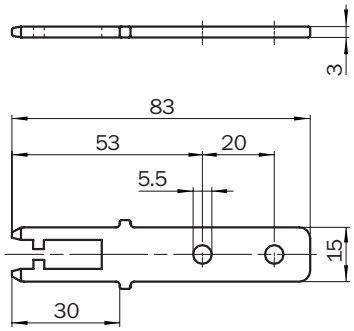
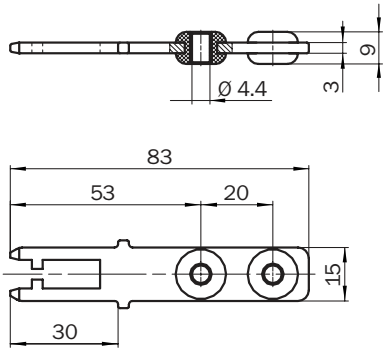
iE10-S1



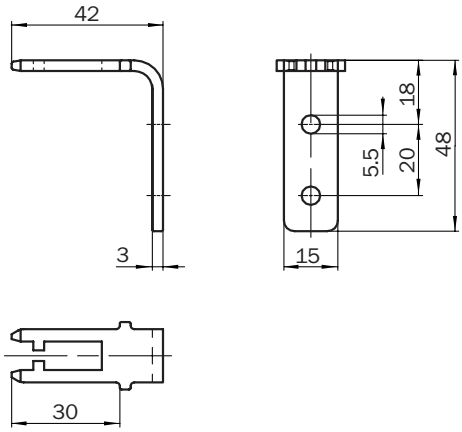
2 safety screws included.
Min. door radius 1000 mm.

iE10-S2



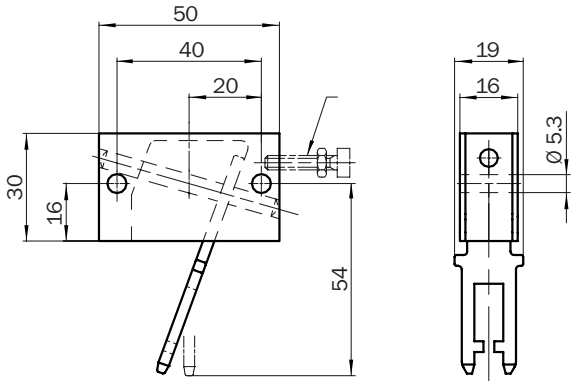
2 safety screws included.
Min. door radius 1000 mm.

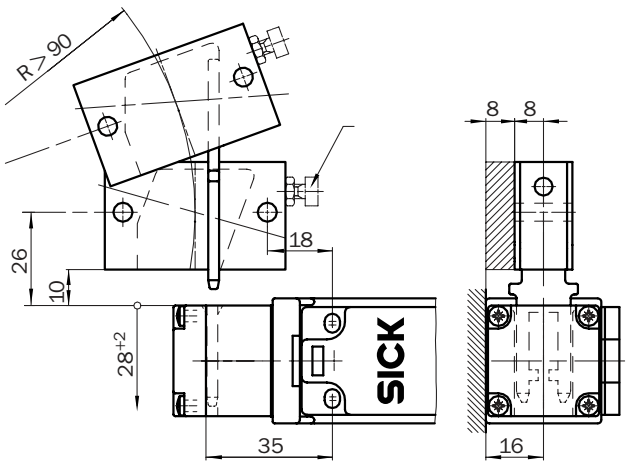
iE10-A1



2 safety screws included.
Min. door radius 1000 mm.

iE10-R1





2 safety screws included.
Min. door radius 90 mm.

Coninued on next page

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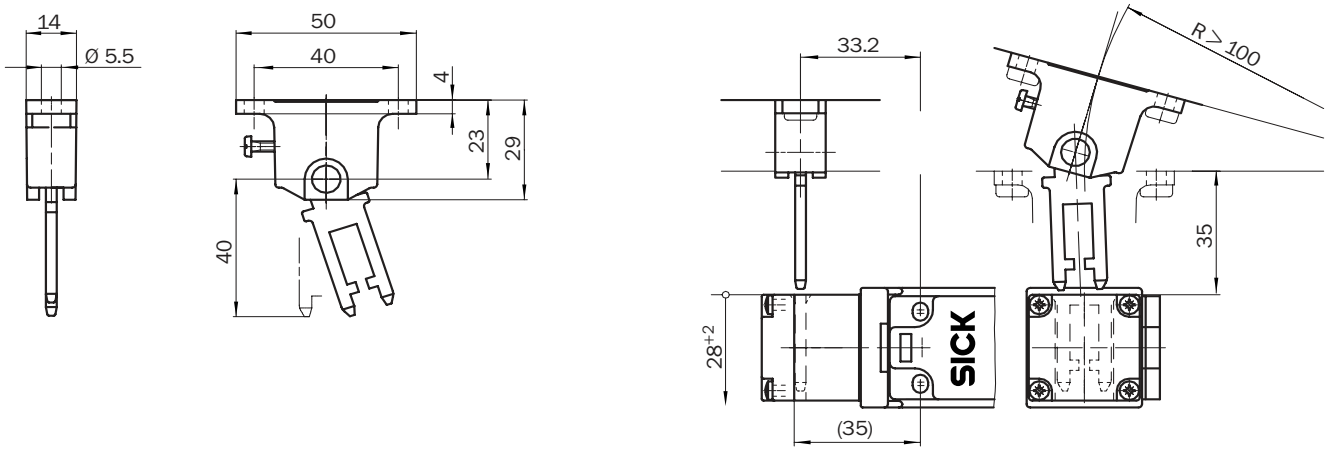
iE10-R2



2 safety screws included.
Min. door radius 100 mm.

Lockout bar

Type	Part number
iE10-S3	5 306 536

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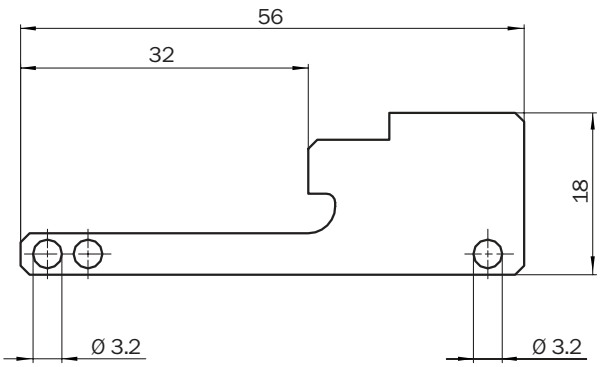
iE10-S3



The locking bar can be inserted into the safety switch in place of the actuator when the safety guard is in the open condition and can be secured to prevent its removal by standard commercially available padlocks (max. 2 pcs.). This guarantees reliable protection for persons who have to enter potentially hazardous areas.

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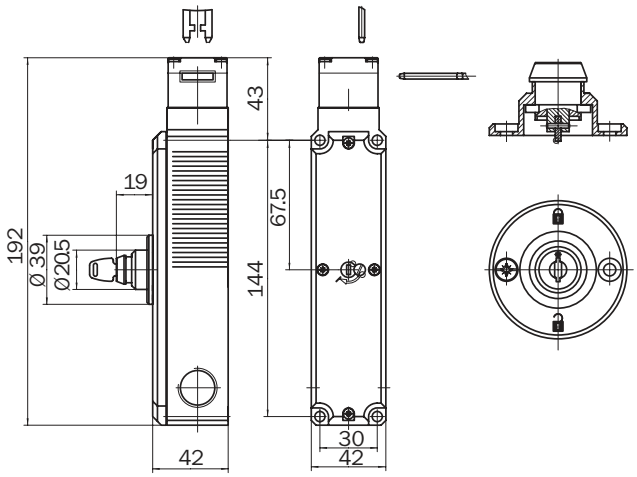
Locks

Property	Delivery	Type	Part number
Opposite closing	Including key	iE10-K1	5 308 269
Parallel closing	Including key	iE10-K2	5 308 270



The mechanical unlocking mechanism of the i10-lock can easily be carried out via a key. The selected lock on the front of the i10-lock is fixed with two screws.

Two versions are available:

- iE10-K1: locking mechanism is different - each lock is unique
- iE10-K2: locking mechanism is the same - the locks are identical

Delivery with fixing screws and two keys

Other accessories

Cable gland

Type	Part number
Cable gland M20	5 309 164

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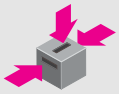
- Housing material glass-fibre reinforced thermoplastic
- Locking force 1200 N
- Three actuating directions
- Cable gland 3 x M20
- LED solenoid monitoring
- Mechanical unlocking mechanisms on three sides



Further information	Page
→ Dimensional drawings	G-10
→ Switching elements	G-10
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→ Other accessories	G-11
→ Services	A-0

Overview of technical specifications

Number of positive action normally closed contacts (depending on type)	2 / 3
Number of normally open contacts (depending on type)	1 / 0
Number of positive action normally closed door monitoring contacts	0 / 0
Number of normally open door monitoring contacts	0 / 0
Number of normally closed door monitoring contacts	0 / 0
Housing material	Plastic
Locking force	1200 N
Locking type	Mechanical

Product description

- Safety switches with separate coded actuator and guard locking
- 3-pole contact element
- Easy conversion of actuating direction through rotatable head

In-system added value

Safety Relays UE 10 - 48

The UE 10 to 48 series of the Safety Relays allows simple integration of safety components into machinery or plant. → see L-0

Safety Controllers UE 100

The UE 100 series is designed for complex applications requiring a medium level of networking capability. It is possible to connect varying safety components. Their connections can be tailored to the relevant machines or plant via drag & drop software. → see M-0

Safety Bus Modules UE 1000

The series UE 1000, Safety Bus Modules, are designed for machinery and plant requiring a high level of networking and programmable logic see controls (PLC). The modules enable the linking of safety components to the bus systems PROFIsafe or AS-I Safety at Work. → see N-0

Ordering information

Positive action normally closed	Normally open	Door monitoring: Positive action normally closed	Door monitoring: Normally open	Door monitoring: Normally closed	Solenoid operating voltage	Locking type	Type	Part number
2	1	0	0	0	24 V DC	Mechanical	i14-M0213 Lock	6 025 060
3	0	0	0	0	24 V DC	Mechanical	i14-M0303 Lock	6 025 062
2	1	0	0	0	110 V AC	Mechanical	i14-M1213 Lock	6 025 064
3	0	0	0	0	110 V AC	Mechanical	i14-M1303 Lock	6 025 066
2	1	0	0	0	230 V AC	Mechanical	i14-M2213 Lock	6 025 068
3	0	0	0	0	230 V AC	Mechanical	i14-M2303 Lock	6 025 070

Please order actuator separately

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Detailed technical specifications

Type	i14-M0213 Lock	i14-M0303 Lock	i14-M1213 Lock	i14-M1303 Lock	i14-M2213 Lock	i14-M2303 Lock
Housing material	Glass-fibre reinforced thermoplastic					
Enclosure rating	IP 66					
Mechanical life (relay contacts)	10^6 switching cycles					
Ambient operating temperature from ... to	–10 °C ... +60 °C					
Maximum approach speed	160 mm/s					
Locking force	1200 N					
Switching principle	Slow-action-switch					
Number of positive action normally closed contacts	2	3	2	3	2	3
Number of normally open contacts	1	0	1	0	1	0
Number of positive action normally closed door monitoring contacts	0					
Number of normally open door monitoring contacts	0					
Number of normally closed door monitoring contacts	0					
Usage category in compliance with IEC 947-5-1	AC-15/DC-13					
Rated operating current (voltage)	2 A (250 V AC), 5 A (100 V AC), 0.5 A (250 V DC), 2 A (24 V DC)					
Rated insulation voltage U_i	250 V					
Impulse withstand voltage U_{imp}	2500 V AC					
Minimum switching voltage	5 V DC					
Minimum switching current (switching voltage)	5 mA (5 V DC)					
Solenoid operating voltage	24 V (20.4 V ... 26.4 V) DC		110 V (93.5 V ... 121 V) AC		230 V (195.5 V ... 253 V) AC	
Duty cycle	100 %					
Connection type	Cable gland					
Maximum connection cable cross-section	1.5 mm²					
Short circuit protection	T10/F10					
Weight	0.37 kg					

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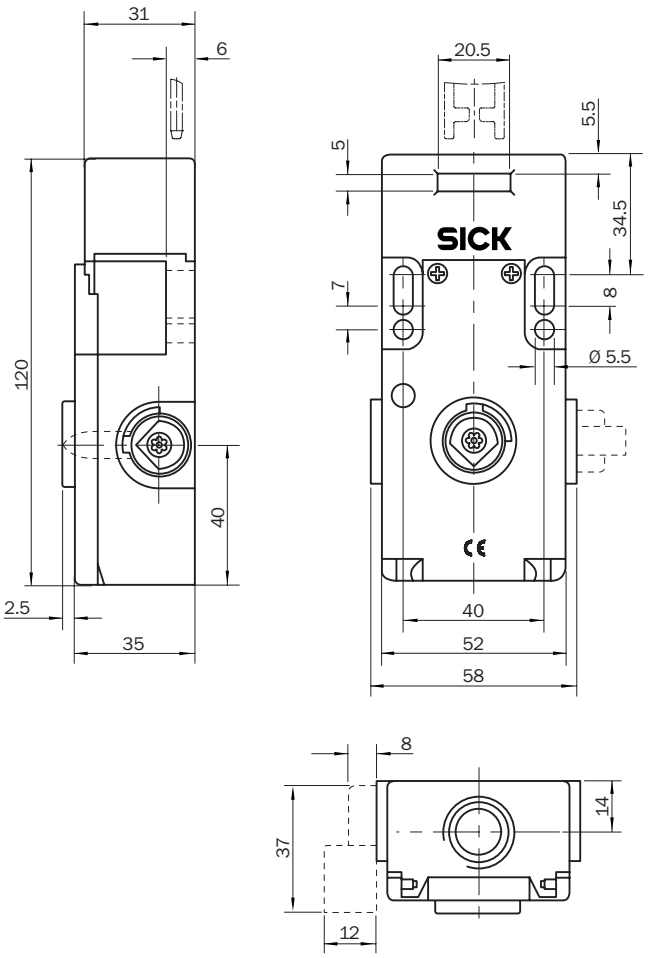
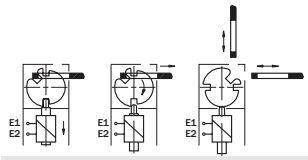
Dimensional drawings

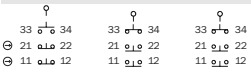


Dimensions in mm

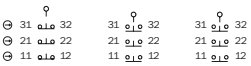
Switching elements

Actuator inserted	Actuator removed
locked	unlocked





21, 2 positive action NC contacts + 1 NO contact



30, 3 positive action NC contacts

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Actuators

Actuation option	Way of actuation	Minimum door radius	Type	Part number
Straight	Rigid	160 mm	iE14-S1	5 311 133

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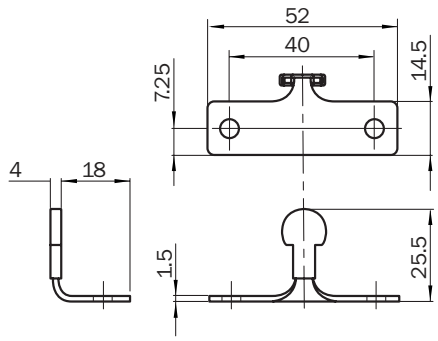
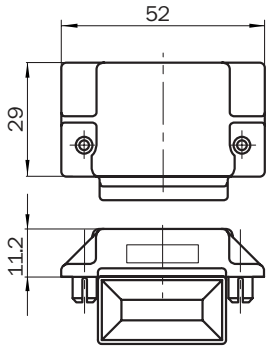
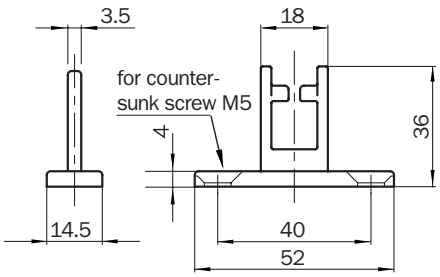
iE14-S1







Other accessories

Key

Mechanical unlocking mechanism	Type	Part number
✔	iE14-E01	5 311 282

Cable gland

Type	Part number
Cable gland M20	5 309 164

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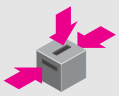
- Housing material glass-fibre reinforced thermoplastic
- Entry for actuator made of stainless steel
- Locking force 2000 N
- Three actuating directions
- Cable gland 3 x M20
- Mechanical unlocking mechanisms on three sides
- LED solenoid monitoring



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Overview of technical specifications

Number of positive action normally closed contacts (depending on type)	1 / 2
Number of normally open contacts (depending on type)	1 / 0
Number of positive action normally closed door monitoring contacts	2 / 2
Number of normally open door monitoring contacts	1 / 1
Number of normally closed door monitoring contacts	0 / 0
Housing material	Plastic
Locking force	2000 N
Locking type (depending on type)	Electrical / mechanical

Product description

- Safety switches with separate coded actuator and guard locking
- Two contact elements for separate door- and solenoid monitoring
- Straight, flexible or bolt actuator available

In-system added value

Safety Relays UE 10 - 48

The UE 10 to 48 series of the Safety Relays allows simple integration of safety components into machinery or plant. → see L-0

Safety Controllers UE 100

The UE 100 series is designed for complex applications requiring a medium level of networking capability. It is possible to connect varying safety components. Their connections can be tailored to the relevant machines or plant via drag & drop software. → see M-0

Safety Bus Modules UE 1000

The series UE 1000, Safety Bus Modules, are designed for machinery and plant requiring a high level of networking and programmable logic controls (PLC). The modules enable the linking of safety components to the bus systems PROFIsafe or AS-I Safety at Work.
→ see N-0

Ordering information

Positive action normally closed	Normally open	Door monitoring: Positive action normally closed	Door monitoring: Normally open	Door monitoring: Normally closed	Solenoid operating voltage	Locking type	Type	Part number
1	1	2	1	0	24 V DC	Electrical	i200-E0323 Lock	6 026 140
						Mechanical	i200-M0323 Lock	6 025 113
2	0	2	1	0	24 V DC	Mechanical	i200-M0413 Lock	6 025 115
1	1	2	1	0	110 V AC	Mechanical	i200-M1323 Lock	6 025 117
2	0	2	1	0	110 V AC	Mechanical	i200-M1413 Lock	6 025 119
1	1	2	1	0	230 V AC	Mechanical	i200-M2323 Lock	6 025 121
2	0	2	1	0	230 V AC	Mechanical	i200-M2413 Lock	6 025 123

Please order actuator separately

Further information	Page
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→ Switching elements	G-14
→ Actuators	G-14
→ Bolt	G-15
→ Other accessories	G-15
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Detailed technical specifications

Type	i200-E0323 Lock	i200-M0323 Lock	i200-M0413 Lock	i200-M1323 Lock	i200-M1413 Lock	i200-M2323 Lock	i200-M2413 Lock
Housing material	GFRP reinforced polyester						
Enclosure rating	IP 65						
Mechanical life (relay contacts)	10^6 switching cycles						
Ambient operating temperature from ... to	–20 °C ... +60 °C						
Maximum approach speed	160 mm/s						
Locking force	2000 N [1)]						
Switching principle	Slow-action-switch						
Number of positive action normally closed contacts	1		2	1	2	1	2
Number of normally open contacts	1		0	1	0	1	0
Number of positive action normally closed door monitoring contacts	2						
Number of normally open door monitoring contacts	1						
Number of normally closed door monitoring contacts	0						
Usage category in compliance with IEC 947-5-1	AC-15						
Rated operating current (voltage)	2 A (250 V AC), 5 A (100 V AC)						
Rated insulation voltage U_i	250 V						
Impulse withstand voltage U_{imp}	2500 V AC						
Minimum switching voltage	5 V DC						
Minimum switching current (switching voltage)	5 mA (5 V DC)						
Solenoid operating voltage	24 V (20.4 V ... 26.4 V) DC			110 V (93.5 V ... 121 V) AC		230 V (195.5 V ... 253 V) AC	
Duty cycle	100 %						
Connection type	Cable gland						
Short circuit protection	T6						
Weight	0.55 kg						

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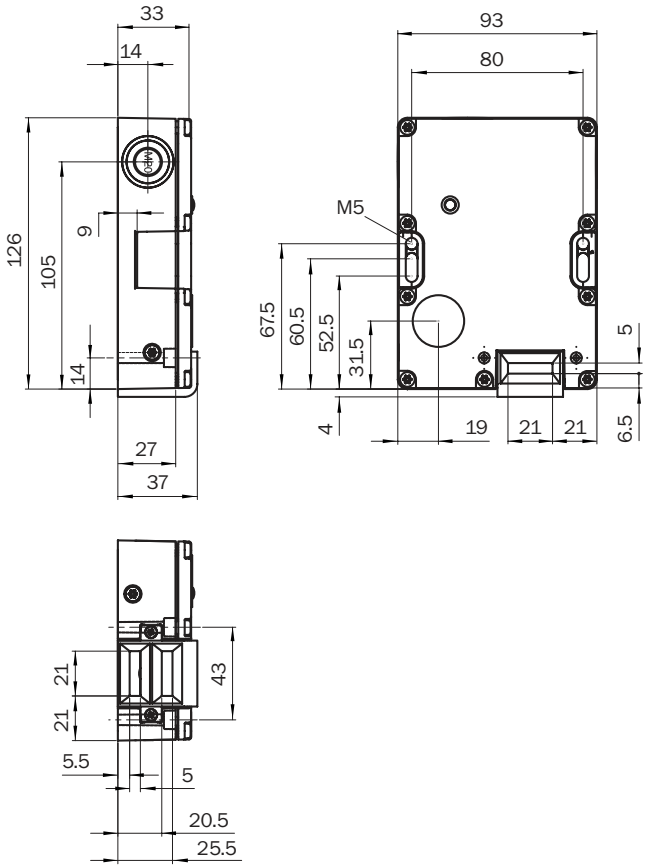
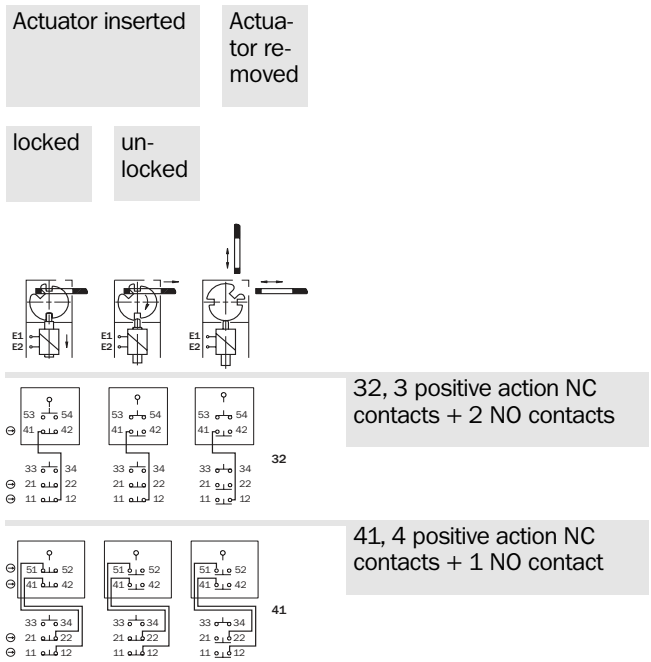
Dimensional drawings



