Operating Instructions (translation of the original instructions)

SNS 4074K
SNS 4084K

Zero-speed monitor

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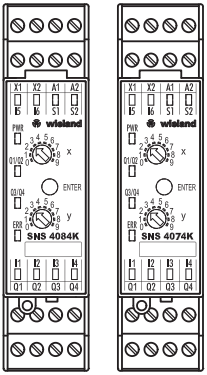


Zero-speed monitor

- Application up to SIL 3 according to EN 61508, EN 62061 or PL e / Category 4 according to EN ISO 13849-1
- Manual or automatic reset
- Eight safe inputs and four safe semiconductor outputs
- 2 kHz cutoff frequency
- Adjustable standstill frequency
  0.1 Hz…9.9 Hz (0.1 Hz steps) and 0.5 Hz …99 Hz (1 Hz steps)
- Sensors:
  – Proximity switches with PNP-output (plus switching)
  – Incremental encoder with HTL-output

Device versions

SNS 4074K-A	0.1–9.9 Hz	R1.188.3620.0	SNS 4084K-A	0.1–9.9 Hz	R1.188.3660.0
SNS 4074K-C	0.1–9.9 Hz	R1.188.3630.0	SNS 4084K-C	0.1–9.9 Hz	R1.188.3670.0
SNS 4074K-A	0.5–99 Hz	R1.188.3640.0	SNS 4084K-A	0.5–99 Hz	R1.188.3480.0
SNS 4074K-C	0.5–99 Hz	R1.188.3650.0	SNS 4084K-C	0.5–99 Hz	R1.188.3490.0

…-A: with screw terminals, pluggable; …-C: with spring-loaded terminals, pluggable

Further Documentation

For the planning, commissioning and operation of the device, please observe the information in the documentation "Manual SNS 4084K/4074K Standstill Monitor" (Doc. No.: BA000506).

SAFETY REGULATIONS

- The installation, commissioning, modification and retrofitting must only be performed by a qualified electrician.
- Disconnect the device / the system from the power supply before starting work. In the case of installation and system errors, mains voltage can be present on the control circuit in the case of non-galvanically isolated devices.
- Observe the electrotechnical and professional trade association safety regulations for the installation of the equipment.
- Opening the case or other manipulation voids any warranty.

ATTENTION

- In the case of improper use or any use other than for the intended purpose, the device must no longer be used and any warranty claim is void. Invalidating causes can be:
  – strong mechanical loading of the device such as, e.g. in the case of falling or voltages, currents, temperatures, humidity outside the specification.
  – Always check all safety functions in accordance with the applicable regulations during initial commissioning of your machine / system and observe the specified inspection cycles for safety devices.
- Take the following safety precautions before starting installation / assembly or dismantling:
  1. Disconnect the device / the system from the power supply before starting work.
  2. Secure the machine / system against being switched on again.
  3. Confirm that no voltage is present.
  4. Ground the phases and short to ground briefly.
  5. Cover and shield neighbouring live parts.
- Limited contact protection!
  Protection class according to EN 60529.
  – Case / terminals: IP 40 / IP 20.
  – Finger-proof according to EN 50274.

Proper Use

The units must only be used as components of safety devices on machines intended to protect persons, material and machines.

Only use the unit in accordance with its intended purpose. Also, pay particular attention to the information in the technical data.

The frequencies present at the inputs I1, I2, I3 and I4 must not exceed 2 kHz (cutoff frequency).

NOTE

- The SIL according to EN 61508 / EN 62061 or PL / Category according to EN ISO 13849-1 depending on the external wiring, the choice of control devices and their location on the machine.
- In applications with a low demand of the safety function, a proof-test once a year has to be implemented (The supply voltage of the device has to be switched off and on again and the safety function of the device has to be activated to verify the safety function).
- The device must be protected with a fuse 4 A Operating Class gG or a circuit breaker 4 A Tripping Characteristics B or C.

Installation (see also "Assembly")

NOTE

- The devices must be installed in a switch cabinet with a protection class of at least IP 54.
- The installation is made on a mounting rail according to EN 50022-35.
- The mounting rail must be connected to protective earth (PE).
- The external power supply must comply with the regulations for low voltages with safe separation (SELV, PELV according to IEC 60536) and EN 50178 (Electrical equipment for use in power installations).
- External loads must be equipped with a suitable protection circuit for the load (e.g. RC elements, varistors, suppressors) in order to reduce electromagnetic interference and to increase the service life of the output switching elements.

