ALC 11 – ESP

CFW-11 – ARTIFICAL LIFT DRIVE

ALC11 User´s Manual – Electrical Submersible Pump

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Summary of Reviews

The information below describes the revisions in this manual.

Reviews	Description	Author	Dat3
00	Initial Emission	DDP	28/09/2020

QUICK REFERENCE OF PARAMETERS / COMMUNICATION TABLE

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
Operating Modes								
P0220	4x8221	Local/remote selection	4 = Dix, Operation as a toggle switch between local and remote modes: In this case, the switch position determines the controller operating mode. In this configuration, toggling between the local and remote operating modes by means of remote control is not allowed 15 = ALC (M), Operation as pushbutton. In this case, each pulse generated on this button toggles between the local and remote modes. In this configuration, toggling between local and remote operating modes by means of remote control is allowed	16bits/INT	4	0	15	-
M0607	4x0608	Acceleration Ramp - Start Level	10 = Command code for Local mode selection in the frequency inverter 11 = Command code for Remote mode selection in the frequency inverter	16bits/INT	0	0	32767	-
Local Mode								
M0289	4x0290	Remote command for the pump in local mode	10 = Start pump 11 = Stop pump	16bits/INT	0	0	32767	-
P1020	4x9021	Command to start / stop the pump using the inverter parameter	1 = Stop pump motor 2 = Star pump motor	16bits/INT	0	0	10	-
P1021	4x9022	Speed reference related to motor speed (RPM) for local mode operation	-	16bits/INT	0	0	5000	rpm
D0195	4x10391	Speed reference related to motor speed (Hz) for local mode operation	-	32bits/Float	40.0	0	500.0	Hz
M0242	4x0243	Command word	23 = Stops the pumping unit	16bits/INT	-	-32768	32767	-
Remote Mode								
R0015	0x0016	Manual / automatic input configuration	OFF = Operation as pushbutton. In this case, each pulse generated on this button toggles between manual and automatic modes. In this configuration, toggling between Manual and Automatic operating modes by means of remote control is allowed ON = Operation as a toggle switch between manual and automatic modes: In this case, the switch position determines the controller operating mode. In this configuration, toggling between Manual and Automatic operating modes by means of remote control is not allowed	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
M0289	4x0290	Remote command for the pump in local mode	10 = Start pump 11 = Stop pump	16bits/INT	0	0	32767	-

Quick Reference of Parameters / Communication Table

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
R0012	0x0013	Treatment for digital inputs from Run/Stop	OFF = Does not handle on / off button in REMOTE ON = Enables treating on / off button in REMOTE too	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
D0194	4x10389	Motor speed reference (Hz) for manual remote mode operation	-	32bits/Float	40.0	0.0	500.0	Hz
D0010	4x10021	Minimum motor speed operating limit	-	32bits/Float	40.0	0.0	500.0	Hz
D0011	4x10023	Maximum motor speed operating limit	-	32bits/Float	60.0	0.0	500.0	Hz
Automatic Remote Mode								
M0170	4x0171	Automatic remote control type	0 = no control 10 = Step Control	16bits/INT	0	0	10	-
D0037	4x10075	Step size: increment / decrement size	-	32bits/Float	0.1	0.1	10.0	Hz
M0037	4x0038	Step interval: time between increments	-	16bits/INT	5	1	180	s
D0036	4x10073	Hysteresis range % where control does not act	-	32bits/Float	10.0	0.0	10.0	%
D0009	4x10019	Setpoint - control target value, pressure or current	-	32bits/Float	3.5	0.0	6500.0	PSI, A
R0009	0x0010	Control type	OFF = Inversely proportional. Uses motor current ON = Directly proportional. Uses downhole pressure	8bits/Bool	1 (ON)	0 (OFF)	1 (ON)	-
R0010	0x0011	Control setpoint type	OFF = Motor current ON = Downhole pressure	8bits/Bool	1 (ON)	0 (OFF)	1 (ON)	-
Start and Stop Ramp								
D0081	4x10163	Start frequency	-	16bits/INT	10	0	100	Hz
D0088	4x10177	Intermediate frequency	-	16bits/INT	30	0	100	Hz
D0082	4x10165	Acceleration ramp - Start level	-	32bits/Float	1.0	0	1000	Hz/s
D0083	4x10167	Deceleration ramp - Start level	-	32bits/Float	1.0	0	1000	Hz/s
D0084	4x10169	Acceleration ramp - Intermediate level	-	32bits/Float	60.0	0	1000	Hz/min
D0085	4x10171	Deceleration ramp - Intermediate level	-	32bits/Float	60.0	0	1000	Hz/min
D0086	4x10173	Acceleration ramp - End level	-	32bits/Float	60.0	0	1000	Hz/min
D0087	4x10175	Deceleration ramp - End level	-	32bits/Float	60.0	0	1000	Hz/min
Step at the Start								
D0027	4x10055	Minimum start frequency	-	16bits/INT	7	0	90	Hz
Locking Pump Monitoring Enabling								
R0014	0x0015	Enables the monitoring of the pump locking	OFF = Function disabled ON = Function enabled	8bits/Bool	1 (ON)	0 (OFF)	1 (ON)	-
Configuration the Pump Locking Monitoring								
M0060	4x0061	Inverter operating frequency where the locked pump condition is checked as a function of the percentage of current programmed in M0061	That is, before the frequency inverter reaches this check frequency, if it reaches the percentage of current programmed in M0061, the locked pump condition is confirmed, and in this case, the inverter is decelerated by ramp to zero speed.	16bits/INT	10	0	45	Hz
M0061	4x0062	This parameter determines the percentage value of the current to detect the locked pump condition	-	16bits/INT	80	60	120	%

Quick Reference of Parameters / Communication Table

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
Activating the Pump Rocking Start routine								
R0270	0x0271	Activates the pump rocking start routine	OFF = Disables rocking start routine ON = Activates rocking start routine	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0185	0x0186	Pump rocking start status	OFF = Pump rocking start routine not activated ON = Pump rocking start routine activated	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0170	0x0171	Rocking start test status	OFF = Out of routine ON = Running test routine	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0171	0x0172	Rocking start test	OFF = Pump rocking start test FAILED. ON = Pump rocking start test SUCCESSFULLY	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
Pump Rocking Start Configuration Parameters								
M0062	4x0063	Additional voltage boost during the pump rocking start. The value set in this parameter is added to the frequency inverter parameter P0143 during the execution of the pump rocking start routine	-	16bits/INT	1	0	9	-
M0063	4x0064	Frequency reference during the execution of the pump rocking start	-	16bits/INT	10	0	45	-
M0064	4x0065	Interval between partial rocking start cycles	-	16bits/INT	30	1	200	-
M0065	4x0066	Duration of partial pump rocking start cycles, where the motor will be running at the frequency programmed in M0063	-	16bits/INT	30	1	200	s
M0066	4x0067	Number of partial cycles of the pump rocking start routine. Number of partial cycles executed consecutively for the clockwise and counterclockwise rotation of the pump during the pump rocking start routine	-	16bits/INT	3	1	100	-
M0067	4x0068	Number of complete cycles to be executed in the attempt of unlocking the pump during the pump rocking start routine	-	16bits/INT	2	1	100	-
M0068	4x0069	Maximum number of pump rocking start attempts in an interval. Each attempt corresponds to a complete pump rocking start cycle	-	16bits/INT	2	1	100	-
M0069	4x0070	Interval during which the number of attempts of pump rocking start will be verified. If the number of attempts programmed in M0068 has exceeded this interval, any attempt to start the pump will be blocked, displaying a locked pump signal.	The pump start is only released after this time has elapsed. To disable this block for time, just set the value 0 (zero).	16bits/INT	1	0	10	h
Monitoring the Pump Rocking Start routine								
M1009	4x1010	Number of partial cycles performed in the pump rocking start routine	-	16bits/INT	0	0	100	-
M1010	4x1011	Number of complete cycles performed in the pump rocking start routine	-	16bits/INT	0	0	100	-
M0224	4x0225	Number of pump rocking start performed during the time interval counting time M0069	-	16bits/INT	0	0	100	-
M0225	4x0226	Remaining pump rocking start interval time for releasing new pump rocking start in min	-	16bits/INT	0	0	600	min

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
Undercurrent Signaling Configuration								
R0013	0x0014	System configuration in motor undercurrent condition	OFF = Signals undercurrent fault ON = Signals undercurrent alarm	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
Undercurrent Limit Curves Configuration								
R0184	0x0185	Undercurrent curves configuration status	OFF = Standard undercurrent level ON = Customized undercurrent level	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
M0077	4x0078	Standard undercurrent level	-	16bits/INT	20	0	3200	A
M0078	4x0079	Customized undercurrent level at 40 Hz	-	16bits/INT	0	0	1500	A
M0079	4x0080	Customized undercurrent level at 45 Hz	-	16bits/INT	0	0	1500	A
M0080	4x0081	Customized undercurrent level at 50 Hz	-	16bits/INT	0	0	1500	A
M0081	4x0082	Customized undercurrent level at 55 Hz	-	16bits/INT	0	0	1500	A
M0082	4x0083	Customized undercurrent level at 60 Hz	-	16bits/INT	0	0	1500	A
M0083	4x0084	Customized undercurrent level at 65 Hz	-	16bits/INT	0	0	1500	A
Undercurrent Configuration								
M0070	4x0071	Number of motor current samples to compose the value average	-	16bits/INT	2	2	10	-
M0071	4x0072	Interval between the motor current samples for the formation of the average	-	16bits/INT	100	100	2000	ms
M0072	4x0073	Time with the pump running in undercurrent to confirm the undercurrent condition	-	16bits/INT				
M0073	4x0074	Delay after the pump start to begin the undercurrent check	-1 = disable undercurrent check	16bits/INT	0	-1	10000	s
M0074	4x0075	Time to begin the pump restart procedure after an undercurrent detection	-	16bits/INT	30	0	600	min
M0075	4x0076	Maximum number of pump restarts allowed per undercurrent	If this amount is 0 (zero) or is reached by the system, the pump will not automatically restart after the time specified in M0074 has expired	16bits/INT	3	0	30	-
M0076	4x0077	Time after the pump restart for which the system must remain without an undercurrent condition to reset the restart counter	-	16bits/INT	60	0	600	min
M0220	4x0221	Restart counter executed by the system for remote supervision	-	16bits/INT	0	0	32767	-
Flow Monitoring								
R0006	0x0007	Enable flow monitoring	OFF = There is no flow transmitter ON = There is a flow transmitter (analog signal)	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0111	0x0112	Flow Fault LL	OFF = Failure not acted ON = Failure acted	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0112	0x0113	Flow Fault HH	OFF = Failure not acted ON = Failure acted	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0152	0x0153	Flow Alarm L	OFF = Alarm not acted ON = Alarm acted	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0153	0x0154	Flow Alarm H	OFF = Alarm not acted ON = Alarm acted	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-

Quick Reference of Parameters / Communication Table

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
D0021	4x10043	Very high flow limit (HH)	*Engineering Unit (depends on the connected sensor)	32bits/Float	1000.00	0.00	1000.00	EU*
D0022	4x10045	High flow limit (H)	*Engineering Unit (depends on the connected sensor)	32bits/Float	1000.00	0.00	1000.00	EU*
D0023	4x10047	Low flow limit (L)	*Engineering Unit (depends on the connected sensor)	32bits/Float	0.00	0.00	1000.00	EU*
D0024	4x10049	Very low flow limit (L)	*Engineering Unit (depends on the connected sensor)	32bits/Float	0.00	0.00	1000.00	EU*
D0025	4x10051	Minimum flow transmitter range	*Engineering Unit (depends on the connected sensor)	32bits/Float	0.00	0.00	1000.00	EU*
D0026	4x10053	Maximum flow transmitter range	*Engineering Unit (depends on the connected sensor)	32bits/Float	1000.00	1.00	1000.00	EU*
PT100 Monitoring								
D0040	4x10081	Limit HH for PT100 1 (Fault)	-	32bits/Float	100.0	0.0	250.0	ºC
D0041	4x10083	Limit HH for PT100 2 (Fault)	-	32bits/Float	100.0	0.0	250.0	ºC
D0042	4x10085	Limit HH for PT100 3 (Fault)	-	32bits/Float	100.0	0.0	250.0	ºC
D0043	4x10087	Limit H for PT100 1 (Alarm)	-	32bits/Float	80.0	0.0	250.0	ºC
D0044	4x10089	Limit H for PT100 2 (Alarm)	-	32bits/Float	80.0	0.0	250.0	ºC
D0045	4x10091	Limit H for PT100 3 (Alarm)	-	32bits/Float	80.0	0.0	250.0	ºC
Motor ON and OFF Time Counters								
D0155	4x10311	Motor time ON	-	32bits/Float	0	0	3.4E+38	h
D0156	4x10313	Motor time OFF	-	32bits/Float	0	0	3.4E+38	h
Operating Speed Limits								
D0010	4x10021	Minimum operating frequency of ESP motor	-	32bits/Float	30.0	0.0	500.0	Hz
D0011	4x10023	Maximum operating frequency of ESP motor	-	32bits/Float	60.0	0.0	500.0	Hz
System Configuration								
D0020	4x10041	Transformation ratio of the transformer	-	32bits/Float	10.25	0.00	100.00	-
D0055	4x10111	Fine adjustment for motor current, calculated by the transformation ratio of the transformer	-	32bits/Float	0	-2.0	2.0	-
D0056	4x10113	Fine adjustment for motor voltage, calculated by the transformation ratio of the transformer	-	32bits/Float	0	-2.0	2.0	-
D0057	4x10115	Rated motor current (motor nameplate data)	-	32bits/Float		0.1	2000.0	A
M0026	4x0027	Rated motor voltage (motor nameplate data)	-	16bits/INT		1	10000	V
Restart Blocking								
M0006	4x0007	Pump restart blocking time	-	16bits/INT	0	0	600	min
D0205	4x10411	Time counter to allow pump restart	-	32bits/Float	0	0	36000	s
Automatic Restart								
M0084	4x0085	Time for automatic pump restart after failure	-	16bits/INT		0	120	min
M0085	4x0086	Number of attempts for automatic restart within a time interval	-	16bits/INT		0	5	-
M0086	4x0087	Time interval to allow automatic restart attempts	-	16bits/INT		1	24	h
D0157	4x10315	Time counter for restarting the pump for "Automatic Restart"	-	32bits/Float	0	0	7200	s
Overload Configuration								
M0027	4x0028	Overload current 100% speed	-	16bits/INT	105	10	150	%
M0028	4x0029	Overload current 50% speed	-	16bits/INT	90	10	150	%
M0029	4x0030	Overload current 5% speed	-	16bits/INT	65	10	150	%

Quick Reference of Parameters / Communication Table

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
Factory Default								
M0605	4x0606	Factory default commands	65 = Loads factory default 66 = Creates new factory default configuration	16bits/INT	0	0	32767	-
M0294	4x0293	Returning factory default commands	-2 = Running -1 = Finished successfully > 0 = Error executing the requested command	16bits/INT	0	-32768	32767	-
Controller General Configurations								
M0005	4x0006	Delay to start the pump at the controller powerup	-	16bits/INT	0	0	60	s
M0007	4x0008	Acoustic signal time before starting the motor	-	16bits/INT	0	0	60	s
M0023	4x0024	Interval for process data history	-	16bits/INT	30	0	32767	s
Downhole Sensor Configuration Via MODBUS								
M0000	4x0001	Downhole device address for Modbus communication	-	16bits/INT		1	1000	-
M0001	4x0002	ALC11 communication port for communication with downhole sensor	-1 = Ethernet Channel 0 = COM1 Channel 1 = COM2 Channel 2 = COM3 Channel	16bits/INT		-1	2	-
M0002	4x0003	Downhole sensor type	0 = None 5 = Transmitters via analog input 100 = Generic downhole controller; it is necessary to specify the downhole variable addresses of the generic controller	16bits/INT		0	100	-
D0030	4x10061	Modbus address for downhole pressure reading of the downhole sensor	0 = Variable does not exist in the sensor model	32bits/Float		30001	50000	-
D0031	4x10063	Modbus address for downhole temperature reading of the downhole sensor	0 = Variable does not exist in the sensor model	32bits/Float		30001	50000	-
D0032	4x10065	Modbus address for motor temperature reading of the downhole sensor	0 = Variable does not exist in the sensor model	32bits/Float		30001	50000	-
D0033	4x10067	Multiplier factor for conversion of the downhole pressure of the downhole sensor	-	32bits/Float		0.0	3.4E+38	-
D0034	4x10069	Multiplier factor for conversion of the downhole temperature of the downhole sensor	-	32bits/Float		0.0	3.4E+38	-
D0035	4x10071	Multiplier factor for conversion of the motor temperature of the downhole sensor	-	32bits/Float		0.0	3.4E+38	-
D0046	4x10093	Modbus address for discharge pressure reading of the downhole sensor	0 = Variable does not exist in the sensor model	32bits/Float		30001	50000	-
D0047	4x10095	Multiplier factor for conversion of the discharge pressure of the downhole sensor	-	32bits/Float		0.0	3.4E+38	-
D0048	4x10097	Modbus address for vibration pressure reading of the downhole sensor	0 = Variable does not exist in the sensor model	32bits/Float		30001	50000	-
D0049	4x10099	Multiplier factor for conversion of the vibration pressure of the downhole sensor	-	32bits/Float		0.0	3.4E+38	-
D0050	4x10101	Modbus address for active leakage current reading of the downhole sensor	0 = Variable does not exist in the sensor model	32bits/Float		30001	50000	-

Quick Reference of Parameters / Communication Table

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
D0051	4x1003	Multiplier factor for conversion of the active leakage current reading of the downhole sensor	-	32bits/Float		0.0	3.4E+38	-
D0052	4x10105	Modbus address for passive leakage current reading of the downhole sensor	0 = Variable does not exist in the sensor model	32bits/Float		30001	50000	-
D0053	4x10107	Multiplier factor for conversion of the passive leakage current reading of the downhole sensor	-	32bits/Float		0.0	3.4E+38	-
R1121	0x0122	Communication status with downhole sensor	OFF = Communication with downhole sensor WITH fault ON = Communication with downhole sensor WITHOUT fault	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
M1206	4x1207	Counter of communication cycles with downhole sensor SUCCESSFUL	-	16bits/INT		0	32767	-
M1207	4x1208	Counter of communication cycles with downhole sensor FAILED	-	16bits/INT		0	32767	-
D0365	4x10731	Downhole sensor discharge pressure	*Engineering Unit (depends on the connected sensor)	32bits/Float		0.0	3.4E+38	EU*
D0366	4x10733	Downhole sensor vibration	*Engineering Unit (depends on the connected sensor)	32bits/Float		0.0	3.4E+38	EU*
D0367	4x10735	Downhole sensor active leakage current	*Engineering Unit (depends on the connected sensor)	32bits/Float		0.0	3.4E+38	EU*
D0368	4X10737	Downhole sensor passive leakage current	*Engineering Unit (depends on the connected sensor)	32bits/Float		0.0	3.4E+38	EU*
D0261	4x10523	Downhole sensor motor temperature	*Engineering Unit (depends on the connected sensor)	32bits/Float		0.0	3.4E+38	EU*
D0251	4x10503	Downhole sensor downhole pressure	*Engineering Unit (depends on the connected sensor)	32bits/Float		0.0	3.4E+38	EU*
D0260	4x10521	Downhole sensor downhole temperature	*Engineering Unit (depends on the connected sensor)	32bits/Float		0.0	3.4E+38	EU*
Downhole Sensor Configuration via Analog Input								
M0002	4x0003	Downhole sensor type	0 = None 5 = Transmitters via analog input 100 = Generic downhole controller; it is necessary to specify the downhole variable addresses of the generic controller	16bits/INT	0	0	100	-
D0002	4x10005	Downhole pressure minimum scale	-	32bits/Float	0.0	0.0	10000.0	PSI
D0003	4x10007	Downhole pressure maximum scale	-	32bits/Float	10000.0	0.0	10000.0	PSI
D0038	4x10077	Downhole temperature minimum scale	-	32bits/Float	0.0	0.0	600.0	ºC
D0039	4x10079	Downhole temperature maximum scale	-	32bits/Float	600.0	0.0	600.0	ºC
D0028	4x10057	Motor temperature minimum scale	-	32bits/Float	0.0	0.0	600.0	ºC
D0029	4x10059	Motor temperature maximum scale	-	32bits/Float	600.0	0.0	600.0	ºC

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
M0003	4x0004	Masking enable monitoring of analog channels without signal	Bit 0 - ON = Broken wire monitoring from analog input 0 of the ALC11 controller is enabled Bit 1 - ON = Broken wire monitoring of analog input 1 of the ALC11 controller is enabled Bit 2 - ON = Broken wire monitoring of analog input 2 of the ALC11 controller is enabled Bit 8 - ON = Broken wire monitoring of analog inverter input 2 is enabled	16bits/INT	0	-32768	32767	-
I/O Expansion Module Configuration								
M0036	4x0037	I/O expansion module type	0 = No expansion module 1 = HI Technology RION type expansion module	16bits/INT	0	0	100	-
M0034	4x0035	I/O expansion module address	-	16bits/INT	1	1	1000	-
M0035	4x0036	ALC11 channel identifier to be used to access the I/O expansion module	-1 = Ethernet channel 0 = COM1 serial channel 1 = COM2 serial channel 2 = COM3 serial channel	16bits/INT	0	-1	2	-
R0280	0x0281	IO Exp: Status of digital output O0 of the I/O expansion module		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0281	0x0282	IO Exp: Status of digital output O1 of the I/O expansion module		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0282	0x0283	IO Exp: Status of digital output O2 of the I/O expansion module		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0283	0x0284	IO Exp: Status of digital output O3 of the I/O expansion module		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0284	0x0285	IO Exp: Status of digital output O4 of the I/O expansion module		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0285	0x0286	IO Exp: Status of digital output O5 of the I/O expansion module		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0286	0x0287	IO Exp: Status of digital output O6 of the I/O expansion module		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0287	0x0288	IO Exp: Status of digital output O7 of the I/O expansion module		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0288	0x0289	IO Exp: Status of digital input I0 of the I/O expansion module		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0289	0x0290	IO Exp: Status of digital input I1 of the I/O expansion module		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0290	0x0291	IO Exp: Status of digital input I2 of the I/O expansion module		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0291	0x0292	IO Exp: Status of digital input I3 of the I/O expansion module		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0292	0x0293	IO Exp: Status of digital input I4 of the I/O expansion module		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0293	0x0294	IO Exp: Status of digital input I5 of the I/O expansion module		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0294	0x0295	IO Exp: Status of digital input I6 of the I/O expansion module		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0295	0x0296	IO Exp: Status of digital input I7 of the I/O expansion module		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
Alarms Configuration								
M0090	4x0091	Motor current: Alarm limit HH	-	16bits/INT	-	0	1000	A
M0091	4x0092	Motor current: Bypass time HH	-1 = disable fault checking	16bits/INT	-1	-1	32000	s
M0092	4x0093	Motor current: TRIP time HH	-	16bits/INT	-	0	32000	s

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
M0093	4x0094	Motor current: Reset time HH	-	16bits/INT	-	0	500	min
M0094	4x0095	Motor current: Maximum number of resets HH	-	16bits/INT	-	0	10	-
M0095	4x0096	Motor temperature: Alarm limit HH	-	16bits/INT	-	0	400	°C
M0096	4x0097	Motor temperature: Bypass time HH	-1 = disable fault checking	16bits/INT	-1	-1	32000	s
M0097	4x0098	Motor temperature: TRIP time HH	-	16bits/INT	-	0	32000	s
M0098	4x0099	Motor temperature: Reset time HH	-	16bits/INT	-	0	500	min
M0099	4x0100	Motor temperature: Maximum number of resets HH	-	16bits/INT	-	0	10	-
M0100	4x0101	Motor voltage: Alarm limit HH	-	16bits/INT	-	0	10000	V
M0101	4x0102	Motor voltage: Bypass time HH	-1 = disable fault checking	16bits/INT	-1	-1	32000	s
M0102	4x0103	Motor voltage: TRIP time HH	-	16bits/INT	-	0	32000	s
M0103	4x0104	Motor voltage: Reset time HH	-	16bits/INT	-	0	500	min
M0104	4x0105	Motor voltage: Maximum number of resets HH	-	16bits/INT	-	0	10	-
M0105	4x0106	Vibration: Alarm limit HH	-	16bits/INT	-	0	100	gn
M0106	4x0107	Vibration: Bypass time	-1 = disable fault checking	16bits/INT	-1	-1	7200	s
M0107	4x0108	Vibration: TRIP time	-	16bits/INT	-	0	3600	s
M0108	4x0109	Vibration: Reset time	-	16bits/INT	-	0	1200	min
M0109	4x0110	Vibration: Maximum number of resets	-	16bits/INT	-	0	10	-
M0110	4x0111	Downhole pressure: Alarm limit HH	-	16bits/INT	-	0	32000	PSI
M0111	4x0112	Downhole pressure: Bypass time HH	-1 = disable fault checking	16bits/INT	-1	-1	32000	s
M0112	4x0113	Downhole pressure: TRIP time HH	-	16bits/INT	-	0	32000	s
M0113	4x0114	Downhole pressure: Reset time HH	-	16bits/INT	-	0	500	min
M0114	4x0115	Downhole pressure: Maximum number of resets HH	-	16bits/INT	-	0	10	-
M0115	4x0116	Downhole temperature: Alarm limit HH	-	16bits/INT	-	0	5000	°C
M0116	4x0117	Downhole temperature: Bypass time HH	-1 = disable fault checking	16bits/INT	-1	-1	32000	s
M0117	4x0118	Downhole temperature: TRIP time HH	-	16bits/INT	-	0	32000	s
M0118	4x0119	Downhole temperature: Reset time HH	-	16bits/INT	-	0	500	min
M0119	4x0120	Downhole temperature: Maximum number of resets HH	-	16bits/INT	-	0	10	-
M0120	4x0121	Discharge pressure: Alarm limit HH	-	16bits/INT	-	0	32000	PSI
M0121	4x0122	Discharge pressure: Bypass time HH	-1 = disable fault checking	16bits/INT	-1	-1	32000	s
M0122	4x0123	Discharge pressure: TRIP time HH	-	16bits/INT	-	0	32000	s
M0123	4x0124	Discharge pressure: Reset time HH	-	16bits/INT	-	0	500	min
M0124	4x0125	Discharge pressure: Maximum number of resets HH	-	16bits/INT	-	0	10	-
M0125	4x0126	Active leakage current: Alarm limit HH	-	16bits/INT	-	0	3000	mA
M0126	4x0127	Active leakage current: Bypass time	-1 = disable fault checking	16bits/INT	-1	-1	7200	s
M0127	4x0128	Active leakage current: TRIP time	-	16bits/INT	-	0	32000	s
M0128	4x0129	Active leakage current: Reset time	-	16bits/INT	-	0	32000	min
M0129	4x0130	Active leakage current: Maximum number of resets	-	16bits/INT	-	0	500	-
M0130	4x0131	Passive leakage current: Alarm limit HH	-	16bits/INT	-	0	3000	mA
M0131	4x0132	Passive leakage current: Bypass time	-1 = disable fault checking	16bits/INT	-1	-1	32000	s
M0132	4x0133	Passive leakage current: TRIP time	-	16bits/INT	-	0	32000	s

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
M0133	4x0134	Passive leakage current: Reset time	-	16bits/INT	-	0	500	min
M0134	4x0135	Passive leakage current: Maximum number of resets	-	16bits/INT	-	0	10	-
M0135	4x0136	Motor temperature: Alarm limit H	-	16bits/INT	-	0	400	°C
M0136	4x0137	Motor voltage: Alarm limit LL	-	16bits/INT	-	0	10000	V
M0137	4x0138	Vibration: Alarm limit H	-	16bits/INT	-	0	100	gn
M0138	4x0139	Downhole pressure: Alarm limit H	-	16bits/INT	-	0	32000	PSI
M0139	4x0140	Downhole pressure: Alarm limit L	-	16bits/INT	-	0	32000	PSI
M0140	4x0141	Downhole pressure: Alarm limit LL	-	16bits/INT	-	0	32000	PSI
M0141	4x0142	Downhole temperature: Alarm limit H	-	16bits/INT	-	0	5000	°C
M0142	4x0143	Discharge pressure: Alarm limit H	-	16bits/INT	-	0	32000	PSI
M0143	4x0144	Discharge pressure: Alarm limit L	-	16bits/INT	-	0	32000	PSI
M0144	4x0145	Discharge pressure: Alarm limit LL	-	16bits/INT	-	0	32000	PSI
M0145	4x0146	Active leakage current: Alarm limit H	-	16bits/INT	-	0	32000	mA
M0146	4x0147	Passive leakage current: Alarm limit H	-	16bits/INT	-	0	32000	mA
M0147	4x0148	Motor current: Alarm limit H	-	16bits/INT	-	0	1000	A
M0148	4x0149	Motor voltage: Alarm limit H	-	16bits/INT	-	0	10000	V
M0149	4x0150	Motor voltage Alarm limit L	-	16bits/INT	-	0	10000	V
M0150	4x0151	Downhole pressure: Bypass time LL	-1 = disable fault checking	16bits/INT	-1	-1	32000	s
M0151	4x0152	Downhole pressure: TRIP time LL	-	16bits/INT	-	0	32000	s
M0152	4x0153	Downhole pressure: Reset time LL	-	16bits/INT	-	0	500	min
M0153	4x0154	Downhole pressure: Maximum number of resets LL	-	16bits/INT	-	0	10	-
M0154	4x0155	Discharge pressure: Bypass time LL	-1 = disable fault checking	16bits/INT	-1	-1	32000	s
M0155	4x0156	Discharge pressure: TRIP time LL	-	16bits/INT	-	0	32000	s
M0156	4x0157	Discharge pressure: Reset time LL	-	16bits/INT	-	0	500	min
M0157	4x0158	Discharge low pressure: Maximum number of resets LL	-	16bits/INT	-	0	10	-
M0158	4x0159	Motor voltage: Bypass time LL	-1 = disable fault checking	16bits/INT	-1	-1	32000	s
M0159	4x0160	Motor voltage: TRIP time LL	-	16bits/INT	-	0	32000	s
M0160	4x0161	Motor voltage: Reset time LL	-	16bits/INT	-	0	500	min
M0161	4x0162	Motor voltage: Maximum number of resets LL	-	16bits/INT	-	0	10	-
Alarms Configuration - Monitoring of the Production Line High Pressure								
M0162	4x0163	Line high pressure: By-pass time	-1 = disable fault checking	16bits/INT	0	-1	32000	s
M0163	4x0164	Line high pressure: TRIP time	-	16bits/INT	0	0	32000	s
M0164	4x0165	Line high pressure: Reset time	-	16bits/INT	0	0	500	min
M0165	4x0166	Line high pressure: Maximum reset number	-	16bits/INT	0	0	10	-
Alarms Configuration - Monitoring of the Production Line Low Pressure								
M0166	4x0167	Line low pressure: By-pass time	-1 = disable fault checking	16bits/INT	0	-1	32000	s
M0167	4x0168	Line low pressure: TRIP time	-	16bits/INT	0	0	32000	s
M0168	4x0169	Line low pressure: Reset time	-	16bits/INT	0	0	500	min
M0169	4x0170	Line low pressure: Maximum reset number	-	16bits/INT	0	0	10	-
Alarms Configuration - Monitoring of the Ground Fault								
M0047	4x0048	Ground fault: By-pass time	-1 = disable fault checking	16bits/INT	0	-1	32000	s
M0048	4x0049	Ground fault: TRIP time	-	16bits/INT	0	0	32000	s

