Safe and reliable rotational speed monitoring

Sensors for motion control

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Speed monitors: decentralised monitoring of rotating machines

Function

Speed monitors monitor rotating machines and installations such as conveyor belts, screw conveyors or V-belt driven machines, provided a target has been fixed to the rotating shaft. The sensor then detects each revolution, the time interval between two rotations being determined via the interval measurement. If the rotational speed falls below the set switch point, the speed monitor sends a fault signal.
The IO-Link interface allows for remote parameter setting or current rotational speed readings.

Hysteresis

The switch point hysteresis prevents a possible "chattering" of the output relay, if the rotational speed fluctuates around the set switch point.

Start-up delay

The start-up delay suppresses error signals as long as the machine is in the process of starting and has not yet reached its nominal speed. It is required in particular in monitoring of underspeed.
The bridging time starts as soon as the operating voltage is applied.
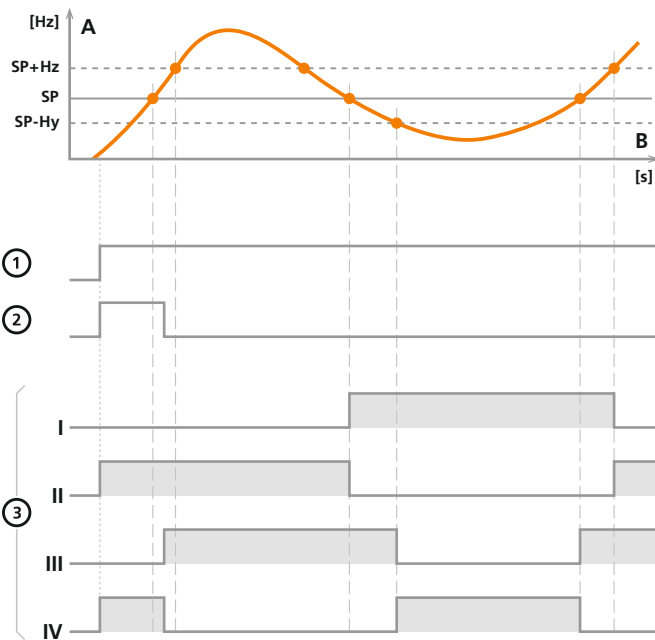
1:	Speed monitor supply voltage (coupled to the motor)
2:	Start-up delay
3:	Switching function
A:	Input frequency as an indication of (rotational) speed
B:	Time
I	Signalled state: minimum rotational speed reached / standstill
II	Error signal: underspeed / blocked
III	Signalled state: rotational speed reached
IV	Error signal: overspeed

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calculation aid
for your application
here**

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Compact speed sensors

Versatile:
Various types for different applications.

Adjustable:
Single, two point or window mode.

With special features:
Many additional functions via IO-Link.

Matching:
Flush and non-flush mountable.

Standard:
Comes as a connector unit with 24 V DC operating voltage.

Type	Installation	Setting range [pulses/min.]	Start-up delay [s]	Communication interface	Order no.
Inductive speed monitor, M12 connector					
M12	f	5...24,000	0...30	IO-Link	**DI5027**
M12	nf	5...24,000	0...30	IO-Link	**DI5028**
M18	f	5...24,000	0...30	IO-Link	**DI5029**
M18	nf	5...24,000	0...30	IO-Link	**DI5030**
M30	f	5...14,000	0...30	IO-Link	**DI5031**
M30	nf	5...14,000	0...30	IO-Link	**DI5032**
Rectangular	f	5...9,600	0...30	IO-Link	**DI5033**
Rectangular	nf	5...9,600	0...30	IO-Link	**DI5034**
Inductive speed monitor, M12 connector · potentiometer					
M30	f	5...3,600	15	–	**DI5023**
M30	f	5...3,600	15 adjustable	IO-Link	**DI5024**
Inductive speed monitor, M12 connector · potentiometer · ATEX approval					
M30	f	5...3,600	15	–	**DI521A**
M30	f	5...3,600	5	–	**DI522A**
M30	f	5...3,600	15 adjustable	IO-Link	**DI524A**

f: flush installation   nf: non-flush installation

Integrated monitoring function

The speed sensors incorporate complete speed monitoring.

Additional values are provided via IO-Link, for example the current speed or the set switch point. Parameters such as the start-up delay can be set remotely using IO-Link. Besides, the "window mode" can be acti-vated via IO-Link. Two switch points that can be set independently of each other provide added value. Teaching can also be done remotely via IO-Link.

Due to the optional background compen-sation it is possible to adjust the sensing range through teaching in order to suppress interfering elements in the back-ground.

