

# Standstill and Rotational Direction **Monitor**

# KFD2-SR2-Ex2.W.SM

- 2-channel isolated barrier
- 24 V DC supply (Power Rail)
- Dry contact or NAMUR inputs
- Selectable frequency trip values
- 2 relay contact outputs
- Start-up override
- Selectable mode of operation
- Line fault detection (LFD)
- Up to SIL 2 acc. to IEC/EN 61508

















### **Function**

This isolated barrier is used for intrinsic safety applications.

This device is a standstill monitor that accepts input frequency pulses and triggers an output when the frequency drops below a preselected limit value.

Two start-up override values are available. This unit can also be used to determine rotation direction.

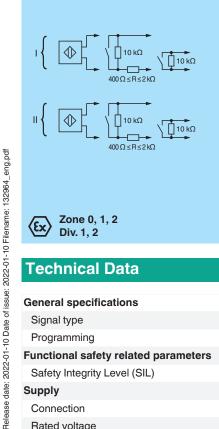
During an error condition, the relay reverts to its de-energized state and the LEDs indicate the fault according to NAMUR NE 44. The device has LED status indicators for direction of rotation detection, limit detection, supply, and hardware faults.

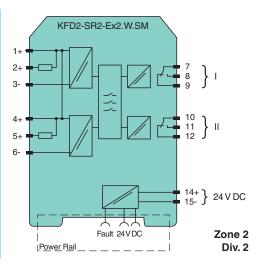
The device is easily configured by the use of DIP switches.

If the device is operated via Power Rail, additionally a collective error message is available.

For additional information, refer to www.pepperl-fuchs.com.

### Connection





### Technical Data

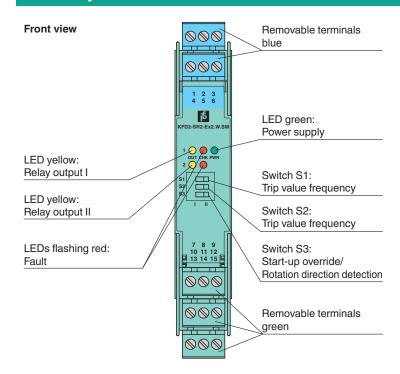
#### **General specifications** Signal type Digital Input Programming via DIP switch and programmable Functional safety related parameters Safety Integrity Level (SIL) SIL 2 Supply Connection Power Rail or terminals 14+, 15-Rated voltage 20 ... 30 V DC

