PRODUCT INFORMATION

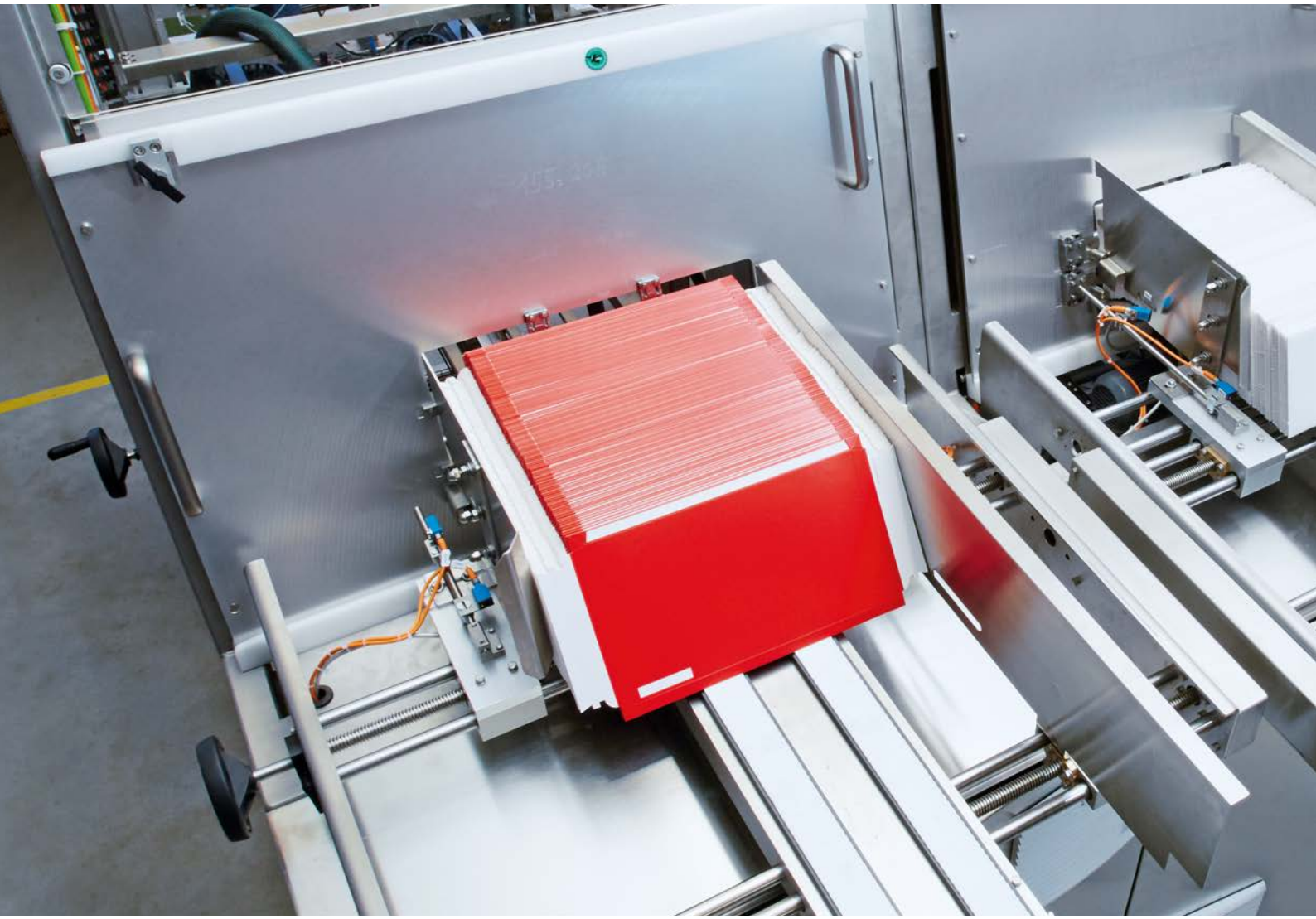
Safeguard Detector

NATURAL PROTECTION BY MATERIAL

Safety systems

SICK
Sensor Intelligence.

PRODUCTIVITY? OF COURSE – BUT NOT AT THE EXPENSE OF SAFETY!



The packaging industry is caught in a trade-off between productivity and costs. Operators need quick and easy processes for changing formats and materials in the input magazine, and for troubleshooting. However, the safety of the machine operator must not lose out. All in all then, it is the ideal application for the TÜV-certified Safeguard Detector safety system.

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Conventional protection

With packaging machines, there is a danger of the operator reaching through the empty magazine and into the machine while it is running, particularly when it comes to material transportation (e.g., for flat carton blanks). The conventional way to stop this from happening is to use mechanical tunnel systems with matching covers. Alternatively, magazines can be positioned so that they are almost out of reach to guarantee the necessary safety. Both of these safety precautions interfere with the smooth operation.