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
M0049	4x0050	Ground fault: Reset time	-	16bits/INT	0	0	500	min
M0050	4x0051	Ground fault: Maximum reset number	-	16bits/INT	0	0	10	-
Alarms Configuration - Monitoring of the Backspin Actuated								
M0039	4x0040	Backspin actuated: By-pass time	-1 = disable fault checking	16bits/INT	0	-1	32000	s
M0040	4x0041	Backspin actuated: TRIP time	-	16bits/INT	0	0	32000	s
M0041	4x0042	Backspin actuated: Reset time	-	16bits/INT	0	0	500	min
M0042	4x0043	Backspin actuated: Maximum reset number	-	16bits/INT	0	0	10	-
Alarms Configuration - Monitoring of the Transformer Temperature								
M0043	4x0044	Transformer overtemperature: By-pass time	-1 = disable fault checking	16bits/INT	0	-1	32000	s
M0044	4x0045	Transformer overtemperature: TRIP time	-	16bits/INT	0	0	32000	s
M0045	4x0046	Transformer overtemperature: Reset time	-	16bits/INT	0	0	500	min
M0046	4x0047	Transformer overtemperature: Maximum reset number	-	16bits/INT	0	0	10	-
Alarms Configuration - Reset Counters								
M0415	4x0416	Discharge Pressure HH: Reset counter	-	16bits/INT	0	0	10	-
M0416	4x0417	Discharge Pressure LL: Reset counter	-	16bits/INT	0	0	10	-
M0417	4x0418	Downhole pressure HH: Reset counter	-	16bits/INT	0	0	10	-
M0418	4x0419	Active leakage current HH: Reset counter	-	16bits/INT	0	0	10	-
M0419	4x0420	Passive leakage current HH: Reset counter	-	16bits/INT	0	0	10	-
M0420	4x0421	Motor current HH: Reset counter	-	16bits/INT	0	0	10	-
M0421	4x0422	Motor temperature HH: Reset counter	-	16bits/INT	0	0	10	-
M0422	4x0423	Motor voltage HH: Reset counter	-	16bits/INT	0	0	10	-
M0423	4x0424	Motor voltage LL: Reset counter	-	16bits/INT	0	0	10	-
M0424	4x0425	Downhole pressure LL: Reset counter	-	16bits/INT	0	0	10	-
M0425	4x0426	Downhole temperature LL: Reset counter	-	16bits/INT	0	0	10	-
M0426	4x0427	Vibration HH: Reset counter	-	16bits/INT	0	0	10	-
M0427	4x0428	Ground fault: Reset counter	-	16bits/INT	0	0	10	-
M0428	4x0429	Line high pressure: Reset counter	-	16bits/INT	0	0	10	-
M0429	4x0430	Line low pressure: Reset counter	-	16bits/INT	0	0	10	-
M0430	4x0431	Transformer overtemperature: Reset counter	-	16bits/INT	0	0	10	-
M0432	4x0433	Backspin actuated: Reset counter	-	16bits/INT	0	0	10	-
Controller Data								
R0164	0x0165	Operation mode status	OFF = Manual ON = Automatic	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0170	0x0171	Rocking start test status	OFF = Out of routine ON = Running test routine	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0171	0x0172	Rocking start test	OFF = Pump rocking start test FAILED. ON = Pump rocking start test SUCCESSFULLY	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0172	0x0173	System warm-up status	OFF = Out of warm up ON = System warm up	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
R0173	0x0174	Status of execution of special actuation routines in the inverter	OFF = Not executing special actuation routines on the inverter ON = In execution of special actuation routines in the inverter	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0174	0x0175	Default parameter configuration file processing status	OFF = Not processing ON = Processing	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0177	0x0178	Number of rocking start made by the system over time	OFF = Rocking start attempts released ON = You have reached the maximum number of rocking start attempts per time	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0181	0x0182	RION status	OFF = RION off-line, in the last communication cycle ON = RION on-line, in the last communication cycle	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0182	0x0183	System fault or alarm	OFF = System operating in normal condition ON = There is fault or alarm in the system	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0183	0x0184	Local / remote selection status	OFF = Pulse button ON = Key	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0184	0x0185	Undercurrent curve configuration status	ON = Custom undercurrent level OFF = Standard undercurrent level	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0185	0x0186	Pump rocking start status	OFF = pump rocking start routine not activated ON = pump rocking start routine activated	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
M0277	4x0278	Bit-mapped status map (R0164...R0179)	Bit 0 - ON = Operation mode in Automatic Bit 1 ... 5 = Reserve Bit 6 - ON = In pump rocking start test procedure Bit 7 - ON = Pump rocking start test SUCCESSFUL Bit 8 - ON = In system warm up Bit 9 - ON = In execution of special actuation routines in the inverter Bit 10 - ON = Processing default parameter configuration file Bit 11 ... 12 = Reserve Bit 13 - ON = You have reached the maximum number of rocking start attempts per time Bit 14 ... 15 = Reserve	16bits/INT	0	-32768	32767	-
M0278	4x0279	Bit-mapped status map (R0180...R0195)	0 = Reserve Bit 1 - ON Online I/O RION expansion module in the last communication cycle Bit 2 - ON = System failure or alarm Bit 3 - ON = Local / remote selection DI programmed for key Bit 4 - ON = Custom undercurrent level Bit 5 - ON = Pump rocking start routine activated Bit 6 ... 15 = Reserve	16bits/INT	0	-32768	32767	-

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
Status I/O								
M0301	4x0302	Internal state of the bit-mapped R digital I/Os (R0551 – R0566)	Bit 0 DI - ON = Backspin relay not actuated (WITHOUT TRIP) Bit 1 DI – ON = No alarm / External fault Bit 2 DI – ON = Start pump for operation in LOCAL mode Bit 3 DI – ON = Button to reset the fault reset counters Bit 4 DI - ON = Emergency not pressed Bit 5 DI - ON = Remote operating mode Bit 6 DI - ON = No line underpressure Bit 7 DI - ON = With line overpressure Bit 8 DI - ON = No fault of ground fault by SubCoe (TRIP) Bit 9 DI - ON = No lift transformer over temperature fault (TRIP) Bit 10 DI - ON = Automatic mode key / button Bit 11 Reserve Bit 12 DI - ON = Does not stop pump for operation in LOCAL mode Bit 13 ... 15 = Reserve	16bits/INT	0	-32768	32767	-
M0302	4x0303	Internal state of the bit-mapped R digital I/Os (R0567– R0582)	Bit 0 DO - Automatic mode selected Bit 1 DO - Acoustic alarm (start) Bit 2 DO - Reset Backspin relay Bit 3 DO – Running in remote Bit 4 ... 7 Reserve Bit 8 DO - O8 (RL1 CFW11) Bit 9 DO - O9 (RL2 CFW11) Bit 10 DO - O10 (RL3 CFW11) Bit 11 ... 13 = Reserve Bit 14 DO - Fault signaling via digital output LED Bit 15 DO - Operating mode panel lamp signaling	16bits/INT	0	-32768	32767	-
R0551	0x0552	DI - Backspin Relay tripped (TRIP)		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0552	0x0553	DI – Alarm/External Fault		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0553	0x0554	DI – Start Button (ON) for LOCAL mode operation		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0554	0x0555	DI – Button to reset the fault reset counters		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0555	0x0556	DI - Emergency	OFF = Disabled ON = Enabled	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0556	0x0557	DI - Switch or button	OFF = Local ON = Remote	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0557	0x0558	DI - Line underpressure		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0558	0x0559	DI - Line overpressure		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0559	0x0560	DI - Ground Fault by Subcoe (TRIP)		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0560	0x0561	DI - Step-up transformer overtemperature fault (TRIP)		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0561	0x0562	DI - Automatic mode switch/button (ON) / Manual (OFF)		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
R0563	0x0563	DI - OFF button for LOCAL mode operation		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0567	0x0567	DO - Automatic mode selected		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0568	0x0568	DO - Acoustic alarm (start)		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0569	0x0569	DO - Backspin relay reset		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0570	0x0570	DO – Running in Remote		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0575	0x0575	DO - O8 (RL1 CFW11)		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0576	0x0576	DO - O9 (RL2 CFW11)		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0577	0x0577	DO - O10 (RL3 CFW11)		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0581	0x0581	DO - Fault signaling via digital output LED		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0582	0x0582	DO - Lamp signaling of the operation mode panel		8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
M0304	4x0305	AO – CFW11 AO1	-	16bits/INT	0	-32768	32767	-
M0305	4x0307	AO – CFW11 AO2	-	16bits/INT	0	-32768	32767	-
M0307	4x0308	AI – Downhole pressure	-	16bits/INT	0	-32768	32767	-
M0308	4x0309	AI – Downhole temperature	-	16bits/INT	0	-32768	32767	-
M0309	4x0310	AI – Temperature PT100 1	-	16bits/INT	0	-32768	32767	-
M0310	4x0311	AI – Temperature PT100 2	-	16bits/INT	0	-32768	32767	-
M0311	4x0312	AI – Temperature PT100 3	-	16bits/INT	0	-32768	32767	-
M0312	4x0314	AI – Load cell	-	16bits/INT	0	-32768	32767	-
M0314	4x0318	AI – Motor temperature	-	16bits/INT	0	-32768	32767	-
M0318	4x0319	AI – Flow	-	16bits/INT	0	-32768	32767	-
M0319	4x0320	AI – Reserve, Speed reference	-	16bits/INT	0	-32768	32767	-
Base of Alerts and Alarms								
M0273	4x0274	Bit-mapped status map (R0132...R0147)	Bit 0 - Invalid parameters Bit 1 - Invalid RTC Bit 2 - Reserve Bit 3 - Communication with downhole sensor with consecutive faults Bit 4 – Pump configuration or transformation ratio are inconsistent (P400, P401, P238, P156, P157 or P158) Bit 5...13 - Reserve Bit 14 - Motor undercurrent alert Bit 15 - Reserve	16bits/INT	0	-32768	32767	-
M0274	4x0275	Bit-mapped status map (R0148...R0163)	Bit 0 - Heavy pump alarm Bit 1...3 - Reserve Bit 4 - Flow Alarm L Bit 5 - Flow Alarm H Bit 6 - Alarm PT100 1 Bit 7 - Alarm PT100 2 Bit 8 - Alarm PT100 3 Bit 9 - Broken wire error on analog channels Bit 10 - ALC11 I / O module failure: WCP110, WIO110, CFW110 Bit 11 – Motor current H Bit 12 – Motor voltage H Bit 13 – Motor voltage L Bit 14...15 - Reserve	16bits/INT	0	-32768	32767	-

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
M0275	4x0276	Bit-mapped status map (R0100..R0115)	Bit 0 ... 3 - Reserve Bit 4 - Line pressure too high (HH) (digital) Bit 5 - Line pressure too low (LL) (digital) Bit 6 - Frequency inverter access via DPRAM failed Bit 7 - Locked pump fault Bit 8 - Motor undercurrent fault Bit 9 - Ground fault Bit 10 - Transformer thermal protection fault Bit 11 - External fault Bit 12 - Flow Fault LL Bit 13 - Flow Fault HH Bit 14 - Backspin tripped fault Bit 15 - Motor overload fault	16bits/INT	0	-32768	32767	-
M0276	4x0277	Bit-mapped status map (R0116..R0131)	Bit 0 - Pump rocking start fault Bit 1 - DC link undervoltage fault Bit 2 - Motor current fault HH Bit 3 - Motor temperature fault HH Bit 4 - Motor voltage fault HH Bit 5 - Motor voltage fault LL Bit 6 - Downhole pressure fault LL Bit 7 - Downhole temperature fault HH Bit 8 - Controller battery fault Bit 9 - ALC11 controller hardware fault Bit 10 - ALC11 ladder application internal fault Bit 11 - SDCARD not detected Bit 12 - SDCARD access fault Bit 13 - Fault PT100 1 Bit 14 - Fault PT100 2 Bit 15 - Fault PT100 3	16bits/INT	0	-32768	32767	-
M0325	4x0326	Bit-mapped status map (R0316..R0331)	Bit 0 - Discharge pressure H Bit 1 - Discharge pressure L Bit 2 - Downhole pressure H Bit 3 - Downhole pressure L Bit 4 - Downhole temperature H Bit 5 - Motor temperature H Bit 6 - Active leakage current H Bit 7 - Passive leakage current H Bit 8 - Vibration H Bit 9 ... 15 - Reserve	16bits/INT	0	-32768	32767	-

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
M0326	4x0327	Bit-mapped status map (R0300..R0315)	Bit 0 - Discharge pressure fault HH Bit 1 - Discharge pressure fault LL Bit 2 - Downhole pressure fault HH Bit 3 - Active leakage current fault HH Bit 4 - Passive leakage current fault HH Bit 5 - Vibration fault HH Bit 6... 14 - Reserve Bit 15 - Downhole sensor analog channel failure	16bits/INT	0	-32768	32767	-
Controller Status								
R0230	0x0231	Inverter alarm status	OFF = No alarm ON = VSD with alarm	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0231	0x0232	Inverter undervoltage status	OFF = No undervoltage ON = VSD with undervoltage	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0232	0x0233	Inverter operating mode status	OFF = Local mode ON = Remote mode	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0233	0x0234	Inverter failure status	OFF = No fault ON = VSD with fault	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0234	0x0235	Inverter status in operation	OFF = Motor stopped ON = Motor running	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0235	0x0236	Motor rotation direction status	OFF = Reverse run ON = Forward run	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
R0236	0x0237	Inverter enable status	OFF = Disabled ON = Enabled	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
M0320	4x0321	Remote control mode status	0 = Local 1 = Manual 2 = Automatic	16bits/INT	0	0	2	-
M0321	4x0322	Well production status	0 = Not defined 1 = Stopped 2 = Producing 3 = Waiting power-up 4 = Rocking start routine 12 = Acoustic alarm to start the pump 20 = Starting 21 = Stopping 22 = With fault 23 = Emergency acted	16bits/INT	0	0	23	-
Controller Commands								
R0268	0x0269	Command to Resets faults and clears fault reset counter	OFF = No function ON = Reset	8bits/Bool	0 (OFF)	0 (OFF)	1 (ON)	-
Controller Date and Time								
M2074	4x2075	Current month day	-	16bits/INT	-	1	31	-
M2075	4x2076	Current month	-	16bits/INT	-	1	12	-
M2076	4x2077	Current year	-	16bits/INT	-	1980	2047	-
M2077	4x2078	Current hour	-	16bits/INT	-	0	23	-
M2078	4x2079	Current minutes	-	16bits/INT	-	0	59	-
M2079	4x2080	Current seconds	-	16bits/INT	-	0	59	-
Alarm Code								
P0048	4x8049	Present alarm	< 700, consult the CFW11 user manual > 700, check the fault and alarm table in this manual	16bits/INT	0	0	9999	-

Quick Reference of Parameters / Communication Table

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
Fault Code								
P0049	4x8050	Present fault	-< 700, consult the CFW11 user manual > 700, check the fault and alarm table in this manual	16bits/INT	0	0	9999	-
CFW11 Parameters								
P0000	4x8000	Access to Parameters	-	16bits/INT	0	0	9999	-
P0001	4x8001	Speed Reference	-	16bits/INT	RO	0	18000	RPM
P0002	4x8002	Motor Speed	-	16bits/INT	RO	0	18000	RPM
P0003	4x8003	Motor Current	-	16bits/INT	RO	0	4500.0	A
P0004	4x8004	DC-Link Voltage	-	16bits/INT	RO	0	2000	V
P0005	4x8005	Motor Frequency	-	16bits/INT	RO	0	1020.0	HZ
P0006	4x8006	Status Drive	0 = Ready 1 = Run 2 = Undervoltage 3 = Fault 4 = Self-Tuning 5 = Settings 6 = DC Braking 7 = STO	16bits/INT	RO	0	28	-
P0007	4x8007	Motor Voltage	-	16bits/INT	RO	0	2000	V
P0009	4x8009	Motor Torque	-	16bits/INT	RO	-1000.0	1000.0	%
P0010	4x8010	Output Power	-	16bits/INT	RO	0	6553.5	KW
P0011	4x8011	Output cos ϕ	-	16bits/INT	RO	0	1.00	-
P0012	4x8012	DI8 to DI1 Status	Bit 0 = DI1 Bit 1 = DI2 Bit 2 = DI3 Bit 3 = DI4 Bit 4 = DI5 Bit 5 = DI6 Bit 6 = DI7 Bit 7 = DI8	16bits/INT	RO	-	-	-
P0013	4x8013	DO5 to DO1 Status	Bit 0 = DO1 Bit 1 = DO2 Bit 2 = DO3 Bit 3 = DO4 Bit 4 = DO5	16bits/INT	RO	-	-	-
P0014	4x8014	AO1 Value	-	16bits/INT	RO	0	100.00	%
P0015	4x8015	AO2 Value	-	16bits/INT	RO	0	100.00	%
P0016	4x8016	AO3 Value	-	16bits/INT	RO	-100.00	100.00	%
P0017	4x8017	AO4 Value	-	16bits/INT	RO	-100.00	100.00	%
P0018	4x8018	AI1 Value	-	16bits/INT	RO	-100.00	100.00	%
P0019	4x8019	AI2 Value	-	16bits/INT	RO	-100.00	100.00	%
P0020	4x8020	AI3 Value	-	16bits/INT	RO	-100.00	100.00	%
P0021	4x8021	AI4 Value	-	16bits/INT	RO	-100.00	100.00	%
P0023	4x8023	Software Version	45.20	16bits/INT	RO	0	655.35	
P0025	4x8025	DI16 to DI9 Status	Bit 0 = DI9 Bit 1 = DI10 Bit 2 = DI11 Bit 3 = DI12 Bit 4 = DI13 Bit 5 = DI14 Bit 6 = DI15 Bit 7 = DI16	16bits/INT	RO	–	–	-

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
P0026	4x8026	DO13 to DO6 Status	Bit 0 = DO6 Bit 1 = DO7 Bit 2 = DO8 Bit 3 = DO9 Bit 4 = DO10 Bit 5 = DO11 Bit 6 = DO12 Bit 7 = DO13	16bits/INT	RO	–	–	-
P0027	4x8027	Accessories 1 Settings	-	-	RO	0000h	FFFFh	-
P0028	4x8028	Accessories 2 Settings	-	-	RO	0000h	FFFFh	-
P0029	4x8029	IGBTs U Temperature	Bit 0 to 5 = Rated Current Bit 6 and 7 = Rated Voltage Bit 8 = EMC Filter Bit 9 = Safety relay Bit 10 = (0)24 V / (1) DC Link Bit 11 = DC special Hw Bit 12 = IGBT Braking Bit 13 = Special Bits 14 and 15 = Reserved	16bits/INT	RO	–	–	-
P0030	4x8030	IGBTs V Temperature	-	16bits/INT	RO	-20.0	-150.0	ºC
P0031	4x8031	IGBTs W Temperature	-	16bits/INT	RO	-20.0	-150.0	ºC
P0032	4x8032	Rectifier Temperature	-	16bits/INT	RO	-20.0	-150.0	ºC
P0033	4x8033	Internal Air Temperature	-	16bits/INT	RO	-20.0	-150.0	ºC
P0034	4x8034	Air temperature control	-	16bits/INT	RO	-20.0	-150.0	ºC
P0035	4x8035	Fan Speed	-	16bits/INT	RO	-20.0	-150.0	ºC
P0036	4x8036	Motor Overload	-	16bits/INT	RO	0	15000	RPM
P0037	4x8037	Encoder Speed	-	16bits/INT	RO	0	100.00	%
P0038	4x8038	Encoder Pulse Counter	-	16bits/INT	RO	0	65535	RPM
P0039	4x8039	PID Process Variable	-	16bits/INT	RO	0	40000	RPM
P0040	4x8040	PID Setpoint Value	-	16bits/INT	RO	0	100.00	%
P0041	4x8041	Hours Energized	-	16bits/INT	RO	0	100.00	%
P0042	4x8042	Hours Enabled	-	16bits/INT	RO	0	65535	h
P0043	4x8043	kWh Counter	-	16bits/INT	RO	0	65535	h
P0044	4x8044	Fan Running Hours	-	16bits/INT	RO	0	65535	kWh
P0045	4x8045	Present Alarm	-	16bits/INT	RO	0	65535	h
P0048	4x8048	Present Fault	-	16bits/INT	RO	0	999	-
P0049	4x8049	Last Fault	-	16bits/INT	RO	0	999	-
P0050	4x8050	Last Fault Day/Month	-	16bits/INT	RO	0	999	-
P0051	4x8051	Last Fault Year	-	16bits/INT	RO	00/00	31/12	-
P0052	4x8052	Last Fault Time	-	16bits/INT	RO	00	99	-
P0053	4x8053	Second Fault	-	16bits/INT	RO	00:00	23:59	-
P0054	4x8054	Second Fault Day/Month	-	16bits/INT	RO	0	999	-
P0055	4x8055	Second Fault Year	-	16bits/INT	RO	00/00	31/12	-
P0056	4x8056	Second Fault Time	-	16bits/INT	RO	00	99	-
P0057	4x8057	Third Fault	-	16bits/INT	RO	00:00	23:59	-
P0058	4x8058	Third Fault Day/Month	-	16bits/INT	RO	0	999	-
P0059	4x8059	Third Fault Year	-	16bits/INT	RO	00/00	31/12	-
P0060	4x8060	Third Fault Time	-	16bits/INT	RO	00	99	-
P0061	4x8061	Fourth Fault	-	16bits/INT	RO	00:00	23:59	-
P0062	4x8062	Fourth Fault Day/Month	-	16bits/INT	RO	0	999	-
P0063	4x8063	IGBTs U Temperature	-	16bits/INT	RO	00/00	31/12	-

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
P0064	4x8064	Fourth Fault Year	-	16bits/INT	RO	00	99	-
P0065	4x8065	Fourth Fault Time	-	16bits/INT	RO	00:00	23:59	-
P0066	4x8066	Fifth Fault	-	16bits/INT	RO	0	999	-
P0067	4x8067	Fifth Fault Day/Month	-	16bits/INT	RO	00/00	31/12	-
P0068	4x8068	Fifth Fault Year	-	16bits/INT	RO	00	99	-
P0069	4x8069	Fifth Fault Time	-	16bits/INT	RO	00:00	23:59	-
P0070	4x8070	Sixth Fault	-	16bits/INT	RO	0	999	-
P0071	4x8071	Sixth Fault Day/Month	-	16bits/INT	RO	00/00	31/12	-
P0072	4x8072	Sixth Fault Yearth	-	16bits/INT	RO	00	99	-
P0073	4x8073	Sixth Fault Time	-	16bits/INT	RO	00:00	23:59	-
P0074	4x8074	Seventh Fault	-	16bits/INT	RO	0	999	-
P0075	4x8075	Seventh Fault Day/Month	-	16bits/INT	RO	00/00	31/12	-
P0076	4x8076	Seventh Fault Year	-	16bits/INT	RO	00	99	-
P0077	4x8077	Seventh Fault Time	-	16bits/INT	RO	00:00	23:59	-
P0078	4x8078	Eighth Fault	-	16bits/INT	RO	0	999	-
P0079	4x8079	Eighth Fault Day/Month	-	16bits/INT	RO	00/00	31/12	-
P0800	4x8080	Eighth Fault Year	-	16bits/INT	RO	00	99	-
P0081	4x8081	Eighth Fault Time	-	16bits/INT	RO	00:00	23:59	-
P0082	4x8082	Ninth Fault	-	16bits/INT	RO	0	999	-
P0083	4x8083	Ninth Fault Day/Month	-	16bits/INT	RO	00/00	31/12	-
P0084	4x8084	Ninth Fault Year	-	16bits/INT	RO	00	99	-
P0085	4x8085	Ninth Fault Time	-	16bits/INT	RO	00:00	23:59	-
P0086	4x8086	Tenth Fault	-	16bits/INT	RO	0	999	-
P0087	4x8087	Tenth Fault Day/Month	-	16bits/INT	RO	00/00	31/12	-
P0088	4x8088	Tenth Fault Year	-	16bits/INT	RO	00	99	-
P0089	4x8089	Tenth Fault Time	-	16bits/INT	RO	00:00	23:59	-
P0090	4x8090	Last Fault Current	-	16bits/INT	RO	0	4000.0	A
P0091	4x8091	Last Fault DC Link	-	16bits/INT	RO	0	2000	V
P0092	4x8092	Last Fault Speed	-	16bits/INT	RO	0	18000	RPM
P0093	4x8093	Last Fault Reference	-	16bits/INT	RO	0	18000	RPM
P0094	4x8094	Last Fault Frequency	-	16bits/INT	RO	0	1020.0	Hz
P0095	4x8095	Last Fault Motor Voltage	-	16bits/INT	RO	0	2000	V
P0096	4x8096	Last Fault DIx Status	Bit 0 = DI1 Bit 1 = DI2 Bit 2 = DI3 Bit 3 = DI4 Bit 4 = DI5 Bit 5 = DI6 Bit 6 = DI7 Bit 7 = DI8	16bits/INT	RO	-	-	-
P0097	4x8097	Last Fault DOx Status	Bit 0 = DO1 Bit 1 = DO2 Bit 2 = DO3 Bit 3 = DO4 Bit 4 = DO5	16bits/INT	RO	-	-	-
P0100	4x8100	Acceleration Time	-	16bits/INT	20.0	0	999.0	s
P0101	4x8101	Deceleration Time	-	16bits/INT	20.0	0	999.0	s
P0102	4x8102	2nd Ramp Acceleration Time	-	16bits/INT	20.0	0	999.0	s
P0103	4x8103	2nd Ramp Deceleration Time	-	16bits/INT	20.0	0	999.0	s

Quick Reference of Parameters / Communication Table

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
P0104	4x8104	S Ramp	0 = Inactive 1 = 50 % 2 = 100 %	16bits/INT	0	-	-	-
P0105	4x8105	1st/2nd Ramp Selection	0 = 1st Ramp 1 = 2nd Ramp 2 = DIx 3 = Serial/USB 4 = Anybus-CC 5 = CANop/DNet/DP 6 = Reserved 7 = ALC11	16bits/INT	2	-	-	-
P0120	4x8120	Speed Reference Backup	0 = Inactive 1 = Active	16bits/INT	1	-	-	-
P0121	4x8121	Reference via HMI	-	16bits/INT	90	0	18000	RPM
P0122	4x8122	JOG/JOG+ Reference	-	16bits/INT	150	0	18000	RPM
P0123	4x8123	JOG- Reference	-	16bits/INT	150	0	18000	RPM
P0124	4x8124	Multispeed Reference 1	-	16bits/INT	90	0	18000	RPM
P0125	4x8125	Multispeed Reference 2	-	16bits/INT	300	0	18000	RPM
P0126	4x8126	Multispeed Reference 3	-	16bits/INT	600	0	18000	RPM
P0127	4x8127	Multispeed Reference 4	-	16bits/INT	900	0	18000	RPM
P0128	4x8128	Multispeed Reference 5	-	16bits/INT	1200	0	18000	RPM
P0129	4x8129	Multispeed Reference 6	-	16bits/INT	1500	0	18000	RPM
P0130	4x8130	Multispeed Reference 7	-	16bits/INT	1800	0	18000	RPM
P0131	4x8131	Multispeed Reference 8	-	16bits/INT	1650	0	18000	RPM
P0132	4x8132	Maximum Overspeed Level	-	16bits/INT	10	0	100	%
P0133	4x8133	Minimum Speed	-	16bits/INT	90	0	18000	RPM
P0134	4x8134	Maximum Speed	-	16bits/INT	1800	0	18000	RPM
P0135	4x8135	Maximum Output Current	-	16bits/INT	1,5 x Inom-ND	0	3420.0	A
P0136	4x8136	Manual Torque Boost	-	16bits/INT	-	0	9	-
P0137	4x8137	Automatic Torque Boost	-	16bits/INT	0,00	0	1.00	-
P0138	4x8138	Slip Compensation	-	16bits/INT	0,0	-10.0	10.0	%
P0139	4x8139	Output Current Filter	-	16bits/INT	0,2	0	16.0	s
P0140	4x8140	Adaptation Time	-	16bits/INT	0,0	0	10	s
P0141	4x8141	Adaptation Speed	-	16bits/INT	90	0	300	RPM
P0142	4x8142	Maximum Output Voltage	-	16bits/INT	100,0	0	100.0	%
P0143	4x8143	Intermediate Output Voltage	-	16bits/INT	50,0	0	100.0	%
P0144	4x8144	3Hz Output Voltage	-	16bits/INT	8,0	0	100.0	%
P0145	4x8145	Field Weakening Start Speed	-	16bits/INT	1800	0	18000	RPM
P0146	4x8146	Intermediate Speed	-	16bits/INT	900	0	18000	RPM
P0150	4x8150	Ud V/f Regulation Type	0 = Ramp Hold 1 = Ramp Acceleration	16bits/INT	0	-	-	-
P0151	4x8151	Ud V/f Regul. Level	-	16bits/INT	-	339	1200	V
P0152	4x8152	Ud Regul. Prop. Gain	-	16bits/INT	1,50	0	9.99	-
P0153	4x8153	Dynamic Braking Level	-	16bits/INT	-	339	1200	V
P0154	4x8154	Dynamic Braking Resistor	-	16bits/INT	0,0	0	500.0	ohm
P0155	4x8155	Dyn. Braking Resist. Power	-	16bits/INT	2,60	0.02	650.0	kW
P0156	4x8156	Overload Current 100%	-	16bits/INT	1,05 x Inom-ND	0	2565.0	A
P0157	4x8157	Overload Current 50%	-	16bits/INT	0,9 x Inom-ND	0	2565.0	A
P0158	4x8158	Overload Current 5%	-	16bits/INT	0,65 x Inom-ND	0	2565.0	A

Quick Reference of Parameters / Communication Table

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
P0159	4x8159	Motor Thermal Class	0 = Class 5 1 = Class 10 2 = Class 15 3 = Class 20 4 = Class 25 5 = Class 30 6 = Class 35 7 = Class 40 8 = Class 45	16bits/INT	1	-	-	-
P0160	4x8160	Speed Regul. Setting	0 = Normal 1 = Saturated	16bits/INT	0	-	-	-
P0161	4x8161	Speed Prop. Gain	-	16bits/INT	7,0	0	63.9	-
P0162	4x8162	Speed Integral Gain	-	16bits/INT	0,005	0	9.999	-
P0163	4x8163	LOC Reference Offset	-	16bits/INT	0	-999	999	-
P0164	4x8164	REM Reference Offset	-	16bits/INT	0	-999	999	-
P0165	4x8165	Speed Filter	-	16bits/INT	0,012	0.012	1.000	s
P0166	4x8166	Speed Diff. Gain	-	16bits/INT	0,00	0	7.99	-
P0167	4x8167	Current Proportional Gain	-	16bits/INT	0,5	0	1.99	-
P0168	4x8168	Current Integral Gain	-	16bits/INT	0,010	0	1.999	-
P0169	4x8169	Maximum Torque Current +	-	16bits/INT	125,0	0	350.0	%
P0170	4x8170	Maximum Torque Current -	-	16bits/INT	125,0	0	350.0	%
P0171	4x8171	Torque Current + at Nmap	-	16bits/INT	125,0	0	350.0	%
P0172	4x8172	Torque Current - at Nmap	-	16bits/INT	125,0	0	350.0	%
P0173	4x8173	Max Torque Curve Type	0 = Ramp 1 = Step	16bits/INT	-	-	-	-
P0175	4x8175	Flux Proportional Gain	-	16bits/INT	2,0	0	31.9	-
P0176	4x8176	Flux Integral Gain	-	16bits/INT	0,020	0	9.999	-
P0178	4x8178	Rated Flux	-	16bits/INT	100	0	120	%
P0180	4x8180	Qi* after the I/f	-	16bits/INT	10	0	350	%
P0181	4x8181	Magnetization Mode	0 = General Enable 1 = Run/Stop	16bits/INT	0	-	-	-
P0182	4x8182	Speed for I/F Activation	-	16bits/INT	18	0	90	RPM
P0183	4x8183	Current in I/F Mode	-	16bits/INT	1	0	9	
P0184	4x8184	DC Link Regul. Mode	0 = With losses 1 = Without losses 2 = Enable/Disab. DIx	16bits/INT	1	-	-	-
P0185	4x8185	Ud Regulation Level	-	16bits/INT	-	339	1200	V
P0186	4x8186	Ud Proportional Gain	-	16bits/INT	18,0	0	63.9	-
P0187	4x8187	Ud Integral Gain	-	16bits/INT	0,002	0	9.999	-
P0188	4x8188	Output V. Prop. Gain	-	16bits/INT	0,200	0	7.999	-
P0189	4x8189	Output V. Integ. Gain	-	16bits/INT	0,001	0	7.999	-
P0190	4x8190	Maximum Output Voltage	-	16bits/INT	P0400	0	690	V
P0191	4x8191	Encoder Zero Search	0 = Inactive 1 = Active	16bits/INT	0	-	-	-
P0192	4x8192	Encoder Zero Search Status	0 = Inactive 1 = Concluded	16bits/INT	0	0	1	-
P0200	4x8200	Password	0 = Inactive 1 = Active 2 = Change password	16bits/INT	1	0	2	-

Quick Reference of Parameters / Communication Table

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
P0201	4x8201	Language	0 = Português 1 = English 2 = Español 3 = Deutsch 4 = Français	16bits/INT	0	0	4	-
P0202	4x8202	Control type	0 = V/f 60Hz 1 = V/f 50Hz 2 = V/f Adjustable 3 = Sensorless 4 = Encoder 5 = VVW 6 = PM with Encoder 7 = PM Sensorless	16bits/INT	0	0	7	-
P0203	4x8203	Special Function Selection	0 = None 1 = PID Controller	16bits/INT	0	0	1	-
P0204	4x8204	Load/Save Parameters	0 = Not Used 1 = Not Used 2 = Reset P0045 3 = Reset P0043 4 = Reset P0044 5 = Load WEG 60Hz 6 = Load WEG 50Hz 7 = Load User 1 8 = Load User 2 9 = Load User 3 10 = Save User 1 11 = Save User 2 12 = Save User 3	16bits/INT	0	0	12	-

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
P0205	4x8205	Read Parameter Sel. 1	0 = Inactive 1 = Speed Reference # 2 = Motor Speed # 3 = Motor Current # 4 = DC Link Voltage # 5 = Motor frequency# 6 = Output Voltage # 7 = Motor Torque # 8 = Output Power# 9 = Process Var. # 10 = PID Setpoint # 11 = Speed Reference - 12 = Motor Speed - 13 = Motor Current - 14 = DC Link Voltage - 15 = Motor Frequency- 16 = Output Voltage - 17 = Motor Torque - 18 = Output Power# 19 = Process Var. - 20 = PID Setpoint - 21 = Reserved P1010 # 22 = Reserved P1011 # 23 = Reserved P1012 # 24 = Reserved P1013 # 25 = Reserved P1014 # 26 = Reserved P1015 # 27 = Reserved P1016 # 28 = Reserved P1017 # 29 = Reserved P1018 # 30 = Reserved P1019 # 31 = ALC11 P1300 # 32 = ALC11 P1301 # 33 = ALC11 P1302 # 34 = ALC11 P1303 # 35 = ALC11 P1304 # 36 = ALC11 P1305 # 37 = ALC11 P1306 # 38 = ALC11 P1307 # 39 = ALC11 P1308 # 40 = ALC11 P1309 # 41 = ALC11 Operating Mode	16bits/INT	2	0	40	-
P0206	4x8206	Read Parameter Sel. 2	See options in P0205	16bits/INT	3	0	40	-
P0207	4x8207	Read Parameter Sel. 3	See options in P0205	16bits/INT	41	0	41	-
P0208	4x8208	Ref. Scale Factor	-	16bits/INT	1800	0	18000	-
P0209	4x8209	Ref. Eng. Unit 1	-	16bits/INT	114	32	127	-
P0210	4x8210	Ref. Eng. Unit 2	-	16bits/INT	112	32	127	-
P0211	4x8211	Ref. Eng. Unit 3	-	16bits/INT	109	32	127	-
P0212	4x8212	Ref. Indication Form	0 = wxyz 1 = wxy.z 2 = wx.yz 3 = w.xyz	16bits/INT	0	0	3	-
P0213	4x8213	Full Scale Reading 1	-	16bits/INT	100,0	0	200.0	%
P0214	4x8214	Full Scale Reading 2	-	16bits/INT	100,0	0	200.0	%
P0215	4x8215	Full Scale Reading 3	-	16bits/INT	100,0	0	200.0	%
P0216	4x8216	HMI Display Contrast	-	16bits/INT	27	0	37	-

