

VARIMETER

Standstill Monitor

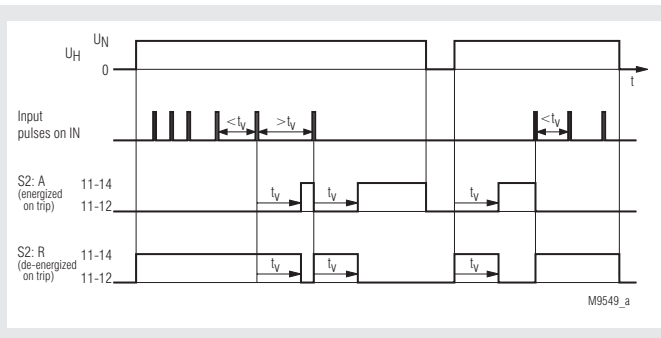
IK 9144, IL 9144, SK 9144, SL 9144

Translation
of the original instructions



- According to IEC/EN 60255-1
- 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 43880
 - 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

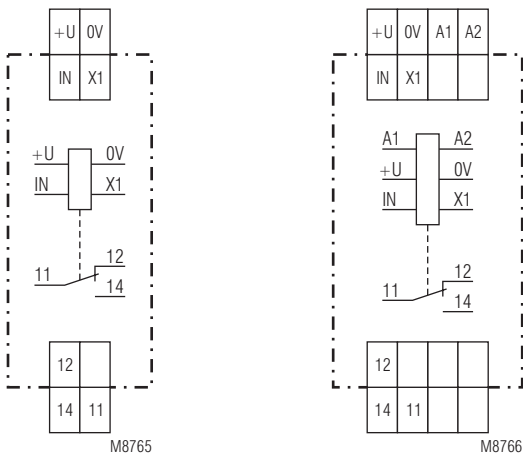
Function Diagram



Approvals and Markings



Circuit Diagrams



IK 9144, SK 9144

IL 9144, SL 9144

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.

Connection Terminals

Terminal designation	Signal description
U+, 0V	Supply voltage device and sensor
A1, A2 (nur bei IL/SL)	Auxiliary voltage input
X1, IN	Connection sensor (see application example)
11, 12, 14	Changeover contact

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

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 60947-5-2 (VDE 0660 part 208)

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).

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.

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.

The model /200 is optimised for Namur proximity sensors according to IEC/EN 60947-5-6 (VDE 0660 part 212). Namur sensors are 2-wire sensors with defined current in on and off state.

Monitoring indicator of sensor input

The upper 2-coloured LED shows indicates the connected supply voltage and the status of the sensor:

Green:	Input IN on LOW level
Red:	Input IN on HIGH level
Green/Red:	Pulses on input IN

Several devices on one sensor

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.

Reaction time

The reaction time is equal to the adjusted monitoring time t_v . 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.

Maximum input frequency, minimum pulse and space time

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.

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).

Technical Data

Input Circuit

Universal input:	For PNP-, NPN-, 2-wire sensors, contacts and voltage suitable for proximity sensors acc. to IEC/EN 60947-5-2 (VDE 0660 part 208)
IK 9144, SK 9144:	Sensor supply by external auxiliary voltage DC 24 V
IL 9144, SL 9144:	Built in power supply approx. DC 24 V, max. 20 mA
Max. residual current	
Of 2-wire sensors:	2 mA (OFF)
Max. voltage drop	
Of 2-wire sensors:	8 V (ON)
Voltage drive	
Input resistance:	Approx. 17 k Ω
Threshold Low	
IK 9144, SK 9144:	Approx. 9.2 V
IL 9144, SL 9144:	Approx. 8.4 V
Threshold High	
IK 9144, SK 9144:	Approx. 11 V
IL 9144, SL 9144:	Approx. 10.3 V

NAMUR Input

IK 9144/200, SK 9144/200, IL 9144/200, SL 9144/200:	For NAMUR-sensors according to IEC/EN 60947-5-6 (VDE 0660 part 212) (previously EN 50227/DIN 19234)
No-load operation voltage:	Approx. 8.2 V
Input resistance:	1 k Ω
Short circuit current:	Approx. 8 mA
Switching thresholds:	

Low:	Approx. 1.5 mA
High:	Approx. 1.8 mA
Response value:	Monitoring time tv adjustable 0.1 ... 20 s (others on request)
Max. input frequency:	5 kHz
Min. pulse and space time:	100 μ s

Auxiliary Circuit

IK 9144, SK 9144

(terminal connection +U/0V):

