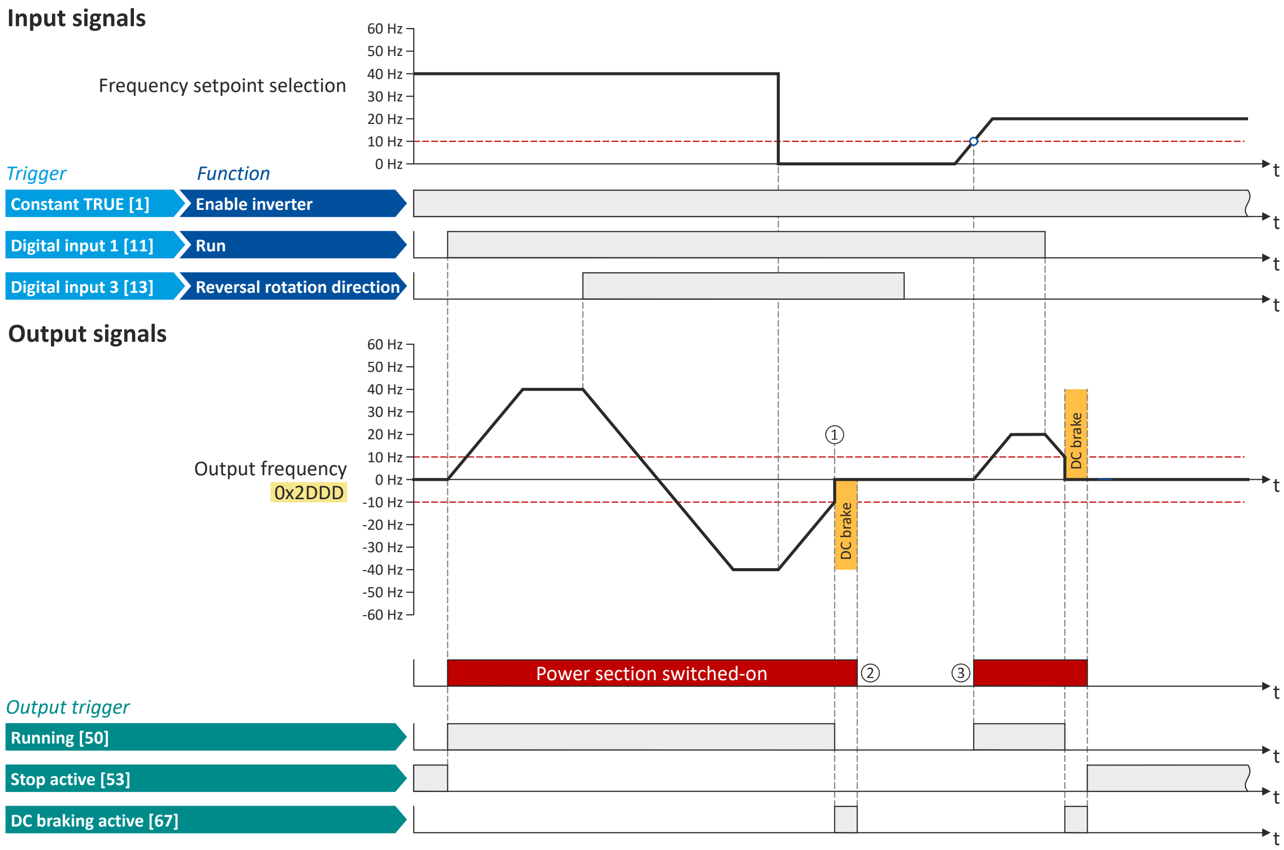
① If DC braking is activated while the motor is running, the output pulses of the inverter are disabled immediately. For stopping the motor, the current set in 0x2B84:001 (P704.01) is injected. The exact drive behaviour depends on the settings for the "DC braking" function and the load properties.

### 10.5.2.4 Migration of Lenze Inverter Drives 8200/8400

The behaviour of the Lenze Inverter Drives 8200/8400 in case of automatic DC braking is different: In case of these inverters, after the auto DCB hold time has elapsed, the motor is deenergised (by means of pulse inhibit) until the setpoint exceeds the auto DCB operating threshold. In order to make a migration to the i500 inverter series easier, the setting 0x2B84:006 (P704.06) = "1" serves to activate the same behaviour in the i500.

The following example illustrates the behaviour of the function if 0x2B84:006 (P704.06) = "1".

| Parameter | Designation | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2631:013 (P400.13) | Reverse rotational direction | Digital input 3 [13] |
| 0x2838:003 (P203.03) | Stop method | Standard ramp [1] |
| 0x2B84:001 (P704.01) | Current | 50 % |
| 0x2B84:002 (P704.02) | Automatic hold time | 10 s |
| 0x2B84:003 (P704.03) | Automatic operating threshold | 10 Hz |
| 0x2B84:006 (P704.06) | Inverter disable | 1 |




The status signals can be assigned to digital outputs. ▶ Configure digital outputs 247

① If the setpoint falls below the operating threshold set in 0x2B84:003 (P704.03), the DC braking gets active for the hold time set in 0x2B84:002 (P704.02).

② After the hold time has elapsed, the power section is switched off.

③ If the setpoint exceeds the operating threshold again, the power section is switched on again. The motor is accelerated to the setpoint again.

### 10.5.3 Holding brake control

This function serves as a low-wear control of a holding brake. The holding is usually mounted to the motor as an option. The holding brake can be automatically released via the start command for the inverter or manually via an external control signal, for instance, by a higher-level Controller. The interaction of higher-level Controller and holding brake is especially important for vertical applications. Horizontal applications need a less demanding holding brake control.

**Preconditions**

- Observe that the holding brake is an important element of the machine's safety concept as a whole. Therefore be sure to carry out commissioning of this system part with particular care!
- Holding brakes are not intended for braking during operation. The increased wear caused by braking during operation may destroy the holding brake prematurely!
- **Automatic DC braking must be deactivated if a holding brake is used.**
- The holding brake control itself only outputs a digital trigger for releasing the holding brake. This trigger "Release holding brake [115]" must be assigned to a digital output or, in the simplest case, to the relay when then switches the brake supply. ▶ Configure digital outputs 📖 247
- If the holding brake is to be controlled via a digital output, the use of an additional relay or power contactor is required. The digital output is not suited for direct control of a holding brake.
- If, instead of an electrically releasing (self-holding) holding brake, an electrically holding (self-releasing) holding brake is to be controlled, a signal inversion for the digital output used or for the relay must be set! ▶ Configure digital outputs 📖 247

### 10.5.3.1 Basic setting

The following parameters must be set for the activation and basic configuration of the holding brake control.

When a power contactor is used, the response time and release time of the contactor are added to the brake application and release time. Both times must also be taken into consideration for parameterising the brake application time and brake opening time!

Deactivate automatic DC braking, if a holding brake is used.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2820:001<br>(P712.01) | Holding brake control: Brake mode<br>(Brake control: Brake mode) | Selecting how the "Release holding brake" command is to be triggered. |
| | 0 Automatically (via device state) | "Automatic operation": The "Release holding brake" command is automatically carried out as a function of the device state and further conditions.<br>⚠ CAUTION!<br>In automatic operation, a manual release of the holding brake is also possible! For details see the following information for selection "Manually [1]". |
| | 1 Manually | The "Release holding brake" command can also be initiated by the following external triggers:<br>• Via the trigger assigned to the "Release holding brake" function in 0x2631:049 (P400.49) if the network control is not active.<br>• Via bit 14 in the CiA control word 0x6040 if the network control is active.<br>⚠ CAUTION!<br>• The manually triggered "Release holding brake" command has a direct impact on the "Release holding brake [115]" trigger. Thus, the holding brake can be manually released if the power section is switched off!<br>• The ramp function generator only starts up when the brake is released in the case of manual control.<br>• The responsibility for a manual release of the holding brake has the external trigger source for the "Release holding brake" command! |
| | **2 Off** | The holding brake is deactivated. |
| 0x2820:002<br>(P712.02) | Holding brake control: Brake closing time<br>(Brake control: Closing time)<br>0 ... [**100**] ... 10000 ms | Application time (engagement time) of the holding brake.<br>• Only effective in automatic operation. |
| 0x2820:003<br>(P712.03) | Holding brake control: Brake opening time<br>(Brake control: Opening time)<br>0 ... [**100**] ... 10000 ms | Release time (disengagement time) of the holding brake.<br>• Only effective in automatic operation. |
| 0x2820:015<br>(P712.15) | Holding brake control: Brake status<br>(Brake control: Brake status)<br>• Read only | Display of the holding brake status.<br>• The status is also displayed via bit 14 in the CiA status word 0x6041 (P780.00). |
| | 0 Active | Holding brake is applied. |
| | 1 Brake released | Holding brake is released. |

For examples and details on more possible settings, see the following subchapter:


- "Automatic" brake mode (automatic operation) 🕮 199
- Brake holding load 🕮 200
- Brake closing threshold 🕮 202
- Manual release of the holding brake 🕮 204

### 10.5.3.2 "Automatic" brake mode (automatic operation)

In automatic operation, the inverter automatically released the holding brake when the motor is started. In the stopped state, the holding brake is closed.

**DANGER!**

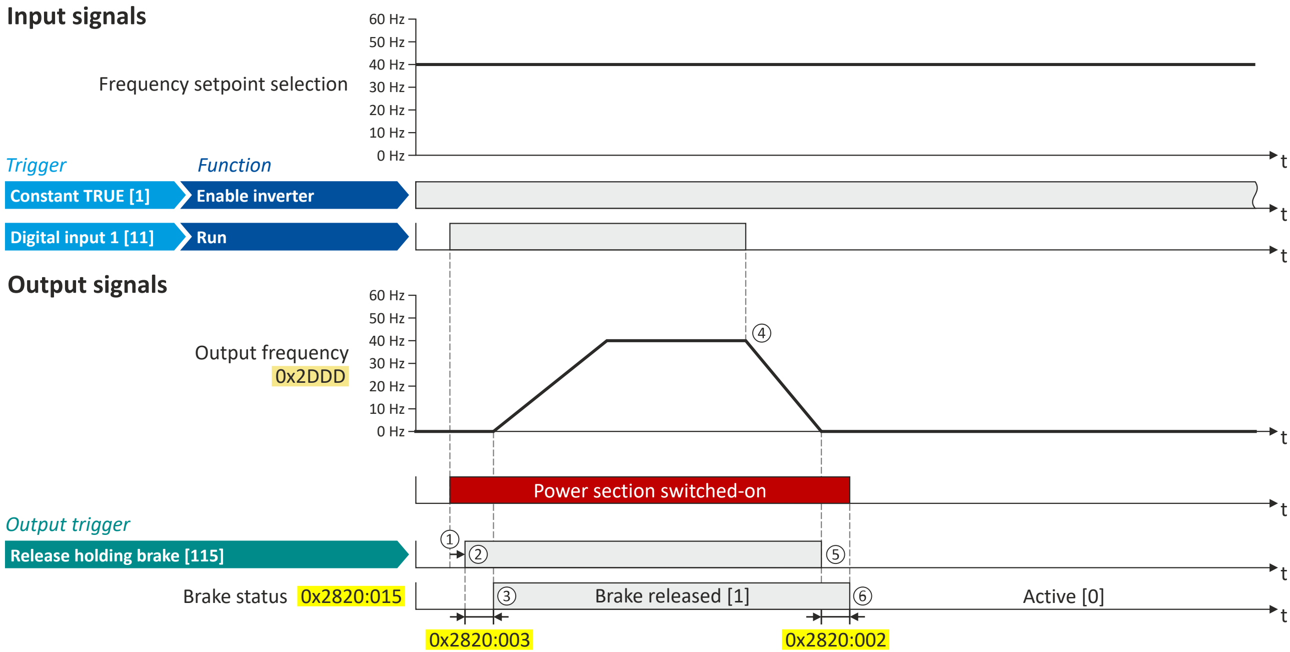
Manual release of the holding brake

In automatic operation, a manual release of the holding brake is also possible. The manually triggered "Release holding brake" command has a direct impact on the "Release holding brake [115]" trigger. Thus, the holding brake can be manually released if the power section is switched off.

- The responsibility for a manual release of the holding brake has the external trigger source for the "Release holding brake" command!

#### General mode of operation

The following diagram demonstrates the general functional principle of automatic operation:




| | |
|---|---|
| ① | If the inverter is enabled and no error is active, the motor can be started with the "Run" function in forward rotating direction. The power section is switched on and the motor is magnetized first. |
| ② | The holding brake is released. In this case, the output trigger "Release holding brake [115]" is set to TRUE. This trigger must be assigned to a digital output or, in the simplest case, to the relay which then switches the brake supply. |
| ③ | After the release time 0x2820:003 (P712.03) has elapsed, the motor is accelerated to the setpoint. In 0x2820:015 (P712.15), the brake status "Brake released [1]" is displayed. |
| ▫ | If "Run" is set to FALSE, the motor is stopped with the stop method set in 0x2838:003 (P203.03). In the example: Stop with standard ramp. |
| ⑤ | Then the holding brake is closed again. |
| ⑥ | After the closing time 0x2820:002 (P712.02) has elapsed, the brake status "Active [0]" is displayed in 0x2820:015 (P712.15). |

If the power section is disabled, the holding brake is closed. This may be due to an error.

### 10.5.3.3 Brake holding load

Depending on the application, a torque at the motor may be required at speed "0" of the motor shaft:

- In order to hold loads in vertical applications and prevent "sagging".
- In order to prevent a position loss in horizontal applications.

For this purpose, a brake holding load can be set. The brake holding load can be optionally generated via a ramp to reduce a vibration stimulation that may be caused by the brake holding load.

**Preconditions**

Ensure that the inverter builds up a sufficient torque in the motor when releasing and applying the holding, in order to hold the load.

- For this purpose, a V/f voltage boost can be set for the V/f characteristic control. ▶ Set voltage boost 📖 175
- The parameters for the V/f voltage boost are automatically set when you carry out an automatic identification of the motor.

**Details**

Relevant parameters:

- 0x2820:008 (P712.08): Brake holding load
- 0x2820:013 (P712.13): Holding load ramptime

Setting notes:

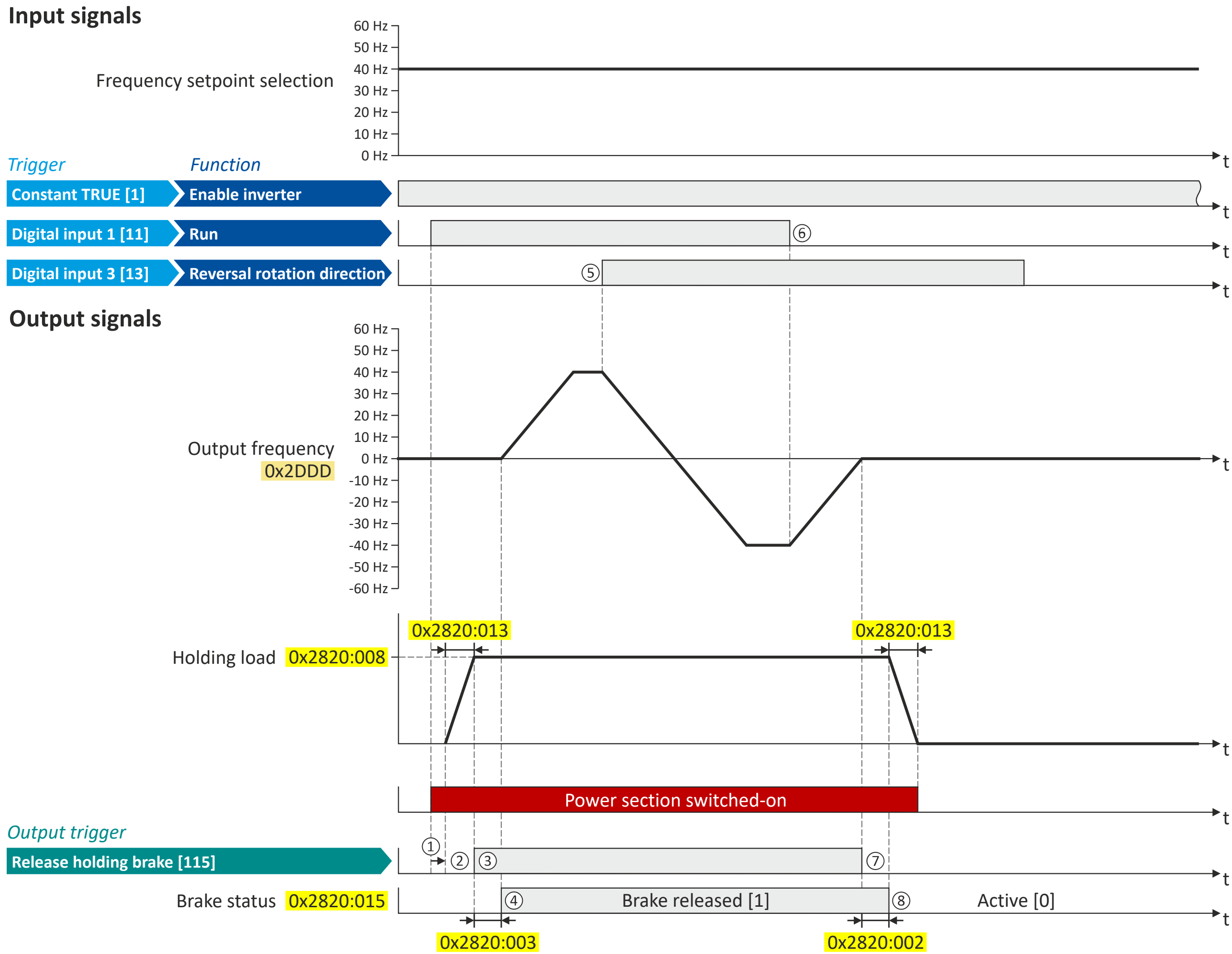
- In case of applications with constant load, a constant value is suitable for the brake holding load.
- If the load changes, an approximate value for the brake holding load has to be considered.
- Start with the setting "0 %" if you do not know the correct direction, otherwise with, for instance, "30 %". Afterwards change the setting upwards or downwards in 10-% steps.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2820:008<br>(P712.08) | Holding brake control: Brake holding load<br>(Brake control: Holding load)<br>-500.0 ... [**0.0**] ... 500.0 %<br>• Setting can only be changed if the inverter is disabled. | By setting a holding load, the load can be held against the force of gravity in case of vertical applications, and a position loss can be prevented in case of horizontal applications.<br>• The setting of "100 %" approximately corresponds to rated motor torque and slip frequency.<br>Note!<br>The torque for creating the holding load depends on the selected motor control type and its settings. Before using this function, make sure that you have set the motor control type correctly. |
| 0x2820:013<br>(P712.13) | Holding brake control: Holding load ramptime<br>(Brake control: HoldLoad ramptim)<br>0 ... [**0**] ... 100 ms<br>• Setting can only be changed if the inverter is disabled.<br>• From version 03.00 | By setting a ramp time, a vibration stimulation can be reduced that might be caused by the brake holding load 0x2820:008 (P712.08). |

### General mode of operation

The following diagram demonstrates the general functioning in automatic operation:




① If the inverter is enabled and no error is active, the motor can be started with the "Run" function in forward rotating direction. The power section is switched on and the motor is magnetised first.

② The brake holding load set in 0x2820:008 (P712.08) is build up via the ramp set in 0x2820:013 (P712.13).

③ The holding brake is released. For this purpose, the output trigger "Release holding brake [115]" is set to TRUE. This trigger must be assigned to a digital output or, in the simplest case, to the relay which then switches the brake supply.

④ After the release time 0x2820:003 (P712.03) has elapsed, the motor is accelerated to the setpoint. The brake status "Brake released [1]" is displayed in 0x2820:015 (P712.15).

⑤ In case the direction of rotation reverses, the holding brake remains released.

⑥ If "Run" is set to FALSE, the motor is stopped with the stop method set in 0x2838:003 (P203.03). In the example: Stop with standard ramp.

⑦ Then the holding brake is closed again.

⑧ After the closing time 0x2820:002 (P712.02) has elapsed, the brake status "Active [0]" is displayed in 0x2820:015 (P712.15). The brake holding load is reduced again via the ramp.

#### 10.5.3.4 Brake closing threshold

In some cases, a low speed does not make any sense from the application point of view. This includes applications with unfavorable load features, such as static friction. In such applications and depending on the type of control, a low speed may cause an unwanted behaviour. In order to prevent such an operating situation, a closing threshold can be set. The power section will only be switched on and the holding brake is opened if the setpoint is higher than the closing threshold. In order to prevent the holding brake from being closed if the setpoint only shortly falls below the closing threshold during operation, a delay time can be set in addition.

**Preconditions**

If the holding brake is controlled manually via an external control signal: It must be ensured that the motor does not move while the motor control is deactivated by this function.

**Details**

The function is part of the holding brake control and does not have independent functionality.

Relevant parameters:
- 0x2820:007 (P712.07): Brake closing threshold
- 0x2820:012 (P712.12): Closing threshold delay

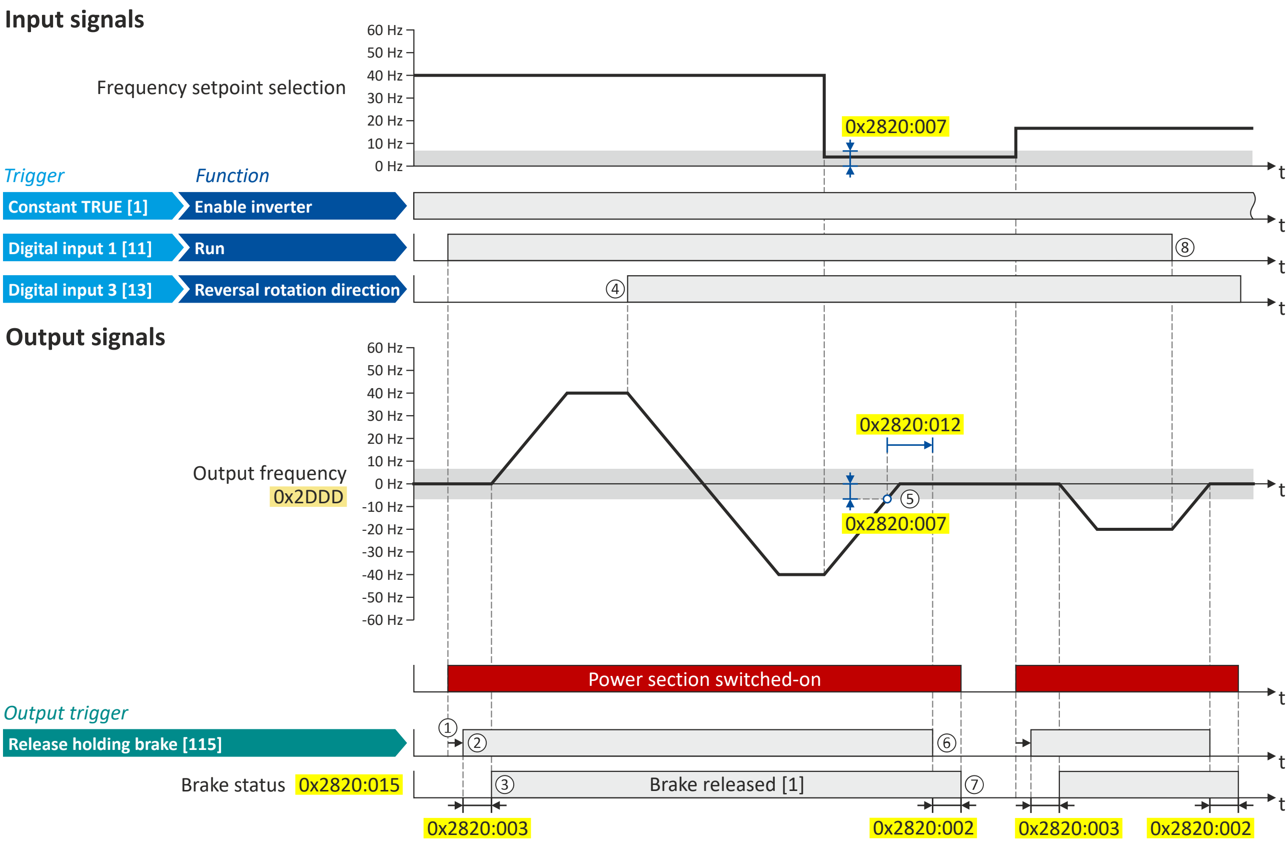
Setting notes:
- The function is active if the brake closing threshold is higher than 0 Hz.
- In order that the brake can work correctly, the brake closing threshold must be set to a value that is greater than or equals the minimum frequency 0x2915 (P210.00).
- The brake closing threshold has a permanent hysteresis of 1 Hz in order to prevent an unwanted change-over. Exception: If the brake closing threshold is set to 0 Hz, the hysteresis is also 0 Hz.
- If the brake closing threshold is set to 0 Hz, a start command is only required to release the holding brake during automatic operation.
- This function can be combined with the setting of a holding load.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2820:007<br>(P712.07) | Holding brake control: Brake closing threshold<br>(Brake control: Closing thresh.)<br>0.0 ... [**0.2**] ... 599.0 Hz | Threshold for closing the holding brake.<br>• The power section will only be switched on and the holding brake will be opened if the setpoint is higher than the threshold set here.<br>• In order that the brake can work correctly, the brake closing threshold must be set to a value that is greater than or equals the minimum frequency 0x2915 (P210.00).<br>• The brake closing threshold has a permanent hysteresis of 1 Hz in order to prevent an unwanted change-over. Exception: If the brake closing threshold is set to 0 Hz, the hysteresis is also 0 Hz.<br>• In case of a setting of "0 Hz", only a start command is required to release the holding break during automatic operation. |
| 0x2820:012<br>(P712.12) | Holding brake control: Closing threshold delay<br>(Brake control: ClosingThr delay)<br>0 ... [**0**] ... 10000 ms<br>• From version 03.00 | By setting a deceleration, a closing of the holding brake can be prevented if the frequency only temporarily falls below the brake closing threshold 0x2820:007 (P712.07). |

### General mode of operation

The following diagram demonstrates the general functioning in automatic operation:




① If the inverter is enabled and no error is active, the motor can be started with the "Run" function in forward rotating direction. The power section is switched on and the motor is magnetised first.

② The holding brake is released. For this purpose, the output trigger "Release holding brake [115]" is set to TRUE. This trigger must be assigned to a digital output or, in the simplest case, to the relay which then switches the brake supply.

③ After the release time 0x2820:003 (P712.03) has elapsed, the motor is accelerated to the setpoint. The brake status "Brake released [1]" is displayed in 0x2820:015 (P712.15).

④ If the direction of rotation reverses, the holding brake remains released (even if the closing threshold delay is running.)

⑤ If the setpoint selection and the internal setpoint for the motor control fall below the brake closing threshold set in 0x2820:007 (P712.07), the output frequency is ramped down to "0 Hz". At the same time the closing threshold delay set in 0x2820:012 (P712.12) starts to run

⑥ If the values fall below the closing threshold longer than the closing threshold delay, the holding brake is closed again.

⑦ After the closing time 0x2820:002 (P712.02) has elapsed, the brake status "Active [0]" is displayed in 0x2820:015 (P712.15).

⑧ If "Run" is set to FALSE, the motor is stopped with the stop method set in 0x2838:003 (P203.03). In the example: Stop with standard ramp. In this case, closing threshold and closing threshold delay are not effective anymore.

### 10.5.3.5 Manual release of the holding brake

The "Open holding brake" function serves to release the holding brake immediately. Brake application time and brake opening time as well as the conditions for the automatic operation are not effective.

#### Preconditions

- Observe setting and application notes in the "Holding brake control" chapter! 📖 197
- The brake mode "Automatic [0]" or "Manual [1]" must be set in 0x2820:001 (P712.01).
- The trigger "Release holding brake [115]" must be assigned to a digital output or, in the simplest case, to the relay which then switches the brake supply.

#### Details

A manual opening of the holding brake is possible in the modes "Automatic [0]" and "Manual [1]" via the following external triggers:

- Via bit 14 in the CiA control word 0x6040.
- Via the trigger in 0x2631:049 (P400.49) assigned to the "Open holding brake" function.

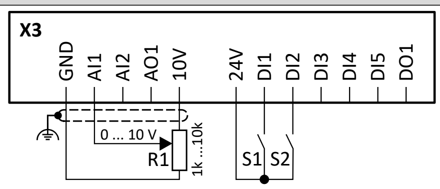
  ▶ Example for operating mode 📖 204

#### Parameter

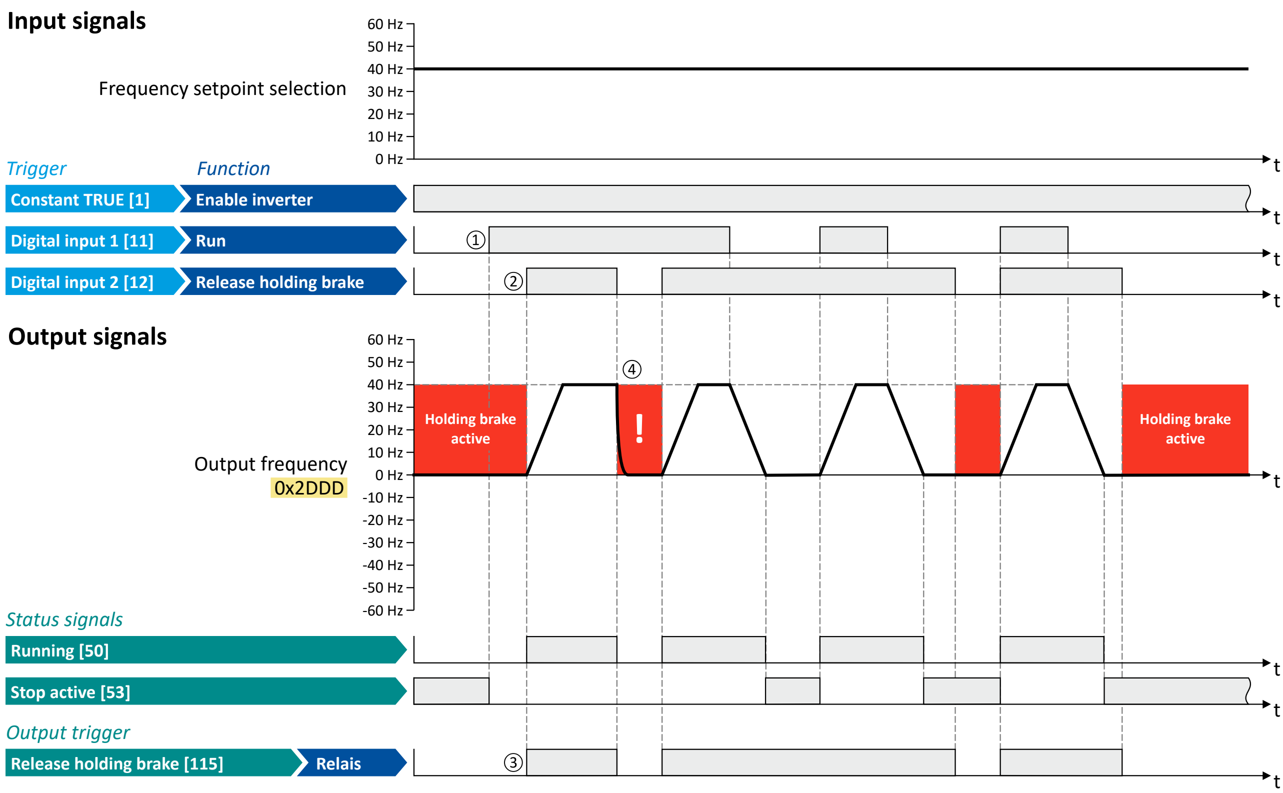
| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2631:049<br>(P400.49) | Function list: Open holding brake<br>(Function list: Open brake)<br>• Setting can only be changed if the inverter is disabled.<br>• Further possible settings: ▶ Trigger list 📖 59 | | Assignment of a trigger for the "Open holding brake" function.<br>Trigger = TRUE: open holding brake (immediately).<br>Trigger = FALSE: no action.<br>Notes:<br>• Function is only executed if the brake mode 0x2820:001 (P712.01) is set to "Automatic [0]" or "Manual [1]".<br>⚠ CAUTION!<br>• The manually triggered "Open holding brake" command has a direct impact on the "Release holding brake [115]" trigger. Thus, the holding brake can be manually released if the power section is switched off!<br>• The responsibility for a manual opening of the holding brake lies with the external trigger source for the "Open holding brake" command! |
| | 0 | **Not connected** | No trigger assigned (trigger is constantly FALSE). |

#### Example for operating mode

- Switch S1 starts the motor in forward direction of rotation. De-asserting switch S1 stops the motor again.
- Switch S2 opens the holding brake. For this purpose, in this example, trigger "Release holding brake [115]" is assigned to the relay that switches the brake supply.

| Connection plan | Function | |
|---|---|---|
|  | Potentiometer R1 | Frequency setpoint selection |
| | Switch S1 | Run |
| | Switch S2 | Open holding brake |

| Parameter | Designation | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2631:004 (P400.04) | Reset fault | Not connected [0] |
| 0x2631:049 (P400.49) | Open holding brake | Digital input 2 [12] |
| 0x2634:001 (P420.01) | Relay | Release holding brake [115] |
| 0x2824 (P200.00) | Control selection | Flexible I/O configuration [0] |
| 0x2838:003 (P203.03) | Stop method | Standard ramp [1] |
| 0x2860:001 (P201.01) | Frequency control: Default setpoint source | Analog input 1 [2] |




The status signals can be assigned to digital outputs. ▶ Configure digital outputs 247

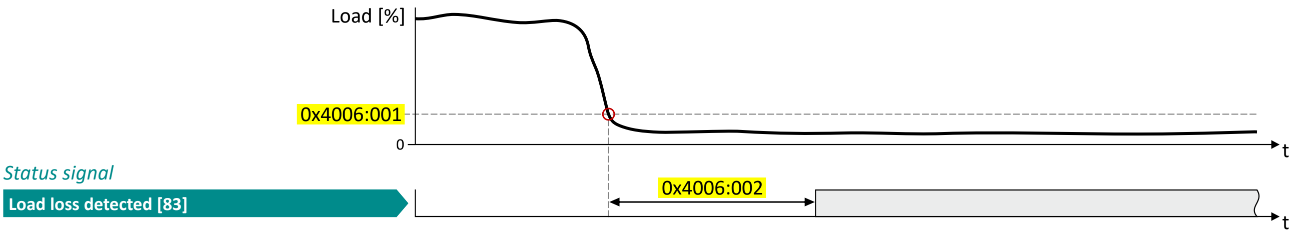
① As the holding brake is active, the motor does not yet start to rotate after the start command.
② The holding brake is opened. The motor is led to the setpoint.
③ In this example, the "Release holding brake [115]" trigger is assigned to the relay that switches the brake supply. In the sleep mode, the holding brake is applied. If the relay is energised, the holding brake is opened.
④ **Note:** Holding brakes are not intended for braking during operation. The increased wear caused by braking during operation may destroy the holding brakes prematurely!

### 10.5.4 Load loss detection

This function serves to detect a load loss during operation and to then activate a specific function, for instance the switching of the relay.

**Details**

If, during operation, the current motor current falls below the threshold set in 0x4006:001 (P710.01) for at least the time set in 0x4006:002 (P710.02), the internal status signal "Load loss detected [83]" is set to TRUE:




- The threshold is set in percent with reference to the rated motor current "Rated motor current" 0x6075 (P323.00).
- The status signal "Load loss detected [83]" can be assigned, for instance, to a digital output or the relay via the flexible I/O configuration. ▶ Configure digital outputs 247
- An error response can be selected in 0x4006:003 (P710.03).
- The load loss detection is not active with active DC braking.

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x4006:001<br>(P710.01) | Load loss detection: Threshold<br>(Load loss detect: Threshold)<br>0.0 ... [**0.0**] ... 200.0 % | | Threshold for load loss detection.<br>• 100 % = rated motor current 0x6075 (P323.00) |
| 0x4006:002<br>(P710.02) | Load loss detection: Delay time<br>(Load loss detect: Delay time)<br>0.0 ... [**0.0**] ... 300.0 s | | Tripping delay for load loss detection. |
| 0x4006:003<br>(P710.03) | Load loss detection: Error response<br>(Load loss detect: Error response)<br>• From version 05.01 | | Selection of the response following the detection of a load loss.<br>Associated error code:<br>• 65336 \| 0xFF38 - Load loss detected |
| | **0** | **No response** | ▶ Error types 456 |
| | 1 | Warning | |
| | 2 | Trouble | |
| | 3 | Fault | |

## 10.6 Options for optimizing the control loops

Various options are available for optimizing the control:

a) Select motor from motor catalog 46
b) Automatic motor identification (energized) 210
c) Automatic motor calibration (non-energized) 211
d) Tuning of the motor and the speed controller 212

**Details**

The option to be selected depends on the respective application. Depending on the selected option, different procedures become active and thus different parameter groups are influenced:

- Rated motor data
- Inverter characteristic
- Motor equivalent circuit diagram data
- Motor controller settings
- Speed controller settings

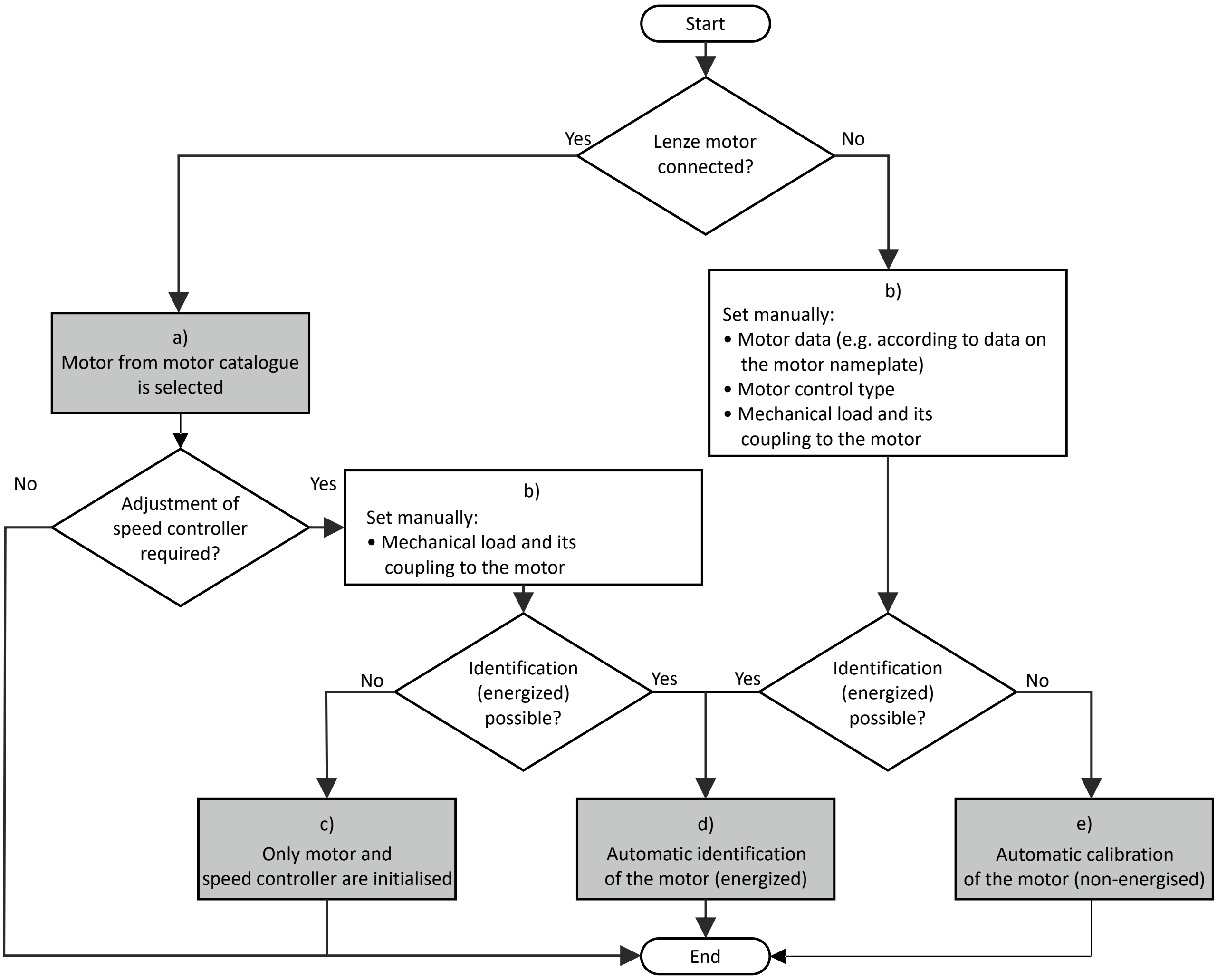
The optimization can be carried out via the keypad or the engineering tools.

Option 1: Performing optimization with engineering tool 208

Option 2: Performing optimization with keypad 209

**Performing optimization with engineering tool**

The following flow diagram shows the optimization process with an engineering tool (e. g. »EASY Starter«):




a) The relevant motor data must be set first. You benefit from very precise motor equivalent circuit diagram data by selecting the motor from the motor catalogue.
   ▶ Select motor from motor catalog 🕮 46

b) Manually set the motor data in accordance with the manufacturer's information / motor data sheet when a third-party motor is connected to the inverter.
   ▶ Manual setting of the motor data🕮 47

c) The speed controller must be first reinitialised alone if the load adjustment in the optimized system has changed.
   ▶ Tuning of the motor and the speed controller 🕮 212

d) If the application enables you to energise the system during the optimization procedure, carry out an automatic identification. This procedure results in the best possible parameter settings.
   ▶ Automatic motor identification (energized) 🕮 210

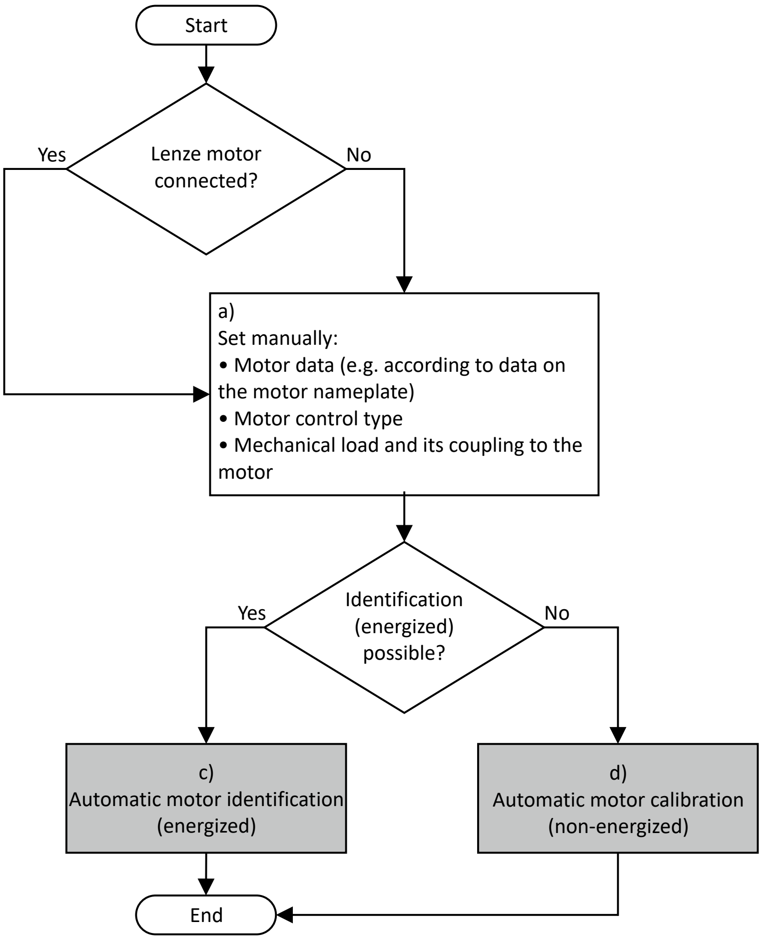
e) If the application does **not** enable you to energise the system during the optimization procedure, carry out an automatic calibration.
   ▶ Automatic motor calibration (non-energized) 🕮 211

**Performing optimization with keypad**

Since there is no access with the keypad to the motor catalogue, first the motor data must be set manually with the keypad according to the manufacturer data/motor data sheet.

▸ Manual setting of the motor data 📖 47

The following flow diagram shows the optimisation process with the keypad:




a) Manually set the motor data in accordance with the manufacturer's information / motor data sheet when a third-party motor is connected to the inverter.
▸ Manual setting of the motor data 📖 47

c) If the application enables you to energise the system during the optimization procedure, carry out an automatic identification. This procedure results in the best possible parameter settings.
▸ Automatic motor identification (energized) 📖 210

d) If the application does not enable you to energise the system during the optimization procedure, carry out an automatic calibration.
▸ Automatic motor calibration (non-energized) 📖 211

### 10.6.1 Automatic motor identification (energized)

The automatic identification of the motor results in the best possible parameter settings. If the application enables you to energise the system during the optimization, carry out this optimization.

**Conditions**

The motor must be cold and at a standstill.

- All rated motor data are known and set in the inverter, either by selecting the motor from the motor catalog or manually:
  - Select motor from motor catalog 46
  - Manual setting of the motor data 47
- In 0x2C00 (P300.00), the motor control type required is suitable for the motor selected.
- In 0x6060 (P301.00), the operating mode "MS: Velocity mode [-2]" or "CiA: Velocity mode [2]" is set.
- DC-bus voltage is available.
- The inverter is error-free and in the "Ready to switch on" or "Switched on" device state.
- The motor is stopped (no start enable).
- No inverter disable is active.
- No quick stop is active.
- No other axis command is active.

**General information on the identification**

- The automatic identification can take from some seconds to minutes.
- The procedure can be aborted any time by inverter disable or cancellation of the start enable without settings being changed.
- During calibration and after the calibration has been completed successfully, the blue LED display is constantly on. As soon as the identification has been executed and the device is deactivated, the LED changes to a blinking mode.
- After completion, a renewed start command is required to start the motor.

**Required steps**

Optimization with engineering tool (e. g. »EASY Starter«):

1. Go to the "Settings" tab and navigate to the parameterization dialog "Advanced motor setting".
2. Press the **Energized** button under "motor calibration".
3. Follow the instructions of the engineering tool.

Optimization with keypad:

1. Request automatic identification: Set 0x2822:004 (P327.04) = "1".
2. Issue the start command to start the procedure.
3. The motor calibration is performed.
4. After completion, issue the start command again.

In order to achieve the most optimum behavior for the user, the parameters listed below can be used to influence the motor identification.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2822:004<br>(P327.04) | Identify motor data (energized)<br>(Identify mot.)<br>0 ... [**0**] ... 1 | 1 = start automatic identification of the motor data.<br>• Inverter characteristics, motor equivalent circuit diagram data and controller settings are identified and set automatically.<br>• During the procedure, the motor is energised! |

**Optimization process**

As soon as the process has been started, the following steps are initiated:

1. The inverter characteristic is automatically identified by the inverter.
2. The motor equivalent circuit diagram data are automatically identified by the inverter.
3. The motor controller settings are automatically calculated.
4. The speed controller settings are automatically calculated.

### 10.6.2 Automatic motor calibration (non-energized)

If the application does not enable you to energise the system during the optimization, carry out this optimization.

**Preconditions**

- All rated motor data is known and set in the inverter, either by selecting the motor from the motor catalogue or manually.
  ▶ Select motor from motor catalog 🕮 46
  ▶ Manual setting of the motor data 🕮 47
- In 0x2C00 (P300.00), the motor control type required and suitable for the motor is selected.
- The inverter is error-free and in the "Ready to switch on" or "Switched on" device state.
- The inverter is disabled or the motor is stopped (no start enable).
- No other axis command is active anymore.

**Required steps**

Optimization with engineering tool (e. g. »EASY Starter«):

1. Go to the "Settings" tab and navigate to the parameterisation dialog "Advanced motor setting".
2. Click the **Non-energized** button under "motor calibration".
3. Follow the instructions of the engineering tool.

Optimization with keypad:

- 0x2822:005 (P327.05) Set = "1" to start the process.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2822:005<br>(P327.05) | Calibrate motor data (non-energized)<br>(Calibrate mot.)<br>0 ... [**0**] ... 1 | 1 = start automatic calibration of the motor data.<br>• A default inverter characteristic is loaded.<br>• the motor equivalent circuit diagram data and controller settings are calculated on the basis of the currently set rated motor data.<br>• The motor is not energised. |

**Optimization process**

As soon as the process has been started, the following steps are initiated:

1. A default inverter characteristic is loaded.
2. The motor equivalent circuit diagram data is calculated based on the currently set rated motor data.
3. The motor controller settings are automatically calculated.
4. The speed controller settings are automatically calculated.

### 10.6.3 Tuning of the motor and the speed controller

The following describes in general how to optimize the speed controller. This may be required if some parameters on the load side of the drive system have changed or have not been set yet, such as:

- Motor moment of inertia
- Load moment of inertia
- Type of coupling between motor moment of inertia and load moment of inertia

**Preconditions**

- All rated motor data is known and set in the inverter, either by selecting the motor from the motor catalog or manually.
  ▸ Select motor from motor catalog 46
  ▸ Manual setting of the motor data 47
- All further options for optimization have been executed before if possible.
  ▸ Automatic motor identification (energized) 210
  ▸ Automatic motor calibration (non-energized) 211
- Optimization is possible online or offline (with or without connected motor).

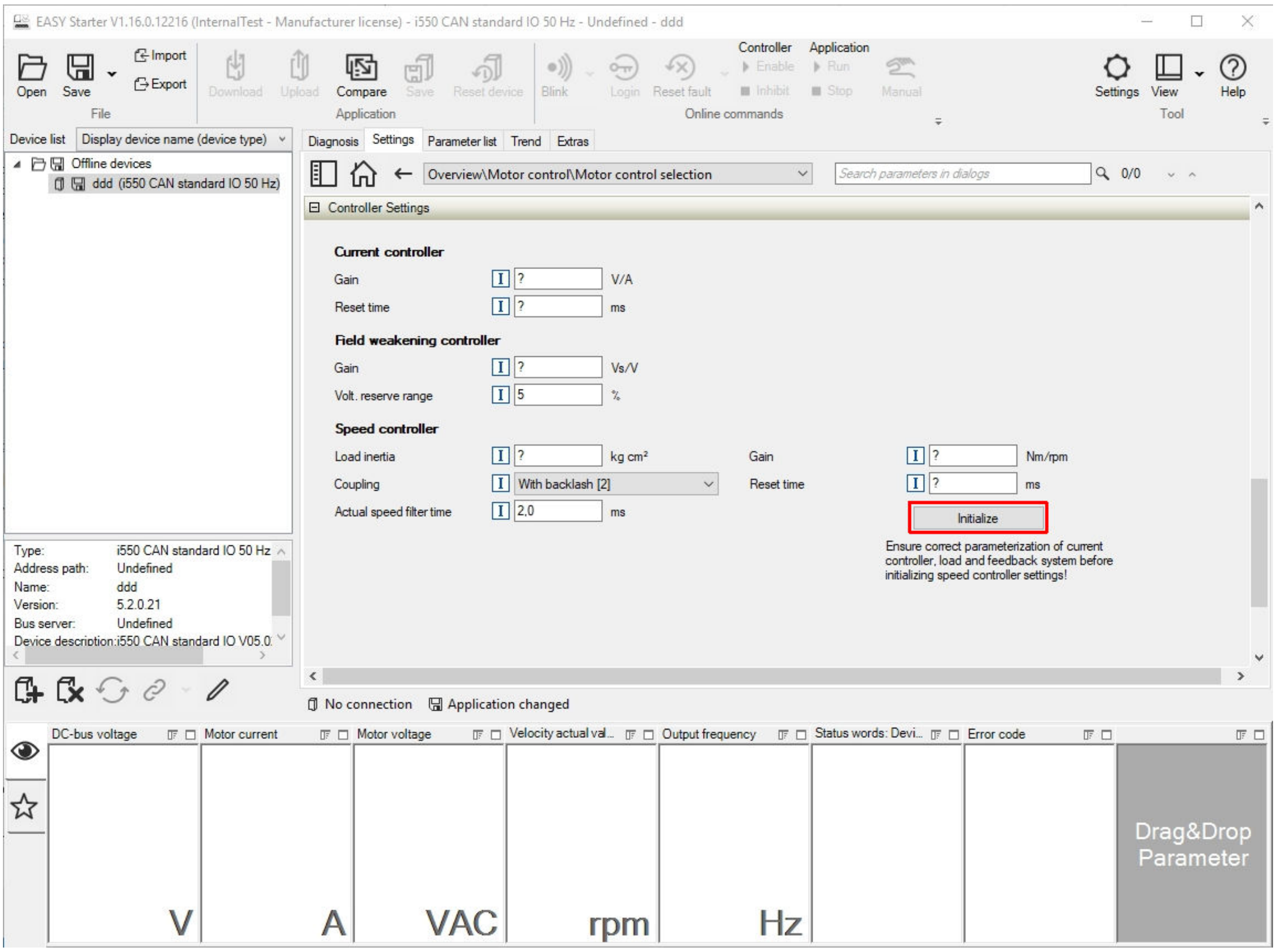


**Required steps**

Adapt the following parameters to your drive system using the engineering tool. Since this only changes load-dependent data, the other parameter groups do not need to be calculated again.

In the engineering tool, the speed control settings can be confirmed via the **Initialise** button.

This function is not available via the keypad.




**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2910:001 (P335.01) | Inertia settings: Motor moment of inertia (Moment of inert.: Motor inertia) 0.00 ... **[3.70]*** ... 20000000.00 kg cm² * Default setting dependent on the model. | | Setting of the moment of inertia of the motor, relating to the motor. |
| 0x2910:002 (P335.02) | Inertia settings: Scaled load inertia (Moment of inert.: Scal load inert.) 0.00 ... [**0.00**] ... 20000000.00 kg cm² | | Setting of the moment of inertia of the load.<br>• Always adjust the setting to the current load, otherwise the optimisation process for the speed controller cannot be executed successfully. |
| 0x2910:003 | Inertia settings: Coupling | | Selection of the type of coupling between the moment of inertia of the motor and that of the load. |
| | 0 | Stiff | |
| | 1 | Elastic | |
| | **2** | **With backlash** | |

For further details on the speed controller, see chapter "Speed controller". 217

### 10.6.4 Inverter characteristic

The inverter characteristic is automatically set if one of the following optimizations is carried out:


▸ Automatic motor identification (energized) 210

▸ Automatic motor calibration (non-energized) 211


The settings made can be seen if required, but should not be changed. A wrong setting may influence the control negatively!

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2947:001 ... 0x2947:017 | Inverter characteristic: Value y1 ... Value y17<br>0.00 ... [**0.00**]* ... 20.00 V<br>* Default setting dependent on the model. | The inverter characteristic (consisting of 17 values) is calculated and set during the automatic identification of the motor data. If only an automatic calibration of the motor data is carried out, a default inverter characteristic is loaded instead.<br><br>Note!<br>Changing these values is not recommended by the manufacturer. |

### 10.6.5 Motor equivalent circuit diagram data

The motor equivalent circuit diagram data are automatically set if one of the following optimizations is carried out:


▸ Select motor from motor catalog 46

▸ Automatic motor identification (energized) 210

▸ Automatic motor calibration (non-energized) 211


If you use a motor of a different manufacturer, you must adapt the data, e. g. from the motor data sheet according to the sizes and units mentioned if required.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2C01:002 | Motor parameters: Stator resistance<br>0.0000 ... [**10.1565**]* ... 125.0000 Ω<br>* Default setting dependent on the model. | General motor data.<br>Carry out settings as specified by manufacturer data/motor data sheet.<br><br>Note!<br>When you enter the motor nameplate data, take into account the phase connection implemented for the motor (star or delta connection). Only enter the data applying to the connection type selected. |
| 0x2C01:003 | Motor parameters: Stator leakage inductance<br>0.000 ... [**23.566**]* ... 500.000 mH<br>* Default setting dependent on the model. | |
| 0x2C02:001<br>(P351.01) | Motor parameter (ASM): Rotor resistance<br>(ASM motor par.: Rotor resistance)<br>0.0000 ... [**8.8944**]* ... 200.0000 Ω<br>* Default setting dependent on the model. | Equivalent circuit data required for the motor model of the asynchronous machine. |
| 0x2C02:002<br>(P351.02) | Motor parameter (ASM): Mutual inductance<br>(ASM motor par.: Mutual induct.)<br>0.0 ... [**381.9**]* ... 50000.0 mH<br>* Default setting dependent on the model. | |
| 0x2C02:003<br>(P351.03) | Motor parameter (ASM): Magnetising current<br>(ASM motor par.: Magn. current)<br>0.00 ... [**0.96**]* ... 500.00 A<br>* Default setting dependent on the model. | |
| 0x2C03:001<br>(P352.01) | Motor parameter (PSM): Back EMF constant<br>(PSM motor par.: BEMF constant)<br>0.0 ... [**41.8**] ... 100000.0 V/1000rpm<br>• From version 02.00 | Voltage induced by the motor (rotor voltage / 1000 rpm).<br>For permanently excited synchronous motors, the e.m.f. constant describes the r.m.s. value of the line-to-line voltage (phase voltage) induced in idle state by the motor (reference: 1000 rpm, 20 °C).<br>Measured: Line to Line (L - L) |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2C03:005<br>(P352.05) | Motor parameter (PSM): D-axis inductance Ld<br>(PSM motor par.: D-axis Ld)<br>0.000 ... [**20.000**]* ... 500.000 mH<br>* Default setting dependent on the model.<br>• From version 05.03 | Parameter not available in this device. |
| 0x2C03:006<br>(P352.06) | Motor parameter (PSM): Q-axis inductance Lq<br>(PSM motor par.: Q-axis Lq)<br>0.000 ... [**20.000**]* ... 500.000 mH<br>* Default setting dependent on the model.<br>• From version 05.03 | |

### 10.6.6 Motor control settings

After the motor settings have been made, the different control loops must be set. For a quick commissioning, the calculations and settings are made automatically if one of the following optimizations is carried out:

- Select motor from motor catalog 46
- Automatic motor identification (energized) 210
- Automatic motor calibration (non-energized) 211

**Details**

The following controllers have an influence in the respective motor control type:

| Controller | Motor control type | | | |
|---|---|---|---|---|
| | VFC open loop | SL-PSM | SLSM-PSM | SLVC |
| Speed controller 217 | | ● | | ● |
| Current controller 218 | ● | ● | | ● |
| ASM field controller 219 | | | | ● |
| ASM field weakening controller 220 | | | | ● |
| Imax controller 221 | ● | | | |
| Flying restart controller 222 | ● | ● | | ● |
| SLVC controller 222 | | | | ● |
| Current controller (field-oriented control) 219 | | | ● | |

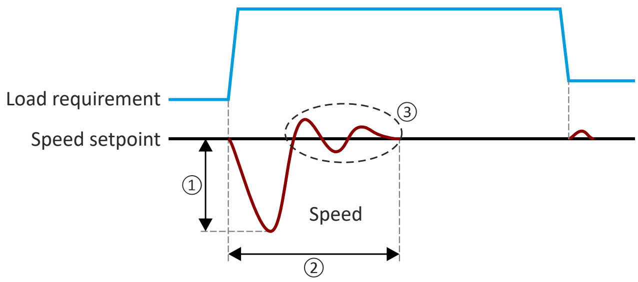
VFC open loop = V/f characteristic control
SL-PSM/SLSM-PSM = sensorless control for synchronous motor
SLVC = sensorless vector control

### 10.6.6.1 Speed controller

For a quick commissioning, the calculations and settings are made automatically during the optimization.

For typical applications, a manual adaptation of the parameters of the speed controller is not recommended. A wrong setting may have a negative effect on the control. For special applications, contact the manufacturer before adapting the parameters.

The automatically calculated settings for the speed controller enable an optimal control behaviour for typical load requirements. The oscillographed actual speed value (red) shows the control mode.




1 Minimum speed loss
2 Minimum settling time
3 Minimum overshoot

**Setting notes**

If oscillations occur during operation after high loads:

- Reduce gain of the speed controller in 0x2900:001 (P332.01).
- Increase reset time of the speed controller in 0x2900:002 (P332.02).

If the speed loss is too high or the settling time too long during operation with high loads:

- Increase gain of the speed controller in 0x2900:001 (P332.01).

If the gain is set too high or the reset time too low, the speed control loop can become unstable!

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2900:001 (P332.01) | Speed controller settings: Gain (Speed controller: Gain) 0.00000 ... [**0.00193**]* ... 20000.00000 Nm/rpm * Default setting dependent on the model. | Gain factor Vp of the speed controller. |
| 0x2900:002 (P332.02) | Speed controller settings: Reset time (Speed controller: Reset time) 1.0 ... [**80.0**]* ... 6000.0 ms * Default setting dependent on the model. | Reset time Ti of the speed controller. |
| 0x2904 | Actual speed filter time 0.0 ... [**2.0**] ... 50.0 ms | Time constant for the actual speed value filter. |

### 10.6.6.2 Current controller

For a quick commissioning, the calculations and settings are made automatically during the motor calibration.

For typical applications, a manual adaptation of the parameters of the current controller is not recommended. A wrong setting may have a negative effect on the control. For special applications, contact the manufacturer before adapting the parameters.

**Preconditions**

The current controller parameters are calculated based on the stator resistance and leakage inductance. Thus, the following parameters must be set correctly, either via optimization or manually (according to manufacturer-data/motor data sheet):

- 0x2C01:002: Stator resistance
- 0x2C01:003: Stator leakage inductance

▶ Motor equivalent circuit diagram data 214

**Parameter**

| Address | Name / setting range / [default setting] | Information |
| --- | --- | --- |
| 0x2942:001<br>(P334.01) | Current controller parameters: Gain<br>(Current contr.: Gain)<br>0.00 ... [**42.55**]* ... 750.00 V/A<br>* Default setting dependent on the model. | Gain factor Vp of the current controller. |
| 0x2942:002<br>(P334.02) | Current controller parameters: Reset time<br>(Current contr.: Reset time)<br>0.01 ... [**4.50**]* ... 2000.00 ms<br>* Default setting dependent on the model. | Reset time Ti of the current controller. |



### 10.6.6.3 Current controller (field-oriented control)

For quick commissioning, the calculations and settings are made automatically during the motor calibration.

For typical applications, a manual adaptation of the parameters of the current controller is not recommended. An incorrect setting may have a negative effect on the control. For special applications, contact the manufacturer before adapting the parameters.

**Preconditions**

The current controller described here is only effective in the following motor control mode:

- Sensorless control for synchronous motors (SLSM-PSM)

The current controller parameters are calculated based on the stator resistance and leakage inductance. Thus, the following parameters must be set correctly, either via optimization or manually (according to manufacturer-data/motor data sheet):

- 0x2C01:002: Stator resistance
- 0x2C03:005 (P352.05): D-axis inductance Ld
- 0x2C03:006 (P352.06): Q-axis inductance Lq

▸ Motor equivalent circuit diagram data 📖 214

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2942:004 | Current controller parameters: d-axis gain<br>0.00 ... [**26.00**]* ... 750.00 V/A<br>* Default setting dependent on the model. | Current controller parameters for "SLSM-PSM" motor control mode.<br>▸ Sensorless control for synchronous motor (SLSM-PSM) 📖 185 |
| 0x2942:005 | Current controller parameters: d-axis reset time<br>0.01 ... [**3.00**]* ... 2000.00 ms<br>* Default setting dependent on the model. | |
| 0x2942:006 | Current controller parameters: q-axis gain<br>0.00 ... [**26.00**]* ... 750.00 V/A<br>* Default setting dependent on the model. | |
| 0x2942:007 | Current controller parameters: q-axis reset time<br>0.01 ... [**3.00**]* ... 2000.00 ms<br>* Default setting dependent on the model. | |

### 10.6.6.4 ASM field controller

For a quick commissioning, the calculations and settings are made automatically during the motor calibration.

**Preconditions**

The field controller is only effective in the motor control type "Sensorless vector control (SLVC)".

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x29C0:001 | Field controller settings: Gain<br>0.00 ... [**59.68**]* ... 50000.00 A/Vs<br>* Default setting dependent on the model. | Gain factor Vp of the field controller. |
| 0x29C0:002 | Field controller settings: Reset time<br>1.0 ... [**45.5**]* ... 6000.0 ms<br>* Default setting dependent on the model. | Reset time Tn of the field controller. |

### 10.6.6.5 ASM field weakening controller

For a quick commissioning, the calculations and settings are made automatically during the motor calibration.

**Preconditions**

The field weakening controller is only effective in the motor control type "Sensorless vector control (SLVC)".

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x29E0:001 | Field weakening controller settings: Gain (ASM)<br>0.000 ... [**0.000**]* ... 2000000.000 Vs/V<br>* Default setting dependent on the model. | Gain factor Vp of the field weakening controller. |
| 0x29E0:002 | Field weakening controller settings: Reset time (ASM)<br>1.0 ... [**1478.3**]* ... 240000.0 ms<br>* Default setting dependent on the model. | Reset time Tn of the field weakening controller. |
| 0x29E1 | Field weakening controller Field limitation<br>5.00 ... [**100.00**] ... 100.00 %<br>• From version 04.00 | Field limitation of the field weakening controller. |

### 10.6.6.6 ASM field weakening controller (extended)

For a quick commissioning, the calculations and settings are made automatically during the motor calibration.

**Preconditions**

The field weakening controller is only effective in the motor control type "Sensorless vector control (SLVC)".

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x29E2 | DC-bus filter time<br>1.0 ... [**25.0**] ... 1000.0 ms | Filter time for the current DC-bus voltage used for field weakening. |
| 0x29E3 | Motor voltage filter time<br>1.0 ... [**25.0**] ... 1000.0 ms | Filter time for the current motor voltage used for field weakening. |
| 0x29E4<br>(P354.00) | Voltage reserve range<br>(Voltage reserve)<br>0 ... [**5**] ... 20 % | Voltage reserve at the transition point to the field weakening, with reference to the current value of the DC-bus voltage.<br>Wirkt bei Sensorless control (SL PSM) (0x2C00 (P300.00) = 3) und bei Sensorless vector control (SLVC) (0x2C00 (P300.00) = 4).<br>• 100% = DC-bus voltage 0x2D87 (P105.00) |

### 10.6.6.7 PSM field weakening controller

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x29E0:003 | Field weakening controller settings: Reset time (PSM)<br>1.0 ... [**800.0**]* ... 240000.0 ms<br>* Default setting dependent on the model.<br>• From version 05.02 | In the time configured (default 800 ms), the swivel control rotates the current phasor by 90°. Increasing the time makes the system smoother at the voltage limit. At the same time, it also reduces the dynamics. |

### 10.6.6.8 Imax controller

For a quick commissioning, the calculations and settings are made automatically during the motor calibration.

For typical applications, a manual adaptation of the parameters of the Imax controller is not recommended. A wrong setting may have a negative effect on the control. For special applications, contact the manufacturer before adapting the parameters.

**Preconditions**

The Imax controller is only effective in the motor control type "V/f characteristic control (VFC open loop)".

**Details**

The Imax controller becomes active in the V/f operation if the actual motor current exceeds the maximum current "Max. current". The Imax controller changes the output frequency to counteract the exceedance.

The maximum current "Max. current" is defined in 0x6073 (P324.00) in percent with regard to the rated motor current "Rated motor current" 0x6075 (P323.00).

If the maximum current is exceeded:

- During operation in motor mode, the Imax controller reduces the output frequency.
- During operation in generator mode, the Imax controller increases the output frequency.

**Setting notes**

If oscillations occur at the current limit during operation:

- Reduce gain of the Imax controller in 0x2B08:001 (P333.01).
- Increase reset time of the Imax controller in 0x2B08:002 (P333.02).
- Carry out the changes in small steps only (by 2 ... 3 % of the set value) until the oscillations do not exist anymore.

If the Imax controller does not respond fast enough after the maximum current has been exceeded:

- Increase gain of the Imax controller in 0x2B08:001 (P333.01).
- Reduce reset time of the Imax controller in 0x2B08:002 (P333.02).
- Carry out the changes in small steps only (by 2 ... 3 % of the set value in each case) until the response time is acceptable.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
| --- | --- | --- |
| 0x2822:019 | Calculate Imax controller parameter<br>0 ... [**0**] ... 1 | 1 = start automatic calculation of the Imax controller parameters.<br>• Gain 0x2B08:001 (P333.01) and reset time 0x2B08:002 (P333.02) of the Imax controller are recalculated and set. |
| 0x2B08:001<br>(P333.01) | V/f Imax controller: Gain<br>(V/f Imax contr.: Gain)<br>0.000 ... [**0.284**]* ... 1000.000 Hz/A<br>* Default setting dependent on the model. | Gain factor Vp of the Imax controller. |
| 0x2B08:002<br>(P333.02) | V/f Imax controller: Reset time<br>(V/f Imax contr.: Reset time)<br>1.0 ... [**2.3**]* ... 2000.0 ms<br>* Default setting dependent on the model. | Reset time Ti of the Imax controller. |

### 10.6.6.9 Flying restart controller

For a quick commissioning, the calculations and settings are made automatically during the motor calibration.

**Preconditions**

The flying restart controller is only effective in the following motor control types:

- V/f characteristic control (VFC open loop)
- Sensorless control (SL PSM)
- Sensorless vector control (SLVC)

**Details**

The following parameter is only relevant for the flying restart circuit if an asynchronous motor is controlled. In case of a sensorless control of a synchronous motor (SL-PSM) the parameter has no meaning.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2BA1:003<br>(P718.03) | Flying restart circuit: Restart time<br>(Flying restart: Restart time)<br>1 ... [**5911**]* ... 60000 ms<br>* Default setting dependent on the model. | Integration time for controlling the flying restart circuit. |

### 10.6.6.10 SLVC controller

For a quick commissioning, the calculations and settings are made automatically during the motor calibration.

**Preconditions**

The SLVC controller is only effective in the motor control type "Sensorless vector control (SLVC)".

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2B40:001 | Gain<br>0.0000 ... [**0.2686**]* ... 1000.0000 Hz/A<br>* Default setting dependent on the model. | Gain of the SLVC-Q controller. |
| 0x2B40:002 | Reset time<br>1.0 ... [**2.3**]* ... 2000.0 ms<br>* Default setting dependent on the model. | Reset time of the SLVC-Q controller. |

### 10.6.6.11 General optimizations

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2DE0:010 | Motor control behavior<br>0 ... [**0**] ... 65535<br>• Setting can only be changed if the inverter is disabled.<br>• From version 05.03 | | Optimization of the behavior of the motor control. |
| | Bit 0 | Slip compensation via equivalent circuit diagram | Bit 0 = 0: calculation via motor data label (standard).<br>Bit 0 = 1: calculation of magnetising current based on equivalent circuit diagram (response <= SW 05.02.00). |
| | Bit 1 | Imax controller without clamp detection | Bit x = 1: Activation of the respective option. |
| | Bit 2 | Motor reference temperatur 20 degree celsius | |
| | Bit 3 | Enhanced SLVC stop behavior | |
| | Bit 4 | Earth fault detection disabled (from version 06.02) | |

## 10.7 Motor protection

Many monitoring functions integrated in the inverter can detect errors and thus protect the device or motor from being destroyed or overloaded.

### 10.7.1 Motor overload monitoring ($i^2xt$)

This function monitors the thermal overload of the motor, taking the motor currents recorded and a mathematical model as a basis.

**⚠ DANGER!**

Fire hazard by overheating of the motor.

Possible consequences: Death or severe injuries

- ▶ To achieve full motor protection, an additional temperature monitoring function with a separate evaluation must be installed.

**Details**

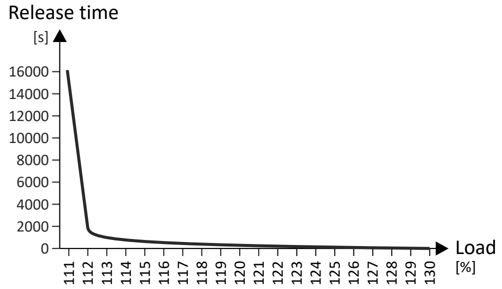
This function only serves to functionally protect the motor. It is not suitable for safety-relevant protection against energy-induced hazards, since the function is not fail-safe.

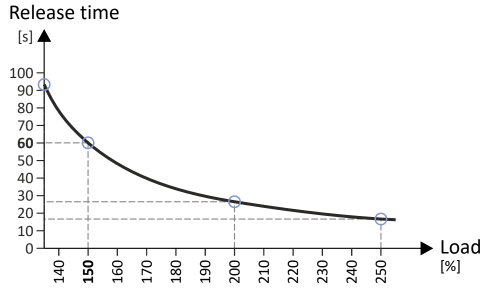
- When the thermal motor utilisation calculated reaches the threshold set in 0x2D4B:001 (P308.01), the response set in 0x2D4B:003 (P308.03) is triggered.
- With the setting 0x2D4B:003 (P308.03) = "No response [0]", the monitoring function is deactivated.

> For operation that complies with NEC article 430 with motor overload protection, do not modify the default settings 0x2D4B:002 (P308.02) and 0x2D4B:003 (P308.03)!
> (0x2D4B:002 (P308.02) = "On [0], 0x2D4B:003 (P308.03) = "Error [3]"). With these settings, the calculated thermal motor load is stored internally when the inverter is switched off and reloaded again when switched on. When the monitoring is deactivated with the setting 0x2D4B:003 (P308.03) = "No response [0]" or "Warning [1]", the motor overload protection is deactivated. For operation that complies with NEC article 430 in this mode, the external overload protection must be provided by the end user.

The following two diagrams show the relation between the motor load and tripping time of the monitoring under the following conditions:

- Maximum utilization 0x2D4B:001 (P308.01) = 150 %
- Speed compensation 0x2D4B:002 (P308.02) = "Off [1]" or output frequency ≥ 40 Hz




| **Maximum utilization 60s [%]** ▸ 0x2D4B:001 (P308.01) | **Load ratio [%]** | **Tripping time [s]** |
|---|---|---|
| 150 | 110 | Indefinite |
| 150 | 135 | 93 |
| 150 | 150 | 60 |
| 150 | 200 | 26 |
| 150 | 250 | 17 |

| **Calculation** |
|---|
| Load ratio:<br>Load ratio = actual motor current 0x2D88 (P104.00) / rated motor current 0x6075 (P323.00) |
| Maximum load ratio for continuous operation at an output frequency ≥ 40 Hz:<br>Maximum load ratio for continuous operation [%] = 0.73 * maximum utilization 0x2D4B:001 (P308.01) |
| Release time at an output frequency ≥ 40 Hz and a load ratio > maximum load ratio for continuous operation:<br>Tripping time [s] ≈ 15.9 / ((load ratio/maximum utilization 0x2D4B:001 (P308.01)) – 0.724) [s] |

## Speed compensation for protecting motors at low speed

The inverter has implemented a compensation for low speeds. If the motor is operated with frequencies below 40 Hz, the speed compensation in 0x2D4B:002 (P308.02) must be set to "On [0]" (default). This setting ensures that the tripping time for the monitoring is reduced at low speeds, in order to take the reduced self-cooling of AC motors into account.

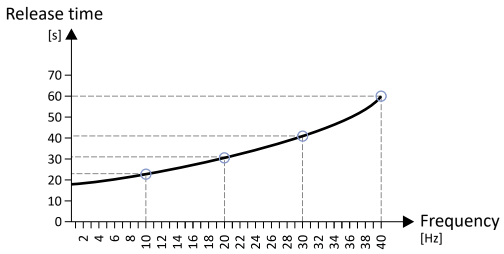
For UL-compliant operation, speed compensation must also be activated. 0x2D4B:002 (P308.02) = "On [0]".

If speed compensation is activated, the **maximum load ratio for continuous operation** is reduced as follows:

| **Calculation** |
|---|
| Output frequency < 40 Hz:<br>**Maximum load ratio for continuous operation** = 62.5 % + 37.5 % * output frequency [Hz] / 40 [Hz] |
| Output frequency ≥ 40 Hz:<br>No reduction |

The following diagram shows the reduced release time with activated speed compensation.

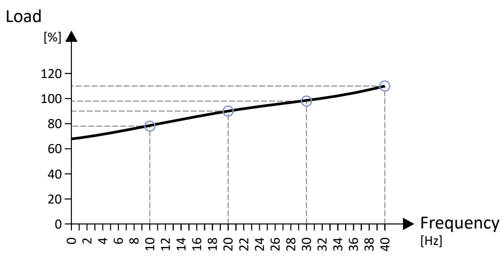
- Maximum utilization 0x2D4B:001 (P308.01) = 150 %
- Speed compensation 0x2D4B:002 (P308.02) = "On [0]"
- Load ratio = 150 %




| Output frequency | Release time |
|---|---|
| 40 Hz | 60 s |
| 30 Hz | ≈ 41 s |
| 20 Hz | ≈ 31 s |
| 10 Hz | ≈ 23 s |

The following diagram shows the possible permanent load with activated speed compensation without the monitoring being triggered.

- Maximum utilization 0x2D4B:001 (P308.01) = 150 %
- Speed compensation 0x2D4B:002 (P308.02) = "On [0]"




| Output frequency | Possible permanent load |
|---|---|
| 40 Hz | 110 % |
| 30 Hz | 99 % |
| 20 Hz | 90 % |
| 10 Hz | 79 % |

At of 0 Hz, only a load of max. 62.7 % (≈ 62.5 %) is possible. Reference: Load at 40 Hz (69 / 110 * 100 % = 62.7 %). The maximum possible motor load changes proportionally to the setting in 0x2D4B:001 (P308.01).

| **Calculation** |
|---|
| Maximum load ratio for continuous operation at an output frequency < 40 Hz:<br>Maximum load ratio for continuous operation = kf = 0.625 + 0.375/40 * output frequency |
| Release time at maximum load ratio for continuous operation:<br>Release time at maximum load ratio for continuous operation [%] = 0.73 * kf * maximum utilization 0x2D4B:001 (P308.01) |
| Release time at an output frequency < 40 Hz and a load ratio > **maximum load ratio for continuous operation**:<br>Release time [s] ≈ 15.9 / ((load ratio/maximum utilization 0x2D4B:001 (P308.01) *kf)) – 0.724) [s] |



### Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2D4B:001<br>(P308.01) | Motor overload monitoring ($i^2xt$): Maximum utilisation [60 s]<br>(Motor overload: Max.load.for 60s)<br>30 ... [**150**] ... 200 % | Maximum permissible thermal motor utilisation (max. permissible motor current for 60 seconds).<br>• 100 % = Rated motor current 0x6075 (P323.00)<br>• If the motor is actuated with the current set here for 60 seconds, the maximum permissible thermal motor utilisation is reached and the response set in 0x2D4B:003 (P308.03) is executed.<br>• If the motor is actuated with a different current, the time period until the motor overload monitoring function is activated is different. Generally the following applies: the lower the current, the lower the thermal utilisation and the later the monitoring function is triggered. |
| 0x2D4B:002<br>(P308.02) | Motor overload monitoring ($i^2xt$): Speed compensation<br>(Motor overload: Speed comp.) | Use this function to protect motors that are actuated at a speed below 40 Hz.<br>• UL-compliant operation with motor overload protection requires the setting "On [0]"! |
| | **0** **On** | Release time for motor overload monitoring is reduced in order to compensate for the reduced cooling of naturally ventilated AC induction motors during operation at low speed. |
| | 1 Off | Function deactivated, no reduction of the motor overload monitoring release time. May require an external motor overload protection for the UL-compliant operation. |
| 0x2D4B:003<br>(P308.03) | Motor overload monitoring ($i^2xt$): Response<br>(Motor overload: Response) | Selection of the response to the triggering of motor overload monitoring.<br>• UL-compliant operation with motor overload protection requires the setting "error [3]"!<br>• If monitoring is deactivated by the setting 0x2D4B:003 (P308.03) = "No response [0]", no motor overload protection is active. In this case, an external motor overload protection can be provided by the user for a UL-compliant operation.<br><br>Associated error code:<br>• 9040 \| 0x2350 - CiA: $i^2xt$ overload (thermal state) |
| | 0 No response | ▸ Error types 📖 456 |
| | 1 Warning | |
| | 2 Trouble | |
| | **3** **Fault** | |
| 0x2D4B:005 | Motor overload monitoring ($i^2xt$): Thermal load<br>• Read only | Display of the value of the internal $i^2*t$ integrator.<br>• 37500 = 100 % thermal load<br>• When power is switched off, this value is saved in the internal EEPROM.<br>• When power is switched on, the saved value is reloaded into the $i^2*t$ integrator.<br>• The internal $i^2*t$ integrator detects the thermal load based on the load conditions even if the motor overload monitoring is deactivated. |
| 0x2D4F<br>(P123.00) | Motor utilisation ($i^2xt$)<br>(Mot. i2t utilis.)<br>• Read only: x % | Display of the current thermal motor utilisation. |

### 10.7.2 Overcurrent monitoring

This function monitors the instantaneous value of the motor current and serves as motor protection.

**⚠WARNING!**

With an incorrect parameterization, the maximum permissible motor current may be exceeded in the process.

Possible consequence: Irreversible damage of the motor.

Avoid motor damages by using the overcurrent monitoring function as follows:

- ▶ The setting of the threshold for the overcurrent monitoring in 0x2D46:001 (P353.01) must be adapted to the connected motor.
- ▶ Set the maximum current of the inverter in 0x6073 (P324.00) much lower than the threshold for overcurrent monitoring for a dynamic limitation of the motor current.

**Details**

The inverter monitors its output current. This monitoring is independent of the maximum overload current setting. ▶ Maximum overload current of the inverter 233

- If the instantaneous value of the motor current exceeds the threshold set in 0x2D46:001 (P353.01), the response set in 0x2D46:002 (P353.02) takes place.
- With the setting 0x2D46:002 (P353.02) = "No response [0]", the monitoring function is deactivated.

The threshold for the overcurrent monitoring is preset to four times the rated motor current. This presetting is overwritten in case a motor in the engineering tool is selected from the "motor catalog" or the automatic identification or calibration of the motor data is carried out. For a suitable protection, the automatically adapted setting should be used. If disturbances occur during operation, the value can be increased.

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2D46:001<br>(P353.01) | Overcurrent monitoring: Threshold<br>(Overcurr. monit.: Threshold)<br>0.0 ... [**6.8**]* ... 1000.0 A<br>* Default setting dependent on the model.<br>• From version 02.00 | | Warning/error threshold for overcurrent monitoring of the motor.<br>• If the active motor current exceeds the set threshold, the response set in 0x2D46:002 (P353.02) is triggered.<br>• The parameter is calculated and set in the course of the automatic identification of the motor.<br>• The parameter can also be set and overwritten by selecting a motor from the "motor catalogue" of the engineering tool or performing an automatic calibration of the motor.<br>▶ Options for optimizing the control loops 207 |
| 0x2D46:002<br>(P353.02) | Overcurrent monitoring: Response<br>(Overcurr. monit.: Response) | | Selection of the response to the triggering of motor current monitoring.<br>Associated error code:<br>• 29056 \| 0x7180 - Motor overcurrent |
| | 0 | No response | ▶ Error types 456 |
| | 1 | Warning | |
| | 2 | Trouble | |
| | **3** | **Fault** | |



### 10.7.3 Motor phase failure detection

The motor phase failure detection function can be activated for both synchronous and asynchronous motors.

**Preconditions**

Motor phase failure detection during operation is suitable for applications which are operated with a constant load and speed. In other cases, transient processes or unfavourable operating points can cause erroneous triggering to occur.

**Details**

If a current-carrying motor phase (U, V, W) fails during operation, the response selected in 0x2D45:001 (P310.01) is tripped and a logbook entry is made.

Exception: With the setting "No response [0]", no logbook entry is made.

A motor phase failure can only be detected if
1. the rated motor current is higher than 10 % of the rated inverter current and
2. the output frequency is not lower than 0.1 Hz (standstill).

The lower the output frequency the longer the detection of the motor phase failure.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2D45:001<br>(P310.01) | Motor phase failure detection: Response - Motor phase 1<br>(Mot.phase.fail.: Response) | Selection of the response following the detection of a motor phase failure during operation.<br>Associated error codes:<br>• 65289 \| 0xFF09 - Motor phase missing<br>• 65290 \| 0xFF0A - Motor phase failure phase U<br>• 65291 \| 0xFF0B - Motor phase failure phase V<br>• 65292 \| 0xFF0C - Motor phase failure phase W |
| | **0** **No response** | ▶ Error types 📖 456 |
| | 1 Warning | |
| | 2 Trouble | |
| | 3 Fault | |
| 0x2D45:002<br>(P310.02) | Motor phase failure detection: Current threshold<br>(Mot.phase.fail.: Current thresh.)<br>1.0 ... [**5.0**] ... 25.0 % | Current threshold for the activation of the motor phase failure detection function.<br>• 100 % = Rated motor current 0x6075 (P323.00)<br>• Display of the present motor current in 0x2D88 (P104.00). |
| 0x2D45:003<br>(P310.03) | Motor phase failure detection: Voltage threshold<br>(Mot.phase.fail.: Voltage thresh.)<br>0.0 ... [**10.0**] ... 100.0 V | Voltage threshold for motor phase monitoring for the VFC control mode (0x2C00 (P300.00) = 6).<br>• The monitoring function is triggered if the motor current exceeds the rated motor current-dependent current threshold for longer than 20 ms. Rated motor current 0x6075 (P323.00)<br>• In case of the V/f characteristic control, the voltage threshold is considered additionally for the motor phase failure detection. If the motor voltage is higher than the voltage threshold, monitoring is combined with the motor current. |

### 10.7.4 Motor speed monitoring

This function monitors the motor speed during operation.

**Conditions**

- In order to detect the current motor speed, the inverter must be enabled and the motor must rotate.
- For an exact monitoring, rated motor speed 0x2C01:004 (P320.04) and rated motor frequency 0x2C01:005 (P320.05) must be set correctly.
- For motor speed monitoring, it must be ensured that the speed limitation (0x6080 (P322.00) / max. motor speed) has a higher value than the actual monitoring (0x2D44:001 (P350.01)).

**Details**

- If the motor speed reaches the threshold set in 0x2D44:001 (P350.01), the response set in 0x2D44:002 (P350.02) takes place.
- With the setting 0x2D44:002 (P350.02) = "No response [0]", the monitoring function is deactivated.

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2D44:001<br>(P350.01) | Overspeed monitoring: Threshold<br>(Overspeed monit.: Threshold)<br>50 ... [**8000**] ... 50000 rpm | | Warning/error threshold for motor speed monitoring.<br>• If the motor speed reaches the threshold set, the response selected in 0x2D44:002 (P350.02) takes place.<br>• The parameter can be set and thus overwritten by selecting a motor in the engineering tool from the "motor catalog”.<br>• Depending on the parameter setting of 0x2D44:001 (P350.01) (Overspeed monitoring: threshold), the speed limitation (0x6080 / Max. motor speed) may become active before speed monitoring.<br>▸ Options for optimizing the control loops 📖 207 |
| 0x2D44:002<br>(P350.02) | Overspeed monitoring: Response<br>(Overspeed monit.: Response) | | Selection of the response to the triggering of motor speed monitoring.<br>Associated error code:<br>• 65286 \| 0xFF06 - Motor overspeed |
| | 0 | No response | ▸ Error types 📖 456 |
| | 1 | Warning | |
| | 2 | Trouble | |
| | **3** | **Fault** | |

### 10.7.5 Motor torque monitoring

This function limits the motor torque during operation.

**Preconditions**

The motor torque monitoring can only be used for the following motor control types with speed controller:

- Sensorless control (SL PSM)
- Sensorless vector control (SLVC)

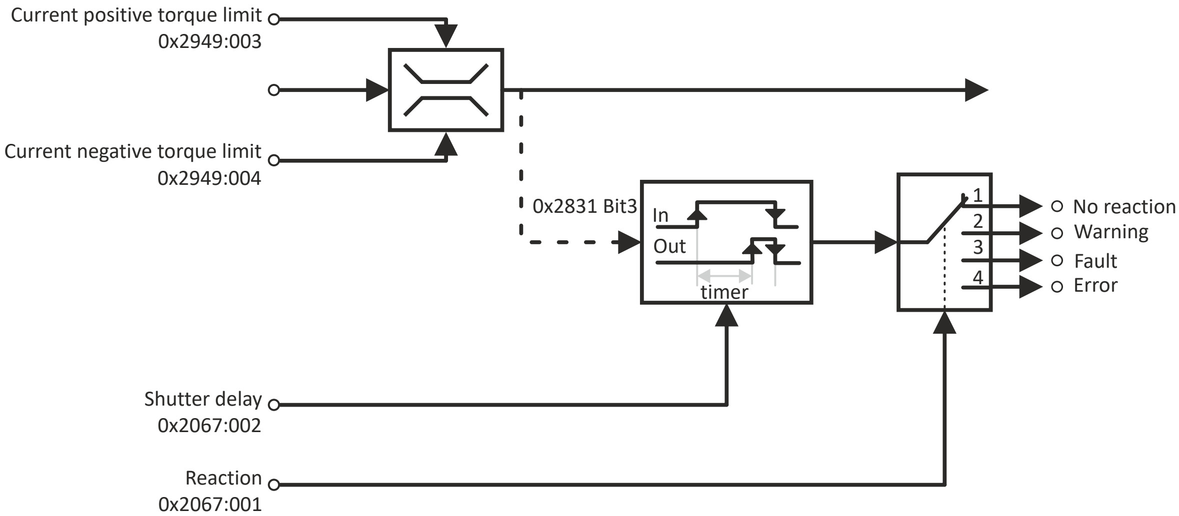
**Details**

This function sets the internal status signal "Torque limit reached [79]" = TRUE when the maximum possible torque has been reached.

The limits of the monitoring function are selected via 0x2949:001 (P337.01) (positive torque limit) and 0x2949:002 (P337.02) (negative torque limit). The actual limits can be seen in 0x2949:003 (P337.03) (actual positive torque limit), 0x2949:004 (P337.04) (actual negative torque limit).

▶ Torque limits 📖 150

- The status signal is set irrespective of the response 0x2D67:001 (P329.01) and the delay time 0x2D67:002 (P329.02) set for this monitoring.
- The status signal can be used by the user to
  - activate certain functions. ▶ Flexible I/O configuration 📖 51
  - set a digital output. ▶ Configure digital outputs 📖 247
  - set a bit of the NetWordOUT1 mappable data word. ▶ Motor speed monitoring 📖 230




**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2D67:001<br>(P329.01) | Maximum torque monitoring: Response<br>(MaxTrq.Monitor: Response)<br>• From version 02.00 | | Selection of response to reaching the maximum possible torque.<br>• The selected response takes place if the status signal "Torque limit reached [79]" = TRUE and the deceleration time set in 0x2D67:002 (P329.02) has elapsed.<br>Associated error code:<br>• 33553 \| 0x8311 - Torque limit reached |
| | **0** | **No response** | ▶ Error types 📖 456 |
| | 1 | Warning | |
| | 2 | Trouble | |
| | 3 | Fault | |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2D67:002<br>(P329.02) | Maximum torque monitoring: Triggering delay<br>(MaxTrq.Monitor: Triggering delay)<br>0.000 ... [**0.000**] ... 10.000 s<br>• From version 02.00 | Optional setting of a deceleration for triggering the response selected in 0x2D67:001 (P329.01).<br>Typical application:<br>• The motor should be driven at the torque limit for a short time without triggering the selected response.<br>• Only after a longer operation (> set deceleration) at the torque limit, the selected response is to take place. |
| 0x6072<br>(P326.00) | Max. torque<br>(Max. torque)<br>0.0 ... [**250.0**] ... 3000.0 %<br>• From version 02.00 | Symmetrical selection of the maximum permissible torque.<br>• 100 % = Rated motor torque 0x6076 (P325.00)<br>• This parameter serves to implement a static and bipolar torque limitation. This can be used, for instance, as overload protection of the mechanical transmission path/elements starting at the motor shaft.<br>• This limitation acts irrespective of the torque limitations acting in unipolar mode that are set in 0x60E0 and 0x60E1. |

### 10.7.6 Maximum overload current of the inverter

For the purpose of current limitation, a maximum overload current can be set for the inverter. If the current consumption of the motor exceeds this current limit, the inverter changes its dynamic behaviour, in order to counteract this exceedance.

**Details**

- The maximum current of the inverter can be set in 0x6073 (P324.00).
- Reference for the percentage setting of the maximum overload current is the rated motor current set in 0x6075 (P323.00).
- The actual motor current is displayed in 0x2D88 (P104.00).

If the change in the dynamic behavior carried out by the inverter does not result in exiting the overcurrent state, the inverter outputs an error.

When 0x6078 (P103.00) (current actual value in %) exceeds 0x6073 (P324.00) (max. current actual value in %) the message 0x238A is displayed. This status is also displayed in the following network status word bits:

- 0x400C:001 bit 14
- 0x400C:002 bit 2

| Load response | Impact |
|---|---|
| Overload during acceleration in motor mode | A longer time is required for reaching the frequency setpoint than has been set. |
| Overload during deceleration in generator mode | A longer time than is required for reaching standstill is set. |
| Increasing load at constant frequency | When the current limit of the motor mode is reached:<br>• The inverter reduces the effective speed setpoint until a stable working is set or an effective speed setpoint of 0 rpm is reached.<br>• If the load is reduced, the inverter increases the effective speed setpoint until the setpoint speed is reached or the load reaches the current limit value again. |
| | When the current limit in the generator mode is reached:<br>• The inverter increases the effective speed setpoint until a stable working point is reached or up to the maximum permissible output frequency 0x2916 (P211.00).<br>• If the load is reduced, the inverter reduces the effective speed setpoint until the setpoint speed is reached or the load reaches the current limit value again. |
| | If an abrupt load is building at the motor shaft (e.g. drive is blocked), the overcurrent switch-off function may respond. |

**Example: Overcurrent switch-off in case of a sudden load at the motor shaft**

### Parameter

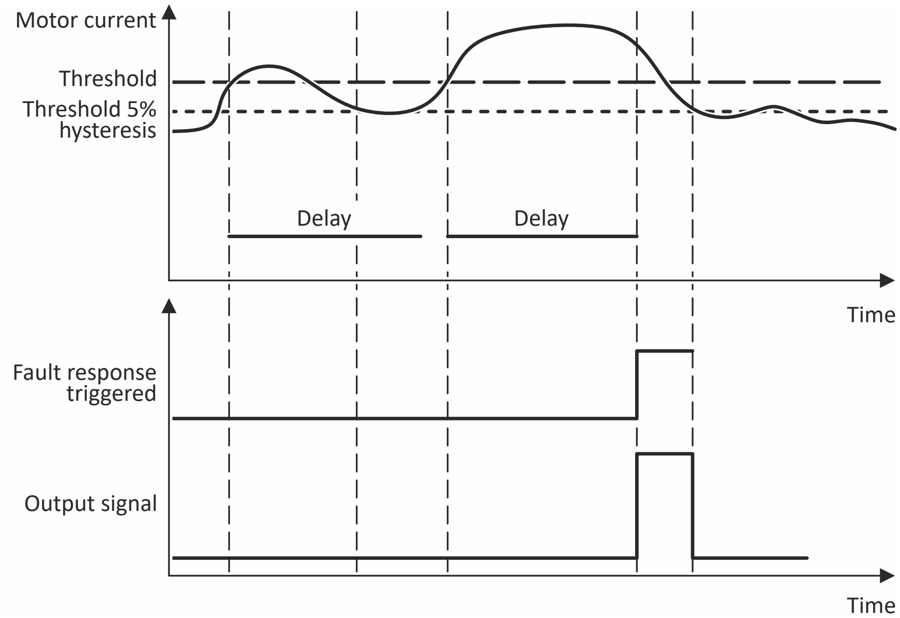
| Address | Name / setting range / [default setting] | Information |
| --- | --- | --- |
| 0x6073<br>(P324.00) | Max. current<br>(Max. current)<br>0.0 ... [**200.0**] ... 3000.0 % | Max. current of the inverter.<br>• 100 % = Rated motor current (0x6075 (P323.00))<br>• If the current consumption of the motor exceeds this current limit, the inverter changes its dynamic behaviour in order to counteract this exceedance.<br>• If the modified dynamic behaviour fails to eliminate the excess current consumption, the inverter outputs an error.<br>When 0x6078 (P103.00) (current actual value in %) exceeds 0x6073 (P324.00) (max. current actual value in %) the message 0x238A is displayed. This status is also displayed in the following network status word bits:<br>• 0x400C:001 bit 14<br>• 0x400C:002 bit 2<br><br>Note!<br>This parameter is not identical to the ultimate motor current $I_{ULT}$.<br>• The value set in 0x2D46:001 (P353.01) (Threshold) is a limit value for synchronous motors to protect their magnets.<br>• The value to be set here should always be considerably below the ultimate motor current. |

### 10.7.7 Heavy load monitoring

If the apparent current of the motor exceeds a defined threshold value due to a heavy duty state, a configurable error is triggered (incl. logbook entry).

**Conditions**

Monitoring is activated as soon as the motor is running. Monitoring can be deactivated with the setting "No response".




**Details**

Exceedance of the defined threshold:

- If the actual apparent current exceeds the configured threshold value, the delay time encoder is started.
- If the actual apparent motor current falls below the threshold value minus 5 % (hysteresis - not adjustable), the delay time encoder is set to zero.

Independent of the error response, the output signal (Heavy duty monitoring [84]) is triggered:

- If the actual apparent current of the motor exceeds the threshold for longer than the delay time, the output signal is set to TRUE.
- If the actual apparent current of the motor falls below the threshold value minus 5 % (hysteresis), the output signal is set to FALSE.
- If the delay time is set to 0 seconds, the output signal is immediately set to TRUE.

The error response is activated according to its settings:

- If the actual apparent current of the motor exceeds the threshold value for longer than the configured delay time, the selected error response is activated.
- When the error response is triggered, an entry is generated in the logbook (exception: Error response - Selection [0]): "Motor overload" (error code 65337 | 0xFF39)

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x4007:001 | Heavy load monitoring: Error threshold<br>0.0 ... [**200.0**] ... 300.0 %<br>• From version 05.02 | When the threshold value for the apparent current of the motor is exceeded, the delay time encoder is started.<br>• 100 % = of rated motor current 0x6075 (P323.00) |
| 0x4007:002 | Heavy load monitoring: Delay time<br>0.0 ... [**3.0**] ... 999.9 s<br>• From version 05.02 | Setting of the delay time. |

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x4007:003 | Heavy load monitoring: Error response<br>• From version 05.02 | | Setting of the error response.<br>Associated error code:<br>• 65337 \| 0xFF39 - Motor overload |
| | **0** | **No response** | ▸ Error types 📖 456 |
| | 1 | Warning | |
| | 2 | Trouble | |
| | 3 | Fault | |

# 11 I/O extensions and control connections

## 11.1 Configure digital inputs

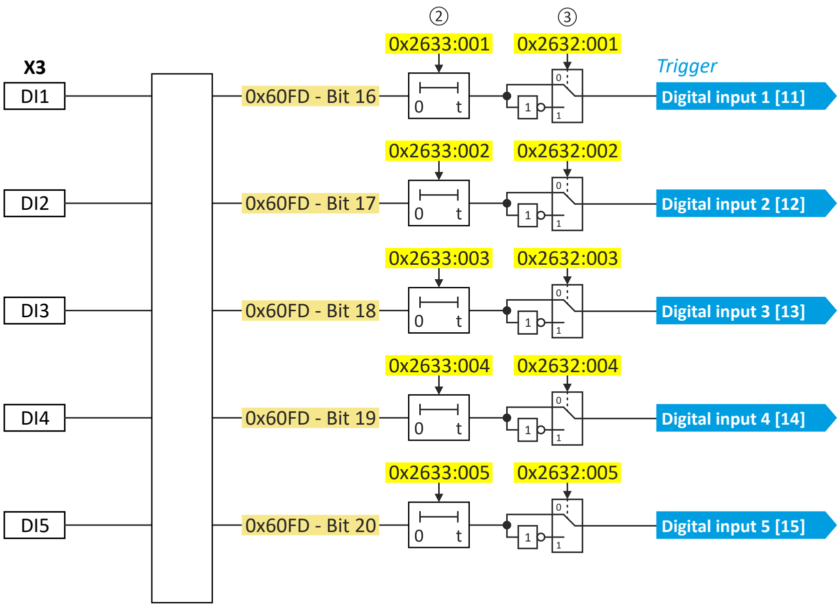
Settings for digital inputs 1 ... 5.

**Details**

The digital inputs are used for control tasks. For this purpose, the digital inputs are available as selectable triggers for functions.

The following settings are possible for the digital inputs:

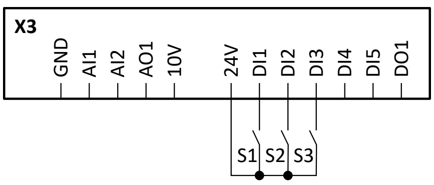
- Debounce time ②
- Inversion ③




Diagnostic parameters:

- The logic status of the digital inputs is displayed in 0x60FD (P118.00).

### Assertion level "HIGH active"

| HIGH active (default setting) |
|---|
| • Internally, the digital input terminals are set to LOW level via pull-down resistors.<br>• The current flows from the current supply (e.g. terminal X3/24 V) through the contact to the digital input terminal (and internally via the pull-down resistor to GND).<br>• If the contact is closed, the digital input is set to HIGH level and is thus HIGH active. |
| Connection plan (example):<br> |



### Debounce time

To minimize interference pulses, a debounce time of 1 ms is set for all digital inputs. Via »EASY Starter«, the debounce time can be increased individually for each digital input to a maximum of 50 ms if necessary.

### Inversion

Each digital input can be configured in such a way that the status pending at the terminal is logically inverted internally. This way, a closed contact, for instance, serves to deactivate an assigned function instead of activating it. Thus, the control of the inverter can be flexibly adapted to the requirements of the actual application.

### Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2630:001 (P410.01) | Settings for digital inputs: Assertion level (DI settings: Assertion level) | Definition of the internal hardware interconnection of the digital input terminal (X3/DIx). |
| | 0 LOW active | Digital input terminals (X3/DIx) are set to HIGH level via pull-up resistors. |
| | **1 HIGH active** | Digital input terminals (X3/DIx) are set to LOW level via pull-down resistors. |
| 0x2630:002 (P410.02) | Settings for digital inputs: Input function (DI settings: Input function) | Input function of the digital terminals DI3 and DI4. |
| | **0 Digital input** | DI3 = digital input<br>DI4 = digital input |
| 0x2632:001 (P411.01) | Inversion of digital inputs: Digital input 1 (DI inversion: DI1 inversion) | Inversion of digital input 1 |
| | **0 Not inverted** | |
| | 1 Inverted | |
| 0x2632:002 (P411.02) | Inversion of digital inputs: Digital input 2 (DI inversion: DI2 inversion) | Inversion of digital input 2 |
| | **0 Not inverted** | |
| | 1 Inverted | |
| 0x2632:003 (P411.03) | Inversion of digital inputs: Digital input 3 (DI inversion: DI3 inversion) | Inversion of digital input 3 |
| | **0 Not inverted** | |
| | 1 Inverted | |
| 0x2632:004 (P411.04) | Inversion of digital inputs: Digital input 4 (DI inversion: DI4 inversion) | Inversion of digital input 4 |
| | **0 Not inverted** | |
| | 1 Inverted | |
| 0x2632:005 (P411.05) | Inversion of digital inputs: Digital input 5 (DI inversion: DI5 inversion) | Inversion of digital input 5 |
| | **0 Not inverted** | |
| | 1 Inverted | |
| 0x2632:006 (P411.06) | Inversion of digital inputs: Digital input 6 (DI inversion: DI6 inversion)<br>• Only available for application I/O. | Inversion of digital input 6 |
| | **0 Not inverted** | |
| | 1 Inverted | |
| 0x2632:007 (P411.07) | Inversion of digital inputs: Digital input 7 (DI inversion: DI7 inversion)<br>• Only available for application I/O. | Inversion of digital input 7 |
| | **0 Not inverted** | |
| | 1 Inverted | |
| 0x2633:001 | Digital input debounce time: Digital input 1<br>1 ... [**1**] ... 50 ms | Debounce time of digital input 1 |
| 0x2633:002 | Digital input debounce time: Digital input 2<br>1 ... [**1**] ... 50 ms | Debounce time of digital input 2 |
| 0x2633:003 | Digital input debounce time: Digital input 3<br>1 ... [**1**] ... 50 ms | Debounce time of digital input 3 |
| 0x2633:004 | Digital input debounce time: Digital input 4<br>1 ... [**1**] ... 50 ms | Debounce time of digital input 4 |
| 0x2633:005 | Digital input debounce time: Digital input 5<br>1 ... [**1**] ... 50 ms | Debounce time of digital input 5 |
| 0x2633:006 | Digital input debounce time: Digital input 6<br>1 ... [**1**] ... 50 ms<br>• Only available for application I/O. | Debounce time of digital input 6 |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2633:007 | Digital input debounce time: Digital input 7<br>1 ... [**1**] ... 50 ms<br>• Only available for application I/O. | Debounce time of digital input 7 |

**Example: Activating two functions simultaneously via digital input 4**

The principle of assigning triggers to functions also enables a digital input to be assigned to several functions. The wiring complexity is reduced since there is no necessity to interconnect several digital inputs.

If, for instance, the frequency preset 1 is to be selected via the digital input 4 and a change-over to the acceleration time 2 and deceleration time 2 is to take place at the same time, this can be easily realised by the following parameter setting:

| Parameter | Designation | Setting for this example |
|---|---|---|
| 0x2631:018 (P400.18) | Activate preset (bit 0) | Digital input 4 [14] |
| 0x2631:039 (P400.39) | Activate ramp 2 | Digital input 4 [14] |

In order to achieve the desired behaviour, the digital input 4 must not be assigned to any further functions!

## 11.2 Configure analog inputs

### 11.2.1 Analog input 1

Settings for analog input 1.

**Intended use**

The analog input 1 can be used for the following tasks:

- As a standard setpoint source

| Intended use | Parameter | Setting | Further information |
|---|---|---|---|
| As a setpoint source for specifying a frequency setpoint. | 0x2860:001 (P201.01) | Analog input 1 [2] | Frequency control ▶ Standard setpoint source 📖 78 |
| As setpoint source for defining the reference value for the process controller. | 0x2860:002 (P201.02) | Analog input 1 [2] | Frequency control ▶ Configuring the process controller 📖 112 |
| As a setpoint source for defining a torque setpoint. | 0x2860:003 (P201.03) | Analog input 1 [2] | Torque control ▶ Standard setpoint source 📖 148 |
| As an alternative to the setting as a standard setpoint source, the "Activate AI1 setpoint" 0x2631:014 (P400.14) function can be used to enable a setpoint change-over to the analog input 1. | | | |

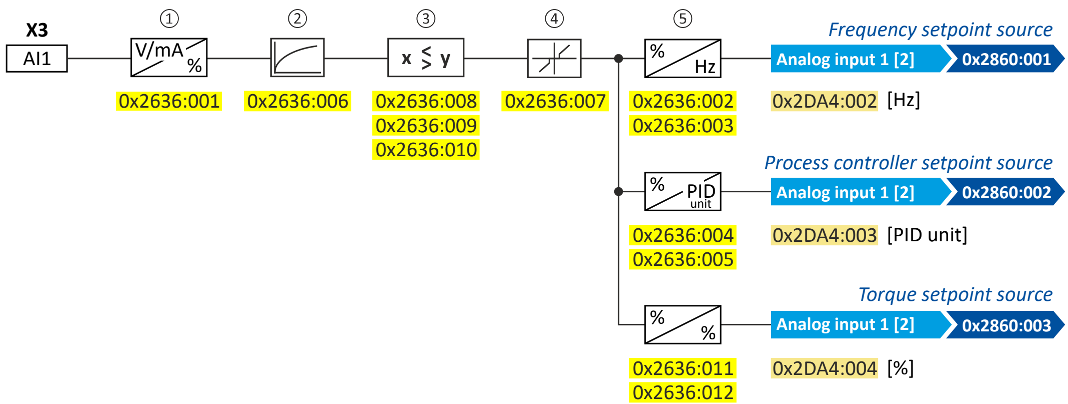
- As an actual value source or speed feedforward source for the process controller:

| Intended use | Parameter | Setting | Further information |
|---|---|---|---|
| As an actual value source for the process controller. | 0x4020:002 (P600.02) | Analog input 1 [1] | Frequency control ▶ Configuring the process controller 📖 112 |
| As a speed feedforward source for the process controller. | 0x4020:004 (P600.04) | Analog input 1 [2] | |

**Details**

The following settings are possible for the analog input:

- Definition of the input range ①
- Filter time for low-pass filters ②
- Monitoring of the input signal ③
- Dead band for eliminating the smallest signal levels ④
- Definition of the setting range ⑤




Diagnostic parameters:

- The frequency value is displayed in 0x2DA4:002 (P110.02).
- The process controller value is displayed in 0x2DA4:003 (P110.03).
- The torque value is displayed in 0x2DA4:004 (P110.04).

**Definition of the input range**

The analog input can be configured as voltage or current input. Internally, the signal is always converted to a value in percent.

**Definition of the setting range**

The setting range results from the set min and max value for the respective mode.



### Configuration examples

Detailed configuration examples can be found in the following subchapters:

▸ Example: Input range 0 ... 10 V = setting range 0 ... 50 Hz 242

▸ Example: Input range 0 ... 10 V = setting range -40 ... +40 Hz 243

▸ Example: Error detection 243

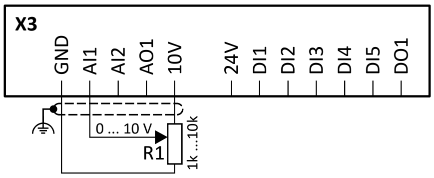
### Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2636:001<br>(P430.01) | Analog input 1: Input range<br>(Analog input 1: AI1 input range)<br>**0** – **0 ... 10 VDC**<br>1 – 0 ... 5 VDC<br>2 – 2 ... 10 VDC<br>3 – -10 ... +10 VDC<br>4 – 4 ... 20 mA<br>5 – 0 ... 20 mA | Definition of the input range. |
| 0x2636:002<br>(P430.02) | Analog input 1: Min frequency value<br>(Analog input 1: AI1 freq @ min)<br>-1000.0 ... [**0.0**] ... 1000.0 Hz | Scaling of the input signal to the frequency value.<br>• Direction of rotation according to sign.<br>• The standard setpoint source for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]" is selected in 0x2860:001 (P201.01).<br>▸ Configuring the frequency control 78 |
| 0x2636:003<br>(P430.03) | Analog input 1: Max frequency value<br>(Analog input 1: AI1 freq @ max)<br>Device for 50-Hz mains: -1000.0 ... [**50.0**] ... 1000.0 Hz<br>Device for 60-Hz mains: -1000.0 ... [**60.0**] ... 1000.0 Hz | |
| 0x2636:004<br>(P430.04) | Analog input 1: Min PID value<br>(Analog input 1: AI1 PID @ min)<br>-300.00 ... [**0.00**] ... 300.00 PID unit | Scaling of the input signal to the PID value.<br>• The standard setpoint source for the reference value of PID control is selected in 0x2860:002 (P201.02).<br>▸ Configuring the process controller 112 |
| 0x2636:005<br>(P430.05) | Analog input 1: Max PID value<br>(Analog input 1: AI1 PID @ max)<br>-300.00 ... [**100.00**] ... 300.00 PID unit | |
| 0x2636:006<br>(P430.06) | Analog input 1: Filter time<br>(Analog input 1: AI1 filter time)<br>0 ... [**10**] ... 10000 ms | PT1 time constant for low-pass filter.<br>• By the use of a low-pass filter, the impacts of noise to an analog signal can be minimised.<br>• For an optimum filter effect, first the noise frequency has to be determined. The time constant then has to be set so that it equals the reciprocal value of the double frequency. |
| 0x2636:007<br>(P430.07) | Analog input 1: Dead band<br>(Analog input 1: AI1 dead band)<br>0.0 ... [**0.0**] ... 100.0 % | Optional setting of a dead band that is placed symmetrically around the frequency zero point.<br>• If the analog input value is within the dead band, the output value for the motor control is set to "0".<br>• 100 % = maximum value of analog input (0x2636:003 (P430.03), 0x2636:005 (P430.05), 0x2636:012 (P430.12))<br>• Example: Dead band 10 % of 50 Hz: -10 V ... 10 V, Dead band -5 Hz ... 5 Hz, 0 V... 10 V, Dead band 0 Hz ... 5 Hz |
| 0x2636:008<br>(P430.08) | Analog input 1: Monitoring threshold<br>(Analog input 1: AI1 monit.level)<br>-100.0 ... [**0.0**] ... 100.0 % | Monitoring threshold for analog input 1.<br>• 100 % = 10 V (with configuration as voltage input)<br>• 100 % = 20 mA (with configuration as current loop)<br>Exception: In the case of a configured input range 4...20 mA (0x2636:001 [4]), the monitoring is triggered at 2 mA with a monitoring threshold of 0.0 %. |
| 0x2636:009<br>(P430.09) | Analog input 1: Monitoring condition<br>(Analog input 1: Monitoring cond.)<br>**0** – **Input value < trigger threshold**<br>1 – Input value > trigger threshold | Monitoring condition for analog input 1.<br>• If the selected condition is met, the "Error of analog input 1 active [81]" trigger is set to TRUE. The trigger can be assigned to a function or a digital output.<br>• If the selected condition is met, the error response set in 0x2636:010 (P430.10) takes place. |

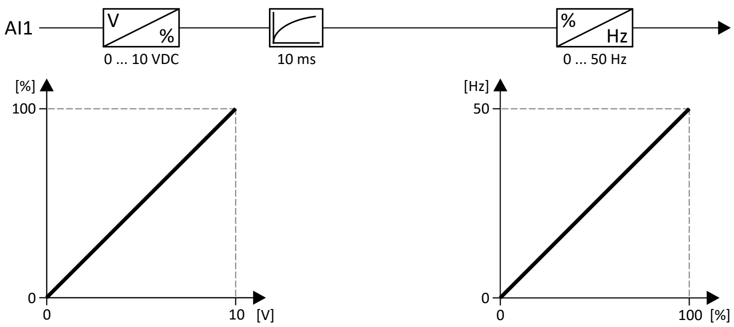
| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2636:010<br>(P430.10) | Analog input 1: Error response<br>(Analog input 1: AI1 error resp.) | | Error response for analog input 1.<br>• The selected response takes place if the monitoring condition selected in 0x2636:009 (P430.09) is met.<br>Associated error code:<br>• 28801 \| 0x7081 - Fault - Analog input 1 |
| | 0 | No response | ▸ Error types 📖 456 |
| | 1 | Warning | |
| | 2 | Trouble | |
| | **3** | **Fault** | |
| 0x2636:011<br>(P430.11) | Analog input 1: Min torque value<br>(Analog input 1: Min. torque)<br>-400.0 ... [**0.0**] ... 400.0 %<br>• From version 03.00 | | Scaling of the input signal to the torque value.<br>• 100 % = permissible maximum torque 0x6072 (P326.00)<br>• Direction of rotation according to sign.<br>• The standard setpoint source for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]" is selected in 0x2860:003 (P201.03).<br>▸ Configuring the torque control 📖 146 |
| 0x2636:012<br>(P430.12) | Analog input 1: Max torque value<br>(Analog input 1: Max. torque)<br>-400.0 ... [**100.0**] ... 400.0 %<br>• From version 03.00 | | |

### 11.2.1.1 Example: Input range 0 ... 10 V = setting range 0 ... 50 Hz

In this configuration, for instance, a frequency setpoint between 0 and 50 Hz can be set with a potentiometer connected to the analog input.

| Connection plan | Function | |
|---|---|---|
|  | Potentiometer R1 | Frequency setpoint definition<br>(Input voltage 1 V = 5 Hz) |

| Parameter | Designation | Setting for this example |
|---|---|---|
| 0x2636:001 (P430.01) | Analog input 1: Input range | 0 ... 10 VDC [0] |
| 0x2636:002 (P430.02) | Analog input 1: Min frequency value | 0.0 Hz |
| 0x2636:003 (P430.03) | Analog input 1: Max frequency value | 50.0 Hz |
| 0x2636:006 (P430.06) | Analog input 1: Filter time | 10 ms |

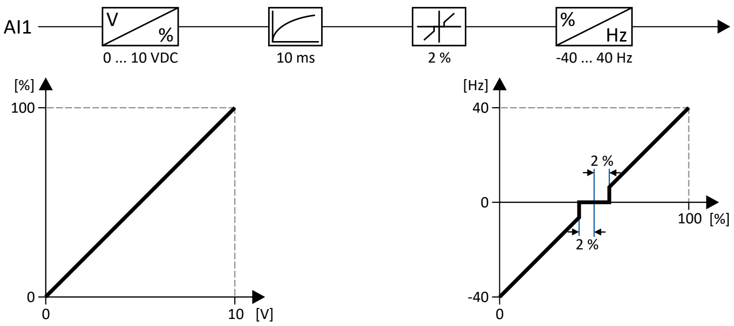




### 11.2.1.2 Example: Input range 0 ... 10 V = setting range -40 ... +40 Hz

In this example, a bipolar setting range and a dead band with 2 % are configured.