Dimensions in mm

Switching elements



32, 3 positive action NC contacts + 2 NO contacts

41, 4 positive action NC contacts + 1 NO contact

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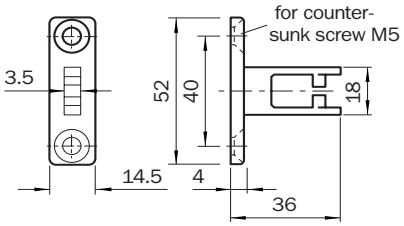
Actuators

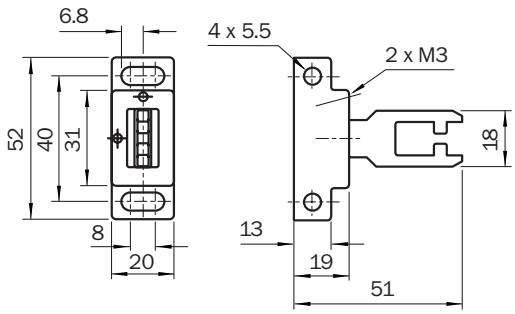
Actuation option	Way of actuation	Minimum door radius	Type	Part number
Straight	Rigid	80 mm	iE200-S1	5 308 758
	Fully flexible	175 mm	iE200-F1	5 308 759

iE200-S1



Min. door radius 175 mm

iE200-F1



Min. door radius 80 mm

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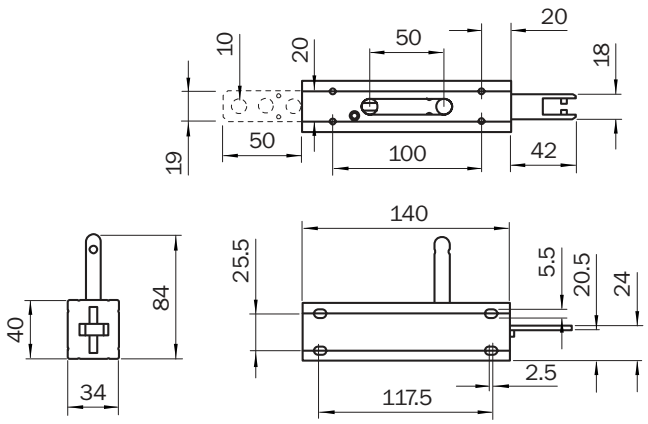
Bolt

Type	Part number
iE200-B1	5 308 760

iE200-B1



Other accessories

Cable gland

Type	Part number
Cable gland M20	5 309 164

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- Housing material powder-coated die-cast zinc
- Locking force 2500 N
- Four actuating directions
- Cable gland PG13.5
- LED function indicator
- Handle actuator

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Overview of technical specifications

Number of positive action normally closed contacts	2
Number of normally open contacts	1
Number of positive action normally closed door monitoring contacts	2
Number of normally open door monitoring contacts	1
Number of normally closed door monitoring contacts	0
Housing material	Metal
Locking force	2500 N
Locking type	Mechanical

Product description

- Safety locking device with handle-operated actuator
- Two contact elements for separate door and solenoid monitoring
- The system can compensate for any misalignment, such as caused by door drop

In-system added value

Safety Relays UE 10 - 48

The UE 10 to 48 series of the Safety Relays allows simple integration of safety components into machinery or plant. → see L-0

Safety Controllers UE 100

The UE 100 series is designed for complex applications requiring a medium level of networking capability. It is possible to connect varying safety components. Their connections can be tailored to the relevant machines or plant via drag & drop software. → see M-0

Safety Bus Modules UE 1000

The series UE 1000, Safety Bus Modules, are designed for machinery and plant requiring a high level of networking and programmable logic controls (PLC). The modules enable the linking of safety components to the bus systems PROFIsafe or AS-I Safety at Work.

→ see N-0

Ordering information

Positive action normally closed	Normally open	Door monitoring: Positive action normally closed	Door monitoring: Normally open	Door monitoring: Normally closed	Solenoid operating voltage	Locking type	Type	Part number
2	1	2	1	0	24 V DC	Mechanical	i1001-24 Lock	6 021 013

Actuator supplied with delivery

Further information	Page
→ Internal circuitry	G-18
→ Trapped key systems	G-18
→ Actuator	G-20
→ Lockout bar	G-21
→ Other accessories	G-21
→ Services	A-0

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Detailed technical specifications

Housing material	Zinc alloy and stainless steel
Surface treatment	Varnished
Enclosure rating	IP 67
Mechanical life (relay contacts)	10^6 switching cycles
Ambient operating temperature from ... to	–5 °C ... +40 °C
Maximum approach speed	333.3 mm/s
Locking force	2500 N
Switching principle	Slow-action-switch
Number of positive action normally closed contacts	2
Number of normally open contacts	1
Number of positive action normally closed door monitoring contacts	2
Number of normally open door monitoring contacts	1
Number of normally closed door monitoring contacts	0
Usage category in compliance with IEC 947-5-1	DC-13
Rated operating current (voltage)	10 A (24 V DC)
Impulse withstand voltage U_{imp}	2500 V AC
Solenoid operating voltage	24 V (20.4 V ... 26.4 V) DC
Duty cycle	100 %
Contact material	90 % silver and 10 % nickel
Connection type	Cable gland
Maximum connection cable cross-section	2.5 mm²
Weight	2.25 kg

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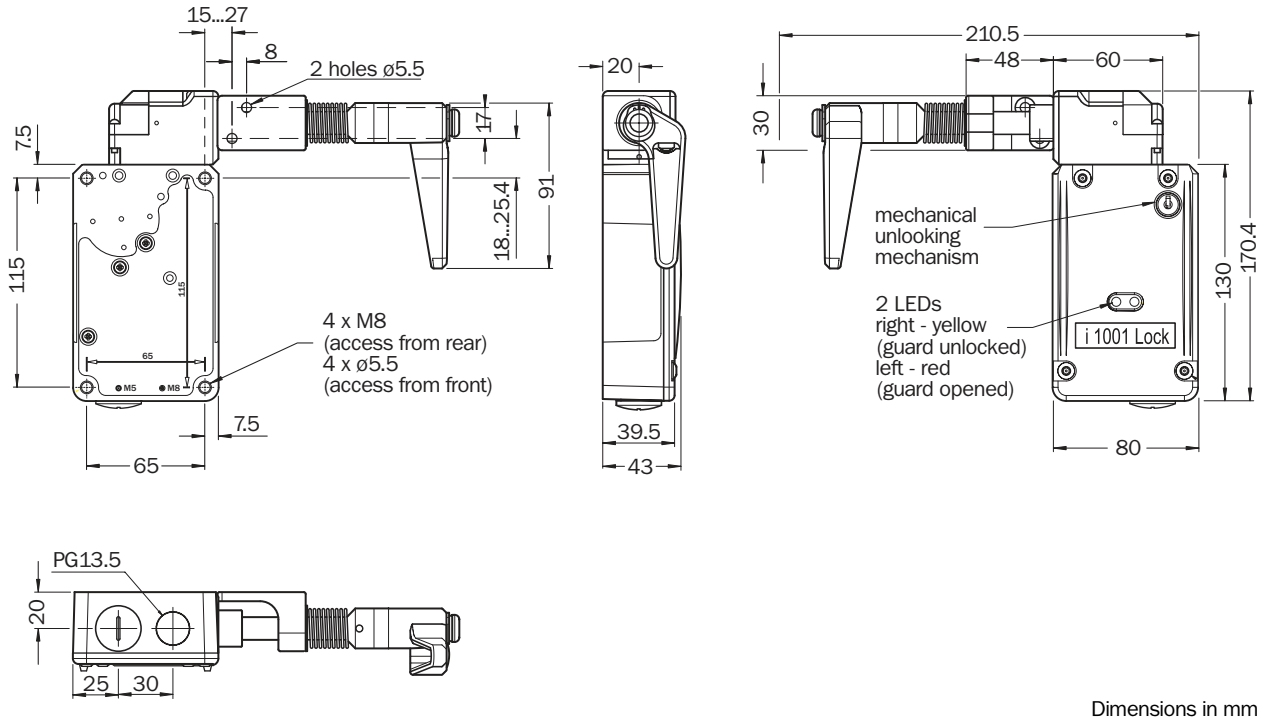
Dimensional drawings



Dimensions in mm

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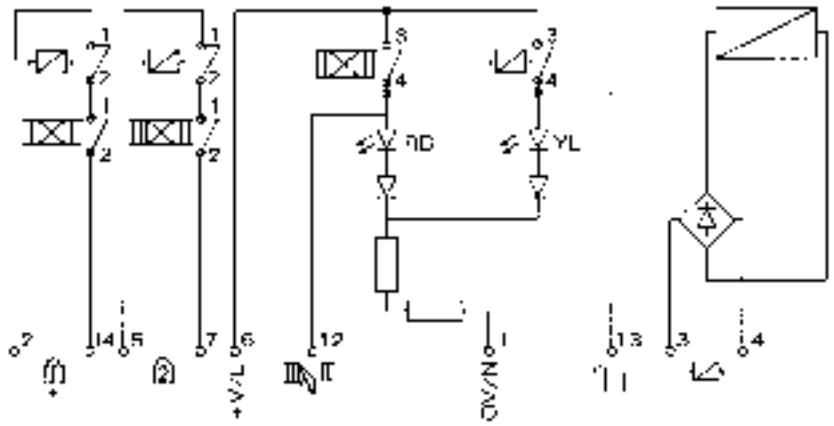
Internal circuitry



Trapped key systems

Accessory type	Coding	Delivery	Type	Part number
Access key adapter	1	Key supplied with delivery	iE1000-AK1	5 308 302
	2	Key supplied with delivery	iE1000-AK2	5 308 303
Safety key adapter	1	Key supplied with delivery	iE1000-SK1	5 308 297
	2	Key supplied with delivery	iE1000-SK2	5 308 298
Enabling unit	1	Key supplied with delivery	iE1000-ES1	6 021 019
	2	Key supplied with delivery	iE1000-ES2	6 021 020

Additional types on request

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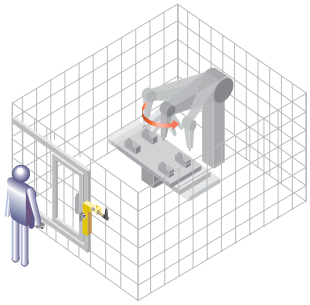
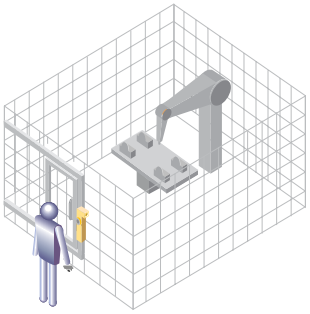
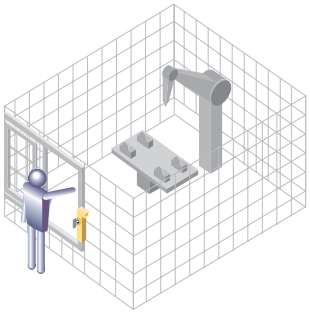
Access key adapter



Plant in action, no key inserted



Key is inserted, plant comes to a standstill

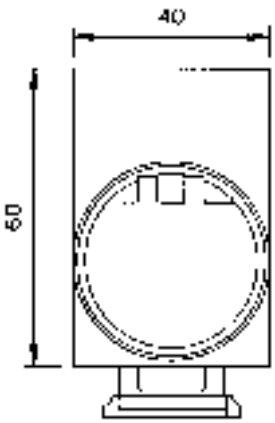


Door can now be opened

Access function

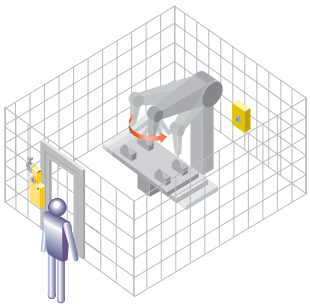
■ Application example

Basic unit + head unit + access key adapter. Only those with an access key can gain access to the machine.

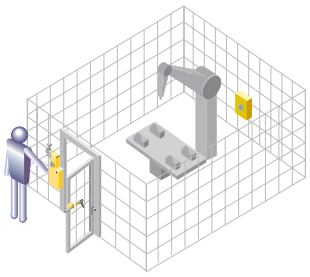


The access key adapter is installed between the head and the housing of the safety switch. If no key present in the adapter, the door is in the closed position. The door can only be opened if the safety key is inserted and turned (enabling access).

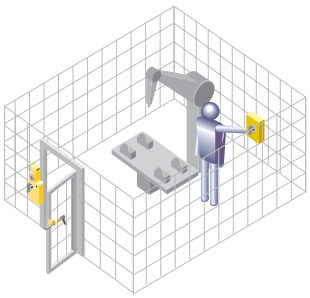
Safety key adapter



Plant in action, door closed, key inserted



Key is removed, plant comes to standstill, door can be opened

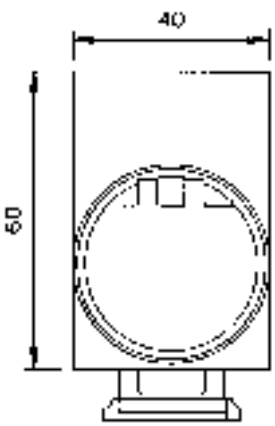


Person enters, key inserted inside, plant runs in enable mode

Enable function

■ Application example

Basic unit + head unit + safety key adapter. In enable mode no person can set the machine in motion from outside. The machine is started from inside with the safety key.



The safety key adapter is installed between the head and the housing of the safety switch. The key is securely held in the unit and the door is kept in the closed position. Only when the safety key is turned and withdrawn access is possible.

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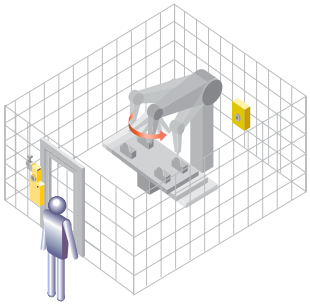
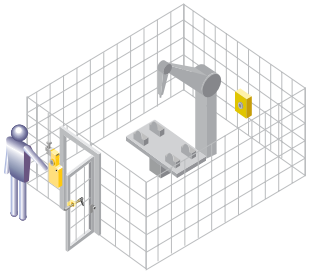
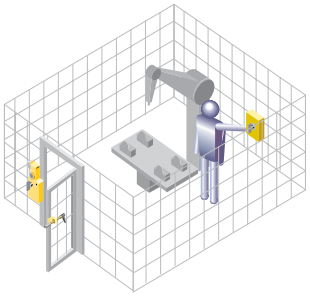
Enabling unit



Plant in action, door closed, key inserted



Key is removed, plant comes to standstill, door can be opened

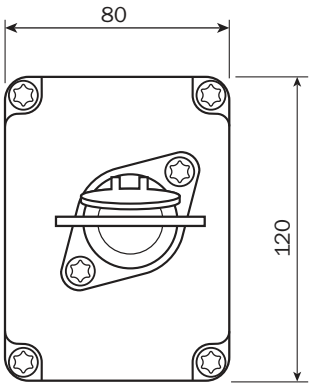


Person enters, key inserted inside, plant runs in enable mode

Enable function

■ Application example

Basic unit + head unit + safety key adapter. In enable mode no person can set the machine in motion from outside. The machine is started from inside with the safety key.



Contact set 2 x NO + 2 x NC for connections into the machine's stop circuit.

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Actuator

Actuation option	Way of actuation	Type	Part number
Turning lever	Fully flexible	iE1001-R1	5 308 316

iE1001-R1

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Lockout bar

Type	Part number
iE1002-R1	5 308 313

iE1002-R1

Other accessories

Keys

Prevention of un-intentional machine starts	Access function	Enabling function	Mechanical unlocking mechanism	Coding	Type	Part number
–	✔	–	–	1	Key AK1	5 308 686
				2	Key AK2	5 308 687
✔	–	✔	–	1	Key SK1	5 308 307
				2	Key SK2	5 308 308
–	–	–	✔	–	Key for emergency unlocking i1001	5 308 320

Cable gland

Type	Part number
Cable gland PG13.5	5 305 811

Safety screws

Type	Part number
Safety allen screws	5 308 317

Safety switch accessories, miscellaneous

Usage	Type	Part number
For safety allen screws	BIT	5 308 319

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- Housing material powder-coated die-cast zinc
- Locking force 2500 N
- Four actuating directions
- Cable gland PG13.5
- LED function indicator
- Separate actuator

Overview of technical specifications

Number of positive action normally closed contacts	2
Number of normally open contacts	1
Number of positive action normally closed door monitoring contacts	2
Number of normally open door monitoring contacts	1
Number of normally closed door monitoring contacts	0
Housing material	Metal
Locking force	2500 N
Locking type	Mechanical

Product description

- Safety switch with separate coded actuator and guard locking
- Two contact elements for separate door and solenoid monitoring
- The system can compensate for any misalignment, such as caused by door drop

In-system added value

Safety Relays UE 10 - 48

The UE 10 to 48 series of the Safety Relays allows simple integration of safety components into machinery or plant. → see L-0

Safety Controllers UE 100

The UE 100 series is designed for complex applications requiring a medium level of networking capability. It is possible to connect varying safety components. Their connections can be tailored to the relevant machines or plant via drag & drop software. → see M-0

Safety Bus Modules UE 1000

The series UE 1000, Safety Bus Modules, are designed for machinery and plant requiring a high level of networking and programmable logic controls (PLC). The modules enable the linking of safety components to the bus systems PROFIsafe or AS-I Safety at Work.

→ see N-0

Ordering information

Positive action normally closed	Normally open	Door monitoring: Positive action normally closed	Door monitoring: Normally open	Door monitoring: Normally closed	Solenoid operating voltage	Locking type	Type	Part number
2	1	2	1	0	24 V DC	Mechanical	i1002-24 Lock	6 021 007

Actuator supplied with delivery

Further information	Page
→ Dimensional drawings	G-24
→ Internal circuitry	G-25
→ Trapped key systems	G-26
→ Actuator	G-28
→ Lockout bar	G-28
→ Other accessories	G-29
→ Services	A-0

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8 010 889/15-10-04

Detailed technical specifications

Housing material	Zinc alloy and stainless steel
Surface treatment	Varnished
Enclosure rating	IP 67
Mechanical life (relay contacts)	10^6 switching cycles
Ambient operating temperature from ... to	–5 °C ... +40 °C
Maximum approach speed	333.3 mm/s
Locking force	2500 N
Switching principle	Slow-action-switch
Number of positive action normally closed contacts	2
Number of normally open contacts	1
Number of positive action normally closed door monitoring contacts	2
Number of normally open door monitoring contacts	1
Number of normally closed door monitoring contacts	0
Usage category in compliance with IEC 947-5-1	DC-13
Rated operating current (voltage)	10 A (24 V DC)
Impulse withstand voltage U_{imp}	2500 V AC
Solenoid operating voltage	24 V (20.4 V ... 26.4 V) DC
Duty cycle	100 %
Contact material	90 % silver and 10 % nickel
Connection type	Cable gland
Maximum connection cable cross-section	2.5 mm²
Weight	1.98 kg

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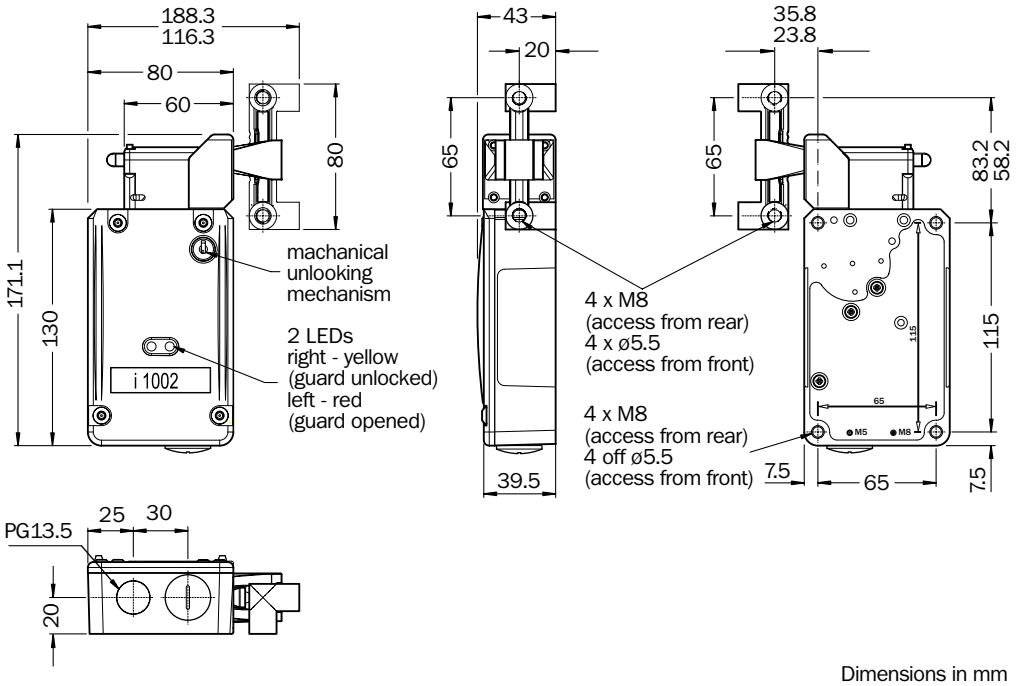
Dimensional drawings



Dimensions in mm

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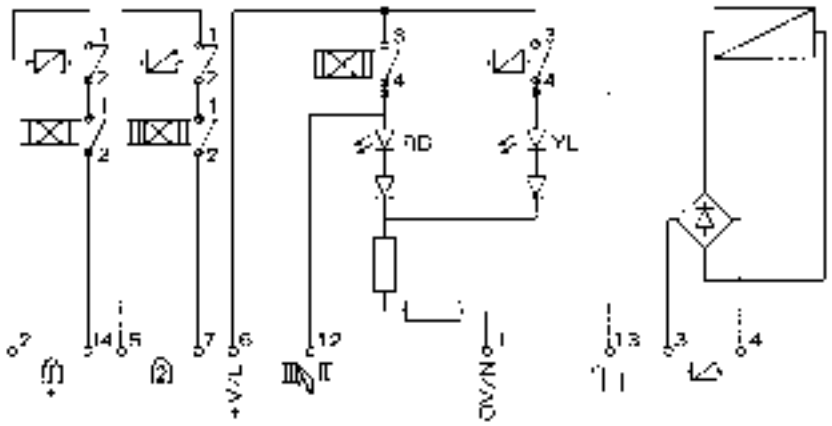
Internal circuitry



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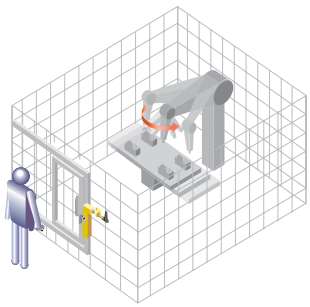
Trapped key systems

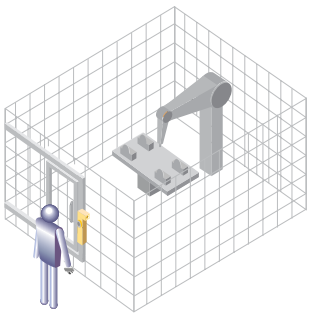
Accessory type	Coding	Delivery	Type	Part number
Access key adapter	1	Key supplied with delivery	iE1000-AK1	5 308 302
	2	Key supplied with delivery	iE1000-AK2	5 308 303
Safety key adapter	1	Key supplied with delivery	iE1000-SK1	5 308 297
	2	Key supplied with delivery	iE1000-SK2	5 308 298
Enabling unit	1	Key supplied with delivery	iE1000-ES1	6 021 019
	2	Key supplied with delivery	iE1000-ES2	6 021 020

Additional types on request

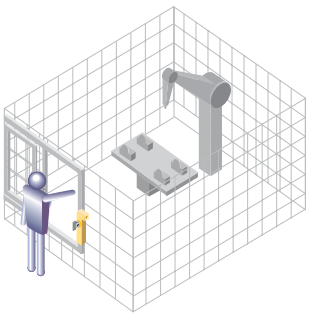
Access key adapter



Plant in action, no key inserted



Key is inserted, plant comes to a standstill

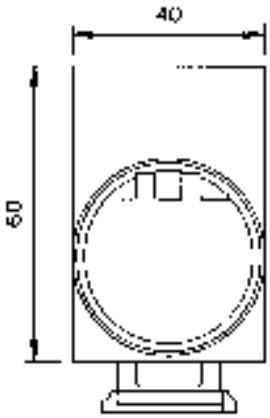


Door can now be opened

Access function

■ Application example

Basic unit + head unit + access key adapter. Only those with an access key can gain access to the machine.