Nominal voltage U_H:	DC 24 V
Voltage range:	19.2 ... 30 V
Nominal consumption:	Max. approx. 0.8 W

IL 9144, SL 9144

(terminal connection A1/A2):

Nominal voltage U_H:	AC 24 V, 42 V, 115 V, 127 V, 230 V, 400 V
Voltage range:	0.8 ... 1.1 U_H
Nominal consumption:	Approx. 4 VA
Frequency range:	45 ... 400 Hz

Output

Contacts:	1 changeover contact	
Thermal current I_{th}:	4 A	
Switching capacity		
To AC 15		
NO contacts:	3 A / AC 230 V	IEC/EN 60947-5-1
NC contacts:	1 A / AC 230 V	IEC/EN 60947-5-1
Switching capacity		
To DC 13		
NO/NC contacts:	1 A / DC 24 V	IEC/EN 60947-5-1
Electrical life		
To AC 15 at 1 A / 230 V:	1.5 x 10 ⁵ switching cycles	IEC/EN 60947-5-1
Short circuit strength		
Max. fuse rating:	4 A gG / gL	IEC/EN 60941-5-1
Mechanical life:	$\geq 30 \times 10^6$ switching cycles	

General Data

Operating mode:	Continuous operation	
Temperature range		
Operation:	- 20 ... + 60 °C	
Storage:	- 20 ... + 60 °C	
Altitude:	< 2000 m	
Clearance and creepage distances		
Rated impulse voltage/ pollution degree:	4 kV / 2	IEC 60664-1

Technical Data

EMC

Electrostatic discharge:	8 kV (air)	IEC/EN 61000-4-2
HF irradiation		
80 MHz ... 1 GHz:	10 V / m	IEC/EN 61000-4-3
1 GHz ... 2 GHz:	3 V / m	IEC/EN 61000-4-3
2 GHz ... 2,7 GHz:	3 V / m	IEC/EN 61000-4-3
Fast transients:	2 kV	IEC/EN 61000-4-4
Surge voltage		
Between		
wires for power supply:	1 kV	IEC/EN 61000-4-5
Between wire and ground:	2 kV	IEC/EN 61000-4-5
HF-wire guided:	10 V	IEC/EN 61000-4-6
Interference suppression:	Limit value class B	EN 55011

Degree of protection

Housing:	IP 40	
Terminals:	IP 20	IEC/EN 60529
Housing:	Thermoplastic with V0 behaviour	
	according to UL subject 94	

Vibration resistance:

Amplitude	0.35 mm,	
Frequency	10...55Hz,	IEC/EN 60068-2-6
	20 / 060 / 04	IEC/EN 60068-1

Climate resistance:

Terminal designation:

DIN EN 50005

Wire connection:

DIN 46228-1/-2/-3/-4	
Cross section:	2 x 0.6 ... 2.5 mm ² solid or
	2 x 0.28 ... 1.5 mm ² stranded wire with
	and without ferrules

Stripping length:

10 mm

Wire fixing:

Plus-Minus-terminal screws M3.5 with self-lifting clamping piece

Fixing torque:

0.8 Nm

Mounting:

DIN rail IEC/EN 60715

Weight

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_H 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_H: DC 24 V
- Output: 1 changeover contact

IL 9144.11 0.1 ... 20 s U_H 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_H: AC 230 V
- Output: 1 changeover contact