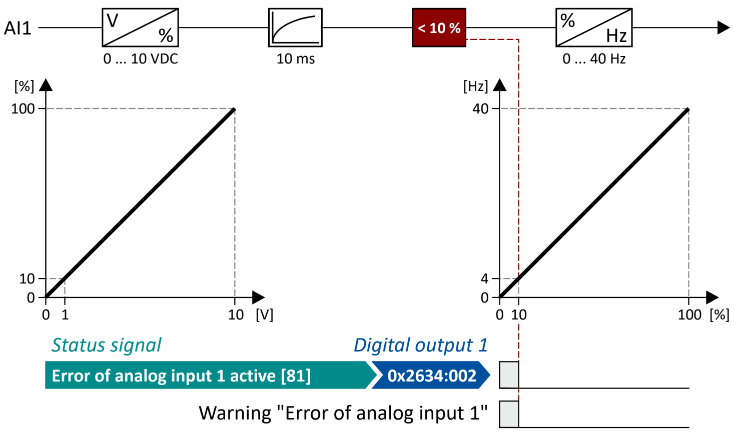
| Parameter | Designation | Setting for this example |
|---|---|---|
| 0x2636:001 (P430.01) | Analog input 1: Input range | 0 ... 10 VDC [0] |
| 0x2636:002 (P430.02) | Analog input 1: Min frequency value | -40.0 Hz |
| 0x2636:003 (P430.03) | Analog input 1: Max frequency value | 40.0 Hz |
| 0x2636:006 (P430.06) | Analog input 1: Filter time | 10 ms |
| 0x2636:007 (P430.07) | Analog input 1: Dead band | 2.0 % |




### 11.2.1.3 Example: Error detection

In this example, the digital output 1 is set via the trigger "Error of analog input 1 active [81]" if the percentage input value is lower than 10 %. Additionally, a warning is output.

| Parameter | Designation | Setting for this example |
|---|---|---|
| 0x2634:002 (P420.02) | Digital outputs function: Digital output 1 | Error of analog input 1 active [81] |
| 0x2636:001 (P430.01) | Analog input 1: Input range | 0 ... 10 VDC [0] |
| 0x2636:002 (P430.02) | Analog input 1: Min frequency value | 0.0 Hz |
| 0x2636:003 (P430.03) | Analog input 1: Max frequency value | 40.0 Hz |
| 0x2636:006 (P430.06) | Analog input 1: Filter time | 10 ms |
| 0x2636:008 (P430.08) | Analog input 1: Monitoring threshold | 10.0 % |
| 0x2636:009 (P430.09) | Analog input 1: Monitoring condition | Input value < trigger threshold [0] |
| 0x2636:010 (P430.10) | Analog input 1: Error response | Warning [1] |



### 11.2.2 Analog input 2

Settings for analog input 2.

**Intended use**

The analog input 2 can be used for the following tasks:

- As a standard setpoint source

| Intended use | Parameter | Setting | Further information |
|---|---|---|---|
| As a setpoint source for specifying a frequency setpoint. | 0x2860:001 (P201.01) | Analog input 1 [3] | Frequency control ▶ Standard setpoint source 📖 78 |
| As setpoint source for defining the reference value for the process controller. | 0x2860:002 (P201.02) | Analog input 1 [3] | Frequency control ▶ Configuring the process controller 📖 112 |
| As a setpoint source for defining a torque setpoint. | 0x2860:003 (P201.03) | Analog input 1 [3] | Torque control ▶ Standard setpoint source 📖 148 |
| As an alternative to the setting as a standard setpoint source, the "Activate AI2 setpoint" 0x2631:015 (P400.15) function can be used to enable a setpoint change-over to the analog input 2. | | | |

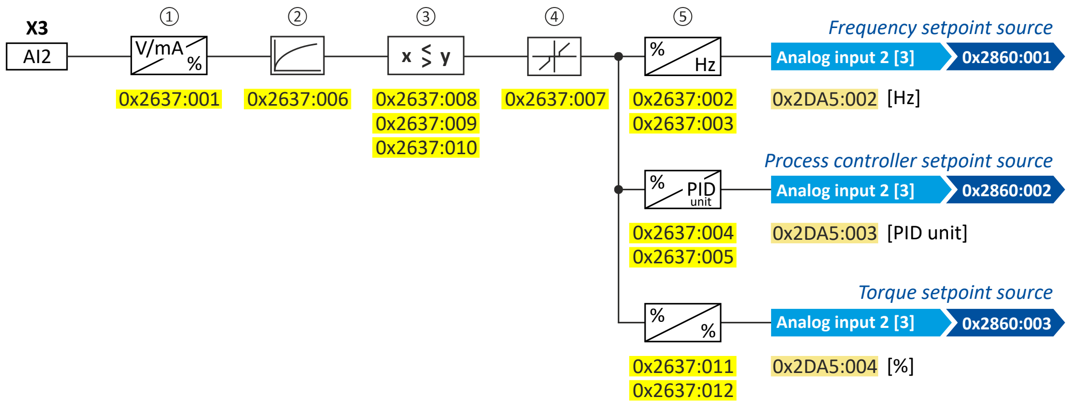
- As an actual value source or speed feedforward source for the process controller:

| Intended use | Parameter | Setting | Further information |
|---|---|---|---|
| As an actual value source for the process controller. | 0x4020:002 (P600.02) | Analog input 2 [2] | Frequency control ▶ Configuring the process controller 📖 112 |
| As a speed feedforward source for the process controller. | 0x4020:004 (P600.04) | Analog input 2 [3] | |

**Details**

The following settings are possible for the analog input:

- Definition of the input range ①
- Filter time for low-pass filters ②
- Monitoring of the input signal ③
- Dead band for eliminating the smallest signal levels ④
- Definition of the setting range ⑤




Diagnostic parameters:

- The frequency value is displayed in 0x2DA5:002 (P111.02).
- The process controller value is displayed in 0x2DA5:003 (P111.03).
- The torque value is displayed in 0x2DA5:004 (P111.04).

For further details and configuration examples, see chapter "Analog input 1". 📖 240



### Parameter

| Address | Name / setting range / [default setting] | Information |
| --- | --- | --- |
| 0x2637:001<br>(P431.01) | Analog input 2: Input range<br>(Analog input 2: AI2 input range)<br>**0 \| 0 ... 10 VDC**<br>1 \| 0 ... 5 VDC<br>2 \| 2 ... 10 VDC<br>3 \| -10 ... +10 VDC<br>4 \| 4 ... 20 mA<br>5 \| 0 ... 20 mA | Definition of the input range. |
| 0x2637:002<br>(P431.02) | Analog input 2: Min frequency value<br>(Analog input 2: AI2 freq @ min)<br>-1000.0 ... [**0.0**] ... 1000.0 Hz | Scaling of the input signal to the frequency value.<br>• Direction of rotation according to sign.<br>• The standard setpoint source for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]" is selected in 0x2860:001 (P201.01).<br>▸ Configuring the frequency control 78 |
| 0x2637:003<br>(P431.03) | Analog input 2: Max frequency value<br>(Analog input 2: AI2 freq @ max)<br>Device for 50-Hz mains: -1000.0 ... [**50.0**] ... 1000.0 Hz<br>Device for 60-Hz mains: -1000.0 ... [**60.0**] ... 1000.0 Hz | |
| 0x2637:004<br>(P431.04) | Analog input 2: Min PID value<br>(Analog input 2: AI2 PID @ min)<br>-300.00 ... [**0.00**] ... 300.00 PID unit | Scaling of the input signal to the PID value.<br>• The standard setpoint source for the reference value of PID control is selected in 0x2860:002 (P201.02).<br>▸ Configuring the process controller 112 |
| 0x2637:005<br>(P431.05) | Analog input 2: Max PID value<br>(Analog input 2: AI2 PID @ max)<br>-300.00 ... [**100.00**] ... 300.00 PID unit | |
| 0x2637:006<br>(P431.06) | Analog input 2: Filter time<br>(Analog input 2: AI2 filter time)<br>0 ... [**10**] ... 10000 ms | PT1 time constant for low-pass filter.<br>• By the use of a low-pass filter, the impacts of noise to an analog signal can be minimised.<br>• For an optimum filter effect, first the noise frequency has to be determined. The time constant then has to be set so that it equals the reciprocal value of the double frequency. |
| 0x2637:007<br>(P431.07) | Analog input 2: Dead band<br>(Analog input 2: AI2 dead band)<br>0.0 ... [**0.0**] ... 100.0 % | Optional setting of a dead band that is placed symmetrically around the frequency zero point.<br>• If the analog input value is within the dead band, the output value for the motor control is set to "0".<br>• 100 % = maximum value of analog input (0x2636:003 (P430.03), 0x2636:005 (P430.05), 0x2636:012 (P430.12))<br>• Example: Dead band 10 % of 50 Hz: -10 V ... 10 V, Dead band -5 Hz ... 5 Hz, 0 V... 10 V, Dead band 0 Hz ... 5 Hz |
| 0x2637:008<br>(P431.08) | Analog input 2: Monitoring threshold<br>(Analog input 2: AI2 monit.level)<br>-100.0 ... [**0.0**] ... 100.0 % | Monitoring threshold for analog input 2.<br>• 100 % = 10 V (with configuration as voltage input)<br>• 100 % = 20 mA (with configuration as current loop)<br>Exception: In the case of a configured input range 4...20 mA (0x2636:001 [4]), the monitoring is triggered at 2 mA with a monitoring threshold of 0.0 %. |
| 0x2637:009<br>(P431.09) | Analog input 2: Monitoring condition<br>(Analog input 2: Monitoring cond.)<br>**0 \| Input value < trigger threshold**<br>1 \| Input value > trigger threshold | Monitoring condition for analog input 2.<br>• If the selected condition is met, the "Error of analog input 2 active [82]" trigger is set to TRUE. The trigger can be assigned to a function or a digital output.<br>• If the selected condition is met for at least 500 ms, the error response set in 0x2637:010 (P431.10) takes place. |
| 0x2637:010<br>(P431.10) | Analog input 2: Error response<br>(Analog input 2: AI2 error resp.) | Error response for analog input 2.<br>• The selected response takes place if the monitoring condition selected in 0x2637:009 (P431.09) is met for at least 500 ms.<br>Associated error code:<br>• 28802 \| 0x7082 - Analog input 2 fault |
| | 0 \| No response<br>1 \| Warning<br>2 \| Trouble<br>**3 \| Fault** | ▸ Error types 456 |

| Address | Name / setting range / [default setting] | Information |
| --- | --- | --- |
| 0x2637:011<br>(P431.11) | Analog input 2: Min torque value<br>(Analog input 2: Min. torque)<br>-400.0 ... [**0.0**] ... 400.0 %<br>• From version 03.00 | Scaling of the input signal to the torque value.<br>• 100 % = permissible maximum torque 0x6072 (P326.00)<br>• Direction of rotation according to sign.<br>• The standard setpoint source for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]" is selected in 0x2860:003 (P201.03).<br>▸ Configuring the torque control 📖 146 |
| 0x2637:012<br>(P431.12) | Analog input 2: Max torque value<br>(Analog input 2: Max. torque)<br>-400.0 ... [**100.0**] ... 400.0 %<br>• From version 03.00 | |



## 11.3 Configure digital outputs

### 11.3.1 Relay output

Settings for the relay.

Relay only switches if the inverter is supplied with 240 V or 400 V.

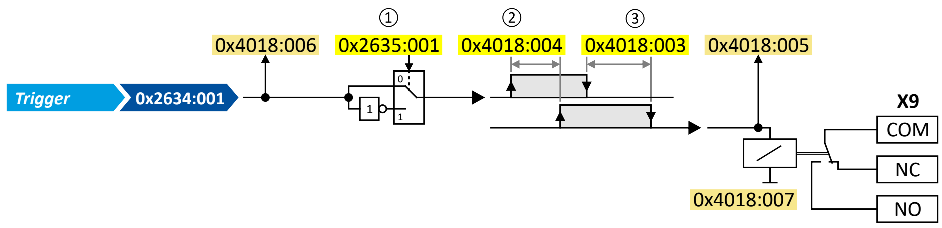
Use a corresponding suppressor circuit in case of an inductive or capacitive load!

**Details**

The relay is controlled with the trigger selected in 0x2634:001 (P420.01).

The following settings are possible for the relay:

- Inversion ①
- Switch-on delay ②
- Cutout delay ③




Diagnostic parameters:

- The logic status of the trigger signal is displayed in 0x4018:006.
- The logic status of the relay is displayed in 0x4018:005.
- The current switching cycles of the relay are shown in 0x4018:007.

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2634:001<br>(P420.01) | Digital outputs function: Relay<br>(Dig.out.function: Relay function) | | Assignment of a trigger to the relay.<br>Trigger = FALSE: X9/NO-COM open and NC-COM closed.<br>Trigger = TRUE: X9/NO-COM closed and NC-COM open.<br>Notes:<br>• An inversion set in 0x2635:001 (P421.01)is taken into consideration here. |
| | 0 | Not connected | No trigger assigned (trigger is constantly FALSE). |
| | 1 | Constant TRUE | Trigger is constantly TRUE. |
| | 11 | Digital input 1 | State of X3/DI1, taking an inversion set in 0x2632:001 (P411.01) into consideration. |
| | 12 | Digital input 2 | State of X3/DI2, taking an inversion set in 0x2632:002 (P411.02) into consideration. |
| | 13 | Digital input 3 | State of X3/DI3, taking an inversion set in 0x2632:003 (P411.03) into consideration. |
| | 14 | Digital input 4 | State of X3/DI4, taking an inversion set in 0x2632:004 (P411.04) into consideration. |
| | 15 | Digital input 5 | State of X3/DI5, taking an inversion set in 0x2632:005 (P411.05) into consideration. |
| | 16 | Digital input 6 | State of X3/DI6, taking an inversion set in 0x2632:006 (P411.06) into consideration. |
| | 17 | Digital input 7 | State of X3/DI7, taking an inversion set in 0x2632:007 (P411.07) into consideration. |
| | 30 | NetWordIN1 - bit 12 | State of NetWordIN1/bit 12 ... 15.<br>• Display of NetWordIN1 in 0x4008:001 (P590.01).<br>• For implementing an individual control word format, NetWordIN1 can be mapped to a process data input word. |
| | 31 | NetWordIN1 - bit 13 | |
| | 32 | NetWordIN1 - bit 14 | |
| | 33 | NetWordIN1 - bit 15 | |

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| | 34 | NetWordIN2 - bit 0 | State of NetWordIN2/bit 0 ... bit 15.<br>• Display of NetWordIN2 in 0x4008:002 (P590.02).<br>• For controlling the digital outputs via network, NetWordIN2 can be mapped to a process data input word. |
| | 35 | NetWordIN2 - bit 1 | |
| | 36 | NetWordIN2 - bit 2 | |
| | 37 | NetWordIN2 - bit 3 | |
| | 38 | NetWordIN2 - bit 4 | |
| | 39 | NetWordIN2 - bit 5 | |
| | 40 | NetWordIN2 - bit 6 | |
| | 41 | NetWordIN2 - bit 7 | |
| | 42 | NetWordIN2 - bit 8 | |
| | 43 | NetWordIN2 - bit 9 | |
| | 44 | NetWordIN2 - bit 10 | |
| | 45 | NetWordIN2 - bit 11 | |
| | 46 | NetWordIN2 - bit 12 | |
| | 47 | NetWordIN2 - bit 13 | |
| | 48 | NetWordIN2 - bit 14 | |
| | 49 | NetWordIN2 - bit 15 | |
| | 50 | Running | TRUE if inverter and start are enabled and output frequency > 0 Hz. Otherwise FALSE.<br>Exception, quick stop mode: TRUE if inverter and start are enabled and output frequency > 0.2 Hz. Otherwise FALSE. |
| | **51** | **Ready for operation** | TRUE, wenn Inverter betriebsbereit (kein Fehler aktiv und Zwischenkreisspannung ok). Sonst FALSE. |
| | 52 | Operation enabled | TRUE if inverter and start are enabled. Otherwise FALSE. |
| | 53 | Stop active | TRUE if inverter is enabled and motor is not started and output frequency = 0. |
| | 54 | Quick stop active | TRUE if quick stop is active. Otherwise FALSE. |
| | 55 | Inverter disabled (safety) | Function is not supported in this device. |
| | 56 | Fault active | TRUE if error is active. Otherwise FALSE. |
| | 57 | Error (non-resettable) active | TRUE if non-resettable error is active. Otherwise FALSE. |
| | 58 | Device warning active | TRUE if warning is active. Otherwise FALSE.<br>• A warning has no impact on the operating status of the inverter.<br>• A warning is reset automatically if the cause has been eliminated. |
| | 59 | Device trouble active | TRUE if a fault is active. Otherwise FALSE.<br>• In the event of a fault, the motor is brought to a standstill with the quick stop ramp. The inverter is then disabled.<br>• Exception: In case of a serious fault, the inverter is disabled immediately. The motor has no torque (coasts).<br>• The error state will be left automatically if the error condition is not active anymore.<br>• The restart behaviour after trouble can be configured. ▸ Automatic restart after a fault 🕮 361 |
| | 60 | Heatsink temperature warning active | TRUE if current heatsink temperature > warning threshold for temperature monitoring. Otherwise FALSE.<br>• Display of the current heatsink temperature in 0x2D84:001 (P117.01).<br>• Setting of the warning threshold in 0x2D84:002. |
| | 66 | Flying restart circuit active | TRUE if flying restart circuit active is active. Otherwise FALSE.<br>▸ Flying restart circuit 🕮 182 |
| | 67 | DC braking active | TRUE if DC braking is active. Otherwise FALSE.<br>▸ DC braking 🕮 190 |
| | 68 | Stop command active | TRUE if delay to standstill active. Otherwise FALSE. |
| | 69 | Rotational direction reversed | TRUE if output frequency is negative. Otherwise FALSE. |
| | 70 | Frequency threshold exceeded | TRUE if current output frequency > frequency threshold. Otherwise FALSE.<br>• Display of the current output frequency in 0x2DDD (P100.00).<br>• Setting Frequency threshold in 0x4005 (P412.00).<br>▸ Trigger action if a frequency threshold is exceeded 🕮 381 |
| | 71 | Actual speed = 0 | TRUE if actual output frequency = 0 Hz (± 0.3 Hz), irrespective of the operating mode. Otherwise FALSE.<br>• Display of the current output frequency in 0x2DDD (P100.00). |

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| | 72 | Setpoint speed reached | TRUE if frequency setpoint reached. Otherwise FALSE. |
| | 73 | PID feedback = setpoint | TRUE if the controlled feedback variable = process controller setpoint (± in 0x404D:003 (P608.03) set hysteresis). Otherwise FALSE.<br>▸ Configuring the process controller 112 |
| | 74 | PID sleep mode active | TRUE if the inverter is in "PID sleep mode". Otherwise FALSE.<br>▸ Process controller sleep mode 119 |
| | 75 | PID MIN alarm active | TRUE if feedback variable (with activated PID control) < MIN alarm threshold. Otherwise FALSE.<br>• Setting of MIN alarm threshold in 0x404D:001 (P608.01).<br>▸ Configuring the process controller 112 |
| | 76 | PID MAX alarm active | TRUE if the feedback variable (with activated PID control) > MAX alarm threshold. Otherwise FALSE.<br>• Setting of MAX alarm threshold in 0x404D:002 (P608.02).<br>▸ Configuring the process controller 112 |
| | 77 | PID MIN-MAX alarm active | TRUE if no PID alarm is active with activated PID control (MIN alarm threshold < feedback variable < MAX alarm threshold). Otherwise FALSE.<br>• Setting of MIN alarm threshold in 0x404D:001 (P608.01).<br>• Setting of MAX alarm threshold in 0x404D:002 (P608.02).<br>▸ Configuring the process controller 112 |
| | 78 | Current limit reached | TRUE if current motor current ≥ maximum current. Otherwise FALSE.<br>• Display of the present motor current in 0x2D88 (P104.00).<br>• Setting for the maximum current in 0x6073 (P324.00). |
| | 79 | Torque limit reached | TRUE if torque limit has been reached or exceeded. Otherwise FALSE.<br>• Setting "Actual positive torque limit" in 0x2949:003 (P337.03).<br>• Setting Actual negative torque limit in 0x2949:004 (P337.04).<br>▸ Motor torque monitoring 231 |
| | 81 | Error of analog input 1 active | TRUE if the monitoring of the input signal at the analog input 1 has responded. Otherwise FALSE.<br>This trigger is set as a function of the following settings:<br>• Monitoring threshold0x2636:008 (P430.08)<br>• Monitoring condition0x2636:009 (P430.09)<br>The setting of the Error response in 0x2636:010 (P430.10) has no effect on this trigger.<br>▸ Analog input 1 240 |
| | 82 | Error of analog input 2 active | TRUE if the monitoring of the input signal at the analog input 2 has responded. Otherwise FALSE.<br>This trigger is set as a function of the following settings:<br>• Monitoring threshold0x2637:008 (P431.08)<br>• Monitoring condition0x2637:009 (P431.09)<br>The setting of the Error response in 0x2637:010 (P431.10) has no effect on this trigger.<br>▸ Analog input 2 244 |
| | 83 | Load loss detected | TRUE if actual motor current < threshold for load loss detection after delay time of the load loss detection has elapsed. Otherwise FALSE.<br>• Display of the actual current in 0x6078 (P103.00).<br>• Setting Threshold in 0x4006:001 (P710.01).<br>• Setting Delay time in 0x4006:002 (P710.02).<br>▸ Load loss detection 206 |
| | 84 | Heavy load monitoring | TRUE if the actual apparent current of the motor exceeds the threshold for longer than the delay time.<br>FALSE if the actual apparent current of the motor falls below the threshold value minus 5 % (hysteresis).<br>▸ Heavy load monitoring 235 |
| | 100 | Sequencer controlled (from version 03.00) | The control is executed via the sequencer (according to the configuration of the digital outputs for the current segment).<br>▸ Segment configuration 89 |
| | 101 | Sequence active (from version 03.00) | Status signal of the "sequencer" function:<br>TRUE if the sequence is running and is currently not suspended.<br>▸ Sequencer 87 |
| | 102 | Sequence suspended (from version 03.00) | Status signal of the "sequencer" function:<br>TRUE if the sequence is currently suspended.<br>▸ Sequencer 87 |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| | 103 Sequence done (from version 03.00) | Status signal of the "sequencer" function:<br>TRUE if the sequence is completed (final segment has been passed through).<br>▶ Sequencer 📖 87 |
| | 104 Local control active | TRUE if local keypad control ("LOC") active. Otherwise FALSE. |
| | 105 Remote control active | TRUE if remote control ("REM") via terminals, network, etc. active. Otherwise FALSE. |
| | 106 Manual setpoint selection active | TRUE if manual setpoint selection ("MAN") via keypad active. Otherwise FALSE.<br>• Selection of the trigger for the "Activate keypad setpoint" function in 0x2631:016 (P400.16). |
| | 107 Automatic setpoint selection active | TRUE if automatic setpoint selection ("AUTO") via terminals, network, etc. active. Otherwise FALSE. |
| | 108 Parameter set 1 active | TRUE if parameter set 1 is loaded and active. Otherwise FALSE. |
| | 109 Parameter set 2 active | TRUE if parameter set 2 is loaded and active. Otherwise FALSE. |
| | 110 Parameter set 3 active | TRUE if parameter set 3 is loaded and active. Otherwise FALSE. |
| | 111 Parameter set 4 active | TRUE if parameter set 4 is loaded and active. Otherwise FALSE. |
| | 112 Parameter set load OK | TRUE after any parameter set has been loaded. Otherwise FALSE. |
| | 113 Parameter set load fail | TRUE if any of the parameter sets could not be loaded. Otherwise FALSE. |
| | 115 Release holding brake | Trigger signal for releasing the holding brake (TRUE = release holding brake).<br>Note!<br>If this trigger is assigned to the relay or a digital output, the deceleration times set for the respective output are not effective (are internally set to "0"). Only the deceleration time set in 0x2820:012 (P712.12) for closing the holding brake influences in this case the time-dependent behaviour of the output.<br>▶ Holding brake control📖 197 |
| | 117 Motor phase failure | TRUE if a motor phase failure has been detected. Otherwise FALSE.<br>Note!<br>In the "SLSM-PSM" motor control mode, detection for motor phase failure is deactivated if HF injection is active in the low-speed range.<br>▶ Motor phase failure detection 📖 229 |
| | 118 UPS operation active | TRUE if UPS operation is active. Otherwise FALSE.<br>▶ Operation with UPS 📖 391 |
| | 155 STO active | Function is not supported in this device. |
| | 160 Assist pump 1 | Trigger signal of the cascade function for the activation of additional pump 1 (TRUE = activate additional pump 1).<br>▶ Cascade function for pumps and fans 📖 394 |
| | 161 Assist pump 2 | Trigger signal of the cascade function for the activation of additional pump 2 (TRUE = activate additional pump 2).<br>▶ Cascade function for pumps and fans 📖 394 |
| | 201 Internal value | Internal values of the manufacturer. |
| | 202 Internal value | |
| | 203 Internal value | |
| | 204 Internal value | |
| | 205 Internal value | |
| | 206 Internal value | |
| 0x2635:001<br>(P421.01) | Inversion of digital outputs: Relay<br>(DO inversion: Relay inverted) | Relay inversion |
| | **0 Not inverted** | |
| | 1 Inverted | |
| 0x4018:003 | Relay: Switch-off delay<br>0.000 ... [**0.000**] ... 65.535 s | Switch-off delay for the relay.<br>Note!<br>The set delay time is not effective (internally set to "0") if the relay is assigned to the trigger "Release holding brake [115]". Only the deceleration time set in 0x2820:012 (P712.12)for closing the holding brake influences the time-dependent behaviour of the relay. |

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x4018:004 | Relay: Switch-on delay<br>0.000 ... [**0.000**] ... 65.535 s | | Switch-on delay for the relay.<br>Note!<br>The set delay time is not effective (internally set to "0") if the relay is assigned to the trigger "Release holding brake [115]". Only the deceleration time set in 0x2820:012 (P712.12)for closing the holding brake influences the time-dependent behaviour of the relay. |
| 0x4018:005 | Relay: Relay state<br>• Read only | | Display of the logic state of the relay. |
| | 0 | FALSE | |
| | 1 | TRUE | |
| 0x4018:006 | Relay: Trigger signal state<br>• Read only | | Display of the logic state of the trigger signal for the relay (without taking a ON/OFF delay set and inversion into consideration). |
| | 0 | FALSE | |
| | 1 | TRUE | |
| 0x4018:007 | Relay: Switching cycles<br>• Read only | | Display of the previous relay switching cycles. |

### 11.3.2 Digital output 1

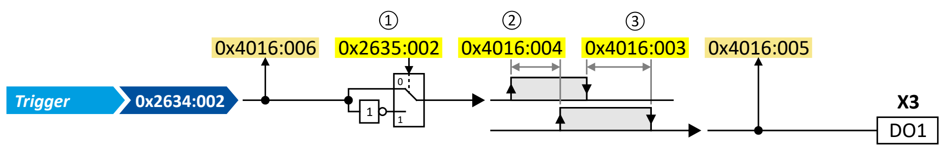
Settings for digital output 1.

#### Details

The digital output 1 is controlled with the trigger selected in 0x2634:002 (P420.02).

The following settings are possible for the digital output:

- Inversion ①
- Switch-on delay ②
- Cutout delay ③




Diagnostic parameters:

- The logic status of the trigger signal is displayed in 0x4016:006.
- The logic status of the digital output is displayed in 0x4016:005.

#### Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2634:002<br>(P420.02) | Digital outputs function: Digital output 1<br>(Dig.out.function: DO1 function)<br>• For further possible settings, see parameter 0x2634:001 (P420.01). 📖 247 | | Assignment of a trigger to digital output 1.<br>Trigger = FALSE: X3/DO1 set to LOW level.<br>Trigger = TRUE: X3/DO1 set to HIGH level.<br>Notes:<br>• An inversion set in 0x2635:002 (P421.02) is taken into consideration here. |
| | **115** | **Release holding brake** | Trigger signal for releasing the holding brake (TRUE = release holding brake).<br>Note!<br>If this trigger is assigned to the relay or a digital output, the deceleration times set for the respective output are not effective (are internally set to "0"). Only the deceleration time set in 0x2820:012 (P712.12) for closing the holding brake influences in this case the time-dependent behaviour of the output.<br>▶ Holding brake control 📖 197 |
| | 100 | Sequencer controlled (from version 03.00) | The control is executed via the sequencer (according to the configuration of the digital outputs for the current segment).<br>▶ Segment configuration 📖 89 |
| 0x2635:002<br>(P421.02) | Inversion of digital outputs: Digital output 1<br>(DO inversion: DO1 inversion) | | Inversion of digital output 1 |
| | **0** | **Not inverted** | |
| | 1 | Inverted | |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x4016:003 | Digital output 1: Cutout delay<br>0.000 ... [**0.000**] ... 65.535 s | Switch-off delay for digital output 1.<br>Note!<br>The set delay time is not effective (internally set to "0") if the relay is assigned to the trigger "Release holding brake [115]". Only the deceleration time set in 0x2820:012 (P712.12)for closing the holding brake influences the time-dependent behaviour of the digital output. |
| 0x4016:004 | Digital output 1: Switch-on delay<br>0.000 ... [**0.000**] ... 65.535 s | Switch-on delay for digital output 1.<br>Note!<br>The set delay time is not effective (internally set to "0") if the relay is assigned to the trigger "Release holding brake [115]". Only the deceleration time set in 0x2820:012 (P712.12)for closing the holding brake influences the time-dependent behaviour of the digital output. |
| 0x4016:005 | Digital output 1: Terminal state<br>• Read only<br>0 FALSE<br>1 TRUE | Display of the logic state of output terminal X3/DO1. |
| 0x4016:006 | Digital output 1: Trigger signal state<br>• Read only<br>0 FALSE<br>1 TRUE | Display of the logic state of the trigger signal for digital output 1 (without taking a ON/OFF delay set and inversion into consideration). |

## 11.4 Configure analog outputs

### 11.4.1 Analog output 1

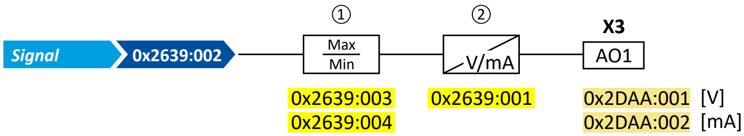
Settings for analog output 1.

**Details**

The analog output 1 is controlled with the signal selected in 0x2639:002 (P440.02).

The following settings are possible for the analog output:

- Definition of the signal range ①
- Definition of the output range ②




Diagnostic parameters:

- The current output voltage is displayed in 0x2DAA:001 (P112.01).
- The actual output current is displayed in 0x2DAA:002 (P112.02).

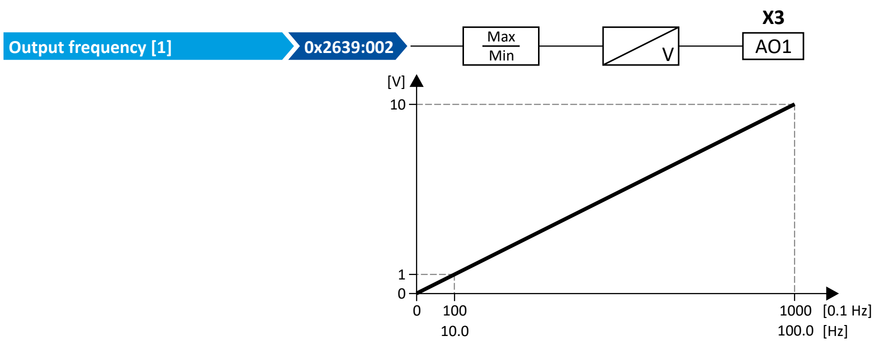
**Definition of the signal range**

The signal range results from the resolution of the selected signal multiplied by the set min and max signal value. Signals outside the signal range are cut off. For examples, see the following table:

| Signal 0x2639:002 (P440.02) | Resolution | Min. signal 0x2639:003 (P440.03) | Max. signal 0x2639:004 (P440.04) | Signal range |
|---|---|---|---|---|
| Output frequency | 0.1 Hz | 0 | 1000 | 0 ... 100.0 Hz |
| Frequency setpoint | 0.1 Hz | 0 | 1000 | 0 ... 100.0 Hz |
| Analog input 1 | 0.1 % | 0 | 1000 | 0 ... 100.0 % |
| Analog input 2 | 0.1 % | 0 | 1000 | 0 ... 100.0 % |
| Motor current | 0.1 A | 0 | 100 | 0 ... 10.0 A |
| Output power | 0.001 kW | 0 | 250 | 0 ... 0.250 kW |
| Actual torque | 0.1 % * | 0 | 1000 | 0 ... 100.0 % * |
| NetWordIN3 | 0.1 % | 200 | 500 | 20.0 ... 50.0 % |
| NetWordIN4 | 0.1 % | 0 | 250 | 0 ... 25.0 % |
| * 100 % = Rated motor torque 0x6076 (P325.00) | | | | |

**Definition of the output range**

The analog output can be configured as voltage source or current source. The output range selected in 0x2639:001 (P440.01) then corresponds to the configured signal range.




**Configuration examples**

Detailed configuration examples can be found in the following subchapters:

▸ Example: Output voltage 0 ... 10 V = output frequency 0 ... 100 Hz 📖 255
▸ Example: Output voltage 2 ... 10 V = output frequency 30 ... 60 Hz 📖 255
▸ Example: mirrored output range 📖 256

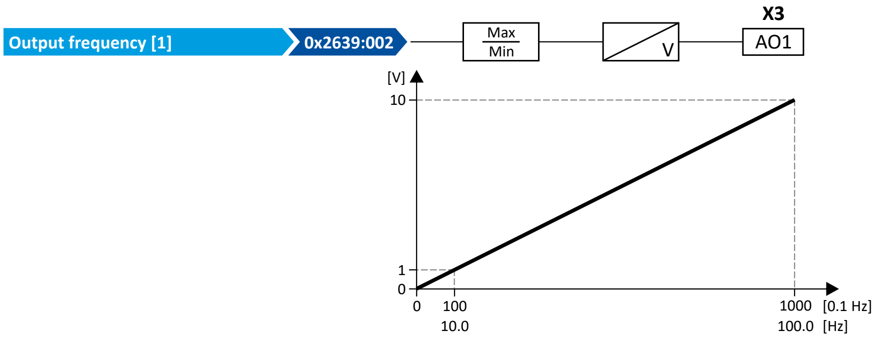
**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2639:001<br>(P440.01) | Analog output 1: Output range<br>(Analog output 1: AO1 outp. range) | | Definition of the output range. |
| | 0 | Inhibited | |
| | **1** | **0 ... 10 VDC** | |
| | 2 | 0 ... 5 VDC | |
| | 3 | 2 ... 10 VDC | |
| | 4 | 4 ... 20 mA | |
| | 5 | 0 ... 20 mA | |
| | 11 | 0 ... 10 VDC (mirrored) | In these configurations, negative analog output values are symmetrically mirrored on the Y axis.<br>▸ Example: mirrored output range 📖 256 |
| | 12 | 0 ... 5 VDC (mirrored) | |
| | 13 | 2 ... 10 VDC (mirrored) | |
| | 14 | 4 ... 20 mA (mirrored) | |
| | 15 | 0 ... 20 mA (mirrored) | |
| 0x2639:002<br>(P440.02) | Analog output 1: Function<br>(Analog output 1: AO1 function) | | Selection of the signal to be shown at analog output 1. |
| | 0 | Not active | No output signal. |
| | **1** | **Output frequency** | Actual output frequency (resolution: 0.1 Hz). |
| | 2 | Frequency setpoint | Current frequency setpoint (resolution: 0.1 Hz). |
| | 3 | Analog input 1 | Input signal of analog input 1 (resolution: 0.1 %). |
| | 4 | Analog input 2 | Input signal of analog input 2 (resolution: 0.1 %). |
| | 5 | Motor current | Actual motor current (resolution: 0.1 A). |
| | 6 | Output power | Actual output power (resolution: 0.001 kW). |
| | 7 | Torque actual value (from version 03.00) | Current torque (resolution: 0.1 %).<br>• 100 % = permissible maximum torque 0x6072 (P326.00) |
| | 8 | Actual motor frequency | Actual motor output frequency (resolution: 0.1 Hz). |
| | 10 | Sequencer controlled (from version 03.00) | Voltage value which has been set for the currently executed sequencer segment (resolution: 0.01 V).<br>▸ Sequencer 📖 87 |
| | 11 | DC-bus voltage | Display of the current DC-bus voltage. |
| | 12 | Device utilisation (ixt) | |
| | 20 | NetWordIN3 | Actual value of the NetWordIN3 data word (resolution: 0.1 %).<br>▸ Control analog outputs via network 📖 279 |
| | 21 | NetWordIN4 | Actual value of the NetWordIN4 data word (resolution: 0.1 %).<br>▸ Control analog outputs via network 📖 279 |
| | 201 | Internal value (from version 05.00) | Internal values of the manufacturer. |
| | 202 | Internal value (from version 05.00) | |
| | 203 | Internal value (from version 05.00) | |
| | 204 | Internal value (from version 05.00) | |
| | 205 | Internal value (from version 05.00) | |
| | 206 | Internal value (from version 05.00) | |
| 0x2639:003<br>(P440.03) | Analog output 1: Min. signal<br>(Analog output 1: AO1 min. signal)<br>-2147483648 ... [**0**] ... 2147483647 | | Definition of the signal value that corresponds to the minimum value at analog output 1.<br>Example: configuration of analog output 1 as a 4 ... 20 mA current loop: output current 4 mA = 0x2639:003 |
| 0x2639:004<br>(P440.04) | Analog output 1: Max. signal<br>(Analog output 1: AO1 max. signal)<br>-2147483648 ... [**1000**] ... 2147483647 | | Definition of the signal value that corresponds to the maximum value at analog output 1.<br>Example: configuration of analog output 1 as a 4 ... 20 mA current loop: output current 20 mA = 0x2639:004 |

### 11.4.1.1 Example: Output voltage 0 ... 10 V = output frequency 0 ... 100 Hz

In this configuration, a voltage is provided at the analog output proportionately to the actual output frequency of the inverter (1 V = 10 Hz, resolution 0.1 Hz).

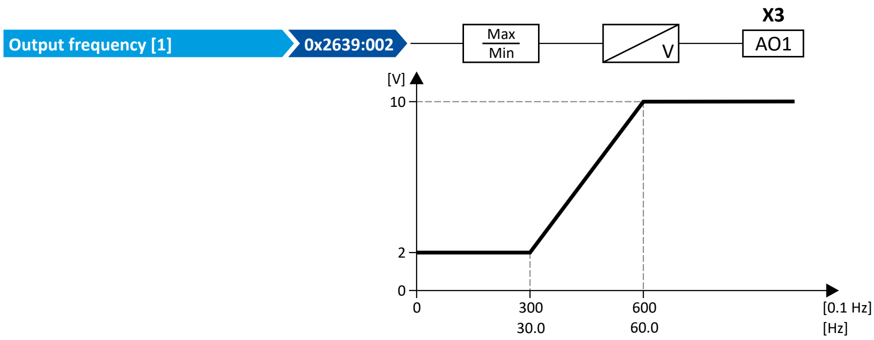
| Parameter | Name | Setting for this example |
|---|---|---|
| 0x2639:001 (P440.01) | Analog output 1: Output range | 0 ... 10 VDC [1] |
| 0x2639:002 (P440.02) | Analog output 1: Function | Output frequency [1] |
| 0x2639:003 (P440.03) | Analog output 1: Min. signal | 0 |
| 0x2639:004 (P440.04) | Analog output 1: Max. signal | 1000 |




### 11.4.1.2 Example: Output voltage 2 ... 10 V = output frequency 30 ... 60 Hz

In this configuration, the output range 2 ... 10 V is used for the output of the output frequency (resolution: 0.1 Hz). The example shows how the signals outside the signal range (here: 30 ... 60 Hz) are cut off.

| Parameter | Designation | Setting for this example |
|---|---|---|
| 0x2639:001 (P440.01) | Analog output 1: Output range | 2 ... 10 VDC [3] |
| 0x2639:002 (P440.02) | Analog output 1: Function | Output frequency [1] |
| 0x2639:003 (P440.03) | Analog output 1: Min. signal | 300 |
| 0x2639:004 (P440.04) | Analog output 1: Max. signal | 600 |



### 11.4.1.3 Example: mirrored output range

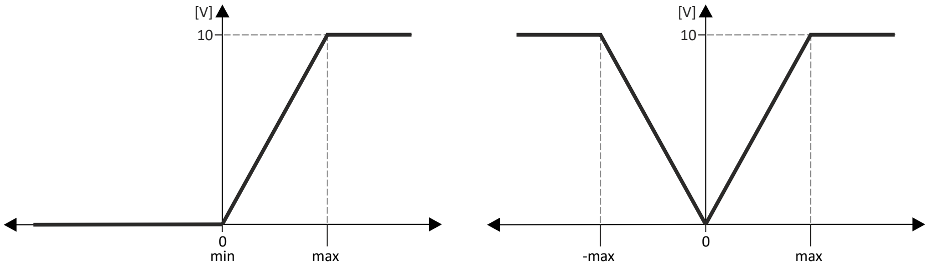
For the definition of the output range, configurations are also available in 0x2639:001 (P440.01) where negative analog output values are mirrored symmetrically on the Y axis. This makes it possible to realize an absolute value generation.

The following examples illustrate the function:

**Example 1: Minimum value = 0**

| Parameter | Name | Setting for this example |
|---|---|---|
| 0x2639:001 (P440.01) | Analog output 1: Output range | 0 ... 10 VDC (mirrored) [11] |
| 0x2639:003 (P440.03) | Analog output 1: Min. signal | 0 |
| 0x2639:004 (P440.04) | Analog output 1: Max. signal | > 0 |

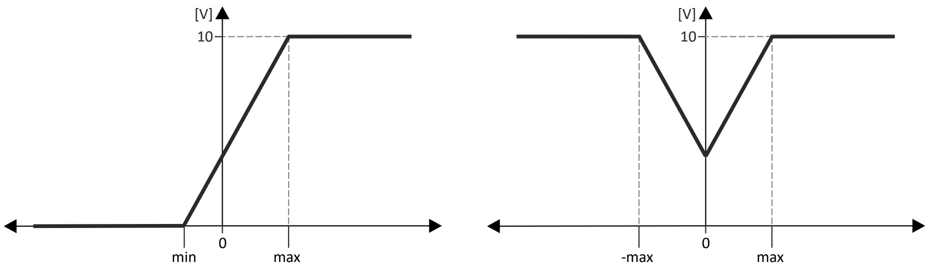
Diagram on the left: without mirroring, diagram on the right: with mirroring of the negative output values on the Y axis




**Example 2: Minimum value lower than 0**

| Parameter | Name | Setting for this example |
|---|---|---|
| 0x2639:001 (P440.01) | Analog output 1: Output range | 0 ... 10 VDC (mirrored) [11] |
| 0x2639:003 (P440.03) | Analog output 1: Min. signal | <0 |
| 0x2639:004 (P440.04) | Analog output 1: Max. signal | > 0 |

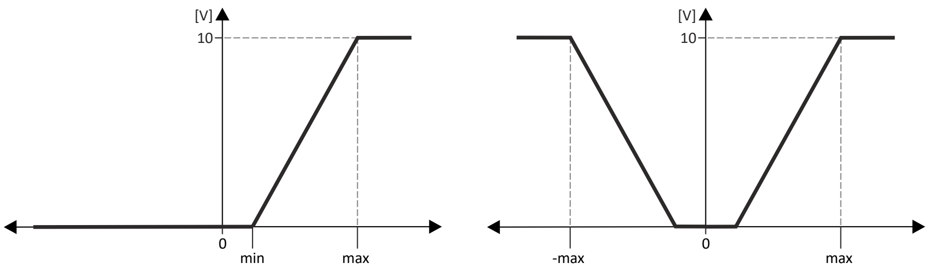
Diagram on the left: without mirroring, diagram on the right: with mirroring of the negative output values on the Y axis




**Example 3: Minimum value higher than 0**

| Parameter | Name | Setting for this example |
|---|---|---|
| 0x2639:001 (P440.01) | Analog output 1: Output range | 0 ... 10 VDC (mirrored) [11] |
| 0x2639:003 (P440.03) | Analog output 1: Min. signal | > 0 |
| 0x2639:004 (P440.04) | Analog output 1: Max. signal | > Min. signal 0x2639:003 (P440.03) |

Diagram on the left: without mirroring, diagram on the right: with mirroring of the negative output values on the Y axis





# 12 Configuring the network

The inverter has various basic functions for network control. The inverter also supports multiple device profiles and is available in versions with the network options CANopen® and Modbus RTU.

**Basic functions for network control**



**Supported device profiles**



**Network options**

## 12.1 Control the inverter via network

### 12.1.1 Activate network control

In order to be able to control the inverter via network, a trigger must be first assigned in 0x2631:037 (P400.37) the "Activate network control" function.

- This trigger can for instance be the constant value "TRUE" or a digital input.
- If the assigned trigger is = TRUE, the motor can only be started via the network control word.
  Exception: jog operation; see chapter "Start, stop and rotating direction commands". 📖 49

In order to control the inverter from the network, the network share 0x2631:037 (P400.37) must be configured.

In case of an activated network control, the following functions are still active:

- 0x2631:001 (P400.01): Inverter enable
- 0x2631:002 (P400.02): Run
- 0x2631:003 (P400.03): Activate quick stop
- 0x2631:004 (P400.04): Reset error
- 0x2631:005 (P400.05): DC braking
- 0x2631:010 (P400.10): Jog forward (CW)
- 0x2631:011 (P400.11): Jog reverse (CCW)*
- 0x2631:012 (P400.12): Activate keypad control*
- 0x2631:037 (P400.37): Activate network control*
- 0x2631:043 (P400.43): Activate fault 1
- 0x2631:044 (P400.44): Activate fault 2
- 0x2631:054 (P400.54): Reset position counter

(*Not active in case of network operation in CiA402 mode 0x6060=2).

In case of an activated network control, the following functions are also still active if they are not configured in the NetWordIN1 bit functionality:

- 0x2631:048 (P400.48): Activate PID influence ramp
- 0x2631:041 (P400.41): Select parameter set (bit 0)
- 0x2631:042 (P400.42): Select parameter set (bit 1)

All other functions configurable via 0x2631:xx (P400.xx) are deactivated in case of network control.

**Parameter**

| Address | | Name / setting range / [default setting] | Information |
|---|---|---|---|
| 0x2631:037<br>(P400.37) | | Function list: Activate network control<br>(Function list: Network control)<br>• Further possible settings: ▸ Trigger list 📖 59 | Assignment of a trigger for the "Activate network control" function.<br>Trigger = TRUE: Activate network control.<br>Trigger = FALSE: no action / deactivate network control again. |
| | **0** | **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| | 114 | Network control active (from version 02.00) | TRUE if the network control is requested via bit 5 of the AC drive control word 0x400B:001 (P592.01). Otherwise FALSE.<br>Notes:<br>• Set this selection if the network control is to be activated via bit 5 of the AC drive control word.<br>• The AC drive control word can be used with any communication protocol.<br>▸ AC drive control word 📖 305 |

### 12.1.2 Predefined control and status words

For establishing a simple network connection, the inverter provides predefined control and status words for the device profile CiA 402, the AC drive profile as well as in the LECOM format.

**Details**

Process data are exchanged via cyclic data exchange between the network master and the inverter.

For the cyclic data exchange, the inverter is provided with 24 network registers.

- 12 network registers are provided as input registers for data words from the network master to the inverter.
- 12 network registers are provided as output registers for data words from the inverter to the network master.
- Each network register is provided with a corresponding code that defines which parameters (or other data codes) are mapped to the network register.
- The input and output registers are divided into three blocks (A, B, C) in each case, featuring 4 successive data words, respectively:

| Network register | |
|---|---|
| **Input register** | **Output register** |
| Network IN A0<br>Network IN A1<br>Network IN A2<br>Network IN A3 | Network OUT A0<br>Network OUT A1<br>Network OUT A2<br>Network OUT A3 |
| Network IN B0<br>Network IN B1<br>Network IN B2<br>Network IN B3 | Network OUT B0<br>Network OUT B1<br>Network OUT B2<br>Network OUT B3 |
| Network IN C0<br>Network IN C1<br>Network IN C2<br>Network IN C3 | Network OUT C0<br>Network OUT C1<br>Network OUT C2<br>Network OUT C3 |

The terms "input" and "output" refer to the point of view of the inverter:
- Input data are transmitted by the network master and received by the inverter.
- Output data are transmitted by the inverter and received by the network master.

The assignment of the network registers and the number of data words that can be transmitted cyclically varies according to the network/communication protocol. Detailed information can be found in the documentation for the respective communication protocol.

Data mapping cannot be applied to all parameters. The mappable parameters are indicated accordingly in the "Parameter attribute list". ▶ Parameter attribute list 📖 480

The following table lists the predefined control and status words. These can be mapped to network registers for the cyclic exchange of data:

| Name | Parameter | Associated mapping entry * | Further information |
|---|---|---|---|
| CiA control word | 0x6040 | 0x60400010 | ▸ CiA 402 device profile 📖 285 |
| CiA status word | 0x6041 (P780.00) | 0x60410010 | |
| AC Drive control word | 0x400B:001 (P592.01) | 0x400B0110 | ▸ AC drive 📖 305 |
| AC Drive status word | 0x400C:001 (P593.01) | 0x400C0110 | |
| LECOM control word | 0x400B:002 (P592.02) | 0x400B0210 | ▸ Lenze LECOM profile 📖 307 |
| LECOM status word | 0x400C:002 (P593.02) | 0x400C0210 | |
| * A mapping entry consists of index, subindex and data length in bits of the parameter to be mapped. | | | |

There are also additional mappable data words to individually control the inverter:

▸ Define your own control word format 📖 261

▸ Define your own status word format 📖 269

▸ Further mappable parameters 📖 278

General information about the process of data mapping can be found in the chapter of the same name for the corresponding network.

### 12.1.3 Define your own control word format

The mappable data word NetWordIN1 is available for implementing a separate control word format.

**Details**

| Designation | Parameter | Associated mapping entry * | Further information |
|---|---|---|---|
| NetWordIN1 | 0x4008:001 (P590.01) | 0x40080110 | The functions that are to be triggered via bits 0 ... 15 of the NetWordIN1 data word are defined in 0x400E:001 (P505.01) ... 0x400E:016 (P505.16). |
| * A mapping entry consists of index, subindex and data length in bits of the parameter to be mapped. | | | |

General information about the process of data mapping can be found in the chapter of the same name for the corresponding network.

### Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x4008:001<br>(P590.01) | Process input words: NetWordIN1<br>(NetWordINx: NetWordIN1)<br>0x0000 ... [**0x0000**] ... 0xFFFF | | Mappable data word for flexible control of the inverter via network. |
| | Bit 0 | Mapping bit 0 | Assignment of the function: 0x400E:001 (P505.01) |
| | Bit 1 | Mapping bit 1 | Assignment of the function: 0x400E:002 (P505.02) |
| | Bit 2 | Mapping bit 2 | Assignment of the function: 0x400E:003 (P505.03) |
| | Bit 3 | Mapping bit 3 | Assignment of the function: 0x400E:004 (P505.04) |
| | Bit 4 | Mapping bit 4 | Assignment of the function: 0x400E:005 (P505.05) |
| | Bit 5 | Mapping bit 5 | Assignment of the function: 0x400E:006 (P505.06) |
| | Bit 6 | Mapping bit 6 | Assignment of the function: 0x400E:007 (P505.07) |
| | Bit 7 | Mapping bit 7 | Assignment of the function: 0x400E:008 (P505.08) |
| | Bit 8 | Mapping bit 8 | Assignment of the function: 0x400E:009 (P505.09) |
| | Bit 9 | Mapping bit 9 | Assignment of the function: 0x400E:010 (P505.10) |
| | Bit 10 | Mapping bit 10 | Assignment of the function: 0x400E:011 (P505.11) |
| | Bit 11 | Mapping bit 11 | Assignment of the function: 0x400E:012 (P505.12) |
| | Bit 12 | Mapping bit 12 | Assignment of the function: 0x400E:013 (P505.13)<br>Alternatively, this mapping bit can be used for controlling the digital outputs.<br>Assignment of the digital outputs:<br>• Relay: 0x2634:001 (P420.01) / selection [30]<br>• Digital output 1: 0x2634:002 (P420.02) / selection [30]<br>Note!<br>Do not assign the mapping bit to a function and a digital output at the same time. A double assignment can cause an unpredictable drive behaviour! |
| | Bit 13 | Mapping bit 13 | Assignment of the function: 0x400E:014 (P505.14)<br>Alternatively, this mapping bit can be used for controlling the digital outputs.<br>Assignment of the digital outputs:<br>• Relay: 0x2634:001 (P420.01) / selection [31]<br>• Digital output 1: 0x2634:002 (P420.02) / selection [31]<br>Note!<br>Do not assign the mapping bit to a function and a digital output at the same time. A double assignment can cause an unpredictable drive behaviour! |
| | Bit 14 | Mapping bit 14 | Assignment of the function: 0x400E:015 (P505.15)<br>Alternatively, this mapping bit can be used for controlling the digital outputs.<br>Assignment of the digital outputs:<br>• Relay: 0x2634:001 (P420.01) / selection [32]<br>• Digital output 1: 0x2634:002 (P420.02) / selection [32]<br>Note!<br>Do not assign the mapping bit to a function and a digital output at the same time. A double assignment can cause an unpredictable drive behaviour! |
| | Bit 15 | Mapping bit 15 | Assignment of the function: 0x400E:016 (P505.16)<br>Alternatively, this mapping bit can be used for controlling the digital outputs.<br>Assignment of the digital outputs:<br>• Relay: 0x2634:001 (P420.01) / selection [33]<br>• Digital output 1: 0x2634:002 (P420.02) / selection [33]<br>Note!<br>Do not assign the mapping bit to a function and a digital output at the same time. A double assignment can cause an unpredictable drive behaviour! |
| 0x400E:001<br>(P505.01) | NetWordIN1 function: Bit 0<br>(NetWordIN1 fct.: NetWordIN1.00)<br>• Setting can only be changed if the inverter is disabled. | | Definition of the function that is to be triggered via bit 0 of the mappable NetWordIN1 data word. |
| | **0** | **Not active** | Trigger bit without any function. |

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| | 1 | Disable inverter | Trigger bit = 0-1 edge: The inverter is disabled.<br>Trigger bit = 0: The inverter is enabled (unless there is another cause for inverter disable).<br>Notes:<br>• In all device states, a 0-1 edge causes an immediate change to the inhibited state with one exception: If the inverter is in the error status and the error condition still exists, the inverter remains in the error status.<br>• Changing to the disabled state causes an immediate stop of the motor, regardless of the stop method set in 0x2838:003 (P203.03). The motor coasts down as a function of the mass inertia of the machine.<br>• In the disabled state, the motor cannot be started.<br>• After the inverter disable is deactivated, a renewed start command is required to restart the motor.<br>• The cause(s) that are active for the disabled state are shown in 0x282A:001 (P126.01). |
| | 2 | Stopping | Trigger bit = 1: Motor is stopped.<br>Trigger bit = 0: No action / Deactivate stop again.<br>Notes:<br>• The stop method can be selected in 0x2838:003 (P203.03). |
| | 3 | Activate quick stop | Trigger bit = 1: "Quick stop" function activated.<br>Trigger bit = 0: no action / deactivate function again.<br>Notes:<br>• The "Quick stop" function brings the motor to a standstill within the deceleration time set in 0x291C (P225.00).<br>• The "Quick stop" function has a higher priority than the "Run" function. |
| | 4 | Reset error | Trigger bit = 0-1 edge: Active error is reset (acknowledged) if the error condition is not active anymore and the error is resettable.<br>Trigger bit = 0: No action.<br>Notes:<br>• After resetting the error, a new enable/start command is required to restart the motor. |
| | 5 | Activate DC braking | Trigger bit = 1: "DC braking" function activated.<br>Trigger bit = 0: no action / deactivate function again.<br>▸ DC braking 📖 190 |
| | 8 | Run forward (CW) | Trigger bit = 0-1 edge: Motor is started in forward rotating direction (CW).<br>Trigger bit = 1-0 edge: Motor is stopped again.<br>Notes:<br>• The stop method can be selected in 0x2838:003 (P203.03).<br>• In the case of a bipolar setpoint selection (e.g ±10 V), the function is executed irrespective of the rotating direction. The rotating direction is determined by the sign of the setpoint.<br>• The function also serves to realise an automatic start after switch-on.<br>▸ Start behavior 📖 39<br>• The "Reverse rotational direction [13]" function can be used in connection with this function. |
| | 9 | Run reverse (CCW) | Trigger bit = 0-1 edge: Motor is started in the reverse rotating direction (CCW).<br>Trigger bit = 1-0 edge: Motor is stopped again.<br>Notes:<br>• The stop method can be selected in 0x2838:003 (P203.03).<br>• In the case of a bipolar setpoint selection (e.g ±10 V), the function is executed irrespective of the rotating direction. The rotating direction is determined by the sign of the setpoint.<br>• The function also serves to realise an automatic start after switch-on.<br>▸ Start behavior 📖 39<br>• The "Reverse rotational direction [13]" function can be used in connection with this function. |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| | 13 Reverse rotational direction | Trigger bit = 1: the setpoint specified is inverted (i. e. the sign is inverted).<br>Trigger bit = 0: no action / deactivate function again. |
| | 14 Activate AI1 setpoint | Trigger bit = 1: analog input 1 is used as setpoint source (if the trigger bit assigned has the highest setpoint priority).<br>Trigger bit = 0: no action / deactivate function again.<br>▸ Analog input 1 📖 240 |
| | 15 Activate AI2 setpoint | Trigger bit = 1: analog input 2 is used as setpoint source (if the trigger bit assigned has the highest setpoint priority).<br>Trigger bit = 0: no action / deactivate function again.<br>▸ Analog input 2 📖 244 |
| | 17 Activate network setpoint | Trigger bit = 1: the network is used as setpoint source (if the trigger bit assigned has the highest setpoint priority).<br>Trigger bit = 0: no action / deactivate function again. |
| | 18 Activate preset (bit 0) | Selection bits for bit coded selection and activation of a parameterised setpoint (preset).<br>▸ Setpoint presets 📖 83 |
| | 19 Activate preset (bit 1) | |
| | 20 Activate preset (bit 2) | |
| | 21 Activate preset (bit 3) | |
| | 26 Activate segment 1 setpoint (from version 03.00) | Selection bits for bit coded selection and activation of a parameterised segment setpoint.<br>Notes:<br>• During normal operation (no active sequence), this function serves to activate the setpoint of a segment (instead of an entire sequence in the sequencer operation).<br>• This function is not intended for the use in the sequencer operation.<br>▸ Segment configuration 📖 89 |
| | 27 Activate segment 2 setpoint (from version 03.00) | |
| | 28 Activate segment 3 setpoint (from version 03.00) | |
| | 29 Activate segment 4 setpoint (from version 03.00) | |
| | 30 Run/abort sequence (from version 03.00) | Trigger bit = 1: Start selected sequence.<br>Trigger bit = 0: Abort sequence.<br>Notes:<br>• The assigned trigger bit must remain set to "1" for the duration of the sequence.<br>• If the trigger bit is reset to "0", the sequence is aborted. In this case, the standard setpoint or the setpoint source selected via setpoint change-over is active again.<br>• A sequence is selected in a binary-coded fashion via the trigger bits assigned to the four functions "Select sequence (bit 0) [50]" ... "Select sequence (bit 3) [53]".<br>▸ Sequencer 📖 87 |
| | 32 Next sequence step (from version 03.00) | Trigger bit = 0↗1 (edge): Next sequence step.<br>Trigger bit = 1↘0 (edge): No action.<br>Notes:<br>• The execution of the current step is completed even if the time parameterised for the segment has not elapsed yet.<br>• The function is only relevant for Sequencer mode0x4025 (P800.00) = "Step operation [2]" or "Time & step operation [3]".<br>• A jump to the next sequence step is not possible if the sequence pauses, the sequence is suspended or the final segment is executed.<br>▸ Sequencer 📖 87 |
| | 33 Pause sequence (from version 03.00) | Trigger bit = 1: Pause sequence.<br>Trigger bit = 0: Continue sequence.<br>Notes:<br>• During the pause, the sequence stops in the current step. The expiration of the time set for the segment is stopped.<br>• The sequencer setpoint continues to remain active.<br>▸ Sequencer 📖 87 |
| | 34 Suspend sequence (from version 03.00) | Trigger bit = 1: Suspend sequence.<br>Trigger bit = 0: Continue sequence.<br>Notes:<br>• This function serves to temporarily change over to the standard setpoint or the setpoint source selected via setpoint change-over.<br>• The sequence is continued at the point where it was suspended.<br>▸ Sequencer 📖 87 |



| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| | 35 | Stop sequence (from version 03.00) | Trigger bit = 0↗1 (edge): Stop sequence.<br>Trigger bit = 1↘0 (edge): No action.<br>Notes:<br>• If the sequence is stopped, it is jumped to the final segment.<br>• The further execution depends on the selected End of sequence mode0x402F (P824.00).<br>▶ Sequencer 87 |
| | 36 | Abort sequence (from version 03.00) | Trigger bit = 0↗1 (edge): Abort sequence.<br>Trigger bit = 1↘0 (edge): No action.<br>Notes:<br>• This function serves to directly stop the sequence without the final segment being executed. In this case, the standard setpoint or the setpoint source selected via setpoint change-over is active again.<br>▶ Sequencer 87 |
| | 39 | Activate ramp 2 | Trigger bit = 1: activate acceleration time 2 and deceleration time 2 manually.<br>Trigger bit = 0: no action / deactivate function again.<br>▶ Ramp times 80 |
| | 40 | Load parameter set | Trigger bit = 0-1 edge: parameter change-over to the value set selected via "Select parameter set (bit 0)" and "Select parameter set (bit 1)".<br>Trigger bit = 0: no action.<br>Notes:<br>• The activation method for the "Parameter change-over" function can be selected in 0x4046 (P755.00).<br>▶ Parameter change-over 370 |
| | 41 | Select parameter set (bit 0) | Selection bits for the "Parameter change-over" function.<br>▶ Parameter change-over 370 |
| | 42 | Select parameter set (bit 1) | |
| | 43 | Activate fault 1 | Trigger bit = 1: Trigger user-defined error 1.<br>Trigger bit = 0: no action.<br>Notes:<br>• After the error is triggered, the motor is brought to a standstill with the quick stop ramp. The inverter is then disabled.<br>Associated error code:<br>• 25249 \| 0x62A1 - Network: user fault 1 |
| | 44 | Activate fault 2 | Trigger bit = 1: Trigger user-defined error 2.<br>Trigger bit = 0: no action.<br>Notes:<br>• After the error is triggered, the motor is brought to a standstill with the quick stop ramp. The inverter is then disabled.<br>Associated error code:<br>• 25250 \| 0x62A2 - Network: user fault 2 |
| | 45 | Deactivate PID controlling | Trigger bit = 1: If PID control is activated, ignore PID control and drive the motor in speed-controlled manner.<br>Trigger bit = 0: If PID control is activated, drive the motor with PID control.<br>Notes:<br>• The PID control can be activated in 0x4020:001 (P600.01).<br>▶ Configuring the process controller 112 |
| | 46 | Set PID output to 0 | Trigger bit = 1: If PID control is activated, I component and the output of the PID controller are set to 0 and the internal control algorithm is stopped. The PID control remains active.<br>Trigger bit = 0: No action / deactivate function again.<br>▶ Configuring the process controller 112 |
| | 47 | Inhibit PID I-component | Trigger bit = 1: If the PID control is activated, the I component of the PID controller is set to 0 and the integration process is stopped.<br>Trigger bit = 0: No action / deactivate function again.<br>▶ Configuring the process controller 112 |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| | 48 Activate PID influence ramp | Trigger bit = 1: the influence of the process controller is shown by means of a ramp.<br>Trigger bit = 0 or not connected: the influence of the process controller is shown by means of a ramp.<br>Notes:<br>• The influence of the process controller is always active (not only when PID control is activated).<br>• Acceleration time for showing the influence of the process controller can be set in 0x404C:001 (P607.01).<br>• Deceleration time for hiding the influence of the process controller can be set in 0x404C:002 (P607.02).<br>▶ Configuring the process controller 📖 112 |
| | 49 Release holding brake | Trigger bit = 1: Release holding brake manually.<br>Trigger bit = 0: No action.<br>Notes:<br>• The manually triggered "Release holding brake" command has a direct impact on the "Release holding brake [115]" trigger. Thus, the holding brake can be manually released if the power section is switched off.<br>• The responsibility for a manual release of the holding brake has the external trigger source for the "Release holding brake" command.<br>▶ Holding brake control 📖 197 |
| | 50 Select sequence (bit 0)<br>51 Select sequence (bit 1)<br>52 Select sequence (bit 2)<br>53 Select sequence (bit 3) | Selection bits for bit coded selection of a sequence.<br>Notes:<br>• The selected sequence is not started automatically.<br>• For a status-controlled start, the function "Run/abort sequence [30]" is available.<br>▶ Sequencer control functions 📖 106 |
| | 54 Position counter reset | Trigger bit = 1: Reset position counter manually.<br>Trigger bit = 0: No action.<br>▶ Position counter 📖 383 |
| | 55 Activate UPS operation | Trigger bit = 1: Activate UPS operation.<br>Trigger bit = 0: No action / deactivate function again.<br>▶ Operation with UPS 📖 391 |
| 0x400E:002<br>(P505.02) | NetWordIN1 function: Bit 1<br>(NetWordIN1 fct.: NetWordIN1.01)<br>• Setting can only be changed if the inverter is disabled.<br>• For further possible settings, see parameter 0x400E:001 (P505.01). 📖 262 | Definition of the function that is to be triggered via bit 1 of the mappable NetWordIN1 data word. |
| | **0 Not active** | Trigger bit without any function. |
| 0x400E:003<br>(P505.03) | NetWordIN1 function: Bit 2<br>(NetWordIN1 fct.: NetWordIN1.02)<br>• Setting can only be changed if the inverter is disabled.<br>• For further possible settings, see parameter 0x400E:001 (P505.01). 📖 262 | Definition of the function that is to be triggered via bit 2 of the mappable NetWordIN1 data word. |
| | **3 Activate quick stop** | Trigger bit = 1: "Quick stop" function activated.<br>Trigger bit = 0: no action / deactivate function again.<br>Notes:<br>• The "Quick stop" function brings the motor to a standstill within the deceleration time set in 0x291C (P225.00).<br>• The "Quick stop" function has a higher priority than the "Run" function. |
| 0x400E:004<br>(P505.04) | NetWordIN1 function: Bit 3<br>(NetWordIN1 fct.: NetWordIN1.03)<br>• Setting can only be changed if the inverter is disabled.<br>• For further possible settings, see parameter 0x400E:001 (P505.01). 📖 262 | Definition of the function that is to be triggered via bit 3 of the mappable NetWordIN1 data word. |
| | **0 Not active** | Trigger bit without any function. |



| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x400E:005<br>(P505.05) | NetWordIN1 function: Bit 4<br>(NetWordIN1 fct.: NetWordIN1.04)<br>• Setting can only be changed if the inverter is disabled.<br>• For further possible settings, see parameter 0x400E:001 (P505.01). 262 | Definition of the function that is to be triggered via bit 4 of the mappable NetWordIN1 data word. |
| | 8 **Run forward (CW)** | Trigger bit = 0-1 edge: Motor is started in forward rotating direction (CW).<br>Trigger bit = 1-0 edge: Motor is stopped again.<br>Notes:<br>• The stop method can be selected in 0x2838:003 (P203.03).<br>• In the case of a bipolar setpoint selection (e.g ±10 V), the function is executed irrespective of the rotating direction. The rotating direction is determined by the sign of the setpoint.<br>• The function also serves to realise an automatic start after switch-on. ▶ Start behavior 39<br>• The "Reverse rotational direction [13]" function can be used in connection with this function. |
| 0x400E:006<br>(P505.06) | NetWordIN1 function: Bit 5<br>(NetWordIN1 fct.: NetWordIN1.05)<br>• Setting can only be changed if the inverter is disabled.<br>• For further possible settings, see parameter 0x400E:001 (P505.01). 262 | Definition of the function that is to be triggered via bit 5 of the mappable NetWordIN1 data word. |
| | 18 **Activate preset (bit 0)** | Selection bits for bit coded selection and activation of a parameterised setpoint (preset).<br>▶ Setpoint presets 83 |
| 0x400E:007<br>(P505.07) | NetWordIN1 function: Bit 6<br>(NetWordIN1 fct.: NetWordIN1.06)<br>• Setting can only be changed if the inverter is disabled.<br>• For further possible settings, see parameter 0x400E:001 (P505.01). 262 | Definition of the function that is to be triggered via bit 6 of the mappable NetWordIN1 data word. |
| | 19 **Activate preset (bit 1)** | Selection bits for bit coded selection and activation of a parameterised setpoint (preset).<br>▶ Setpoint presets 83 |
| 0x400E:008<br>(P505.08) | NetWordIN1 function: Bit 7<br>(NetWordIN1 fct.: NetWordIN1.07)<br>• Setting can only be changed if the inverter is disabled.<br>• For further possible settings, see parameter 0x400E:001 (P505.01). 262 | Definition of the function that is to be triggered via bit 7 of the mappable NetWordIN1 data word. |
| | 4 **Reset error** | Trigger bit = 0-1 edge: Active error is reset (acknowledged) if the error condition is not active anymore and the error is resettable.<br>Trigger bit = 0: No action.<br>Notes:<br>• After resetting the error, a new enable/start command is required to restart the motor. |
| 0x400E:009<br>(P505.09) | NetWordIN1 function: Bit 8<br>(NetWordIN1 fct.: NetWordIN1.08)<br>• Setting can only be changed if the inverter is disabled.<br>• For further possible settings, see parameter 0x400E:001 (P505.01). 262 | Definition of the function that is to be triggered via bit 8 of the mappable NetWordIN1 data word. |
| | 0 **Not active** | Trigger bit without any function. |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x400E:010<br>(P505.10) | NetWordIN1 function: Bit 9<br>(NetWordIN1 fct.: NetWordIN1.09)<br>• Setting can only be changed if the inverter is disabled.<br>• For further possible settings, see parameter 0x400E:001 (P505.01). 262 | Definition of the function that is to be triggered via bit 9 of the mappable NetWordIN1 data word. |
| | 5 **Activate DC braking** | Trigger bit = 1: "DC braking" function activated.<br>Trigger bit = 0: no action / deactivate function again.<br>▶ DC braking 190 |
| 0x400E:011<br>(P505.11) | NetWordIN1 function: Bit 10<br>(NetWordIN1 fct.: NetWordIN1.10)<br>• Setting can only be changed if the inverter is disabled.<br>• For further possible settings, see parameter 0x400E:001 (P505.01). 262 | Definition of the function that is to be triggered via bit 10 of the mappable NetWordIN1 data word. |
| | 0 **Not active** | Trigger bit without any function. |
| 0x400E:012<br>(P505.12) | NetWordIN1 function: Bit 11<br>(NetWordIN1 fct.: NetWordIN1.11)<br>• Setting can only be changed if the inverter is disabled.<br>• For further possible settings, see parameter 0x400E:001 (P505.01). 262 | Definition of the function that is to be triggered via bit 11 of the mappable NetWordIN1 data word. |
| | 0 **Not active** | Trigger bit without any function. |
| 0x400E:013<br>(P505.13) | NetWordIN1 function: Bit 12<br>(NetWordIN1 fct.: NetWordIN1.12)<br>• Setting can only be changed if the inverter is disabled.<br>• For further possible settings, see parameter 0x400E:001 (P505.01). 262 | Definition of the function that is to be triggered via bit 12 of the mappable NetWordIN1 data word. |
| | 13 **Reverse rotational direction** | Trigger bit = 1: the setpoint specified is inverted (i. e. the sign is inverted).<br>Trigger bit = 0: no action / deactivate function again. |
| 0x400E:014<br>(P505.14) | NetWordIN1 function: Bit 13<br>(NetWordIN1 fct.: NetWordIN1.13)<br>• Setting can only be changed if the inverter is disabled.<br>• For further possible settings, see parameter 0x400E:001 (P505.01). 262 | Definition of the function that is to be triggered via bit 13 of the mappable NetWordIN1 data word. |
| | 0 **Not active** | Trigger bit without any function. |
| 0x400E:015<br>(P505.15) | NetWordIN1 function: Bit 14<br>(NetWordIN1 fct.: NetWordIN1.14)<br>• Setting can only be changed if the inverter is disabled.<br>• For further possible settings, see parameter 0x400E:001 (P505.01). 262 | Definition of the function that is to be triggered via bit 14 of the mappable NetWordIN1 data word. |
| | 0 **Not active** | Trigger bit without any function. |
| 0x400E:016<br>(P505.16) | NetWordIN1 function: Bit 15<br>(NetWordIN1 fct.: NetWordIN1.15)<br>• Setting can only be changed if the inverter is disabled.<br>• For further possible settings, see parameter 0x400E:001 (P505.01). 262 | Definition of the function that is to be triggered via bit 15 of the mappable NetWordIN1 data word. |
| | 0 **Not active** | Trigger bit without any function. |



### 12.1.4 Define your own status word format

The mappable data word NetWordOUT1 is available for implementing a separate status word format.

#### Details

| Designation | Parameter | Associated mapping entry * | Further information |
|---|---|---|---|
| NetWordOUT1 | 0x400A:001 (P591.01) | 0x400A0110 | The triggers for bits 0 ... 15 of the NetWordOUT1 data word are defined in 0x2634:010 (P420.10) ... 0x2634:025 (P420.25). |
| * A mapping entry consists of index, subindex and data length in bits of the parameter to be mapped. | | | |

General information about the process of data mapping can be found in the chapter of the same name for the corresponding network.

#### Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2634:010 (P420.10) | Digital outputs function: NetWordOUT1 - bit 0 (Dig.out.function: NetWordOUT1.00)<br>• For further possible settings, see parameter 0x2634:001 (P420.01). 247 | Assignment of a trigger to bit 0 of NetWordOUT1.<br>Trigger = FALSE: bit set to 0.<br>Trigger = TRUE: bit set to 1. |
| | **51** **Ready for operation** | TRUE, wenn Inverter betriebsbereit (kein Fehler aktiv und Zwischenkreisspannung ok). Sonst FALSE. |
| 0x2634:011 (P420.11) | Digital outputs function: NetWordOUT1 - bit 1 (Dig.out.function: NetWordOUT1.01)<br>• For further possible settings, see parameter 0x2634:001 (P420.01). 247 | Assignment of a trigger to bit 1 of NetWordOUT1.<br>Trigger = FALSE: bit set to 0.<br>Trigger = TRUE: bit set to 1. |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2634:012 (P420.12) | Digital outputs function: NetWordOUT1 - bit 2 (Dig.out.function: NetWordOUT1.02)<br>• For further possible settings, see parameter 0x2634:001 (P420.01). 247 | Assignment of a trigger to bit 2 of NetWordOUT1.<br>Trigger = FALSE: bit set to 0.<br>Trigger = TRUE: bit set to 1. |
| | **52** **Operation enabled** | TRUE if inverter and start are enabled. Otherwise FALSE. |
| 0x2634:013 (P420.13) | Digital outputs function: NetWordOUT1 - bit 3 (Dig.out.function: NetWordOUT1.03)<br>• For further possible settings, see parameter 0x2634:001 (P420.01). 247 | Assignment of a trigger to bit 3 of NetWordOUT1.<br>Trigger = FALSE: bit set to 0.<br>Trigger = TRUE: bit set to 1. |
| | **56** **Fault active** | TRUE if error is active. Otherwise FALSE. |
| 0x2634:014 (P420.14) | Digital outputs function: NetWordOUT1 - bit 4 (Dig.out.function: NetWordOUT1.04)<br>• For further possible settings, see parameter 0x2634:001 (P420.01). 247 | Assignment of a trigger to bit 4 of NetWordOUT1.<br>Trigger = FALSE: bit set to 0.<br>Trigger = TRUE: bit set to 1. |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2634:015 (P420.15) | Digital outputs function: NetWordOUT1 - bit 5 (Dig.out.function: NetWordOUT1.05)<br>• For further possible settings, see parameter 0x2634:001 (P420.01). 247 | Assignment of a trigger to bit 5 of NetWordOUT1.<br>Trigger = FALSE: bit set to 0.<br>Trigger = TRUE: bit set to 1. |
| | **54** **Quick stop active** | TRUE if quick stop is active. Otherwise FALSE. |
| 0x2634:016 (P420.16) | Digital outputs function: NetWordOUT1 - bit 6 (Dig.out.function: NetWordOUT1.06)<br>• For further possible settings, see parameter 0x2634:001 (P420.01). 247 | Assignment of a trigger to bit 6 of NetWordOUT1.<br>Trigger = FALSE: bit set to 0.<br>Trigger = TRUE: bit set to 1. |
| | **50** **Running** | TRUE if inverter and start are enabled and output frequency > 0 Hz. Otherwise FALSE.<br>Exception, quick stop mode: TRUE if inverter and start are enabled and output frequency > 0.2 Hz. Otherwise FALSE. |
| 0x2634:017 (P420.17) | Digital outputs function: NetWordOUT1 - bit 7 (Dig.out.function: NetWordOUT1.07)<br>• For further possible settings, see parameter 0x2634:001 (P420.01). 247 | Assignment of a trigger to bit 7 of NetWordOUT1.<br>Trigger = FALSE: bit set to 0.<br>Trigger = TRUE: bit set to 1. |
| | **58** **Device warning active** | TRUE if warning is active. Otherwise FALSE.<br>• A warning has no impact on the operating status of the inverter.<br>• A warning is reset automatically if the cause has been eliminated. |

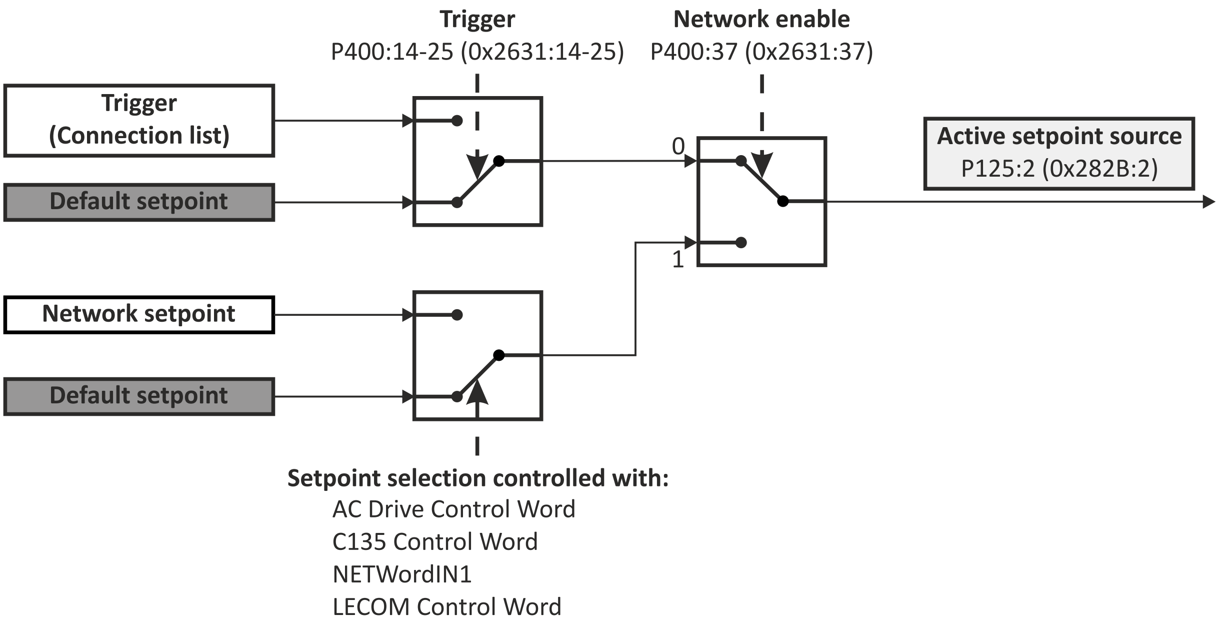
| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2634:018 (P420.18) | Digital outputs function: NetWordOUT1 - bit 8 (Dig.out.function: NetWordOUT1.08)<br>• For further possible settings, see parameter 0x2634:001 (P420.01). 247 | Assignment of a trigger to bit 8 of NetWordOUT1.<br>Trigger = FALSE: bit set to 0.<br>Trigger = TRUE: bit set to 1. |
| | **0 Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2634:019 (P420.19) | Digital outputs function: NetWordOUT1 - bit 9 (Dig.out.function: NetWordOUT1.09)<br>• For further possible settings, see parameter 0x2634:001 (P420.01). 247 | Assignment of a trigger to bit 9 of NetWordOUT1.<br>Trigger = FALSE: bit set to 0.<br>Trigger = TRUE: bit set to 1. |
| | **0 Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2634:020 (P420.20) | Digital outputs function: NetWordOUT1 - bit 10 (Dig.out.function: NetWordOUT1.10)<br>• For further possible settings, see parameter 0x2634:001 (P420.01). 247 | Assignment of a trigger to bit 10 of NetWordOUT1.<br>Trigger = FALSE: bit set to 0.<br>Trigger = TRUE: bit set to 1. |
| | **72 Setpoint speed reached** | TRUE if frequency setpoint reached. Otherwise FALSE. |
| 0x2634:021 (P420.21) | Digital outputs function: NetWordOUT1 - bit 11 (Dig.out.function: NetWordOUT1.11)<br>• For further possible settings, see parameter 0x2634:001 (P420.01). 247 | Assignment of a trigger to bit 11 of NetWordOUT1.<br>Trigger = FALSE: bit set to 0.<br>Trigger = TRUE: bit set to 1. |
| | **78 Current limit reached** | TRUE if current motor current ≥ maximum current. Otherwise FALSE.<br>• Display of the present motor current in 0x2D88 (P104.00).<br>• Setting for the maximum current in 0x6073 (P324.00). |
| 0x2634:022 (P420.22) | Digital outputs function: NetWordOUT1 - bit 12 (Dig.out.function: NetWordOUT1.12)<br>• For further possible settings, see parameter 0x2634:001 (P420.01). 247 | Assignment of a trigger to bit 12 of NetWordOUT1.<br>Trigger = FALSE: bit set to 0.<br>Trigger = TRUE: bit set to 1. |
| | **71 Actual speed = 0** | TRUE if actual output frequency = 0 Hz (± 0.3 Hz), irrespective of the operating mode. Otherwise FALSE.<br>• Display of the current output frequency in 0x2DDD (P100.00). |
| 0x2634:023 (P420.23) | Digital outputs function: NetWordOUT1 - bit 13 (Dig.out.function: NetWordOUT1.13)<br>• For further possible settings, see parameter 0x2634:001 (P420.01). 247 | Assignment of a trigger to bit 13 of NetWordOUT1.<br>Trigger = FALSE: bit set to 0.<br>Trigger = TRUE: bit set to 1. |
| | **69 Rotational direction reversed** | TRUE if output frequency is negative. Otherwise FALSE. |
| 0x2634:024 (P420.24) | Digital outputs function: NetWordOUT1 - bit 14 (Dig.out.function: NetWordOUT1.14)<br>• For further possible settings, see parameter 0x2634:001 (P420.01). 247 | Assignment of a trigger to bit 14 of NetWordOUT1.<br>Trigger = FALSE: bit set to 0.<br>Trigger = TRUE: bit set to 1. |
| | **115 Release holding brake** | Trigger signal for releasing the holding brake (TRUE = release holding brake).<br>Note!<br>If this trigger is assigned to the relay or a digital output, the deceleration times set for the respective output are not effective (are internally set to "0"). Only the deceleration time set in 0x2820:012 (P712.12) for closing the holding brake influences in this case the time-dependent behaviour of the output.<br>▸ Holding brake control 197 |
| 0x2634:025 (P420.25) | Digital outputs function: NetWordOUT1 - bit 15 (Dig.out.function: NetWordOUT1.15)<br>• For further possible settings, see parameter 0x2634:001 (P420.01). 247 | Assignment of a trigger to bit 15 of NetWordOUT1.<br>Trigger = FALSE: bit set to 0.<br>Trigger = TRUE: bit set to 1. |
| | **55 Inverter disabled (safety)** | Function is not supported in this device. |
| 0x2635:010 | Inversion of digital outputs: NetWordOUT1.00 | Inversion of bit 0 of NetWordOUT1. |
| | **0 Not inverted** | |
| | 1 Inverted | |
| 0x2635:011 | Inversion of digital outputs: NetWordOUT1.01 | Inversion of bit 1 of NetWordOUT1. |
| | **0 Not inverted** | |
| | 1 Inverted | |
| 0x2635:012 | Inversion of digital outputs: NetWordOUT1.02 | Inversion of bit 2 of NetWordOUT1. |
| | **0 Not inverted** | |
| | 1 Inverted | |

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2635:013 | Inversion of digital outputs: NetWordOUT1.03 | | Inversion of bit 3 of NetWordOUT1. |
| | **0** | **Not inverted** | |
| | 1 | Inverted | |
| 0x2635:014 | Inversion of digital outputs: NetWordOUT1.04 | | Inversion of bit 4 of NetWordOUT1. |
| | **0** | **Not inverted** | |
| | 1 | Inverted | |
| 0x2635:015 | Inversion of digital outputs: NetWordOUT1.05 | | Inversion of bit 5 of NetWordOUT1. |
| | **0** | **Not inverted** | |
| | 1 | Inverted | |
| 0x2635:016 | Inversion of digital outputs: NetWordOUT1.06 | | Inversion of bit 6 of NetWordOUT1. |
| | **0** | **Not inverted** | |
| | 1 | Inverted | |
| 0x2635:017 | Inversion of digital outputs: NetWordOUT1.07 | | Inversion of bit 7 of NetWordOUT1. |
| | **0** | **Not inverted** | |
| | 1 | Inverted | |
| 0x2635:018 | Inversion of digital outputs: NetWordOUT1.08 | | Inversion of bit 8 of NetWordOUT1. |
| | **0** | **Not inverted** | |
| | 1 | Inverted | |
| 0x2635:019 | Inversion of digital outputs: NetWordOUT1.09 | | Inversion of bit 9 of NetWordOUT1. |
| | **0** | **Not inverted** | |
| | 1 | Inverted | |
| 0x2635:020 | Inversion of digital outputs: NetWordOUT1.10 | | Inversion of bit 10 of NetWordOUT1. |
| | **0** | **Not inverted** | |
| | 1 | Inverted | |
| 0x2635:021 | Inversion of digital outputs: NetWordOUT1.11 | | Inversion of bit 11 of NetWordOUT1. |
| | **0** | **Not inverted** | |
| | 1 | Inverted | |
| 0x2635:022 | Inversion of digital outputs: NetWordOUT1.12 | | Inversion of bit 12 of NetWordOUT1. |
| | **0** | **Not inverted** | |
| | 1 | Inverted | |
| 0x2635:023 | Inversion of digital outputs: NetWordOUT1.13 | | Inversion of bit 13 of NetWordOUT1. |
| | **0** | **Not inverted** | |
| | 1 | Inverted | |
| 0x2635:024 | Inversion of digital outputs: NetWordOUT1.14 | | Inversion of bit 14 of NetWordOUT1. |
| | **0** | **Not inverted** | |
| | 1 | Inverted | |
| 0x2635:025 | Inversion of digital outputs: NetWordOUT1.15 | | Inversion of bit 15 of NetWordOUT1. |
| | **0** | **Not inverted** | |
| | 1 | Inverted | |

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x400A:001 (P591.01) | Process output words: NetWordOUT1 (NetWordOUTx: NetWordOUT1)<br>• Read only | | Mappable data word for the output of status messages of the inverter via network. |
| | Bit 0 | Mapping bit 0 | Mappable data word for the output of status messages of the inverter via network.<br>Assignment of the status message: 0x2634:010 (P420.10) |
| | Bit 1 | Mapping bit 1 | Mappable data word for the output of status messages of the inverter via network.<br>Assignment of the status message: 0x2634:011 (P420.11) |
| | Bit 2 | Mapping bit 2 | Mappable data word for the output of status messages of the inverter via network.<br>Assignment of the status message: 0x2634:012 (P420.12) |
| | Bit 3 | Mapping bit 3 | Mappable data word for the output of status messages of the inverter via network.<br>Assignment of the status message: 0x2634:013 (P420.13) |
| | Bit 4 | Mapping bit 4 | Mappable data word for the output of status messages of the inverter via network.<br>Assignment of the status message: 0x2634:014 (P420.14) |
| | Bit 5 | Mapping bit 5 | Mappable data word for the output of status messages of the inverter via network.<br>Assignment of the status message: 0x2634:015 (P420.15) |
| | Bit 6 | Mapping bit 6 | Mappable data word for the output of status messages of the inverter via network.<br>Assignment of the status message: 0x2634:016 (P420.16) |
| | Bit 7 | Mapping bit 7 | Mappable data word for the output of status messages of the inverter via network.<br>Assignment of the status message: 0x2634:017 (P420.17) |
| | Bit 8 | Mapping bit 8 | Mappable data word for the output of status messages of the inverter via network.<br>Assignment of the status message: 0x2634:018 (P420.18) |
| | Bit 9 | Mapping bit 9 | Mappable data word for the output of status messages of the inverter via network.<br>Assignment of the status message: 0x2634:019 (P420.19) |
| | Bit 10 | Mapping bit 10 | Mappable data word for the output of status messages of the inverter via network.<br>Assignment of the status message: 0x2634:020 (P420.20) |
| | Bit 11 | Mapping bit 11 | Mappable data word for the output of status messages of the inverter via network.<br>Assignment of the status message: 0x2634:021 (P420.21) |
| | Bit 12 | Mapping bit 12 | Mappable data word for the output of status messages of the inverter via network.<br>Assignment of the status message: 0x2634:022 (P420.22) |
| | Bit 13 | Mapping bit 13 | Mappable data word for the output of status messages of the inverter via network.<br>Assignment of the status message: 0x2634:023 (P420.23) |
| | Bit 14 | Mapping bit 14 | Mappable data word for the output of status messages of the inverter via network.<br>Assignment of the status message: 0x2634:024 (P420.24) |
| | Bit 15 | Mapping bit 15 | Mappable data word for the output of status messages of the inverter via network.<br>Assignment of the status message: 0x2634:025 (P420.25) |

## 12.2 Define setpoint via network

The network setpoint must be explicitly selected if the setpoint is to be specified via the network.




▸ Option 1: Define network as standard setpoint source 📖 274
▸ Option 2: Change over to the network setpoint during operation 📖 275

### Mappable parameters

The following mappable parameters are available, among others, for specifying the setpoint.

- The parameters are always available irrespective of the network option.
- Additional mappable parameters with different resolutions are available for selection to transfer the frequency setpoint and actual frequency value. ▸ Mappable parameters for exchanging setpoints and actual values 📖 276

### Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x400B:006<br>(P592.06) | Process input data: Velocity mode setpoint<br>(Process data IN: Veloc. mode setp)<br>-599.0 ... **[0.0]** ... 599.0 Hz | Mappable parameter for defining the setpoint for operating mode "MS: Velocity mode" via network.<br>• If this parameter is to be used as standard setpoint source, the selection "Network [5]" must be set in 0x2860:001 (P201.01).<br>• If this bipolar setpoint is used, the direction of rotation cannot be controlled via the network control word. The direction of rotation is determined by the sign of the setpoint. |
| 0x400B:007<br>(P592.07) | Process input data: PID setpoint<br>(Process data IN: PID setpoint)<br>-300.00 ... **[0.00]** ... 300.00 PID unit | Mappable parameter for defining the setpoint for the PID control via network.<br>• If this parameter is to be used as standard setpoint source, the selection "Network [5]" must be set in 0x2860:002 (P201.02). |
| 0x400B:008<br>(P592.08) | Process input data: Torque mode setpoint<br>(Process data IN: Torque mode setp)<br>-32768 ... **[0]** ... 32767 Nm | Mappable parameter for defining the setpoint for operating mode "MS: Torque mode" via network.<br>• If this parameter is to be used as standard setpoint source, the selection "Network [5]" must be set in 0x2860:003 (P201.03).<br>• The scaling factor can be set in 0x400B:009 (P592.09).<br>• Scaled torque setpoint = torque setpoint (0x400B:008) / $2^{\text{scaling factor}}$<br>Example:<br>• Torque setpoint (0x400B:008) = 345 [Nm]<br>• Scaling factor (0x400B:009) = 3<br>• Scaled torque setpoint = 345 [Nm] / $2^3$ = 43.125 [Nm] |

### 12.2.1 Option 1: Define network as standard setpoint source

If the setpoint is to be specified exclusively via the network, the network for the corresponding control can be simply set as the standard setpoint source.

- Setting for the frequency control: 0x2860:001 (P201.01) = "Network [5]".
- See the following table for settings for additional controls.

| Control: size | Parameter | Setting | Further information |
| --- | --- | --- | --- |
| Frequency control: frequency setpoint | 0x2860:001 (P201.01) | Network [5] | Frequency control ▶ Standard setpoint source 📖 78 |
| PID control: reference value | 0x2860:002 (P201.02) | Network [5] | Frequency control ▶ Configuring the process controller 📖 112 |
| PID control: feedback of the control variable (actual value) | 0x4020:002 (P600.02) | Network [5] | |
| PID control: speed feedforward control | 0x4020:004 (P600.04) | Network [8] | |
| Torque control: torque setpoint | 0x2860:003 (P201.03) | Network [5] | Torque control ▶ Standard setpoint source 📖 148 |

### 12.2.2 Option 2: Change over to the network setpoint during operation

There are several options for change-over to the network setpoint.

Example 1: Independent of the network used, a change-over from the standard setpoint source to the network setpoint is to be possible via a digital trigger (e. g. digital input).

1. Set a standard setpoint source different than "Network [5]" in 0x2860:001 (P201.01).
2. Set the desired digital trigger (e. g. digital input) in via which the change-over to the network setpoint is to take place.

The current setpoint source is shown in 0x282B:002 (P125.02).

The setpoint change-over by means of the network control words is only possible if the controller is activated via the network 0x2631:037 (P400.37).

The following table describes the change-over to the network setpoint via the different network control words:

<table>
<tr><th>Network control word</th><th colspan="3">Change-over to network setpoint</th></tr>
<tr><td rowspan="4">NetWordIN1 data word<br>0x4008:001 (P590.01)</td><td colspan="3">Assign the function "Activate network setpoint [17]" to the bit that is to be used for activating the network setpoint.<br>• The functions that are to be triggered via bits 0 ... 15 of the NetWordIN1 data word are defined in 0x400E:001 (P505.01) ... 0x400E:016 (P505.16).</td></tr>
<tr><td colspan="2">Bit x</td><td>Selection:</td></tr>
<tr><td colspan="2">0</td><td>Standard setpoint source selected in 0x2860:001 (P201.01).</td></tr>
<tr><td colspan="2">1</td><td>Network setpoint</td></tr>
<tr><td rowspan="5">AC drive control word<br>0x400B:001 (P592.01)</td><td colspan="3">The network setpoint is activated via bit 6 of the AC Drive control word:</td></tr>
<tr><td colspan="2">Bit 6</td><td>Selection:</td></tr>
<tr><td colspan="2">0</td><td>Standard setpoint source selected in 0x2860:001 (P201.01).</td></tr>
<tr><td colspan="2">1</td><td>Network setpoint</td></tr>
<tr><td colspan="3">In order that the activation via bit 6 works, "Activate network control" bit 5 must be TRUE. (Standard)!<br>If control is to be initiated via bit 6 without "Activate network control" bit 5, the selection "Network setpoint active [116]" must be set in 0x2631:017 (P400.17).</td></tr>
<tr><td rowspan="6">LECOM control word<br>0x400B:002 (P592.02)</td><td colspan="3">The setpoint is selected via bit 0 and bit 1 of the LECOM control word:</td></tr>
<tr><td>Bit 1</td><td>Bit 0</td><td>Selection:</td></tr>
<tr><td>0</td><td>0</td><td>Standard setpoint source selected in 0x2860:001 (P201.01).</td></tr>
<tr><td>0</td><td>1</td><td>Frequency setpoint preset 1 0x2911:001 (P450.01)</td></tr>
<tr><td>1</td><td>0</td><td>Frequency setpoint preset 2 0x2911:002 (P450.02)</td></tr>
<tr><td>1</td><td>1</td><td>Frequency setpoint preset 3 0x2911:002 (P450.02)</td></tr>
<tr><td>CiA control word<br>0x6040</td><td colspan="3">In case of control via the device profile CiA 402:<br>• In operating mode "CiA: Velocity mode [2]", the setpoint speed defined via the "Set speed" 0x6042 (P781.00) parameter is used.<br>• A changeover to an alternative setpoint source via the CiA control word is not possible.</td></tr>
</table>

### 12.2.3 Mappable parameters for exchanging setpoints and actual values

The parameters listed in the following can also be mapped to network registers, in order to transfer set points and actual values via the network.

- The parameters are always available irrespective of the network option.
- Several parameters with different resolutions are available for selection to transfer the frequency setpoint and actual value.
- The use of these parameters for the transmission of process data is optional. It is also possible to use only a selection of the parameters.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x400B:003<br>(P592.03) | Process input data: Network setpoint frequency (0.1)<br>(Process data IN: Net.freq. 0.1)<br>0.0 ... [**0.0**] ... 599.0 Hz | Mappable parameter for specifying the frequency setpoint in [0.1 Hz] via network.<br>• The specification is made without sign (irrespective of the rotating direction).<br>• The rotating direction is specified via the control word.<br>• Example: 456 = 45.6 Hz |
| 0x400B:004<br>(P592.04) | Process input data: Network setpoint speed<br>(Process data IN: Net.setp. speed)<br>0 ... [**0**] ... 50000 rpm | Mappable parameter for specifying the setpoint as speed in [rpm] via network.<br>• The specification is made without sign (irrespective of the rotating direction).<br>• The rotating direction is specified via the control word.<br>• Example: 456 ≡ 456 rpm |
| 0x400B:005<br>(P592.05) | Process input data: Network setpoint frequency (0.01)<br>(Process data IN: Net.freq. 0.01)<br>0.00 ... [**0.00**] ... 599.00 Hz | Mappable parameter for specifying the frequency setpoint in [0.01 Hz] via network.<br>• The specification is made without sign (irrespective of the rotating direction).<br>• The rotating direction is specified via the control word.<br>• Example: 456 = 4.56 Hz |
| 0x400B:009<br>(P592.09) | Process input data: Torque scaling<br>(Process data IN: Torque scaling)<br>-128 ... [**0**] ... 127<br>• From version 02.00 | Scaling factor for torque setpoint 0x400B:008 (P592.08) and actual torque value 0x400C:007 (P593.07) via network.<br>• With the setting 0, no scaling takes place.<br>Example:<br>• Scaled actual torque value (0x400C:007) = 345 [Nm]<br>• Scaling factor (0x400B:009) = 3<br>• Actual torque value = 345 [Nm] / 23 = 43.125 [Nm] |
| 0x400B:012<br>(P592.12) | Process input data: Network setpoint frequency [0.02Hz]<br>(Process data IN: NetSetfreq0.02Hz)<br>-29950 ... [**0**] ... 29950 Hz<br>• From version 04.00 | Mappable parameter for specifying the frequency setpoint in [0.02 Hz] via network.<br>• The specification is made without sign (irrespective of the rotating direction).<br>• The rotating direction is specified via the control word.<br>• Examples: 50 = 1 Hz, 100 = 2 Hz |
| 0x400B:013<br>(P592.13) | Process input data: Network frequency setpoint [+/-16384]<br>(Process data IN: N.FrqSet+/-16384)<br>-16384 ... [**0**] ... 16384<br>• From version 05.00 | Mappable parameter for specifying the frequency setpoint via network.<br>• ±16384 = ±100 % Maximum frequency 0x2916 (P211.00) |
| 0x400C:003<br>(P593.03) | Process output data: Frequency (0.1)<br>(Process data OUT: Frequency (0.1))<br>• Read only: x.x Hz | Mappable parameter for the output of the actual frequency value in [0.1 Hz] via network.<br>• The output is effected without sign (irrespective of the rotating direction).<br>• The rotating direction is specified via the status word.<br>• Example: 456 = 45.6 Hz |
| 0x400C:004<br>(P593.04) | Process output data: Motor speed<br>(Process data OUT: Motor speed)<br>• Read only: x rpm | Mappable parameter for the output of the actual value as speed in [rpm] via network.<br>• The output is made without sign (irrespective of the rotating direction).<br>• The rotating direction is specified via the status word.<br>• Example: 456 ≡ 456 rpm |
| 0x400C:006<br>(P593.06) | Process output data: Frequency (0.01)<br>(Process data OUT: Frequency 0.01)<br>• Read only: x.xx Hz | Mappable parameter for the output of the actual frequency value in [0.01 Hz] via network.<br>• The output is made without sign (irrespective of the rotating direction).<br>• The rotating direction is specified via the status word.<br>• Example: 456 = 4.56 Hz |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x400C:007<br>(P593.07) | Process output data: Torque scaled<br>(Process data OUT: Torque scaled)<br>• Read only<br>• From version 02.00 | Mappable parameter for the output of the actual torque value in [Nm / $2^{\text{scaling factor}}$] via network.<br>• The scaling factor can be set in 0x400B:009 (P592.09).<br>• Actual torque value = scaled actual torque value (0x400C:007) / $2^{\text{scaling factor}}$<br><br>Example:<br>• Scaled actual torque value (0x400C:007) = 345 [Nm]<br>• Scaling factor (0x400B:009) = 3<br>• Actual torque value = 345 [Nm] / $2^3$ = 43.125 [Nm] |
| 0x400C:008<br>(P593.08) | Process output data: Frequency [0.02 Hz]<br>(Process data OUT: Frequency 0.02Hz)<br>• Read only: Hz<br>• From version 04.00 | Mappable parameter for the output of the actual frequency value in [0.02 Hz] via network.<br>• The output is effected without sign (irrespective of the rotating direction).<br>• The rotating direction is specified via the status word.<br>• Examples: 50 = 1 Hz, 100 = 2 Hz |
| 0x400C:009<br>(P593.09) | Process output data: Frequency [+/-16384]<br>(Process data OUT: Freq. [+/-16384])<br>• Read only<br>• From version 05.00 | Mappable parameter for the output of the actual frequency value via network.<br>• ±16384 = ±100 % Maximum frequency 0x2916 (P211.00) |

## 12.3 Further mappable parameters

The parameters listed in the following can also be mapped to network registers to transmit, for example, control and status information as process data or to control outputs of the inverter via the network.

- The parameters are always available irrespective of the network option.
- The use of these parameters for the transmission of process data is optional. It is also possible to use only a selection of the parameters.

### Process input data

| Address | Designation | Info |
|---|---|---|
| 0x400B:011 (P592.11) | Process input data: PID feedback | ▶ Feedback of PID variable via network 279 |
| 0x4008:002 (P590.02) | Process input words: NetWordIN2 | ▶ Control digital outputs via network 279 |
| 0x4008:003 (P590.03) | Process input words: NetWordIN3 | ▶ Control analog outputs via network 279 |
| 0x4008:004 (P590.04) | Process input words: NetWordIN4 | |
| 0x4008:005 (P590.05) | Process input words: NetWordIN5 | ▶ Additive voltage impression via network 280 |

### Process output data

| Address | Designation | Info |
|---|---|---|
| 0x400C:005 (P593.05) | Process output data: Drive status | ▶ Drive status 281 |
| 0x2C49:003 (P711.03) | Position counter: Actual position | ▶ Position counter 383 |
| 0x400A:002 (P591.02) | Process output words: NetWordOUT2 | ▶ Output messages of the "sequencer" function via network 281 |

### 12.3.1 Process input data

#### 12.3.1.1 Feedback of PID variable via network

The feedback of the control variable (actual value) can also be initiated via the network for the process controller. In this case, the following mappable parameter is available.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x400B:011<br>(P592.11) | Process input data: PID feedback<br>(Process data IN: PID feedback)<br>-300.00 ... [**0.00**] ... 300.00 PID unit<br>• From version 03.00 | Mappable parameter for the feedback of the variable (actual value) via network.<br>• Only effective with the selection "Network[5]" in 0x4020:002 (P600.02). |

**Related topics**

▶ Configuring the process controller 📖 112

#### 12.3.1.2 Control digital outputs via network

The mappable data word NetWordIN2 is available for controlling the digital outputs via the network.

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x4008:002<br>(P590.02) | Process input words: NetWordIN2<br>(NetWordINx: NetWordIN2)<br>0x0000 ... [**0x0000**] ... 0xFFFF | | Mappable data word for optional control of the digital outputs via network.<br>Assignment of the digital outputs:<br>• Relay: 0x2634:001 (P420.01) / selection [34] ... [49]<br>• Digital output 1: 0x2634:002 (P420.02) / selection [34] ... [49] |
| | Bit 0 | Mapping bit 0 | |
| | Bit 1 | Mapping bit 1 | |
| | Bit 2 | Mapping bit 2 | |
| | Bit 3 | Mapping bit 3 | |
| | Bit 4 | Mapping bit 4 | |
| | Bit 5 | Mapping bit 5 | |
| | Bit 6 | Mapping bit 6 | |
| | Bit 7 | Mapping bit 7 | |
| | Bit 8 | Mapping bit 8 | |
| | Bit 9 | Mapping bit 9 | |
| | Bit 10 | Mapping bit 10 | |
| | Bit 11 | Mapping bit 11 | |
| | Bit 12 | Mapping bit 12 | |
| | Bit 13 | Mapping bit 13 | |
| | Bit 14 | Mapping bit 14 | |
| | Bit 15 | Mapping bit 15 | |

**Related topics**

▶ Configure digital outputs 📖 247

#### 12.3.1.3 Control analog outputs via network

The mappable data words NetWordIN3 and NetWordIN4 are available for controlling the analog outputs via the network.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x4008:003<br>(P590.03) | Process input words: NetWordIN3<br>(NetWordINx: NetWordIN3)<br>0.0 ... [**0.0**] ... 100.0 % | Mappable data word for optional control of an analog output via network.<br>Assignment of the analog output:<br>• Analog output 1: 0x2639:002 (P440.02) = "NetWordIN3 [20]" |
| 0x4008:004<br>(P590.04) | Process input words: NetWordIN4<br>(NetWordINx: NetWordIN4)<br>0.0 ... [**0.0**] ... 100.0 % | Mappable data word for optional control of an analog output via network.<br>Assignment of the analog output:<br>• Analog output 1: 0x2639:002 (P440.02) = "NetWordIN4 [21]" |

**Related topics**

▶ Configure analog outputs 📖 253

### 12.3.1.4 Additive voltage impression via network

The mappable data word NetWordIN5 is available for the optional specification of an additive voltage setpoint via the network.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x4008:005<br>(P590.05) | Process input words: NetWordIN5<br>(NetWordINx: NetWordIN5)<br>-100.0 ... [**0.0**] ... 100.0 % | Mappable data word for optionally specifying an additive voltage setpoint via network.<br>• 100 % = Rated voltage 0x2C01:007 (P320.07)<br>• This value is used if "Network [3]" is selected in 0x2B13:002. |

**Related topics**

▶ Additive voltage impression 📖 183

## 12.3.2 Process output data

### 12.3.2.1 Drive status

The following mappable parameter is available for the output of the drive status via the network.

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x400C:005<br>(P593.05) | Process output data: Drive status<br>(Process data OUT: Drive status)<br>• Read only | | Mappable status word (Modbus Legacy Register 2003). |
| | 0 | Error (non-resettable) active | |
| | 1 | Fault active | |
| | 2 | Waiting for start | |
| | 3 | Identification not executed | |
| | 4 | Inverter disabled | |
| | 5 | Stop active | |
| | 7 | Identification active | |
| | 8 | Running | |
| | 9 | Acceleration active | |
| | 10 | Deceleration active | |
| | 11 | Deceleration override active | |
| | 12 | DC braking active | |
| | 13 | Flying start active | |
| | 14 | Current limit reached | |
| | 16 | Process controller sleep mode | |

### 12.3.2.2 Output messages of the "sequencer" function via network

The mappable data word NetWordOUT2 is available to output messages of the "Sequencer" function via the network.

- An individual message (16 bit value) can be configured for each sequencer segment.
  ▶ Segment configuration 89
- The NetWordOUT2 data word is set to the value set for the execution time of the segment.

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x400A:002<br>(P591.02) | Process output words: NetWordOUT2<br>(NetWordOUTx: NetWordOUT2)<br>• Read only | | Mappable data word for the output of messages of the "Sequencer" function via network.<br><br>Configuration of the messages:<br>• 0x4026:008: NetWordOUT2 value for sequencer segment 1<br>• 0x4027:008: NetWordOUT2 value for sequencer segment 2<br>• 0x4028:008: NetWordOUT2 value for sequencer segment 3<br>• 0x4029:008: NetWordOUT2 value for sequencer segment 4<br>• 0x402A:008: NetWordOUT2 value for sequencer segment 5<br>• 0x402B:008: NetWordOUT2 value for sequencer segment 6<br>• 0x402C:008: NetWordOUT2 value for sequencer segment 7<br>• 0x402D:008: NetWordOUT2 value for sequencer segment 8<br>• 0x402E:008: NetWordOUT2 value for final segment |
| | Bit 0 | Mapping bit 0 | |
| | Bit 1 | Mapping bit 1 | |
| | Bit 2 | Mapping bit 2 | |
| | Bit 3 | Mapping bit 3 | |
| | Bit 4 | Mapping bit 4 | |
| | Bit 5 | Mapping bit 5 | |
| | Bit 6 | Mapping bit 6 | |
| | Bit 7 | Mapping bit 7 | |
| | Bit 8 | Mapping bit 8 | |
| | Bit 9 | Mapping bit 9 | |
| | Bit 10 | Mapping bit 10 | |
| | Bit 11 | Mapping bit 11 | |
| | Bit 12 | Mapping bit 12 | |
| | Bit 13 | Mapping bit 13 | |
| | Bit 14 | Mapping bit 14 | |
| | Bit 15 | Mapping bit 15 | |

**Related topics**

▶ Sequencer 87

## 12.4 Parameter access monitoring (PAM)

The parameter access monitoring can be used as basic protection against a control loss of the inverter. Monitoring is triggered if a parameter write access to a certain index does not take place at regular intervals via the established communication connection.