The access key adapter is installed between the head and the housing of the safety switch. If no key present in the adapter, the door is in the closed position. The door can only be opened if the safety key is inserted and turned (enabling access).

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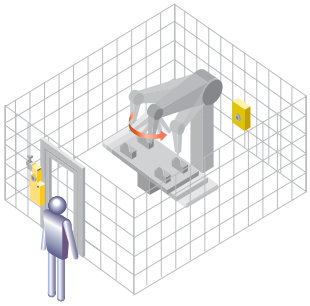
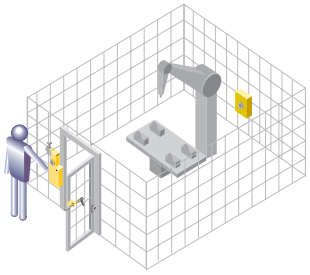
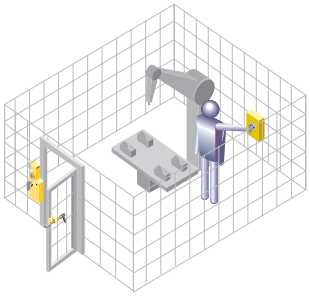
Safety key adapter



Plant in action, door closed, key inserted



Key is removed, plant comes to standstill, door can be opened

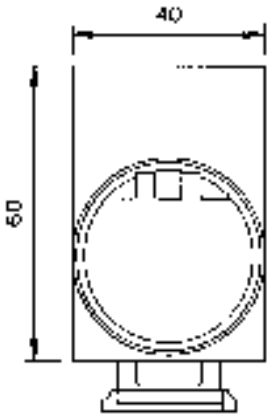


Person enters, key inserted inside, plant runs in enable mode

Enable function

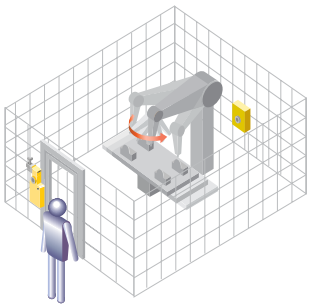
■ Application example

Basic unit + head unit + safety key adapter. In enable mode no person can set the machine in motion from outside. The machine is started from inside with the safety key.

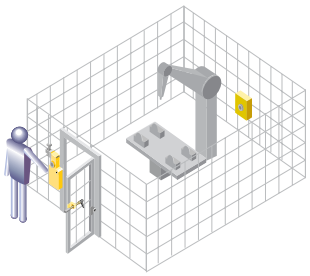


The safety key adapter is installed between the head and the housing of the safety switch. The key is securely held in the unit and the door is kept in the closed position. Only when the safety key is turned and withdrawn access is possible.

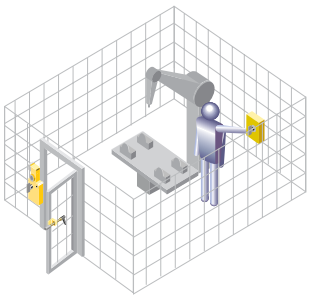
Enabling unit



Plant in action, door closed, key inserted



Key is removed, plant comes to standstill, door can be opened

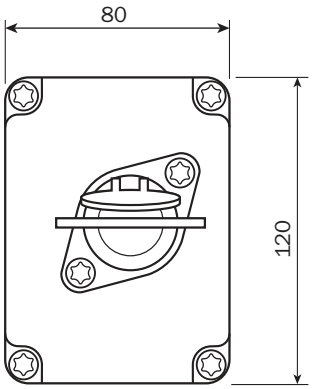


Person enters, key inserted inside, plant runs in enable mode

Enable function

■ Application example

Basic unit + head unit + safety key adapter. In enable mode no person can set the machine in motion from outside. The machine is started from inside with the safety key.



Contact set 2 x NO + 2 x NC for connections into the machine's stop circuit.

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Actuator

Actuation option	Way of actuation	Minimum door radius	Type	Part number
Straight	Semi flexible	300 mm	iE1002-S2	5 308 315

iE1002-S2

Lockout bar

Type	Part number
iE1002-S3	5 308 312

iE1002-S3

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Other accessories

Keys

Prevention of un-intentional machine starts	Access function	Enabling function	Mechanical unlocking mechanism	Coding	Type	Part number
–	✔	–	–	1	Key AK1	5 308 686
				2	Key AK2	5 308 687
✔	–	✔	–	1	Key SK1	5 308 307
				2	Key SK2	5 308 308
–	–	–	✔	–	Key for emergency unlocking i1001	5 308 320

Cable gland

Type	Part number
Cable gland PG13.5	5 305 811

Safety screws

Type	Part number
Safety allen screws	5 308 317

Safety switch accessories, miscellaneous

Usage	Type	Part number
For safety allen screws	BIT	5 308 319

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Explanations of features

Positive action normally closed contacts/normally open contacts

Safety switches have contact elements in normally closed contact/normally open contact combinations. The normally closed contacts of a safety switch are of the “positive action” type, i.e. the forced movement of the normally closed contact ensures that the contacts are separated every time. Normally open contacts primarily serve as signalling contacts and must not be used for the safety circuit.

Housing material

The housing materials used can be separated into two large groups - “metals” and “plastics”. The metal housing materials are available as both anodised die-cast light metal and painted die-cast zinc versions. Glass-fibre reinforced thermoplastics are exclusively used for the plastic housings.

Switching principle

- Slow-action-switch

The speed with which the slow-acting switching element is actuated directly affects the speed of normally closed contacts or normally open contacts. The switching points for actuating and resetting the position switch are in the same position.

- Snap-action-switch

Snap-action switching elements react independently of the actuation speed and open or close at a defined point. The contacts of the snap-action switching elements have a different switching point depending on the directional movement, i.e. the switching points for actuating and resetting the position switch are in different positions.

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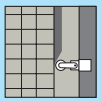
Safety position switches

Safety application	Number of positive action normally closed contacts/ normally open contacts [1]	Housing material [1]	Switching principle [1]	Type of actuator	Enclosure rating	Product	Page
	2 / 1	Plastic	Slow-action-switch	Roller plunger	IP 66	i10 P	H-2
				Turning lever		i10 R	H-4
	3 / 1	Metal	Slow-action-switch	Roller plunger	IP 67	i100 P	H-6
				Turning lever		i100 R	H-8
	1 / 1 2 / 2 3 / 1		Slow-action-switch/ snap-action-switch	Roller plunger	IP 66	i110 P	H-11
				Turning lever		i110 R	H-14

[1] Explanation see page H-0

H

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- Housing material glass-fibre reinforced thermoplastic
- Cable gland M20
- Design according to EN 50047
- Enclosure rating IP 66

Overview of technical specifications

Number of positive action normally closed contacts	2
Number of normally open contacts	1
Switching principle	Slow-action-switch
Type of actuator	Roller plunger
Housing material	Plastic
Enclosure rating	IP 66

Product description

- Roller plunger design
- Plunger made of plastic
- 3-pole contact element

In-system added value

Safety Relays UE 10 - 48

The UE 10 to 48 series of the Safety Relays allows simple integration of safety components into machinery or plant. → see L-0

Safety Controllers UE 100

The UE 100 series is designed for complex applications requiring a medium level of networking capability. It is possible to connect varying safety components. Their connections can be tailored to the relevant machines or plant via drag & drop software. → see M-0

Safety Bus Modules UE 1000

The series UE 1000, Safety Bus Modules, are designed for machinery and plant requiring a high level of networking and programmable logic controls (PLC). The modules enable the linking of safety components to the bus systems PROFIsafe or AS-I Safety at Work.
→ see N-0

Ordering information

Positive action normally closed	Normally open	Switching principle	Type	Part number
2	1	Slow-action-switch	i10-PA213	6 025 088

Further information	Page
→ Services	A-0

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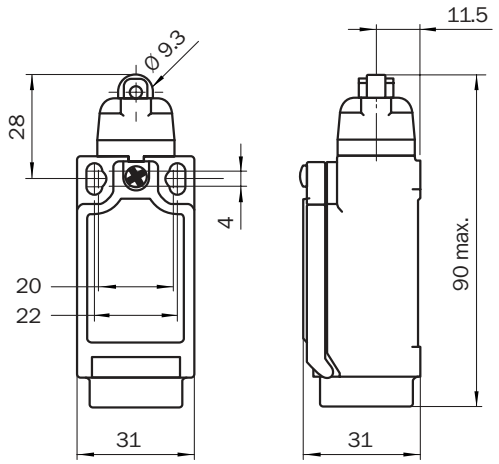
Detailed technical specifications

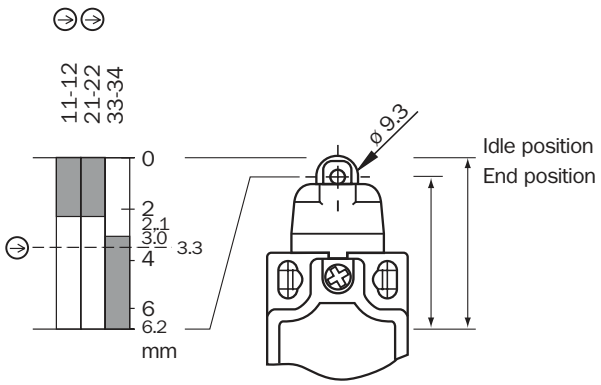
Housing material	Glass-fibre reinforced thermoplastic
Enclosure rating	IP 66
Mechanical life (relay contacts)	10 x 10^6 switching cycles
Ambient operating temperature from ... to	–25 °C ... +80 °C
Approach speed from ... to	3 m/min ... 15 m/min
Switching principle	Slow-action-switch
Number of positive action normally closed contacts	2
Number of normally open contacts	1
Usage category in compliance with IEC 947-5-1	AC-15/DC-13
Rated operating current (voltage)	3 A (230 V AC), 0.27 A (230 V DC)
Rated insulation voltage U_i	250 V
Impulse withstand voltage U_{imp}	2500 V AC
Minimum switching current (switching voltage)	5 mA (5 V DC)
Connection type	Cable gland
Maximum connection cable cross-section	2.5 mm²
Short circuit protection	F15
Weight	0.11 kg

Dimensional drawings



Dimensions in mm

Actuator travel diagram



Contacts open

Contacts closed

Accessories

Cable gland

Type	Part number
Cable gland M20	5 309 164

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- Housing material glass-fibre reinforced thermoplastic
- Cable gland M20
- Design according to EN 50047
- Enclosure rating IP 66

H

Overview of technical specifications

Number of positive action normally closed contacts	2
Number of normally open contacts	1
Switching principle	Slow-action-switch
Type of actuator	Turning lever
Housing material	Plastic
Enclosure rating	IP 66

Product description

- Turning lever design
- Roller made of plastic
- 3-pole contact element

In-system added value

Safety Relays UE 10 - 48

The UE 10 to 48 series of the Safety Relays allows simple integration of safety components into machinery or plant. → see L-0

Safety Controllers UE 100

The UE 100 series is designed for complex applications requiring a medium level of networking capability. It is possible to connect varying safety components. Their connections can be tailored to the relevant machines or plant via drag & drop software. → see M-0

Safety Bus Modules UE 1000

The series UE 1000, Safety Bus Modules, are designed for machinery and plant requiring a high level of networking and programmable logic controls (PLC). The modules enable the linking of safety components to the bus systems PROFIsafe or AS-I Safety at Work.

→ see N-0

Ordering information

Positive action normally closed	Normally open	Switching principle	Type	Part number
2	1	Slow-action-switch	i10-RA213	6 025 085

Further information	Page
→ Services	A-0

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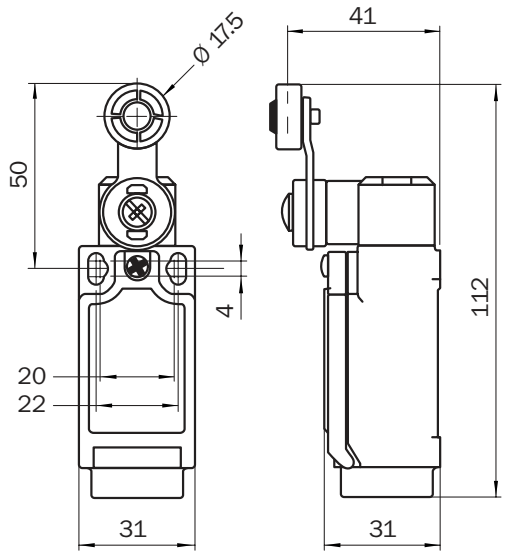
Detailed technical specifications

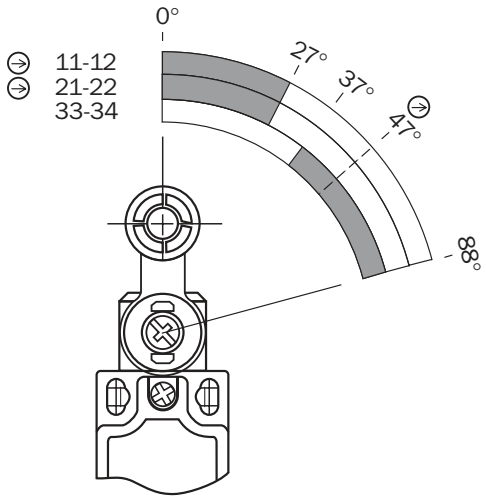
Housing material	Glass-fibre reinforced thermoplastic
Enclosure rating	IP 66
Mechanical life (relay contacts)	10 x 10^6 switching cycles
Ambient operating temperature from ... to	–25 °C ... +80 °C
Approach speed from ... to	3 m/min ... 15 m/min
Switching principle	Slow-action-switch
Number of positive action normally closed contacts	2
Number of normally open contacts	1
Usage category in compliance with IEC 947-5-1	AC-15/DC-13
Rated operating current (voltage)	3 A (230 V AC), 0.27 A (230 V DC)
Rated insulation voltage U_i	250 V
Impulse withstand voltage U_{imp}	2500 V AC
Minimum switching current (switching voltage)	5 mA (5 V DC)
Connection type	Cable gland
Maximum connection cable cross-section	2.5 mm²
Short circuit protection	F15
Weight	0.11 kg

Dimensional drawings



Dimensions in mm

Actuator travel diagram



Contacts open

Contacts closed

Accessories

Cable gland

Type	Part number
Cable gland M20	5 309 164

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- Housing material die-cast light alloy
- Roller plunger with stainless steel roller
- Cable gland M20
- Design according to EN 50041
- Enclosure rating IP 67

Overview of technical specifications

Number of positive action normally closed contacts	3
Number of normally open contacts	1
Switching principle	Slow-action-switch
Type of actuator	Roller plunger
Housing material	Metal
Enclosure rating	IP 67

Product description

- Roller plunger design
- 4-pole contact element

In-system added value

Safety Relays UE 10 - 48

The UE 10 to 48 series of the Safety Relays allows simple integration of safety components into machinery or plant. → see L-0

Safety Controllers UE 100

The UE 100 series is designed for complex applications requiring a medium level of networking capability. It is possible to connect varying safety components. Their connections can be tailored to the relevant machines or plant via drag & drop software. → see M-0

Safety Bus Modules UE 1000

The series UE 1000, Safety Bus Modules, are designed for machinery and plant requiring a high level of networking and programmable logic controls (PLC). The modules enable the linking of safety components to the bus systems PROFIsafe or AS-I Safety at Work.

→ see N-0

Ordering information

Positive action normally closed	Normally open	Switching principle	Type	Part number
3	1	Slow-action-switch	i100-P313	6 022 589

Further information	Page
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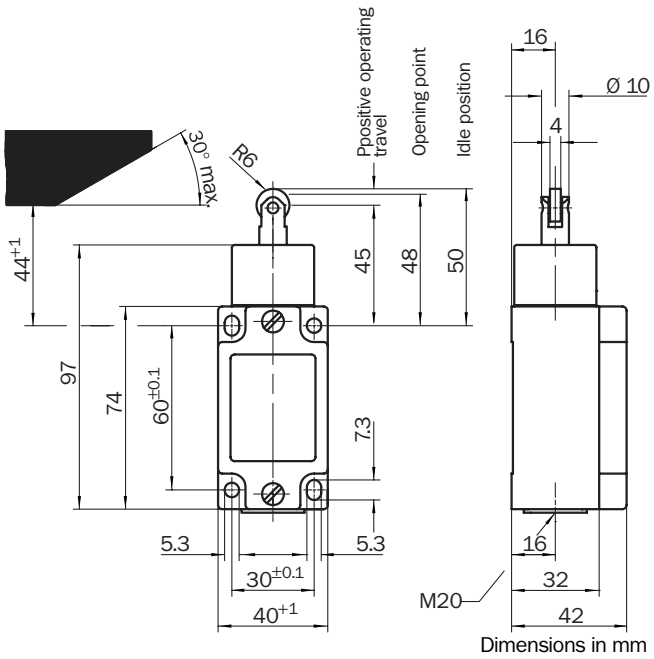
Detailed technical specifications

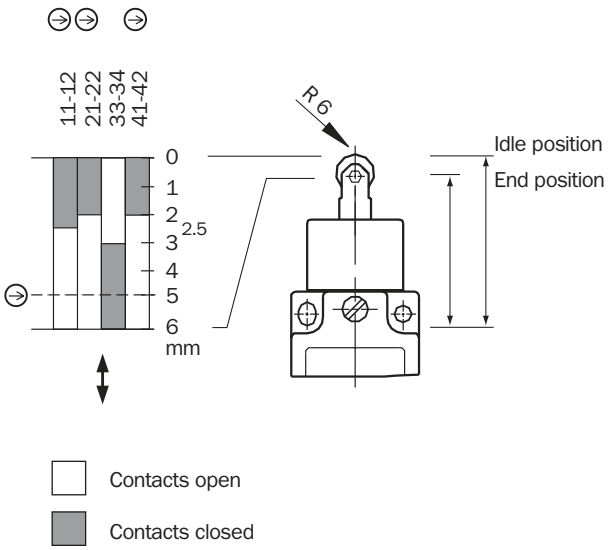
Housing material	Die-cast light alloy
Surface treatment	Anodized
Enclosure rating	IP 67
Mechanical life (relay contacts)	30 x 10^6 switching cycles
Ambient operating temperature from ... to	–25 °C ... +80 °C
Approach speed from ... to	0.01 m/min ... 20 m/min
Actuation force	15 N
Switching principle	Slow-action-switch
Number of positive action normally closed contacts	3
Number of normally open contacts	1
Usage category in compliance with IEC 947-5-1	AC-15/DC-13
Rated operating current (voltage)	6 A (230 V AC), 6 A (24 V DC)
Rated insulation voltage U_i	250 V
Impulse withstand voltage U_{imp}	4000 V AC
Minimum switching current (switching voltage)	10 mA (24 V DC)
Contact material	Silver alloy, gold flashed
Connection type	Cable gland
Maximum connection cable cross-section	1.5 mm²
Short circuit protection	T10/F20
Weight	0.33 kg

Dimensional drawings



Dimensions in mm

Actuator travel diagram



Accessories

Cable gland

Type	Part number
Cable gland M20	5 309 164

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- Housing material die-cast light alloy
- Adjustable switching direction (left, right, both sides)
- Turning lever with stainless steel roller
- Cable gland M20
- Design according to EN 50041
- Enclosure rating IP 67

H

Overview of technical specifications

Number of positive action normally closed contacts	3
Number of normally open contacts	1
Switching principle	Slow-action-switch
Type of actuator	Turning lever
Housing material	Metal
Enclosure rating	IP 67

Product description

- Turning lever design
- 4-pole contact element
- High flexibility through adjustable switching direction

In-system added value

Safety Relays UE 10 - 48

The UE 10 to 48 series of the Safety Relays allows simple integration of safety components into machinery or plant. → see L-0

Safety Controllers UE 100

The UE 100 series is designed for complex applications requiring a medium level of networking capability. It is possible to connect varying safety components. Their connections can be tailored to the relevant machines or plant via drag & drop software. → see M-0

Safety Bus Modules UE 1000

The series UE 1000, Safety Bus Modules, are designed for machinery and plant requiring a high level of networking and programmable logic controls (PLC). The modules enable the linking of safety components to the bus systems PROFIsafe or AS-I Safety at Work.