Connection side         control side           Connection         output It terminals 7, 8, 9; output II: terminals 10, 11, 12           Connect loading         253 V AC/2 A/cos φ > 0.7; 126.5 V AC/4 A/cos φ > 0.7; 40 V DC/2 A resistive load Minimum switch current         2 mA /24 V DC           Energized/De-energized delay         approx. 20 ms / approx. 20 ms           Mechanical life         10° switching cycles           Trip value         fmax         for sandstill monitoring: 0.1 Hz; 0.5 Hz; 2 Hz; 10 Hz           Trip value         5 % (S3 = 1), 30 % (S3 = II)           Start-up override         5 % (S3 = I), 30 % (S3 = II)           Accuracy         5 % (S3 = I), 30 % (S3 = II)           Start-up override         5 seconds or 20 seconds, programmable           Frequency range         ≤ 2 kHz           Rotation direction detection         90° phase difference between pulse input signal 1 and 2, overlapping ≥ 125 µs           Salavanic Isolation         10µU/Output         reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>aff</sub> output/Output         reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>aff</sub> output/Output         reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>aff</sub> output/Output         reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>aff</sub> output/Output         reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>aff</sub> output/Output	Technical Data		
Connection side   field side   Connection   Input I: terminals 1+, 2+, 3-   Input II: terminals 4+, 5+, 6-   Input III: terminals 4+, 5+, 6-   Inpu	Power consumption		max 1.5 W
Connection side         field side           Connection         Impair it terminals 14, 2e, 3 - 1 input it is reminals 44, 54, 66           Rated values         acc, 16 K047-5-6 (NAMUR)           Open dircult votage/short-circuit current         approx. 8 V DC / approx. 8 m A           Switching point/switching hysteresis         1.2	•		Пах. 1.5 W
Papel   terminals 14, 24, 3 - 1   Fingul   terminals 14, 25, 4 - 1	•		field cide
Rated values   aprox. 8 V DC / approx. 8 mA			Input I: terminals 1+, 2+, 3-;
Open circuit voltage/short-circuit current         approx. 8 VDC / approx. 8 mA           Switching point/switching hysteresis         1.2 2.1 mA / approx. 0.2 mA           Line fault detection         breakage Is o.0 1 mA , short-circuit Is 6 mA           Control input         sensor power supply approx. 8 z. V. impedance 1.2 kΩ           Pulse duration         ≥ 200 µs for rotation direction detection           Victor         Connection         control side           Connection idea         control side         control side           Connectioning         2.583 V ACZ A/cos φ > 0.7; 126.5 V AC/4 A/cos φ > 0.7; 40 V DC/2 A resistive load           Minimum switch current         2.83 V ACZ A/cos φ > 0.7; 126.5 V AC/4 A/cos φ > 0.7; 40 V DC/2 A resistive load           Minimum switch current         2.250 µs for rotation direction detection           Minimum switch current         2.253 V ACZ A/cos φ > 0.7; 126.5 V AC/4 A/cos φ > 0.7; 40 V DC/2 A resistive load           Minimum switch current         2.253 V ACZ A/cos φ > 0.7; 126.5 V AC/4 A/cos φ > 0.7; 40 V DC/2 A resistive load           Minimum switch current         2.250 µs for rotation direction	Patert at an		
Switching point/switching hysteresis			, ,
Line fault detection breakage   ≤ 0.1 mA , short-circuit   > 6 mA Control Input sensor power supply approx. 8.2 V, impedance 1.2 kΩ Pulse duration   ≥ 200 us for standardil monitoring, > 259 µs for rotation direction detection  Voluptut  Connection side   control side   con	1		
Control input         sensor power supply approx. 8.2 V, impedance 1.2 kΩ           Pulse duration         > 200 us for standstill monitoring.           Connection         control side           Connection         output 1: terminals 7, 8, 9; output II: terminals 10, 11, 12           Contact loading         253 V AC/2 A/cos φ > 0.7; 126.5 V AC/4 A/cos φ > 0.7; 40 V DC/2 A resistive load Minimum switch current           Energized/De-energized delay         approx. 20 ms / approx. 20 ms           Mechanical life         10° switching cycles           Trip value         firmate of retardstill monitoring: 0.11±2; 0.5 Hz; 2 Hz; 10 Hz           Trip value         firmate of selection of power adjustable vision 10 Ps witch (51 and 82)           Trip value         5 % (S3 = I), 30 % (S3 = II)           Start-up override         5 seconds or 20 seconds, programmable           Frequency range         ≤ 2 kHz           Rotation direction delection         90° phase difference between pulse input signal 1 and 2, overlapping ≥ 125 µs           Salvanic isolation         input/Output           Imput/Output         reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> output/Output voltage 400 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> output/Output voltage 400 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 3			
Pulse duration         > 200 µs for standstill monitoring, > 250 µs for rotation direction detection           Output           Connection side         control side           Connection         output t terminals 7, 8, 9; output ill terminals 10, 11, 12           Connection         253 V AC/2 A/cos φ > 0.7; 126.5 V AC/4 A/cos φ > 0.7; 40 V DC/2 A resistive load Minimum switch current         2 mA / 24 V DC           Energized/De-energized delay         approx. 20 ms / approx. 20 ms           Mechanical life         10² switching cycles           Trip value         fms.         fms.         fms. (or standstill monitoring; fm. 12 ms.)			