**Preconditions**

This monitoring only works when the network control is activated.

Except for the keypad, the monitoring can be used for all communication connections, for instance:

- PC/Engineering Tool <--> inverter with USB module
- PC/Engineering Tool <--> inverter with WLAN module
- Controller <--> network <--> inverter with network option

**Details**

For monitoring purposes, a non-zero value must be written into the "Keep-alive register" 0x2552:002 (P595.02) at regular intervals. The first write access with a non-zero value activates monitoring. The intervals between the write accesses must not be higher than the time-out time set in 0x2552:003 (P595.03). If no parameter write access takes place within the time-out time, monitoring is triggered: The response selected in 0x2552:005 (P595.05) takes place and the action selected in 0x2552:005 (P595.05). In addition, the status bit 1 in 0x2552:006 (P595.06) is set to "1".

The error status can be left by a normal "error reset". Since monitoring continues to be active and the time-out time is not reset by the error reset, the inverter immediately changes again to the error status. In order to prevent his, you have the following options:

a) Restore communication exchange.
b) Set the monitoring response in 0x2552:004 (P595.04) to "No response [0]" or "Warning [1]".
c) Change over to local or flexible control.

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2552:002<br>(P595.02) | Parameter access monitoring: Keep alive register<br>(PAM monitoring: Keep alive reg.)<br>0 ... [**0**] ... 65535<br>• From version 04.00 | | Register for cyclic parameter write accesses for monitoring the communication link.<br>• If the setting is non-zero, the monitoring is active.<br>• In order that the monitoring is not tripped, a non-zero value has to be entered into this index at regular intervals. The temporal distances of the write accesses must not be higher than the time-out time set in 0x2552:003 (P595.03). |
| 0x2552:003<br>(P595.03) | Parameter access monitoring: Time-out time<br>(PAM monitoring: Time-out time)<br>0.0 ... [**10.0**] ... 6553.5 s<br>• From version 04.00 | | Maximum permitted time between two write accesses to the "keep-alive-register".<br>In case of a time-out<br>• the error response selected in 0x2552:004 (P595.04) is effected,<br>• the action selected in 0x2552:005 (P595.05) is effected,<br>• the status bit 1 in 0x2552:006 (P595.06) is set to "1". |
| 0x2552:004<br>(P595.04) | Parameter access monitoring: Reaction<br>(PAM monitoring: Reaction)<br>• From version 04.00 | | Selection of the response to the triggering of the parameter access monitoring.<br>Associated error code:<br>• 33045 \| 0x8115 - Time-out (PAM) |
| | **0** | **No response** | ▸ Error types 📖 456 |
| | 1 | Warning | |
| | 2 | Trouble | |
| | 3 | Fault | |
| 0x2552:005<br>(P595.05) | Parameter access monitoring: Action<br>(PAM monitoring: Action)<br>• From version 04.00 | | Selection of the action to be executed if the parameter access monitoring is triggered. |
| | **0** | **No action** | |
| | 1 | Reserved | |



| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2552:006<br>(P595.06) | Parameter access monitoring: Parameter Access Monitoring-Status<br>(PAM monitoring: PAM status)<br>• Read only<br>• From version 04.00 | | Bit coded display of the status of parameter access monitoring. |
| | Bit 0 | Monitoring activated | 1 = parameter access monitoring is active. |
| | Bit 1 | Timeout | 1 = within the time-out time set in 0x2552:003 (P595.03), no successful parameter write access to the "keep-alive register" 0x2552:002 (P595.02) was made. |
| | Bit 2 | WLAN time-out | |
| 0x2552:007<br>(P595.07) | Parameter access monitoring: WLAN reset time-out time<br>(PAM monitoring: WLAN reset t.out)<br>0 ... [**0**] ... 65535 s<br>• From version 05.00 | | Time after which the WLAN network with the current settings of the WLAN parameters is restarted if no "keep alive" messages are received.<br>• 0 s = function deactivated (no WLAN restart).<br>• With a setting > 0 s and a time-out, the control units sets 0x2440 = "Restart with current values [1]". |

## 12.5 Process data handling in the event of error

Received invalid process data is not used. The inverter uses the last valid process data received. You can optionally set that the contents of the process data in the inverter are set to the value "0" after invalid process data has been received.

The setting in 0x24E5:001 is independent of the response selected in 0x2859:005 if invalid process data has been received!

If the application requires that the drive keeps moving with the last valid process data when receiving invalid process data, set the response "No response" or "Warning" in 0x2859:005. In addition, the selection "Clear data [1]" must not be set in 0x24E5:001. Deleting the process data would stop the motor.

### Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x24E5:001 | Process data handling in case of error: Procedure | | Selection which process data the inverter is to use after receiving invalid process data. |
| | **0** | **Keep last data** | The last valid process data of the master are used. |
| | 1 | Clear data | The contents of the process data in the inverter is set to the value "0". |
| | 2 | Reset control word (from version 05.04) | The RUN command is reset. All other parameters keep their current value. |

## 12.6 Suppress certain alarm / emergency messages to the master

To simplify the error handling between a master and the inverter, a function for suppressing diagnostic or alarm messages is implemented. If desired, the user can suppress the display of alarm responses in the master.

Usually, all errors occurring in the device are reported to a connected PLC if an alarm / emergency mechanism with the connected communication system is supported. In order to suppress certain alarm / emergency messages, this filter mechanism selects the error messages that shall not be reported to the PLC.

In object 0x285C, the corresponding error numbers are given in n subindex. Up to n = 10 error numbers can be selected.

If the "0xFFFFFFFF" error code is found in one of the subindices, all messages are blocked.

### Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x285C:001 | Alarm supression: Entry 1<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Definition of error numbers that shall not be sent as alarm, emergency, or diagnostic message to the connected master.<br>"0xFFFFFFFF"= suppression of all messages to the master. |
| 0x285C:002 | Alarm supression: Entry 2<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | |
| 0x285C:003 | Alarm supression: Entry 3<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | |
| 0x285C:004 | Alarm supression: Entry 4<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | |
| 0x285C:005 | Alarm supression: Entry 5<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | |
| 0x285C:006 | Alarm supression: Entry 6<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | |
| 0x285C:007 | Alarm supression: Entry 7<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | |
| 0x285C:008 | Alarm supression: Entry 8<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | |
| 0x285C:009 | Alarm supression: Entry 9<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | |
| 0x285C:010 | Alarm supression: Entry 10<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | |



## 12.7 CiA 402 device profile

The CiA® 402 device profile defines the functional behaviour of stepping motors, servo drives, and frequency inverters. In order to be able to describe the different drive types, various operating modes and device parameters are specified in the device profile. Each operating mode provides objects (e.g. for the setpoint speed, acceleration and deceleration) to generate the desired drive behaviour.

- CiA® is a registered community trademark of the CAN in Automation e. V user organisation.
- More information can be found in the CiA 402 specification(CANopen device profile for drives and Motion Control) of the CAN in Automation (CiA) user organisation: http://www.can-cia.org

### 12.7.1 Supported operating modes

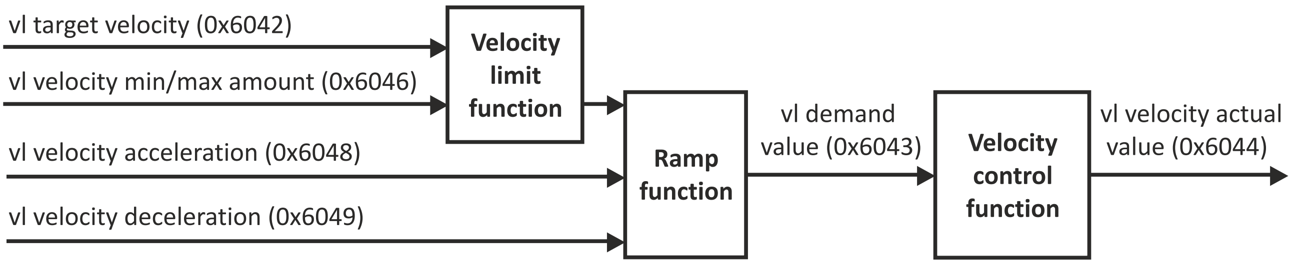
The inverter only supports the CiA 402 operating mode "CiA: Velocity mode".

**Details**

In the following, the steps required for configuring the operating mode "CiA: Velocity mode" are described.

1. Set the operating mode "CiA: Velocity mode [2]" in 0x6060 (P301.00).
2. Set speed is specified via the parameter "Set speed" 0x6042 (P781.00).
3. Process input data and process output data are available for the control in the CiA402.

The following signal flow shows the internal setpoint logics:




The "CiA: Velocity mode" operating mode is now active and the inverter reacts to the setpoint speed specified via the network.

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x6060 (P301.00) | CiA: Operation mode (Operation mode)<br>• Setting can only be changed if the inverter is disabled. | | CiA: Operation mode |
| | **-2** | **MS: Velocity mode** | Vendor specific velocity mode<br>▸ Configuring the frequency control 📖 78 |
| | -1 | MS: Torque mode (from version 03.00) | Vendor specific torque mode<br>• Only possible in motor control type 0x2C00 (P300.00) = "Sensorless vector control (SLVC) [4]".<br>▸ Configuring the torque control 📖 146 |
| | 0 | No selection | No selection |
| | 2 | CiA: Velocity mode | CiA: Velocity mode<br>▸ CiA 402 device profile 📖 285 |
| 0x6061 (P788.00) | CiA: Active operation mode (Act. op. mode)<br>• Read only | | CiA: Active operation mode |
| | -2 | MS: Velocity mode | Vendor specific velocity mode |
| | -1 | MS: Torque mode (from version 03.00) | Manufacturer-specific torque mode |
| | 0 | No selection | No selection |
| | 2 | CiA: Velocity mode | CiA: Velocity mode |

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x6502 (P789.00) | Supported drive modes (Supported modes)<br>• Read only | | Bit coded display of the operating modes supported. |
| | Bit 0 | Reserved | - |
| | Bit 1 | CiA: Velocity mode | 1 = CiA: velocity mode is supported. |
| | Bit 2 | Reserved | - |
| | Bit 3 | Reserved | |
| | Bit 5 | Reserved | |
| | Bit 6 | Reserved | |
| | Bit 7 | Cyclic sync position mode | Always 0 (not supported). |
| | Bit 8 | Cyclic sync velocity mode | |
| | Bit 9 | Cyclic sync torque mode | |
| | Bit 17 | MS: Velocity mode | 1 = vendor specific velocity mode is supported. |
| | Bit 18 | MS: Torque mode | -<br>1 = Manufacturer-specific torque mode. |

### 12.7.2 Basic setting

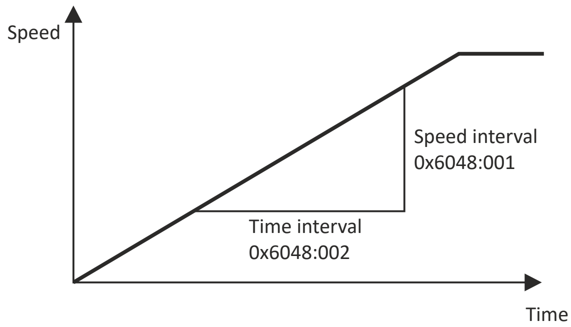
Set the following parameters.

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x605A | CiA: Quick stop mode | | Device status after exiting the quick stop ramp.<br>• Setting is only effective in the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]". |
| | **2** | **Ramp > switch on disabled** | Automatic change to the "Switch-on inhibited" device state.<br>• The "Quick stop active [54]" status is reset to FALSE after ramp-down to standstill. |
| | 6 | Ramp > quick stop active | The inverter remains in the "Quick stop active" device state.<br>• The "Quick stop active [54]" status remains TRUE until the "Quick stop" function is activated. |
| 0x605B | Shutdown option code<br>• From version 05.02 | | Defines the transition from the status "Operation enabled" to "Ready to start". |
| | **0** | **Disable drive function** | 0: Immediate inverter disable (standard setting) |
| | 1 | Slow down on quick stop ramp and disable drive function | 1: "Quick stop" with subsequent inverter disable. |
| 0x6085 (P790.00) | Quick stop deceleration (Quick stop dec.)<br>0 ... [**546000**] ... 2147483647 pos. unit/s² | | Change in velocity used for deceleration to a standstill if quick stop is activated.<br>• Setting is only effective in the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]".<br>• Setting is only effective in the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]".<br>• In operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]", the deceleration time set in 0x291C (P225.00) is effective.<br>0x6085 = (initial speed of the motor [rpm] / duration of the ramp until standstill [s]) * 1092 |

### 12.7.3 Process input data

The following diagram demonstrates the relationship of the parameters 0x6048:001 (P785.01) and 0x6048:002 (P785.02).




#### Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x6042<br>(P781.00) | Set speed<br>(Set speed)<br>-32768 ... [**0**] ... 32767 rpm | Set speed (velocity mode). |
| 0x6046:001<br>(P784.01) | Speed limits: Min. speed<br>(Speed limits: Min. speed)<br>0 ... [**0**] ... 480000 rpm | Min. speed (velocity mode). |
| 0x6046:002<br>(P784.02) | Speed limits: Max. speed<br>(Speed limits: Max. speed)<br>0 ... [**2147483647**] ... 2147483647 rpm | Max. speed (velocity mode). |
| 0x6048:001<br>(P785.01) | Acceleration ramp: CiA acceleration: Delta speed<br>(Accel. ramp: Delta speed)<br>0 ... [**3000**] ... 2147483647 rpm | CiA acceleration: Delta speed |
| 0x6048:002<br>(P785.02) | Acceleration ramp: CiA acceleration: Delta time<br>(Accel. ramp: Delta time)<br>0 ... [**10**] ... 65535 s | CiA acceleration: Delta time |
| 0x6049:001<br>(P786.01) | Deceleration ramp: CiA deceleration: Delta speed<br>(Decel. ramp: Delta speed)<br>0 ... [**3000**] ... 2147483647 rpm | CiA deceleration: Delta speed |
| 0x6049:002<br>(P786.02) | Deceleration ramp: CiA deceleration: Delta time<br>(Decel. ramp: Delta time)<br>0 ... [**10**] ... 65535 s | CiA deceleration: Delta time |
| 0x6071 | Set torque<br>-3276.8 ... [**0.0**] ... 3276.7 % | Setting of the setpoint torque for the torque operating modes.<br>• 100 % = Rated motor torque 0x6076 (P325.00)<br>The inverter does not support the CiA 402 torque mode. |

### 12.7.4 Process output data

#### Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x6043<br>(P782.00) | Internal set speed<br>(Int. set speed)<br>• Read only: x rpm | Display of the internal set speed (velocity demand). |
| 0x6044<br>(P783.00) | Actual speed<br>(Actual speed)<br>• Read only: x rpm | Display of the actual speed (velocity mode). |
| 0x6074 | Internal set torque<br>• Read only: x.x %<br>• From version 02.00 | Display of the internal set torque.<br>• 100 % = Rated motor torque 0x6076 (P325.00). |

### 12.7.5 Commands for device state control

0x6040 (CiA control word) can be used to trigger commands to put the inverter into a certain device state.

| Command | Bit pattern in the CiA control word (0x6040) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| | Reset fault | Dependent on the operating mode | | | Operation enable | Activating quick stop | Establish readiness for operation | Switch-on |
| Switch-off 289 | 0 | X | X | X | X | 1 | 1 | 0 |
| Switch on 290 | 0 | X | X | X | 0 | 1 | 1 | 1 |
| Enable operation 291 | 0 | X | X | X | 1 | 1 | 1 | 1 |
| Activate quick stop 292 | 0 | X | X | X | X | 0 | 1 | X |
| Disable operation 293 | 0 | X | X | X | 0 | 1 | 1 | 1 |
| Pulse inhibit 294 | 0 | X | X | X | X | X | 0 | X |
| Reset fault 295 | 0↗1 | X | X | X | X | X | X | X |
| X = state is not relevant | | | | | | | | |

### More Lenze-specific control bits (bit 8 ... 15)

| Command | Bit pattern in the CiA control word (0x6040) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Bit 15 | Bit 14 | Bit 13 | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 |
| | Reserved | Release brake | Reserved | Dependent on the operating mode | | | | Stop motor |
| Apply brake | X | 0 | X | X | X | X | X | X |
| Release brake | X | 1 | X | X | X | X | X | X |
| Stop motor | X | X | X | X | X | X | X | 1 |
| X = state is not relevant | | | | | | | | |

Detailed information on the various commands can be found in the following sections.

### Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x6040 | CiA control word<br>0 ... **[0]** ... 65535 | | Mappable CiA control word with bit assignment according to device profile CiA 402. |
| | Bit 0 | Switch on | 1 = switch-on |
| | Bit 1 | Enable voltage | 1 = Enable voltage |
| | Bit 2 | Disable quick stop | 0 = activate quick stop |
| | Bit 3 | Enable operation | 1 = Enable operation |
| | Bit 4 | Operation mode specific | Operation mode specific |
| | Bit 5 | Operation mode specific | |
| | Bit 6 | Operation mode specific | |
| | Bit 7 | Fault reset | 0-1 edge = fault reset |
| | Bit 8 | Halt (from version 04.00) | 1 = stop motor (ramping down to frequency setpoint 0 Hz) |
| | Bit 9 | Operation mode specific | Operating mode specific |
| | Bit 14 | Release holding brake | 1 = release holding brake<br>⚠ CAUTION!<br>• The manually triggered "Release holding brake" command has a direct impact on the "Release holding brake [115]" trigger. Thus, the holding brake can be manually released if the power section is switched off.<br>• The responsibility for a manual opening of the holding brake lies with the external trigger source for the "Release holding brake" command.<br>▸ Holding brake control 197 |

### Example

A PLC program of a PLCopen control can, for instance, trigger several commands for state changes in a row by the level change at the *bRegulatorOn* input of the "MC_Power" block.

In the mentioned example, these device commands are "Switch-off" and "Switch on" in this order.

### 12.7.5.1 Switch-off

This command serves to change the "Switch-on inhibited" device state to the "Ready to switch on" device state.

If the pulse inhibit has already been deactivated and the device status of the inverter is "Operation enabled", this command sets the pulse inhibit again.

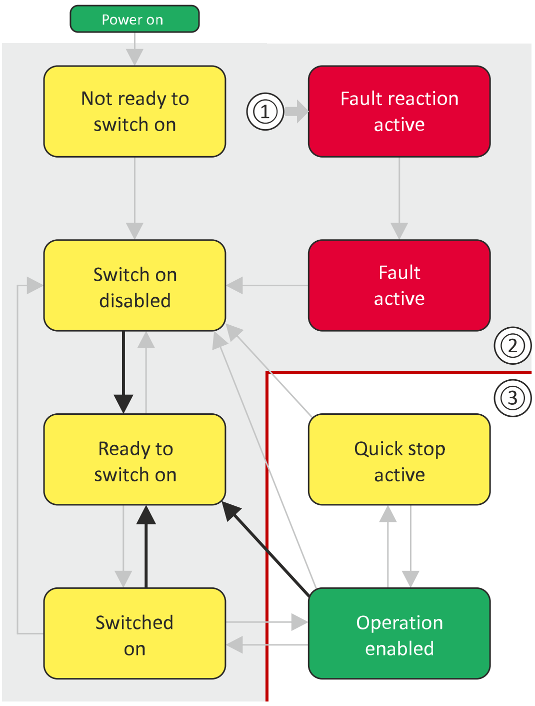
- If automatic brake operation is activated, the parameterized Brake closing time (0x2820:002 (P712.02)) is observed: The system waits until the brake is applied before the pulse inhibit is set. In the CiA 402 "CiA: Velocity mode", the Brake closing time is not observed.
- The motor has no torque.
- The device state "Switched on" or "Operation enabled" changes back to the "Ready to switch on" state.

**⚠ DANGER!**

Uncontrolled movement

If the motor has no torque, a load that is connected to motors without a holding brake may cause uncontrolled movements!

► Without a load, the motor will coast.



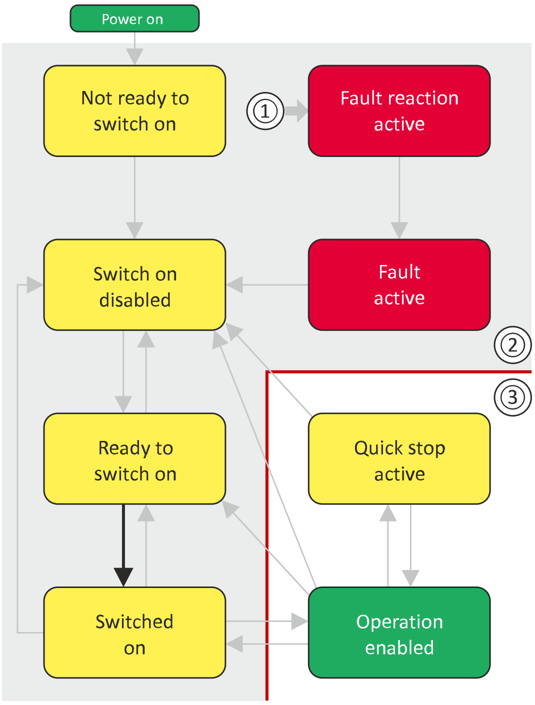

1 From all states
2 Power section disabled (pulse inhibit)
3 Power section enabled

| Bit pattern in the CiA control word (0x6040) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Bit 15 ... 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Reserved (specific)** | **Reset fault** | **Operating mode dependent** | | | **Operation enabled** | **Activate quick stop** | **Establish readiness for operation** | **Switch-on** |
| X | 0 | X | X | X | X | 1 | 1 | 0 |
| X = state is not relevant | | | | | | | | |

### 12.7.5.2 Switch on

This command serves to deactivate the switch on inhibit which is active after switch on or after the reset (acknowledgement) of an error.

A changeover to the "Switched on" device status takes place.



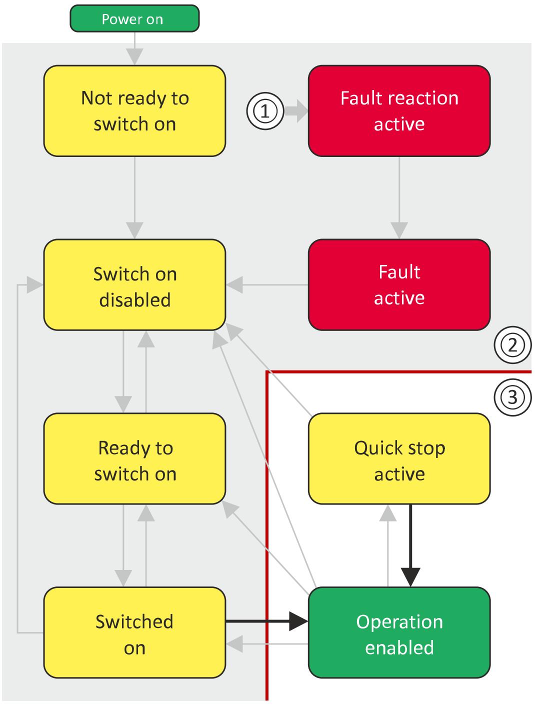

1 From all states
2 Power section inhibited (pulse inhibit)
3 Power section enabled

| Bit pattern in the CiA control word (0x6040) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Bit 15 ... 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Reserved (specific)** | **Reset fault** | **Operating mode-dependent** | | | **Operation enabled** | **Activate quick stop** | **Establish readiness for operation** | **Switch-on** |
| X | 0 | X | X | X | 0 | 1 | 1 | 1 |
| X = state is not relevant | | | | | | | | |

### 12.7.5.3 Enable operation

This command enables the operation and stop an active quick stop again.

- A changeover to the "Operation enabled" device status takes place.
- The output stages of the inverter become active.




1 From all states
2 Power section inhibited (pulse inhibit)
3 Power section enabled

| Bit pattern in the CiA control word (0x6040) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Bit 15 ... 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Reserved (specific)** | **Reset fault** | **Operating mode dependent** | | | **Operation enabled** | **Activate quick stop** | **Establish readiness for operation** | **Switch-on** |
| X | 0 | X | X | X | 1 | 1 | 1 | 1 |
| X = state is not relevant | | | | | | | | |

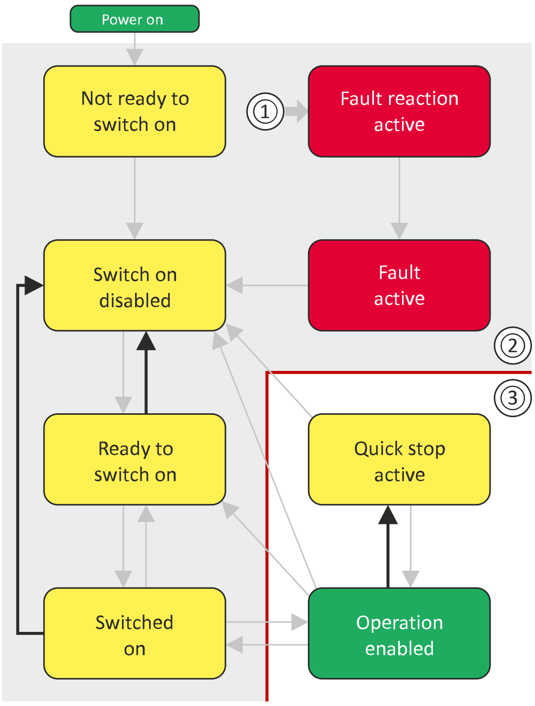
If the device status "Operation enabled" is signalled in the CiA status word, the inverter is ready to accept set points from the network master.

#### 12.7.5.4 Activate quick stop

This command activates quick stop when the operation is enabled.

- The drive is brought to a standstill irrespective of the setpoint specified with the deceleration (0x6085 (P790.00)) set for quick stop.
- A changeover to the "Quick stop active" device status takes place.
- Then, state change to "Switch-on inhibited" parameter 0x605A "CiA: Quick stop mode".

If the operation is not enabled (device state "Ready to switch on" or "Switched on"), this command changes the state to "operation disabled".




1 From all states
2 Power section disabled (pulse inhibit)
3 Power section enabled

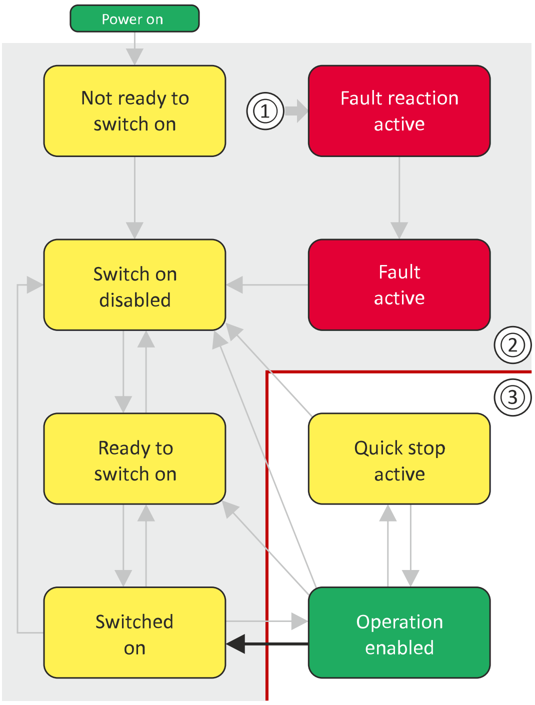
| Bit pattern in the CiA control word (0x6040) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Bit 15 ... 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Reserved (specific)** | **Reset fault** | **Operating mode dependent** | | | **Operation enabled** | **Activate quick stop** | **Establish readiness for operation** | **Switch-on** |
| X | 0 | X | X | X | X | 0 | 1 | X |
| X = state is not relevant | | | | | | | | |

- During quick stop, the inverter executes the setpoint generation and no longer follows the setpoint defined by the network master.
- If several inverters execute a chained synchronous motion, the quick stop function has to be coordinated by the network master by means of a quick stop profile (master function). In this case, quick stop cannot be activated via the control bit 2.
- During the quick stop, the maximum current (0x6073 (P324.00)) and the maximum torque (0x6072 (P326.00)) are active. The lower of the two limits determines the motor torque output. The torque limits from 0x60E0 and 0x60E1 are not effective during the quick stop.

### 12.7.5.5 Disable operation

This command disables the enabled operation again.

- The pulse inhibit is set (pulses of the inverter are inhibited).
- If automatic brake operation is activated, the parameterized Brake closing time (0x2820:002 (P712.02)) is observed: The system waits until the brake is applied before the pulse inhibit is set. In the CiA 402 "CiA: Velocity mode", the Brake closing time is not observed.
- A changeover to the "Switched on" device state takes place.




1 From all states
2 Power section disabled (pulse inhibit)
3 Power section enabled

| Bit pattern in the CiA control word (0x6040) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Bit 15 ... 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Reserved (specific)** | **Reset fault** | **Operating mode dependent** | | | **Operation enabled** | **Activate quick stop** | **Establish readiness for operation** | **Switch-on** |
| X | 0 | X | X | X | 0 | 1 | 1 | 1 |
| X = state is not relevant | | | | | | | | |

### 12.7.5.6 Pulse inhibit

This command disables the output stages of the inverter.

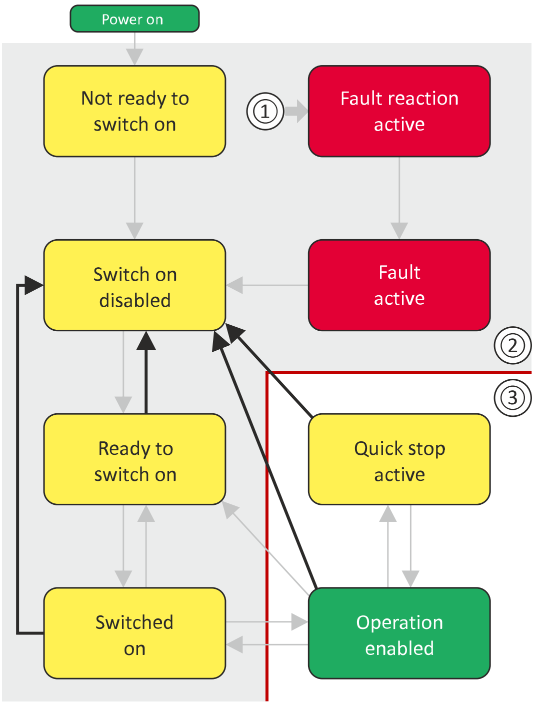
- The pulse inhibit is activated (pulses of the inverter are inhibited) if not already active.
- The motor has no torque.
- A changeover to the "Switch-on inhibited" device state takes place.

**⚠ DANGER!**

Uncontrolled movement

If the motor has no torque, a load that is connected to motors without a holding brake may cause uncontrolled movements!

▸ Without a load, the motor will coast.



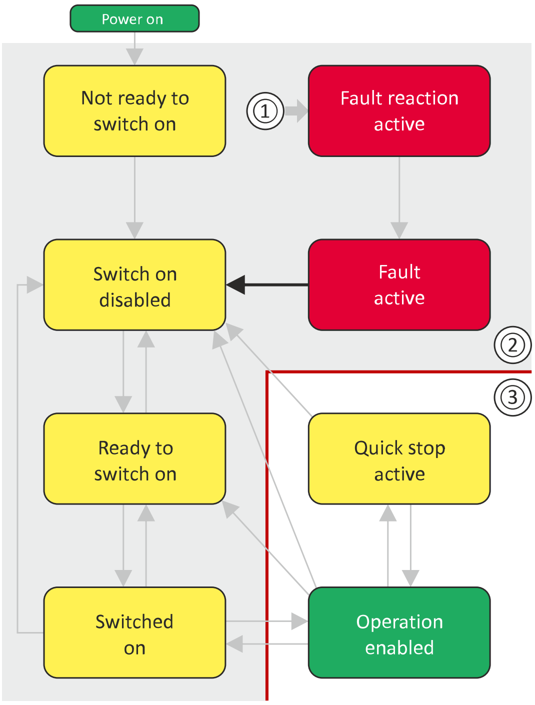

1 From all states
2 Power section inhibited (pulse inhibit)
3 Power section enabled

| Bit pattern in the CiA control word (0x6040) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Bit 15 ... 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Reserved (specific)** | **Reset fault** | **Operating mode dependent** | | | **Operation enabled** | **Activate quick stop** | **Establish readiness for operation** | **Switch-on** |
| X | 0 | X | X | X | X | X | 0 | X |
| X = state is not relevant | | | | | | | | |

#### 12.7.5.7 Reset fault

This command resets a pending fault if the cause of the fault has been eliminated.

- The pulse inhibit remains active (pulses of the inverter are inhibited).
- A changeover to the "Switch-on inhibited" device status takes place (switch-on inhibit remains active).




1 From all states
2 Power section inhibited (pulse inhibit)
3 Power section enabled

| **Bit pattern in the CiA control word (0x6040)** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Bit 15 ... 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Reserved (specific)** | **Reset fault** | **Operating mode dependent** | | | **Operation enabled** | **Activating quick stop** | **Establish readiness for operation** | **Switch-on** |
| X | 0↗1 | X | X | X | X | X | X | X |
| X = state is not relevant | | | | | | | | |

## 12.7.6 Device states

0x6041 (P780.00) (CiA status word) displays the current device status of the inverter.

**Status bit 7: "Warning active"**

Status bit 7 indicates a warning.

- A warning does **not** cause a state change.
- Warnings do not need to be reset.

### More Lenze-specific status bits (bit 8 ... 15)

| Device state | Bit pattern in the CiA status word (0x6041 (P780.00)) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Bit 15 | Bit 14 | Bit 13 | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 |
| | Not active | Brake released | Reserved | Reserved | Internal limitation is active | Target position reached | Control word processed successfully | RPDOs deactivated |
| Brake applied | X | 0 | 0 | 0 | X | X | X | X |
| Brake released | X | 1 | 0 | 0 | X | X | X | X |
| X = state is not relevant | | | | | | | | |

Detailed information on the various device states can be found in the following sections.

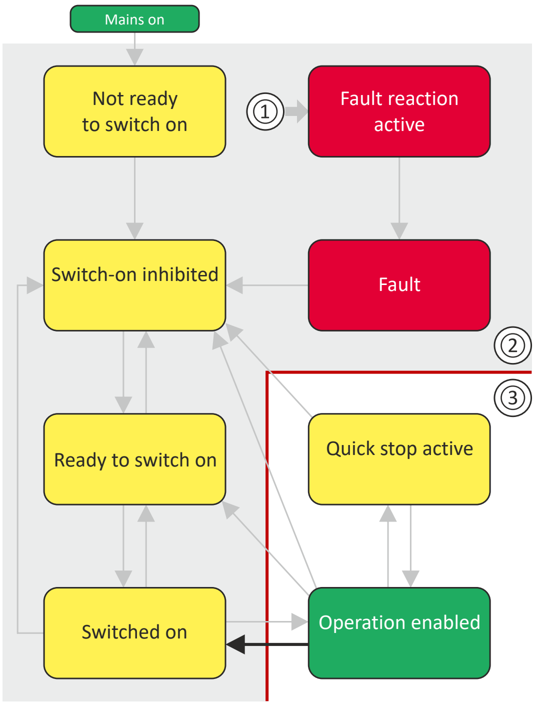
### Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x6041 (P780.00) | CiA status word (CiA status word)<br>• Read only | | Mappable CiA status word with bit assignment according to device profile CiA 402. |
| | Bit 0 | Ready to switch on | 1 = drive ready to start |
| | Bit 1 | Switched on | 1 = drive switched-on |
| | Bit 2 | Operation enabled | 1 = operation enabled |
| | Bit 3 | Fault | 1 = fault or trouble active |
| | Bit 4 | Voltage enabled | 1 = DC bus ready for operation |
| | Bit 5 | Quick stop disabled | 0 = quick stop active |
| | Bit 6 | Switch on disabled | 1 = operation inhibited |
| | Bit 7 | Warning | 1 = warning active |
| | Bit 8 | RPDOs deactivated | 1 = cyclic PDOs have been deactivated. |
| | Bit 9 | CiA control enabled | 1 = inverter can receive commands via network.<br>• Bit is not set in the operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]". |
| | Bit 10 | Setpoint reached | 1 = the actual speed is in the window. |
| | Bit 11 | Internal limit active | 1 = internal limitation of a setpoint active. |
| | Bit 14 | Holding brake released | 1 = holding brake released |
| | Bit 15 | STO not active | 0 = the inverter has been disabled by the integrated safety system<br>1 = the integrated safety system is not active<br>Not available for i410 and i510 (always TRUE). |

### 12.7.6.1 Not ready to switch on

This is the device state of the inverter directly after switching on the supply voltage.

- In this device status, the device is initialised.
- Communication is not possible yet.
- The inverter cannot be parameterised yet and no device commands can be carried out yet.
- The motor brake, if available, is closed.
- Operation is inhibited.



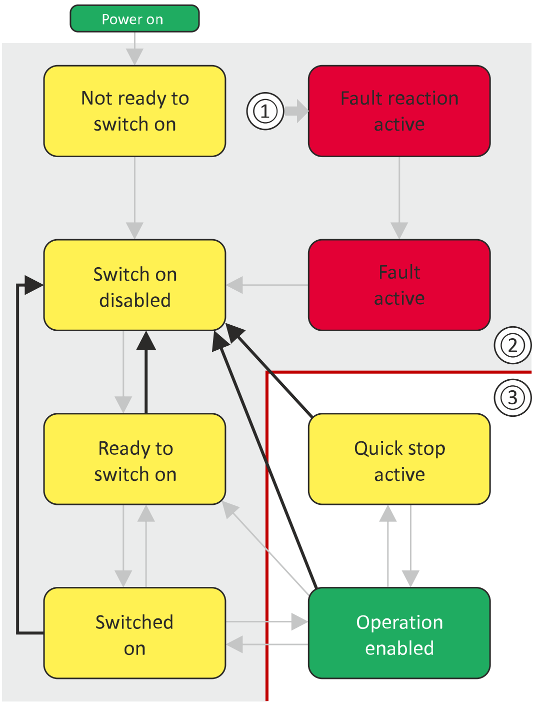

1 From all states
2 Power section inhibited (pulse inhibit)
3 Power section enabled

| Bit pattern in the CiA status word (0x6041 (P780.00)) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Bit 15 ... 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Reserved (specific)** | **Warning active** | **Operation inhibited** | **Quick stop active** | **DC bus ready for operation** | **Fault active** | **Operation enabled** | **Switched on** | **Ready to switch on** |
| X | X | 0 | X | X | 0 | 0 | 0 | 0 |
| X = state is not relevant | | | | | | | | |

### 12.7.6.2 Switch-on inhibited

This is the device state of the inverter after the device has been initialized successfully.

- Process data monitoring is active.
- Communication is possible.
- The DC-bus voltage can be present.
- The inverter can be parameterized.
- If the internal holding brake control (0x2820:001 (P712.01)) is active in the inverter, the motor brake is closed.
- Operation is inhibited.




1 From all states
2 Power section inhibited (pulse inhibit)
3 Power section enabled

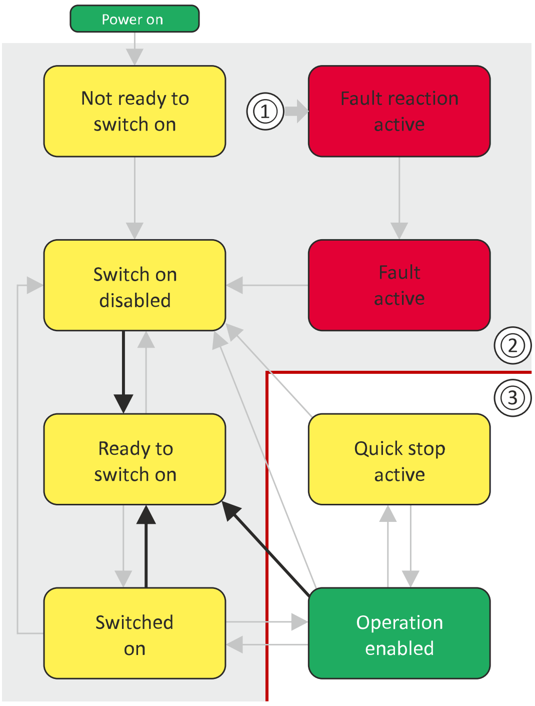
| Bit pattern in the CiA 402 status word (0x6041 (P780.00)) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Bit 15 ... 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Reserved (specific)** | **Warning is active** | **Operation inhibited** | **Quick stop active** | **DC bus ready for operation** | **Fault active** | **Operation enabled** | **Switched on** | **Ready to switch on** |
| X | X | 1 | X | X | 0 | 0 | 0 | 0 |
| X = state is not relevant | | | | | | | | |

### 12.7.6.3 Ready to switch on

This is the device state of the inverter after the device has been initialised successfully and after the Switch-off command has been triggered.

A change to this device state also takes place if the "Switch-off" command was triggered in the states "Switched on" or ".

- Process data monitoring is active.
- Communication is possible.
- The DC-bus voltage is available.
- The inverter can be parameterised.
- If the internal holding brake control (0x2820:001 (P712.01)) is active in the inverter, the motor brake is closed.
- Operation is inhibited.



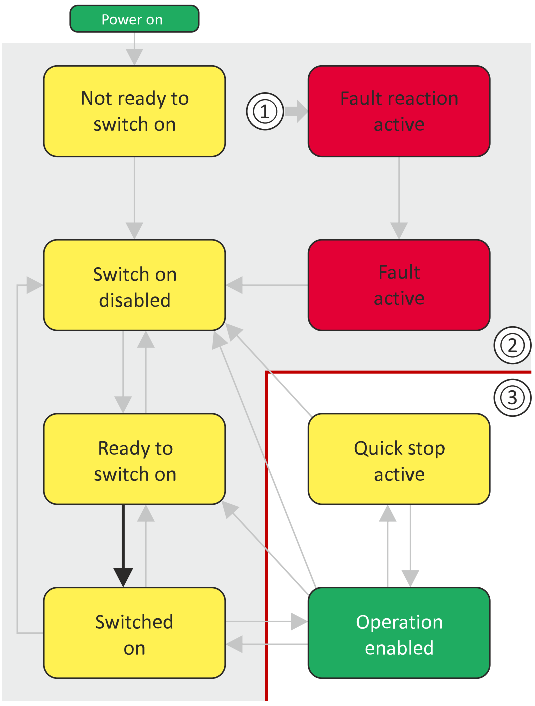

1 From all states
2 Power section inhibited (pulse inhibit)
3 Power section enabled

| Bit pattern in the CiA status word (0x6041 (P780.00)) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Bit 15 ... 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Reserved (specific)** | **Warning active** | **Operation inhibited** | **Quick stop active** | **DC bus ready for operation** | **Fault active** | **Operation enabled** | **Switched on** | **Ready to switch on** |
| X | X | 0 | 1 | X | 0 | 0 | 0 | 1 |
| X = state is not relevant | | | | | | | | |

### 12.7.6.4 Switched on

This is the device state of the inverter after the "Switch on" command has been triggered in the "Ready to switch on" device state.

- Process data monitoring is active.
- Communication is possible.
- The DC-bus voltage is available.
- The inverter can be parameterised.
- If the internal holding brake control (0x2820:001 (P712.01)) is active in the inverter, the motor brake is closed.
- Operation is inhibited.



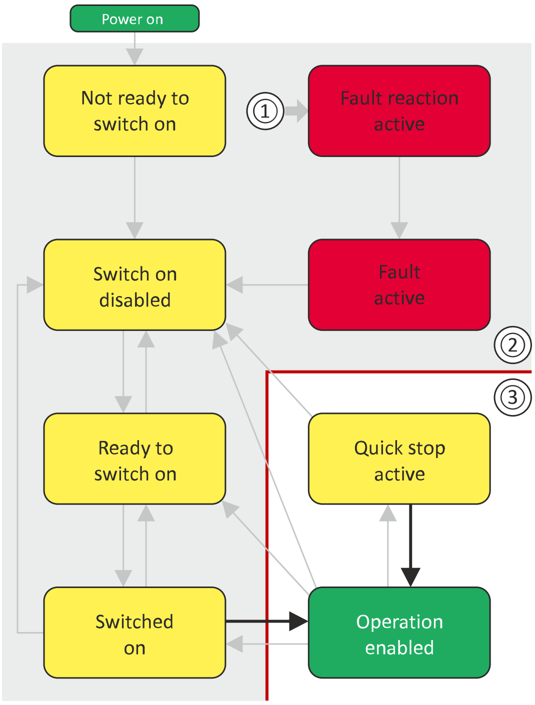

1 From all states
2 Power section inhibited (pulse inhibit)
3 Power section enabled

| Bit pattern in the CiA status word (0x6041 (P780.00)) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Bit 15 ... 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Reserved (specific)** | **Warning active** | **Operation inhibited** | **Quick stop active** | **DC bus ready for operation** | **Fault active** | **Operation enabled** | **Switched on** | **Ready to switch on** |
| X | X | 1 | 1 | X | 0 | 0 | 1 | 1 |
| X = state is not relevant | | | | | | | | |

### 12.7.6.5 Operation enabled

This device state represents normal operation. Operation in the selected operating mode is enabled and no errors have occurred.

- Only the parameters of the inverter can be changed that do not require an inverter disable.
- A motor brake, if any, is open if the automatic operation of the holding brake control is activated (0x2820:001 (P712.01) = 0).
- The drive control is active.




1 From all states
2 Power section inhibited (pulse inhibit)
3 Power section enabled

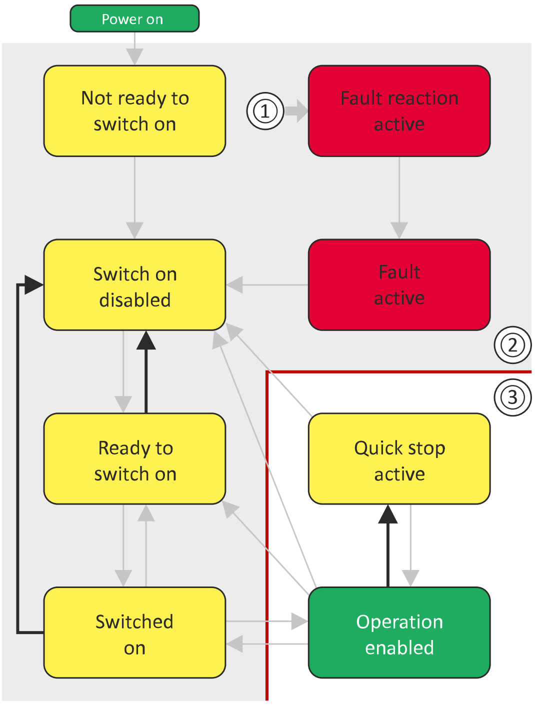
| Bit pattern in the CiA status word (0x6041 (P780.00)) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Bit 15 ... 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Reserved (specific)** | **Warning active** | **Operation inhibited** | **Quick stop active** | **DC bus ready for operation** | **Fault active** | **Operation enabled** | **Switched on** | **Ready to switch on** |
| X | X | 0 | 1 | X | 0 | 1 | 1 | 1 |
| X = state is not relevant | | | | | | | | |

If the device status "Operation enabled" is signalled in the CiA status word, the inverter is ready to accept set points from the network master.

### 12.7.6.6 Quick stop active

This device state is active if quick stop is executed or active.

- Only the parameters of the inverter can be changed that do not require an inverter disable.
- If the internal holding brake control (0x2820:001 (P712.01)) is active in the inverter, the motor brake is closed.
- The drive control is active.




1 From all states
2 Power section inhibited (pulse inhibit)
3 Power section enabled

| Bit pattern in the CiA status word (0x6041 (P780.00)) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Bit 15 ... 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Reserved (specific)** | **Warning active** | **Operation inhibited** | **Quick stop active** | **DC bus ready for operation** | **Fault active** | **Operation enabled** | **Switched on** | **Ready to switch on** |
| X | X | 0 | 0 | X | 0 | 1 | 1 | 1 |
| X = state is not relevant | | | | | | | | |

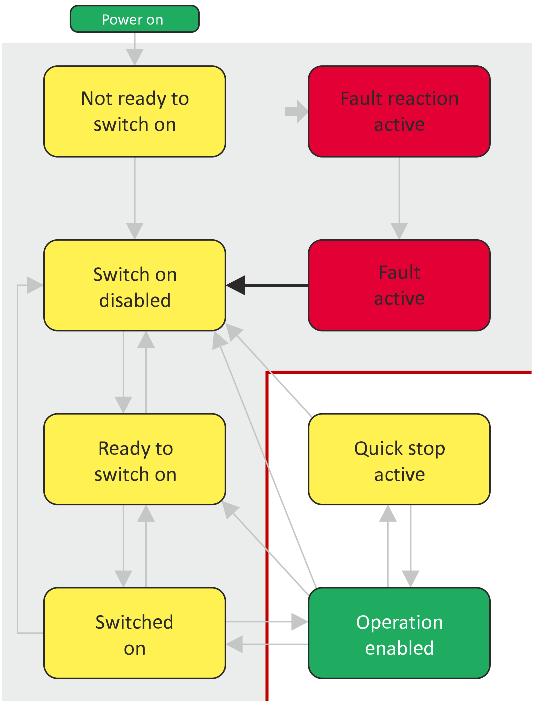
The "Enable operation" command stops an active quick stop.

### 12.7.6.7 Fault reaction active

This device state becomes active if a minor fault occurs. This means that the inverter is still able to drive the motor in a controlled way.

- The inverter is brought to a standstill irrespective of the setpoint specified with the deceleration (0x6085 (P790.00)) set for quick stop.

  If the inverter is at standstill, a change to the "Trouble" device state take place automatically.
- Only the parameters of the inverter can be changed that do not require an inverter disable.
- If the internal holding brake control (0x2820:001 (P712.01)) is active in the inverter, the motor brake is closed.
- The drive control is active.



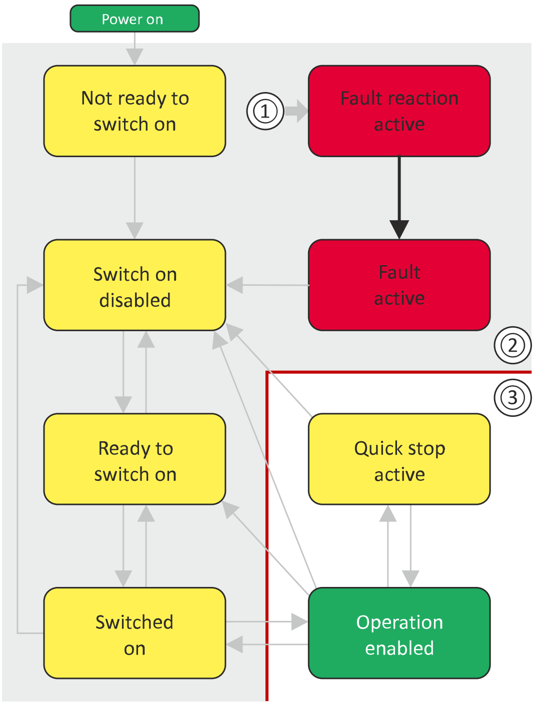

1 From all states
2 Power section inhibited (pulse inhibit)
3 Power section enabled

| Bit pattern in the CiA status word (0x6041 (P780.00)) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Bit 15 ... 8** | **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| **Reserved (specific)** | **Warning active** | **Operation inhibited** | **Quick stop active** | **DC bus ready for operation** | **Fault active** | **Operation enabled** | **Switched on** | **Ready to switch on** |
| X | X | 0 | X | X | 1 | 1 | 1 | 1 |
| X = state is not relevant | | | | | | | | |

### 12.7.6.8 Trouble

This device state becomes active if a serious system fault occurs. This means that the inverter is no longer able to drive the motor in a controlled way. The inverter is switched off immediately.

- The pulse inhibit is active (pulses of the inverter are inhibited).
- The motor is torqueless.
- The motor brake, if available, is closed.
- Operation is inhibited.
- The inverter can be parameterised.




1 From all states
2 Power section inhibited (pulse inhibit)
3 Power section enabled

| Bit pattern in the CiA status word (0x6041 (P780.00)) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Bit 15 ... 8 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| Reserved (specific) | Warning active | Operation inhibited | Quick stop active | DC bus ready for operation | Fault active | Operation enabled | Switched on | Ready to switch on |
| X | X | 0 | X | X | 1 | 0 | 0 | 0 |
| X = state is not relevant | | | | | | | | |

This device state can only be left with the "Reset fault" command if the cause of the fault has been removed.



## 12.8 AC drive

For control via the AC drive profile, the parameters listed in the following can be mapped to network registers.

- Mapping entry for the AC Drive control word (0x400B:001 (P592.01)): 0x400B0110
- Mapping entry for the AC Drive status word (0x400C:001 (P593.01)): 0x400C0110
- Detailed information on the data mapping can be found in the chapter of the corresponding network.

### 12.8.1 AC drive control word

The AC drive control word (0x400B:001 (P592.01)) will only be processed if the network control in 0x2631:037 (P400.37) has been activated and the network is also active as the control source.

▶ Changing the control source during operation 📖 72

Moreover, some bits in the control word are ignored if the bit 5 "Activate network control" is not set. For details see the parameter description for 0x400B:001 (P592.01).

The following logic applies to bit 0 "Run forward (CW)" and bit 1 "Run reverse (CCW)":

| Bit 0<br>"Run forward (CW)" | Bit 1<br>"Run reverse (CCW)" | Action |
|---|---|---|
| 0 | 0 | Stopping with stop method set in 0x2838:003 (P203.03). |
| 0↗1 (edge) | 0 | Run forward (CW) |
| 0 | 0↗1 (edge) | Run reverse (CCW) |
| 0↗1 (edge) | 0↗1 (edge) | No action / last action is continued to be executed. |
| 1 | 1 | |
| 1 | 0 | |
| 0 | 1 | |
| 1↘0 (edge) | 1 | Run reverse (CCW) |
| 1 | 1↘0 (edge) | Run forward (CW) |

#### Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x400B:001<br>(P592.01) | Process input data: AC Drive control word<br>(Process data IN: AC control word)<br>0x0000 ... [**0x0000**] ... 0xFFFF | | Mappable control word with bit assignment in compliance with EtherNet/IP™ AC drive profile. |
| | Bit 0 | Run forward (CW) | Bits are only evaluated if bit 5 = "1".<br>For the exact logic, see the above truth table. |
| | Bit 1 | Run reverse (CCW) | |
| | Bit 2 | Reset error (0-1 edge) | |
| | Bit 5 | Activate network control | If bit 5 = "1" and 0x2631:037 (P400.37) = "Network control active [114]": All bits of the AC Drive control word are evaluated.<br>If bit 5 = "0" or 0x2631:037 (P400.37) = "Not connected [0]":<br>• Bit 0, 1, 6, 12, 13, 14, 15 of the AC drive control word are not evaluated (ignored).<br>• Active control source is the "Flexible I/O configuration". ▶ Changing the control source during operation 📖 72 |
| | Bit 6 | Activate network setpoint | 0 = the standard setpoint source selected in 0x2860:001 (P201.01) is used.<br>Bits are only evaluated if bit 5 = "1".<br>1 = network setpoint is used.<br>For control without bit 5, the "Network setpoint active [116]" selection must be set in . |
| | Bit 12 | Disable inverter | Bits are only evaluated if bit 5 = "1". |
| | Bit 13 | Activate quick stop | |
| | Bit 14 | Deactivate PID controlling | |
| | Bit 15 | Activate DC braking | |

### 12.8.2 AC drive status word

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x400C:001<br>(P593.01) | Process output data: AC Drive status word<br>(Process data OUT: AC status word)<br>• Read only | | Mappable status word with bit assignment in compliance with EtherNet/IP™ AC drive profile. |
| | Bit 0 | Fault/Trip active | |
| | Bit 1 | Warning active | |
| | Bit 2 | Running forward | |
| | Bit 3 | Running reverse | |
| | Bit 4 | Ready | |
| | Bit 5 | Network control active | |
| | Bit 6 | Network setpoint active | |
| | Bit 7 | At Reference | |
| | Bit 8 | Profile-State bit 0 | The drive status is coded as follows:<br>0: Manufacturer-specific (reserved)<br>1: Startup (drive initialisation)<br>2: Not_Ready (mains voltage switched off)<br>3: Ready (mains voltage switched on)<br>4: Enabled (drive has received run command)<br>5: Stopping (drive has received stop command and is stopped)<br>6: Fault_Stop (drive is stopped due to a fault)<br>7: Faulted (faults have occurred) |
| | Bit 9 | Profile-State bit 1 | |
| | Bit 10 | Profile-State bit 2 | |
| | Bit 11 | Profile-State bit 3 | |
| | Bit 12 | Process controller active | |
| | Bit 13 | Torque mode active | |
| | Bit 14 | Current limit reached | |
| | Bit 15 | DC braking active | |

### 12.8.3 AC motor type

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x6402 | Motor type<br>• From version 02.00 | | AC motor type<br>• Motor Data Object (0x28) - instance attribute 3 |
| | 3 | PM synchronous | |
| | **7** | **Squirrel cage induction** | |

## 12.9 Lenze LECOM profile

For connection to Lenze inverters with a LECOM control word (C135) and LECOM status word (C150), the parameters listed in the following can be mapped to network registers.

### Details

Mapping entries

- LECOM control word (0x400B:002 (P592.02)): 0x400B0210
- LECOM status word (0x400C:002 (P593.02)): 0x400C0210
- Detailed information on the data mapping can be found in the chapter of the corresponding network.

### Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x400B:002 (P592.02) | Process input data: LECOM control word (Process data IN: LECOM ctrl word) 0x0000 ... [**0x0000**] ... 0xFFFF | | Mappable control word with bit assignment in compliance with code C135 of the 8200 Lenze inverter. |
| | Bit 0 | Activate preset (bit 0) | |
| | Bit 1 | Activate preset (bit 1) | |
| | Bit 2 | Reverse rotational direction | |
| | Bit 3 | Activate quick stop | |
| | Bit 9 | Disable inverter | |
| | Bit 10 | Activate user fault | |
| | Bit 11 | Reset error (0-1 edge) | |
| | Bit 14 | Activate DC braking | |
| 0x400C:002 (P593.02) | Process output data: LECOM status word (Process data OUT: LECOM stat. word) • Read only | | Mappable status word with bit assignment in compliance with code C150 of the 8200 Lenze inverter. |
| | Bit 0 | Active parameter set (0 = set 1 or 3; 1 = set 2 or 4) | |
| | Bit 1 | Power section inhibited | |
| | Bit 2 | Current or Torque limit reached | |
| | Bit 3 | Frequency setpoint reached | |
| | Bit 4 | Ramp generator (input = output) | |
| | Bit 5 | Frequency < frequency threshold | |
| | Bit 6 | Actual frequency = 0 | |
| | Bit 7 | Inverter disabled | |
| | Bit 8 | Coded status bit 0 | |
| | Bit 9 | Coded status bit 1 | |
| | Bit 10 | Coded status bit 2 | |
| | Bit 11 | Coded status bit 3 | |
| | Bit 12 | Overtemperature warning | |
| | Bit 13 | DC-bus overvoltage | |
| | Bit 14 | Rotational direction reversed | |
| | Bit 15 | Ready for Operation | |

## 12.10 CANopen

CANopen® is an internationally approved communication protocol which is designed for commercial and industrial automation applications. High data transfer rates in connection with efficient data formatting provide for the coordination of motion control devices in multi-axis applications.

- CANopen® is a registered community trademark of the CAN in Automation e. V user organisation.
- Detailed information on CANopen can be found on the web page of the CAN in Automation (CiA) user organisation: http://www.can-cia.org
- Information about the dimensioning of a CANopen network can be found in the configuration document for the inverter.

**Details**

- The implementation of the CANopen communication profile (CiA DS301, version 4.02) enables baud rates of 20 kbps to 1 Mbps.
- For establishing a simple network connection, the inverter provides predefined control and status words for these profiles.

▸ CiA 402 device profile 📖 285

▸ AC drive 📖 305

▸ Lenze LECOM profile 📖 307

There are also additional mappable data words to individually control the inverter:

- The inverter control is preconfigured via a CiA control word.



### 12.10.1 Commissioning

In the following, the steps required for controlling the inverter via CANopen are described.

**Parameterization required**

1. Set the CANopen node address.
   - Each network node must be provided with a unique node address.
   - Details: ▶ Node address setting 313
2. Set the CANopen baud rate.
   - Default setting: 500 = kbit/s
   - Details: ▶ Baud rate setting 313
3. Optional: Configure inverter as "mini master".
   - Required if the initialization of the CANopen network and the associated status change from "Pre-Operational" to "Operational" is not effected by a higher-level host system.
   - Details: ▶ Configuring the device as mini master 313
4. Optional: Change the response of the inverter to the triggering of the RPDO time monitoring.
   - Default setting: In case of missing RPDOs, an error is triggered.
   - Details: ▶ Error responses 326
5. Save parameter settings: 0x2022:003 (P700.03) = "On / start = [1]".
6. Switch the inverter off and then on again in order that the changed communication settings can get effective.
7. Program the master so that the following SDO messages are sent to the inverter:
   1. 0x2631:037 (P400.37) = 1 (activate network control)
   2. 0x2860:001 (P201.01) = 5 (set network as standard setpoint source)
   3. PDO mapping and configuration of the process data objects RPDO1 and TPDO1 (see the sections "RPDO1 mapping modification" and "TPDO1 mapping modification").
8. Control inverter via RPDO1 (and evaluate the current status via TPDO1).
   - For assignment of the control word and setpoint selection, see section "RPDO1 mapping modification".
   - For assignment of the status word and actual value output, see section "TPDO1 mapping modification".
   - Acceleration 0x2917 (P220.00) and deceleration 0x2918 (P221.00) can be set/changed via SDO messages.

In the default setting, the digital input DI1 is assigned the "Run" function. If the network control is activated, this function serves as "start enable" for start commands via network. Hence, the digital input DI1 must be set to the HIGH level in order that the motor can be started via the network.

▶ Flexible I/O configuration of the start, stop and rotating direction commands 54

### RPDO1 mapping modification

The RPDO1 is used to control the inverter.

Changing the identifier (COB-ID) and the PDO mapping only allows the following procedure:

1. Set RPDO1 to "invalid": Set bit 31 in the identifier 0x1400:001 (P540.01) = 1.
2. Set RPDO1 mapping to "invalid": set 0x1600:000 = 0
3. Map NetWordIN1 data word 0x4008:001 (P590.01) to RPDO1: set 0x1600:001 = 0x40080110.
4. Network setpoint frequency (0.1) 0x400B:003 (P592.03) to RPDO1: set 0x1600:002 = 0x400B0310.
5. Set RPDO1 mapping to "valid" again: set 0x1600:000 = 2 (number of mapped parameters).
6. Optional: Set timeout time for monitoring the data reception in 0x1400:005 (P540.05) in [ms].
   - Default setting: 100 ms
7. Change identifier for RPDO1 (optional) and set RPDO1 to "valid" again: Write the new identifier into 0x1400:001 (P540.01) and simultaneously set bit 31 to "0".
   - Default setting: 0x200 + node address (hex)
   - Example: Node address = 10 (0xA) and basic identifier = default setting:

     Identifier to be written into = 0x200 + 0xA = 0x20A = (0b0011 0000 1010)

**Function assignment of the NetWordIN1 data word (byte 1+2 of the RPDO1)**

| Bit | Default setting | For details and configuration, see |
|---|---|---|
| 0 | Not active (reserve) | 0x400E:001 (P505.01) |
| 1 | Not active (reserve) | 0x400E:002 (P505.02) |
| 2 | Activate quick stop | 0x400E:003 (P505.03) |
| 3 | Not active (reserve) | 0x400E:004 (P505.04) |
| 4 | Run forward (CW) | 0x400E:005 (P505.05) |
| 5 | Activate preset (bit 0) | 0x400E:006 (P505.06) |
| 6 | Activate preset (bit 1) | 0x400E:007 (P505.07) |
| 7 | Reset error | 0x400E:008 (P505.08) |
| 8 | Not active (reserve) | 0x400E:009 (P505.09) |
| 9 | Activate DC braking | 0x400E:010 (P505.10) |
| 10 | Not active (reserve) | 0x400E:011 (P505.11) |
| 11 | Not active (reserve) | 0x400E:012 (P505.12) |
| 12 | Reverse rotational direction | 0x400E:013 (P505.13) |
| 13 | Not active (reserve) | 0x400E:014 (P505.14) |
| 14 | Not active (reserve) | 0x400E:015 (P505.15) |
| 15 | Not active (reserve) | 0x400E:016 (P505.16) |

Specifying the frequency setpoint (byte 3+4 of the RPDO1)

- The specification is made unsigned (independent of the direction of rotation) as integer in the resolution [0.1 Hz].
- The direction of rotation is defined in the default setting via bit 12 of the NetWordIN1 data word.
- Example: 456 = 45.6 Hz

**TPDO1 mapping modification**

The TPDO1 is used for the output of status information and the actual frequency value.

Changing the identifier (COB-ID) and the PDO mapping only allows the following procedure:

1. Set TPDO1 to "invalid": Set bit 31 in the identifier 0x1800:001 (P550.01) = 1.
2. Set TPDO1 mapping to "invalid": set 0x1A00:000 = 0.
3. Map NetWordOUT1 data word 0x400A:001 (P591.01) to TPDO1:
   set 0x1A00:001 = 0x400A0110.
4. Frequency (0.1) 0x400B:003 (P592.03) to TPDO1: set 0x1A00:002 = 0x400C0310.
5. Set TPDO1 mapping to "valid" again: set 0x1A00:000 = 2 (number of mapped parameters).
6. Option: Transmission type in 0x1800:002 (P550.02) Event timer in 0x1800:005 (P550.05).
   - Default setting: Cyclic transmission every 20 ms.
7. Change identifier for TPDO1 (optional) and set TPDO1 to "valid" again: Write the new identifier into 0x1800:001 (P550.01) and simultaneously set bit 31 to "0".
   - Default setting: 0x40000180 + node address (hex)
   - Example: Node address = = 10 (0xA) and TPDO1 basic identifier = default setting:

     Identifier to be written into 0x1800:001 (P550.01) = 0x40000180 + 0xA = 0x4000018A (0b0100 0000 0000 0000 0000 0001 1000 1010)

**Status assignment of the NetWordOUT1 data word (byte 1+2 of the TPDO1)**

| Bit | Default setting | For details and configuration, see |
|---|---|---|
| 0 | Ready for operation | 0x2634:010 (P420.10) |
| 1 | Not connected | 0x2634:011 (P420.11) |
| 2 | Operation enabled | 0x2634:012 (P420.12) |
| 3 | Fault active | 0x2634:013 (P420.13) |
| 4 | Not connected | 0x2634:014 (P420.14) |
| 5 | Quick stop active | 0x2634:015 (P420.15) |
| 6 | Running | 0x2634:016 (P420.16) |
| 7 | Device warning active | 0x2634:017 (P420.17) |
| 8 | Not connected | 0x2634:018 (P420.18) |
| 9 | Not connected | 0x2634:019 (P420.19) |
| 10 | Setpoint speed reached | 0x2634:020 (P420.20) |
| 11 | Current limit reached | 0x2634:021 (P420.21) |
| 12 | Actual speed = 0 | 0x2634:022 (P420.22) |
| 13 | Rotational direction reversed | 0x2634:023 (P420.23) |
| 14 | Release holding brake | 0x2634:024 (P420.24) |
| 15 | Inverter disabled (safety) | 0x2634:025 (P420.25) |

Output of the actual frequency value (byte 3+4 of the TPDO1)

- The output is made unsigned (independent of the direction of rotation) as integer in the resolution [0.1 Hz].
- An active reversal is displayed via bit 13 of the NetWordOUT1 data word.
- Example: 456 = 45.6 Hz

**Restart of the communication**

A restart of communication is required after changes of the interface configuration (e. g. node address and baud rate) in order that the changed settings become effective.

For restarting communication, there are two options:

a) Switch inverter off and on again.
b) 0x2300 (P508.00) Set = "Restart with current values [1]".

The following parameter can be used to restart or stop communication.

Optionally it is also possible to reset all communication parameters to the default status.

## Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2300<br>(P508.00) | CANopen communication<br>(CANopen comm.)<br>• Setting can only be changed if the inverter is disabled. | | Restart / stop communication.<br>• After successful execution, the value 0 is shown. |
| | **0** | **No action/no error** | Only status feedback |
| | 1 | Restart with current values | Restart communication with the current values. |
| | 2 | Restart with default values | Restart communication with the standard values of the CAN parameters (0x1000 ... 0x1FFF and 0x2301). |
| | 5 | Stop network communication | Stop communication.<br>• The "Stop Remote Node" NMT command is executed. After successful execution of this command, only the reception of network management frames is possible. |
| | 10 | In progress | Only status feedback |
| | 11 | Action cancelled | |
| | 12 | Fault | |

## 12.10.2 Basic setting and options

### 12.10.2.1 Node address setting

Each network node must be provided with a unique node address.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2301:001 (P510.01) | CANopen settings: Node ID (CANopen sett.: Node ID) 1 ... [**1**] ... 127 | Setting of the node address. • A change in the node address will not be effective until a CAN Reset Node is performed. |

### 12.10.2.2 Baud rate setting

All network nodes must be set to the same baud rate.

**Details**

- The baud rate can be set in 0x2301:002 (P510.02).
- The setting that is active when the inverter is switched on is the effective setting.
- The active baud rate is displayed in 0x2302:002 (P511.02).

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2301:002 (P510.02) | CANopen settings: Baud rate (CANopen sett.: Baud rate) | | Setting of the baud rate. • A change in the baud rate will not be effective until a CAN reset node is performed. |
| | 0 | Automatic (from version 03.00) | |
| | 1 | 20 kbps | Setting of the baud rate. • A change in the baud rate will not be effective until a CAN reset node is performed. |
| | 2 | 50 kbps | |
| | 3 | 125 kbps | |
| | 4 | 250 kbps | |
| | **5** | **500 kbps** | |
| | 6 | 800 kbps | |
| | 7 | 1 Mbps | |

### 12.10.2.3 Configuring the device as mini master

If the initialisation of the CANopen network and the associated status change from "Pre-Operational" to "Operational" is not effected by a master (PLC), the inverter can instead be defined as a "mini master” to execute this task.

**Details**

The inverter is configured as mini master in 0x2301:003 (P510.03).

- In the default setting, the inverter is configured as slave and waits for the NMT telegram "Start Remote Node" from the master (PLC) in the "Pre-Operational" state after being switched on.
- Configured as mini master, the inverter changes to the "Operational" state after being switched on and sets all nodes connected to the CAN bus (broadcast telegram) to the "Operational" communication state using the "Start Remote Node" NMT telegram after the deceleration time set in 0x2301:004 (P510.04) has elapsed. Only this communication status enables data exchange via the process data objects.

> The change of the master/slave operation only becomes effective by renewed mains switching of the inverter or by sending the NMT telegram "Reset Node" or "Reset Communication" to the inverter. Alternatively, the CAN communication can be restarted via 0x2300 (P508.00).

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2301:003 (P510.03) | CANopen settings: Slave/Master (CANopen sett.: Slave/Master) | | 1 = after mains switching, inverter starts as mini-master. |
| | **0** | **Slave** | |
| | 1 | Mini-master | |

| Address | Name / setting range / [default setting] | Information |
| --- | --- | --- |
| 0x2301:004<br>(P510.04) | CANopen settings: Start remote delay<br>(CANopen sett.: Start rem. delay)<br>0 ... [**3000**] ... 65535 ms | If the inverter has been defined as mini-master, a delay time can be set here, which has to elapse after mains switching before the inverter deposits the "Start Remote Node" NMT telegram on the CAN bus. |

### 12.10.3 Process data transfer

Process data objects (PDOs) are used for the cyclic transmission of (process) data via CANopen. PDOs only contain data and an identifier. They do not contain any information about the sender or receiver and are therefore very efficient.

**Details**

- Process data objects which the inverter receives via the network are referred to as "Receive PDOs" (RPDOs).
- Process data objects which the inverter sends via the network are referred to as "Transmit PDOs" (TPDOs).
- The maximum length of a PDO is 8 bytes (4 data words).
- Each PDO requires a unique identifier ("COB-ID") for the purpose of identification within the network.
- Communication parameters such as the transmission type and cycle time for each PDO can be set freely and independently of the settings of other PDOs

**Transmission type**

Process data objects can be transmitted in an event-controlled or time-controlled manner. The below table shows that it is possible to combine the different methods by means of logic operations (AND, OR):

- Event-controlled: The PDO is sent if a special device-internal event has occurred, for instance, if the data contents of the TPDO have changed or if a transmission cycle time has elapsed.
- Synchronous transmission: Transmission of a TPDOs or reception of an RPDO is effected after the inverter has received a sync telegram (COB-ID 0x80).
- Cyclic transmission: The cyclic transmission of PDOs is effected when the transmission cycle time has elapsed.
- Polled via RTR: Transmission of a TPDO is carried out on request by another device via data request frame (RTR remote transmit request). For this, the data requester (e.g. master) sends the data request frame with the COB-ID of the TPDO that is to be requested to transmit. The receiver recognises the RTR and carries out the transmission.

| Transmission type | PDO transmission | | | Logic combination of different transmission types |
|---|---|---|---|---|
| | cyclic | synchronous | event-controlled | |
| 0 | | ● | ● | AND |
| 1 ... 240 | | ● | | - |
| 254, 255 | ● | | ● | OR |

| Transmission type | Description |
|---|---|
| 0 | Synchronous and acyclic<br>• The PDO is transmitted on an event-controlled basis with every sync (e.g. when a bit change occurs in the PDO). |
| 1 ... 240 | Synchronous and cyclic (sync-controlled with a response)<br>• Selection n = 1: The PDO is transmitted with every sync.<br>• Selection 1 < n ≤ 240: The PDO is transmitted with every n-th sync. |
| 241 ... 251 | Reserved |
| 252 | Synchronous - RTR only |
| 253 | Asynchronous - RTR only |
| 254, 255 | Asynchronous - manufacturer-specific / device profile-specific<br>• If the value 255 is entered, sending and receiving takes place in the set cycle time. Linked signals are also sent and received every time the PDO is changed. The PDO is event-driven and cyclically transmitted.<br>• If the value 254 is entered, sending and receiving takes place in the set cycle time. A change in the PDO linked signals has no influence. |

### Synchronisation of PDOs via sync telegram

During cyclic transmission, one or more PDOs are transmitted/received in fixed time intervals. An additional specific telegram, the so-called sync telegram, is used for synchronising cyclic process data.

- The sync telegram is the trigger point for the transmission of process data from the slaves to the master and for the acceptance of process data from the master in the slaves.
- For sync-controlled process data processing, the sync telegram must be generated accordingly.
- The response to a sync telegram is determined by the transmission type selected.

Generating the sync telegram:

- 0x1005 can be used to activate the generation of sync telegrams and to write the identifier value.
- Sync telegrams are created when bit 30 (see below) is set to "1".
- The interval between sync telegrams is to be set in 0x1006.

Writing identifiers:

- To receive sync telegrams, the value 0x80 must be entered in the 11-bit identifier in the default setting (and in compliance with the CANopen specification). This means that all inverters are set to the same sync telegram by default.
- If sync telegrams are only to be received by specific nodes, their identifiers can be entered with a value of up to and including 0x07FF.
- The identifier can only be changed if the inverter does not send any sync telegrams (0x1005, Bit 30 = "0").

### Data telegram assignment

<table>
<tr><th colspan="3">8th byte (data 4)</th><th>7th byte (data 3)</th><th colspan="2">6th byte (data 2)</th><th>5th byte (data 1)</th></tr>
<tr><td>Bit 31</td><td>Bit 30</td><td colspan="3">Bit 29 ... bit 11</td><td colspan="2">Bit 10 ... bit 0</td></tr>
<tr><td>x</td><td>0/1</td><td colspan="3">Extended identifier*</td><td colspan="2">11-bit identifier</td></tr>
<tr><td colspan="7">* The extended identifier is not supported. Bit 11 ... bit 29 must be set to "0".</td></tr>
</table>

### Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x1005 | COB-ID SYNC<br>0x00000000 ... [**0x00000080**] ... 0xFFFFFFFF | | Identifier for sync telegram.<br>How to change the identifier:<br>1. Deactivate Sync: Set bit 30 to "0".<br>2. Change identifier.<br>3. Activate Sync: Set bit 30 to "1". |
| 0x1006 | Communication cyclic period<br>0 ... [**0**] ... 65535000 us | | Cycle time for sync telegrams.<br>• With the setting "0", no sync telegrams are generated.<br>• The set time is internally rounded up to the next multiple of 10 ms. The shortest possible cycle time thus is 10 ms. |
| 0x1400:000 | RPDO1 communication parameter: Highest sub-index supported<br>• Read only | | |
| 0x1400:001<br>(P540.01) | RPDO1 communication parameter: COB-ID<br>(RPDO1 config.: COB-ID)<br>0x00000000 ... [**0x00000200**] ... 0xFFFFFFFF | | RPDO1: identifier<br>How to change the identifier:<br>1. Set PDO to "invalid": Set bit 31 to "1".<br>2. Change identifier and reset PDO to "valid" (bit 31 = "0"). |
| | Bit 0 | COB-ID bit 0 | |
| | Bit 1 | COB-ID bit 1 | |
| | Bit 2 | COB-ID bit 2 | |
| | Bit 3 | COB-ID bit 3 | |
| | Bit 4 | COB-ID bit 4 | |
| | Bit 5 | COB-ID bit 5 | |
| | Bit 6 | COB-ID bit 6 | |
| | Bit 7 | COB-ID bit 7 | |
| | Bit 8 | COB-ID bit 8 | |
| | Bit 9 | COB-ID bit 9 | |
| | Bit 10 | COB-ID bit 10 | |
| | Bit 31 | PDO invalid | |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x1400:002<br>(P540.02) | RPDO1 communication parameter: Transmission type<br>(RPDO1 config.: Transm. type)<br>0 ... [**255**] ... 255 | RPDO1: transmission type in compliance with DS301 V4.02 |
| 0x1400:005<br>(P540.05) | RPDO1 communication parameter: Event timer<br>(RPDO1 config.: Event timer)<br>0 ... [**100**] ... 65535 ms | RPDO1: time-out for the monitoring of data reception. |
| 0x1401:001<br>(P541.01) | RPDO2 communication parameter: COB-ID<br>(RPDO2 config.: COB-ID)<br>0x00000000 ... [**0x80000300**] ... 0xFFFFFFFF | RPDO2: identifier<br>How to change the identifier:<br>1. Set PDO to "invalid": Set bit 31 to "1".<br>2. Change identifier and reset PDO to "valid" (bit 31 = "0"). |
| | Bit 0 COB-ID bit 0 | |
| | Bit 1 COB-ID bit 1 | |
| | Bit 2 COB-ID bit 2 | |
| | Bit 3 COB-ID bit 3 | |
| | Bit 4 COB-ID bit 4 | |
| | Bit 5 COB-ID bit 5 | |
| | Bit 6 COB-ID bit 6 | |
| | Bit 7 COB-ID bit 7 | |
| | Bit 8 COB-ID bit 8 | |
| | Bit 9 COB-ID bit 9 | |
| | Bit 10 COB-ID bit 10 | |
| | Bit 31 PDO invalid | |
| 0x1401:002<br>(P541.02) | RPDO2 communication parameter: Transmission type<br>(RPDO2 config.: Transm. type)<br>0 ... [**255**] ... 255 | RPDO2: transmission type in compliance with DS301 V4.02 |
| 0x1401:005<br>(P541.05) | RPDO2 communication parameter: Event timer<br>(RPDO2 config.: Event timer)<br>0 ... [**100**] ... 65535 ms | RPDO2: time-out for the monitoring of data reception. |
| 0x1402:001<br>(P542.01) | RPDO3 communication parameter: COB-ID<br>(RPDO3 config.: COB-ID)<br>0x00000000 ... [**0x80000400**] ... 0xFFFFFFFF | RPDO3: identifier<br>How to change the identifier:<br>1. Set PDO to "invalid": Set bit 31 to "1".<br>2. Change identifier and reset PDO to "valid" (bit 31 = "0"). |
| | Bit 0 COB-ID bit 0 | |
| | Bit 1 COB-ID bit 1 | |
| | Bit 2 COB-ID bit 2 | |
| | Bit 3 COB-ID bit 3 | |
| | Bit 4 COB-ID bit 4 | |
| | Bit 5 COB-ID bit 5 | |
| | Bit 6 COB-ID bit 6 | |
| | Bit 7 COB-ID bit 7 | |
| | Bit 8 COB-ID bit 8 | |
| | Bit 9 COB-ID bit 9 | |
| | Bit 10 COB-ID bit 10 | |
| | Bit 31 PDO invalid | |
| 0x1402:002<br>(P542.02) | RPDO3 communication parameter: Transmission type<br>(RPDO3 config.: Transm. type)<br>0 ... [**255**] ... 255 | RPDO3: transmission type in compliance with DS301 V4.02 |
| 0x1402:005<br>(P542.05) | RPDO3 communication parameter: Event timer<br>(RPDO3 config.: Event timer)<br>0 ... [**100**] ... 65535 ms | RPDO3: time-out for the monitoring of data reception. |
| 0x1800:000 | TPDO1 communication parameter: Highest sub-index supported<br>• Read only | The value "5" is permanently set. |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x1800:001<br>(P550.01) | TPDO1 communication parameter: COB-ID<br>(TPDO1 config.: COB-ID)<br>0x00000001 ... [**0x40000180**] ... 0xFFFFFFFF | TPDO1: identifier<br>How to change the identifier:<br>1. Set PDO to "invalid": Set bit 31 to "1".<br>2. Change identifier and reset PDO to "valid" (bit 31 = "0"). |
| | Bit 0 COB-ID bit 0 | |
| | Bit 1 COB-ID bit 1 | |
| | Bit 2 COB-ID bit 2 | |
| | Bit 3 COB-ID bit 3 | |
| | Bit 4 COB-ID bit 4 | |
| | Bit 5 COB-ID bit 5 | |
| | Bit 6 COB-ID bit 6 | |
| | Bit 7 COB-ID bit 7 | |
| | Bit 8 COB-ID bit 8 | |
| | Bit 9 COB-ID bit 9 | |
| | Bit 10 COB-ID bit 10 | |
| | Bit 30 RTR not allowed | |
| | Bit 31 PDO invalid | |
| 0x1800:002<br>(P550.02) | TPDO1 communication parameter: Transmission type<br>(TPDO1 config.: Transm. type)<br>0 ... [**255**] ... 255 | TPDO1: transmission type in compliance with DS301 V4.02 |
| 0x1800:003<br>(P550.03) | TPDO1 communication parameter: Inhibit time<br>(TPDO1 config.: Inhibit time)<br>0.0 ... [**0.0**] ... 6553.5 ms | TPDO1: minimum time between the transmission of two identical PDOs (see DS301 V4.02).<br>• The set time between is internally rounded up to the next multiple of 10ms. |
| 0x1800:005<br>(P550.05) | TPDO1 communication parameter: Event timer<br>(TPDO1 config.: Event timer)<br>0 ... [**20**] ... 65535 ms | TPDO1: Cycle time for PDO transmission with transmission type "254" or "255".<br>• The set time is internally rounded up to the next multiple of 10 ms. |
| 0x1801:000 | TPDO2 communication parameter: Highest sub-index supported<br>• Read only | The value "5" is permanently set. |
| 0x1801:001<br>(P551.01) | TPDO2 communication parameter: COB-ID<br>(TPDO2 config.: COB-ID)<br>0x00000001 ... [**0xC0000280**] ... 0xFFFFFFFF | TPDO2: identifier<br>How to change the identifier:<br>1. Set PDO to "invalid": Set bit 31 to "1".<br>2. Change identifier and reset PDO to "valid" (bit 31 = "0"). |
| | Bit 0 COB-ID bit 0 | |
| | Bit 1 COB-ID bit 1 | |
| | Bit 2 COB-ID bit 2 | |
| | Bit 3 COB-ID bit 3 | |
| | Bit 4 COB-ID bit 4 | |
| | Bit 5 COB-ID bit 5 | |
| | Bit 6 COB-ID bit 6 | |
| | Bit 7 COB-ID bit 7 | |
| | Bit 8 COB-ID bit 8 | |
| | Bit 9 COB-ID bit 9 | |
| | Bit 10 COB-ID bit 10 | |
| | Bit 30 RTR not allowed | |
| | Bit 31 PDO invalid | |
| 0x1801:002<br>(P551.02) | TPDO2 communication parameter: Transmission type<br>(TPDO2 config.: Transm. type)<br>0 ... [**255**] ... 255 | TPDO2: transmission type in compliance with DS301 V4.02 |
| 0x1801:003<br>(P551.03) | TPDO2 communication parameter: Inhibit time<br>(TPDO2 config.: Inhibit time)<br>0.0 ... [**0.0**] ... 6553.5 ms | TPDO2: minimum time between the transmission of two identical PDOs (see DS301 V4.02). |
| 0x1801:005<br>(P551.05) | TPDO2 communication parameter: Event timer<br>(TPDO2 config.: Event timer)<br>0 ... [**0**] ... 65535 ms | TPDO2: Cycle time for PDO transmission with transmission type "254" or "255".<br>• The set time is internally rounded up to the next multiple of 10 ms. |
| 0x1802:000 | TPDO3 communication parameter: Highest sub-index supported<br>• Read only | The value "5" is permanently set. |



| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x1802:001<br>(P552.01) | TPDO3 communication parameter: COB-ID<br>(TPDO3 config.: COB-ID)<br>0x00000001 ... [**0xC0000380**] ... 0xFFFFFFFF | | TPDO3: identifier<br>How to change the identifier:<br>1. Set PDO to "invalid": Set bit 31 to "1".<br>2. Change identifier and reset PDO to "valid" (bit 31 = "0"). |
| | Bit 0 | COB-ID bit 0 | |
| | Bit 1 | COB-ID bit 1 | |
| | Bit 2 | COB-ID bit 2 | |
| | Bit 3 | COB-ID bit 3 | |
| | Bit 4 | COB-ID bit 4 | |
| | Bit 5 | COB-ID bit 5 | |
| | Bit 6 | COB-ID bit 6 | |
| | Bit 7 | COB-ID bit 7 | |
| | Bit 8 | COB-ID bit 8 | |
| | Bit 9 | COB-ID bit 9 | |
| | Bit 10 | COB-ID bit 10 | |
| | Bit 30 | RTR not allowed | |
| | Bit 31 | PDO invalid | |
| 0x1802:002<br>(P552.02) | TPDO3 communication parameter: Transmission type<br>(TPDO3 config.: Transm. type)<br>0 ... [**255**] ... 255 | | TPDO3: transmission type in compliance with DS301 V4.02 |
| 0x1802:003<br>(P552.03) | TPDO3 communication parameter: Inhibit time<br>(TPDO3 config.: Inhibit time)<br>0.0 ... [**0.0**] ... 6553.5 ms | | TPDO3: minimum time between the transmission of two identical PDOs (see DS301 V4.02). |
| 0x1802:005<br>(P552.05) | TPDO3 communication parameter: Event timer<br>(TPDO3 config.: Event timer)<br>0 ... [**0**] ... 65535 ms | | TPDO3: Cycle time for PDO transmission with transmission type "254" or "255".<br>• The set time is internally rounded up to the next multiple of 10 ms. |
| 0x2301:006<br>(P510.06) | CANopen settings: COB-ID Configuration - PDO<br>(CANopen sett.: COB-IDConfig PDO)<br>• From version 03.00 | | Selection of the process for assigning the identifiers.<br>Irrespective of this selection, these are the following bits of the identifiers:<br>• Bit 30: "RTR not allowed" (only in case of TPDO)<br>• Bit 31: "PDO invalid" |
| | **0** | **Base + node-ID** | Identifier = set (basic) identifiers + set node address |
| | 1 | Freely configurable | Identifier = set identifiers |
| | 2 | Legacy base + node ID | Identifier = inherited (basic) identifier + set node address |

### 12.10.3.1 Data mapping

Data mapping serves to define which process data are transmitted cyclically via the process data channels.

**Details**

Data mapping (in the case of CANopen also referred to as "PDO mapping") is preconfigured for control of the inverter via the device profile CiA 402:

- RPDO1 = 0x6040 (CiA control word) and 0x6042 (P781.00) (Set speed).
- TPDO1 = 0x6041 (P780.00) (CiA status word) and 0x6044 (P783.00) (Actual speed).

**Variable PDO mapping**

The inverter supports variable PDO mapping for individual drive solutions. With 8 mapping entries each, 8-bit, 16-bit and 32-bit parameters can be assigned to a PDO in any order.

The total length of the mapped parameters must not exceed 8 bytes. The PDO mapping cannot be applied to all parameters. The mappable parameters are marked correspondingly in the parameter attribute list. ▶ Parameter attribute list 📖 480

The process of variable PDO mapping only allows the following procedure:

1. Set PDO to "invalid": set bit 31 in the corresponding identifier (0x1400:001 (P540.01)
   ...
   0x1402:001 (P542.01) or 0x1800:001 (P550.01)
   ...
   0x1802:001 (P552.01)) to "1".
2. Set PDO mapping to "invalid": set subindex 0 in the mapping parameter (0x1600:000
   ...
   0x1602:000 or 0x1A00:000
   ...
   0x1A02:000) to "0".
3. Set desired PDO mapping via the corresponding mapping entries.
   Format: 0xiiiissll
   (iiii = hexadecimal index,
   ss = hexadecimal subindex,
   ll = hexadecimal data length)
4. Set subindex 0 in the mapping parameter (0x1600:000
   ...
   0x1602:000 or 0x1A00:000
   ...
   0x1A02:000) to valid value (number of mapped parameters).
5. Set PDO back to "valid": set bit 31 in the corresponding identifier (0x1400:001 (P540.01)
   ...
   0x1402:001 (P542.01) or 0x1800:001 (P550.01)
   ...
   0x1802:001 (P552.01)) to "0".

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x1600:000 | RPDO1 mapping parameter: Number of mapped application objects in PDO<br>0 ... [**2**] ... 8 | Number of objects mapped in RPDO1. |
| 0x1600:001 | RPDO1 mapping parameter: Application object 1<br>0x00000000 ... [**0x60400010**] ... 0xFFFFFFFF | Mapping entry 1 for RPDO1. |
| 0x1600:002 | RPDO1 mapping parameter: Application object 2<br>0x00000000 ... [**0x60420010**] ... 0xFFFFFFFF | Mapping entry 2 for RPDO1. |
| 0x1600:003 | RPDO1 mapping parameter: Application object 3<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 3 for RPDO1. |
| 0x1600:004 | RPDO1 mapping parameter: Application object 4<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 4 for RPDO1. |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x1600:005 | RPDO1 mapping parameter: Application object 5<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 5 for RPDO1. |
| 0x1600:006 | RPDO1 mapping parameter: Application object 6<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 6 for RPDO1. |
| 0x1600:007 | RPDO1 mapping parameter: Application object 7<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 7 for RPDO1. |
| 0x1600:008 | RPDO1 mapping parameter: Application object 8<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 8 for RPDO1. |
| 0x1601:000 | RPDO2 mapping parameter: Number of mapped application objects in PDO<br>0 ... [**0**] ... 8 | Number of objects mapped in RPDO2. |
| 0x1601:001 | RPDO2 mapping parameter: Application object 1<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 1 for RPDO2. |
| 0x1601:002 | RPDO2 mapping parameter: Application object 2<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 2 for RPDO2. |
| 0x1601:003 | RPDO2 mapping parameter: Application object 3<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 3 for RPDO2. |
| 0x1601:004 | RPDO2 mapping parameter: Application object 4<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 4 for RPDO2. |
| 0x1601:005 | RPDO2 mapping parameter: Application object 5<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 5 for RPDO2. |
| 0x1601:006 | RPDO2 mapping parameter: Application object 6<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 6 for RPDO2. |
| 0x1601:007 | RPDO2 mapping parameter: Application object 7<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 7 for RPDO2. |
| 0x1601:008 | RPDO2 mapping parameter: Application object 8<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 8 for RPDO2. |
| 0x1602:000 | RPDO3 mapping parameter: Number of mapped application objects in PDO<br>0 ... [**0**] ... 8 | Number of objects mapped in RPDO3. |
| 0x1602:001 | RPDO3 mapping parameter: Application object 1<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 1 for RPDO3. |
| 0x1602:002 | RPDO3 mapping parameter: Application object 2<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 2 for RPDO3. |
| 0x1602:003 | RPDO3 mapping parameter: Application object 3<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 3 for RPDO3. |
| 0x1602:004 | RPDO3 mapping parameter: Application object 4<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 4 for RPDO3. |
| 0x1602:005 | RPDO3 mapping parameter: Application object 5<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 5 for RPDO3. |
| 0x1602:006 | RPDO3 mapping parameter: Application object 6<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 6 for RPDO3. |
| 0x1602:007 | RPDO3 mapping parameter: Application object 7<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 7 for RPDO3. |
| 0x1602:008 | RPDO3 mapping parameter: Application object 8<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 8 for RPDO3. |
| 0x1A00:000 | TPDO1 mapping parameter: Number of mapped application objects in TPDO<br>0 ... [**2**] ... 8 | Number of objects mapped in TPDO1. |
| 0x1A00:001 | TPDO1 mapping parameter: Application object 1<br>0x00000000 ... [**0x60410010**] ... 0xFFFFFFFF | Mapping entry 1 for TPDO1. |
| 0x1A00:002 | TPDO1 mapping parameter: Application object 2<br>0x00000000 ... [**0x60440010**] ... 0xFFFFFFFF | Mapping entry 2 for TPDO1. |
| 0x1A00:003 | TPDO1 mapping parameter: Application object 3<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 3 for TPDO1. |
| 0x1A00:004 | TPDO1 mapping parameter: Application object 4<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 4 for TPDO1. |
| 0x1A00:005 | TPDO1 mapping parameter: Application object 5<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 5 for TPDO1. |
| 0x1A00:006 | TPDO1 mapping parameter: Application object 6<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 6 for TPDO1. |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x1A00:007 | TPDO1 mapping parameter: Application object 7<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 7 for TPDO1. |
| 0x1A00:008 | TPDO1 mapping parameter: Application object 8<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 8 for TPDO1. |
| 0x1A01:000 | TPDO2 mapping parameter: Number of mapped application objects in TPDO<br>0 ... [**0**] ... 8 | Number of objects mapped in TPDO2. |
| 0x1A01:001 | TPDO2 mapping parameter: Application object 1<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 1 for TPDO2. |
| 0x1A01:002 | TPDO2 mapping parameter: Application object 2<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 2 for TPDO2. |
| 0x1A01:003 | TPDO2 mapping parameter: Application object 3<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 3 for TPDO2. |
| 0x1A01:004 | TPDO2 mapping parameter: Application object 4<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 4 for TPDO2. |
| 0x1A01:005 | TPDO2 mapping parameter: Application object 5<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 5 for TPDO2. |
| 0x1A01:006 | TPDO2 mapping parameter: Application object 6<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 6 for TPDO2. |
| 0x1A01:007 | TPDO2 mapping parameter: Application object 7<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 7 for TPDO2. |
| 0x1A01:008 | TPDO2 mapping parameter: Application object 8<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 8 for TPDO2. |
| 0x1A02:000 | TPDO3 mapping parameter: Number of mapped application objects in TPDO<br>0 ... [**0**] ... 8 | Number of objects mapped in TPDO3. |
| 0x1A02:001 | TPDO3 mapping parameter: Application object 1<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 1 for TPDO3. |
| 0x1A02:002 | TPDO3 mapping parameter: Application object 2<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 2 for TPDO3. |
| 0x1A02:003 | TPDO3 mapping parameter: Application object 3<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 3 for TPDO3. |
| 0x1A02:004 | TPDO3 mapping parameter: Application object 4<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 4 for TPDO3. |
| 0x1A02:005 | TPDO3 mapping parameter: Application object 5<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 5 for TPDO3. |
| 0x1A02:006 | TPDO3 mapping parameter: Application object 6<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 6 for TPDO3. |
| 0x1A02:007 | TPDO3 mapping parameter: Application object 7<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 7 for TPDO3. |
| 0x1A02:008 | TPDO3 mapping parameter: Application object 8<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF | Mapping entry 8 for TPDO3. |



### 12.10.4 Parameter data transfer

Service data objects (SDOs) make it possible to read and write all parameters of the inverter via CANopen.

**Details**

- Two independent SDO channels are provided at the same time. SDO channel 1 is always active. SDO channel 2 can be activated via 0x2301:005 (P510.05).
- An SDO is always transmitted with confirmation, i. e. the reception of an SDO frame is acknowledged by the receiver.
- The identifiers for SDO1 and SDO2 are generated from the basic identifier (in compliance with the "Predefined Connection Set") and the node address set:

| Object | Direction | | Identifier |
|---|---|---|---|
| | to the device | from the device | |
| SDO1 | ● | | Basic identifier 0x600 + node address |
| | | ● | Basic identifier 0x580 + node address |
| SDO2 | ● | | Basic identifier 0x640 + node address |
| | | ● | Basic identifier 0x5C0 + node address |

**Structure of the SDO frame user data**

The user data are shown in Motorola format:

| 1st byte | 2nd byte | 3rd byte | 4th byte | 5th byte | 6th byte | 7th byte | 8th byte |
|---|---|---|---|---|---|---|---|
| Command | Index | | Subindex | Data 1 | Data 2 | Data 3 | Data 4 |
| See table below. | LOW byte | HIGH byte | | LOW word | | HIGH word | |
| | Address of the parameter to be read or written. | | | LOW byte | HIGH byte | LOW byte | HIGH byte |

The following commands can be transmitted or received for writing and reading the parameters:

| Command | 1st byte | | Data length | Info |
|---|---|---|---|---|
| | hex | dec | | |
| Write request | 0x23 | 35 | 4 bytes | Writing of a parameter to the inverter. |
| | 0x2B | 43 | 2 bytes | |
| | 0x2F | 47 | 1 byte | |
| | 0x21 | 33 | Block | |
| Write response | 0x60 | 96 | 4 bytes | Inverter acknowledges a write request. |
| Read request | 0x40 | 64 | 4 bytes | Reading of a parameter from the inverter. |
| Read response | 0x43 | 67 | 4 bytes | Inverter response to a read request with the current parameter value. |
| | 0x4B | 75 | 2 bytes | |
| | 0x4F | 79 | 1 byte | |
| | 0x41 | 65 | Block | |
| Error response | 0x80 | 128 | 4 bytes | Inverter response to the incorrect execution of the read/write request. |

More precisely, the command byte comprises the following information:

| Command | 1st byte | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Command specifier (cs) | | | Toggle (t) | Length* | | e | s |
| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| Write request | 0 | 0 | 1 | 0 | 0/1 | 0/1 | 1 | 1 |
| Write response | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| Read request | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Read response | 0 | 1 | 0 | 0 | 0/1 | 0/1 | 1 | 1 |
| Error response | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

*Bit coding of the length: 00 = 4 bytes, 01 = 3 bytes, 10 = 2 bytes, 11 = 1 byte
e: expedited (shortened block service)
s: segmented (normal block service)

More commands are defined in the DS301 V4.02 CANopen specification (e. g. segmented transfer).

Up to 4 bytes are available for parameter value entries. Depending on the data format, they are assigned as follows:

<table>
<tr><th>5th byte</th><th>6th byte</th><th>7th byte</th><th>8th byte</th></tr>
<tr><td>Parameter value (1 byte)</td><td>0x00</td><td>0x00</td><td>0x00</td></tr>
<tr><td colspan="2">Parameter value (2 bytes)</td><td rowspan="2">0x00</td><td rowspan="2">0x00</td></tr>
<tr><td>LOW byte</td><td>HIGH byte</td></tr>
<tr><td colspan="4">Parameter value (4 bytes)</td></tr>
<tr><td colspan="2">LOW word</td><td colspan="2">HIGH word</td></tr>
<tr><td>LOW byte</td><td>HIGH byte</td><td>LOW byte</td><td>HIGH byte</td></tr>
</table>

The parameter attribute list in the annex also specifies a so-called “scaling factor”. The scaling factor is relevant to the transmission of parameter values which are represented with one or several decimal positions in the parameter list. If the scaling factor is > 1, the value must be multiplied with the scaling factor specified before the transmission, so that the value can be transferred completely (as an integer value). On the SDO client side, the integer value must then be divided by the scaling factor again, in order to receive the original value with decimal positions.

### Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x1200:000 | SDO1 server parameter: Highest sub-index supported<br>• Read only | | |
| 0x1200:001 | SDO1 server parameter: COB-ID client > server (rx)<br>• Read only | | Display of the receive identifier for SDO server channel 1 (basic SDO channel).<br>• According to DS301 V4.02, the basic SDO channel can neither be changed nor deactivated. |
| 0x1200:002 | SDO1 server parameter: COB-ID server > client (tx)<br>• Read only | | Display of the transmit identifier for SDO server channel 1 (basic SDO channel).<br>• According to DS301 V4.02, the basic SDO channel can neither be changed nor deactivated. |
| 0x1201:000 | SDO2 server parameter: Highest sub-index supported<br>• Read only | | |
| 0x1201:001 | SDO2 server parameter: COB-ID client > server (rx)<br>0x00000000 ... [**0x80000640**] ... 0xFFFFFFFF | | Specification of the receive identifier for SDO server channel 2.<br>• If SDO server channel 2 is activated via 0x2301:005 (P510.05), this parameter is set to the value "node address + 0x640". This default setting can be changed. |
| 0x1201:002 | SDO2 server parameter: COB-ID server > client (tx)<br>0x00000000 ... [**0x800005C0**] ... 0xFFFFFFFF | | Specification of the transmit identifier for SDO server channel 2.<br>• If SDO server channel 2 is activated via 0x2301:005 (P510.05), this parameter is set to the value "node address + 0x5C0". This default setting can be changed. |
| 0x1201:003 | SDO2 server parameter: Node-ID of the SDO client<br>1 ... [**0**] ... 127 | | Specification of the node address for the SDO client. |
| 0x2301:005<br>(P510.05) | CANopen settings: Activate SDO2 channel<br>(CANopen sett.: SDO2 channel) | | 1 = activate SDO server channel 2. |
| | **0** | **Not active** | |
| | 1 | Active | |
| 0x2301:007<br>(P510.07) | CANopen settings: COB-ID Configuration - SDO2<br>(CANopen sett.: COB-IDConfigSDO2) | | 1 = COB-ID configuration -SDO 2 freely configurable. |
| | 0 | Base + node-ID | |
| | **1** | **Freely configurable** | |

## 12.10.5 Monitoring

### 12.10.5.1 Emergency telegram

If the error status changes when an internal device error occurs or is remedied, an emergency telegram is sent to the NMT master once.

**Details**

- The identifier for the emergency telegram is fixedly defined and is shown in 0x1014.
- In 0x1015, a blocking time can be set, in order to limit the bus load in the case of emergency telegrams following quickly in succession.

**Parameter**

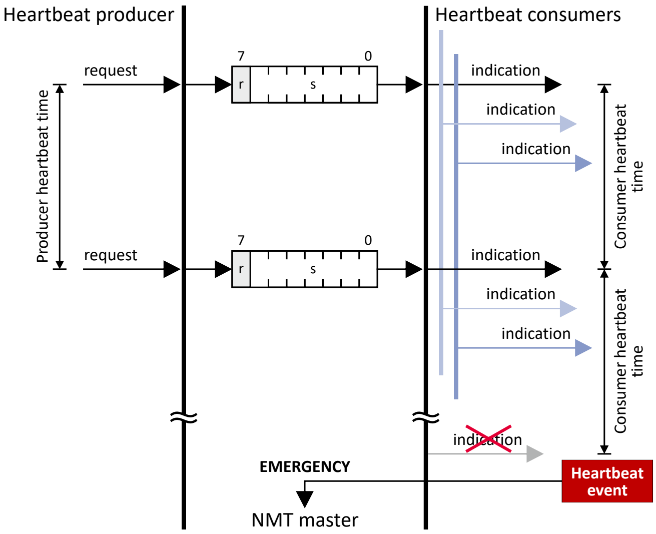
| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x1014 | COB-ID Emergency telegram (EMCY)<br>• Read only | Display of the identifier for emergency telegrams. |
| 0x1015 | Inhibit time EMCY<br>0.0 ... [**0.0**] ... 6553.5 ms | Blocking time which can be set in order to limit the bus load in the case of emergency telegrams following quickly in succession. |

### 12.10.5.2 Heartbeat protocol

The heartbeat protocol can be used for node monitoring purposes within a CAN network.

**Basic procedure**

1. A heartbeat producer cyclically sends a heartbeat telegram to one or several receivers (consumers).
2. The consumer(s) monitor(s) the heartbeat telegram for arrival on a regular basis.




The inverter can be configured as producer or as consumer to monitor up to four other nodes.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x1016:000<br>(P520.00) | Consumer heartbeat time: Highest sub-index supported<br>(Cons. heartbeat: Highest subindex)<br>• Read only | Highest subindex, permanently set to 4. Corresponds at the same time to the maximum possible number of nodes to be monitored. |
| 0x1016:001<br>(P520.01) | Consumer heartbeat time: Consumer heartbeat time 1<br>(Cons. heartbeat: Cons. heartbeat1)<br>0x00000000 ... [**0x00000000**] ... 0x00FFFFFF | Node ID and heartbeat time of node 1 which is to be monitored.<br>• Format: 0x00nnhhhh (nn = node ID, hhhh = heartbeat time in [ms]) |
| 0x1016:002<br>(P520.02) | Consumer heartbeat time: Consumer heartbeat time 2<br>(Cons. heartbeat: Cons. heartbeat2)<br>0x00000000 ... [**0x00000000**] ... 0x00FFFFFF | Node ID and heartbeat time of node 2 which is to be monitored.<br>• Format: 0x00nnhhhh (nn = node ID, hhhh = heartbeat time in [ms]) |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x1016:003<br>(P520.03) | Consumer heartbeat time: Consumer heartbeat time 3<br>(Cons. heartbeat: Cons. heartbeat3)<br>0x00000000 ... [**0x00000000**] ... 0x00FFFFFF | Node ID and heartbeat time of node 3 which is to be monitored.<br>• Format: 0x00nnhhhh (nn = node ID, hhhh = heartbeat time in [ms]) |
| 0x1016:004<br>(P520.04) | Consumer heartbeat time: Consumer heartbeat time 4<br>(Cons. heartbeat: Cons. heartbeat4)<br>0x00000000 ... [**0x00000000**] ... 0x00FFFFFF | Node ID and heartbeat time of node 4 which is to be monitored.<br>• Format: 0x00nnhhhh (nn = node ID, hhhh = heartbeat time in [ms]) |
| 0x1017<br>(P522.00) | Producer heartbeat time<br>(Prod. heartbeat)<br>0 ... [**0**] ... 65535 ms | Time interval for the transmission of the heartbeat telegram to the consumer(s).<br>• The heartbeat telegram is sent automatically as soon as a time > 0 ms is set.<br>• The set time is internally rounded up to the next multiple of 10 ms. |

### 12.10.5.3 Error responses

The responses to CANopen errors such as missing PDOs or heartbeat frames can be configured via the following parameters.

#### Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x1029:000 | Error behavior: Highest sub-index supported<br>• Read only | | |
| 0x1029:001 | Error behavior: Communication error | | Selection of the NMT state to which the inverter is to change automatically if a failure of a CANopen node or an internal error is detected in the "Operational" state.<br>These also include the following communication errors:<br>• Change-over of the CAN interface to the "Bus-off" state.<br>• Occurrence of a "Heartbeat Event". |
| | **0** | **Status > Pre-operational** | In the "Pre-operational" state, network management, sync, and emergency telegrams as well as parameter data can be received; process data, however, are ignored. |
| | 1 | No status change | |
| | 2 | Status > Stopped | In the "Stopped" state, only network management telegrams can be received. |
| 0x2857:001 | CANopen monitoring: RPDO1-Timeout | | Selection of the response to triggering the RPDO1 time monitoring.<br>Associated error code:<br>• 33425 \| 0x8291 - CAN: RPDO1 time-out |
| | 0 | No response | ▸ Error types 📖 456 |
| | 1 | Warning | |
| | 2 | Trouble | |
| | **3** | **Fault** | |
| 0x2857:002 | CANopen monitoring: RPDO2-Timeout | | Selection of the response to triggering the RPDO2 time monitoring.<br>Associated error code:<br>• 33426 \| 0x8292 - CAN: RPDO2 time-out |
| | 0 | No response | ▸ Error types 📖 456 |
| | 1 | Warning | |
| | 2 | Trouble | |
| | **3** | **Fault** | |
| 0x2857:003 | CANopen monitoring: RPDO3-Timeout | | Selection of the response to triggering the RPDO3 time monitoring.<br>Associated error code:<br>• 33427 \| 0x8293 - CAN: RPDO3 time-out |
| | 0 | No response | ▸ Error types 📖 456 |
| | 1 | Warning | |
| | 2 | Trouble | |
| | **3** | **Fault** | |



| Address | Name / setting range / [default setting] | Information |
| --- | --- | --- |
| 0x2857:005 | CANopen monitoring: Heartbeat-Timeout Consumer 1 | Selection of the response with "Heartbeat Event" in consumer 1.<br>Associated error code:<br>• 33156 \| 0x8184 - CAN: heartbeat time-out consumer 1 |
| | 0 No response | ▸ Error types 📖 456 |
| | 1 Warning | |
| | 2 Trouble | |
| | **3 Fault** | |
| 0x2857:006 | CANopen monitoring: Heartbeat-Timeout Consumer 2 | Selection of the response with "Heartbeat Event" in consumer 2.<br>Associated error code:<br>• 33157 \| 0x8185 - CAN: heartbeat time-out consumer 2 |
| | 0 No response | ▸ Error types 📖 456 |
| | 1 Warning | |
| | 2 Trouble | |
| | **3 Fault** | |
| 0x2857:007 | CANopen monitoring: Heartbeat-Timeout Consumer 3 | Selection of the response with "Heartbeat Event" in consumer 3.<br>Associated error code:<br>• 33158 \| 0x8186 - CAN: heartbeat time-out consumer 3 |
| | 0 No response | ▸ Error types 📖 456 |
| | 1 Warning | |
| | 2 Trouble | |
| | **3 Fault** | |
| 0x2857:008 | CANopen monitoring: Heartbeat-Timeout Consumer 4 | Selection of the response with "Heartbeat Event" in consumer 4.<br>Associated error code:<br>• 33159 \| 0x8187 - CAN: heartbeat time-out consumer 4 |
| | 0 No response | ▸ Error types 📖 456 |
| | 1 Warning | |
| | 2 Trouble | |
| | **3 Fault** | |
| 0x2857:010 | CANopen monitoring: "Bus-off" state change | Selection of the response to changing to the "Bus off" state.<br>Associated error code:<br>• 33154 \| 0x8182 - CAN: bus off |
| | 0 No response | ▸ Error types 📖 456 |
| | 1 Warning | |
| | **2 Trouble** | |
| | 3 Fault | |
| 0x2857:011 | CANopen monitoring: Warning | Selection of the response that is executed in the case of too many incorrectly sent or received CAN telegrams (> 96).<br>Associated error code:<br>• 33155 \| 0x8183 - CAN: warning |
| | 0 No response | ▸ Error types 📖 456 |
| | **1 Warning** | |
| | 2 Trouble | |
| | 3 Fault | |

### 12.10.6 Diagnostics

#### 12.10.6.1 LED status display

Information on the CAN bus status can be obtained quickly via the "BUS RDY" and "BUS ERR" LED displays on the front of the inverter.

The meaning can be seen from the tables below.

**Inverter not active on the CAN bus (yet)**

| LED "BUS RDY" | LED "BUS ERR" | Meaning |
|---|---|---|
| off | off | Inverter is not active on the CAN bus. |
| | on | "Bus Off" state. |
| Both LEDs are flickering alternately | | Automatic baud rate detection active. |

**Inverter active on the CAN bus**

The green "BUS RDY" LED indicates the CANopen state:

| LED "BUS RDY" | CANopen state |
|---|---|
| blinking fast (5 Hz) | Pre-Operational |
| on | Operational |
| blinking 1x, then goes off for 1 s | Stopped |

The red "BUS ERR" LED indicates a CANopen error:

| LED "BUS ERR" | CANopen error |
|---|---|
| blinking 1x, then goes off for 1 s | Warning Limit reached |
| blinking 2x, then goes off for 1 s | Heartbeat Event |
| blinking 3x, then goes off for 1 s | Sync message error (only possible in the "Operational" state) |

#### 12.10.6.2 Information on the network

The inverter has various diagnostic parameters for displaying ...

- the network status, the CAN master status and the status of various time monitors;
- telegram counters.