Functional Description

In the **SNS 4084K/4074K** there are four operating mode groups A, B, C, D available for safe speed monitoring tasks (see manual):

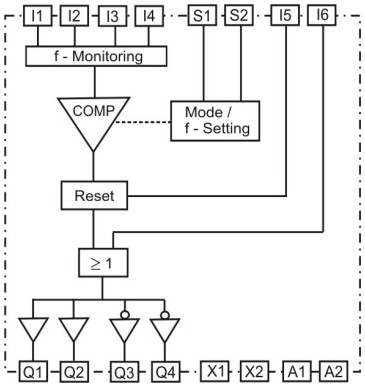
- Zero-speed monitoring (A, B)
- Diverse zero-speed monitoring (C, D) with PLC-signal

Connections and indicators (see also the section "Terminal Diagram")

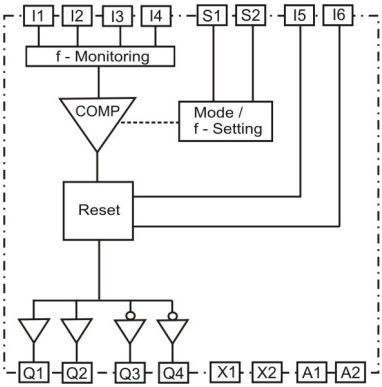
Terminal	Function	LED	Meaning, if LED lights
A1	Operating voltage connection U_B	PWR	U_B is present
A2	Operating voltage connection Ground		
X1, X2	Semiconductor signal outputs for indicating and evaluating operating and error statuses		
S1	Input for function selection (operating mode)	S1	High signal is present
S2	Input for function selection (operating mode)	S2	High signal is present
I1 – I4 I2 – I4	Inputs for sensor transmitter or Input for function selection (operating mode)	I1 – I4	High signal is present
I5	Input for RESET function	I5	High signal is present
I6	Input for enable/start delay	I6	High signal is present
Q1 / Q2	Outputs (semiconductors), safety related	Q1 / Q2	High signal is present
Q3 / Q4	Inverted outputs (semiconductors), safety related	Q3 / Q4	High signal is present
		ERR	Error (see manual BA000506)

Settings of the standstill monitor (diagram)

SNS 4074K



SNS 4084K



Information on the outputs
The outputs Q1/Q2 can be used up to SIL 3.
The outputs Q3/Q4 can be used for controlling magnetically operated interlocks up to SIL 1.

X1, X2 are not safe semiconductor outputs.
X1 signals error states.
X2 signals the logic state of A and the RESET request by I5.

Setting of the speed to be monitored

The standstill frequency is set using the two rotary switches "x" and "y".

Device Variants	Rotary switch	Freq. [Hz]
0.1–9.9 Hz	00 / 01– 99	0.1 / 0.1–9.9
0.5–99 Hz	00 / 01– 99	0,5 / 01–99

"ENTER" button: Activation of the function block and control circuit functions

- Set the required operating mode, speed (at the rotary switches) and the control circuit function (using external wiring at S1, S2, I5).
- Then apply the operating voltage with the ENTER button pressed; the ERR indicator flashes (max. 3 s).
- Release the ENTER button while the ERR indicator is flashing (an error is detected if the ENTER button is pressed for longer than 3 s).

The selected operating mode, speed and RESET function are then saved and active.

RESET / BYPASS function I5/I6 (SNS 4074K)

The automatic(high)/manual (low) Reset function is defined during the activation of the POU, see ENTER button.

automatic RESET: A High signal at I5 (open) transmits the comparator signal to the outputs.

manual RESET:A High pulse at I5 transmits the enable of the comparator to the outputs.

The transfer of the Reset signals can be influenced using the Bypass function (ODER) at the input I6 of the SNS 4074K, If the input I6 is wired (HIGH), the outputs Q1 and Q2 are permanently HIGH and Q3 and Q4 permanently LOW. The generation of the bypass signal has to fulfill the same safety requirements as the operating mode and the designated safety function.

RESET / Start-up bridging I5/I6 (SNS 4084K)

The automatic(high)/manual (low) Reset function is defined during the activation of the POU, see ENTER button.

automatic RESET: A High signal at I5 (open) transmits the comparator signal to the outputs. This transfer can be disabled with I6 (I6 = LOW)

manual RESET: A High pulse at I5 transmits the enable of the comparator to the outputs. A High pulse at I6 revokes this enable.