Connection side         control side           Connection         output I: terminals 7, 8, 9; output II: terminals 10, 11, 12           Contact loading         253 V ACQ Aloos φ > 0.7; 126.5 V AC/4 A/cos φ > 0.7; 40 V DC/2 A resistive load           Minimum switch current         2 mA / 24 V DC           Energized/De-energized delay         approx. 20 ms / approx. 20 ms           Mechanical life         107 switching cycles           Trip value         fmmx         for standstill monitoring: adjustable via DP swinch (S1 and S2)           Trip value         5 % (S3 = I), 30 % (S3 = II)           Start-up override         5 seconds or 20 seconds, programmable           Frequency range         ≤ 2 kHz           Start-up override         5 seconds or 20 seconds, programmable           Frequency range         ≤ 2 kHz           Start-up override         5 seconds or 20 seconds programmable           Frequency range         ≤ 2 kHz           Start-up override         5 seconds or 20 seconds, programmable           Frequency range         ≤ 2 kHz           Start-up override         5 seconds or 20 seconds, programmable           Frequency range         ≤ 2 kHz           Start-up override         5 seconds or 20 seconds, programmable           Input Output put over supply         reinforced insulation according to IEC/EN 610	Pulse duration		
Connection	Output		
Contact loading         253 V AC/2 A/cos φ > 0.7; 126.5 V AC/4 A/cos φ > 0.7; 40 V DC/2 A resistive load Minimum switch current         2 mA / 24 V DC           Energized/De-energized delay         approx. 20 ms / approx. 20 ms           Mechanical life         10° switching cycles           Trip value         for standstill monitoring: 0.1 Hz; 0.5 Hz; 2 Hz; 10 Hz adjustable via DIP switch (S1 and S2)           Transfer characteristics         5 % (S3 = I), 30 % (S3 = II)           Accuracy         5 % (S3 = I), 30 % (S3 = II)           Start-up override         5 seconds or 20 seconds, programmable           Frequency range         ≤ 2 kHz           Rotation direction detection         90° phase difference between pulse input signal 1 and 2, overlapping ≥ 125 µs           Salvanic isolation         Input/Output           Input/Output         reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> output/Output           Input/Output         reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> output/Output           Output/Output         reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> insulation second in the IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> indicators/settings           Display elements         LEDs           Control elements         DIP switch           Configuration         via DIP switch           Elect	Connection side		control side
Minimum switch current         2 mA /24 V DC           Energized/De-energized delay         approx. 20 ms (approx. 20 ms)           Mechanical life         107 switching cycles           Trip value         ∫max for standstill monitoring: adjustable via DIP switch (61 and S2)           Transfer characteristics         Seconds or 20 seconds, programmable           Frequency range         ≤ 2 kHz           Rotation direction detection         390° phase difference between pulse input signal 1 and 2, overlapping ≥ 125 μs ablavanic isolation           Input/Output         reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> voltage           Display elements         LEDs           Control elements         DIP switch           Control elements         DIP switch           Control elements         DIP swit	Connection		output I: terminals 7, 8, 9; output II: terminals 10, 11, 12
Energized/De-energized delay	Contact loading		253 V AC/2 A/cos $\varphi$ > 0.7; 126.5 V AC/4 A/cos $\varphi$ > 0.7; 40 V DC/2 A resistive load
Mechanical life         10° switching cycles           Trip value         fmax         chrackandstill monitorings           cransfer characteristics           Accuracy         5 % (S3 = I), 30 % (S3 = II)           Start-up override         5 seconds or 20 seconds, programmable           Frequency range         ≤ 2 kHz           Rotation direction detection         90° phase difference between pulse input signal 1 and 2, overlapping ≥ 125 µs           Salvanic Isolation         reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> Output/Duptut         1 reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> Output/Duptut         1 reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> Output/Duptut         1 reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> Output/Output         1 reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> Output/Output         1 reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> Output/Output         2 reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> Output/Output         3 pack set insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> Display elements         LEDs           <	Minimum switch current		2 mA / 24 V DC
Trip value    fmax	Energized/De-energized delay		approx. 20 ms / approx. 20 ms
Content   Con	Mechanical life		10 <sup>7</sup> switching cycles