The telegram counters are free-running, i. e. after reaching the maximum value , the respective counter starts again at 0.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x1001 | Error register<br>• Read only | Bit-coded error status.<br>• Bit 0 is set if an error is active.<br><br>The other bits signalise which group the active error belongs to:<br>• Bit 1: Current error<br>• Bit 2: Voltage error<br>• Bit 3: Temperature error<br>• Bit 4: Communication error<br>• Bit 5: Device profile-specific error<br>• Bit 6: Reserved (always 0)<br>• Bit 7: Manufacturer-specific error |
| 0x2302:001<br>(P511.01) | Active CANopen settings: Active node ID<br>(CANopen diag.: Active node ID)<br>• Read only | Display of the active node address. |



| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2302:002<br>(P511.02) | Active CANopen settings: Active baud rate<br>(CANopen diag.: Active baud rate)<br>• Read only | Display of the active baud rate. |
| | 0 Automatic (from version 03.00) | |
| | 1 20 kbps | |
| | 2 50 kbps | |
| | 3 125 kbps | |
| | 4 250 kbps | |
| | 5 500 kbps | |
| | 6 800 kbps | |
| | 7 1 Mbps | |
| 0x2307<br>(P515.00) | CANopen time-out status<br>(Time-out status)<br>• Read only | Bit-coded status display of the CAN time monitoring functions. |
| | Bit 0 RPDO1-Timeout | 1 = RPDO1 was not received within the monitoring time or not with the sync configured.<br>• Status is reset automatically after the RPDO has been received again.<br>• Setting of monitoring time for RPDO1 in 0x1400:005 (P540.05). |
| | Bit 1 RPDO2-Timeout | 1 = RPDO2 was not received within the monitoring time or not with the sync configured.<br>• Status is reset automatically after the RPDO has been received again.<br>• Setting of monitoring time for RPDO2 in 0x1401:005 (P541.05). |
| | Bit 2 RPDO3-Timeout | 1 = RPDO3 was not received within the monitoring time or not with the sync configured.<br>• Status is reset automatically after the RPDO has been received again.<br>• Setting of monitoring time for RPDO3 in 0x1402:005 (P542.05). |
| | Bit 8 Heartbeat-Timeout Consumer 1 | 1 = within the "Heartbeat Consumer Time", no heartbeat telegram was received from node 1 to be monitored.<br>• Status can only be reset by mains switching or error reset.<br>• "Heartbeat Consumer Time" setting in 0x1016:001 (P520.01). |
| | Bit 9 Heartbeat-Timeout Consumer 2 | 1 = within the "Heartbeat Consumer Time", no heartbeat telegram was received from node 2 to be monitored.<br>• Status can only be reset by mains switching or error reset.<br>• "Heartbeat Consumer Time" setting in 0x1016:002 (P520.02). |
| | Bit 10 Heartbeat-Timeout Consumer 3 | 1 = within the "Heartbeat Consumer Time", no heartbeat telegram was received from node 3 to be monitored.<br>• Status can only be reset by mains switching or error reset.<br>• "Heartbeat Consumer Time" setting in 0x1016:003 (P520.03). |
| | Bit 11 Heartbeat-Timeout Consumer 4 | 1 = within the "Heartbeat Consumer Time", no heartbeat telegram was received from node 4 to be monitored.<br>• Status can only be reset by mains switching or error reset.<br>• "Heartbeat Consumer Time" setting in 0x1016:004 (P520.04). |
| 0x2308<br>(P516.00) | CANopen status<br>(CANopen status)<br>• Read only | Display of the current state. |
| | 0 Initialisation | Initialisation active.<br>• The initialisation is started automatically at mains connection. During this phase, the inverter us not involved in the data exchange process on the CAN bus.<br>• All CAN-relevant parameters are initialised with the saved settings.<br>• When the initialisation process has been completed, the inverter automatically adopts the "Pre-Operational" state. |
| | 1 Reset node | "Reset Node" NMT command active.<br>• All parameters are initialised with the saved settings (not only the CAN-relevant parameters). |
| | 2 Reset communication | "Reset Communication" NMT command active.<br>• Initialisation of all CAN-relevant parameters with the values stored. |
| | 4 Stopped | Only network management telegrams can be received. |
| | 5 Operational | Parameter data and process data can be received. If defined, process data is sent as well. |
| | 127 Pre-Operational | Parameter data can be received, process data are ignored. |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2309<br>(P517.00) | CANopen controller status<br>(CAN contr.status)<br>• Read only | Status display of the internal CANopen controller. |
| | 1 Error active | The inverter is a fully-fledged communication node at the CANopen network. It is able to transmit and receive data and to report faults. |
| | 2 Error passive | The inverter can only passively indicate faulty reception via the ACK field. |
| | 3 Bus off | The inverter is electrically separated from the CANopen network. In order to exit this state, the CANopen interface must be reset. An automatic restart is implemented. |
| 0x230A:000 | CANopen statistics: Highest subindex<br>• Read only | Number of frame and error counters. |
| 0x230A:001<br>(P580.01) | CANopen statistics: PDO1 received<br>(CAN statistics: PDO1 received)<br>• Read only | Display of the number of PDO1 telegrams received. |
| 0x230A:002<br>(P580.02) | CANopen statistics: PDO2 received<br>(CAN statistics: PDO2 received)<br>• Read only | Display of the number of PDO2 telegrams received. |
| 0x230A:003<br>(P580.03) | CANopen statistics: PDO3 received<br>(CAN statistics: PDO3 received)<br>• Read only | Display of the number of PDO3 telegrams received. |
| 0x230A:005<br>(P580.05) | CANopen statistics: PDO1 transmitted<br>(CAN statistics: PDO1 transmitted)<br>• Read only | Display of the number of PDO1 telegrams sent. |
| 0x230A:006<br>(P580.06) | CANopen statistics: PDO2 transmitted<br>(CAN statistics: PDO2 transmitted)<br>• Read only | Display of the number of PDO2 telegrams sent. |
| 0x230A:007<br>(P580.07) | CANopen statistics: PDO3 transmitted<br>(CAN statistics: PDO3 transmitted)<br>• Read only | Display of the number of PDO3 telegrams sent. |
| 0x230A:009<br>(P580.09) | CANopen statistics: SDO1 telegrams<br>(CAN statistics: SDO1 counter)<br>• Read only | Display of the number of SDO1 telegrams. |
| 0x230A:010<br>(P580.10) | CANopen statistics: SDO2 telegrams<br>(CAN statistics: SDO2 counter)<br>• Read only | Display of the number of SDO2 telegrams. |
| 0x230B<br>(P518.00) | CANopen error counter<br>(CAN errorcounter)<br>• Read only | Display of the total number of CAN faults that have occurred. |

### 12.10.6.3 Device identification

For device identification in the network, the inverter provides the parameters listed in the following.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x1000 | Device type<br>• Read only | CANopen device profile according CANopen specification CiA 301/ CiA 402.<br>Specifies the axis type:<br>• 0x01010192 = single axis<br>• 0x02010192 = double axis<br>• 0x01020192 = servo single axis<br>• 0x02020192 = servo double axis<br>• 0x01030192 = stepper single axis<br>• 0x02030192 = stepper double axis |
| 0x1008 | Manufacturer device name<br>• Read only | Display of the manufacturer device name. |
| 0x1009 | Manufacturer hardware version<br>• Read only | Display of the manufacturer hardware version. |
| 0x100A | Manufacturer software version<br>• Read only | Display of the manufacturer software version. |
| 0x1018:001 | Identity object: Vendor ID<br>• Read only | Display of the manufacturer's identification number. |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x1018:002 | Identity object: Product ID<br>• Read only | Display of the product code of the inverter. |
| 0x1018:003 | Identity object: Revision number<br>• Read only | Display of the main and subversion of the firmware. |
| 0x1018:004 | Identity object: Serial number<br>• Read only | Display of the serial number of the inverter. |

## 12.11 Modbus RTU

Modbus is an internationally approved, asynchronous, serial communication protocol, designed for commercial and industrial automation applications.

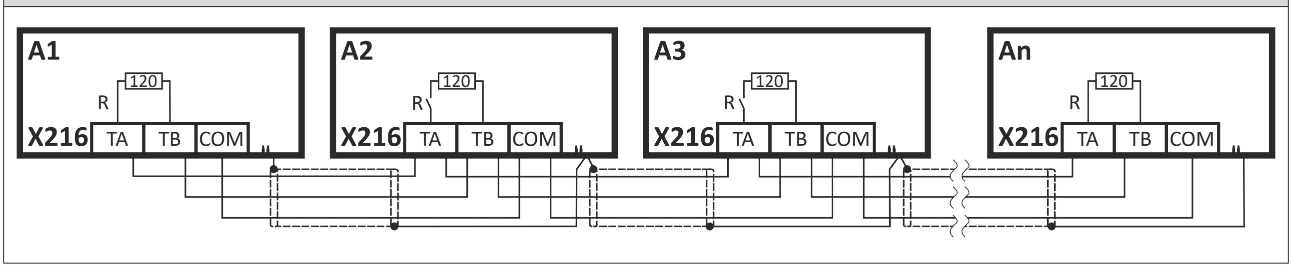
- Detailed information on the Modbus can be found on the web page of the international Modbus Organization, USA, who also further develop the Modbus protocol: http://www.modbus.org
- Information about the dimensioning of a Modbus network can be found in the configuration document for the inverter.

**Details**

- The process of data transmission distinguishes between three different operating modes: Modbus ASCII, Modbus RTU, and Modbus TCP. This chapter describes the Modbus RTU operating mode ("Remote Terminal Unit").
- The Modbus protocol is based on a master/slave architecture where the inverter always works as slave.
- The Modbus network only permits one master sending commands and requests. The master is also the sole instance to be allowed to initiate Modbus communication. No direct communication takes place between the slaves.
- The physical interface corresponds to TIA/EIA-485-A which is very common and suitable for the industrial environment. This interface enables baud rates from 2400 to 115200 kbps.
- The inverter supports Modbus function codes 3, 6, 16 (0x10) and 23 (0x17).

**Typical topology**

Line





### 12.11.1 Commissioning

In the following, the steps required for controlling the inverter via Modbus are described.

**Parameterization required**

1. Activate network control: 0x2631:037 (P400.37) = "TRUE [1]"
2. Set network as standard setpoint source: 0x2860:001 (P201.01) ="Network [5]"
3. Set Modbus node address.
   - Each network node must be provided with a unique node address.
   - See: Basic setting and options 335
4. Set Modbus baud rate.
   - Default setting: Automatic detection.
   - If the automatic baud rate detection function is activated, the first 5 to 10 messages are lost after switch-on.
   - See: Basic setting and options 335
5. Set Modbus data format.
   - Default setting: Automatic detection.
   - If the automatic data format detection function is activated, the first 5 to. 10 messages are lost after switch-on.
   - See: Basic setting and options 335
6. Save parameter settings: 0x2022:003 (P700.03) = "on / start [1]".
7. Switch the inverter off and then on again in order that the changed communication settings can get effective.

In the default setting, the "Run" function is assigned to digital input DI1. If network control is activated, this function serves as the "start enable" for starting commands via the network. Hence, digital input DI1 must be set to the HIGH level so the motor can be started via the network.

Flexible I/O configuration of the start, stop and rotating direction commands 54

**Starting/stopping the drive via Modbus**

For starting/stopping the drive, Modbus register 42101 can be used.

- The Modbus register 42101 is permanently assigned to the parameter 0x400B:001 (P592.01) (AC Drive control word).
- In the frame, the leading 4 is omitted in the addressing process. The numbering of the registers starts with 1; addressing, however, starts with 0. Therefore the address 2100 (0x0834) is used in the frame when register 42101 is written.

Bits set in the AC Drive control word:

- Bit 0 = Run forward (CW)
- Bit 5 = Activate network control
- Bit 6 = Activate network setpoint

Example of an inverter with the node address 1:

| **Request frame by the master** | | | | | |
|---|---|---|---|---|---|
| Slave address | Function code | Data | | | |
| | | Register address | | AC Drive control word | |
| 0x01 | 0x06 | 0x08 | 0x34 | 0x00 | 0x61 |

If the digital input DI1 ("Start enable") is set to HIGH level, the drive should start and the inverter should respond with the same frame as confirmation:

| **Response message from the inverter** | | | | | |
|---|---|---|---|---|---|
| Slave address | Function code | Data | | | |
| | | Register address | | AC Drive control word | |
| 0x01 | 0x06 | 0x08 | 0x34 | 0x00 | 0x61 |

### Write the speed of the drive via Modbus

The drive speed can be changed via the modbus register 42102, see:

▸ Data mapping 🕮 339

Example of an inverter with the node address 1:

| Request frame by the master | | | | | |
|---|---|---|---|---|---|
| Slave address | Function code | Data | | | |
| | | Register address | | Network setpoint frequency (0.01) | |
| 0x01 | 0x06 | 0x08 | 0x35 | 0x04 | 0xD2 |

| Response message from the inverter | | | | | |
|---|---|---|---|---|---|
| Slave address | Function code | Data | | | |
| | | Register address | | Network setpoint frequency (0.01) | |
| 0x01 | 0x06 | 0x08 | 0x35 | 0x04 | 0xD2 |

The drive now rotates with a frequency of 12.34 Hz.

### Read the drive speed via Modbus

The drive speed can be read via the Modbus register 42002, see:

▸ Data mapping 🕮 339

The function code 3 is used to read a single register or several interrelated register blocks, see:

▸ Function codes 🕮 337

Example of an inverter with the node address 1:

| Request frame by the master | | | | | |
|---|---|---|---|---|---|
| Slave address | Function code | Data | | | |
| | | Register address | | Number of words | |
| 0x01 | 0x03 | 0x07 | 0xD1 | 0x00 | 0x01 |

| Response message from the inverter | | | | |
|---|---|---|---|---|
| Slave address | Function code | Data | | |
| | | Read bytes | Frequency (0.01) | |
| 0x01 | 0x03 | 0x02 | 0x04 | 0xD1 |

The drive rotates with a frequency of 12.33 Hz.

### Restart of the communication

A restart of communication is required after changes of the interface configuration (e. g. node address and baud rate) in order that the changed settings become effective.

For restarting communication, there are two options:

a) Switch inverter off and on again.

b) 0x2320 (P508.00) Set = "Restart with current values [1]".

### Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2320 (P508.00) | Modbus communication (Modbus comm.) | | 1 = restart communication in order that changed settings of the interface configuration become effective. |
| | **0** | **No action/no error** | |
| | 1 | Restart with current values | |



## 12.11.2 Basic setting and options

### 12.11.2.1 Node address setting

Each network node must be provided with a unique node address.

- The node address can be set in 0x2321:001 (P510.01).
- The setting that is active when the inverter is switched on is the effective setting.
- The node address 0 is reserved for messages to all nodes ("Broadcast") .
- The active node address is shown in 0x2322:001 (P511.01).

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2321:001<br>(P510.01) | Modbus settings: Node ID<br>(Modbus sett.: Node ID)<br>1 ... [**1**] ... 247 | Setting of the node address.<br>• A change in the node address only becomes effective after a restart of Modbus communication. |

### 12.11.2.2 Baud rate setting

All network nodes must be set to the same baud rate.

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2321:002<br>(P510.02) | Modbus settings: Baud rate<br>(Modbus sett.: Baud rate) | | Setting of the baud rate.<br>• A change in the baud rate only becomes effective after a restart of Modbus communication.<br>• If the automatic baud rate detection function is activated, the first 5 ... 10 messages are lost after switch-on. |
| | **0** | **Automatic** | |
| | 1 | 2400 bps | |
| | 2 | 4800 bps | |
| | 3 | 9600 bps | |
| | 4 | 19200 bps | |
| | 5 | 38400 bps | |
| | 6 | 57600 bps | |
| | 7 | 115200 bps | |

### 12.11.2.3 Data format setting

All network nodes must be set to the same data format.

- The data format can be set in 0x2321:003 (P510.03).
- If the automatic data format detection function is activated, the first 5 ... 10 messages are lost after switch-on.
- The active data format is displayed in 0x2322:003 (P511.03).

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2321:003<br>(P510.03) | Modbus settings: Data format<br>(Modbus sett.: Data format) | | Definition of the parity and stop bits. |
| | **0** | **Automatic** | Automatic data format detection.<br>• With this setting, the first 5 ... 10 messages are lost after switch-on. |
| | 1 | 8, E, 1 | 8 data bits, even parity, 1 stop bit |
| | 2 | 8, O, 1 | 8 data bits, odd parity, 1 stop bit |
| | 3 | 8, N, 2 | 8 data bits, no parity bit, 2 stop bits |
| | 4 | 8, N, 1 | 8 data bits, no parity bit, 1 stop bit |

### 12.11.2.4 Minimum response time setting

Some Modbus masters have issues turning around their transceiver at higher baud rates. To resolve integration issues the user may use Modbus: Minimum Response Time (0x2321:004) to set a minimum time delay to be observed between the receipt of a valid Modbus message and the drive’s response. Time is entered in milliseconds 0x2321:004 (P510.04).

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2321:004<br>(P510.04) | Modbus settings: Minimum response time<br>(Modbus sett.: Min. resp. time)<br>0 ... [**0**] ... 1000 ms | Minimum time delay between the reception of a valid message and the response of the drive. |

### 12.11.3 Data transfer

The mode of access to inverter data (parameters) is controlled via function codes.

### 12.11.3.1 Function codes

The inverter supports the following function codes:

| Function code | | Function name | Description |
|---|---|---|---|
| 3 | 0x03 | Read Holding Registers | Read one or more 16-bit data words. |
| 6 | 0x06 | Preset Single Register | Write a 16-bit data word. |
| 16 | 0x10 | Preset Multiple Registers | Write one or more 16-bit data words. |
| 23 | 0x17 | Read/Write 4X Registers | Within a transaction<br>• write into a group of connected 4X holding registers.<br>• read from a group of connected 4X holding registers. |

**Addressing**

- The function codes listed above exclusively refer to 4X registers in Modbus addressing.
- All data in the inverter can only be accessed via 4X registers, i.e. via register addresses from 40001.
- The 4xxxx reference is implicit, i. e. given by the function code used. In the frame therefore the leading 4 is omitted in the addressing process.
- Lenze supports the basic 1 addressing of Modbus, i.e. the numbering of the registers starts with 1 whereas addressing starts with 0. For example, the address 0 is used in the frame when register 40001 is read.

**Frame structure**

Communication is established on the basis of the central medium access method. Communication is always started by a master request. The inverter (slave) then either gives a valid response or outputs an error code (provided that the request has been received and evaluated as a valid Modbus frame). Error causes can be invalid CRC checksums, function codes that are not supported, or impermissible data access.

All Modbus frames have the following basic structure:

- A "frame" consists of a PDU (Protocol Data Unit) and an ADU (Application Data Unit).
- The PDU contains the function code and the data belonging to the function code.
- The ADU serves the purposes of addressing and error detection.
- The data are represented in Big Endian format (most significant byte first).

| ADU (Application Data Unit) | | | |
|---|---|---|---|
| Slave address | Function code | Data | Checksum (CRC) |
| | **PDU (Protocol Data Unit)** | | |

### Error codes

In the event of an error, the Modbus node responds with a function code associated with the message:

| Function code | Associated function code in the event of an error | Supported error codes |
|---|---|---|
| 0x03 | 0x83 | 0x01, 0x02, 0x03, 0x04 |
| 0x06 | 0x86 | 0x01, 0x02, 0x03, 0x04 |
| 0x10 | 0x90 | 0x01, 0x02, 0x03, 0x04 |
| 0x17 | 0x97 | 0x01, 0x02, 0x03, 0x04 |

| Error code | Designation | Cause(s) |
|---|---|---|
| 0x01 | Invalid function code | The function code is not supported by the inverter, or the inverter is in a state in which the request is not permissible or in which it cannot be processed. |
| 0x02 | Invalid data address | The combination of a start address and the length of the data to be transmitted is invalid.<br>Example: If you have a slave with 100 registers, the first register has the address 0 and the last register has the address 99. If there is a request of four registers now, from the start address 96, the request can be processed successfully (for registers 96, 97, 98, and 99). If, however, five registers from the start address 96 are queried, this error code is returned, since the slave has no register with the address 100. |
| 0x03 | Invalid data value | Error in the reset structure of a complex request, e. g. because the data length that has resulted implicitly is not correct.<br>The cause, however, is not that a (parameter) value is written outside the valid setting range. As a matter of principle, the Modbus protocol has no information on valid setting ranges of single registers or their meaning. |
| 0x04 | Slave device failure | A non-correctable error has occurred while the request was processed in the inverter. |



### 12.11.3.2 Data mapping

The process of data mapping is used for defining which Modbus registers read or write to which inverter parameters.

- There are pre-defined Modbus registers for common control and status words, which are located in coherent blocks, in order to facilitate communication with OPC servers and other Modbus masters. In order to access all relevant data of the inverter, only a minimum number of commands is required.
- In addition, 24 registers are provided for variable mapping, i. e. free assignment to inverter parameters.

#### Predefined Modbus control registers

- These registers are provided with write and read access.
- The cross-reference in column 2 leads to the detailed parameter description.

| Modbus registers | Permanently assigned parameter | |
|---|---|---|
| | Address | Designation |
| 42101 | 0x400B:001 (P592.01) | AC Drive control word |
| 42102 | 0x400B:005 (P592.05) | Network setpoint frequency (0.01) |
| 42103 | 0x4008:002 (P590.02) | NetWordIN2 |
| 42104 | 0x4008:003 (P590.03) | NetWordIN3 |
| 42105 | 0x400B:007 (P592.07) | PID setpoint |
| 42106 | 0x6071 | Set torque |
| 42107 | 0x4008:001 (P590.01) | NetWordIN1 |
| 42108 | 0x4008:004 (P590.04) | NetWordIN4 |
| 42109 ... 42121 | - | Reserved |

#### Predefined Modbus status registers

- These registers are only provided with read access.
- The cross-reference in column 2 leads to the detailed parameter description.

| Modbus registers | Permanently assigned parameter | |
|---|---|---|
| | Address | Designation |
| 42001 | 0x400C:001 (P593.01) | AC Drive status word |
| 42002 | 0x400C:006 (P593.06) | Frequency (0.01) |
| 42003 | 0x603F (P150.00) | Error code |
| 42004 | 0x400C:005 (P593.05) | Drive status |
| 42005 | 0x2D89 (P106.00) | Motor voltage |
| 42006 | 0x2D88 (P104.00) | Motor current |
| 42007 | 0x6078 (P103.00) | Actual current |
| 42008 | 0x2DA2:002 (P108.02) | Apparent power<br>(42008 = High Word, 42009 = Low Word) |
| 42009 | | |
| 42010 | 0x2D84:001 (P117.01) | Heatsink temperature |
| 42011 | 0x2D87 (P105.00) | DC-bus voltage |
| 42012 | 0x60FD (P118.00) | Digital input status (only bit 16 ... bit 31) |
| 42013 | 0x6077 (P107.00) | Actual torque |
| 42014 ... 42021 | - | Reserved |

### Variable mapping

- Via 0x232B:001 ... 0x232B:024 (P530.01 ... 24), 24 registers can be mapped to parameters of the inverter. Format:
  0xiiiiss00
  (iiii = index hexadecimal,
  ss = subindex hexadecimal)
- The display of the internal Modbus register numbers in 0x232C:001 ... 0x232C:024 (P531.01 ... 24) is generated automatically. Since 32-bit parameters require two registers, there is no 1:1 assignment.
- For the mappable registers, a CRC (Cyclic Redundancy Check) is executed. The checksum determined is displayed in 0x232D (P532.00). The user can read this "validation code" and use it for comparison in the Modbus master. In this way it can be checked whether the inverter currently queried is configured correctly for the respective application.

### Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x232B:001 ... 0x232B:024 (P530.01 ... 24) | Modbus parameter mapping: Parameter 1 ... Parameter 24 (Para. mapping: Parameter 1 ... Parameter 24) 0x00000000 ... [**0x00000000**] ... 0xFFFFFF00 | Mapping entries for the variable mapped Modbus registers. • Format: 0xiiiiss00 (iiii = index, ss = subindex) |
| 0x232C:001 ... 0x232C:024 (P531.01 ... 24) | Modbus register assignment: Register 1 ... Register 24 (Reg. assigned: Register 1 ... Register 24) • Read only | Display of the internal Modbus register number starting from which the parameter mapped in 0x232B:001 ... 0x232B:024 (P530.01 ... 24) is stored. • For the first parameter mapped, always 2500. • From the second parameter mapped, 2500 + offset. The offset results from the data types of the previously mapped parameters. |
| 0x232D (P532.00) | Modbus verification code (Verificationcode) • Read only | |

## 12.11.4 Monitoring

### Time-out monitoring

The response to the missing Modbus messages can be configured via the following parameters.

### Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2858:001 (P515.01) | Modbus monitoring: Response to time-out (Modbus monit.: Resp. Time-out) | | Selection of the response executed if no valid messages have been received via the Modbus for a longer time than the time-out period set in 0x2858:002 (P515.02). Associated error code: • 33185 \| 0x81A1 - Modbus: network time-out |
| | 0 | No response | ▸ Error types 📖 456 |
| | 1 | Warning | |
| | 2 | Trouble | |
| | **3** | **Fault** | |
| 0x2858:002 (P515.02) | Modbus monitoring: Time-out time (Modbus monit.: Time-out time) 0.0 ... [**2.0**] ... 300.0 s | | Time-out period for monitoring the message reception via Modbus. |

### 12.11.5 Diagnostics

#### 12.11.5.1 LED status display

Information on the Modbus status can be obtained quickly via the "BUS RDY" and "BUS ERR" LED displays on the front of the inverter.

The meaning can be seen from the tables below.

**Inverter not active on the Modbus bus (yet)**

| LED "BUS RDY" | LED "BUS ERR" | Meaning |
|---|---|---|
| off | on | Internal error |
| Both LEDs are flickering alternately | | Automatic detection of baud rate and data format active. |

**Inverter active on the Modbus**

The green "BUS RDY" LED indicates the communication status:

| LED "BUS RDY" | Communication status |
|---|---|
| off | No reception / no transmission |
| on | Reception / transmission active |

The red "BUS ERR" LED indicates an error:

| LED "BUS ERR" | Fault |
|---|---|
| off | No fault |
| blinking | Communication error |

#### 12.11.5.2 Information on the network

The following parameters serve to diagnose the communication activities between the inverter and the Modbus network.

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2322:001<br>(P511.01) | Active Modbus settings: Active node ID<br>(Modbus diag.: Active node ID)<br>• Read only | | Display of the active node address. |
| 0x2322:002<br>(P511.02) | Active Modbus settings: Active baud rate<br>(Modbus diag.: Active baud rate)<br>• Read only | | Display of the active baud rate. |
| | 0 | Automatic | Setting of the baud rate.<br>• A change in the baud rate only becomes effective after a restart of Modbus communication.<br>• If the automatic baud rate detection function is activated, the first 5 ... 10 messages are lost after switch-on. |
| | 1 | 2400 bps | |
| | 2 | 4800 bps | |
| | 3 | 9600 bps | |
| | 4 | 19200 bps | |
| | 5 | 38400 bps | |
| | 6 | 57600 bps | |
| | 7 | 115200 bps | |
| 0x2322:003<br>(P511.03) | Active Modbus settings: Data format<br>(Modbus diag.: Data format)<br>• Read only | | Display of the active data format. |
| | 0 | Automatic | Automatic data format detection.<br>• With this setting, the first 5 ... 10 messages are lost after switch-on. |
| | 1 | 8, E, 1 | 8 data bits, even parity, 1 stop bit |
| | 2 | 8, O, 1 | 8 data bits, odd parity, 1 stop bit |
| | 3 | 8, N, 2 | 8 data bits, no parity bit, 2 stop bits |
| | 4 | 8, N, 1 | 8 data bits, no parity bit, 1 stop bit |
| 0x232A:001<br>(P580.01) | Modbus statistics: Messages received<br>(Modbus statistic: Mess. received)<br>• Read only | | Display of the total number of messages received.<br>• This counter counts both valid and invalid messages.<br>• After the maximum value has been reached, the counter starts again "0". |

| Address | Name / setting range / [default setting] | Information |
| --- | --- | --- |
| 0x232A:002<br>(P580.02) | Modbus statistics: Valid messages received<br>(Modbus statistic: Val. mess. rec.)<br>• Read only | Display of the number of valid messages received.<br>• After the maximum value has been reached, the counter starts again "0". |
| 0x232A:003<br>(P580.03) | Modbus statistics: Messages with exceptions<br>(Modbus statistic: Mess. w. exc.)<br>• Read only | Display of the number of messages with exceptions that have been received.<br>• After the maximum value has been reached, the counter starts again "0". |
| 0x232A:004<br>(P580.04) | Modbus statistics: Messages with errors<br>(Modbus statistic: Mess. w. errors)<br>• Read only | Display of the number of messages received with a faulty data integrity (parity, CRC).<br>• After the maximum value has been reached, the counter starts again "0". |
| 0x232A:005<br>(P580.05) | Modbus statistics: Messages sent<br>(Modbus statistic: Messages sent)<br>• Read only | Display of the total number of messages sent.<br>• After the maximum value has been reached, the counter starts again "0". |
| 0x232E:001<br>(P583.01) | Modbus diagnostics of last Rx data: Offset<br>(Rx data diagn.: Rx data offset)<br>0 ... [**0**] ... 240 | For purposes of diagnostics, the last message received (max. 16 bytes) is shown in 0x232E:002 (P583.02)...0x232E:017 (P583.17). For longer messages, an offset can be specified here, indicating from which byte of the message the display of the 16 bytes is to start. |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x232E:002 (P583.02) | Modbus diagnostics of last Rx data: Data byte 0 (Rx data diagn.: Last RxD byte0) • Read only | Display of the message received last. |
| 0x232E:003 (P583.03) | Modbus diagnostics of last Rx data: Data byte 1 (Rx data diagn.: Last RxD byte1) • Read only | |
| 0x232E:004 (P583.04) | Modbus diagnostics of last Rx data: Data byte 2 (Rx data diagn.: Last RxD byte2) • Read only | |
| 0x232E:005 (P583.05) | Modbus diagnostics of last Rx data: Data byte 3 (Rx data diagn.: Last RxD byte3) • Read only | |
| 0x232E:006 (P583.06) | Modbus diagnostics of last Rx data: Data byte 4 (Rx data diagn.: Last RxD byte4) • Read only | |
| 0x232E:007 (P583.07) | Modbus diagnostics of last Rx data: Data byte 5 (Rx data diagn.: Letzt RxD-Byte5) • Read only | |
| 0x232E:008 (P583.08) | Modbus diagnostics of last Rx data: Data byte 6 (Rx data diagn.: Last RxD byte6) • Read only | |
| 0x232E:009 (P583.09) | Modbus diagnostics of last Rx data: Data byte 7 (Rx data diagn.: Last RxD byte7) • Read only | |
| 0x232E:010 (P583.10) | Modbus diagnostics of last Rx data: Data byte 8 (Rx data diagn.: Last RxD byte8) • Read only | |
| 0x232E:011 (P583.11) | Modbus diagnostics of last Rx data: Data byte 9 (Rx data diagn.: Last RxD byte9) • Read only | |
| 0x232E:012 (P583.12) | Modbus diagnostics of last Rx data: Data byte 10 (Rx data diagn.: Last RxD byte10) • Read only | |
| 0x232E:013 (P583.13) | Modbus diagnostics of last Rx data: Data byte 11 (Rx data diagn.: Last RxD byte11) • Read only | |
| 0x232E:014 (P583.14) | Modbus diagnostics of last Rx data: Data byte 12 (Rx data diagn.: Last RxD byte12) • Read only | |
| 0x232E:015 (P583.15) | Modbus diagnostics of last Rx data: Data byte 13 (Rx data diagn.: Last RxD byte13) • Read only | |
| 0x232E:016 (P583.16) | Modbus diagnostics of last Rx data: Data byte 14 (Rx data diagn.: Last RxD byte14) • Read only | |
| 0x232E:017 (P583.17) | Modbus diagnostics of last Rx data: Data byte 15 (Rx data diagn.: Last RxD byte15) • Read only | |
| 0x232F:001 (P585.01) | Modbus diagnostics of last Tx data: Offset (Tx data diagn.: Tx data offset) 0 ... [**0**] ... 240 | For purposes of diagnostics, the last message sent (max. 16 bytes) is shown in 0x232F:002 (P585.02)...0x232F:017 (P585.17). For longer messages, an offset can be specified here, indicating from which byte of the message the display of the 16 bytes is to start. |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x232F:002<br>(P585.02) | Modbus diagnostics of last Tx data: Data byte 0<br>(Tx data diagn.: Last TxD byte0)<br>• Read only | Display of the message sent last. |
| 0x232F:003<br>(P585.03) | Modbus diagnostics of last Tx data: Data byte 1<br>(Tx data diagn.: Last TxD Byte1)<br>• Read only | |
| 0x232F:004<br>(P585.04) | Modbus diagnostics of last Tx data: Data byte 2<br>(Tx data diagn.: Last TxD byte2)<br>• Read only | |
| 0x232F:005<br>(P585.05) | Modbus diagnostics of last Tx data: Data byte 3<br>(Tx data diagn.: Last TxD byte3)<br>• Read only | |
| 0x232F:006<br>(P585.06) | Modbus diagnostics of last Tx data: Data byte 4<br>(Tx data diagn.: Last TxD byte4)<br>• Read only | |
| 0x232F:007<br>(P585.07) | Modbus diagnostics of last Tx data: Data byte 5<br>(Tx data diagn.: Last TxD byte5)<br>• Read only | |
| 0x232F:008<br>(P585.08) | Modbus diagnostics of last Tx data: Data byte 6<br>(Tx data diagn.: Last TxD byte6)<br>• Read only | |
| 0x232F:009<br>(P585.09) | Modbus diagnostics of last Tx data: Data byte 7<br>(Tx data diagn.: Last TxD byte7)<br>• Read only | |
| 0x232F:010<br>(P585.10) | Modbus diagnostics of last Tx data: Data byte 8<br>(Tx data diagn.: Last TxD byte8)<br>• Read only | |
| 0x232F:011<br>(P585.11) | Modbus diagnostics of last Tx data: Data byte 9<br>(Tx data diagn.: Last TxD byte9)<br>• Read only | |
| 0x232F:012<br>(P585.12) | Modbus diagnostics of last Tx data: Data byte 10<br>(Tx data diagn.: Last TxD byte10)<br>• Read only | |
| 0x232F:013<br>(P585.13) | Modbus diagnostics of last Tx data: Data byte 11<br>(Tx data diagn.: Last TxD byte11)<br>• Read only | |
| 0x232F:014<br>(P585.14) | Modbus diagnostics of last Tx data: Data byte 12<br>(Tx data diagn.: Last TxD byte12)<br>• Read only | |
| 0x232F:015<br>(P585.15) | Modbus diagnostics of last Tx data: Data byte 13<br>(Tx data diagn.: Last TxD byte13)<br>• Read only | |
| 0x232F:016<br>(P585.16) | Modbus diagnostics of last Tx data: Data byte 14<br>(Tx data diagn.: Last TxD byte14)<br>• Read only | |
| 0x232F:017<br>(P585.17) | Modbus diagnostics of last Tx data: Data byte 15<br>(Tx data diagn.: Last TxD byte15)<br>• Read only | |

# 13 Device functions

## 13.1 Optical device identification

For applications including several interconnected inverters it may be difficult to locate a device that has been connected online. The "Optical device identification" function serves to locate the inverter by means of blinking LEDs.

**Details**

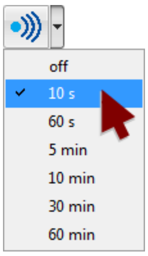
In order to start the visual tracking,

- click the button in the toolbar of the »EASY Starter« or
- set 0x2021:001 (P230.01) = "Start [1]".

After the start, both LEDs "RDY" and "ERR" on the front of the inverter synchronously blink very fast.

| "RDY" LED (blue) | "ERR" LED (red) | Status/meaning |
|---|---|---|
| Both LEDs are blinking in a very rapidly synchronous mode | | "Visual tracking" function is active. |

The blinking duration can be set in 0x2021:002 (P230.02) or selected in the »EASY Starter« in the dropdown list field:




**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2021:001 (P230.01) | Optical tracking: Start detection (Optical tracking: Start detection) | | 1 = start optical device identification.<br>• After the start, the two LEDs "RDY" and "ERR" on the front of the inverter are blinking with a blinking frequency of 20 Hz for the blinking duration set in 0x2021:002 (P230.02). The setting is then automatically reset to "0" again.<br>• If the function is reactivated within the blinking time set, the time is extended correspondingly.<br>• A manual reset to "0" makes it possible to stop the function prematurely. |
| | **0** | **Stop** | |
| | 1 | Start | |
| 0x2021:002 (P230.02) | Optical tracking: Blinking duration (Optical tracking: Blink. duration)<br>0 ... [**5**] ... 3600 s | | Setting of the blinking duration for the visual tracking. |

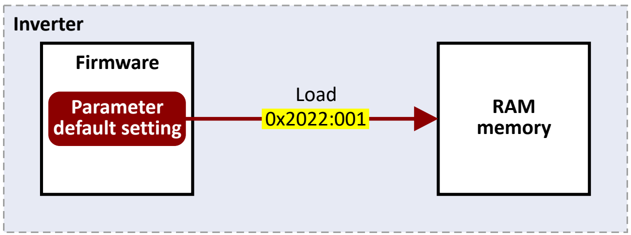
## 13.2 Reset parameters to default

With the "Load default settings" device command, all parameters can be reset to the default setting.

By executing this device command, all parameter settings made by the user are lost!

### Details

- All current parameters in the RAM memory of the device are overwritten by the default parameters stored in the firmware. The persistent parameters in the memory module remain unaffected by this measure.




- Afterwards, the device can be parameterized again on the basis of this initial state.
- Typical application: Incorrect or unknown parameter settings.
- The device command only has an effect on the RAM. For a permanent acceptance of the changes made, the data must subsequently be saved in memory. ▸ Saving/loading the parameter settings 📖 348

### Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2022:001 (P700.01) | Device commands: Load default settings (Device commands: Load def. sett.) • Setting can only be changed if the inverter is disabled. | | 1 = reset all parameters in the RAM memory of the inverter to the default setting that is stored in the inverter firmware. • All parameter changes made by the user are lost during this process! • It may take some seconds to execute the task. When the task has been executed successfully, the value 0 is shown. • Loading parameters has a direct effect on the cyclic communication: The data exchange for control is interrupted and a communication error is generated. |
| | **0** | **Off / ready** | Only status feedback |
| | 1 | On / start | Execute device command |
| | 2 | In progress | Only status feedback |
| | 3 | Action cancelled | |
| | 4 | No access | |
| | 5 | No access (Device disabled) | |

### 13.2.1 Configure reset behaviour

For some customers it is a common method to always have the same starting conditions of the parameters.

This function allows a user to exclude certain parameter groups from being reset to the default settings using the "Load default settings" device command.

**Details**

By default, all parameters are reset when the default settings are loaded.

▸ 0x2022:001 (P700.01)

The user can reconfigure this function.

▸ 0x2024:001

Thus, certain parameter groups can be excluded.

The following cannot be selected for the reset:

- address of the communication bus,
- data format,
- baud rate,
- subnet mask,

and for WLAN:

- channel,
- safety,
- network password,
- SSID name.

Your setting values remain stored.

Please make sure that bit 0 must be set to 1 in the parameter 0x2024:001 before executing the default settings in order that the network parameters are excluded from the reset.

Note that the purpose of this function is to enable the master to restore the connection to an inverter after loading the default settings. Because all data mapping and functional settings are reset, the user must let the master reconfigure the settings of the inverter before it operates the inverter.

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2024:001 | Special settings: Configure default setting<br>0 ... [**0**] ... 65535 | | By default, all parameters are reset when the default settings are loaded (0x2022: 001). The user has the option of reconfiguring this function with the parameter. This allows certain parameter groups to be excluded. |
| | Bit 0 | Exclude network | TRUE: Exclusion of the network parameters (address of the communication bus, the data format, the baud rate, the subnet mask, and for WLAN, channel, security, network password and SSID name). |
| | Bit 1 | Exclude internal registers | |

## 13.3 Saving/loading the parameter settings

If parameter settings of the inverter are changed, these changes at first are only made in the RAM memory of the inverter. In order to save the parameter settings with mains failure protection, the inverter is provided with a pluggable memory module and corresponding device commands.

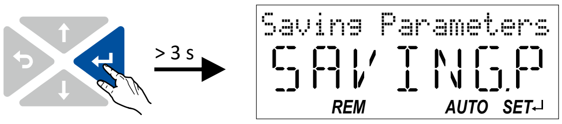
**Details**

The memory module is provided with two memories, the user memory and the OEM memory.

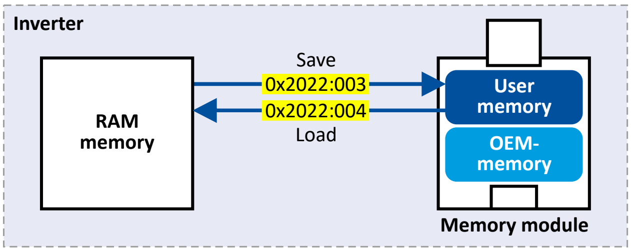
**User memory**

The user memory is used as power-failure-proof storage of parameter settings made by the user during commissioning/operation.

- The SET display blinks on the keypad if a parameter setting has been changed but has not been saved in the memory module with mains failure protection. In order to save parameter settings in the user memory of the memory module, press and hold the enter key for longer than 3 s.



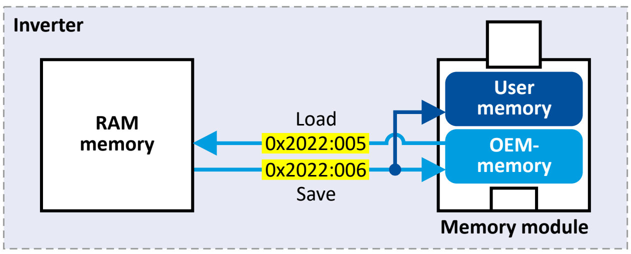

- Parameter settings carried out with »EASY Starter« or via network must be explicitly saved in the user memory by means of the "Save user data" device command, so that the changes carried out are not lost when the mains of the inverter are switched.
- Saving can also be made in the »EASY Starter« via the button or the **<F6>** function key.
- The device command "Load user data" serves to reload the data from the user memory into the RAM.




**OEM memory**

The OEM memory is provided for the storage of customised parameter settings by the OEM/ engineer. If the user carries out parameter settings with the keypad, they are always saved in the user memory if the enter key is pressed and held for longer than 3 s. The OEM memory remains unaffected by these changes.

- With the "Load OEM data" device command, the parameter settings preconfigured by the OEM/ engineer can be reloaded to the RAM memory of the inverter at any time if required.
- For saving parameter settings in the OEM memory, the "Save OEM data" device command must be executed explicitly. The parameter settings are simultaneously saved in the user memory.



### Response after initial switch-on of the inverter

After switch-on, the inverter first tries to load the parameter settings stored in the user memory. If the user memory is empty or damaged, an error message is output and the user must intervene:

- Case 1 = user memory empty: → default setting is loaded automatically from the firmware → data are saved automatically in the user memory of the memory module.
- Case 2 = user memory damaged: → Error message → default setting is loaded automatically → data are saved automatically in the user memory of the memory module.
- Case 3 = OEM memory empty/damaged: → error message → data are loaded automatically from the user memory of the memory module.

### Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2022:003<br>(P700.03) | Device commands: Save user data<br>(Device commands: Save user data) | 1 = save current parameter settings in the user memory of the memory module with mains failure protection.<br>• This process may take some seconds. When the device command has been executed successfully, the value 0 is shown.<br>• Do not switch off the supply voltage during the saving process and do not unplug the memory module from the device!<br>• When the device is switched on, all parameters are automatically loaded from the user memory of the memory module to the RAM memory of the device. |
| | **0** **Off / ready** | Only status feedback |
| | 1 On / start | Execute device command |
| | 2 In progress | Only status feedback |
| | 3 Action cancelled | |
| | 4 No access | |
| | 5 No access (Device disabled) | |
| 0x2022:004<br>(P700.04) | Device commands: Load user data<br>(Device commands: Load user data)<br>• Setting can only be changed if the inverter is disabled. | 1 = load data from the user memory of the memory module to the RAM memory of the inverter.<br>• When the device command has been executed successfully, the value 0 is shown.<br>• Loading parameters has a direct effect on the cyclic communication: The data exchange for control is interrupted and a communication error is generated. |
| | **0** **Off / ready** | Only status feedback |
| | 1 On / start | Execute device command |
| | 2 In progress | Only status feedback |
| | 3 Action cancelled | |
| | 4 No access | |
| | 5 No access (Device disabled) | |
| 0x2022:005<br>(P700.05) | Device commands: Load OEM data<br>(Device commands: Load OEM data)<br>• Setting can only be changed if the inverter is disabled. | 1 = load data from the OEM memory of the memory module to the RAM memory of the inverter.<br>• When the device command has been executed successfully, the value 0 is shown.<br>• Loading parameters has a direct effect on the cyclic communication: The data exchange for control is interrupted and a communication error is generated. |
| | **0** **Off / ready** | Only status feedback |
| | 1 On / start | Execute device command |
| | 2 In progress | Only status feedback |
| | 3 Action cancelled | |
| | 4 No access | |
| | 5 No access (Device disabled) | |

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2022:006<br>(P700.06) | Device commands: Save OEM data<br>(Device commands: Save OEM data) | | 1 = save current parameter settings in the OEM memory of the memory module with mains failure protection.<br>• At the same time, the parameter settings are saved in the main memory of the memory module.<br>• When the device command has been executed successfully, the value 0 is shown. |
| | **0** | **Off / ready** | Only status feedback |
| | 1 | On / start | Execute device command |
| | 2 | In progress | Only status feedback |
| | 3 | Action cancelled | |
| | 4 | No access | |
| | 5 | No access (Device disabled) | |

**Related topics**

▸ Behaviour of the inverter in case of incompatible data in the memory module 📖 364

## 13.4 Access protection

### 13.4.1 Write access protection

Optionally a write access protection can be installed for the inverter parameters.

Write access protection only restricts parameterisation via keypad and »EASY Starter«. Write access protection via network is not restricted. Irrespective of the write access protection that is currently set, a higher-level controller, OPC-UA server, or any other communication partner connected to the inverter is always provided with full read/write access to all parameters of the inverter.

After activating the write access protection, you have to enter a valid PIN to remove the write access protection. Note down the defined PIN(s) and keep this information in a safe place! If you lose the PIN(s), the inverter can only be disabled by resetting it to the delivery status. This means, all parameter settings made by the user get lost! ▸ Reset parameters to default 📖 346

**Details**

Usually the write access protection function is implemented by the engineer/OEM , for example to protect the inverter against incorrect parameterization by non-authorised persons. For diagnostic purposes, a read access to all parameters is always possible.

The write access protection allows for the following configurations:

- Full write access
- Write access only to favorites or (when knowing PIN1) to all parameters
- No write access or (when knowing PIN2) full write access
- No write access or (when knowing PIN1) write access only to favorites or (when knowing PIN2) to all parameters

The following table compares the four possible configurations:

| PIN1 setting | PIN2 setting | Log-in | Status display after log-in | Active write access protection (via keypad/»EASY Starter«) |
|---|---|---|---|---|
| 0x203D (P730.00) | 0x203E (P731.00) | 0x203F | 0x2040 (P197.00) | |
| 0 | 0 | - | 0 | No access protection configured. |
| | | Access → | | Diagnostics (read access) · Favorites · All parameters |
| > 0 | 0 | 0 or wrong PIN | 2 | Write access only possible to favorites. |
| | | Correct PIN1 | 0 | Write access to all parameters possible. |
| | | Access → | | Diagnostics (read access) · Favorites · PIN1 · All parameters |
| 0 | > 0 | 0 or wrong PIN | 1 | No write access. |
| | | Correct PIN2 | 0 | Write access to all parameters possible. |
| | | Access → | | Diagnostics (read access) · PIN2 · Favorites · All parameters |
| > 0 | > 0 | 0 or wrong PIN | 1 | No write access. |
| | | Correct PIN1 | 2 | Write access only possible to favorites. |
| | | Correct PIN2 | 0 | Write access to all parameters possible. |
| | | Access → | | Diagnostics (read access) · PIN1 · Favorites · PIN2 · All parameters |
| | | If PIN1 and PIN2 are set identically, a write access to all parameters is possible after the PIN has been entered correctly. | | |

Notes:

- The access protection is realised by the keypad and engineering tools as "clients" themselves based on the current protection status 0x2040 (P197.00).

More details on how to configure the write access protection with the respective client can be found in the following subchapters:


▶ Write access protection in the »EASY Starter« 353

▶ Write access protection in the keypad 356


**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x203D<br>(P730.00) | PIN1 access protection<br>(PIN1 protection)<br>-1 ... [**0**] ... 9999 | PIN definition for write access protection.<br>• 1 ... 9999 = set/change PIN.<br>• 0 = delete PIN (deactivate access protection).<br>• When the PIN has been set successfully, the value -1 is shown; otherwise 0.<br>• Setting/changing the PIN via keypad/»EASY Starter« only possible if no write access protection is active.<br>• Settings/changes via »EASY Starter« become effective immediately; via keypad they only become effective when the parameter group has been exited. |
| 0x203E<br>(P731.00) | PIN2 access protection<br>(PIN2 protection)<br>-1 ... [**0**] ... 9999 | |
| 0x203F | PIN1/PIN2 log-in<br>-32768 ... [**0**] ... 32767 | Parameter for PIN entry for the purpose of deactivating an active access protection temporarily.<br>• 1 ... 9999 = log-in (deactivate access protection temporarily).<br>• 0 = log-out (reactivate access protection).<br>• After having logged in successfully, the value 0 is shown; otherwise -1.<br>• After 10 invalid entries, the log-in function is inhibited. In order to remove the log-in inhibit, the inverter must be switched off and on again. |



### 13.4.1.1 Write access protection in the »EASY Starter«

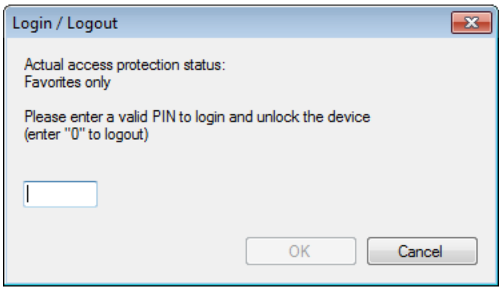
If a write access protection is active for the online connected inverter, it is displayed in the status bar of the »EASY Starter«:

| Display | Representation of the parameters in the »EASY Starter« |
|---|---|
| No write access | All parameters in all dialogs are displayed as read-only parameters. |
| Only favorites | Except for the favorites, all parameters in all dialogs are displayed as read-only parameters. |

An active write access protection can be removed when the PIN is known.

How to remove an active write access protection temporarily:

1. Click the symbol in the toolbar.
   The "Log in / Log off" dialog box is displayed:




2. Enter the valid PIN and confirm with **OK**.

After 10 invalid entries, the log-in function is inhibited. In order to remove the log-in inhibit, the inverter must be switched off and on again.

The write access protection gets active again:

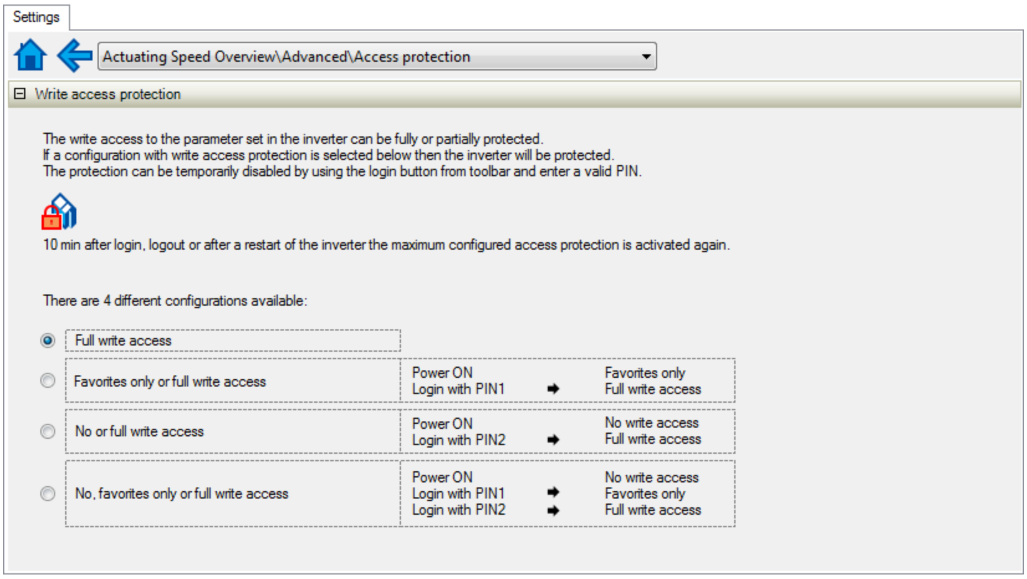
- Automatically 10 minutes after the last login or after the last active write access. It takes max. 10 minutes to be automatically logged out again after each write access.
- Automatically after the mains voltage is switched on again.
- Manually by entering a "0" in the dialog box "Log in / Log off" (see above).

### Configuring the write access protection with »EASY Starter«

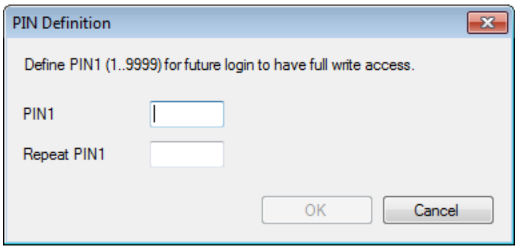
The write access protection is activated by specifying PIN1 and/or PIN2 (depending on the desired configuration of the write access protection).

How to activate the write access protection:

1. Go to the "Settings" tab and navigate to the "Access protection" parameterisation dialog:




2. Select the desired configuration of the write access protection.
   The "PIN definition" dialog box is displayed. The possible entries depend on the selected configuration.




3. Enter the desired PIN(s) and confirm with **OK**.
   After successful execution, the write access protection is immediately effective and is displayed in the »EASY Starter« status bar.
4. For a permanent acceptance of the configuration: Save parameter settings in the device.

How to change already defined PIN(s):

1. Remove the active write access protection temporarily (see above).
2. Select the "Full write access" configuration in the "Access protection" parameterisation dialog.
3. Select again the desired configuration of the write access protection.
4. Enter new PIN(s) and confirm with **OK**.
5. Save parameter settings in the device.

How to remove a configured write access protection permanently:

1. Remove the active write access protection temporarily (see above).
2. Select the "Full write access" configuration in the "Access protection" parameterisation dialog.
3. Save parameter settings in the device.

**Impact of the write access protection on »EASY Starter« functions**

The following »EASY Starter« functions are not supported when write access protection is active:

- Parameter set download
- Definition of the "Favorites" parameters.
- Definition of the parameters for the "Parameter change-over" function

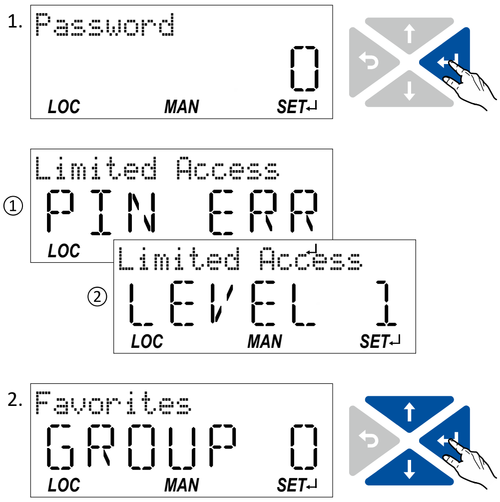
The following »EASY Starter« functions are supported irrespective of whether write access protection is active:

- Optical device identification 0x2021:001 (P230.01)
- Enable/inhibit inverter
- Resetting parameters to default 0x2022:001 (P700.01)
- Save parameter set 0x2022:003 (P700.03)
- Load user parameter 0x2022:004 (P700.04)
- Load OEM parameter 0x2022:005 (P700.05)
- Error reset 0x2631:004 (P400.04)

### 13.4.1.2 Write access protection in the keypad

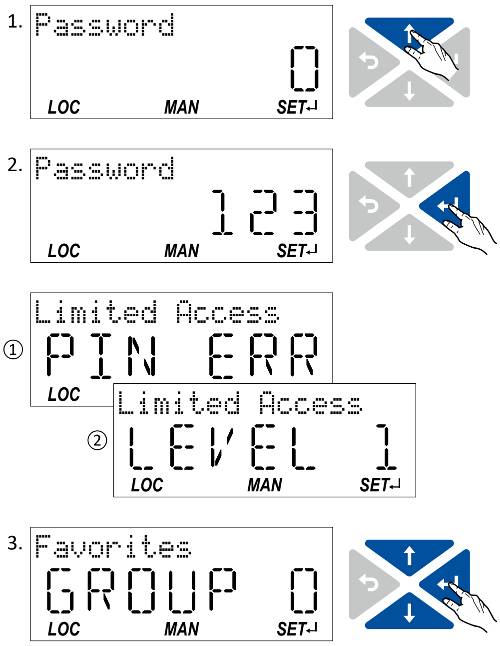
If a write access protection is active for the inverter, the keypad automatically displays a log-in when changing to the parameterisation mode. You can either skip the log-in and thus keep the access protection active or remove it temporarily by entering a valid PIN.

**Option 1 - skip log-in and keep access protection active**




1. Use the ↵ key to skip the log-in.
   The configured access protection remains active and is briefly displayed:
   ① PIN ERR: No write access
   ② LEVEL 1: Write access only to favorites
   You are now in the group level.
2. You can now use the navigation keys ↑ and ↓ to select the desired group and with key ↵ navigate one level lower to the parameter level.
   Note: By using the ↶ key you can navigate one level upwards again anytime.

**Option 2 - remove access protection temporarily by entering a valid PIN**




1. Use the ↑ key to enter the defined PIN.
2. Use the ↵ key to accept the changed setting.
   If the access remains restricted, it is briefly displayed:
   ① PIN ERR: No write access
   ② LEVEL 1: Write access only to favorites
   You are now in the group level.
3. You can now use the navigation keys ↑ and ↓ to select the desired group and with key ↵ navigate one level lower to the parameter level.
   Note: By using the ↶ key you can navigate one level upwards again anytime.

After 10 invalid entries, the log-in function is inhibited. In order to remove the log-in inhibit, the inverter must be switched off and on again.

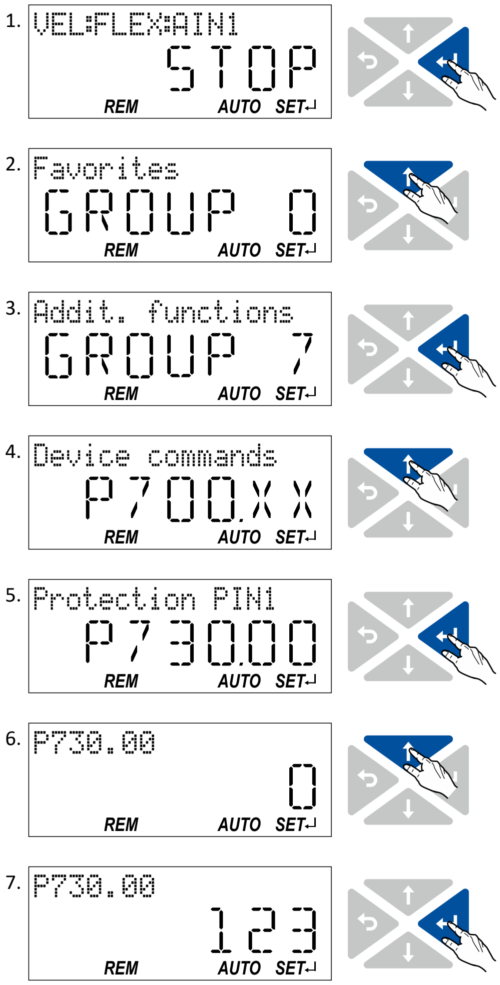
The write access protection gets active again:

- Automatically 10 minutes after the last log-in or the last keypad entry.
- Automatically after the mains voltage is switched on again.

**Configuring the write access protection with the keypad**

The write access protection is activated by defining PIN1 in P730.00 and/or PIN2 in P731.00 (depending on the desired configuration of the write access protection).

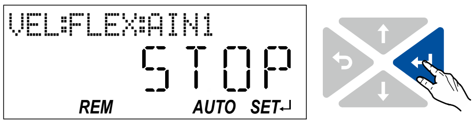
In the following example, the write access protection is configured in such a way that a write access to the favorites only is possible or (when knowing PIN) to all parameters. This configuration only requires the definition of PIN1 (here: "123").

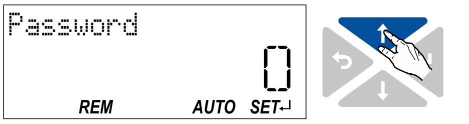


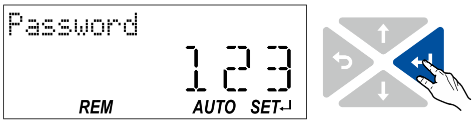

**Defining PIN1:**

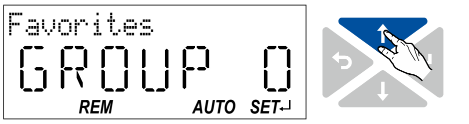
1. Use the ↵ key in the operating mode to navigate to the parameterisation mode one level below.
   You are now in the group level.
   Note: By using the ↶ key you can navigate one level upwards again anytime.
2. Use the ↑ navigation key to select group 7.
3. Use the ↵ key to navigate to one level below.
   You are now in the parameter level of the group selected.
4. Use the ↑ navigation key to select the P730.00 parameter.
5. Use the ↵ key to navigate to one level below.
   You are now in the editing mode.
6. Use the ↑ navigation key to set PIN1 to the value "123".
7. Use the ↵ key to accept the changed setting.
   The editing mode is exited.
   Note: The configured access protection only gets effective after the parameter group is quit.

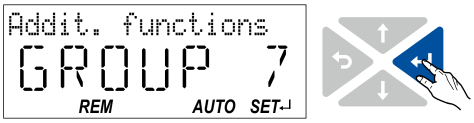
In the following example, PIN1 is changed from "123" to "456". For this purpose, the defined PIN must first be deleted by the setting "0".

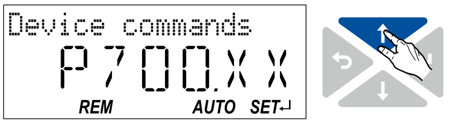
1.


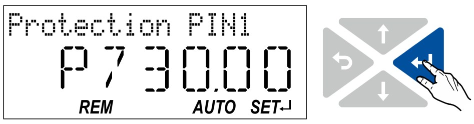

2.


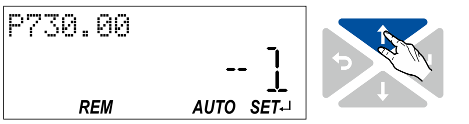

3.


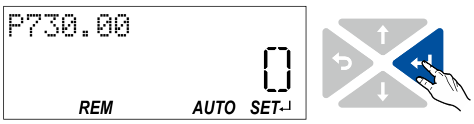

4.


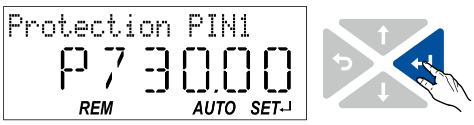

5.


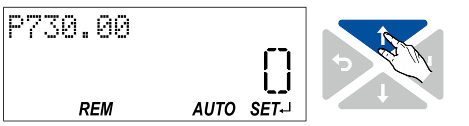

6.


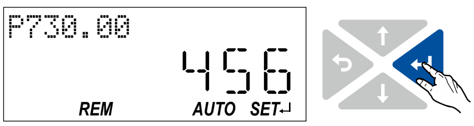

7.



8.



9.



10.



11.



12.



**Change defined PIN1:**

1. Use the ↵ key in the operating mode to navigate to the parameterisation mode one level below.
   Since the access protection is active, the input dialog for the PIN is displayed.
2. Use the ↑ navigation key to set PIN "123" to remove the access protection temporarily.
3. Use the ↵ key to accept the entered PIN.
   You are now in the group level.
4. Use the ↑ navigation key to select group 7.
5. Use the ↵ key to navigate to one level below.
   You are now in the parameter level of the group selected.
6. Use the ↑ navigation key to select the P730.00 parameter.
7. Use the ↵ key to navigate to one level below.
   You are now in the editing mode.
8. Use the ↑ key to set PIN1 to the value "0". This setting first deletes PIN1.
9. Use the ↵ key to accept the changed setting.
   The editing mode is exited.
10. Use the ↵ key to navigate again one level below to the editing mode.
11. Use the ↑ navigation key t set the previously deleted PIN1 to the new value "456".
12. Use the ↵ key to accept the changed setting.
    The editing mode is exited.
    Note: The configured access protection only gets effective after the parameter group is quit.



How to remove a configured write access protection permanently:

1. Remove the active write access protection temporarily (see above).
2. Set PIN1 (P730.00) and PIN2 (P731.00) to the value "0" (see instructions for changing the PIN).

**Impact of the write access protection to the keypad functions**

The following keypad functions are supported irrespective of the active write access protection:

- Optical device identification 0x2021:001 (P230.01)
- Resetting parameters to default 0x2022:001 (P700.01)
- Load user parameter 0x2022:004 (P700.04)
- Load OEM parameter 0x2022:005 (P700.05)

## 13.5 Switching frequency changeover

The output voltage of the inverter is a DC voltage with sine-coded pulse width modulation (PWM). This corresponds by approximation to an AC voltage with variable frequency. The frequency of the PWM pulses is adjustable and is called "switching frequency".

Not all products support all options.

**Details**

The switching frequency has an impact on the smooth running performance and the noise generation in the motor connected as well as on the power loss in the inverter. The lower the switching frequency, the better the concentricity factor, the smaller the power loss and the higher the audible noise .

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2939<br>(P305.00) | Switching frequency<br>(Switching freq.)<br>* Default setting dependent on the model. | | Selection of the inverter switching frequency.<br>Abbreviations used:<br>• "Variable": Adaptation of the switching frequency as afunction of the current. The carrier frequency is reduced depending on the heat sink temperature and the ixt load.<br>• "Fixed": The carrier frequency is fixed, no frequency reduction.<br>• "Drive-optimised": reduces the capacitive currents from the motor to the earth.<br>• "Min. Pv": increases the capacitive currents from the motor to the earth. |
| | 11 | 4 kHz variable / min. Pv | |
| | 12 | 8 kHz variable / min. Pv | |
| | 14 | 12kHz variable / min. Pv | |
| | 16 | 4 kHz fixed / min. Pv | |
| | 17 | 8 kHz fixed / min. Pv | |
| | 18 | 16 kHz fixed / min. Pv | |
| | 19 | 12 kHz fixed / min. Pv | |
| 0x293A<br>(P116.00) | Actual switching frequency<br>(Actual sw. freq.)<br>• Read only | | Display of the currently active switching frequency of the inverter.<br>Example:<br>• "16 kHz variable / drive-optimised / 4 kHz min. [22]" is selected as switching frequency in 0x2939 (P305.00).<br>• An increase of the ambient temperature and/or the load have caused a decrease of the switching frequency to 8 kHz. In this case, this parameter indicates the selection "8 kHz power loss-optimized [7]". |
| | 1 | 2 kHz drive-optimized | |
| | 2 | 4 kHz drive-optimized | |
| | 3 | 8 kHz drive-optimized | |
| | 4 | 16 kHz drive-optimized | |
| | 5 | 2 kHz power loss-optimized | |
| | 6 | 4 kHz power loss-optimized | |
| | 7 | 8 kHz power loss-optimized | |
| | 8 | 16 kHz power loss-optimized | |
| | 9 | 12 kHz drive-optimised | |
| | 10 | 12 kHz power loss-optimised | |

## 13.6 Device overload monitoring (ixt)

The inverter calculates the i*t utilisation in order to protect itself against thermal overload. In simple terms: a higher current or an overcurrent that continues for a longer time causes a higher i*t utilisation.

**⚠ DANGER!**

Uncontrolled motor movements by pulse inhibit.

When the device overload monitoring function is activated, pulse inhibit is set and the motor has no torque. A load that is connected to motors without a holding brake may therefore cause uncontrolled movements! Without a load, the motor will coast.

▶ Only operate the inverter under permissible load conditions.

**Details**

The device overload monitoring function primarily offers protection to the power section. Indirectly, also other components such as filter chokes, circuit-board conductors, and terminals are protected against overheating. Short-time overload currents followed by recovery periods (times of smaller current utilisation) are permissible. The monitoring function during operation checks whether these conditions are met, taking into consideration that higher switching frequencies and lower stator frequencies as well as higher DC voltages cause a greater device utilisation.

- If the device utilisation exceeds the warning threshold set in 0x2D40:002 (default setting: 95 %), the inverter outputs a warning.
- If the device utilisation exceeds the permanent error threshold 100 %, the inverter is disabled immediately and any further operation is stopped.
- Device overload monitoring depends on the inverter load characteristic 0x2D43:001 (P306.01).
- The device overload can be obtained from the configuration document.

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2D40:002 | Device utilisation ixt: Power unit warning threshold<br>0 ... [**95**] ... 101 % | | If the device utilisation exceeds the threshold set, the inverter outputs a warning.<br>• With the setting 0 % or ≥ 100 %, the warning is deactivated. |
| 0x2D40:004<br>(P135.04) | Device utilisation ixt: Device actual utilisation<br>(Device utilisat.: ixt utilisation)<br>• Read only: x % | | Display of the current device utilisation. |
| 0x2D40:005<br>(P135.05) | Device utilisation ixt: Device utilisation (ixt): Error response<br>(Device utilisat.: Error response) | | Selection of the response to be executed when the device overload monitoring function is triggered.<br>Associated error code:<br>• 9090 \| 0x2382 - Fault - Device utilization (ixt) too high |
| | 2 | Trouble | ▶ Error types 456 |
| | **3** | **Fault** | |

## 13.7 Heatsink temperature monitoring

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2D84:001<br>(P117.01) | Heatsink temperature: Heatsink temperature<br>(Heatsink temp.: Heatsink temp.)<br>• Read only: x.x °C | Display of the current heatsink temperature. |
| 0x2D84:002 | Heatsink temperature: Warning threshold<br>50.0 ... [**80.0**]* ... 100.0 °C<br>* Default setting dependent on the model. | Warning threshold for temperature monitoring.<br>• If the heatsink temperature exceeds the threshold set here, the inverter outputs a warning.<br>• The warning is reset with a hysteresis of approx. 5 °C.<br>• If the heatsink temperature increases further and exceeds the non-adjustable error threshold (100 °C), the inverter changes to the "Fault" device status. The inverter is disabled and thus any further operation is stopped. |



## 13.8 Automatic restart after a fault

Configuration of the restart behaviour after a fault.

The settings have no impact on errors and warnings of the inverter.

### Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2839:002<br>(P760.02) | Fault configuration: Restart delay<br>(Fault config.: Restart delay)<br>0.0 ... [**3.0**] ... 1000.0 s | If a fault occurs, a restart is possible at the earliest after the time set here has elapsed. |
| 0x2839:003<br>(P760.03) | Fault configuration: Number of restart attempts<br>(Fault config.: Restart counter)<br>0 ... [**5**] ... 255 | Number of restart attempts after a fault.<br>• 255 = unlimited number of restart attempts. |
| 0x2839:004<br>(P760.04) | Fault configuration: Trouble counter reset time<br>(Fault config.: Tro.count r.time)<br>0.1 ... [**40.0**] ... 3600.0 s | Time of trouble-free operation after which the fault counter is decreased by 1. |
| 0x2839:005<br>(P760.05) | Fault configuration: Trouble counter<br>(Fault config.: Trouble counter)<br>• Read only | Display of the current fault counter content.<br>• The counter content is increased by 1 after each restart attempt. |

### Related topics

▸ Error handling 455

▸ Timeout for error response 457

## 13.9 User-defined error triggering

The "Activate fault 1" and "Activate fault 2" functions serve to set the inverter from the process to the error status.

### Details

If, for instance, sensors or switches are provided for process monitoring, which are designed to stop the process (and thus the drive) under certain conditions, these sensors/switches can be connected to free digital inputs of the inverter. The digital inputs used for the sensors/switches then have to be assigned to the functions "Activate fault 1" and "Activate fault 2" as triggers.

### Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2631:043<br>(P400.43) | Function list: Activate fault 1<br>(Function list: Fault 1)<br>• Further possible settings: ▸ Trigger list 📖 59 | Assignment of a trigger for the "Activate fault 1" function.<br>Trigger = TRUE: Trigger user-defined error 1.<br>Trigger = FALSE: no action.<br>Notes:<br>• After the error is triggered, the motor is brought to a standstill with the quick stop ramp. The inverter is then disabled.<br>Associated error code:<br>• 25217 \| 0x6281 - User-defined fault 1 |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:044<br>(P400.44) | Function list: Activate fault 2<br>(Function list: Fault 2)<br>• Further possible settings: ▸ Trigger list 📖 59 | Assignment of a trigger for the "Activate fault 2" function.<br>Trigger = TRUE: Trigger user-defined error 2.<br>Trigger = FALSE: no action.<br>Notes:<br>• After the error is triggered, the motor is brought to a standstill with the quick stop ramp. The inverter is then disabled.<br>Associated error code:<br>• 25218 \| 0x6282 - User-defined fault 2 |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |

### Example

An example of the operating mode can be found in the chapter "Error reset". 📖 458

### Related topics

▸ Error handling 📖 455



## 13.10 Update device firmware

The device firmware is continuously improved by the manufacturer. New firmware versions contain error corrections, function extensions and simplify the handling.

A new firmware is always compatible with the older version:

- A device with updated firmware and unchanged parameter settings shows the same behaviour as before.
- Parameter settings must only be adapted if new functions are used.

### 13.10.1 Firmware download with »EASY Starter (firmware loader)«

The »EASY Starter (firmware loader)« is a PC software which serves to update the firmware of the device.

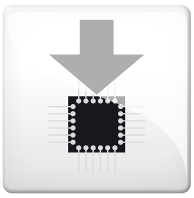
**Preconditions**

- For the firmware download, we recommend a direct USB connection to the device. For this purpose, the USB module and a USB 2.0 cable (A plug on Micro-B plug) are required. The voltage supply of the control electronics also takes place via the USB connection.
- The control electronics of the inverter must be supplied with voltage via the USB connection.
- Voltage supply and communication must not be interrupted during the firmware download.

**Details**

Together with the »EASY Starter« engineering tool, the following tools are installed as well:

| Tool | Brief description |
|---|---|
| »EASY Navigator« | Helps you to find the right tool for your application. |
| »EASY Package Manager« | Enables the automatic download and the installation of files for the engineering tools.<br>• For this purpose, the »EASY Package Manager« is provided with current files by the manufacturer and enables the user to install them.<br>• The files also include new firmware versions for inverters. |
| »EASY Starter (firmware loader)« | Enables the update of the firmware for inverters.<br>• The update can be made by the mechanical engineer or the end user depending on the access protection set for the device. |



**Carry out the firmware download with the »EASY Starter (firmware loader)«:**

1. Start »EASY Navigator« (All programs → Lenze → EASY Navigator).
2. In the »EASY Navigator«, change to the "Ensuring productivity" engineering phase.
3. Click the »EASY Starter (firmware loader)« icon (see on the left).
4. Follow the instructions of the »EASY Starter (firmware loader)«.

Notes:

- The firmware download will not take more than 20 seconds. The progress is shown in the »EASY Starter (firmware loader)«.
- After the firmware download, the connection to the device gets lost for some second and is then restored again automatically.
- Device settings are not changed by the firmware download.
- The brand protection does not get lost by the firmware download.
- The firmware can neither be exported from the device nor be deleted from the device.

If the connection is aborted during the firmware download, this may have the following consequences:

- The device starts with the old firmware. The firmware download can be restarted.
- The firmware in the device is damaged. Consultation with the manufacturer is required.

## 13.11 Behaviour of the inverter in case of incompatible data in the memory module

Below you will find a description of the inverter behaviour when the data on the memory module does not match the inverter hardware or firmware.

The following points are described in detail here:

- Automatic loading of the parameter settings when the inverter is switched on
- Manual loading of the user data via device command
- Manual loading of the OEM data via device command
- Manual saving of the parameter settings via device command
- Hardware and firmware updates/downgrades

**Automatic loading of the parameter settings when the inverter is switched on**

Process when the inverter is switched on:

1. The default setting saved in the inverter firmware is loaded.
2. If a memory module with valid data is available, the data is loaded from the user memory.

   Otherwise a corresponding error message is output:

| Error message | Info |
|---|---|
| 0x7681: Memory module not present | The default setting saved in the inverter firmware is loaded. The error cannot be reset by the user.<br>Remedy:<br>1. Switch off inverter.<br>2. Plug the memory module into the inverter.<br>3. Switch the inverter on again.<br>Note: The memory module cannot be replaced during ongoing operation! |
| 0x7682: Memory module: Invalid user data | The user parameter settings in the memory module are invalid. Thus, the user parameter settings get lost. The default setting is loaded automatically.<br>Remedy:<br>1. Execute user parameter settings again.<br>2. Execute device command "Save user data" 0x2022:003 (P700.03). |
| 0x7684: Data not compl. saved before powerdown | Saving the parameter settings was interrupted by an unexpected disconnection. The user parameter settings were not saved completely. When the inverter is switched on the next time, the backup data is copied to the user memory.<br>Remedy:<br>1. Check user parameter settings. (The loaded backup is an older version.)<br>2. If required, repeat the changes made last.<br>3. Execute device command "Save user data" 0x2022:003 (P700.03). |
| 0x7689: Memory module: invalid OEM data | The OEM memory contains invalid parameter settings or is empty. The user parameter settings are loaded automatically.<br>Remedy:<br>• Execute device command "Save OEM data" 0x2022:006 (P700.06).<br>• Thus, the user parameter settings get lost! |

Notes:

- If the memory module contains invalid data, the device commands "Load user data" 0x2022:004 (P700.04) and "Load OEM data" 0x2022:005 (P700.05) are not executed. The status feedback "Action cancelled" takes place.
- If the memory module is empty, the default setting saved in the inverter firmware is loaded. No action is required by the user. The memory module remains empty until the device command "Save user data" 0x2022:003 (P700.03) or "Save OEM data" 0x2022:006 (P700.06) is executed.
- Irrespective of the data on the memory module, the device command "Load default settings" 0x2022:001 (P700.01) is always enabled.

**Manual loading of the user data via device command**

Device command: "Load user data" 0x2022:004 (P700.04)

- If the user memory contains invalid parameter settings, the default setting saved in the inverter firmware is automatically loaded.
- For possible error messages, see the table above.



**Manual loading of the OEM data via device command**

Device command: "Load OEM data" 0x2022:005 (P700.05)

- If the OEM memory contains invalid parameter settings, the user parameter settings are loaded automatically.
- If the OEM memory is empty, the status feedback "Action cancelled" takes place. The current parameter settings remain unchanged.

**Manual saving of the parameter settings via device command**

Device command: "Save user data" 0x2022:003 (P700.03)

- It may happen that the parameter settings cannot be saved because the user memory is full. In this case, the following error message appears:

| Error message | Info |
|---|---|
| 0x7680: Memory module is full | The memory module contains too many parameter settings. The parameter settings were not saved in the memory module.<br>Remedy: Execute device command "Save user data" 0x2022:003 (P700.03) again. This reinitialises the user memory with the current parameter settings. By this means, parameter settings no longer required are deleted automatically. |

### Hardware and firmware upgrades/downgrades

By "taking along" the memory module, all parameter settings of a device can be transferred to another device, for instance, in case of a device replacement. When switched on, the inverter checks whether the parameter settings saved in the memory module match the inverter hardware and firmware. In case of an incompatibility, a corresponding error message is output.

The following table contains details on different scenarios:

| Prio | Compatibility check<br>User data ←→ device | Error message | Info |
|---|---|---|---|
| 1 | Device has a newer firmware<br>Example: Version 2.x → version 3.x | - | The "firmware upgrade" is recognised.<br>• The user parameter settings are loaded without an action being required by the user.<br>• If the parameter settings are saved afterwards, the user memory is reinitialised with the current parameter settings. By this means, parameter settings no longer required are deleted automatically. |
| | Device has an older firmware<br>Example: Version 4.x → version 3.x | 0x7690: EPM firmware version incompatible | The data is loaded into the RAM memory but are incompatible.<br>Remedy:<br>1. Execute device command "Load default settings" 0x2022:001 (P700.01).<br>2. Execute "Save user data" 0x2022:003 (P700.03) or "Save OEM data" 0x2022:006 (P700.06) device command. |
| 2 | Firmware type is different | 0x7691: EPM data: firmware type incompatible | |
| | Power unit is different (and incompatible with saved data) | 0x7693: EPM data: PU size incompatible | |
| | Country code is different<br>Example: EU → USA | 0x7691: EPM data: firmware type incompatible | |
| | Device has less functionality<br>Examples:<br>i550 → i510<br>Application I/O → Standard I/O | | |
| 3 | Network option is different<br>Example: CANopen → PROFIBUS | 0x7692: EPM data: new firmware type detected | The data is loaded into the RAM memory and is compatible. However, the settings must be accepted by the user:<br>1. Check parameter settings.<br>2. Reset error.<br>3. Execute "Save user data" 0x2022:003 (P700.03) or "Save OEM data" 0x2022:006 (P700.06) device command. |
| 4 | Device has more functionality<br>Examples:<br>i510 → i550<br>Standard I/O → application I/O | - | The "hardware upgrade" is recognised.<br>• The user parameter settings are loaded without an action being required by the user.<br>• If the parameter settings are saved afterwards, the user memory is reinitialised with the current parameter settings. By this means, parameter settings no longer required are deleted automatically. |
| 5 | Power unit is different (but compatible with saved data)<br>Example:<br>230 V/0.75 kW → 400 V/5.5 kW | 0x7694: EPM data: new PU size detected | The data is loaded into the RAM memory and is compatible. However, the settings must be accepted by the user:<br>1. Check parameter settings.<br>2. Reset error.<br>3. Execute "Save user data" 0x2022:003 (P700.03) or "Save OEM data" 0x2022:006 (P700.06) device command. |

# 14 Additional functions

## 14.1 Brake energy management

When braking electrical motors, the kinetic energy of the drive train is fed back regeneratively to the DC bus. This energy causes a DC-bus voltage boost. If the energy fed back is too high, the inverter reports an error.

Several different strategies can serve to avoid DC-bus overvoltage:
- Stopping the deceleration ramp function generator when the active voltage threshold for the brake operation is exceeded
- Use of the "Inverter motor brake" function
- Combination of the above named options

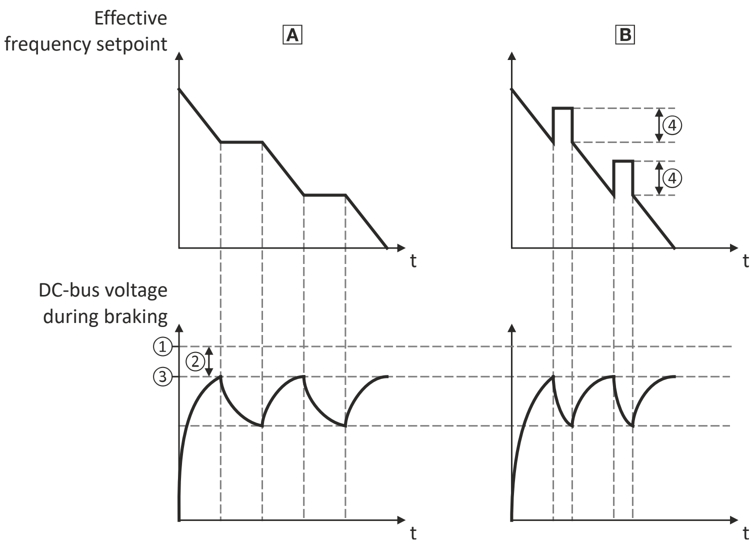
**Details**

The voltage threshold for braking operation results on the basis of the rated mains voltage set:

| Rated mains voltage | Voltage thresholds for braking operation | |
|---|---|---|
| | Braking operation on | Braking operation off |
| 230 V | DC 390 V | DC 380 V |
| 400 V | DC 725 V | DC 710 V |
| 480 V | DC 780 V | DC 765 V |

The voltage threshold for braking operation can be reduced by 0 ... 100 V. The reduction required must be set in 0x2541:003 (P706.03). However, the reduction must be made to such an extent that the reduced voltage threshold is still above the normal stationary DC-bus voltage.The active voltage threshold for the braking operation is displayed in 0x2541:002 (P706.02).

If the DC-bus voltage exceeds the voltage threshold for braking operation, the braking method selected in 0x2541:001 (P706.01) is applied.
- Stopping the deceleration ramp function generator enables smoother deceleration with lower torque oscillation.
- The "Inverter motor brake" function allows for quick braking. For process-related reasons, torque oscillations may occur.




① Voltage threshold for braking operation
② Reduced threshold 0x2541:003 (P706.03)
③ Active threshold 0x2541:002 (P706.02)
④ Additional frequency 0x2541:004 (P706.04)

A Stopping the deceleration ramp function generator 368
B Inverter motor brake 369

## Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2541:001 (P706.01) | Brake energy management: Operating mode (Brake management: Operating mode) | Selection of the braking method.<br>• The braking method(s) selected is/are activated if the DC-bus voltage exceeds the voltage threshold for the braking operation shown in 0x2541:002 (P706.02). |
| | **1 Ramp function generator stop (RFGS)** | The deceleration ramp function generator is stopped.<br>▶ Stopping the deceleration ramp function generator 368 |
| | 3 Inverter motor brake (IMB) + RFGS | Braking with the "Inverter motor brake" braking method in connection with "Deceleration ramp function generator stop" is executed.<br>▶ Inverter motor brake 369 |
| 0x2541:002 (P706.02) | Brake energy management: Active threshold (Brake management: Active threshold)<br>• Read only: x V | Display of the active voltage threshold for the braking operation.<br>• The voltage threshold shown depends on the mains voltage selected in 0x2540:001 (P208.01) and the voltage value set in 0x2541:003 (P706.03).<br>• The voltage threshold must be higher than the stationary DC voltage in the DC bus. |
| 0x2541:003 (P706.03) | Brake energy management: Reduced threshold (Brake management: Red. threshold)<br>0 ... [**0**] ... 100 V | The voltage threshold for the braking operation is reduced by the voltage value set here. |
| 0x2541:005 (P706.05) | Brake energy management: Deceleration override time (Brake management: Del.overr.time)<br>0.0 ... [**2.0**] ... 60.0 s | Maximum permissible time for the deceleration override by means of the braking method selected in 0x2541:001 (P706.01).<br>• If the DC-bus voltage does not fall below the voltage threshold for braking operation shown in 0x2541:002 (P706.02) within this time, the motor is decelerated further.<br>• The time is only reset if the voltage threshold shown in 0x2541:002 (P706.02) is not reached. |

### 14.1.1 Stopping the deceleration ramp function generator

The deceleration ramp function generator is stopped for a short time if the voltage threshold for braking operation is exceeded.

**Details**

When this braking method is selected, the maximum permissible time for the deceleration override has to be set in 0x2541:005 (P706.05).

- If the DC-bus voltage does not fall below the voltage threshold for braking operation shown in 0x2541:002 (P706.02) within this time, the motor is decelerated further.
- The time is only reset if the voltage threshold shown in 0x2541:002 (P706.02) is not reached.

**Precondition**

The "inverter motor brake" braking method only works in operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".



### 14.1.2 Inverter motor brake

**NOTICE**

If it is braked too frequently, there is a risk of the motor being thermally overloaded or the motor overload monitoring does not work properly!

The "Inverter motor brake" braking method must not be used with vertical conveyors (hoists) or with active loads!

Avoid activating the "Inverter motor brake" function over a longer time!

- The "inverter motor brake" braking method only works in operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".
- In applications with a high mass inertia and long braking times (> 2 s), use the "DC braking" function.

With this braking method, which can be selected in 0x2541:001 (P706.01), the regenerative energy is converted into heat in the motor as a result of rapid acceleration/deceleration with down-ramping of the ramp function generator.

**Conditions**

The "inverter motor brake" braking method only works in operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".

- When this braking method is used, the motor overload monitoring is not adapted. A too frequent use of the inverter motor brake may cause an incorrect operation of the motor overload monitoring. ▶ Motor overload monitoring ($i^2xt$) 📖 224

**Details**

During the deceleration process, the ramp function generator is stopped. The frequency set in 0x2541:004 (P706.04) is added to the frequency setpoint, taking the sign of the current actual frequency into consideration. Furthermore the ramp function generator is stopped in a state of overvoltage. If the DC-bus voltage falls below a defined DC-bus voltage potential, the additional frequency connected is reduced again and the ramp function generator is re-activated. By the alternating acceleration and deceleration resulting from this circuit, the energy is converted thermally in the motor. For process-related reasons, torque oscillations may occur.

**Setting instructions**

Generally, the smallest value possible required by the application for being able to still traverse the load to be moved in a controlled fashion should be set as additional frequency. Greater mass inertia values require an increase in the rated motor frequency set. Increasing the rated motor frequency, however, causes greater torque oscillations. A possible consequence is the reduced service life of mechanical components. Furthermore an increase in the rated motor frequency also increases the energy converted into heat in the motor. A possible consequence is the reduced service life of the motor.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2541:004<br>(P706.04) | Brake energy management: Additional frequency<br>(Brake management: Add.frequency)<br>0.0 ... [**0.0**] ... 10.0 Hz | Frequency deviation which is connected to the deceleration ramp in a pulsative fashion when the "Inverter motor brake" braking method is used. |

## 14.2 Parameter change-over

For up to 32 freely selectable parameters, this function provides a change-over between four sets with different parameter values.

**DANGER!**

Changed parameter settings can become effective immediately depending on the activating method set in 0x4046 (P755.00).

The possible consequence is an unexpected response of the motor shaft while the inverter is enabled.

- If possible, only carry out parameter changes while the inverter is disabled.
- Certain device commands or settings which might cause a critical state of the drive behaviour can generally only be carried out when the inverter is inhibited.

**Details**

The parameter list is compiled in the same way as that of the "Favorites" via configuration. »EASY Starter« provides a user-friendly parameterisation dialog for this purpose.

Change-over to another value set can optionally be effected via corresponding device commands and/or special functions/triggers:

- Device commands for parameter change-over 373
- Functions for parameter change-over 375



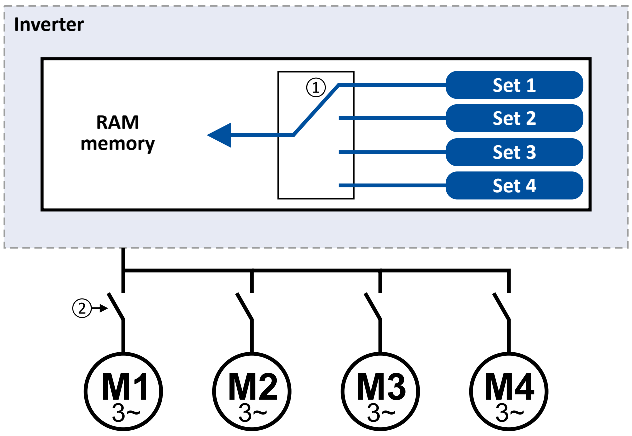
### 14.2.1 Example: Selective control of several motors with one inverter

#### 14.2.1.1

A typical application for the parameter change-over is an application/machine in which several axes must be triggered successively but a simultaneous operation of several motors is not required. In this case, one and the same inverter can trigger the motors in succession. Advantages of this solution are the reduced amount of components (inverters) and a reduced energy consumption.

Principle:

- The motor to be currently controlled is connected to the inverter via motor contactors. (The contactor system can, for instance, be controlled via the digital outputs of the inverter.)
- At the same time, the motor and control settings suitable for motor are activated in the inverter by means of parameter change-over.




- Motor data change-over (via the "parameter change-over" function)
- Motor change-over (e.g. via motor contactors)

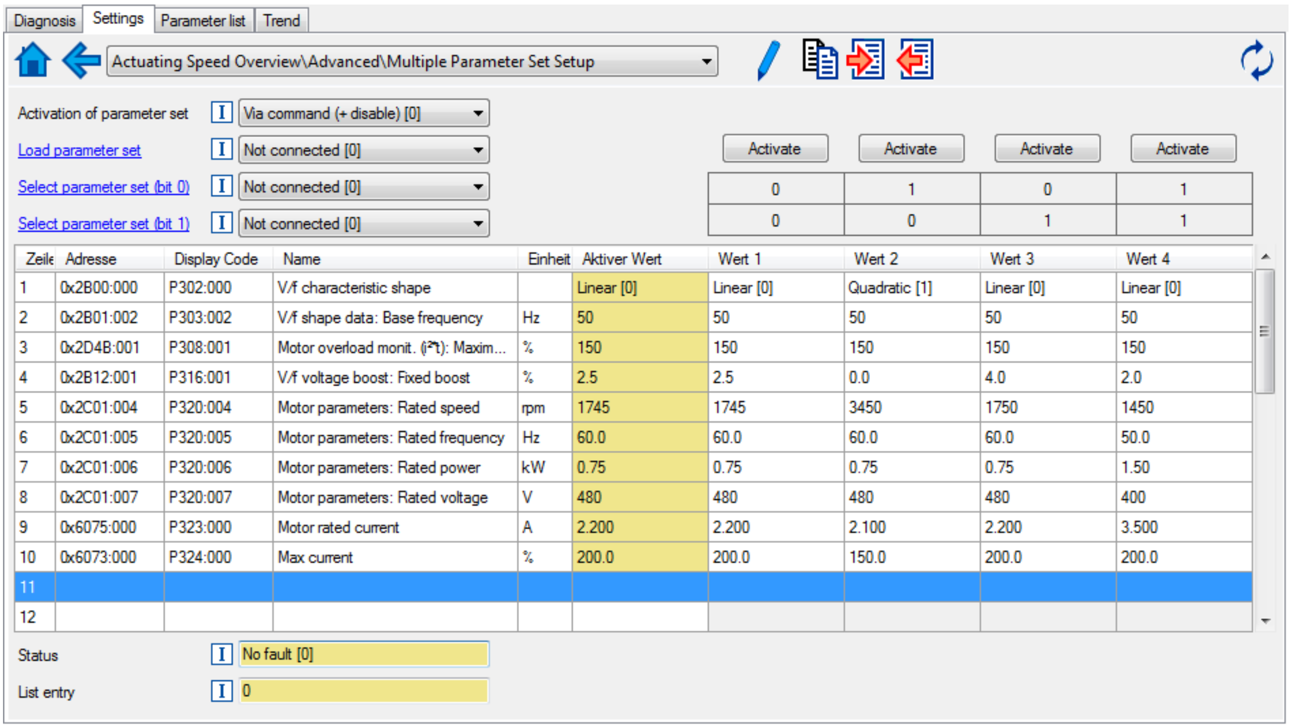
The following table lists all parameters that require different settings for the four motors:

| # | Parameter | Name | Setting | | | |
|---|---|---|---|---|---|---|
| | | | M1 | M2 | M3 | M4 |
| 1 | 0x2B00 (P302.00) | V/f characteristic shape | Linear [0] | Square-law [1] | Linear [0] | Linear [0] |
| 2 | 0x2B01:002 (P303.02) | Base frequency | 60 Hz | 60 Hz | 60 Hz | 50 Hz |
| 3 | 0x2D4B:001 (P308.01) | Maximum utilisation [60 s] | 150 % | 120 % | 150 % | 150 % |
| 4 | 0x2B12:001 (P316.01) | Fixed boost | 2.5 % | 0.0 % | 4.0 % | 2.0 % |
| 5 | 0x2C01:004 (P320.04) | Rated speed | 1745 | 3450 | 1750 | 1450 |
| 6 | 0x2C01:005 (P320.05) | Rated frequency | 60.0 Hz | 60.0 Hz | 60.0 Hz | 50.0 Hz |
| 7 | 0x2C01:006 (P320.06) | Rated power | 0.75 kW | 0.75 kW | 0.75 kW | 1.50 kW |
| 8 | 0x2C01:007 (P320.07) | Rated voltage | 480 V | 480 V | 480 V | 400 V |
| 9 | 0x6075 (P323.00) | Rated motor current | 2,200 A | 2,100 A | 2,200 A | 3,500 A |
| 10 | 0x6073 (P324.00) | Max. current | 200.0 % | 150.0 % | 200.0 % | 200.0 % |

**Settings required for the "parameter change-over" function**

The easiest way to make the required settings is via the parameterization dialog in the »EASY Starter«:

1. Click the button to first select the 10 relevant parameters.
2. Set values for motor M1 ... M4 in the corresponding fields:




In case of a direct setting in the parameters of the "parameter change-over" function:

- The addresses must be set in the following: 0xiiiiss00 (iiii = hexadecimal index, ss = hexadecimal subindex) The keypad can be used to select the desired parameter from a list.
- The values for the motors must be set as integer values. The integer value results from the multiplication of the actual setting value by the factor of the respective parameter. In the table of attributes, the factor for each parameter must be given.

The following table shows the required settings:

| # | Address 0x4041:x (PAR 750/x) | | Name | Value 1 0x4042:x (PAR 752/x) | Value 2 0x4043:x (PAR 753/x) | Value 3 0x4044:x (PAR 754/x) | Value 4 0x4045:x (PAR 755/x) |
|---|---|---|---|---|---|---|---|
| | hex | decimal | | | | | |
| 1 | 0x2B000000 | 721420288 | V/f characteristic shape | 0 | 1 | 0 | 0 |
| 2 | 0x2B010200 | 721486336 | Base frequency | 60 | 60 | 60 | 50 |
| 3 | 0x2D4B0100 | 759890176 | Maximum utilisation [60 s] | 150 | 120 | 150 | 150 |
| 4 | 0x2B120100 | 722600192 | Fixed boost | 25 | 0 | 40 | 20 |
| 5 | 0x2C010400 | 738264064 | Rated speed | 1745 | 3450 | 1750 | 1450 |
| 6 | 0x2C010500 | 738264320 | Rated frequency | 600 | 600 | 600 | 500 |
| 7 | 0x2C010600 | 738264576 | Rated power | 75 | 75 | 75 | 150 |
| 8 | 0x2C010700 | 738264832 | Rated voltage | 480 | 480 | 480 | 400 |
| 9 | 0x60750000 | 1618280448 | Rated motor current | 2200 | 2100 | 2200 | 3500 |
| 10 | 0x60730000 | 1618149376 | Max. current | 2000 | 1500 | 2000 | 2000 |

## 14.2.2 Parameter set configuration

### Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x4041:001 ... 0x4041:032 (P750.01 ... 32) | Parameter change-over: Parameter 1 ... Parameter 32 (Param.set setup: Parameter 1 ... Parameter 32) 0x00000000 ... **[0x00000000]** ... 0xFFFFFF00 | Definition of the parameter list for the "Parameter change-over" function.<br>• Format: 0xiiiiss00 (iiii = hexadecimal index, ss = hexadecimal subindex)<br>• The lowest byte is always 0x00. |

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x4042:001 ... 0x4042:032 (P751.01 ... 32) | Parameter value set 1: Value of parameter 1 ... Value of parameter 32 (Par. value set 1: Set 1 - Value 1 ... Set 1 - Value 32) -2147483648 ... **[0]** ... 2147483647 | | Value set 1 for the parameter list defined in 0x4041:001 ... 0x4041:032 (P750.01 ... 32). |
| 0x4043:001 ... 0x4043:032 (P752.01 ... 32) | Parameter value set 2: Value of parameter 1 ... Value of parameter 32 (Par. value set 2: Set 2 - Value 1 ... Set 2 - Value 32) -2147483648 ... **[0]** ... 2147483647 | | Value set 2 for the parameter list defined in 0x4041:001 ... 0x4041:032 (P750.01 ... 32). |
| 0x4044:001 ... 0x4044:032 (P753.01 ... 32) | Parameter value set 3: Value of parameter 1 ... Value of parameter 32 (Par. value set 3: Set 3 - Value 1 ... Set 3 - Value 32) -2147483648 ... **[0]** ... 2147483647 | | Value set 3 for the parameter list defined in 0x4041:001 ... 0x4041:032 (P750.01 ... 32). |
| 0x4045:001 ... 0x4045:032 (P754.01 ... 32) | Parameter value set 4: Value of parameter 1 ... Value of parameter 32 (Par. value set 4: Set 4 - Value 1 ... Set 4 - Value 32) -2147483648 ... **[0]** ... 2147483647 | | Value set 4 for the parameter list defined in 0x4041:001 ... 0x4041:032 (P750.01 ... 32). |
| 0x4047:001 (P756.01) | Parameter change-over error message: Status (PSet error msg.: Status) • Read only | | Error message for the "parameter change-over" function. • In the event of an error, an error status is shown here, and in 0x4047:002 (P756.02) the number of the list entry in which the error has occurred is displayed (in connection with the value set selected). • If several errors occur at the same time, only the first incorrect list entry will be displayed. Hence, after elimination of the displayed error and repeated activation, more errors may be displayed. • The parameter list will always be processed from beginning to end, even if errors occur in the meantime. |
| | 0 | No fault | |
| | 33803 | Invalid data type | |
| | 33804 | Range violation | |
| | 33806 | Invalid index | |
| | 33813 | No element selected | |
| | 33815 | Writing impermissible | |
| | 33816 | Device not inhibited | |
| | 33829 | Invalid subindex | |
| | 33837 | Access impermissible | |
| | 33860 | Parameter not mappable | |
| | 33865 | No subindexes | |
| | 33876 | Parameter not changeable | |
| 0x4047:002 (P756.02) | Parameter change-over error message: List entry (PSet error msg.: List entry) • Read only | | Error message for the "Parameter set changeover" function. • In the event of an error, the number of the list entry for which the error displayed in 0x4047:001 (P756.01) has occurred is shown here. |

### 14.2.3 Device commands for parameter change-over

The parameter set can be selected with the device commands "Load parameter set 1" ... "Load parameter set 4".

#### Details

The change-over via the device commands depends on the activation method set in 0x4046 (P755.00):

- Activation method = 1 or 3: Change-over takes place immediately.
- Activation method = 0 or 2: The respective device command is only executed if the inverter is disabled.

#### Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2022:007 (P700.07) | Device commands: Load parameter set 1 (Device commands: Load par. set 1) | | 1 = load value set 1 of the "Parameter change-over" function. • The parameters specified in 0x4041/1...32 are set to the values set in 0x4042/1...32. • When the device command has been executed successfully, the value 0 is shown. |
| | **0** | **Off / ready** | Only status feedback |
| | 1 | On / start | Execute device command |
| | 2 | In progress | Only status feedback |
| | 3 | Action cancelled | |
| | 4 | No access | |
| | 5 | No access (Device disabled) | |

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2022:008<br>(P700.08) | Device commands: Load parameter set 2<br>(Device commands: Load par. set 2) | | 1 = load value set 2 of the "Parameter change-over" function.<br>• The parameters specified in 0x4041/1...32 are set to the values set in 0x4043/1...32.<br>• When the device command has been executed successfully, the value 0 is shown. |
| | **0** | **Off / ready** | Only status feedback |
| | 1 | On / start | Execute device command |
| | 2 | In progress | Only status feedback |
| | 3 | Action cancelled | |
| | 4 | No access | |
| | 5 | No access (Device disabled) | |
| 0x2022:009<br>(P700.09) | Device commands: Load parameter set 3<br>(Device commands: Load par. set 3) | | 1 = load value set 3 of the "Parameter change-over" function.<br>• The parameters specified in 0x4041/1...32 are set to the values set in 0x4044/1...32.<br>• When the device command has been executed successfully, the value 0 is shown. |
| | **0** | **Off / ready** | Only status feedback |
| | 1 | On / start | Execute device command |
| | 2 | In progress | Only status feedback |
| | 3 | Action cancelled | |
| | 4 | No access | |
| | 5 | No access (Device disabled) | |
| 0x2022:010<br>(P700.10) | Device commands: Load parameter set 4<br>(Device commands: Load par. set 4) | | 1 = load value set 4 of the "Parameter change-over" function.<br>• The parameters specified in 0x4041/1...32 are set to the values set in 0x4045/1...32.<br>• When the device command has been executed successfully, the value 0 is shown. |
| | **0** | **Off / ready** | Only status feedback |
| | 1 | On / start | Execute device command |
| | 2 | In progress | Only status feedback |
| | 3 | Action cancelled | |
| | 4 | No access | |
| | 5 | No access (Device disabled) | |
| 0x2022:011<br>(P700.11) | Device commands: Save parameter set 1<br>(Device commands: Save par. set 1) | | 1 = save value set 1 of the "Parameter change-over" function.<br>• When the device command has been executed successfully, the value 0 is shown. |
| | **0** | **Off / ready** | Only status feedback |
| | 1 | On / start | Execute device command |
| | 2 | In progress | Only status feedback |
| | 3 | Action cancelled | |
| | 4 | No access | |
| | 5 | No access (Device disabled) | |
| 0x2022:012<br>(P700.12) | Device commands: Save parameter set 2<br>(Device commands: Save par. set 2) | | 1 = save value set 2 of the "Parameter change-over" function.<br>• When the device command has been executed successfully, the value 0 is shown. |
| | **0** | **Off / ready** | Only status feedback |
| | 1 | On / start | Execute device command |
| | 2 | In progress | Only status feedback |
| | 3 | Action cancelled | |
| | 4 | No access | |
| | 5 | No access (Device disabled) | |



| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2022:013 (P700.13) | Device commands: Save parameter set 3 (Device commands: Save par. set 3) | | 1 = save value set 3 of the "Parameter change-over" function.<br>• When the device command has been executed successfully, the value 0 is shown. |
| | **0** | **Off / ready** | Only status feedback |
| | 1 | On / start | Execute device command |
| | 2 | In progress | Only status feedback |
| | 3 | Action cancelled | |
| | 4 | No access | |
| | 5 | No access (Device disabled) | |
| 0x2022:014 (P700.14) | Device commands: Save parameter set 4 (Device commands: Save par. set 4) | | 1 = save value set 3 of the "Parameter change-over" function.<br>• When the device command has been executed successfully, the value 0 is shown. |
| | **0** | **Off / ready** | Only status feedback |
| | 1 | On / start | Execute device command |
| | 2 | In progress | Only status feedback |
| | 3 | Action cancelled | |
| | 4 | No access | |
| | 5 | No access (Device disabled) | |

### 14.2.4 Functions for parameter change-over

The parameter set can be selected with the functions "Select parameter set (bit 0)" and "Select parameter set (bit 1)".

**Details**

A value set is selected in a binary-coded fashion via the triggers assigned to the two Select parameter set (bit 0)" and " Select parameter set (bit 1)" functions in compliance with the following truth table:

| Select parameter set (bit 1) 0x2631:042 (P400.42) | Select parameter set (bit 0) 0x2631:041 (P400.41) | Selection |
|---|---|---|
| FALSE | FALSE | Value set 1 |
| FALSE | TRUE | Value set 2 |
| TRUE | FALSE | Value set 3 |
| TRUE | TRUE | Value set 4 |

Change-over is effected depending on the activation method selected in 0x4046 (P755.00) when a state change of the selection inputs takes place or via the trigger assigned to the "Load parameter set" function.

**Parameter**

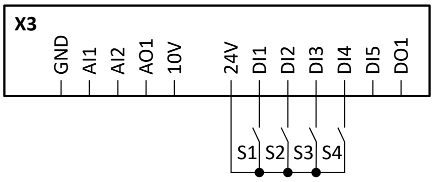
| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2631:040 (P400.40) | Function list: Load parameter set (Function list: Load param.set)<br>• Setting can only be changed if the inverter is disabled.<br>• Further possible settings: ▸ Trigger list 📖 59 | | Assignment of a trigger for the "Load parameter set" function.<br>Trigger = FALSE-TRUE edge: parameter change-over to the value set selected via "Select parameter set (bit 0)" and "Select parameter set (bit 1)".<br>Trigger = FALSE: no action.<br>Notes:<br>• The activation method for the "Parameter change-over" function can be selected in 0x4046 (P755.00). |
| | **0** | **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:041 (P400.41) | Function list: Select parameter set (bit 0) (Function list: Sel. paramset b0)<br>• Setting can only be changed if the inverter is disabled.<br>• Further possible settings: ▸ Trigger list 📖 59 | | Assignment of a trigger for the "Select parameter set (bit 0)" function.<br>Selection bit with the valency $2^0$ for "Parameter change-over" function.<br>Trigger = FALSE: selection bit = "0".<br>Trigger = TRUE: selection bit = "1". |
| | **0** | **Not connected** | No trigger assigned (trigger is constantly FALSE). |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2631:042<br>(P400.42) | Function list: Select parameter set (bit 1)<br>(Function list: Sel. paramset b1)<br>• Setting can only be changed if the inverter is disabled.<br>• Further possible settings: ▸ Trigger list 📖 59 | Assignment of a trigger for the "Select parameter set (bit 1)" function.<br>Selection bit with the valency $2^1$ for "Parameter change-over" function.<br>Trigger = FALSE: selection bit = "0".<br>Trigger = TRUE: selection bit = "1". |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x4046<br>(P755.00) | Activation of parameter set<br>(PSet activation) | Selection of the activation method for the parameter change-over.<br>• If the selection is changed from "Via command... [0]/[1]" to "If the selection is changed...[2]/[3]" after switch-on, the parameter set selected via the functions "Select parameter set (bit 0)" and "Select parameter set (bit 1)" is activated immediately. In case of selection [2], however, this only takes place if the inverter is disabled, the motor is stopped or an error is active. |
| | **0** **Via command (disable required)** | The parameter set selected via the functions "Select parameter set (bit 0)" and "Select parameter set (bit 1)" is activated if the trigger assigned to the "Load parameter set" function in 0x2631:040 (P400.40) provides a FALSE-TRUE edge AND the inverter is inhibited, the motor is stopped or an error is active.<br>▸ Example: Activation via command (only when disabled) 📖 377 |
| | 1 Via command (immediately) | The parameter set selected via the functions "Select parameter set (bit 0)" and "Select parameter set (bit 1)" is immediately activated if the trigger assigned to the "Load parameter set" function in 0x2631:040 (P400.40) provides a FALSE-TRUE edge.<br>▸ Example: Activation via command (immediately) 📖 378 |
| | 2 If the selection is changed (disable required) | The parameter set selected via the functions "Select parameter set (bit 0)" and "Select parameter set (bit 1)" is activated if the state of these selection bits changes AND the inverter is inhibited, the motor is stopped or an error is active.<br>▸ Example: Activation if the selection is changed (only if the inverter is disabled) 📖 379 |
| | 3 If the selection is changed (immediately) | The parameter set selected via the functions "Select parameter set (bit 0)" and "Select parameter set (bit 1)" is activated immediately if the state of these selection bits is changed.<br>▸ Example: Activation if the selection is changed (immediately) 📖 380 |

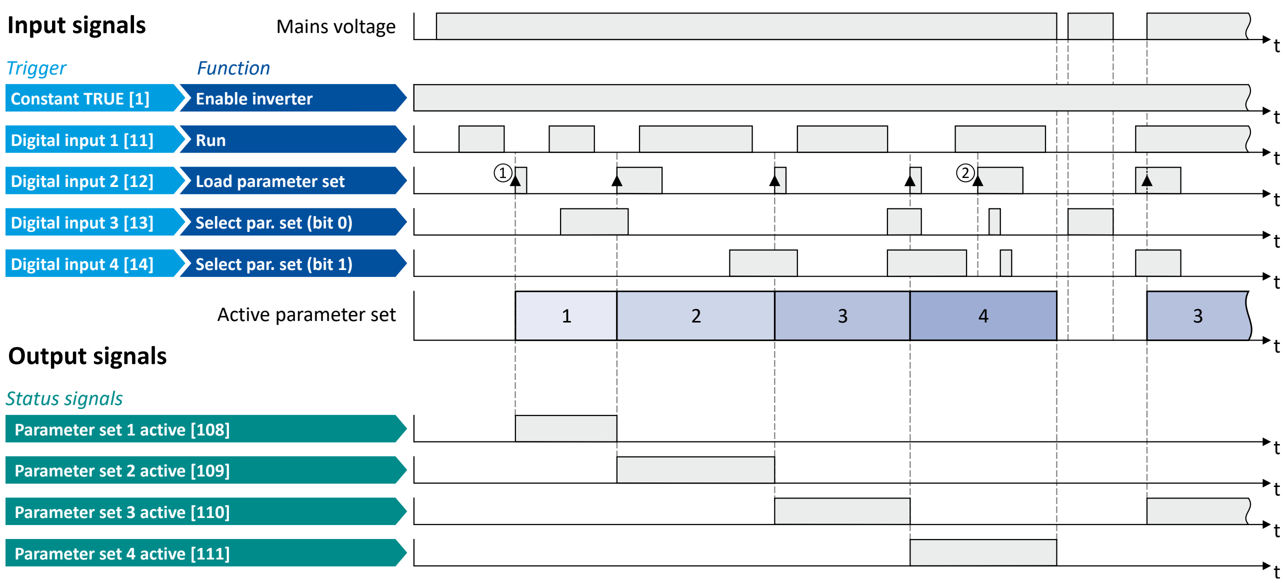
### 14.2.4.1 Example: Activation via command (only when disabled)

Activation method 0x4046 (P755.00) = "Via command (disable required) [0]":

- Switches S3 and S4 serve to select the parameter set (see the following table).
- Switch S2 activates the change-over. Since the change-over is activated with a rising edge, a button (normally-open contact) can be used instead of a switch.
- Change-over is only possible if the motor is not started (switch S1 open).

| Connection plan | Function | | | |
|---|---|---|---|---|
|   | Switch S1 | Run | | |
| | Switch S2 | Load parameter set | | |
| | Switches S3 ... S4 | Parameter set selection: | | |
| | | **S3** | **S4** | |
| | | Off | Off | Parameter set 1 |
| | | On | Off | Parameter set 2 |
| | | Off | On | Parameter set 3 |
| | | On | On | Parameter set 4 |

| Parameter | Designation | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2631:004 (P400.04) | Reset fault | Not connected [0] |
| 0x2631:013 (P400.13) | Reverse rotational direction | Not connected [0] |
| 0x2631:018 (P400.18) | Activate preset (bit 0) | Not connected [0] |
| 0x2631:040 (P400.40) | Load parameter set | Digital input 2 [12] |
| 0x2631:041 (P400.41) | Select parameter set (bit 0) | Digital input 3 [13] |
| 0x2631:042 (P400.42) | Select parameter set (bit 1) | Digital input 4 [14] |
| 0x2824 (P200.00) | Control selection | Flexible I/O configuration [0] |
| 0x4046 (P755.00) | Activation of parameter set | Via command (disable required) [0] |




The status signals can be assigned to digital outputs. ▶ Configure digital outputs 247

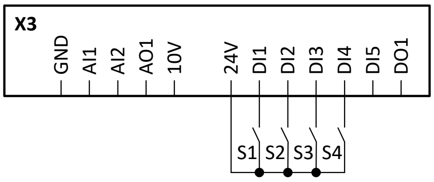
① The change-over is activated with the "Load parameter set" function (FALSE/TRUE edge).

