



Safety switches

OVERVIEW OF THE PRODUCTS

Electro-mechanical safety switches, non-contact safety switches, safety locking devices, safety command devices

SICK
Sensor Intelligence.



SAFETY SWITCHES

Safety switches are indispensable in any application where safety is required for people and machinery. They are used for monitoring movable physical guards, determining the position of dangerous movements, and the safe stop function. The portfolio is divided into electro-mechanical and non-contact safety switches, safety locking devices, and safety command devices. In conjunction with safe control solutions, SICK offers ideal complete solutions from a single source.

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Electro-mechanical safety switches	8
i12S, i16S, i17S, i110S, i10P, i10R, i110P, i110R	
Non-contact safety switches	12
RE1, RE2, STR1, IN3000 Direct, IN4000 Direct	
Safety locking devices	14
TR10 Lock, i14 Lock, i10 Lock, i110 Lock, i200 Lock	
Safety command devices	16
ES11, ES21, ER12, i110RP, i150RP, E100	

Application areas:



Door monitoring without locking



Door monitoring with locking



Safety commands





How to find the right safety switch for the safety task → Page 6

Design and selection of interlocking devices in accordance with EN ISO 14119


The international standard EN ISO 14119 defines the guidelines that shall, regardless of the type of technology being used, be applied when designing and selecting interlocking devices associated with physical guards.

Critical situations arise during every attempt to manipulate or bypass installed protective devices. SICK offers uncoded as well as safety switches with a low or high coding level in order to satisfy the manipulation protection requirements.

The high coding level makes additional measures for manipulation protection unnecessary during mounting and still fulfill the requirements of standard EN ISO 14119.

Measures for manipulation protection in accordance with EN ISO 14119 (examples)	No or low coding level (e.g. electro-mechanical safety switches)	High coding level (e.g. transponder safety switches)
Mounting outside of reach of the operator		
Physical obstruction or shielding		
Mounting in hidden position		
Status monitoring or cyclical testing		

 = No measure required.

 = The application of at least one of these measures is required.