Accuracy         5 % (S3 = I), 30 % (S3 = II)           Start-up override         5 seconds or 20 seconds, programmable           Frequency range         ≤ 2 kHz           Rotation direction detection         90° base difference between pulse input signal 1 and 2, overlapping ≥ 125 µs           Salvanic Isolation         Input/Output         reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> Input/power supply         reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> Output/power supply         reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> Output/power supply         reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> Output/power supply         reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> Display elements         LEDs           Control elements         DIP switche           Configuration         via DIP switches           Labeling         space for labeling at the front           Directive conformity         Electromagnetic compatibility           Directive 2014/36/EU         EN 61010-1:2010           Conformity         Electromagnetic compatibility           Degree of protection         IEC 60529:2001           Input         EN 60947-56:2000	Trip value	f <sub>max</sub>	0.1 Hz; 0.5 Hz; 2 Hz; 10 Hz
Start-up override 5 seconds or 20 seconds, programmable Frequency range ≤ 2 kHz  Rotation direction detection 90° phase difference between pulse input signal 1 and 2, overlapping ≥ 125 µs Salvanic Isolation Input/Output reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Verlapping verinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Verlapping verinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Verlapping verinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Verlapping verinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Verlapping verinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Verlapping verinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Verlapping verinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Verlapping verinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Verlapping verinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Verlapping verinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Verlapping verinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Verlapping verinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Verlapping verinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Verlapping verinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Verlapping verinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Verlapping verinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Verlapping verinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Verlapping verinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Verlapping 300 Verlapping 300 Verlapping 300 Verlapping 300 Verlapping 300 Verlapping 300	Transfer characteristics		
Frequency range  Rotation direction detection  90° phase difference between pulse input signal 1 and 2, overlapping ≥ 125 µs alavanic isolation  Input/Output  Input/Output  Input/Output  Output/Power supply  reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>ett</sub> Input/Output  Output/Output  reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>ett</sub> Output/Output  reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>ett</sub> Output/Output  reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>ett</sub> Indicators/settings  Display elements  LEDs Control elements  Dip switch Configuration  via DIP switch  Configuration  via DIP switch  Space for labeling at the front  Directive conformity  Electromagnetic compatibility  Directive 2014/30/EU  EN 61326-1:2013 (industrial locations)  Conformity  Electromagnetic compatibility  Directive 2014/35/EU  EN 61010-1:2010  Conformity  Electromagnetic compatibility  NE 21:2006  Elegree of protection  Input  EN 60947-5-6:2000	Accuracy		5 % (S3 = I), 30 % (S3 = II)
Rotation direction detection  90° phase difference between pulse input signal 1 and 2, overlapping ≥ 125 µs  Ralvanic isolation  Input/Output reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Vert Input/power supply reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Vert Output/power supply reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Vert Output/Output reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Vert Output/Output reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Vert Output/Output reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Vert Output/Output reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Vert Output/Output reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Vert Output/Output reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Vert Output/Output LEDs  Control elements  LEDs  Control elements  DIP switch Space for labeling at the front  Directive conformity  Electromagnetic compatibility  Directive 2014/30/EU  EN 61326-1:2013 (industrial locations)  EN 61010-1:2010  Conformity  Electromagnetic compatibility  NE 21:2006  Degree of protection  IEC 60529:2001  Input EN 60947-5-6:2000  Ambient conditions  Ambient temperature  -20 60 °C (-4 140 °F)  Mechanical specifications  Degree of protection  P20  Connection  Sorew terminals  Mass  approx. 150 g  Dimensions  20 x 119 x 115 mm (0.8 x 4.7 x 4.5 inch) (W x H x D) , housing type B2	Start-up override		5 seconds or 20 seconds, programmable
Input/Output reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> (Dutput/power supply) reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> (Output/power supply) reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> (Output/power supply) reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> (Output/Output) reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> (Output/Output) reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> (Output/Power supply) reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> (Output/Power supply) reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> (Output/Power supply) reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> (Output/Power supply) reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> (Output/Power supply) reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> (Output/Power supply) reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> (Output/Power supply) reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> (Output/Power supply) reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> (Output/Power supply) reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> (Output/Power supply) reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> (Output/Power supply) reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> (Output/Power supply) reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> (Output/Power supply) reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>e</sub>	Frequency range		≤2 kHz