② If the inverter is enabled and the motor is started, a change-over is not possible.

### 14.2.4.2 Example: Activation via command (immediately)

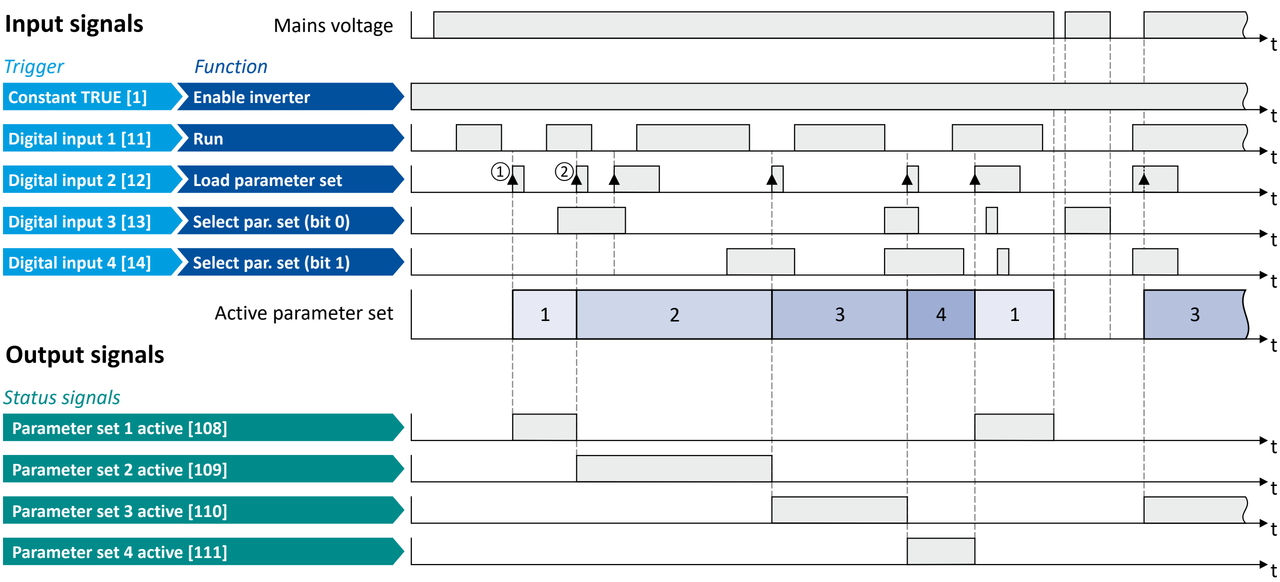
Activation method 0x4046 (P755.00) = "Via command (immediately) [1]":

- Switches S3 and S4 serve to select the parameter set (see the following table).
- Switch S2 activates the change-over. Since the change-over is activated with a rising edge, a button (normally-open contact) can be used instead of a switch.
- Change-over takes place immediately, even if the motor is started (switch S1 closed).

| Connection plan | Function | | |
|---|---|---|---|
|  | Switch S1 | Run | |
| | Switch S2 | Load parameter set | |
| | Switches S3 ... S4 | Parameter set selection: | |
| | | **S3** | **S4** | |
| | | Off | Off | Parameter set 1 |
| | | On | Off | Parameter set 2 |
| | | Off | On | Parameter set 3 |
| | | On | On | Parameter set 4 |



| Parameter | Designation | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2631:004 (P400.04) | Reset fault | Not connected [0] |
| 0x2631:018 (P400.18) | Activate preset (bit 0) | Not connected [0] |
| 0x2631:040 (P400.40) | Load parameter set | Digital input 2 [12] |
| 0x2631:041 (P400.41) | Select parameter set (bit 0) | Digital input 3 [13] |
| 0x2631:042 (P400.42) | Select parameter set (bit 1) | Digital input 4 [14] |
| 0x2824 (P200.00) | Control selection | Flexible I/O configuration [0] |
| 0x4046 (P755.00) | Activation of parameter set | Via command (immediately) [1] |




The status signals can be assigned to digital outputs. ▶ Configure digital outputs 247

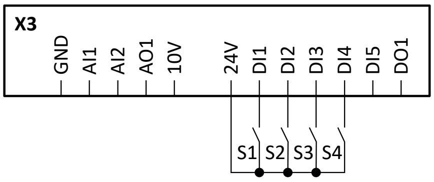
① The change-over is activated with the "Load parameter set" function (FALSE/TRUE edge).
② Change-over is also possible if the inverter is enabled and the motor is started.



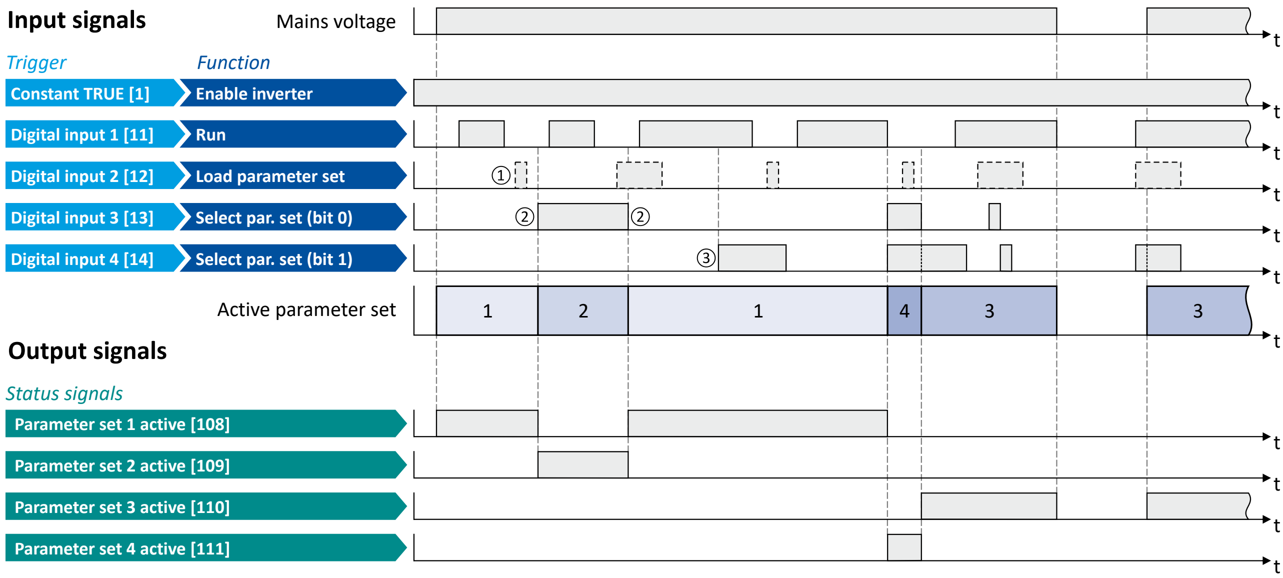
### 14.2.4.3 Example: Activation if the selection is changed (only if the inverter is disabled)

Activation method 0x4046 (P755.00) = "If the selection is changed (disable required) [2]":

- Switches S3 and S4 serve to select the parameter set (see the following table). At the same time, the change-over is activated by a status change of the selection inputs.
- Change-over is only possible if the motor is not started (switch S1 open).
- Switch S2 ("Load parameter set") is ignored in this configuration.

| Connection plan | Function | | | |
|---|---|---|---|---|
|  | Switch S1 | Run | | |
| | Switch S2 | Load parameter set (is ignored in this configuration) | | |
| | Switches S3 ... S4 | Parameter set selection and activation at the same time: | | |
| | | **S3** | **S4** | |
| | | Off | Off | Parameter set 1 |
| | | On | Off | Parameter set 2 |
| | | Off | On | Parameter set 3 |
| | | On | On | Parameter set 4 |

| Parameter | Designation | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2631:004 (P400.04) | Reset fault | Not connected [0] |
| 0x2631:013 (P400.13) | Reverse rotational direction | Not connected [0] |
| 0x2631:018 (P400.18) | Activate preset (bit 0) | Not connected [0] |
| 0x2631:040 (P400.40) | Load parameter set | Digital input 2 [12] |
| 0x2631:041 (P400.41) | Select parameter set (bit 0) | Digital input 3 [13] |
| 0x2631:042 (P400.42) | Select parameter set (bit 1) | Digital input 4 [14] |
| 0x2824 (P200.00) | Control selection | Flexible I/O configuration [0] |
| 0x4046 (P755.00) | Activation of parameter set | If the selection is changed (disable required) [2] |



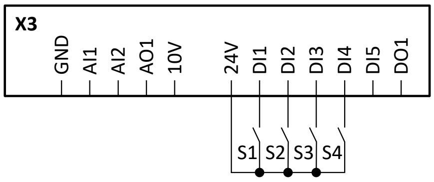

The status signals can be assigned to digital outputs. ▸ Configure digital outputs 247

① The "Load parameter set" function is ignored in this configuration.
② Change-over takes place by a status change of the selection inputs.
③ If the inverter is enabled and the motor is started, a change-over is not possible.

### 14.2.4.4 Example: Activation if the selection is changed (immediately)

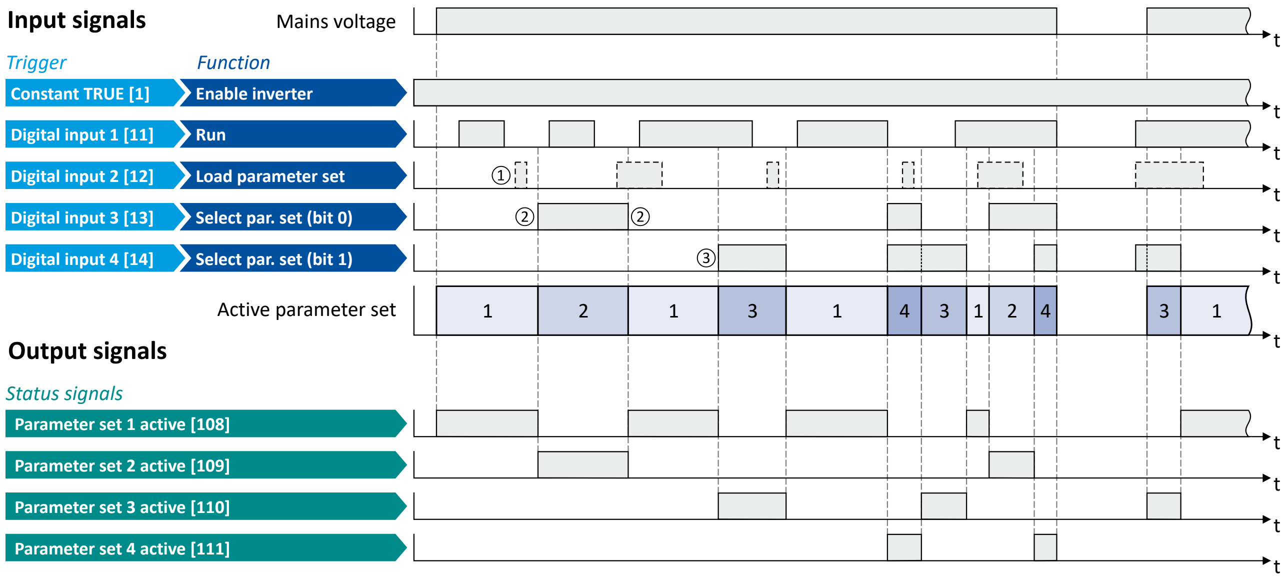
Activation method 0x4046 (P755.00) = "If the selection is changed (immediately) [3]":

- Switches S3 and S4 serve to select the parameter set (see the following table). At the same time, the change-over is activated by a status change of the selection inputs.
- Change-over takes place immediately, even if the motor is started (switch S1 closed).
- Switch S2 ("Load parameter set") is ignored in this configuration.

| Connection plan | Function | |
|---|---|---|
|  | Switch S1 | Run |
| | Switch S2 | Load parameter set (is ignored in this configuration) |
| | Switches S3 ... S4 | Parameter set selection and activation at the same time: |

| S3 | S4 | |
|---|---|---|
| Off | Off | Parameter set 1 |
| On | Off | Parameter set 2 |
| Off | On | Parameter set 3 |
| On | On | Parameter set 4 |

| Parameter | Designation | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2631:004 (P400.04) | Reset fault | Not connected [0] |
| 0x2631:013 (P400.13) | Reverse rotational direction | Not connected [0] |
| 0x2631:018 (P400.18) | Activate preset (bit 0) | Not connected [0] |
| 0x2631:040 (P400.40) | Load parameter set | Digital input 2 [12] |
| 0x2631:041 (P400.41) | Select parameter set (bit 0) | Digital input 3 [13] |
| 0x2631:042 (P400.42) | Select parameter set (bit 1) | Digital input 4 [14] |
| 0x2824 (P200.00) | Control selection | Flexible I/O configuration [0] |
| 0x4046 (P755.00) | Activation of parameter set | If the selection is changed (immediately) [3] |




The status signals can be assigned to digital outputs. ▸ Configure digital outputs 247

① The "Load parameter set" function is ignored in this configuration.
② Change-over takes place by a status change of the selection inputs.
③ Change-over is also possible if the inverter is enabled and the motor is started.



## 14.3 Trigger action if a frequency threshold is exceeded

As a function of the current output frequency, the adjustable frequency threshold serves to trigger a certain function or set a digital output.

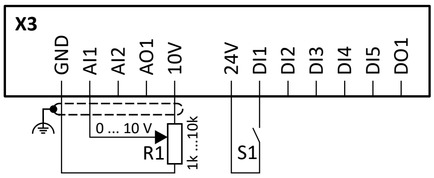
**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x4005<br>(P412.00) | Frequency threshold<br>(Freq. threshold)<br>0.0 ... [**0.0**] ... 599.0 Hz | Threshold for the "Frequency threshold exceeded [70]" trigger.<br>• The "Frequency threshold exceeded [70]" trigger is TRUE if the current output frequency is higher than the set threshold.<br>• The trigger can be assigned to a function or to a digital output. |

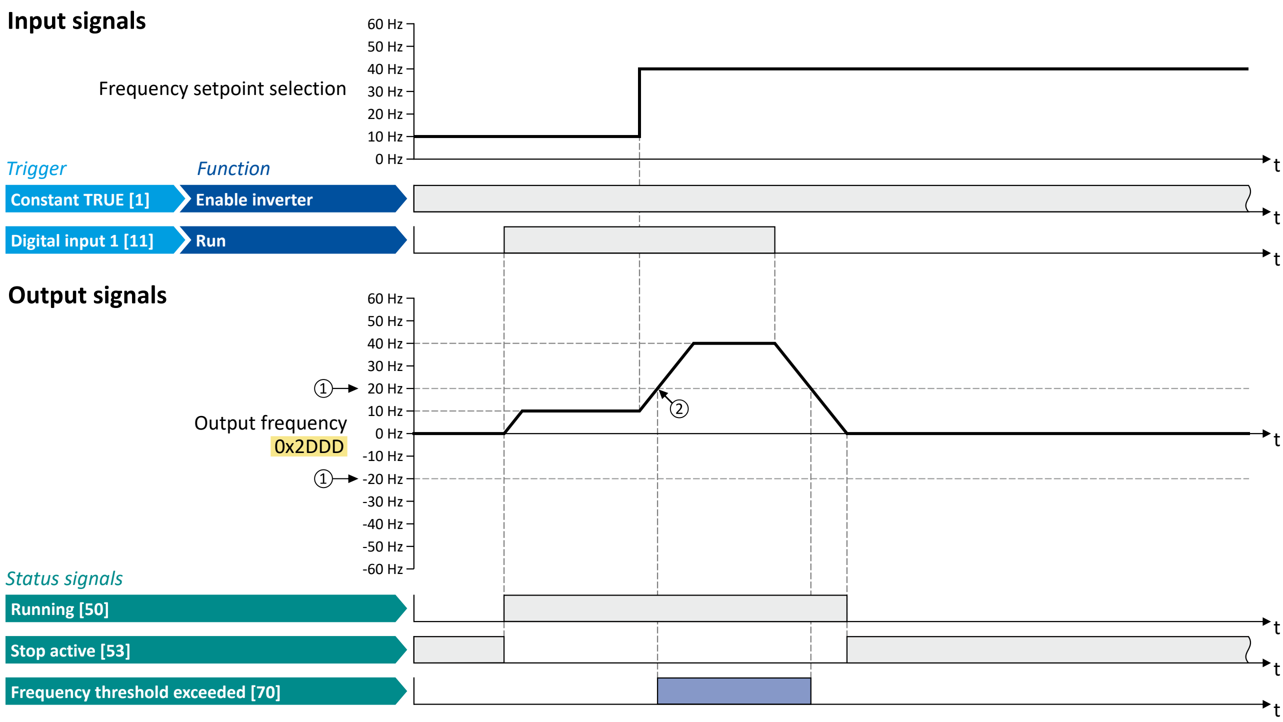
**Example for operating mode**

In the following example, the digital output 1 is set to TRUE if the output frequency is higher than 20 Hz.

- The analog input 1 is set as standard setpoint source.
- Switch S1 starts the motor in forward direction of rotation. De-Asserting switch S1 stops the motor again.

| Connection plan | Function | |
|---|---|---|
|  | Potentiometer R1 | Frequency setpoint selection |
| | Switch S1 | Run |

| Parameter | Designation | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2634:002 (P420.02) | Digital outputs function: Digital output 1 | Frequency threshold exceeded [70] |
| 0x2824 (P200.00) | Control selection | Flexible I/O configuration [0] |
| 0x2860:001 (P201.01) | Frequency control: Default setpoint source | Analog input 1 [2] |
| 0x4005 (P412.00) | Frequency threshold | 20 Hz |



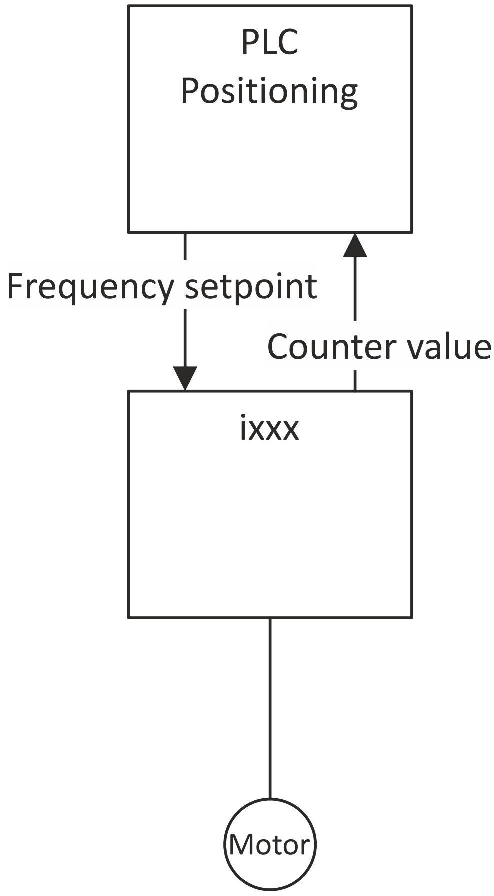

The status signals can be assigned to digital outputs. ▶ Configure digital outputs 📖 247

① Frequency threshold 0x4005 (P412.00)

② Frequency threshold exceeded: Via trigger "Frequency threshold exceeded [70]", the digital output 1 is set to TRUE.

### 14.4 Position counter

This function counts the number of motor revolutions. The current counter content (actual position) can be output as process data value via network to implement a simple position control in a higher-level Controller.

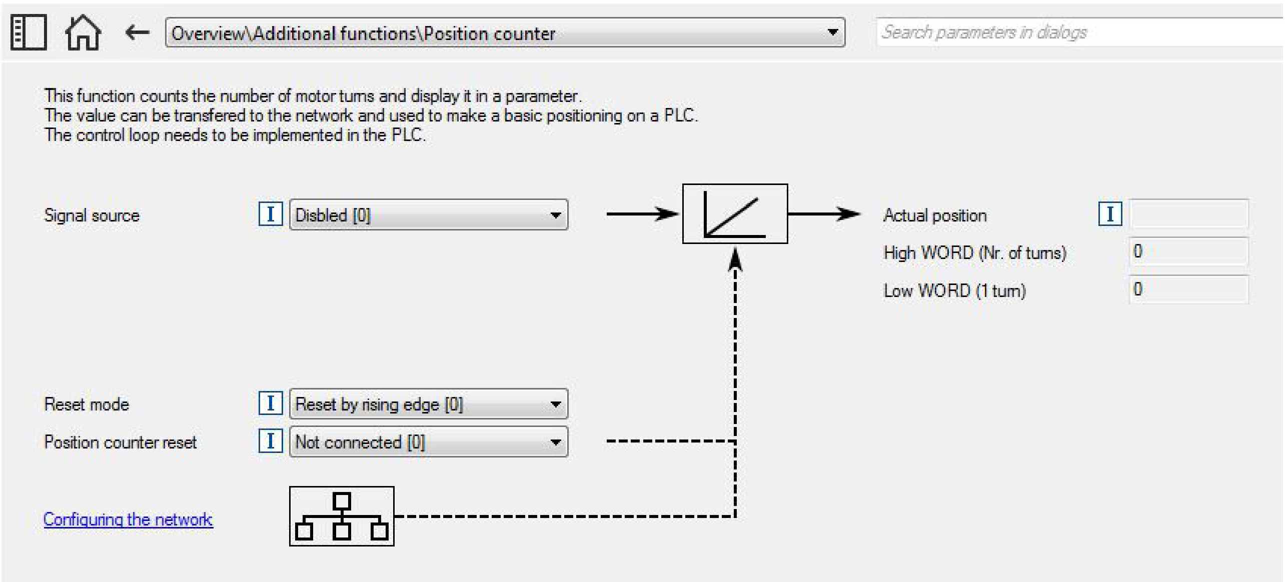



**Preconditions**

- The number of motor revolutions is reconstructed from the motor model. For this purpose, the motor control type "Sensorless control (SL PSM) [3]" must be selected and set in 0x2C00 (P300.00). ▸ Sensorless control for synchronous motor (SL-PSM) 📖 162
- The position control must be implemented in the Controller.

### Details

The signal source for the position counter is selected in 0x2C49:001 (P711.01). The position counter can count forwards and backwards. The current counter content (actual position) is displayed in 0x2C49:003 (P711.03). After the maximum or minimum value has been reached, an overflow takes place.




Reset position counter:

- The position counter is reset when the supply voltage is switched on.
- The position counter can be reset manually via the "Position counter reset" 0x2631:054 (P400.54) function or the NetWordIN1 0x4008:001 (P590.01) data word. For a reset via NetWordIN1, the "Position counter reset [54]" function must be assigned to a bit of the data word. Depending on the selection in 0x2C49:002 (P711.02), the reset can be made either edge-controlled or status-controlled.

### Parameter

| Address | | Name / setting range / [default setting] | Information |
|---|---|---|---|
| 0x2631:054<br>(P400.54) | | Function list: Position counter reset<br>(Function list: PosCounter reset)<br>• From version 03.00<br>• Further possible settings: ▸ Trigger list 📖 59 | Assignment of a trigger for the "Position counter reset" function.<br>Trigger = FALSE-TRUE edge: Reset position counter manually.<br>Trigger = FALSE: no action.<br>Notes:<br>• In 0x2C49:002 (P711.02) it can be selected whether the reset is to be effected edge-controlled (default setting) or status-controlled. |
| | **0** | **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2C49:001<br>(P711.01) | | Position counter: Signal source<br>(Position counter: Signal source)<br>• From version 03.00 | Selection of the signal source for the position counter. |
| | **0** | **Disbled** | Position counter is deactivated. |
| | 1 | Feedback 1 (DI3/DI4) | Selection is not supported by the inverter i510. |
| | 5 | Internal motor model | The motor revolutions reconstructed from the internal motor model of the sensorless control (SL PSM) are counted.<br>• The counter content will not be updated if the power section is switched off.<br>• After restarting the power section, the counting of the last counter content is continued. |
| 0x2C49:002<br>(P711.02) | | Position counter: Reset mode<br>(Position counter: Reset mode)<br>• From version 03.00 | Selection if the manual reset of the position counter is to be effected edge-controlled or status-controlled. |
| | **0** | **Reset by rising edge** | |
| | 1 | Reset by signal state true | |

| Address | Name / setting range / [default setting] | Information |
| --- | --- | --- |
| 0x2C49:003<br>(P711.03) | Position counter: Actual position<br>(Position counter: Actual position)<br>• Read only<br>• From version 03.00 | Mappable parameter for providing the current counter content (actual position) via network.<br>Scaling (applies to every measuring method or encoder resolution):<br>• Upper 16 bits: Counted revolutions (0 ... 65535, overflow possible)<br>• Lower 16 bits: Current position within the revolution (0 ... 65535) |

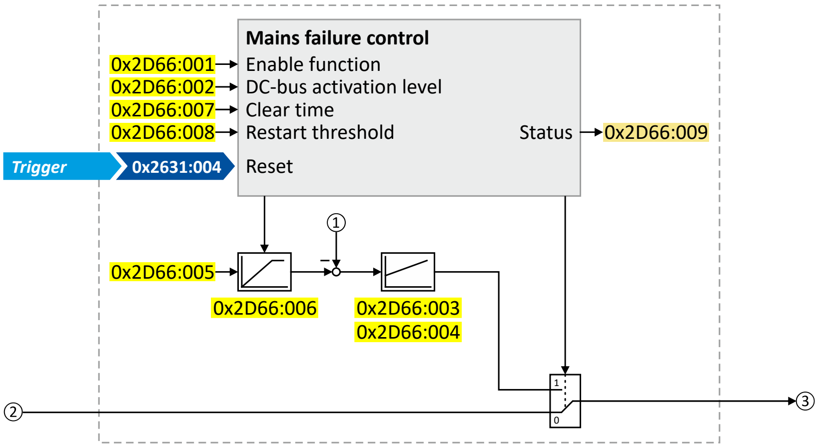
## 14.5 Mains failure control

In case of power failure, this function can decelerate the motor and use its rotational energy to maintain the DC-bus voltage for a certain period of time. This makes it possible to continue to let the drive run during a short-term failure of the mains voltage. After mains recovery, the operating status that was active before the failure is adopted again.

**Details**

A failure of the mains voltage causes a continuous DC-bus voltage drop. If the mains failure control is enabled in 0x2D66:001 (P721.01), it will get active if the DC-bus voltage falls below the activation threshold set in 0x2D66:002 (P721.02).

As soon as the mains failure control is active, the motor is decelerated. Now the rotational energy of the motor is used to maintain the DC-bus voltage above the error threshold for undervoltage until the motor is decelerated to standstill in a controlled way. This process is controlled by the DC-bus voltage controller.




① Current DC-bus voltage
② Frequency setpoint (internal input signal)
③ Frequency setpoint (internal output signal for motor control)

The activation and commissioning of the mains failure control are described in detail in the following subchapters.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
| --- | --- | --- |
| 0x2D66:001 (P721.01) | Mains failure control: Enable function (Mains fail. ctrl: Enable function) • From version 02.00 | 1 = enable mains failure control. |
| | **0** **Disabled** | |
| | 1 Enabled | |
| 0x2D66:002 (P721.02) | Mains failure control: DC-bus activation level (Mains fail. ctrl: DC-bus act.level) 60 ... [**0**]* ... 90 % * Default setting dependent on the model. • From version 02.00 | Threshold below which the mains failure control is activated if it is enabled (0x2D66:001 (P721.01) = 1). • 100 % = nominal DC-bus voltage Recommended setting: • In general: 5 ... 10 % above the error threshold for undervoltage (display in 0x2540:003 (P208.03)). • 230-V devices: 72 % • 400/480-V devices: 82 % |
| 0x2D66:003 (P721.03) | Mains failure control: Gain V-controller (Mains fail. ctrl: Gain V-ctrl) 0.00001 ... [**0.01000**] ... 0.50000 Hz/V • From version 02.00 | Proportional gain of the DC-bus voltage controller. |
| 0x2D66:004 (P721.04) | Mains failure control: Reset time V-controller (Mains fail. ctrl: Res. time V-ctrl) 5 ... [**20**] ... 2000 ms • From version 02.00 | Reset time of the DC-bus voltage controller. |



| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2D66:005<br>(P721.05) | Mains failure control: DC voltage setpoint<br>(Mains fail. ctrl: DC voltage setp.)<br>80 ... [**100**] ... 110 %<br>• From version 02.00 | Voltage setpoint onto which the DC-bus voltage is to maintained.<br>• 100 % = nominal DC-bus voltage |
| 0x2D66:006<br>(P721.06) | Mains failure control: Setpoint ramp<br>(Mains fail. ctrl: Setp. ramp)<br>1 ... [**20**] ... 16000 ms<br>• From version 02.00 | Acceleration time for the voltage setpoint set in 0x2D66:005 (P721.05).<br>• The set acceleration time refers to the acceleration from 0 to 100 % of the nominal DC-bus voltage. |
| 0x2D66:007<br>(P721.07) | Mains failure control: Clear time<br>(Mains fail. ctrl: Clear time)<br>1 ... [**20**] ... 60000 ms<br>• From version 02.00 | After the DC-bus voltage has exceeded the activation threshold 0x2D66:002 (P721.02) (+hysteresis) again, the time set here must be elapsed before the mains failure control is deactivated again if the restart protection is not activated (default setting). |
| 0x2D66:008<br>(P721.08) | Mains failure control: Restart threshold<br>(Mains fail. ctrl: Restart level)<br>0.0 ... [**0.0**] ... 599.0 Hz<br>• From version 02.00 | Threshold for restart protection. Below the threshold set here no restart takes place after mains recovery. |
| 0x2D66:009<br>(P721.09) | Mains failure control: Status mains failure control<br>(Mains fail. ctrl: RERT:Status)<br>• Read only<br>• From version 02.00 | Bit coded display of the mains failure control status. |
| | Bit 0 Control active | 1 = mains failure control active.<br>• The DC-bus voltage has fallen below the activation threshold 0x2D66:002 (P721.02).<br>• The bit is reset to 0 after the DC-bus voltage has exceeded the activation threshold (+hysteresis) again and the clear time set in 0x2D66:007 (P721.07) has elapsed. |
| | Bit 1 I-Reset active | 1 = I component of the speed controller of the motor control is reset.<br>• Bit is set to 1 if bit 0 is set to 1 (mains failure control active).<br>• Bit is reset to 0 if the frequency setpoint falls below 0.1 Hz. |

### 14.5.1 Activating the mains failure control

1. Set the selection "Enabled [1]" in 0x2D66:001 (P721.01).
2. Set the activation threshold in [%] with reference to the nominal DC-bus voltage in 0x2D66:002 (P721.02).
    - Recommended setting: 5 ... 10 % above the error threshold for undervoltage (display in 0x2540:003 (P208.03)).
3. Set the voltage setpoint onto which the DC-bus voltage is to be maintained in 0x2D66:005 (P721.05).
    - Recommended setting: 95 ... 100 % (of the nominal DC-bus voltage).

The mains failure control gets active with these settings if the DC-bus voltage falls below the activation threshold. The DC-bus voltage controller now generates the required operational energy from the rotational energy of the motor. The motor is decelerated by the mains failure control. Thus, the deceleration ramp is shorter than the one of a non-guided system (coasting drive).

After the mains failure control has been activated:

1. The DC-bus voltage is controlled with the acceleration time set in 0x2D66:006 (P721.06) to the setpoint set in 0x2D66:005 (P721.05).
2. An internally generated frequency setpoint is transferred to the motor control which enables the motor (via the frequency setpoint) to be decelerated to a frequency close to "0 Hz".
    - Starting value for the guided deceleration is the current output frequency.
    - The deceleration ramp (and hence the braking torque) results from the moment of inertia of the load machine(s), the power loss of the drive (system) and the set parameterisation.

**Behaviour after mains recovery**

If, after mains recovery, the DC-bus voltage has exceeded the activation threshold (+hysteresis) again, an internal timing element is started. After the time period set in 0x2D66:007 (P721.07) has elapsed, the mains failure control is stopped if the restart protection is not activated (default setting).

▸ Restart protection 📖 389

▸ Fast mains recovery 📖 389

### 14.5.2 Restart protection

The integrated restart protection prevents a restart in the lower frequency range if the mains voltage was only interrupted briefly (mains recovery before the motor stands still).

- In the default setting 0x2D66:008 (P721.08) = 0 Hz, the restart protection is deactivated.
- In order to activate the restart protection, set the restart threshold in [Hz] in 0x2D66:008 (P721.08) below which no automatic start shall take place after mains recovery.
- If, in case of mains recovery, the output frequency is below the restart threshold, the restart protection gets active:
  - If the current DC-bus voltage is lower than the voltage setpoint 0x2D66:005 (P721.05), the motor is continued to be decelerated (until frequency 0 Hz).
  - If the current DC-bus voltage is higher than the voltage setpoint 0x2D66:005 (P721.05), the motor is accelerated in a controlled way until the output frequency exceeds the restart threshold.
- If, in case of mains recovery, the output frequency is above the restart threshold, the motor is accelerated again to the frequency setpoint. ▶ Fast mains recovery 389

Diagnostic parameters:

- An active restart protection is displayed via the status bit 0 in 0x2D66:009 (P721.09) if the mains failure control is not active.

#### Terminating the active restart protection

If, after mains recovery, the restart protection is active, it can be terminated by the following actions:

- Error reset via the trigger set in 0x2631:004 (P400.04).
- Short-time inverter disable via the trigger set in 0x2631:001 (P400.01).
- Restart via the trigger set in 0x2631:002 (P400.02).

### 14.5.3 Fast mains recovery

A fast mains recovery is caused by a short interruption at the energy supply company (for instance due to a thunderstorm) and by faulty components in the supply cables (for instance slip rings).

The fast mains recovery causes a restart of the motor

- if the restart protection is deactivated (0x2D66:008 (P721.08) = 0 Hz, default setting) or
- the restart protection does not get active (output frequency > 0x2D66:008 (P721.08)).

If this behaviour is not desired, you can delay the restart by setting a switch-off time in 0x2D66:007 (P721.07) or prevent it in connection with the restart protection. ▶ Restart protection 389

### 14.5.4 Commissioning the mains failure control

Commissioning should be executed with motors without load:

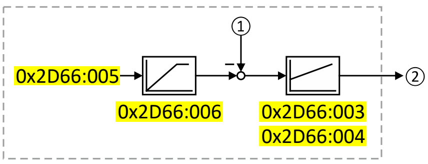
1. Let the motor rotate with a rated frequency of 100 %.
2. Disable the inverter and measure the time until the motor has reached standstill.
    - The time can be measured with a stop watch or similar.
    - If a motor encoder is connected to the inverter and set as feedback system for the motor control, this signal can be output at the analog output and measured with an oscilloscope.
3. Set the acceleration time for the voltage setpoint in 0x2D66:006 (P721.06) to approx. 1/10 of the time measured before.
4. Set the switch-off time n 0x2D66:007 (P721.07) to the time measured before.

#### Fine adjustment of the mains failure control

For the fine adjustment, you must repeat the following points several times:

1. An end frequency as low as possible should be reached before the inverter reaches the error threshold for undervoltage:
    - Increase the proportional gain of the DC-bus voltage controller in 0x2D66:003 (P721.03).
    - Reduce the reset time of the DC-bus voltage controller in 0x2D66:004 (P721.04).
2. If, during the mains failure control, monitoring for overvoltage in the DC bus is triggered:
    - Increase the reset time again in 0x2D66:004 (P721.04) until monitoring is not triggered anymore.
    - If required, additionally reduce the voltage setpoint in 0x2D66:005 (P721.05) onto which the DC-bus voltage is to be controlled.
3. Increasing the delay time or reducing the braking torque is only possible to a limited extent:
    - Increasing the acceleration time in 0x2D66:006 (P721.06) reduces the initial braking torque and simultaneously increases the deceleration time.
    - Increasing the reset time of the DC-bus voltage controller in 0x2D66:004 (P721.04) reduces the braking torque and simultaneously increases the deceleration time. If the reset time is too high, the inverter reaches the error threshold for undervoltage before standstill is reached. From this point on, the motor is not guided anymore.

Signal flow - DC-bus voltage controller




① Current DC-bus voltage

② Internally generated frequency setpoint that is transferred to the motor control in case of an active mains failure control.



## 14.6 Operation with UPS

This function enables the operation of a 3x400-V inverter with an uninterruptible 1x230-V power supply (UPD) to be able to operate the motor with reduced load for a certain period in the event of a power failure.

In case of UL, CSA or other North American applications with this function, the standards of the end application must be taken into account.

**NOTICE**

UPS operation is not suitable for a continuous operation.

Possible consequence: Device overload

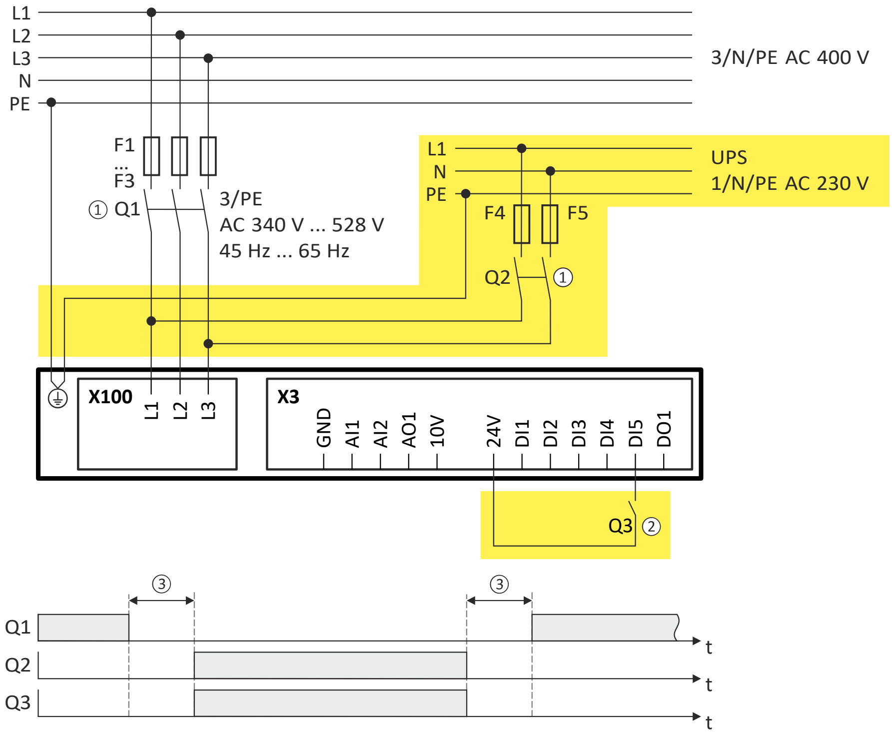
► Prevent a too frequent use of this function.

**Restrictions**

- UPS operation is only available for 3x400/480 V devices up to 11 kW.
- For UPS operation, one reduced output current and one reduced overload are available only:
  - Output current: 60 % of the 400/480 V rated current
  - Overload: 80 %/5 min, 120 %/3 s of the 400/480 V rated current
- In order to change over to UPS operation, a minimum delay of 10 s is required.

### Details

The following figure shows the principal connection of the UPS to the inverter. For further technical details, please contact the inverter manufacturer.




① A mutual locking is required for the contactors Q1 and Q2.

② In this example, the digital input DI5 is used to activate the UPS operation. For this purpose, the function "Activate UPS operation" 0x2631:055 (P400.55) must be assigned to trigger "Digital input 5 [15]".

③ In order to change over to UPS operation, a minimum delay of 10 s is required.

The UPS operation can be alternatively activated via network. In this case, a bit of the mappable data word NetWordIN1 0x4008:001 (P590.01) must be assigned to the "Activate UPS operation [55]" function.

If the UPS operation is active,

- the device overload monitoring (i*t) is adapted accordingly.
- the DC limit values are reduced.
- the phase failure detection is switched off.
- the warning "UPS operation active" (error code 12672 | 0x3180) is output.
- trigger "UPS operation active [118]" is set to TRUE. The trigger can be assigned to a digital output.
- bit 15 ("UPS operation active") in the inverter status word 2 0x2833 is set to "1".

Notes:

- An additional limitation of speed, current, etc. can be realised via the application with the "Parameter change-over" function. 📖 370

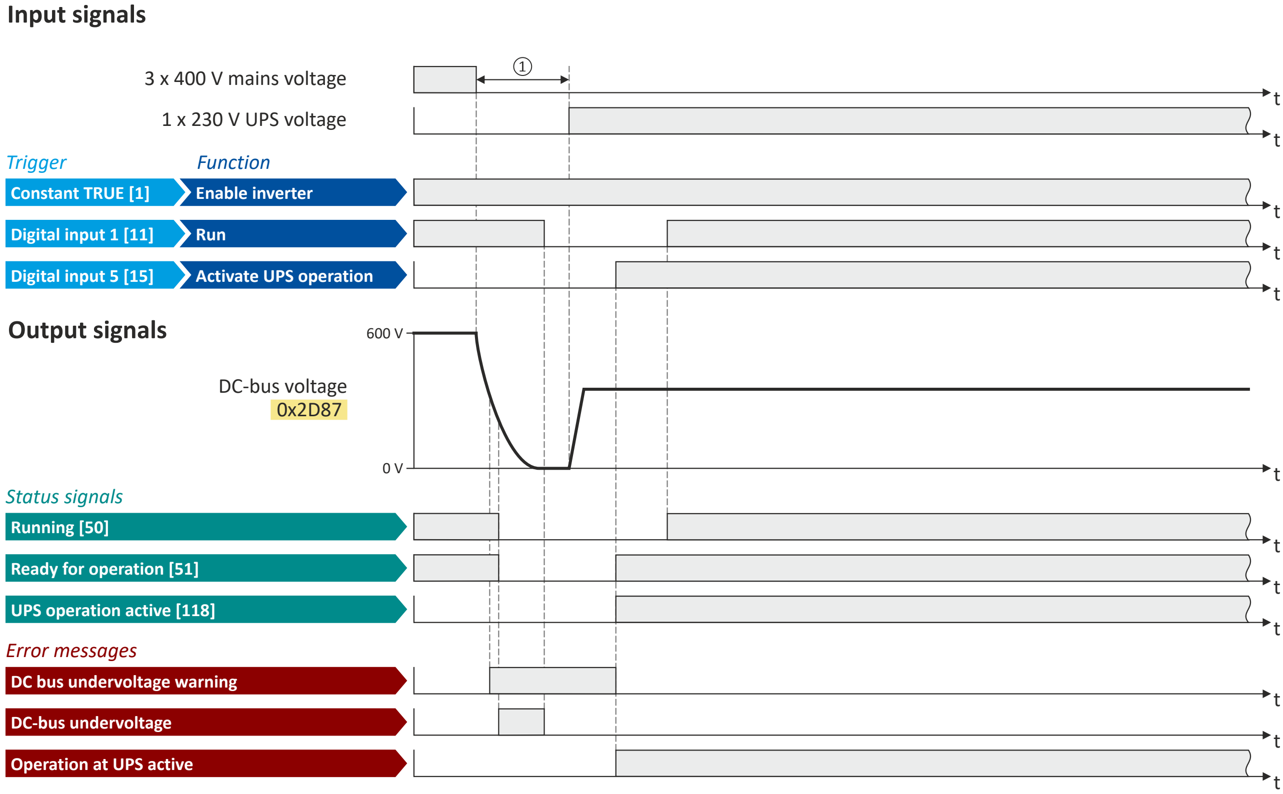
### Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2631:055 (P400.55) | Function list: Activate UPS operation<br>(Function list: Activ. UPS oper.)<br>• Further possible settings: ▸ Trigger list 📖 59 | | Assignment of a trigger to the "Activate UPS operation" function.<br>Trigger = TRUE: Activate UPS operation.<br>Trigger = FALSE: no action / deactivate function again. |
| | 0 | **Not connected** | No trigger assigned (trigger is constantly FALSE). |



### Example for operating mode

| Parameter | Designation | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2631:055 (P400.55) | Activate UPS operation | Digital input 5 [15] |




The status signals can be assigned to digital outputs. ▶ Configure digital outputs 📖 247

① In order to change over to UPS operation, a minimum delay is required.

## 14.7 Cascade function for pumps and fans

This feature allows you to control multiple drives in fan and pump applications. The main drive is controlled by the inverter and the (maximum two) auxiliary drives are switched on directly via contactors if required. The main drive is controlled by the PID controller or another alternative setpoint source (digital/analog inputs, keypad, network) The switching cycles of the auxiliary drives are triggered depending on the actual load (PID controller).

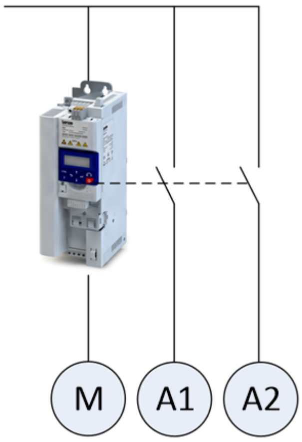
### Preconditions

The process controller has been configured. ▶ Configuring the process controller 📖 112

### Possible configurations

| Inverter | Drive |
|---|---|
| i5xx with standard IO (with or without network) | 1 main drive (controlled via this inverter) |
| | 2 auxiliary drives (controlled via relay/digital output) |

Example with i550 cabinet frequency inverter:



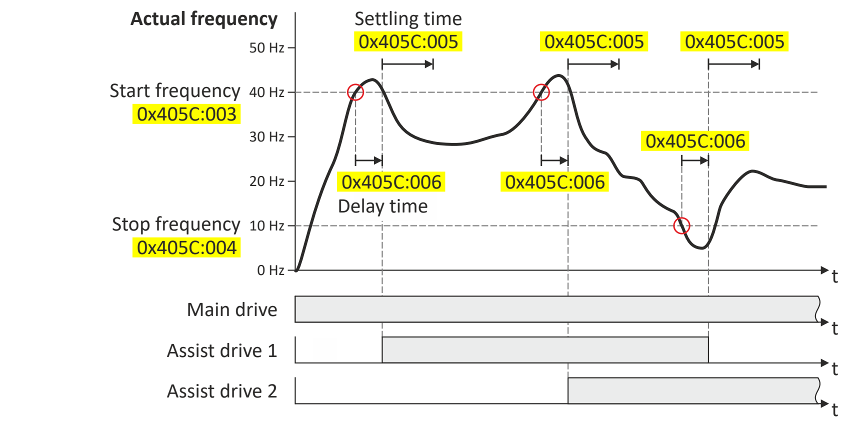

M Main drive
A1 Auxiliary drive 1
A2 Auxiliary drive 2

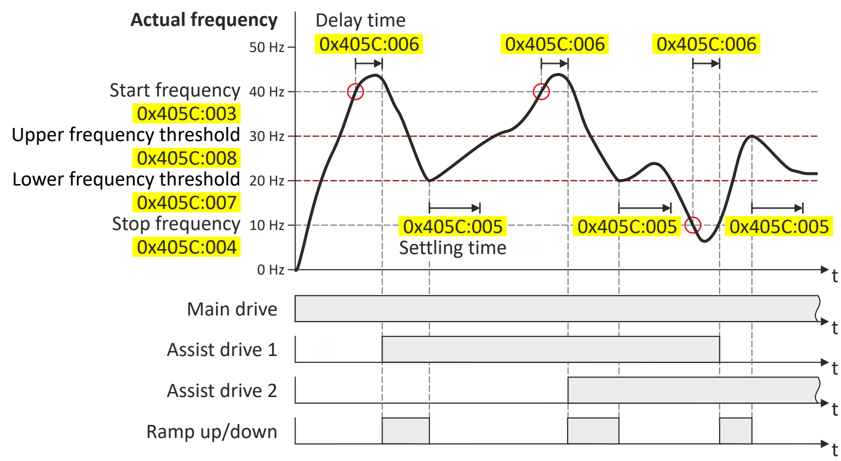
Additional relays may be required to control the power contactors if the current/voltage range from the relay/digital output is not sufficient for direct control.



### Operating modes

Two operating modes are available for the cascade function, "without ramp" and "with ramp".
The following diagrams illustrate the respective behavior.

<table>
<tr><th colspan="2">0x405C:001 (P770.01) = "1: without ramp"</th></tr>
<tr><td>
</td>
<td>When the current frequency reaches the start frequency set in 0x405C:003 (P770.03), the delay time set in 0x405C:006 (P770.06) starts. The delay time is used to avoid unwanted on/off cycles.<br><br>After the delay time has elapsed:<ul><li>The on/off command for the next auxiliary drive is set.</li><li>The settling time set in 0x405C:005 (P770.05) starts.</li></ul>During the settling time, no other auxiliary drive may be controlled by means of an on/off command. This time is also required so that the PID controller for the main drive can regulate itself again.</td></tr>
</table>

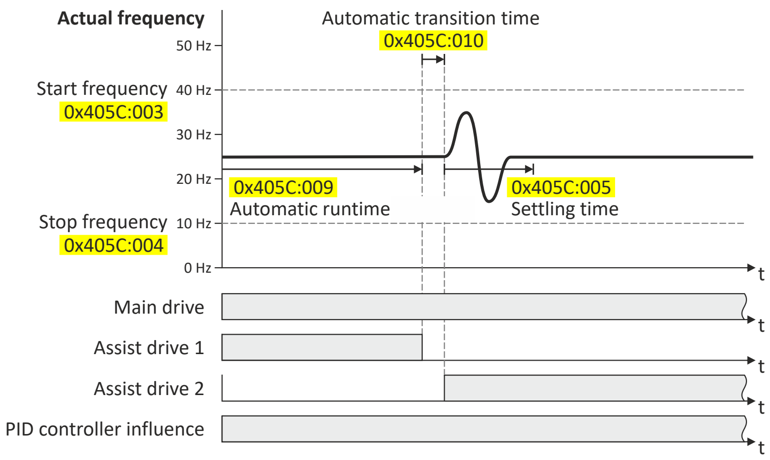
<table>
<tr><th colspan="2">0x405C:001 (P770.01) = "2: with ramp"</th></tr>
<tr><td>
</td>
<td>When the current frequency reaches the start frequency set in 0x405C:003 (P770.03), the delay time set in 0x405C:006 (P770.06) starts. The delay time is used to avoid unwanted on/off cycles.<br><br>After the delay time has elapsed:<ul><li>The on/off command for the next auxiliary drive is set.</li><li>The frequency is reduced via a ramp to the lower frequency threshold set in 0x405C:007 (P770.07).</li></ul>When the current frequency reaches the lower frequency threshold, the settling time set in 0x405C:005 (P770.05) starts.<br>During the settling time, no other auxiliary drive may be controlled by means of an on/off command. This time is also required so that the PID controller for the main drive can regulate itself again.</td></tr>
</table>

### Transition mode configuration

To ensure equal operating times of both auxiliary drives, a specific transition behavior from one add-on drive to the second add-on drive can be configured by setting the "Automatic reversing time" in 0x405C:010 (P770.10).

The following three transition modes are possible:

| Transition mode | Information | Required setting |
|---|---|---|
| Direct transition | The active auxiliary drive switches off, the other auxiliary drive switches on. Note that this may cause undesirable behavior in your system. | 0x405C:010 (P770.10) = 0.0 s (default setting) |
| Sequential transition | The active auxiliary drive switches off. The other auxiliary drive only switches on after the reversing time set in 0x405C:010 (P770.10) has elapsed. | 0x405C:010 (P770.10) > 0.0 s |
| Overlapping transition | The other auxiliary drive switches on immediately. The auxiliary drive that is already switched on does not switch off until the (negative) reversing time set in 0x405C:010 (P770.10) has elapsed. | 0x405C:010 (P770.10) < 0.0 s |

| Example of "Sequential transition" mode | |
|---|---|
|  | The example shows a sequential transition from auxiliary drive 1 to auxiliary drive 2.<br>• Auxiliary drive 1 is switched off after the operating time set in 0x405C:009 (P770.09).<br>• After the reversing time set in 0x405C:010 (P770.10) (e.g. 5 s) has elapsed, the transition to auxiliary drive 2 is executed.<br>• No further transitions are possible during the settling time set in 0x405C:005 (P770.05). |

### Basic settings

In the following description and in the parameter designations, the term "additional pump", which is more unambiguous for a pump cascade, is used instead of "auxiliary drive". Of course, the function can be used in the same way for a fan cascade.

Based on the default setting, we recommend the following proceeding:

1. Configuring the process controller 📖 112
2. Activate one or both additional pumps for the cascade function:
   - Activate additional 1: 0x2631:056 (P400.56) = "constant TRUE [1]"
   - Activate additional pump 2: 0x2631:057 (P400.57) = "constant TRUE [1]"
3. Configure control of the additional pumps via digital output 1 or the relay:
   - Digital output 1 switches additional pump 1: 0x2634:001 (P420.01) = "additional pump 1 [160]"
   - Digital output 1 switches additional pump 2: 0x2634:001 (P420.01) = "additional pump 2 [161]"
   - Relay switches additional pump 1: 0x2634:002 (P420.02) = "additional pump 1 [160]"
   - Relay switches additional pump 2: 0x2634:002 (P420.02) = "additional pump 2 [161]"
4. Set operating mode ("without ramp" or "with ramp") in 0x405C:001 (P770.01).
5. Set transition mode by setting the automatic reversing time in 0x405C:010 (P770.10).
6. Adjust other parameters of the function (start/stop frequency, delay time, settling time, frequency thresholds, etc.) according to the application.



### Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2631:056 (P400.56) | Function list: Assist pump 1<br>(Function list: Assist pump 1)<br>• Further possible settings: ▸ Trigger list 📖 59 | Assignment of a trigger to the "Additional pump 1" function.<br>Trigger = TRUE: Cascade function uses additional pump 1.<br>Trigger = FALSE: No action. |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:057 (P400.57) | Function list: Assist pump 2<br>(Function list: Assist pump 2)<br>• Further possible settings: ▸ Trigger list 📖 59 | Assignment of a trigger to the "Additional pump 2" function.<br>Trigger = TRUE: Cascade function uses additional pump 2.<br>Trigger = FALSE: No action. |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x2631:058 (P400.58) | Function list: Reset operating time<br>(Function list: Reset oper.time)<br>• Further possible settings: ▸ Trigger list 📖 59 | Assignment of a trigger to the "Reset power-on time" function.<br>Trigger = TRUE: Both counters for the power-on time of the additional pumps are reset to zero.<br>Trigger = FALSE: No action. |
| | **0** **Not connected** | No trigger assigned (trigger is constantly FALSE). |
| 0x405C:001 (P770.01) | Pump cascading: Operating mode<br>(Pump cascading: Operating mode) | Selection of the operating mode for the cascade function. |
| | **0** **Disabled** | Cascade function is deactivated. |
| | 1 Without ramp | After reaching the start or stop frequency, the cascade function has no influence on the frequency setpoint. |
| | 2 With ramp | After reaching the start or stop frequency, the cascade function leads the frequency setpoint via a ramp to the lower or upper frequency threshold, respectively.<br>The active auxiliary pump switches on/off:<br>• When the start or stop frequency is reached.<br>• When the delay time has elapsed. |
| 0x405C:002 (P770.02) | Pump cascading: Priority at startup<br>(Pump cascading: Prior.at startup) | |
| | 0 Assist pump 1 | |
| | **1** **By operating time** | The auxiliary pump with the fewest operating hours starts first. |
| 0x405C:003 (P770.03) | Pump cascading: Start frequency<br>(Pump cascading: Start frequency)<br>0.0 ... [**40.0**] ... 599.0 Hz | |
| 0x405C:004 (P770.04) | Pump cascading: Stop frequency<br>(Pump cascading: Stop frequency)<br>0.0 ... [**10.0**] ... 599.0 Hz | |
| 0x405C:005 (P770.05) | Pump cascading: Settling time<br>(Pump cascading: Settling time)<br>0.0 ... [**5.0**] ... 3600.0 s | |
| 0x405C:006 (P770.06) | Pump cascading: Delay time<br>(Pump cascading: Delay time)<br>0.0 ... [**2.0**] ... 3600.0 s | |
| 0x405C:007 (P770.07) | Pump cascading: Lower frequency threshold<br>(Pump cascading: Low F threshold)<br>0.0 ... [**20.0**] ... 599.0 Hz | |
| 0x405C:008 (P770.08) | Pump cascading: Upper frequency threshold<br>(Pump cascading: Up. F threshold)<br>0.0 ... [**30.0**] ... 599.0 Hz | |
| 0x405C:009 (P770.09) | Pump cascading: Automatic runtime<br>(Pump cascading: Auto runtime)<br>0 ... [**0**] ... 1000 h | |
| 0x405C:010 (P770.10) | Pump cascading: Automatic transition time<br>(Pump cascading: Auto trans.time)<br>-10.0 ... [**0.0**] ... 10.0 s | The reversing time also defines the transition mode:<br>• Reversing time = 0.0 s: Direct transition<br>• Reversing time > 0.0 s: Sequential transition<br>• Reversing time < 0.0 s: Overlapping transition |
| 0x405C:011 (P770.11) | Pump cascading: Reset operating time<br>(Pump cascading: Reset oper.time) | 1 = Both counters for the power-on time of the additional pumps are reset to zero. |
| | **0** **Disabled** | |
| | 1 Activate | |

| Address | Name / setting range / [default setting] | Information |
| --- | --- | --- |
| 0x405C:012<br>(P770.12) | Pump cascading: Status word<br>(Pump cascading: Status word)<br>• Read only | |
| | Bit 0 Assist pump 1 activated | Additional pump 1 was activated for the cascade function via 0x2631:056 (P400.56). |
| | Bit 1 Assist pump 2 activated | Additional pump 2 was activated for the cascade function via 0x2631:057 (P400.57). |
| | Bit 3 Assist pump 1 running | |
| | Bit 4 Assist pump 2 running | |
| | Bit 6 Start frequency reached | The start frequency set in 0x405C:003 (P770.03) has been reached. |
| | Bit 7 Stop frequency reached | The stop frequency set in 0x405C:004 (P770.04) has been reached. |
| | Bit 8 Cascading overload | The maximum frequency in 0x2916 (P211.00) has been reached and no free additional pump is available.<br>Associated error code: 65317 \| 0xFF25 |
| 0x405C:013<br>(P770.13) | Pump cascading: Operating time pump 1<br>(Pump cascading: Operatingtime p1)<br>• Read only: x s | |
| 0x405C:014<br>(P770.14) | Pump cascading: Operating time pump 2<br>(Pump cascading: Operatingtime p2)<br>• Read only: x s | |

# 15 Using accessories

## 15.1 Keypad

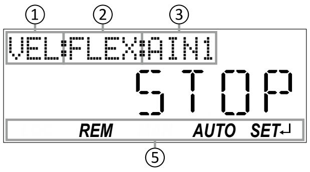
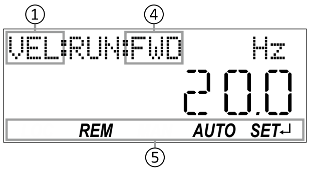
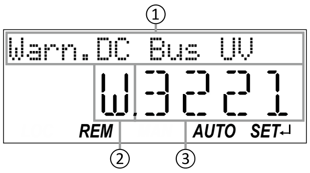
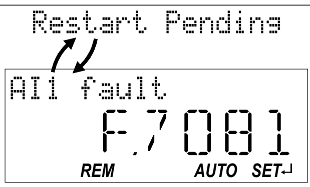
The keypad is an easy means for the local operation, parameterisation, and diagnostics of the inverter.

### 15.1.1 Keypad operating mode

After switching on the inverter, the keypad plugged in is in "Operating mode" after a short initialisation phase.

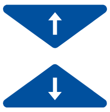
#### 15.1.1.1 Keypad status display

In the operating mode, the keypad displays information on the status of the inverter.

| Keypad display | Display | Meaning |
|---|---|---|
| If the inverter is inhibited, the keypad shows "STOP":<br><br>If the inverter is enabled, the keypad shows the output frequency of the inverter:<br><br>• In the process controller mode, instead of the output frequency, the process controller setpoint is displayed.<br>• The display can be configured in 0x2864 (P703.00).<br>• The language for the keypad display is preset to "English". The language can be changed in 0x2863 (P705.00). | ① Active control mode: | |
| | VEL | Speed mode |
| | PID | Process controller mode |
| | TRQ | Torque mode |
| | JOG | Manual mode |
| | ② Active control source: | |
| | FLEX | Flexible I/O configuration |
| | KPD | Keypad |
| | KPDF | Keypad (complete control via keypad including setpoint selection) |
| | NET | Network |
| | ③ Active setpoint source: | |
| | AINx | Analog input x |
| | KPD | Keypad |
| | NET | Network |
| | FREQ | Digital frequency |
| | PRx | Preset setpoint x |
| | SEGx | Segment x |
| | MOP | Motor potentiometer |
| | ④ Current direction of rotation: | |
| | FWD | Motor is rotating forwards |
| | REV | Motor is rotating backwards |
| | ⑤ Lower status line: | |
| | LOC | Local keypad control active. |
| | REM | Remote control via terminals, network, etc. active. |
| | MAN | Manual setpoint selection via keypad active. |
| | AUTO | Automatic setpoint selection via terminals, network, etc. active. |
| | SET | Blinking if one parameter setting has been changed but has not been saved in the memory module with mains failure protection.<br>Save settings: Press keypad enter key longer than 3 s. |
| If an error is pending, the keypad shows the following information:<br><br>• Faults (F) and trouble (T) are displayed continuously.<br>• Warnings (W) are only displayed every 2 seconds for a short time. | ① Error text | |
| | ② Error type: | |
| | F | Fault |
| | T | Trouble |
| | W | Warning |
| | ③ Error code (hexadecimal) | |
| | ▶ Error codes, causes and remedies 461<br>▶ Error handling 455<br>▶ Error reset with keypad 402 | |
|  | After a disturbance, a restart is possible if the error condition is not active anymore. The keypad shows this by the "Restart Pending" note. The note is displayed in a 1-second interval alternating with the error text.<br>▶ Automatic restart after a fault 361 | |

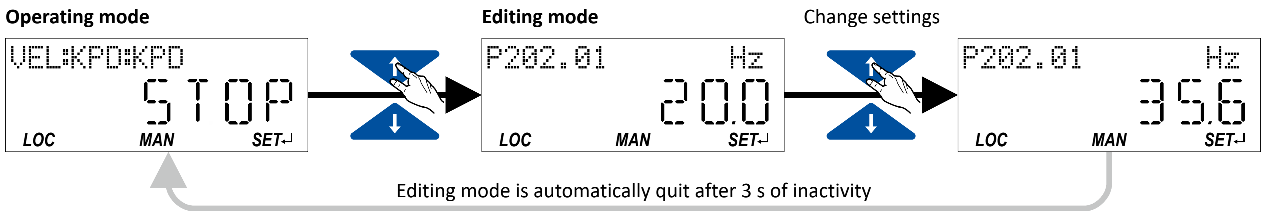
### 15.1.1.2 Function of keypad keys in operating mode

In the operating mode, the keypad can be used for local control and for manual setpoint selection.

| Function of keypad keys in operating mode | | | |
|---|---|---|---|
| **Key** | **Actuation** | **Condition** | **Action** |
|  | Briefly | Local keypad control active.<br>Display "LOC" | Run motor. |
| | | Remote control active<br>Display "REM"<br>Display "KSTOP" | Deactivate keypad triggered stop.<br>The motor remains at standstill.<br>Display changes from "KSTOP" to "STOP". |
|  | Briefly | No Jog operation | Stop motor.<br>Display "KSTOP" |
|  | Briefly | Operating mode | Change to parameterisation mode.<br>▸ Keypad parameterisation mode 📖 403 |
| | Longer than 3 s | None (anytime possible) | Save parameter settings in the user memory of the memory module. |
|  | Briefly | During operation | Scroll through information in the above status line. |
|  | Briefly | Manual setpoint selection via keypad active.<br>Display "MAN" | Change frequency setpoint. |
|  | Briefly | Operating mode | Activate full keypad control<br>Display "ON?" → Confirm with ↵<br>Control and setpoint selection can now only be carried out via keypad.<br>Renewed clicking: Exit full keypad control.<br>Display "OFF?" → Confirm with ↵<br>▸ Keypad full control 📖 53 |
|  | Briefly | Local keypad control active.<br>Display "LOC" | Reversal of rotation direction.<br>Display "REV?" → Confirm with ↵<br>▸ Configure R/F and CTRL keys 📖 426 |

**Example: Change setpoint**

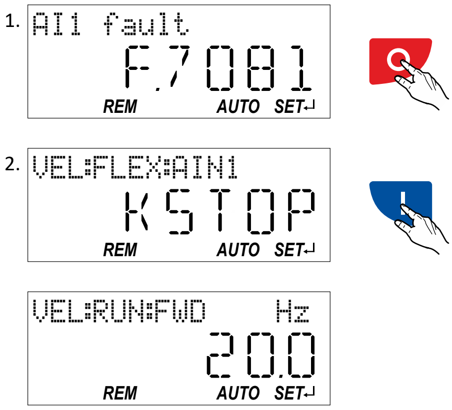
If the setpoints are selected manually via keypad, the frequency setpoint can be changed in the operating mode via the arrow keys (even while the motor is running):



### 15.1.1.3 Error reset with keypad

Use the keypad key to reset a resettable error if the error condition no longer exists and no blocking time is active.

- The "Error codes, causes and remedies" table gives the blocking time (if available) for each error. 461




1. Press keypad key.
   The error is reset. The motor remains stopped via keypad (display "KSTOP").
2. In order to cancel the stop via keypad again: Press keypad key.



### 15.1.2 Keypad parameterisation mode

In the parameterisation mode of the keypad you can have actual values of the inverter displayed for purposes of diagnostics and change settings of the inverter.

Use the to change from operating mode to the parameterisation mode.

- If a write access protection is active for the inverter, the keypad automatically displays a log-in when changing to the parameterisation mode. You can either skip the log-in and thus keep the access protection active or remove it temporarily by entering a valid PIN. ▶ Write access protection 351
- Use the to return to the operating mode.

#### 15.1.2.1 Parameter groups

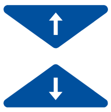
In order to provide for quick access, all parameters of the inverter are divided into different groups according to their function.

- Group 0 contains the configurable "Favorites". In the default setting these are the most common parameters for the solution of typical applications. ▶ Favorites 30
- Based on the hundreds digit of the display code (P**x**xx) you can quickly see in which group the parameter is to be found on the keypad:

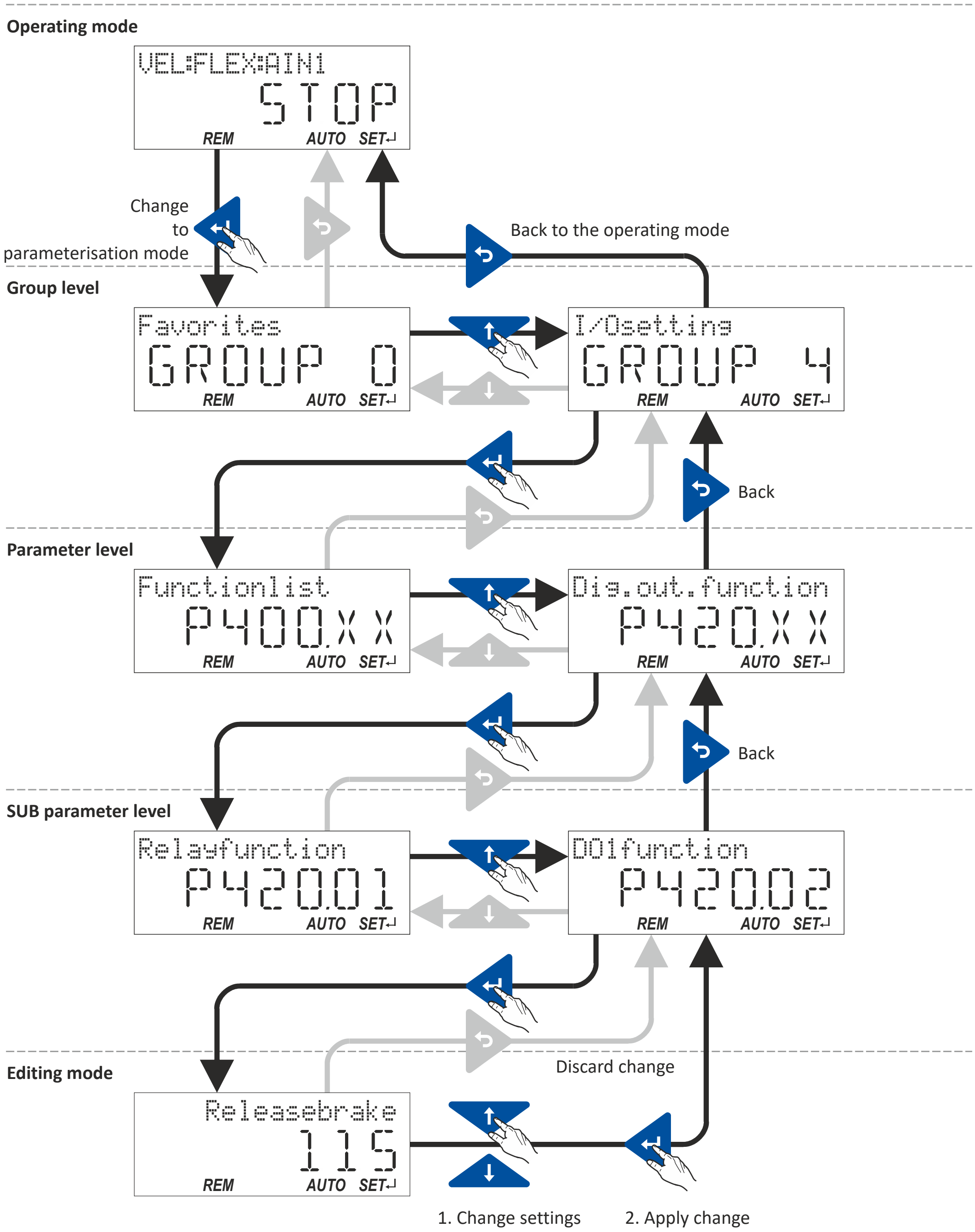
| Parameter | Group/name | Description |
|---|---|---|
| P**1**xx | Group 1 - Diagnostics | Diagnostic/display parameters for displaying device-internal process factors, current actual values, and status messages.<br>▶ Diagnostic parameters 444 |
| P**2**xx | Group 2 - Basic setting | Setting of the mains voltage, selection of the control and setpoint source, start and stop behavior, frequency limits and ramp times.<br>▶ Basic setting 36 |
| P**3**xx | Group 3 - Motor control | Configuration of the motor and motor control<br>▶ Configuring the motor control 160 |
| P**4**xx | Group 4 - I/O setting | Function assignment and configuration of the inputs and outputs<br>▶ Start, stop and rotating direction commands 49<br>▶ Configure digital inputs 237<br>▶ Configure analog inputs 240<br>▶ Configure digital outputs 247<br>▶ Configure analog outputs 253 |
| P**5**xx | Group 5 - Network setting | Configuration of the network (if available)<br>▶ Configuring the network 257 |
| P**6**xx | Group 6 - Process controller | Configuration of the process controller<br>▶ Configuring the process controller 112 |
| P**7**xx | Group 7 - Additional functions | Parameterisable additional functions<br>▶ Additional functions 367 |
| P**8**xx | Group 8 - Sequencer | The "sequencer" function serves to define a programmed sequence of speed setpoints, PID setpoints or torque setpoints for the motor control. Switching to the next setpoint can be executed in a time-based or event-based manner.<br>▶ Sequencer 87 |

### 15.1.2.2 Function of the keypad keys in the parameterisation mode

In the parameterisation mode of the keypad you can have actual values of the inverter displayed for purposes of diagnostics and change settings of the inverter.

| Function of the keypad keys in the parameterisation mode | | | |
|---|---|---|---|
| **Key** | **Actuation** | **Condition** | **Action** |
|   | Shortly | Local keypad control active.<br>Display "LOC" | Run motor. |
| | | Remote control active<br>Display "REM"<br>Display "KSTOP" | Deactivate keypad triggered stop.<br>The motor remains at standstill.<br>Display changes from "KSTOP" to "STOP". |
|   | Shortly | No Jog operation | Stop motor.<br>Display "KSTOP" |
|  | Shortly | Parameterisation mode | Navigate to one level below.<br>Group level → Parameter level → [SUB parameter level] → Editing mode |
| | | Editing mode | Exit editing mode and accept new setting. |
| | Longer than 3 s | None (anytime possible) | Save parameter settings in the user memory of the memory module. |
|  | Shortly | Parameterisation mode | Navigate to one level above.<br>[SUB parameter level] → Parameter level → Group level → Operating mode |
| | | Editing mode | Abort: Exit editing mode without accepting new setting. |
|  | Shortly | Group level/Parameter level | Navigate: Select group/parameter. |
| | | Editing mode | Change parameter setting. |
|   | | | Without function |
|   | | | Without function |

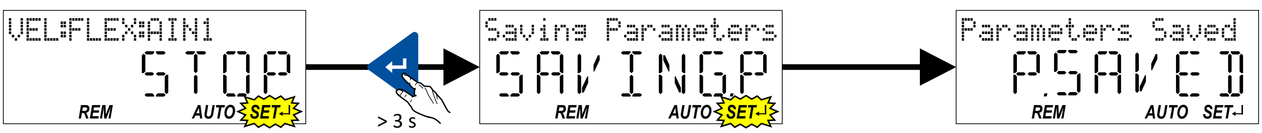
**Changing inverter settings by means of the keypad (general operation)**




### 15.1.2.3 Save parameter settings with keypad

If one parameter setting has been changed with the keypad but has not been saved in the memory module with mains failure protection, the SET display is blinking.

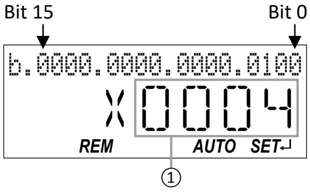
In order to save parameter settings in the user memory of the memory module, press and hold the enter key for longer than 3 s.



### 15.1.2.4 Display of status words on keypad

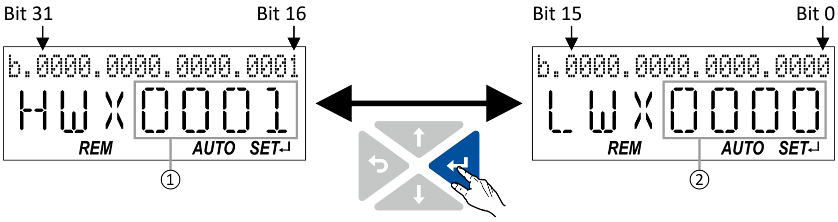
Some diagnostics parameters contain bit-coded status words. Each single bit has a certain meaning.

**Display of 16-bit status words on the keypad**




① Hexadecimal value

**Display of 32-bit status words on the keypad**




① Hexadecimal value High word (HW)
② Hexadecimal value Low word (LW)



### 15.1.2.5 Keypad parameter list

For commissioning or diagnostics using the keypad, all parameters of the inverter that can be accessed by means of the keypad are listed in the following "Keypad parameter list".

- The keypad parameter list is sorted in ascending order in compliance with the "display code" (Pxxx).
- In order to provide for quick access, all parameters of the inverter are divided into different groups according to their function. ▶ Parameter groups 📖 403
- Group 0 contains the configurable "Favorites". In the default setting these are the most common parameters for the solution of typical applications. ▶ Favorites 📖 30

A complete overview of all parameter indexes can be found in the annex in the Parameter attribute list. 📖 480

**Frequently used abbreviations in the short keypad designations of the parameters:**

| Abbreviation | Meaning |
|---|---|
| AI | Analog input |
| AO | Analog output |
| B0, B1, ... | Bit 0, bit 1, ... |
| CU | Control unit |
| DI | Digital input |
| DO | Digital output |
| LU | Undervoltage |
| MOP | Motor potentiometer |
| NET | Network |
| OU | Overvoltage |
| PID | Process controller |
| PU | Power unit |
| QSP | Quick stop |
| Setp | Setpoint |
| WD | Watchdog |

**How to read the keypad parameter list:**

| Column | Meaning |
|---|---|
| Display code | Parameter number on the keypad.<br>Format: Number.Subindex |
| Short designation | Short keypad designation limited to 16 characters. |
| Default setting | Default setting of the parameter. |
| Setting range | Possible setting range for the parameter.<br>Format: minimum value ... maximum value [unit] |
| Address | Address of the parameter in the object directory.<br>Format: Index:Subindex |
| Category | Functional assignment of the parameter, for example "motor control" or "CANopen". |

**Keypad parameter list (short overview of all parameters with display code)**

| Display code | Short designation | Default setting | Setting range | Address | Category |
|---|---|---|---|---|---|
| P100.00 | Inv. outp. freq. | x.x Hz | - (Read only) | 0x2DDD | general |
| P101.00 | Scaled act value | x Units | - (Read only) | 0x400D | general |
| P102.00 | Freq. setpoint | x.x Hz | - (Read only) | 0x2B0E | general |
| P103.00 | Actual current | x.x % | - (Read only) | 0x6078 | general |
| P104.00 | Motor current | x.x A | - (Read only) | 0x2D88 | general |
| P105.00 | DC-bus voltage | x V | - (Read only) | 0x2D87 | general |
| P106.00 | Motor voltage | x VAC | - (Read only) | 0x2D89 | general |
| P107.00 | Actual torque | x.x % | - (Read only) | 0x6077 | general |
| P108.xx | Output power | | | | |
| └ P108.01 | Effective power | x.xxx kW | - (Read only) | 0x2DA2:001 | general |
| * Default setting dependent on the model. | | | | | |

| Display code | Short designation | Default setting | Setting range | Address | Category |
|---|---|---|---|---|---|
| └ P108.02 | Apparent power | x.xxx kVA | - (Read only) | 0x2DA2:002 | general |
| P109.xx | Output energy | | | | |
| └ P109.01 | Motor | x.xx kWh | - (Read only) | 0x2DA3:001 | general |
| └ P109.02 | Generator | x.xx kWh | - (Read only) | 0x2DA3:002 | general |
| P110.xx | AI1 diagnostics | | | | |
| └ P110.01 | AI1 terminal % | x.x % | - (Read only) | 0x2DA4:001 | general |
| └ P110.02 | AI1 scaled freq. | x.x Hz | - (Read only) | 0x2DA4:002 | general |
| └ P110.03 | AI1 scaled PID | x.xx PID unit | - (Read only) | 0x2DA4:003 | general |
| └ P110.04 | AI1 scaled torq. | x.x % | - (Read only) | 0x2DA4:004 | general |
| └ P110.16 | AI1 status | - | - (Read only) | 0x2DA4:016 | general |
| P111.xx | AI2 diagnostics | | | | |
| └ P111.01 | AI2 terminal % | x.x % | - (Read only) | 0x2DA5:001 | general |
| └ P111.02 | AI2 scaled freq. | x.x Hz | - (Read only) | 0x2DA5:002 | general |
| └ P111.03 | AI2 scaled PID | x.xx PID unit | - (Read only) | 0x2DA5:003 | general |
| └ P111.04 | AI2 scaled torq. | x.x % | - (Read only) | 0x2DA5:004 | general |
| └ P111.16 | AI2 status | - | - (Read only) | 0x2DA5:016 | general |
| P112.xx | AO1 diagnostics | | | | |
| └ P112.01 | AO1 Voltage | x.xx V | - (Read only) | 0x2DAA:001 | general |
| └ P112.02 | AO1 Current | x.xx mA | - (Read only) | 0x2DAA:002 | general |
| P116.00 | Actual sw. freq. | - | - (Read only) | 0x293A | general |
| P117.xx | Heatsink temp. | | | | |
| └ P117.01 | Heatsink temp. | x.x °C | - (Read only) | 0x2D84:001 | general |
| P118.00 | Digital inputs | - | - (Read only) | 0x60FD | general |
| P119.00 | Keypad status | - | - (Read only) | 0x2DAC | general |
| P120.00 | Int. HW states | - | - (Read only) | 0x2DAD | general |
| P121.xx | PID diagnostics | | | | |
| └ P121.01 | PID setpoint | x.xx PID unit | - (Read only) | 0x401F:001 | general |
| └ P121.02 | PID process var. | x.xx PID unit | - (Read only) | 0x401F:002 | general |
| └ P121.03 | PID status | - | - (Read only) | 0x401F:003 | general |
| P123.00 | Mot. i2t utilis. | x % | - (Read only) | 0x2D4F | MCTRL |
| P125.xx | Inverter diag. | | | | |
| └ P125.01 | Active control | - | - (Read only) | 0x282B:001 | general |
| └ P125.02 | Active setpoint | - | - (Read only) | 0x282B:002 | general |
| └ P125.03 | Keypad LCD stat. | - | - (Read only) | 0x282B:003 | general |
| └ P125.04 | Drive mode | - | - (Read only) | 0x282B:004 | general |
| └ P125.05 | Netw. contr.reg. | - | - (Read only) | 0x282B:005 | general |
| └ P125.06 | Netw. setp.reg. | - | - (Read only) | 0x282B:006 | general |
| P126.xx | Status words | | | | |
| └ P126.01 | Cause of disable | - | - (Read only) | 0x282A:001 | general |
| └ P126.02 | Cause of QSP | - | - (Read only) | 0x282A:002 | general |
| └ P126.03 | Cause of stop | - | - (Read only) | 0x282A:003 | general |
| └ P126.05 | Device status | - | - (Read only) | 0x282A:005 | general |
| P135.xx | Device utilisat. | | | | |
| └ P135.04 | ixt utilisation | x % | - (Read only) | 0x2D40:004 | general |
| └ P135.05 | Error response | **Fault [3]** | Selection list | 0x2D40:005 | general |
| P140.xx | Sequencer diag | | | | |
| └ P140.01 | Active Step | - | - (Read only) | 0x2DAE:001 | Sequencer |
| └ P140.02 | StepTime elapsed | x.x s | - (Read only) | 0x2DAE:002 | Sequencer |
| └ P140.03 | StepTime remain | x.x s | - (Read only) | 0x2DAE:003 | Sequencer |
| └ P140.04 | Steps complete | - | - (Read only) | 0x2DAE:004 | Sequencer |
| └ P140.05 | Steps remain | - | - (Read only) | 0x2DAE:005 | Sequencer |
| └ P140.06 | Active sequence | - | - (Read only) | 0x2DAE:006 | Sequencer |
| └ P140.07 | Active segment | - | - (Read only) | 0x2DAE:007 | Sequencer |
| └ P140.08 | SeqTime remain % | x % | - (Read only) | 0x2DAE:008 | Sequencer |

* Default setting dependent on the model.

| Display code | Short designation | Default setting | Setting range | Address | Category |
|---|---|---|---|---|---|
| └ P140.09 | SeqTime remain | x.x s | - (Read only) | 0x2DAE:009 | Sequencer |
| P150.00 | Error code | - | - (Read only) | 0x603F | general |
| P151.xx | Life-diagnosis | | | | |
| └ P151.01 | Operating time | x s | - (Read only) | 0x2D81:001 | general |
| └ P151.02 | Power-on time | x s | - (Read only) | 0x2D81:002 | general |
| └ P151.03 | CU oper. time | x ns | - (Read only) | 0x2D81:003 | general |
| └ P151.04 | Switching cycles | - | - (Read only) | 0x2D81:004 | general |
| └ P151.05 | Relay cycles | - | - (Read only) | 0x2D81:005 | general |
| └ P151.06 | Short-circ.count | - | - (Read only) | 0x2D81:006 | general |
| └ P151.07 | Earthfault count | - | - (Read only) | 0x2D81:007 | general |
| └ P151.08 | Clamp active | - | - (Read only) | 0x2D81:008 | general |
| └ P151.09 | Fan oper. time | x s | - (Read only) | 0x2D81:009 | general |
| P155.xx | Fault memory | | | | |
| P155.00 | Error memory | - | - (Read only) | 0x2006:000 | general |
| P190.xx | Device data | | | | |
| └ P190.01 | Product code | - | - (Read only) | 0x2000:001 | general |
| └ P190.02 | Serial number | - | - (Read only) | 0x2000:002 | general |
| └ P190.04 | CU firmware ver. | - | - (Read only) | 0x2000:004 | general |
| └ P190.05 | CU firmware type | - | - (Read only) | 0x2000:005 | general |
| └ P190.06 | CU bootlder ver. | - | - (Read only) | 0x2000:006 | general |
| └ P190.07 | CU bootlder type | - | - (Read only) | 0x2000:007 | general |
| └ P190.08 | OBD version | - | - (Read only) | 0x2000:008 | general |
| └ P190.10 | PU firmware ver. | - | - (Read only) | 0x2000:010 | general |
| └ P190.11 | PU firmware type | - | - (Read only) | 0x2000:011 | general |
| └ P190.12 | PU bootlder ver. | - | - (Read only) | 0x2000:012 | general |
| └ P190.13 | PU bootlder type | - | - (Read only) | 0x2000:013 | general |
| └ P190.14 | Mod. firmware | - | - (Read only) | 0x2000:014 | general |
| └ P190.15 | Com. FW rev no. | - | - (Read only) | 0x2000:015 | general |
| └ P190.16 | ComBootlderRevNo | - | - (Read only) | 0x2000:016 | general |
| └ P190.17 | CU FW subtype | - | - (Read only) | 0x2000:017 | general |
| P191.00 | Device name | **"My Device"** | Text | 0x2001 | general |
| P197.00 | Protect. status | - | - (Read only) | 0x2040 | general |
| P198.00 | Status load. par | - | - (Read only) | 0x2827 | general |
| P200.00 | Control select. | **Flexible I/O [0]** | Selection list | 0x2824 | general |
| P201.xx | Stnd. setpoints | | | | |
| └ P201.01 | Freq. setp. src. | **Analog input 1 [2]** | Selection list | 0x2860:001 | general |
| └ P201.02 | PID setp. src. | **Keypad [1]** | Selection list | 0x2860:002 | general |
| └ P201.03 | Torque setp.src. | **Analog input 1 [2]** | Selection list | 0x2860:003 | general |
| P202.xx | Keypad setpoints | | | | |
| └ P202.01 | KP freq.setpoint | **20.0 Hz** | 0.0 ... 599.0 Hz | 0x2601:001 | general |
| └ P202.02 | KP PID setpoint | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x2601:002 | general |
| └ P202.03 | Torque setp. | **100.0 %** | -400.0 ... 400.0 % | 0x2601:003 | general |
| P203.xx | Start/stop confg | | | | |
| └ P203.01 | Start method | **Normal [0]** | Selection list | 0x2838:001 | MCTRL |
| └ P203.02 | Start at powerup | **Off [0]** | Selection list | 0x2838:002 | general |
| └ P203.03 | Stop method | **Standard ramp [1]** | Selection list | 0x2838:003 | general |
| P208.xx | Mains settings | | | | |
| └ P208.01 | Mains voltage | **230 Veff [0]** | Selection list | 0x2540:001 | general |
| └ P208.02 | LU warn. thresh. | **0 V** * | 0 ... 1000 V | 0x2540:002 | general |
| └ P208.03 | LU error thresh. | x V | - (Read only) | 0x2540:003 | general |
| └ P208.04 | LU reset thresh. | x V | - (Read only) | 0x2540:004 | general |
| └ P208.05 | OU warn. thresh. | **0 V** * | 0 ... 1000 V | 0x2540:005 | general |
| └ P208.06 | OU error thresh. | x V | - (Read only) | 0x2540:006 | general |
| └ P208.07 | OU reset thresh. | x V | - (Read only) | 0x2540:007 | general |
| * Default setting dependent on the model. | | | | | |

| Display code | Short designation | Default setting | Setting range | Address | Category |
|---|---|---|---|---|---|
| P210.00 | Min. frequency | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x2915 | general |
| P211.00 | Max. frequency | Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz** | 0.0 ... 599.0 Hz | 0x2916 | general |
| P220.00 | Accelerat.time 1 | **5.0 s** | 0.0 ... 3600.0 s | 0x2917 | general |
| P221.00 | Decelerat.time 1 | **5.0 s** | 0.0 ... 3600.0 s | 0x2918 | general |
| P222.00 | Accelerat.time 2 | **5.0 s** | 0.0 ... 3600.0 s | 0x2919 | general |
| P223.00 | Decelerat.time 2 | **5.0 s** | 0.0 ... 3600.0 s | 0x291A | general |
| P224.00 | Ramp 2 thresh. | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x291B | general |
| P225.00 | QSP dec. time | **1.0 s** | 0.0 ... 3600.0 s | 0x291C | general |
| P226.xx | S-ramp char. | | | | |
| └ P226.01 | Smoothing factor | **0.0 %** | 0.0 ... 100.0 % | 0x291E:001 | general |
| └ P226.03 | Stop threshold | **10.0 %** | 0.0 ... 100.0 % | 0x291E:003 | general |
| P230.xx | Optical tracking | | | | |
| └ P230.01 | Start detection | **Stop [0]** | Selection list | 0x2021:001 | general |
| └ P230.02 | Blink. duration | **5 s** | 0 ... 3600 s | 0x2021:002 | general |
| P300.00 | Motor ctrl mode | **VFC open loop [6]** | Selection list | 0x2C00 | MCTRL |
| P301.00 | Operation mode | **MS: Velocitymode [-2]** | Selection list | 0x6060 | MCTRL |
| P302.00 | V/f charac.shape | **Linear [0]** | Selection list | 0x2B00 | MCTRL |
| P303.xx | V/f shape data | | | | |
| └ P303.01 | Base voltage | **230 V** * | 0 ... 5000 V | 0x2B01:001 | MCTRL |
| └ P303.02 | Base frequency | Device for 50-Hz mains: **50 Hz** * Device for 60-Hz mains: **60 Hz** * | 0 ... 1500 Hz | 0x2B01:002 | MCTRL |
| └ P303.03 | Midpoint voltage | **0 V** | 0 ... 5000 V | 0x2B01:003 | MCTRL |
| └ P303.04 | Midpoint freq | **0 Hz** | 0 ... 1500 Hz | 0x2B01:004 | MCTRL |
| P304.00 | Limit. rotation | **Both rot. direct [1]** | Selection list | 0x283A | general |
| P305.00 | Switching freq. | **0** * | 1 ... 33 | 0x2939 | general |
| P306.xx | Inv. load char. | | | | |
| └ P306.01 | Duty selection | **Heavy Duty [0]** | Selection list | 0x2D43:001 | general |
| P308.xx | Motor overload | | | | |
| └ P308.01 | Max.load.for 60s | **150 %** | 30 ... 200 % | 0x2D4B:001 | MCTRL |
| └ P308.02 | Speed comp. | **On [0]** | Selection list | 0x2D4B:002 | MCTRL |
| └ P308.03 | Response | **Fault [3]** | Selection list | 0x2D4B:003 | general |
| P310.xx | Mot.phase.fail. | | | | |
| └ P310.01 | Response | **No response [0]** | Selection list | 0x2D45:001 | general |
| └ P310.02 | Current thresh. | **5.0 %** | 1.0 ... 25.0 % | 0x2D45:002 | MCTRL |
| └ P310.03 | Voltage thresh. | **10.0 V** | 0.0 ... 100.0 V | 0x2D45:003 | MCTRL |
| P315.xx | Slip compens. | | | | |
| └ P315.01 | Slip: gain | **100.00 %** | -200.00 ... 200.00 % | 0x2B09:001 | MCTRL |
| └ P315.02 | Filter time | **100 ms** | 1 ... 6000 ms | 0x2B09:002 | MCTRL |
| P316.xx | V/f boosts | | | | |
| └ P316.01 | Fixed V/f boost | **2.5 %** * | 0.0 ... 20.0 % | 0x2B12:001 | MCTRL |
| └ P316.02 | Dynam. V/f boost | **0.0 %** | 0.0 ... 20.0 % | 0x2B12:002 | general |
| P317.xx | Skip frequencies | | | | |
| └ P317.01 | Skip frequency 1 | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x291F:001 | general |
| └ P317.02 | Skip bandwidth 1 | **0.0 Hz** | 0.0 ... 10.0 Hz | 0x291F:002 | general |
| └ P317.03 | Skip frequency 2 | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x291F:003 | general |
| └ P317.04 | Skip bandwidth 2 | **0.0 Hz** | 0.0 ... 10.0 Hz | 0x291F:004 | general |
| └ P317.05 | Skip frequency 3 | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x291F:005 | general |
| └ P317.06 | Skip bandwidth 3 | **0.0 Hz** | 0.0 ... 10.0 Hz | 0x291F:006 | general |
| P318.xx | Oscillat. damp. | | | | |
| └ P318.01 | Gain | **150 %** | -400 ... 400 % | 0x2B0A:001 | MCTRL |
| * Default setting dependent on the model. | | | | | |



| Display code | Short designation | Default setting | Setting range | Address | Category |
|---|---|---|---|---|---|
| └ P318.02 | Filter time | **30 ms** | 1 ... 600 ms | 0x2B0A:002 | MCTRL |
| P319.00 | Field weak thold | **0.0 Hz** | -599.0 ... 599.0 Hz | 0x2B0C | MCTRL |
| P319.00 | Field weak thold | **-40.0 Hz** | -599.0 ... 599.0 Hz | 0x2B0C | MCTRL |
| P320.xx | Motor parameters | | | | |
| └ P320.04 | Rated speed | Device for 50-Hz mains: **1450 rpm** Device for 60-Hz mains: **1750 rpm** | 50 ... 50000 rpm | 0x2C01:004 | MCTRL |
| └ P320.05 | Rated frequency | Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz** | 1.0 ... 1000.0 Hz | 0x2C01:005 | MCTRL |
| └ P320.06 | Rated power | **0.25 kW** * | 0.00 ... 655.35 kW | 0x2C01:006 | MCTRL |
| └ P320.07 | Rated voltage | **230 V** * | 0 ... 65535 V | 0x2C01:007 | MCTRL |
| └ P320.08 | Cosine phi | **0.80** | 0.00 ... 1.00 | 0x2C01:008 | MCTRL |
| P322.00 | Max. motor speed | **6075 rpm** | 0 ... 480000 rpm | 0x6080 | MCTRL |
| P323.00 | Rated mot.curr. | **1.700 A** * | 0.001 ... 500.000 A | 0x6075 | MCTRL |
| P324.00 | Max. current | **200.0 %** | 0.0 ... 3000.0 % | 0x6073 | MCTRL |
| P325.00 | Rated mot torque | **1.650 Nm** * | 0.001 ... 4294967.295 Nm | 0x6076 | MCTRL |
| P326.00 | Max. torque | **250.0 %** | 0.0 ... 3000.0 % | 0x6072 | MCTRL |
| └ P327.04 | Identify mot. | **0** | 0 ... 1 | 0x2822:004 | general |
| └ P327.05 | Calibrate mot. | **0** | 0 ... 1 | 0x2822:005 | general |
| P329.xx | MaxTrq.Monitor | | | | |
| └ P329.01 | Response | **No response [0]** | Selection list | 0x2D67:001 | MCTRL |
| └ P329.02 | Triggering delay | **0.000 s** | 0.000 ... 10.000 s | 0x2D67:002 | MCTRL |
| P330.xx | VFC-ECO | | | | |
| └ P330.01 | Min. voltage | **20 %** | 20 ... 100 % | 0x2B0D:001 | MCTRL |
| └ P330.06 | Cos Phi actual | - | - (Read only) | 0x2B0D:006 | MCTRL |
| P332.xx | Speed controller | | | | |
| └ P332.01 | Gain | **0.00193 Nm/rpm** * | 0.00000 ... 20000.00000 Nm/rpm | 0x2900:001 | MCTRL |
| └ P332.02 | Reset time | **80.0 ms** * | 1.0 ... 6000.0 ms | 0x2900:002 | MCTRL |
| P333.xx | V/f Imax contr. | | | | |
| └ P333.01 | Gain | **0.284 Hz/A** * | 0.000 ... 1000.000 Hz/A | 0x2B08:001 | MCTRL |
| └ P333.02 | Reset time | **2.3 ms** * | 1.0 ... 2000.0 ms | 0x2B08:002 | MCTRL |
| P334.xx | Current contr. | | | | |
| └ P334.01 | Gain | **42.55 V/A** * | 0.00 ... 750.00 V/A | 0x2942:001 | MCTRL |
| └ P334.02 | Reset time | **4.50 ms** * | 0.01 ... 2000.00 ms | 0x2942:002 | MCTRL |
| P335.xx | Moment of inert. | | | | |
| └ P335.01 | Motor inertia | **3.70 kg cm²** * | 0.00 ... 20000000.00 kg cm² | 0x2910:001 | MCTRL |
| └ P335.02 | Scal load inert. | **0.00 kg cm²** | 0.00 ... 20000000.00 kg cm² | 0x2910:002 | MCTRL |
| P336.xx | Torque setpoint | | | | |
| └ P336.02 | Ramp time | **1.0 s** | 0.0 ... 60.0 s | 0x2948:002 | general |
| P337.xx | Trq. lim. source | | | | |
| └ P337.01 | Pos. torqlim src | **Max torque [0]** | Selection list | 0x2949:001 | general |
| └ P337.02 | Neg. torqlim src | **(-) Max torque [0]** | Selection list | 0x2949:002 | general |
| └ P337.03 | Act postorqlim | x.x % | - (Read only) | 0x2949:003 | general |
| └ P337.04 | Act negtorqlim | x.x % | - (Read only) | 0x2949:004 | general |
| P340.xx | Speed limitation | | | | |
| └ P340.01 | Upper limit | **0 vel. unit** | -2147483647 ... 2147483647 vel. unit | 0x2946:001 | general |
| └ P340.02 | Lower limit | **0 vel. unit** | -2147483647 ... 2147483647 vel. unit | 0x2946:002 | general |
| └ P340.03 | Uppspeed lim src | **Max. frequency [0]** | Selection list | 0x2946:003 | general |
| └ P340.04 | Lowspeed lim src | **(-) Max. freq. [0]** | Selection list | 0x2946:004 | general |
| * Default setting dependent on the model. | | | | | |

| Display code | Short designation | Default setting | Setting range | Address | Category |
|---|---|---|---|---|---|
| └ P340.05 | Upper freq.limit | Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz** | -1000.0 ... 1000.0 Hz | 0x2946:005 | general |
| └ P340.06 | Lower freq.limit | Device for 50-Hz mains: **-50.0 Hz** Device for 60-Hz mains: **-60.0 Hz** | -1000.0 ... 1000.0 Hz | 0x2946:006 | general |
| └ P340.07 | Act uppspeed lim | x.x Hz | - (Read only) | 0x2946:007 | general |
| └ P340.08 | Act lowspeed lim | x.x Hz | - (Read only) | 0x2946:008 | general |
| P350.xx | Overspeed monit. | | | | |
| └ P350.01 | Threshold | **8000 rpm** | 50 ... 50000 rpm | 0x2D44:001 | MCTRL |
| └ P350.02 | Response | **Fault [3]** | Selection list | 0x2D44:002 | general |
| P351.xx | ASM motor par. | | | | |
| └ P351.01 | Rotor resistance | **8.8944 Ω** * | 0.0000 ... 200.0000 Ω | 0x2C02:001 | MCTRL |
| └ P351.02 | Mutual induct. | **381.9 mH** * | 0.0 ... 50000.0 mH | 0x2C02:002 | MCTRL |
| └ P351.03 | Magn. current | **0.96 A** * | 0.00 ... 500.00 A | 0x2C02:003 | MCTRL |
| └ P351.04 | Slip frequency | x.x Hz | - (Read only) | 0x2C02:004 | MCTRL |
| P352.xx | PSM motor par. | | | | |
| └ P352.01 | BEMF constant | **41.8 V/1000rpm** | 0.0 ... 100000.0 V/1000rpm | 0x2C03:001 | MCTRL |
| └ P352.05 | D-axis Ld | **20.000 mH** * | 0.000 ... 500.000 mH | 0x2C03:005 | MCTRL |
| └ P352.06 | Q-axis Lq | **20.000 mH** * | 0.000 ... 500.000 mH | 0x2C03:006 | MCTRL |
| P353.xx | Overcurr. monit. | | | | |
| └ P353.01 | Threshold | **6.8 A** * | 0.0 ... 1000.0 A | 0x2D46:001 | MCTRL |
| └ P353.02 | Response | **Fault [3]** | Selection list | 0x2D46:002 | general |
| P354.00 | Voltage reserve | **5 %** | 0 ... 20 % | 0x29E4 | MCTRL |
| P400.xx | Function list | | | | |
| └ P400.01 | Enable inverter | **TRUE [1]** | Trigger list 🕮 59 | 0x2631:001 | general |
| └ P400.02 | Run | **Digital input 1 [11]** | Trigger list 🕮 59 | 0x2631:002 | general |
| └ P400.03 | Quick stop | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:003 | general |
| └ P400.04 | Reset fault | **Digital input 2 [12]** | Trigger list 🕮 59 | 0x2631:004 | general |
| └ P400.05 | DC braking | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:005 | general |
| └ P400.06 | Start forward | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:006 | general |
| └ P400.07 | Start reverse | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:007 | general |
| └ P400.08 | Run forward | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:008 | general |
| └ P400.09 | Run reverse | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:009 | general |
| └ P400.10 | Jog foward | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:010 | general |
| └ P400.11 | Jog reverse | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:011 | general |
| └ P400.12 | Keypad control | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:012 | general |
| └ P400.13 | Reverse rot.dir. | **Digital input 3 [13]** | Trigger list 🕮 59 | 0x2631:013 | general |
| └ P400.14 | Setp: AI1 | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:014 | general |
| └ P400.15 | Setp: AI2 | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:015 | general |
| └ P400.16 | Setp: Keypad | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:016 | general |
| └ P400.17 | Setp: Network | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:017 | general |
| └ P400.18 | Setp: Preset b0 | **Digital input 4 [14]** | Trigger list 🕮 59 | 0x2631:018 | general |
| └ P400.19 | Setp: Preset b1 | **Digital input 5 [15]** | Trigger list 🕮 59 | 0x2631:019 | general |
| └ P400.20 | Setp: Preset b2 | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:020 | general |
| └ P400.21 | Setp: Preset b3 | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:021 | general |
| └ P400.23 | MOP up | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:023 | general |
| └ P400.24 | MOP down | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:024 | general |
| └ P400.25 | Setp: MOP | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:025 | general |
| └ P400.26 | Setp: Segment b0 | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:026 | Sequencer |
| └ P400.27 | Setp: Segment b1 | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:027 | Sequencer |
| └ P400.28 | Setp: Segment b2 | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:028 | Sequencer |
| └ P400.29 | Setp: Segment b3 | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:029 | Sequencer |
| * Default setting dependent on the model. | | | | | |



| Display code | Short designation | Default setting | Setting range | Address | Category |
|---|---|---|---|---|---|
| └ P400.30 | Seq: Run/abort | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:030 | Sequencer |
| └ P400.31 | Seq: Start | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:031 | Sequencer |
| └ P400.32 | Seq: Next step | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:032 | Sequencer |
| └ P400.33 | Seq: Pause | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:033 | Sequencer |
| └ P400.34 | Seq: Suspense | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:034 | Sequencer |
| └ P400.35 | Seq: Stop | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:035 | Sequencer |
| └ P400.36 | Seq: Abort | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:036 | Sequencer |
| └ P400.37 | Network control | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:037 | general |
| └ P400.39 | Activ. ramp 2 | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:039 | general |
| └ P400.40 | Load param.set | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:040 | general |
| └ P400.41 | Sel. paramset b0 | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:041 | general |
| └ P400.42 | Sel. paramset b1 | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:042 | general |
| └ P400.43 | Fault 1 | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:043 | general |
| └ P400.44 | Fault 2 | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:044 | general |
| └ P400.45 | PID off | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:045 | general |
| └ P400.46 | PID output=0 | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:046 | general |
| └ P400.47 | PID-I inhibited | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:047 | general |
| └ P400.48 | PID-Inf ramp on | **TRUE [1]** | Trigger list 🕮 59 | 0x2631:048 | general |
| └ P400.49 | Open brake | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:049 | general |
| └ P400.50 | Seq: Select. b0 | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:050 | Sequencer |
| └ P400.51 | Seq: Select. b1 | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:051 | Sequencer |
| └ P400.52 | Seq: Select. b2 | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:052 | Sequencer |
| └ P400.53 | Seq: Select. b3 | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:053 | Sequencer |
| └ P400.54 | PosCounter reset | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:054 | general |
| └ P400.55 | Activ. UPS oper. | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:055 | general |
| └ P400.56 | Assist pump 1 | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:056 | |
| └ P400.57 | Assist pump 2 | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:057 | |
| └ P400.58 | Reset oper.time | **Not connected [0]** | Trigger list 🕮 59 | 0x2631:058 | |
| P410.xx | DI settings | | | | |
| └ P410.01 | Assertion level | **HIGH active [1]** | Selection list | 0x2630:001 | general |
| └ P410.02 | Input function | **Digital Input [0]** | Selection list | 0x2630:002 | general |
| P411.xx | DI inversion | | | | |
| └ P411.01 | DI1 inversion | **Not inverted [0]** | Selection list | 0x2632:001 | general |
| └ P411.02 | DI2 inversion | **Not inverted [0]** | Selection list | 0x2632:002 | general |
| └ P411.03 | DI3 inversion | **Not inverted [0]** | Selection list | 0x2632:003 | general |
| └ P411.04 | DI4 inversion | **Not inverted [0]** | Selection list | 0x2632:004 | general |
| └ P411.05 | DI5 inversion | **Not inverted [0]** | Selection list | 0x2632:005 | general |
| └ P411.06 | DI6 inversion | **Not inverted [0]** | Selection list | 0x2632:006 | Appl. I/O |
| └ P411.07 | DI7 inversion | **Not inverted [0]** | Selection list | 0x2632:007 | Appl. I/O |
| P412.00 | Freq. threshold | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x4005 | general |
| P413.00 | MOP startmode | **Last value [0]** | Selection list | 0x4003 | general |
| P414.xx | MOP start value | | | | |
| └ P414.01 | Frequency | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x4004:001 | general |
| └ P414.02 | PID value | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x4004:002 | general |
| └ P414.03 | Torque | **0.0 %** | 0.0 ... 1000.0 % | 0x4004:003 | general |
| P420.xx | Dig.out.function | | | | |
| └ P420.01 | Relay function | **Rdy for operat. [51]** | Selection list | 0x2634:001 | general |
| └ P420.02 | DO1 function | **Release brake [115]** | Selection list | 0x2634:002 | general |
| └ P420.10 | NetWordOUT1.00 | **Rdy for operat. [51]** | Selection list | 0x2634:010 | general |
| └ P420.11 | NetWordOUT1.01 | **Not connected [0]** | Selection list | 0x2634:011 | general |
| └ P420.12 | NetWordOUT1.02 | **Operat. enabled [52]** | Selection list | 0x2634:012 | general |
| └ P420.13 | NetWordOUT1.03 | **Fault [56]** | Selection list | 0x2634:013 | general |
| └ P420.14 | NetWordOUT1.04 | **Not connected [0]** | Selection list | 0x2634:014 | general |
| └ P420.15 | NetWordOUT1.05 | **Quick stop [54]** | Selection list | 0x2634:015 | general |
| * Default setting dependent on the model. | | | | | |

| Display code | Short designation | Default setting | Setting range | Address | Category |
|---|---|---|---|---|---|
| └ P420.16 | NetWordOUT1.06 | **Running [50]** | Selection list | 0x2634:016 | general |
| └ P420.17 | NetWordOUT1.07 | **Device warning [58]** | Selection list | 0x2634:017 | general |
| └ P420.18 | NetWordOUT1.08 | **Not connected [0]** | Selection list | 0x2634:018 | general |
| └ P420.19 | NetWordOUT1.09 | **Not connected [0]** | Selection list | 0x2634:019 | general |
| └ P420.20 | NetWordOUT1.10 | **Speed - setp=act [72]** | Selection list | 0x2634:020 | general |
| └ P420.21 | NetWordOUT1.11 | **At current limit [78]** | Selection list | 0x2634:021 | general |
| └ P420.22 | NetWordOUT1.12 | **Actual speed=0 [71]** | Selection list | 0x2634:022 | general |
| └ P420.23 | NetWordOUT1.13 | **Rot.dir.reversed [69]** | Selection list | 0x2634:023 | general |
| └ P420.24 | NetWordOUT1.14 | **Release brake [115]** | Selection list | 0x2634:024 | general |
| └ P420.25 | NetWordOUT1.15 | **Inv.dis.safety [55]** | Selection list | 0x2634:025 | general |
| P421.xx | DO inversion | | | | |
| └ P421.01 | Relay inverted | **Not inverted [0]** | Selection list | 0x2635:001 | general |
| └ P421.02 | DO1 inversion | **Not inverted [0]** | Selection list | 0x2635:002 | general |
| P430.xx | Analog input 1 | | | | |
| └ P430.01 | AI1 input range | **0 ... 10 VDC [0]** | Selection list | 0x2636:001 | general |
| └ P430.02 | AI1 freq @ min | **0.0 Hz** | -1000.0 ... 1000.0 Hz | 0x2636:002 | general |
| └ P430.03 | AI1 freq @ max | Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz** | -1000.0 ... 1000.0 Hz | 0x2636:003 | general |
| └ P430.04 | AI1 PID @ min | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x2636:004 | general |
| └ P430.05 | AI1 PID @ max | **100.00 PID unit** | -300.00 ... 300.00 PID unit | 0x2636:005 | general |
| └ P430.06 | AI1 filter time | **10 ms** | 0 ... 10000 ms | 0x2636:006 | general |
| └ P430.07 | AI1 dead band | **0.0 %** | 0.0 ... 100.0 % | 0x2636:007 | general |
| └ P430.08 | AI1 monit.level | **0.0 %** | -100.0 ... 100.0 % | 0x2636:008 | general |
| └ P430.09 | Monitoring cond. | **IN < threshold [0]** | Selection list | 0x2636:009 | general |
| └ P430.10 | AI1 error resp. | **Fault [3]** | Selection list | 0x2636:010 | general |
| └ P430.11 | Min. torque | **0.0 %** | -400.0 ... 400.0 % | 0x2636:011 | general |
| └ P430.12 | Max. torque | **100.0 %** | -400.0 ... 400.0 % | 0x2636:012 | general |
| P431.xx | Analog input 2 | | | | |
| └ P431.01 | AI2 input range | **0 ... 10 VDC [0]** | Selection list | 0x2637:001 | general |
| └ P431.02 | AI2 freq @ min | **0.0 Hz** | -1000.0 ... 1000.0 Hz | 0x2637:002 | general |
| └ P431.03 | AI2 freq @ max | Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz** | -1000.0 ... 1000.0 Hz | 0x2637:003 | general |
| └ P431.04 | AI2 PID @ min | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x2637:004 | general |
| └ P431.05 | AI2 PID @ max | **100.00 PID unit** | -300.00 ... 300.00 PID unit | 0x2637:005 | general |
| └ P431.06 | AI2 filter time | **10 ms** | 0 ... 10000 ms | 0x2637:006 | general |
| └ P431.07 | AI2 dead band | **0.0 %** | 0.0 ... 100.0 % | 0x2637:007 | general |
| └ P431.08 | AI2 monit.level | **0.0 %** | -100.0 ... 100.0 % | 0x2637:008 | general |
| └ P431.09 | Monitoring cond. | **IN < threshold [0]** | Selection list | 0x2637:009 | general |
| └ P431.10 | AI2 error resp. | **Fault [3]** | Selection list | 0x2637:010 | general |
| └ P431.11 | Min. torque | **0.0 %** | -400.0 ... 400.0 % | 0x2637:011 | general |
| └ P431.12 | Max. torque | **100.0 %** | -400.0 ... 400.0 % | 0x2637:012 | general |
| P440.xx | Analog output 1 | | | | |
| └ P440.01 | AO1 outp. range | **0 ... 10 VDC [1]** | Selection list | 0x2639:001 | general |
| └ P440.02 | AO1 function | **Outp. frequency [1]** | Selection list | 0x2639:002 | general |
| └ P440.03 | AO1 min. signal | **0** | -2147483648 ... 2147483647 | 0x2639:003 | general |
| └ P440.04 | AO1 max. signal | **1000** | -2147483648 ... 2147483647 | 0x2639:004 | general |
| P450.xx | Freq. presets | | | | |
| └ P450.01 | Freq. preset 1 | **20.0 Hz** | 0.0 ... 599.0 Hz | 0x2911:001 | general |
| └ P450.02 | Freq. preset 2 | **40.0 Hz** | 0.0 ... 599.0 Hz | 0x2911:002 | general |
| * Default setting dependent on the model. | | | | | |