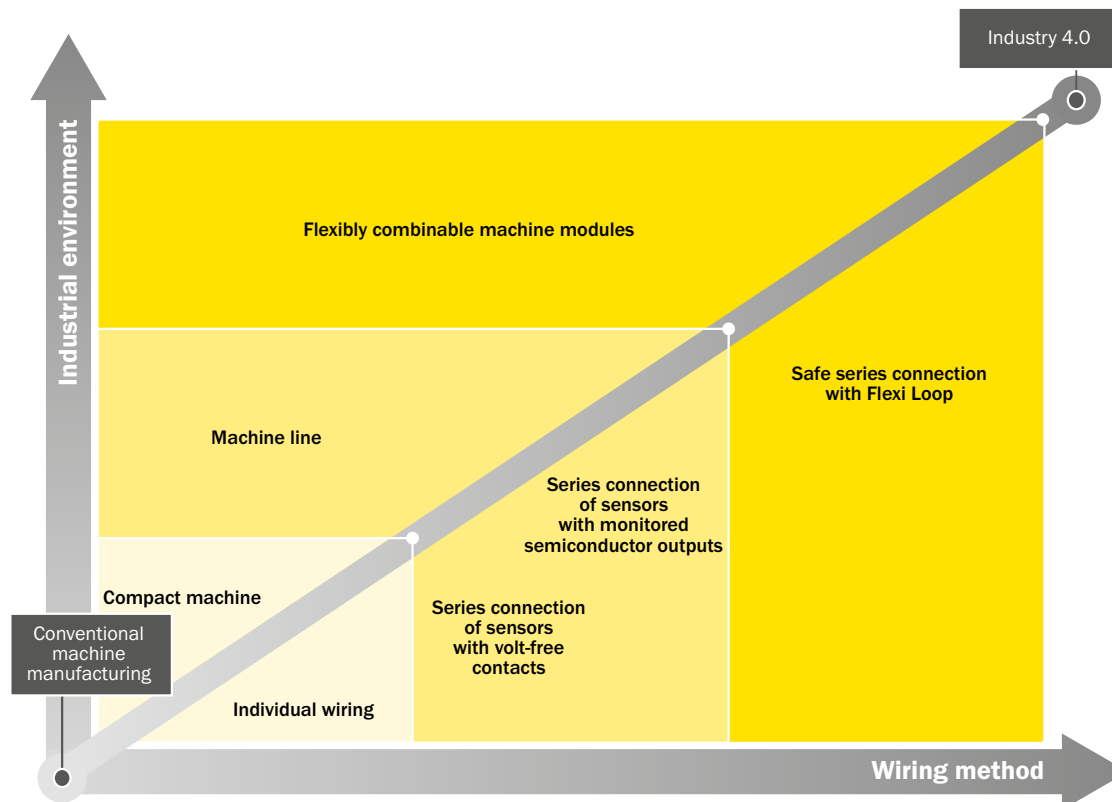
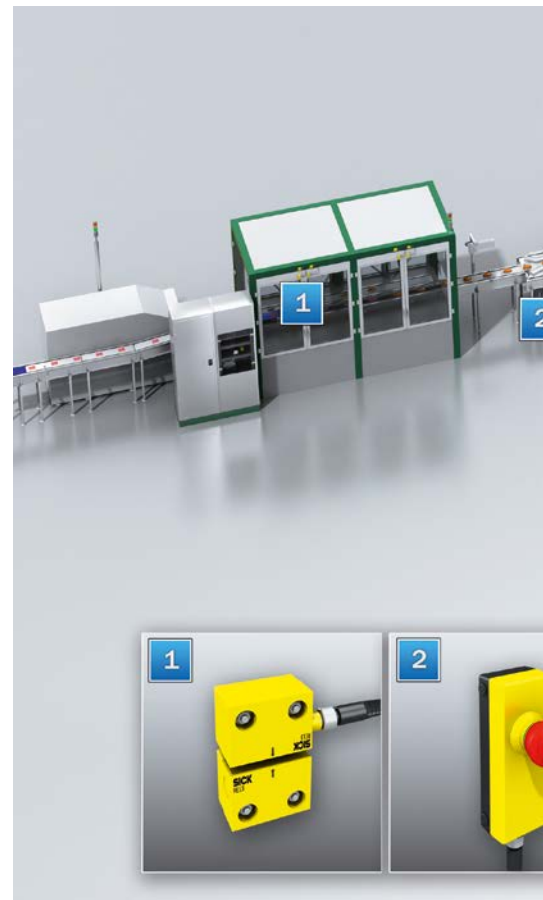


→ www.sick.com/8017392 (White paper "Design and selection of interlocking devices in accordance with EN ISO 14119")

THE RIGHT SOLUTION FOR EVERY REQUIREMENT

Different sectors, different tasks, different requirements – modern industry is becoming more and more heterogeneous. Good thing there is a reliable partner in this area: SICK. SICK has a suitable solution for sensor wiring for every customer.

- For the conventional machine builder who produces compact machines and wires the required sensors individually
- For the manufacturer of machine system who wants to wire several simple protective devices safely
- For the producer of flexible machine modules who would like to cascade a wide range of safety sensors and pays close attention to safety and diagnostic information





When the decision is hard: The selection of the right wiring method









- www.sick.com/eliminate_fault_masking
- www.sick.com/8018283 (Special information "Safe series connection")

SICK SOLUTIONS

	Individual wiring	Series connection of sensors with volt-free contacts	Series connection of sensors with monitored semi-conductor outputs	Safe series connection with Flexi Loop
Safety	★★★★★★	★☆☆☆☆	★★★★★★	★★★★★★
Diagnostics	★★★★★★	★☆☆☆☆	★★★★★	★★★★★★
Wiring	★☆☆☆☆	★★★★★	★★★★★★	★★★★★★
Cost effectiveness	★☆☆☆☆	★★★★★	★★★★★★	★★★★★★
Flexibility	★★★★★	★☆☆☆☆	★☆☆☆☆	★★★★★★
Classification	The safe and established solution	The low-cost solution for low safety requirements	The safe solution for sensors with semi-conductor outputs	The flexible, innovative and safe solution