The material as a movable physical guard

In open systems on the other hand, the packaging material in the conveyor magazine, for example, acts as a physical guard. If there is sufficient material in the magazine, then it is not possible to reach into the mechanics while the machine is running. This protection ceases to function as soon as there is no material left in the magazine. Safeguard Detector also detects every other physical guard.

Safety and productivity – Safeguard Detector

The TÜV-certified Safeguard Detector safety system is the ideal solution for your productivity and safety: This means that you can get rid of any covers while still adhering to any protection requirements – even if the conveyor magazine is empty. Distances from hazardous points and, as a result, the space needed for the machine itself remain small and the magazine is easier for the machine operator to load.

Retrofitting made simple – with the box variant

Existing machines, too, can be quickly and easily retrofitted with the box variant of the Safeguard Detector, which contains the UE410-SD safety evaluation module. Its switching outputs (OSSDs) can be integrated into any existing safety controller.

TO MAKE SURE NOTHING GETS IN THE WAY

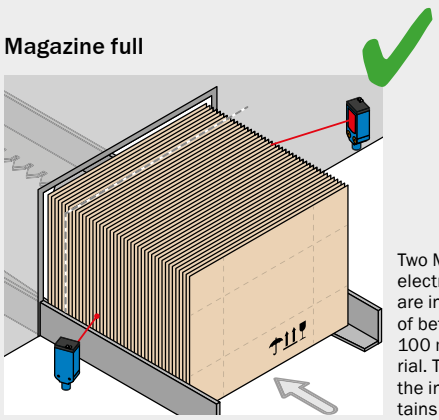
Productivity and safety are the main priorities for the Safeguard Detector. The TÜV-certified safety system not only makes sure that everything runs smoothly when setting up the carton and loading the input magazine, it also ensures that only the required material is fed into the machine.

Intelligent application solution

Two MultiPulse photoelectric proximity sensors are mounted on both sides of the induction line and monitor the packaging machine's magazine. The logic for analyzing the signals is provided by certified function blocks in the connected safety controller or safety evaluation module.

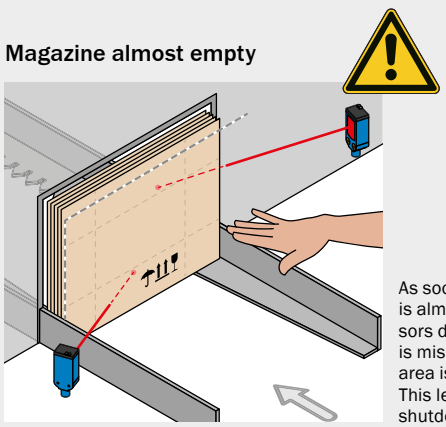
Once the material in the magazine begins to run out, the hazardous area is no longer covered. The safety controller then safely switches the plant off and the machine's dangerous movement is stopped.

Magazine full



Two MultiPulse photoelectric proximity sensors are installed at a distance of between 30 mm and 100 mm from the material. They detect whether the input magazine contains enough material.

Magazine almost empty



As soon as the material is almost empty, the sensors detect that material is missing. The hazardous area is no longer covered. This leads to a safety shutdown in the system.

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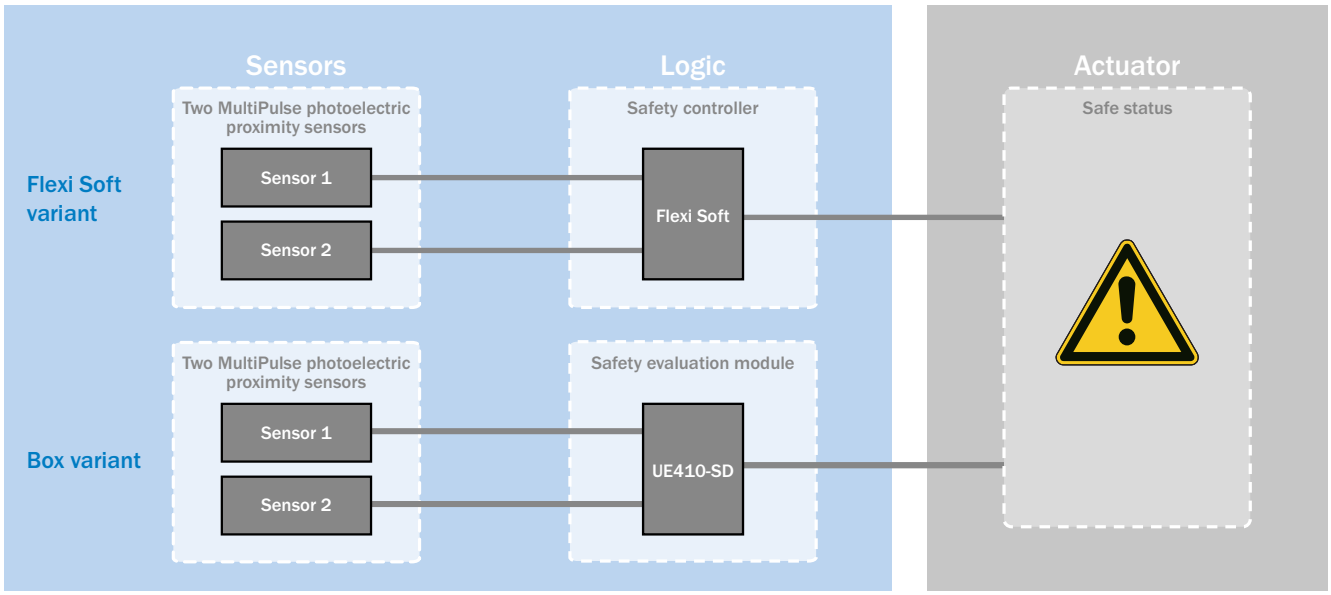
Block diagram of the Safeguard Detector