Input/Output reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Vert Input/power supply reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Vert Input/power supply reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Vert Inductors/settings  Output/Output reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Vert Inductors/settings  Display elements  Control elements  DIP switch  Configuration  via DIP switch  Configuration  via DIP switches  Labeling space for labeling at the front  Directive conformity  Electromagnetic compatibility  Directive 2014/30/EU  EN 61326-1:2013 (industrial locations)  Low voltage  Directive 2014/35/EU  EN 61010-1:2010  Conformity  Electromagnetic compatibility  NE 21:2006  Degree of protection  IEC 60529:2001  Input  EN 60947-5-6:2000  Imput  EN 60947-5	Rotation direction detection		$90^{\circ}$ phase difference between pulse input signal 1 and 2, overlapping $\geq 125~\mu s$
Input/power supply reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> Output/power supply reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> Output/Output reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> Output/Output reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> Output/Output  reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> Output/Output  reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> Output/Output  reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> Output/Output  Display elements Control elements  DIP switch Configuration  via DIP switch Space for labeling at the front  DIP switches Space for labeling at the front  Electromagnetic compatibility Directive conformity  Electromagnetic compatibility Directive 2014/30/EU EN 61010-1:2010  Conformity  Electromagnetic compatibility NE 21:2006 Degree of protection IPC 60529:2001 Input EN 60947-5-6:2000  Imput EN 60947-5-6:20	Galvanic isolation		
Output/power supply reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V <sub>eff</sub> reinforced insulation acc	Input/Output		reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 $V_{\text{eff}}$
Output/Output reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 Vert indicators/settings  Display elements LEDs Control elements DIP switch Configuration via DIP switches Labeling space for labeling at the front  Directive conformity Electromagnetic compatibility Directive 2014/30/EU EN 61326-1:2013 (industrial locations)  Low voltage Directive 2014/35/EU EN 61010-1:2010  Conformity Electromagnetic compatibility NE 21:2006 Degree of protection Input EN 60947-5-6:2000  Imput EN 60947-5-6:2000  Imput Conditions  Ambient conditions  Ambient emperature -20 60 °C (-4 140 °F)  Mechanical specifications  Degree of protection IP20 Connection screw terminals Mass approx. 150 g Dimensions  Dimensions  Diput Suppose Suppo	Input/power supply		reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 $\ensuremath{V_{\text{eff}}}$
Display elements	Output/power supply		reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 $\mathrm{V}_{\mathrm{eff}}$
Display elements	Output/Output		reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 $\ensuremath{V_{\text{eff}}}$
Control elements	ndicators/settings		
Configuration         via DIP switches           Labeling         space for labeling at the front           Directive conformity         Electromagnetic compatibility           Directive 2014/30/EU         EN 61326-1:2013 (industrial locations)           Low voltage         EN 61010-1:2010           Directive 2014/35/EU         EN 61010-1:2010           Conformity         Electromagnetic compatibility         NE 21:2006           Degree of protection         IEC 60529:2001           Input         EN 60947-5-6:2000           Ambient conditions         Ambient temperature           Ambient temperature         -20 60 °C (-4 140 °F)           Acchanical specifications         IP20           Connection         screw terminals           Mass         approx. 150 g           Dimensions         20 x 119 x 115 mm (0.8 x 4.7 x 4.5 inch) (W x H x D) , housing type B2	Display elements		LEDs
Labeling space for labeling at the front  Directive conformity  Electromagnetic compatibility Directive 2014/30/EU  Low voltage Directive 2014/35/EU  EN 61326-1:2013 (industrial locations)  EN 61326-1:2013 (industrial locations)  EN 61010-1:2010  Conformity  Electromagnetic compatibility NE 21:2006  Degree of protection IEC 60529:2001 Input EN 60947-5-6:2000  Ambient conditions  Ambient temperature -20 60 °C (-4 140 °F)  Acchanical specifications  Degree of protection IP20  Connection Screw terminals Mass Dimensions Degree of protection (0.8 x 4.7 x 4.5 inch) (W x H x D) , housing type B2	Control elements		DIP switch