AN OVERVIEW OF THE MOST IMPORTANT FEATURES OF THE SAFETY SWITCHES

	Safety application	Important selection criteria	Manipulation protection with the coding level of the actuator (EN ISO 14119)	Product group	Products	from page	
Interlocking movable physical guards							
	Interlocking with guard locking	Power to release principle	Low coding	Safety locking devices	i14 Lock, i10 Lock, i110 Lock, i200 Lock	14	→
			Low / high coding		TR10 Lock	14	
		Power to lock principle	Low coding		i10 Lock, i110 Lock, i200 Lock	14	
			Low / high coding		TR10 Lock	14	
	Interlocking without guard locking	Retaining force required	Low coding	Safety switches with separate actuator	i12S, i16S, i17S, i110S	8	
					Retaining force not required	Magnetic safety switches	RE1, RE2
			Low / high coding	Transponder safety switches		STR1	12
Safe position monitoring							
	Monitoring of machine stop positions	Activation mechanical ^{*)}	No coding	Safety position switches	i10P, i10R, i110P, i110R	10	→
		Activation with metal ^{**)}			IN3000 Direct	12	
					IN4000 Direct	12	
		Activation with coded actuator ^{**)}	Low / high coding	Transponder safety switches	STR1	12	
Safety commands							
	Emergency stop	Triggering emergency stop at defined positions	-	Emergency stop pushbuttons	ES11, ES21	16	→
		Triggering emergency stop throughout the entire distance	-	Rope pull switches	110RP, 150RP	16	
	Reset of protective device	-	-	Reset pushbuttons	ER12	16	
	Manual approval for maintenance and setup mode	-	-	Enabling switches	E100	16	

^{*)} Activation mechanical: Switch off when activated.

^{**)} Activation with metal or coded actuator: Switch on when activated.

ACHIEVABLE PERFORMANCE LEVEL FOR THE SAFE EVALUATION UNIT AND THE SAFETY SWITCH



UE43-2MF
For volt-free contacts



UE48-20S
For volt-free contacts and OSSDs



Flexi Classic
For volt-free contacts and OSSDs



Flexi Soft
For volt-free contacts and OSSDs

	PL c / (PL d) ¹⁾	PL c / (PL d) ¹⁾	PL c / (PL d) ¹⁾	PL c / (PL d) ¹⁾
	-	PL e ²⁾	PL e ²⁾	PL e
	PL c / (PL d) ¹⁾	PL c / (PL d) ¹⁾	PL c / (PL d) ¹⁾	PL c / (PL d) ¹⁾
→	-	PL e ²⁾	PL e	PL e
	PL c / (PL d) ¹⁾	PL c / (PL d) ¹⁾	PL c / (PL d) ¹⁾	PL c / (PL d) ¹⁾
	PL c / (PL d) ^{1), 5)}	PL c / (PL d) ^{1), 5)}	PL d / (PL e) ⁴⁾	PL d / (PL e) ⁴⁾
	-	PL e	PL e	PL e
	PL c / (PL d) ¹⁾	PL c / (PL d) ¹⁾	PL c / (PL d) ¹⁾	PL c / (PL d) ¹⁾
→	-	PL d	PL d	PL d
	-	PL e	PL e	PL e
	-	PL e	PL e	PL e
	PL c / (PL d) ¹⁾	PL c / (PL d) ¹⁾	PL e ³⁾	PL e ³⁾
	PL c / (PL d) ¹⁾	PL c / (PL d) ¹⁾	PL e	PL e
→	-	-	Yes	Yes
	Yes ⁶⁾	Yes ⁶⁾	Yes ⁶⁾	Yes
	→ www.sick.com/UE43-2MF	→ www.sick.com/UE48-20S	→ www.sick.com/Flexi_Classic	→ www.sick.com/Flexi_Soft

¹⁾ PL d with fault exclusion.

²⁾ Recommended for applications without overrun movement since the time delay cannot be set via the safe evaluation unit.

³⁾ PL e with integrated dropout protection contact (additional contact which monitors the correct position of the contact block in the built-in version of the emergency stop pushbutton).

⁴⁾ Depending on the frequency of activation (EN ISO 14119, 8.2).