Functional safety in the system

The system's functional safety is made up of the certified "sensors" and "logic" components (see block diagram). The two MultiPulse photoelectric proximity sensors create a dual-channel structure. The connected safety controller performs a safety-related evaluation of the pulsed signals.

The Safeguard Detector switches the machine to a safe state in the following circumstances:

- There is no material in the detection zone of at least one sensor, while the logic unit is permanently analyzing the sensors' signals. The output of at least one of the sensors is therefore in an off state (LOW)
- The connection between one of the sensors and the logic unit has been interrupted
- The supply voltage to one of the sensors and/or the logic unit has been interrupted
- An internal error has occurred in one sensor. The output of the sensor is therefore permanently in the operational state (HIGH)
- The logic unit reports an internal error

The Safeguard Detector has been tested and verified for safety:

- The system is certified by TÜV SÜD
- PL d as per EN ISO 13849
- SIL2 as per EN 62061
- An EU-type examination for safety function is available
- Corresponds to the definition of a PDDB[1)] as per EN 60947-5-3

[1)] PDDB = Proximity devices with defined behaviour under fault conditions.

SAFE MATERIAL TRANSPORTATION? ALWAYS!

Includes the Flexi Soft safety controller: full flexibility and evaluation of other safety components

Modular and intuitive configuration: the Flexi Soft safety controller from SICK. It is also an efficient tool in the packaging industry, where machines with many doors and flaps that require protective measures are used.

The benefits of the Flexi Soft variant:

- Connection and evaluation of additional safety components, for example emergency stop or door switch
- Evaluation of multiple Safeguard Detector sensor pairs
- Extensive diagnostic options for process optimization using an Industry 4.0 approach
- Cost effective as no additional safety controller is required
- Convenient programming thanks to pre-configured function blocks and drag-and-drop functionality in the license-free Flexi Soft Designer configuration software

If a safety controller is already present: easy retrofitting of existing machines with no additional controller required

If a safety controller has already been implemented in the machine, the box variant of the Safeguard Detector adds pre-configured function blocks thereby guaranteeing certified safety.

The benefits of the box variant:

- Easy retrofitting to protect existing machines
- Easy integration into the existing safety controller
- Plug and play
- No programming required
- Compact system for evaluating one or two sensor pairs

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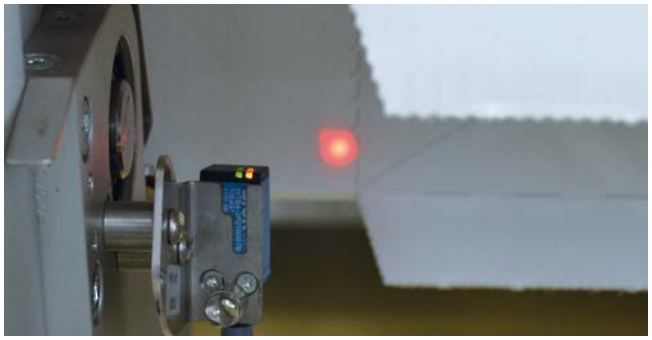
MultiPulse photoelectric proximity sensor – Reliable detection in a miniature housing

Key features of the MultiPulse[1] photoelectric proximity sensor

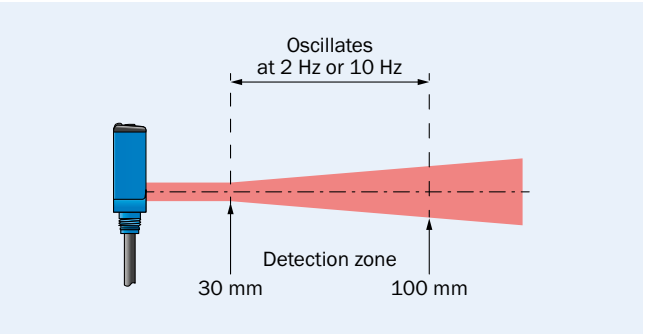
- Highly visible light spot
- Oscillating emitted light of 2 Hz (Flexi Soft variant only) or 10 Hz (Flexi Soft variant and Box variant)
- Precise background suppression for reliable detection
- PinPoint technology
- Tried-and-tested measurement principle for high availability
- Space-saving miniature housing
- Sensing range: 30 mm to 100 mm

[1] SICK offers a range of variants for the MultiPulse photoelectric proximity sensor. Only the variants listed in the product section (➜ see page 8), however, have been certified for the Safeguard Detector safety function. Only these variants meet the necessary safety requirements, taking the operating instructions into account.