→ see N-0

Ordering information

Positive action normally closed	Normally open	Switching principle	Type	Part number
3	1	Slow-action-switch	i100-R313	6 022 588

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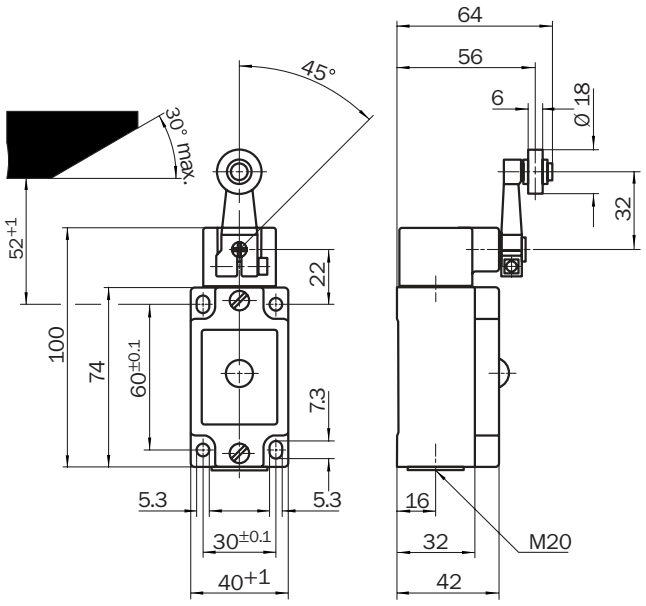
Detailed technical specifications

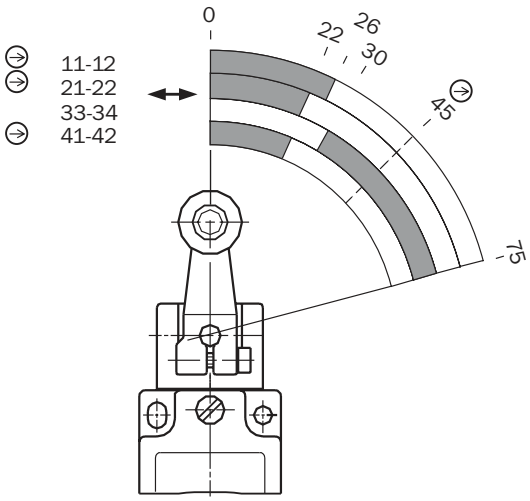
Housing material	Die-cast light alloy
Surface treatment	Anodized
Enclosure rating	IP 67
Mechanical life (relay contacts)	30 x 10^6 switching cycles
Ambient operating temperature from ... to	–25 °C ... +80 °C
Approach speed from ... to	0.1 m/min ... 60 m/min
Actuation force	10 N
Switching principle	Slow-action-switch
Number of positive action normally closed contacts	3
Number of normally open contacts	1
Usage category in compliance with IEC 947-5-1	AC-15/DC-13
Rated operating current (voltage)	6 A (230 V AC), 6 A (24 V DC)
Rated insulation voltage U_i	250 V
Impulse withstand voltage U_{imp}	4000 V AC
Minimum switching current (switching voltage)	10 mA (24 V DC)
Contact material	Silver alloy, gold flashed
Connection type	Cable gland
Maximum connection cable cross-section	1.5 mm²
Short circuit protection	T10/F20
Weight	0.37 kg

Dimensional drawings



Dimensions in mm

Actuator travel diagram



Contacts open

Contacts closed

H

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Accessories

Cable gland

Type	Part number
Cable gland M20	5 309 164

H

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Overview of technical specifications

Number of positive action normally closed contacts (depending on type)	1 / 2 / 3
Number of normally open contacts (depending on type)	1 / 2 / 1
Switching principle (depending on type)	Snap-action-switch / slow-action-switch
Type of actuator	Roller plunger
Housing material	Metal
Enclosure rating	IP 66

Product description

- Roller plunger design
- 4-pole contact element

In-system added value

Safety Relays UE 10 - 48

The UE 10 to 48 series of the Safety Relays allows simple integration of safety components into machinery or plant. → see L-0

Safety Controllers UE 100

The UE 100 series is designed for complex applications requiring a medium level of networking capability. It is possible to connect varying safety components. Their connections can be tailored to the relevant machines or plant via drag & drop software. → see M-0

Safety Bus Modules UE 1000

The series UE 1000, Safety Bus Modules, are designed for machinery and plant requiring a high level of networking and programmable logic controls (PLC). The modules enable the linking of safety components to the bus systems PROFIsafe or AS-I Safety at Work.

→ see N-0

Ordering information

Positive action normally closed	Normally open	Switching principle	Type	Part number
1	1	Snap-action-switch	i110-PA123	6 025 106
2	2	Slow-action-switch	i110-PA223	6 025 105
3	1	Slow-action-switch	i110-PA313	6 025 104

- Housing material die-cast zinc
- Roller plunger with stainless steel roller
- Slow- or snap-action switch
- Cable gland M20
- Design according to EN 50041
- Enclosure rating IP 66

H

Further information	Page
→ Technical specifications	H-12
→ Dimensional drawings	H-12
→ Actuator travel diagrams	H-13
→ Accessories	H-13
→ Services	A-0

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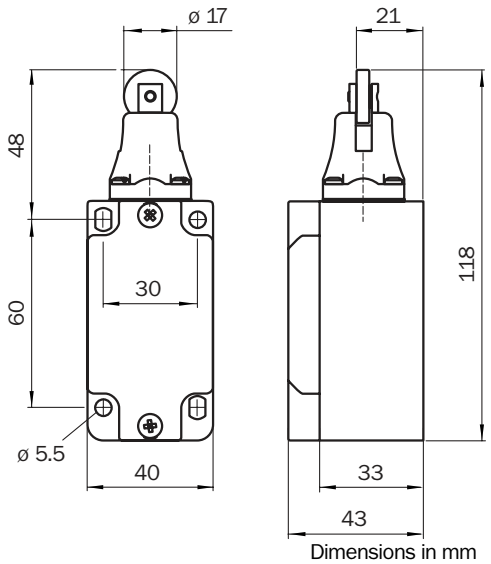
Detailed technical specifications

Type	i110-PA123	i110-PA223	i110-PA313
Housing material	Zinc die-cast		
Surface treatment	Varnished		
Enclosure rating	IP 66		
Mechanical life (relay contacts)	10 x 10^6 switching cycles		
Ambient operating temperature from ... to	–25 °C ... +80 °C		
Approach speed from ... to	3 m/min ... 15 m/min		
Switching principle	Snap-action-switch	Slow-action-switch	Slow-action-switch
Number of positive action normally closed contacts	1	2	3
Normally open	1	2	1
Usage category in compliance with IEC 947-5-1	AC-15/DC-13		
Rated operating current (voltage)	3 A (230 V AC), 0.27 A (230 V DC)		
Rated insulation voltage U_i	250 V		
Impulse withstand voltage U_{imp}	2500 V AC		
Minimum switching current (switching voltage)	5 mA (5 V DC)		
Connection type	Cable gland		
Maximum connection cable cross-section	2.5 mm²		
Short circuit protection	F15		
Weight	0.43 g		

Dimensional drawings



Dimensions in mm

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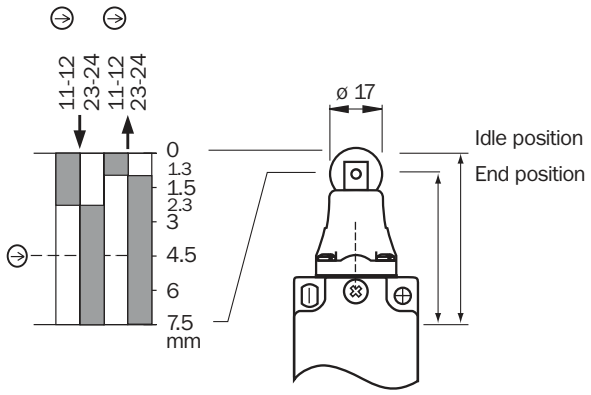
Actuator travel diagrams

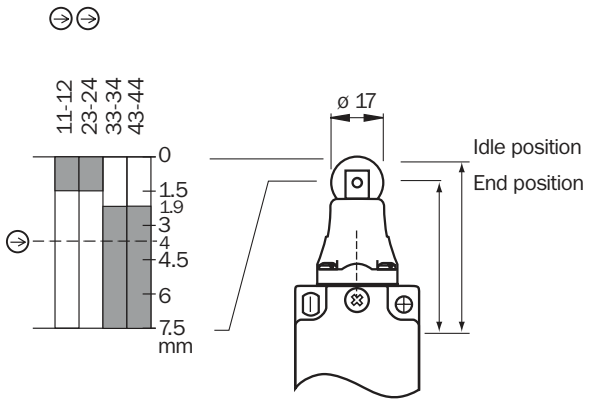
i110-PA123



Contacts open

Contacts closed

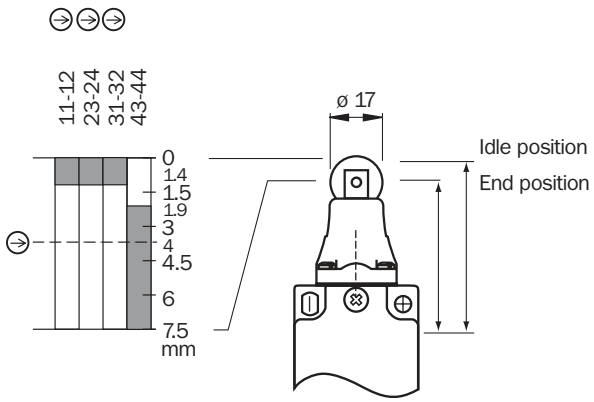
i110-PA223



Contacts open

Contacts closed

i110-PA313



Contacts open

Contacts closed

Accessories

Cable gland

Type	Part number
Cable gland M20	5 309 164

H

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- Housing material die-cast zinc
- Turning lever with plastic roller
- Slow- or snap-action switch
- Cable gland M20
- Design according to EN 50041
- Enclosure rating IP 66

H

Further information	Page
→ Actuator travel diagrams	H-16
→ Accessories	H-17
→ Services	A-0

Overview of technical specifications

Number of positive action normally closed contacts (depending on type)	1 / 2 / 3
Number of normally open contacts (depending on type)	1 / 2 / 1
Switching principle (depending on type)	Snap-action-switch / slow-action-switch
Type of actuator	Turning lever
Housing material	Metal
Enclosure rating	IP 66

Product description

- Turning lever design
- 4-pole contact element

In-system added value

Safety Relays UE 10 - 48

The UE 10 to 48 series of the Safety Relays allows simple integration of safety components into machinery or plant. → see L-0

Safety Controllers UE 100

The UE 100 series is designed for complex applications requiring a medium level of networking capability. It is possible to connect varying safety components. Their connections can be tailored to the relevant machines or plant via drag & drop software. → see M-0

Safety Bus Modules UE 1000

The series UE 1000, Safety Bus Modules, are designed for machinery and plant requiring a high level of networking and programmable logic controls (PLC). The modules enable the linking of safety components to the bus systems PROFIsafe or AS-I Safety at Work.
→ see N-0

Ordering information

Positive action normally closed	Normally open	Switching principle	Type	Part number
1	1	Snap-action-switch	i110-RA123	6 025 109
2	2	Slow-action-switch	i110-RA223	6 025 108
3	1	Slow-action-switch	i110-RA313	6 025 107

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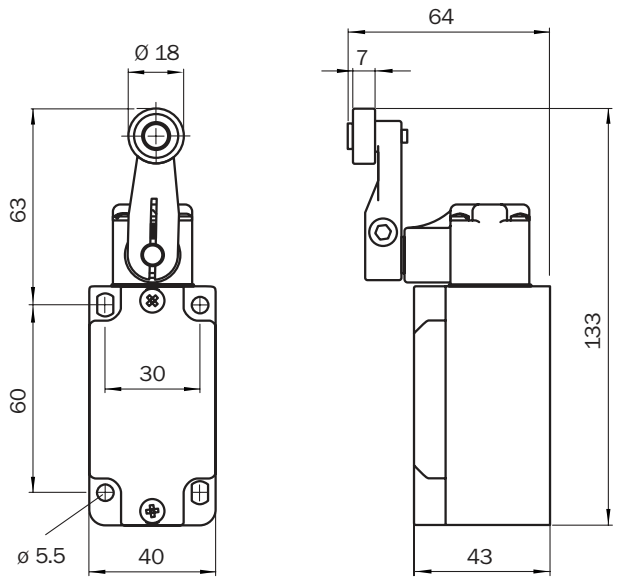
Detailed technical specifications

Type	i110-RA123	i110-RA223	i110-RA313
Housing material	Zinc die-cast		
Surface treatment	Varnished		
Enclosure rating	IP 66		
Mechanical life (relay contacts)	10 x 10^6 switching cycles		
Ambient operating temperature from ... to	–25 °C ... +80 °C		
Approach speed from ... to	3 m/min ... 15 m/min		
Switching principle	Snap-action-switch	Slow-action-switch	Slow-action-switch
Number of positive action normally closed contacts	1	2	3
Number of normally open contacts	1	2	1
Usage category in compliance with IEC 947-5-1	AC-15/DC-13		
Rated operating current (voltage)	3 A (230 V AC), 0.27 A (230 V DC)		
Rated insulation voltage U_i	250 V		
Impulse withstand voltage U_{imp}	2500 V AC		
Minimum switching current (switching voltage)	5 mA (5 V DC)		
Connection type	Cable gland		
Maximum connection cable cross-section	2.5 mm²		
Short circuit protection	F15		
Weight	0.52 kg		

Dimensional drawings



Dimensions in mm

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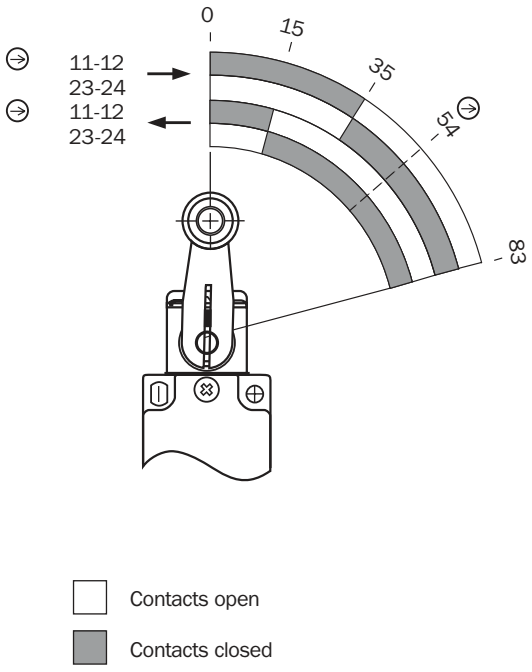
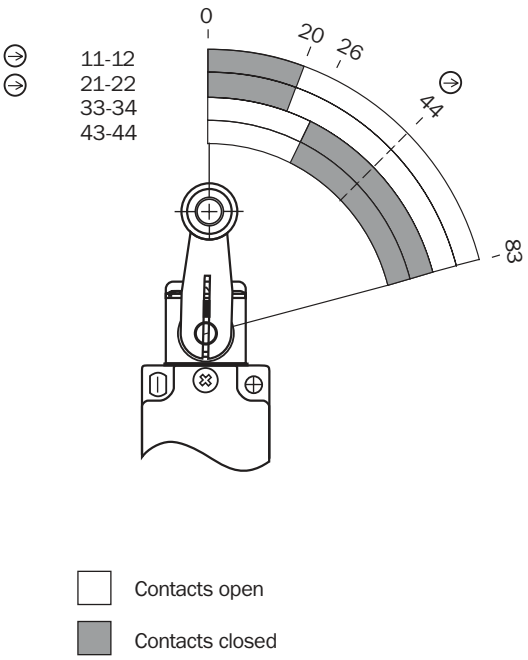
Actuator travel diagrams

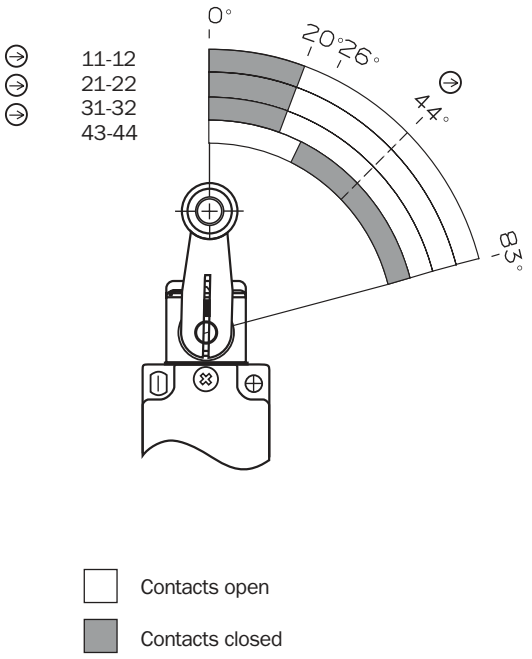
i110-RA123



i110-RA223



i110-RA313



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Accessories

Cable gland

Type	Part number
Cable gland M20	5 309 164

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Explanations of features

Positive action normally closed contacts/normally open contacts

Safety switches have contact elements in normally closed contact/normally open contact combinations. The normally closed contacts of a safety switch are of the “positive action” type, i.e. the forced movement of the normally closed contact ensures that the contacts are separated every time. Normally open contacts primarily serve as signalling contacts and must not be used for the safety circuit.

Housing material

The housing materials used can be separated into two large groups - “metals” and “plastics”. The metal housing materials are available as both anodised die-cast light metal and painted die-cast zinc versions. Glass-fibre reinforced thermoplastics are exclusively used for the plastic housings.

Shaft version

The safety hinge switches are designed to be directly fitted to pivotal protective devices. For this, either the solid shaft is used to replace the existing hinge pin, or the solid shaft or hollow shaft is connected directly to the existing hinge pin.

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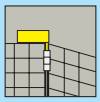
Safety hinge switches

Safety application	Number of positive action normally closed contacts/ normally open contacts [1]	Housing material [1]	Type of shaft [1]	Length of the shaft	Enclosure rating	Product	Page
	1 / 1 2 / 1	Plastic	Solid	55 mm 85 mm	IP 67	i10 H	I-2
	2 / 1	Metal	Hollow shaft	36.5 mm	IP 66	i110 H	I-5

[1] Explanation see page I-0

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- Housing material glass-fibre reinforced thermoplastic
- Solid stainless steel shaft
- Cable gland M16
- Adjustable switching point
- Miniature desing and design according to EN 50047
- Enclosure rating IP 67

Overview of technical specifications

Number of positive action normally closed contacts (depending on type)	1 / 2
Number of normally open contacts (depending on type)	1 / 1
Type of shaft	Solid
Length of the shaft (depending on type)	55 mm / 85 mm
Housing material	Plastic
Enclosure rating	IP 67

Product description

- Safety hinge switches for direct installation to pivotal protective devices
- Solid shaft design
- 2- or 3-pole contact element

In-system added value

Safety Relays UE 10 - 48

The UE 10 to 48 series of the Safety Relays allows simple integration of safety components into machinery or plant. ➜ see L-0

Safety Controllers UE 100

The UE 100 series is designed for complex applications requiring a medium level of networking capability. It is possible to connect varying safety components. Their connections can be tailored to the relevant machines or plant via drag & drop software. ➜ see M-0

Safety Bus Modules UE 1000

The series UE 1000, Safety Bus Modules, are designed for machinery and plant requiring a high level of networking and programmable logic controls (PLC). The modules enable the linking of safety components to the bus systems PROFIsafe or AS-I Safety at Work.

➜ see N-0

Ordering information

Positive action normally closed	Normally open	Type	Part number
1	1	i10-HA113	6 025 050
2	1	i10-HB213	6 025 053

Further information	Page
➜ Switching elements	I-4
➜ Mounting	I-4
➜ Accessories	I-4
➜ Services	A-0

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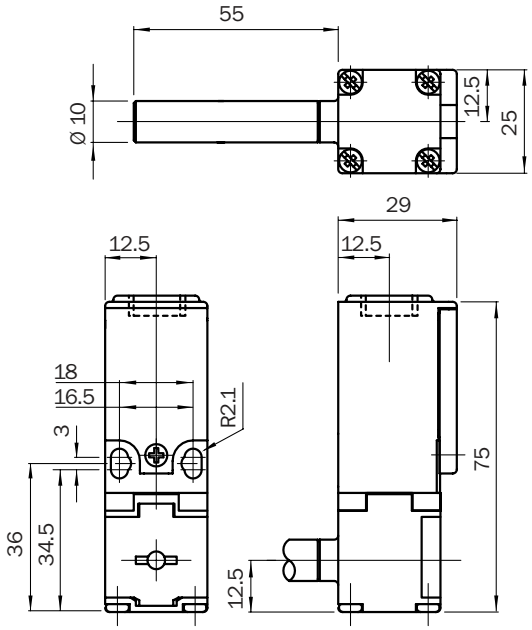
Detailed technical specifications

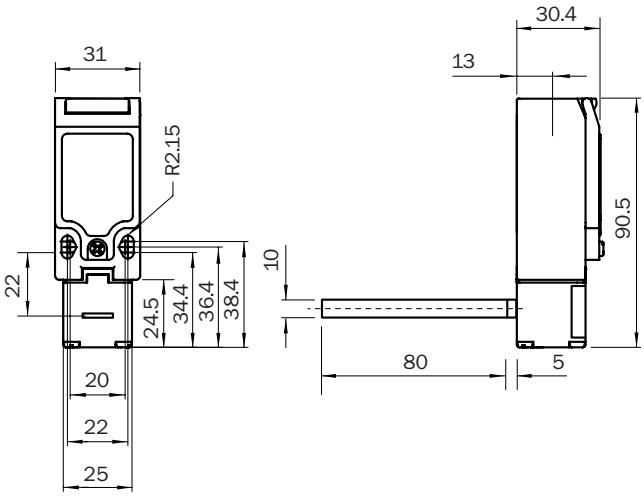
Type	i10-HA113	i10-HB213
Housing material	GFRP reinforced polyester	
Enclosure rating	IP 67	
Mechanical life (relay contacts)	10^6 switching cycles	
Ambient operating temperature from ... to	–20 °C ... +80 °C	
Minimum actuation torque	0.02 Nm	0.035 Nm
Switching principle	Slow-action-switch	
Switching angle	3° ... 11° adjustable	5° ... 14° adjustable
Number of positive action normally closed contacts	1	2
Number of normally open contacts	1	
Usage category in compliance with IEC 947-5-1	AC-15/DC-13	
Rated operating current (voltage)	1.5 A (240 V AC), 3 A (120 V AC), 0.55 A (240 V DC), 1.1 A (125 V DC)	3 A (240 V AC), 6 A (120 V AC), 1.1 A (240 V DC), 2.2 mA (125 V DC)
Rated insulation voltage U_i	250 V	
Impulse withstand voltage U_{imp}	2500 V AC	
Minimum switching voltage	5 V DC	
Minimum switching current (switching voltage)	5 mA (5 V DC)	
Connection type	Cable gland	
Weight	0.12 kg	0.17 kg

Dimensional drawings

i10-HA113



i10-HB213



Dimensions in mm

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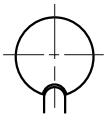
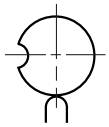
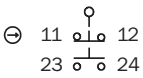
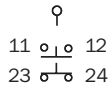
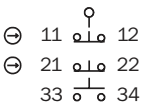
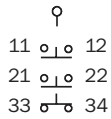
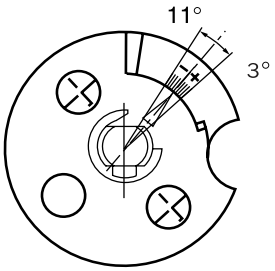
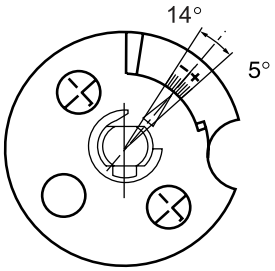
Switching elements

Not actuated	Actuated	
		
		11, 1 positive action NC contact + 1 NO contact
		21, 2 positive action NC contacts + 1 NO contact

Mounting





Adjusting the switching angle

The switching angle can be set in the range of 3° ... 11° (i10HA) or 5° ... 14° (i10HB).

After functional testing safety hinge switches and switch cams must be pinned together to ensure integral intermeshed connection.

Accessories

Cable gland

Type	Part number
Cable gland M16	5 309 163

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Overview of technical specifications

Number of positive action normally closed contacts	2
Number of normally open contacts	1
Type of shaft	Hollow shaft
Length of the shaft	36.5 mm
Housing material	Metal
Enclosure rating	IP 66

Product description

- Safety hinge switch for direct installation to pivotal protective devices
- Hollow shaft design
- 3-pole contact element

In-system added value

Safety Relays UE 10 - 48

The UE 10 to 48 series of the Safety Relays allows simple integration of safety components into machinery or plant. → see L-0

Safety Controllers UE 100

The UE 100 series is designed for complex applications requiring a medium level of networking capability. It is possible to connect varying safety components. Their connections can be tailored to the relevant machines or plant via drag & drop software. → see M-0

Safety Bus Modules UE 1000

The series UE 1000, Safety Bus Modules, are designed for machinery and plant requiring a high level of networking and programmable logic controls (PLC). The modules enable the linking of safety components to the bus systems PROFIsafe or AS-I Safety at Work.