Behaviour of the device in the case of an error

The detection of random or systematic system errors in the system or its control results in deactivation. In doing so, all safety-oriented output circuits are switched off and the ERR LED of the module lights or flashes. Error codes are also output via the signal output X1 and the LEDs of the inputs.

Three error categories are distinguished:

- ERR lights: system error, all outputs are deactivated.
- ERR flashes: serious error, all outputs are deactivated.
- ERR off: no errors or minor process errors

Detailed information can be found in the manual.

The deactivation can be revoked if necessary by the user by elimination of an error (e.g. in the control) and by switching off the operating voltage and then switching it on again.

Setting the operating mode

		Input Assignment					
Operating mode	*Sensor*	*S1*	*S2*	*I1*	*I2*	*I3*	*I4*
A-1 A-2	– Incremental encoder with HTL output	low	low	Sensor 1	Sensor 2	Sensor 1 inverted	Sensor 2 inverted
B-1	– Incremental encoder with HTL output – Sensor with PNP output	low	high	Sensor 1	Sensor 1 inverted	low	low
B-2 [1)]	– Sensor with PNP output			Sensor 1	Sensor 2	low	high
B-3	– Incremental encoder with HTL output – Sensor with PNP output			Sensor 1	low	high	low
C-1	– Incremental encoder with HTL output – Sensor with PNP output	high	low	Sensor 1	PLC signal	Sensor 1 inverted	low
C-1	– Incremental encoder with HTL output – Sensor with PNP output			Sensor 1	static HIGH signal	Sensor 1 inverted	high
D-1	– Incremental encoder with HTL output – Sensor with PNP output	high	high	Sensor 1	PLC signal	low	low
D-1	– Incremental encoder with HTL output – Sensor with PNP output			Sensor 1	static HIGH signal	low	high

[1)] In operating mode B-2, the specified safety level can only be adhered to if the sensor lines are individually sheathed and laid so that they are protected.

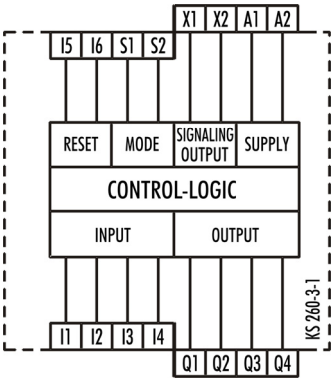
Technical Data

		min	typical	max
Power circuit (A1, A2)				
Operating voltage U_B, DC		19,2 V DC	**24 V DC**	30 V DC
Rated voltage U_N		–	**24 V DC**	–
Residual ripple Uss		–	–	3.0 V
Rated power DC		–	2.5 W	3.0 W
Peak current I_P		–	–	25 A
Ready time t_{on} (after applying U_B)			5sec. + $1/f_{ST}$	
Fuse Class gG or circuit breaker			4 A (gG)	
Input circuit (I2, I3, I4, I5, I6, S1, S2)				
Input voltage	U_e (HIGH	13.0 V	–	30 V
	U_e (LOW)	-0.5 V	–	5.0 V
Input current	I_e (HIGH)	2.4 mA	**3.0 mA**	3.8 mA
	I_e (LOW)	-2.5 mA	–	2.1 mA
Input capacitance, C_{IN}			**10 nF**	
Input resistance R_{IN}			**7200** Ω	
Duty cycle t_E		52 ms	–	70 ms
Break time t_A		52 ms	–	70 ms
Interruption time of U_e (test pulses)		–	–	4.0 ms
Input circuit (I1, I2, I3, I4)				
Input voltage	U_e (High)	13.0 V	–	30 V
	U_e (LOW)	-0.5 V	–	5 V
Input current	I_e (HIGH)	2.4 mA		3.8 mA
	I_e (LOW)	-2.5 mA		2.1 mA
Input capacitance, C_{IN}			**10 nF**	
Input resistance R_{IN}			**7200** Ω	
Cutoff frequency				2 kHz
Frequency change				21 kHz/s
Measurement accuracy of the frequency measurement		1% (<1Hz)	6 % (<50Hz)	12 % (≤99Hz)
Pulse duration LOW level (for f<100 Hz)		> 600 µs		
Pulse duration High level (for f<100 Hz)		> 600 µs		

