

## VARIMETER

### Standstill Monitor

IK 9144, IL 9144, SK 9144, SL 9144



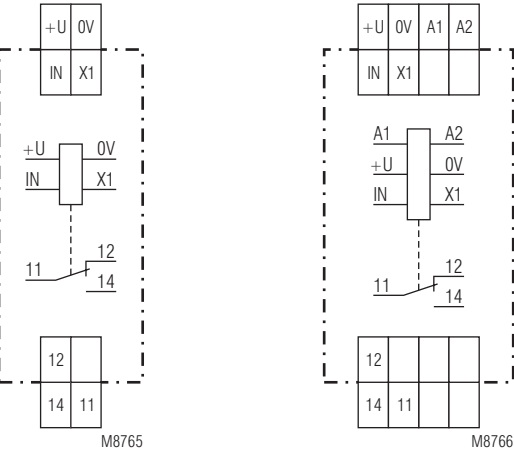
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- According to IEC/EN 60 255, DIN VDE 0435-303
- Detection of standstill of rotating machine parts and cyclic pulses
- Detection of blocking or missing pulses
- Monitoring time adjustable between 0.1 ... 20 s (others on request)
- Energized or de-energized on trip
- For input frequency up to 5 kHz ( $\approx$  300000 ipm)
- Universal input, suitable for a variety of sensors (PNP, NPN, 2-wire, contact, voltage)
- Input also suitable for SKF sensor bearings
- As option for Namur sensors
- On request with manual reset
- IK 9144 and SK 9144: compact version for DC 24V auxiliary supply
- IL 9144 and SL 9144: for auxiliary supply up to AC 400V with galvanic separation to sensor input
- LED indicators for auxiliary supply, sensor pulses and contact position
- 1 changeover contact (2 changeover on request)
- **Devices available in 2 enclosure versions:**
  - IK/IL 9144:** depth 59 mm, with terminals at the bottom for installation systems and industrial distribution systems according to DIN 43 880
  - SK/SL 9144:** depth 98 mm, with terminals at the top for cabinets with mounting plate and cable duct
- IK 9144, SK 9144: width 17.5 mm
- IL 9144, SL 9144: width 35 mm

### Function Diagram



### Circuit Diagrams



IK 9144, SK 9144

IL 9144, SL 9144

### Approvals and Marking



### Applications

Speed monitoring on rotating machine parts, monitoring of cyclic movements, general monitoring of pulse sequences (transportation, conveyors production systems), monitoring of pulse frequency (e.g. flow sensors, anemometers), watchdog function for controllers and PLCs.

### Function

The frequency to be monitored is connected to the input terminal IN.

If the time between 2 pulses exceeds the adjusted monitoring time  $t_v$  the output relay changes state.

In energized on trip mode (slide switch in position A), the output relay is de-energized when connecting the supply (contacts 11-14 open). It energises (contacts 11-14 closed) when during the monitoring time  $t_v$  no pulses are detected on input IN. With a new pulse the relay de-energises immediately and the monitoring time  $t_v$  is started again.

In de-energized on trip mode (slide switch in position R), the output relay is energized when connecting the supply (contacts 11-14 closed). It de-energized (contacts 11-14 open), when during the monitoring time  $t_v$  no pulses are detected on input IN. With a new pulse the relay energized immediately and the monitoring time  $t_v$  is started again.

### Indicators

- Green LED:** On, when only auxiliary voltage connected to A1 - A2, intermittent red/green flashing when pulses are on the input IN
- Yellow LED:** On, when the output relay is energized (contacts 11-14 closed)