Electromagnetic compatibility Directive 2014/30/EU EN 61326-1:2013 (industrial locations)  Low voltage Directive 2014/35/EU EN 61010-1:2010  Conformity  Electromagnetic compatibility NE 21:2006 Degree of protection Input EN 60947-5-6:2000  Ambient conditions  Ambient temperature -20 60 °C (-4 140 °F)  Mechanical specifications  Degree of protection P20 Connection Screw terminals Mass Approx. 150 g Dimensions  EN 61326-1:2013 (industrial locations)  EN 61326-1:2013 (industrial locations)  EN 61326-1:2013 (industrial locations)  EN 61326-1:2013 (industrial locations)  EN 61010-1:2010  EN	Configuration		via DIP switches
Electromagnetic compatibility Directive 2014/30/EU  EN 61326-1:2013 (industrial locations)  Low voltage Directive 2014/35/EU  EN 61010-1:2010  Conformity  Electromagnetic compatibility NE 21:2006 Degree of protection Input EN 60947-5-6:2000  Ambient conditions  Ambient temperature -20 60 °C (-4 140 °F)  Mechanical specifications  Degree of protection IP20  Connection Screw terminals Mass Approx. 150 g  Dimensions  EN 61326-1:2013 (industrial locations)  EN 61326-1:2013 (industrial locations)  EN 61326-1:2013 (industrial locations)  EN 61010-1:2010  EN 61010-1:2010  EN 61010-1:2010  EN 621:2006  IP20  Connection Screw terminals Approx. 150 g  Dimensions  EN 61326-1:2013 (industrial locations)  EN 61010-1:2010  EN 61020-1:2010  EN 61020-1:2010  EN 61020-1:2010  EN 61010-1:2010  EN 61010-1:2010  EN 61010-1:2010  EN 61020-1:2010  E	Labeling		space for labeling at the front
Directive 2014/30/EU EN 61326-1:2013 (industrial locations)  Low voltage Directive 2014/35/EU EN 61010-1:2010  Conformity  Electromagnetic compatibility NE 21:2006 Degree of protection IEC 60529:2001 Input EN 60947-5-6:2000  Ambient conditions  Ambient temperature -20 60 °C (-4 140 °F)  Mechanical specifications  Degree of protection IP20  Connection screw terminals  Mass approx. 150 g  Dimensions  EN 61326-1:2013 (industrial locations)  EN 61326-1:2013 (industrial locations)  EN 61010-1:2010  EN 61010-1:2010  EN 61010-1:2010  EN 6010-1:2010  EN 60529:2001  EN 60947-5-6:2000  IP20  Screw terminals  Mass approx. 150 g  Dimensions  EN 61326-1:2013 (industrial locations)  EN 61010-1:2010	Directive conformity		
Low voltage   EN 61010-1:2010   EN 61010-1:2010   EN 61010-1:2010   En 61010-1:2010   Electromagnetic compatibility   NE 21:2006   EC 60529:2001   EN 60947-5-6:2000	Electromagnetic compatibility		
Directive 2014/35/EU  Electromagnetic compatibility  Degree of protection  Input  EN 60947-5-6:2000  Ambient conditions  Ambient temperature  Degree of protection  IP20  Connection  IP20  Connection  Mass  Degree of protection  IP20  Connection  Degree of protection  EN 60947 - 5-6:2000  IP20  Connection  Degree of protection  IP20  Connection  Degree of protection  Degre	Directive 2014/30/EU		EN 61326-1:2013 (industrial locations)
Electromagnetic compatibility  Degree of protection  Input  EN 60947-5-6:2000  Ambient conditions  Ambient temperature  -20 60 °C (-4 140 °F)  Mechanical specifications  Degree of protection  IP20  Connection  Screw terminals  Mass  Dimensions  Dimensions  NE 21:2006  IEC 60529:2001  EN 60947-5-6:2000  EN 60	Low voltage		
Electromagnetic compatibility  Degree of protection  Input  EN 60947-5-6:2000  Ambient conditions  Ambient temperature  -20 60 °C (-4 140 °F)  Mechanical specifications  Degree of protection  IP20  Connection  Screw terminals  Mass  Dimensions  NE 21:2006  IEC 60529:2001  EN 60947-5-6:2000  EN 60947-5-6:2000  IN 60947-5-6:2000  EN 60947-5-6:2000  FOR ON EN	Directive 2014/35/EU		EN 61010-1:2010
Degree of protection         IEC 60529:2001           Input         EN 60947-5-6:2000           Ambient conditions         -20 60 °C (-4 140 °F)           Mechanical specifications         IP20           Connection         screw terminals           Mass         approx. 150 g           Dimensions         20 x 119 x 115 mm (0.8 x 4.7 x 4.5 inch) (W x H x D) , housing type B2	Conformity		
Input EN 60947-5-6:2000  Ambient conditions  Ambient temperature -20 60 °C (-4 140 °F)  Mechanical specifications  Degree of protection IP20  Connection screw terminals  Mass approx. 150 g  Dimensions 20 x 119 x 115 mm (0.8 x 4.7 x 4.5 inch) (W x H x D) , housing type B2	Electromagnetic compatibility		NE 21:2006
Ambient conditions Ambient temperature -20 60 °C (-4 140 °F)  Mechanical specifications  Degree of protection IP20  Connection screw terminals  Mass approx. 150 g  Dimensions 20 x 119 x 115 mm (0.8 x 4.7 x 4.5 inch) (W x H x D) , housing type B2	Degree of protection		IEC 60529:2001
Ambient temperature -20 60 °C (-4 140 °F)  Mechanical specifications  Degree of protection IP20  Connection screw terminals  Mass approx. 150 g  Dimensions 20 x 119 x 115 mm (0.8 x 4.7 x 4.5 inch) (W x H x D) , housing type B2	Input		EN 60947-5-6:2000
Mechanical specifications       Degree of protection     IP20       Connection     screw terminals       Mass     approx. 150 g       Dimensions     20 x 119 x 115 mm (0.8 x 4.7 x 4.5 inch) (W x H x D) , housing type B2	Ambient conditions		
Degree of protectionIP20Connectionscrew terminalsMassapprox. 150 gDimensions20 x 119 x 115 mm (0.8 x 4.7 x 4.5 inch) (W x H x D) , housing type B2	Ambient temperature		-20 60 °C (-4 140 °F)
Connectionscrew terminalsMassapprox. 150 gDimensions20 x 119 x 115 mm (0.8 x 4.7 x 4.5 inch) (W x H x D) , housing type B2	Mechanical specifications		
Mass         approx. 150 g           Dimensions         20 x 119 x 115 mm (0.8 x 4.7 x 4.5 inch) (W x H x D) , housing type B2	Degree of protection		IP20
Dimensions 20 x 119 x 115 mm (0.8 x 4.7 x 4.5 inch) (W x H x D) , housing type B2	Connection		screw terminals
	Mass		approx. 150 g
Mounting on 35 mm DIN mounting rail acc. to EN 60715:2001	Dimensions		20 x 119 x 115 mm (0.8 x 4.7 x 4.5 inch) (W x H x D) , housing type B2
	Mounting		on 35 mm DIN mounting rail acc. to EN 60715:2001