→ see N-0

Ordering information

Positive action normally closed	Normally open	Type	Part number
2	1	i110-HA213	6 025 072

- Housing material die-cast zinc
- Hollow shaft stainless steel
- Cable gland M20
- Adjustable switching point
- Enclosure rating IP 66

Further information	Page
→ Technical specifications	I-6
→ Dimensional drawings	I-6
→ Switching elements	I-6
→ Mounting	I-7
→ Accessories	I-7
→ Services	A-0

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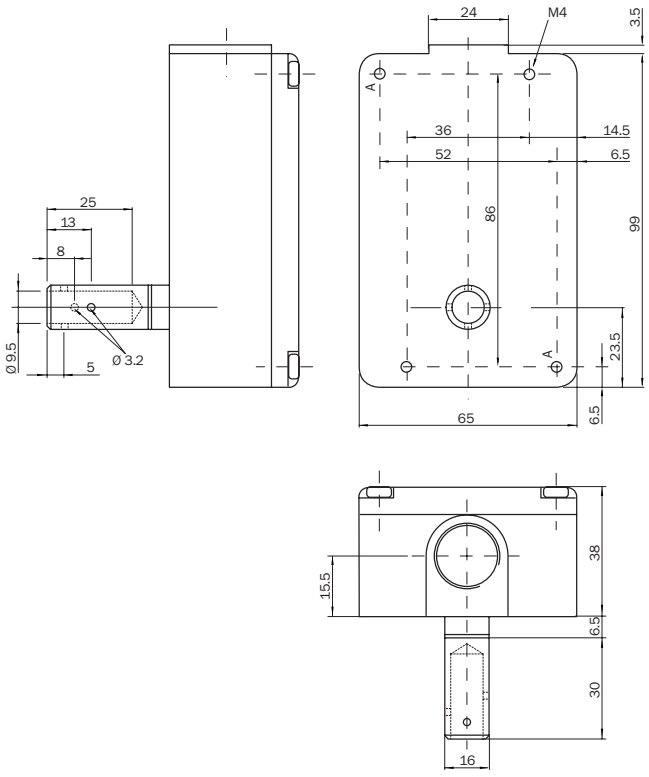
Detailed technical specifications

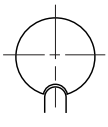
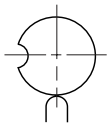
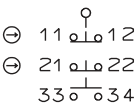
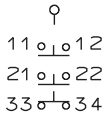
Housing material	Zinc die-cast
Surface treatment	Varnished
Enclosure rating	IP 66
Mechanical life (relay contacts)	10^6 switching cycles
Ambient operating temperature from ... to	–25 °C ... +80 °C
Minimum actuation torque	0.012 Nm
Switching principle	Slow-action-switch
Switching angle	5° ... 11° adjustable
Number of positive action normally closed contacts	2
Number of normally open contacts	1
Usage category in compliance with IEC 947-5-1	AC-15/DC-13
Rated operating current (voltage)	2 A (250 V AC), 5 A (100 V AC), 0.4 A (250 V DC), 2 A (24 V DC)
Rated insulation voltage U_i	250 V
Impulse withstand voltage U_{imp}	2500 V AC
Minimum switching voltage	5 V DC
Minimum switching current (switching voltage)	5 mA (5 V DC)
Connection type	Cable gland
Maximum connection cable cross-section	1.5 mm²
Short circuit protection	T6
Weight	0.45 kg

Dimensional drawings



Dimensions in mm

Switching elements

Not actuated	Actuated
	
	

21, 2 positive action NC contacts + 1 NO contact

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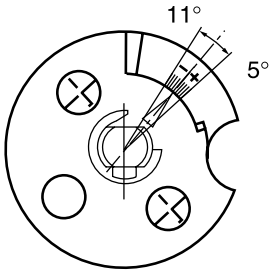
Mounting



Adjusting the switching angle

The switching angle can be set within the range of 5° ... 11°.

After functional testing safety hinge switches and switch cams must be pinned together to ensure integral intermeshed connection.

Accessories

Cable gland

Type	Part number
Cable gland M20	5 309 164

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Explanations of features

Sensor principle

Safety sensors can be sub-divided into the following groups according to the principle upon which they operate:

- Reed
  These safety sensors have reed-type contacts in the sensor, which are opened or closed in the actuator by means of solenoids/magnets.
- Transponder
  In the case of transponder-type sensors, a wireless communication link is effected between the sensor and the actuator. Each actuator is distinctly coded and is consequently a "unique copy".
  Data is transferred between the sensor and the actuator within the response zone of the sensor. The code of the actuator is scanned and compared with the code stored in the memory of the evaluation unit.
- Inductive
  Inductive safety sensors do not require any physical actuators. The sensors are actuated by metal (typically ST37 steel) in the response zone.

Control category

In accordance with the Directive on Machinery, machine manufacturers and system manufacturers must carry out a risk assessment analysis.

The EN 954-1 Standard will assist in determining the control category of the safety-related parts of the manufacturer's control system.

The illustrated safety sensors comply in each case with the requirements of the control category in accordance with EN 954-1.

Type of output

Safety sensors generally comprise 2 or 3 components:

- the sensor
- any possible actuator and
- an evaluation unit

The evaluation units are sub-divided into 2 categories, based upon the technologies utilised:

- with relay outputs and
- with semi-conductor outputs

Number of safe outputs

Apart from the control category and the type of output adopted, the number of safe outputs plays an important role when connecting safety sensors to the control system.

The number required is dependent upon the number of safe outputs of the evaluation unit.

External device monitoring (EDM)

See glossary page P-3

Restart interlock

See glossary page P-9

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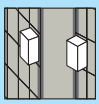
Safety sensors

Safety application	Sensor principle [1]	Type of output [1]	Control category according to EN954-1	Maximum number of sensors	Number of safe outputs	Restart interlock (RES) [1]	External device monitoring (EDM) [1]	Product	Page
	Reed	Relay	3	1	2	✔	✔	RE 300	J-2
			4	6	3	✔	✔	RE 4000	J-7
	Transponder	Relay	3	1	2	–	–	T 4000	J-12
		Semiconductor	3	1	2	–	–	T 4000 Compact	J-17
	Inductive	Relay	4	10	3	–	✔	IN 4000	J-21

[1] Explanation see page J-0

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- Actuator with coding
- Sensor and actuator with IP 67 enclosure rating
- Evaluation unit for all common operating voltages

J

Overview of technical specifications

Sensor principle	Reed
Control category according to EN 954-1	3
Number of safety sensors	1
Type of output	Relay
Number of safe outputs	2 NO
Number of application diagnostic outputs	1 NC

Product description

The RE 300 safety sensor system comprises of the following components:

- 1 sensor
- 1 magnetically coded actuator and
- 1 evaluation unit

The evaluation unit is further equipped with:

- 1 application diagnostic output (normally closed contact)
- 1 LED status display

Ordering information

System part	Cable length	Type	Part number
Evaluation unit	–	RE300-RA2	6 025 082
Sensor & actuator	3 m	RE300-DA03P	6 025 080
	10 m	RE300-DA10P	6 025 079

Further information	Page
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→ Response range	J-5
→ Internal circuitry	J-5
→ Mounting	J-6
→ Services	A-0

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8 010 889/15-10-04

Detailed technical specifications

Evaluation unit

Control category according to EN 954-1	3
Classification in compliance with IEC/EN 60947-5-3	PDF-S
Housing material	PC, polycarbonate
Enclosure rating	IP 20
Mechanical life (relay contacts)	10^6 switching cycles
Ambient operating temperature from ... to	–10 °C ... +55 °C
Shock resistance	30 g, 11 ms according to IEC 60068-2
Vibration resistance	10 Hz ... 55 Hz, 0.35 mm according to IEC 60068-2
Operating voltage	230 V AC (207 V AC ... 253 V AC) [1]
Operating voltage	110 V AC (99 V AC ... 121 V AC) [1]
Operating voltage	24 V AC/DC (21.6 V AC/DC ... 26.4 V AC/DC) [2]
Number of safety sensors	1
Impulse withstand voltage U_{imp}	4000 V AC
Type of output	Relay
Number of safe outputs	2
Number of application diagnostic outputs	1 NC
Short circuit protection	F5 (AC), F3 (DC)
Usage category in compliance with IEC 947-5-1	AC-15/DC-13
Rated operating current (voltage)	4 A (250 V AC), 2 A (30 V DC)
Minimum switching current (switching voltage)	10 mA (10 V DC)
Minimum switching current (switching voltage)	10 mA (10 V AC)
Maximum switching current (switching voltage)	2 A (30 V DC)
Maximum switching current (switching voltage)	4 A (250 V AC)
Maximum switching power	1000 VA (cos phi = 1)
Weight	0.503 kg
Out indication	✔
Power indication	✔
Error indication	–
Status display	–
Maximum switch-on time	70 ms
Switching delay from state change	25 ms
Maximum cable resistance at sensor input	75 Ohm
External device monitoring	✔
Restart interlock	✔

[1] When using the 110 V AC or 230 V AC operating voltage, protective earth conductor PE must be connected to the -/PE terminal.

[2] PELV earthed safety extra-low voltage. When using terminals +/-, terminal -/PE must be connected to the protective earth conductor PE.

Continued on next page

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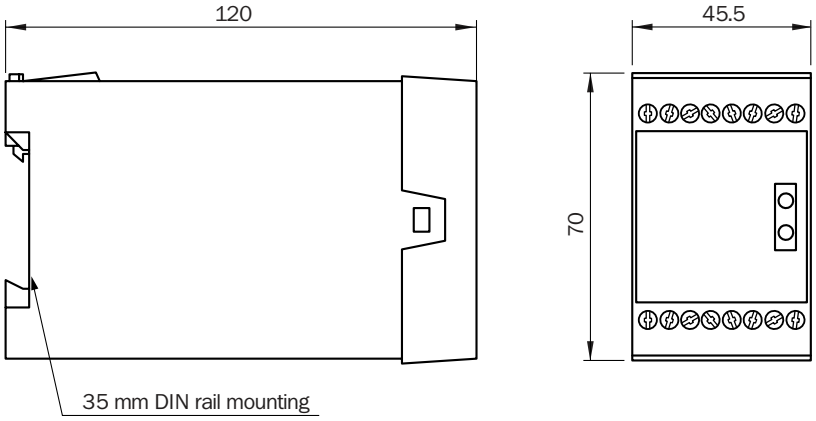
Sensor & actuator

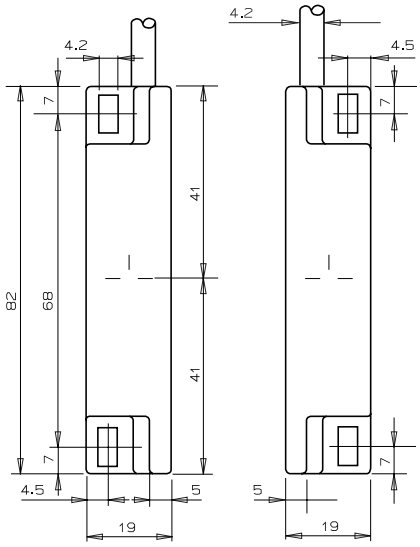
Type	RE300-DA03P	RE300-DA10P
Sensor principle	Reed	
Housing material	ABS shape	
Enclosure rating	IP 67	
Ambient operating temperature from ... to	–10 °C ... +55 °C	
Shock resistance	30 g, 11 ms according to IEC 60068-2	
Vibration resistance	10 Hz ... 55 Hz, 0.5 mm according to IEC 60068-2	
Weight	0.168 kg	0.322 kg
Switch-on distance	5 mm	
Switch-off distance	15 mm	
Safe switch-off distance	15 mm	
Minimum approach speed	17 mm/s	
Cable length	3 m	10 m
Cable material	PVC	

Dimensional drawings

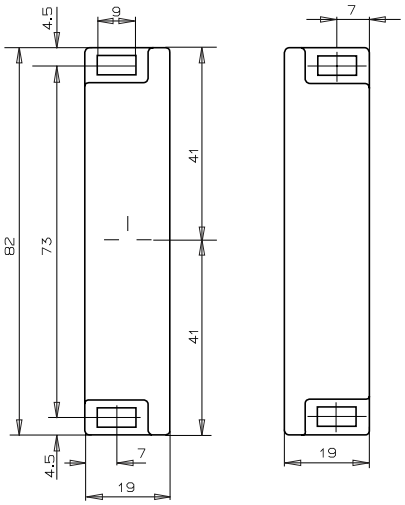
Evaluation unit



Sensor



Actuator



Dimensions in mm

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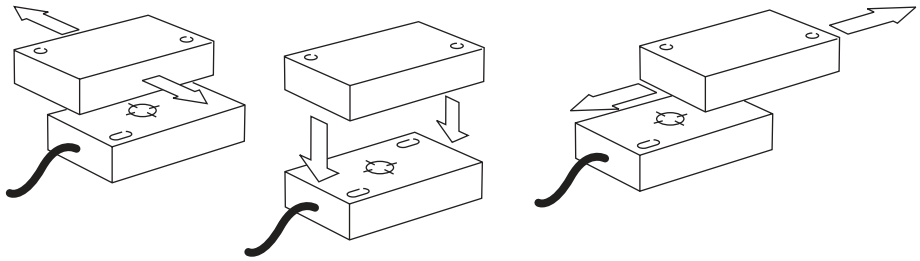
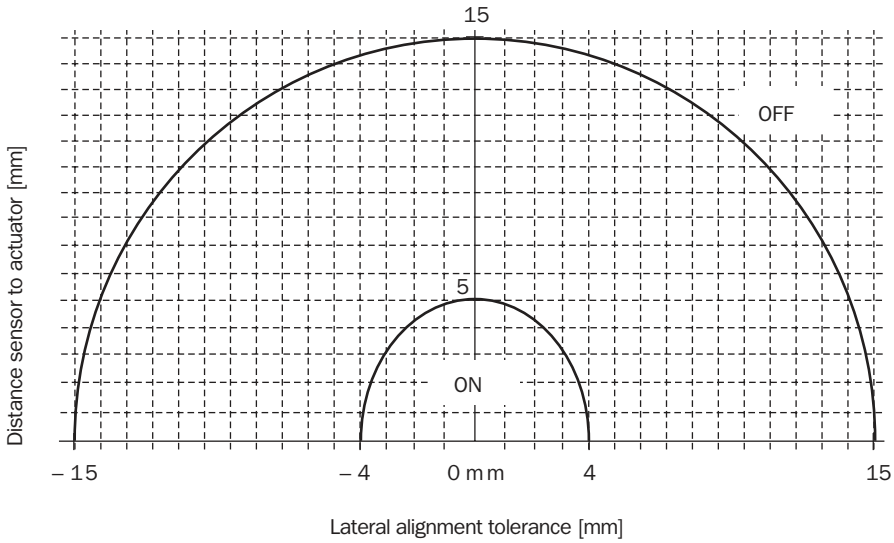
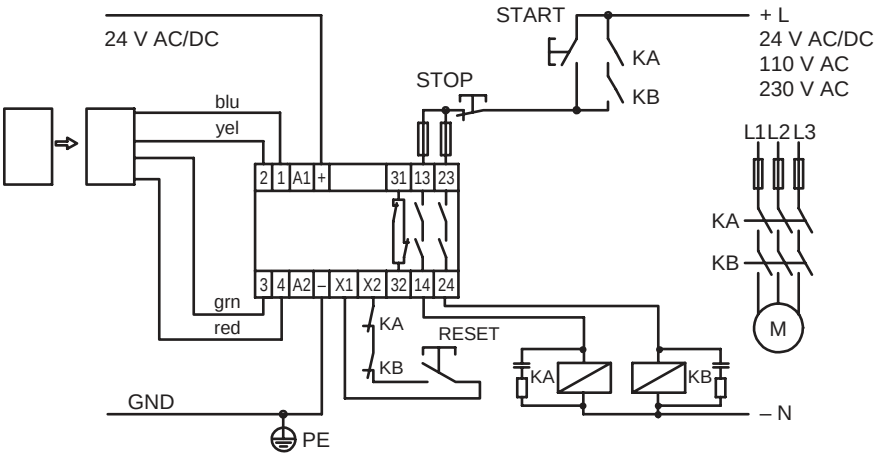
Response range





Internal circuitry



Example of wiring 24 V AC/DC with contactor control and static reset

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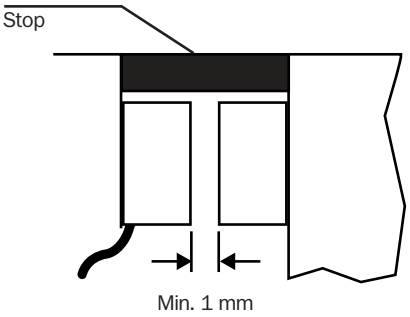
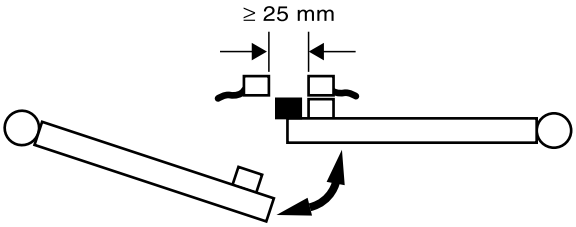
Mounting



Minimum distance between sensor and actuator



Minimum distance to neighbouring sensors

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Overview of technical specifications

Sensor principle	Reed
Control category according to EN 954-1	Up to cat. 4
Number of safety sensors from ... to	2 ... 6
Type of output	Relay
Number of safe outputs	3 NO
Number of application diagnostic outputs	1 x relay
Number of delayed safe outputs	1 NO

Product description

The RE 4000 safety sensor system comprises of the following components:
- 2 to 6 sensors
- 2 to 6 magnetically coded actuators and
- 1 evaluation unit

The evaluation unit is further equipped with:
- 1 application diagnostic output (normally closed contact) and
- 1 delayed output (normally open contact) with adjustable time delay from 0.6 s to 30 s
- 2 LED status displays and
- 6 LEDs for status display of each individual sensor

Ordering information

System part	Cable length	Type	Part number
Evaluation unit	–	RE4000-RB3	6 025 083
Sensor & actuator	3 m	RE300-DA03P	6 025 080
	10 m	RE300-DA10P	6 025 079

- Actuator with coding
- Sensor and actuator with IP 67 enclosure rating
- Evaluation unit for all common operating voltages
- Evaluation unit for monitoring 2 to 6 independently actuated protective devices
- Adjustable release delay from 0.6 to 30 s for additional safety output

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Further information	Page
→ Technical specifications	J-8
→ Dimensional drawings	J-9
→ Response range	J-10
→ Internal circuitry	J-11
→ Mounting	J-11
→ Services	A-0

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Detailed technical specifications

Evaluation unit

Control category according to EN 954-1	Up to cat. 4
Classification in compliance with IEC/EN 60947-5-3	PDF-S
Housing material	PC, polycarbonate
Enclosure rating	IP 20
Mechanical life (relay contacts)	10^6 switching cycles
Ambient operating temperature from ... to	–10 °C ... +55 °C
Shock resistance	30 g, 11 ms according to IEC 60068-2
Vibration resistance	10 Hz ... 55 Hz, 0.35 mm according to IEC 60068-2
Operating voltage	230 V AC (196 V AC ... 253 V AC) [1]
Operating voltage	110 V AC (94 V AC ... 121 V AC) [1]
Operating voltage	24 V AC/DC (20.4 V AC/DC ... 27.6 V AC/DC) [2]
Number of safety sensors from ... to	2 ... 6
Impulse withstand voltage U_{imp}	4000 V AC
Type of output	Relay
Number of safe outputs	3 NO
Number of application diagnostic outputs	1 x relay
Number of delayed safe outputs	1 NO
Off delay min ... max	0.6 s ... 30 s
Short circuit protection	F5 (AC), F3 (DC)
Usage category in compliance with IEC 947-5-1	AC-15/DC-13
Rated operating current (voltage)	2 A (240 V AC), 1 A (24 V DC)
Minimum switching current (switching voltage)	10 mA (10 V DC)
Minimum switching current (switching voltage)	10 mA (10 V AC)
Maximum switching current (switching voltage)	2 A (30 V DC)
Maximum switching current (switching voltage)	4 A (250 V AC)
Maximum switching power	1000 VA (cos phi = 1)
Weight	0.675 kg
Out indication	✔
Power indication	✔
Error indication	✔
Status display	–
Sensor display	✔
Maximum switch-on time	50 ms
Switching delay from state change	25 ms
Maximum cable resistance at sensor input	50 Ohm
External device monitoring	✔
Restart interlock	✔

[1] On the usage of 110 V AC or 230V AC operating voltage, the -V/PE terminal must be connected to the PE earth conductor.

[2] PELV earthed safety extra-low voltage. On usage of +V/-V terminals, the -V/PE terminal must be connected to the PE earth conductor.