⁵⁾ Can only be combined with magnetic safety switches with equivalent contacts (RE13, RE23, RE27).

⁶⁾ Only with series connection of one normally closed and one normally open each.

	 <p>i12S</p>	 <p>i16S</p>	
	Safe and economical door monitoring with retaining force	Safe and economical door monitoring with retaining force	

Technical data overview

Switch type	Safety switches with separate actuator	Safety switches with separate actuator
Number of positive action N/C contacts	1 / 2	1 / 2
Number of N/O contacts	1 / 0	1 / 0
Housing material	Plastic	Plastic
Enclosure rating	IP67 (IEC 60529)	IP67 (IEC 60529)
Switching principle	Slow action switching element	Slow action switching element
Connection type	Cable gland, 1 x M16 / plug connector, M12, 4-pin	Cable gland, 3 x M20 / plug connector, M12, 4-pin
Flexi-Loop-ready	- / ✓	- / ✓

At a glance

- Narrow plastic housing
- Rigid and mobile actuators
- Available with M16 X 1.5 cable entry gland or Flexi Loop-compatible M12 plug connector (depending on variant)
- Slow-action switching element with up to three contacts
- IP 67 enclosure rating



- Compact plastic housing
- Rigid and mobile actuators
- Available with M20 X 1.5 cable entry glands or Flexi Loop-compatible M12 plug connector (depending on variant)
- Slow-action switching elements with two contacts
- High retaining force
- IP 67 enclosure rating



Detailed information

→ www.sick.com/i12S

→ www.sick.com/i16S



i17S

Safe and economical door monitoring with retaining force



i110S

Safe and economical door monitoring with retaining force

Safety switches with separate actuator

2

1

Plastic

IP67 (IEC 60529)

Slow action switching element

Cable gland, 3 x M20

-

Safety switches with separate actuator

2 / 3

2 / 0 / 1

Metal

IP67 (IEC 60529)

Slow action switching element

Cable gland, 1 x M20 / plug connector, M12, 4-pin

- / ✓

- Compact plastic housing
- Rigid or mobile actuators
- 3 M20 x 1.5 cable entry glands
- Slow-action switching elements with three contacts
- IP 67 enclosure rating

- Standardized metal housing
- Rigid or mobile actuators
- Available with M20 X 1.5 cable entry gland or Flexi Loop-compatible M12 plug connector (depending on variant)
- Slow-action switching elements with four contacts
- IP 67 enclosure rating





→ www.sick.com/i17S



→ www.sick.com/i110S

	 <p>i10P</p>	 <p>i10R</p>	
	Safe and established position monitoring	Safe and established position monitoring	

Technical data overview			
Switch type	Safety position switches	Safety position switches	
Number of positive action N/C contacts	2	2	
Number of N/O contacts	1	1	
Housing material	Plastic	Plastic	
Enclosure rating	IP66 (IEC 60529)	IP66 (IEC 60529)	
Switching principle	Slow action switching element	Slow action switching element	
Connection type	Cable gland, 1 x M20	Cable gland, 1 x M20	

At a glance			
	<ul style="list-style-type: none"> • Standardized plastic housing • Roller plunger with plastic roller • 1 M20 x 1.5 cable entry gland • Slow-action switching elements with three contacts 	<ul style="list-style-type: none"> • Standardized plastic housing • Turning lever with plastic roller • 1 M20 x 1.5 cable entry gland • Slow-action switching element with three contacts 	
			

Detailed information	→ www.sick.com/i10P	→ www.sick.com/i10R	
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i110P

Safe and established position monitoring



i110R

Safe and established position monitoring

Safety position switches

1 / 2 / 3

1 / 2

Metal

IP66 (IEC 60529)

Snap action switching element / slow action switching element

Cable gland, 1 x M20

Safety position switches

1 / 2 / 3

1 / 2

Metal

IP66 (IEC 60529)

Snap action switching element / slow action switching element

Cable gland, 1 x M20

- Standardized metal housing
- Roller plunger with stainless steel roller
- 1 M20 x 1.5 cable entry gland
- Slow-action or snap-action switching element with up to four contacts