| Display code | Short designation | Default setting | Setting range | Address | Category |
|---|---|---|---|---|---|
| └ P450.03 | Freq. preset 3 | Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz** | 0.0 ... 599.0 Hz | 0x2911:003 | general |
| └ P450.04 | Freq. preset 4 | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x2911:004 | general |
| └ P450.05 | Freq. preset 5 | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x2911:005 | general |
| └ P450.06 | Freq. preset 6 | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x2911:006 | general |
| └ P450.07 | Freq. preset 7 | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x2911:007 | general |
| └ P450.08 | Freq. preset 8 | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x2911:008 | general |
| └ P450.09 | Freq. preset 9 | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x2911:009 | general |
| └ P450.10 | Freq. preset 10 | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x2911:010 | general |
| └ P450.11 | Freq. preset 11 | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x2911:011 | general |
| └ P450.12 | Freq. preset 12 | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x2911:012 | general |
| └ P450.13 | Freq. preset 13 | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x2911:013 | general |
| └ P450.14 | Freq. preset 14 | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x2911:014 | general |
| └ P450.15 | Freq. preset 15 | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x2911:015 | general |
| P451.xx | PID presets | | | | |
| └ P451.01 | PID preset 1 | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x4022:001 | general |
| └ P451.02 | PID preset 2 | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x4022:002 | general |
| └ P451.03 | PID preset 3 | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x4022:003 | general |
| └ P451.04 | PID preset 4 | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x4022:004 | general |
| └ P451.05 | PID preset 5 | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x4022:005 | general |
| └ P451.06 | PID preset 6 | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x4022:006 | general |
| └ P451.07 | PID preset 7 | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x4022:007 | general |
| └ P451.08 | PID preset 8 | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x4022:008 | general |
| P452.xx | Torque presets | | | | |
| └ P452.01 | Torque preset 1 | **100.0 %** | -400.0 ... 400.0 % | 0x2912:001 | general |
| └ P452.02 | Torque preset 2 | **100.0 %** | -400.0 ... 400.0 % | 0x2912:002 | general |
| └ P452.03 | Torque preset 3 | **100.0 %** | -400.0 ... 400.0 % | 0x2912:003 | general |
| └ P452.04 | Torque preset 4 | **100.0 %** | -400.0 ... 400.0 % | 0x2912:004 | general |
| └ P452.05 | Torque preset 5 | **100.0 %** | -400.0 ... 400.0 % | 0x2912:005 | general |
| └ P452.06 | Torque preset 6 | **100.0 %** | -400.0 ... 400.0 % | 0x2912:006 | general |
| └ P452.07 | Torque preset 7 | **100.0 %** | -400.0 ... 400.0 % | 0x2912:007 | general |
| └ P452.08 | Torque preset 8 | **100.0 %** | -400.0 ... 400.0 % | 0x2912:008 | general |
| P500.xx | Module ID | | | | |
| └ P500.01 | Active module ID | - | - (Read only) | 0x231F:001 | general |
| └ P500.02 | Module ID conn. | - | - (Read only) | 0x231F:002 | general |
| P505.xx | NetWordIN1 fct. | | | | |
| └ P505.01 | NetWordIN1.00 | **Not active [0]** | Selection list | 0x400E:001 | general |
| └ P505.02 | NetWordIN1.01 | **Not active [0]** | Selection list | 0x400E:002 | general |
| └ P505.03 | NetWordIN1.02 | **Quick stop [3]** | Selection list | 0x400E:003 | general |
| └ P505.04 | NetWordIN1.03 | **Not active [0]** | Selection list | 0x400E:004 | general |
| └ P505.05 | NetWordIN1.04 | **Run forward [8]** | Selection list | 0x400E:005 | general |
| └ P505.06 | NetWordIN1.05 | **Setp: Preset b0 [18]** | Selection list | 0x400E:006 | general |
| └ P505.07 | NetWordIN1.06 | **Setp: Preset b1 [19]** | Selection list | 0x400E:007 | general |
| └ P505.08 | NetWordIN1.07 | **Reset error [4]** | Selection list | 0x400E:008 | general |
| └ P505.09 | NetWordIN1.08 | **Not active [0]** | Selection list | 0x400E:009 | general |
| └ P505.10 | NetWordIN1.09 | **DC braking [5]** | Selection list | 0x400E:010 | general |
| └ P505.11 | NetWordIN1.10 | **Not active [0]** | Selection list | 0x400E:011 | general |
| └ P505.12 | NetWordIN1.11 | **Not active [0]** | Selection list | 0x400E:012 | general |
| └ P505.13 | NetWordIN1.12 | **Reverse rot.dir. [13]** | Selection list | 0x400E:013 | general |
| └ P505.14 | NetWordIN1.13 | **Not active [0]** | Selection list | 0x400E:014 | general |
| └ P505.15 | NetWordIN1.14 | **Not active [0]** | Selection list | 0x400E:015 | general |
| └ P505.16 | NetWordIN1.15 | **Not active [0]** | Selection list | 0x400E:016 | general |
| * Default setting dependent on the model. | | | | | |

| Display code | Short designation | Default setting | Setting range | Address | Category |
|---|---|---|---|---|---|
| P508.00 | CANopen comm. | **No action [0]** | Selection list | 0x2300 | CANopen |
| P508.00 | Modbus comm. | **No action [0]** | Selection list | 0x2320 | Modbus RTU |
| P510.xx | CANopen sett. | | | | |
| └ P510.01 | Node ID | **1** | 1 ... 127 | 0x2301:001 | CANopen |
| └ P510.02 | Baud rate | **500 kbps [5]** | Selection list | 0x2301:002 | CANopen |
| └ P510.03 | Slave/Master | **Slave [0]** | Selection list | 0x2301:003 | CANopen |
| └ P510.04 | Start rem. delay | **3000 ms** | 0 ... 65535 ms | 0x2301:004 | CANopen |
| └ P510.05 | SDO2 channel | **Not active [0]** | Selection list | 0x2301:005 | CANopen |
| └ P510.06 | COB-IDConfig PDO | **Base + node-ID [0]** | Selection list | 0x2301:006 | CANopen |
| └ P510.07 | COB-IDConfigSDO2 | **Freely config. [1]** | Selection list | 0x2301:007 | CANopen |
| P510.xx | Modbus sett. | | | | |
| └ P510.01 | Node ID | **1** | 1 ... 247 | 0x2321:001 | Modbus RTU |
| └ P510.02 | Baud rate | **Automatic [0]** | Selection list | 0x2321:002 | Modbus RTU |
| └ P510.03 | Data format | **Automatic [0]** | Selection list | 0x2321:003 | Modbus RTU |
| └ P510.04 | Min. resp. time | **0 ms** | 0 ... 1000 ms | 0x2321:004 | Modbus RTU |
| P511.xx | CANopen diag. | | | | |
| └ P511.01 | Active node ID | - | - (Read only) | 0x2302:001 | CANopen |
| └ P511.02 | Active baud rate | - | - (Read only) | 0x2302:002 | CANopen |
| P511.xx | Modbus diag. | | | | |
| └ P511.01 | Active node ID | - | - (Read only) | 0x2322:001 | Modbus RTU |
| └ P511.02 | Active baud rate | - | - (Read only) | 0x2322:002 | Modbus RTU |
| └ P511.03 | Data format | - | - (Read only) | 0x2322:003 | Modbus RTU |
| P515.00 | Time-out status | - | - (Read only) | 0x2307 | CANopen |
| P515.xx | Modbus monit. | | | | |
| └ P515.01 | Resp. Time-out | **Fault [3]** | Selection list | 0x2858:001 | Modbus RTU |
| └ P515.02 | Time-out time | **2.0 s** | 0.0 ... 300.0 s | 0x2858:002 | Modbus RTU |
| P516.00 | CANopen status | - | - (Read only) | 0x2308 | CANopen |
| P517.00 | CAN contr.status | - | - (Read only) | 0x2309 | CANopen |
| P518.00 | CAN errorcounter | - | - (Read only) | 0x230B | CANopen |
| P520.xx | Cons. heartbeat | | | | |
| P520.00 | Highest subindex | - | - (Read only) | 0x1016:000 | CANopen |
| └ P520.01 | Cons. heartbeat1 | **0x00000000** | 0x00000000 ... 0x00FFFFFF | 0x1016:001 | CANopen |
| └ P520.02 | Cons. heartbeat2 | **0x00000000** | 0x00000000 ... 0x00FFFFFF | 0x1016:002 | CANopen |
| └ P520.03 | Cons. heartbeat3 | **0x00000000** | 0x00000000 ... 0x00FFFFFF | 0x1016:003 | CANopen |
| └ P520.04 | Cons. heartbeat4 | **0x00000000** | 0x00000000 ... 0x00FFFFFF | 0x1016:004 | CANopen |
| P522.00 | Prod. heartbeat | **0 ms** | 0 ... 65535 ms | 0x1017 | CANopen |
| P530.xx | Para. mapping | | | | |
| └ P530.01 ... 24 | Parameter 1 ... Parameter 24 | **0x00000000** | 0x00000000 ... 0xFFFFFF00 | 0x232B:001 ... 0x232B:024 | Modbus RTU |
| P531.xx | Reg. assigned | | | | |
| └ P531.01 ... 24 | Register 1 ... Register 24 | - | - (Read only) | 0x232C:001 ... 0x232C:024 | Modbus RTU |
| P532.00 | Verificationcode | - | - (Read only) | 0x232D | Modbus RTU |
| P540.xx | RPDO1 config. | | | | |
| └ P540.01 | COB-ID | **0x00000200** | 0x00000000 ... 0xFFFFFFFF | 0x1400:001 | CANopen |
| └ P540.02 | Transm. type | **255** | 0 ... 255 | 0x1400:002 | CANopen |
| └ P540.05 | Event timer | **100 ms** | 0 ... 65535 ms | 0x1400:005 | CANopen |
| P541.xx | RPDO2 config. | | | | |
| └ P541.01 | COB-ID | **0x80000300** | 0x00000000 ... 0xFFFFFFFF | 0x1401:001 | CANopen |
| └ P541.02 | Transm. type | **255** | 0 ... 255 | 0x1401:002 | CANopen |
| └ P541.05 | Event timer | **100 ms** | 0 ... 65535 ms | 0x1401:005 | CANopen |
| P542.xx | RPDO3 config. | | | | |
| └ P542.01 | COB-ID | **0x80000400** | 0x00000000 ... 0xFFFFFFFF | 0x1402:001 | CANopen |
| └ P542.02 | Transm. type | **255** | 0 ... 255 | 0x1402:002 | CANopen |
| * Default setting dependent on the model. | | | | | |



| Display code | Short designation | Default setting | Setting range | Address | Category |
|---|---|---|---|---|---|
| └ P542.05 | Event timer | **100 ms** | 0 ... 65535 ms | 0x1402:005 | CANopen |
| P550.xx | TPDO1 config. | | | | |
| └ P550.01 | COB-ID | **0x40000180** | 0x00000001 ... 0xFFFFFFFF | 0x1800:001 | CANopen |
| └ P550.02 | Transm. type | **255** | 0 ... 255 | 0x1800:002 | CANopen |
| └ P550.03 | Inhibit time | **0.0 ms** | 0.0 ... 6553.5 ms | 0x1800:003 | CANopen |
| └ P550.05 | Event timer | **20 ms** | 0 ... 65535 ms | 0x1800:005 | CANopen |
| P551.xx | TPDO2 config. | | | | |
| └ P551.01 | COB-ID | **0xC0000280** | 0x00000001 ... 0xFFFFFFFF | 0x1801:001 | CANopen |
| └ P551.02 | Transm. type | **255** | 0 ... 255 | 0x1801:002 | CANopen |
| └ P551.03 | Inhibit time | **0.0 ms** | 0.0 ... 6553.5 ms | 0x1801:003 | CANopen |
| └ P551.05 | Event timer | **0 ms** | 0 ... 65535 ms | 0x1801:005 | CANopen |
| P552.xx | TPDO3 config. | | | | |
| └ P552.01 | COB-ID | **0xC0000380** | 0x00000001 ... 0xFFFFFFFF | 0x1802:001 | CANopen |
| └ P552.02 | Transm. type | **255** | 0 ... 255 | 0x1802:002 | CANopen |
| └ P552.03 | Inhibit time | **0.0 ms** | 0.0 ... 6553.5 ms | 0x1802:003 | CANopen |
| └ P552.05 | Event timer | **0 ms** | 0 ... 65535 ms | 0x1802:005 | CANopen |
| P580.xx | CAN statistics | | | | |
| └ P580.01 | PDO1 received | - | - (Read only) | 0x230A:001 | CANopen |
| └ P580.02 | PDO2 received | - | - (Read only) | 0x230A:002 | CANopen |
| └ P580.03 | PDO3 received | - | - (Read only) | 0x230A:003 | CANopen |
| └ P580.05 | PDO1 transmitted | - | - (Read only) | 0x230A:005 | CANopen |
| └ P580.06 | PDO2 transmitted | - | - (Read only) | 0x230A:006 | CANopen |
| └ P580.07 | PDO3 transmitted | - | - (Read only) | 0x230A:007 | CANopen |
| └ P580.09 | SDO1 counter | - | - (Read only) | 0x230A:009 | CANopen |
| └ P580.10 | SDO2 counter | - | - (Read only) | 0x230A:010 | CANopen |
| P580.xx | Modbus statistic | | | | |
| └ P580.01 | Mess. received | - | - (Read only) | 0x232A:001 | Modbus RTU |
| └ P580.02 | Val. mess. rec. | - | - (Read only) | 0x232A:002 | Modbus RTU |
| └ P580.03 | Mess. w. exc. | - | - (Read only) | 0x232A:003 | Modbus RTU |
| └ P580.04 | Mess. w. errors | - | - (Read only) | 0x232A:004 | Modbus RTU |
| └ P580.05 | Messages sent | - | - (Read only) | 0x232A:005 | Modbus RTU |
| P583.xx | Rx data diagn. | | | | |
| └ P583.01 | Rx data offset | **0** | 0 ... 240 | 0x232E:001 | Modbus RTU |
| └ P583.02 | Last RxD byte0 | - | - (Read only) | 0x232E:002 | Modbus RTU |
| └ P583.03 | Last RxD byte1 | - | - (Read only) | 0x232E:003 | Modbus RTU |
| └ P583.04 | Last RxD byte2 | - | - (Read only) | 0x232E:004 | Modbus RTU |
| └ P583.05 | Last RxD byte3 | - | - (Read only) | 0x232E:005 | Modbus RTU |
| └ P583.06 | Last RxD byte4 | - | - (Read only) | 0x232E:006 | Modbus RTU |
| └ P583.07 | Letzt RxD-Byte5 | - | - (Read only) | 0x232E:007 | Modbus RTU |
| └ P583.08 | Last RxD byte6 | - | - (Read only) | 0x232E:008 | Modbus RTU |
| └ P583.09 | Last RxD byte7 | - | - (Read only) | 0x232E:009 | Modbus RTU |
| └ P583.10 | Last RxD byte8 | - | - (Read only) | 0x232E:010 | Modbus RTU |
| └ P583.11 | Last RxD byte9 | - | - (Read only) | 0x232E:011 | Modbus RTU |
| └ P583.12 | Last RxD byte10 | - | - (Read only) | 0x232E:012 | Modbus RTU |
| └ P583.13 | Last RxD byte11 | - | - (Read only) | 0x232E:013 | Modbus RTU |
| └ P583.14 | Last RxD byte12 | - | - (Read only) | 0x232E:014 | Modbus RTU |
| └ P583.15 | Last RxD byte13 | - | - (Read only) | 0x232E:015 | Modbus RTU |
| └ P583.16 | Last RxD byte14 | - | - (Read only) | 0x232E:016 | Modbus RTU |
| └ P583.17 | Last RxD byte15 | - | - (Read only) | 0x232E:017 | Modbus RTU |
| P585.xx | Tx data diagn. | | | | |
| └ P585.01 | Tx data offset | **0** | 0 ... 240 | 0x232F:001 | Modbus RTU |
| └ P585.02 | Last TxD byte0 | - | - (Read only) | 0x232F:002 | Modbus RTU |
| └ P585.03 | Last TxD Byte1 | - | - (Read only) | 0x232F:003 | Modbus RTU |
| └ P585.04 | Last TxD byte2 | - | - (Read only) | 0x232F:004 | Modbus RTU |
| * Default setting dependent on the model. | | | | | |

| Display code | Short designation | Default setting | Setting range | Address | Category |
|---|---|---|---|---|---|
| └ P585.05 | Last TxD byte3 | - | - (Read only) | 0x232F:005 | Modbus RTU |
| └ P585.06 | Last TxD byte4 | - | - (Read only) | 0x232F:006 | Modbus RTU |
| └ P585.07 | Last TxD byte5 | - | - (Read only) | 0x232F:007 | Modbus RTU |
| └ P585.08 | Last TxD byte6 | - | - (Read only) | 0x232F:008 | Modbus RTU |
| └ P585.09 | Last TxD byte7 | - | - (Read only) | 0x232F:009 | Modbus RTU |
| └ P585.10 | Last TxD byte8 | - | - (Read only) | 0x232F:010 | Modbus RTU |
| └ P585.11 | Last TxD byte9 | - | - (Read only) | 0x232F:011 | Modbus RTU |
| └ P585.12 | Last TxD byte10 | - | - (Read only) | 0x232F:012 | Modbus RTU |
| └ P585.13 | Last TxD byte11 | - | - (Read only) | 0x232F:013 | Modbus RTU |
| └ P585.14 | Last TxD byte12 | - | - (Read only) | 0x232F:014 | Modbus RTU |
| └ P585.15 | Last TxD byte13 | - | - (Read only) | 0x232F:015 | Modbus RTU |
| └ P585.16 | Last TxD byte14 | - | - (Read only) | 0x232F:016 | Modbus RTU |
| └ P585.17 | Last TxD byte15 | - | - (Read only) | 0x232F:017 | Modbus RTU |
| P590.xx | NetWordINx | | | | |
| └ P590.01 | NetWordIN1 | **0x0000** | 0x0000 ... 0xFFFF | 0x4008:001 | general |
| └ P590.02 | NetWordIN2 | **0x0000** | 0x0000 ... 0xFFFF | 0x4008:002 | general |
| └ P590.03 | NetWordIN3 | **0.0 %** | 0.0 ... 100.0 % | 0x4008:003 | general |
| └ P590.04 | NetWordIN4 | **0.0 %** | 0.0 ... 100.0 % | 0x4008:004 | general |
| └ P590.05 | NetWordIN5 | **0.0 %** | -100.0 ... 100.0 % | 0x4008:005 | general |
| P591.xx | NetWordOUTx | | | | |
| └ P591.01 | NetWordOUT1 | - | - (Read only) | 0x400A:001 | general |
| └ P591.02 | NetWordOUT2 | - | - (Read only) | 0x400A:002 | general |
| P592.xx | Process data IN | | | | |
| └ P592.01 | AC control word | **0x0000** | 0x0000 ... 0xFFFF | 0x400B:001 | general |
| └ P592.02 | LECOM ctrl word | **0x0000** | 0x0000 ... 0xFFFF | 0x400B:002 | general |
| └ P592.03 | Net.freq. 0.1 | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x400B:003 | general |
| └ P592.04 | Net.setp. speed | **0 rpm** | 0 ... 50000 rpm | 0x400B:004 | general |
| └ P592.05 | Net.freq. 0.01 | **0.00 Hz** | 0.00 ... 599.00 Hz | 0x400B:005 | general |
| └ P592.06 | Veloc. mode setp | **0.0 Hz** | -599.0 ... 599.0 Hz | 0x400B:006 | general |
| └ P592.07 | PID setpoint | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x400B:007 | general |
| └ P592.08 | Torque mode setp | **0 Nm** | -32768 ... 32767 Nm | 0x400B:008 | general |
| └ P592.09 | Torque scaling | **0** | -128 ... 127 | 0x400B:009 | general |
| └ P592.11 | PID feedback | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x400B:011 | general |
| └ P592.12 | NetSetfreq0.02Hz | **0 Hz** | -29950 ... 29950 Hz | 0x400B:012 | general |
| └ P592.13 | N.FrqSet+/-16384 | **0** | -16384 ... 16384 | 0x400B:013 | general |
| P593.xx | Process data OUT | | | | |
| └ P593.01 | AC status word | - | - (Read only) | 0x400C:001 | general |
| └ P593.02 | LECOM stat. word | - | - (Read only) | 0x400C:002 | general |
| └ P593.03 | Frequency (0.1) | x.x Hz | - (Read only) | 0x400C:003 | general |
| └ P593.04 | Motor speed | x rpm | - (Read only) | 0x400C:004 | general |
| └ P593.05 | Drive status | - | - (Read only) | 0x400C:005 | general |
| └ P593.06 | Frequency 0.01 | x.xx Hz | - (Read only) | 0x400C:006 | general |
| └ P593.07 | Torque scaled | - | - (Read only) | 0x400C:007 | general |
| └ P593.08 | Frequency 0.02Hz | Hz | - (Read only) | 0x400C:008 | general |
| └ P593.09 | Freq. [+/-16384] | - | - (Read only) | 0x400C:009 | general |
| P595.xx | PAM monitoring | | | | |
| └ P595.02 | Keep alive reg. | **0** | 0 ... 65535 | 0x2552:002 | general |
| └ P595.03 | Time-out time | **10.0 s** | 0.0 ... 6553.5 s | 0x2552:003 | general |
| └ P595.04 | Reaction | **No response [0]** | Selection list | 0x2552:004 | general |
| └ P595.05 | Action | **No action [0]** | Selection list | 0x2552:005 | general |
| └ P595.06 | PAM status | - | - (Read only) | 0x2552:006 | general |
| └ P595.07 | WLAN reset t.out | **0 s** | 0 ... 65535 s | 0x2552:007 | general |
| P600.xx | PID setup | | | | |
| └ P600.01 | Operating mode | **Inhibited [0]** | Selection list | 0x4020:001 | general |
| * Default setting dependent on the model. | | | | | |



| Display code | Short designation | Default setting | Setting range | Address | Category |
|---|---|---|---|---|---|
| └ P600.02 | PID process var. | **Analog input 1 [1]** | Selection list | 0x4020:002 | general |
| └ P600.03 | PID speed range | **100 %** | 0 ... 100 % | 0x4020:003 | general |
| └ P600.04 | PID line speed | **w/o speed.add. [0]** | Selection list | 0x4020:004 | general |
| └ P600.05 | Min speed lim | **-100.0 %** | -100.0 ... 100.0 % | 0x4020:005 | general |
| └ P600.06 | Max speed lim | **100.0 %** | -100.0 ... 100.0 % | 0x4020:006 | general |
| P601.00 | PID P-component | **5.0 %** | 0.0 ... 1000.0 % | 0x4048 | general |
| P602.00 | PID I- component | **400 ms** | 10 ... 6000 ms | 0x4049 | general |
| P603.00 | PID D-component | **0.0 s** | 0.0 ... 20.0 s | 0x404A | general |
| P604.00 | PID setp.ramp | **20.0 s** | 0.0 ... 100.0 s | 0x404B | general |
| P605.xx | PID setp. limit | | | | |
| └ P605.01 | Minimum setpoint | **-300.00 PID unit** | -300.00 ... 300.00 PID unit | 0x404E:001 | general |
| └ P605.02 | Maximum setpoint | **300.00 PID unit** | -300.00 ... 300.00 PID unit | 0x404E:002 | general |
| P606.xx | PID speed op. | | | | |
| └ P606.01 | Accel. time | **1.0 s** | 0.0 ... 3600.0 s | 0x4021:001 | general |
| └ P606.02 | Decel. time | **1.0 s** | 0.0 ... 3600.0 s | 0x4021:002 | general |
| P607.xx | PID influence | | | | |
| └ P607.01 | Activation time | **5.0 s** | 0.0 ... 999.9 s | 0x404C:001 | general |
| └ P607.02 | Mask out time | **5.0 s** | 0.0 ... 999.9 s | 0x404C:002 | general |
| P608.xx | PID alarms | | | | |
| └ P608.01 | MIN alarm thrsh. | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x404D:001 | general |
| └ P608.02 | MAX alarm thrsh. | **100.00 PID unit** | -300.00 ... 300.00 PID unit | 0x404D:002 | general |
| └ P608.03 | Bandw. feedback | **2.00 %** | 0.00 ... 100.00 % | 0x404D:003 | general |
| P610.xx | PID sleep mode | | | | |
| └ P610.01 | Activation | **Disabled [0]** | Selection list | 0x4023:001 | general |
| └ P610.02 | Stop method | **Coasting [0]** | Selection list | 0x4023:002 | general |
| └ P610.03 | Freq. thresh. | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x4023:003 | general |
| └ P610.04 | Feedback thresh. | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x4023:004 | general |
| └ P610.05 | Delay time | **0.0 s** | 0.0 ... 300.0 s | 0x4023:005 | general |
| └ P610.06 | Recovery | **Setp. > P610.3 [0]** | Selection list | 0x4023:006 | general |
| └ P610.07 | Bandwidth | **0.00 PID unit** | 0.00 ... 300.00 PID unit | 0x4023:007 | general |
| └ P610.08 | Recovery thresh. | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x4023:008 | general |
| P615.xx | Auto-rinsing | | | | |
| └ P615.01 | Rinsing in idle | **Inhibited [0]** | Selection list | 0x4024:001 | general |
| └ P615.02 | Rinse interval | **30.0 min** | 0.0 ... 6000.0 min | 0x4024:002 | general |
| └ P615.03 | Rinse speed | **0.0 Hz** | -599.0 ... 599.0 Hz | 0x4024:003 | general |
| └ P615.04 | Rinse period | **0.0 s** | 0.0 ... 6000.0 s | 0x4024:004 | general |
| P700.xx | Device commands | | | | |
| └ P700.01 | Load def. sett. | **Off / ready [0]** | Selection list | 0x2022:001 | general |
| └ P700.03 | Save user data | **Off / ready [0]** | Selection list | 0x2022:003 | general |
| └ P700.04 | Load user data | **Off / ready [0]** | Selection list | 0x2022:004 | general |
| └ P700.05 | Load OEM data | **Off / ready [0]** | Selection list | 0x2022:005 | general |
| └ P700.06 | Save OEM data | **Off / ready [0]** | Selection list | 0x2022:006 | general |
| └ P700.07 | Load par. set 1 | **Off / ready [0]** | Selection list | 0x2022:007 | general |
| └ P700.08 | Load par. set 2 | **Off / ready [0]** | Selection list | 0x2022:008 | general |
| └ P700.09 | Load par. set 3 | **Off / ready [0]** | Selection list | 0x2022:009 | general |
| └ P700.10 | Load par. set 4 | **Off / ready [0]** | Selection list | 0x2022:010 | general |
| └ P700.11 | Save par. set 1 | **Off / ready [0]** | Selection list | 0x2022:011 | general |
| └ P700.12 | Save par. set 2 | **Off / ready [0]** | Selection list | 0x2022:012 | general |
| └ P700.13 | Save par. set 3 | **Off / ready [0]** | Selection list | 0x2022:013 | general |
| └ P700.14 | Save par. set 4 | **Off / ready [0]** | Selection list | 0x2022:014 | general |
| └ P700.15 | Delete logbook | **Off / ready [0]** | Selection list | 0x2022:015 | general |
| P701.00 | KP setp. incr. | **1** | 1 ... 100 | 0x2862 | general |
| P702.00 | Scal.speed fact. | **0.00** | 0.00 ... 650.00 | 0x4002 | general |
| P703.00 | KP status displ. | **0x00000000** | 0x00000000 ... 0xFFFFFF00 | 0x2864 | general |
| * Default setting dependent on the model. | | | | | |

| Display code | Short designation | Default setting | Setting range | Address | Category |
|---|---|---|---|---|---|
| P704.xx | DC braking | | | | |
| └ P704.01 | Current | **0.0 %** | 0.0 ... 200.0 % | 0x2B84:001 | MCTRL |
| └ P704.02 | Hold time autom. | **0.0 s** | 0.0 ... 1000.0 s | 0x2B84:002 | general |
| └ P704.03 | Threshold autom. | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x2B84:003 | general |
| └ P704.04 | Demagnet. time | **100 %** | 0 ... 150 % | 0x2B84:004 | general |
| └ P704.05 | Def. demag. time | x ms | - (Read only) | 0x2B84:005 | general |
| └ P704.06 | Inverter disable | **Deactivated [0]** | Selection list | 0x2B84:006 | general |
| P705.00 | KP language | **English [1]** | Selection list | 0x2863 | general |
| P706.xx | Brake management | | | | |
| └ P706.01 | Operating mode | **Rfg stop (RFGS) [1]** | Selection list | 0x2541:001 | general |
| └ P706.02 | Active threshold | x V | - (Read only) | 0x2541:002 | general |
| └ P706.03 | Red. threshold | **0 V** | 0 ... 100 V | 0x2541:003 | general |
| └ P706.04 | Add.frequency | **0.0 Hz** | 0.0 ... 10.0 Hz | 0x2541:004 | general |
| └ P706.05 | Del.overr.time | **2.0 s** | 0.0 ... 60.0 s | 0x2541:005 | general |
| P708.xx | Manual control | | | | |
| └ P708.01 | Keypad setting | **CTRL&F/R enable [1]** | Selection list | 0x2602:001 | general |
| └ P708.02 | Keypad rot.dir. | **Forward [0]** | Selection list | 0x2602:002 | general |
| └ P708.03 | Mode | **Keyp.control off [0]** | Selection list | 0x2602:003 | general |
| P709.xx | KP disp. setup | | | | |
| └ P709.01 | User MS velocity | | Text | 0x2865:001 | general |
| └ P709.02 | User PID control | | Text | 0x2865:002 | general |
| P710.xx | Load loss detect | | | | |
| └ P710.01 | Threshold | **0.0 %** | 0.0 ... 200.0 % | 0x4006:001 | general |
| └ P710.02 | Delay time | **0.0 s** | 0.0 ... 300.0 s | 0x4006:002 | general |
| └ P710.03 | Error response | **No response [0]** | Selection list | 0x4006:003 | general |
| P711.xx | Position counter | | | | |
| └ P711.01 | Signal source | **Disbled [0]** | Selection list | 0x2C49:001 | general |
| └ P711.02 | Reset mode | **Rising edge [0]** | Selection list | 0x2C49:002 | general |
| └ P711.03 | Actual position | - | - (Read only) | 0x2C49:003 | general |
| P712.xx | Brake control | | | | |
| └ P712.01 | Brake mode | **Off [2]** | Selection list | 0x2820:001 | general |
| └ P712.02 | Closing time | **100 ms** | 0 ... 10000 ms | 0x2820:002 | general |
| └ P712.03 | Opening time | **100 ms** | 0 ... 10000 ms | 0x2820:003 | general |
| └ P712.07 | Closing thresh. | **0.2 Hz** | 0.0 ... 599.0 Hz | 0x2820:007 | general |
| └ P712.08 | Holding load | **0.0 %** | -500.0 ... 500.0 % | 0x2820:008 | general |
| └ P712.12 | ClosingThr delay | **0 ms** | 0 ... 10000 ms | 0x2820:012 | general |
| └ P712.13 | HoldLoad ramptim | **0 ms** | 0 ... 100 ms | 0x2820:013 | general |
| └ P712.15 | Brake status | - | - (Read only) | 0x2820:015 | general |
| P718.xx | Flying restart | | | | |
| └ P718.01 | Current | **30 %** | 0 ... 100 % | 0x2BA1:001 | MCTRL |
| └ P718.02 | Start frequency | **20.0 Hz** | -599.0 ... 599.0 Hz | 0x2BA1:002 | MCTRL |
| └ P718.03 | Restart time | **5911 ms** * | 1 ... 60000 ms | 0x2BA1:003 | MCTRL |
| └ P718.08 | Fl.res.frequency | x.x Hz | - (Read only) | 0x2BA1:008 | MCTRL |
| P721.xx | Mains fail. ctrl | | | | |
| └ P721.01 | Enable function | **Disabled [0]** | Selection list | 0x2D66:001 | general |
| └ P721.02 | DC-bus act.level | **0 %** * | 60 ... 90 % | 0x2D66:002 | general |
| └ P721.03 | Gain V-ctrl | **0.01000 Hz/V** | 0.00001 ... 0.50000 Hz/V | 0x2D66:003 | general |
| └ P721.04 | Res. time V-ctrl | **20 ms** | 5 ... 2000 ms | 0x2D66:004 | general |
| └ P721.05 | DC voltage setp. | **100 %** | 80 ... 110 % | 0x2D66:005 | general |
| └ P721.06 | Setp. ramp | **20 ms** | 1 ... 16000 ms | 0x2D66:006 | general |
| └ P721.07 | Clear time | **20 ms** | 1 ... 60000 ms | 0x2D66:007 | general |
| └ P721.08 | Restart level | **0.0 Hz** | 0.0 ... 599.0 Hz | 0x2D66:008 | general |
| └ P721.09 | RERT:Status | - | - (Read only) | 0x2D66:009 | general |
| P730.00 | PIN1 protection | **0** | -1 ... 9999 | 0x203D | general |
| * Default setting dependent on the model. | | | | | |



| Display code | Short designation | Default setting | Setting range | Address | Category |
|---|---|---|---|---|---|
| P731.00 | PIN2 protection | **0** | -1 ... 9999 | 0x203E | general |
| P732.00 | Auto-Save EPM | **Inhibit [0]** | Selection list | 0x2829 | general |
| P740.xx | Favorites sett. | | | | |
| └ P740.01 | Parameter 1 | **0x2DDD0000** | 0x00000000 ... 0xFFFFFF00 | 0x261C:001 | general |
| └ P740.02 | Parameter 2 | **0x60780000** | 0x00000000 ... 0xFFFFFF00 | 0x261C:002 | general |
| └ P740.03 | Parameter 3 | **0x2D890000** | 0x00000000 ... 0xFFFFFF00 | 0x261C:003 | general |
| └ P740.04 | Parameter 4 | **0x603F0000** | 0x00000000 ... 0xFFFFFF00 | 0x261C:004 | general |
| └ P740.05 | Parameter 5 | **0x28240000** | 0x00000000 ... 0xFFFFFF00 | 0x261C:005 | general |
| └ P740.06 | Parameter 6 | **0x28600100** | 0x00000000 ... 0xFFFFFF00 | 0x261C:006 | general |
| └ P740.07 | Parameter 7 | **0x28380100** | 0x00000000 ... 0xFFFFFF00 | 0x261C:007 | general |
| └ P740.08 | Parameter 8 | **0x28380300** | 0x00000000 ... 0xFFFFFF00 | 0x261C:008 | general |
| └ P740.09 | Parameter 9 | **0x25400100** | 0x00000000 ... 0xFFFFFF00 | 0x261C:009 | general |
| └ P740.10 | Parameter 10 | **0x29150000** | 0x00000000 ... 0xFFFFFF00 | 0x261C:010 | general |
| └ P740.11 | Parameter 11 | **0x29160000** | 0x00000000 ... 0xFFFFFF00 | 0x261C:011 | general |
| └ P740.12 | Parameter 12 | **0x29170000** | 0x00000000 ... 0xFFFFFF00 | 0x261C:012 | general |
| └ P740.13 | Parameter 13 | **0x29180000** | 0x00000000 ... 0xFFFFFF00 | 0x261C:013 | general |
| └ P740.14 | Parameter 14 | **0x2C000000** | 0x00000000 ... 0xFFFFFF00 | 0x261C:014 | general |
| └ P740.15 | Parameter 15 | **0x2B000000** | 0x00000000 ... 0xFFFFFF00 | 0x261C:015 | general |
| └ P740.16 | Parameter 16 | **0x2B010100** | 0x00000000 ... 0xFFFFFF00 | 0x261C:016 | general |
| └ P740.17 | Parameter 17 | **0x2B010200** | 0x00000000 ... 0xFFFFFF00 | 0x261C:017 | general |
| └ P740.18 | Parameter 18 | **0x283A0000** | 0x00000000 ... 0xFFFFFF00 | 0x261C:018 | general |
| └ P740.19 | Parameter 19 | **0x29390000** | 0x00000000 ... 0xFFFFFF00 | 0x261C:019 | general |
| └ P740.20 | Parameter 20 | **0x2D430100** | 0x00000000 ... 0xFFFFFF00 | 0x261C:020 | general |
| └ P740.21 | Parameter 21 | **0x2D4B0100** | 0x00000000 ... 0xFFFFFF00 | 0x261C:021 | general |
| └ P740.22 | Parameter 22 | **0x2B120100** | 0x00000000 ... 0xFFFFFF00 | 0x261C:022 | general |
| └ P740.23 | Parameter 23 | **0x60750000** | 0x00000000 ... 0xFFFFFF00 | 0x261C:023 | general |
| └ P740.24 | Parameter 24 | **0x60730000** | 0x00000000 ... 0xFFFFFF00 | 0x261C:024 | general |
| └ P740.25 | Parameter 25 | **0x26310100** | 0x00000000 ... 0xFFFFFF00 | 0x261C:025 | general |
| └ P740.26 | Parameter 26 | **0x26310200** | 0x00000000 ... 0xFFFFFF00 | 0x261C:026 | general |
| └ P740.27 | Parameter 27 | **0x26310300** | 0x00000000 ... 0xFFFFFF00 | 0x261C:027 | general |
| └ P740.28 | Parameter 28 | **0x26310400** | 0x00000000 ... 0xFFFFFF00 | 0x261C:028 | general |
| └ P740.29 | Parameter 29 | **0x26310500** | 0x00000000 ... 0xFFFFFF00 | 0x261C:029 | general |
| └ P740.30 | Parameter 30 | **0x26310600** | 0x00000000 ... 0xFFFFFF00 | 0x261C:030 | general |
| └ P740.31 | Parameter 31 | **0x26310700** | 0x00000000 ... 0xFFFFFF00 | 0x261C:031 | general |
| └ P740.32 | Parameter 32 | **0x26310800** | 0x00000000 ... 0xFFFFFF00 | 0x261C:032 | general |
| └ P740.33 | Parameter 33 | **0x26310900** | 0x00000000 ... 0xFFFFFF00 | 0x261C:033 | general |
| └ P740.34 | Parameter 34 | **0x26310D00** | 0x00000000 ... 0xFFFFFF00 | 0x261C:034 | general |
| └ P740.35 | Parameter 35 | **0x26311200** | 0x00000000 ... 0xFFFFFF00 | 0x261C:035 | general |
| └ P740.36 | Parameter 36 | **0x26311300** | 0x00000000 ... 0xFFFFFF00 | 0x261C:036 | general |
| └ P740.37 | Parameter 37 | **0x26311400** | 0x00000000 ... 0xFFFFFF00 | 0x261C:037 | general |
| └ P740.38 | Parameter 38 | **0x26340100** | 0x00000000 ... 0xFFFFFF00 | 0x261C:038 | general |
| └ P740.39 | Parameter 39 | **0x26340200** | 0x00000000 ... 0xFFFFFF00 | 0x261C:039 | general |
| └ P740.40 | Parameter 40 | **0x26360100** | 0x00000000 ... 0xFFFFFF00 | 0x261C:040 | general |
| └ P740.41 | Parameter 41 | **0x26360200** | 0x00000000 ... 0xFFFFFF00 | 0x261C:041 | general |
| └ P740.42 | Parameter 42 | **0x26360300** | 0x00000000 ... 0xFFFFFF00 | 0x261C:042 | general |
| └ P740.43 | Parameter 43 | **0x26390100** | 0x00000000 ... 0xFFFFFF00 | 0x261C:043 | general |
| └ P740.44 | Parameter 44 | **0x26390200** | 0x00000000 ... 0xFFFFFF00 | 0x261C:044 | general |
| └ P740.45 | Parameter 45 | **0x26390300** | 0x00000000 ... 0xFFFFFF00 | 0x261C:045 | general |
| └ P740.46 | Parameter 46 | **0x26390400** | 0x00000000 ... 0xFFFFFF00 | 0x261C:046 | general |
| └ P740.47 | Parameter 47 | **0x29110100** | 0x00000000 ... 0xFFFFFF00 | 0x261C:047 | general |
| └ P740.48 | Parameter 48 | **0x29110200** | 0x00000000 ... 0xFFFFFF00 | 0x261C:048 | general |
| └ P740.49 | Parameter 49 | **0x29110300** | 0x00000000 ... 0xFFFFFF00 | 0x261C:049 | general |
| └ P740.50 | Parameter 50 | **0x29110400** | 0x00000000 ... 0xFFFFFF00 | 0x261C:050 | general |
| P750.xx | Param.set setup | | | | |
| * Default setting dependent on the model. | | | | | |

| Display code | Short designation | Default setting | Setting range | Address | Category |
|---|---|---|---|---|---|
| └ P750.01 ... 32 | Parameter 1 ... Parameter 32 | **0x00000000** | 0x00000000 ... 0xFFFFFF00 | 0x4041:001 ... 0x4041:032 | general |
| P751.xx | Par. value set 1 | | | | |
| └ P751.01 ... 32 | Set 1 - Value 1 ... Set 1 - Value 32 | **0** | -2147483648 ... 2147483647 | 0x4042:001 ... 0x4042:032 | general |
| P752.xx | Par. value set 2 | | | | |
| └ P752.01 ... 32 | Set 2 - Value 1 ... Set 2 - Value 32 | **0** | -2147483648 ... 2147483647 | 0x4043:001 ... 0x4043:032 | general |
| P753.xx | Par. value set 3 | | | | |
| └ P753.01 ... 32 | Set 3 - Value 1 ... Set 3 - Value 32 | **0** | -2147483648 ... 2147483647 | 0x4044:001 ... 0x4044:032 | general |
| P754.xx | Par. value set 4 | | | | |
| └ P754.01 ... 32 | Set 4 - Value 1 ... Set 4 - Value 32 | **0** | -2147483648 ... 2147483647 | 0x4045:001 ... 0x4045:032 | general |
| P755.00 | PSet activation | **On op. disabled [0]** | Selection list | 0x4046 | general |
| P756.xx | PSet error msg. | | | | |
| └ P756.01 | Status | - | - (Read only) | 0x4047:001 | general |
| └ P756.02 | List entry | - | - (Read only) | 0x4047:002 | general |
| P760.xx | Fault config. | | | | |
| └ P760.02 | Restart delay | **3.0 s** | 0.0 ... 1000.0 s | 0x2839:002 | general |
| └ P760.03 | Restart counter | **5** | 0 ... 255 | 0x2839:003 | general |
| └ P760.04 | Tro.count r.time | **40.0 s** | 0.1 ... 3600.0 s | 0x2839:004 | general |
| └ P760.05 | Trouble counter | - | - (Read only) | 0x2839:005 | general |
| └ P760.06 | FaultStateChange | **Reset fault [0]** | Selection list | 0x2839:006 | general |
| P770.xx | Pump cascading | | | | |
| └ P770.01 | Operating mode | **Disabled [0]** | Selection list | 0x405C:001 | |
| └ P770.02 | Prior.at startup | **By oper. time [1]** | Selection list | 0x405C:002 | |
| └ P770.03 | Start frequency | **40.0 Hz** | 0.0 ... 599.0 Hz | 0x405C:003 | |
| └ P770.04 | Stop frequency | **10.0 Hz** | 0.0 ... 599.0 Hz | 0x405C:004 | |
| └ P770.05 | Settling time | **5.0 s** | 0.0 ... 3600.0 s | 0x405C:005 | |
| └ P770.06 | Delay time | **2.0 s** | 0.0 ... 3600.0 s | 0x405C:006 | |
| └ P770.07 | Low F threshold | **20.0 Hz** | 0.0 ... 599.0 Hz | 0x405C:007 | |
| └ P770.08 | Up. F threshold | **30.0 Hz** | 0.0 ... 599.0 Hz | 0x405C:008 | |
| └ P770.09 | Auto runtime | **0 h** | 0 ... 1000 h | 0x405C:009 | |
| └ P770.10 | Auto trans.time | **0.0 s** | -10.0 ... 10.0 s | 0x405C:010 | |
| └ P770.11 | Reset oper.time | **Disabled [0]** | Selection list | 0x405C:011 | |
| └ P770.12 | Status word | - | - (Read only) | 0x405C:012 | |
| └ P770.13 | Operatingtime p1 | x s | - (Read only) | 0x405C:013 | |
| └ P770.14 | Operatingtime p2 | x s | - (Read only) | 0x405C:014 | |
| P780.00 | CiA status word | - | - (Read only) | 0x6041 | general |
| P781.00 | Set speed | **0 rpm** | -32768 ... 32767 rpm | 0x6042 | MCTRL |
| P782.00 | Int. set speed | x rpm | - (Read only) | 0x6043 | general |
| P783.00 | Actual speed | x rpm | - (Read only) | 0x6044 | general |
| P784.xx | Speed limits | | | | |
| └ P784.01 | Min. speed | **0 rpm** | 0 ... 480000 rpm | 0x6046:001 | MCTRL |
| └ P784.02 | Max. speed | **2147483647 rpm** | 0 ... 2147483647 rpm | 0x6046:002 | MCTRL |
| P785.xx | Accel. ramp | | | | |
| └ P785.01 | Delta speed | **3000 rpm** | 0 ... 2147483647 rpm | 0x6048:001 | MCTRL |
| └ P785.02 | Delta time | **10 s** | 0 ... 65535 s | 0x6048:002 | MCTRL |
| P786.xx | Decel. ramp | | | | |
| └ P786.01 | Delta speed | **3000 rpm** | 0 ... 2147483647 rpm | 0x6049:001 | MCTRL |
| └ P786.02 | Delta time | **10 s** | 0 ... 65535 s | 0x6049:002 | MCTRL |
| P788.00 | Act. op. mode | - | - (Read only) | 0x6061 | MCTRL |
| P789.00 | Supported modes | - | - (Read only) | 0x6502 | general |
| P790.00 | Quick stop dec. | **546000 pos. unit/s²** | 0 ... 2147483647 pos. unit/s² | 0x6085 | MCTRL |
| * Default setting dependent on the model. | | | | | |

| Display code | Short designation | Default setting | Setting range | Address | Category |
|---|---|---|---|---|---|
| P800.00 | Sequencer mode | **Disabled [0]** | Selection list | 0x4025 | Sequencer |
| P801.xx | Segment 1 | | | | |
| └ P801.01 | Frequency setp. | **0.0 Hz** | -599.0 ... 599.0 Hz | 0x4026:001 | Sequencer |
| └ P801.02 | Accel./decel. | **5.0 s** | 0.0 ... 3600.0 s | 0x4026:002 | Sequencer |
| └ P801.03 | Time | **0.0 s** | 0.0 ... 100000.0 s | 0x4026:003 | Sequencer |
| └ P801.04 | Digital outp. | **0** | 0 ... 255 | 0x4026:004 | Sequencer |
| └ P801.05 | Analog outp. | **0.00 VDC** | 0.00 ... 10.00 VDC | 0x4026:005 | Sequencer |
| └ P801.06 | PID setp. | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x4026:006 | Sequencer |
| └ P801.07 | Torque setp. | **100.0 %** | -400.0 ... 400.0 % | 0x4026:007 | Sequencer |
| P802.xx | Segment 2 | | | | |
| └ P802.01 | Frequency setp. | **0.0 Hz** | -599.0 ... 599.0 Hz | 0x4027:001 | Sequencer |
| └ P802.02 | Accel./decel. | **5.0 s** | 0.0 ... 3600.0 s | 0x4027:002 | Sequencer |
| └ P802.03 | Time | **0.0 s** | 0.0 ... 100000.0 s | 0x4027:003 | Sequencer |
| └ P802.04 | Digital outp. | **0** | 0 ... 255 | 0x4027:004 | Sequencer |
| └ P802.05 | Analog outp. | **0.00 VDC** | 0.00 ... 10.00 VDC | 0x4027:005 | Sequencer |
| └ P802.06 | PID setp. | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x4027:006 | Sequencer |
| └ P802.07 | Torque setp. | **100.0 %** | -400.0 ... 400.0 % | 0x4027:007 | Sequencer |
| P803.xx | Segment 3 | | | | |
| └ P803.01 | Frequency setp. | **0.0 Hz** | -599.0 ... 599.0 Hz | 0x4028:001 | Sequencer |
| └ P803.02 | Accel./decel. | **5.0 s** | 0.0 ... 3600.0 s | 0x4028:002 | Sequencer |
| └ P803.03 | Time | **0.0 s** | 0.0 ... 100000.0 s | 0x4028:003 | Sequencer |
| └ P803.04 | Digital outp. | **0** | 0 ... 255 | 0x4028:004 | Sequencer |
| └ P803.05 | Analog outp. | **0.00 VDC** | 0.00 ... 10.00 VDC | 0x4028:005 | Sequencer |
| └ P803.06 | PID setp. | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x4028:006 | Sequencer |
| └ P803.07 | Torque setp. | **100.0 %** | -400.0 ... 400.0 % | 0x4028:007 | Sequencer |
| P804.xx | Segment 4 | | | | |
| └ P804.01 | Frequency setp. | **0.0 Hz** | -599.0 ... 599.0 Hz | 0x4029:001 | Sequencer |
| └ P804.02 | Accel./decel. | **5.0 s** | 0.0 ... 3600.0 s | 0x4029:002 | Sequencer |
| └ P804.03 | Time | **0.0 s** | 0.0 ... 100000.0 s | 0x4029:003 | Sequencer |
| └ P804.04 | Digital outp. | **0** | 0 ... 255 | 0x4029:004 | Sequencer |
| └ P804.05 | Analog outp. | **0.00 VDC** | 0.00 ... 10.00 VDC | 0x4029:005 | Sequencer |
| └ P804.06 | PID setp. | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x4029:006 | Sequencer |
| └ P804.07 | Torque setp. | **100.0 %** | -400.0 ... 400.0 % | 0x4029:007 | Sequencer |
| P805.xx | Segment 5 | | | | |
| └ P805.01 | Frequency setp. | **0.0 Hz** | -599.0 ... 599.0 Hz | 0x402A:001 | Sequencer |
| └ P805.02 | Accel./decel. | **5.0 s** | 0.0 ... 3600.0 s | 0x402A:002 | Sequencer |
| └ P805.03 | Time | **0.0 s** | 0.0 ... 100000.0 s | 0x402A:003 | Sequencer |
| └ P805.04 | Digital outp. | **0** | 0 ... 255 | 0x402A:004 | Sequencer |
| └ P805.05 | Analog outp. | **0.00 VDC** | 0.00 ... 10.00 VDC | 0x402A:005 | Sequencer |
| └ P805.06 | PID setp. | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x402A:006 | Sequencer |
| └ P805.07 | Torque setp. | **100.0 %** | -400.0 ... 400.0 % | 0x402A:007 | Sequencer |
| P806.xx | Segment 6 | | | | |
| └ P806.01 | Frequency setp. | **0.0 Hz** | -599.0 ... 599.0 Hz | 0x402B:001 | Sequencer |
| └ P806.02 | Accel./decel. | **5.0 s** | 0.0 ... 3600.0 s | 0x402B:002 | Sequencer |
| └ P806.03 | Time | **0.0 s** | 0.0 ... 100000.0 s | 0x402B:003 | Sequencer |
| └ P806.04 | Digital outp. | **0** | 0 ... 255 | 0x402B:004 | Sequencer |
| └ P806.05 | Analog outp. | **0.00 VDC** | 0.00 ... 10.00 VDC | 0x402B:005 | Sequencer |
| └ P806.06 | PID setp. | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x402B:006 | Sequencer |
| └ P806.07 | Torque setp. | **100.0 %** | -400.0 ... 400.0 % | 0x402B:007 | Sequencer |
| P807.xx | Segment 7 | | | | |
| └ P807.01 | Frequency setp. | **0.0 Hz** | -599.0 ... 599.0 Hz | 0x402C:001 | Sequencer |
| └ P807.02 | Accel./decel. | **5.0 s** | 0.0 ... 3600.0 s | 0x402C:002 | Sequencer |
| └ P807.03 | Time | **0.0 s** | 0.0 ... 100000.0 s | 0x402C:003 | Sequencer |
| └ P807.04 | Digital outp. | **0** | 0 ... 255 | 0x402C:004 | Sequencer |
| * Default setting dependent on the model. | | | | | |

| Display code | Short designation | Default setting | Setting range | Address | Category |
|---|---|---|---|---|---|
| └ P807.05 | Analog outp. | **0.00 VDC** | 0.00 ... 10.00 VDC | 0x402C:005 | Sequencer |
| └ P807.06 | PID setp. | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x402C:006 | Sequencer |
| └ P807.07 | Torque setp. | **100.0 %** | -400.0 ... 400.0 % | 0x402C:007 | Sequencer |
| P808.xx | Segment 8 | | | | |
| └ P808.01 | Frequency setp. | **0.0 Hz** | -599.0 ... 599.0 Hz | 0x402D:001 | Sequencer |
| └ P808.02 | Accel./decel. | **5.0 s** | 0.0 ... 3600.0 s | 0x402D:002 | Sequencer |
| └ P808.03 | Time | **0.0 s** | 0.0 ... 100000.0 s | 0x402D:003 | Sequencer |
| └ P808.04 | Digital outp. | **0** | 0 ... 255 | 0x402D:004 | Sequencer |
| └ P808.05 | Analog outp. | **0.00 VDC** | 0.00 ... 10.00 VDC | 0x402D:005 | Sequencer |
| └ P808.06 | PID setp. | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x402D:006 | Sequencer |
| └ P808.07 | Torque setp. | **100.0 %** | -400.0 ... 400.0 % | 0x402D:007 | Sequencer |
| P820.00 | StartOfSeq. mode | **Restart sequencr [0]** | Selection list | 0x4040 | Sequencer |
| P822.xx | End segment | | | | |
| └ P822.01 | Frequency setp. | **0.0 Hz** | -599.0 ... 599.0 Hz | 0x402E:001 | Sequencer |
| └ P822.02 | Accel./decel. | **5.0 s** | 0.0 ... 3600.0 s | 0x402E:002 | Sequencer |
| └ P822.03 | Time | **0.0 s** | 0.0 ... 100000.0 s | 0x402E:003 | Sequencer |
| └ P822.04 | Digital outp. | **0** | 0 ... 255 | 0x402E:004 | Sequencer |
| └ P822.05 | Analog outp. | **0.00 VDC** | 0.00 ... 10.00 VDC | 0x402E:005 | Sequencer |
| └ P822.06 | PID setp. | **0.00 PID unit** | -300.00 ... 300.00 PID unit | 0x402E:006 | Sequencer |
| └ P822.07 | Torque setp. | **100.0 %** | -400.0 ... 400.0 % | 0x402E:007 | Sequencer |
| P824.00 | End of seq. mode | **Keep running [0]** | Selection list | 0x402F | Sequencer |
| P830.xx | Sequence 1 | | | | |
| └ P830.01 ... 16 | Step 1 ... Step 16 | **Skip step [0]** | Selection list | 0x4030:001 ... 0x4030:016 | Sequencer |
| P831.00 | Cycl. sequence 1 | **1** | 1 ... 65535 | 0x4031 | Sequencer |
| P835.xx | Sequence 2 | | | | |
| └ P835.01 ... 16 | Step 1 ... Step 16 | **Skip step [0]** | Selection list | 0x4032:001 ... 0x4032:016 | Sequencer |
| P836.00 | Cycl. sequence 2 | **1** | 1 ... 65535 | 0x4033 | Sequencer |
| P840.xx | Sequence 3 | | | | |
| └ P840.01 ... 16 | Step 1 ... Step 16 | **Skip step [0]** | Selection list | 0x4034:001 ... 0x4034:016 | Sequencer |
| P841.00 | Cycl. sequence 3 | **1** | 1 ... 65535 | 0x4035 | Sequencer |
| P845.xx | Sequence 4 | | | | |
| └ P845.01 ... 16 | Step 1 ... Step 16 | **Skip step [0]** | Selection list | 0x4036:001 ... 0x4036:016 | Sequencer |
| P846.00 | Cycl. sequence 4 | **1** | 1 ... 65535 | 0x4037 | Sequencer |
| P850.xx | Sequence 5 | | | | |
| └ P850.01 ... 16 | Step 1 ... Step 16 | **Skip step [0]** | Selection list | 0x4038:001 ... 0x4038:016 | Sequencer |
| P851.00 | Cycl. sequence 5 | **1** | 1 ... 65535 | 0x4039 | Sequencer |
| P855.xx | Sequence 6 | | | | |
| └ P855.01 ... 16 | Step 1 ... Step 16 | **Skip step [0]** | Selection list | 0x403A:001 ... 0x403A:016 | Sequencer |
| P856.00 | Cycl. sequence 6 | **1** | 1 ... 65535 | 0x403B | Sequencer |
| P860.xx | Sequence 7 | | | | |
| └ P860.01 ... 16 | Step 1 ... Step 16 | **Skip step [0]** | Selection list | 0x403C:001 ... 0x403C:016 | Sequencer |
| P861.00 | Cycl. sequence 7 | **1** | 1 ... 65535 | 0x403D | Sequencer |
| P865.xx | Sequence 8 | | | | |
| └ P865.01 ... 16 | Step 1 ... Step 16 | **Skip step [0]** | Selection list | 0x403E:001 ... 0x403E:016 | Sequencer |
| P866.00 | Cycl. sequence 8 | **1** | 1 ... 65535 | 0x403F | Sequencer |
| * Default setting dependent on the model. | | | | | |



### 15.1.3 Keypad settings

For the keypad various settings can be made, which are described in detail in the following subchapters.

#### 15.1.3.1 Select language

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2863 (P705.00) | Keypad language selection (KP language) | | Language selection for the keypad display. |
| | 0 | No language selected | |
| | **1** | **English** | |
| | 2 | German | |

#### 15.1.3.2 Change setpoint increment

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2862 (P701.00) | Keypad setpoint increment<br>(KP setp. incr.)<br>1 ... [**1**] ... 100 | Adaptation of the increment for keypad setpoints when a keypad arrow key is pressed once. The value set serves as a multiplier for the preset increments.<br>Setting 1 corresponds to the following increments:<br>• 0.1 Hz for frequency setpoint 0x2601:001 (P202.01).<br>• 0.01 PUnit for process controller setpoint 0x2601:002 (P202.02).<br>• 0.1 % for torque setpoint 0x2601:003 (P202.03).<br>Notes:<br>• With a setting > 1, the option of repeatedly changing the setpoint by pressing the key for a longer time is deactivated.<br>• The setting only has an impact on the keypad setpoints.<br>Example: with the setting "5", the keypad frequency setpoint is increased/decreased by 0.5 Hz every time the key is pressed. |

#### 15.1.3.3 Configure status display

During operation, the keypad displays the output frequency of the inverter, or with an active PID control it shows the process controller setpoint. Alternatively, an optional diagnostic parameter can be displayed during operation.

**Parameter**

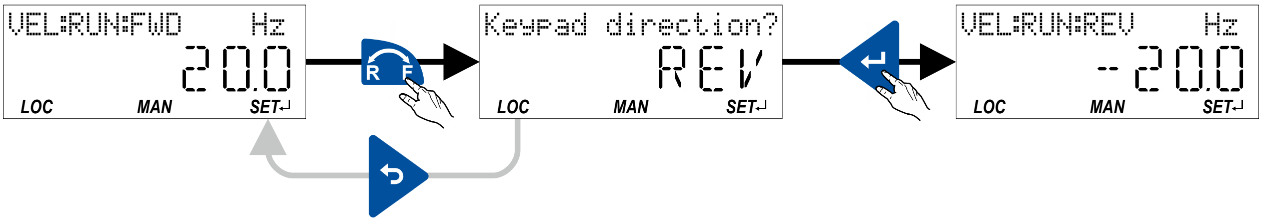
| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2864 (P703.00) | Keypad status display<br>(KP status displ.)<br>0x00000000 ... [**0x00000000**] ... 0xFFFFFF00 | 0 = normal display depending on the operating mode<br>• In case of an active frequency control, the keypad displays the output frequency of the inverter.<br>• In case of active PID control, the keypad displays the current Process controller setpoint in [P-Unit].<br>As an alternative, an optional diagnostic parameter can be set here, which is to be shown on the keypad during operation.<br>• Format: 0xiiiiss00 (iiii = hexadecimal index, ss = hexadecimal subindex)<br>• The lowest byte is always 0x00.<br>• The keypad can be used to select the desired diagnostics parameter from a list. |
| 0x2865:001 (P709.01) | Keypad display setup: User unit MS velocity mode<br>(KP disp. setup: User MS velocity) | Optional setting of an individual unit for the keypad operation display of the output frequency.<br>• Setting is only possible with »EASY Starter«.<br>• Maximum text length = 6 ASCII characters. |
| 0x2865:002 (P709.02) | Keypad display setup: User unit PID control<br>(KP disp. setup: User PID control) | Optional setting of an individual unit for the keypad operation display of the current process controller setpoint.<br>• Setting is only possible with »EASY Starter«.<br>• Maximum text length = 6 ASCII characters. |
| 0x4002 (P702.00) | Speed display scaling<br>(Scal.speed fact.)<br>0.00 ... [**0.00**] ... 650.00 | Factor for the scaling of the speed display in 0x400D (P101.00).<br>• With the setting "0.00", no scaling takes place.<br>• Example: with the "16.50" and the actual frequency = 50 Hz, 0x400D (P101.00) shows the speed "825 units". |

### 15.1.3.4 Configure R/F and CTRL keys

**Keypad rotation setup**

Use the keypad to reverse the rotation direction at local keypad control.

- After the key has been pressed, the reversal of rotation direction must be confirmed with the key. (The key serves to cancel the action.)




The keypad key

- directly changes the keypad rotation setup in 0x2602:002 (P708.02).
- has no function in case of a bipolar setpoint selection (e. g. ±10 V). In this case, the direction of rotation is determined by the sign of the setpoint.
- has no function if the rotation limitation "Only clockwise (CW) [0]" is set in 0x283A (P304.00).
- has no function in the operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]".
- has no function if the PID control is activated.
- can be deactivated in 0x2602:001 (P708.01).

**Keypad Full Control**

The "Keypad Full Control" control mode can be activated with the keypad key “CTRL”. Both the control and the setpoint selection are then made via the keypad. This special control mode can be, for instance, used during the commissioning phase if external control and setpoint sources are not ready to use yet.

For details see chapter "Overview of the control options: Keypad full control". 📖 53

The keypad key CTRL

- directly changes the setting in 0x2602:003 (P708.03).
- can be deactivated in 0x2602:001 (P708.01).

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2602:001<br>(P708.01) | Manual control: Keypad setting<br>(Manual control: Keypad setting)<br>• From version 03.00 | | Disable/enable CTRL and F/R key of the keypad. |
| | 0 | CTRL & F/R disable | |
| | **1** | **CTRL & F/R enable** | |
| | 2 | CTRL enable F/R disable | |
| | 3 | CTRL disable F/R enable | |
| 0x2602:002<br>(P708.02) | Manual control: Keypad rotational direction<br>(Manual control: Keypad rot.dir.)<br>• From version 03.00 | | Instructed direction of rotation if local keypad control is active.<br>• If the local keypad control is active, this setting can be directly changed via the keypad key if the key in 0x2602:001 (P708.01) has not been disabled.<br>• When the remote control is changed over to local keypad control and vice versa, this parameter is set to "Forward [0]". |
| | **0** | **Forward** | |
| | 1 | Reverse | |

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2602:003<br>(P708.03) | Manual control: Mode<br>(Manual control: Mode)<br>• From version 03.00 | | Activate/deactivate full keypad control.<br>• This setting can be changed directly via the keypad key **CTRL** if the key in 0x2602:001 (P708.01) has not been disabled.<br>• When the control mode is changed over, the motor is stopped and the "Forward" direction of rotation is set. |
| | **0** | **Keypad full control off** | |
| | 1 | Keypad full control on | |
| | 2 | Manual mode | • Access via engineering tools only.<br>• The active control is removed from the current control source / setpoint source.<br>• Start and stop command as well as the setpoint are controlled via a special dialog.<br>• A connection control is active (engineering tool <-> inverter)<br>• The operator is responsible for the safety and impact of this function. |

## 15.2 WLAN module

The pluggable WLAN module enables
- an easy access to inverters that are installed in difficult access areas,
- an easy parameter setting without cable and instead of the keypad,
- a comfortable monitoring and adaptation of the machine.

The inverter can be accessed via WLAN with the following devices:
- Engineering PC (with WLAN functionality) and the »EASY Starter« engineering tool.
- Android smartphone with Lenze Smart Keypad App.

The Lenze Smart Keypad App is recommended for the adaptation of simple applications. The Lenze Smart Keypad App can be found in the Google Play Store and in the Apple App Store.

Android

iOS

Default settings: Access-Point mode, WLAN-SSID = "i5", WLAN password = "password"

If the WLAN module is to be plugged onto the inverter for a longer period of time, it is important to select a safe password in 0x2441:008. Otherwise, a potential attacker might connect to the WLAN access point and attack the device and other connected devices or networks.

### 15.2.1 WLAN LED status displays

Information on the WLAN module status can be obtained quickly via the LED displays "Power", "TX/RX" and "WLAN" on the front of the WLAN module.

The meaning can be seen from the table below.

| LED "Power" (green) | LED "TX/RX" (yellow) | LED "WLAN" (green) | Status/meaning |
|---|---|---|---|
| off | off | off | No supply voltage. |
| on | on | on | Self-test (duration approx. 1 s) |
| | off | off | Ready for operation — no active WLAN connection. |
| | Flashing | on | Communication active. |
| | off | blinking | Client mode — waiting for connection. |
| blinking | off | off | Trouble |

After being plugged in, the WLAN module needs approx. 20 seconds until it is ready for operation.

### 15.2.2 WLAN basic settings

The WLAN functionality can be configured via the following parameters.

**Preconditions**

WLAN module has been plugged onto the interface X16 on the front of the inverter.

**Details**

- The WLAN module can be connected and removed during operation.
- The WLAN module can either create an own WLAN network (access point mode, default setting) or implement itself as a WLAN client in an already existing WLAN network. For details see the following subchapters.
- The WLAN connection is encrypted. The WLAN encryption can be selected in 0x2441:009.
- 0x2441:012 can be used to set the name of the WLAN network, called SSID, so that it is not visible for other WLAN devices. As a result, the number of WLAN networks displayed on smartphone or PC can be reduced.
- Two data sources are possible for the WLAN settings: Inverter and WLAN module.
  - Data source - inverter: The WLAN settings saved in the inverter are used. Each inverter has its own WLAN settings.
  - Data source - WLAN module: The WLAN settings saved in the WLAN module are used. In this "stand-alone" mode, the WLAN module can be plugged onto another inverter and then be used with the same settings (irrespective of the WLAN settings of the inverter).
  - The data source is activated with 0x2440.
  - The currently active data source is displayed in 0x2442:004.

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2440 | Initiate WLAN<br>• From version 02.00 | | Restart WLAN network with default setting or current settings. |
| | **0** | **No action/no error** | Only status display. |
| | 1 | Restart with current values (from version 04.00) | Restart WLAN network with current settings of the WLAN parameters.<br>• The WLAN settings of the active data source (inverter or WLAN module) are used.<br>• The active data source is displayed in 0x2442:004.<br>• The data source is not changed by this selection.<br>Note!<br>This selection is currently not supported by the WLAN module V1.0. |
| | 2 | Restart with default values | Restart WLAN network with default setting of the WLAN parameters.<br>• The WLAN settings saved in the WLAN module are deleted.<br>• Active data source for the WLAN settings is now the inverter. |
| | 11 | Save settings in WLAN module | Restart WLAN network with current settings of the WLAN parameters.<br>• The current settings are saved in the WLAN module.<br>• Active data source for the WLAN settings is now the WLAN module. |
| 0x2441:004 | WLAN settings: DHCP<br>• From version 02.00 | | 1 = Dynamic Host Configuration Protocol (DHCP) is enabled.<br>• In the access point mode, the DHCP server of the WLAN module is activated.<br>• In the client mode, the DHCP-client function is activated. |
| | 0 | Disabled | |
| | **1** | **Enabled** | |
| 0x2441:005 | WLAN settings: DHCP start address<br>0.0.0.0 ... [**0.0.0.0**] ... 255.255.255.255<br>• From version 02.00 | | Definition of the start address when the Dynamic Host Configuration Protocol (DHCP) is used.<br>• Only relevant for access point mode.<br>• When 0 is set, the active IP address + 1 is used as start address. |
| 0x2441:006 | WLAN settings: WLAN operation mode<br>• From version 02.00 | | Definition of the operating mode of the WLAN module. |
| | **0** | **Access point mode** | For a direct connection to another WLAN device, the WLAN module creates an own WLAN network.<br>▸ WLAN access point mode 📖 432 |
| | 1 | Client mode | The WLAN module can be integrated as WLAN client into an already existing WLAN network.<br>▸ WLAN client mode 📖 437 |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2441:007 | WLAN settings: WLAN SSID<br>["**i5**"]<br>• From version 02.00 | Name (Service Set Identifier, SSID) of the WLAN network.<br>• The preset name consists of the device name (iXXX) and the last 10 digits of the serial number of the Control Unit.<br>• Example: "i550_0123456789"<br>• The serial number is displayed in 0x2000:002 (P190.02). |
| 0x2441:008 | WLAN settings: WLAN password<br>["**password**"]<br>• From version 02.00 | Password (WLAN network key) of the WLAN network.<br>• This password serves to secure the WLAN connections.<br>• The password must have a minimum length of 8 characters. Although shorter passwords are accepted and saved, the WLAN module cannot be operated with such a password.<br>• The character "*" is not allowed.<br>Note!<br>If the WLAN module is to be plugged onto the inverter for a longer period of time, it is important to select a safe password. Otherwise, a potential attacker might connect to the WLAN access point and attack the device and other connected devices or networks.<br><br>Currently (status: 2016), a WLAN is considered as safe if the password<br>• consists of more than 20 characters,<br>• contains capital and small letters, numbers and special characters and<br>• cannot be found in any dictionary. |
| 0x2441:009 | WLAN settings: WLAN security<br>• From version 02.00 | Selection of the WLAN encryption. |
| | 0 WPA | |
| | **1 WPA2** | |
| 0x2441:010 | WLAN settings: WLAN access<br>• From version 02.00 | Switch on/off WLAN. |
| | 0 Disabled (WLAN off) | |
| | **1 Enabled (WLAN on)** | |
| 0x2441:011 | WLAN settings: WLAN channel<br>• From version 02.00 | Selection of the WLAN channel. |
| | **1 Channel 1** | |
| | 2 Channel 2 | |
| | 3 Channel 3 | |
| | 4 Channel 4 | |
| | 5 Channel 5 | |
| | 6 Channel 6 | |
| | 7 Channel 7 | |
| | 8 Channel 8 | |
| | 9 Channel 9 | |
| | 10 Channel 10 | |
| | 11 Channel 11 | |
| 0x2441:012 | WLAN settings: WLAN SSID broadcast<br>• From version 02.00 | 1 = the name of the WLAN network, called SSID, is not visible for other WLAN devices. |
| | **0 Activated** | |
| | 1 Deactivated | |
| 0x2442:004 | Active WLAN settings: Active module mode<br>• Read only<br>• From version 02.00 | Display of the active data source for the WLAN settings.<br>• This parameter indicates whether the settings used come from the inverter or from the WLAN module. |
| | 0 Inverter | The WLAN settings saved in the inverter are used. |
| | 1 Standalone | The WLAN settings saved in the WLAN module are used. |
| 0x2442:005 | Active WLAN settings: MAC address<br>• Read only<br>• From version 02.00 | Display of the MAC address of the WLAN module. |

#### 15.2.2.1 Resetting WLAN settings to default setting

Possible reasons:

- Password is not known anymore.
- WLAN SSID is not visible and not known anymore.
- WLAN module mode "stand-alone" shall be deactivated.

0x2440 serves to reset all WLAN settings to the default setting. For this purpose, the inverter must be connected to the »EASY Starter« via the USB module or an existing network.

**Option 1: Reset via USB module**

How to reset the WLAN settings to default setting by means of the USB module:

Requirements:

- The inverter is ready for operation (supplied with voltage).

Required accessories:

- USB module
- USB 2.0 cable (A-plug on micro B-plug)
- PC with installed »EASY Starter« software

1. Remove the WLAN module from the inverter and plug in the USB module instead.
2. Establish a connection between inverter and »EASY Starter« via the USB module.
3. Set the parameter 0x2440 to "Restart with default values [2]".
4. Remove the USB module from the inverter and plug in the WLAN module instead again.

The default setting is loaded.

**Option 2: Reset via network**

How to reset the WLAN settings to default setting via network:

Requirements:

- The inverter is ready for operation (supplied with voltage).
- The inverter is connected to a functioning network.

Required accessories:

- PC with installed »EASY Starter«. In addition, the PC must be connected to the network which also implements the inverter.

1. Establish a connection between the inverter and »EASY Starter« via the used network.
2. Set the parameter 0x2440 to "Restart with default values [2]".

The default setting is loaded.

### 15.2.3 WLAN access point mode

By default, the WLAN module is configured as a WLAN access point because this is the most frequent application. In this operating mode, the WLAN module creates its own WLAN network for a direct connection to other WLAN devices.

The supported WLAN devices are:

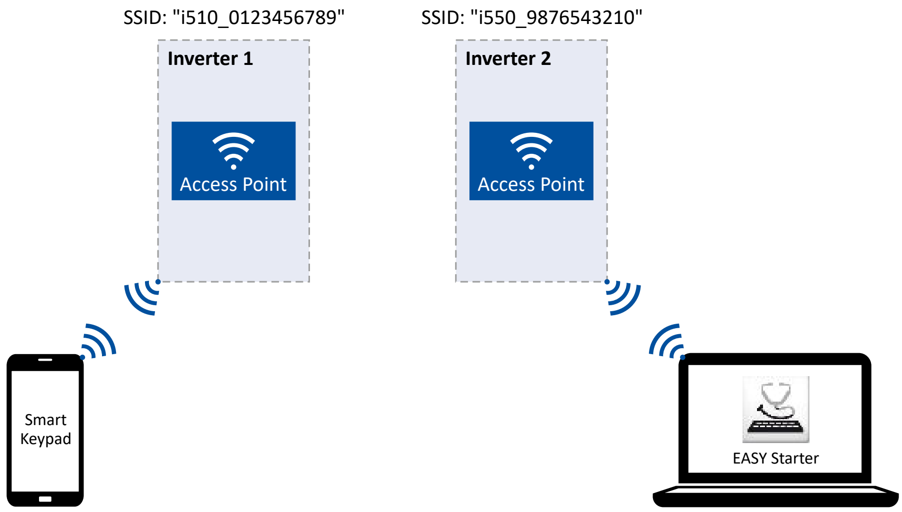
- Android smartphone with Lenze Smart Keypad App.
- Engineering PC (with WLAN functionality) and the »EASY Starter« engineering tool.

**Details**

- By default, every inverter with WLAN functionality comes with an individual network name, called "SSID".
- The preset network name consists of the device name (iXXX) and the first 10 digits of the serial number (example: "i550_0123456789").
- By default, the password for the WLAN network is "password" and can be changed in 0x2441:008.

If the WLAN module is to be plugged onto the inverter for a longer period of time, it is important to select a safe password. Otherwise, a potential attacker might connect to the WLAN access point and attack the device and other connected devices or networks. Currently (status: 2016), a WLAN is considered as safe if the password consists of more than 20 characters, contains capital and small letters, numbers and special characters and cannot be found in any dictionary.

The following illustration displays the SSIDs as examples only:




For establishing a WLAN connection, only a few settings are required. The respective setting is described in the following subchapters:

- Establish a WLAN connection between smartphone and inverter 433
- Using the smartphone as "Smart Keypad" 434
- Establish a WLAN connection between Engineering PC and inverter 435

#### 15.2.3.1 Establish a WLAN connection between smartphone and inverter

How to establish a direct WLAN connection to the inverter on the smartphone:

Requirements:
- The functional test described in the mounting and switch-on instructions has been completed successfully (without any errors or faults).
- The inverter is ready for operation (supplied with voltage).

Required accessories:
- WLAN module
- Android smartphone
- Lenze Smart Keypad App (available free of charge in the Google Play Store)

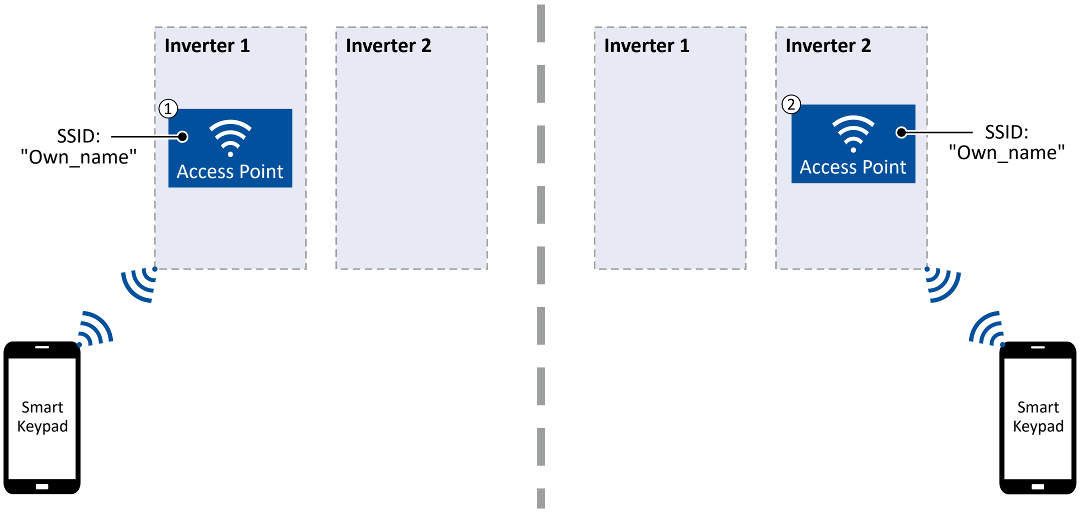
1. Plug the WLAN module onto the front of the inverter (interface X16).
2. Unless already activated, activate the WLAN function on the smartphone under "Settings" → "WLAN".
   The WLAN networks available in your range are now displayed.
3. Select the WLAN network established by the inverter.
4. Enter the password for the WLAN network (default setting "password") and click "Connect".
   The connection to the WLAN network of the inverter is now established.
5. Start the Lenze Smart Keypad App on the Android smartphone.

If a WLAN connection to the inverter has been established, the Lenze Smart Keypad App serves to
- read out diagnostics parameters of the inverter,
- change parameter settings of the inverter and
- transmit parameter sets.

#### 15.2.3.2 Using the smartphone as "Smart Keypad"

In the default setting, the WLAN settings of the inverters are used. If the WLAN module is plugged onto another inverter, the WLAN connection must be set up again because the replugging causes a change of the network name.

For using the smartphone as "Smart Keypad", the WLAN module can be configured such that the WLAN settings are saved locally in the WLAN module and only these settings are used. In this "standalone" mode, the WLAN module remains permanently coupled to the smartphone because after replugging onto another inverter, the login data for the WLAN network (SSID and password) is the same:




① WLAN module is plugged onto the inverter 1. After the connection to the smartphone has been established, the inverter 1 can be diagnosed or parameterised with the Lenze Smart Keypad App.

② WLAN module is plugged onto the inverter 2. After the WLAN network is restarted, a connection is established again to the smartphone because the WLAN settings are identical. Now, the inverter 2 can be diagnosed or parameterised with the Lenze Smart Keypad App.

How to configure the WLAN module for a "Smart Keypad" use:

Requirements:

- The WLAN settings of the inverter can be accessed via the Lenze Smart Keypad App or »EASY Starter«.

1. Define your own network name (SSID) in 0x2441:007.
2. Define your own password in 0x2441:008.
3. Set the selection "Save settings in WLAN module [11]" in 0x2440.

The defined network name and the password are saved locally in the WLAN module. The WLAN network is restarted with the current settings.

If the WLAN module is then plugged onto another inverter, the settings that are locally saved in the WLAN module are used (irrespective of the WLAN settings of the inverter).

- The active mode ("Inverter" or "Standalone") is displayed in 0x2442:004.
- In order to return to the standard mode "Inverter", the selection "Restart with default values [2]" must be set in 0x2440.

### 15.2.3.3 Establish a WLAN connection between Engineering PC and inverter

How to establish a direct WLAN connection to the inverter on the Engineering PC:

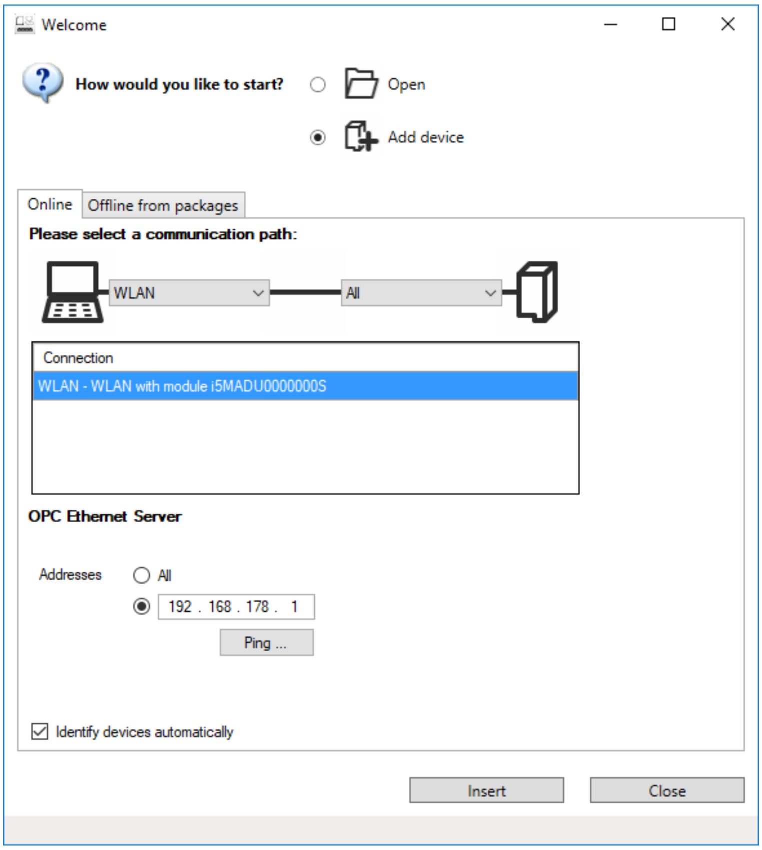
Requirements:

- The functional test described in the mounting and switch-on instructions has been completed successfully (without any errors or faults).
- The inverter is ready for operation (supplied with voltage).

Required accessories:

- WLAN module
- PC (with WLAN functionality) and installed »EASY Starter«

1. Plug the WLAN module onto the front of the inverter (interface X16).
2. Open the network settings on the Engineering PC: "Control panel" → "Network and sharing center".
3. Select the "Set up a new connection or network" option under "Change your network settings".
   The "Set Up a Connection or Network" dialog box is displayed.
4. Select the "Manually connect to a wireless network" connection option and click the "Next" button.
   The "Manually connect to a wireless network" dialog box is displayed.
5. Enter the SSID of the inverter as network name.
6. Select "WPA2-Personal" as safety type.
7. Select "AES" as encryption type.
8. Enter the password as safety key for the WLAN network (default setting "password").
9. Tick "Start this connection automatically".
10. Click "Next".
    A note indicates that the connection has been added successfully.
11. Click "Close".
12. Start »EASY Starter«.
    The "Add devices" dialog is shown.
13. Select connection "WLAN - WLAN with module i5MADU0000000S":



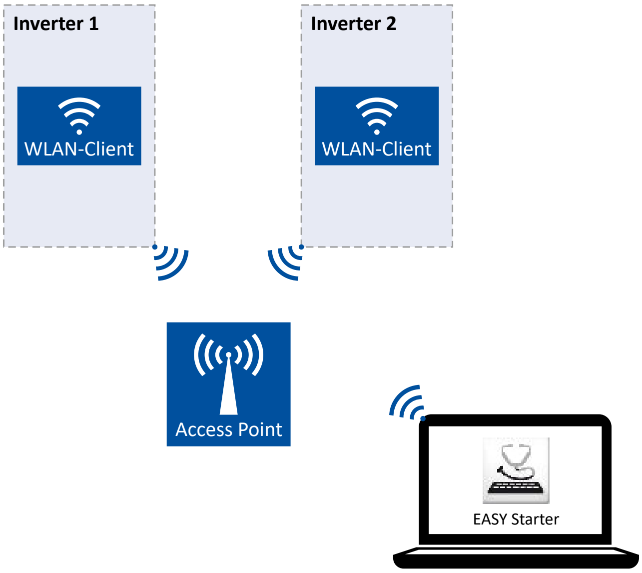
14. Set the address to the WLAN IP address of the drive. The default IP address of the WLAN module is: 192.168.178.1. The active WLAN address is in 0x2442:001.
15. Click the **Insert** button.

    »EASY Starter« searches for connected devices via the communication path selected. When the connection has been established successfully, the inverter is displayed in the device list of »EASY Starter«. The inverter parameters can now be accessed via the tabs of »EASY Starter«.

Recommendation: Click the button in the toolbar of the »EASY Starter« to start visual tracking. This function serves to quickly check whether the connection to the correct device has been established. Optical device identification 345

### 15.2.4 WLAN client mode

The WLAN module can be optionally configured as a WLAN client. In this operating mode, the WLAN module can be implemented into an already existing WLAN network.




How to configure the WLAN module as WLAN client:

Requirements:

- The WLAN settings of the inverter can be accessed via »EASY Starter«.
- Name (SSID) and password of the external WLAN network are known.

1. Set the selection "Client mode [1]" in 0x2441:006.
2. Set the name (SSID) of the external WLAN network in 0x2441:007.
3. Set the password of the external WLAN network in 0x2441:008.
4. Saving the parameter settings. 📖 35

Before activating the changed WLAN settings in the next step: Make sure that the name (SSID) and the password of the external WLAN network are set correctly. The restart of the WLAN module in the client mode causes a termination of an existing WLAN connection in the access point mode!

5. Restart the inverter or remove and replug the WLAN module to activate the changed WLAN settings.

The WLAN module now tries as a client to establish a connection to the set external WLAN network.

Notes:

- In the default setting, the WLAN client is configured as DHCP client in 0x2441:004.
  - Settings as IP address, subnetwork mask and gateway are automatically made by the DHCP server of the external WLAN network.
  - The active settings are displayed in 0x2442:001, 0x2442:002 and 0x2442:003.
- A static IP configuration can be made via the parameters 0x2441:001, 0x2441:002 and 0x2441:003.

#### Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2441:001 | WLAN settings: IP address<br>0.0.0.0 ... [**192.168.178.1**] ... 255.255.255.255<br>• From version 02.00 | Definition of the IP address for the WLAN access point.<br>• In the client mode, a static IP address can be set here for the WLAN client. In order that the static configuration becomes effective, DHCP must be disabled in 0x2441:004.<br>• Byte order is "Big-Endian":<br>192.168.178.01 = 0x01B2A8C0 (= 28485824) |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2441:002 | WLAN settings: Netmask<br>0.0.0.0 ... [**255.255.255.0**] ... 255.255.255.255<br>• From version 02.00 | Definition of the network mask for the WLAN access point.<br>• In the client mode, a static network mask can be set here for the WLAN client. In order that the static configuration becomes effective, DHCP must be disabled in 0x2441:004.<br>• Byte order is "Big-Endian":<br>255.255.255.0 = 0x00FFFFFF (= 16777215) |
| 0x2441:003 | WLAN settings: Gateway<br>0.0.0.0 ... [**192.168.178.1**] ... 255.255.255.255<br>• From version 02.00 | Definition of the gateway for the WLAN access point.<br>• In the client mode, a static gateway can be set here for the WLAN client. In order that the static configuration becomes effective, DHCP must be disabled in 0x2441:004.<br>• Byte order is "Big-Endian":<br>192.168.178.1 = 0x01B2A8C0 (= 28485824) |
| 0x2442:001 | Active WLAN settings: Active IP address<br>• Read only<br>• From version 02.00 | Display of the active IP address.<br>• If DHCP is activated, the active IP address usually derives from the configured static IP address of the device. |
| 0x2442:002 | Active WLAN settings: Active netmask<br>• Read only<br>• From version 02.00 | Display of the active netmask. |
| 0x2442:003 | Active WLAN settings: Active gateway<br>• Read only<br>• From version 02.00 | Display of the active gateway IP address. |

### 15.2.5 WLAN diagnostics

The following parameters serve to diagnose the WLAN module and the WLAN communication.

#### Preconditions

WLAN module has been plugged onto the interface X16 on the front of the inverter.

#### Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2448:001 | WLAN status: Connection time<br>• Read only<br>• From version 02.00 | Display of the connection time in [s] since the current connection was established. |
| 0x2448:002 | WLAN status: Number of connections<br>• Read only<br>• From version 02.00 | In access point mode: Display of the number of currently connected clients.<br>In client mode: 0 = not connected; 1 = connected with external WLAN network. |
| 0x2448:003 | WLAN status: Rx frame counter<br>• Read only<br>• From version 02.00 | Display of the number of request received via WLAN. |
| 0x2448:004 | WLAN status: Error statistics<br>• Read only<br>• From version 02.00 | Display of the quality of the WLAN connection. A display value > 0 indicates communication problemsn. |
| 0x2449 | WLAN error<br>• Read only<br>• From version 02.00 | Bit coded display of WLAN errors. |
| | Bit 2 WLAN error | |
| | Bit 3 Memory problem | |
| | Bit 4 WLAN connection problem | |
| | Bit 7 WLAN off | |
| | Bit 9 Client mode off | |
| | Bit 12 TCP/IP configuration error | |
| | Bit 13 Password length | |
| | Bit 14 Access denied | |

# 16 Diagnostics and fault elimination

This section contains information on error handling, drive diagnostics and fault analysis.

## 16.1 LED status display

The "RDY" and "ERR" LED status displays on the front of the inverter provide some quick information about certain operating states.

| "RDY" LED (blue) | "ERR" LED (red) | Status/meaning |
|---|---|---|
| Off | Off | Supply voltage not available. |
| On | On | Initialisation in progress (inverter is being started.) |
| Blinks (1 Hz) | Off | Safe torque off (STO) active. The inverter has been inhibited by the integrated safety system. |
| Blinks (1 Hz) | On | Inverter inhibited, error active.<br>▸ Error handling 455 |
| On | Off | Inverter enabled.<br>**Motor rotates according to the specified setpoint or quick stop is active.** |
| Both LEDs are blinking in a rapidly alternating mode | | Firmware update active.<br>▸ Update device firmware 363 |
| Both LEDs are blinking in a very rapidly synchronous mode | | "Visual tracking" function is active.<br>▸ Optical device identification 345 |

## 16.2 Logbook

With the logbook, the controller has access to the last 32 messages of the inverter.

- The logbook is saved persistently in the inverter.
- The logbook has a ring buffer structure:
  - As long as free memory is available in the logbook, a message is entered following the next free memory unit.
  - When all memory units are occupied, the oldest message is deleted for a new message.
  - Always the most recent messages remain available.
- On the basis of the "Diag code" (32-bit word) of each individual message it can be seen which axis the message refers to.

### Parameter

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2022:015<br>(P700.15) | Device commands: Delete logbook<br>(Device commands: Delete logbook)<br>• Setting can only be changed if the inverter is disabled. | | • When the device command has been executed successfully, the value 0 is shown.<br>• Do not switch off the supply voltage during the deletion process and do not unplug the memory module! |
| | **0** | **Off / ready** | Only status feedback |
| | 1 | On / start | |

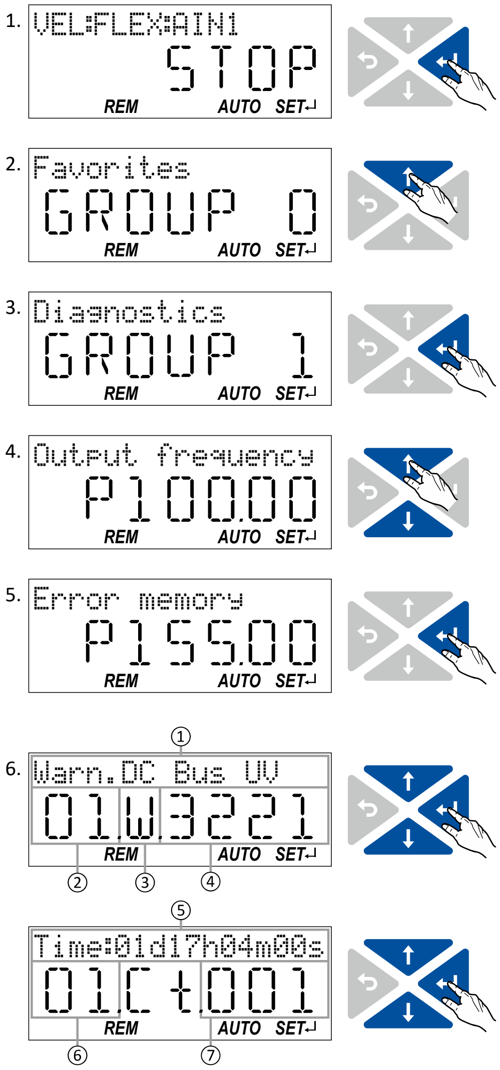
## 16.3 Error history buffer

For purposes of diagnostics, the error history buffer contains the last 32 error and warning messages of the inverter, which have occurred during operation. The error history buffer can be read out using the keypad via P155.00 and provides a limited view on the logbook.

**Details**

- For each event that is recorded, the error history buffer contains the message text, the error code, the time of occurrence as well as a counter for successive, identical events. If an event that has already been recorded occurs repeatedly, only the counter is incremented.
- The error history buffer can be reset by the user. In order to prevent the buffer from being reset by the user, this function can be protected by means of a password.
- Observe that the error history buffer only presents a snapshot at the time the data are read out. If a new event occurs, the error history buffer must be read out again via P155.00 so that the new event becomes visible.

**Accessing the error history buffer with the keypad**




1. Use the ↵ key in the operating mode to navigate to the parameterisation mode one level below.
   You are now in the group level. All parameters of the inverter are divided into different groups according to their function.
   Note: By using the ↶ key you can navigate one level upwards again anytime.
2. Use the ↑ navigation key to select group 1 ("Diagnostics").
3. Use the ↵ key to navigate to one level below.
   You are now in the parameter level of the group selected.
4. Use the ↑ and ↓ select the P155.00 parameter.
5. Use the ↵ key to navigate to one level below.
   You are now in the error history buffer.
6. Use the ↑ and ↓ navigation keys you can now scroll through the error history buffer entries.
   Use the ↵ key, you can switch over the display.

   **Information displayed (page 1):**
   ① Message text
   ② No. of the entry (01 = latest event)
   ③ Response (W = warning, T = trouble, F = fault)
   ④ Error code

   **Information displayed (page 2):**
   ⑤ Time of occurrence
   ⑥ No. of the entry (01 = latest event)
   ⑦ Counter for successive, identical events

   Note: By using the ↶ key you can exit the error history buffer again.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2006:000<br>(P155.00) | Error history buffer: Keypad display<br>(Fault memory: Error memory)<br>• Read only | Display of the error history buffer on the keypad. |
| 0x2006:001 | Error history buffer: Maximum number of messages<br>• Read only | Display of the maximum number of messages which can be stored in the history buffer (from subindex 6). |



| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2006:002 | Error history buffer: Latest message<br>• Read only | Display of the subindex of the most recent message. |
| 0x2006:003 | Error history buffer: Latest acknowledgement message<br>0 ... [**0**] ... 37 | 0 = delete all entries in the error history buffer. |
| 0x2006:004 | Error history buffer: New message<br>• Read only | Reserved for future extensions. |
| 0x2006:005 | Error history buffer: Buffer overflow<br>0 ... [**1**] ... 65535<br>Bit 0 Send emergency message<br>Bit 1 Disable info message<br>Bit 2 Disable warning message<br>Bit 3 Disable error message<br>Bit 4 Mode selection<br>Bit 5 Message overwritten | Bit 0 ... bit 4 = 0.<br>Bit 5 = 1 = overflow (after recording the 33rd event in the error history buffer. |
| 0x2006:006 | Error history buffer: Message 0<br>• Read only | Error history buffer entry 01 (latest event) |
| 0x2006:007 | Error history buffer: Message 1<br>• Read only | Error history buffer entry 02 |
| 0x2006:008 | Error history buffer: Message 2<br>• Read only | Error history buffer entry 03 |
| 0x2006:009 | Error history buffer: Message 3<br>• Read only | Error history buffer entry 04 |
| 0x2006:010 | Error history buffer: Message 4<br>• Read only | Error history buffer entry 05 |
| 0x2006:011 | Error history buffer: Message 5<br>• Read only | Error history buffer entry 06 |
| 0x2006:012 | Error history buffer: Message 6<br>• Read only | Error history buffer entry 07 |
| 0x2006:013 | Error history buffer: Message 7<br>• Read only | Error history buffer entry 08 |
| 0x2006:014 | Error history buffer: Message 8<br>• Read only | Error history buffer entry 09 |
| 0x2006:015 | Error history buffer: Message 9<br>• Read only | Error history buffer entry 10 |
| 0x2006:016 | Error history buffer: Message 10<br>• Read only | Error history buffer entry 11 |
| 0x2006:017 | Error history buffer: Message 11<br>• Read only | Error history buffer entry 12 |
| 0x2006:018 | Error history buffer: Message 12<br>• Read only | Error history buffer entry 13 |
| 0x2006:019 | Error history buffer: Message 13<br>• Read only | Error history buffer entry 14 |
| 0x2006:020 | Error history buffer: Message 14<br>• Read only | Error history buffer entry 15 |
| 0x2006:021 | Error history buffer: Message 15<br>• Read only | Error history buffer entry 16 |
| 0x2006:022 | Error history buffer: Message 16<br>• Read only | Error history buffer entry 17 |
| 0x2006:023 | Error history buffer: Message 17<br>• Read only | Error history buffer entry 18 |
| 0x2006:024 | Error history buffer: Message 18<br>• Read only | Error history buffer entry 19 |
| 0x2006:025 | Error history buffer: Message 19<br>• Read only | Error history buffer entry 20 |
| 0x2006:026 | Error history buffer: Message 20<br>• Read only | Error history buffer entry 21 |
| 0x2006:027 | Error history buffer: Message 21<br>• Read only | Error history buffer entry 22 |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2006:028 | Error history buffer: Message 22<br>• Read only | Error history buffer entry 23 |
| 0x2006:029 | Error history buffer: Message 23<br>• Read only | Error history buffer entry 24 |
| 0x2006:030 | Error history buffer: Message 24<br>• Read only | Error history buffer entry 25 |
| 0x2006:031 | Error history buffer: Message 25<br>• Read only | Error history buffer entry 26 |
| 0x2006:032 | Error history buffer: Message 26<br>• Read only | Error history buffer entry 27 |
| 0x2006:033 | Error history buffer: Message 27<br>• Read only | Error history buffer entry 28 |
| 0x2006:034 | Error history buffer: Message 28<br>• Read only | Error history buffer entry 29 |
| 0x2006:035 | Error history buffer: Message 29<br>• Read only | Error history buffer entry 30 |
| 0x2006:036 | Error history buffer: Message 30<br>• Read only | Error history buffer entry 31 |
| 0x2006:037 | Error history buffer: Message 31<br>• Read only | Error history buffer entry 32 |

**Structure of the messages**

The following example shows the detailed structure of one of the following messages (parameter 0x2006:006 ... 0x2006:037):

| Message: | 00E010431201990000520B0473FC0100050001 | | | | | |
|---|---|---|---|---|---|---|
| | 00E01043 | 1201 | 9900 | 00520B0473FC0100 | 0500 | 01 |
| Meaning: | Diag code | Message type | Text ID | Time stamp in [ns] | Flag param. 1 | Parameter 1 |
| Data type: | U32 | U16 | U16 | U64 | U16 | U8 |
| Hex value: | 0x4310 E000 | 0x0112 | 0x0099 | 0x0001 FC73 040B 5200 | 0x0005 | 0x01 |

Notes:

- The upper 16 bits of the "Diag Code" contain the error code (in the example "0x4310").
- Bit 0 ... 3 of the message type contain the error type (0: Info, 1: Warning, 2: Trouble, 3: Fault).
- Convert time stamp: 0x0001 FC73 040B 5200 = 559045896000000 ns = 6 days, 11 hours, 17 minutes, 25 seconds
- The flag for parameter 1 has no meaning for decoding the message.
- The parameter 1 contains the counter for successive, identical events.

### 16.3.1 Read out error history buffer

There are two different options to read individual messages of the "error history memory" (in the logbook) from an external control or visualization system:

a) Via the standard path defined by "ETG 1020" (EtherCat Technology Group)
b) Via simple parameter access to messages in the "error history memory"

Option (b) is described here.

You read diagnostic messages via simple parameter access to the "error history memory".

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2007:001 | Error history buffer: Message number<br>1 ... [**1**] ... 32 | |
| 0x2007:002 | Error history buffer: Time stamp<br>• Read only: x.xx s | |
| 0x2007:003 | Error history buffer: Response to error<br>• Read only | |
| | 0 Info (from version 05.01) | |
| | 1 Warning (from version 05.01) | |
| | 2 Error (from version 05.01) | |
| 0x2007:004 | Error history buffer: Message ID<br>• Read only | |
| 0x2007:005 | Error history buffer: Diag Code Ident<br>• Read only | |
| 0x2007:006 | Error history buffer: Message counter<br>• Read only | |
| 0x2007:007 | Error history buffer: IO-Link message number<br>• Read only<br>• From version 05.04 | |

## 16.4 Diagnostic parameters

The inverter provides many diagnostic parameters which are helpful for operation, maintenance, error diagnosis, error correction, etc.

- The following overview lists the most common diagnostic parameters.
- Further parameters for more specific diagnostic purposes are described in the following subchapters.
- The diagnostic parameters can only be read and cannot be written to.
- The diagnostic parameters in group 1 are found on the keypad.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2030 | CRC parameter set<br>0 ... [**0**] ... 4294967295 | Display of the 32-bit hash sum for the integrity check of the parameter set. |
| 0x2B0B | Frequency setpoint<br>• Read only: x.x Hz<br>• From version 03.00 | Display of the current frequency setpoint. The frequency setpoint is internally transferred to the motor control (based on scaling and ramp generator).<br>The frequency setpoint is internally transferred to the motor control (based on scaling and ramp generator). |
| 0x2B0E<br>(P102.00) | Frequency setpoint<br>(Freq. setpoint)<br>• Read only: x.x Hz | Display of the frequency setpoint currently assigned.<br>• Depending on the present operating conditions, this value may differ from the current output frequency 0x2DDD (P100.00). |
| 0x2B0F | Output frequency motor<br>• Read only: x.x Hz | The inverter controls the motor so that the motor output frequency 0x2B0F corresponds to the frequency setpoint 0x2B0E (P102.00). (Motor output frequency = output frequency of inverter - motor slip) |
| 0x2D4F<br>(P123.00) | Motor utilisation (i²xt)<br>(Mot. i2t utilis.)<br>• Read only: x % | Display of the current thermal motor utilisation. |
| 0x2D87<br>(P105.00) | DC-bus voltage<br>(DC-bus voltage)<br>• Read only: x V | Display of the current DC-bus voltage. |
| 0x2D88<br>(P104.00) | Motor current<br>(Motor current)<br>• Read only: x.x A | Display des present current-r.m.s. value. |
| 0x2D89<br>(P106.00) | Motor voltage<br>(Motor voltage)<br>• Read only: x VAC | Display of the current motor voltage. |
| 0x2DA2:001<br>(P108.01) | Output power: Effective power<br>(Output power: Effective power)<br>• Read only: x.xxx kW | Display of the active output power for an energy analysis in the respective application. |
| 0x2DA2:002<br>(P108.02) | Output power: Apparent power<br>(Output power: Apparent power)<br>• Read only: x.xxx kVA | Display of the apparent output power for an energy analysis in the respective application. |
| 0x2DA3:001<br>(P109.01) | Output energy: Motor<br>(Output energy: Motor)<br>• Read only: x.xx kWh | Display of the output power in motor mode for an energy analysis in the respective application. |
| 0x2DA3:002<br>(P109.02) | Output energy: Generator<br>(Output energy: Generator)<br>• Read only: x.xx kWh | Display of the output power in generator mode for an energy analysis in the respective application. |
| 0x2DD1:001 | Motor currents: Actual D-current (id)<br>• Read only: x.xx A | Display of the actual D current. |
| 0x2DD1:002 | Motor currents: Actual Q-current (iq)<br>• Read only: x.xx A | Display of the actual Q current. |
| 0x2DD1:003 | Motor currents: Setpoint D-current (id)<br>• Read only: x.xx A | Display of the setpoint D current. |
| 0x2DD1:004 | Motor currents: Setpoint Q-current (iq)<br>• Read only: x.xx A | Display of the setpoint Q current. |
| 0x2DD1:005 | Motor currents: Motor current (Ieff)<br>• Read only: x.xx A | Display of the effective motor current. |
| 0x2DD3:003 | Speed setpoint limited<br>• Read only: x rpm | Display of the limited speed setpoint. |



| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2DDD<br>(P100.00) | Output frequency<br>(Inv. outp. freq.)<br>• Read only: x.x Hz | Display of the current output frequency of the inverter. |
| 0x2DDF:001 | Axis information: Rated current<br>• Read only: x.xx A | Display of the rated current of the axis. |
| 0x2DDF:002 | Axis information: Maximum current<br>• Read only: x.xx A | Display of the maximum current of the axis. |
| 0x400D<br>(P101.00) | Scaled actual value<br>(Scaled act value)<br>• Read only: x Units | Display of the current speed in application units. |
| 0x6077<br>(P107.00) | Actual torque<br>(Actual torque)<br>• Read only: x.x % | Display of the actual torque.<br>• 100 % = Rated motor torque 0x6076 (P325.00) |
| 0x6078<br>(P103.00) | Actual current<br>(Actual current)<br>• Read only: x.x % | Display of the motor actual current.<br>• 100 % = Rated motor current 0x6075 (P323.00) |
| 0x6079 | DC-bus voltage<br>• Read only: x.xxx V<br>• From version 02.00 | Display of the current DC-bus voltage. |

### 16.4.1 Inverter diagnostics

The following parameters supply some information about the current operating status of the inverter.

This includes the following information:

- Active access protection after log-in by means of PIN1/PIN2
- Currently loaded parameter settings
- Cause(s) for disable, quick stop and stop
- Active control source and active setpoint source
- Active operating mode
- Status of the internal motor control
- Keypad status

Some of the following parameters contain bit-coded status words. Each single bit has a certain meaning.

▸ Display of status words on keypad 406

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2040<br>(P197.00) | Access protection status<br>(Protect. status)<br>• Read only | | Bit-coded display of the active access protection after login by PIN1/ PIN2. |
| | Bit 0 | No write access | |
| | Bit 1 | Only favorites changeable | |
| 0x2827<br>(P198.00) | Currently loaded parameter settings<br>(Status load. par)<br>• Read only | | Display of the parameter settings currently loaded.<br>▸ Behaviour of the inverter in case of incompatible data in the memory module 364<br>▸ Saving/loading the parameter settings 348 |
| | 0 | User settings | User parameter settings of the memory module |
| | 1 | Reset 60 Hz setting | Delivery status (default setting) for 50-Hz device |
| | 2 | Reset 50 Hz setting | Delivery status (default setting) for 60-Hz device |
| | 3 | OEM default settings | OEM parameter settings of the memory module |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x282A:001<br>(P126.01) | Status words: Cause of disable<br>(Status words: Cause of disable)<br>• Read only | Bit-coded display of the cause(s) for disabled inverter. |
| | Bit 0 Flexible I/O configuration | 1 = the inverter was disabled by the trigger set in 0x2631:001 (P400.01). |
| | Bit 1 Network | 1 = the inverter was disabled via network. |
| | Bit 2 Axis command | 1 = the inverter was disabled via axis command . |
| | Bit 6 Fault DC-bus | 1 = The inverter was disabled due to a DC-bus error. |
| | Bit 7 Drive not ready | 1 = the inverter was disabled internally since the drive was not ready for operation.<br>Possible causes:<br>• Under/overvoltage in the DC bus<br>• Defective device hardware |
| | Bit 8 Quick stop active | 1 = the inverter was disabled by the "Quick stop" function. |
| | Bit 9 Motor data identification | 1 = the inverter was disabled by the "Automatic identification of the motor data" function. |
| | Bit 10 Holding brake | 1 = the inverter was disabled by the "Holding brake control" function. |
| | Bit 11 DC braking | |
| | Bit 12 CiA402 Inverter disabled | 1 = the inverter was disabled by the internal state machine.<br>The bit is only set if<br>• Operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]" and<br>• state machine in the "Switch on disabled" state and<br>• the state change has not been carried out via the "Disable operation" command. |
| | Bit 13 CiA402 Quick stop option code 2 | 1 = the inverter was disabled by the "Quick stop" function. |
| | Bit 14 Safety | Function is not supported in this device. |
| | Bit 15 CiA402 operation mode 0 | 1 = the inverter has been disabled because the selection "No selection [0]" is set in 0x6060 (P301.00). |
| 0x282A:002<br>(P126.02) | Status words: Cause of quick stop<br>(Status words: Cause of QSP)<br>• Read only | Bit coded display of the cause(s) of quick stop. |
| | Bit 0 Flexible I/O configuration | 1 = quick stop was activated by the trigger set in 0x2631:003 (P400.03). |
| | Bit 1 Network | 1 = quick stop was activated via network. |
| | Bit 2 Axis command | 1 = quick stop was activated via axis command . |
| | Bit 6 Error response | 1 = quick stop has been activated as a response to an error. |
| 0x282A:003<br>(P126.03) | Status words: Cause of stop<br>(Status words: Cause of stop)<br>• Read only | Bit coded display of the cause(s) of stop. |
| | Bit 0 Flexible I/O: Start disabled | 1 = stop was activated by the trigger set in 0x2631:002 (P400.02). |
| | Bit 1 Flexible I/O: Run forward | 1 = stop has been activated due to cancellation of the command "Run forward (CW)". |
| | Bit 2 Flexible I/O: Run reverse | 1 = stop has been activated due to cancellation of the command "Run reverse (CCW)". |
| | Bit 3 Flexible I/O: Jog forward | 1 = stop has been activated due to cancellation of the command "Jog foward (CW)". |
| | Bit 4 Flexible I/O: Jog reverse | 1 = stop has been activated due to cancellation of the command "Jog reverse (CCW)". |
| | Bit 5 Network | 1 = stop was activated via network. |
| | Bit 6 Keypad | 1 = stop was activated via keypad. |
| | Bit 7 Control mode transition | 1 = stop has been activated due to a change of the operating mode. |
| | Bit 8 End of sequence | 1 = stop was activated by the "sequencer" function since the sequence is completed.<br>• The bit is only set after the sequence is completed if End of sequence mode 0x402F (P824.00) is set ="Stop [1]" or "Stop and abort [2]". |
| | Bit 9 Manual mode | |
| | Bit 15 Waiting for start | 1 = stop is active as a start command is not yet available (e. g. after enabling the inverter). |

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x282A:004 | Status words: Extended status word<br>• Read only | | Bit-coded status word. |
| | Bit 8 | Reverse rotational direction | 1 = reversal active. |
| | Bit 10 | Inverter disabled (safety) | Function is not supported in this device. |
| | Bit 11 | STO active | |
| 0x282A:005<br>(P126.05) | Status words: Device status<br>(Status words: Device status)<br>• Read only | | Display of the current inverter device state. |
| | 0 | Initialisation | |
| | 2 | Not ready to switch on | |
| | 3 | Switch on disabled | |
| | 4 | Ready to switch on | |
| | 5 | Switched on | |
| | 6 | Operation enabled | |
| | 7 | Disable operation | |
| | 8 | Shut down | |
| | 9 | Quick stop active | |
| | 10 | Fault reaction active | |
| | 11 | Fault | |
| 0x282B:001<br>(P125.01) | Inverter diagnostics: Active control source<br>(Inverter diag.: Active control)<br>• Read only | | Display of the control source that is currently active. |
| | 0 | Flexible I/O configuration | |
| | 1 | Network | |
| | 2 | Keypad | |
| | 8 | Keypad full control | |
| | 9 | Manual mode | |
| 0x282B:002<br>(P125.02) | Inverter diagnostics: Active setpoint source<br>(Inverter diag.: Active setpoint)<br>• Read only | | Display of the setpoint source that is currently active. |
| | 0 | Not selected | |
| | 1 | Analog input 1 | |
| | 2 | Analog input 2 | |
| | 3 | Keypad Setpoint | |
| | 4 | HTL input | |
| | 5 | Network Setpoint | |
| | 9 | Manual mode: setpoint | |
| | 11 | Setpoint preset 1 | |
| | 12 | Setpoint preset 2 | |
| | 13 | Setpoint preset 3 | |
| | 14 | Setpoint preset 4 | |
| | 15 | Setpoint preset 5 | |
| | 16 | Setpoint preset 6 | |
| | 17 | Setpoint preset 7 | |
| | 18 | Setpoint preset 8 | |
| | 19 | Setpoint preset 9 | |
| | 20 | Setpoint preset 10 | |
| | 21 | Setpoint preset 11 | |
| | 22 | Setpoint preset 12 | |
| | 23 | Setpoint preset 13 | |
| | 24 | Setpoint preset 14 | |
| | 25 | Setpoint preset 15 | |
| | 31 | Segment preset 1 | |
| | 32 | Segment preset 2 | |
| | 33 | Segment preset 3 | |
| | 34 | Segment preset 4 | |

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| | 35 | Segment preset 5 | |
| | 36 | Segment preset 6 | |
| | 37 | Segment preset 7 | |
| | 38 | Segment preset 8 | |
| | 39 | Last segment | |
| | 50 | Motor potentiometer | |
| | 51 | PID setpoint (from version 04.00) | |
| | 201 | Internal value (from version 05.00) | Internal values of the manufacturer. |
| | 202 | Internal value (from version 05.00) | |
| | 203 | Internal value (from version 05.00) | |
| | 204 | Internal value (from version 05.00) | |
| | 205 | Internal value (from version 05.00) | |
| | 206 | Internal value (from version 05.00) | |
| 0x282B:003<br>(P125.03) | Inverter diagnostics: Keypad LCD status<br>(Inverter diag.: Keypad LCD stat.)<br>• Read only | | Bit-coded state of the keypad status displays. |
| | Bit 0 | LOC | 1 = local keypad control active. |
| | Bit 1 | REM | 1 = remote control via terminals, network, etc. active. |
| | Bit 2 | MAN | 1 = manual setpoint selection via keypad active. |
| | Bit 3 | Auto | 1 = automatic setpoint selection via terminals, network, etc. active. |
| | Bit 4 | Set | 1 = a parameter setting has been changed but not been saved yet in the memory module with mains failure protection . |
| 0x282B:004<br>(P125.04) | Inverter diagnostics: Active drive mode<br>(Inverter diag.: Drive mode)<br>• Read only | | Display of the active drive mode. |
| | 0 | Velocity mode | "Velocity mode" active. |
| | 1 | PID control | PID control active. |
| | 2 | Torque mode (from version 03.00) | "Torque mode" active. |
| | 4 | Jog operation | "Jog foward (CW)" or "Jog reverse (CCW)" function active. |
| 0x2831 | Inverter-Statuswort<br>• Read only | | Bit coded status word of the internal motor control. |
| | Bit 1 | Speed setpoint 1 limited | 1 = input of speed controller 1 in limitation. |
| | Bit 2 | Speed controller in limitation | 1 = output of speed controller 1 in limitation. |
| | Bit 3 | Torque setpoint limited | 1 = setpoint torque in limitation. |
| | Bit 4 | Soll-Q-Strom limitiert | 1 = setpoint current in limitation. |
| | Bit 5 | Speed setpoint 2 limited | 1 = input of speed controller 2 in "torque mode" in limitation. |
| | Bit 6 | Obere Drehzahlgrenze aktiv | 1 = in "torque mode", the speed is limited to upper speed limit 0x2946:001 (P340.01) . |
| | Bit 7 | Untere Drehzahlgrenze aktiv | 1 = in "torque mode", the speed is limited to lower speed limit 0x2946:002 (P340.02) . |
| | Bit 8 | Flying restart active | - |
| | Bit 10 | Output frequency limited | 1 = setpoint frequency with V/f operation in limitation. |
| | Bit 11 | Magnetisation completed | 1 = during V/f operation, the factor 7 rotor time constant has passed (calculated from the time at which the inverter was enabled without restart on the fly and with a total motor current of 20 % rated motor current for the first time). Otherwise 0. |
| | Bit 12 | Motorphasenfehler | 1 = motor phase failure detection active. |
| | Bit 14 | Error reset blocking time active | 1 = the error can only be reset when the blocking time has elapsed. |
| 0x2833 | Inverter status word 2<br>• Read only | | Bit-coded status word 2 of the inverter. |
| | Bit 1 | Manual test mode active | 1 = manual test mode active. |
| | Bit 2 | Manual control active | 1 = manual control active. |
| | Bit 6 | DC braking active | 1 = DC braking active. |
| | Bit 15 | UPS operation active | 1 = UPS operation active. |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x293A<br>(P116.00) | Actual switching frequency<br>(Actual sw. freq.)<br>• Read only | Display of the currently active switching frequency of the inverter.<br>Example:<br>• "16 kHz variable / drive-optimised / 4 kHz min. [22]" is selected as switching frequency in 0x2939 (P305.00).<br>• An increase of the ambient temperature and/or the load have caused a decrease of the switching frequency to 8 kHz. In this case, this parameter indicates the selection "8 kHz power loss-optimized [7]". |
| | 1 2 kHz drive-optimized | |
| | 2 4 kHz drive-optimized | |
| | 3 8 kHz drive-optimized | |
| | 4 16 kHz drive-optimized | |
| | 5 2 kHz power loss-optimized | |
| | 6 4 kHz power loss-optimized | |
| | 7 8 kHz power loss-optimized | |
| | 8 16 kHz power loss-optimized | |
| | 9 12 kHz drive-optimised | |
| | 10 12 kHz power loss-optimised | |
| 0x2DAC<br>(P119.00) | Keypad status<br>(Keypad status)<br>• Read only | Bit-coded display of the keypad status. |
| | Bit 0 Start Key | 1 = keypad start key pressed. |
| | Bit 1 Stop Key | 1 = keypad stop key pressed. |
| | Bit 2 Up arrow | 1 = keypad up-arrow key pressed. |
| | Bit 3 Down arrow | 1 = keypad down-arrow key pressed. |
| | Bit 4 Enter Key | 1 = keypad enter key pressed. |
| | Bit 5 Back key | 1 = keypad back key pressed. |
| 0x2DAD<br>(P120.00) | Internal hardware states<br>(Int. HW states)<br>• Read only | Bit-coded display of internal hardware states. |
| | Bit 0 Relay | 0 = X9/NO-COM open and NC-COM closed.<br>1 = X9/NO-COM closed and NC-COM open. |
| | Bit 1 Digital output 1 | 0 = LOW level, 1 = HIGH level. |
| | Bit 2 Digital output 2 | Function is not supported in this device. |
| | Bit 10 Charge Relay | 1 = precharging of the DC bus via charge relay is active. |
| 0x603F<br>(P150.00) | Error code<br>(Error code)<br>• Read only | Error message |

### 16.4.2 Network diagnostics

The following parameters show some general information with regard to the network option available and the network.