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
P0217	4x8217	Zero Speed Disable	0 = off 1= on (N* and N) 2 = on (N*)	16bits/INT	0	0	2	-
P0218	4x8218	Zero Speed Dis. Output	0 = Reference or Speed 1 = Reference	16bits/INT	0	0	1	-
P0219	4x8219	Zero Speed Time	-	16bits/INT	0	0	999	s
P0220	4x8220	LOC/REM Selection Source	0 = Always LOC 1 = Always REM 2 = LR Key (LOC) 3 = LR Key (REM) 4 = DIx 5 = Serial/USB LOC 6 = Serial/USB REM 7 = Anybus-CC LOC 8 = Anybus-CC REM 9 = CO/DN/DP LOC 10 = CO/DN/DP REM 11 = Reserved LOC 12 = Reserved REM 13 = ALC11 LOC 14 = ALC11 REM	16bits/INT	2	0	14	-
P0221	4x8221	LOC Reference Selection	0 = HMI 1 = AI1 2 = AI2 3 = AI3 4 = AI4 5 = Sum AIs > 0 6 = Sum AIs 7 = E.P. 8 = Multispeed 9 = Serial/USB 10 = Anybus-CC 11 = CANop/DNet/DP 12 = Reserved 13 = ALC11	16bits/INT	0	0	13	-
P0222	4x8222	REM Reference Selection	See options in P0221	16bits/INT	1	0	13	-
P0223	4x8223	LOC FWD/REV Selection	0 = Forward 1 = Reverse 2 = FR Key (FWD) 3 = FR Key (REV) 4 = DIx 5 = Serial/USB (FWD) 6 = Serial/USB (REV) 7 = Anybus-CC (FWD) 8 = Anybus-CC (REV) 9 = CO/DN/DP (FWD) 10 = CO/DN/DP (REV) 11 = Polarity AI4 12 = Reserved (FWD) 13 = Reserved (REV) 14 = Polarity AI2 15 = ALC11 (FWD) 16 = ALC11 (REV)	16bits/INT	2	0	16	-

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
P0224	4x8224	LOC Run/Stop Selection	0 = I,O Keys 1 = DIx 2 = Serial/USB 3 = Anybus-CC 4 = CANop/DNet/DP 5 = Reserved 6 = ALC11	16bits/INT	0	0	6	-
P0225	4x8225	JOG LOC Selection	0 = Inactive 1 = JOG key 2 = DIx 3 = Serial/USB 4 = Anybus-CC 5 = CANop/DNet/DP 6 = Reserved 7 = ALC11	16bits/INT	1	0	7	-
P0226	4x8226	REM FWD/REV Selection	See options in P0223	16bits/INT	4	0	16	-
P0227	4x8227	REM Run/Stop Selection	See options in P0224	16bits/INT	1	0	6	-
P0228	4x8228	REM JOG Selection	See options in P0225	16bits/INT	2	0	7	-
P0229	4x8229	Stop Mode Selection	0 = By Ramp 1 = By Inertia 2 = Quick Stop 3 = By Ramp Iq=0 4 = Quick Stop Iq=0	16bits/INT	0	0	4	-
P0230	4x8230	Dead Zone (AIs)	0 = Inactive 1 = Active	16bits/INT	0	0	1	-
P0231	4x8231	AI1 Signal Function	0 = Speed Reference 1 = N* without Ramp 2 = Max. Torque Current 3 = Process Var. 4 = PTC 5 = Not Used 6 = Not Used 7 = ALC Use	16bits/INT	0	0	7	-
P0232	4x8232	AI1 Gain	-	16bits/INT	1,000	0	9.999	-
P0233	4x8233	AI1 Input Signal	0 = 0 to 10 V/20 mA 1 = 4 to 20 mA 2 = 10 V/20 mA to 0 3 = 20 to 4 mA	16bits/INT	0	0	3	-
P0234	4x8234	AI1 Offset	-	16bits/INT	0,00	-100.00	100.00	%
P0235	4x8235	AI1 Filter	-	16bits/INT	0,00	0	16.00	s
P0236	4x8236	AI2 Signal Function	0 = Speed Reference 1 = N* without Ramp 2 = Max. Torque Current 3 = Process Var. 4 = PTC 5 = Not Used 6 = Not Used 7 = ALC Use	16bits/INT	0	0	7	-
P0237	4x8237	AI2 Gain	-	16bits/INT	1,000	0	9.999	-
P0238	4x8238	AI2 Input Signal	0 = 0 to 10 V/20 mA 1 = 4 to 20 mA 2 = 10 V/20 mA to 0 3 = 20 to 4 mA	16bits/INT	0	0	3	-
P0239	4x8239	AI2 Offset	-	16bits/INT	0,00	-100.00	100.00	%
P0240	4x8240	AI2 Filter	-	16bits/INT	0,00	0	16.00	s

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
P0241	4x8241	AI3 Signal Function	0 = Speed Reference 1 = N* without Ramp 2 = Max. Torque Current 3 = Process Var. 4 = PTC 5 = Not Used 6 = Not Used 7 = ALC Use	16bits/INT	0	0	7	-
P0242	4x8242	AI3 Gain	-	16bits/INT	1,000	0	9.999	-
P0243	4x8243	AI3 Input Signal	0 = 0 to 10 V/20 mA 1 = 4 to 20 mA 2 = 10 V/20 mA to 0 3 = 20 to 4 mA	16bits/INT	0	0	3	-
P0244	4x8244	Offset da Entrada AI3	-	16bits/INT	0,00	-100.00	100.00	%
P0245	4x8245	AI3 Offset	-	16bits/INT	0,00	0	16.00	s
P0246	4x8246	AI4 Signal Function	0 = Speed Reference 1 = N* without Ramp 2 = Max. Torque Current 3 = Process Var. 4 = PTC 5 = Not Used 6 = Not Used 7 = ALC Use	16bits/INT	0	0	7	-
P0247	4x8247	AI4 Gain	-	16bits/INT	1,000	0	9.999	-
P0248	4x8248	AI4 Input Signal	0 = 0 to 10 V/20 mA 1 = 4 to 20 mA 2 = 10 V/20 mA to 0 3 = 20 to 4 mA	16bits/INT	0	0	3	-
P0249	4x8249	AI4 Offset	-	16bits/INT	0,00	-100.00	100.00	%
P0250	4x8250	AI4 Filter	-	16bits/INT	0,00	0	16.00	s
P0251	4x8251	AO1 Function	0 = Speed Reference 1 = Total Reference 2 = Real Speed 3 = Torque Current Reference 4 = Torque Current 5 = Output Current 6 = Process Var. 7 = Active Current 8 = Output Power 9 = PID Setpoint 10 = Torque Current > 0 11 = Motor Torque 12 = Reserved 13 = PTC 14 = Not Used 15 = Not Used 16 = Motor Ixt 17 = Encoder Speed 18 = P0696 Content 19 = P0697 Content 20 = P0698 Content 21 = P0699 Content 22 = ALC11 23 = Id* Current	16bits/INT	2	0	23	-
P0252	4x8252	AO1 Gain	-	16bits/INT	1,000	0	9.999	-
P0253	4x8253	AO1 Signal Type	0 = 0 a 10 V/20 mA 1 = 4 a 20 mA 2 = 10 V/20 mA a 0 3 = 20 a 4 mA	16bits/INT	0	0	3	-

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
P0254	4x8254	AO2 Function	See options in P0251	16bits/INT	2	0	23	-
P0255	4x8255	AO2 Gain	-	16bits/INT	1,000	0	9.999	-
P0256	4x8256	AO2 Signal Type	See options in P0253	16bits/INT	0	0	3	-
P0263	4x8263	DI1 Function	0 = Not Used 1 = Run/Stop 2 = General Enable 3 = Quick Stop 4 = Forward 5 = Reverse 6 = Start 7 = Stop 8 = FWD/REV 9 = LOC/REM 10 = JOG 11 = Increase P.E. 12 = Decrease P.E. 13 = Not Used 14 = 2nd Ramp 15 = Speed/Torque 16 = JOG+ 17 = JOG- 18 = No External Alarm 19 = No External Fault 20 = Reset 21 = ALC Use 22 = Manual/Autom. 23 = Not Used 24 = Disab.FlyStart 25 = DC Link Regul. 26 = Prog. Off 27 = Load User 1/2 28 = Load User 3 29 = DO2 Timer 30 = DO3 Timer 31 = Trace Function	16bits/INT	2	0	31	-
P0264	4x8264	DI2 Function	See options in P0263	16bits/INT	9	0	31	-
P0265	4x8265	DI3 Function	See options in P0263	16bits/INT	21	0	31	-
P0266	4x8266	DI4 Function	See options in P0263	16bits/INT	23	0	31	-
P0267	4x8267	DI5 Function	See options in P0263	16bits/INT	23	0	31	-
P0268	4x8268	DI6 Function	See options in P0263	16bits/INT	18	0	31	-

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
P0275	4x8275	DO1 Function (RL1)	0 = Not Used 1 = N* > Nx 2 = N > Nx 3 = N < Ny 4 = N = N* 5 = Zero Speed 6 = Is > Ix 7 = Is < Ix 8 = Torque > Tx 9 = Torque < Tx 10 = Remote 11 = Run 12 = Ready 13 = No Fault 14 = No F070 15 = No F071 16 = No F006/21/22 17 = No F051/54/57 18 = No F072 19 = 4-20 mA OK 20 = P0695 Content 21 = Forward 22 = Proc. V > VPx 23 = Proc. V < VPy 24 = Ride-Through 25 = Pre-Charge OK 26 = With Fault 27 = Hours Enab > Hx 28 = Reserved 29 = Not Used 30 = N>Nx and Nt>Nx 31 = F > Fx (1) 32 = F > Fx (2) 33 = STO 34 = No F160 35 = No Alarm 36 = No Fault/Alarm 37 = ALC11 38 = No IOE Fault 39 = No IOE Alarm 40 = No IOE Cable 41 = No A/ IOE Cable 42 = No F/ IOE Cable	16bits/INT	0	0	42	-
P0276	4x8276	DO2 Function (RL2)	See options in P0275	16bits/INT	11	0	42	-
P0277	4x8277	DO3 Function (RL3)	See options in P0275	16bits/INT	28	0	42	-
P0281	4x8281	Fx Frequency	-	16bits/INT	4,0	0	300.0	Hz
P0282	4x8282	Fx Hysteresis	-	16bits/INT	2,0	0	15.0	Hz
P0283	4x8283	DO2 ON Time	-	16bits/INT	0,0	0	300.0	s
P0284	4x8284	DO2 OFF Time	-	16bits/INT	0,0	0	300.0	s
P0285	4x8285	DO3 ON Time	-	16bits/INT	0,0	0	300.0	s
P0286	4x8286	DO3 OFF Time	-	16bits/INT	0,0	0	300.0	s
P0287	4x8287	Nx/Ny Hysteresis	-	16bits/INT	18	0	900	RPM
P0288	4x8288	Nx Speed	-	16bits/INT	120	0	18000	RPM
P0289	4x8289	Ny Speed	-	16bits/INT	1800	0	18000	RPM
P0290	4x8290	Ix Current	-	16bits/INT	1,0 x Inom-ND	0	3420.0	A
P0291	4x8291	Zero Speed	-	16bits/INT	18	0	18000	RPM

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
P0292	4x8292	N = N* Band	-	16bits/INT	18	0	18000	RPM
P0293	4x8293	Tx Torque	-	16bits/INT	100	0	200	%
P0294	4x8294	Hx Hours	-	16bits/INT	4320h	0	6553	h
P0295	4x8295	ND/HD VFD Rated Current	0 = 3,6 A / 3,6 A 1 = 5 A / 5 A 2 = 6 A / 5 A 3 = 7 A / 5,5 A 4 = 7 A / 7 A 5 = 10 A / 8 A 6 = 10 A / 10 A 7 = 13 A / 11 A 8 = 13,5 A / 11 A 9 = 16 A / 13 A 10 = 17 A / 13,5 A 11 = 24 A / 19 A 12 = 24 A / 20 A 13 = 28 A / 24 A 14 = 31 A / 25 A 15 = 33,5 A / 28 A 16 = 38 A / 33 A 17 = 45 A / 36 A 18 = 45 A / 38 A 19 = 54 A / 45 A 20 = 58,5 A / 47 A 21 = 70 A / 56 A 22 = 70,5 A / 61 A 23 = 86 A / 70 A 24 = 88 A / 73 A 25 = 105 A / 86 A 26 = 427 A / 340 A 27 = 470 A / 380 A 28 = 811 A / 646 A 29 = 893 A / 722 A 30 = 1217 A / 969 A 31 = 1340 A / 1083 A 32 = 1622 A / 1292 A 33 = 1786 A / 1444 A 34 = 2028 A / 1615 A 35 = 2232 A / 1805 A 36 = 2 A / 2 A 37 = 640 A / 515 A 38 = 1216 A / 979 A 39 = 14x824 A / 1468 A 40 = 2432 A / 1957 A 41 = 3040 A / 2446 A 42 = 600 A / 515 A 43 = 1140 A / 979 A 44 = 1710 A / 1468 A 45 = 2280 A / 1957 A 46 = 2850 A / 2446 A 47 = 105 A / 88 A 48 = 142 A / 115 A 49 = 180 A / 142 A 50 = 211 A / 180 A 51 = 242 A / 211 A 52 = 312 A / 242 A 53 = 370 A / 312 A 54 = 477 A / 370 A 55 = 515 A / 477 A 56 = 601 A / 515 A 57 = 720 A / 560 A	16bits/INT	-	0	107	-

			58 = 2,9 A / 2,7 A 59 = 4,2 A / 3,8 A 60 = 7 A / 6,5 A 61 = 8,5 A / 7 A 62 = 10 A / 9 A 63 = 11 A / 9 A 64 = 12 A / 10 A 65 = 15 A / 13 A 66 = 17 A / 17 A 67 = 20 A / 17 A 68 = 22 A / 19 A 69 = 24 A / 21 A 70 = 27 A / 22 A 71 = 30 A / 24 A 72 = 32 A / 27 A 73 = 35 A / 30 A 74 = 44 A / 36 A 75 = 46 A / 39 A 76 = 53 A / 44 A 77 = 54 A / 46 A 78 = 63 A / 53 A 79 = 73 A / 61 A 80 = 80 A / 66 A 81 = 100 A / 85 A 82 = 107 A / 90 A 83 = 108 A / 95 A 84 = 125 A / 107 A 85 = 130 A / 108 A 86 = 150 A / 122 A 87 = 147 A / 127 A 88 = 170 A / 150 A 89 = 195 A / 165 A 90 = 216 A / 180 A 91 = 289 A / 240 A 92 = 259 A / 225 A 93 = 315 A / 289 A 94 = 312 A / 259 A 95 = 365 A / 315 A 96 = 365 A / 312 A 97 = 435 A / 357 A 98 = 428 A / 355 A 99 = 472 A / 388 A 100 = 700 A / 515 A 101 = 1330 A / 979 A 102 = 1995 A / 1468 A 103 = 2660 A / 1957 A 104 = 3325 A / 2446 A 105 = 760 A / 600 A 106 = 760 A / 560 A 107 = 226 A / 180 A				

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
P0296	4x8296	Line Rated Voltage	0 = 200 - 240 V 1 = 380 V 2 = 400 - 415 V 3 = 440 - 460 V 4 = 480 V 5 = 500 - 525 V 6 = 550 - 575 V 7 = 600 V 8 = 660 - 690 V	16bits/INT	According to inverter model	0	8	-
P0297	4x8297	Switching Frequency	0 = 1.25 kHz 1 = 2.5 kHz 2 = 5.0 kHz 3 = 10.0 kHz 4 = 2.0 kHz	16bits/INT	According to inverter model	0	4	-
P0298	4x8298	Application	0 = Normal Duty (ND) 1 = Heavy Duty (HD)	16bits/INT	0	0	1	-
P0299	4x8299	DC-Braking Start Time	-	16bits/INT	0,0	0	15.0	s
P0300	4x8300	DC-Braking Stop Time	-	16bits/INT	0,0	0	15.0	s
P0301	4x8301	Starting Speed	-	16bits/INT	30	0	450	RPM
P0302	4x8302	DC-Braking Voltage	-	16bits/INT	2,0	0	10.0	%
P0303	4x8303	Skip Speed 1	-	16bits/INT	600	0	18000	RPM
P0304	4x8304	Skip Speed 2	-	16bits/INT	900	0	18000	RPM
P0305	4x8305	Skip Speed 1	-	16bits/INT	1200	0	18000	RPM
P0306	4x8306	Skip Band	-	16bits/INT	0	0	750	RPM
P0308	4x8308	Serial Address	-	16bits/INT	1	1	247	-
P0310	4x8310	Serial Baud Rate	0 = 9600 bits/s 1 = 19200 bits/s 2 = 38400 bits/s 3 = 57600 bits/s	16bits/INT	0	0	3	-
P0311	4x8311	Serial Byte Configuration	0 = 8bits/Bool, no, 1 1 = 8bits/Bool, even, 1 2 = 8bits/Bool, odd, 1 3 = 8bits/Bool, no, 2 1 = 8bits/Bool, even, 2 5 = 8bits/Bool, odd, 2	16bits/INT	3	0	5	-
P0312	4x8312	Serial Protocol	1 = TP 2 = Modbus RTU	16bits/INT	2	1	2	-
P0313	4x8313	Communication Error Action	0 = Inactive 1 = Stop by Ramp 2 = General Disable 3 = Go to LOC 4 = LOC Keeping Enable 5 = Cause Fault	16bits/INT	1	0	5	-
P0314	4x8314	Watchdog Serial	-	16bits/INT	0,0	0	999.0	s
P0315	4x8315	LOCAL/REMOTE Transition Action	0 = Keep status 1 = Stop motor	16bits/INT	0	0	1	
P0316	4x8316	Serial Interface Status	0 = Inactive 1 = Active 2 = Watchdog Error	16bits/INT	RO	0	2	-
P0320	4x8320	FlyStart/Ride-Through	0 = Inactive 1 = Flying Start 2 = FS/RT 3 = Ride-Through	16bits/INT	2	0	3	-
P0321	4x8321	DC Link Power Loss	-	16bits/INT	-	178	846	V
P0322	4x8322	DC Link Ride-Through	-	16bits/INT	-	178	846	V
P0323	4x8323	DC Link Power Back	-	16bits/INT	-	178	846	V

Quick Reference of Parameters / Communication Table

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
P0324	4x8324	Action for ALC 11 Communication Error	0 = Inactive 1 = Stop by Ramp 2 = General Disable 3 = Go to LOC 4 = Cause Fault	16bits/INT	0	0	4	-
P0325	4x8325	RT Proportional Gain	-	16bits/INT	22,8	0	63.9	-
P0326	4x8326	RT Integral Gain	-	16bits/INT	0,128	0	9.999	-
P0327	4x8327	F.S. I/F Current Ramp	-	16bits/INT	0,070	0	1.000	s
P0328	4x8328	Flying Start Filter	-	16bits/INT	0,085	0	1.000	s
P0329	4x8329	F.S. I/F Frequency Ramp	-	16bits/INT	6,0	2.0	50.0	s
P0331	4x8331	Voltage Ramp	-	16bits/INT	2,0	0.2	60.0	s
P0332	4x8332	Dead Time	-	16bits/INT	1,0	0.1	10.0	s
P0340	4x8340	Auto-Reset Time	-	16bits/INT	0	0	255	s
P0342	4x8342	Motor Unbal. Curr. Conf.	0 = Inativa 1 = Ativa	16bits/INT	0	0	1	-
P0343	4x8343	Ground Fault Config.	0 = Inativa 1 = Ativa	16bits/INT	1	0	1	-
P0344	4x8344	Current Lim. Conf.	0 = Hold - LR ON 1 = Desac. - LR ON 2 = Hold - LR OFF 3 = Desac.- LR OFF	16bits/INT	3	0	3	-
P0348	4x8348	Motor Overload Configuration	0 = Inativa 1 = Falha/Alarme 2 = Falha 3 = Alarme	16bits/INT	1	0	3	-
P0349	4x8349	Ixt Alarm Level	-	16bits/INT	85	70	100	%
P0350	4x8350	IGBT Overload Setting	0 = F w/rd. Fs 1 = F/A w/rd. Fs 2 = F no/rd. Fs 3 = F/A no/rd. Fs	16bits/INT	1	0	3	-
P0351	4x8351	Motor Overtemp. Setting	0 = Inactive 1 = Fault/Alarm 2 = Fault 3 = Alarm	16bits/INT	1	0	3	-
P0352	4x8352	Fan Setting	0 = VD-OFF, VI-OFF 1 = VD-ON, VI-ON 2 = VD-CT, VI-CT 3 = VD-CT, VI-OFF 4 = VD-CT, VI-ON 5 = VD-ON, VI-OFF 6 = VD-ON, VI-CT 7 = VD-OFF, VI-ON 8 = VD-OFF, VI-CT	16bits/INT	2	0	8	-
P0353	4x8353	IGBTs/Air Overtemp. Config.	0 = D-F/A, AR-F/A 1 = D-F/A, AR-F 2 = D-F, AR-F/A 3 = D-F, AR-F	16bits/INT	0	0	3	-
P0354	4x8354	Fan Speed Setting	0 = Inactive 1 = Fault	16bits/INT	1	0	1	-
P0355	4x8355	Fault F185 Setting	0 = Inactive 1 = Active	16bits/INT	1	0	1	-
P0356	4x8356	Dead Time Compensation	0 = Inactive 1 = Active	16bits/INT	1	0	1	-
P0357	4x8357	Line Phase Loss Time	-	16bits/INT	3	0	60	s

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
P0358	4x8358	Encoder Fault Setting	0 = OFF 1 = F67 ON 2 = F79 ON 3 = F67,F79 ON	16bits/INT	3	0	3	-
P0359	4x8359	Motor Current Stabilization	0 = Inactive 1 = Active	16bits/INT	0	0	1	-
P0372	4x8372	DC-Braking Curr Sless	-	16bits/INT	40.0	0	90.0	%
P0373	4x8373	PTC1 Sensor Type	0 = Single PTC 1 = Triple PTC	16bits/INT	1	0	1	-
P0374	4x8374	F/A Sensor 1 Setting	0 = Inactive 1 = Cable/Alarm Fault 2 = Cable Fault 3 = Alarm/Cable 4 = Fault/Alarm 5 = Fault 6 = Alarm 7 = Cable Alarm	16bits/INT	1	0	7	-
P0375	4x8375	F/A Temperature Sensor 1	-	16bits/INT	130	-20	200	ºC
P0376	4x8376	PTC2 Sensor Type	0 = Single PTC 1 = Triple PTC	16bits/INT	1	0	1	-
P0377	4x8377	F/A Sensor 2 Setting	See options in P0374	16bits/INT	1	0	7	-
P0378	4x8378	F/A Temperature Sensor 2	-	16bits/INT	130	-20	200	ºC
P0379	4x8379	PTC3 Sensor Type	0 = Single PTC 1 = Triple PTC	16bits/INT	1	0	1	-
P0380	4x8380	F/A Sensor 3 Setting	See options in P0374	16bits/INT	1	0	7	-
P0381	4x8381	F/A Temperature Sensor 3	-	16bits/INT	130	-20	200	ºC
P0382	4x8382	PTC4 Sensor Type	0 = Single PTC 1 = Triple PTC	16bits/INT	1	0	1	-
P0383	4x8383	F/A Sensor 4 Setting	See options in P0374	16bits/INT	1	0	7	-
P0384	4x8384	F/A Temperature Sensor 4	-	16bits/INT	130	-20	200	ºC
P0385	4x8385	PTC5 Sensor Type	0 = Single PTC 1 = Triple PTC	16bits/INT	1	0	1	-
P0386	4x8386	F/A Sensor 5 Setting	See options in P0374	16bits/INT	1	0	7	-
P0387	4x8387	F/A Temperature Sensor 5	-	16bits/INT	130	-20	200	ºC
P0388	4x8388	Temperature Sensor 1	-	16bits/INT	RO	-20	200	ºC
P0389	4x8389	Temperature Sensor 2	-	16bits/INT	RO	-20	200	ºC
P0390	4x8390	Temperature Sensor 3	-	16bits/INT	RO	-20	200	ºC
P0391	4x8391	Temperature Sensor 4	-	16bits/INT	RO	-20	200	ºC
P0392	4x8392	Temperature Sensor 5	-	16bits/INT	RO	-20	200	ºC
P0393	4x8393	Highest Temperature of the sensor	-	16bits/INT	RO	-20	200	ºC
P0397	4x8397	Regen. Slip Compens.	0 = Inactive 1 = Active Motorizing/ Regenerating 2 = Active Motorizing 3 = Active Regenerating	16bits/INT	1	0	3	-
P0398	4x8398	Motor Service Factor	-	16bits/INT	1,00	1	1.50	-
P0399	4x8399	Motor Rated Efficiency	-	16bits/INT	67,9	50	99.9	%
P0400	4x8400	Motor Rated Voltage	-	16bits/INT	-	0	690	V
P0401	4x8401	Motor Rated Current	-	16bits/INT	1,0 x Inom-ND	0	2223.0	A
P0402	4x8402	Motor Rated Speed	-	16bits/INT	1750	0	18000	RPM
P0403	4x8403	Motor Rated Frequency	-	16bits/INT	60	0	300	Hz

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
P0404	4x8404	Motor Rated Power	0 = 0.33 CV 1 = 0.50 CV 2 = 0.75 CV 3 = 1.0 CV 4 = 1.5 CV 5 = 2.0 CV 6 = 3.0 CV 7 = 4.0 CV 8 = 5.0 CV 9 = 5.5 CV 10 = 6.0 CV 11 = 7.5 CV 12 = 10.0 CV 13 = 12.5 CV 14 = 15.0 CV 15 = 20.0 CV 16 = 25.0 CV 17 = 30.0 CV 18 = 40.0 CV 19 = 50.0 CV 20 = 60.0 CV 21 = 75.0 CV 22 = 100.0 CV 23 = 125.0 CV 24 = 150.0 CV 25 = 175.0 CV 26 = 180.0 CV 27 = 200.0 CV 28 = 220.0 CV 29 = 250.0 CV 30 = 270.0 CV 31 = 300.0 CV 32 = 350.0 CV 33 = 380.0 CV 34 = 400.0 CV 35 = 430.0 CV 36 = 440.0 CV 37 = 450.0 CV 38 = 475.0 CV 39 = 500.0 CV 40 = 540.0 CV 41 = 600.0 CV 42 = 620.0 CV 43 = 670.0 CV 44 = 700.0 CV 45 = 760.0 CV 46 = 800.0 CV 47 = 850.0 CV 48 = 900.0 CV 49 = 1000.0 CV 50 = 1100.0 CV 51 = 1250.0 CV 52 = 1400.0 CV 53 = 1500.0 CV 54 = 1600.0 CV 55 = 1800.0 CV 56 = 2000.0 CV 57 = 2300.0 CV 58 = 2500.0 CV 59 = 2900.0 CV 60 = 3400.0 CV	16bits/INT	Motorma x-ND	0	60	-
P0405	4x8405	Encoder Pulse Number	-	16bits/INT	1024	100	9999	ppr
P0406	4x8406	Motor Ventilation	0 = Self-ventilated 1 = Separate Vent. 2 = Optimal Flux 3 = Extended Protection	16bits/INT	0	0	3	-
P0407	4x8407	Motor Rated Power Factor	-	16bits/INT	0,68	0.5	0.99	%
P0409	4x8409	Stator Resistance	-	16bits/INT	0,000	0	9.999	ohm
P0410	4x8410	Magnetization Current	-	16bits/INT	Inom-ND	0	2137.5	A
P0411	4x8411	Leakage Inductance	-	16bits/INT	0,00	0	99.99	mH

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
P0412	4x8412	Tr Time Constant	-	16bits/INT	0,000	0	9.999	s
P0413	4x8413	Tm Time Constant	-	16bits/INT	0,00	0	99.99	s
P0431	4x8431	Number of Poles	-	16bits/INT	6	2	24	-
P0433	4x8433	Lq Inductance	-	16bits/INT	0,00	0	100.00	mH
P0434	4x8434	Ld Inductance	-	16bits/INT	0,00	0	100.00	mH
P0435	4x8435	Ke Time Constant	-	16bits/INT	100,0	0	600.0	-
P0438	4x8438	Iq Proportional Gain	-	16bits/INT	0,80	0	1.99	-
P0439	4x8439	Iq Integral Gain	-	16bits/INT	0,005	0	1.999	-
P0440	4x8440	Id Proportional Gain	-	16bits/INT	0,50	0	1.99	-
P0441	4x8441	Id Integral Gain	-	16bits/INT	0,005	0	1.999	-
P0520	4x8520	PID Proportional Gain	-	16bits/INT	1,000	0	7.999	-
P0521	4x8521	PID Integral Gain	-	16bits/INT	0,043	0	7.999	-
P0522	4x8522	PID Differential Gain	-	16bits/INT	0,000	0	3.499	-
P0523	4x8523	PID Ramp Time	-	16bits/INT	3,0	0	999.0	s
P0524	4x8524	PID Feedback Selection	0 = AI1 (P0231) 1 = AI2 (P0236) 2 = AI3 (P0241) 3 = AI4 (P0246)	16bits/INT	1	0	3	-
P0525	4x8525	PID Setpoint via HMI	-	16bits/INT	0,0	0	100.0	%
P0527	4x8527	PID Action Type	0 = Direct 1 = Reverse	16bits/INT	0	0	1	-
P0528	4x8528	VP Scale Factor	-	16bits/INT	1000	1	9999	-
P0529	4x8529	VP Indication Form	0 = wxyz 1 = wxy.z 2 = wx.yz 3 = w.xyz	16bits/INT	1	0	3	-
P0530	4x8530	PV Engineering Unit 1	-	16bits/INT	37	32	127	-
P0531	4x8531	PV Engineering Unit 2	-	16bits/INT	32	32	127	-
P0532	4x8532	PV Engineering Unit 3	-	16bits/INT	32	32	127	-
P0533	4x8533	PVx value	-	16bits/INT	90,0	0	100.0	%
P0534	4x8534	PVy value	-	16bits/INT	10,0	0	100.0	%
P0535	4x8535	Output N=0 PID	-	16bits/INT	0	0	100	%
P0536	4x8536	Automatic Setting P0525	0 = Inactive 1 = Active	16bits/INT	1	0	1	-
P0538	4x8538	PVx/PVy Hysteresis	-	16bits/INT	1,0	0	5.0	%
P0550	4x8550	Trace Trigger Source	0 = Inactive 1 = Speed Reference 2 = Motor Speed 3 = Motor Current 4 = DC Link Voltage 5 = Motor Frequency 6 = Output Voltage 7 = Motor Torque 8 = Process Var. 9 = PID Setpoint 10 = AI1 11 = AI2 12 = AI3 13 = AI4	16bits/INT	0	0	13	-
P0551	4x8551	Trace Trigger Value	-	16bits/INT	0,0	-100.0	340.0	%

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
P0552	4x8552	Trace Trigger Condition	0 = P0550* = P0551 1 = P0550* <>P0551 2 = P0550* > P0551 3 = P0550* < P0551 4 = Alarm 5 = Fault 6 = DIx	16bits/INT	5	0	6	-
P0553	4x8553	Trace Sampling Period	-	16bits/INT	1	1	65535	-
P0554	4x8554	Trace Pre-Trigger	-	16bits/INT	0	0	100	%
P0559	4x8559	Trace Maximum Memory	-	16bits/INT	0	0	100	%
P0560	4x8560	Trace Available Memory	-	16bits/INT	RO	0	100	%
P0561	4x8561	CH1: Trace Channel 1	0 = Inactive 1 = Speed Reference 2 = Motor Speed 3 = Motor Current 4 = DC Link Voltage 5 = Motor Frequency 6 = Output Voltage 7 = Motor Torque 8 = Process Var. 9 = PID Setpoint 10 = AI1 11 = AI2 12 = AI3 13 = AI4	16bits/INT	1	0	13	-
P0562	4x8562	CH2: Canal 2 do Trace	See options in P0561	16bits/INT	2	0	13	-
P0563	4x8563	CH3: Canal 3 do Trace	See options in P0561	16bits/INT	3	0	13	-
P0564	4x8564	CH4: Canal 4 do Trace	See options in P0561	16bits/INT	0	0	13	-
P0571	4x8571	Start Trace	0 = Inactive 1 = Active	16bits/INT	0	0	1	-
P0572	4x8572	Trace Trig. Day/Month	-	16bits/INT	RO	00/00	31/12	-
P0573	4x8573	Trace Trig. Year	-	16bits/INT	RO	00	99	-
P0574	4x8574	Trace Trig. Hour	-	16bits/INT	RO	00:00	23:59	-
P0575	4x8575	Trace Trig. Second	-	16bits/INT	RO	00	59	-
P0576	4x8576	Trace Function Status	0 = Inactive 1 = Waiting 2 = Trigger 3 = Concluded	16bits/INT	RO	0	3	-
P0680	4x8680	Logical Status	Bit 0 to 3 = Reserved Bit 4 = In Fast Stop Bit 5 = 2nd Ramp Bit 6 = Configuration Mode Bit 7 = Alarm Bit 8 = Running Bit 9 = Enabled Bit 10 = Forward Bit 11 = JOG Bit 12 = Remote Bit 13 = Undervoltage Bit 14 = Automatic Bit 15 = Fault	16bits/INT	RO	-	-	-
P0681	4x8681	Speed 13 bits	-	16bits/INT	RO	-32768	32767	