- Standardized metal housing
- Metal turning lever with plastic roller
- 1 M20 x 1.5 cable entry gland
- Slow-action or snap-action switching element with up to four contacts





→ www.sick.com/i110P



→ www.sick.com/i110R

	 <p>RE1</p>	 <p>RE2</p>	
	Simple and established non-contact door monitoring	Simple and established non-contact door monitoring	

Technical data overview			
Sensor principle	Magnetic	Magnetic	
Safety integrity level	-	-	
Category	-	-	
Number of N/C contacts	1 / 0	1 / 0	
Performance level	-	-	
Actuator coding level	Low coding level (EN ISO 14119)	Low coding level (EN ISO 14119)	
Number of N/O contacts	1 / 2	1 / 2	
Type of output	Reed contacts	Reed contacts	
Number of safe outputs	-	-	
Connection type	Plug connector, M8, 4-pin Cable Cable with M12 male connector, 4-pin Cable with M8 male connector, 4-pin	Plug connector, M8, 4-pin Cable Cable with M8 male connector, 4-pin Cable with M12 male connector, 4-pin Cable with plug M12, 8-pin	
Flexi-Loop-ready	- / ✓	- / ✓	

At a glance		
	<ul style="list-style-type: none"> • Response range up to 7 mm • 2 or 3 contacts • Up to performance level PL e (EN ISO 13849) • Sensors with plug connector or connected cable • Flexi Loop-compatible M12 plug connector (depending on variant) 	<ul style="list-style-type: none"> • Response range of up to 9 mm • 2 or 3 contacts • Up to performance level PL e / Cat. 4 (EN ISO 13849) • Sensors with plug connector or connected cable • LED status indicator (RE27) • Flexi Loop-compatible M12 plug connector (depending on variant)
		

Detailed information	→ www.sick.com/RE1	→ www.sick.com/RE2
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STR1

Compact, safe and flexible



IN3000 Direct

Safe, non-contact position monitoring



IN4000 Direct

Safe, non-contact position monitoring

STR1	IN3000 Direct	IN4000 Direct
Transponder	Inductive	Inductive
SIL3 (IEC 61508), SILCL3 (EN 62061) Category 4 (EN ISO 13849)	SIL2 (IEC 61508), SILCL2 (EN 62061) Applicable up to category 3 (EN ISO 13849)	SIL3 (IEC 61508), SILCL3 (EN 62061) Category 4 (EN ISO 13849)
-	-	-
PL e (EN ISO 13849) Low coding level (EN ISO 14119) High coding level (EN ISO 14119)	PL d (EN ISO 13849) Uncoded (EN ISO 14119)	PL e (EN ISO 13849) Uncoded (EN ISO 14119)
-	-	-
Semiconductor (OSSD)	Semiconductor	Semiconductor (OSSD)
2	2	2
Cable with plug M12, 5-pin Cable with plug M12, 8-pin Cable, 5-wire Cable, 7-wire	Plug connector, M12, 4-pin	Plug connector, M12, 4-pin
✓ / -	✓	✓

- Response range of up to 14 mm
- Small housing with flexible mounting options
- Sensor activation possible from three sides
- Three different actuators available
- Universally coded, uniquely coded, and permanently coded sensors
- PL e (EN ISO 13849), SIL3 (IEC 61508)
- Reliable series connection of up to 30 sensors possible



→ www.sick.com/STR1

- Response range of up to 15 mm
- LED status indicator
- Up to performance level PL d (EN ISO 13849), SILCL2 (EN 62061), SIL2 (IEC 61508)
- Flexi Loop-compatible M12 plug connector



→ www.sick.com/IN3000_Direct



- Two OSSD safety outputs for direct connection of sensors to a single safety controller
- Response range of up to 20 mm
- LED status indicator
- Up to performance level PL e / Cat. 4 (EN ISO 13849)
- Flexi Loop-compatible M12 plug connector



→ www.sick.com/IN4000_Direct

	 <p>TR10 Lock</p>	 <p>i14 Lock</p>	
	Tried-and-tested safety with advanced features – safety locking device with RFID monitoring	Safe and economical door monitoring with high locking force	