#### Parameter

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x282B:005<br>(P125.05) | Inverter diagnostics: Most recently used control register<br>(Inverter diag.: Netw. contr.reg.)<br>• Read only | Display of the network register for the control that was accessed last (e. g. 0x6040 or 0x400B:1).<br>• Format: 0xiiiiss00 (iiii = hexadecimal index, ss = hexadecimal subindex)<br>• The lowest byte is always 0x00. |
| 0x282B:006<br>(P125.06) | Inverter diagnostics: Most recently used setpoint register<br>(Inverter diag.: Netw. setp.reg.)<br>• Read only | Display of the network register for setpoint selection that was accessed last (e. g. 0x6042 or 0x400B:3).<br>• Format: 0xiiiiss00 (iiii = hexadecimal index, ss = hexadecimal subindex)<br>• The lowest byte is always 0x00. |

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x231F:001<br>(P500.01) | Communication module ID: Active module ID<br>(Module ID: Active module ID)<br>• Read only | | Display of the network options currently configured in the device.<br>• With the help of this module ID, the keypad only shows the communication parameters relevant to the respective network.<br><br>Note!<br>When switched on, the device checks whether the parameter settings saved in the memory module match the device hardware and firmware. In case of an incompatibility, a corresponding error message is output. For details see chapter "Behaviour of the inverter in case of incompatible data in the memory module" (section "Hardware and firmware updates/downgrades"). 364 |
| | 48 | No network | |
| | 67 | CANopen | |
| | 72 | BACnet | |
| | 87 | Modbus | |
| 0x231F:002<br>(P500.02) | Communication module ID: Module ID connected<br>(Module ID: Module ID conn.)<br>• Read only | | Display of the network options currently available in the device.<br>Note!<br>When switched on, the device checks whether the parameter settings saved in the memory module match the device hardware and firmware. In case of an incompatibility, a corresponding error message is output. For details see chapter "Behaviour of the inverter in case of incompatible data in the memory module" (section "Hardware and firmware updates/downgrades"). 364 |
| | 48 | No network | |
| | 67 | CANopen | |
| | 72 | BACnet | |
| | 87 | Modbus | |

**Related topics**

- Configuring the network 257

### 16.4.3 I/O diagnostics

This section describes the diagnostics of the analog and digital inputs and outputs that can be found on the control terminal X3.

#### 16.4.3.1 Digital inputs and outputs

The following parameters serve to diagnose the digital inputs and outputs of the inverter.

**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x60FD<br>(P118.00) | Digital input status<br>(Digital inputs)<br>• Read only | | Bit coded display of the current status of the digital inputs |
| | Bit 16 | Digital input 1 | 0 = LOW level, 1 = HIGH level. |
| | Bit 17 | Digital input 2 | |
| | Bit 18 | Digital input 3 | |
| | Bit 19 | Digital input 4 | |
| | Bit 20 | Level from digital input 5 | |
| | Bit 21 | Level from digital input 6 | Function is not supported in this device. |
| | Bit 22 | Level from digital input 7 | |
| | Bit 25 | Internal interconnection of digital inputs | 0 = digital input terminals are set to HIGH (PNP) level via pull-up resistors.<br>1 = digital input terminals are set to LOW (PNP) level via pull-down resistors. |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2DAD<br>(P120.00) | Internal hardware states<br>(Int. HW states)<br>• Read only | Bit-coded display of internal hardware states. |
| | Bit 0 Relay | 0 = X9/NO-COM open and NC-COM closed.<br>1 = X9/NO-COM closed and NC-COM open. |
| | Bit 1 Digital output 1 | 0 = LOW level, 1 = HIGH level. |
| | Bit 2 Digital output 2 | Function is not supported in this device. |
| | Bit 10 Charge Relay | 1 = precharging of the DC bus via charge relay is active. |
| 0x4016:005 | Digital output 1: Terminal state<br>• Read only | Display of the logic state of output terminal X3/DO1. |
| | 0 FALSE | |
| | 1 TRUE | |
| 0x4016:006 | Digital output 1: Trigger signal state<br>• Read only | Display of the logic state of the trigger signal for digital output 1 (without taking a ON/OFF delay set and inversion into consideration). |
| | 0 FALSE | |
| | 1 TRUE | |
| 0x4018:005 | Relay: Relay state<br>• Read only | Display of the logic state of the relay. |
| | 0 FALSE | |
| | 1 TRUE | |
| 0x4018:006 | Relay: Trigger signal state<br>• Read only | Display of the logic state of the trigger signal for the relay (without taking a ON/OFF delay set and inversion into consideration). |
| | 0 FALSE | |
| | 1 TRUE | |

**Related topics**

▶ Configure digital inputs 📖 237

▶ Configure digital outputs 📖 247

### 16.4.3.2 Analog inputs and outputs

The following parameters serve to diagnose the analog inputs and outputs of the inverter.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2DA4:001<br>(P110.01) | Diagnostics of analog input 1: Value in percent<br>(AI1 diagnostics: AI1 terminal %)<br>• Read only: x.x % | Display of the current input value at X3/AI1 scaled as value in percent.<br>• 100 % = 10 V or 20 mA or 5 V |
| 0x2DA4:002<br>(P110.02) | Diagnostics of analog input 1: Frequency value<br>(AI1 diagnostics: AI1 scaled freq.)<br>• Read only: x.x Hz | Display of the current input value at X3/AI1 scaled as a frequency value.<br>• The standard setpoint source for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]" is selected in 0x2860:001 (P201.01). |
| 0x2DA4:003<br>(P110.03) | Diagnostics of analog input 1: Process controller value<br>(AI1 diagnostics: AI1 scaled PID)<br>• Read only: x.xx PID unit | Display of the current input value at X3/AI1 scaled as a process controller value.<br>• The standard setpoint source for the reference value of PID control is selected in 0x2860:002 (P201.02). |
| 0x2DA4:004<br>(P110.04) | Diagnostics of analog input 1: Torque value<br>(AI1 diagnostics: AI1 scaled torq.)<br>• Read only: x.x % | Display of the current input value at X3/AI1 scaled as a percentage torque value.<br>• 100 % = permissible maximum torque 0x6072 (P326.00)<br>• The standard setpoint source for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]" is selected in 0x2860:003 (P201.03). |

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2DA4:016<br>(P110.16) | Diagnostics of analog input 1: Status<br>(AI1 diagnostics: AI1 status)<br>• Read only<br>• From version 04.00 | Bit coded display of the status of analog input 1 (X3/AI1). |
| | Bit 0 Mode 0: 0 ... 10 VDC active | |
| | Bit 1 Mode 1: 0 ... 5 VDC active | |
| | Bit 2 Mode 2: 2 ... 10 VDC active | |
| | Bit 3 Mode 3: -10 ... 10 VDC active | |
| | Bit 4 Mode 4: 4 ... 20 mA active | |
| | Bit 5 Mode 5: 0 ... 20 mA active | |
| | Bit 6 24 V supply OK | |
| | Bit 7 Calibration successful | |
| | Bit 8 Monitoring threshold exceeded/not reached | |
| | Bit 9 Input current too low (mode 4) | |
| | Bit 10 Input voltage too low (mode 2) | |
| | Bit 11 Input voltage too high (mode 4) | |
| 0x2DA5:001<br>(P111.01) | Diagnostics of analog input 2: Value in percent<br>(AI2 diagnostics: AI2 terminal %)<br>• Read only: x.x % | Display of the current input value at X3/AI2 scaled as a value in percent.<br>• 100 % = 10 V or 20 mA or 5 V |
| 0x2DA5:002<br>(P111.02) | Diagnostics of analog input 2: Frequency value<br>(AI2 diagnostics: AI2 scaled freq.)<br>• Read only: x.x Hz | Display of the current input value at X3/AI2 scaled as a frequency value.<br>• The standard setpoint source for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]" is selected in 0x2860:001 (P201.01). |
| 0x2DA5:003<br>(P111.03) | Diagnostics of analog input 2: Process controller value<br>(AI2 diagnostics: AI2 scaled PID)<br>• Read only: x.xx PID unit | Display of the current input value at X3/AI2 scaled as a process controller value.<br>• The standard setpoint source for the reference value of PID control is selected in 0x2860:002 (P201.02). |
| 0x2DA5:004<br>(P111.04) | Diagnostics of analog input 2: Torque value<br>(AI2 diagnostics: AI2 scaled torq.)<br>• Read only: x.x % | Display of the current input value at X3/AI2 scaled as a percentage torque value.<br>• 100 % = permissible maximum torque 0x6072 (P326.00) |
| 0x2DA5:016<br>(P111.16) | Diagnostics of analog input 2: Status<br>(AI2 diagnostics: AI2 status)<br>• Read only<br>• From version 04.00 | Bit-coded display of the status of analog input 2 (X3/AI2). |
| | Bit 0 Mode 0: 0 ... 10 VDC active | |
| | Bit 1 Mode 1: 0 ... 5 VDC active | |
| | Bit 2 Mode 2: 2 ... 10 VDC active | |
| | Bit 3 Mode 3: -10 ... 10 VDC active | |
| | Bit 4 Mode 4: 4 ... 20 mA active | |
| | Bit 5 Mode 5: 0 ... 20 mA active | |
| | Bit 6 24 V supply OK | |
| | Bit 7 Calibration successful | |
| | Bit 8 Monitoring threshold exceeded/not reached | |
| | Bit 9 Input current too low | |
| | Bit 10 Input voltage too low | |
| | Bit 11 Input voltage too high | |
| 0x2DAA:001<br>(P112.01) | Diagnostics of analog output 1: Voltage<br>(AO1 diagnostics: AO1 Voltage)<br>• Read only: x.xx V | Display of the current output voltage at X3/AO1. |
| 0x2DAA:002<br>(P112.02) | Diagnostics of analog output 1: Current<br>(AO1 diagnostics: AO1 Current)<br>• Read only: x.xx mA | Display of the present output current at X3/AO1. |

**Related topics**

▸ Configure analog inputs 240

▸ Configure analog outputs 253

### 16.4.4 Service life diagnostics

The following parameters provide some information about the use of the inverter.

This includes the following information:

- Operating and power-on time of the inverter/control unit
- Operating time of the internal fan
- Number of switching cycles of the mains voltage
- Number of switching cycles of the relay
- Number of short-circuits and earth faults that have occurred
- Display of the number of "Clamp responded too often" errors that have occurred.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2D81:001<br>(P151.01) | Life-diagnosis: Operating time<br>(Life-diagnosis: Operating time)<br>• Read only: x s | Display showing for how long the device has been running so far (device status “operation enabled”). |
| 0x2D81:002<br>(P151.02) | Life-diagnosis: Power-on time<br>(Life-diagnosis: Power-on time)<br>• Read only: x s | Display showing for how long the device has been supplied with line voltage so far. |
| 0x2D81:003<br>(P151.03) | Life-diagnosis: Control unit operating time<br>(Life-diagnosis: CU oper. time)<br>• Read only: x ns | Display showing how long the control unit of the inverter has been supplied with voltage via the USB module. |
| 0x2D81:004<br>(P151.04) | Life-diagnosis: Main switching cycles<br>(Life-diagnosis: Switching cycles)<br>• Read only | Display of the number of switching cycles of the mains voltage. |
| 0x2D81:005<br>(P151.05) | Life-diagnosis: Relay switching cycles<br>(Life-diagnosis: Relay cycles)<br>• Read only | Display of the number of switching cycles of the relay. |
| 0x2D81:006<br>(P151.06) | Life-diagnosis: Short-circuit counter<br>(Life-diagnosis: Short-circ.count)<br>• Read only | Display of the number of short circuits that have occurred. |
| 0x2D81:007<br>(P151.07) | Life-diagnosis: Earth fault counter<br>(Life-diagnosis: Earthfault count)<br>• Read only | Display of the number of earth faults that have occurred. |
| 0x2D81:008<br>(P151.08) | Life-diagnosis: Clamp active<br>(Life-diagnosis: Clamp active)<br>• Read only | Display of the number of "Clamp responded too often" errors that have occurred.<br>• "Clamp" = short-time inhibit of the inverter in V/f operation when the current limit shown in 0x2DDF:002 is reached. |
| 0x2D81:009<br>(P151.09) | Life-diagnosis: Fan operating time<br>(Life-diagnosis: Fan oper. time)<br>• Read only: x s | Display showing for how long the internal fan has been running so far. |

### 16.4.5 Device identification

The following parameters show some general information about the inverter.

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2000:001<br>(P190.01) | Device data: Product code<br>(Device data: Product code)<br>• Read only | Product code of the complete device. |
| 0x2000:002<br>(P190.02) | Device data: Serial number<br>(Device data: Serial number)<br>• Read only | Serial number of the complete device.<br>Example: "0000000000000000XYZXYZ" |
| 0x2000:004<br>(P190.04) | Device data: CU firmware version<br>(Device data: CU firmware ver.)<br>• Read only | Firmware version of the control unit.<br>Example: "01.00.01.00" |
| 0x2000:005<br>(P190.05) | Device data: CU firmware type<br>(Device data: CU firmware type)<br>• Read only | Firmware type of the control unit.<br>Example: "IOFW51AC10" |
| 0x2000:006<br>(P190.06) | Device data: CU bootloader version<br>(Device data: CU bootlder ver.)<br>• Read only | Bootloader version of the control unit.<br>Example: "2015.10-20180517" |

| Address | Name / setting range / [default setting] | Information |
| --- | --- | --- |
| 0x2000:007 (P190.07) | Device data: CU bootloader type<br>(Device data: CU bootlder type)<br>• Read only | Bootloader type of the control unit.<br>Example: "IOBL51AOnn" |
| 0x2000:008 (P190.08) | Device data: Object directory version<br>(Device data: OBD version)<br>• Read only | Example: "108478" |
| 0x2000:010 (P190.10) | Device data: PU firmware version<br>(Device data: PU firmware ver.)<br>• Read only | Firmware version of the power unit.<br>Example: "00202" |
| 0x2000:011 (P190.11) | Device data: PU firmware type<br>(Device data: PU firmware type)<br>• Read only | Firmware type of the power unit.<br>Example: "IDFW5AA" |
| 0x2000:012 (P190.12) | Device data: PU bootloader version<br>(Device data: PU bootlder ver.)<br>• Read only | Bootloader version of the power unit. |
| 0x2000:013 (P190.13) | Device data: PU bootloader type<br>(Device data: PU bootlder type)<br>• Read only | Bootloader type of the power unit. |
| 0x2000:014 (P190.14) | Device data: Module - firmware version<br>(Device data: Mod. firmware)<br>• Read only | Firmware version of the plugged-in module (e.g. WLAN module). |
| 0x2000:015 (P190.15) | Device data: Communication firmware revision number<br>(Device data: Com. FW rev no.)<br>• Read only | Firmware version of the network option. |
| 0x2000:016 (P190.16) | Device data: Communication bootloader revision number<br>(Device data: ComBootlderRevNo)<br>• Read only | Bootloader version of the network option. |
| 0x2000:017 (P190.17) | Device data: CU firmware subtype<br>(Device data: CU FW subtype)<br>• Read only | Additional information on the firmware. |

## 16.5 Error handling

Many functions integrated in the inverter can

- detect errors and thus protect inverter and motor from damages,
- detect an operating error of the user,
- output a warning or information if desired.

### 16.5.1 Error types

In the event of an error, the inverter response is determined by the error type defined for the error.

**Error type "No response"**

The error is completely ignored (does not affect the running process).

**Error type "Warning"**

A warning does not severely affect the process and may be also ignored in consideration of safety aspects.

**Error type "Fault"**

The motor is brought to a standstill with the quick stop ramp.

- The inverter will only be disabled after the quick stop is executed (motor at standstill) or after the time-out time set in 0x2826 has been elapsed. ▶ Timeout for error response 📖 457
- **Exception:** In case of a serious fault, the inverter is disabled immediately. The motor has no torque (coasts). For details see the table "Error codes, causes and remedies".

**Error type "Trouble"**

Just like "Fault", but the error state will be left automatically if the error condition is not active anymore.

- **Exception:** In case of a severe trouble, the inverter is disabled immediately. The motor has no torque (coasts). For details see the table "Error codes, causes and remedies". 📖 461
- The restart behaviour after trouble can be configured. ▶ Automatic restart after a fault 📖 361

In the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]", the behaviour in case of "Trouble" is just like in case of "Fault"!

**Comparison of the error types**

The following table compares the main differences of the error types:

<table>
<tr><th>Error type</th><th>Logging in the Error history buffer / Logbook</th><th>Display in the CiA status word 0x6041 (P780.00)</th><th>Inverter disable</th><th>Motor stop</th><th>Error reset is required</th><th>"ERR" LED (red)</th></tr>
<tr><td>No response</td><td>No</td><td>No</td><td>No</td><td>No</td><td>No</td><td>off</td></tr>
<tr><td>Warning</td><td>Yes</td><td>yes, bit 7</td><td>No</td><td>No</td><td>No</td><td>blinking fast (4 Hz)</td></tr>
<tr><td>Trouble</td><td>Yes</td><td>yes, bit 3</td><td>after quick stop or immediately.</td><td>quick stop ramp or coasting.</td><td>No</td><td>blinking (1 Hz)</td></tr>
<tr><td>Fault</td><td>Yes</td><td>yes, bit 3</td><td colspan="2">For details see table "Error codes, causes and remedies". 📖 461</td><td>Yes</td><td>on</td></tr>
</table>

### 16.5.1.1 Timeout for error response

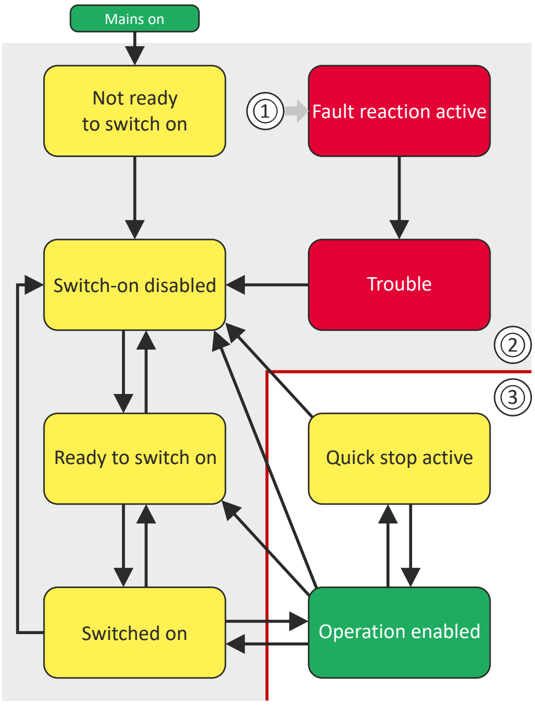
If an error occurs that does not immediately cause a switch-off, the "Fault reaction active" device status initially becomes active. The motor is brought to a standstill with quick stop ramp. The change to the device status "Fault" is only made after the quick stop (motor at standstill) has been executed or after an adjustable timeout time has expired.

Disabling the inverter interrupts the quick stop ramp. The drive coasts immediately.

**Details**

In the device status "Fault reaction active"

- only the parameters of the inverter can be changed that do not require an inverter disable.
- If a holding brake in brake mode 0x2820:001 (P712.01) = "Automatically (via device state) [0]" is triggered for closing,
- the motor control continues to be operable.




① From all states
② Power section disabled (pulse inhibit)
③ Power section enabled

Diagnostic parameters:

- 0x282A:005 (P126.05) displays the current device status of the inverter

**Parameter**

| Address | Name / setting range / [default setting] | Information |
|---|---|---|
| 0x2826 | Time-out for error response<br>0.0 ... [**6.0**] ... 100.0 s | This timer is started when a change-over to the "Fault reaction active" device status takes place. If the motor is still rotating after the time-out time has elapsed, a change-over to the "Fault" device status takes place.<br>• In case of a serious error, an immediate change-over to the "Fault" device status takes place.<br>⚠ CAUTION!<br>Changing this parameter may cause a longer ramptime in the event of an error. This must be considered when changing this parameter. |

**Related topics**

▸ Automatic restart after a fault 361

### 16.5.2 Error configuration

The errors can be divided into two types:

- Errors with predefined error type
- Errors with configurable error type

Especially critical errors are permanently set to the "Fault" error type in order to protect inverter and motor from damages.

In case of errors with configurable error type, the default setting can be changed in consideration of safety aspects and the operational performance. The selection "No response [0]" is, however, only available for minor errors.

The "Error codes, causes and remedies" table lists the error type for each error. If the error type can be configured by the user, the "adjustable in" column displays the corresponding parameter. 461

### 16.5.3 Error reset

If the error condition is not active anymore, there are several options to reset an active error and thus leave the error state again:

- Via the keypad key . ▶ Error reset with keypad 402
- Via the trigger assigned to the "Reset fault" function.
- Via the button in the »EASY Starter« ("Diagnostics" tab).
- In the default setting of 0x400E:008 (P505.08) via bit 7 in the mappable data word NetWordIN1 0x4008:001 (P590.01).
- Via bit 7 in the mappable CiA control word 0x6040.
- Via bit 2 in the mappable AC Drive control word 0x400B:001 (P592.01).
- Via bit 11 in the mappable LECOM control word 0x400B:002 (P592.02).

Notes:

- Certain errors can only be reset by mains switching.
- Certain errors (e. g. earth fault or short circuit of the motor phases) may cause a blocking time. In this case, the error can be reset only after the blocking time has elapsed. An active blocking time is displayed via bit 14 in the inverter status word 0x2831.

The "Error codes, causes and remedies" table gives the blocking time (if available) for each error. This table also shows whether mains switching is required for the error reset. 461

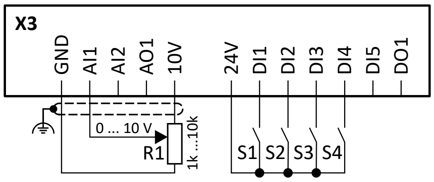
**Parameter**

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2631:004<br>(P400.04) | Function list: Reset fault<br>(Function list: Reset fault)<br>• Further possible settings: ▶ Trigger list 59 | | Assignment of a trigger for the "Reset fault" function.<br>Trigger = FALSE↗TRUE (edge): The active error is reset (acknowledged) if the error condition no longer exists and the error is resettable.<br>Trigger = FALSE: no action. |
| | 12 | **Digital input 2** | State of X3/DI2, taking an inversion set in 0x2632:002 (P411.02) into consideration. |

| Address | Name / setting range / [default setting] | | Information |
|---|---|---|---|
| 0x2839:006 (P760.06) | Fault configuration: Fault handling in case of state change (Fault config.: FaultStateChange) | | Selection whether a pending error is to be reset via the functions "Enable inverter" 0x2631:001 (P400.01) and "Run" 0x2631:002 (P400.02) as well. |
| | **0** | **Reset fault** | |
| | 1 | Do not reset fault | |

### Example for operating mode

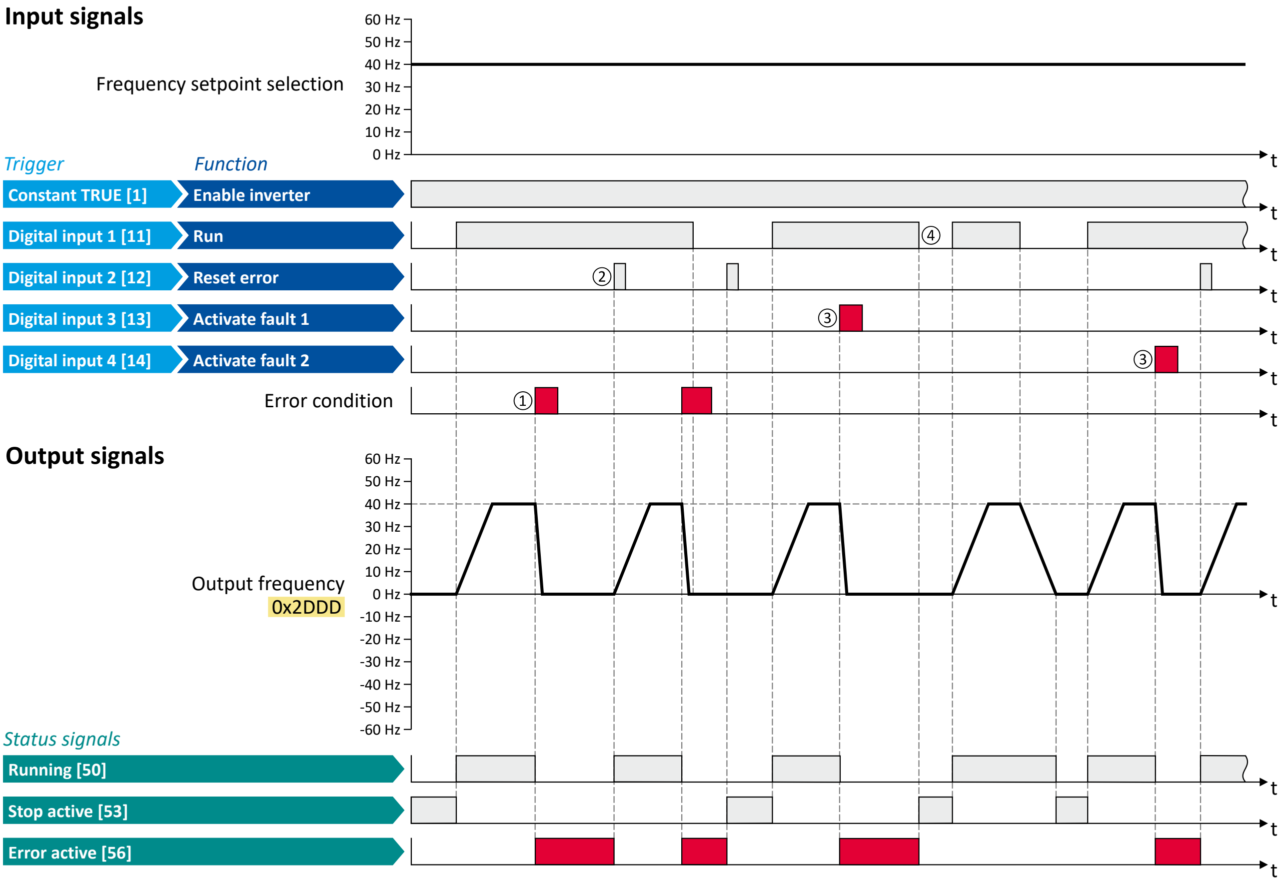
- Switch S1 starts the motor in forward direction of rotation. De-asserting switch S1 stops the motor again.
- Switch S2 resets the current error if the error condition is not active anymore and the error is resettable.
- The switches/sensors S3 and S4 serve to set the inverter from the process to the error status. ▶ User-defined error triggering 362

| Connection plan | Function | |
|---|---|---|
|  | Potentiometer R1 | Frequency setpoint selection |
| | Switch S1 | Run |
| | Switch S2 | Reset fault |
| | Switch S3 | Activate fault 1 |
| | Switch S4 | Activate fault 2 |



| Parameter | Designation | Setting for this example |
|---|---|---|
| 0x2631:001 (P400.01) | Enable inverter | Constant TRUE [1] |
| 0x2631:002 (P400.02) | Run | Digital input 1 [11] |
| 0x2631:004 (P400.04) | Reset fault | Digital input 2 [12] |
| 0x2631:013 (P400.13) | Reverse rotational direction | Not connected [0] |
| 0x2631:018 (P400.18) | Activate preset (bit 0) | Not connected [0] |
| 0x2631:043 (P400.43) | Activate fault 1 | Digital input 3 [13] |
| 0x2631:044 (P400.44) | Activate fault 2 | Digital input 4 [14] |
| 0x2824 (P200.00) | Control selection | Flexible I/O configuration [0] |
| 0x2838:003 (P203.03) | Stop method | Standard ramp [1] |
| 0x2860:001 (P201.01) | Frequency control: Default setpoint source | Analog input 1 [2] |
| 0x2918 (P221.00) | Deceleration time 1 | 5.0 s |
| 0x291C (P225.00) | Quick stop deceleration time | 1.0 s |

The following signal flow illustrates the reset of an error both with the "Reset error" function ② and by cancelling the start command ④:




The status signals can be assigned to digital outputs. ▶ Configure digital outputs📖 247

① If an error condition is active in the inverter, the motor is brought to a standstill with the quick stop ramp. The inverter is then disabled. Exception: In case of a serious error, the inverter is disabled immediately. The motor has no torque (coasts).

② If the error can be reset, the error state can be left again with the "Reset fault" function (if the error condition no longer exists). The motor accelerates again to the setpoint since the start command is still active.

③ The functions "Activate fault 1" and "Activate fault 2" serve to set the inverter from the process to the error status.

④ If the error can be reset, the cancelled start command results in leaving the error state (if the error condition no longer exists).

## 16.6 Error codes, causes and remedies

The following table contains the most important error codes of the device in ascending order.

- Clicking the error code shows you a detailed description of the error message.
- If the device displays an "internal error" that is not listed here, restart the device. If the error persists, make a note of the error code and contact the manufacturer.

| Error code | | Error message | Error type | Configurable in |
|---|---|---|---|---|
| 8784 | 0x2250 | CiA: Continuous over current (internal) | Fault | - |
| 8992 | 0x2320 | Short circuit or earth leakage at the motor end | Fault | - |
| 9024 | 0x2340 | Short circuit at the motor end | Fault | - |
| 9040 | 0x2350 | CiA: i²xt overload (thermal state) | Fault | 0x2D4B:003 (P308.03) |
| 9090 | 0x2382 | Fault - Device utilization (ixt) too high | Fault | 0x2D40:005 (P135.05) |
| 9091 | 0x2383 | Warning - Device utilization (ixt) too high | Warning | - |
| 9095 | 0x2387 | Clamp responded too often | Fault | - |
| 9096 | 0x2388 | SL-PSM stall detection active | Trouble | - |
| 9098 | 0x238A | Maximum current reached | Information | - |
| 12576 | 0x3120 | Mains phase fault | Fault | - |
| 12672 | 0x3180 | UPS operation active | Warning | - |
| 12816 | 0x3210 | Fault - DC bus overvoltage | Fault | - |
| 12817 | 0x3211 | DC bus overvoltage warning | Warning | - |
| 12832 | 0x3220 | Fault - DC bus undervoltage | Trouble | - |
| 12833 | 0x3221 | DC bus undervoltage warning | Warning | - |
| 12834 | 0x3222 | DC-bus voltage to low for power up | Warning | - |
| 16912 | 0x4210 | Fault - Power unit overtemperature | Fault | - |
| 17024 | 0x4280 | Fault - Heat sink temperature sensor | Fault | - |
| 17025 | 0x4281 | Heat sink fan warning | Warning | - |
| 17029 | 0x4285 | PU overtemperature warning | Warning | - |
| 20754 | 0x5112 | 24 V supply critical | Warning | - |
| 20864 | 0x5180 | Overload 24 V supply | Warning | - |
| 21376 | 0x5380 | OEM hardware incompatible | Fault | - |
| 24970 | 0x618A | Warning - Internal fan | Warning | - |
| 25216 | 0x6280 | Trigger/functions connected incorrectly | Trouble | - |
| 25217 | 0x6281 | User-defined fault 1 | Fault | - |
| 25218 | 0x6282 | User-defined fault 2 | Fault | - |
| 25232 | 0x6290 | Warning invert rotation | Warning | - |
| 25233 | 0x6291 | Maximuml allowed troubles exceeded | Fault | - |
| 25248 | 0x62A0 | User-defined fault (LECOM) | Fault | - |
| 25249 | 0x62A1 | Network: user fault 1 | Fault | - |
| 25250 | 0x62A2 | Network: user fault 2 | Fault | - |
| 25265 | 0x62B1 | NetWordIN1 configuration incorrect | Trouble | - |
| 25505 | 0x63A1 | CU: load error ID tag | Fault | - |
| 25506 | 0x63A2 | PU: load error ID tag | Fault | - |
| 25507 | 0x63A3 | Power unit unknown | Fault | - |
| 28800 | 0x7080 | Assertion level monitoring (Low/High) | Fault | - |
| 28801 | 0x7081 | Fault - Analog input 1 | Fault | 0x2636:010 (P430.10) |
| 28802 | 0x7082 | Analog input 2 fault | Fault | 0x2637:010 (P431.10) |
| 28833 | 0x70A1 | Analog output 1 fault | Warning | - |
| 28834 | 0x70A2 | Analog output 2 fault | Warning | - |
| 28961 | 0x7121 | Fault - Pole position identification | Fault | 0x2C60 |
| 29056 | 0x7180 | Motor overcurrent | Fault | 0x2D46:002 (P353.02) |
| 29573 | 0x7385 | Feedback system: speed limit | Warning | - |
| 30336 | 0x7680 | Memory module is full | Warning | - |
| 30337 | 0x7681 | Memory module not present | Fault | - |
| 30338 | 0x7682 | Memory module: Invalid user data | Fault | - |
| 30340 | 0x7684 | Data not compl. saved before powerdown | Warning | - |
| 30345 | 0x7689 | Memory module: invalid OEM data | Warning | - |

| Error code | | Error message | Error type | Configurable in |
|---|---|---|---|---|
| 30346 | 0x768A | Memory module: wrong type | Fault | - |
| 30352 | 0x7690 | EPM firmware version incompatible | Fault | - |
| 30353 | 0x7691 | EPM data: firmware type incompatible | Fault | - |
| 30354 | 0x7692 | EPM data: new firmware type detected | Fault | - |
| 30355 | 0x7693 | EPM data: PU size incompatible | Fault | - |
| 30356 | 0x7694 | EPM data: new PU size detected | Fault | - |
| 30357 | 0x7695 | Invalid parameter changeover configuration | Warning | - |
| 30358 | 0x7696 | EPM data: unknown parameter found | Information | - |
| 30359 | 0x7697 | Parameter changes lost | Fault | - |
| 33045 | 0x8115 | Time-out (PAM) | No response | 0x2552:004 (P595.04) |
| 33154 | 0x8182 | CAN: bus off | Trouble | 0x2857:010 |
| 33155 | 0x8183 | CAN: warning | Warning | 0x2857:011 |
| 33156 | 0x8184 | CAN: heartbeat time-out consumer 1 | Fault | 0x2857:005 |
| 33157 | 0x8185 | CAN: heartbeat time-out consumer 2 | Fault | 0x2857:006 |
| 33158 | 0x8186 | CAN: heartbeat time-out consumer 3 | Fault | 0x2857:007 |
| 33159 | 0x8187 | CAN: heartbeat time-out consumer 4 | Fault | 0x2857:008 |
| 33185 | 0x81A1 | Modbus: network time-out | Fault | 0x2858:001 (P515.01) |
| 33186 | 0x81A2 | Modbus: incorrect request by master | Warning | - |
| 33425 | 0x8291 | CAN: RPDO1 time-out | Fault | 0x2857:001 |
| 33426 | 0x8292 | CAN: RPDO2 time-out | Fault | 0x2857:002 |
| 33427 | 0x8293 | CAN: RPDO3 time-out | Fault | 0x2857:003 |
| 33553 | 0x8311 | Torque limit reached | No response | 0x2D67:001 (P329.01) |
| 33664 | 0x8380 | Function not allowed in selected operating mode | Warning | - |
| 36992 | 0x9080 | Keypad removed | Fault | - |
| 65285 | 0xFF05 | Safety option - Internal error | Fault | - |
| 65286 | 0xFF06 | Motor overspeed | Fault | 0x2D44:002 (P350.02) |
| 65289 | 0xFF09 | Motor phase missing | No response | 0x2D45:001 (P310.01) |
| 65290 | 0xFF0A | Motor phase failure phase U | No response | 0x2D45:001 (P310.01) |
| 65291 | 0xFF0B | Motor phase failure phase V | No response | 0x2D45:001 (P310.01) |
| 65292 | 0xFF0C | Motor phase failure phase W | No response | 0x2D45:001 (P310.01) |
| 65305 | 0xFF19 | Motor parameter identification fault | Fault | - |
| 65311 | 0xFF1F | FMF Error | Fault | - |
| 65317 | 0xFF25 | Cascading overload | Warning | - |
| 65335 | 0xFF37 | Automatic start disabled | Fault | - |
| 65336 | 0xFF38 | Load loss detected | No response | 0x4006:003 (P710.03) |
| 65337 | 0xFF39 | Motor overload | No response | 0x4007:003 |
| 65366 | 0xFF56 | Maximum motor frequency reached | Warning | - |
| 65370 | 0xFF5A | Manual mode deactivated | Warning | - |
| 65371 | 0xFF5B | Manual mode activated | Warning | - |
| 65372 | 0xFF5C | Manual mode time-out | Fault | - |
| 65393 | 0xFF71 | Wrong password | Warning | - |
| 65394 | 0xFF72 | Warning | Warning | - |
| 65395 | 0xFF73 | Fatal Error | Fault | - |
| 65413 | 0xFF85 | Keypad full control active | Warning | - |

8784 | 0x2250 **CiA: Continuous over current (internal)** Keypad display: **PU over current**

| Cause | Remedy | Error type/response |
|---|---|---|
| • Continuous overcurrent on the inverter/ motor side.<br>• DC bus relay has not been closed due to a malfunction. | • Check motor and wiring for short circuits. | Fault<br>• The inverter is disabled immediately. The motor has no torque (is coasting).<br>• The error can only be reset after a blocking time. |
| | | Blocking time: 5 s |

8992 | 0x2320 **Short circuit or earth leakage at the motor end** Keypad display: **Earth leak**

| Cause | Remedy | Error type/response |
|---|---|---|
| • Short circuit/earth fault of motor cable<br>• Capacitive charging current of the motor cable too high. | • Check motor cable.<br>• Check length of the motor cable.<br>• Use shorter or lower-capacitance motor cable. | Fault<br>• The inverter is disabled immediately. The motor has no torque (is coasting).<br>• The error can only be reset after a blocking time. |
| | | Blocking time: 5 s |

9024 | 0x2340 **Short circuit at the motor end** Keypad display: **Motor shorted**

| Cause | Remedy | Error type/response |
|---|---|---|
| Short circuit of motor cable | Check motor cable for short circuit. | Fault<br>• The inverter is disabled immediately. The motor has no torque (is coasting).<br>• The error can only be reset after a blocking time. |
| | | Blocking time: 5 s |

9040 | 0x2350 **CiA: i²xt overload (thermal state)** Keypad display: **i2t motor**

| Cause | Remedy | Error type/response |
|---|---|---|
| Motor thermally overloaded, e. g. by an impermissible continuous current or by frequent or too long acceleration processes. | • Check drive sizing.<br>• Check machine/driven mechanics for excessive load.<br>• Check settings of the motor data.<br>• Reduce values for slip compensation 0x2B09:001 (P315.01), 0x2B09:002 (P315.02) and oscillation damping 0x2B0A:001 (P318.01), 0x2B0A:002 (P318.02). | Fault (configurable)<br>• The error can only be reset after a blocking time. |
| | | Blocking time: 5 s |
| | | Setting parameters: 0x2D4B:003 (P308.03) |

Related topics

▸ Motor overload monitoring (i²xt) 📖 224

9090 | 0x2382 **Fault - Device utilization (ixt) too high** Keypad display: **Ixt error**

| Cause | Remedy | Error type/response |
|---|---|---|
| Device utilisation (I*t) too high by frequent and too long acceleration processes. | Check drive sizing.<br>• Reduce the maximum current of the inverter 0x6073 (P324.00).<br>• In case of high mass inertias, reduce maximum current of the inverter 0x6073 (P324.00) to 150 %. | Fault (configurable)<br>• The error can only be reset after a blocking time. |
| | | Blocking time: 3 s |
| | | Setting parameters: 0x2D40:005 (P135.05) |

Related topics

▸ Device overload monitoring (ixt) 📖 360

9091 | 0x2383 **Warning - Device utilization (ixt) too high** Keypad display: **Ixt warning**

| Cause | Remedy | Error type/response |
|---|---|---|
| Device utilisation (I*t) too high by frequent and too long acceleration processes. | Check drive dimensioning. | Warning |

Related topics

▸ Device overload monitoring (ixt) 📖 360

9095 | 0x2387 **Clamp responded too often** Keypad display: **Clamp timeout**

| Cause | Remedy | Error type/response |
|---|---|---|
| Maximum current of the axis (display in 0x2DDF:002) has been reached too often in succession. | • Select a flatter speed ramp.<br>• Reduce the load.<br>• Set Imax controller more dynamically. | Fault |

Related topics
▸ Imax controller 📖 221

9096 | 0x2388 **SL-PSM stall detection active** Keypad display: **SL-PSM stall det.**

| Cause | Remedy | Error type/response |
|---|---|---|
| Overload of the motor with sensorless control for synchronous motors (SL-PSM). | • Reduce load at the axis.<br>• Check settings of the SL-PSM parameters. | Trouble<br>• The inverter is disabled immediately. The motor has no torque (is coasting). |

Related topics
▸ Sensorless control for synchronous motor (SL-PSM) 📖 162

9098 | 0x238A **Maximum current reached** Keypad display: **Imax reached**

| Cause | Remedy | Error type/response |
|---|---|---|
| The actual current0x6078 (P103.00) is equal to or higher than the max. current 0x6073 (P324.00). | • Reduce the load on the motor or change the settings for the maximum current. 0x6073 (P324.00) | Information |

12576 | 0x3120 **Mains phase fault** Keypad display: **Mains Phase fail**

| Cause | Remedy | Error type/response |
|---|---|---|
| Mains phase failure | • Check wiring of the mains connection.<br>• Check fuses. | Fault |

12672 | 0x3180 **UPS operation active** Keypad display: **UPS oper. active**

| Cause | Remedy | Error type/response |
|---|---|---|
| Operation on uninterrupted 1x230V current supply (UPS) has been activated: Only a reduced output current is provided. | Switch back to operation with regular mains voltage. | Warning |

Related topics
Operation with UPS 📖 391

12816 | 0x3210 **Fault - DC bus overvoltage** Keypad display: **DC Bus OV**

| Cause | Remedy | Error type/response |
|---|---|---|
| DC-bus voltage has exceeded the error threshold for overvoltage due to a too high braking energy or a too high mains voltage. The error threshold (display in 0x2540:006 (P208.06)) results from the setting of the rated mains voltage in 0x2540:001 (P208.01). | • Reduce dynamic performance of the load profile.<br>• Check mains voltage.<br>• Check settings for brake energy management. | Fault |

Related topics
▸ Mains voltage 📖 36
▸ Brake energy management 📖 367



12817 | 0x3211 **DC bus overvoltage warning** Keypad display: **Warn.DC Bus OV**

| Cause | Remedy | Error type/response |
|---|---|---|
| DC-bus voltage has exceeded the warning threshold for overvoltage set in 0x2540:005 (P208.05) due to a too high braking energy or a too high mains voltage. | • Reduce dynamic performance of the load profile.<br>• Check mains voltage.<br>• Check settings for brake energy management. | Warning |

Related topics
▸ Mains voltage 📖 36
▸ Brake energy management 📖 367

12832 | 0x3220 **Fault - DC bus undervoltage** Keypad display: **DC Bus UV**

| Cause | Remedy | Error type/response |
|---|---|---|
| DC-bus voltage has fallen below the error threshold for undervoltage. The error threshold (display in 0x2540:003 (P208.03)) results from the setting of the rated mains voltage in 0x2540:001 (P208.01). | • Check mains voltage.<br>• 0x2D87 (P105.00)Check DC-bus voltage.<br>• Check mains settings.<br>• Check fuses. | Trouble |

Related topics
▸ Mains voltage 📖 36

12833 | 0x3221 **DC bus undervoltage warning** Keypad display: **Warn.DC Bus UV**

| Cause | Remedy | Error type/response |
|---|---|---|
| DC-bus voltage has fallen below the warning threshold for undervoltage set in 0x2540:002 (P208.02). | • Check mains voltage.<br>• 0x2D87 (P105.00) Check DC-bus voltage.<br>• Check mains settings.<br>• Check fuses. | Warning |

Related topics
▸ Mains voltage 📖 36

12834 | 0x3222 **DC-bus voltage to low for power up** Keypad display: **DC-bus on-UV**

| Cause | Remedy | Error type/response |
|---|---|---|
| The input voltage is too low to switch on the inverter. | • Check mains voltage.<br>• Check mains settings.<br>• Check fuses. | Warning |

Related topics
▸ Mains voltage 📖 36

16912 | 0x4210 **Fault - Power unit overtemperature** Keypad display: **PU Overtemp.**

| Cause | Remedy | Error type/response |
|---|---|---|
| The heatsink temperature of the power unit (display in 0x2D84:001 (P117.01)) has exceeded the fixed error threshold (100 °C).<br>• Ambient temperature too high.<br>• Fan or ventilation slots are polluted.<br>• Fan is defective. | • Check mains voltage.<br>• Provide for a sufficient cooling of the device. In case of a 100 % load, 60 C to +70°C are normal. Display of the heatsink temperature in 0x2D84:001 (P117.01).<br>• Clean fan and ventilation slots. If required, replace fan.<br>• Reduce switching frequency 0x2939 (P305.00) | Fault |

17024 | 0x4280 **Fault - Heat sink temperature sensor** Keypad display: **Heatsink sensor**

| Cause | Remedy | Error type/response |
|---|---|---|
| Sensor for the temperature monitoring of the power unit is defective. The failure of the temperature monitoring function poses the risk of overheating! | Hardware error: it is necessary to contact the manufacturer, since the device must be replaced. | Fault |

17025 | 0x4281 **Heat sink fan warning** Keypad display: **Heatsink fan**

| Cause | Remedy | Error type/response |
|---|---|---|
| Warning of the heatsink fan. | Clean fan and ventilation slots. If required, replace fan. The fans can be unlocked via locking hooks and can then be removed. | Warning |

17029 | 0x4285 **PU overtemperature warning** Keypad display: **Warn.PU Overtemp**

| Cause | Remedy | Error type/response |
|---|---|---|
| The heatsink temperature of the power unit (display in 0x2D84:001 (P117.01)) has exceeded the warning threshold set in 0x2D84:002.<br>• Ambient temperature too high.<br>• Fan or ventilation slots are polluted.<br>• Fan is defective. | • Provide for a sufficient cooling of the device.<br>• Clean fan and ventilation slots.<br>• If required, replace fan. | Warning |

Related topics


▸ Heatsink temperature monitoring 360


20754 | 0x5112 **24 V supply critical** Keypad display: **24V supply low**

| Cause | Remedy | Error type/response |
|---|---|---|
| 24V voltage failed or too low. | • Check optional external 24V voltage supply (terminal X3/24E), if connected.<br>• Check mains voltage. | Warning |

20864 | 0x5180 **Overload 24 V supply** Keypad display: **Overlaod 24V**

| Cause | Remedy | Error type/response |
|---|---|---|
| Output current at the 24V output or at the digital outputs too high. | Check 24V output and digital outputs for earth fault or overload. | Warning |

21376 | 0x5380 **OEM hardware incompatible** Keypad display: **Incomp. OEM HW**

| Cause | Remedy | Error type/response |
|---|---|---|
| The control unit (OEM hardware) is not compatible with the power unit (OEM hardware). | • Use compatible hardware.<br>• Contact the OEM. | Fault<br>• The inverter is disabled immediately. The motor has no torque (is coasting).<br>• The error can only be reset by mains switching. |

24970 | 0x618A **Warning - Internal fan** Keypad display: **Internal fan**

| Cause | Remedy | Error type/response |
|---|---|---|
| Warning of the internal fan. | Check/replace internal fan. | Warning |

25216 | 0x6280 **Trigger/functions connected incorrectly** Keypad display: **P400 config err**

| Cause | Remedy | Error type/response |
|---|---|---|
| The assignment directives have not been observed.<br>• If the "flexible I/O configuration" is active as control source, the "Enable inverter" or "Run" function must be connected to a digital input in order that the motor can be stopped again any time!<br>• The use of the "Start forward (CW)" and "Start reverse (CCW)" functions excludes the use of the "Run forward (CW)" and "Run reverse (CCW)" functions, and vice versa. | Check and correct the assignment of the triggers to the functions.<br>• With keypad or network control, the two "Enable inverter 0x2631:001 (P400.01)" and "Run 0x2631:002 (P400.02)" functions can also be set to "Constant TRUE [1]" to start the motor. | Trouble |

Related topics
▶ Start, stop and rotating direction commands 📖 49

25217 | 0x6281 **User-defined fault 1** Keypad display: **User fault 1**

| Cause | Remedy | Error type/response |
|---|---|---|
| Flexible I/O configuration: the "Activate fault 1" function was activated via the trigger selected in 0x2631:043 (P400.43). | Eliminate error cause and then reset error. | Fault |

Related topics
▶ User-defined error triggering 📖 362

25218 | 0x6282 **User-defined fault 2** Keypad display: **User fault 2**

| Cause | Remedy | Error type/response |
|---|---|---|
| Flexible I/O configuration: the "Activate fault 2" function was activated via the trigger selected in 0x2631:044 (P400.44). | Eliminate error cause and then reset error. | Fault |

Related topics
▶ User-defined error triggering 📖 362

25232 | 0x6290 **Warning invert rotation** Keypad display: **Invert rotation**

| Cause | Remedy | Error type/response |
|---|---|---|
| • Negative setpoint selection with an active limitation of rotation 0x283A (P304.00).<br>• The "Reverse rotational direction" 0x2631:013 (P400.13) function was requested with an active limitation of rotation 0x283A (P304.00). | • Check setpoint selection and trigger.<br>• Check setting in 0x283A (P304.00). | Warning<br>• The motor is brought to a standstill, since a reversal of the rotating direction is not permissible. |

Related topics
▶ Control/restrict direction of rotation of the motor 📖 71

25233 | 0x6291 **Maximuml allowed troubles exceeded** Keypad display: **Trouble overflow**

| Cause | Remedy | Error type/response |
|---|---|---|
| The number of permitted restart attempts after a fault set in 0x2839:003 (P760.03) was exceeded. The fault occurred to frequently and could not be reset. | Check and the eliminate the fault. | Fault<br>• The motor remains at a standstill, no automatic restart is executed. |

Related topics
▶ Automatic restart after a fault 📖 361

25248 | 0x62A0 **User-defined fault (LECOM)** Keypad display: **UserFault(LECOM)**

| Cause | Remedy | Error type/response |
|---|---|---|
| The "Activate fault" function was triggered via bit 10 of the LECOM control word 0x400B:002 (P592.02). | Eliminate error cause and then reset error. | Fault |

25249 | 0x62A1 **Network: user fault 1** Keypad display: **Netw.UserFault 1**

| Cause | Remedy | Error type/response |
|---|---|---|
| The "Activate fault 1" function was triggered via the NetWordIN1 data word 0x4008:001 (P590.01). | Eliminate error cause and then reset error. | Fault |

Related topics
▸ Define your own control word format 261

25250 | 0x62A2 **Network: user fault 2** Keypad display: **Netw.UserFault 2**

| Cause | Remedy | Error type/response |
|---|---|---|
| The "Activate fault 2" function was triggered via the NetWordIN1 data word 0x4008:001 (P590.01). | Eliminate error cause and then reset error. | Fault |

Related topics
▸ Define your own control word format 261

25265 | 0x62B1 **NetWordIN1 configuration incorrect** Keypad display: **NetWordIN1 error**

| Cause | Remedy | Error type/response |
|---|---|---|
| Two bits of the NetWordIN1 data word 0x4008:001 (P590.01) were assigned to the same function. | Check and correct configuration of the NetWordIN1 data word.<br>• The functions that are to be triggered via bits 0 ... 15 of the NetWordIN1 data word are defined in 0x400E:001 (P505.01) ... 0x400E:016 (P505.16). | Trouble |

Related topics
▸ Define your own control word format 261

25505 | 0x63A1 **CU: load error ID tag** Keypad display: **CU ID tag error**

| Cause | Remedy | Error type/response |
|---|---|---|
| Calibration data of the control unit not compatible or faulty. | • Update firmware of the inverter to the most recent version.<br>• If the error persists, the control unit or the device has to be replaced. In this case, please contact the manufacturer. | Fault<br>• The inverter is disabled immediately. The motor has no torque (is coasting).<br>• The error can only be reset by mains switching. |

25506 | 0x63A2 **PU: load error ID tag** Keypad display: **PU ID tag error**

| Cause | Remedy | Error type/response |
|---|---|---|
| Calibration data of the power unit not compatible or faulty. | • Update firmware of the inverter to the most recent version.<br>• If the error persists, the power unit or the device has to be replaced. In this case, please contact the manufacturer. | Fault<br>• The inverter is disabled immediately. The motor has no torque (is coasting).<br>• The error can only be reset by mains switching. |

25507 | 0x63A3 **Power unit unknown** Keypad display: **PU unknown**

| Cause | Remedy | Error type/response |
|---|---|---|
| The power unit installed is not supported by the software. | Update firmware of the inverter to the most recent version. | Fault<br>• The inverter is disabled immediately. The motor has no torque (is coasting).<br>• The error can only be reset by mains switching. |

28800 | 0x7080 **Assertion level monitoring (Low/High)** Keypad display: **Assertionlevel**

| Cause | Remedy | Error type/response |
|---|---|---|
| The last setting of the connection level differs from the saved setting. | 1. Execute device command "Save user data" 0x2022:003 (P700.03).<br>2. Switch inverter off and on again. | Fault |

28801 | 0x7081 **Fault - Analog input 1** Keypad display: **AI1 fault**

| Cause | Remedy | Error type/response |
|---|---|---|
| The monitoring function of the input signal configured for analog input 1 in 0x2636:008 (P430.08) and 0x2636:009 (P430.09) has been triggered. | • Check input signal at analog input 1.<br>• Check configuration of the monitoring function. | Fault (configurable)<br>Setting parameters: 0x2636:010 (P430.10) |

28802 | 0x7082 **Analog input 2 fault** Keypad display: **AI2 fault**

| Cause | Remedy | Error type/response |
|---|---|---|
| The monitoring function of the input signal configured for analog input 2 in 0x2637:008 (P431.08) and 0x2637:009 (P431.09) has been triggered. | • Check input signal at analog input 2.<br>• Check configuration of the monitoring function. | Fault (configurable)<br>Setting parameters: 0x2637:010 (P431.10) |

28833 | 0x70A1 **Analog output 1 fault** Keypad display: **AO1 fault**

| Cause | Remedy | Error type/response |
|---|---|---|
| Open circuit or short circuit at analog output 1. | • Check wiring of analog output 1.<br>• Check definition of the output range in 0x2639:001 (P440.01). | Warning |

Related topics
▸ Analog output 1 📖 253

28834 | 0x70A2 **Analog output 2 fault** Keypad display: **AO2 fault**

| Cause | Remedy | Error type/response |
|---|---|---|
| Error message is not available. | | Warning |

28961 | 0x7121 **Fault - Pole position identification** Keypad display: **Pole pos. error**

| Cause | Remedy | Error type/response |
|---|---|---|
| • Too many deviations during the pole position identification.<br>• Compared to the inverter, the rated motor current is too high or too low. | • Check setting of the motor data.<br>• Ensure that the motor is at a standstill during the pole position identification process.<br>• Ensure that the motor and inverter match each other in terms of power. | Fault (configurable)<br>Setting parameters: 0x2C60 |

29056 | 0x7180 **Motor overcurrent** Keypad display: **Mot max current**

| Cause | Remedy | Error type/response |
|---|---|---|
| The motor current has exceeded the warning/ error threshold for the motor current monitoring set in 0x2D46:001 (P353.01). | • Check motor load.<br>• Check drive dimensioning.<br>• Check warning threshold or error threshold set in 0x2D46:001 (P353.01). | Fault (configurable)<br>• The error can only be reset after a blocking time. |
| | | Blocking time: 1 s |
| | | Setting parameters: 0x2D46:002 (P353.02) |

Related topics

▸ Overcurrent monitoring 📖 228

29573 | 0x7385 **Feedback system: speed limit** Keypad display: **F.fdb spd limit**

| Cause | Remedy | Error type/response |
|---|---|---|
| The feedback system exceeds the maximum permissible frequency range of the digital inputs. | Check feedback system. | Warning |

Related topics

30336 | 0x7680 **Memory module is full** Keypad display: **EPM full**

| Cause | Remedy | Error type/response |
|---|---|---|
| The memory module contains too many parameter settings. | Execute "Save user data" 0x2022:003 (P700.03) device command again. This reinitialises the user memory with the current parameter settings. In this way, parameter settings that are no longer required are automatically deleted. | Warning<br>• The parameter settings were not saved in the memory module. |

30337 | 0x7681 **Memory module not present** Keypad display: **EPM not present**

| Cause | Remedy | Error type/response |
|---|---|---|
| The inverter memory module was removed. | 1. Switch off inverter.<br>2. Plug the memory module into the inverter.<br>3. Switch the inverter on again.<br>Note: The memory module cannot be replaced during ongoing operation! | Fault<br>• The default setting stored in the inverter firmware has been loaded.<br>• The error cannot be reset by the user. |

30338 | 0x7682 **Memory module: Invalid user data** Keypad display: **EPM invalid data**

| Cause | Remedy | Error type/response |
|---|---|---|
| The user parameter settings in the memory module are invalid. | 1. Execute user parameter settings again.<br>2. Execute device command "Save user data" 0x2022:003 (P700.03). | Fault<br>• The user parameter settings are lost.<br>• The default settings were automatically loaded. |

30340 | 0x7684 **Data not compl. saved before powerdown** Keypad display: **Save incomplete**

| Cause | Remedy | Error type/response |
|---|---|---|
| Saving of the parameter settings was interrupted by an unexpected disconnection. | 1. Check user parameter settings. (The loaded backup is an older version.)<br>2. If required, repeat the changes made last.<br>3. Execute device command "Save user data" 0x2022:003 (P700.03). | Warning<br>• The user parameter settings were not fully saved.<br>• At the next switch-on, the data stored are copied to the user memory. |



30345 | 0x7689 **Memory module: invalid OEM data** Keypad display: **OEM data invalid**

| Cause | Remedy | Error type/response |
|---|---|---|
| The OEM memory contains invalid parameter settings or is empty. | • Execute device command "Save OEM data" 0x2022:006 (P700.06).<br>• Thus, the user parameter settings get lost! | Warning<br>• The user parameter settings were automatically loaded. |

30346 | 0x768A **Memory module: wrong type** Keypad display: **Wrong EPM**

| Cause | Remedy | Error type/response |
|---|---|---|
| The memory module connected is not supported by the inverter. | 1. Switch off inverter.<br>2. Replace plugged-in memory module by a memory module that matches the inverter.<br>3. Switch the inverter on again. | Fault<br>• The default setting stored in the inverter firmware has been loaded.<br>• The error cannot be reset by the user. |

30352 | 0x7690 **EPM firmware version incompatible** Keypad display: **EPM-FW incomp.**

| Cause | Remedy | Error type/response |
|---|---|---|
| The parameter settings saved in the memory module are incompatible with the firmware version. | 1. Execute device command "Load default settings" 0x2022:001 (P700.01).<br>2. Execute "Save user data" 0x2022:003 (P700.03) or "Save OEM data" 0x2022:006 (P700.06) device command. | Fault<br>• The data have been loaded into the RAM memory, but they are incompatible. |

30353 | 0x7691 **EPM data: firmware type incompatible** Keypad display: **EPM: FW incomp.**

| Cause | Remedy | Error type/response |
|---|---|---|
| The parameter settings saved in the memory module are incompatible with the firmware type.<br>Example: Memory module of an inverter with an application IO is used in an inverter with a standard IO. | 1. Execute device command "Load default settings" 0x2022:001 (P700.01).<br>2. Execute "Save user data" 0x2022:003 (P700.03) or "Save OEM data" 0x2022:006 (P700.06) device command. | Fault<br>• The data have been loaded into the RAM memory, but they are incompatible. |

30354 | 0x7692 **EPM data: new firmware type detected** Keypad display: **UserCU not match**

| Cause | Remedy | Error type/response |
|---|---|---|
| The parameter settings saved in the memory module do not match the inverter hardware. | 1. Check parameter settings.<br>2. Reset error.<br>3. Execute "Save user data" 0x2022:003 (P700.03) or "Save OEM data" 0x2022:006 (P700.06) device command. | Fault<br>• The data have been loaded into the RAM memory without being modified, and they are compatible.<br>• The settings loaded must be accepted by the user (see remedy). |

30355 | 0x7693 **EPM data: PU size incompatible** Keypad display: **EPM PU size inco**

| Cause | Remedy | Error type/response |
|---|---|---|
| The parameter settings saved in the memory module are incompatible with the inverter. | 1. Execute device command "Load default settings" 0x2022:001 (P700.01).<br>2. Execute "Save user data" 0x2022:003 (P700.03) or "Save OEM data" 0x2022:006 (P700.06) device command. | Fault<br>• The data have been loaded into the RAM memory, but they are incompatible. |

30356 | 0x7694 **EPM data: new PU size detected** Keypad display: **EPM new PU size**

| Cause | Remedy | Error type/response |
|---|---|---|
| The parameter settings saved in the memory module comply with a different hardware. Example: Memory module of an inverter with a power of 3 kW is used in an inverter with a power of 18.5 kW. | 1. Check parameter settings.<br>2. Reset error.<br>3. Execute "Save user data" 0x2022:003 (P700.03) or "Save OEM data" 0x2022:006 (P700.06) device command. | Fault<br>• The data have been loaded into the RAM memory without being modified, and they are compatible.<br>• The settings loaded must be accepted by the user (see remedy). |

30357 | 0x7695 **Invalid parameter changeover configuration** Keypad display: **InvalidChgovrCfg**

| Cause | Remedy | Error type/response |
|---|---|---|
| One or more parameters can no longer be used for the "Parameter change-over" function. | 1. Check error message for parameter change-over in 0x4047:001 (P756.01).<br>2. Correct the list entry shown in 0x4047:002 (P756.02). | Warning<br>• The parameter change-over function is deactivated. |

30358 | 0x7696 **EPM data: unknown parameter found** Keypad display: **Unkn. Par in EPM**

| Cause | Remedy | Error type/response |
|---|---|---|
| The memory module contains parameter settings for one or several parameters that are not known to the inverter. | Execute the "Save user data" 0x2022:003 (P700.03) device command. This reinitialises the user memory with the current parameter settings. In this way, parameter settings that are no longer required are automatically deleted. | Information |

30359 | 0x7697 **Parameter changes lost** Keypad display: **Parameter loss**

| Cause | Remedy | Error type/response |
|---|---|---|
| A voltage failure has occurred and changed parameter settings that had not been saved yet were available. | 1. Execute parameter settings again.<br>2. Execute device command "Save user data" 0x2022:003 (P700.03). | Fault<br>• The parameter settings changed have been lost. |

33045 | 0x8115 **Time-out (PAM)** Keypad display: **Time-out (PAM)**

| Cause | Remedy | Error type/response |
|---|---|---|
| The parameter access monitoring (PAM) function has been activated. For a time longer than the time-out period set in 0x2552:003 (P595.03), no value was entered into the "Keep-alive-Register" 0x2552:002 (P595.02). | • Check communication.<br>• Check settings of the parameter access monitoring (PAM) function. | No response (configurable)<br>Setting parameters: 0x2552:004 (P595.04) |

Related topics


▸ Parameter access monitoring (PAM) 📖 282


33154 | 0x8182 **CAN: bus off** Keypad display: **CAN bus off**

| Cause | Remedy | Error type/response |
|---|---|---|
| Too many faulty frames have been received.<br>• Defective cable (e. g. loose contact).<br>• Two nodes with the same node address. | • Check wiring of the network.<br>• Check bus terminating resistor.<br>• Set the identical baud rate for each node of the network.<br>• Assign a unique node address to each node of the network.<br>• Eliminate EMC interferences. | Trouble (configurable)<br>• Change to the "Bus-Off" communication status.<br>Setting parameters: 0x2857:010 |



33155 | 0x8183 **CAN: warning** Keypad display: **CAN bus warning**

| Cause | Remedy | Error type/response |
|---|---|---|
| Too many faulty frames have been received.<br>• Defective cable (e. g. loose contact).<br>• Two nodes with the same node address. | • Check wiring of the network.<br>• Check bus terminating resistor.<br>• Set the identical baud rate for each node of the network.<br>• Assign a unique node address to each node of the network.<br>• Eliminate EMC interferences. | Warning (configurable)<br>Setting parameters: 0x2857:011 |

33156 | 0x8184 **CAN: heartbeat time-out consumer 1** Keypad display: **CAN heartb. C1**

| Cause | Remedy | Error type/response |
|---|---|---|
| Within the heartbeat time 0x1016:001 (P520.01), no heartbeat telegram was received by node 1 to be monitored. | • Check communication with the heartbeat producer.<br>• Reactivate heartbeat producer. | Fault (configurable)<br>Setting parameters: 0x2857:005 |

Related topics

▶ Heartbeat protocol 📖 325

33157 | 0x8185 **CAN: heartbeat time-out consumer 2** Keypad display: **CAN heartb. C2**

| Cause | Remedy | Error type/response |
|---|---|---|
| Within the heartbeat time 0x1016:002 (P520.02), no heartbeat telegram was received by node 2 to be monitored. | • Check communication with the heartbeat producer.<br>• Reactivate heartbeat producer. | Fault (configurable)<br>Setting parameters: 0x2857:006 |

Related topics

▶ Heartbeat protocol 📖 325

33158 | 0x8186 **CAN: heartbeat time-out consumer 3** Keypad display: **CAN heartb. C3**

| Cause | Remedy | Error type/response |
|---|---|---|
| Within the heartbeat time 0x1016:003 (P520.03), no heartbeat telegram was received by node 3 to be monitored. | • Check communication with the heartbeat producer.<br>• Reactivate heartbeat producer. | Fault (configurable)<br>Setting parameters: 0x2857:007 |

Related topics

▶ Heartbeat protocol 📖 325

33159 | 0x8187 **CAN: heartbeat time-out consumer 4** Keypad display: **CAN heartb. C4**

| Cause | Remedy | Error type/response |
|---|---|---|
| Within the heartbeat time 0x1016:004 (P520.04), no heartbeat telegram was received by node 4 to be monitored. | • Check communication with the heartbeat producer.<br>• Reactivate heartbeat producer. | Fault (configurable)<br>Setting parameters: 0x2857:008 |

Related topics

▶ Heartbeat protocol 📖 325

33185 | 0x81A1 **Modbus: network time-out** Keypad display: **Modbus time-out**

| Cause | Remedy | Error type/response |
|---|---|---|
| No valid messages have been received via the Modbus for a longer time than the time-out time set in 0x2858:002 (P515.02). | • Check communication with the master.<br>• Check wiring.<br>• Check bus termination. | Fault (configurable)<br>Setting parameters: 0x2858:001 (P515.01) |

33186 | 0x81A2 **Modbus: incorrect request by master** Keypad display: **Modbus request**

| Cause | Remedy | Error type/response |
|---|---|---|
| The request by the master is invalid, e. g. invalid CRC checksum, non-supported function code, or impermissible data access. | Check request by the master:<br>• Value in the valid range?<br>• Function code valid?<br>• No impermissible write access? (e. g. with regard to read-only parameters) | Warning<br>The inverter (slave) responds to the master with an error code:<br>• 0x01 = invalid function code<br>• 0x02 = invalid data address<br>• 0x03 = invalid data value<br>• 0x04 = slave device failure |

33425 | 0x8291 **CAN: RPDO1 time-out** Keypad display: **Timeout RPDO1**

| Cause | Remedy | Error type/response |
|---|---|---|
| RPDO1 was not received within the time-out period set in 0x1400:005 (P540.05) or with the sync configured. | • Eliminate EMC interferences.<br>• Check bus load. | Fault (configurable)<br>Setting parameters: 0x2857:001 |

Related topics
▸ Process data transfer 📖 315

33426 | 0x8292 **CAN: RPDO2 time-out** Keypad display: **Timeout RPDO2**

| Cause | Remedy | Error type/response |
|---|---|---|
| RPDO2 was not received within the time-out period set in 0x1401:005 (P541.05) or with the sync configured. | • Eliminate EMC interferences.<br>• Check bus load. | Fault (configurable)<br>Setting parameters: 0x2857:002 |

Related topics
▸ Process data transfer 📖 315

33427 | 0x8293 **CAN: RPDO3 time-out** Keypad display: **Timeout RPDO3**

| Cause | Remedy | Error type/response |
|---|---|---|
| RPDO3 was not received within the time-out period set in 0x1402:005 (P542.05) or with the sync configured. | • Eliminate EMC interferences.<br>• Check bus load. | Fault (configurable)<br>Setting parameters: 0x2857:003 |

Related topics
▸ Process data transfer 📖 315

33553 | 0x8311 **Torque limit reached** Keypad display: **Torque limit**

| Cause | Remedy | Error type/response |
|---|---|---|
| Motor has reached the torque limit:<br>• 0x2949:003 (P337.03): Actual positive torque limit<br>• 0x2949:004 (P337.04): Actual negative torque limit | • Observe load requirements.<br>• Reduce motor load.<br>• Check set torque limits and sources for the torque limits. | No response (configurable)<br>Setting parameters: 0x2D67:001 (P329.01) |

Related topics
▸ Motor torque monitoring 📖 231

33664 | 0x8380 **Function not allowed in selected operating mode** Keypad display: **Func. n. allowed**

| Cause | Remedy | Error type/response |
|---|---|---|
| The selected function is not permissible in the chosen operating mode.<br>• Selection of torque mode [-1] in 0x6060 (P301.00) with incompatible motor control in 0x2C00 (P300.00).<br>• Selection of invalid drive mode [0] in 0x6060 (P301.00). | • Note: selection of torque mode [-1] in 0x6060 (P301.00) with incompatible motor control in 0x2C00 (P300.00).<br>• Check settings of operation modes.<br>• 0x6060 (P301.00) | Warning |

36992 | 0x9080 **Keypad removed** Keypad display: **Keypad removed**

| Cause | Remedy | Error type/response |
|---|---|---|
| The keypad was removed while the keypad control was activated. | • Plug keypad back in or activate another control source. | Fault |

Related topics

▸ Changing the control source during operation 📖 72

65285 | 0xFF05 **Safety option - Internal error** Keypad display: **STO locked**

| Cause | Remedy | Error type/response |
|---|---|---|
| Error message is not available. | | Fault<br>• The inverter is disabled immediately. The motor has no torque (is coasting).<br>• The error can only be reset by mains switching. |

65286 | 0xFF06 **Motor overspeed** Keypad display: **Motor overspeed**

| Cause | Remedy | Error type/response |
|---|---|---|
| The motor speed has reached the error threshold for overspeed set in 0x2D44:001 (P350.01). | Adapt the maximum motor speed 0x6080 (P322.00) and the warning threshold or error threshold 0x2D44:001 (P350.01). | Fault (configurable)<br>• The error can only be reset after a blocking time. |
| | | Blocking time: 1 s |
| | | Setting parameters: 0x2D44:002 (P350.02) |

Related topics

▸ Motor speed monitoring 📖 230

65289 | 0xFF09 **Motor phase missing** Keypad display: **Mot.Phase miss.**

| Cause | Remedy | Error type/response |
|---|---|---|
| A failure of several motor phases has been detected. | • Check wiring between inverter and motor.<br>• In case of a false tripping, adapt the settings for the motor phase failure detection. | No response (configurable)<br>• The error can only be reset after a blocking time. |
| | | Blocking time: 2 s |
| | | Setting parameters: 0x2D45:001 (P310.01) |

Related topics

▸ Motor phase failure detection 📖 229

65290 | 0xFF0A **Motor phase failure phase U** Keypad display: **Phase U failure**

| Cause | Remedy | Error type/response |
|---|---|---|
| A failure of the motor phase U has been detected. | • Check wiring between inverter and motor.<br>• In case of a false tripping, adapt the settings for the motor phase failure detection. | No response (configurable)<br>• The error can only be reset after a blocking time. |
| | | Blocking time: 2 s |
| | | Setting parameters: 0x2D45:001 (P310.01) |

Related topics
▶ Motor phase failure detection 229

65291 | 0xFF0B **Motor phase failure phase V** Keypad display: **Phase V failure**

| Cause | Remedy | Error type/response |
|---|---|---|
| A failure of the motor phase V has been detected. | • Check wiring between inverter and motor.<br>• In case of a false tripping, adapt the settings for the motor phase failure detection. | No response (configurable)<br>• The error can only be reset after a blocking time. |
| | | Blocking time: 2 s |
| | | Setting parameters: 0x2D45:001 (P310.01) |

Related topics
▶ Motor phase failure detection 229

65292 | 0xFF0C **Motor phase failure phase W** Keypad display: **Phase W failure**

| Cause | Remedy | Error type/response |
|---|---|---|
| A failure of the motor phase W has been detected. | • Check wiring between inverter and motor.<br>• In case of a false tripping, adapt the settings for the motor phase failure detection. | No response (configurable)<br>• The error can only be reset after a blocking time. |
| | | Blocking time: 2 s |
| | | Setting parameters: 0x2D45:001 (P310.01) |

Related topics
▶ Motor phase failure detection 229

65305 | 0xFF19 **Motor parameter identification fault** Keypad display: **Motor ID fault**

| Cause | Remedy | Error type/response |
|---|---|---|
| During the automatic identification of the motor, an error has occurred. | • Set motor data so that they comply with the data on the motor nameplate.<br>• Check wiring of the motor. | Fault |

65311 | 0xFF1F **FMF Error** Keypad display: **FMF Error**

| Cause | Remedy | Error type/response |
|---|---|---|
| Configuration or runtime error | • Check configuration<br>• Check FMF error code 0x4050:002 to determine the error cause. | Fault |

65317 | 0xFF25 **Cascading overload** Keypad display: **Cascad. overload**

| Cause | Remedy | Error type/response |
|---|---|---|
| Cascade function for pumps and fans The maximum frequency in 0x2916 (P211.00) has been reached and no free additional pump is available. | • Check configuration of the cascade function.<br>• Check drive sizing. | Warning |

Related topics
▶ Cascade function for pumps and fans 394



65335 | 0xFF37 **Automatic start disabled** Keypad display: **Auto start disab**

| Cause | Remedy | Error type/response |
|---|---|---|
| At mains connection, a start command was already available and the automatic start at power-up is set in 0x2838:002 (P203.02) to "Off [0]". | Deactivate starting command and reset error. | Fault |

65336 | 0xFF38 **Load loss detected** Keypad display: **Load loss**

| Cause | Remedy | Error type/response |
|---|---|---|
| In a running motor, the motor load (current) is monitored. When the motor load falls below the threshold value specified in Load loss detection: threshold (0x4006:001 (P710.01)) for the period of time specified in Load loss detection: delay time (0x4006:002 (P710.02)), load loss protection is triggered. | Check utilisation | No response (configurable) |
| | | Setting parameters: 0x4006:003 (P710.03) |

65337 | 0xFF39 **Motor overload** Keypad display: **Motor overload**

| Cause | Remedy | Error type/response |
|---|---|---|
| If the apparent motor current exceeds a defined threshold value 0x4007:002 for a certain amount of time 0x4007:001, heavy duty monitoring is triggered. | Check the motor load. | No response (configurable) |
| | | Setting parameters: 0x4007:003 |

65366 | 0xFF56 **Maximum motor frequency reached** Keypad display: **Max. motor freq.**

| Cause | Remedy | Error type/response |
|---|---|---|
| • The limitation of the maximum motor speed set in 0x6080 (P322.00) is active.<br>• The maximum output frequency of the inverter has been reached.<br>• Depending on the parameter setting of 0x2D44:001 (P350.01) (Overspeed monitoring: threshold), the speed limitation (0x6080 / Max. motor speed) may become active before speed monitoring. | Check application. | Warning |

65370 | 0xFF5A **Manual mode deactivated** Keypad display: **Man. mode deact.**

| Cause | Remedy | Error type/response |
|---|---|---|
| Indicates the deactivation of the manual speed control. | | Warning |

65371 | 0xFF5B **Manual mode activated** Keypad display: **Man. mode act.**

| Cause | Remedy | Error type/response |
|---|---|---|
| Indicates the activation of the manual speed control. | | Warning |

65372 | 0xFF5C **Manual mode time-out** Keypad display: **ManMode time-out**

| Cause | Remedy | Error type/response |
|---|---|---|
| If "manual operation" is active, an error is generated in case the communication links get lost. | The error can be only be reset if the connection is restored or the control mode is changed to a different value than "manual operation". | Fault |

65393 | 0xFF71 **Wrong password** Keypad display: **Wrong password**

| Cause | Remedy | Error type/response |
|---|---|---|
| A wrong password has been entered several times. | Wait until the blocking time has elapsed and then enter the correct password. | Warning<br>• The blocking time for entering a password is more than 10 seconds. (The blocking time is doubled every time an incorrect password is entered.)<br>• No password can be entered as long as the blocking time is active. |

Related topics
▸ Access protection 📖 351

65394 | 0xFF72 **Warning** Keypad display: **Warning**

| Cause | Remedy | Error type/response |
|---|---|---|
| Inverter is not compatible with the Controller/PLC (brand protection).<br>• The Controller has not written a deactivation password in the parameter yet.<br>• The deactivation password written by the Controller is incorrect. | Use corresponding (compatible) OEM components. | Warning<br>• No response from the inverter.<br>• The decision on whether the machine will be commissioned or not is made by the Controller. |

Related topics
▸ Access protection 📖 351

65395 | 0xFF73 **Fatal Error** Keypad display: **Fatal Error**

| Cause | Remedy | Error type/response |
|---|---|---|
| Error when reading the data from the control unit. | • Switch inverter off and on again.<br>• If the error occurs again, the manufacturer must be contacted, since the control unit or the device has to be replaced. | Fault<br>• Operation of the inverter is not possible. |

65413 | 0xFF85 **Keypad full control active** Keypad display: **Keypad full ctrl**

| Cause | Remedy | Error type/response |
|---|---|---|
| If the "Keypad Full Control" control mode is active. | To exit the control mode, press the keypad key **CTRL**. | Warning<br>• Both the activity of controlling and the setpoint selection are carried out via the keypad. |

Related topics
▸ Keypad full control 📖 53

# 17 Technical data

The technical data for the device (dimensions, rated data, standards and operating conditions) can be found in the associated project planning document.

# 18 Appendix

## 18.1 Parameter attribute list

The parameter attribute list in particular contains some information required for reading and writing parameters via network.

- The parameter attribute list contains all parameters of the inverter.
- The parameter attribute list is sorted by addresses (index:subindex) in ascending order.

**How to read the parameter attribute list:**

| Column | Meaning | |
|---|---|---|
| Address | Address of the parameter in the object directory. Format: index:subindex<br>If the parameter can also be accessed via keypad, the "Display Code" is given in addition in brackets. | |
| Name | Parameter name | |
| Default setting | Default setting of the parameter | |
| Category | Functional assignment of the parameter, for example "motor control" or "CANopen". | |
| Data type | Data type of the parameter: | |
| | I8 | 1 byte, with sign |
| | I16 | 2 bytes with sign |
| | I32 | 4 bytes with sign |
| | I64 | 8 bytes with sign |
| | U8 | 1 byte without sign |
| | U16 | 2 bytes without sign |
| | U32 | 4 bytes without sign |
| | U64 | 8 bytes without sign |
| | REAL32 | 4 bytes floating point |
| | STRING[xx] | ASCII string (with character length xx) |
| | OCTET[xx] | OCTET string (with xx bytes) |
| | IDX | 4 bytes without sign. Is used specially for addressing parameters. |
| Factor | Factor for data transmission via network, depending on the number of decimal positions: | |
| | 1 | No decimal positions |
| | 10 | 1 decimal position |
| | 100 | 2 decimal positions |
| | 1000 | 3 decimal positions |
| | 10000 | 4 decimal positions |
| A | Attributes (combinations of several attributes also possible): | |
| | C | Setting can only be changed if the inverter is inhibited. |
| | E | Value is displayed as IP address on the keypad. |
| | H | Value is displayed as hexadecimal value on the keypad. |
| | I | Parameter is not displayed. |
| | k | Parameter is only displayed on the keypad. |
| | O | Parameter can be recorded with the oscilloscope function. |
| | P | Setting is saved in the memory module. |
| | X | Parameter is not displayed in the engineering tools. |
| M | Mapping: | |
| | r | Receive mapping permissible. |
| | t | Transmit mapping permissible. |
| | rt | Receive and transmit mapping permissible. |
| | - | Mapping not permissible. |

**Parameter attribute list (short overview of all parameter indexes)**

| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x1000 | Device type | - (Read only) | CANopen | U32 | 1 | H | - |
| 0x1001 | Error register | - (Read only) | CANopen | U8 | 1 | H | t |
| 0x1005 | COB-ID SYNC | **0x00000080** | CANopen | U32 | 1 | PH | - |
| 0x1006 | Communication cyclic period | **0 us** | CANopen | U32 | 1 | P | - |
| * Default setting dependent on the model. | | | | | | | |



| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x1008 | Manufacturer device name | - (Read only) | CANopen | STRING[50] | 1 | - | - |
| 0x1009 | Manufacturer hardware version | - (Read only) | CANopen | STRING[50] | 1 | - | - |
| 0x100A | Manufacturer software version | - (Read only) | CANopen | STRING[50] | 1 | - | - |
| 0x1014 | COB-ID Emergency telegram (EMCY) | - (Read only) | CANopen | U32 | 1 | H | - |
| 0x1015 | Inhibit time EMCY | **0.0 ms** | CANopen | U16 | 10 | P | - |
| 0x1016:000 (P520.00) | Consumer heartbeat time: Highest sub-index supported | - (Read only) | CANopen | U8 | 1 | - | - |
| 0x1016:001 (P520.01) | Consumer heartbeat time: Consumer heartbeat time 1 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1016:002 (P520.02) | Consumer heartbeat time: Consumer heartbeat time 2 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1016:003 (P520.03) | Consumer heartbeat time: Consumer heartbeat time 3 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1016:004 (P520.04) | Consumer heartbeat time: Consumer heartbeat time 4 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1017 (P522.00) | Producer heartbeat time | **0 ms** | CANopen | U16 | 1 | P | - |
| 0x1018:001 | Identity object: Vendor ID | - (Read only) | CANopen | U32 | 1 | - | - |
| 0x1018:002 | Identity object: Product ID | - (Read only) | CANopen | U32 | 1 | H | - |
| 0x1018:003 | Identity object: Revision number | - (Read only) | CANopen | U32 | 1 | - | - |
| 0x1018:004 | Identity object: Serial number | - (Read only) | CANopen | U32 | 1 | - | - |
| 0x1029:000 | Error behavior: Highest sub-index supported | - (Read only) | CANopen | U8 | 1 | - | - |
| 0x1029:001 | Error behavior: Communication error | **Status > Pre-operational [0]** | CANopen | U8 | 1 | P | - |
| 0x1200:000 | SDO1 server parameter: Highest sub-index supported | - (Read only) | CANopen | U8 | 1 | - | - |
| 0x1200:001 | SDO1 server parameter: COB-ID client > server (rx) | - (Read only) | CANopen | U32 | 1 | H | - |
| 0x1200:002 | SDO1 server parameter: COB-ID server > client (tx) | - (Read only) | CANopen | U32 | 1 | H | - |
| 0x1201:000 | SDO2 server parameter: Highest sub-index supported | - (Read only) | CANopen | U8 | 1 | - | - |
| 0x1201:001 | SDO2 server parameter: COB-ID client > server (rx) | **0x80000640** | CANopen | U32 | 1 | PH | - |
| 0x1201:002 | SDO2 server parameter: COB-ID server > client (tx) | **0x800005C0** | CANopen | U32 | 1 | PH | - |
| 0x1201:003 | SDO2 server parameter: Node-ID of the SDO client | **0** | CANopen | U8 | 1 | P | - |
| 0x1400:000 | RPDO1 communication parameter: Highest sub-index supported | - (Read only) | CANopen | U8 | 1 | - | - |
| 0x1400:001 (P540.01) | RPDO1 communication parameter: COB-ID | **0x00000200** | CANopen | U32 | 1 | PH | - |
| 0x1400:002 (P540.02) | RPDO1 communication parameter: Transmission type | **255** | CANopen | U8 | 1 | P | - |
| 0x1400:005 (P540.05) | RPDO1 communication parameter: Event timer | **100 ms** | CANopen | U16 | 1 | P | - |
| 0x1401:001 (P541.01) | RPDO2 communication parameter: COB-ID | **0x80000300** | CANopen | U32 | 1 | PH | - |
| 0x1401:002 (P541.02) | RPDO2 communication parameter: Transmission type | **255** | CANopen | U8 | 1 | P | - |
| 0x1401:005 (P541.05) | RPDO2 communication parameter: Event timer | **100 ms** | CANopen | U16 | 1 | P | - |
| 0x1402:001 (P542.01) | RPDO3 communication parameter: COB-ID | **0x80000400** | CANopen | U32 | 1 | PH | - |
| 0x1402:002 (P542.02) | RPDO3 communication parameter: Transmission type | **255** | CANopen | U8 | 1 | P | - |
| 0x1402:005 (P542.05) | RPDO3 communication parameter: Event timer | **100 ms** | CANopen | U16 | 1 | P | - |
| 0x1600:000 | RPDO1 mapping parameter: Number of mapped application objects in PDO | **2** | CANopen | U8 | 1 | P | - |
| 0x1600:001 | RPDO1 mapping parameter: Application object 1 | **0x60400010** | CANopen | U32 | 1 | PH | - |
| 0x1600:002 | RPDO1 mapping parameter: Application object 2 | **0x60420010** | CANopen | U32 | 1 | PH | - |
| * Default setting dependent on the model. | | | | | | | |

| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x1600:003 | RPDO1 mapping parameter: Application object 3 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1600:004 | RPDO1 mapping parameter: Application object 4 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1600:005 | RPDO1 mapping parameter: Application object 5 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1600:006 | RPDO1 mapping parameter: Application object 6 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1600:007 | RPDO1 mapping parameter: Application object 7 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1600:008 | RPDO1 mapping parameter: Application object 8 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1601:000 | RPDO2 mapping parameter: Number of mapped application objects in PDO | **0** | CANopen | U8 | 1 | P | - |
| 0x1601:001 | RPDO2 mapping parameter: Application object 1 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1601:002 | RPDO2 mapping parameter: Application object 2 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1601:003 | RPDO2 mapping parameter: Application object 3 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1601:004 | RPDO2 mapping parameter: Application object 4 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1601:005 | RPDO2 mapping parameter: Application object 5 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1601:006 | RPDO2 mapping parameter: Application object 6 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1601:007 | RPDO2 mapping parameter: Application object 7 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1601:008 | RPDO2 mapping parameter: Application object 8 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1602:000 | RPDO3 mapping parameter: Number of mapped application objects in PDO | **0** | CANopen | U8 | 1 | P | - |
| 0x1602:001 | RPDO3 mapping parameter: Application object 1 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1602:002 | RPDO3 mapping parameter: Application object 2 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1602:003 | RPDO3 mapping parameter: Application object 3 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1602:004 | RPDO3 mapping parameter: Application object 4 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1602:005 | RPDO3 mapping parameter: Application object 5 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1602:006 | RPDO3 mapping parameter: Application object 6 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1602:007 | RPDO3 mapping parameter: Application object 7 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1602:008 | RPDO3 mapping parameter: Application object 8 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1800:000 | TPDO1 communication parameter: Highest sub-index supported | - (Read only) | CANopen | U8 | 1 | - | - |
| 0x1800:001 (P550.01) | TPDO1 communication parameter: COB-ID | **0x40000180** | CANopen | U32 | 1 | PH | - |
| 0x1800:002 (P550.02) | TPDO1 communication parameter: Transmission type | **255** | CANopen | U8 | 1 | P | - |
| 0x1800:003 (P550.03) | TPDO1 communication parameter: Inhibit time | **0.0 ms** | CANopen | U16 | 10 | P | - |
| 0x1800:005 (P550.05) | TPDO1 communication parameter: Event timer | **20 ms** | CANopen | U16 | 1 | P | - |
| 0x1801:000 | TPDO2 communication parameter: Highest sub-index supported | - (Read only) | CANopen | U8 | 1 | - | - |
| 0x1801:001 (P551.01) | TPDO2 communication parameter: COB-ID | **0xC0000280** | CANopen | U32 | 1 | PH | - |
| 0x1801:002 (P551.02) | TPDO2 communication parameter: Transmission type | **255** | CANopen | U8 | 1 | P | - |
| 0x1801:003 (P551.03) | TPDO2 communication parameter: Inhibit time | **0.0 ms** | CANopen | U16 | 10 | P | - |
| 0x1801:005 (P551.05) | TPDO2 communication parameter: Event timer | **0 ms** | CANopen | U16 | 1 | P | - |
| 0x1802:000 | TPDO3 communication parameter: Highest sub-index supported | - (Read only) | CANopen | U8 | 1 | - | - |
| 0x1802:001 (P552.01) | TPDO3 communication parameter: COB-ID | **0xC0000380** | CANopen | U32 | 1 | PH | - |
| 0x1802:002 (P552.02) | TPDO3 communication parameter: Transmission type | **255** | CANopen | U8 | 1 | P | - |
| 0x1802:003 (P552.03) | TPDO3 communication parameter: Inhibit time | **0.0 ms** | CANopen | U16 | 10 | P | - |
| 0x1802:005 (P552.05) | TPDO3 communication parameter: Event timer | **0 ms** | CANopen | U16 | 1 | P | - |
| * Default setting dependent on the model. | | | | | | | |

| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x1A00:000 | TPDO1 mapping parameter: Number of mapped application objects in TPDO | **2** | CANopen | U8 | 1 | P | - |
| 0x1A00:001 | TPDO1 mapping parameter: Application object 1 | **0x60410010** | CANopen | U32 | 1 | PH | - |
| 0x1A00:002 | TPDO1 mapping parameter: Application object 2 | **0x60440010** | CANopen | U32 | 1 | PH | - |
| 0x1A00:003 | TPDO1 mapping parameter: Application object 3 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1A00:004 | TPDO1 mapping parameter: Application object 4 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1A00:005 | TPDO1 mapping parameter: Application object 5 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1A00:006 | TPDO1 mapping parameter: Application object 6 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1A00:007 | TPDO1 mapping parameter: Application object 7 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1A00:008 | TPDO1 mapping parameter: Application object 8 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1A01:000 | TPDO2 mapping parameter: Number of mapped application objects in TPDO | **0** | CANopen | U8 | 1 | P | - |
| 0x1A01:001 | TPDO2 mapping parameter: Application object 1 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1A01:002 | TPDO2 mapping parameter: Application object 2 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1A01:003 | TPDO2 mapping parameter: Application object 3 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1A01:004 | TPDO2 mapping parameter: Application object 4 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1A01:005 | TPDO2 mapping parameter: Application object 5 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1A01:006 | TPDO2 mapping parameter: Application object 6 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1A01:007 | TPDO2 mapping parameter: Application object 7 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1A01:008 | TPDO2 mapping parameter: Application object 8 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1A02:000 | TPDO3 mapping parameter: Number of mapped application objects in TPDO | **0** | CANopen | U8 | 1 | P | - |
| 0x1A02:001 | TPDO3 mapping parameter: Application object 1 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1A02:002 | TPDO3 mapping parameter: Application object 2 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1A02:003 | TPDO3 mapping parameter: Application object 3 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1A02:004 | TPDO3 mapping parameter: Application object 4 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1A02:005 | TPDO3 mapping parameter: Application object 5 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1A02:006 | TPDO3 mapping parameter: Application object 6 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1A02:007 | TPDO3 mapping parameter: Application object 7 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x1A02:008 | TPDO3 mapping parameter: Application object 8 | **0x00000000** | CANopen | U32 | 1 | PH | - |
| 0x2000:001 (P190.01) | Device data: Product code | - (Read only) | general | STRING[18] | 1 | - | - |
| 0x2000:002 (P190.02) | Device data: Serial number | - (Read only) | general | STRING[50] | 1 | - | - |
| 0x2000:004 (P190.04) | Device data: CU firmware version | - (Read only) | general | STRING[50] | 1 | - | - |
| 0x2000:005 (P190.05) | Device data: CU firmware type | - (Read only) | general | STRING[50] | 1 | - | - |
| 0x2000:006 (P190.06) | Device data: CU bootloader version | - (Read only) | general | STRING[50] | 1 | - | - |
| 0x2000:007 (P190.07) | Device data: CU bootloader type | - (Read only) | general | STRING[50] | 1 | - | - |
| 0x2000:008 (P190.08) | Device data: Object directory version | - (Read only) | general | U32 | 1 | - | - |
| 0x2000:010 (P190.10) | Device data: PU firmware version | - (Read only) | general | STRING[50] | 1 | - | - |
| 0x2000:011 (P190.11) | Device data: PU firmware type | - (Read only) | general | STRING[50] | 1 | - | - |
| 0x2000:012 (P190.12) | Device data: PU bootloader version | - (Read only) | general | STRING[50] | 1 | - | - |
| 0x2000:013 (P190.13) | Device data: PU bootloader type | - (Read only) | general | STRING[50] | 1 | - | - |
| 0x2000:014 (P190.14) | Device data: Module - firmware version | - (Read only) | general | STRING[11] | 1 | - | - |
| 0x2000:015 (P190.15) | Device data: Communication firmware revision number | - (Read only) | general | STRING[50] | 1 | - | - |
| * Default setting dependent on the model. | | | | | | | |

| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x2000:016 (P190.16) | Device data: Communication bootloader revision number | - (Read only) | general | STRING[50] | 1 | - | - |
| 0x2000:017 (P190.17) | Device data: CU firmware subtype | - (Read only) | general | STRING[50] | 1 | - | - |
| 0x2001 (P191.00) | Device name | "**My Device**" | general | STRING[128] | 1 | P | - |
| 0x2006:000 (P155.00) | Error history buffer: Keypad display | - (Read only) | general | U8 | 1 | - | - |
| 0x2006:001 | Error history buffer: Maximum number of messages | - (Read only) | general | U8 | 1 | - | - |
| 0x2006:002 | Error history buffer: Latest message | - (Read only) | general | U8 | 1 | - | - |
| 0x2006:003 | Error history buffer: Latest acknowledgement message | **0** | general | U8 | 1 | - | - |
| 0x2006:004 | Error history buffer: New message | - (Read only) | general | U8 | 1 | - | t |
| 0x2006:005 | Error history buffer: Buffer overflow | **1** | general | U16 | 1 | - | - |
| 0x2006:006 | Error history buffer: Message 0 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:007 | Error history buffer: Message 1 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:008 | Error history buffer: Message 2 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:009 | Error history buffer: Message 3 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:010 | Error history buffer: Message 4 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:011 | Error history buffer: Message 5 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:012 | Error history buffer: Message 6 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:013 | Error history buffer: Message 7 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:014 | Error history buffer: Message 8 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:015 | Error history buffer: Message 9 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:016 | Error history buffer: Message 10 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:017 | Error history buffer: Message 11 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:018 | Error history buffer: Message 12 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:019 | Error history buffer: Message 13 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:020 | Error history buffer: Message 14 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:021 | Error history buffer: Message 15 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:022 | Error history buffer: Message 16 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:023 | Error history buffer: Message 17 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:024 | Error history buffer: Message 18 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:025 | Error history buffer: Message 19 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:026 | Error history buffer: Message 20 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:027 | Error history buffer: Message 21 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:028 | Error history buffer: Message 22 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:029 | Error history buffer: Message 23 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:030 | Error history buffer: Message 24 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:031 | Error history buffer: Message 25 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:032 | Error history buffer: Message 26 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:033 | Error history buffer: Message 27 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:034 | Error history buffer: Message 28 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:035 | Error history buffer: Message 29 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:036 | Error history buffer: Message 30 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2006:037 | Error history buffer: Message 31 | - (Read only) | general | OCTET[19] | 1 | - | - |
| 0x2007:001 | Error history buffer: Message number | **1** | general | U8 | 1 | - | - |
| 0x2007:002 | Error history buffer: Time stamp | x.xx s (Read only) | general | U32 | 100 | - | - |
| 0x2007:003 | Error history buffer: Response to error | - (Read only) | general | U8 | 1 | - | - |
| 0x2007:004 | Error history buffer: Message ID | - (Read only) | general | U16 | 1 | - | - |
| 0x2007:005 | Error history buffer: Diag Code Ident | - (Read only) | general | U16 | 1 | - | - |
| 0x2007:006 | Error history buffer: Message counter | - (Read only) | general | U8 | 1 | - | - |
| 0x2007:007 | Error history buffer: IO-Link message number | - (Read only) | IO-Link | U16 | 1 | - | - |
| 0x2021:001 (P230.01) | Optical tracking: Start detection | **Stop [0]** | general | U8 | 1 | - | - |
| * Default setting dependent on the model. | | | | | | | |

| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x2021:002 (P230.02) | Optical tracking: Blinking duration | **5 s** | general | U16 | 1 | - | - |
| 0x2022:001 (P700.01) | Device commands: Load default settings | **Off / ready [0]** | general | U8 | 1 | C | - |
| 0x2022:003 (P700.03) | Device commands: Save user data | **Off / ready [0]** | general | U8 | 1 | - | - |
| 0x2022:004 (P700.04) | Device commands: Load user data | **Off / ready [0]** | general | U8 | 1 | C | - |
| 0x2022:005 (P700.05) | Device commands: Load OEM data | **Off / ready [0]** | general | U8 | 1 | C | - |
| 0x2022:006 (P700.06) | Device commands: Save OEM data | **Off / ready [0]** | general | U8 | 1 | - | - |
| 0x2022:007 (P700.07) | Device commands: Load parameter set 1 | **Off / ready [0]** | general | U8 | 1 | - | - |
| 0x2022:008 (P700.08) | Device commands: Load parameter set 2 | **Off / ready [0]** | general | U8 | 1 | - | - |
| 0x2022:009 (P700.09) | Device commands: Load parameter set 3 | **Off / ready [0]** | general | U8 | 1 | - | - |
| 0x2022:010 (P700.10) | Device commands: Load parameter set 4 | **Off / ready [0]** | general | U8 | 1 | - | - |
| 0x2022:011 (P700.11) | Device commands: Save parameter set 1 | **Off / ready [0]** | general | U8 | 1 | - | - |
| 0x2022:012 (P700.12) | Device commands: Save parameter set 2 | **Off / ready [0]** | general | U8 | 1 | - | - |
| 0x2022:013 (P700.13) | Device commands: Save parameter set 3 | **Off / ready [0]** | general | U8 | 1 | - | - |
| 0x2022:014 (P700.14) | Device commands: Save parameter set 4 | **Off / ready [0]** | general | U8 | 1 | - | - |
| 0x2022:015 (P700.15) | Device commands: Delete logbook | **Off / ready [0]** | general | U8 | 1 | C | - |
| 0x2024:001 | Special settings: Configure default setting | **0** | general | U16 | 1 | - | - |
| 0x2030 | CRC parameter set | **0** | general | U32 | 1 | P | - |
| 0x203D (P730.00) | PIN1 access protection | **0** | general | I16 | 1 | - | - |
| 0x203E (P731.00) | PIN2 access protection | **0** | general | I16 | 1 | - | - |
| 0x203F | PIN1/PIN2 log-in | **0** | general | I16 | 1 | - | - |
| 0x2040 (P197.00) | Access protection status | - (Read only) | general | U16 | 1 | - | - |
| 0x2300 (P508.00) | CANopen communication | **No action/no error [0]** | CANopen | U8 | 1 | C | - |
| 0x2301:001 (P510.01) | CANopen settings: Node ID | **1** | CANopen | U8 | 1 | P | - |
| 0x2301:002 (P510.02) | CANopen settings: Baud rate | **500 kbps [5]** | CANopen | U8 | 1 | P | - |
| 0x2301:003 (P510.03) | CANopen settings: Slave/Master | **Slave [0]** | CANopen | U8 | 1 | P | - |
| 0x2301:004 (P510.04) | CANopen settings: Start remote delay | **3000 ms** | CANopen | U16 | 1 | P | - |
| 0x2301:005 (P510.05) | CANopen settings: Activate SDO2 channel | **Not active [0]** | CANopen | U8 | 1 | - | - |
| 0x2301:006 (P510.06) | CANopen settings: COB-ID Configuration - PDO | **Base + node-ID [0]** | CANopen | U8 | 1 | P | - |
| 0x2301:007 (P510.07) | CANopen settings: COB-ID Configuration - SDO2 | **Freely configurable [1]** | CANopen | U8 | 1 | P | - |
| 0x2302:001 (P511.01) | Active CANopen settings: Active node ID | - (Read only) | CANopen | U8 | 1 | - | - |
| 0x2302:002 (P511.02) | Active CANopen settings: Active baud rate | - (Read only) | CANopen | U8 | 1 | - | - |
| * Default setting dependent on the model. | | | | | | | |

| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x2307 (P515.00) | CANopen time-out status | - (Read only) | CANopen | U32 | 1 | - | - |
| 0x2308 (P516.00) | CANopen status | - (Read only) | CANopen | U16 | 1 | - | - |
| 0x2309 (P517.00) | CANopen controller status | - (Read only) | CANopen | U16 | 1 | - | - |
| 0x230A:000 | CANopen statistics: Highest subindex | - (Read only) | CANopen | U8 | 1 | - | - |
| 0x230A:001 (P580.01) | CANopen statistics: PDO1 received | - (Read only) | CANopen | U16 | 1 | - | - |
| 0x230A:002 (P580.02) | CANopen statistics: PDO2 received | - (Read only) | CANopen | U16 | 1 | - | - |
| 0x230A:003 (P580.03) | CANopen statistics: PDO3 received | - (Read only) | CANopen | U16 | 1 | - | - |
| 0x230A:005 (P580.05) | CANopen statistics: PDO1 transmitted | - (Read only) | CANopen | U16 | 1 | - | - |
| 0x230A:006 (P580.06) | CANopen statistics: PDO2 transmitted | - (Read only) | CANopen | U16 | 1 | - | - |
| 0x230A:007 (P580.07) | CANopen statistics: PDO3 transmitted | - (Read only) | CANopen | U16 | 1 | - | - |
| 0x230A:009 (P580.09) | CANopen statistics: SDO1 telegrams | - (Read only) | CANopen | U16 | 1 | - | - |
| 0x230A:010 (P580.10) | CANopen statistics: SDO2 telegrams | - (Read only) | CANopen | U16 | 1 | - | - |
| 0x230B (P518.00) | CANopen error counter | - (Read only) | CANopen | U16 | 1 | - | - |
| 0x231F:001 (P500.01) | Communication module ID: Active module ID | - (Read only) | general | U8 | 1 | P | - |
| 0x231F:002 (P500.02) | Communication module ID: Module ID connected | - (Read only) | general | U8 | 1 | - | - |
| 0x2320 (P508.00) | Modbus communication | **No action/no error [0]** | Modbus RTU | U8 | 1 | - | - |
| 0x2321:001 (P510.01) | Modbus settings: Node ID | **1** | Modbus RTU | U8 | 1 | P | - |
| 0x2321:002 (P510.02) | Modbus settings: Baud rate | **Automatic [0]** | Modbus RTU | U8 | 1 | P | - |
| 0x2321:003 (P510.03) | Modbus settings: Data format | **Automatic [0]** | Modbus RTU | U8 | 1 | P | - |
| 0x2321:004 (P510.04) | Modbus settings: Minimum response time | **0 ms** | Modbus RTU | U16 | 1 | P | - |
| 0x2322:001 (P511.01) | Active Modbus settings: Active node ID | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x2322:002 (P511.02) | Active Modbus settings: Active baud rate | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x2322:003 (P511.03) | Active Modbus settings: Data format | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232A:001 (P580.01) | Modbus statistics: Messages received | - (Read only) | Modbus RTU | U32 | 1 | - | - |
| 0x232A:002 (P580.02) | Modbus statistics: Valid messages received | - (Read only) | Modbus RTU | U32 | 1 | - | - |
| 0x232A:003 (P580.03) | Modbus statistics: Messages with exceptions | - (Read only) | Modbus RTU | U32 | 1 | - | - |
| 0x232A:004 (P580.04) | Modbus statistics: Messages with errors | - (Read only) | Modbus RTU | U32 | 1 | - | - |
| 0x232A:005 (P580.05) | Modbus statistics: Messages sent | - (Read only) | Modbus RTU | U32 | 1 | - | - |
| 0x232B:001 ... 0x232B:024 (P530.01 ... 24) | Modbus parameter mapping: Parameter 1 ... Parameter 24 | **0x00000000** | Modbus RTU | IDX | 1 | PH | - |
| * Default setting dependent on the model. | | | | | | | |



| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x232C:001 ... 0x232C:024 (P531.01 ... 24) | Modbus register assignment: Register 1 ... Register 24 | - (Read only) | Modbus RTU | U16 | 1 | - | - |
| 0x232D (P532.00) | Modbus verification code | - (Read only) | Modbus RTU | U16 | 1 | - | - |
| 0x232E:001 (P583.01) | Modbus diagnostics of last Rx data: Offset | **0** | Modbus RTU | U8 | 1 | - | - |
| 0x232E:002 (P583.02) | Modbus diagnostics of last Rx data: Data byte 0 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232E:003 (P583.03) | Modbus diagnostics of last Rx data: Data byte 1 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232E:004 (P583.04) | Modbus diagnostics of last Rx data: Data byte 2 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232E:005 (P583.05) | Modbus diagnostics of last Rx data: Data byte 3 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232E:006 (P583.06) | Modbus diagnostics of last Rx data: Data byte 4 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232E:007 (P583.07) | Modbus diagnostics of last Rx data: Data byte 5 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232E:008 (P583.08) | Modbus diagnostics of last Rx data: Data byte 6 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232E:009 (P583.09) | Modbus diagnostics of last Rx data: Data byte 7 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232E:010 (P583.10) | Modbus diagnostics of last Rx data: Data byte 8 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232E:011 (P583.11) | Modbus diagnostics of last Rx data: Data byte 9 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232E:012 (P583.12) | Modbus diagnostics of last Rx data: Data byte 10 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232E:013 (P583.13) | Modbus diagnostics of last Rx data: Data byte 11 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232E:014 (P583.14) | Modbus diagnostics of last Rx data: Data byte 12 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232E:015 (P583.15) | Modbus diagnostics of last Rx data: Data byte 13 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232E:016 (P583.16) | Modbus diagnostics of last Rx data: Data byte 14 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232E:017 (P583.17) | Modbus diagnostics of last Rx data: Data byte 15 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232F:001 (P585.01) | Modbus diagnostics of last Tx data: Offset | **0** | Modbus RTU | U8 | 1 | - | - |
| 0x232F:002 (P585.02) | Modbus diagnostics of last Tx data: Data byte 0 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232F:003 (P585.03) | Modbus diagnostics of last Tx data: Data byte 1 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232F:004 (P585.04) | Modbus diagnostics of last Tx data: Data byte 2 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232F:005 (P585.05) | Modbus diagnostics of last Tx data: Data byte 3 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232F:006 (P585.06) | Modbus diagnostics of last Tx data: Data byte 4 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232F:007 (P585.07) | Modbus diagnostics of last Tx data: Data byte 5 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232F:008 (P585.08) | Modbus diagnostics of last Tx data: Data byte 6 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232F:009 (P585.09) | Modbus diagnostics of last Tx data: Data byte 7 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232F:010 (P585.10) | Modbus diagnostics of last Tx data: Data byte 8 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| * Default setting dependent on the model. | | | | | | | |

| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x232F:011 (P585.11) | Modbus diagnostics of last Tx data: Data byte 9 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232F:012 (P585.12) | Modbus diagnostics of last Tx data: Data byte 10 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232F:013 (P585.13) | Modbus diagnostics of last Tx data: Data byte 11 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232F:014 (P585.14) | Modbus diagnostics of last Tx data: Data byte 12 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232F:015 (P585.15) | Modbus diagnostics of last Tx data: Data byte 13 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232F:016 (P585.16) | Modbus diagnostics of last Tx data: Data byte 14 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x232F:017 (P585.17) | Modbus diagnostics of last Tx data: Data byte 15 | - (Read only) | Modbus RTU | U8 | 1 | - | - |
| 0x2440 | Initiate WLAN | **No action/no error [0]** | WLAN | U8 | 1 | - | - |
| 0x2441:001 | WLAN settings: IP address | **192.168.178.1** | WLAN | U32 | 1 | PE | - |
| 0x2441:002 | WLAN settings: Netmask | **255.255.255.0** | WLAN | U32 | 1 | PE | - |
| 0x2441:003 | WLAN settings: Gateway | **192.168.178.1** | WLAN | U32 | 1 | PE | - |
| 0x2441:004 | WLAN settings: DHCP | **Enabled [1]** | WLAN | U8 | 1 | P | - |
| 0x2441:005 | WLAN settings: DHCP start address | **0.0.0.0** | WLAN | U32 | 1 | PE | - |
| 0x2441:006 | WLAN settings: WLAN operation mode | **Access point mode [0]** | WLAN | U8 | 1 | P | - |
| 0x2441:007 | WLAN settings: WLAN SSID | "**i5**" | WLAN | STRING[32] | 1 | P | - |
| 0x2441:008 | WLAN settings: WLAN password | "**password**" | WLAN | STRING[64] | 1 | P | - |
| 0x2441:009 | WLAN settings: WLAN security | **WPA2 [1]** | WLAN | U8 | 1 | P | - |
| 0x2441:010 | WLAN settings: WLAN access | **Enabled (WLAN on) [1]** | WLAN | U8 | 1 | P | - |
| 0x2441:011 | WLAN settings: WLAN channel | **Channel 1 [1]** | WLAN | U8 | 1 | P | - |
| 0x2441:012 | WLAN settings: WLAN SSID broadcast | **Activated [0]** | WLAN | U8 | 1 | P | - |
| 0x2442:001 | Active WLAN settings: Active IP address | - (Read only) | WLAN | U32 | 1 | E | - |
| 0x2442:002 | Active WLAN settings: Active netmask | - (Read only) | WLAN | U32 | 1 | E | - |
| 0x2442:003 | Active WLAN settings: Active gateway | - (Read only) | WLAN | U32 | 1 | E | - |
| 0x2442:004 | Active WLAN settings: Active module mode | - (Read only) | WLAN | U8 | 1 | - | - |
| 0x2442:005 | Active WLAN settings: MAC address | - (Read only) | WLAN | OCTET[6] | 1 | - | - |
| 0x2448:001 | WLAN status: Connection time | - (Read only) | WLAN | U32 | 1 | - | - |
| 0x2448:002 | WLAN status: Number of connections | - (Read only) | WLAN | U16 | 1 | - | - |
| 0x2448:003 | WLAN status: Rx frame counter | - (Read only) | WLAN | U16 | 1 | - | - |
| 0x2448:004 | WLAN status: Error statistics | - (Read only) | WLAN | U16 | 1 | - | - |
| 0x2449 | WLAN error | - (Read only) | WLAN | U16 | 1 | - | - |
| 0x24E5:001 | Process data handling in case of error: Procedure | **Keep last data [0]** | general | U8 | 1 | P | - |
| 0x2540:001 (P208.01) | Mains settings: Rated mains voltage | **230 Veff [0]** | general | U8 | 1 | PC | - |
| 0x2540:002 (P208.02) | Mains settings: Undervoltage warning threshold | **0 V** * | general | U16 | 1 | P | - |
| 0x2540:003 (P208.03) | Mains settings: Undervoltage error threshold | x V (Read only) | general | U16 | 1 | - | - |
| 0x2540:004 (P208.04) | Mains settings: Undervoltage reset threshold | x V (Read only) | general | U16 | 1 | - | - |
| 0x2540:005 (P208.05) | Mains settings: Overvoltage warning threshold | **0 V** * | general | U16 | 1 | P | - |
| 0x2540:006 (P208.06) | Mains settings: Overvoltage error threshold | x V (Read only) | general | U16 | 1 | - | - |
| 0x2540:007 (P208.07) | Mains settings: Overvoltage reset threshold | x V (Read only) | general | U16 | 1 | - | - |
| 0x2541:001 (P706.01) | Brake energy management: Operating mode | **Ramp function generator stop (RFGS) [1]** | general | U8 | 1 | P | - |
| 0x2541:002 (P706.02) | Brake energy management: Active threshold | x V (Read only) | general | U16 | 1 | P | - |