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
P0682	4x8682	USB/Serial Control	Bit 0 = Ramp Enable Bit 1 = General Enable Bit 2 = Run Forward Bit 3 = JOG Enable Bit 4 = Remote Bit 5 = 2nd Ramp Bit 6 = Reserved Bit 7 = Fault Reset Bit 8 to 15 = Reserved	16bits/INT	RO	-	-	-
P0683	4x8683	Serial/USB Speed Ref.	-	16bits/INT	RO	-32768	32767	-
P0684	4x8684	CO/DN/DP Control	See options in P0682	16bits/INT	RO	-	-	-
P0685	4x8685	CO/DN/DP Speed Ref.	-	16bits/INT	RO	-32768	32767	-
P0686	4x8686	Anybus-DC Control	See options in P0682	16bits/INT	RO	-	-	-
P0687	4x8687	Anybus-DC Speed Ref.	-	16bits/INT	RO	-32768	32767	-
P0695	4x8695	DOx Value	Bit 0 = DO1 Bit 1 = DO2 Bit 2 = DO3 Bit 3 = DO4 Bit 4 = DO5	16bits/INT	RO	-	-	-
P0696	4x8696	AOx Value 1	-	16bits/INT	RO	-32768	32767	-
P0697	4x8697	AOx Value 2	-	16bits/INT	RO	-32768	32767	-
P0698	4x8698	AOx Value 3	-	16bits/INT	RO	-32768	32767	-
P0699	4x8699	AOx Value 4	-	16bits/INT	RO	-32768	32767	-
P0700	4x8700	CAN Protocol	1 = CANopen 2 = DeviceNet	16bits/INT	2	1	2	-
P0701	4x8701	CAN address	-	16bits/INT	63	0	127	-
P0702	4x8702	CAN Baud Rate	0 = 1 Mbps/Auto 1 = Reserved/Auto 2 = 500 Kbps 3 = 250 Kbps 4 = 125 Kbps 5 = 100 Kbps/Auto 6 = 50 Kbps/Auto 7 = 20 Kbps/Auto 8 = 10 Kbps/Auto	16bits/INT	0	0	8	-
P0703	4x8703	Bus Off Reset	0 = Manual 1 = Automatic	16bits/INT	1	0	1	-
P0705	4x8705	CAN Controller Status	0 = Inactive 1 = Auto-Baud 2 = Active CAN 3 = Warning 4 = Error Passive 5 = Bus Off 6 = Not Supplied	16bits/INT	RO	0	6	-
P0706	4x8706	CAN RX Telegrams	-	16bits/INT	RO	0	65535	-
P0707	4x8707	CAN TX Telegrams	-	16bits/INT	RO	0	65535	-
P0708	4x8708	Bus Off Counter	-	16bits/INT	RO	0	65535	-
P0709	4x8709	Lost CAN Messages	-	16bits/INT	RO	0	65535	-
P0710	4x8710	DNet I/O Instances	0 = ODVA Basic 2W 1 = ODVA Extend 2W 2 = Especif.Fab.2W 3 = Especif.Fab.3W 4 = Especif.Fab.4W 5 = Especif.Fab.5W 6 = Especif.Fab.6W	16bits/INT	0	0	6	-
P0711	4x8711	DeviceNet Reading #3	-	16bits/INT	RO	-1	1499	-
P0712	4x8712	DeviceNet Reading #4	-	16bits/INT	RO	-1	1499	-

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
P0713	4x8713	DeviceNet Reading #5	-	16bits/INT	RO	-1	1499	-
P0714	4x8714	DeviceNet Reading #6	-	16bits/INT	RO	-1	1499	-
P0715	4x8715	DeviceNet Reading #3	-	16bits/INT	-1	-1	1499	-
P0716	4x8716	DeviceNet Reading #4	-	16bits/INT	-1	-1	1499	-
P0717	4x8717	DeviceNet Reading #5	-	16bits/INT	-1	-1	1499	-
P0718	4x8718	DeviceNet Reading #6	-	16bits/INT	-1	-1	1499	-
P0719	4x8719	DeviceNet Network Status	0 = Offline 1 = Online, Not Connected 2 = Online, Connected 3 = Connection Timed Out 4 = Link Failure 5 = Auto-Baud	16bits/INT	RO	0	5	-
P0720	4x8720	DNet Master Status	0 = Run 1 = Idle	16bits/INT	RO	0	1	-
P0721	4x8721	CANopen Comm. Status	0 = Inactive 1 = Reserved 2 = Communic. Enab. 3 = Error Control Enab. 4 = Guarding Error 5 = Heartbeat Error	16bits/INT	RO	0	5	-
P0722	4x8722	CANopen Node Status	0 = Inactive 1 = Start 2 = Stopped 3 = Operational 4 = Pre-operational	16bits/INT	RO	0	4	-
P0723	4x8723	Anybus ID	0 = Inactive 1 = RS232 2 = RS422 3 = USB 4 = Serial Server 5 = Bluetooth 6 = Zigbee 7 = Reserved 8 = Reserved 9 = Reserved 10 = RS485 11 = Reserved 12 = Reserved 13 = Reserved 14 = Reserved 15 = Reserved 16 = Profibus DP 17 = DeviceNet 18 = CANopen 19 = EtherNet/IP 10 – DC link 21 = Modbus TCP 22 = Modbus RTU 23 = Profinet IO 24 = Reserved 25 = Reserved	16bits/INT	RO	0	25	-
P0724	4x8724	Anybus Communication Status	0 = Inactive 1 = Not supported 2 = Access Error 3 = Offline 4 = Online	16bits/INT	RO	0	4	-
P0725	4x8725	Anybus Address	-	16bits/INT	0	0	255	-
P0726	4x8726	Anybus Baud Rate	-	16bits/INT	0	0	3	-

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
P0727	4x8727	Anybus I/O Words	1 = Flexible 2 = 2 Words 3 = 3 Words 4 = 4 Words 5 = 5 Words 6 = 6 Words 7 = 7 Words 8 = 8 Words 9 = ALC11 Card	16bits/INT	2	1	9	-
P0728	4x8728	Anybus Reading #3	-	16bits/INT	0	0	1499	-
P0729	4x8729	Anybus Reading #4	-	16bits/INT	0	0	1499	-
P0730	4x8730	Anybus Reading #5	-	16bits/INT	0	0	1499	-
P0731	4x8731	Anybus Reading #6	-	16bits/INT	0	0	1499	-
P0732	4x8732	Anybus Reading #7	-	16bits/INT	0	0	1499	-
P0733	4x8733	Anybus Reading #8	-	16bits/INT	0	0	1499	-
P0734	4x8734	Anybus Writing #3	-	16bits/INT	0	0	1499	-
P0735	4x8735	Anybus Writing #4	-	16bits/INT	0	0	1499	-
P0736	4x8736	Anybus Writing #5	-	16bits/INT	0	0	1499	-
P0737	4x8737	Anybus Writing #6	-	16bits/INT	0	0	1499	-
P0738	4x8738	Anybus Writing #7	-	16bits/INT	0	0	1499	-
P0739	4x8739	Anybus Writing #8	-	16bits/INT	0	0	1499	-
P0740	4x8740	Profibus Comm. Status	0 = Inactive 1 = Access Error 2 = Offline 3 = Configuration Error 4 = Parameter Error 5 = Clear Mode 6 = Online	16bits/INT	RO	0	6	-
P0741	4x8741	Profibus Data Profile	0 = PROFIdrive 1 = Manufacturer	16bits/INT	1	0	1	-
P0742	4x8742	Profibus Reading #3	-	16bits/INT	RO	0	1199	-
P0743	4x8743	Profibus Reading #4	-	16bits/INT	RO	0	1199	-
P0744	4x8744	Profibus Reading #5	-	16bits/INT	RO	0	1199	-
P0745	4x8745	Profibus Reading #6	-	16bits/INT	RO	0	1199	-
P0746	4x8746	Profibus Reading #7	-	16bits/INT	RO	0	1199	-
P0747	4x8747	Profibus Reading #8	-	16bits/INT	RO	0	1199	-
P0748	4x8748	Profibus Reading #9	-	16bits/INT	RO	0	1199	-
P0749	4x8749	Profibus Reading #10	-	16bits/INT	RO	0	1199	-
P0750	4x8750	Profibus Writing #3	-	16bits/INT	0	0	1199	-
P0751	4x8751	Profibus Writing #4	-	16bits/INT	0	0	1199	-
P0752	4x8752	Profibus Writing #5	-	16bits/INT	0	0	1199	-
P0753	4x8753	Profibus Writing #6	-	16bits/INT	0	0	1199	-
P0754	4x8754	Profibus Writing #7	-	16bits/INT	0	0	1199	-
P0755	4x8755	Profibus Writing #8	-	16bits/INT	0	0	1199	-
P0756	4x8756	Profibus Writing #9	-	16bits/INT	0	0	1199	-
P0757	4x8757	Profibus Writing #10	-	16bits/INT	0	0	1199	-
P0799	4x8799	Delay I/O Update	-	16bits/INT	0,0	0	999.0	s
P0800	4x8800	Temp. Phase U Book 1	-	16bits/INT	RO	-20.0	150.0	ºC
P0801	4x8801	Temp. Phase V Book 1	-	16bits/INT	RO	-20.0	150.0	ºC
P0802	4x8802	Temp. Phase W Book 1	-	16bits/INT	RO	-20.0	150.0	ºC
P0803	4x8803	Temp. Phase U Book 2	-	16bits/INT	RO	-20.0	150.0	ºC
P0804	4x8804	Temp. Phase V Book 2	-	16bits/INT	RO	-20.0	150.0	ºC

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
P0805	4x8805	Temp. Phase W Book 2	-	16bits/INT	RO	-20.0	150.0	ºC
P0806	4x8806	Temp. Phase U Book 3	-	16bits/INT	RO	-20.0	150.0	ºC
P0807	4x8807	Temp. Phase V Book 3	-	16bits/INT	RO	-20.0	150.0	ºC
P0808	4x8808	Temp. Phase W Book 3	-	16bits/INT	RO	-20.0	150.0	ºC
P0809	4x8809	Temp. Phase U Book 4	-	16bits/INT	RO	-20.0	150.0	ºC
P0810	4x8810	Temp. Phase V Book 4	-	16bits/INT	RO	-20.0	150.0	ºC
P0811	4x8811	Temp. Phase W Book 4	-	16bits/INT	RO	-20.0	150.0	ºC
P0812	4x8812	Temp. Phase U Book 5	-	16bits/INT	RO	-20.0	150.0	ºC
P0813	4x8813	Temp. Phase V Book 5	-	16bits/INT	RO	-20.0	150.0	ºC
P0814	4x8814	Temp. Phase W Book 5	-	16bits/INT	RO	-20.0	150.0	ºC
P0832	4x8832	DIM1 Input Function	0 = Not Used 1 = No Ext. Fault IPS 2 = No SisRef Fault 3 = No SobFren Fault 4 = No Sob Ret Fault 5 = No TRtEx Alarm 6 = No RetEx Fault	16bits/INT	0	0	6	-
P0833	4x8833	DIM2 Input Function	See the options in P0832	16bits/INT	0	0	6	-
P0834	4x8834	DIM1 to DIM2 Status	Bit 0 = DIM1 Bit 1 = DIM2	16bits/INT	-	-	-	-
P0918	4x8918	Profibus Address	-	16bits/INT	1	1	126	-
P0922	4x8922	Profibus Teleg. Sel.	1 = Standard Teleg. 1 2 = Telegram 100 3 = Telegram 101 4 = Telegram 102 5 = Telegram 103 6 = Telegram 104 7 = Telegram 105 8 = Telegram 106 9 = Telegram 107	16bits/INT	1	1	9	-
P0944	4x8944	Fault Counter	-	16bits/INT	RO	0	65535	-
P0947	4x8947	Fault Number	-	16bits/INT	RO	0	65535	-
P0963	4x8963	Profibus Baud Rate	0 = 9.6 kbit/s 1 = 19.2 Kbit/s 2 = 93.75 Kbit/s 3 = 187.5 Kbit/s 4 = 500 Kbit/s 5 = Not detected 6 = 1500 Kbit/s 7 = 3000 Kbit/s 8 = 6000 kbit/s 9 = 12000 kbit/s 10 = Reserved 11 = 45.45 kbit/s	16bits/INT	RO	0		-
P0964	4x8964	Drive Identification	-	16bits/INT	RO	0	65535	-
P0965	4x8965	Identification Profile	-	16bits/INT	RO	0	65535	-
P0967	4x8967	Control Word 1	Bit 0 = Turn Off Bit 1 = Disab. Motor Bit 2 = Fast Stop Bit 3 = Stop Motor Bit 4 = Reset Ramp Bit 5 = Freeze Ramp Bit 6 = Reset Ref. Bit 7 = Reset Fault Bit 8 = Jog 1 Bit 9 = Jog 2 Bit 10 = No ALC Ctrl. Bit 11...15 = Reserved	16bits/INT	RO	0	-	-

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
P0968	4x8968	Status Word 1	Bit 0 = Not Ready to Start Bit 1 = Not Ready to Run Bit 2 = Stopped Bit 3 = No error Bit 4 = Disabled Bit 5 = In fast stop Bit 6 = No power supply Bit 7 = No alarm Bit 8 = Speed out of range Bit 9 = No ctrl. via network Bit 10 = Speed not reached Bit 11...15 = Reserved	16bits/INT	RO	0	-	–
P1000	4x9001	SoftPLC Status	0 = No Application 1 = Install. App. 2 = Incompat. App. 3 = App. Stopped 4 = App. Running	16bits/INT	RO	0	4	-
P1001	4x9002	SoftPLC Command	0 = Stop Program 1 = Run Program 2 = Delete Program	16bits/INT	0	0	2	-
P1002	4x9003	Scan Cycle Time	-	16bits/INT	RO	0	65535	ms
P1010	4x9011	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1011	4x9012	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1012	4x9013	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1013	4x9014	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1014	4x9015	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1015	4x9016	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1016	4x9017	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1018	4x9019	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1019	4x9020	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1020	4x9021	Command to start/stop the pump using inverter parameter	1 = Stops pump motor 2 = Starts pump motor	16bits/INT	0	0	10	-
P1021	4x9022	Speed reference related to motor speed (RPM) for local mode operation	-	16bits/INT	0	-5000	5000	RPM
P1023	4x9024	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1024	4x9025	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1025	4x9026	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1026	4x9027	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1027	4x9028	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1028	4x9029	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1029	4x9030	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1030	4x9031	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1031	4x9032	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1032	4x9033	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1033	4x9034	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1034	4x9035	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1035	4x9036	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1036	4x9037	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1037	4x9038	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1038	4x9039	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1039	4x9040	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1040	4x9041	Reserve Parameter	-	16bits/INT	0	0	65635	-

Parameter	Address	Description	Status	Size	Default	Min.	Max.	Unit
P1041	4x9042	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1042	4x9043	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1043	4x9044	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1044	4x9045	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1045	4x9046	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1046	4x9047	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1047	4x9048	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1048	4x9049	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1049	4x9050	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1050	4x9051	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1051	4x9052	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1052	4x9053	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1053	4x9054	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1054	4x9055	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1055	4x9056	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1056	4x9057	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1057	4x9058	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1058	4x9059	Reserve Parameter	-	16bits/INT	0	0	65635	-
P1059	4x9060	RP_PCP_ESP Version	-	16bits/INT	1.08	0	327.67	-

FAULTS AND ALARMS TABLE

ALC11-ESP generates the following fault and alarm messages:

Fault / Alarm	Description	Possible causes
ALC11 in STOP	ALC11 controller did not initialize correctly.	■ Check emergency pushbutton. ■ Check inverter power circuit.
A758: SRW error	Indicates that the SRW relay connected to the panel power input is in error.	■ Problems in the panel power supply, most common errors in the SRW are undervoltage or overvoltage at the input. Communication error between SRW and ALC11.
A759: Backspin error	Indicates that the Backspin equipment, the SubCoe is in error.	■ Communication error between SubCoe and ALC11.
A794: Emergency acted	Indicates that the panel's emergency button is activated.	■ Emergency button acted.
A939: Analog input error	This alarm signals that any analog input programmed for enabled wire break alarm, presents an error in the signal.	■ Broken wire alarm enabled without connection to analog input. ■ Broken wire on some analog input.
F940: Very low discharge pressure	This fault indicates that the discharge pressure signal is below the programmed level.	■ Effectively very low discharge pressure. ■ Check if the pressure levels for the system are correct.
A941: Low discharge pressure	This alarm indicates that the discharge pressure signal is below the programmed level.	■ Effectively low discharge pressure. ■ Check if the pressure levels for the system are correct.
A942: High discharge pressure	This alarm indicates that the discharge pressure signal is above the programmed level.	■ Effectively high discharge pressure. ■ Check if the pressure levels for the system are correct.
F943: Very high discharge pressure	This fault indicates that the discharge pressure signal is above the programmed level.	■ Effectively very high discharge pressure. ■ Check if the pressure levels for the system are correct.
F944: Very high vibration	This fault indicates that the vibration signal is above the programmed level.	■ Effectively very high vibration. ■ Check if the vibration levels for the system are correct.
A945: High vibration	This alarm indicates that the vibration signal is above the programmed level.	■ Effectively high vibration. ■ Check if the vibration levels for the system are correct.
F946: Very high active leakage current	This fault indicates that the active leakage current signal is above the programmed level.	■ Effectively very high active leakage current. ■ Check if the current levels for the system are correct.
A947: High active leakage current	This alarm indicates that the active leakage current signal is above the programmed level.	■ Effectively high active leakage current. ■ Check if the current levels for the system are correct.
F948: Very high passive leakage current	This fault indicates that the passive leakage current signal is above the programmed level.	■ Effectively very high passive leakage current. ■ Check if the current levels for the system are correct.
A949: High passive leakage current	This alarm indicates that the passive leakage current signal is above the programmed level.	■ Effectively high passive leakage current. ■ Check if the current levels for the system are correct.
F950: ALC11 controller hardware fault	Indicates ALC11 board hardware fault to initialize	■ Check if the board is fitted correctly and with the fixing screws. ■ Incorrect connections or voltage surges may have damaged board components requiring replacement.

Faults and Alarms Table

Fault / Alarm	Description	Possible causes
F951: ALC11 ladder application internal fault	Indicates internal fault of the control method ladder application.	■ Problems in the method exchange. ■ Problems at the time of upgrading the ladder, requiring upgrading the board again.
A952: SDCARD not detected	Indicates the absence of SDCARD.	■ SDCARD improperly inserted; it is necessary to remove and reinsert it with the board de-energized.
A953: SDCARD access fault	Indicates that the ALC11 is unable to access SDCARD.	■ SDCARD corrupted. ■ SDCARD is badly inserted into the board. ■ Required to update SDCARD folders and reinsert it.
A954: ALC11 battery fault	Indicates that the ALC11 board battery has low or no charge.	■ Indicates that the board battery is dead. ■ Tab to prevent battery from discharging not removed after the panel was received.
A955: COM1 serial communication fault	Indicates communication error on COM1 serial port.	■ Necessary to check COM1 and slave settings or network master.
A956: COM2 serial communication fault	Indicates communication error on COM2 serial port.	■ Necessary to check COM2 and slave settings or network master.
A957: COM3 serial communication fault	Indicates communication error on COM3 serial port.	■ Necessary to check COM3 and slave settings or network master.
F959: Pump rocking start fault	The ALC11 was unable to release the pump or perform the Rocking Start function properly.	■ Check if the pump is locked.
F960: Locked pump fault	Indicates that the current level after the check frequency has reached the fault level, indicating that the pump is locked. When pump rocking start monitoring is enabled, it generates locked pump fault.	■ Pump rocking start check current level has been reached after the check frequency. ■ Pump is effectively locked reflecting on high current. ■ The current level is very low for the pump.
A961: Heavy pump alarm	Indicates that the current level after the check frequency has reached the locked pump level, indicating that the pump is locked. When pump rocking start monitoring is disabled, it generates heavy pump alarm.	■ Pump rocking start check current level has been reached after the check frequency. ■ Pump is effectively locked reflecting on high current. ■ The current level is very low for the pump.
A962: Motor undercurrent alarm	Indicates that the motor current level is below the undercurrent level.	■ Check if the undercurrent level is appropriate for the pump. ■ Pump may be operating without load.
F962: Motor undercurrent fault	Indicates that the motor current level is below the undercurrent level.	■ Check if the undercurrent level is appropriate for the pump. ■ Pump may be operating without load.
F963: Actuated Backspin fault	Indicates that the Backspin relay has detected that the pump is in the pumping reverse direction.	■ Backspin relay detected speed reversal. ■ Inverted motor cables at relay connection. ■ Check relay setting if necessary.
F964: Ground fault	Indicates that the backspin relay has detected a ground fault in the motor voltage.	■ Check if readings on the relay is of backspin. ■ Probable phase drop for the motor.
A965: ALC11 analog I / O hardware error	Error in the ALC11 card modules.	■ Internal error in ALC11, change card.
F966: High temperature on transformer fault	Indicates that the Transformer temperature fault level has been reached.	■ Very high temperature level on transformer; check if the indexes are correct for application.
F967: Very low line pressure (digital sensor)	It indicates that the very low pressure switch is open.	■ It indicates that the very low pressure switch is open. ■ Effectively very low line pressure, which indicates possible line leakage.

Fault / Alarm	Description	Possible causes
F968: Analog signal downhole sensor failure	This fault signals that any analog input programmed for enabled wire break alarm, presents an error in the signal. To generate the fault, the downhole sensor type must be selected Analog type, otherwise only A939 alarm is generated.	■ Broken wire alarm enabled without connection to analog input. ■ Broken wire on some analog input.
F970: Very high line pressure (digital sensor)	It indicates that the very high pressure switch is open.	■ Check very high pressure switch connection. ■ Effectively very high line pressure.
A973: Low intake pressure	This alarm indicates that the intake pressure signal is below the programmed level.	■ Effectively low pressure intake. ■ Check if the pressure levels for the system are correct.
F974: Very high intake pressure	This fault indicates that the intake pressure signal is above the programmed level.	■ Effectively very high line pressure. ■ Check if the pressure levels for the system are correct.
A975: High downhole temperature	This alarm indicates that the downhole temperature signal is above the programmed level.	■ Effectively high downhole temperature. ■ Check if the temperature levels for the system are correct.
A977: High motor temperature	This alarm indicates that the motor temperature signal is above the programmed level.	■ Effectively high motor temperature ■ Check if the temperature levels for the system are correct
F979: High motor voltage	Indicates that the calculated motor voltage level has reached the maximum level.	■ The calculated motor voltage has reached the maximum programmed level. ■ Check if the transformation ratio setting is correct for the Transformer.
F981: Very low flow fault (LL)	This fault indicates that the flow signal is below the programmed level.	■ Effectively very low flow. ■ Check if the flow levels for the system are correct.
A982: Low flow alarm (L)	This alarm indicates that the flow signal is below the programmed level.	■ Effectively low flow. ■ Check if the flow levels for the system are correct.
A983: High flow alarm (H)	This alarm indicates that the flow signal is above the programmed level.	■ Effectively high flow. ■ Check if the flow levels for the system are correct.
F984: Very high flow fault (HH)	This fault indicates that the flow signal is above the programmed level.	■ Effectively very high flow. ■ Check if the flow levels for the system are correct.
F985: Motor high current	Indicates that the motor current level has reached the fault level.	■ The calculated motor current has reached the maximum programmed level. ■ Check if the transformation ratio setting is correct for the Transformer.
F986: Very high motor temperature	Indicates that the motor temperature has reached the maximum level.	■ Check if the motor temperature level is appropriate for the system.
F987: Very high motor voltage	Indicates that the calculated motor voltage level has reached the maximum level.	■ The calculated motor voltage has reached the maximum programmed level. ■ Check if the transformation ratio setting is correct for the Transformer.
F988: Very low motor voltage	Indicates that the calculated motor voltage level has reached the minimum level.	■ The calculated motor voltage has reached the minimum programmed level. ■ Check if the transformation ratio setting is correct for the Transformer.
F989: Very low intake pressure	Indicates that the minimum pressure level has been reached.	■ Check if the pressure level is appropriate for this system. ■ Check if the downhole sensor pressure readings are consistent.
F990: Very high downhole temperature	Indicates that the downhole temperature has reached the maximum programmed level.	■ Check if the temperature level is appropriate for the system. ■ Check if the downhole sensor temperature readings are consistent.
F991: Very high temperature PT100 1	Indicates that the downhole temperature at PT100-1 has reached the maximum programmed level.	■ Check if the temperature level is appropriate for the system. ■ Check if the temperature PT100-1 readings are consistent.

Faults and Alarms Table

Fault / Alarm	Description	Possible causes
F992: Very high temperature PT100 2	Indicates that the downhole temperature at PT100-2 has reached the maximum programmed level	■ Check if the temperature level is appropriate for the system. ■ Check if the temperature PT100-2 readings are consistent.
F993: Very high temperature PT100 3	Indicates that the downhole temperature at PT100-3 has reached the maximum programmed level	■ Check if the temperature level is appropriate for the system. ■ Check if the temperature PT100-3 readings are consistent.
A994: High temperature PT100 1	Indicates that the temperature at PT100-1 has reached the maximum programmed level.	■ Check if the temperature level is appropriate for the system. ■ Check if the temperature PT100-1 readings are consistent.
A995: High temperature PT100 2	Indicates that the temperature at PT100-2 has reached the maximum programmed level.	■ Check if the temperature level is appropriate for the system. ■ Check if the temperature PT100-2 readings are consistent.
A996: High temperature PT100 3	Indicates that the temperature at PT100-3 has reached the maximum programmed level.	■ Check if the temperature level is appropriate for the system. ■ Check if the temperature PT100-3 readings are consistent.
A997: High intake pressure	This alarm indicates that the intake pressure signal is above the programmed level.	■ Effectively high pressure intake. ■ Check if the pressure levels for the system are correct.
F998: MODBUS communication failure with downhole sensor	Failed to read telegrams via MODBUS from the downhole sensor.	■ Check wiring between downhole sensor and ALC11. ■ Check parameters of the COM port configured to perform the communication, and compare with the sensor configuration. ■ Check sensor network address. ■ Check MODBUS Address of downhole sensor tags.
F999: Low motor voltage	Indicates that the calculated motor voltage level has reached the minimum level.	■ The calculated motor voltage has reached the minimum programmed level. ■ Check if the transformation ratio setting is correct for the Transformer.

1 SAFETY INSTRUCTIONS

This manual contains the required information for the correct use of the ALC11 with electrical submersible pump method.

This manual must be used by people with proper technical training or qualification to operate this kind of equipment.

1.1 SAFETY NOTICES IN THE MANUAL

The following safety warnings are used in this manual:

DANGER!
The procedures recommended in this warning aim at protecting the user against death, serious injuries and considerable material damages.

ATTENTION!
The procedures recommended in this warning aim at preventing material damages.

NOTE!
The item contains important points to be observed.

2 GENERAL INFORMATION

2.1 ABOUT THE MANUAL

This manual provides the required description to configure the ALC11 module for the electrical submersible pump method with the CFW11 Artificial Lift Drive (ALD11) frequency inverter. This manual must be used together with the CFW11 user manual and the ALC11Tools manual.

2.2 TERMINOLOGY AND DEFINITIONS

2.2.1 Abbreviations and Definitions Used

ALD11 Artificial Lift Drive, CFW 11 frequency inverter with artificial lift firmware + ALC11 controller (CFW11...HALSTZ)
ALC11 Pumping controller (Artificial Lift Controller)
ALC11-ESP ALC11 with electrical submersible pump firmware
ALC11Tools ALC11 Configuration software
API Oil density degree
BSW Indicates the water content in the oil
CRC Cycling Redundancy Check
ESP Electrical Submersible Pump artificial lift method
EU Engineering unit
HMI Human Machine Interface
PLC Programmable Logic Controller
RAM Random access memory
USB Universal Serial Bus
WLP Ladder Language Programming Software
WPT ALC-11 Ladder Language Programming Software

2.2.2 Numerical Representation

Decimal numbers are represented by means of digits without suffix. Hexadecimal numbers are represented with the letter “h” after the number.

3 INTRODUCTIONS TO ELECTRICAL SUBMERSIBLE PUMPING IN THE ALC11-ESP

This manual describes the closed loop control system of oil wells operated by the CSP (Submersible Centrifugal Pump) lifting method. In general terms, it mainly describes the ALS11-CSP controller database, addressing the structure of its memory map, as well as the functional meaning of the configuration parameters and process data provided for supervision.

3.1 THE ELECTRICAL SUBMERSIBLE PUMPING

In the oil industry, there are several strategies developed to displace the oil from the reservoirs to the surface. These strategies are known as artificial oil lifting methods. One of the methods used in this process is known as Electrical Submersible Pump or by the acronym ESP. In this lifting method, a pump and subsurface motor are positioned at the lower end of the production column and move the oil to the surface by pressure.

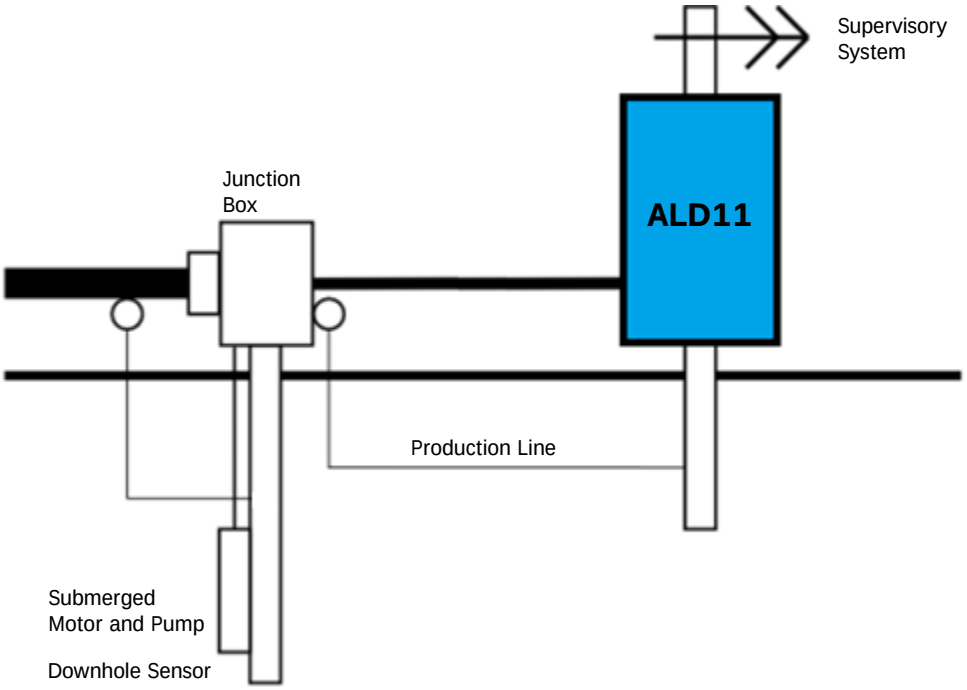


Figure 3.1 – Electrical submersible pumping well with ALD11 controller

The ALD11 panel, through the ALC11-ESP module incorporated into the CFW11 frequency inverter, performs the ESP pump speed control. The control methods can be changed by the user between current and downhole pressure. Where in both cases with a user-defined control point, ALC11 uses this information to implement a speed control loop in order to stabilize the control variable and keep the error (difference between setpoint and control variable) the smallest possible, maximizing production and preventing the dynamic level from reaching the pump.

3.2 CFW11 ARTIFICIAL LIFT DRIVE – ESP

The CFW11 Artificial Lift Drive ESP comes with factory default configurations for both digital and analog input/output functions. The control connections (analog inputs/outputs, digital inputs/outputs) must be made to the CFW11 XC1 connector.

Figure 3.2 – CFW11 Artificial Lift Drive

Below we present the functions of the CFW 11 inputs and outputs in the ESP method:

Table 3.1 – Signals on the standard XC1 connector for the ESP method

Function	Type	Order	Connector XC1		Description
Inputs	Analog	01	2	AI1 +	Reserve
			3	AI1 -	
		02	5	AI2 +	Intake Pressure
			6	AI2 -	
	Digital		13	24 V	24V Source
		01	15	DI1	Starts Local
		02	16	DI2	Local/Remote
		03	17	DI3	Stops local
		04	18	DI4	Emergency actuated
		05	19	DI5	Fault Reset
		06	20	DI6	Alarm/External fault
Outputs	Analog	01	7	AO1	Motor speed
			8	AGND	
		02	9	AO2	Motor current
			10	AGND	
	Digital	01	22	COM	No fault
			23	NA1	
		02	25	COM	Run
			26	NA2	
		03	28	COM	Reserve
			29	NA3	

3.2.1 ALC11 Controller

The CFW11 Artificial Lift Drive is composed of the ALC11 control board, which is inserted into the CFW11.