Variants

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

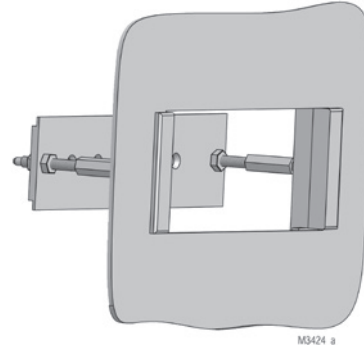
Accessoires

Flush mounting kit

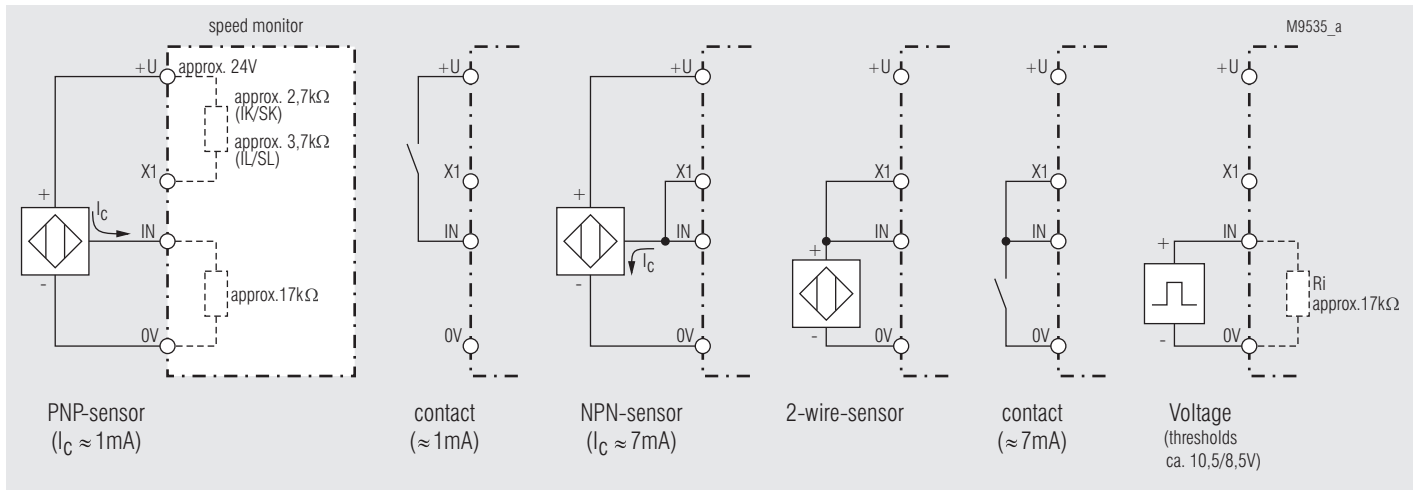
Order reference: KU 4087-150/0056598

For universal use with:

- I-series devices of 17.5 to 105 mm width
- Easy mounting

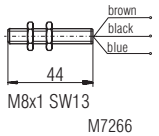
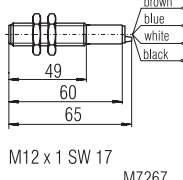
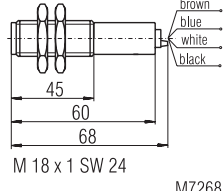
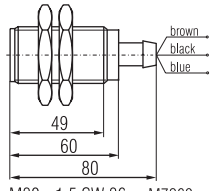


Application Example Universal Input



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

Initiators (proximity sensors), inductive

Type	NA 5001.01.10 pnp NA 5001.01.20 npn	NA 5002.01.34 pnp/npn	NA 5005.01.34 pnp/npn	NA 5010.01.10 pnp NA 5010.01.20 npn
Dimensions				
Enclosure	Metal	Metal	Metal	Metal
Switching distance S_n	1 mm	2 mm	5 mm	10 mm
Switching frequency	5 000 Hz	1 000 Hz	300 Hz	200 Hz
Hysteresis	2 ... 10 %			
Repeat accuracy	5 %			
Voltage range	10 ... 30 V			
Residual ripple	< 10 %			
Continuous current	≤ 200 mA	≤ 100 mA	≤ 100 mA	≤ 400 mA
Output	.10 pnp NO .20 npn NO	.34 pnp NO + npn NO	.34 pnp NO + npn NO	.10 pnp NO .20 npn NO
Indication of output state	LED			
Ambient temperature	- 25 ... 70°C			
Temperature influence	10 %			
Degree of protection	IP 67			
Connection wire	2 m			
Fixing torque	4 Nm	15 Nm	40 Nm	100 Nm
Weight	45 g	70 g	120 g	270 g

Connection Table IK 9144, SK 9144, IL 9144, SL 9144

Type	Wire	Terminal on IK / SK / IL / SL 9144
NA 5001.01.10	brown +	+ U
	blue -	0 V
	black NO	IN
NA 5002.01.34	brown +	+ U
	blanc +	+ U
NA 5005.01.34	blue -	0 V
	black NO	IN
NA 5010.01.10	brown +	+ U
	blue -	0 V
	black NO	IN

Connection Table IK 9144, SK 9144, IL 9144, SL 9144

Type	Wire	Terminal on IK / SK / IL / SL 9144
NA 5001.01.20	brown +	+ U
	blue -	0 V
	black NO	IN, X1
NA 5002.01.34	brown +	+ U
	blanc NO	IN, X1
NA 5005.01.34	blue -	0 V
	black -	0 V
	black NO	IN, X1
NA 5010.01.20	brown +	+ U
	blue -	0 V
	black NO	IN, X1