Technical data overview			
Type	Type 4, RFID (EN ISO 14119)	Type 2, electro-mechanical (EN ISO 14119)	
Actuator coding level	Low coding level (EN ISO 14119) High coding level (EN ISO 14119)	Low coding level (EN ISO 14119)	
Type of output	Semiconductor (OSSD)	Electro-mechanical contacts	
Locking principle	Power to release / power to lock	Power to release	
Locking monitoring	✓	✓	
Door monitoring	✓	-	
Locking force F_{max}	1,690 N (EN ISO 14119)	1,000 N (EN ISO 14119)	
Connection type	Cable with plug M12, 8-pin / cable	Cable gland, 1 x M20	
Flexi-Loop-ready	✓	-	
LED	✓	✓	

At a glance		
	<ul style="list-style-type: none"> • PL e for door and locking monitoring (EN ISO 13849) • 1,690 N locking force • RFID actuator with low or high coding level (EN ISO 14119) • Enclosure rating IP 67, IP 69K • Power to lock or power to release variants • Reliable series connection of safety outputs (OSSDs) • Four actuation directions • Flexi-Loop-ready 	<ul style="list-style-type: none"> • Compact plastic housing • M20 x 1.5 cable entry gland • Power to release • Lock monitoring • LED locking indicator • Mechanical unlocking mechanism on three sides
		

Detailed information	→ www.sick.com/TR10_Lock	→ www.sick.com/i14_Lock
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i10 Lock

Safe and economical door monitoring with high locking force



i110 Lock

Safe and economical door monitoring with high locking force



i200 Lock

Safe and economical door monitoring with high locking force

Type 2, electro-mechanical (EN ISO 14119)

Low coding level (EN ISO 14119)

Electro-mechanical contacts

Power to release / power to lock



1,300 N (EN ISO 14119)

Cable gland, 3 x M20 / plug connector, M12, 8-pin



Type 2, electro-mechanical (EN ISO 14119)

Low coding level (EN ISO 14119)

Electro-mechanical contacts

Power to release / power to lock



2,500 N (EN ISO 14119)

Cable gland, 3 x M20 / plug connector, M12, 8-pin



Type 2, electro-mechanical (EN ISO 14119)

Low coding level (EN ISO 14119)

Electro-mechanical contacts

Power to release / power to lock



2,600 N (EN ISO 14119)

Cable gland, 3 x M20



- Narrow plastic housing
- Rigid or mobile actuators
- Available with M20 X 1.5 cable entry glands or Flexi Loop-compatible M12 plug connector (depending on variant)
- Power to lock or power to release variants
- Lock and door monitoring
- IP 67 enclosure rating



→ www.sick.com/i10_Lock

- Narrow plastic housing
- Metal actuator head
- Rigid or mobile actuators
- Available with M20 X 1.5 cable entry glands or Flexi Loop-compatible M12 plug connector (depending on variant)
- Power to lock or power to release variants
- Lock and door monitoring



→ www.sick.com/i110_Lock

- Compact plastic housing
- Stainless steel entry for actuator
- Either rigid, mobile or bolt actuators available
- 3 M20 x 1.5 cable entry glands
- Power to lock or power to release variants
- Lock and door monitoring
- LED locking indicator



→ www.sick.com/i200_Lock

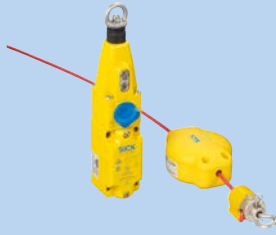
		
ES11	ES21	ER12
Reliable and safe with emergency stop pushbutton and reset pushbutton	Quick, reliable emergency stop safety protection	Reliable and safe start with a reset button