Figure 3.3 – ALC11 Controller

Below we present the functions of the ALC11 inputs and outputs in the ESP method::

Table 3.2 – Signals on the standard XC30 and XC31 connector for the ESP method

Function	Type	Order	Connector XC30		Description
Inputs	Analog	00	6	E0	Motor temperature
		01	7	E1	Downhole flow
		02	8	E2	Downhole temperature
		06	1..5	E6	Reserve
	PT 100	03	10..12	E3	Temperature of phase U
		04	13..15	E4	Temperature of phase V
		05	16..18	E5	Temperature of phase W
	Type	**Order**	**Connector XC31**		**Description**
	Digital	00	1..2	I0	Ground fault
		01	3..4	I1	Transformer overtemperature trip
		02	5	I2	Line underpressure
		03	6	I3	Line overpressure
		04	7	I4	Backspin actuated
		05	8	I5	Manual/Automatic
Outputs	Digital	00	12	O0	Reserve
		01	13	O1	Automatic mode selected
		02	14	O2	Acoustic alarm
		03	15	O3	Remotely connected

4 OPERATION MODES

The CFW11 Artificial Lift Drive enables the operation of the pumping unit in a variety of conditions, facilitating operations such as maintenance, operation at constant speed or automatically controlled by control strategies. The following operating modes are available:

■ LOCAL Operation: In this mode, the CFW11 Artificial Lift Drive operates in the LOCAL mode, and the ALC11 controller does not control the pump speed. In this scenario, it allows the pump to start and stop, as well as to manually specify the motor HZ operating speed, either locally on the control panel or via the ALC11Tools application.

■ REMOTE Operation: In this mode, the CFW11 Lift Artificial Drive operates in the REMOTE mode, providing remote operation resources, for example by means of a communication system via radio. In this scenario, we have the following subtypes of system operation:

- Manual Remote Mode: Allows remote start and stop of the pump, as well as manual speed adjustment via the ALC11Tools application or remote supervision system.

- Automatic Remote Mode: The controller has a control strategy that acts on the pump speed using a configurable control point of the downhole pressure or the motor current as reference. This strategy controls the operating speed, acting on the speed of the pumping unit in order to keep the pressure level stable upon the reservoir variations.

4.1 LOCAL/REMOTE SELECTION MODE

In the CFW11 Artificial Lift Drive, the digital input used to select the local / remote mode must always be the DI2 input of the CFW11, for this we must program digital input DI2 for local / remote selection (P0264 = 9).

With the digital input properly programmed, we can select the local / remote mode. The selection between the “local” and “remote” modes can be carried out via the “local / remote” selector button or key installed on the control panel door. To select between the key or button modes we have the following configuration

Table 4.1 – Description of local / remote mode via selection key (DIx) or push button

Parameter	Address	Description	Status	Min.	Max.	Unit
P0220	4x8221	Local/remote selection	4 = DIx, Operation as selection switch between local and remote modes: In this case the switch position determines the operation mode of the controller. In this Configuration, toggling between the local and remote operation modes by means of remote control is not allowed 15 = ALC(M), Operation as pushbutton. In this case, each pulse generated on this button toggles between the local and remote modes. In this configuration, toggling between local and remote operating modes by means of remote control is allowed	0	15	-

To select the local / remote mode on the frequency inverter when configured for the push button (P0220 = 15), just send the code of the respective command:

Table 4.2 – Description of local and remote command code

Parameter	Address	Description	Status	Min.	Max.	Unit
M0607	4x0608	Local/remote selection via ALC(M)	10 = Command code for Local mode selection in the frequency inverter 11 = Command code for Remote mode selection in the frequency inverter	0	32767	-

4.2 LOCAL MODE

With the “Local” mode selected, the pumping unit can be started/stopped by means of:

■ “Run/Stop” pushbuttons installed on the control panel door, allowing the pump to be turned on and off.

■ HMI application on the opening screen on the “Start” and “Stop” buttons, allowing the pump to be turned on and off.

■ ALC11Tools opening screen on the “Start” and “Stop” buttons, allowing the pump to be turned on and off.

■ remote command for the ALC11 by means of variable M0289.

Table 4.3 – Pump remote command in LOCAL mode

Parameter	Address	Description	Status	Min.	Max.	Unit
M0289	4x0290	Pump remote command in local mode	10 = Starts pump 11 = Stops pump	0	32767	-

Actuation at the pump speed reference in local mode can be done:

■ HMI of the frequency inverter by means of parameter P1021. In this case this parameter must be programmed in RPM and not in Hz.

■ HMI of the marker application D0195. In this case this parameter must be programmed in Hz.

NOTE!
The speed reference value for the motor speed is limited by the inverter via parameters P0134 (maximum speed) and P0133 (minimum speed) in RPM.

The programmed speed will follow the acceleration curve set in the starting ramp parameters, and in case of a “stop pump” command, the deceleration will also follow the parameters related to the stop ramp.

Table 4.4 – Pump local command in LOCAL mode

Parameter	Address	Description	Status	Min.	Max.	Unit
P1020	4x9021	Command to start/stop the pump using inverter parameter	1 = Stops pump motor 2 = Starts pump motor	0	10	-
P1021	4x9022	Speed reference related to motor speed (RPM) for local mode operation		0	5000	rpm
D0195	4x10391	Speed reference related to motor speed (Hz) for local mode operation		0	500	Hz

ATTENTION!
The parameter P1021 must be programmed in (RPM) and not in (Hz).

4.3 REMOTE MODE

With the “Remote” mode selected, it is possible to select between the “manual” and “automatic” modes. The selection between the “manual” and “automatic” modes can be done via:

■ "Manual / Automatic" selector button or switch installed on the control panel door. To select between the switch or button modes, we have the following configuration:

Table 4.5 – Description of the "Manual / Automatic" selector button or switch

Parameter	Address	Description	Status	Min.	Max.	Unit
R0015	0x0006	Manual/Automatic input configuration	OFF = Operation as pushbutton. In this case, each pulse generated on this button toggles between manual and automatic modes. In this configuration, toggling between Manual and Automatic operating modes by means of remote control is allowed ON = Operation as selection switch between the local and remote modes: In this case, the switch position determines the controller operating mode. In this configuration, toggling between Manual and Automatic operating modes by means of remote control is not allowed	0 (OFF)	1 (ON)	-

4.3.1 Manual Remote Mode

In manual remote mode the pump can be started/stopped by means of:

■ HMI application on the opening screen on the “Start” and “Stop” buttons, allowing the pump to be turned on and off.

■ ALC11Tools opening screen on the “Start” and “Stop” buttons, allowing the pump to be turned on and off.

■ Remote command for the ALC11 by means of variable M0289.

Table 4.6 – Pump remote command in REMOTE mode

Parameter	Address	Description	Status	Min.	Max.	Unit
M0289	4x0290	Pump remote command in remote mode	10 = Starts pump 11 = Stops pump	0	32767	-

■ “Run/Stop” pushbuttons installed on the control panel door, allowing the pump to be turned on and off. If parameter R0012 is programmed for this:

Table 4.7 – Treatment for “Run/Stop” pushbuttons

Parameter	Address	Description	Status	Min.	Max.	Unit
R0012	0x0013	Treatment for “Run/Stop” digital inputs	OFF = Disables the *“Run/Stop” pushbuttons* in REMOTE ON = Enables the “Run/Stop” pushbuttons in REMOTE	0 (OFF)	1 (ON)	-

Actuation of the pumping unit speed reference in remote mode can be done:

■ Remote command for the ALC11 by means of variable D0194. This variable refers to the motor frequency and must be programmed in Hz. In this case the speed is limited by parameters D0010 (minimum motor speed) and D0011 (maximum motor speed).

Table 4.8 – Pump command in MANUAL REMOTE mode

Parameter	Address	Description	Status	Min.	Max.	Unit
D0194	4x10389	Motor speed reference (Hz) for manual remote mode operation		0.0	500.0	Hz
D0010	4x10021	Minimum motor speed operating limit		0.0	500.0	Hz
D0011	4x10023	Maximum motor speed operating limit		0.0	500.0	Hz

4.3.2 Automatic Remote Mode

In the automatic remote mode, the pump motor can be started/stopped as in the manual remote mode, and the current reference speed of the system is kept.

Operation in automatic mode differs from manual in the handling related to the pump speed control described in the following section.

4.3.3 Control Strategy in Automatic

The ALD11-ESP allows the user to configure automatic pump control, acting on the pump frequency to seek the defined setpoint, whether it is current or pressure.

When the system is in remote mode, it is possible to activate the automatic mode on M170 = 10. With the system in automatic remote mode the ALD11-ESP will act on the frequency and check the system response to find the user defined setpoint.

The user can choose between the current or pressure control variables, the variable can be acquired via ModBus or via inverter analog input, depending on the type of sensor programmed in parameter M0002, according to section 7.1 Downhole Sensor Settings. By default, the control is set to directly proportional, i.e., if we increase the frequency, the feedback must increase; if the user wishes, it is possible to set to inversely proportional.

The user will have to configure the following parameters:

Table 4.9 – Configuring automatic speed control

Parameter	Address	Description	Status	Min.	Max.	Unit
M0170	4x0171	Automatic remote control type	0 = No control 10 = Step control	0	10	-
D0037	4x10075	Increment/decrement step size		0.1	10.0	Hz
M0037	4x0038	Interval step (time between increments in seconds) scale		1	180	s
D0036	4x10073	Hysteresis range % where the control does not act		0.0	10.0	%
D0009	4x10019	Setpoint control target value, pressure or current		0.0	6500.0	PSI, A
R0009	0x0010	Control type	OFF = Inversely proportional: Uses motor current ON = Directly proportional: Uses downhole pressure	0 (OFF)	1 (ON)	-
R0010	0x0011	Control setpoint type	OFF = Motor current ON = Downhole pressure	0 (OFF)	1 (ON)	-

4.3.3.1 Directly Proportional Control

The controller has a speed control strategy directly proportional as shown below:

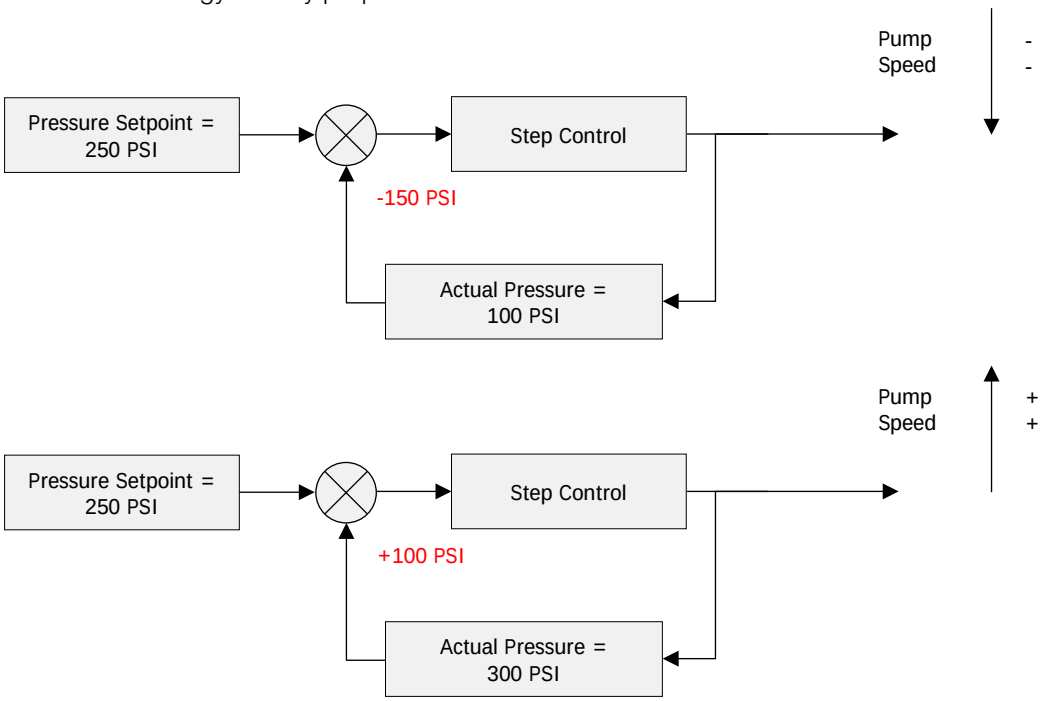


Figure 4.1 – Directly proportional control mode

4.3.3.2 Inversely Proportional Control

The controller has a speed control strategy inversely proportional as shown below:

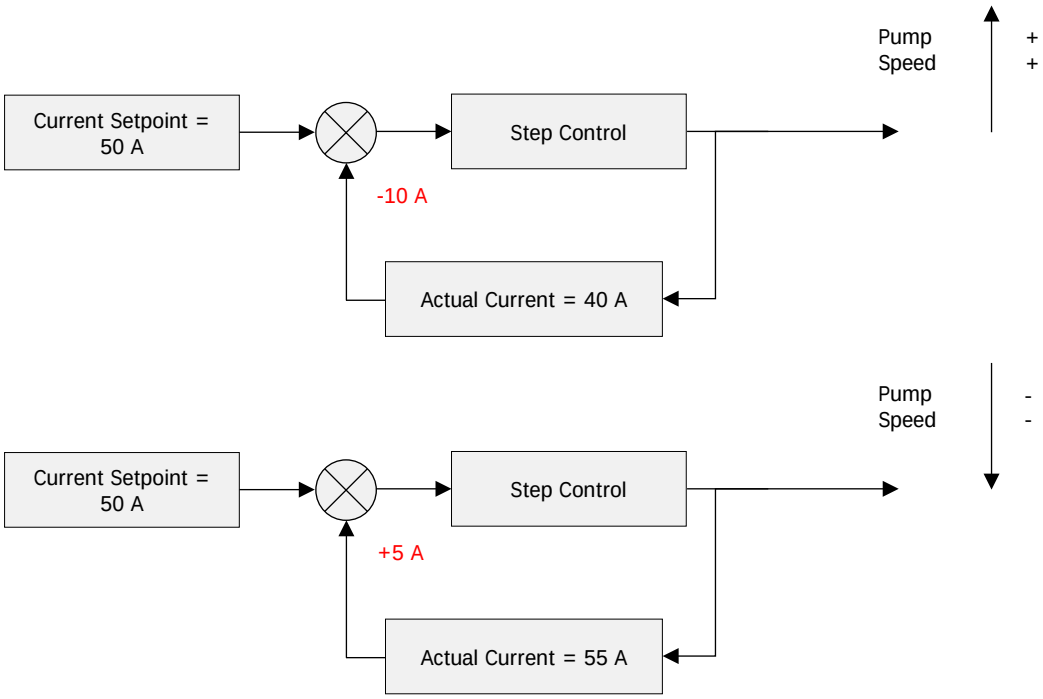
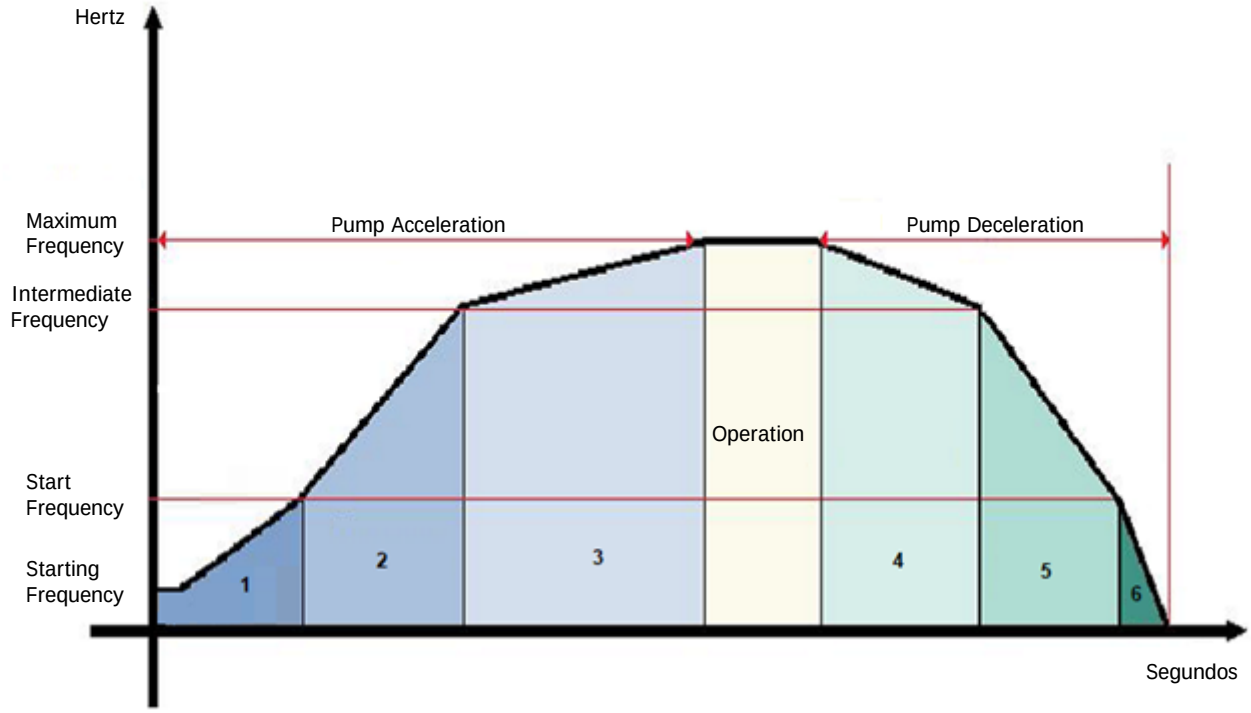


Figure 4.2 – Inversely proportional control mode

5 SYSTEM START AND STOP

The Start and Stop Ramp function allows the user to modify the motor acceleration rate during the start and the motor deceleration rate during system stop. These acceleration and deceleration rates are defined in Hertz per second (Hz /s) and Hertz per minute (Hz /min).

The system allows you to customize the pump start and stop in three different levels: Start Ramp, Intermediate Ramp and End Ramp. This division allows the user to program different curves for the pump start and stop. The frequency ranges in each level can be seen in the figure below.



1-Acceleration Start Ramp [Hz/s]
2-Acceleration Intermediate Ramp [Hz/min]
3-Acceleration End Ramp [Hz/min]
4-Deceleration End Ramp [Hz/min]
5-Deceleration Intermediate Ramp [Hz/min]
6-Deceleration Start Ramp [Hz/s]

Figure 5.1 – Start and stop ramp chart

■ START RAMP: The start ramp is the range between frequency 0 to the frequency defined in the “Start frequency” parameter (D0081). The acceleration and deceleration for this range can be modified using parameters D0082 and D0083, which are set in Hz/s.

■ INTERMEDIATE RAMP: The intermediate ramp is the range between the “Start Frequency” (D0081) and the “Intermediate Frequency” (D0088). The acceleration and deceleration for this range can be modified using parameters D0084 and D0085, which are set in Hz/s min.

■ END RAMP: The end ramp is the range between the Intermediate frequency (D0088) and the Frequency reference (Operating frequency), where the parameter will vary according to the mode in which the inverter is operating (Local or Remote). The acceleration and deceleration for this range can be modified using parameters D0086 and D0087, which are set in Hz/s min.

5.1 CONFIGURATION PARAMETERS

The parameters described in this item are intended to configure the ESP start and stop ramps.

Both acceleration and deceleration can be customized using the parameters D0081 to D0087.

Table 5.1 – Start and stop ramp configuration parameters

Parameter	Address	Description	Status	Min.	Max.	Unit
D0081	4x10163	Start frequency		0	100	Hz
D0088	4x10177	Intermediate frequency		0	100	Hz
D0082	4x10165	Acceleration ramp - Start level		0	1000	Hz/s
D0083	4x10167	Deceleration ramp - Start level		0	1000	Hz/s
D0084	4x10169	Acceleration ramp - Intermediate level		0	1000	Hz/min
D0085	4x10171	Deceleration ramp - Intermediate level		0	1000	Hz/min
D0086	4x10173	Acceleration ramp - End level		0	1000	Hz/min
D0087	4x10175	Deceleration ramp - End level		0	1000	Hz/min

The parameters above allow the user to configure the ramps of the inverter for the motor to be accelerated or decelerated at a faster or slower rate. These parameters are recalculated internally by the ESP controller.

ATTENTION!
Due to the large inertia of a pump, care should be taken when setting the pump acceleration and deceleration values. A very high value may cause the frequency inverter to fail while the pump is driven.

For the start frequency it is not recommended to use a frequency below 7Hz. Because the inverter's output filter is designed to work at operating frequencies, so at low frequencies it may not protect the Trafo-motor circuit.

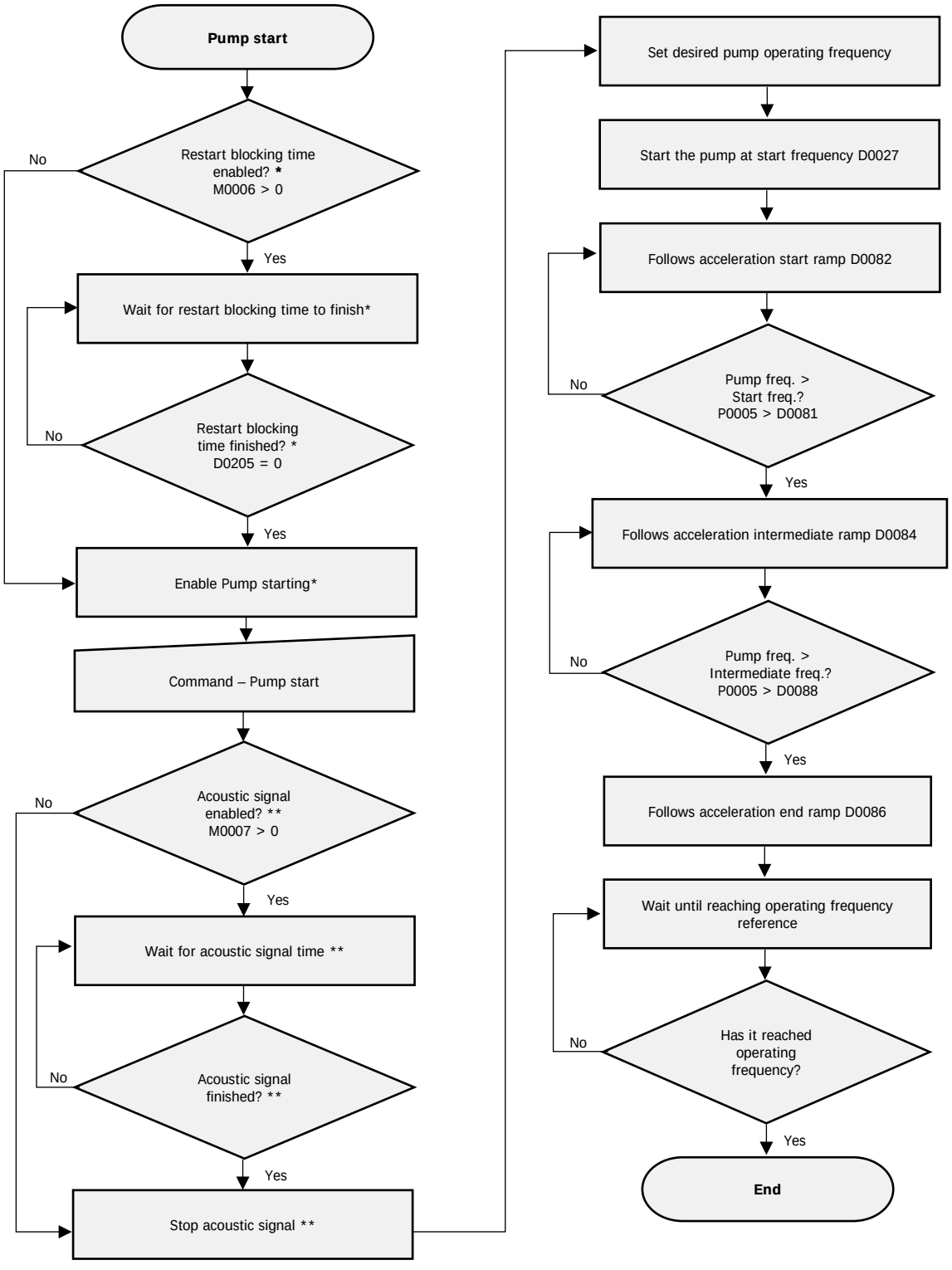
Table 5.2 – Start minimum frequency

Parameter	Address	Description	Status	Min.	Max.	Unit
D0027	4x10055	Start minimum frequency		0	90	Hz

ATTENTION!
At extremely low frequencies, there may be a high imbalance and the filter is not effective and does not provide protection for the circuit. For this reason, operating the inverter at these lower frequencies can damage electronic components. A typical fault caused during starting by the very low Start Frequency (D0027) is F071 - Output overcurrent failure.

5.2 PUMP START

The figure below illustrates the flow chart of the pump start in remote mode.



*** Has no effect in local mode**

**** In local mode, the acceleration ramp occurs in parallel**

Figure 5.2 – Pump start procedure

5.3 PUMP STOP

The figure below illustrates the flow chart of the pump stop in remote mode.

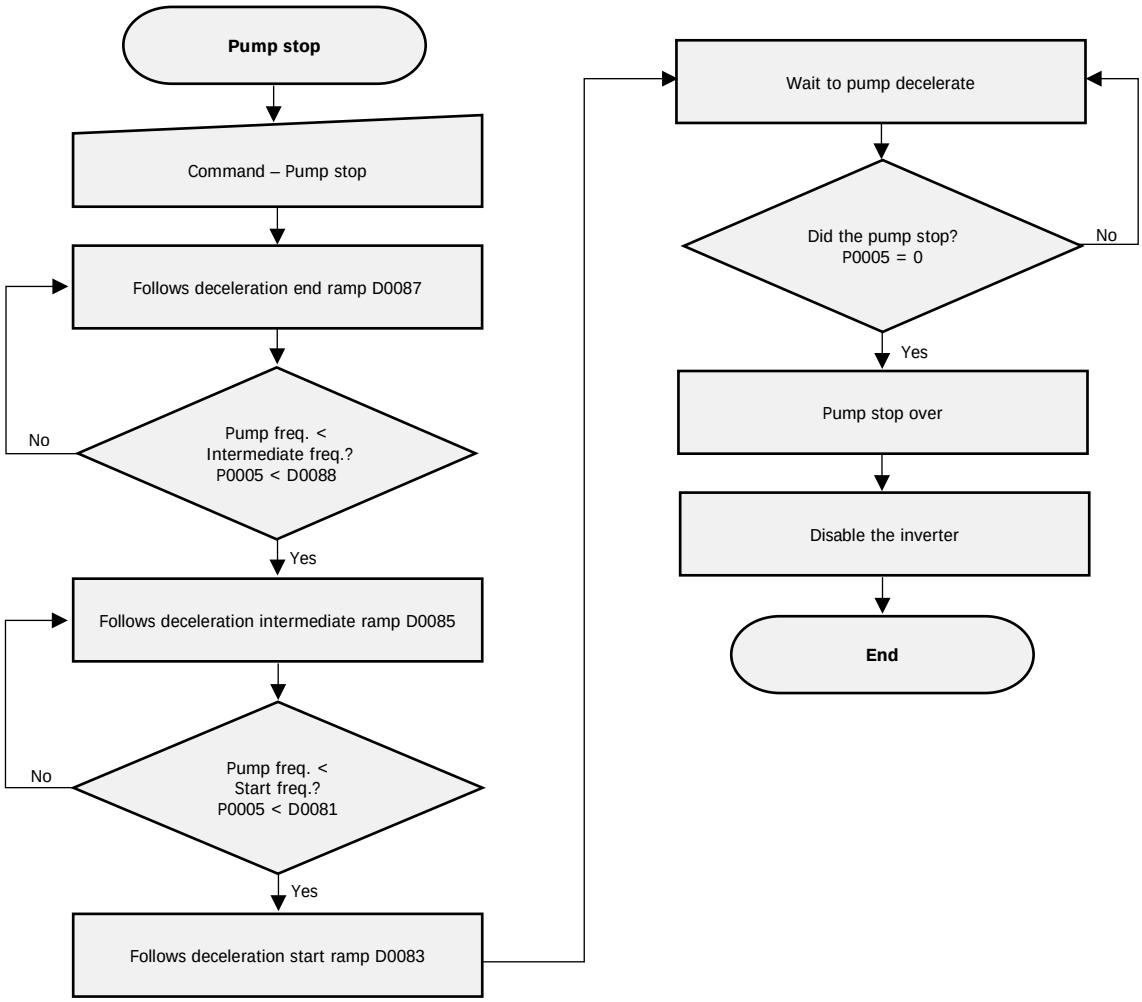


Figure 5.3 – Pump stop procedure

6 OPERATING FUNCIONALITIES

6.1 PUMP LOCKING MONITORING

Pump locking monitoring is performed whenever the pump is turned on. This functionality is user-configurable and can simply generate a “Heavy Pump” alarm, without interrupting the pumping, or generate a “Locked Pump” fault, interrupting the pumping by turning off the frequency inverter.

6.1.1 Enabling of the Pump Locking Monitoring

Parameter R0014 allows activating the locked pump check. If it is ON, it activates the locked pump check so that, if it is detected that the pump is locked at the start, it stops the pump and generates the “Locked Pump” alarm, and, in this case, it requires that the pump rocking start routine be performed.

If it is in OFF, the locked pump check is deactivated, only monitoring if the pump is heavy at the start. In this case, if the pump is heavy, a “Heavy Pump” alarm is generated, but it does not stop the pump:

Table 6.1 – Enabling of the pump locking checking

Parameter	Address	Description	Status	Min.	Max.	Unit
R0014	0x0015	Enables the locked pump check	OFF = Disabled function ON = Enabled function	0 (OFF)	1 (ON)	-

6.1.2 Configuration of the pump locking monitoring

The unlocking attempt is based on pump locking monitoring. These parameters are described in the table below.

Table 6.2 – Configuration of the pump locking monitoring

Parameter	Address	Description	Status	Min.	Max.	Unit
M0060	4x0061	Inverter operating frequency where the locked pump condition is checked as a function of the percentage of current programmed in M0061	Before the frequency inverter reaches this check frequency, if it reaches the percentage of current programmed in M0061, the locked pump condition is confirmed, and in this case, the inverter is decelerated by ramp to speed zero	0	45	Hz
M0061	4x0062	This parameter determines the percentage of the current to detect the locked pump condition		60	120	%

The flowchart below illustrates the sequence related to the pump locking monitoring procedure.

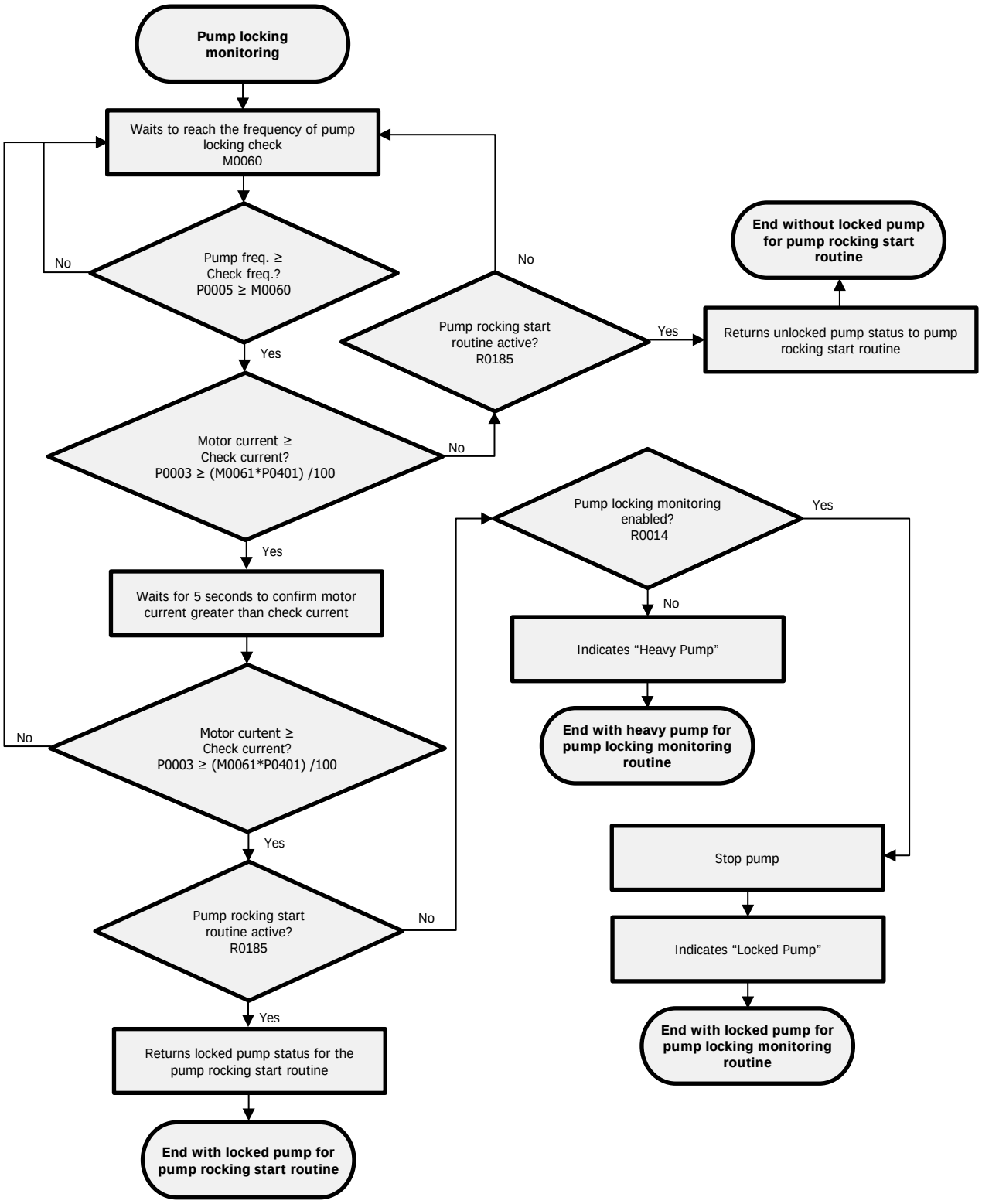


Figure 6.1 – Pump locking monitoring procedure

Example of detection of locked pump

The figure below shows the check frequency and current of locked pump indicated in the following points:

■ Point A: moment when the current reaches the value programmed in M0061 at a frequency lower than M0060. Five seconds is counted, and if the current does not decrease, the software detects it and generates a locked pump alarm.