The MultiPulse photoelectric proximity sensor is best suited to applications where a confirmed sensor signal and reliable functioning are essential. The MultiPulse photoelectric proximity sensor detects when the opening to the hazardous point is covered by an object, e.g., carton blanks. If there is an object in the detection zone, the sensor's emitted light oscillates at 2 Hz (Flexi Soft variant only) or 10 Hz (Flexi Soft variant and Box variant), clearly visible due to the pulsating light spot. If there is no object in the detection zone, the light spot remains static. The light spot is also permanently visible if there is an internal error in the sensor. Thanks to foreground and background suppression, an object is only detected if it is located in the detection zone.



Reliable detection of various packaging materials.



Self-monitoring due to oscillating emitted light.

Benefits of the Safeguard Detector at a glance

- High productivity for the machine
  - thanks to quick changeover of format cuts
  - thanks to quick loading due to easy access
  - thanks to quick troubleshooting
- Everything from a single source – rugged sensors, reliable machine controller or evaluation unit, and certified safety
- No additional work – safety function does not require additional testing, but can be used straight away to meet standard requirements
- Secure investment – arbitrarily extendable Flexi Soft variant for additional safety and automation tasks, and easy retrofitting of existing machines when using the box variant
- Minimal spatial requirements – ultra-compact, miniature sensor housing
- Easy integration – even into existing machines and systems
- Flexible applications – magazine monitoring does not depend on the material type
- Lower costs – particularly in comparison to conventional, mechanical protection solutions
- Certified system – minimal effort required for machine acceptance

NATURAL PROTECTION BY MATERIAL

Product description

Increase safety and productivity of packaging machines with the modular Safeguard Detector safety sensor. The Safeguard Detector consists of two MultiPulse photoelectric proximity sensors, and the Flexi Soft safety controller or the UE410-SD safety evaluation module. Safeguard Detector safely detects whether a movable physical guard is located at a previously defined position, e.g., the packaging material in the carton magazine of packaging machines. If there is sufficient packaging in the carton magazine, then it is not possible to reach into the hazardous area while the machine is running.

At a glance

- Certified to SILCL2 (EN 62061), PL d (EN ISO 13849)
- Highly available sensors in miniature enclosure
- Safe detection of objects with a remission of 6% to 90%
- Detection range: maximum 100 mm
- Background and foreground suppression protects against manipulation
- Logic evaluation of redundant sensor signals

Your benefits

- Rugged sensors, flexible machine controller, and reliable safety in one system
- Certified safety sensor saves time and costs. An additional safety appraisal is not necessary.
- Fewer costs compared to complex mechanical protection
- Minimum space requirements thanks to an ultra-compact sensor enclosure
- Easily adaptable: Make format changeovers in an instant
- Modular system: Facilitates retrofitting of older machines
- Can be integrated into any existing safety controller

Additional information

→ www.sick.com/Safeguard_Detector

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.

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Detailed technical data

Safety-related parameters of the safety system

	Box variant	Flexi Soft variant
Safety integrity level	SIL2 (IEC 61508) SILCL2 (EN 62061)	
Category	Category 3 (EN ISO 13849-1)	
Performance level	PL d (EN ISO 13849-1)	
PFH_D (mean probability of a dangerous failure per hour)	1.5×10^{-7}	1.8×10^{-7}
DC_{avg} (diagnostic coverage)	80 % (EN ISO 13849-1)	91 % (EN ISO 13849-1)
$MTTF_D$ (mean time to dangerous failure)	250 years (EN ISO 13849-1)	63 years (EN ISO 13849-1)
CCF (common cause failure)	Fulfilled (EN ISO 13849-1)	
T_M (mission time)	20 years (EN ISO 13849-1)	

UE410-SD safety evaluation module

Note	The UE410-SD safety evaluation module can be operated with one or two MultiPulse sensor pairs. The actuator can be connected directly to the UE410-SD safety evaluation module. The safety chain can also be expanded with additional logic elements (e.g., a higher-level safety controller).
Configuration method	Hard wired
Number of connectable sensor pairs	1 or 2
Connection type	Screw-type terminals / spring terminals (depending on type)
Pulse rate of the sensors	10 Hz
Supply voltage V_S	24 V DC (19.2 V ... 30 V)
Protection class	III (EN 50178)
Enclosure rating	IP20 (EN 60529)
Ambient operating temperature	–25 °C ... 55 °C
Response time of the overall safety system (sensors and safety evaluation module)	≤ 160 ms