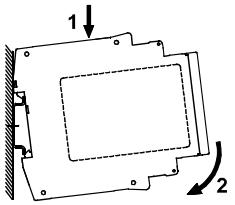
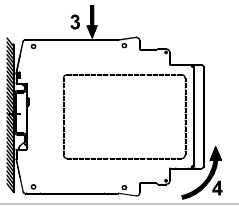
LOW level (for 100 Hz< f< 2 kHz)	> 200 µs		
High level (for 100 Hz< f< 2 kHz)	> 200 µs		
Output circuit (X1, X2)			
Output voltage	18,4 V	–	30.0 V
Output current	–	–	150 mA
Load capacitance C_L	–	–	1000 nF
Line resistance R_L, effective during discharge of C_L			100 Ω
Line length (single, ∅ 1.5 mm²)	–	–	100 m
Short-circuit behaviour	strictly short-circuit protected		
Output circuit (Q1, Q2, Q3, Q4)			
Output voltage	18,4 V	–	30 V
Output current I_{On}, $T_U \leq 45$ °C (resistive / inductive) Output current I_{On}, $T_U \leq 55$ °C	–	1.6	2.0 A / 1,0 A 1,6 A
Sum current ΣI_{On}, $T_U \leq 45$ °C Sum current ΣI_{On}, $T_U \leq 55$ °C	–	–	4.0 A 3.2 A
Test pulse width $t_{TI,HL}$		**400 µs**	650 µs
Test pulse period duration $T_{PI,HL}$		**192 ms**	
Load capacitance C_L			500 nF
Inductive cutoff energy E (E = 0.5 * L * I^2)			370 mJ
Line length (single, ∅1.5 mm²)			100 m
Short-circuit behaviour	strictly short-circuit protected		
Response time (t_{AN}) for overspeed			
for standstill frequency (f_{st}) 0.1 HZ - 99 HZ			
for duty cycle 1:1 (3:2)	1 / f_{st}		1,8 (1,6) / f_{st}
plus the internal processing time	8 ms		12 ms
Error detection time			
Short circuit to GND, U_B			
– Incremental encoder HTL	52 ms		116 ms
– Sensors with PNP output (duty cycle 3:2, Mode B-2)	52 ms		3/f
Short circuit to U_B (internal input)			576 ms
Short circuit to U_B (output)			576 ms
Error in the power supply			576 ms

General Data			
Electrical isolation	Power circuit - input circuit	no	
	Power circuit - output circuit	no	
	Input circuit - output circuit	no	
Weight		0.16 kg	
Climatic conditions			
Climatic conditions according to		EN 61131-2	
Ambient operating temperature T_B		-25°C to +55°C	
Storage temperature		-25°C to +70°C	
Relative humidity		10% to 95%, no moisture condensation	
Air pressure in operation		860 hPa to 1060 hPa	
Mechanical strength			
Vibration according to		EN 60068-2-xx (see manual for further information)	
Electrical safety			
Protection class according to EN 60529 case/terminals		IP 40 / IP 20	
Finger-proof		EN 50274	
Air gap/Creepage paths		EN 60664-1	
EMC according to		EN 61000-4-xx (see manual for further information)	
Surge voltage category		III	
Degree of soiling		2 inside, 3 outside	
Terminals and connection data		Screw clamp terminals	Spring-loaded terminals
Single-core or finely stranded		1 × 0.14–2.5 mm² / 2 × 0.14–0.75 mm²	2 × 0.2–1.5 mm²
Finely stranded with wire-end ferrule according to DIN 46228		1 × 0.25–2.5 mm² / 2 × 0.25–0.5 mm²	2 × 0.25–1.5 mm² (trapezoid crimping)
AWG		26–14	24–16
Maximum tightening torque		0,5–0,6 Nm (5–7 lbf-in)	–
Stripping length		max. 8 mm	

Terminal diagram

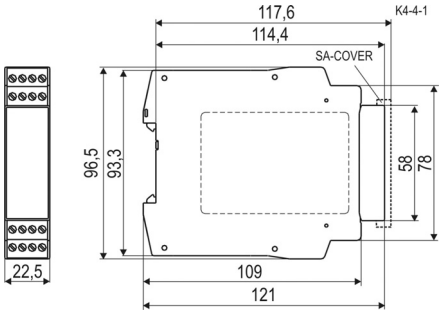


Assembly, Disassembly

	Assembly
	1 Attach device to DIN rail. 2 Press the device carefully onto the DIN rail (in direction of arrow) until it locks into place.
	Disassembly
	3 Push device down (in direction of arrow) 4 Release device and remove it from the DIN rail (see arrow)

Dimension Diagram

SNS 4084K-A DC 24V



SNS 4084K-C DC 24V