_eng.pdf
132964
Filename:
2-01-10
: 202
of issue
Date
022-01-1
date: 20
Release

EU-type examination certificate		PTB 00 ATEX 2080
Marking		<ul> <li>II (1)G [Ex ia Ga] IIC</li> <li>II (1)D [Ex ia Da] IIIC</li> <li>I (M1) [Ex ia Ma] I</li> </ul>
Input		Exia
Voltage	Uo	10.5 V
Current	Io	13 mA
Power	Po	34 mW (linear characteristic)
Supply		
Maximum safe voltage	U <sub>m</sub>	253 V AC / 125 V DC (Attention! U <sub>m</sub> is no rated voltage.)
Output		
Contact loading		253 V AC/2 A/cos $\varphi$ > 0.7; 126.5 V AC/4 A/cos $\varphi$ > 0.7; 40 V DC/2 A resistive load
Maximum safe voltage	$U_{m}$	253 V AC (Attention! The rated voltage can be lower.)
Fault indication output		
Maximum safe voltage	$U_{m}$	40 V DC (Attention! U <sub>m</sub> is no rated voltage.)
Certificate		TÜV 99 ATEX 1493 X
Marking		
Output		
Contact loading		50 V AC/4 A/cos φ > 0.7; 40 V DC/2 A resistive load
Galvanic isolation		
Input/Output		safe electrical isolation acc. to IEC/EN 60079-11, voltage peak value 375 V
Input/power supply		safe electrical isolation acc. to IEC/EN 60079-11, voltage peak value 375 V
Directive conformity		
Directive 2014/34/EU		EN IEC 60079-0:2018 , EN 60079-7:2015+A1:2018 , EN 60079-11:2012 , EN IEC 60079-15:2019
nternational approvals		
FM approval		
FM certificate		FM19US0207X
Control drawing		116-0035
UL approval		E106378
Control drawing		116-0145
CSA approval		
Control drawing		116-0047
IECEx approval		
IECEx certificate		IECEx PTB 11.0034 , IECEx TUN 19.0013X
IECEx marking		[Ex ia Ga] IIC [Ex ia Da] IIIC [Ex ia Ma] I Ex ec nC IIC T4 Gc
ieneral information		

# **Assembly**



# **Matching System Components**

The state of the s	KFD2-EB2	Power Feed Module
	UPR-03	Universal Power Rail with end caps and cover, 3 conductors, length: 2 m
	UPR-03-M	Universal Power Rail with end caps and cover, 3 conductors, length: 1,6 m
	UPR-03-S	Universal Power Rail with end caps and cover, 3 conductors, length: 0.8 m
	K-DUCT-BU	Profile rail, wiring comb field side, blue
	K-DUCT-BU-UPR-03	Profile rail with UPR-03- * insert, 3 conductors, wiring comb field side, blue

# **Accessories**

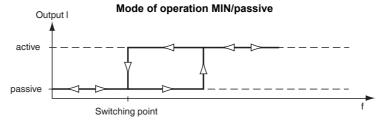
	F-NR3-Ex1	NAMUR Resistor Network
	KF-ST-5GN	Terminal block for KF modules, 3-pin screw terminal, green
	KF-ST-5BU	Terminal block for KF modules, 3-pin screw terminal, blue
*	KF-CP	Red coding pins, packaging unit: 20 x 6

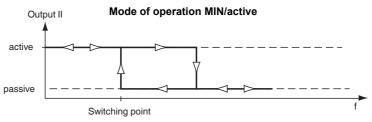
S3:	1	II	
Function:	Standstill monitor with	Standstill monitor with	
	start-up override	rotation direction monitoring	
Input I:	Pulse input 1:	Pulse input 1:	
	NAMUR	NAMUR	
	contacts (bounce-free)	contacts (bounce-free)	
Input II:	Start-up override:	Pulse input 2:	
	contact terminal 4 + 6: 20 seconds	NAMUR	
	contact terminal 5 + 6: 5 seconds	contacts (bounce-free)	
Output I:	MIN/passive	MIN/passive	
Output II:	MIN/active	Direction of rotation/error	