Flexi Soft safety controller

Note	The Flexi Soft station has a modular design and can be customized based on the operator's requirements. At least one main module, the right system plug, and at least one I/O module must be used.
Flexi Soft station construction	Modular: 1 main module 1 system plug 0 ... 2 gateways 1 ... 12 expansion modules
Module interconnection	Internal bus (FLEXBUS+)
Configuration method	Via software
Configuration software	Flexi Soft Designer
Example program	Safeguard Detector function block example application for download ➜ www.sick.com/Safeguard_Detector
Number of connectable sensor pairs	Approx. 30 (depending on logic/number of logic modules used)
Connection type	Spring terminals
Pulse rate of the sensors	10 Hz / 2 Hz (depending on type)
Max. safety controller cycle time	
Pulse rate 10 Hz	≤ 28 ms
Pulse rate 2 Hz	≤ 148 ms
Supply voltage V_S	24 V DC (16.8 V ... 30 V)
Protection class	III (EN 50178)
Enclosure rating	IP20 (EN 60529)
Ambient operating temperature	–25 °C ... 55 °C
Fieldbus, industrial network	CANopen, EtherCAT®, EtherNet/IP™, Modbus TCP, PROFIBUS DP, PROFINET, DeviceNet™
Type of fieldbus integration	Via Gateway

MultiPulse photoelectric proximity sensor

	10 Hz variant	2 Hz variant
Number of sensors	2 pieces	
Detection zone	30 mm ... 100 mm [1]	
Remission	6 % ... 90 %	
Pulse frequency	10 Hz	2 Hz
Response time [2]	≤ 100 ms	≤ 500 ms
Type of light	Visible red light	
Wave length	650 nm	
Light spot size (distance)	Ø 7 mm (50 mm)	
Connection type	Connector M8, 3-pin	
Voltage supply	Via Flexi Soft or via UE410-SD	Via Flexi Soft
Enclosure rating	IP67 (EN 60529)	
Ambient operating temperature	–40 °C ... +60 °C	

[1] If no movable physical guard is identified in the detection zone, the safety controller prompts the machine to enter the safe state.

[2] For the Flexi Soft variant: The response time of the safety system has to be calculated. You can find more details about the calculation in the operating instructions.

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Ordering information Safeguard Detector safety system

Box variant

Safety evaluation module included	UE410-SD connection type	MultiPulse sensors included	Pulse rate of the MultiPulse sensors	Type	Part no.
1 x Safety evaluation module UE410-SD400	Spring terminals	1 x MultiPulse sensor pair SAPP02D-06A0001	10 Hz	SAPPD2D-06AP005	1089445
		2 x MultiPulse sensor pair SAPP02D-06A0001	10 Hz	SAPPD2D-06AP006	1089446
1 x Safety evaluation module UE410-SD300	Screw-type terminals	1 x MultiPulse sensor pair SAPP02D-06A0001	10 Hz	SAPPD2D-06AP007	1089570
		2 x MultiPulse sensor pair SAPP02D-06A0001	10 Hz	SAPPD2D-06AP008	1089571

Flexi Soft variant

Safety controller included	Flexi Soft connection type	MultiPulse sensors included	Pulse rate of the MultiPulse sensors	Type	Part no.
Flexi Soft: 1 x Main module FX3-CPU000000 1 x System plug FX3-MPL000001 1 x I/O module FX3-XTIO84002	Spring terminals	1 x MultiPulse sensor pair SAPP02D-06A0001	10 Hz	SAPP02D-06AP001	1065548
		1 x MultiPulse sensor pair SAPP02D-06A0002	2 Hz	SAPP02D-06AP002	1066072

Ordering information Safeguard Detector components

UE410-SD safety evaluation module

Connection type	Type	Part no.
Screw-type terminals	UE410-SD300	1089540
Spring terminals	UE410-SD400	1088689

Flexi Soft safety controller

Main modules

Number of EFI interfaces	Flexi Link	Automatic Configuration Recovery (ACR)	Flexi Line	Type	Part no.
0	–	–	–	FX3-CPU000000	1043783
2	✔	–	–	FX3-CPU130002	1043784
		✔	–	FX3-CPU230002	1058999
			✔	FX3-CPU320002	1059305

Please note: The system plug has to be ordered separately. You can find a suitable system plug in the accessory section.
➜ page 14