To increase plant transparency, a connection to the ifm SMARTOBSERVER is possible. Of course it is also possible to operate the IO-Link enabled sensor in SIO mode.
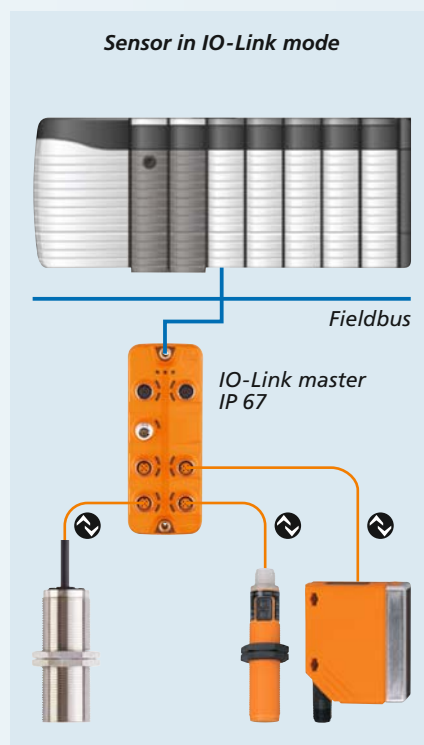
For the first time, IO-Link enabled speed monitors are also available with ATEX or IECex approval (II, 3D).
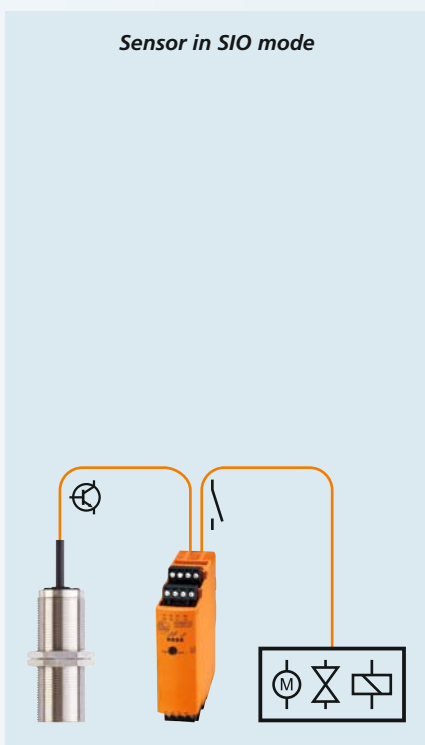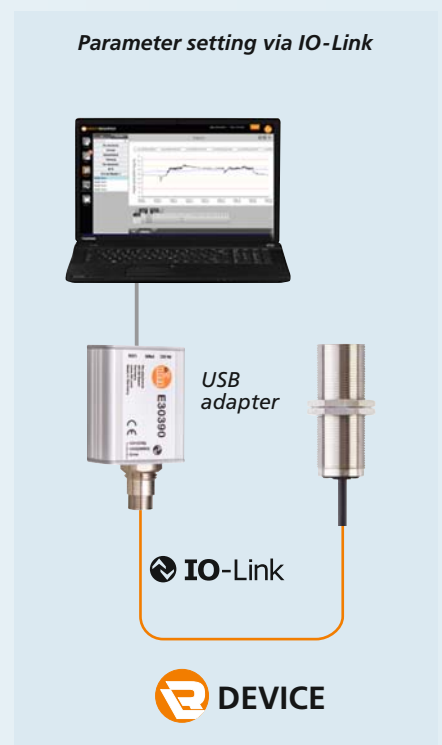
Sensor in SIO mode	Sensor in IO-Link mode	Parameter setting via IO-Link

Fieldbus

IO-Link master IP 67

USB adapter

IO-Link

DEVICE

Safety-related speed monitoring

Intuitive:
Easy parameter setting.

Safe:
Speed monitor uses standard sensors as pick-ups.

Insensitive:
Reliable operation at extreme ambient temperatures.

Slim:
Housing width only 25 mm.

Practice-oriented:
Speed limit adjustable in Hz or RPM, hysteresis 5 %.

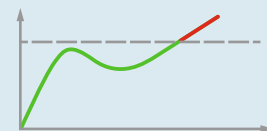*Monitoring of overspeed*

The machine speed is detected using two non-safe inductive proximity sensors. The two-channel monitoring relay allows for safety-related monitoring up to performance level e.
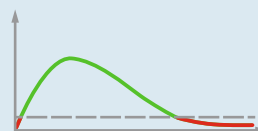
Function

Output on above switch point

Standstill monitor

Access to certain installations may only be enabled if they are not moving. The limit frequency can be set (0.2 / 0.5 / 1 / 2 Hz).