### Standstill monitor with start-up override (S3 = I)

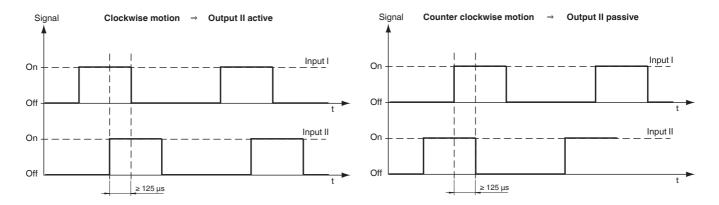
If the frequency falls below the trip value set with the DIP switches S1 and S2, the standstill monitor with start-up override switches the output I to passive and the output II to active. Input I is used to monitor the frequency of rising current edges. Signal transmitters can be sensors in accordance with EN 60947-5-6 (NAMUR) or contacts. Input I is monitored for lead breakage/short-circuiting. A start-up override can be initiated via input II. The duration of the start-up override can be selected between 5 and 20 seconds by means of a bridge (starting trigger) or an external trigger signal. During the start-up override time the outputs assume the "no standstill" state. In this case there is no lead breakage/short-circuit monitoring at input II.

Trip value	Hysteresis	Switch S2	Switch S1
0.1 Hz	0.02 Hz	I	I
0.5 Hz	0.1 Hz	I	II
2 Hz	0.4 Hz	II	I
10 Hz	2 Hz	II	II





The device also offers stand still monitoring with direction of rotation monitoring as an alternative to stand still monitoring with start-up override. The trip values are identical to the standstill monitor with start-up override. At input II a signal that is offset by 90° to input I has to be applied; in this context minimum signal overlapping should be ensured. Signal transmitters at input I and input II can be sensors in accordance with DIN EN 60947-5-6 (NAMUR) or contacts. Both inputs are monitored for lead faults. Output I is used for standstill signalling and switches to a de-energized state (passive) in the event of a standstill. Output II is switched to active when the direction of rotation is clockwise. If a reverse rotation is detected or if a signal overlap is missing, output II switches to a de-energized state (passive). In this case it can be concluded, that the sensor is misadjusted or defective. If the sensor at input I is misadjusted or defective, input II is used for standstill monitoring.



### Behaviour during malfunction:

- · Monitoring for lead faults
- · Continuous monitoring of the device for errors in internal memory

If an error occurs, both relays go into the secure state, the red LEDs indicate the error and a collective error message is generated via the Power Rail.

### Advice on use in SIL2 applications (Functional safety)

Care should be taken to ensure that the relays are de-energized (passive) in the critical condition of the application. Then, in the event of a power failure (de-energized, passive relay) the safety-critical state (energized) relay cannot be achieved.

### Example 1:

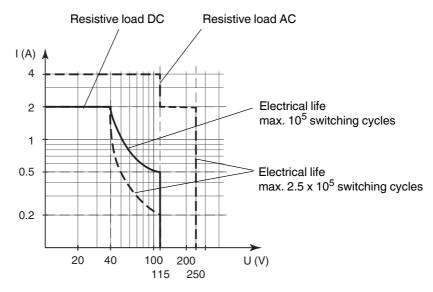
The protective guard for a rotating shaft must remain locked in position until the shaft has stopped rotating. The safety-critical condition is the rotation of the shaft (risk of injury). For this reason, the locking of the protective guard should be achieved by means of a de-energized (passive) relay. The relay shall be energized (active) only when the shaft has stopped (safe condition). This device function is only achieved with "Standstill monitoring with start-up override" (S3 = I) and control of the protective guard with relay 2.

### Example 2:

The cooling of a critical process by means of fans/coolant pumps has to be monitored. The safety-critical condition is the standstill of the fans/pumps (overheating). For this reason an alarm must be triggered when a relay has de-energized (passive). As long as the fans or the pumps are running (safety condition) the relay is energized (active). This device function can be achieved with "Standstill monitoring with start-up override" (S3 = I) and "Standstill monitoring with direction of rotation signalling" (S3 = II) with relay 1.

## **Characteristic Curve**

Maximum switching power of output contacts



The maximum number of switching cycles is depending on the electrical load and may be higher when reduced currents and voltages are applied.