Gateways

Fieldbus, industrial network	Type	Part no.
CANopen	FX0-GCAN00000	1044076
CC-Link	FX0-GCC100200	1085195
DeviceNet™	FX0-GDEV00000	1044077
EtherCAT®	FX0-GETC00000	1051432
EtherNet/IP™	FX0-GENT00000	1044072
Modbus	FX0-GMOD00000	1044073
PROFIBUS DP	FX0-GPRO00000	1044075
PROFINET	FX0-GPNT00000	1044074

I/O modules

Number of safety inputs	Number of non-safe inputs	Number of test outputs	Number of safe outputs	Number of non-safe outputs	Type	Part no.
8	0	2	4	0	FX3-XTIO84002	1044125
		8	0	0	FX3-XTDI80002	1044124
		0-2	0	4-6	FX3-XTDS84002	1061777
0	6-8	0	0	6-8	FX0-STIO68002	1061778

MultiPulse photoelectric proximity sensor

Number of sensors	Detection zone	Pulse frequency	Type	Part no.
2 pieces	30 mm ... 100 mm	10 Hz	SAPP02D-06A0001	1068895
		2 Hz	SAPP02D-06A0002	1066074

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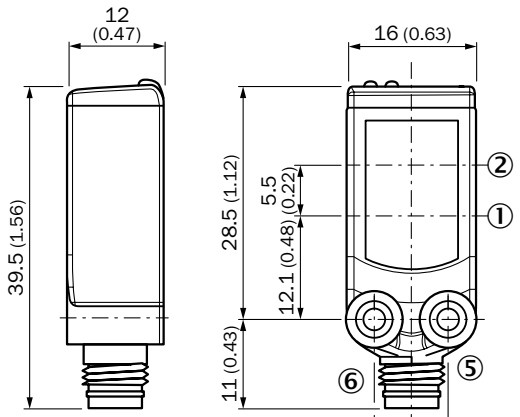
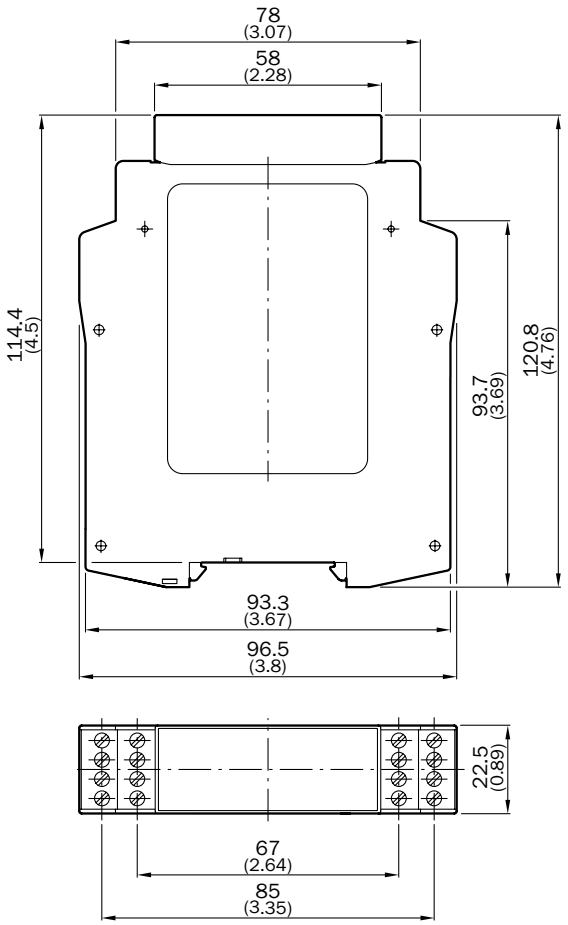
Dimensional drawing (Dimensions in mm (inch))

MultiPulse photoelectric proximity sensor



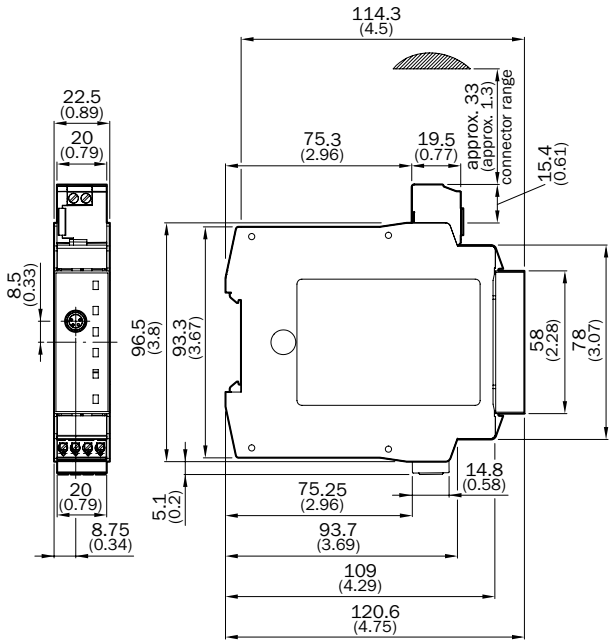
① Optical axis, sender
② Optical axis, receiver
③ LED indicator yellow:
Status of received light beam
④ LED indicator green:
Supply voltage active
⑤ M3 mounting bracket
⑥ M8 connection