■ Point B: moment when five seconds is reached, an alarm of Locked Pump is generated, and the inverter is decelerated by ramp up to speed zero.

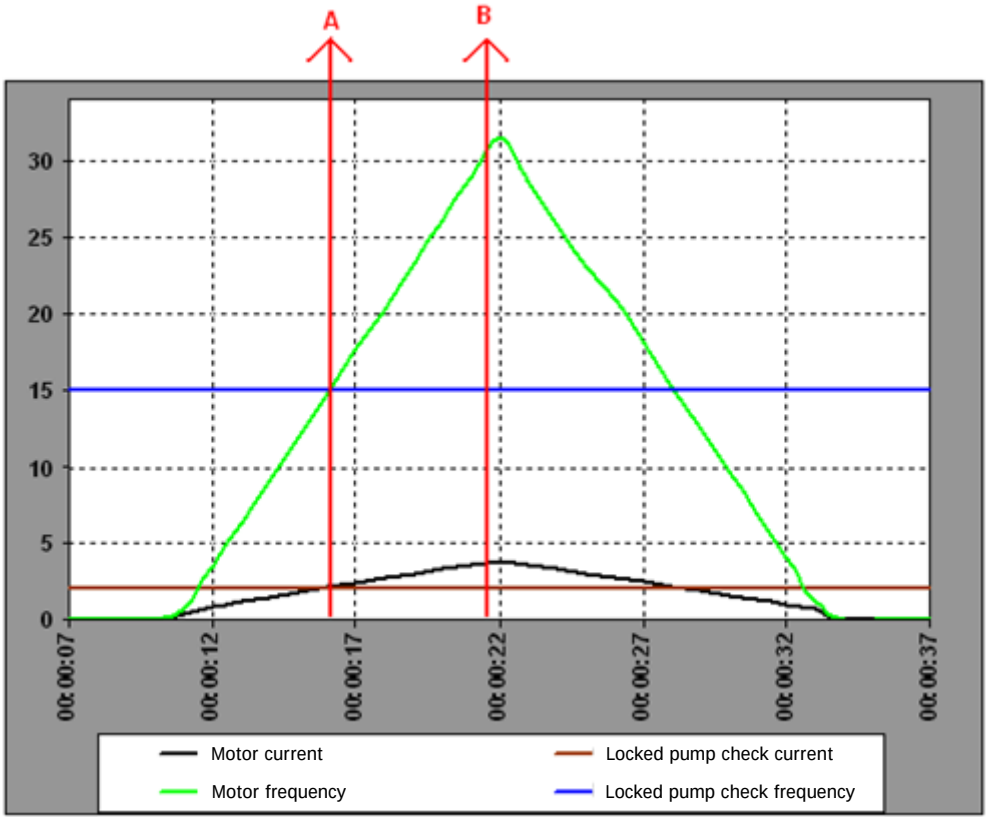


Figure 6.2 – Example chart of detection of locked pump

6.2 PUMP ROCKING START FUNCTION

This function enables the ESP to start the equipment with an additional voltage boost in order to release the pump. The pump may get stuck because of internal wear of the pumps and protections, or, more commonly, because of the accumulation of materials/waste, such as sand, on the blades of the pump, preventing it from starting and causing damage if it runs under overload.

This rocking start function is based on the drive of the equipment for a certain time in the opposite direction of that used for pumping the fluid; then the equipment is driven in the pumping direction. At the end of the complete cycle, the motor is accelerated to the programmed reference for a new locked pump check. If it is detected that pump is unlocked, the motor is switched off and then started again up to the speed reference for the corresponding operating mode.

This pump rocking start function is performed upon the user demand. That is, the execution of the rocking start routine must be activated by the user and not automatically executed by the system.

NOTE!
To cancel the rocking start routine during the process, press the emergency button on the panel.

6.2.1 Activation of the Pump Rocking Start Routine

This pump rocking start function is not automatically performed by the system, so it must be performed upon the user's demand. In order to do so, the user must set the variable R0270 to ON, and after the rocking start routine begins, this variable return to OFF.

Table 6.3 – Parameter to activate the pump rocking start routine

Parameter	Address	Description	Status	Min.	Max.	Unit
R0270	0x0271	Activates the pump rocking start routine	OFF = Disables rocking start routine ON = Activates rocking start routine	0 (OFF)	1 (ON)	-
R0185	0x0186	Pump rocking start status	OFF = Pump rocking start routine not activated ON = Pump rocking start routine activated	0 (OFF)	1 (ON)	-
R0170	0x0171	Rocking start test status	OFF = Out of routine ON = Running test routine	0 (OFF)	1 (ON)	-
R0171	0x0172	Rocking start test	OFF = Pump rocking start test FAILED. ON = Pump rocking start test SUCCESSFULLY	0 (OFF)	1 (ON)	-

6.2.2 Configuration Parameters

The pump rocking start has specific parameters related to speed reference during the unlocking attempt cycles, as described in the table below:

Table 6.4 – Parameters to configure the pump rocking start 1

Parameter	Address	Description	Status	Min.	Max.	Unit
M0062	4x0063	Additional voltage boost during the pump rocking start. The value set in this parameter is added to the frequency inverter parameter P0143 during the execution of the pump rocking start routine		0	9	-
M0063	4x0064	Frequency reference during the execution of the pump rocking start		0	45	Hz

The voltage boost by the M0062 configuration is inserted during the motor acceleration to the rocking start frequency. The higher the value of M0062, the higher the voltage level applied to the motor, as shown in the following figure:

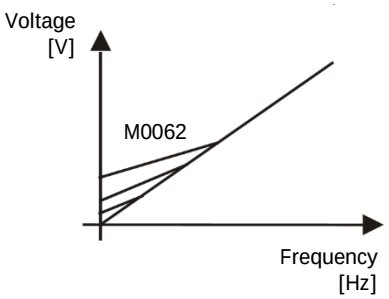


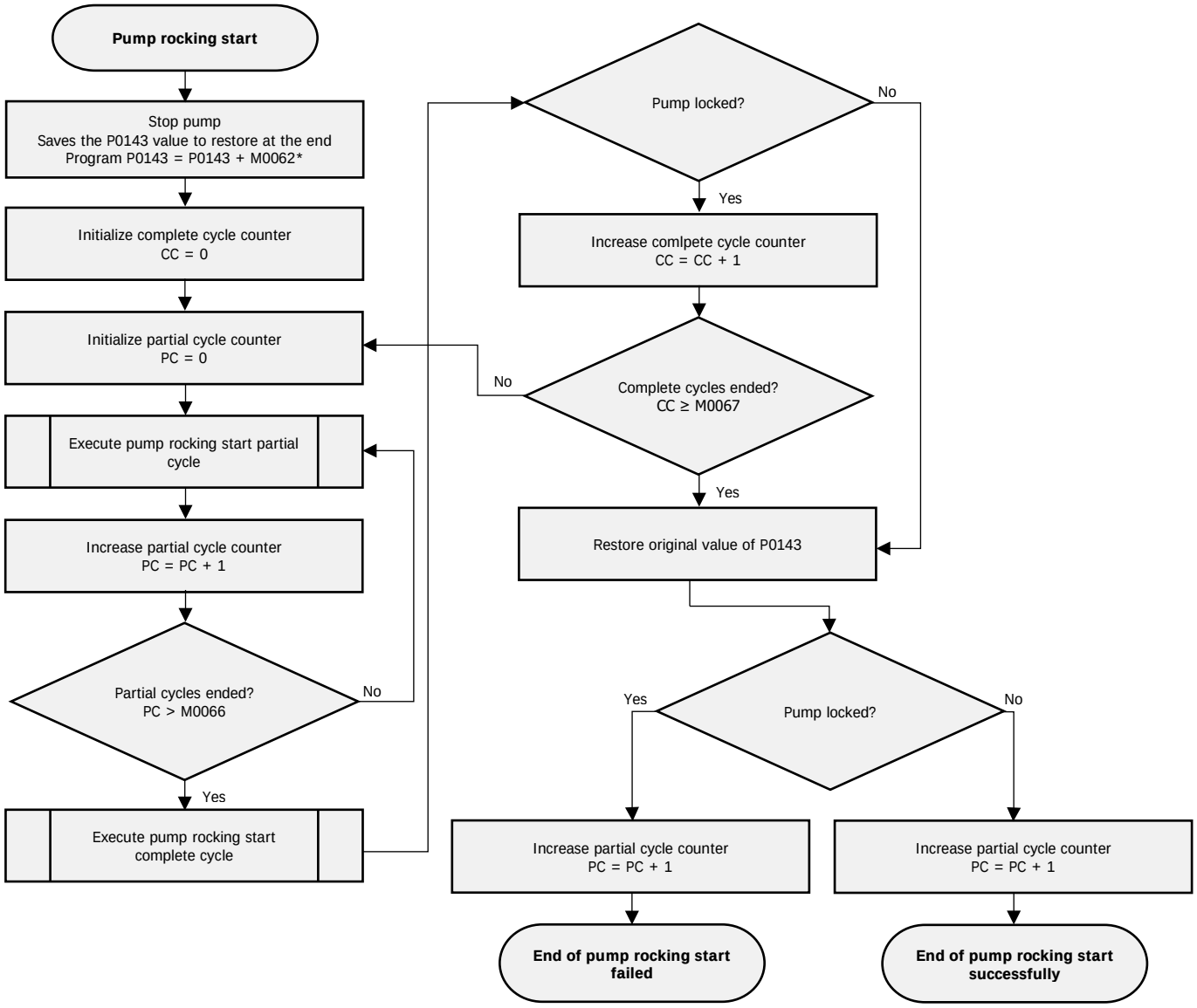
Figure 6.3 – Voltage boost curve applied to the motor

The rocking start routine consists of two types of cycles:

■ **Partial Cycle:** A partial cycle corresponds to the driving of the set for a certain time in the same or opposite direction of the fluid pumping. Finally, at the end of this driving cycle, there is a time interval for the execution of the next partial cycle.

■ **Complete Cycle:** A complete cycle corresponds to a set of consecutive partial cycles, with the number of partial cycles configured in M0066. At the end of a complete cycle, an attempt to unlock the pump is executed.

The flowchart below illustrates the sequence related to the pump rocking start procedure.



*** Percentage is added according to the selected curve**

Figure 6.4 – Pump rocking start procedure

The partial cycle has the parameters described in the table below.

Table 6.5 – Parameters to configure the pump rocking start 2

Parameter	Address	Description	Status	Min.	Max.	Unit
M0064	4x0065	Interval between partial rocking start cycles		1	200	s
M0065	4x0066	Duration of partial pump rocking start cycles, where the motor will be running at the frequency programmed in M0063		1	200	s
M0066	4x0067	Number of partial cycles of the pump rocking start routine. Number of partial cycles executed consecutively for the clockwise and counterclockwise rotation of the pump during the pump rocking start routine		1	100	

The flowchart below illustrates the sequence related to the pump rocking start procedure partial cycle.

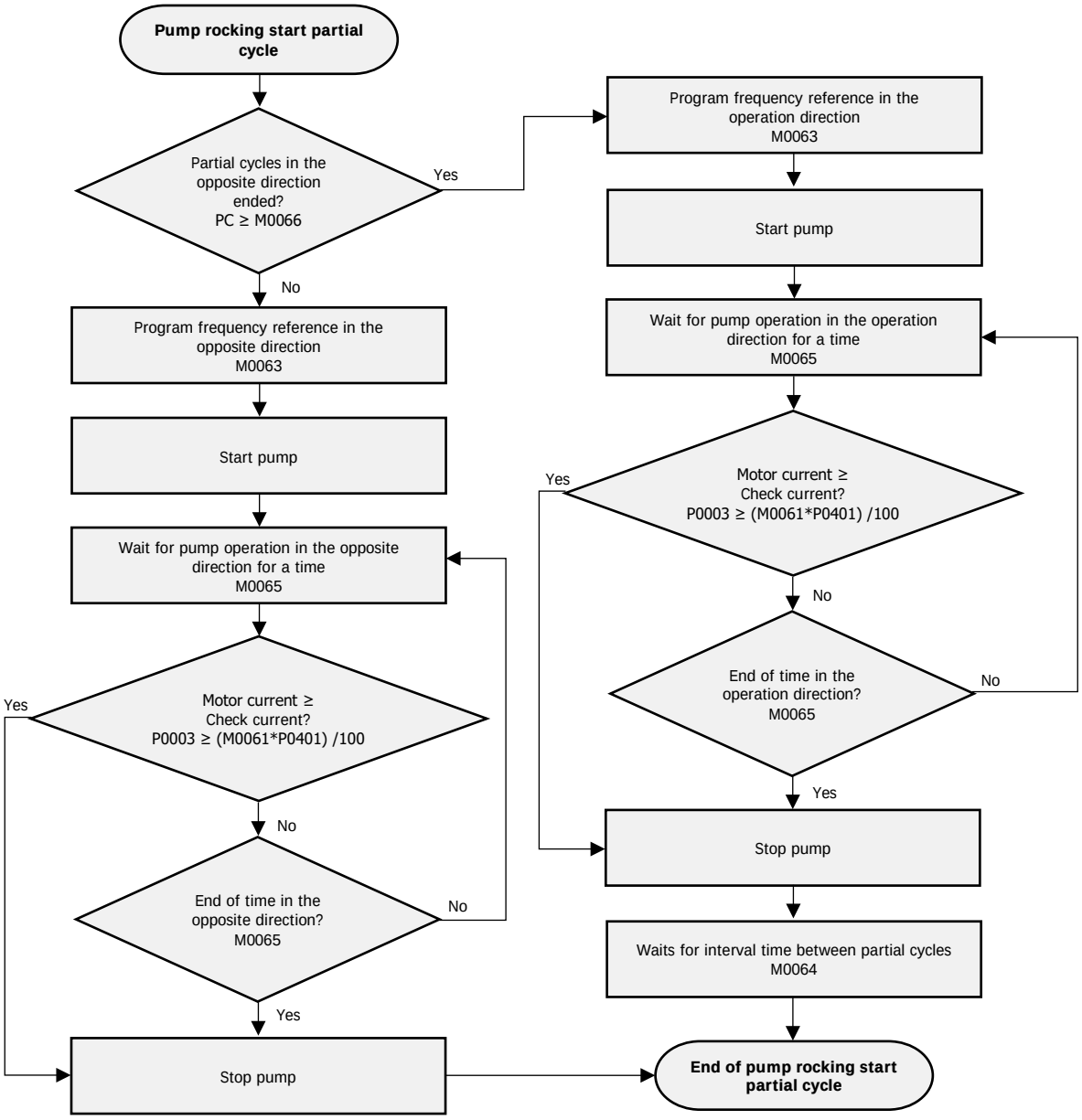


Figure 6.5 – Pump rocking start procedure partial cycle

The complete cycle has the parameters described in the table below.

Table 6.6 – Parameters to configure the pump rocking start 3

Parameter	Address	Description	Status	Min.	Max.	Unit
M0067	4x0068	Number of complete cycles to be executed in the attempt of unlocking the pump during the pump rocking start routine		1	100	

The flowchart below illustrates the sequence related to the pump rocking start procedure complete cycle.

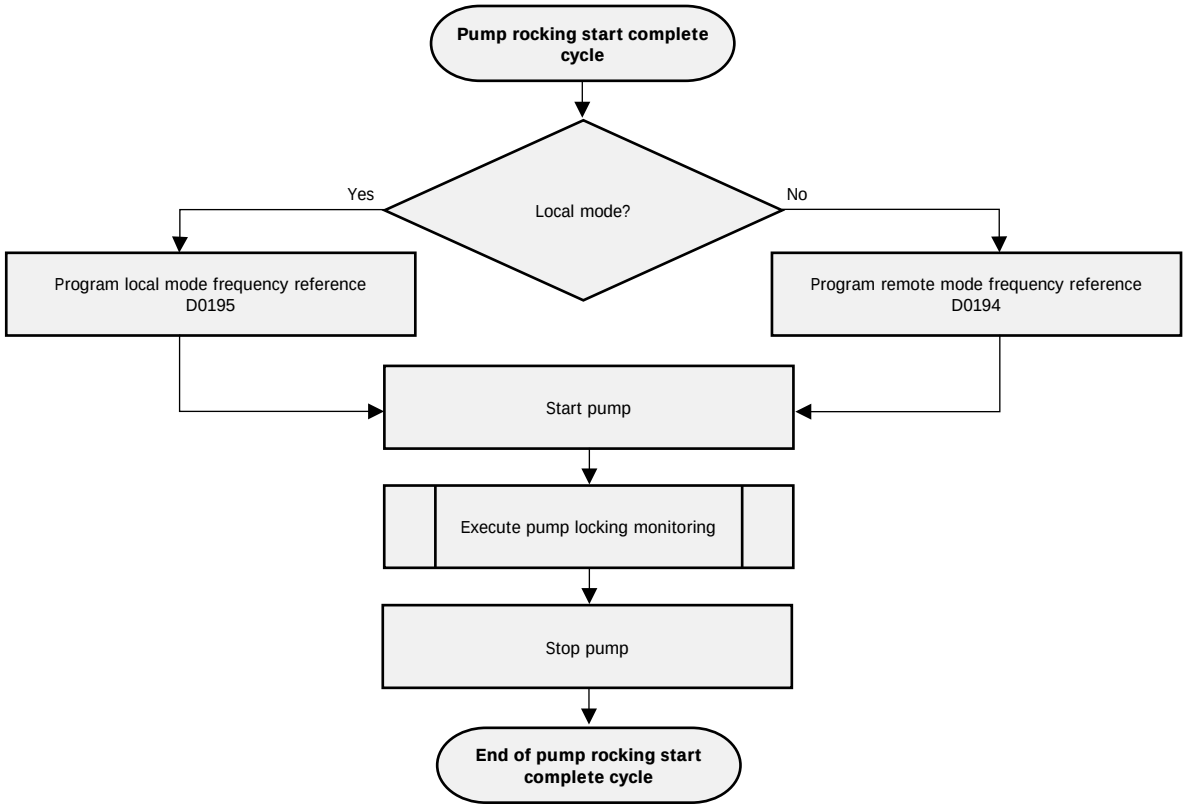


Figure 6.6 – Pump rocking start procedure complete cycle

Each cycle of execution performed is an unlock attempt.

NOTE!
At the end of the programmed complete cycles, one more attempt is made, if none of these attempts are successful, the pump rocking start failure is generated and 1 more is added in parameter M0068, the maximum number of unlocking attempts. These parameters are described in the following table

Table 6.7 – Parameters to configure the pump rocking start attempts

Parameter	Address	Description	Status	Min.	Max.	Unit
M0068	4x0069	Maximum number of pump rocking start attempts in an interval. Each attempt corresponds to a complete pump rocking start cycle		1	100	-
M0069	4x0070	Interval during which the number of attempts of pump rocking start will be verified. If the number of attempts programmed in M0068 has exceeded this interval, any attempt to start the pump will be blocked, displaying a locked pump signal.		0	10	h

It is possible to monitor the pump rocking start routine with the following ALC11 parameters, as shown in the following table:

Table 6.8 – Monitoring parameters of the pump rocking start routine

Parameter	Address	Description	Status	Min.	Max.	Unit
M1009	4x1010	Number of partial cycles performed in the pump rocking start routine		0	100	-
M1010	4x1011	Number of complete cycles performed in the pump rocking start routine		0	100	-
M0224	4x0255	Number of pump rocking start performed during the time interval counting time M0069		0	100	-

6.3 UNDERCURRENT FUNCTION

The undercurrent function is intended to monitor whether the motor current is operating at a current below the reference during the system operation.

The undercurrent check is based on the current reading and motor frequency and compares the point at which the pump is operating to the operating point given in the current curve. If the pump current at a certain operating point remains below the tolerance specified for current in the system for a certain period of uninterrupted time, the undercurrent condition is confirmed.

This function is user configurable and can simply generate an undercurrent alarm, without interrupting the pumping, or generate an undercurrent fault, interrupting the pumping by turning off the frequency inverter.

This function is extremely important for applications in ESP, because, based on the measurement of the motor current, it is possible to know if the motor is operating at low flow rates, which can be highly harmful to the motor + pump set, considering that the pumped fluid is responsible for the cooling of the assembly.

Once the flow can suffer a significant reduction, caused either by a reservoir problem, pump shaft rupture or any other reason, the motor may come to an electrical failure (low insulation or short-circuit) as a result of the overheating caused by the lack of cooling.

6.3.1 Configuration Parameters

The undercurrent monitoring is performed whenever the pump is switched on, taking into account the operating range of the minimum and maximum operating frequencies of the frequency inverter. The current reference limit should be programmed directly in ampere, and the other parameters related to this functionality will be described in the next sessions.

6.3.2 Undercurrent Signaling Configuration

The pump undercurrent check is always performed when the pump is running. However, it is possible to configure the system behavior in the undercurrent condition by means of parameter R0013.

Table 6.9 – Configuration the undercurrent signaling

Parameter	Address	Description	Status	Min.	Max.	Unit
R0013	0x0014	System configuration in motor undercurrent condition	OFF = Signals undercurrent fault ON = Signals undercurrent alarm	0 (OFF)	1 (ON)	-

Detailing the options above, we have:

■ ON: In the undercurrent condition, an undercurrent alarm is generated, in which case the pump is not switched off.

■ OFF: In the undercurrent condition, an undercurrent fault is generated, in which case the pump is switched off via fault indicated on the frequency inverter.

6.3.3 Configuration of Undercurrent Limit Curves

The limit associated with the undercurrent condition must be set directly in [Ampere] and can be performed by means of two curves:

■ Standard curve: where a single value is defined for the whole operating range of the frequency inverter. This unique value must be programmed in M0077.

■ Customized curve: where 6 values are defined to discretize the operating range of the frequency inverter. These values must be programmed from M0078 to M0083.

Table 6.10 – Undercurrent curves configuration status

Parameter	Address	Description	Status	Min.	Max.	Unit
R0184	0x0185	Undercurrent curves configuration status	OFF = Standard undercurrent level ON = Customized undercurrent level	0 (OFF)	1 (ON)	-

Table 6.11 – Configuration the undercurrent curve

Parameter	Address	Description	Status	Min.	Max.	Unit
M0077	4x0078	Standard undercurrent level		0	3200	A
M0078	4x0079	Customized undercurrent level at 40 Hz		0	1500	A
M0079	4x0080	Customized undercurrent level at 45 Hz		0	1500	A
M0080	4x0081	Customized undercurrent level at 50 Hz		0	1500	A
M0081	4x0082	Customized undercurrent level at 55 Hz		0	1500	A
M0082	4x0083	Customized undercurrent level at 60 Hz		0	1500	A
M0083	4x0084	Customized undercurrent level at 65 Hz		0	1500	A

If one of the parameters from M0078 to M0083 is set to 0 (zero), the current curve used for the pump will be the standard curve defined in M0077. That is, to use the customized curve, it is necessary that all 6 values have a value different from zero.

The correct configuration of these current curves is very important for the undercurrent routine to monitor the pump during its operation and thus avoid operation with no load. The table below illustrates a configuration example for the customized curve.

Table 6.12 – Example of the undercurrent limit customized curve

Parameter	Description	Valuer
M0078	Customized undercurrent level at 40 Hz	500 A
M0078	Customized undercurrent level at 45 Hz	520 A
M0078	Customized undercurrent level at 50 Hz	610 A
M0078	Customized undercurrent level at 55 Hz	630 A
M0078	Customized undercurrent level at 60 Hz	667 A
M0078	Customized undercurrent level at 65 Hz	690 A

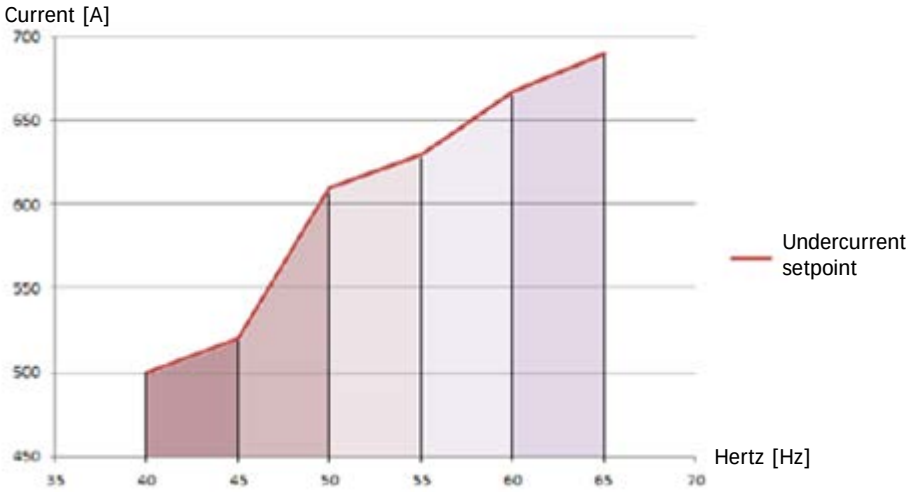


Figure 6.7 – Configuration example chart of the undercurrent limit customized curve

6.3.4 Undercurrent Configuration

The undercurrent check is based on the motor frequency and current reading. In case of motor current reading, it is possible to configure a filter to calculate its average values, as described in the table below:

Table 6.13 – Treatment of the current value measured at the motor

Parameter	Address	Description	Status	Min.	Max.	Unit
M0070	4x0071	Number of motor current samples to compose the value average		2	10	-
M0071	4x0072	Interval between the motor current samples for the formation of the average		100	2000	ms

The undercurrent check has some time-related parameters to avoid system transients, as described in the table below.

Table 6.14 – Configuration the undercurrent detection

Parameter	Address	Description	Status	Min.	Max.	Unit
M0072	4x0073	Time with the pump running in undercurrent to confirm the undercurrent condition		0	600	s
M0073	4x0074	Delay after the pump start to begin the undercurrent check	-1 = disable undercurrent check	-1	10000	s

After the pump shutdown due to undercurrent (if R0013 is set to OFF), it is possible to configure the pump to restart. We can specify the time the pump should remain off due to undercurrent, as well as the maximum number of pump restart attempts in a time interval. These parameters are described in the table below.

Table 6.15 – Configuration the pump restart after undercurrent

Parameter	Address	Description	Status	Min.	Max.	Unit
M0074	4x0075	Time to begin the pump restart procedure after an undercurrent detection		0	600	min
M0075	4x0076	Maximum number of pump restarts allowed per undercurrent	If this amount is 0 (zero) or is reached by the system, the pump will not automatically restart after the time specified in M0074 has expired	0	30	-
M0076	4x0077	Time after the pump restart for which the system must remain without an undercurrent condition to reset the restart counter		0	600	min

Table 6.16 – Restart by the system due to undercurrent

Parameter	Address	Description	Status	Min.	Max.	Unit
M0220	4x0221	Restart counter executed by the system for remote supervision		0	32767	-

6.4 MONITORING OF THE DIGITAL ALARMS

The action of digital failures occurs as shown in the following subchapters. The following is a flow chart for understanding the treatment for actuation of digital failures via ALC11.

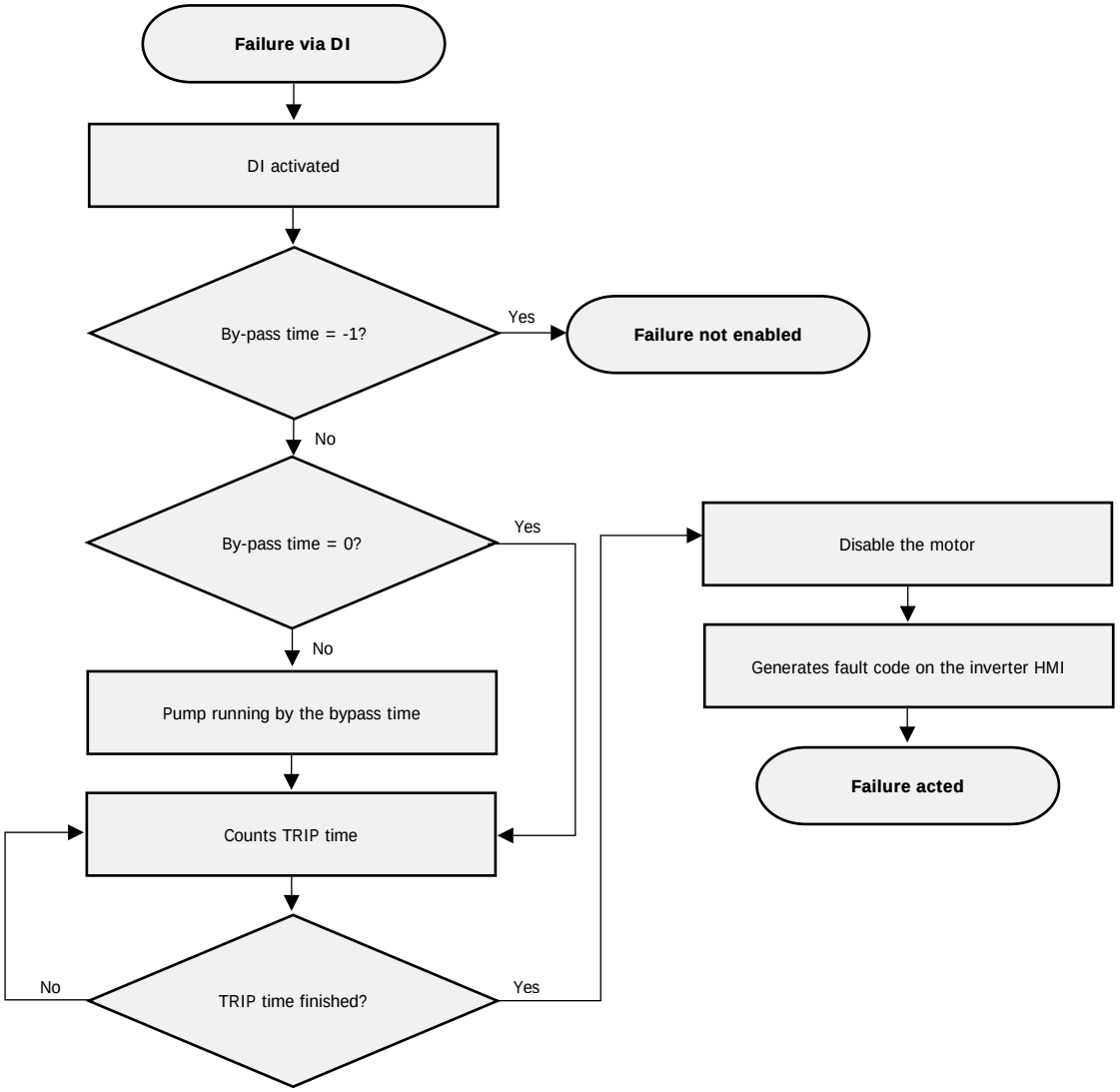


Figure 6.8 – Actuation of digital failures via ALC11

The following flowchart shows the treatment for the automatic reset of digital faults.

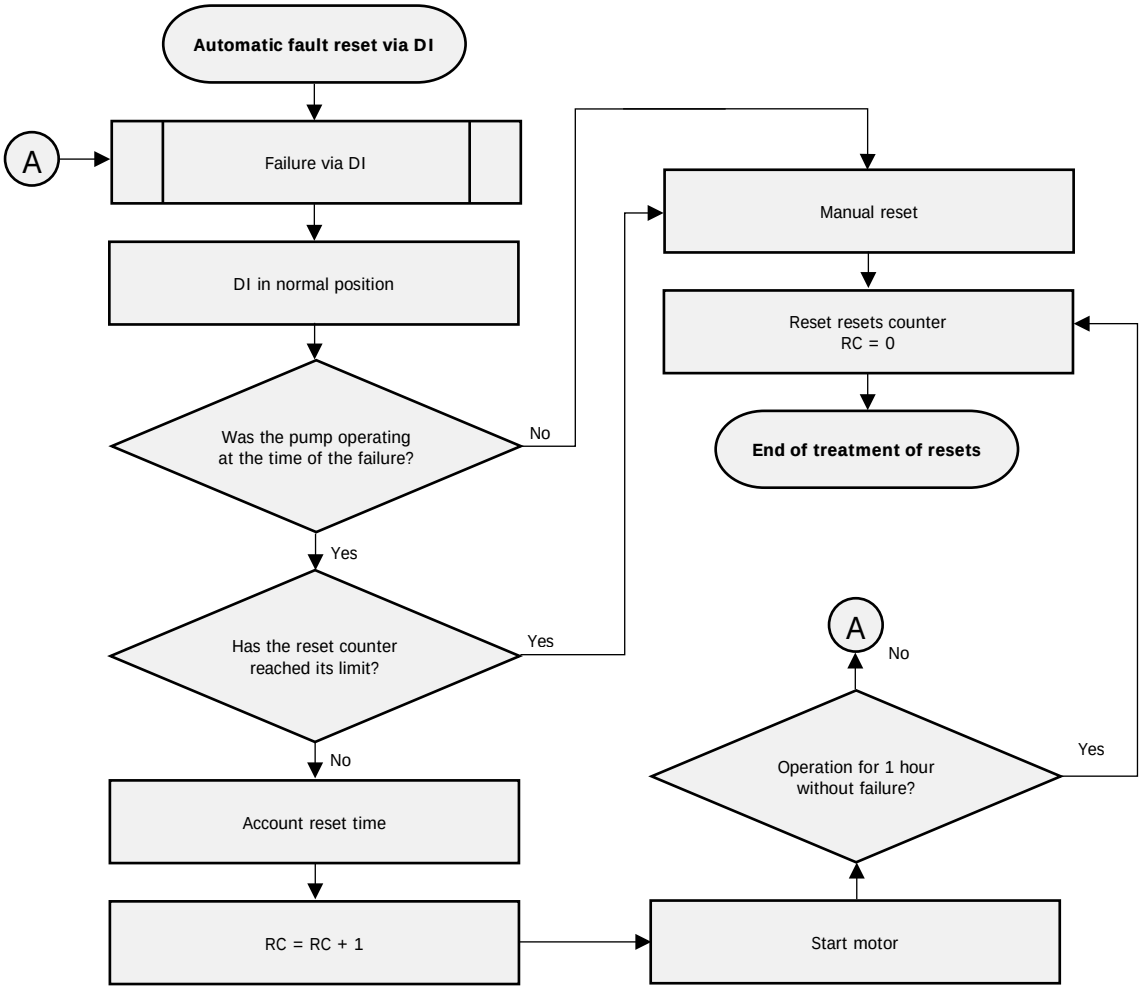


Figure 6.9 – Automatic reset of digital faults via ALC11

6.4.1 Monitoring of the Production Line Low Pressure

The ALD11-ESP controller can monitor the production line low pressure. This monitoring can be performed by the reading of two digital signals linked to a pressure switch related to an underpressure condition of the production line.