Notes	Technical Data
<p>To the universal input of the speed monitor (terminals +U, X1, IN, 0V) a wide range of different sensors can be connected (capacitive, inductive, ultrasonic, hall effect, optical, reed, etc.) The input is suitable for proximity sensors according to IEC/EN 60 947-5-2 (VDE 0660 part 208)</p> <p>Depending on the type of sensor (3-wire PNP or NPN, 2-wire, contact, voltage) the connection is made to different terminals (see Connection Examples).</p> <p>The models IL and SL 9144 have a galvanic separation between Input Circuit (+U, X1, IN, 0V) and auxiliary supply (A1, A2 e.g. 230VAC). 24V DC with up to 20mA is provided on the terminals U+/0V for the supply of the sensor. If sensors with higher power consumption are used, the model IK and SK 9144 is suitable, where the sensors and the speed monitor is supplied by DC 24V from an external power supply.</p> <p>The speed monitors can be operated with SKF sensor bearings. Sensor bearings include ball bearing and speed sensor in a compact way. The actual sensors are hall effect sensors with NPN output. The connection is made as with NPN proximity sensors.</p> <p>The model /200 is optimised for Namur proximity sensors according to IEC/EN 60 947-5-6 (VDE 0660 part 212). Namur sensors are 2-wire sensors with defined current in on and off state.</p>	<p><b>Input Circuit</b></p> <p><b>Universal input:</b> for PNP-, NPN-, 2-wire sensors, contacts and voltage suitable for proximity sensors according to IEC/EN 60 947-5-2 (VDE 0660 part 208)</p> <p><b>IK 9144, SK 9144:</b> sensor supply by external auxiliary voltage DC 24 V</p> <p><b>IL 9144, SL 9144:</b> built in power supply approx. DC 24 V, max. 20 mA</p> <p><b>Max. residual current</b> of 2-wire sensors: 2 mA (OFF)</p> <p><b>Max. voltage drop</b> of 2-wire sensors: 8 V (ON)</p> <p><b>Voltage drive</b> input resistance: approx. 17 kΩ</p> <p>Threshold Low IK 9055, SK 9055: approx. 9.2 V IL 9055, SL 9055: approx. 8.4 V</p> <p>Threshold High IK 9055, SK 9055: approx. 11 V IL 9055, SL 9055: approx. 10.3 V</p> <p><b>NAMUR Input</b> IK 9144/200, SK 9144/200, IL 9144/200, SL 9144/200: für NAMUR-sensors according to IEC/EN 60 947-5-6 (VDE 0660 part 212) (previously EN 50227/DIN 19234)</p> <p><b>No-load operation voltage:</b> approx. 8.2 V</p> <p><b>Input resistance:</b> 1 kΩ</p> <p><b>Short circuit current:</b> approx. 8 mA</p> <p><b>Switching thresholds:</b></p> <p>Low: approx. 1.5 mA High: approx. 1.8 mA</p> <p><b>Response value:</b> Monitoring time <math>t_v</math> adjustable 0.1 ... 20 s (others on request)</p> <p><b>Max. input frequency:</b> 5 kHz</p> <p><b>Minimum pulse and space time:</b> 100 μs</p>
<p><b>Monitoring indicator of sensor input</b></p> <p>The upper 2-coloured LED shows indicates the connected supply voltage and the status of the sensor:</p> <p>Green: input IN on LOW level Red: input IN on HIGH level Green/Red: pulses on input IN</p>	<p><b>Auxiliary Circuit</b></p> <hr/> <p><b>IK 9144, SK 9144</b> (terminal connection +U/0V):</p> <p><b>Nominal voltage <math>U_H</math>:</b> DC 24 V <b>Voltage range:</b> 19.2 ... 30 V <b>Nominal consumption:</b> max. approx. 0.8 W</p> <p><b>IL 9144, SL 9144</b> (terminal connection A1/A2):</p> <p><b>Nominal voltage <math>U_H</math>:</b> AC 24 V, 42 V, 115 V, 127 V, 230 V, 400 V <b>Voltage range:</b> 0.8 ... 1.1 <math>U_H</math> <b>Nominal consumption:</b> approx. 4 VA <b>Frequency range:</b> 45 ... 400 Hz</p>
<p><b>Several devices on one sensor</b></p> <p>A parallel connection of several monitors to one sensor is possible without problems on the universal input, when several tripping values are required or a range between to limits should be monitored. The corresponding terminals are connected in parallel.</p>	<p><b>Output</b></p> <hr/> <p><b>Contacts:</b> 1 changeover contact</p> <p><b>Thermal current <math>I_{th}</math>:</b> 4 A</p> <p><b>Switching capacity</b></p> <p>to AC 15</p> <p>NO contacts: 3 A / AC 230 V IEC/EN 60 947-5-1 NC contacts: 1 A / AC 230 V IEC/EN 60 947-5-1</p> <p><b>Switching capacity</b></p> <p>to DC 13</p> <p>NO/NC contacts: 1 A / DC 24 V IEC/EN 60 947-5-1</p> <p><b>Electrical life</b></p> <p>to AC 15 at 1 A / 230 V: 1.5 x 10<sup>5</sup> switching cycles IEC/EN 60 947-5-1</p> <p><b>Short circuit strength</b></p> <p>max. fuse rating: 4 A gL IEC/EN 60 941-5-1</p> <p><b>Mechanical life:</b> ≥ 30 x 10<sup>6</sup> switching cycles</p>
<p><b>Reaction time</b></p> <p>The reaction time is equal to the adjusted monitoring time <math>t_v</math>. To shorten the reaction time the number of incoming pulses should be increased, e. g. by adding sensing points to a rotating part. The monitoring time then can be adjusted shorter.</p>	
<p><b>Maximum input frequency, minimum pulse and space time</b></p> <p>Every frequency measuring device detects input pulses only up to a certain maximum input frequency. (This is also a result of a proper interference suppression). If the input frequency is higher then the maximum value, the input pulses are not longer detected, i.e. the monitor detects frequency 0. The maximum frequency is always much higher then the maximum setting value of the highest setting range</p> <p>Also the maximum switching frequency of the sensors must be observed. In addition every frequency input needs a certain minimum pulse and space duration of the connected sensor to react properly. This is very important with high frequency and a low or high pulse/space ratio (e. g. a small active area on big diameter or a small gap on big diameter at high rotation speed). The minimum pulse or space times are very short on these modules, so that most applications are uncritical (see technical data).</p>	