UE410-SD safety evaluation module

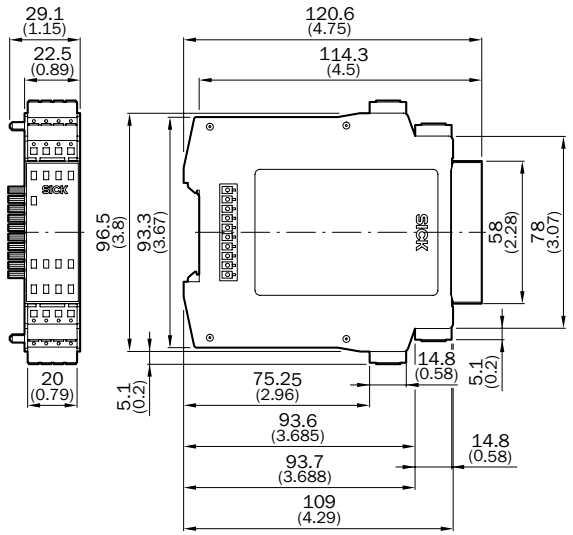


Flexi Soft safety controller

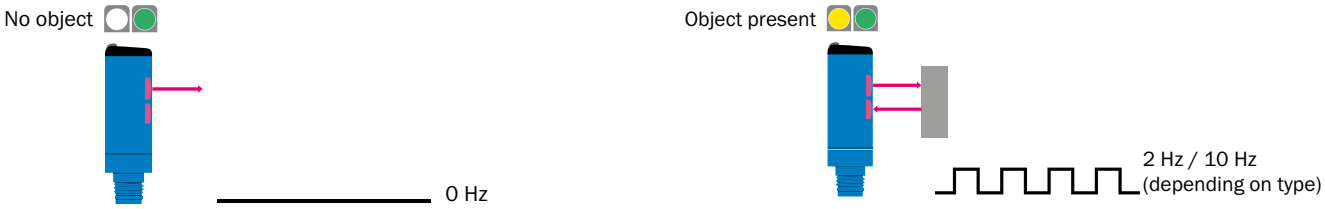
FX3-CPU0, FX3-CPU1, FX3-CPU2, FX3-CPU3



FX3-XTIO, FX3-XTDI, FX3-XTDS, FX0-STIO



Principle of operation



Accessories

Mounting systems

Mounting brackets

Figure	Description	Type	Part no.	UE410-SD	Flexi Soft	MultiPulse
	Mounting bracket for wall mounting, Stainless steel 1.4571, mounting hardware included	BEF-W4-A	2051628	–	–	●
	Mounting bracket for floor mounting, Stainless steel 1.4571, mounting hardware included	BEF-W4-B	2051630	–	–	●

Dimensional drawings ➜ page 16

Universal bar clamp systems

Figure	Description	Type	Part no.			
	Plate N08 for universal clamp bracket, Zinc plated steel (sheet), Zinc die cast (clamping bracket), Universal clamp (5322626), mounting hardware	BEF-KHS-N08	2051607	–	–	●

Connection systems

Plug connectors and cables

System plugs

Figure	Description	Specialty	Type	Part no.			
	System plug: Voltage supply of the Flexi Soft system and storage of system configuration (without EFI-compatible devices)	For FX3-CPU0 and FX3-CPU1	FX3-MPL000001	1043700	–	●	–
	System plug: Voltage supply of the Flexi Soft system, storage of system configuration (including EFI-compatible devices), and automatic configuration of connected EFI-compatible safety sensors (automatic configuration recovery)	For FX3-CPU2 and FX3-CPU3	FX3-MPL100001	1047162	–	●	–

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Connecting cables with female connector

Figure	Connection type		Model	Conductor cross-section	Cable length	Type	Part no.	UE410-SD	Flexi Soft	MultiPulse
	Female connector, M8, 3-pin, straight	Open cable ends	PUR, halogen-free, unshielded	0.25 mm²	2 m	DOL-0803-G02MC	6025888	–	–	●
					5 m	DOL-0803-G05MC	6025889	–	–	●
					10 m	DOL-0803-G10MC	6025890	–	–	●
			PVC, unshielded	0.34 mm²	2 m	DOL-0803-G02M	6010785	–	–	●
					5 m	DOL-0803-G05M	6022009	–	–	●
					10 m	DOL-0803-G10M	6022011	–	–	●
	Female connector, M8, 3-pin, angled	Open cable ends	PUR, halogen-free, unshielded	0.25 mm²	2 m	DOL-0803-W02MC	6025891	–	–	●
					5 m	DOL-0803-W05MC	6025892	–	–	●
					10 m	DOL-0803-W10MC	6025893	–	–	●
			PVC, unshielded	0.34 mm²	2 m	DOL-0803-W02M	6008489	–	–	●
					5 m	DOL-0803-W05M	6022010	–	–	●
					10 m	DOL-0803-W10M	6022012	–	–	●