Example: Cam contour for standstill monitoring. To reliably detect wire break or sensor failure, both sensors must not be simultaneously undamped.
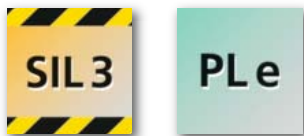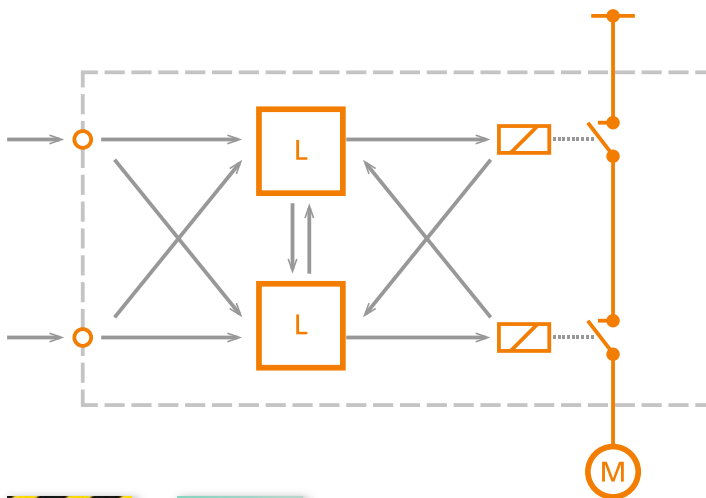
Function

Output on below switch point

Double safety

The two-channel speed monitor is designed for the highest safety categories. Both channels monitor each other and stop the machine in the event of a fault. As the input signal monitoring is dynamic, "non-safe" sensors may be used.
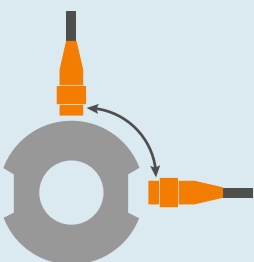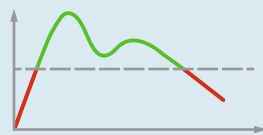
Monitoring of underspeed

These systems allow for easy monitoring of underspeed on fans, standstill monitoring or belt break detection.

The limit frequency can be set in Hz or RPM. Hysteresis (5 %) and start-up delay (10 s) are already firmly set to tried-and-tested values.

Function

Output on below switch point

Function	Setting range [Hz]	Order no.
Safety speed monitor, SIL 3, PL e		
Monitoring rotational or linear movements for preset value exceeded	0.5...990	**DD110S**
	0.1...99.9	**DD111S**
Monitoring rotational or linear movements for preset value not reached	0.5...990	**DU110S**
Safety standstill monitor, SIL 3, PL e		
Monitoring rotational or linear movements for preset value not reached	0.2 / 0.5 / 1 / 2	**DA102S**

Monitors for motion control

Convenient:
Use of DC sensors in AC applications.

Worldwide use:
Wide-range power supply for 110...230 V AC or 24 V DC supply voltage.
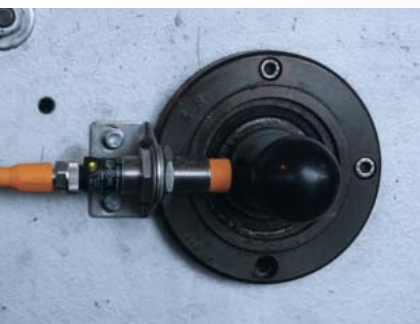
Simple:
Integrated display and intuitive menu navigation.

Insensitive:
Reliable operation at extreme ambient temperatures down to -40 °C.

Reliable:
If NAMUR sensors are used, devices with wire break monitoring are available.

Speed monitor

By using pulse evaluation, rotational speed of the machine is monitored for overspeed or underspeed. The current speed is displayed and provided as an analogue signal (4...20 mA).

Monitoring the sensor cable allows for additional safety. Single and dual channel versions are available.

Slip monitor

The slip monitor detects rotational speed pulses from the drive and non-drive end, the slip being the deviation in percent between the two rotational speed values. If this adjustable deviation is exceeded, the output switches. In addition to slip monitoring, rotational speed monitoring is also possible.

Direction of rotation monitoring

Detection of the direction of rotation on a machine is done via two sensors.