## Technical Data

### General Data

<b>Operating mode:</b>	Continuous operation	
<b>Temperature range</b> (operation):	-20 ... +60 °C	
<b>Clearance and creepage distances</b>	rated impuls voltage/ pollution degree 4 kV/2	
<b>EMC</b>		
Electrostatic discharge:	8 kV (air)	IEC/EN 61 000-4-2
Fast transients:	1 kV	IEC/EN 61 000-4-4
Surge voltages:	1 kV	IEC/EN 61 000-4-5
HF-wire guided:	10 V	IEC/EN 61 000-4-6
Interference suppression:	Limit value class B	EN 55 011
<b>Degree of protection</b>		
Housing:	IP 40	
Terminals:	IP 20	IEC/EN 60 529
<b>Housing:</b>	Thermoplastic with V0 behaviour according to UL subject 94	
<b>Vibration resistance:</b>	Amplitude 0.35 mm, frequency 10...55Hz, IEC/EN 60 068-2-6	
<b>Climate resistance:</b>	20 / 060 / 04	IEC/EN 60 068-1
<b>Terminal designation:</b>	DIN EN 50 005	
<b>Wire connection:</b>	2 x 2.5 mm <sup>2</sup> solid or                   DIN 46 228 2 x 1.5 mm <sup>2</sup> stranded wire with sleeve                               DIN 46 228-1/-2/-3 Flat terminals with self-lifting clamping piece                       IEC/EN 60 999 DIN rail                                    IEC/EN 60 715	
<b>Wire fixing:</b>		
<b>Mounting:</b>		
<b>Weight</b>		
IK 9144:	approx. 65 g	
SK 9144:	approx. 85 g	
IL 9144:	approx. 140 g	
SL 9144:	approx. 160 g	

### Dimensions

width x height x depth	
IK 9144:	17.5 x 90 x 59 mm
SK 9144:	17.5 x 90 x 98 mm
IL 9144:	35 x 90 x 59 mm
SL 9144:	35 x 90 x 98 mm

## Standard types

IK 9144.11 0.1 ... 20 s U<sub>H</sub> DC 24 V  
 Article number: 0057162

- Universal input, suitable for a variety of sensors (PNP,NPN,2-wire, contact, voltage)
- Energized or de-energized on trip
- Monitoring time adjustable between 0.1 ... 20 s
- Auxiliary voltage U<sub>H</sub>: DC 24 V
- Output: 1 changeover contact