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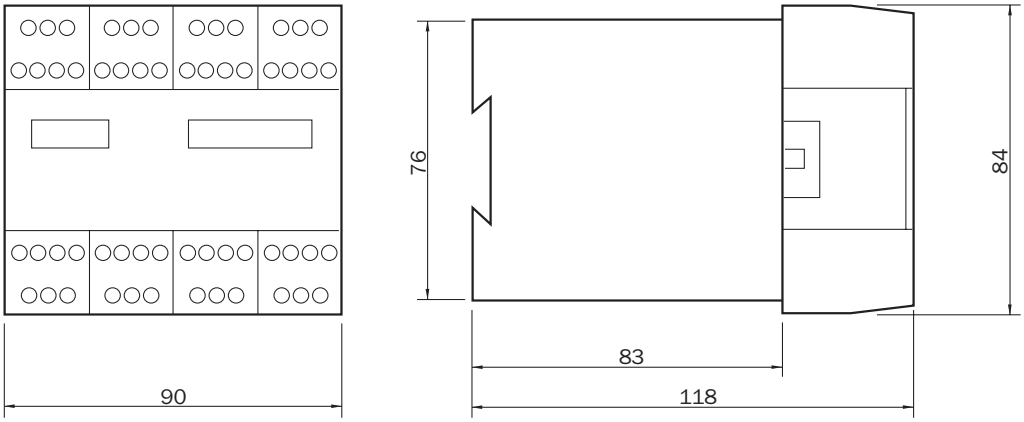
Sensor & actuator

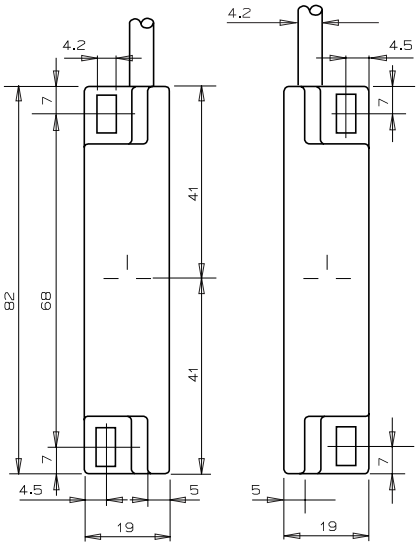
Type	RE300-DA03P	RE300-DA10P
Sensor principle	Reed	
Housing material	ABS shape	
Enclosure rating	IP 67	
Ambient operating temperature from ... to	–10 °C ... +55 °C	
Shock resistance	30 g, 11 ms according to IEC 60068-2	
Vibration resistance	10 Hz ... 55 Hz, 0.5 mm according to IEC 60068-2	
Weight	0.168 kg	0.322 kg
Switch-on distance	5 mm	
Switch-off distance	15 mm	
Safe switch-off distance	15 mm	
Minimum approach speed	17 mm/s	
Cable length	3 m	10 m
Cable material	PVC	

Dimensional drawings

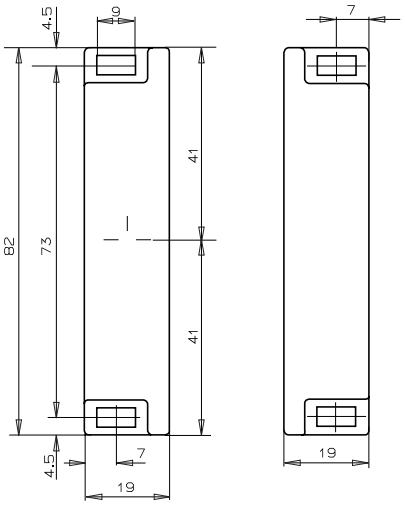
Evaluation unit



Sensor



Actuator



Dimensions in mm

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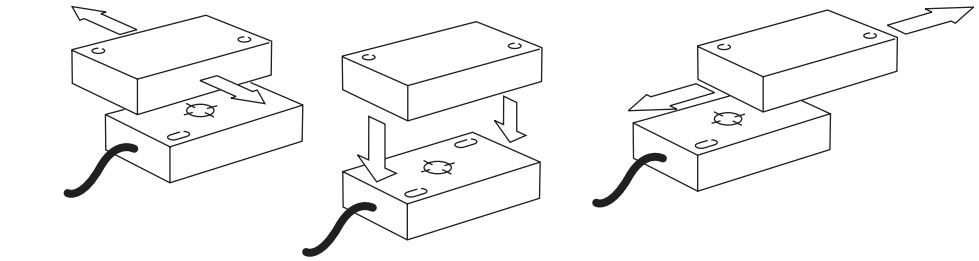
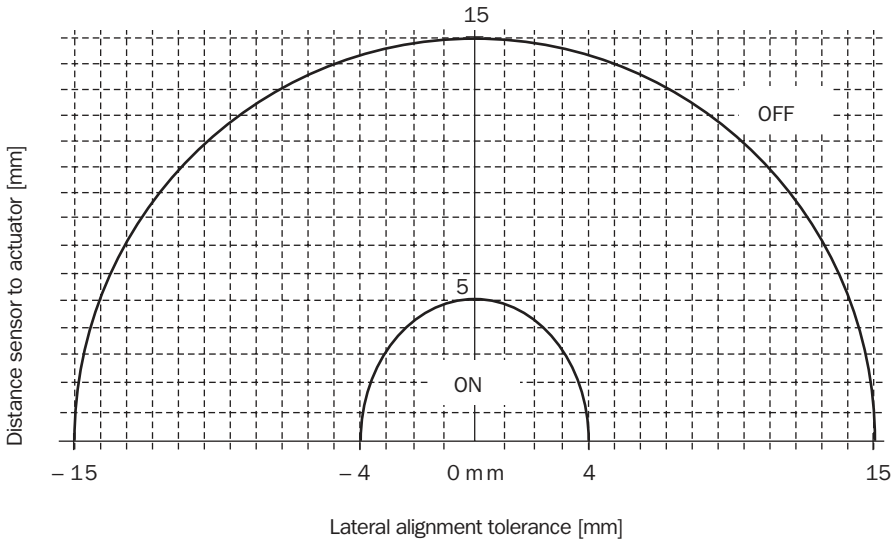
Response range





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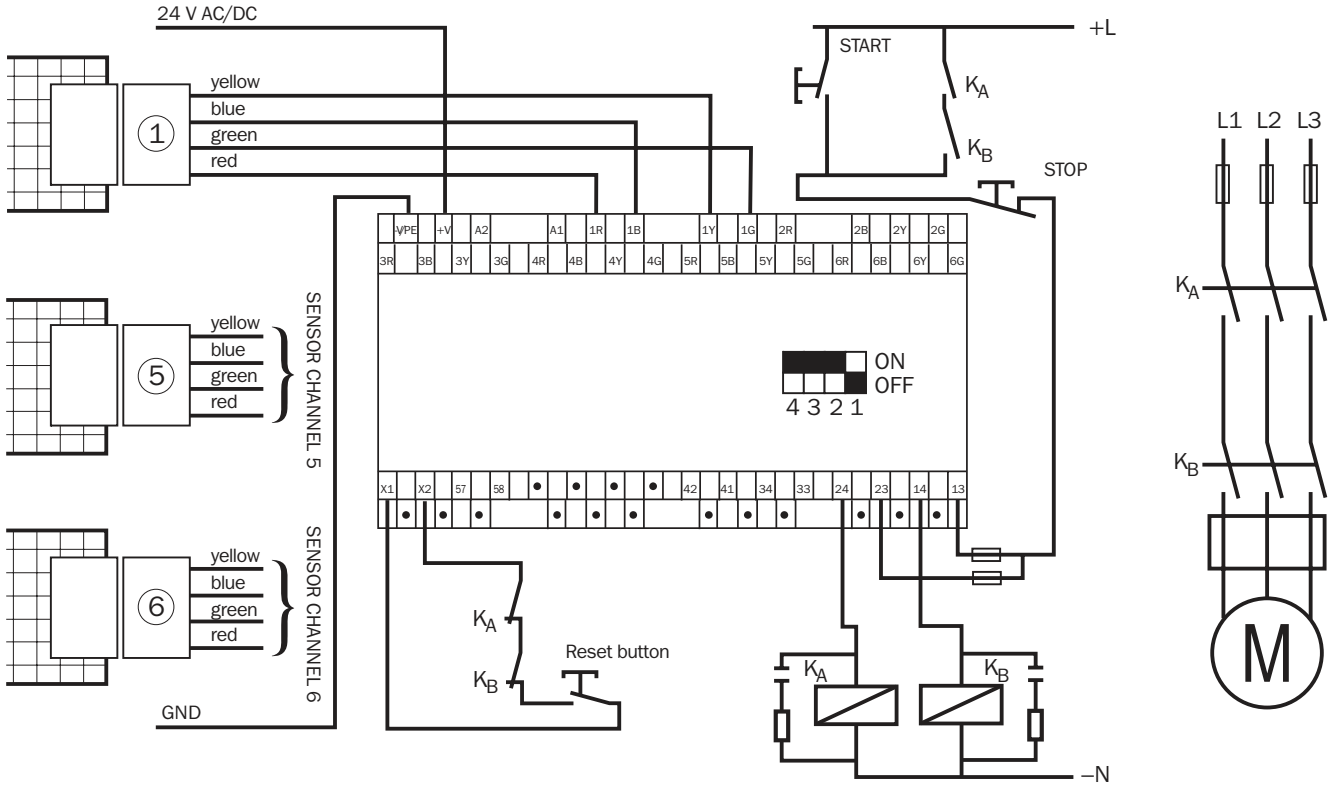
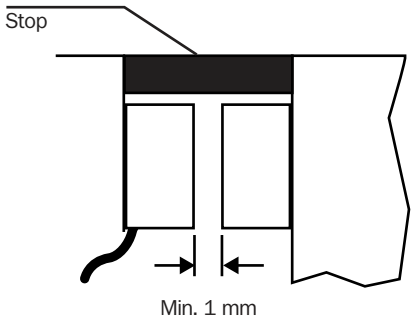
Internal circuitry

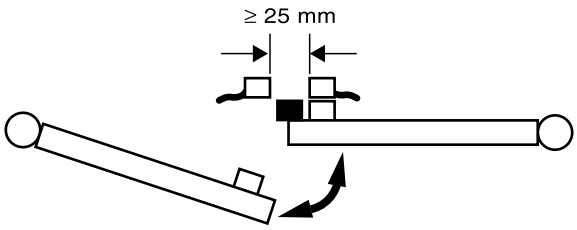


Example wiring for 24 V AC/DC with 3 sensors, with external device monitoring and static reset

Mounting



Minimum distance between sensor and actuator



Minimum distance to neighbouring sensors

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- High protection against manipulation through individually coded actuator
- Small compact design of sensor and actuator
- Sensor and actuator with IP 67 protection

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Overview of technical specifications

Sensor principle	Transponder
Control category according to EN 954-1	3
Number of safety sensors	1
Type of output	Relay
Number of safe outputs (N/O)	2
Number of application diagnostic outputs	1 x semiconductor, p-switching

Product description

The T 4000 safety sensor system comprises of the following components:

- 1 sensor
- 1 coded actuator (unique copy)
- 1 evaluation unit

The evaluation unit is further equipped with:

- 1 solid-state application diagnostic output
- 2 LED status displays

Ordering information

System part	Connection type	Cable length	Type	Part number
Evaluation unit	Plug-in terminals	–	T4000-1 RBA 01	6 012 147
Sensor	Connector	–	T4000 DNAC	6 021 912
	Cable	5 m	T4000 DNA05P	6 012 144
		10 m	T4000 DNA10P	6 012 145
		15 m	T4000 DNA15P	6 012 146
Actuator	–	–	T4000-1 KBA	5 306 531

Connecting cable not supplied with delivery

Further information	Page
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→ Response range	J-15
→ Internal circuitry	J-16
→ Accessories	J-16
→ Services	A-0

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Detailed technical specifications

Evaluation unit

Control category according to EN 954-1	3
Classification in compliance with IEC/EN 60947-5-3	PDF-M
Housing material	Plastic PA6.6
Enclosure rating	IP 20
Mechanical life (relay contacts)	10 x 10^6 switching cycles
Ambient operating temperature from ... to	0 °C ... +55 °C
Protection class	3
Shock resistance	30 g, 11 ms according to IEC 60068-2
Vibration resistance	10 Hz ... 55 Hz, 0.5 mm according to IEC 60068-2
Operating voltage	24 V AC (21 V AC ... 27 V AC)
Number of safety sensors	1
Connection type	Plug-in terminals
Rated insulation voltage U_i	63 V
Impulse withstand voltage U_{imp}	1500 V AC
Type of output	Relay
Number of safe outputs	2 NO
Number of application diagnostic outputs	1 x semiconductor, p-switching
Short circuit protection	F6.3
Usage category in compliance with IEC 947-5-1	AC-12/DC-12, AC-140/DC-13
Rated operating current (voltage)	0.3 A (60 V AC) 50 Hz, 2 A (30 V AC) 50 Hz, 0.3 A (60 V DC), 4 A (30 V DC)
Minimum switching current (switching voltage)	1 mA (0.1 V DC)
Maximum switching power	60 VA
Weight	0.327 kg
Out indication	✔
Power indication	–
Error indication	✔
Status display	✔
Monitoring time minimum dwell time	0.5 s
Maximum switch-on time	3000 ms
Switching delay from state change	180 ms
External device monitoring	–
Restart interlock	–

Continued on next page

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Sensor

Type	T4000 DNAC	T4000 DNA05P	T4000 DNA10P	T4000 DNA15P
Sensor principle	Transponder			
Housing material	Fortron, glass-fibre reinforced thermoplastic			
Enclosure rating	IP 67			
Ambient operating temperature from ... to	–25 °C ... +70 °C			
Connection type	Connector	Cable		
Size of the cable gland	M8			
Weight	0.12 kg	0.25 kg	0.39 kg	0.53 kg
Switch-on distance	6 mm (min. 5 mm), cable length 0 ... 25 m, centre offset m = 0 [1]			
Switch-on distance	4.8 mm (min. 4 mm), cable length 25 ... 50 m, centre offset m = 0 [1]			
Switch-off distance	7 mm, cable length 0 ... 25 m, centre offset m = 0 [1]			
Switch-off distance	6 mm, cable length 25 ... 50 m, centre offset m = 0 [1]			
Safe switch-off distance	23 mm, cable length 0 ... 25 m, centre offset m = 0 [1]			
Monitoring time minimum dwell time	0.5 s			
Cable length	–	5 m	10 m	15 m
Maximum cable length	50 m			
Cable material	–	PVC		

[1] These values only apply for the protruding and flush installation of the sensor and the actuator in aluminium.

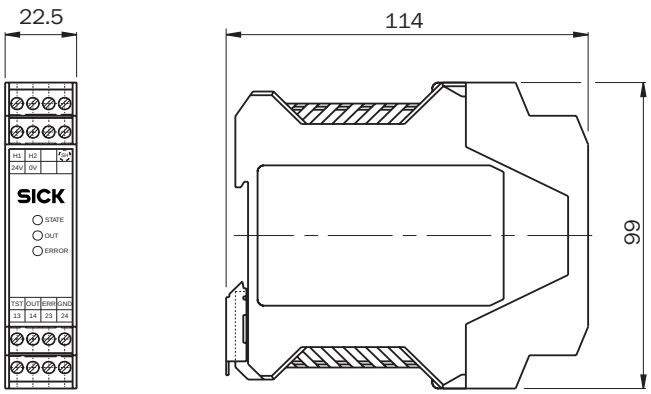
Actuator

Housing material	Fortron, glass-fibre reinforced thermoplastic
Enclosure rating	IP 67
Ambient operating temperature from ... to	–25 °C ... +70 °C
Weight	0.03 kg
Monitoring time minimum dwell time	0.5 s

Dimensional drawings

J

Evaluation unit



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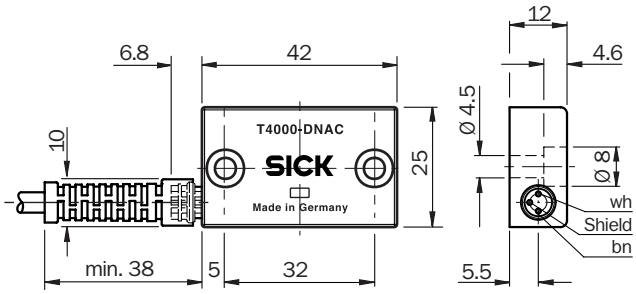
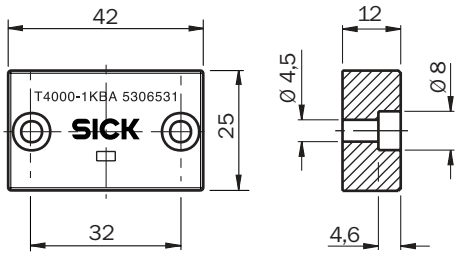
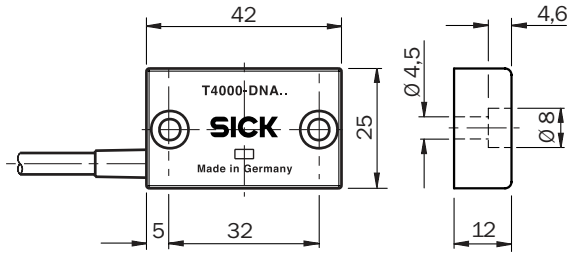
Sensor, connector



Actuator



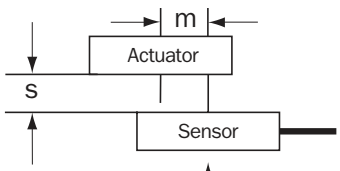
Sensor, cable



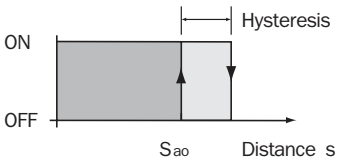
Dimensions in mm

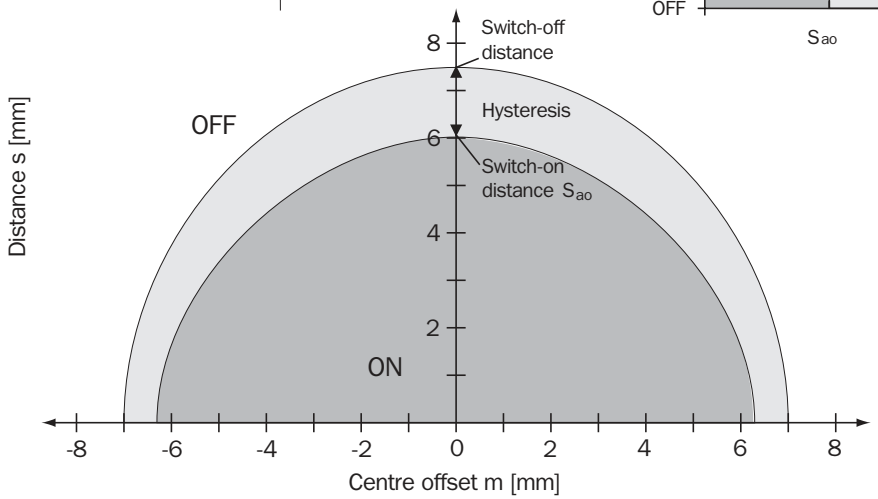
Response range

Observe the safe switch-off distance s_{ar} = 23 mm
Relay outputs are safely deactivated



Output stat e





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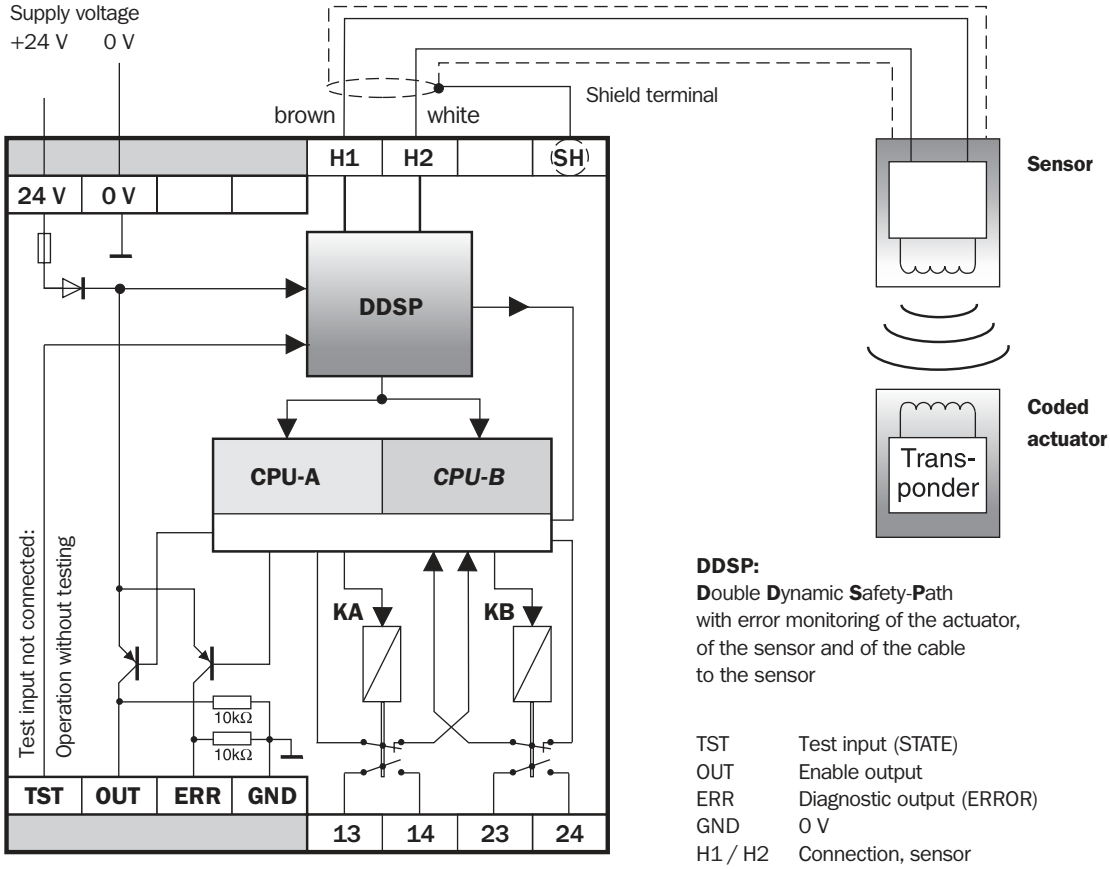
Internal circuitry



DDSP:
Double **D**ynamic **S**afety-**P**ath
with error monitoring of the actuator,
of the sensor and of the cable
to the sensor

TST	Test input (STATE)
OUT	Enable output
ERR	Diagnostic output (ERROR)
GND	0 V
H1 / H2	Connection, sensor
13 / 14	Connection, NO contact 1, enable contact safety relay
23 / 24	Connection, NO contact 2, enable contact safety relay

Accessories

J

Connection cable

Cable length	Type	Part number
20 m	T4000-DNA20C	6 021 913
25 m	T4000-DNA25C	6 021 914
50 m	T4000-DNA50C	6 021 915

Safety screws

Type	Part number
Safety screws T4000	5 309 170

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Overview of technical specifications

Sensor principle	Transponder
Control category according to EN 954-1	3
Number of safety sensors	1
Type of output	Semiconductor, p-switching
Number of safe outputs	2

Product description

The T 4000 Compact safety sensor system comprises of the following components:

- 1 sensor with integrated evaluation unit and
- 1 coded actuator

The sensor with integrated evaluation unit is further equipped with:

- 1 solid-state application diagnostic output
- 2 LED status displays

In-system added value

Possible connections to

- SICK UE 10 safety relays series (see table) → see L-0
- SICK UE 440 and UE 470 safety controllers → see M-0
- SICK UE 4100 PROFIsafe bus modules → see N-0

Ordering information

System part	Connection type	Type	Part number
Evaluation unit & sensor	Connector	T4000-2 DRNAC	6 022 052
Actuator	–	T4000-1 KBA	5 306 531

Connecting cable not supplied with delivery

- High protection against manipulation through individually coded actuator
- Sensor response range up to 20 mm
- Compact design of the actuator
- Sensor with integrated evaluation unit
- Sensor with LED status display - directly on the protective device
- Sensor with integrated evaluation unit and actuator with IP 67 enclosure rating

J

Further information	Page
→ Technical specifications	J-18
→ Dimensional drawings	J-19
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Detailed technical specifications

Evaluation unit & sensor

Sensor principle	Transponder
Control category according to EN 954-1	3
Classification in compliance with IEC/EN 60947-5-3	PDF-M
Housing material	Plastic PTB VO GF20
Enclosure rating	IP 67
Ambient operating temperature from ... to	0 °C ... +55 °C
Protection class	2
Shock resistance	30 g, 11 ms according to IEC 60068-2
Vibration resistance	10 Hz ... 55 Hz, 0.5 mm according to IEC 60068-2
Operating voltage	18 V DC ... 27 V DC
Number of safety sensors	1
Connection type	Connector
Size of the cable gland	M12
Rated insulation voltage U_i	30 V
Impulse withstand voltage U_{imp}	1500 V AC
Type of output	Semiconductor, p-switching
Number of safe outputs	2
Short circuit protection	F0.4
Usage category in compliance with IEC 947-5-1	DC-13
Rated operating current (voltage)	0.4 A (24 V DC)
Maximum switching power	2 VA
Weight	0.4 kg
Out indication	✔
Power indication	–
Error indication	✔
Status display	✔
Switch-on distance	20 mm
Switch-off distance	23 mm
Safe switch-off distance	40 mm
Monitoring time minimum dwell time	0.5 s
Maximum switch-on time	3 s
Switching delay from state change	180 ms
Discrepancy time of the safety outputs	120 ms
Cable length	300 m