Table 6.17 – Alarms configuration – Monitoring of the production line low pressure

Parameter	Address	Description	Status	Min.	Max.	Unit
M0166	4x0167	Line low pressure: By-pass time	-1 = disable fault checking	-1	32000	s
M0167	4x0168	Line low pressure: TRIP time		0	32000	s
M0168	4x0169	Line low pressure: Reset time		0	500	min
M0169	4x0170	Line low pressure: Maximum reset number		0	10	-

6.4.2 Monitoring of the Production Line High Pressure

The ALD11-ESP controller can monitor the production line high pressure. This monitoring is performed by the reading of two digital signals linked to a pressure switch related to an overpressure condition of the production line.

Table 6.18 – Alarms configuration – Monitoring of the production line high pressure

Parameter	Address	Description	Status	Min.	Max.	Unit
M0162	4x0163	Line high pressure: By-pass time	-1 = disable fault checking	-1	32000	s
M0163	4x0164	Line high pressure: TRIP time		0	32000	s
M0164	4x0165	Line high pressure: Reset time		0	500	min
M0165	4x0166	Line high pressure: Maximum reset number		0	10	-

6.4.3 Monitoring of the Ground Fault

The ALD11-ESP controller can monitor the ground fault. This monitoring is performed by reading a digital signal associated with a digital SubCoe output installed internally to the ALD11 panel.

Table 6.19 – Alarms configuration – Ground fault

Parameter	Address	Description	Status	Min.	Max.	Unit
M0047	4x0048	Ground fault: By-pass time	-1 = disable fault checking	-1	7200	s
M0048	4x0049	Ground fault: TRIP time		0	3600	s
M0049	4x0050	Ground fault: Reset time		0	1200	min
M0050	4x0051	Ground fault: Maximum reset number		0	10	-

6.4.4 Monitoring of the Backspin Actuated

The ALD11-ESP controller can to monitor the Backspin. This monitoring is performed by reading a digital signal associated with a digital SubCoe output installed internally to the ALD11 panel.

Table 6.20 – Alarms configuration – Backspin actuated

Parameter	Address	Description	Status	Min.	Max.	Unit
M0039	4x0040	Backspin actuated: By-pass time	-1 = disable fault checking	-1	7200	s
M0040	4x0041	Backspin actuated: TRIP time		0	3600	s
M0041	4x0042	Backspin actuated: Reset time		0	1200	min
M0042	4x0043	Backspin actuated: Maximum reset number		0	10	-

6.4.5 Monitoring of the Transformer Temperature

The ALD11-ESP controller can monitor the temperature of the transformer. This monitoring is performed by reading a digital signal associated with a thermostat installed in the elevator transformer of the system.

Table 6.21 – Alarms configuration – Transformer temperature

Parameter	Address	Description	Status	Min.	Max.	Unit
M0043	4x0044	Transformer overtemperature: By-pass time	-1 = disable fault checking	-1	7200	s
M0044	4x0045	Transformer overtemperature: TRIP time		0	3600	s
M0045	4x0046	Transformer overtemperature: Reset time		0	1200	min
M0046	4x0047	Transformer overtemperature: Maximum reset number		0	10	-

6.5 MONITORING OF THE DOWNHOLE FLOW

The ALD11-ESP controller can monitor the downhole flow. The monitoring is performed via analog input available on the controller ALD-11. Below are the parameters to configure the downhole flow.

Table 6.22 – Monitoring of the downhole flow

Parameter	Address	Description	Status	Min.	Max.	Unit
R0006	0x0007	Enable flow monitoring	OFF = There is no flow transmitter ON = There is a flow transmitter (analog signal)	0 (OFF)	1 (ON)	-
R0111	0x0112	Flow Fault LL	OFF = Failure not acted ON = Failure acted	0 (OFF)	1 (ON)	-
R0112	0x0113	Flow Fault HH	OFF = Failure not acted ON = Failure acted	0 (OFF)	1 (ON)	-
R0152	0x0153	Flow Alarm L	OFF = Alarm not acted ON = Alarm acted	0 (OFF)	1 (ON)	-
R0153	0x0154	Flow Alarm H	OFF = Alarm not acted ON = Alarm acted	0 (OFF)	1 (ON)	-
D0021	4x10043	Very high flow limit (HH)	*Engineering Unit (depends on the connected sensor)	0.00	1000.00	EU*
D0022	4x10045	High flow limit (H)	*Engineering Unit (depends on the connected sensor)	0.00	1000.00	EU*
D0023	4x10047	Low flow limit (L)	*Engineering Unit (depends on the connected sensor)	0.00	1000.00	EU*
D0024	4x10049	Very low flow limit (L)	*Engineering Unit (depends on the connected sensor)	0.00	1000.00	EU*

6.6 GENERAL CONFIGURATIONS

6.6.1 Monitoring of the Temperature

The ALD11-ESP controller has 3 inputs for PT100 to monitor the temperature; each PT100 has alarm and fault level:

Table 6.23 – Monitoring of the PT100

Parameter	Address	Description	Status	Min.	Max.	Unit
D0040	4x10081	Limit HH for PT100 1 (Fault)		0.0	250.0	°C
D0041	4x10083	Limit HH for PT100 2 (Fault)		0.0	250.0	°C
D0042	4x10085	Limit HH for PT100 3 (Fault)		0.0	250.0	°C
D0043	4x10087	Limit H for PT100 1 (Alarm)		0.0	250.0	°C
D0044	4x10089	Limit H for PT100 2 (Alarm)		0.0	250.0	°C
D0045	4x10091	Limit H for PT100 3 (Alarm)		0.0	250.0	°C

6.6.2 Minimum Start Frequency

The minimum start frequency consists of the frequency value at which the pump will start, that is, instead of starting from speed 0 Hz, the pump will start at the speed in Hz programmed in this parameter.

Table 6.24 – Minimum start frequency

Parameter	Address	Description	Status	Min.	Max.	Unit
D0027	4x10055	Pump minimum start frequency		0	90	Hz

6.6.3 Motor ON/OFF Time Counters

The ALC11 has two time counters so that it is possible to check how long the motor has been running and how long the motor has been off.

Table 6.25 – Motor ON/OFF time counters

Parameter	Address	Description	Status	Min.	Max.	Unit
D0155	4x10311	Motor time ON		0	3.4E+38	h
D0156	4x10313	Motor time OFF		0	3.4E+38	h

6.6.4 Operating Speed Limits

ALC11 defines operating speeds so that in manual mode, speeds incompatible with that of the motor-pump set are not applied by the user, and for automatic mode, limits acting on the control are defined. Therefore, for speed reference, the following limits must be obeyed.

Table 6.26 – Operating speed limits

Parameter	Address	Description	Status	Min.	Max.	Unit
D0010	4x10021	Minimum operating frequency of ESP motor		0.0	500.0	Hz
D0011	4x10023	Maximum operating frequency of ESP motor		0.0	500.0	Hz

6.6.5 System Configuration

The system configuration parameters refer to the motor-pump assembly plus the lift transformer at the transformer output. Where these parameters are used for the correct calculation of the low voltage parameters required for the frequency inverter.

Table 6.27 – System configuration

Parameter	Address	Description	Status	Min.	Max.	Unit
D0020	4x10041	Transformation ratio of the transformer		0.00	100.00	-
D0055	4x10111	Fine adjustment for motor current, calculated by the transformation ratio of the transformer		-2.0	2.0	-
D0056	4x10113	Fine adjustment for motor voltage, calculated by the transformation ratio of the transformer		-2.0	2.0	-
D0057	4x10115	Rated motor current (motor nameplate data)		0.1	2000.0	A
M0026	4x0027	Rated motor voltage (motor nameplate data)		1	10000	V

The voltage and current calculations for low voltage are shown below:

$$Inverter\ Output\ Voltage\ (Low) = \frac{Motor\ Voltage\ (High)}{Transformation\ Ratio + Voltage\ Fine\ Adjustment}$$

$$Inverter\ Output\ Current\ (Low) = Motor\ Current\ (High) * [Transformation\ Ratio + Current\ Fine\ Adjustment]$$

6.6.6 Restart Blocking

The restart blocking is used to avoid restart the system with very large oil columns that can damage the system due to a high inertia at the start.

Table 6.28 – Restart blocking

Parameter	Address	Description	Status	Min.	Max.	Unit
M0006	4x0007	Pump restart blocking time		0	600	min
D0205	4x10411	Time counter to allow pump restart		0	36000	s

6.6.7 Automatic Restart

Function used to automatically restart the inverter after an inverter failure occurs. Inverter faults are characterized by codes less than 700.

Table 6.29 – Automatic restart

Parameter	Address	Description	Status	Min.	Max.	Unit
M0084	4x0085	Time for automatic pump restart after failure		0	120	min
M0085	4x0086	Number of attempts for automatic restart within a time interval		0	5	-
M0086	4x0087	Time interval to allow automatic restart attempts		1	24	h
D0157	4x10315	Time counter for restarting the pump for "Automatic Restart"		0	7200	s

NOTE!
If the system detects F021 - Undervoltage in the inverter with the pump running and switching off the panel, when energized, the system will automatically restart after a time fixed internally by the ALC11 controller in 30 seconds.

6.6.8 Overload Configuration

Natively the CFW11 frequency inverter already has motor overload protection, however there are parameters in ALC11 to configure an overload curve according to the motor speed in% by the motor current also in%.

Table 6.30 – Overload configuration

Parameter	Address	Description	Status	Min.	Max.	Unit
M0027	4x0028	Overload current 100% speed		10	150	%
M0028	4x0029	Overload current 50% speed		10	150	%
M0029	4x0030	Overload current 5% speed		10	150	%

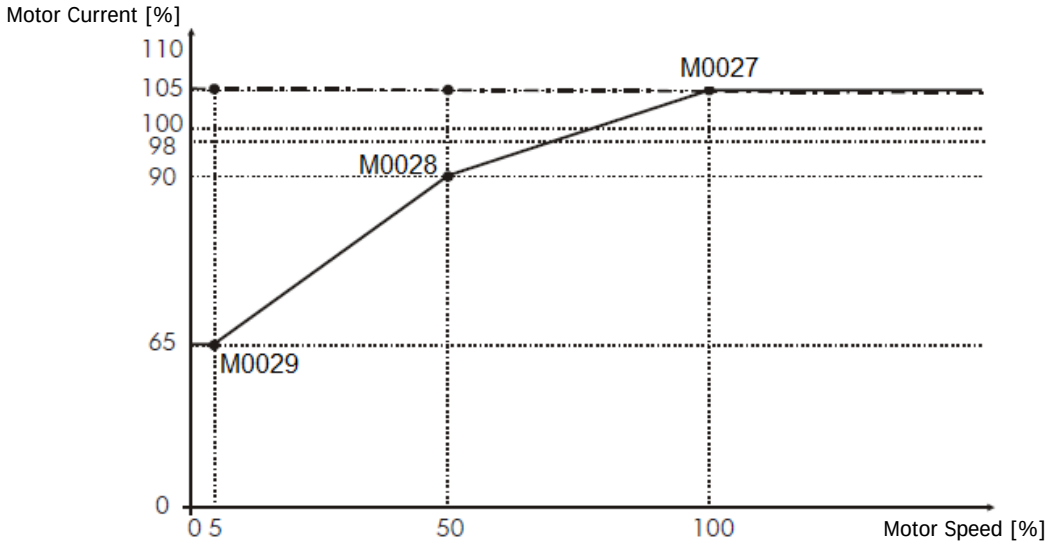


Figure 6.10– Example graphic of custom overload curve configuration

6.6.9 Factory Default

In ALC11 it is possible to restore the entire well configuration using a single command, the factory default. In it, the user can apply the parameters set at the factory by WEG. It is also possible to create a new pattern, if the user wishes.

ATTENTION!
Creating a new standard file, will cause the one configured by the manufacturer to be overwritten without guaranteeing consistent values for correct functioning.

Table 6.31 – Factory default

Parameter	Address	Description	Status	Min.	Max.	Unit
M0605	4x0606	Factory default commands	65 = Loads factory default 66 = Creates new factory default configuration	0	32767	-
M0294	4x0293	Returning factory default commands	-2 = Running -1 = Finished successfully > 0 = Error executing the requested command	-32768	32767	-

6.6.10 Controller General Configurations

The ALC11 has general system configuration parameters that are shown below:

Table 6.32– ALC11 general configurations

Parameter	Address	Description	Status	Min.	Max.	Unit
M0005	4x0006	Delay to start the pump at the controller powerup		0	60	s
M0007	4x0008	Acoustic signal time before starting the motor		0	60	s
M0023	4x0024	Interval for process data history		0	32767	s

7 CONTROLLER CONFIGURATION BASE

The ALC11-ESP controller needs a group of configuration parameters for its correct operation. These parameters are described in this document, clustered according to the system functionalities.

■ Field Instrumentation Configuration: the various field-installed instruments, which are analog signals to the ALD11-ESP controller, must be properly configured according to the specific parameters of each instrument.

7.1 DOWNHOLE SENSOR CONFIGURATION

If the well is equipped with a downhole sensor, it is necessary to configure some parameters related to it. The ALC11 allows the reading of 7 variables in any Modbus address so that it is possible to place any downhole sensor model just by having RS485 communication Modbus-RTU protocol. The following table describes the variables to configure this communication:

Table 7.1– Downhole sensor configuration via Modbus

Parameter	Address	Description	Status	Min.	Max.	Unit
M0000	4x0001	Downhole device address for Modbus communication		1	1000	-
M0001	4x0002	ALC11 communication port for communication with downhole sensor	-1 = Ethernet Channel 0 = COM1 Channel 1 = COM2 Channel 2 = COM3 Channel	-1	2	-
M0002	4x0003	Downhole sensor type	0 = None 5 = Transmitters via analog input 100 = Generic downhole controller; it is necessary to specify the downhole variable addresses of the generic controller	0	100	-
D0030	4x10061	Modbus address for downhole pressure reading of the downhole sensor	0 = Variable does not exist in the sensor model	30001	50000	-
D0031	4x10063	Modbus address for downhole temperature reading of the downhole sensor	0 = Variable does not exist in the sensor model	30001	50000	-
D0032	4x10065	Modbus address for motor temperature reading of the downhole sensor	0 = Variable does not exist in the sensor model	30001	50000	-
D0033	4x10067	Multiplier factor for conversion of the downhole pressure of the downhole sensor		0.0	3.4E+38	-
D0034	4x10069	Multiplier factor for conversion of the downhole temperature of the downhole sensor		0.0	3.4E+38	-
D0035	4x10071	Multiplier factor for conversion of the motor temperature of the downhole sensor		0.0	3.4E+38	-
D0046	4x10093	Modbus address for discharge pressure reading of the downhole sensor	0 = Variable does not exist in the sensor model	30001	50000	-
D0047	4x10095	Multiplier factor for conversion of the discharge pressure of the downhole sensor		0.0	3.4E+38	-
D0048	4x10097	Modbus address for vibration pressure reading of the downhole sensor	0 = Variable does not exist in the sensor model	30001	50000	-
D0049	4x10099	Multiplier factor for conversion of the vibration pressure of the downhole sensor		0.0	3.4E+38	-
D0050	4x10101	Modbus address for active leakage current reading of the downhole sensor	0 = Variable does not exist in the sensor model	30001	50000	-
D0051	4x10103	Multiplier factor for conversion of the active leakage current reading of the downhole sensor		0.0	3.4E+38	-

Parameter	Address	Description	Status	Min.	Max.	Unit
D0052	4x10105	Modbus address for passive leakage current reading of the downhole sensor	0 = Variable does not exist in the sensor model	30001	50000	-
D0053	4x10107	Multiplier factor for conversion of the passive leakage current reading of the downhole sensor		0.0	3.4E+38	-
R1121	0x0122	Communication status with downhole sensor	OFF = Communication with downhole sensor WITH fault ON = Communication with downhole sensor WITHOUT fault	0 (OFF)	1 (ON)	-
M1206	4x1207	Counter of communication cycles with downhole sensor SUCCESSFUL		0	32767	-
M1207	4x1208	Counter of communication cycles with downhole sensor FAILED		0	32767	-
D0365	4x10731	Downhole sensor discharge pressure	*Engineering Unit (depends on the connected sensor)	0.0	3.4E+38	EU*
D0366	4x10733	Downhole sensor vibration	*Engineering Unit (depends on the connected sensor)	0.0	3.4E+38	EU*
D0367	4x10735	Downhole sensor active leakage current	*Engineering Unit (depends on the connected sensor)	0.0	3.4E+38	EU*
D0368	4x10737	Downhole sensor passive leakage current	*Engineering Unit (depends on the connected sensor)	0.0	3.4E+38	EU*
D0261	4x10523	Downhole sensor motor temperature	*Engineering Unit (depends on the connected sensor)	0.0	3.4E+38	EU*
D0251	4x10503	Downhole sensor downhole pressure	*Engineering Unit (depends on the connected sensor)	0.0	3.4E+38	EU*
D0260	4x10521	Downhole sensor downhole temperature	*Engineering Unit (depends on the connected sensor)	0.0	3.4E+38	EU**

NOTE!
If the listed variable does not exist in the downhole sensor, the Modbus address must be set to zero.

ATTENTION!
With the downhole sensor programmed for Modbus and it is not communicating with the ALC11 controller, communication failure with code F968 will be indicated.

If the well is equipped with downhole sensor via analog signal, inputs are available for the following field readings:

- Downhole pressure.
- Downhole temperature.
- Motor temperature.

Table 7.2– Downhole sensor configuration via Analog input

Parameter	Address	Description	Status	Min.	Max.	Unit
M0002	4x0003	Downhole sensor type	0 = None 5 = Transmitters via analog input 100 = Generic downhole controller; it is necessary to specify the downhole variable addresses of the generic controller	0	100	-
D0002	4x10005	Downhole pressure minimum scale		0.0	10000.0	PSI
D0003	4x10007	Downhole pressure maximum scale		0.0	10000.0	PSI
D0038	4x10077	Downhole temperature minimum scale		0.0	600.0	°C
D0039	4x10079	Downhole temperature maximum scale		0.0	600.0	°C
D0028	4x10057	Motor temperature minimum scale		0.0	600.0	°C
D0029	4x10059	Motor temperature maximum scale		0.0	600.0	°C
M0003	4x0004	Masking enable monitoring of analog channels without signal	Bit 0 - ON = Broken wire monitoring from analog input 0 of the ALC11 controller is enabled Bit 1 - ON = Broken wire monitoring of analog input 1 of the ALC11 controller is enabled Bit 2 - ON = Broken wire monitoring of analog input 2 of the ALC11 controller is enabled Bit 8 - ON = Broken wire monitoring of analog inverter input 2 is enabled	-32768	32767	-

ATTENTION!
With the downhole sensor programmed for analog and the ALC11 does not read the signal from the programmed inputs with broken wire monitoring, a communication fault with code F998 will be indicated.

7.2 I/O EXPANSION MODULE CONFIGURATION (ONLY BRAZIL)

The ALD11-CPS controller can interface with an I/O expansion module. In order to do so, it uses one of its communication channels for Modbus-RTU protocol access to the expansion module, in which case it is necessary to configure some parameters, listed in the table below.

Table 7.3– I/O expansion module configuration

Parameter	Address	Description	Status	Min.	Max.	Unit
M0036	4x0037	I/O expansion module type	0 = No expansion module 1 = HI Technology RION type expansion module	0	100	-
M0034	4x0035	I/O expansion module address		0	1000	-
M0035	4x0036	ALC11 channel identifier to be used to access the I/O expansion module	-1 = Ethernet channel 0 = COM1 serial channel 1 = COM2 serial channel 2 = COM3 serial channel	-1	2	-
R0280	0x0281	IO Exp: Status of digital output O0 of the I/O expansion module		0 (OFF)	1 (ON)	-
R0281	0x0282	IO Exp: Status of digital output O1 of the I/O expansion module		0 (OFF)	1 (ON)	-
R0282	0x0283	IO Exp: Status of digital output O2 of the I/O expansion module		0 (OFF)	1 (ON)	-
R0283	0x0284	IO Exp: Status of digital output O3 of the I/O expansion module		0 (OFF)	1 (ON)	-
R0284	0x0285	IO Exp: Status of digital output O4 of the I/O expansion module		0 (OFF)	1 (ON)	-
R0285	0x0286	IO Exp: Status of digital output O5 of the I/O expansion module		0 (OFF)	1 (ON)	-
R0286	0x0287	IO Exp: Status of digital output O6 of the I/O expansion module		0 (OFF)	1 (ON)	-
R0287	0x0288	IO Exp: Status of digital output O7 of the I/O expansion module		0 (OFF)	1 (ON)	-
R0288	0x0289	IO Exp: Status of digital input I0 of the I/O expansion module		0 (OFF)	1 (ON)	-
R0289	0x0290	IO Exp: Status of digital input I1 of the I/O expansion module		0 (OFF)	1 (ON)	-
R0290	0x0291	IO Exp: Status of digital input I2 of the I/O expansion module		0 (OFF)	1 (ON)	-
R0291	0x0292	IO Exp: Status of digital input I3 of the I/O expansion module		0 (OFF)	1 (ON)	-
R0292	0x0293	IO Exp: Status of digital input I4 of the I/O expansion module		0 (OFF)	1 (ON)	-
R0293	0x0294	IO Exp: Status of digital input I5 of the I/O expansion module		0 (OFF)	1 (ON)	-
R0294	0x0295	IO Exp: Status of digital input I6 of the I/O expansion module		0 (OFF)	1 (ON)	-
R0295	0x0296	IO Exp: Status of digital input I7 of the I/O expansion module		0 (OFF)	1 (ON)	-

7.3 ALARMS CONFIGURATION

The ALC-ESP has some specific alarms to protect the ESP pump. For the correct operation of alarms based on motor current and voltage, it is necessary to correctly program the transformation ratio of the transformer that is connected to the panel output and raises the voltage to the pump motor. The following table lists the ESP pump fault configuration parameters.

Table 7.4– Alarms and faults configuration

Parameter	Address	Description	Status	Min.	Max.	Unit
M0090	4x0091	Motor current: Alarm limit HH		0	1000	A
M0091	4x0092	Motor current: Bypass time HH	-1 = disable fault checking	-1	32000	s
M0092	4x0093	Motor current: TRIP time HH		0	32000	s
M0093	4x0094	Motor current: Reset time HH		0	500	min
M0094	4x0095	Motor current: Maximum number of resets HH		0	10	-
M0095	4x0096	Motor temperature: Alarm limit HH		0	400	°C
M0096	4x0097	Motor temperature: Bypass time HH	-1 = disable fault checking	-1	32000	s
M0097	4x0098	Motor temperature: TRIP time HH		0	32000	s
M0098	4x0099	Motor temperature: Reset time HH		0	500	min
M0099	4x0100	Motor temperature: Maximum number of resets HH		0	10	-
M0100	4x0101	Motor voltage: Alarm limit HH		0	10000	V
M0101	4x0102	Motor voltage: Bypass time HH	-1 = disable fault checking	-1	32000	s
M0102	4x0103	Motor voltage: TRIP time HH		0	32000	s
M0103	4x0104	Motor voltage: Reset time HH		0	500	min
M0104	4x0105	Motor voltage: Maximum number of resets HH		0	10	-
M0105	4x0106	Vibration: Alarm limit HH		0	100	gn
M0106	4x0107	Vibration: Bypass time	-1 = disable fault checking	-1	7200	s
M0107	4x0108	Vibration: TRIP time		0	3600	s
M0108	4x0109	Vibration: Reset time		0	1200	min
M0109	4x0110	Vibration: Maximum number of resets		0	10	-
M0110	4x0111	Downhole pressure: Alarm limit HH		0	32000	PSI
M0111	4x0112	Downhole pressure: Bypass time HH	-1 = disable fault checking	-1	32000	s
M0112	4x0113	Downhole pressure: TRIP time HH		0	32000	s
M0113	4x0114	Downhole pressure: Reset time HH		0	500	min
M0114	4x0115	Downhole pressure: Maximum number of resets HH		0	10	-

Parameter	Address	Description	Status	Min.	Max.	Unit
M0115	4x0116	Downhole temperature: Alarm limit HH		0	5000	°C
M0116	4x0117	Downhole temperature: Bypass time HH	-1 = disable fault checking	-1	32000	s
M0117	4x0118	Downhole temperature: TRIP time HH		0	32000	s
M0118	4x0119	Downhole temperature: Reset time HH		0	500	min
M0119	4x0120	Downhole temperature: Maximum number of resets HH		0	10	-
M0120	4x0121	Discharge pressure: Alarm limit HH		0	32000	PSI
M0121	4x0122	Discharge pressure: Bypass time HH	-1 = disable fault checking	-1	32000	s
M0122	4x0123	Discharge pressure: TRIP time HH		0	32000	s
M0123	4x0124	Discharge pressure: Reset time HH		0	500	min
M0124	4x0125	Discharge pressure: Maximum number of resets HH		0	10	-
M0125	4x0126	Active leakage current: Alarm limit HH		0	3000	mA
M0126	4x0127	Active leakage current: Bypass time	-1 = disable fault checking	-1	32000	s
M0127	4x0128	Active leakage current: TRIP time		0	32000	s
M0128	4x0129	Active leakage current: Reset time		0	500	min
M0129	4x0130	Active leakage current: Maximum number of resets		0	10	-
M0130	4x0131	Passive leakage current: Alarm limit HH		0	3000	mA
M0131	4x0132	Passive leakage current: Bypass time	-1 = disable fault checking	-1	32000	s
M0132	4x0133	Passive leakage current: TRIP time		0	32000	s
M0133	4x0134	Passive leakage current: Reset time		0	500	min
M0134	4x0135	Passive leakage current: Maximum number of resets		0	10	-
M0135	4x0136	Motor temperature: Alarm limit H		0	400	°C
M0136	4x0137	Motor voltage: Alarm limit LL		0	10000	V
M0137	4x0138	Vibration: Alarm limit H		0	100	gn
M0138	4x0139	Downhole pressure: Alarm limit H		0	32000	PSI
M0139	4x0140	Downhole pressure: Alarm limit L		0	32000	PSI
M0140	4x0141	Downhole pressure: Alarm limit LL		0	32000	PSI
M0141	4x0142	Downhole temperature: Alarm limit H		0	5000	°C
M0142	4x0143	Discharge pressure: Alarm limit H		0	32000	PSI

Parameter	Address	Description	Status	Min.	Max.	Unit
M0143	4x0144	Discharge pressure: Alarm limit L		0	32000	PSI
M0144	4x0145	Discharge pressure: Alarm limit LL		0	32000	PSI
M0145	4x0146	Active leakage current: Alarm limit H		0	32000	mA
M0146	4x0147	Passive leakage current: Alarm limit H		0	32000	mA
M0147	4x0148	Motor current: Alarm limit H		0	1000	A
M0148	4x0149	Motor voltage: Alarm limit H		0	10000	V
M0149	4x0150	Motor voltage Alarm limit L		0	10000	V
M0150	4x0151	Downhole pressure: Bypass time LL	-1 = disable fault checking	-1	32000	s
M0151	4x0152	Downhole pressure: TRIP time LL		0	32000	s
M0152	4x0153	Downhole pressure: Reset time LL		0	500	min
M0153	4x0154	Downhole pressure: Maximum number of resets LL		0	10	-
M0154	4x0155	Discharge pressure: Bypass time LL	-1 = disable fault checking	-1	32000	s
M0155	4x0156	Discharge pressure: TRIP time LL		0	32000	s
M0156	4x0157	Discharge pressure: Reset time LL		0	500	min
M0157	4x0158	Discharge low pressure: Maximum number of resets LL		0	10	-
M0158	4x0159	Motor voltage: Bypass time LL	-1 = disable fault checking	-1	32000	s
M0159	4x0160	Motor voltage: TRIP time LL		0	32000	s
M0160	4x0161	Motor voltage: Reset time LL		0	500	min
M0161	4x0162	Motor voltage: Maximum number of resets LL		0	10	-

The following is a flowchart for understanding the treatment for the performance of faults generated via software via ALC11.

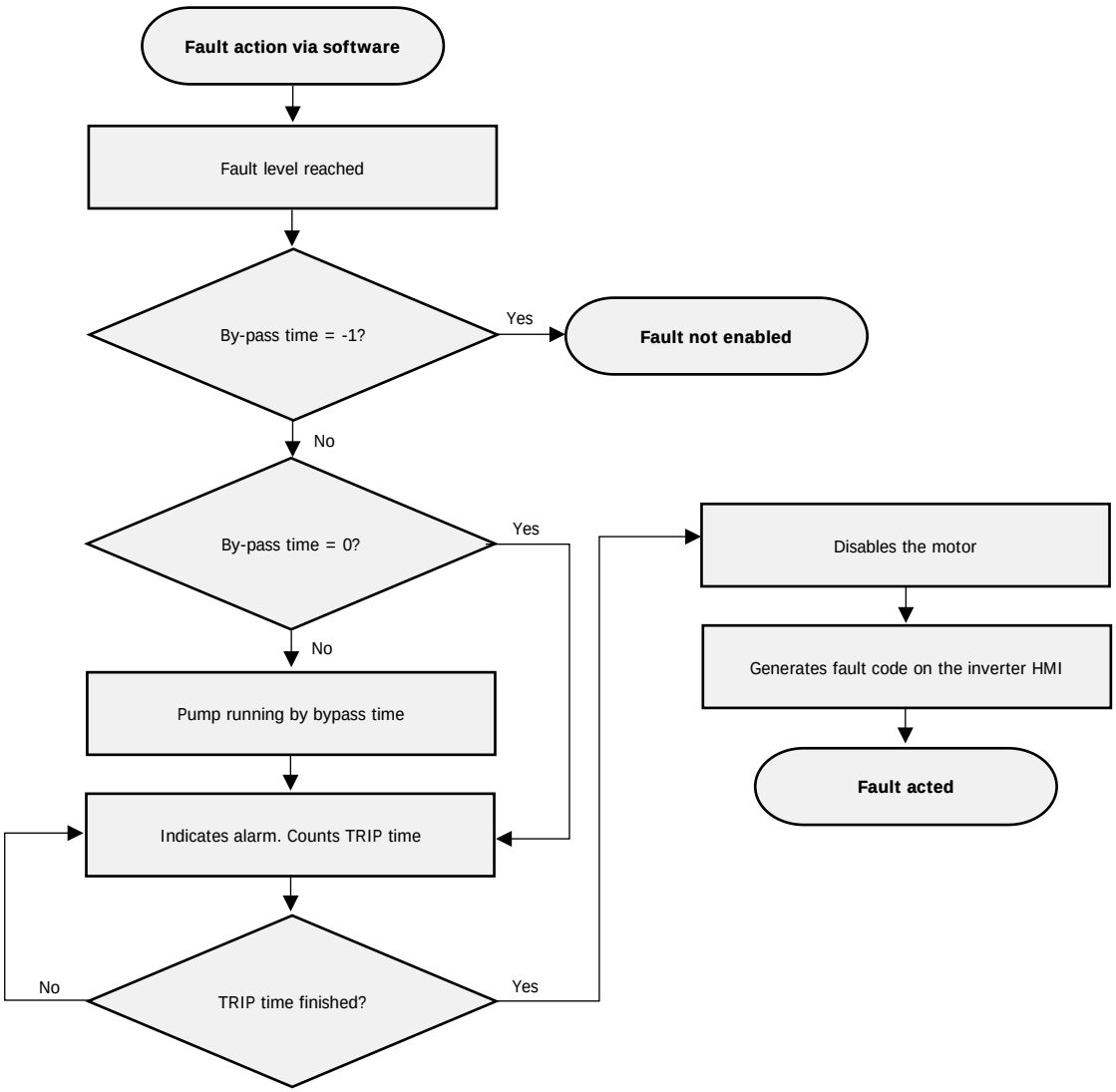


Figure 7.1 – Fault action via ALC11

The ALC11-ESP has some reading parameters of the system alarm reset counter status.