IL 9144.11 0.1 ... 20 s U<sub>H</sub> AC 230 V  
 Article number: 0057161

- Universal input, suitable for a variety of sensors (PNP,NPN,2-wire, contact, voltage)
- Energized or de-energized on trip
- Monitoring time adjustable between 0.1 ... 20 s
- Auxiliary voltage U<sub>H</sub>: AC 230 V
- Output: 1 changeover contact

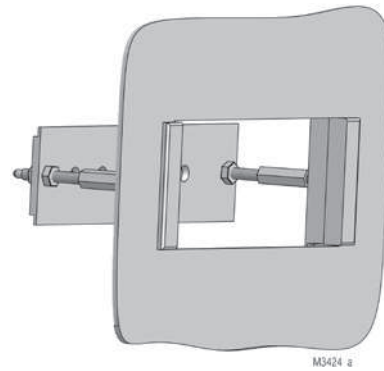
## Variants

IK 9144.11/200,  
 SK 9144.11/200,  
 IL 9144.11/200,  
 SL 9144.11/200:                   Input for NAMUR sensors

## Accessoires

### Flush mounting kit

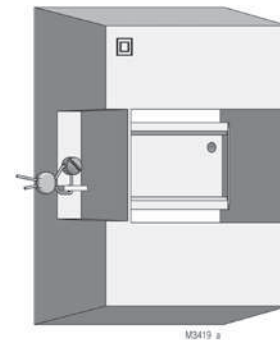
Order reference: KU 4087-150/0056598



- For universal use with:
- I-series devices of 17.5 to 105 mm width
  - easy mounting

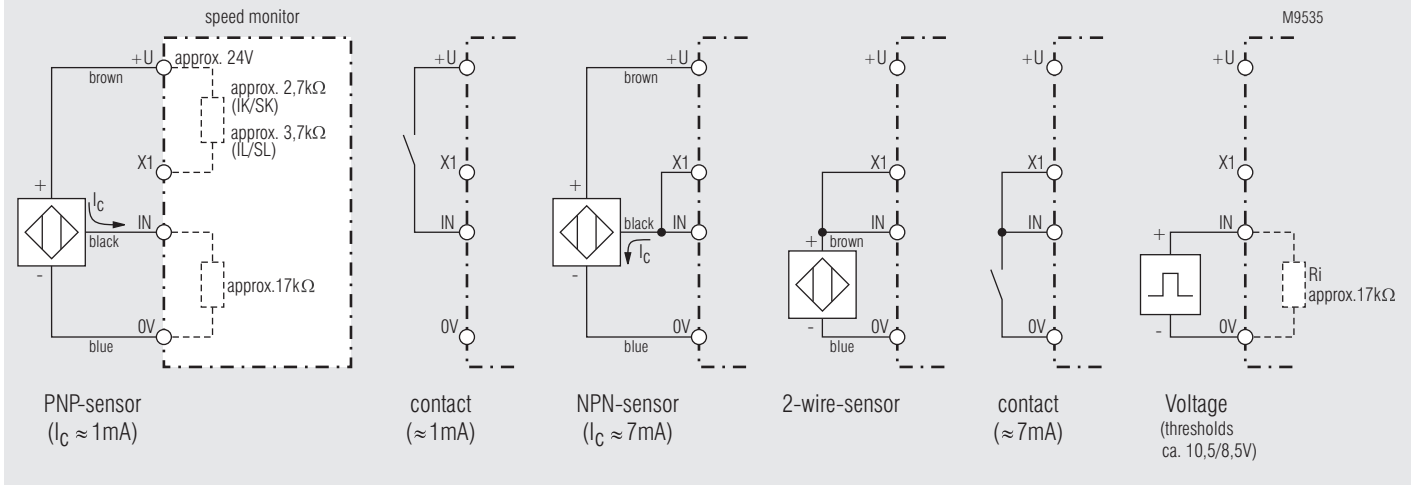
### Mounting kit for surface mounting

KU 4087-100



Types of I-series	Width (mm)	Order reference
IK	17.5	KU4087-100/56763
IL	35.0	KU4088-100/56764
IN	52.5	KU4084-100/56765
IP	70.0	KU4089-100/56766
IR	105.0	KU4090-100/56767

## Application Example Universal Input



Note: For IK-models the auxiliary voltage (DC 24 V) must be additionally connected to terminals +U/0V