* Default setting dependent on the model.



| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x2541:003 (P706.03) | Brake energy management: Reduced threshold | **0 V** | general | U16 | 1 | P | - |
| 0x2541:004 (P706.04) | Brake energy management: Additional frequency | **0.0 Hz** | general | U16 | 10 | P | - |
| 0x2541:005 (P706.05) | Brake energy management: Deceleration override time | **2.0 s** | general | U16 | 10 | P | - |
| 0x2552:002 (P595.02) | Parameter access monitoring: Keep alive register | **0** | general | U16 | 1 | K | - |
| 0x2552:003 (P595.03) | Parameter access monitoring: Time-out time | **10.0 s** | general | U16 | 10 | P | - |
| 0x2552:004 (P595.04) | Parameter access monitoring: Reaction | **No response [0]** | general | U8 | 1 | P | - |
| 0x2552:005 (P595.05) | Parameter access monitoring: Action | **No action [0]** | general | U8 | 1 | P | - |
| 0x2552:006 (P595.06) | Parameter access monitoring: Parameter Access Monitoring-Status | - (Read only) | general | U16 | 1 | O | - |
| 0x2552:007 (P595.07) | Parameter access monitoring: WLAN reset time-out time | **0 s** | general | U16 | 1 | P | - |
| 0x2601:001 (P202.01) | Keypad setpoints: Frequency setpoint | **20.0 Hz** | general | U16 | 10 | P | r |
| 0x2601:002 (P202.02) | Keypad setpoints: Process controller setpoint | **0.00 PID unit** | general | I16 | 100 | P | r |
| 0x2601:003 (P202.03) | Keypad setpoints: Torque setpoint | **100.0 %** | general | I16 | 10 | P | r |
| 0x2602:001 (P708.01) | Manual control: Keypad setting | **CTRL & F/R enable [1]** | general | U8 | 1 | P | - |
| 0x2602:002 (P708.02) | Manual control: Keypad rotational direction | **Forward [0]** | general | U8 | 1 | P | - |
| 0x2602:003 (P708.03) | Manual control: Mode | **Keypad full control off [0]** | general | U8 | 1 | - | - |
| 0x261C:001 (P740.01) | Favorites settings: Parameter 1 | **0x2DDD0000** | general | IDX | 1 | PH | - |
| 0x261C:002 (P740.02) | Favorites settings: Parameter 2 | **0x60780000** | general | IDX | 1 | PH | - |
| 0x261C:003 (P740.03) | Favorites settings: Parameter 3 | **0x2D890000** | general | IDX | 1 | PH | - |
| 0x261C:004 (P740.04) | Favorites settings: Parameter 4 | **0x603F0000** | general | IDX | 1 | PH | - |
| 0x261C:005 (P740.05) | Favorites settings: Parameter 5 | **0x28240000** | general | IDX | 1 | PH | - |
| 0x261C:006 (P740.06) | Favorites settings: Parameter 6 | **0x28600100** | general | IDX | 1 | PH | - |
| 0x261C:007 (P740.07) | Favorites settings: Parameter 7 | **0x28380100** | general | IDX | 1 | PH | - |
| 0x261C:008 (P740.08) | Favorites settings: Parameter 8 | **0x28380300** | general | IDX | 1 | PH | - |
| 0x261C:009 (P740.09) | Favorites settings: Parameter 9 | **0x25400100** | general | IDX | 1 | PH | - |
| 0x261C:010 (P740.10) | Favorites settings: Parameter 10 | **0x29150000** | general | IDX | 1 | PH | - |
| 0x261C:011 (P740.11) | Favorites settings: Parameter 11 | **0x29160000** | general | IDX | 1 | PH | - |
| 0x261C:012 (P740.12) | Favorites settings: Parameter 12 | **0x29170000** | general | IDX | 1 | PH | - |
| 0x261C:013 (P740.13) | Favorites settings: Parameter 13 | **0x29180000** | general | IDX | 1 | PH | - |
| 0x261C:014 (P740.14) | Favorites settings: Parameter 14 | **0x2C000000** | general | IDX | 1 | PH | - |

* Default setting dependent on the model.

| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x261C:015 (P740.15) | Favorites settings: Parameter 15 | **0x2B000000** | general | IDX | 1 | PH | - |
| 0x261C:016 (P740.16) | Favorites settings: Parameter 16 | **0x2B010100** | general | IDX | 1 | PH | - |
| 0x261C:017 (P740.17) | Favorites settings: Parameter 17 | **0x2B010200** | general | IDX | 1 | PH | - |
| 0x261C:018 (P740.18) | Favorites settings: Parameter 18 | **0x283A0000** | general | IDX | 1 | PH | - |
| 0x261C:019 (P740.19) | Favorites settings: Parameter 19 | **0x29390000** | general | IDX | 1 | PH | - |
| 0x261C:020 (P740.20) | Favorites settings: Parameter 20 | **0x2D430100** | general | IDX | 1 | PH | - |
| 0x261C:021 (P740.21) | Favorites settings: Parameter 21 | **0x2D4B0100** | general | IDX | 1 | PH | - |
| 0x261C:022 (P740.22) | Favorites settings: Parameter 22 | **0x2B120100** | general | IDX | 1 | PH | - |
| 0x261C:023 (P740.23) | Favorites settings: Parameter 23 | **0x60750000** | general | IDX | 1 | PH | - |
| 0x261C:024 (P740.24) | Favorites settings: Parameter 24 | **0x60730000** | general | IDX | 1 | PH | - |
| 0x261C:025 (P740.25) | Favorites settings: Parameter 25 | **0x26310100** | general | IDX | 1 | PH | - |
| 0x261C:026 (P740.26) | Favorites settings: Parameter 26 | **0x26310200** | general | IDX | 1 | PH | - |
| 0x261C:027 (P740.27) | Favorites settings: Parameter 27 | **0x26310300** | general | IDX | 1 | PH | - |
| 0x261C:028 (P740.28) | Favorites settings: Parameter 28 | **0x26310400** | general | IDX | 1 | PH | - |
| 0x261C:029 (P740.29) | Favorites settings: Parameter 29 | **0x26310500** | general | IDX | 1 | PH | - |
| 0x261C:030 (P740.30) | Favorites settings: Parameter 30 | **0x26310600** | general | IDX | 1 | PH | - |
| 0x261C:031 (P740.31) | Favorites settings: Parameter 31 | **0x26310700** | general | IDX | 1 | PH | - |
| 0x261C:032 (P740.32) | Favorites settings: Parameter 32 | **0x26310800** | general | IDX | 1 | PH | - |
| 0x261C:033 (P740.33) | Favorites settings: Parameter 33 | **0x26310900** | general | IDX | 1 | PH | - |
| 0x261C:034 (P740.34) | Favorites settings: Parameter 34 | **0x26310D00** | general | IDX | 1 | PH | - |
| 0x261C:035 (P740.35) | Favorites settings: Parameter 35 | **0x26311200** | general | IDX | 1 | PH | - |
| 0x261C:036 (P740.36) | Favorites settings: Parameter 36 | **0x26311300** | general | IDX | 1 | PH | - |
| 0x261C:037 (P740.37) | Favorites settings: Parameter 37 | **0x26311400** | general | IDX | 1 | PH | - |
| 0x261C:038 (P740.38) | Favorites settings: Parameter 38 | **0x26340100** | general | IDX | 1 | PH | - |
| 0x261C:039 (P740.39) | Favorites settings: Parameter 39 | **0x26340200** | general | IDX | 1 | PH | - |
| 0x261C:040 (P740.40) | Favorites settings: Parameter 40 | **0x26360100** | general | IDX | 1 | PH | - |
| 0x261C:041 (P740.41) | Favorites settings: Parameter 41 | **0x26360200** | general | IDX | 1 | PH | - |
| 0x261C:042 (P740.42) | Favorites settings: Parameter 42 | **0x26360300** | general | IDX | 1 | PH | - |
| 0x261C:043 (P740.43) | Favorites settings: Parameter 43 | **0x26390100** | general | IDX | 1 | PH | - |
| * Default setting dependent on the model. | | | | | | | |



| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x261C:044 (P740.44) | Favorites settings: Parameter 44 | **0x26390200** | general | IDX | 1 | PH | - |
| 0x261C:045 (P740.45) | Favorites settings: Parameter 45 | **0x26390300** | general | IDX | 1 | PH | - |
| 0x261C:046 (P740.46) | Favorites settings: Parameter 46 | **0x26390400** | general | IDX | 1 | PH | - |
| 0x261C:047 (P740.47) | Favorites settings: Parameter 47 | **0x29110100** | general | IDX | 1 | PH | - |
| 0x261C:048 (P740.48) | Favorites settings: Parameter 48 | **0x29110200** | general | IDX | 1 | PH | - |
| 0x261C:049 (P740.49) | Favorites settings: Parameter 49 | **0x29110300** | general | IDX | 1 | PH | - |
| 0x261C:050 (P740.50) | Favorites settings: Parameter 50 | **0x29110400** | general | IDX | 1 | PH | - |
| 0x2630:001 (P410.01) | Settings for digital inputs: Assertion level | **HIGH active [1]** | general | U8 | 1 | P | - |
| 0x2630:002 (P410.02) | Settings for digital inputs: Input function | **Digital input [0]** | general | U8 | 1 | P | - |
| 0x2631:001 (P400.01) | Function list: Enable inverter | **Constant TRUE [1]** | general | U8 | 1 | PC | - |
| 0x2631:002 (P400.02) | Function list: Run | **Digital input 1 [11]** | general | U8 | 1 | PC | - |
| 0x2631:003 (P400.03) | Function list: Activate quick stop | **Not connected [0]** | general | U8 | 1 | PC | - |
| 0x2631:004 (P400.04) | Function list: Reset fault | **Digital input 2 [12]** | general | U8 | 1 | P | - |
| 0x2631:005 (P400.05) | Function list: Activate DC braking | **Not connected [0]** | general | U8 | 1 | P | - |
| 0x2631:006 (P400.06) | Function list: Start forward (CW) | **Not connected [0]** | general | U8 | 1 | PC | - |
| 0x2631:007 (P400.07) | Function list: Start reverse (CCW) | **Not connected [0]** | general | U8 | 1 | PC | - |
| 0x2631:008 (P400.08) | Function list: Run forward (CW) | **Not connected [0]** | general | U8 | 1 | PC | - |
| 0x2631:009 (P400.09) | Function list: Run reverse (CCW) | **Not connected [0]** | general | U8 | 1 | PC | - |
| 0x2631:010 (P400.10) | Function list: Jog foward (CW) | **Not connected [0]** | general | U8 | 1 | PC | - |
| 0x2631:011 (P400.11) | Function list: Jog reverse (CCW) | **Not connected [0]** | general | U8 | 1 | PC | - |
| 0x2631:012 (P400.12) | Function list: Activate keypad control | **Not connected [0]** | general | U8 | 1 | P | - |
| 0x2631:013 (P400.13) | Function list: Reverse rotational direction | **Digital input 3 [13]** | general | U8 | 1 | PC | - |
| 0x2631:014 (P400.14) | Function list: Activate AI1 setpoint | **Not connected [0]** | general | U8 | 1 | P | - |
| 0x2631:015 (P400.15) | Function list: Activate AI2 setpoint | **Not connected [0]** | general | U8 | 1 | P | - |
| 0x2631:016 (P400.16) | Function list: Activate keypad setpoint | **Not connected [0]** | general | U8 | 1 | P | - |
| 0x2631:017 (P400.17) | Function list: Activate network setpoint | **Not connected [0]** | general | U8 | 1 | P | - |
| 0x2631:018 (P400.18) | Function list: Activate preset (bit 0) | **Digital input 4 [14]** | general | U8 | 1 | P | - |
| 0x2631:019 (P400.19) | Function list: Activate preset (bit 1) | **Digital input 5 [15]** | general | U8 | 1 | P | - |
| 0x2631:020 (P400.20) | Function list: Activate preset (bit 2) | **Not connected [0]** | general | U8 | 1 | P | - |
| * Default setting dependent on the model. | | | | | | | |

| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x2631:021 (P400.21) | Function list: Activate preset (bit 3) | **Not connected [0]** | general | U8 | 1 | P | - |
| 0x2631:023 (P400.23) | Function list: MOP setpoint up | **Not connected [0]** | general | U8 | 1 | P | - |
| 0x2631:024 (P400.24) | Function list: MOP setpoint down | **Not connected [0]** | general | U8 | 1 | P | - |
| 0x2631:025 (P400.25) | Function list: Activate MOP setpoint | **Not connected [0]** | general | U8 | 1 | P | - |
| 0x2631:026 (P400.26) | Function list: Activate segment setpoint (bit 0) | **Not connected [0]** | Sequencer | U8 | 1 | P | - |
| 0x2631:027 (P400.27) | Function list: Activate segment setpoint (bit 1) | **Not connected [0]** | Sequencer | U8 | 1 | P | - |
| 0x2631:028 (P400.28) | Function list: Activate segment setpoint (bit 2) | **Not connected [0]** | Sequencer | U8 | 1 | P | - |
| 0x2631:029 (P400.29) | Function list: Activate segment setpoint´(bit 3) | **Not connected [0]** | Sequencer | U8 | 1 | P | - |
| 0x2631:030 (P400.30) | Function list: Run/abort sequence | **Not connected [0]** | Sequencer | U8 | 1 | PC | - |
| 0x2631:031 (P400.31) | Function list: Start sequence | **Not connected [0]** | Sequencer | U8 | 1 | PC | - |
| 0x2631:032 (P400.32) | Function list: Next sequence step | **Not connected [0]** | Sequencer | U8 | 1 | PC | - |
| 0x2631:033 (P400.33) | Function list: Pause sequence | **Not connected [0]** | Sequencer | U8 | 1 | PC | - |
| 0x2631:034 (P400.34) | Function list: Suspend sequence | **Not connected [0]** | Sequencer | U8 | 1 | PC | - |
| 0x2631:035 (P400.35) | Function list: Stop sequence | **Not connected [0]** | Sequencer | U8 | 1 | PC | - |
| 0x2631:036 (P400.36) | Function list: Abort sequence | **Not connected [0]** | Sequencer | U8 | 1 | PC | - |
| 0x2631:037 (P400.37) | Function list: Activate network control | **Not connected [0]** | general | U8 | 1 | P | - |
| 0x2631:039 (P400.39) | Function list: Activate ramp 2 | **Not connected [0]** | general | U8 | 1 | P | - |
| 0x2631:040 (P400.40) | Function list: Load parameter set | **Not connected [0]** | general | U8 | 1 | PC | - |
| 0x2631:041 (P400.41) | Function list: Select parameter set (bit 0) | **Not connected [0]** | general | U8 | 1 | PC | - |
| 0x2631:042 (P400.42) | Function list: Select parameter set (bit 1) | **Not connected [0]** | general | U8 | 1 | PC | - |
| 0x2631:043 (P400.43) | Function list: Activate fault 1 | **Not connected [0]** | general | U8 | 1 | P | - |
| 0x2631:044 (P400.44) | Function list: Activate fault 2 | **Not connected [0]** | general | U8 | 1 | P | - |
| 0x2631:045 (P400.45) | Function list: Deactivate PID controller | **Not connected [0]** | general | U8 | 1 | P | - |
| 0x2631:046 (P400.46) | Function list: Set process controller output to 0 | **Not connected [0]** | general | U8 | 1 | P | - |
| 0x2631:047 (P400.47) | Function list: Inhibit process controller I-component | **Not connected [0]** | general | U8 | 1 | P | - |
| 0x2631:048 (P400.48) | Function list: Activate PID influence ramp | **Constant TRUE [1]** | general | U8 | 1 | P | - |
| 0x2631:049 (P400.49) | Function list: Open holding brake | **Not connected [0]** | general | U8 | 1 | PC | - |
| 0x2631:050 (P400.50) | Function list: Select sequence (bit 0) | **Not connected [0]** | Sequencer | U8 | 1 | PC | - |
| 0x2631:051 (P400.51) | Function list: Select sequence (bit 1) | **Not connected [0]** | Sequencer | U8 | 1 | PC | - |

* Default setting dependent on the model.



| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x2631:052 (P400.52) | Function list: Select sequence (bit 2) | **Not connected [0]** | Sequencer | U8 | 1 | PC | - |
| 0x2631:053 (P400.53) | Function list: Select sequence (bit 3) | **Not connected [0]** | Sequencer | U8 | 1 | PC | - |
| 0x2631:054 (P400.54) | Function list: Position counter reset | **Not connected [0]** | general | U8 | 1 | P | - |
| 0x2631:055 (P400.55) | Function list: Activate UPS operation | **Not connected [0]** | general | U8 | 1 | P | - |
| 0x2631:056 (P400.56) | Function list: Assist pump 1 | **Not connected [0]** | | U8 | 1 | P | - |
| 0x2631:057 (P400.57) | Function list: Assist pump 2 | **Not connected [0]** | | U8 | 1 | P | - |
| 0x2631:058 (P400.58) | Function list: Reset operating time | **Not connected [0]** | | U8 | 1 | P | - |
| 0x2632:001 (P411.01) | Inversion of digital inputs: Digital input 1 | **Not inverted [0]** | general | U8 | 1 | P | - |
| 0x2632:002 (P411.02) | Inversion of digital inputs: Digital input 2 | **Not inverted [0]** | general | U8 | 1 | P | - |
| 0x2632:003 (P411.03) | Inversion of digital inputs: Digital input 3 | **Not inverted [0]** | general | U8 | 1 | P | - |
| 0x2632:004 (P411.04) | Inversion of digital inputs: Digital input 4 | **Not inverted [0]** | general | U8 | 1 | P | - |
| 0x2632:005 (P411.05) | Inversion of digital inputs: Digital input 5 | **Not inverted [0]** | general | U8 | 1 | P | - |
| 0x2632:006 (P411.06) | Inversion of digital inputs: Digital input 6 | **Not inverted [0]** | Appl. I/O | U8 | 1 | P | - |
| 0x2632:007 (P411.07) | Inversion of digital inputs: Digital input 7 | **Not inverted [0]** | Appl. I/O | U8 | 1 | P | - |
| 0x2633:001 | Digital input debounce time: Digital input 1 | **1 ms** | general | U8 | 1 | P | - |
| 0x2633:002 | Digital input debounce time: Digital input 2 | **1 ms** | general | U8 | 1 | P | - |
| 0x2633:003 | Digital input debounce time: Digital input 3 | **1 ms** | general | U8 | 1 | P | - |
| 0x2633:004 | Digital input debounce time: Digital input 4 | **1 ms** | general | U8 | 1 | P | - |
| 0x2633:005 | Digital input debounce time: Digital input 5 | **1 ms** | general | U8 | 1 | P | - |
| 0x2633:006 | Digital input debounce time: Digital input 6 | **1 ms** | Appl. I/O | U8 | 1 | P | - |
| 0x2633:007 | Digital input debounce time: Digital input 7 | **1 ms** | Appl. I/O | U8 | 1 | P | - |
| 0x2634:001 (P420.01) | Digital outputs function: Relay | **Ready for operation [51]** | general | U8 | 1 | P | - |
| 0x2634:002 (P420.02) | Digital outputs function: Digital output 1 | **Release holding brake [115]** | general | U8 | 1 | P | - |
| 0x2634:010 (P420.10) | Digital outputs function: NetWordOUT1 - bit 0 | **Ready for operation [51]** | general | U8 | 1 | P | - |
| 0x2634:011 (P420.11) | Digital outputs function: NetWordOUT1 - bit 1 | **Not connected [0]** | general | U8 | 1 | P | - |
| 0x2634:012 (P420.12) | Digital outputs function: NetWordOUT1 - bit 2 | **Operation enabled [52]** | general | U8 | 1 | P | - |
| 0x2634:013 (P420.13) | Digital outputs function: NetWordOUT1 - bit 3 | **Fault active [56]** | general | U8 | 1 | P | - |
| 0x2634:014 (P420.14) | Digital outputs function: NetWordOUT1 - bit 4 | **Not connected [0]** | general | U8 | 1 | P | - |
| 0x2634:015 (P420.15) | Digital outputs function: NetWordOUT1 - bit 5 | **Quick stop active [54]** | general | U8 | 1 | P | - |
| 0x2634:016 (P420.16) | Digital outputs function: NetWordOUT1 - bit 6 | **Running [50]** | general | U8 | 1 | P | - |
| 0x2634:017 (P420.17) | Digital outputs function: NetWordOUT1 - bit 7 | **Device warning active [58]** | general | U8 | 1 | P | - |
| 0x2634:018 (P420.18) | Digital outputs function: NetWordOUT1 - bit 8 | **Not connected [0]** | general | U8 | 1 | P | - |
| 0x2634:019 (P420.19) | Digital outputs function: NetWordOUT1 - bit 9 | **Not connected [0]** | general | U8 | 1 | P | - |
| * Default setting dependent on the model. | | | | | | | |

| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x2634:020 (P420.20) | Digital outputs function: NetWordOUT1 - bit 10 | **Setpoint speed reached [72]** | general | U8 | 1 | P | - |
| 0x2634:021 (P420.21) | Digital outputs function: NetWordOUT1 - bit 11 | **Current limit reached [78]** | general | U8 | 1 | P | - |
| 0x2634:022 (P420.22) | Digital outputs function: NetWordOUT1 - bit 12 | **Actual speed = 0 [71]** | general | U8 | 1 | P | - |
| 0x2634:023 (P420.23) | Digital outputs function: NetWordOUT1 - bit 13 | **Rotational direction reversed [69]** | general | U8 | 1 | P | - |
| 0x2634:024 (P420.24) | Digital outputs function: NetWordOUT1 - bit 14 | **Release holding brake [115]** | general | U8 | 1 | P | - |
| 0x2634:025 (P420.25) | Digital outputs function: NetWordOUT1 - bit 15 | **Inverter disabled (safety) [55]** | general | U8 | 1 | P | - |
| 0x2635:001 (P421.01) | Inversion of digital outputs: Relay | **Not inverted [0]** | general | U8 | 1 | P | - |
| 0x2635:002 (P421.02) | Inversion of digital outputs: Digital output 1 | **Not inverted [0]** | general | U8 | 1 | P | - |
| 0x2635:010 | Inversion of digital outputs: NetWordOUT1.00 | **Not inverted [0]** | general | U8 | 1 | P | - |
| 0x2635:011 | Inversion of digital outputs: NetWordOUT1.01 | **Not inverted [0]** | general | U8 | 1 | P | - |
| 0x2635:012 | Inversion of digital outputs: NetWordOUT1.02 | **Not inverted [0]** | general | U8 | 1 | P | - |
| 0x2635:013 | Inversion of digital outputs: NetWordOUT1.03 | **Not inverted [0]** | general | U8 | 1 | P | - |
| 0x2635:014 | Inversion of digital outputs: NetWordOUT1.04 | **Not inverted [0]** | general | U8 | 1 | P | - |
| 0x2635:015 | Inversion of digital outputs: NetWordOUT1.05 | **Not inverted [0]** | general | U8 | 1 | P | - |
| 0x2635:016 | Inversion of digital outputs: NetWordOUT1.06 | **Not inverted [0]** | general | U8 | 1 | P | - |
| 0x2635:017 | Inversion of digital outputs: NetWordOUT1.07 | **Not inverted [0]** | general | U8 | 1 | P | - |
| 0x2635:018 | Inversion of digital outputs: NetWordOUT1.08 | **Not inverted [0]** | general | U8 | 1 | P | - |
| 0x2635:019 | Inversion of digital outputs: NetWordOUT1.09 | **Not inverted [0]** | general | U8 | 1 | P | - |
| 0x2635:020 | Inversion of digital outputs: NetWordOUT1.10 | **Not inverted [0]** | general | U8 | 1 | P | - |
| 0x2635:021 | Inversion of digital outputs: NetWordOUT1.11 | **Not inverted [0]** | general | U8 | 1 | P | - |
| 0x2635:022 | Inversion of digital outputs: NetWordOUT1.12 | **Not inverted [0]** | general | U8 | 1 | P | - |
| 0x2635:023 | Inversion of digital outputs: NetWordOUT1.13 | **Not inverted [0]** | general | U8 | 1 | P | - |
| 0x2635:024 | Inversion of digital outputs: NetWordOUT1.14 | **Not inverted [0]** | general | U8 | 1 | P | - |
| 0x2635:025 | Inversion of digital outputs: NetWordOUT1.15 | **Not inverted [0]** | general | U8 | 1 | P | - |
| 0x2636:001 (P430.01) | Analog input 1: Input range | **0 ... 10 VDC [0]** | general | U8 | 1 | P | - |
| 0x2636:002 (P430.02) | Analog input 1: Min frequency value | **0.0 Hz** | general | I16 | 10 | P | - |
| 0x2636:003 (P430.03) | Analog input 1: Max frequency value | Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz** | general | I16 | 10 | P | - |
| 0x2636:004 (P430.04) | Analog input 1: Min PID value | **0.00 PID unit** | general | I16 | 100 | P | - |
| 0x2636:005 (P430.05) | Analog input 1: Max PID value | **100.00 PID unit** | general | I16 | 100 | P | - |
| 0x2636:006 (P430.06) | Analog input 1: Filter time | **10 ms** | general | U16 | 1 | P | - |
| 0x2636:007 (P430.07) | Analog input 1: Dead band | **0.0 %** | general | U16 | 10 | P | - |
| 0x2636:008 (P430.08) | Analog input 1: Monitoring threshold | **0.0 %** | general | I16 | 10 | P | - |
| 0x2636:009 (P430.09) | Analog input 1: Monitoring condition | **Input value < trigger threshold [0]** | general | U8 | 1 | P | - |
| 0x2636:010 (P430.10) | Analog input 1: Error response | **Fault [3]** | general | U8 | 1 | P | - |
| 0x2636:011 (P430.11) | Analog input 1: Min torque value | **0.0 %** | general | I16 | 10 | P | - |
| 0x2636:012 (P430.12) | Analog input 1: Max torque value | **100.0 %** | general | I16 | 10 | P | - |
| * Default setting dependent on the model. | | | | | | | |



| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x2637:001 (P431.01) | Analog input 2: Input range | **0 ... 10 VDC [0]** | general | U8 | 1 | P | - |
| 0x2637:002 (P431.02) | Analog input 2: Min frequency value | **0.0 Hz** | general | I16 | 10 | P | - |
| 0x2637:003 (P431.03) | Analog input 2: Max frequency value | Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz** | general | I16 | 10 | P | - |
| 0x2637:004 (P431.04) | Analog input 2: Min PID value | **0.00 PID unit** | general | I16 | 100 | P | - |
| 0x2637:005 (P431.05) | Analog input 2: Max PID value | **100.00 PID unit** | general | I16 | 100 | P | - |
| 0x2637:006 (P431.06) | Analog input 2: Filter time | **10 ms** | general | U16 | 1 | P | - |
| 0x2637:007 (P431.07) | Analog input 2: Dead band | **0.0 %** | general | U16 | 10 | P | - |
| 0x2637:008 (P431.08) | Analog input 2: Monitoring threshold | **0.0 %** | general | I16 | 10 | P | - |
| 0x2637:009 (P431.09) | Analog input 2: Monitoring condition | **Input value < trigger threshold [0]** | general | U8 | 1 | P | - |
| 0x2637:010 (P431.10) | Analog input 2: Error response | **Fault [3]** | general | U8 | 1 | P | - |
| 0x2637:011 (P431.11) | Analog input 2: Min torque value | **0.0 %** | general | I16 | 10 | P | - |
| 0x2637:012 (P431.12) | Analog input 2: Max torque value | **100.0 %** | general | I16 | 10 | P | - |
| 0x2639:001 (P440.01) | Analog output 1: Output range | **0 ... 10 VDC [1]** | general | U8 | 1 | P | - |
| 0x2639:002 (P440.02) | Analog output 1: Function | **Output frequency [1]** | general | U8 | 1 | P | - |
| 0x2639:003 (P440.03) | Analog output 1: Min. signal | **0** | general | I32 | 1 | P | - |
| 0x2639:004 (P440.04) | Analog output 1: Max. signal | **1000** | general | I32 | 1 | P | - |
| 0x2820:001 (P712.01) | Holding brake control: Brake mode | **Off [2]** | general | U8 | 1 | P | r |
| 0x2820:002 (P712.02) | Holding brake control: Brake closing time | **100 ms** | general | U16 | 1 | P | - |
| 0x2820:003 (P712.03) | Holding brake control: Brake opening time | **100 ms** | general | U16 | 1 | P | - |
| 0x2820:007 (P712.07) | Holding brake control: Brake closing threshold | **0.2 Hz** | general | U16 | 10 | P | - |
| 0x2820:008 (P712.08) | Holding brake control: Brake holding load | **0.0 %** | general | I16 | 10 | PC | - |
| 0x2820:012 (P712.12) | Holding brake control: Closing threshold delay | **0 ms** | general | U16 | 1 | P | - |
| 0x2820:013 (P712.13) | Holding brake control: Holding load ramptime | **0 ms** | general | U16 | 1 | PC | - |
| 0x2820:015 (P712.15) | Holding brake control: Brake status | - (Read only) | general | U8 | 1 | O | - |
| 0x2822:004 (P327.04) | Identify motor data (energized) | **0** | general | U8 | 1 | - | - |
| 0x2822:005 (P327.05) | Calibrate motor data (non-energized) | **0** | general | U8 | 1 | - | - |
| 0x2822:019 | Calculate Imax controller parameter | **0** | general | U8 | 1 | - | - |
| 0x2824 (P200.00) | Control selection | **Flexible I/O configuration [0]** | general | U8 | 1 | P | - |
| 0x2826 | Time-out for error response | **6.0 s** | general | U16 | 10 | P | - |

* Default setting dependent on the model.

| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x2827 (P198.00) | Currently loaded parameter settings | - (Read only) | general | U8 | 1 | O | - |
| 0x2829 (P732.00) | Automatic storage in the memory module | **Inhibit [0]** | general | U8 | 1 | P | - |
| 0x282A:001 (P126.01) | Status words: Cause of disable | - (Read only) | general | U32 | 1 | O | - |
| 0x282A:002 (P126.02) | Status words: Cause of quick stop | - (Read only) | general | U16 | 1 | O | - |
| 0x282A:003 (P126.03) | Status words: Cause of stop | - (Read only) | general | U16 | 1 | O | - |
| 0x282A:004 | Status words: Extended status word | - (Read only) | general | U16 | 1 | O | t |
| 0x282A:005 (P126.05) | Status words: Device status | - (Read only) | general | U8 | 1 | O | t |
| 0x282B:001 (P125.01) | Inverter diagnostics: Active control source | - (Read only) | general | U8 | 1 | O | t |
| 0x282B:002 (P125.02) | Inverter diagnostics: Active setpoint source | - (Read only) | general | U8 | 1 | O | t |
| 0x282B:003 (P125.03) | Inverter diagnostics: Keypad LCD status | - (Read only) | general | U8 | 1 | O | - |
| 0x282B:004 (P125.04) | Inverter diagnostics: Active drive mode | - (Read only) | general | U8 | 1 | O | t |
| 0x282B:005 (P125.05) | Inverter diagnostics: Most recently used control register | - (Read only) | general | U32 | 1 | H | - |
| 0x282B:006 (P125.06) | Inverter diagnostics: Most recently used setpoint register | - (Read only) | general | U32 | 1 | H | - |
| 0x282B:007 | Inverter diagnostics: Default frequency setpoint | x.x Hz (Read only) | general | I16 | 10 | - | - |
| 0x282B:008 | Inverter diagnostics: Preset frequency setpoint | x.x Hz (Read only) | general | I16 | 10 | - | - |
| 0x282B:009 | Inverter diagnostics: Actual frequency setpoint | x.x Hz (Read only) | general | I16 | 10 | O | - |
| 0x282B:010 | Inverter diagnostics: Default PID setpoint | x.xx PID unit (Read only) | general | I16 | 100 | - | - |
| 0x282B:011 | Inverter diagnostics: Preset PID setpoint | x.xx PID unit (Read only) | general | I16 | 100 | - | - |
| 0x282B:012 | Inverter diagnostics: Default torque setpoint | x.x % (Read only) | general | I16 | 10 | - | - |
| 0x282B:013 | Inverter diagnostics: Preset torque setpoint | x.x % (Read only) | general | I16 | 10 | - | - |
| 0x2831 | Inverter-Statuswort | - (Read only) | MCTRL | U16 | 1 | O | t |
| 0x2833 | Inverter status word 2 | - (Read only) | MCTRL | U16 | 1 | O | t |
| 0x2838:001 (P203.01) | Start/stop configuration: Start method | **Normal [0]** | MCTRL | U8 | 1 | PC | - |
| 0x2838:002 (P203.02) | Start/stop configuration: Start at power-up | **Off [0]** | general | U8 | 1 | P | - |
| 0x2838:003 (P203.03) | Start/stop configuration: Stop method | **Standard ramp [1]** | general | U8 | 1 | P | - |
| 0x2839:002 (P760.02) | Fault configuration: Restart delay | **3.0 s** | general | U16 | 10 | P | - |
| 0x2839:003 (P760.03) | Fault configuration: Number of restart attempts | **5** | general | U8 | 1 | P | - |
| 0x2839:004 (P760.04) | Fault configuration: Trouble counter reset time | **40.0 s** | general | U16 | 10 | P | - |
| 0x2839:005 (P760.05) | Fault configuration: Trouble counter | - (Read only) | general | U8 | 1 | O | - |
| 0x2839:006 (P760.06) | Fault configuration: Fault handling in case of state change | **Reset fault [0]** | general | U8 | 1 | P | - |
| 0x283A (P304.00) | Limitation of rotation | **Both rotational directions [1]** | general | U8 | 1 | P | - |
| 0x2857:001 | CANopen monitoring: RPDO1-Timeout | **Fault [3]** | CANopen | U8 | 1 | P | - |
| 0x2857:002 | CANopen monitoring: RPDO2-Timeout | **Fault [3]** | CANopen | U8 | 1 | P | - |
| 0x2857:003 | CANopen monitoring: RPDO3-Timeout | **Fault [3]** | CANopen | U8 | 1 | P | - |
| 0x2857:005 | CANopen monitoring: Heartbeat-Timeout Consumer 1 | **Fault [3]** | CANopen | U8 | 1 | P | - |

* Default setting dependent on the model.



| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x2857:006 | CANopen monitoring: Heartbeat-Timeout Consumer 2 | **Fault [3]** | CANopen | U8 | 1 | P | - |
| 0x2857:007 | CANopen monitoring: Heartbeat-Timeout Consumer 3 | **Fault [3]** | CANopen | U8 | 1 | P | - |
| 0x2857:008 | CANopen monitoring: Heartbeat-Timeout Consumer 4 | **Fault [3]** | CANopen | U8 | 1 | P | - |
| 0x2857:010 | CANopen monitoring: "Bus-off" state change | **Trouble [2]** | CANopen | U8 | 1 | P | - |
| 0x2857:011 | CANopen monitoring: Warning | **Warning [1]** | CANopen | U8 | 1 | P | - |
| 0x2858:001 (P515.01) | Modbus monitoring: Response to time-out | **Fault [3]** | Modbus RTU | U8 | 1 | P | - |
| 0x2858:002 (P515.02) | Modbus monitoring: Time-out time | **2.0 s** | Modbus RTU | U16 | 10 | P | - |
| 0x285C:001 | Alarm supression: Entry 1 | **0x00000000** | | U32 | 1 | PH | - |
| 0x285C:002 | Alarm supression: Entry 2 | **0x00000000** | | U32 | 1 | PH | - |
| 0x285C:003 | Alarm supression: Entry 3 | **0x00000000** | | U32 | 1 | PH | - |
| 0x285C:004 | Alarm supression: Entry 4 | **0x00000000** | | U32 | 1 | PH | - |
| 0x285C:005 | Alarm supression: Entry 5 | **0x00000000** | | U32 | 1 | PH | - |
| 0x285C:006 | Alarm supression: Entry 6 | **0x00000000** | | U32 | 1 | PH | - |
| 0x285C:007 | Alarm supression: Entry 7 | **0x00000000** | | U32 | 1 | PH | - |
| 0x285C:008 | Alarm supression: Entry 8 | **0x00000000** | | U32 | 1 | PH | - |
| 0x285C:009 | Alarm supression: Entry 9 | **0x00000000** | | U32 | 1 | PH | - |
| 0x285C:010 | Alarm supression: Entry 10 | **0x00000000** | | U32 | 1 | PH | - |
| 0x2860:001 (P201.01) | Frequency control: Default setpoint source | **Analog input 1 [2]** | general | U8 | 1 | P | - |
| 0x2860:002 (P201.02) | PID control: Default setpoint source | **Keypad [1]** | general | U8 | 1 | P | - |
| 0x2860:003 (P201.03) | Torque control: Default setpoint source | **Analog input 1 [2]** | general | U8 | 1 | P | - |
| 0x2862 (P701.00) | Keypad setpoint increment | **1** | general | U16 | 1 | P | - |
| 0x2863 (P705.00) | Keypad language selection | **English [1]** | general | U8 | 1 | P | - |
| 0x2864 (P703.00) | Keypad status display | **0x00000000** | general | IDX | 1 | PH | - |
| 0x2865:001 (P709.01) | Keypad display setup: User unit MS velocity mode | | general | STRING[6] | 1 | P | - |
| 0x2865:002 (P709.02) | Keypad display setup: User unit PID control | | general | STRING[6] | 1 | P | - |
| 0x2900:001 (P332.01) | Speed controller settings: Gain | **0.00193 Nm/rpm** * | MCTRL | U32 | 100000 | P | - |
| 0x2900:002 (P332.02) | Speed controller settings: Reset time | **80.0 ms** * | MCTRL | U16 | 10 | P | - |
| 0x2904 | Actual speed filter time | **2.0 ms** | MCTRL | U16 | 10 | P | - |
| 0x2910:001 (P335.01) | Inertia settings: Motor moment of inertia | **3.70 kg $cm^2$** * | MCTRL | U32 | 100 | P | - |
| 0x2910:002 (P335.02) | Inertia settings: Scaled load inertia | **0.00 kg $cm^2$** | MCTRL | U32 | 100 | P | - |
| 0x2910:003 | Inertia settings: Coupling | **With backlash [2]** | MCTRL | U8 | 1 | P | - |
| 0x2911:001 (P450.01) | Frequency setpoint presets: Preset 1 | **20.0 Hz** | general | U16 | 10 | OP | - |
| 0x2911:002 (P450.02) | Frequency setpoint presets: Preset 2 | **40.0 Hz** | general | U16 | 10 | OP | - |
| 0x2911:003 (P450.03) | Frequency setpoint presets: Preset 3 | Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz** | general | U16 | 10 | OP | - |
| 0x2911:004 (P450.04) | Frequency setpoint presets: Preset 4 | **0.0 Hz** | general | U16 | 10 | OP | - |
| * Default setting dependent on the model. | | | | | | | |

| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x2911:005 (P450.05) | Frequency setpoint presets: Preset 5 | **0.0 Hz** | general | U16 | 10 | OP | - |
| 0x2911:006 (P450.06) | Frequency setpoint presets: Preset 6 | **0.0 Hz** | general | U16 | 10 | OP | - |
| 0x2911:007 (P450.07) | Frequency setpoint presets: Preset 7 | **0.0 Hz** | general | U16 | 10 | OP | - |
| 0x2911:008 (P450.08) | Frequency setpoint presets: Preset 8 | **0.0 Hz** | general | U16 | 10 | OP | - |
| 0x2911:009 (P450.09) | Frequency setpoint presets: Preset 9 | **0.0 Hz** | general | U16 | 10 | OP | - |
| 0x2911:010 (P450.10) | Frequency setpoint presets: Preset 10 | **0.0 Hz** | general | U16 | 10 | OP | - |
| 0x2911:011 (P450.11) | Frequency setpoint presets: Preset 11 | **0.0 Hz** | general | U16 | 10 | OP | - |
| 0x2911:012 (P450.12) | Frequency setpoint presets: Preset 12 | **0.0 Hz** | general | U16 | 10 | OP | - |
| 0x2911:013 (P450.13) | Frequency setpoint presets: Preset 13 | **0.0 Hz** | general | U16 | 10 | OP | - |
| 0x2911:014 (P450.14) | Frequency setpoint presets: Preset 14 | **0.0 Hz** | general | U16 | 10 | OP | - |
| 0x2911:015 (P450.15) | Frequency setpoint presets: Preset 15 | **0.0 Hz** | general | U16 | 10 | OP | - |
| 0x2912:001 (P452.01) | Torque setpoint presets: Preset 1 | **100.0 %** | general | I16 | 10 | OP | - |
| 0x2912:002 (P452.02) | Torque setpoint presets: Preset 2 | **100.0 %** | general | I16 | 10 | OP | - |
| 0x2912:003 (P452.03) | Torque setpoint presets: Preset 3 | **100.0 %** | general | I16 | 10 | OP | - |
| 0x2912:004 (P452.04) | Torque setpoint presets: Preset 4 | **100.0 %** | general | I16 | 10 | OP | - |
| 0x2912:005 (P452.05) | Torque setpoint presets: Preset 5 | **100.0 %** | general | I16 | 10 | OP | - |
| 0x2912:006 (P452.06) | Torque setpoint presets: Preset 6 | **100.0 %** | general | I16 | 10 | OP | - |
| 0x2912:007 (P452.07) | Torque setpoint presets: Preset 7 | **100.0 %** | general | I16 | 10 | OP | - |
| 0x2912:008 (P452.08) | Torque setpoint presets: Preset 8 | **100.0 %** | general | I16 | 10 | OP | - |
| 0x2915 (P210.00) | Minimum frequency | **0.0 Hz** | general | U16 | 10 | P | - |
| 0x2916 (P211.00) | Maximum frequency | Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz** | general | U16 | 10 | P | - |
| 0x2917 (P220.00) | Acceleration time 1 | **5.0 s** | general | U16 | 10 | P | rt |
| 0x2918 (P221.00) | Deceleration time 1 | **5.0 s** | general | U16 | 10 | P | rt |
| 0x2919 (P222.00) | Acceleration time 2 | **5.0 s** | general | U16 | 10 | P | - |
| 0x291A (P223.00) | Deceleration time 2 | **5.0 s** | general | U16 | 10 | P | - |
| 0x291B (P224.00) | Auto-changeover threshold of ramp 2 | **0.0 Hz** | general | U16 | 10 | P | - |
| 0x291C (P225.00) | Quick stop deceleration time | **1.0 s** | general | U16 | 10 | P | - |
| 0x291E:001 (P226.01) | S-Ramp characteristic: Smoothing factor | **0.0 %** | general | U16 | 10 | P | r |
| * Default setting dependent on the model. | | | | | | | |



| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x291E:003 (P226.03) | S-Ramp characteristic: Stop threshold | **10.0 %** | general | U16 | 10 | P | - |
| 0x291F:001 (P317.01) | Skip frequencies: Skip frequency 1 | **0.0 Hz** | general | U16 | 10 | P | - |
| 0x291F:002 (P317.02) | Skip frequencies: Skip bandwidth 1 | **0.0 Hz** | general | U8 | 10 | P | - |
| 0x291F:003 (P317.03) | Skip frequencies: Skip frequency 2 | **0.0 Hz** | general | U16 | 10 | P | - |
| 0x291F:004 (P317.04) | Skip frequencies: Skip bandwidth 2 | **0.0 Hz** | general | U8 | 10 | P | - |
| 0x291F:005 (P317.05) | Skip frequencies: Skip frequency 3 | **0.0 Hz** | general | U16 | 10 | P | - |
| 0x291F:006 (P317.06) | Skip frequencies: Skip bandwidth 3 | **0.0 Hz** | general | U8 | 10 | P | - |
| 0x291F:016 | Skip frequencies: Status | - (Read only) | general | U16 | 1 | O | - |
| 0x291F:032 | Skip frequencies: Input frequency | x.xx Hz (Read only) | general | I32 | 100 | O | - |
| 0x291F:033 | Skip frequencies: Output frequency | x.xx Hz (Read only) | general | I32 | 100 | O | - |
| 0x2939 (P305.00) | Switching frequency | **0** * | general | U8 | 1 | P | - |
| 0x293A (P116.00) | Actual switching frequency | - (Read only) | general | U8 | 1 | O | t |
| 0x2942:001 (P334.01) | Current controller parameters: Gain | **42.55 V/A** * | MCTRL | U32 | 100 | P | - |
| 0x2942:002 (P334.02) | Current controller parameters: Reset time | **4.50 ms** * | MCTRL | U32 | 100 | P | - |
| 0x2942:004 | Current controller parameters: d-axis gain | **26.00 V/A** * | MCTRL | U32 | 100 | P | - |
| 0x2942:005 | Current controller parameters: d-axis reset time | **3.00 ms** * | MCTRL | U32 | 100 | P | - |
| 0x2942:006 | Current controller parameters: q-axis gain | **26.00 V/A** * | MCTRL | U32 | 100 | P | - |
| 0x2942:007 | Current controller parameters: q-axis reset time | **3.00 ms** * | MCTRL | U32 | 100 | P | - |
| 0x2946:001 (P340.01) | Speed limitation: Upper speed limit | **0 vel. unit** | general | I32 | 480000 / 2147483647 | P | r |
| 0x2946:002 (P340.02) | Speed limitation: Lower speed limit | **0 vel. unit** | general | I32 | 480000 / 2147483647 | P | r |
| 0x2946:003 (P340.03) | Speed limitation: Upper speed limit source | **Maximum frequency [0]** | general | U8 | 1 | P | - |
| 0x2946:004 (P340.04) | Speed limitation: Lower speed limit source | **(-) Maximum frequency [0]** | general | U8 | 1 | P | - |
| 0x2946:005 (P340.05) | Speed limitation: Upper frequency limit | Device for 50-Hz mains: **50.0 Hz**<br>Device for 60-Hz mains: **60.0 Hz** | general | I16 | 10 | P | - |
| 0x2946:006 (P340.06) | Speed limitation: Lower frequency limit | Device for 50-Hz mains: **-50.0 Hz**<br>Device for 60-Hz mains: **-60.0 Hz** | general | I16 | 10 | P | - |
| 0x2946:007 (P340.07) | Speed limitation: Actual upper speed limit | x.x Hz (Read only) | general | I16 | 10 | - | - |
| 0x2946:008 (P340.08) | Speed limitation: Actual lower speed limit | x.x Hz (Read only) | general | I16 | 10 | - | - |
| 0x2947:001 ... 0x2947:017 | Inverter characteristic: Value y1 ... Value y17 | **0.00 V** * | MCTRL | U16 | 100 | P | - |
| 0x2948:001 | Torque setpoint: Actual torque setpoint | x.x % (Read only) | general | I16 | 10 | O | - |
| 0x2948:002 (P336.02) | Torque setpoint: ramp time | **1.0 s** | general | U16 | 10 | P | - |
| * Default setting dependent on the model. | | | | | | | |

| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x2949:001 (P337.01) | Torque limit source selection: Positive torque limit source | **Max torque [0]** | general | U8 | 1 | P | - |
| 0x2949:002 (P337.02) | Torque limit source selection: Negative torque limit source | **(-) Max torque [0]** | general | U8 | 1 | P | - |
| 0x2949:003 (P337.03) | Torque limit source selection: Actual positive torque limit | x.x % (Read only) | general | I16 | 10 | O | - |
| 0x2949:004 (P337.04) | Torque limit source selection: Actual negative torque limit | x.x % (Read only) | general | I16 | 10 | O | - |
| 0x29C0:001 | Field controller settings: Gain | **59.68 A/Vs** * | MCTRL | U32 | 100 | P | - |
| 0x29C0:002 | Field controller settings: Reset time | **45.5 ms** * | MCTRL | U16 | 10 | P | - |
| 0x29E0:001 | Field weakening controller settings: Gain (ASM) | **0.000 Vs/V** * | MCTRL | U32 | 1000 | P | - |
| 0x29E0:002 | Field weakening controller settings: Reset time (ASM) | **1478.3 ms** * | MCTRL | U32 | 10 | P | - |
| 0x29E0:003 | Field weakening controller settings: Reset time (PSM) | **800.0 ms** * | MCTRL | U32 | 10 | P | - |
| 0x29E1 | Field weakening controller Field limitation | **100.00 %** | MCTRL | U16 | 100 | P | r |
| 0x29E2 | DC-bus filter time | **25.0 ms** | MCTRL | U16 | 10 | P | - |
| 0x29E3 | Motor voltage filter time | **25.0 ms** | MCTRL | U16 | 10 | P | - |
| 0x29E4 (P354.00) | Voltage reserve range | **5 %** | MCTRL | U8 | 1 | P | - |
| 0x2B00 (P302.00) | V/f characteristic shape | **Linear [0]** | MCTRL | U8 | 1 | PC | - |
| 0x2B01:001 (P303.01) | V/f shape data: Base voltage | **230 V** * | MCTRL | U16 | 1 | P | - |
| 0x2B01:002 (P303.02) | V/f shape data: Base frequency | Device for 50-Hz mains: **50 Hz**<br>Device for 60-Hz mains: **60 Hz** * | MCTRL | U16 | 1 | P | - |
| 0x2B01:003 (P303.03) | V/f shape data: Midpoint voltage | **0 V** | MCTRL | U16 | 1 | P | - |
| 0x2B01:004 (P303.04) | V/f shape data: Midpoint frequency | **0 Hz** | MCTRL | U16 | 1 | P | - |
| 0x2B02:001 | Frequency grid points (x) user V/f characteristic: x1 = f01 | **0 Hz** | | I16 | 1 | P | - |
| 0x2B02:002 | Frequency grid points (x) user V/f characteristic: x2 = f02 | **0 Hz** | | I16 | 1 | P | - |
| 0x2B02:003 | Frequency grid points (x) user V/f characteristic: x3 = f03 | **0 Hz** | | I16 | 1 | P | - |
| 0x2B02:004 | Frequency grid points (x) user V/f characteristic: x4 = f04 | **0 Hz** | | I16 | 1 | P | - |
| 0x2B02:005 | Frequency grid points (x) user V/f characteristic: x5 = f05 | **0 Hz** | | I16 | 1 | P | - |
| 0x2B02:006 | Frequency grid points (x) user V/f characteristic: x6 = f06 | **0 Hz** | | I16 | 1 | P | - |
| 0x2B02:007 | Frequency grid points (x) user V/f characteristic: x7 = f07 | **0 Hz** | | I16 | 1 | P | - |
| 0x2B02:008 | Frequency grid points (x) user V/f characteristic: x8 = f08 | **0 Hz** | | I16 | 1 | P | - |
| 0x2B02:009 | Frequency grid points (x) user V/f characteristic: x9 = f09 | **0 Hz** | | I16 | 1 | P | - |
| 0x2B02:010 | Frequency grid points (x) user V/f characteristic: x10 = f10 | **0 Hz** | | I16 | 1 | P | - |
| 0x2B02:011 | Frequency grid points (x) user V/f characteristic: x11 = f11 | **0 Hz** | | I16 | 1 | P | - |
| 0x2B03:001 | Voltage grid points (y) user V/f characteristic: y1 = U01 (x = f01) | **0.00 V** | | I32 | 100 | P | - |
| 0x2B03:002 | Voltage grid points (y) user V/f characteristic: y2 = U02 (x = f02) | **0.00 V** | | I32 | 100 | P | - |
| * Default setting dependent on the model. | | | | | | | |

| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x2B03:003 | Voltage grid points (y) user V/f characteristic: y3 = U03 (x = f03) | **0.00 V** | | I32 | 100 | P | - |
| 0x2B03:004 | Voltage grid points (y) user V/f characteristic: y4 = U04 (x = f04) | **0.00 V** | | I32 | 100 | P | - |
| 0x2B03:005 | Voltage grid points (y) user V/f characteristic: y5 = U05 (x = f05) | **0.00 V** | | I32 | 100 | P | - |
| 0x2B03:006 | Voltage grid points (y) user V/f characteristic: y6 = U06 (x = f06) | **0.00 V** | | I32 | 100 | P | - |
| 0x2B03:007 | Voltage grid points (y) user V/f characteristic: y7 = U07 (x = f07) | **0.00 V** | | I32 | 100 | P | - |
| 0x2B03:008 | Voltage grid points (y) user V/f characteristic: y8 = U08 (x = f08) | **0.00 V** | | I32 | 100 | P | - |
| 0x2B03:009 | Voltage grid points (y) user V/f characteristic: y9 = U09 (x = f09) | **0.00 V** | | I32 | 100 | P | - |
| 0x2B03:010 | Voltage grid points (y) user V/f characteristic: y10 = U10 (x = f10) | **0.00 V** | | I32 | 100 | P | - |
| 0x2B03:011 | Voltage grid points (y) user V/f characteristic: y11 = U11 (x = f11) | **0.00 V** | | I32 | 100 | P | - |
| 0x2B08:001 (P333.01) | V/f Imax controller: Gain | **0.284 Hz/A** * | MCTRL | U32 | 1000 | P | - |
| 0x2B08:002 (P333.02) | V/f Imax controller: Reset time | **2.3 ms** * | MCTRL | U32 | 10 | P | - |
| 0x2B09:001 (P315.01) | Slip compensation: Gain | **100.00 %** | MCTRL | I16 | 100 | P | - |
| 0x2B09:002 (P315.02) | Slip compensation: Filter time | **100 ms** | MCTRL | U16 | 1 | P | - |
| 0x2B0A:001 (P318.01) | Oscillation damping: Gain | **150 %** | MCTRL | I16 | 1 | P | - |
| 0x2B0A:002 (P318.02) | Oscillation damping: Filter time | **30 ms** | MCTRL | U16 | 1 | P | - |
| 0x2B0B | Frequency setpoint | x.x Hz (Read only) | general | I16 | 10 | O | t |
| 0x2B0C (P319.00) | Override field weakening | **0.0 Hz** | MCTRL | I16 | 10 | P | - |
| 0x2B0C (P319.00) | Override field weakening | **-40.0 Hz** | MCTRL | I16 | 10 | P | - |
| 0x2B0D:001 (P330.01) | VFC-ECO: Minimum voltage | **20 %** | MCTRL | I16 | 1 | P | - |
| 0x2B0D:006 (P330.06) | VFC-ECO: Cos phi actual value | - (Read only) | MCTRL | I16 | 100 | - | t |
| 0x2B0E (P102.00) | Frequency setpoint | x.x Hz (Read only) | general | I16 | 10 | O | t |
| 0x2B0F | Output frequency motor | x.x Hz (Read only) | MCTRL | I16 | 10 | O | t |
| 0x2B10:001 | V/f torque limitation: Gain | **0.00 %** | MCTRL | U16 | 100 | P | - |
| 0x2B12:001 (P316.01) | V/f voltage boost: Fixed boost | **2.5 %** * | MCTRL | U8 | 10 | P | - |
| 0x2B12:002 (P316.02) | V/f voltage boost: Boost at acceleration | **0.0 %** | general | U8 | 10 | P | - |
| 0x2B13:001 | Additive voltage impression: Enable Function | **Disable [0]** | general | U8 | 1 | P | - |
| 0x2B13:002 | Additive voltage impression: Setpoint source | **Analog input 1 [1]** | general | U8 | 1 | P | - |
| 0x2B13:003 | Additive voltage impression: Actual voltage | x V (Read only) | general | I16 | 1 | O | - |
| 0x2B13:004 | Additive voltage impression: Ramp time | **0.0 s** | general | U16 | 10 | P | - |
| 0x2B40:001 | Gain | **0.2686 Hz/A** * | MCTRL | U32 | 10000 | P | - |
| 0x2B40:002 | Reset time | **2.3 ms** * | MCTRL | U32 | 10 | P | - |
| 0x2B40:003 | Q-Feedforward | **0.00** | MCTRL | U32 | 100 | P | - |
| 0x2B40:004 | D-Feedforward | **0.00** | MCTRL | U32 | 100 | P | - |
| 0x2B84:001 (P704.01) | DC braking: Current | **0.0 %** | MCTRL | U16 | 10 | P | - |

* Default setting dependent on the model.

| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x2B84:002 (P704.02) | DC braking: Automatic hold time | **0.0 s** | general | U16 | 10 | P | - |
| 0x2B84:003 (P704.03) | DC braking: Automatic operating threshold | **0.0 Hz** | general | U16 | 10 | P | - |
| 0x2B84:004 (P704.04) | DC braking: Demagnetization time | **100 %** | general | U8 | 1 | P | - |
| 0x2B84:005 (P704.05) | DC braking: Default demagnetization time | x ms (Read only) | general | U16 | 1 | - | - |
| 0x2B84:006 (P704.06) | DC braking: Inverter disable | **Deactivated [0]** | general | U8 | 1 | P | - |
| 0x2BA1:001 (P718.01) | Flying restart circuit: Current | **30 %** | MCTRL | U16 | 1 | P | - |
| 0x2BA1:002 (P718.02) | Flying restart circuit: Start frequency | **20.0 Hz** | MCTRL | I16 | 10 | P | - |
| 0x2BA1:003 (P718.03) | Flying restart circuit: Restart time | **5911 ms** * | MCTRL | U16 | 1 | P | - |
| 0x2BA1:008 (P718.08) | Flying restart circuit: Flying restart frequency | x.x Hz (Read only) | MCTRL | I16 | 10 | O | t |
| 0x2C00 (P300.00) | Motor control mode | **V/f characteristic control (VFC open loop) [6]** | MCTRL | U8 | 1 | PC | - |
| 0x2C01:001 | Motor parameters: Number of pole pairs | - (Read only) | MCTRL | U8 | 1 | - | - |
| 0x2C01:002 | Motor parameters: Stator resistance | **10.1565 Ω** * | MCTRL | U32 | 10000 | P | - |
| 0x2C01:003 | Motor parameters: Stator leakage inductance | **23.566 mH** * | MCTRL | U32 | 1000 | P | - |
| 0x2C01:004 (P320.04) | Motor parameters: Rated speed | Device for 50-Hz mains: **1450 rpm** Device for 60-Hz mains: **1750 rpm** | MCTRL | U16 | 1 | P | - |
| 0x2C01:005 (P320.05) | Motor parameters: Rated frequency | Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz** | MCTRL | U16 | 10 | P | - |
| 0x2C01:006 (P320.06) | Motor parameters: Rated power | **0.25 kW** * | MCTRL | U16 | 100 | P | - |
| 0x2C01:007 (P320.07) | Motor parameters: Rated voltage | **230 V** * | MCTRL | U16 | 1 | P | - |
| 0x2C01:008 (P320.08) | Motor parameters: Cosine phi | **0.80** | MCTRL | U16 | 100 | P | - |
| 0x2C01:010 | Motor parameters: Motor name | | MCTRL | STRING[25] | 1 | P | - |
| 0x2C02:001 (P351.01) | Motor parameter (ASM): Rotor resistance | **8.8944 Ω** * | MCTRL | U32 | 10000 | P | - |
| 0x2C02:002 (P351.02) | Motor parameter (ASM): Mutual inductance | **381.9 mH** * | MCTRL | U32 | 10 | P | - |
| 0x2C02:003 (P351.03) | Motor parameter (ASM): Magnetising current | **0.96 A** * | MCTRL | U16 | 100 | P | - |
| 0x2C02:004 (P351.04) | Motor parameter (ASM): Slip frequency | x.x Hz (Read only) | MCTRL | U16 | 10 | O | - |
| 0x2C03:001 (P352.01) | Motor parameter (PSM): Back EMF constant | **41.8 V/1000rpm** | MCTRL | U32 | 10 | P | - |
| 0x2C03:005 (P352.05) | Motor parameter (PSM): D-axis inductance Ld | **20.000 mH** * | MCTRL | U32 | 1000 | P | - |
| 0x2C03:006 (P352.06) | Motor parameter (PSM): Q-axis inductance Lq | **20.000 mH** * | MCTRL | U32 | 1000 | P | - |
| 0x2C10:001 | HF amplitude | **50.0 V** | MCTRL | U16 | 10 | P | - |
| 0x2C10:008 | HF injection range | **6.0 %** | MCTRL | U16 | 10 | P | - |
| 0x2C11:001 | High speed range: Lower limit | **10 %** | MCTRL | U16 | 1 | P | - |
| 0x2C11:002 | High speed range: Tracking controller gain | **200 %** | MCTRL | U16 | 1 | P | - |
| 0x2C11:003 | High speed range: Tracking controller reset time | **6.00 ms** | MCTRL | U16 | 100 | P | - |
| 0x2C11:004 | High speed range: Tracking controller decouple time | **200.0 ms** | MCTRL | U16 | 10 | P | - |
| 0x2C11:006 | High speed range: Stall monitoring limit | **50 %** | MCTRL | U16 | 1 | P | - |
| * Default setting dependent on the model. | | | | | | | |

| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x2C12:001 | SM low speed range: Acceleration current | **70 %** | MCTRL | U16 | 1 | P | - |
| 0x2C12:002 | SM low speed range: Standstill current | **30 %** | MCTRL | U16 | 1 | P | - |
| 0x2C13 | SLSM-PSM low speed method | **Carrier based [1]** | MCTRL | U8 | 1 | P | - |
| 0x2C49:001 (P711.01) | Position counter: Signal source | **Disbled [0]** | general | U8 | 1 | P | - |
| 0x2C49:002 (P711.02) | Position counter: Reset mode | **Reset by rising edge [0]** | general | U8 | 1 | P | - |
| 0x2C49:003 (P711.03) | Position counter: Actual position | - (Read only) | general | U32 | 1 | OH | t |
| 0x2C60 | PPI monitoring: Reaction | **Fault [3]** | general | U8 | 1 | P | - |
| 0x2C63:001 | PPI without movement: Execution | **After each enable [2]** | MCTRL | U8 | 1 | PC | - |
| 0x2D40:002 | Device utilisation ixt: Power unit warning threshold | **95 %** | general | U16 | 1 | P | - |
| 0x2D40:004 (P135.04) | Device utilisation ixt: Device actual utilisation | x % (Read only) | general | U16 | 1 | O | t |
| 0x2D40:005 (P135.05) | Device utilisation ixt: Device utilisation (ixt): Error response | **Fault [3]** | general | U8 | 1 | P | - |
| 0x2D43:001 (P306.01) | Inverter load characteristic: Duty selection | **Heavy Duty [0]** | general | U8 | 1 | PC | - |
| 0x2D44:001 (P350.01) | Overspeed monitoring: Threshold | **8000 rpm** | MCTRL | U16 | 1 | P | - |
| 0x2D44:002 (P350.02) | Overspeed monitoring: Response | **Fault [3]** | general | U8 | 1 | P | - |
| 0x2D45:001 (P310.01) | Motor phase failure detection: Response - Motor phase 1 | **No response [0]** | general | U8 | 1 | P | - |
| 0x2D45:002 (P310.02) | Motor phase failure detection: Current threshold | **5.0 %** | MCTRL | U8 | 10 | P | - |
| 0x2D45:003 (P310.03) | Motor phase failure detection: Voltage threshold | **10.0 V** | MCTRL | U16 | 10 | P | - |
| 0x2D46:001 (P353.01) | Overcurrent monitoring: Threshold | **6.8 A** * | MCTRL | U16 | 10 | P | - |
| 0x2D46:002 (P353.02) | Overcurrent monitoring: Response | **Fault [3]** | general | U8 | 1 | P | - |
| 0x2D4B:001 (P308.01) | Motor overload monitoring (i²xt): Maximum utilisation [60 s] | **150 %** | MCTRL | U16 | 1 | P | - |
| 0x2D4B:002 (P308.02) | Motor overload monitoring (i²xt): Speed compensation | **On [0]** | MCTRL | U8 | 1 | P | - |
| 0x2D4B:003 (P308.03) | Motor overload monitoring (i²xt): Response | **Fault [3]** | general | U8 | 1 | P | - |
| 0x2D4B:005 | Motor overload monitoring (i²xt): Thermal load | - (Read only) | general | U16 | 1 | O | - |
| 0x2D4F (P123.00) | Motor utilisation (i²xt) | x % (Read only) | MCTRL | U16 | 1 | O | t |
| 0x2D66:001 (P721.01) | Mains failure control: Enable function | **Disabled [0]** | general | U8 | 1 | P | - |
| 0x2D66:002 (P721.02) | Mains failure control: DC-bus activation level | **0 %** * | general | U8 | 1 | P | - |
| 0x2D66:003 (P721.03) | Mains failure control: Gain V-controller | **0.01000 Hz/V** | general | U16 | 100000 | P | - |
| 0x2D66:004 (P721.04) | Mains failure control: Reset time V-controller | **20 ms** | general | U16 | 1 | P | - |
| 0x2D66:005 (P721.05) | Mains failure control: DC voltage setpoint | **100 %** | general | U8 | 1 | P | - |
| 0x2D66:006 (P721.06) | Mains failure control: Setpoint ramp | **20 ms** | general | U16 | 1 | P | - |
| 0x2D66:007 (P721.07) | Mains failure control: Clear time | **20 ms** | general | U16 | 1 | P | - |
| 0x2D66:008 (P721.08) | Mains failure control: Restart threshold | **0.0 Hz** | general | U16 | 10 | P | - |
| 0x2D66:009 (P721.09) | Mains failure control: Status mains failure control | - (Read only) | general | U8 | 1 | O | t |
| * Default setting dependent on the model. | | | | | | | |

| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x2D67:001 (P329.01) | Maximum torque monitoring: Response | **No response [0]** | MCTRL | U8 | 1 | P | - |
| 0x2D67:002 (P329.02) | Maximum torque monitoring: Triggering delay | **0.000 s** | MCTRL | U16 | 1000 | P | - |
| 0x2D81:001 (P151.01) | Life-diagnosis: Operating time | x s (Read only) | general | U32 | 1 | T | - |
| 0x2D81:002 (P151.02) | Life-diagnosis: Power-on time | x s (Read only) | general | U32 | 1 | T | - |
| 0x2D81:003 (P151.03) | Life-diagnosis: Control unit operating time | x ns (Read only) | general | U64 | 1 | T | - |
| 0x2D81:004 (P151.04) | Life-diagnosis: Main switching cycles | - (Read only) | general | U32 | 1 | O | - |
| 0x2D81:005 (P151.05) | Life-diagnosis: Relay switching cycles | - (Read only) | general | U32 | 1 | O | - |
| 0x2D81:006 (P151.06) | Life-diagnosis: Short-circuit counter | - (Read only) | general | U16 | 1 | O | - |
| 0x2D81:007 (P151.07) | Life-diagnosis: Earth fault counter | - (Read only) | general | U16 | 1 | O | - |
| 0x2D81:008 (P151.08) | Life-diagnosis: Clamp active | - (Read only) | general | U16 | 1 | O | - |
| 0x2D81:009 (P151.09) | Life-diagnosis: Fan operating time | x s (Read only) | general | U32 | 1 | OT | - |
| 0x2D84:001 (P117.01) | Heatsink temperature: Heatsink temperature | x.x °C (Read only) | general | I16 | 10 | O | t |
| 0x2D84:002 | Heatsink temperature: Warning threshold | **80.0 °C** * | general | I16 | 10 | P | - |
| 0x2D87 (P105.00) | DC-bus voltage | x V (Read only) | general | U16 | 1 | O | t |
| 0x2D88 (P104.00) | Motor current | x.x A (Read only) | general | I16 | 10 | O | t |
| 0x2D89 (P106.00) | Motor voltage | x VAC (Read only) | general | U16 | 1 | O | t |
| 0x2DA2:001 (P108.01) | Output power: Effective power | x.xxx kW (Read only) | general | I32 | 1000 | O | t |
| 0x2DA2:002 (P108.02) | Output power: Apparent power | x.xxx kVA (Read only) | general | I32 | 1000 | O | t |
| 0x2DA3:001 (P109.01) | Output energy: Motor | x.xx kWh (Read only) | general | I32 | 100 | O | t |
| 0x2DA3:002 (P109.02) | Output energy: Generator | x.xx kWh (Read only) | general | I32 | 100 | O | t |
| 0x2DA4:001 (P110.01) | Diagnostics of analog input 1: Value in percent | x.x % (Read only) | general | I16 | 10 | O | t |
| 0x2DA4:002 (P110.02) | Diagnostics of analog input 1: Frequency value | x.x Hz (Read only) | general | I16 | 10 | O | t |
| 0x2DA4:003 (P110.03) | Diagnostics of analog input 1: Process controller value | x.xx PID unit (Read only) | general | I16 | 100 | O | t |
| 0x2DA4:004 (P110.04) | Diagnostics of analog input 1: Torque value | x.x % (Read only) | general | I16 | 10 | O | t |
| 0x2DA4:016 (P110.16) | Diagnostics of analog input 1: Status | - (Read only) | general | U16 | 1 | O | - |
| 0x2DA5:001 (P111.01) | Diagnostics of analog input 2: Value in percent | x.x % (Read only) | general | I16 | 10 | O | t |
| 0x2DA5:002 (P111.02) | Diagnostics of analog input 2: Frequency value | x.x Hz (Read only) | general | I16 | 10 | O | t |
| 0x2DA5:003 (P111.03) | Diagnostics of analog input 2: Process controller value | x.xx PID unit (Read only) | general | I16 | 100 | O | t |
| 0x2DA5:004 (P111.04) | Diagnostics of analog input 2: Torque value | x.x % (Read only) | general | I16 | 10 | O | t |
| 0x2DA5:016 (P111.16) | Diagnostics of analog input 2: Status | - (Read only) | general | U16 | 1 | O | - |
| * Default setting dependent on the model. | | | | | | | |

| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x2DAA:001 (P112.01) | Diagnostics of analog output 1: Voltage | x.xx V (Read only) | general | U16 | 100 | O | t |
| 0x2DAA:002 (P112.02) | Diagnostics of analog output 1: Current | x.xx mA (Read only) | general | U16 | 100 | O | t |
| 0x2DAC (P119.00) | Keypad status | - (Read only) | general | U16 | 1 | O | t |
| 0x2DAD (P120.00) | Internal hardware states | - (Read only) | general | U16 | 1 | O | - |
| 0x2DAE:001 (P140.01) | Sequencer diagnostics: Active step | - (Read only) | Sequencer | U8 | 1 | O | t |
| 0x2DAE:002 (P140.02) | Sequencer diagnostics: Step time elapsed | x.x s (Read only) | Sequencer | I32 | 10 | O | t |
| 0x2DAE:003 (P140.03) | Sequencer diagnostics: Step time remaining | x.x s (Read only) | Sequencer | I32 | 10 | O | t |
| 0x2DAE:004 (P140.04) | Sequencer diagnostics: Steps complete | - (Read only) | Sequencer | I32 | 1 | O | t |
| 0x2DAE:005 (P140.05) | Sequencer diagnostics: Steps remaining | - (Read only) | Sequencer | I32 | 1 | O | t |
| 0x2DAE:006 (P140.06) | Sequencer diagnostics: Active sequence | - (Read only) | Sequencer | U8 | 1 | O | t |
| 0x2DAE:007 (P140.07) | Sequencer diagnostics: Active segment | - (Read only) | Sequencer | U8 | 1 | O | t |
| 0x2DAE:008 (P140.08) | Sequencer diagnostics: Relative sequence time remaining | x % (Read only) | Sequencer | U8 | 1 | O | t |
| 0x2DAE:009 (P140.09) | Sequencer diagnostics: Absolute sequence time remaining | x.x s (Read only) | Sequencer | I32 | 10 | O | t |
| 0x2DAE:010 | Sequencer diagnostics: Frequency setpoint | x.x Hz (Read only) | Sequencer | I16 | 10 | - | - |
| 0x2DAE:011 | Sequencer diagnostics: PID setpoint | x.xx PID unit (Read only) | Sequencer | I16 | 100 | - | - |
| 0x2DAE:012 | Sequencer diagnostics: Torque setpoint | x.x % (Read only) | Sequencer | I16 | 10 | - | - |
| 0x2DD1:001 | Motor currents: Actual D-current (id) | x.xx A (Read only) | MCTRL | I32 | 100 | O | t |
| 0x2DD1:002 | Motor currents: Actual Q-current (iq) | x.xx A (Read only) | general | I32 | 100 | O | t |
| 0x2DD1:003 | Motor currents: Setpoint D-current (id) | x.xx A (Read only) | general | I32 | 100 | O | t |
| 0x2DD1:004 | Motor currents: Setpoint Q-current (iq) | x.xx A (Read only) | MCTRL | I32 | 100 | O | t |
| 0x2DD1:005 | Motor currents: Motor current (Ieff) | x.xx A (Read only) | MCTRL | I32 | 100 | O | t |
| 0x2DD3:003 | Speed setpoint limited | x rpm (Read only) | MCTRL | I32 | 1 | O | t |
| 0x2DD5 | Torque setpoint | x.xx Nm (Read only) | general | I32 | 100 | - | t |
| 0x2DDD (P100.00) | Output frequency | x.x Hz (Read only) | general | I16 | 10 | O | t |
| 0x2DDF:001 | Axis information: Rated current | x.xx A (Read only) | MCTRL | U16 | 100 | O | t |
| 0x2DDF:002 | Axis information: Maximum current | x.xx A (Read only) | MCTRL | U16 | 100 | O | t |
| 0x2DE0:010 | Motor control behavior | **0** | general | U16 | 1 | PC | - |
| 0x4002 (P702.00) | Speed display scaling | **0.00** | general | U16 | 100 | P | - |
| 0x4003 (P413.00) | MOP starting mode | **Last value [0]** | general | U8 | 1 | P | - |
| 0x4004:001 (P414.01) | MOP starting values: Frequency | **0.0 Hz** | general | U16 | 10 | P | - |
| 0x4004:002 (P414.02) | MOP starting values: PID value | **0.00 PID unit** | general | I16 | 100 | P | - |
| 0x4004:003 (P414.03) | MOP starting values: Torque | **0.0 %** | general | U16 | 10 | P | - |
| 0x4005 (P412.00) | Frequency threshold | **0.0 Hz** | general | U16 | 10 | P | - |
| 0x4006:001 (P710.01) | Load loss detection: Threshold | **0.0 %** | general | U16 | 10 | P | - |
| 0x4006:002 (P710.02) | Load loss detection: Delay time | **0.0 s** | general | U16 | 10 | P | - |

* Default setting dependent on the model.

| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x4006:003 (P710.03) | Load loss detection: Error response | **No response [0]** | general | U8 | 1 | P | - |
| 0x4007:001 | Heavy load monitoring: Error threshold | **200.0 %** | general | U16 | 10 | P | - |
| 0x4007:002 | Heavy load monitoring: Delay time | **3.0 s** | general | U16 | 10 | P | - |
| 0x4007:003 | Heavy load monitoring: Error response | **No response [0]** | general | U8 | 1 | P | - |
| 0x4008:001 (P590.01) | Process input words: NetWordIN1 | **0x0000** | general | U16 | 1 | HK | r |
| 0x4008:002 (P590.02) | Process input words: NetWordIN2 | **0x0000** | general | U16 | 1 | HK | r |
| 0x4008:003 (P590.03) | Process input words: NetWordIN3 | **0.0 %** | general | U16 | 10 | K | r |
| 0x4008:004 (P590.04) | Process input words: NetWordIN4 | **0.0 %** | general | U16 | 10 | K | r |
| 0x4008:005 (P590.05) | Process input words: NetWordIN5 | **0.0 %** | general | I16 | 10 | K | r |
| 0x4009:001 | MOP values saved: Frequency | x.x Hz (Read only) | general | U16 | 10 | - | t |
| 0x4009:002 | MOP values saved: PID value | x.xx PID unit (Read only) | general | I16 | 100 | - | t |
| 0x4009:003 | MOP values saved: Torque | x.x % (Read only) | general | U16 | 10 | - | t |
| 0x400A:001 (P591.01) | Process output words: NetWordOUT1 | - (Read only) | general | U16 | 1 | OH | t |
| 0x400A:002 (P591.02) | Process output words: NetWordOUT2 | - (Read only) | general | U16 | 1 | O | t |
| 0x400B:001 (P592.01) | Process input data: AC Drive control word | **0x0000** | general | U16 | 1 | HK | r |
| 0x400B:002 (P592.02) | Process input data: LECOM control word | **0x0000** | general | U16 | 1 | HK | r |
| 0x400B:003 (P592.03) | Process input data: Network setpoint frequency (0.1) | **0.0 Hz** | general | U16 | 10 | K | r |
| 0x400B:004 (P592.04) | Process input data: Network setpoint speed | **0 rpm** | general | U16 | 1 | K | r |
| 0x400B:005 (P592.05) | Process input data: Network setpoint frequency (0.01) | **0.00 Hz** | general | U16 | 100 | K | r |
| 0x400B:006 (P592.06) | Process input data: Velocity mode setpoint | **0.0 Hz** | general | I16 | 10 | K | r |
| 0x400B:007 (P592.07) | Process input data: PID setpoint | **0.00 PID unit** | general | I16 | 100 | K | r |
| 0x400B:008 (P592.08) | Process input data: Torque mode setpoint | **0 Nm** | general | I16 | 1 | K | r |
| 0x400B:009 (P592.09) | Process input data: Torque scaling | **0** | general | I8 | 1 | K | r |
| 0x400B:011 (P592.11) | Process input data: PID feedback | **0.00 PID unit** | general | I16 | 100 | K | r |
| 0x400B:012 (P592.12) | Process input data: Network setpoint frequency [0.02Hz] | **0 Hz** | general | I16 | 50 | K | r |
| 0x400B:013 (P592.13) | Process input data: Network frequency setpoint [+/-16384] | **0** | general | I16 | 1 | - | r |
| 0x400C:001 (P593.01) | Process output data: AC Drive status word | - (Read only) | general | U16 | 1 | - | t |
| 0x400C:002 (P593.02) | Process output data: LECOM status word | - (Read only) | general | U16 | 1 | - | t |
| 0x400C:003 (P593.03) | Process output data: Frequency (0.1) | x.x Hz (Read only) | general | U16 | 10 | - | t |
| 0x400C:004 (P593.04) | Process output data: Motor speed | x rpm (Read only) | general | U16 | 1 | - | t |
| 0x400C:005 (P593.05) | Process output data: Drive status | - (Read only) | general | U16 | 1 | - | t |
| 0x400C:006 (P593.06) | Process output data: Frequency (0.01) | x.xx Hz (Read only) | general | U16 | 100 | - | t |

* Default setting dependent on the model.

| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x400C:007 (P593.07) | Process output data: Torque scaled | - (Read only) | general | I16 | 1 | - | t |
| 0x400C:008 (P593.08) | Process output data: Frequency [0.02 Hz] | Hz (Read only) | general | I16 | 50 | - | t |
| 0x400C:009 (P593.09) | Process output data: Frequency [+/-16384] | - (Read only) | general | I16 | 1 | - | t |
| 0x400D (P101.00) | Scaled actual value | x Units (Read only) | general | I16 | 1 | O | t |
| 0x400E:001 (P505.01) | NetWordIN1 function: Bit 0 | **Not active [0]** | general | U8 | 1 | PC | - |
| 0x400E:002 (P505.02) | NetWordIN1 function: Bit 1 | **Not active [0]** | general | U8 | 1 | PC | - |
| 0x400E:003 (P505.03) | NetWordIN1 function: Bit 2 | **Activate quick stop [3]** | general | U8 | 1 | PC | - |
| 0x400E:004 (P505.04) | NetWordIN1 function: Bit 3 | **Not active [0]** | general | U8 | 1 | PC | - |
| 0x400E:005 (P505.05) | NetWordIN1 function: Bit 4 | **Run forward (CW) [8]** | general | U8 | 1 | PC | - |
| 0x400E:006 (P505.06) | NetWordIN1 function: Bit 5 | **Activate preset (bit 0) [18]** | general | U8 | 1 | PC | - |
| 0x400E:007 (P505.07) | NetWordIN1 function: Bit 6 | **Activate preset (bit 1) [19]** | general | U8 | 1 | PC | - |
| 0x400E:008 (P505.08) | NetWordIN1 function: Bit 7 | **Reset error [4]** | general | U8 | 1 | PC | - |
| 0x400E:009 (P505.09) | NetWordIN1 function: Bit 8 | **Not active [0]** | general | U8 | 1 | PC | - |
| 0x400E:010 (P505.10) | NetWordIN1 function: Bit 9 | **Activate DC braking [5]** | general | U8 | 1 | PC | - |
| 0x400E:011 (P505.11) | NetWordIN1 function: Bit 10 | **Not active [0]** | general | U8 | 1 | PC | - |
| 0x400E:012 (P505.12) | NetWordIN1 function: Bit 11 | **Not active [0]** | general | U8 | 1 | PC | - |
| 0x400E:013 (P505.13) | NetWordIN1 function: Bit 12 | **Reverse rotational direction [13]** | general | U8 | 1 | PC | - |
| 0x400E:014 (P505.14) | NetWordIN1 function: Bit 13 | **Not active [0]** | general | U8 | 1 | PC | - |
| 0x400E:015 (P505.15) | NetWordIN1 function: Bit 14 | **Not active [0]** | general | U8 | 1 | PC | - |
| 0x400E:016 (P505.16) | NetWordIN1 function: Bit 15 | **Not active [0]** | general | U8 | 1 | PC | - |
| 0x4016:003 | Digital output 1: Cutout delay | **0.000 s** | general | U16 | 1000 | P | - |
| 0x4016:004 | Digital output 1: Switch-on delay | **0.000 s** | general | U16 | 1000 | P | - |
| 0x4016:005 | Digital output 1: Terminal state | - (Read only) | general | U8 | 1 | O | - |
| 0x4016:006 | Digital output 1: Trigger signal state | - (Read only) | general | U8 | 1 | O | - |
| 0x4018:003 | Relay: Switch-off delay | **0.000 s** | general | U16 | 1000 | P | - |
| 0x4018:004 | Relay: Switch-on delay | **0.000 s** | general | U16 | 1000 | P | - |
| 0x4018:005 | Relay: Relay state | - (Read only) | general | U8 | 1 | O | - |
| 0x4018:006 | Relay: Trigger signal state | - (Read only) | general | U8 | 1 | O | - |
| 0x4018:007 | Relay: Switching cycles | - (Read only) | general | U32 | 1 | O | - |
| 0x401F:001 (P121.01) | Process controller diagnostics: Current setpoint | x.xx PID unit (Read only) | general | I16 | 100 | O | t |
| 0x401F:002 (P121.02) | Process controller diagnostics: Current process variable | x.xx PID unit (Read only) | general | I16 | 100 | O | t |
| 0x401F:003 (P121.03) | Process controller diagnostics: Status | - (Read only) | general | U8 | 1 | O | t |
| 0x401F:004 | Process controller diagnostics: PID control value | x.x Hz (Read only) | general | I16 | 10 | O | - |
| 0x401F:005 | Process controller diagnostics: PID Feedforward value | x.x Hz (Read only) | general | I16 | 10 | O | - |
| * Default setting dependent on the model. | | | | | | | |

| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x401F:006 | Process controller diagnostics: PID output value | x.x Hz (Read only) | general | I16 | 10 | O | t |
| 0x401F:007 | Process controller diagnostics: PID error value | x.xx PID unit (Read only) | general | I32 | 100 | O | - |
| 0x4020:001 (P600.01) | Process controller setup (PID): Operating mode | **Inhibited [0]** | general | U8 | 1 | P | - |
| 0x4020:002 (P600.02) | Process controller setup (PID): PID process variable | **Analog input 1 [1]** | general | U8 | 1 | P | - |
| 0x4020:003 (P600.03) | Process controller setup (PID): Closed-loop controlled speed range | **100 %** | general | U16 | 1 | P | rt |
| 0x4020:004 (P600.04) | Process controller setup (PID): Speed feedforward control source | **Without speed addition [0]** | general | U8 | 1 | P | - |
| 0x4020:005 (P600.05) | Process controller setup (PID): Min speed limit | **-100.0 %** | general | I16 | 10 | P | - |
| 0x4020:006 (P600.06) | Process controller setup (PID): Max speed limit | **100.0 %** | general | I16 | 10 | P | - |
| 0x4021:001 (P606.01) | PID speed operation: Acceleration time | **1.0 s** | general | U16 | 10 | P | - |
| 0x4021:002 (P606.02) | PID speed operation: Deceleration time | **1.0 s** | general | U16 | 10 | P | - |
| 0x4022:001 (P451.01) | PID setpoint presets: Preset 1 | **0.00 PID unit** | general | I16 | 100 | OP | - |
| 0x4022:002 (P451.02) | PID setpoint presets: Preset 2 | **0.00 PID unit** | general | I16 | 100 | OP | - |
| 0x4022:003 (P451.03) | PID setpoint presets: Preset 3 | **0.00 PID unit** | general | I16 | 100 | OP | - |
| 0x4022:004 (P451.04) | PID setpoint presets: Preset 4 | **0.00 PID unit** | general | I16 | 100 | OP | - |
| 0x4022:005 (P451.05) | PID setpoint presets: Preset 5 | **0.00 PID unit** | general | I16 | 100 | OP | - |
| 0x4022:006 (P451.06) | PID setpoint presets: Preset 6 | **0.00 PID unit** | general | I16 | 100 | OP | - |
| 0x4022:007 (P451.07) | PID setpoint presets: Preset 7 | **0.00 PID unit** | general | I16 | 100 | OP | - |
| 0x4022:008 (P451.08) | PID setpoint presets: Preset 8 | **0.00 PID unit** | general | I16 | 100 | OP | - |
| 0x4023:001 (P610.01) | PID sleep mode: Activation | **Disabled [0]** | general | U8 | 1 | P | - |
| 0x4023:002 (P610.02) | PID sleep mode: Stop method | **Coasting [0]** | general | U8 | 1 | P | - |
| 0x4023:003 (P610.03) | PID sleep mode: Frequency threshold | **0.0 Hz** | general | U16 | 10 | P | - |
| 0x4023:004 (P610.04) | PID sleep mode: Feedback threshold | **0.00 PID unit** | general | I16 | 100 | P | - |
| 0x4023:005 (P610.05) | PID sleep mode: Delay time | **0.0 s** | general | U16 | 10 | P | - |
| 0x4023:006 (P610.06) | PID sleep mode: Recovery | **Setpoint > threshold OR system deviation > bandwidth [0]** | general | U8 | 1 | P | - |
| 0x4023:007 (P610.07) | PID sleep mode: Bandwidth | **0.00 PID unit** | general | U16 | 100 | P | - |
| 0x4023:008 (P610.08) | PID sleep mode: Recovery threshold | **0.00 PID unit** | general | I16 | 100 | P | - |
| 0x4024:001 (P615.01) | Automatic rinsing: Rinsing in sleep mode | **Inhibited [0]** | general | U8 | 1 | P | - |
| 0x4024:002 (P615.02) | Automatic rinsing: Rinse interval | **30.0 min** | general | U16 | 10 | P | - |
| 0x4024:003 (P615.03) | Automatic rinsing: Rinse speed | **0.0 Hz** | general | I16 | 10 | P | - |
| 0x4024:004 (P615.04) | Automatic rinsing: Rinse period | **0.0 s** | general | U16 | 10 | P | - |
| * Default setting dependent on the model. | | | | | | | |



| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x4025 (P800.00) | Sequencer mode | **Disabled [0]** | Sequencer | U8 | 1 | P | - |
| 0x4026:001 (P801.01) | Sequencer segment 1: Frequency setpoint | **0.0 Hz** | Sequencer | I16 | 10 | P | - |
| 0x4026:002 (P801.02) | Sequencer segment 1: Acceleration/deceleration | **5.0 s** | Sequencer | U16 | 10 | P | - |
| 0x4026:003 (P801.03) | Sequencer segment 1: Time | **0.0 s** | Sequencer | U32 | 10 | P | - |
| 0x4026:004 (P801.04) | Sequencer segment 1: Digital outputs | **0** | Sequencer | U8 | 1 | P | - |
| 0x4026:005 (P801.05) | Sequencer segment 1: Analog outputs | **0.00 VDC** | Sequencer | U16 | 100 | P | - |
| 0x4026:006 (P801.06) | Sequencer segment 1: PID setpoint | **0.00 PID unit** | Sequencer | I16 | 100 | P | - |
| 0x4026:007 (P801.07) | Sequencer segment 1: Torque setpoint | **100.0 %** | Sequencer | I16 | 10 | P | - |
| 0x4026:008 | Sequencer segment 1: NetWordOUT2 | **0** | Sequencer | U16 | 1 | P | - |
| 0x4026:009 | Sequencer segment 1: Reserved | **0** | Sequencer | U32 | 1 | P | - |
| 0x4027:001 (P802.01) | Sequencer segment 2: Frequency setpoint | **0.0 Hz** | Sequencer | I16 | 10 | P | - |
| 0x4027:002 (P802.02) | Sequencer segment 2: Acceleration/deceleration | **5.0 s** | Sequencer | U16 | 10 | P | - |
| 0x4027:003 (P802.03) | Sequencer segment 2: Time | **0.0 s** | Sequencer | U32 | 10 | P | - |
| 0x4027:004 (P802.04) | Sequencer segment 2: Digital outputs | **0** | Sequencer | U8 | 1 | P | - |
| 0x4027:005 (P802.05) | Sequencer segment 2: Analog outputs | **0.00 VDC** | Sequencer | U16 | 100 | P | - |
| 0x4027:006 (P802.06) | Sequencer segment 2: PID setpoint | **0.00 PID unit** | Sequencer | I16 | 100 | P | - |
| 0x4027:007 (P802.07) | Sequencer segment 2: Torque setpoint | **100.0 %** | Sequencer | I16 | 10 | P | - |
| 0x4027:008 | Sequencer segment 2: NetWordOUT2 | **0** | Sequencer | U16 | 1 | P | - |
| 0x4027:009 | Sequencer segment 2: Reserved | **0** | Sequencer | U32 | 1 | P | - |
| 0x4028:001 (P803.01) | Sequencer segment 3: Frequency setpoint | **0.0 Hz** | Sequencer | I16 | 10 | P | - |
| 0x4028:002 (P803.02) | Sequencer segment 3: Acceleration/deceleration | **5.0 s** | Sequencer | U16 | 10 | P | - |
| 0x4028:003 (P803.03) | Sequencer segment 3: Time | **0.0 s** | Sequencer | U32 | 10 | P | - |
| 0x4028:004 (P803.04) | Sequencer segment 3: Digital outputs | **0** | Sequencer | U8 | 1 | P | - |
| 0x4028:005 (P803.05) | Sequencer segment 3: Analog outputs | **0.00 VDC** | Sequencer | U16 | 100 | P | - |
| 0x4028:006 (P803.06) | Sequencer segment 3: PID setpoint | **0.00 PID unit** | Sequencer | I16 | 100 | P | - |
| 0x4028:007 (P803.07) | Sequencer segment 3: Torque setpoint | **100.0 %** | Sequencer | I16 | 10 | P | - |
| 0x4028:008 | Sequencer segment 3: NetWordOUT2 | **0** | Sequencer | U16 | 1 | P | - |
| 0x4028:009 | Sequencer segment 3: Reserved | **0** | Sequencer | U32 | 1 | P | - |
| 0x4029:001 (P804.01) | Sequencer segment 4: Frequency setpoint | **0.0 Hz** | Sequencer | I16 | 10 | P | - |
| 0x4029:002 (P804.02) | Sequencer segment 4: Acceleration/deceleration | **5.0 s** | Sequencer | U16 | 10 | P | - |
| 0x4029:003 (P804.03) | Sequencer segment 4: Time | **0.0 s** | Sequencer | U32 | 10 | P | - |
| 0x4029:004 (P804.04) | Sequencer segment 4: Digital outputs | **0** | Sequencer | U8 | 1 | P | - |

* Default setting dependent on the model.

| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x4029:005 (P804.05) | Sequencer segment 4: Analog outputs | **0.00 VDC** | Sequencer | U16 | 100 | P | - |
| 0x4029:006 (P804.06) | Sequencer segment 4: PID setpoint | **0.00 PID unit** | Sequencer | I16 | 100 | P | - |
| 0x4029:007 (P804.07) | Sequencer segment 4: Torque setpoint | **100.0 %** | Sequencer | I16 | 10 | P | - |
| 0x4029:008 | Sequencer segment 4: NetWordOUT2 | **0** | Sequencer | U16 | 1 | P | - |
| 0x4029:009 | Sequencer segment 4: Reserved | **0** | Sequencer | U32 | 1 | P | - |
| 0x402A:001 (P805.01) | Sequencer segment 5: Frequency setpoint | **0.0 Hz** | Sequencer | I16 | 10 | P | - |
| 0x402A:002 (P805.02) | Sequencer segment 5: Acceleration/deceleration | **5.0 s** | Sequencer | U16 | 10 | P | - |
| 0x402A:003 (P805.03) | Sequencer segment 5: Time | **0.0 s** | Sequencer | U32 | 10 | P | - |
| 0x402A:004 (P805.04) | Sequencer segment 5: Digital outputs | **0** | Sequencer | U8 | 1 | P | - |
| 0x402A:005 (P805.05) | Sequencer segment 5: Analog outputs | **0.00 VDC** | Sequencer | U16 | 100 | P | - |
| 0x402A:006 (P805.06) | Sequencer segment 5: PID setpoint | **0.00 PID unit** | Sequencer | I16 | 100 | P | - |
| 0x402A:007 (P805.07) | Sequencer segment 5: Torque setpoint | **100.0 %** | Sequencer | I16 | 10 | P | - |
| 0x402A:008 | Sequencer segment 5: NetWordOUT2 | **0** | Sequencer | U16 | 1 | P | - |
| 0x402A:009 | Sequencer segment 5: Reserved | **0** | Sequencer | U32 | 1 | P | - |
| 0x402B:001 (P806.01) | Sequencer segment 6: Frequency setpoint | **0.0 Hz** | Sequencer | I16 | 10 | P | - |
| 0x402B:002 (P806.02) | Sequencer segment 6: Acceleration/deceleration | **5.0 s** | Sequencer | U16 | 10 | P | - |
| 0x402B:003 (P806.03) | Sequencer segment 6: Time | **0.0 s** | Sequencer | U32 | 10 | P | - |
| 0x402B:004 (P806.04) | Sequencer segment 6: Digital outputs | **0** | Sequencer | U8 | 1 | P | - |
| 0x402B:005 (P806.05) | Sequencer segment 6: Analog outputs | **0.00 VDC** | Sequencer | U16 | 100 | P | - |
| 0x402B:006 (P806.06) | Sequencer segment 6: PID setpoint | **0.00 PID unit** | Sequencer | I16 | 100 | P | - |
| 0x402B:007 (P806.07) | Sequencer segment 6: Torque setpoint | **100.0 %** | Sequencer | I16 | 10 | P | - |
| 0x402B:008 | Sequencer segment 6: NetWordOUT2 | **0** | Sequencer | U16 | 1 | P | - |
| 0x402B:009 | Sequencer segment 6: Reserved | **0** | Sequencer | U32 | 1 | P | - |
| 0x402C:001 (P807.01) | Sequencer segment 7: Frequency setpoint | **0.0 Hz** | Sequencer | I16 | 10 | P | - |
| 0x402C:002 (P807.02) | Sequencer segment 7: Acceleration/deceleration | **5.0 s** | Sequencer | U16 | 10 | P | - |
| 0x402C:003 (P807.03) | Sequencer segment 7: Time | **0.0 s** | Sequencer | U32 | 10 | P | - |
| 0x402C:004 (P807.04) | Sequencer segment 7: Digital outputs | **0** | Sequencer | U8 | 1 | P | - |
| 0x402C:005 (P807.05) | Sequencer segment 7: Analog outputs | **0.00 VDC** | Sequencer | U16 | 100 | P | - |
| 0x402C:006 (P807.06) | Sequencer segment 7: PID setpoint | **0.00 PID unit** | Sequencer | I16 | 100 | P | - |
| 0x402C:007 (P807.07) | Sequencer segment 7: Torque setpoint | **100.0 %** | Sequencer | I16 | 10 | P | - |
| 0x402C:008 | Sequencer segment 7: NetWordOUT2 | **0** | Sequencer | U16 | 1 | P | - |
| 0x402C:009 | Sequencer segment 7: Reserved | **0** | Sequencer | U32 | 1 | P | - |
| 0x402D:001 (P808.01) | Sequencer segment 8: Frequency setpoint | **0.0 Hz** | Sequencer | I16 | 10 | P | - |
| * Default setting dependent on the model. | | | | | | | |



| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x402D:002 (P808.02) | Sequencer segment 8: Acceleration/deceleration | **5.0 s** | Sequencer | U16 | 10 | P | - |
| 0x402D:003 (P808.03) | Sequencer segment 8: Time | **0.0 s** | Sequencer | U32 | 10 | P | - |
| 0x402D:004 (P808.04) | Sequencer segment 8: Digital outputs | **0** | Sequencer | U8 | 1 | P | - |
| 0x402D:005 (P808.05) | Sequencer segment 8: Analog outputs | **0.00 VDC** | Sequencer | U16 | 100 | P | - |
| 0x402D:006 (P808.06) | Sequencer segment 8: PID setpoint | **0.00 PID unit** | Sequencer | I16 | 100 | P | - |
| 0x402D:007 (P808.07) | Sequencer segment 8: Torque setpoint | **100.0 %** | Sequencer | I16 | 10 | P | - |
| 0x402D:008 | Sequencer segment 8: NetWordOUT2 | **0** | Sequencer | U16 | 1 | P | - |
| 0x402D:009 | Sequencer segment 8: Reserved | **0** | Sequencer | U32 | 1 | P | - |
| 0x402E:001 (P822.01) | End segment: Frequency setpoint | **0.0 Hz** | Sequencer | I16 | 10 | P | - |
| 0x402E:002 (P822.02) | End segment: Acceleration/deceleration | **5.0 s** | Sequencer | U16 | 10 | P | - |
| 0x402E:003 (P822.03) | End segment: Time | **0.0 s** | Sequencer | U32 | 10 | P | - |
| 0x402E:004 (P822.04) | End segment: Digital outputs | **0** | Sequencer | U8 | 1 | P | - |
| 0x402E:005 (P822.05) | End segment: Analog outputs | **0.00 VDC** | Sequencer | U16 | 100 | P | - |
| 0x402E:006 (P822.06) | End segment: PID setpoint | **0.00 PID unit** | Sequencer | I16 | 100 | P | - |
| 0x402E:007 (P822.07) | End segment: Torque setpoint | **100.0 %** | Sequencer | I16 | 10 | P | - |
| 0x402E:008 | End segment: NetWordOUT2 | **0** | Sequencer | U16 | 1 | P | - |
| 0x402E:009 | End segment: Reserved | **0** | Sequencer | U32 | 1 | P | - |
| 0x402F (P824.00) | End of sequence mode | **Keep running [0]** | Sequencer | U8 | 1 | P | - |
| 0x4030:001 ... 0x4030:016 (P830.01 ... 16) | Sequence 1: Step 1 ... Step 16 | **Skip step [0]** | Sequencer | I8 | 1 | P | - |
| 0x4031 (P831.00) | Number of cycles sequence 1 | **1** | Sequencer | U16 | 1 | P | - |
| 0x4032:001 ... 0x4032:016 (P835.01 ... 16) | Sequence 2: Step 1 ... Step 16 | **Skip step [0]** | Sequencer | I8 | 1 | P | - |
| 0x4033 (P836.00) | Number of cycles sequence 2 | **1** | Sequencer | U16 | 1 | P | - |
| 0x4034:001 ... 0x4034:016 (P840.01 ... 16) | Sequence 3: Step 1 ... Step 16 | **Skip step [0]** | Sequencer | I8 | 1 | P | - |
| 0x4035 (P841.00) | Number of cycles sequence 3 | **1** | Sequencer | U16 | 1 | P | - |
| 0x4036:001 ... 0x4036:016 (P845.01 ... 16) | Sequence 4: Step 1 ... Step 16 | **Skip step [0]** | Sequencer | I8 | 1 | P | - |
| 0x4037 (P846.00) | Number of cycles sequence 4 | **1** | Sequencer | U16 | 1 | P | - |
| 0x4038:001 ... 0x4038:016 (P850.01 ... 16) | Sequence 5: Step 1 ... Step 16 | **Skip step [0]** | Sequencer | I8 | 1 | P | - |
| 0x4039 (P851.00) | Number of cycles sequence 5 | **1** | Sequencer | U16 | 1 | P | - |
| * Default setting dependent on the model. | | | | | | | |

| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x403A:001 ... 0x403A:016 (P855.01 ... 16) | Sequence 6: Step 1 ... Step 16 | **Skip step [0]** | Sequencer | I8 | 1 | P | - |
| 0x403B (P856.00) | Number of cycles sequence 6 | **1** | Sequencer | U16 | 1 | P | - |
| 0x403C:001 ... 0x403C:016 (P860.01 ... 16) | Sequence 7: Step 1 ... Step 16 | **Skip step [0]** | Sequencer | I8 | 1 | P | - |
| 0x403D (P861.00) | Number of cycles sequence 7 | **1** | Sequencer | U16 | 1 | P | - |
| 0x403E:001 ... 0x403E:016 (P865.01 ... 16) | Sequence 8: Step 1 ... Step 16 | **Skip step [0]** | Sequencer | I8 | 1 | P | - |
| 0x403F (P866.00) | Number of cycles sequence 8 | **1** | Sequencer | U16 | 1 | P | - |
| 0x4040 (P820.00) | Start of sequence mode | **Restart sequencer [0]** | Sequencer | U8 | 1 | P | - |
| 0x4041:001 ... 0x4041:032 (P750.01 ... 32) | Parameter change-over: Parameter 1 ... Parameter 32 | **0x00000000** | general | IDX | 1 | PH | - |
| 0x4042:001 ... 0x4042:032 (P751.01 ... 32) | Parameter value set 1: Value of parameter 1 ... Value of parameter 32 | **0** | general | I32 | 1 | P | - |
| 0x4043:001 ... 0x4043:032 (P752.01 ... 32) | Parameter value set 2: Value of parameter 1 ... Value of parameter 32 | **0** | general | I32 | 1 | P | - |
| 0x4044:001 ... 0x4044:032 (P753.01 ... 32) | Parameter value set 3: Value of parameter 1 ... Value of parameter 32 | **0** | general | I32 | 1 | P | - |
| 0x4045:001 ... 0x4045:032 (P754.01 ... 32) | Parameter value set 4: Value of parameter 1 ... Value of parameter 32 | **0** | general | I32 | 1 | P | - |
| 0x4046 (P755.00) | Activation of parameter set | **Via command (disable required) [0]** | general | U8 | 1 | P | - |
| 0x4047:001 (P756.01) | Parameter change-over error message: Status | - (Read only) | general | U16 | 1 | O | - |
| 0x4047:002 (P756.02) | Parameter change-over error message: List entry | - (Read only) | general | U8 | 1 | O | - |
| 0x4048 (P601.00) | PID P-component | **5.0 %** | general | U16 | 10 | P | rt |
| 0x4049 (P602.00) | PID I- component | **400 ms** | general | U16 | 1 | P | rt |
| 0x404A (P603.00) | PID D-component | **0.0 s** | general | U8 | 10 | P | rt |
| 0x404B (P604.00) | PID setpoint ramp | **20.0 s** | general | U16 | 10 | P | - |
| 0x404C:001 (P607.01) | PID influence: Acceleration time for activation | **5.0 s** | general | U16 | 10 | P | - |
| 0x404C:002 (P607.02) | PID influence: Deceleration time for masking out | **5.0 s** | general | U16 | 10 | P | - |
| 0x404D:001 (P608.01) | PID alarms: MIN alarm threshold | **0.00 PID unit** | general | I16 | 100 | P | - |
| 0x404D:002 (P608.02) | PID alarms: MAX alarm threshold | **100.00 PID unit** | general | I16 | 100 | P | - |
| 0x404D:003 (P608.03) | PID alarms: Monitoring bandwidth PID feedback signal | **2.00 %** | general | U16 | 100 | P | - |
| 0x404E:001 (P605.01) | PID setpoint limits: Minimum setpoint | **-300.00 PID unit** | general | I16 | 100 | P | - |
| 0x404E:002 (P605.02) | PID setpoint limits: Maximum setpoint | **300.00 PID unit** | general | I16 | 100 | P | - |
| * Default setting dependent on the model. | | | | | | | |



| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x405C:001 (P770.01) | Pump cascading: Operating mode | **Disabled [0]** | | U8 | 1 | P | - |
| 0x405C:002 (P770.02) | Pump cascading: Priority at startup | **By operating time [1]** | | U8 | 1 | P | - |
| 0x405C:003 (P770.03) | Pump cascading: Start frequency | **40.0 Hz** | | U16 | 10 | P | - |
| 0x405C:004 (P770.04) | Pump cascading: Stop frequency | **10.0 Hz** | | U16 | 10 | P | - |
| 0x405C:005 (P770.05) | Pump cascading: Settling time | **5.0 s** | | U16 | 10 | P | - |
| 0x405C:006 (P770.06) | Pump cascading: Delay time | **2.0 s** | | U16 | 10 | P | - |
| 0x405C:007 (P770.07) | Pump cascading: Lower frequency threshold | **20.0 Hz** | | U16 | 10 | P | - |
| 0x405C:008 (P770.08) | Pump cascading: Upper frequency threshold | **30.0 Hz** | | U16 | 10 | P | - |
| 0x405C:009 (P770.09) | Pump cascading: Automatic runtime | **0 h** | | U16 | 1 | P | - |
| 0x405C:010 (P770.10) | Pump cascading: Automatic transition time | **0.0 s** | | I16 | 10 | P | - |
| 0x405C:011 (P770.11) | Pump cascading: Reset operating time | **Disabled [0]** | | U8 | 1 | P | - |
| 0x405C:012 (P770.12) | Pump cascading: Status word | - (Read only) | | U16 | 1 | - | - |
| 0x405C:013 (P770.13) | Pump cascading: Operating time pump 1 | x s (Read only) | | U32 | 1 | T | - |
| 0x405C:014 (P770.14) | Pump cascading: Operating time pump 2 | x s (Read only) | | U32 | 1 | T | - |
| 0x603F (P150.00) | Error code | - (Read only) | general | U16 | 1 | O | t |
| 0x6040 | CiA control word | **0** | general | U16 | 1 | O | r |
| 0x6041 (P780.00) | CiA status word | - (Read only) | general | U16 | 1 | O | t |
| 0x6042 (P781.00) | Set speed | **0 rpm** | MCTRL | I16 | 1 | K | r |
| 0x6043 (P782.00) | Internal set speed | x rpm (Read only) | general | I16 | 1 | O | t |
| 0x6044 (P783.00) | Actual speed | x rpm (Read only) | general | I16 | 1 | O | t |
| 0x6046:001 (P784.01) | Speed limits: Min. speed | **0 rpm** | MCTRL | U32 | 1 | P | r |
| 0x6046:002 (P784.02) | Speed limits: Max. speed | **2147483647 rpm** | MCTRL | U32 | 1 | P | r |
| 0x6048:001 (P785.01) | Acceleration ramp: CiA acceleration: Delta speed | **3000 rpm** | MCTRL | U32 | 1 | P | r |
| 0x6048:002 (P785.02) | Acceleration ramp: CiA acceleration: Delta time | **10 s** | MCTRL | U16 | 1 | P | r |
| 0x6049:001 (P786.01) | Deceleration ramp: CiA deceleration: Delta speed | **3000 rpm** | MCTRL | U32 | 1 | P | r |
| 0x6049:002 (P786.02) | Deceleration ramp: CiA deceleration: Delta time | **10 s** | MCTRL | U16 | 1 | P | r |
| 0x605A | CiA: Quick stop mode | **Ramp > switch on disabled [2]** | general | I16 | 1 | P | - |
| 0x605B | Shutdown option code | **Disable drive function [0]** | general | I16 | 1 | P | - |
| 0x6060 (P301.00) | CiA: Operation mode | **MS: Velocity mode [-2]** | MCTRL | I8 | 1 | PC | - |
| 0x6061 (P788.00) | CiA: Active operation mode | - (Read only) | MCTRL | I8 | 1 | O | t |
| 0x6071 | Set torque | **0.0 %** | general | I16 | 10 | K | r |

* Default setting dependent on the model.

| Address | Name | Default setting | Category | Data type | Factor | A | M |
|---|---|---|---|---|---|---|---|
| 0x6072 (P326.00) | Max. torque | **250.0 %** | MCTRL | U16 | 10 | P | r |
| 0x6073 (P324.00) | Max. current | **200.0 %** | MCTRL | U16 | 10 | P | r |
| 0x6074 | Internal set torque | x.x % (Read only) | MCTRL | I16 | 10 | O | - |
| 0x6075 (P323.00) | Rated motor current | **1.700 A** * | MCTRL | U32 | 1000 | PC | - |
| 0x6076 (P325.00) | Rated motor torque | **1.650 Nm** * | MCTRL | U32 | 1000 | PC | - |
| 0x6077 (P107.00) | Actual torque | x.x % (Read only) | general | I16 | 10 | O | t |
| 0x6078 (P103.00) | Actual current | x.x % (Read only) | general | I16 | 10 | O | t |
| 0x6079 | DC-bus voltage | x.xxx V (Read only) | general | U32 | 1000 | O | t |
| 0x6080 (P322.00) | Max. motor speed | **6075 rpm** | MCTRL | U32 | 1 | P | r |
| 0x6085 (P790.00) | Quick stop deceleration | **546000 pos. unit/s²** | MCTRL | U32 | 1 | P | - |
| 0x60E0 | Positive torque limit | **250.0 %** | MCTRL | U16 | 10 | P | r |
| 0x60E1 | Negative torque limit | **250.0 %** | MCTRL | U16 | 10 | P | r |
| 0x60FD (P118.00) | Digital input status | - (Read only) | general | U32 | 1 | O | t |
| 0x6402 | Motor type | **Squirrel cage induction [7]** | MCTRL | U16 | 1 | P | - |
| 0x6502 (P789.00) | Supported drive modes | - (Read only) | general | U32 | 1 | - | - |
| * Default setting dependent on the model. | | | | | | | |



## 18.2 Glossary

| Abbreviation | Meaning |
| --- | --- |
| AIE | Acknowledge In Error, error acknowledgement |
| AIS | Acknowledge In Stop, restart acknowledgement |
| OFF state | Triggered signal status of the sensors |
| CCF | Common Cause Error (also β-value) |
| EC_FS | Error Class Fail Safe |
| EC_SS1 | Error-Class Safe Stop 1 |
| EC_SS2 | Error-Class Safe Stop 2 |
| EC_STO | Error-Class Safe Torque Off Stop 0 |
| ON state | Signal status of the safety sensor in normal operation |
| FIT | Failure In Time, 1 FIT = 10-9 Error/h |
| FMEA | Failure Mode and Effect Analysis |
| FSoE | FailSafe over EtherCAT |
| GSDML | Device description file with PROFINET-specific data to integrate the configuring software of a PROFINET controller. |
| HFT | Hardware Failure Tolerance |
| Cat. | Category in accordance with EN ISO 13849-1 |
| OSSD | Output Signal Switching Device, tested signal output |
| PELV | Protective Extra Low Voltage, extra-low voltage with safe isolation |
| PL | Performance Level according to EN ISO 13849-1 |
| PM | Plus−Minus − switched signal paths |
| PP | Plus−Plus − switched signal paths |
| PS | PROFIsafe |
| PWM | Pulse width modulation |
| SCS | Safe crawling speed |
| SD−In | Safe Digital Input |
| SD−Out | Safe Digital Output |
| SELV | Safety Extra Low Voltage |
| SFF | Safe Failure Fraction |
| SIL | Safety Integrity Level in accordance with IEC 61508 |