Connection cables with male and male connector

Figure	Connection type		Cable length	Type	Part no.			
	Male connector, M8, 4-pin, straight	Male connector, USB-A, straight	2 m	DSL-8U04G02M025KM1	6034574	–	●	–
			10 m	DSL-8U04G10M025KM1	6034575	–	●	–
	Male connector, USB-A, straight	Male connector, Mini-USB, straight	3 m	Connection cable (male connector-male connector)	6042517	–	●	–

Power supply units and power supply cables

Figure	Input voltage	Output voltage	Output current	Type	Part no.			
 Illustration may differ	100 V AC ... 240 V AC	24 V DC	≤ 2.1 A	PS50WE24V	7028789	●	●	–
			≤ 3.9 A	PS95WE24V	7028790	●	●	–

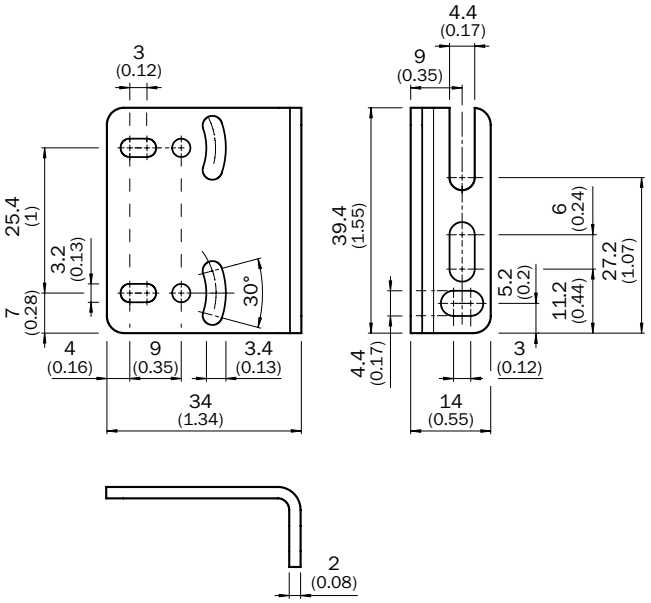
Safety command devices

Figure	Description	Items supplied	Type	Part no.			
	Emergency stop pushbutton	Including retaining clip and “RESET” cover	ES11-SC4D8	6051329	–	●	–

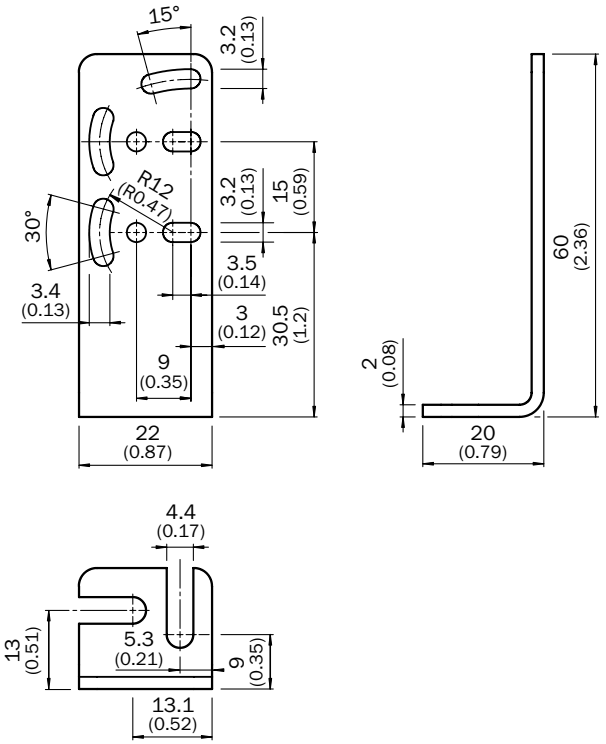
Dimensional drawings for accessories (Dimensions in mm (inch))

Mounting brackets and plates

BEF-W4-A



BEF-W4-B



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SICK AT A GLANCE

SICK is a leading manufacturer of intelligent sensors and sensor solutions for industrial applications. With more than 8,000 employees and over 50 subsidiaries and equity investments as well as numerous agencies worldwide, we are always close to our customers. A unique range of products and services creates the perfect basis for controlling processes securely and efficiently, protecting individuals from accidents and preventing damage to the environment.

We have extensive experience in various industries and understand their processes and requirements. With intelligent sensors, we can deliver exactly what our customers need. In application centers in Europe, Asia and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes us a reliable supplier and development partner.

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For us, that is "Sensor Intelligence."

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