Technical data overview				
Switch type	Emergency stop pushbuttons	Emergency stop pushbuttons	Reset pushbuttons	
Number of positive action N/C contacts	2	1 / 2	-	
Number of N/O contacts	0 / 1	0 / 1	1	
Housing material	-	Plastic	-	
Enclosure rating	IP65 (EN 60529)	IP65 (IEC 60529) IP54 (IEC 60529)	IP65 (EN 60529)	
Emergency stop pushbutton (illuminable)	- / ✓	- / ✓	-	
Reset pushbutton (illuminable)	- / ✓	-	✓	
Suitable for muting applications (with UE403)	-	-	- / ✓	
Connection type	Plug connector, M12, 4-pin / plug connector, M12, 8-pin	Cable gland, 2 x M20	Plug connector, M12, 4-pin / plug connector, M12, 5-pin	
Suitable for reset/override applications (with deTec4)	-	-	- / ✓	
Flexi-Loop-ready	✓	-	-	

At a glance

<ul style="list-style-type: none"> • Slim plastic housing with quick disconnect mounting clip • Available as an emergency stop pushbutton or as a combined emergency stop/reset unit • Emergency stop pushbutton with optional LED illumination • Illuminated reset pushbutton • Flexi Loop-compatible M12 plug connector 	<ul style="list-style-type: none"> • Available either as a surface-mounted version with housing or as a built-in version (Ø 22 mm) • Built-in version for machine control panels with self-monitoring contacts between pushbutton and switching element • Surface-mounted version for direct mounting on different machines and systems • Variants with LED ring lighting • Optionally available with protective collar to prevent inadvertent actuation 	<ul style="list-style-type: none"> • Slim plastic housing with quick disconnect mounting clip • Illuminated reset pushbutton • 1 NO • M12 plug connector
		

Detailed information	→ www.sick.com/ES11	→ www.sick.com/ES21	→ www.sick.com/ER12
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i110RP

Safety protection over long distances



i150RP

Safety protection over extra long distances



E100

Safety protection during setup or maintenance

Rope pull switches 2 / 3	Rope pull switches 2 / 3	Enabling switches 2
2 / 0 / 1	2 / 0 / 1	2
Metal	Metal	Plastic
IP66 (IEC 60529)	IP65 (IEC 60529)	IP67 (EN 60529) IP65 (EN 60529)
-	-	-
-	-	-
-	-	-
Cable gland, 1 x M20 / plug connector, M12, 4-pin	Cable gland, 3 x M20 / plug connector, M12, 4-pin	Cable open end
-	-	-
- / ✓	- / ✓	-

- Rope lengths up to 30 m, with rope break and rope pull function
- Metal housing with integrated rotary unlocking lever and tension display
- Available with M20 X 1.5 cable entry gland or Flexi Loop-compatible M12 plug connector (depending on variant)
- Slow-action switching elements with four contacts
- Complies to the standards EN ISO 13850 and IEC/EN 60947-5-5



→ www.sick.com/i110RP

- Rope lengths up to 75 m, with rope break and rope pull function
- Metal housing with integrated emergency stop push button and tension display
- Rotary unlocking lever
- Available with M20 X 1.5 cable entry gland or Flexi Loop compatible M12 plug connector (depending on variant)
- Slow-action switching elements with four contacts



→ www.sick.com/i150RP

- Plastic housing with connected cable
- 3-stage functional structure (off-on-off)
- Slow-action switching elements with four contacts
- Variant with additional plus/minus buttons
- Complies to the standard IEC/EN 60947-5-8



→ www.sick.com/E100

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SERVICES FOR MACHINES AND SYSTEMS: SICK LifeTime Services

Our comprehensive and versatile LifeTime Services are the perfect addition to the comprehensive range of products from SICK. The services range from product-independent consulting to traditional product services.



- 
Consulting and design
 Safe and professional
- 
Product and system support
 Reliable, fast and on-site
- 
Verification and optimization
 Safe and regularly inspected
- 
Upgrade and retrofits
 Easy, safe and economical
- 
Training and education
 Practical, focused and professional

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.

Comprehensive services round out our offering: SICK LifeTime Services provide support throughout the machine life cycle and ensure safety and productivity.

For us, that is “Sensor Intelligence.”

Worldwide presence:

Australia, Austria, Belgium, Brazil, Canada, Chile, China, Czech Republic, Denmark, Finland, France, Germany, Great Britain, Hungary, India, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Poland, Romania, Russia, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Arab Emirates, USA, Vietnam.

Detailed addresses and further locations → www.sick.com