In addition to monitoring the direction of rotation, rotational speed monitoring is possible in parallel.
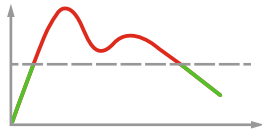
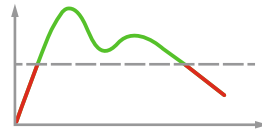**Still looking for more choice? For more articles see ifm.com**
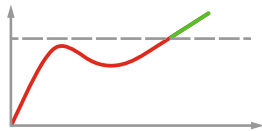
Function
Output on below switch point
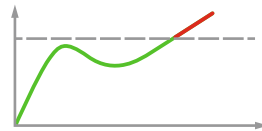
Function
Output off below switch point

Function
Output on above switch point

Function
Output off above switch point

Synchronous monitor

The evaluation system compares the pulse signals of two separate drives and monitors the pulse differences. If in case of asynchronism a certain time interval between the pulses is exceeded, the system provides a warning signal via the switching output. At the same time, monitoring of the rotational speed of the drives is also possible.

Function	Inputs	Input function	Setting range [Hz / % / pulses]	Order no.
Speed monitor				
Two switch points for monitoring if the preset value is exceeded or not reached or to indicate the acceptable range	1	PNP / NPN / NAMUR	0.1...1,000 Hz	**DD2503**
	1	NAMUR 8.2 V	0.1...1,000 Hz	**DD2603**
	2	PNP / NPN / NAMUR	0.1...1,000 Hz	**DD2505**
	2	NAMUR 8.2 V	0.1...1,000 Hz	**DD2605**
Monitoring for preset value exceeded or not reached	1	PNP	0.1...1,000 Hz	**DD0203**
Slip monitor				
One switch point for speed and one for slip monitoring	2	PNP / NPN / NAMUR	0.1...99.9 %	**DS2503**
	2	NAMUR 8.2 V	0.1...99.9 %	**DS2603**
Synchronous monitor				
With two switch points for synchronous monitoring	2	PNP / NPN / NAMUR	1...999 pulses	**DS2505**
	2	PNP / NPN / NAMUR	1...999 pulses	**DS2506**
	2	NAMUR 8.2 V	1...999 pulses	**DS2605**
Direction monitor				
One switch point for speed and one for direction monitoring	2	PNP / NPN / NAMUR	0.1...1,000 Hz	**DR2503**
With two switch points for separate direction monitoring	2	PNP / NPN / NAMUR	0.1...1,000 Hz	**DR2503**

Displays for pulse monitoring

Highly visible:
Large bright numbers on black background.

Intuitive:
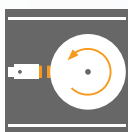Touch-screen display and clear text.

Clear:
Display changes colour red / yellow / green when preset value is exceeded or not reached.

Optional:
4 switching outputs and / or analogue outputs (V or mA).

Universal:
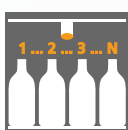HTL pulse pick-up inputs with PNP / NPN or NAMUR inputs.

Speed: Indication of rotational speed (RPM), operation as tachometer or for frequency measurement.

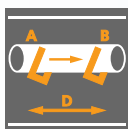*Process time: Operation as baking time or processing time display (reciprocal rotational speed).*

Timer: Operation as stop watch. Start and stop functions freely configurable.

Counter: Operation as position display, pulse, totalisator, differential, up or down counter.

Velocity: Speed indication from operating time measurement. Input A serves as start input and input B as stop input.

Find the suitable calculation aid for your application here

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Digital display 4.0

The new multifunctional display is more than just a display: It pre-processes digital signals in a decentralised manner and passes the information on to a higher-level controller if necessary.
This intelligent feature makes it ideally suited for Industry 4.0 applications.

Versatile pulse evaluation

The multifunction display shows various measured values in industrial automation. It uses the principle of interval measurement to process input pulses. The scaling factor allows (rotational) speed and processing time, etc., to be calculated, displayed and converted into an analogue signal. Moreover, the unit is suitable for counting and timer tasks.

High visibility with a compact design

With its small size, the multifunction display doesn't take up much panel space. Nevertheless, the numbers are large enough to allow for reliable reading of the measured value from some distance.

User-friendly handling

All settings can be made via a modern, resistive touch-screen interface.
The display automatically changes from display mode to parameter setting mode. All parameters are displayed in clear text on the screen, enabling an easy and intuitive use. A password mechanism provides protection against tampering.

Monitoring of switch points

The user can define up to four switch points. Up to four transistor outputs switch if a preset value is not reached or exceeded.

The status of the outputs is displayed via pictograms and the colour of the display can be shown in red, yellow or green depending on the process value.

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Analogue output	Operating voltage [V]	Outputs transistor	Order no.
Multifunction display, touch display and clear text			
–	115 / 230 AC / 24 DC	–	**DX2021**
V or mA	115 / 230 AC / 24 DC	4	**DX2022**
–	115 / 230 AC / 24 DC	4	**DX2023**
–	24 DC	–	**DX2031**
V or mA	24 DC	4	**DX2032**
–	24 DC	4	**DX2033**

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