Actuator

Housing material	Fortron, glass-fibre reinforced thermoplastic
Enclosure rating	IP 67
Ambient operating temperature from ... to	–25 °C ... +70 °C
Weight	0.03 kg
Monitoring time minimum dwell time	0.5 s

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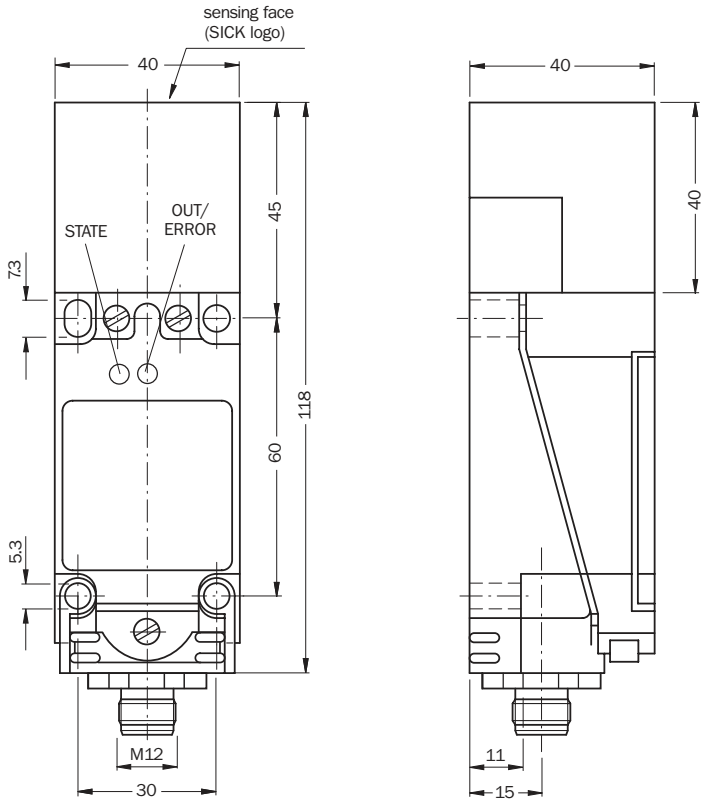
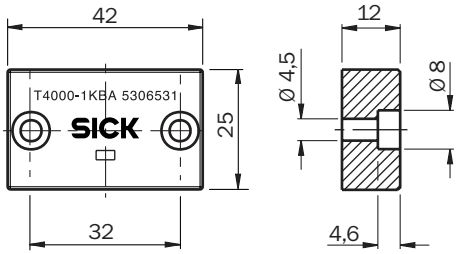
Dimensional drawings

Evaluation unit & sensor



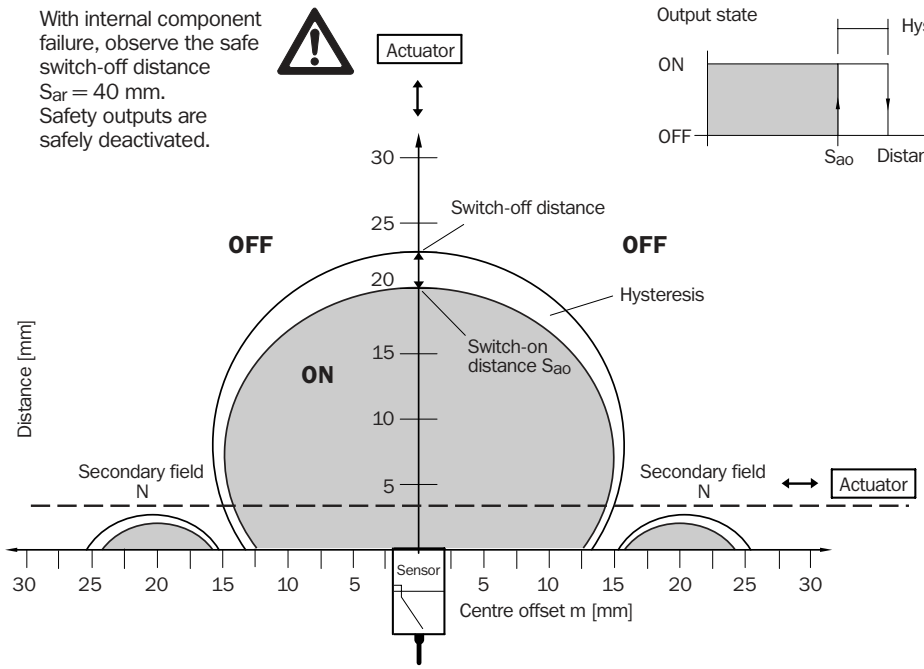
Actuator



Dimensions in mm

Response range

With internal component failure, observe the safe switch-off distance S_{ar} = 40 mm. Safety outputs are safely deactivated.



A minimum distance of s = 3 mm must be maintained in the case of lateral approach in order to prevent entry into the operating range of the secondary fields.

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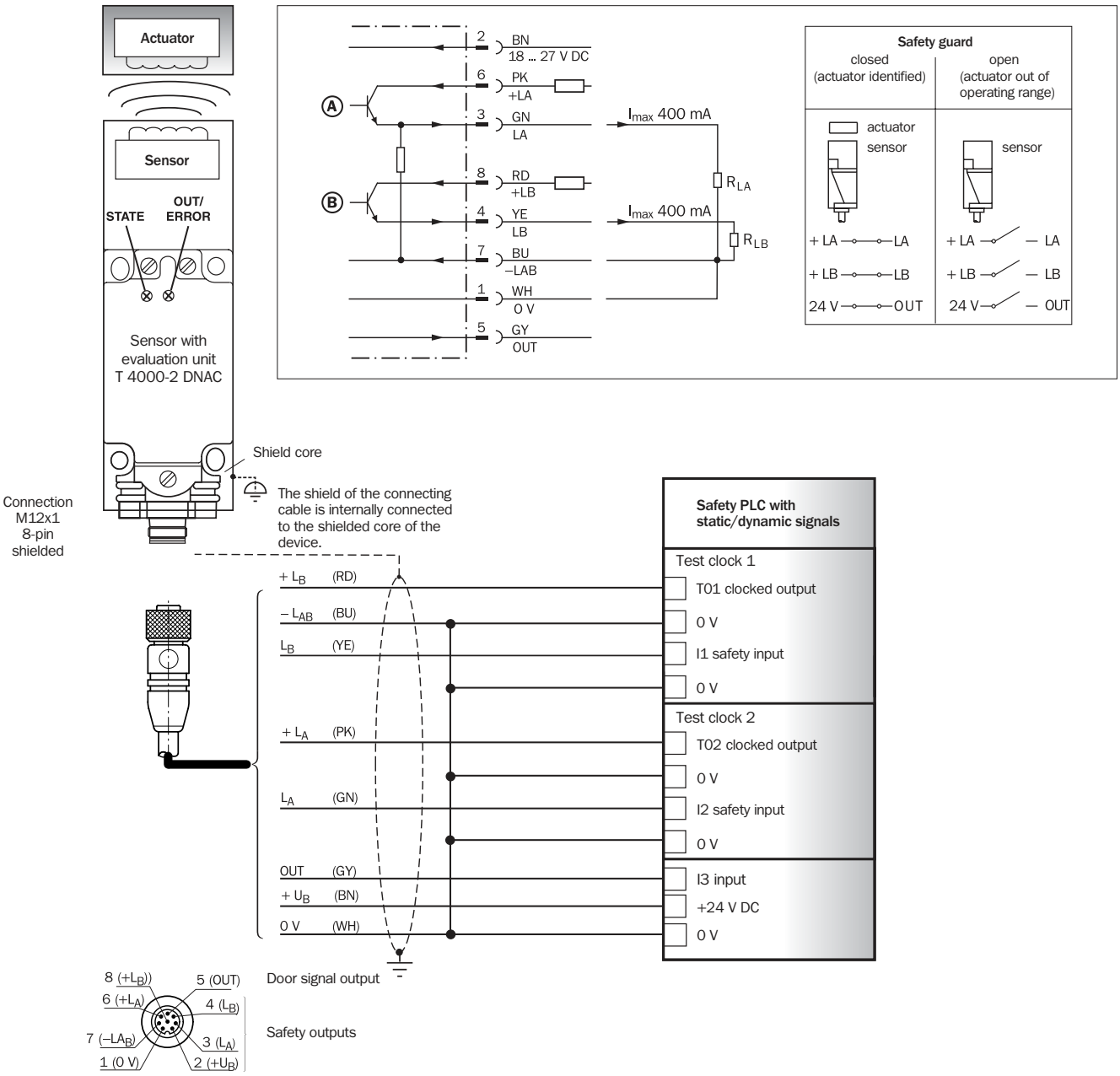
Internal circuitry



Accessories

Connection cable

Cable length	Type	Part number
5 m	DOL-1208-G05MA	6 020 993
10 m	DOL-1208-G10MA	6 022 152
15 m	DOL-1208-G15MA	6 022 153
30 m	DOL-1208-G30MA	6 022 242

Safety screws

Type	Part number
Safety screws T4000	5 309 170

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Overview of technical specifications

Sensor principle	Inductive
Control category according to EN 954-1	4
Number of safety sensors from ... to	1 ... 10
Type of output	Relay
Number of safe outputs	3 NO
Number of application diagnostic outputs	2 x relay

Product description

The safety sensor IN 4000 is an inductive safety sensor that is activated by metal (e.g. steel ST37). It does not, therefore, require a separate coded actuator.
Due to the non-contact form of operation, this sensor has advantages in that it is straightforward to adjust and install. It also has increased resistance to shock and vibration.
The response range of the sensor is monitored spatially and over time. In this way, increased protection against tampering is provided.

In-system added value

- Possible connections to SICK UE 4100 PROFIsafe bus modules → see N-0

Ordering information

System part	Connection type	Type	Part number
Evaluation unit	–	IN40-R1212B	6 027 390
Sensor	Connector	IN40-D0101K	6 027 389

- Control category 4 according to EN 954-1
- No actuator necessary
- Sensor with LED status display
- Safe cascading of the sensors possible
- Direct connection of the sensors to safe PLC
- Connection of up to 10 sensors to one evaluation unit

J

Further information	Page
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→ Response range	J-23
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→ Accessories	J-25
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Detailed technical specifications

Evaluation unit

Control category according to EN 954-1	4
Housing material	PA
Enclosure rating	IP 20
Ambient operating temperature from ... to	0 °C ... +70 °C
Operating voltage	24 V DC (19.2 V DC ... 30 V DC)
Number of safety sensors from ... to	1 ... 10
Type of output	Relay
Number of safe outputs	3 NO
Number of application diagnostic outputs	2 NC
Usage category in compliance with IEC 947-5-1	AC-15/DC-13
Rated operating current (voltage)	3 A (250 V AC), 3 A (24 V DC)
Weight	350 g
Out indication	✔
Power indication	✔
Error indication	✔
Status display	✔
Sensor display	✔
Maximum switch-on time	1000 ms
Switching delay from state change	210 ms
External device monitoring	✔
Restart interlock	–

Sensor

Sensor principle	Inductive
Control category according to EN 954-1	4
Classification in compliance with IEC/EN 60947-5-3	PDF-M
Housing material	PPE/zink-die cast
Enclosure rating	IP 67
Ambient operating temperature from ... to	–25 °C ... +70 °C
Protection class	3
Shock resistance	According to EN 60947-5-3
Vibration resistance	According to EN 60947-5-3
Operating voltage	24 V DC (19.2 V DC ... 30 V DC)
Connection type	Connector
Size of the cable gland	M12
Weight	0.22 g
Power indication	✔
Status display	✔
Switch-on distance from ... to	10 mm ... 15 mm [1)]
Safe switch-off distance	30 mm [1)]
Monitoring time minimum dwell time	0.2 s
Switching delay from state change	20 ms

[1)] Dependent on material. The indicated values refer to steel ST37

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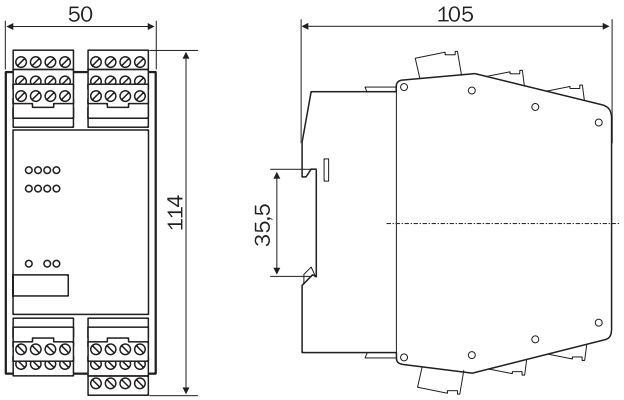
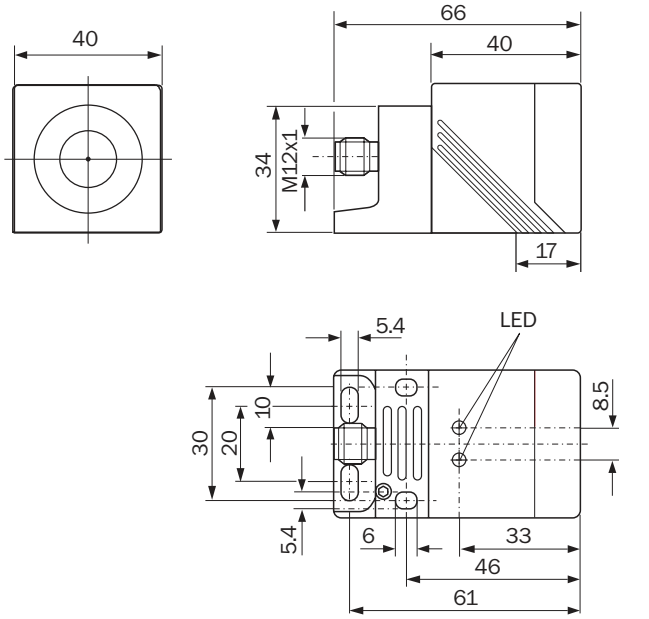
Dimensional drawings

Evaluation unit

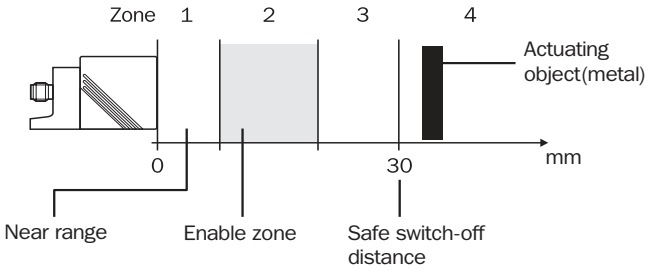


Sensor



Dimensions in mm

Response range



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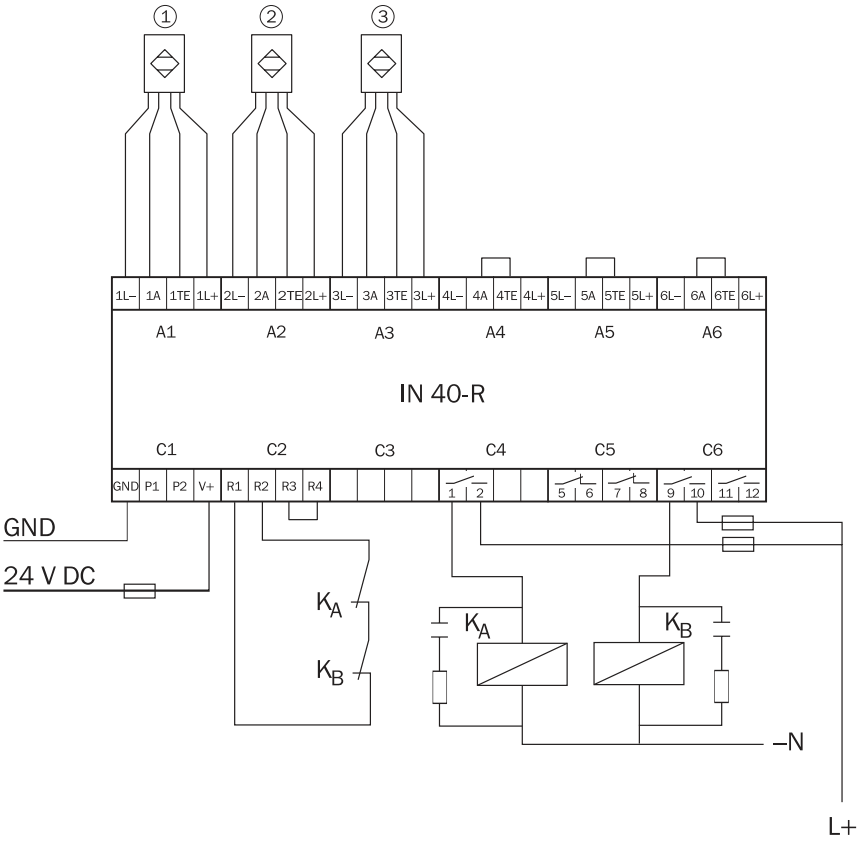
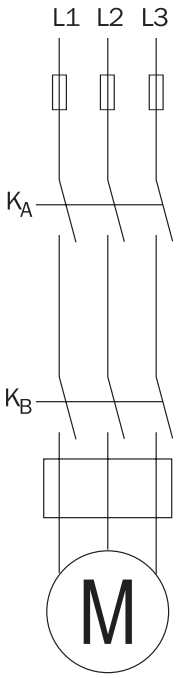
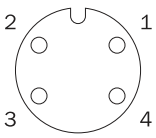
Internal circuitry

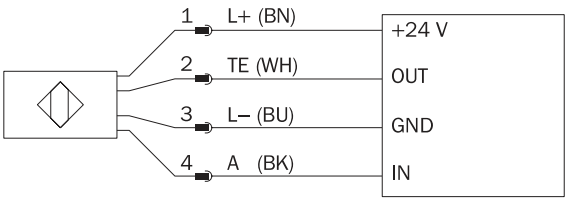
Evaluation unit



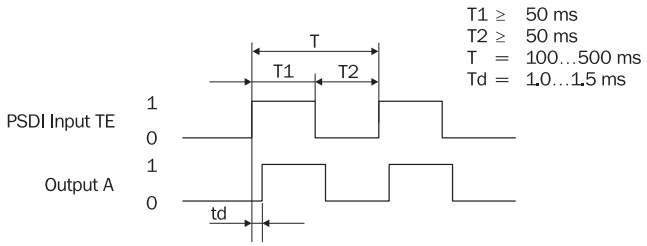


Sensor connections





Sensor timing



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Accessories

Connection cable

Cable length	Type	Part number
5 m	DOL-1204-G05M	6 009 866
10 m	DOL-1204-G10M	6 010 543
15 m	DOL-1204-G15M	6 010 753

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Explanations of features

Positive action normally closed contacts/normally open contacts

Safety switches have contact elements in normally closed contact/normally open contact combinations. The normally closed contacts of a safety switch are of the “positive action” type, i.e. the forced movement of the normally closed contact ensures that the contacts are separated every time. Normally open contacts primarily serve as signalling contacts and must not be used for the safety circuit.

Housing material

The housing materials used can be separated into two large groups - “metals” and “plastics”. The metal versions of the rope switch are made of painted die-cast zinc. Neoprene is used for the plastic cap of the enabling switch.

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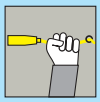
Safety operating devices

Safety application	Model	Number of positive action normally closed contacts/ normally open contacts [1]	Housing material [1]	Connection type	Cable length/ number x size of cable gland	Enclosure rating	Product	Page
	enabling switch	2 / 2	plastic	cable	5 m 10 m	IP 65 IP 67	E 100	K-2
	rope-operated emergency stop switch	3 / 1 2 / 2	metal	cable gland	1 x M20	IP 66	i110 RP	K-6

[1] Explanation see page K-0

K

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- Enabling switch to EN 775
- Ergonomic design
- Light weight
- 3 position operation
- Options with additional plus/ minus buttons

SUVA CNA INSAI

Overview of technical specifications

Number of positive action normally closed contacts	2
Number of normally open contacts	2
Housing material	Plastic
Connection type	Cable
Cable length (depending on type)	5 m / 10 m
Type of connection cable (depending on type)	Straight / coil

Product description

- Enabling switch for safe maintenance work within a hazardous area
- 4 volt free contacts
- Plus/minus buttons for additional control of direction of movement

In-system added value

Safety Relays UE 10 - 48

The UE 10 to 48 series of the Safety Relays allows simple integration of safety components into machinery or plant. ➜ see L-0

Safety Controllers UE 100

The UE 100 series is designed for complex applications requiring a medium level of networking capability. It is possible to connect varying safety components. Their connections can be tailored to the relevant machines or plant via drag & drop software. ➜ see M-0

Safety Bus Modules UE 1000

The series UE 1000, Safety Bus Modules, are designed for machinery and plant requiring a high level of networking and programmable logic controls (PLC). The modules enable the linking of safety components to the bus systems PROFIsafe or AS-I Safety at Work.