Table 7.5 – Alarms configuration – Reset counters

Parameter	Address	Description	Status	Min.	Max.	Unit
M0415	4x0416	Discharge Pressure HH: Reset counter		0	10	-
M0416	4x0417	Discharge Pressure LL: Reset counter		0	10	-
M0417	4x0418	Downhole pressure HH: Reset counter		0	10	-
M0418	4x0419	Active leakage current HH: Reset counter		0	10	-
M0419	4x0420	Passive leakage current HH: Reset counter		0	10	-
M0420	4x0421	Motor current HH: Reset counter		0	10	-
M0421	4x0422	Motor temperature HH: Reset counter		0	10	-
M0422	4x0423	Motor voltage HH: Reset counter		0	10	-
M0423	4x0424	Motor voltage LL: Reset counter		0	10	-
M0424	4x0425	Downhole pressure LL: Reset counter		0	10	-
M0425	4x0426	Downhole temperature LL: Reset counter		0	10	-
M0426	4x0427	Vibration HH: Reset counter		0	10	-
M0427	4x0428	Ground fault: Reset counter		0	10	-
M0428	4x0429	Line high pressure: Reset counter		0	10	-
M0429	4x0430	Line low pressure: Reset counter		0	10	-
M0430	4x0431	Transformer overtemperature: Reset counter		0	10	-
M0432	4x0433	Backspin actuated: Reset counter		0	10	-

The following flowchart shows the treatment for automatic fault reset via software.

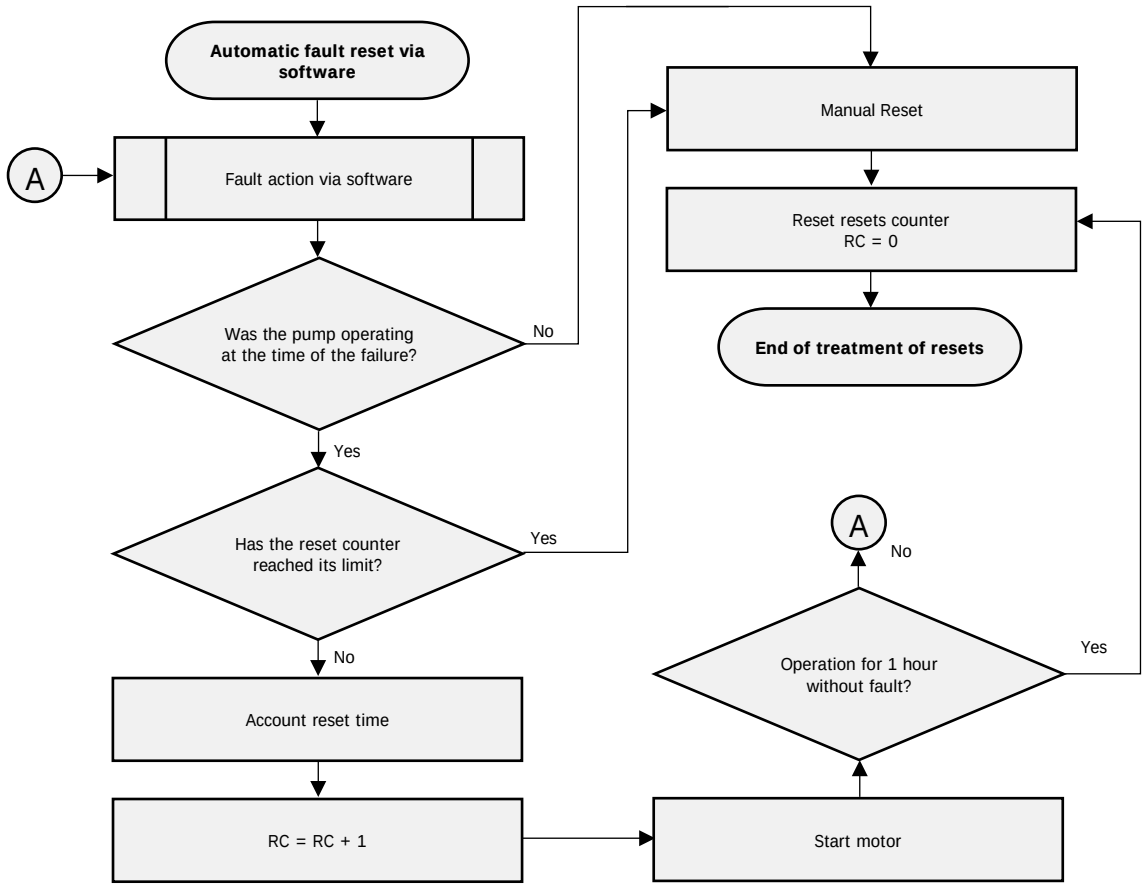


Figure 7.2 – Automatic fault reset via ALC11

8 CONTROLLER DATA

8.1 SYSTEM STATUS BASE

The parameters of the System Internal Status base are presented below.

Table 8.1 – System status base

Parameter	Address	Description	Status	Min.	Max.	Unit
R0164	0x0165	Operation mode status	OFF = Manual ON = Automatic	0 (OFF)	1 (ON)	-
R0170	0x0171	Rocking start test status	OFF = Out of routine ON = Running test routine	0 (OFF)	1 (ON)	-
R0171	0x0172	Rocking start test	OFF = Pump rocking start test FAILED. ON = Pump rocking start test SUCCESSFULLY	0 (OFF)	1 (ON)	-
R0172	0x0173	System warm-up status	OFF = Out of warm-up ON = System warm-up	0 (OFF)	1 (ON)	-
R0173	0x0174	Status of execution of special actuation routines in the inverter	OFF = Not executing special actuation routines on the inverter ON = In execution of special actuation routines in the inverter	0 (OFF)	1 (ON)	-
R0174	0x0175	Default parameter configuration file processing status	OFF = Not processing ON = Processing	0 (OFF)	1 (ON)	-
R0177	0x0178	Number of rocking start made by the system over time	OFF = Rocking start attempts released ON = You have reached the maximum number of rocking start attempts per time	0 (OFF)	1 (ON)	-
R0181	0x0182	RION status	OFF = RION off-line, in the last communication cycle ON = RION on-line, in the last communication cycle	0 (OFF)	1 (ON)	-
R0182	0x0183	System fault or alarm	OFF = System operating in normal condition ON = There is fault or alarm in the system	0 (OFF)	1 (ON)	-
R0183	0x0184	Local / remote selection status	OFF = Pulse button ON = Key	0 (OFF)	1 (ON)	-
R0184	0x0185	Undercurrent curve configuration status	ON = Custom undercurrent level OFF = Standard undercurrent level	0 (OFF)	1 (ON)	-
R0185	0x0186	Pump rocking start status	OFF = pump rocking start routine not activated ON = pump rocking start routine activated	0 (OFF)	1 (ON)	-

Parameter	Address	Description	Status	Min.	Max.	Unit
M0277	4x0278	Bit-mapped status map (R0164...R0179)	Bit 0 - ON = Operation mode in Automatic Bit 1 ... 5 = Reserve Bit 6 - ON = In pump rocking start test procedure Bit 7 - ON = Pump rocking start test SUCCESSFUL Bit 8 - ON = In system warm up Bit 9 - ON = In execution of special actuation routines in the inverter Bit 10 - ON = Processing default parameter configuration file Bit 11 ... 12 = Reserve Bit 13 - ON = You have reached the maximum number of rocking start attempts per time Bit 14 ... 15 = Reserve	-32768	32767	-
M0278	4x0279	Bit-mapped status map (R0180...R0195)	0 = Reserve Bit 1 - ON Online I/O RION expansion module in the last communication cycle Bit 2 - ON = System failure or alarm Bit 3 - ON = Local / remote selection DI programmed for key Bit 4 - ON = Custom undercurrent level Bit 5 - ON = Pump rocking start routine activated Bit 6 ... 15 = Reserve	-32768	32767	-

8.2 I/O STATUS

The controller I/O status parameters are presented below:

Table 8.2 – I/O Status

Parameter	Address	Description	Status	Min.	Max.	Unit
M0301	4x0302	Internal state (2) of the bit-mapped R digital I/Os (R0551 – R0566)	Bit 0 DI - ON = Backspin relay not actuated (WITHOUT TRIP) Bit 1 DI – ON = No alarm / External fault Bit 2 DI – ON = Start pump for operation in LOCAL mode Bit 3 DI – ON = Button to reset the fault reset counters Bit 4 DI - ON = Emergency not pressed Bit 5 DI - ON = Remote operating mode Bit 6 DI - ON = No line underpressure Bit 7 DI - ON = With line overpressure Bit 8 DI - ON = No fault of ground fault by SubCoe (TRIP) Bit 9 DI - ON = No lift transformer over temperature fault (TRIP) Bit 10 DI - ON = Automatic mode key / button Bit 11 Reserve Bit 12 DI - ON = Does not stop pump for operation in LOCAL mode Bit 13 ... 15 = Reserve	-32768	32767	-
M0302	4x0303	Internal state (2) of the bit-mapped R digital I/Os (R0567– R0582)	Bit 0 DO - Automatic mode selected Bit 1 DO - Acoustic alarm (start) Bit 2 DO - Reset Backspin relay Bit 3 DO – Running in remote Bit 4 ... 7 Reserve Bit 8 DO - O8 (RL1 CFW11) Bit 9 DO - O9 (RL2 CFW11) Bit 10 DO - O10 (RL3 CFW11) Bit 11 ... 13 = Reserve Bit 14 DO - Fault signaling via digital output LED Bit 15 DO - Operating mode panel lamp signaling	-32768	32767	-
R0551	0x0552	DI - Backspin Relay tripped (TRIP)		0 (OFF)	1 (ON)	-
R0552	0x0553	DI – Alarm/External Fault		0 (OFF)	1 (ON)	-
R0553	0x0554	DI – Start Button (ON) for LOCAL mode operation		0 (OFF)	1 (ON)	-
R0554	0x0555	DI – Button to reset the fault reset counters		0 (OFF)	1 (ON)	-
R0555	0x0556	DI - Emergency	OFF = Disabled ON = Enabled	0 (OFF)	1 (ON)	-
R0556	0x0557	DI - Switch or button	OFF = Local ON = Remote	0 (OFF)	1 (ON)	-
R0557	0x0558	DI - Line underpressure		0 (OFF)	1 (ON)	-
R0558	0x0559	DI - Line overpressure		0 (OFF)	1 (ON)	-
R0559	0x0560	DI - Ground Fault by Subcoe (TRIP)		0 (OFF)	1 (ON)	-

Parameter	Address	Description	Status	Min.	Max.	Unit
R0560	0x0561	DI - Step-up transformer overtemperature fault (TRIP)		0 (OFF)	1 (ON)	-
R0561	0x0562	DI - Automatic mode switch/button (ON) / Manual (OFF)		0 (OFF)	1 (ON)	-
R0563	0x0564	DI - OFF button for LOCAL mode operation		0 (OFF)	1 (ON)	-
R0567	0x0568	DO - Automatic mode selected		0 (OFF)	1 (ON)	-
R0568	0x0569	DO - Acoustic alarm (start)		0 (OFF)	1 (ON)	-
R0569	0x0570	DO - Backspin relay reset		0 (OFF)	1 (ON)	-
R0570	0x0571	DO – Running in Remote		0 (OFF)	1 (ON)	-
R0575	0x0576	DO - O8 (RL1 CFW11)		0 (OFF)	1 (ON)	-
R0576	0x0577	DO - O9 (RL2 CFW11)		0 (OFF)	1 (ON)	-
R0577	0x0578	DO - O10 (RL3 CFW11)		0 (OFF)	1 (ON)	-
R0581	0x0582	DO - Fault signaling via digital output LED		0 (OFF)	1 (ON)	-
R0582	0x0583	DO - Lamp signaling of the operation mode panel		0 (OFF)	1 (ON)	-
M0304	4x0305	AO – CFW11 AO1		-32768	32767	-
M0305	4x0306	AO – CFW11 AO2		-32768	32767	-
M0307	4x0308	AI – Downhole pressure		-32768	32767	-
M0308	4x0309	AI – Downhole temperature		-32768	32767	-
M0309	4x0310	AI – Temperature PT100 1		-32768	32767	-
M0310	4x0311	AI – Temperature PT100 2		-32768	32767	-
M0311	4x0312	AI – Temperature PT100 3		-32768	32767	-
M0312	4x0313	AI – Load cell		-32768	32767	-
M0314	4x0315	AI – Motor temperature		-32768	32767	-
M0318	4x0319	AI – Flow		-32768	32767	-
M0319	4x0320	AI – Reserve, Speed reference		-32768	32767	-

8.3 BASE OF ALERTS AND ALARMS

Alert bases generate alerts in the system and alarm bases generate events that are related to the system actions.

Table 8.3 – Base of alerts and alarms

Parameter	Address	Description	Status	Min.	Max.	Unit
M0273	4x0274	Bit-mapped status map (R0132...R0147)	Bit 0 - Invalid parameters Bit 1 - Invalid RTC Bit 2 - Reserve Bit 3 - Communication with downhole sensor with consecutive faults Bit 4 – Pump configuration or transformation ratio are inconsistent (P400, P401, P238, P156, P157 or P158) Bit 5...13 - Reserve Bit 14 - Motor undercurrent alert Bit 15 - Reserve	-32768	32767	-
M0274	4x0275	Bit-mapped status map (R0148...R0163)	Bit 0 - Heavy pump alarm Bit 1...3 - Reserve Bit 4 - Flow Alarm L Bit 5 - Flow Alarm H Bit 6 - Alarm PT100 1 Bit 7 - Alarm PT100 2 Bit 8 - Alarm PT100 3 Bit 9 - Broken wire error on analog channels Bit 10 - ALC11 I / O module failure: WCP110, WIO110, CFW110 Bit 11 – Motor current H Bit 12 – Motor voltage H Bit 13 – Motor voltage L Bit 14...15 - Reserve	-32768	32767	-
M0275	4x0276	Bit-mapped status map (R0100..R0115)	Bit 0 ... 3 - Reserve Bit 4 - Line pressure too high (HH) (digital) Bit 5 - Line pressure too low (LL) (digital) Bit 6 - Frequency inverter access via DPRAM failed Bit 7 - Locked pump fault Bit 8 - Motor undercurrent fault Bit 9 - Ground fault Bit 10 - Transformer thermal protection fault Bit 11 - External fault Bit 12 - Flow Fault LL Bit 13 - Flow Fault HH Bit 14 - Backspin tripped fault Bit 15 - Motor overload fault	-32768	32767	-

Parameter	Address	Description	Status	Min.	Max.	Unit
M0276	4x0277	Bit-mapped status map (R0116..R0131)	Bit 0 - Pump rocking start fault Bit 1 - DC link undervoltage fault Bit 2 - Motor current fault HH Bit 3 - Motor temperature fault HH Bit 4 - Motor voltage fault HH Bit 5 - Motor voltage fault LL Bit 6 - Downhole pressure fault LL Bit 7 - Downhole temperature fault HH Bit 8 - Controller battery fault Bit 9 - ALC11 controller hardware fault Bit 10 - ALC11 ladder application internal fault Bit 11 - SDCARD not detected Bit 12 - SDCARD access fault Bit 13 - Fault PT100 1 Bit 14 - Fault PT100 2 Bit 15 - Fault PT100 3	-32768	32767	-
M0325	4x0326	Bit-mapped status map (R0316..R0331)	Bit 0 - Discharge pressure H Bit 1 - Discharge pressure L Bit 2 - Downhole pressure H Bit 3 - Downhole pressure L Bit 4 - Downhole temperature H Bit 5 - Motor temperature H Bit 6 - Active leakage current H Bit 7 - Passive leakage current H Bit 8 - Vibration H Bit 9 ... 15 - Reserve	-32768	32767	-
M0326	4x0327	Bit-mapped status map (R0300..R0315)	Bit 0 - Discharge pressure fault HH Bit 1 - Discharge pressure fault LL Bit 2 - Downhole pressure fault HH Bit 3 - Active leakage current fault HH Bit 4 - Passive leakage current fault HH Bit 5 - Vibration fault HH Bit 6... 14 - Reserve Bit 15 - Downhole sensor analog channel failure	-32768	32767	-

8.4 CONTROLLER STATUS

The table below shows the parameters with the controller status.

Table 8.4 – Controller status

Parameter	Address	Description	Status	Min.	Max.	Unit
R0230	0x0231	Inverter alarm status	OFF = No alarm ON = VSD with alarm	0 (OFF)	1 (ON)	-
R0231	0x0232	Inverter undervoltage status	OFF = No undervoltage ON = VSD with undervoltage	0 (OFF)	1 (ON)	-
R0232	0x0233	Inverter operating mode status	OFF = Local mode ON = Remote mode	0 (OFF)	1 (ON)	-
R0233	0x0234	Inverter failure status	OFF = No fault ON = VSD with fault	0 (OFF)	1 (ON)	-
R0234	0x0235	Inverter status in operation	OFF = Motor stopped ON = Motor running	0 (OFF)	1 (ON)	-
R0235	0x0236	Motor rotation direction status	OFF = Reverse run ON = Forward run	0 (OFF)	1 (ON)	-
R0236	0x0237	Inverter enable status	OFF = Disabled ON = Enabled	0 (OFF)	1 (ON)	-
M0320	4x0321	Remote control mode status	0 = Local 1 = Manual 2 = Automatic	0	2	-
M0321	4x0322	Well production status	0 = Not defined 1 = Stopped 2 = Producing 3 = Waiting power-up 4 = Rocking start routine 12 = Acoustic alarm to start the pump 20 = Starting 21 = Stopping 22 = With fault 23 = Emergency acted	0	23	-

8.5 CONTROLLER COMMANDS

The table below shows the controller commands.

Table 8.5 – Controller commands

Parameter	Address	Description	Status	Min.	Max.	Unit
R0268	0x0269	Command to Resets faults and clears fault reset counter	OFF = No function ON = Reset	0 (OFF)	1 (ON)	-

8.6 CONTROLLER DATE AND TIME

The table below shows the controller date and time parameters ALD11 - ESP.

Table 8.6 – Controller date and time

Parameter	Address	Description	Status	Min.	Max.	Unit
M2074	4x2075	Current month day		1	31	-
M2075	4x2076	Current month		1	12	-
M2076	4x2077	Current year		1980	2047	-
M2077	4x2078	Current hour		0	23	-
M2078	4x2079	Current minutes		0	59	-
M2079	4x2080	Current seconds		0	59	-

9 ALARM MANAGEMENT

Exception conditions configure situations where the system is operating outside specifications. Alarm and fault flags have been provided to signal such conditions to the user, which are detailed in the following items.

9.1 ALARMS

System alarms indicate conditions that may subsequently become Alarms. Alarms do not have associated actions; they are only for supervision; the alarm code is indicated in P0048. The table below details the system alarms.

Table 9.1 – Alarm code

Parameter	Address	Description	Status	Min.	Max.	Unit
P0048	4x8049	Present alarm	< 700, consult the CFW11 user manual > 700, check the fault and alarm table in this manual	0	9999	-

The following table shows the description of the application alarms.

Table 9.2 – Description of the application alarms

Alarm	Description
A939 - Analog input error	This alarm signals that any analog input programmed for a broken wire enabled alarm has an error in the signal
A941 - Low pressure discharge	This alarm indicates that the discharge pressure signal is below the programmed level
A942 - High pressure discharge	This alarm indicates that the discharge pressure signal is above the programmed level
A945 - High vibration	This alarm indicates that the vibration signal is above the programmed level
A947 - High active leakage current	This alarm indicates that the active leakage current signal is above the programmed level
A949 - High passive leakage current	This alarm indicates that the passive leakage current signal is above the programmed level
A952 - SDCARD not detected	Indicates the ALD11 SD card is poorly fitted or damaged
A953 - SDCARD access fault	Indicates that the controller is unable to read the SD card; it is necessary to check if the SD card files are not corrupted or the SD card is properly inserted
A954 - ALC11 Battery Fault	It suggests that the battery in the ALD11 card is missing or that its battery is low
A955 - COM1 serial communication fault	Communication with communication port 1 faulty; check parameterization and connection with communication equipment
A956 – COM2 serial communication fault	Communication with communication port 2 faulty; check parameterization and connection with communication equipment
A957 – COM3 serial communication fault	Communication with communication port 3 faulty; check parameterization and connection with communication equipment
A961 - Heavy pump alarm	Alarm actuated during locked pump check if locked pump fault is disabled. It indicates that the pump load is above the estimation in the check frequency
A962 - Motor undercurrent alarm	Alarm indicating that the motor is running below the set current level. For the alarm to occur, it must be configured as such, otherwise a fault will be indicated, and the system will stop
A965 - ALC11 analog I/O hardware error	Error in the ALC11 card modules
A972 - High motor current	This alarm signals that the motor current value is above the programmed level.
A973 - Low intake pressure	This alarm indicates that the intake pressure signal is below the programmed level.
A975 - High downhole temperature	This alarm signals that the downhole temperature signal is above the programmed level.

Alarm	Description
A977 - High motor temperature	This alarm signals that the motor temperature signal is above the programmed level.
A979 - High motor voltage	This alarm signals that the motor voltage value is above the programmed level.
A982 - Low flow alarm	This alarm indicates that the flow signal is below the programmed level.
A983 - High flow alarm	This alarm indicates that the flow signal is above the programmed level.
A994 - High temperature PT100 1	Temperature PT100 at ALD11 input 1 is above the alarm setpoint on the controller
A995 - High temperature PT100 2	Temperature PT100 at ALD11 input 2 is above the alarm setpoint on the controller
A996 - High temperature PT100 3	Temperature PT100 at ALD11 input 3 is above the alarm setpoint on the controller
A997 - High intake pressure	This alarm signals that the intake pressure signal is above the programmed level.
A999 - Low motor voltage	This alarm signals that the motor voltage value is below the programmed level.

9.2 FAULTS

System faults signal operational failure conditions. In a fault event, the system will stop the pump automatically; the fault code is indicated in P0049. The following table details the system failures.

Table 9.3 – Fault code

Parameter	Address	Description	Status	Min.	Max.	Unit
P0049	4x8050	Present fault	< 700, consult the CFW11 user manual > 700, check the fault and alarm table in this manual	0	9999	-

The following table shows the description of the application faults.

Table 9.4 – Description of the application faults

Fault	Description
F940 - Very low discharge pressure	This fault indicates that the discharge pressure signal is below the programmed level
F943 - Very high discharge pressure	This fault indicates that the discharge pressure signal is above the programmed level
F944 - Very high vibration	This fault indicates that the vibration signal is above the programmed level
F946 - Very high active leakage current	This fault indicates that the active leakage current signal is above the programmed level
F948 - Very high passive leakage current	This fault indicates that the passive leakage current signal is above the programmed level
F950 - ALC11 controller hardware fault	Check ALC11 board connections on the CFW11
F951 - ALC11 ladder application internal fault	Check if the ALC11 has ladder; make a method change with ALCTools.
F959 - Pump rocking start fault	The ALC11 was unable to release the pump or perform the Rocking Start function properly.
F960 - Locked pump fault	Fault actuated during locked pump check if locked pump fault is enabled. It indicates that the pump load is above the estimate check frequency.
F962 - Motor undercurrent alarm	Fault indicating that the motor is running below the set current level. For the fault to occur, it must be configured as such, otherwise only alarm will be indicated.
F963 - Backspin tripped fault (digital sensor)	Backspin sensor tripped indicates that the motor has reversed the direction of rotation of normal operation. The fault is caused by a digital input on the drive.
F964 - Ground fault (digital sensor)	Backspin sensor tripped in the ground fault protection indicates that there is an imbalance between the motor phases and the ground. The fault is caused by a digital input on the drive.

Fault	Description
F966 - High temperature fault on transformer (digital sensor)	This fault indicates that the digital input intended for transformer high temperature fault has been actuated.
F967 - Very low line pressure (digital sensor)	Digital input that indicates very low line pressure active.
F968 - Analog signal downhole sensor fault	This fault signals that any analog input programmed for enabled wire break alarm, presents an error in the signal. To generate the fault, the background sensor type must be selected Analog type, otherwise only an alarm is generated.
F970 - Very high line pressure (digital sensor)	Digital input that indicates very high line pressure active.
F981 - Very low flow fault	This fault indicates that the flow signal is below the programmed level
F984 - Very high flow fault	This fault indicates that the flow signal is above the programmed TRIP level
F985 - Motor very high current	This fault indicates that the motor current value is above the programmed TRIP level
F986 - Motor very high temperature	This fault indicates that the motor temperature value is above the programmed TRIP level
F987 - Motor very high voltage	This fault indicates that the motor voltage value is above the programmed TRIP level
F988 - Motor very low voltage	This fault indicates that the motor voltage value is below the programmed TRIP level
F989 – Very low intake pressure	This fault indicates that the intake pressure value is below the programmed TRIP level
F990 – Very high downhole temperature	This fault indicates that the downhole temperature value is above the programmed TRIP level.
F991 - Very high temperature PT100 1	Temperature PT100 at ALD11 input 1 is above the fault setpoint on the controller
F992 - Very high temperature PT100 2	Temperature PT100 at ALD11 input 2 is above the fault setpoint on the controller
F993 - Very high temperature PT100 3	Temperature PT100 at ALD11 input 3 is above the fault setpoint on the controller
F998 - MODBUS communication failure with the downhole sensor	Failed to read telegrams via MODBUS from the downhole sensor

10 COMMUNICATION

The ALC11 provides three RS485 serial communication channels and one Ethernet connection.

10.1 ETHERNET

The ALC11 module provides a female RJ45 type Ethernet connector. It is possible to communicate with the controller through this interface via:

- Ethernet Crossover cable when connected directly to the computer.
- Standard Ethernet cable (Type V) when connected to a hub, switch, or router.

NOTE!
If the connected computer has an Ethernet interface with Auto-MDIX resource, a crossover cable is not required, and a standard Ethernet cable can be used.

NOTE!
Use Ethernet network cables following EIA/TIA-568-B.2 standards, category 5e or superior.

10.1.1 Operation Modes

The Ethernet channel is capable to operate with the following settings:

Table 10.1– Ethernet channel operation modes

Speed	Communication
10 Mbps	Full Duplex
10 Mbps	Half Duplex
100 Mbps	Full Duplex
100 Mbps	Half Duplex

The settings are automatically detected.

10.1.2 Transportation and Application Protocols

The Ethernet channel provides the following transportation protocols:

- TCP/IP.
- UDP.
- UDP-Broadcast.

These protocols mentioned above can carry packages using the application protocols:

- MODBUS-TCP.

The Ethernet channel provides 4 simultaneous connections: three intended for users, called user's sockets 1, 2 and 3, and an equipment management connection, called control socket (socket 0). The user can use any of these 4 connections. The control connection has fixed settings, and cannot be changed. Thus, it is possible to make up to 4 simultaneous connections.

10.1.3 Factory Parameters

The table below indicates the factory parameters for the Ethernet channel:

Table 10.2– Ethernet channel factory parameters

Parameter	Value
IP Address	192.168.0.200
Gateway IP	192.168.0.1
Subnet mask	255.255.255.0
Connection timeout.	200 ms
Number of connection attempts	8

10.2 SERIAL RS485

The ALC11 provides three RS485 serial communication channels identified as COM1, COM2 and COM3. These three serial interfaces are galvanically isolated from the equipment hardware, but they are not isolated from each other.

10.2.1 Technical Data

Table 10.3– Technical data of the serial interfaces

Parameter	Value
Baud Rate	1200, 2400, 4800, 9600, 19200, 38400, 56800, 115200
Data bits	7 or 8
Parity	None, even, odd
Stop bits	1 or 2
Protocol	Modbus-RTU
Mode	Master or slave
Maximum number of RS485 network nodes	256 (*)

(*) The RS485 standard defines a minimum number of nodes supported by the network as 32. For 256-node operation, all network drivers must be of the low-power type (1/8 load).

NOTE!
Always use twisted pair, with ground mat in the RS485 network.

10.3 ACCESS TO THE MEMORY MAP VIA MODBUS TCP/RTU

This section shows how to access the controller addresses using a Modbus TCP or Modbus RTU connection.

10.3.1 Accessing R Type Addresses

The R-type addresses correspond to 8-bit Boolean variables. These markers can only receive values "0" or “1”. Add “1” to the desired R to obtain the Modbus address, as shown in the equation below:

Rxxxx=XXXX+1

Example:

Desired R: 50
Address = 50 + 1 = 0x0051

10.3.2 Accessing M Type Addresses

The M-type addresses correspond to 16-bit integer variables with signal. These markers can only receive values from “- 32767” to “32768”. Add “1” to the desired M to obtain the Modbus address, as shown in the equation below:

Mxxxx=XXXX+1

Example:

Desired M: 140
Address = 140 + 1 = 4x0141

10.3.3 Accessing D Type Addresses

The D-type addresses correspond to 32-bit floating point variables. These markers can only receive values from “0” to “2^32-1”. To obtain the desired D Modbus address, use the equation below:

Dxxxx=2·XXXX+10000+1

Example:

Desired D: 80
Address = 80*2 + 10001 = 4x_10161

10.4 RS485 NETWORK ACCESS VIA ETHERNET NETWORK

The ALC11 controller has packet redirection from the serial port to ethernet. In the serial port we have the SRW-01 and the SUBCOE Backspin relay. We suggest keeping the Modbus addresses of the devices at the default addresses.

Table 10.4– Device network address

Device	Address
SRW-01	63
SubCoe	16

The Modbus table of each device must be followed, the serial address as specified by the supervisory used to perform the readings of the devices on the serial network.

11 COMMISSIONING AN APPLICATION WITH ALC11 - ESP

The following is an example of commissioning a panel with ALD11. To start the operation of the pumping unit, the sequence of procedures will be presented.

The following figure illustrates the flowchart associated with the initial system startup.

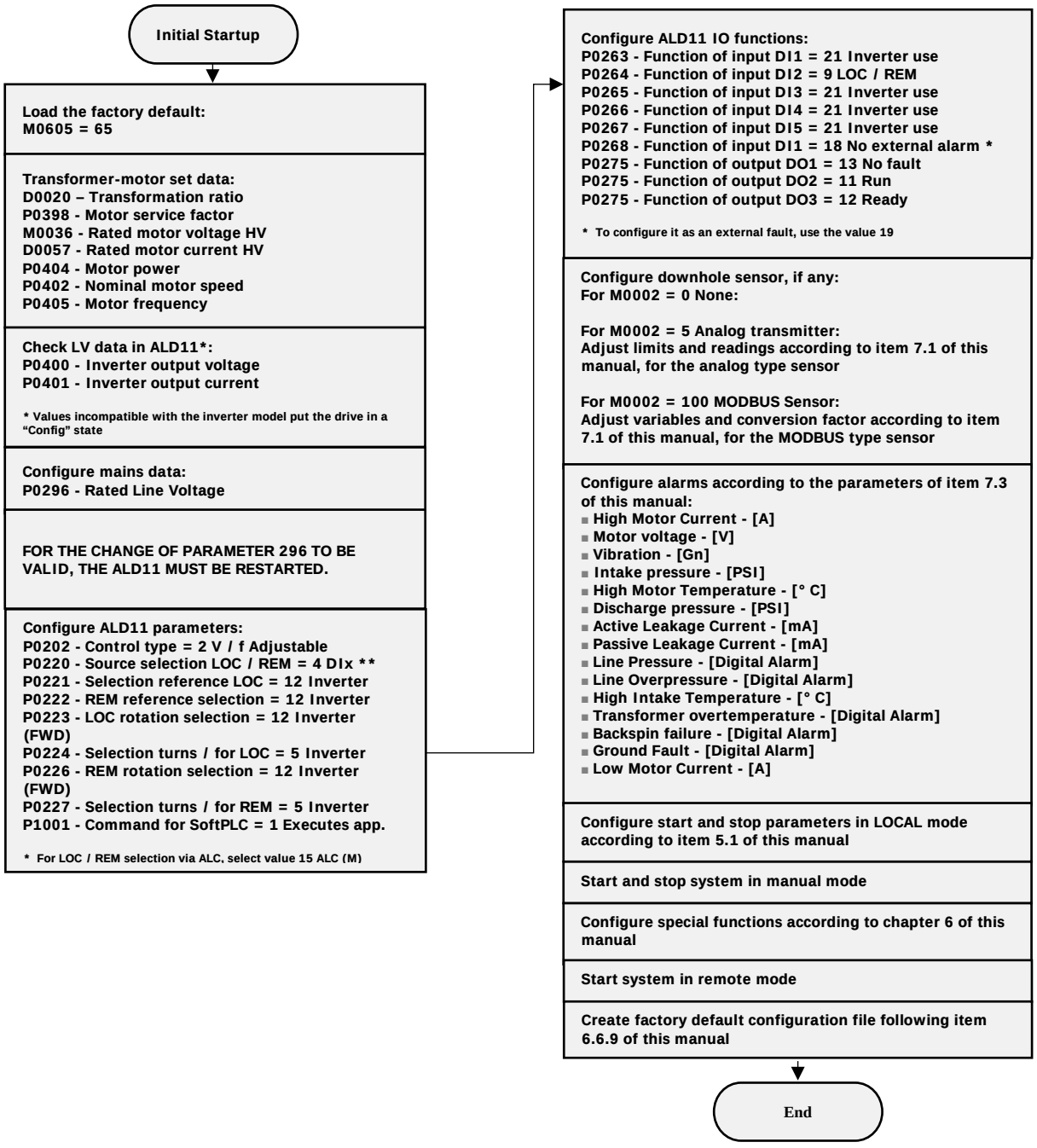


Figure 11.1 – Initial Startup procedure