➜ see N-0

Ordering information

Positive action normally closed	Normally open	Type of connection cable	Cable length	Plus/minus buttons	Type	Part number
2	2	Straight	5 m	–	E100-A2A22S05A	6 012 141
			10 m	–	E100-A2A22S10A	6 021 916
		Coil	5 m	–	E100-A2A22W05A	6 021 917
		Straight	5 m	✔	E100-B2A22S05A	6 022 879
			10 m	✔	E100-B2A22S10A	6 022 880

K

Further information	Page
➜ Actuator travel diagrams	K-4
➜ Accessories	K-5
➜ Services	A-0

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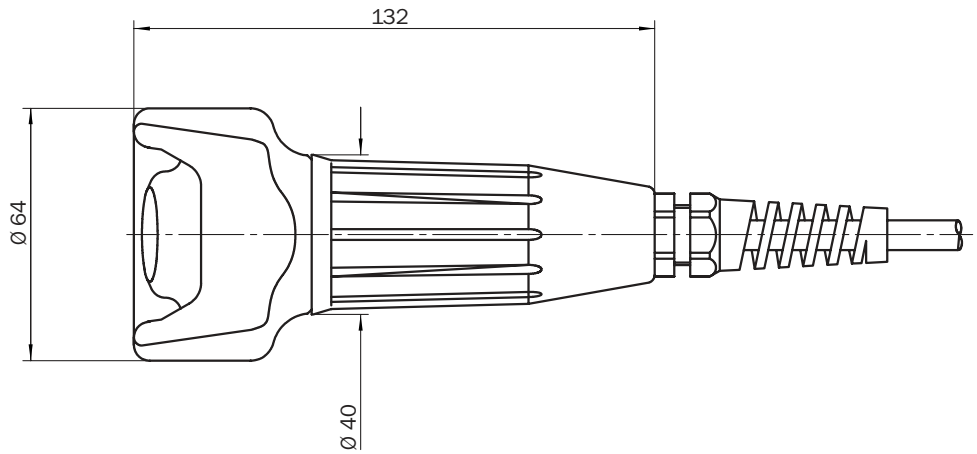
8 010 889/15-10-04

Detailed technical specifications

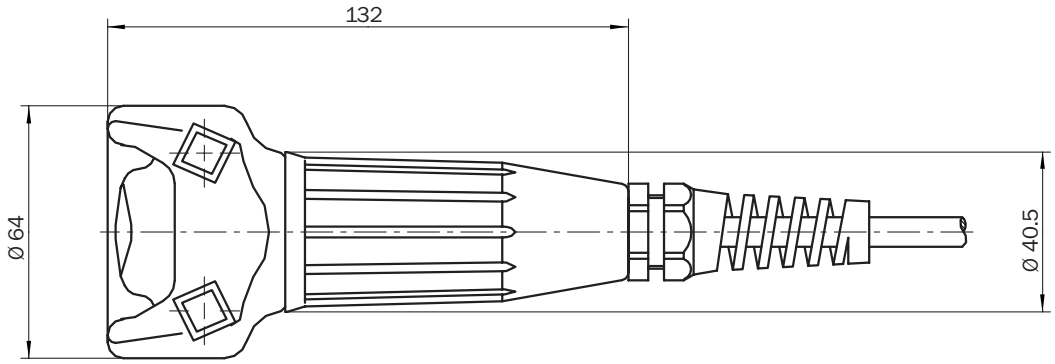
Type	E100-A2A22S05A	E100-A2A22S10A	E100-A2A22W05A	E100-B2A22S05A	E100-B2A22S10A
Housing material	Plastic				
Enclosure rating	IP 67	IP 67	IP 67	IP 65	IP 65
Mechanical life (relay contacts)	10^6 switching cycles				
Ambient operating temperature from ... to	–5 °C ... +60 °C				
Switching principle	Slow-action-switch				
Number of positive action normally closed contacts	2				
Number of normally open contacts	2				
Usage category in compliance with IEC 947-5-1	AC-15/DC-13				
Rated operating current (voltage)	4 A (230 V AC), 3 A (24 V DC)				
Connection type	Cable				
Connection conductor cross-section	0.34 mm²				
Short circuit protection	F6				
Weight	0.86 kg	1.27 kg	1.32 kg	1.32 kg	1.32 kg

Dimensional drawings

E 100 A



E 100 B



Dimensions in mm

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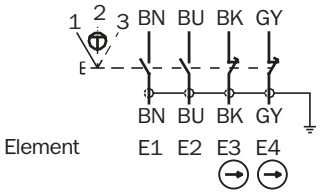
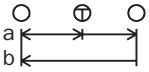
Actuator travel diagrams

E 100 A

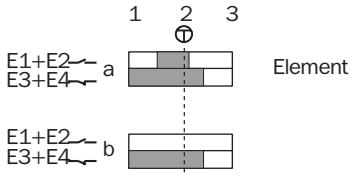
2 NO
2 positive action NC



Positive action NC

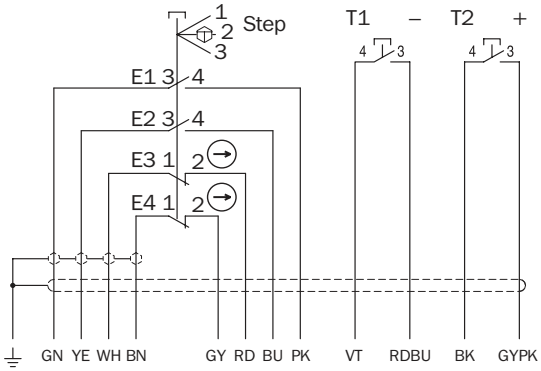


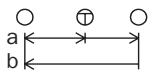
Trigger point



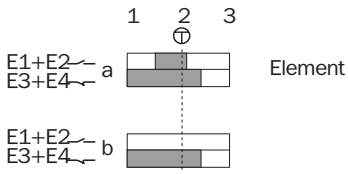
Contacts open
Contacts closed

E 100 B





Trigger point



Contacts open
Contacts closed

K

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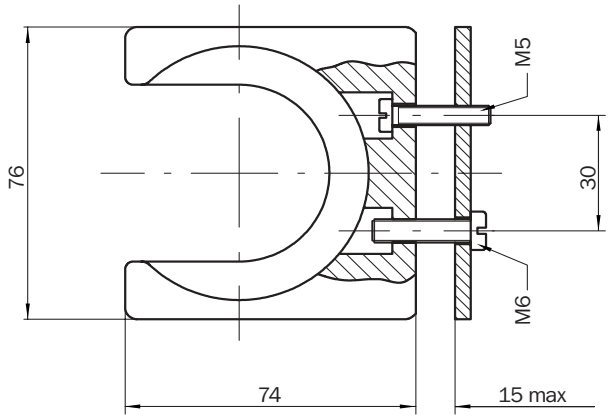
Accessories

Safety switch accessories, miscellaneous

Type	Part number
Fixing bracket	5 308 209

Fixing bracket



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- Rope-operated emergency stop switch according to EN 418
- Housing material die-cast zinc
- Cable entry M20
- Design of the basic housing according to EN 50041
- Enclosure rating IP 66
- Wide range of accessories for quick installation

K

Further information	Page
→ Dimensional drawings	K-8
→ Switching elements	K-8
→ Rope accessories	K-8
→ Other accessories	K-9
→ Services	A-0

Overview of technical specifications

Number of positive action normally closed contacts (depending on type)	2 / 3
Number of normally open contacts (depending on type)	2 / 1
Housing material	Metal
Connection type	Cable gland

Product description

- Rope-operated switch
- 4 volt free contacts
- Complete wire sets available for simple installation

In-system added value

Safety Relays UE 10 - 48

The UE 10 to 48 series of the Safety Relays allows simple integration of safety components into machinery or plant. → see L-0

Safety Controllers UE 100

The UE 100 series is designed for complex applications requiring a medium level of networking capability. It is possible to connect varying safety components. Their connections can be tailored to the relevant machines or plant via drag & drop software. → see M-0

Safety Bus Modules UE 1000

The series UE 1000, Safety Bus Modules, are designed for machinery see and plant requiring a high level of networking and programmable logic controls (PLC). The modules enable the linking of safety components to the bus systems PROFIsafe or AS-I Safety at Work.

→ see N-0

Ordering information

Positive action normally closed	Normally open	Type	Part number
2	2	i110-RP223	6 025 077
3	1	i110-RP313	6 025 076

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Detailed technical specifications

Type	i110-RP223	i110-RP313
Housing material	Metal	
Surface treatment	Varnished	
Enclosure rating	IP 66	
Mechanical life (relay contacts)	10^6 switching cycles	
Ambient operating temperature from ... to	–25 °C ... +80 °C	
Actuation force	125 N	
Switching principle	Slow-action-switch	
Number of positive action normally closed contacts	2	3
Number of normally open contacts	2	1
Usage category in compliance with IEC 947-5-1	AC-15/DC-13	
Rated operating current (voltage)	2 A (250 V AC), 5 A (100 V AC), 0.4 A (250 V DC), 2 A (24 V DC)	
Rated insulation voltage U_i	250 V	
Impulse withstand voltage U_{imp}	2500 V AC	
Minimum switching voltage	5 V DC	
Minimum switching current (switching voltage)	5 mA (5 V DC)	
Connection type	Cable gland	
Connection conductor cross-section	1.5 mm²	
Short circuit protection	T6	
Weight	0.84 kg	

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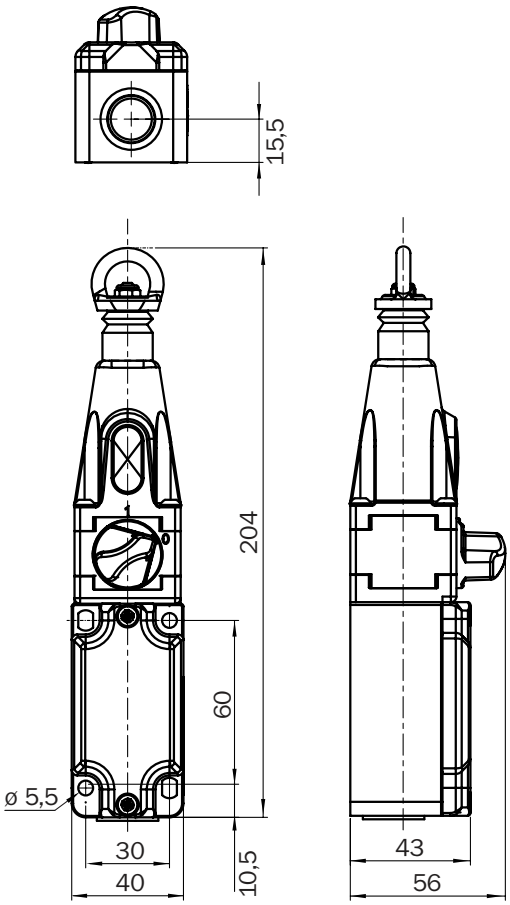
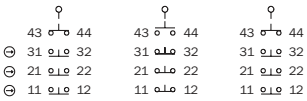
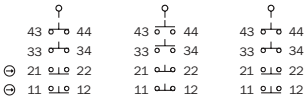
Dimensional drawings



Dimensions in mm

Switching elements

Rope stack	Rope tensio-ned	Rope pulled	
			31, 3 positive action NC contacts, 1 NO contact
			22, 2 positive action NC contacts, 2 NO contacts

Rope accessories

Accessory type	Cord length	Type	Part number
Rope accessory set	5 m	iE110-P05	5 311 136
	10 m	iE110-P10	5 311 137
	20 m	iE110-P20	5 311 138
	30 m	iE110-P30	5 311 139
Rope	30 m	iE110-PL30	5 310 813
	100 m	iE110-PL100	5 310 814
Eye bolt	–	iE110-PTB	5 309 035
Tensioner set	–	iE110-PTR	5 309 034
Spring	–	iE110-PTS	5 311 290

K

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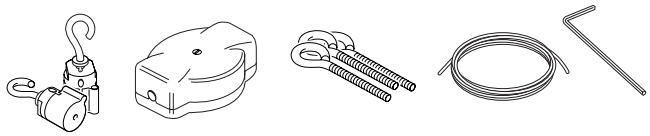

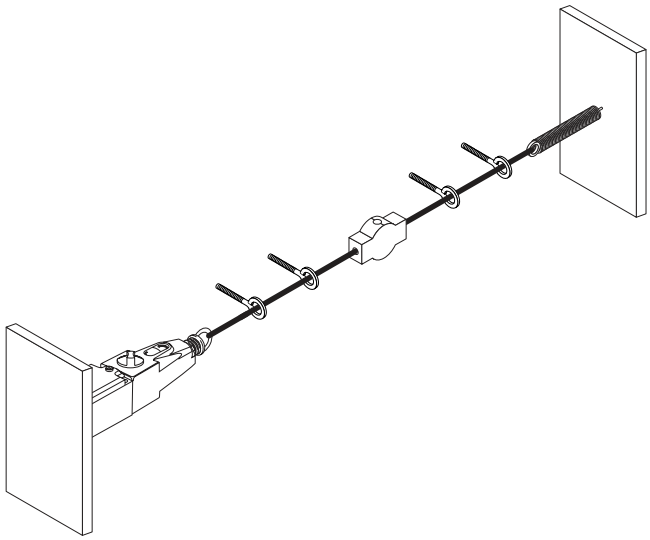

For rope spans < 10 m, a tensioner spring can be used instead of a second rope pull switch.

Rope accessory set iE110-P05

2 rope grippers, 1 tensioner, 3 eye bolts, 5 m rope, 1 allan key

Rope accessory set iE110-P10

2 rope grippers, 1 tensioner, 6 eye bolts, 10 m rope, 1 allan key

Rope accessory set iE110-P20

2 rope grippers, 1 tensioner, 10 eye bolts, 20 m rope, 1 allan key

Rope accessory set iE110-P30

2 rope grippers, 1 top roller, 14 eye bolts, 30 m rope, 1 allan key

Tensioner set iE110-PTR

2 rope grippers, 1 tensioner, 1 allan key

Other accessories

Cable gland

Type	Part number
Cable gland M20	5 309 164

K

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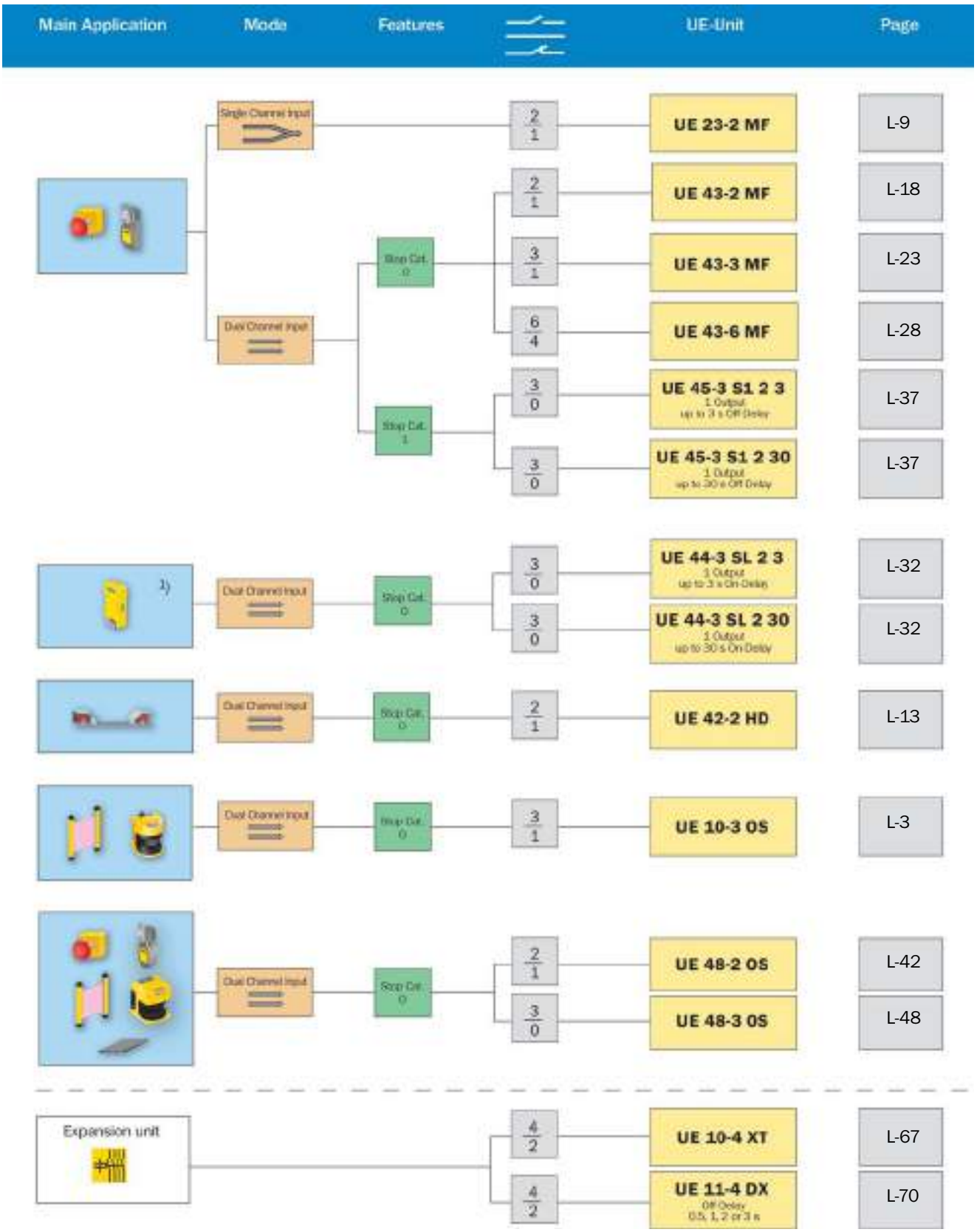
Selection table



[1] Safety switch with mechanical locking

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Safety relays

intelliface
the intelligent interface

Applications									Technical specifications				Type of unit			
Emergency stop	Safety switch	Two-hand controls Typ III C	Pressure sensitive mats (in 4-wire technology)	Opto-electronic protective device	Monitoring of simultaneous activation (s)	Muting	Manual reset (monitored)	Automatic reset	Control category according to EN 954-1	Number of enable current paths/signalling current paths	Input circuit (number of channels)	Housing width (mm)	Main unit	Expansion unit	Product	Page
–	–	–	–	✔	–	–	–	–	– [1]	3 / 1	1 or 2	22.5	✔	–	UE 10-3 OS	L-3
✔	✔	–	–	–	–	–	✔	✔	4 [2]	2 / 1	1	22.5	✔	–	UE 23-2 MF	L-9
–	✔	✔	–	–	0.5	–	–	✔	4	2 / 1	2	22.5	✔	–	UE 42-2 HD	L-13
✔	✔	–	–	–	–	–	✔	✔	4	2 / 1	1 or 2	22.5	✔	–	UE 43-2 MF	L-18
✔	✔	–	–	–	–	–	✔	✔	4	3 / 1	1 or 2	45	✔	–	UE 43-3 MF	L-23
✔	✔	–	–	–	–	–	✔	✔	4	6 / 4	1 or 2	90	✔	–	UE 43-6 MF	L-28
✔	✔	–	–	–	–	–	✔	✔	4	3 [3] / 0	1 or 2	22.5	✔	–	UE 44-3 SL	L-32
✔	✔	–	–	–	–	–	✔	✔	4	3 [4] / 0	1 or 2	22.5	✔	–	UE 45-3 S1	L-37
✔	✔	–	✔	✔	–	–	✔	✔	4	2 / 1	1 or 2	22.5	✔	–	UE 48-2 OS	L-42
✔	✔	–	✔	✔	–	–	✔	✔	4	3 / 0	1 or 2	22.5	✔	–	UE 48-3 OS	L-48
–	–	–	–	✔ [5]	–	–	✔	✔	2	2	2	100.2	✔	–	LE 20	L-53
–	–	–	–	✔ [5]	3	✔	✔	✔	2	2	2	100.2	✔	–	LE 20 Muting	L-60
–	–	–	–	–	–	–	–	–	– [6]	4 / 2	–	22.5	–	✔	UE 10-4 XT	L-67
–	–	–	–	–	–	–	–	–	– [6]	4 / 2 [7]	–	22.5	–	✔	UE 11-4 DX	L-70

[1] Same as protective device
[2] The wires for the input and output signals shall be routed outside the control cabinet according to the safety category to be used
[3] One normally open contact on-delayed
[4] One normally open contact off-delayed
[5] Testable
[6] Same as main unit
[7] 4 normally open contacts / 2 normally closed contacts with off-delay function

L

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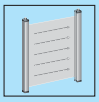
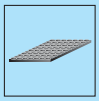
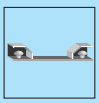
Symbols

Function		Off-delay
		On-delay
		External device monitoring
		Expansion unit
Reset		Automatic reset
		Manual reset (monitored)
Applications		Safety switch
		Emergency stop
		Safety laser scanner
		Safety light curtain / light grid
		Pressure sensitive mat
		Two-hand controls
		Safety locking device, mechanically locked

L

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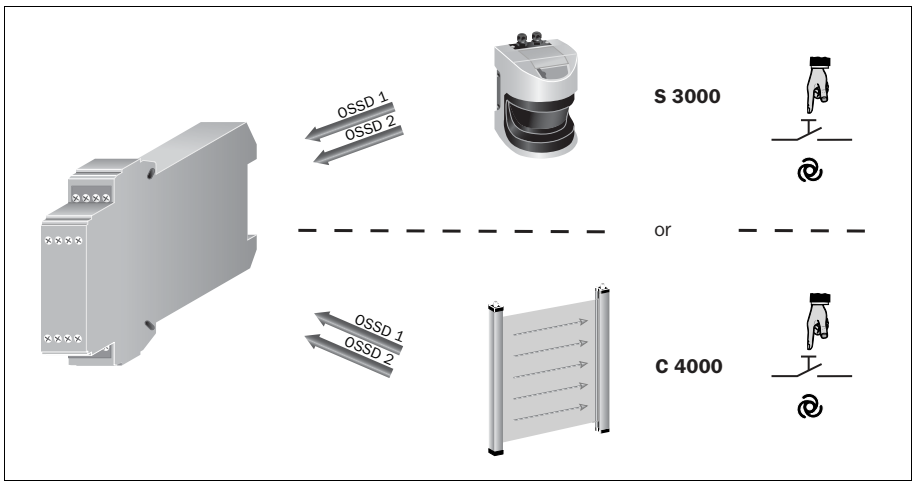
Overview of technical specifications

Control category according to EN 954-1	4
Number of enable current paths/signalling current paths	3 / 1
Input circuit	Single- or dual-channel
Housing width	22.5 mm

Product description

- NC contact for external device monitoring (EDM)
- 2 LEDs for:
  - Relay K 1
  - Relay K 2
- Increase in the number of outputs by way of the expansion units
  - UE 10-4 XT
  - UE 11-4 DX
- Available with plug-in terminals (key coded)

Applications



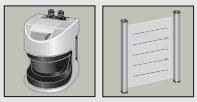
In-system added value

The safety relay UE 10-3 OS is a relay module for:

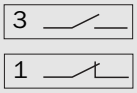
- Opto-electronic protective devices with monitored semiconductor outputs, integral external device monitoring (EDM) and restart interlock, such as
  - C 4000
  - C/M 2000
  - MSL
  - S 3000
- Safety systems with monitored semiconductor outputs, integral external device monitoring and restart interlock, such as
  - LSI and
  - LE 20

Ordering information

Connection type	Type	Part number
Screw-type terminals	UE10-3OS2D0	6 024 917
Plug-in terminals	UE10-3OS3D0	6 024 918



- For safety laser scanners
- For safety light curtains



L

Further information	Page
→ Symbols	L-2
→ Technical specifications	L-4
→ Internal circuitry	L-5
→ Dimensional drawings	L-6
→ Connection diagrams	L-7
→ Expansion modules	L-67 L-70
→ Services	A-0

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Detailed technical specifications

General system data

Supply voltage to B 1 - B 2, B 3 - B 4	
Electrical output circuit > 25 V AC / 60 V DC	PELV
Electrical output circuit < 25 V AC / 60 V DC	PELV or SELV

Inputs B 1 ... B 4

Activation time	40 ms
Switch-on voltage	24 V (15 V ... 30 V)
Switch-on current	500 mA

Output circuits (13 - 14, 23 - 24, 33 - 34, 41 - 42, Y 1 - Y 2)

Response time (K 1 / K 2)	20 ms
Relay contacts	3 NO, enable current paths, safety relevant 1 NC, signalling current path, not safety relevant 1 NC, contactor monitoring
Contact type	Positively guided
Contact material	Silver alloy; gold-plated
Load capacity of contacts	
Switching voltage enable current paths/signalling current paths	10 V AC ... 230 V AC / 10 V DC ... 30 V DC
Switching voltage contactor monitoring	10 V DC ... 24 V DC
Switching current enable current paths	10 mA ... 6 A
Switching current signalling current paths	10 mA ... 2 A
Switching current contactor monitoring	10 mA ... 0.1 A
Total current across all contacts	12 A
Application category according to EN 60947-5-1	AC-15 U_e 230 V AC, I_e 4 A (360 c/h) AC-15 U_e 230 V AC, I_e 3 A (3600 c/h) DC-13 U_e 24 V DC, I_e 4 A (360 c/h) DC-13 U_e 24 V DC, I_e 2.5 A (3600 c/h)
Permitted switching frequency	3600 c/h
Service life, mechanical (relay contacts)	1 x 10^7 switching cycles
Service life, electrical (dependent on the load)	2 x 10^6 switching cycles

Operating data

Surge voltage rating ($U_{Imp.}$)	4 kV
Excess voltage category	III
Contamination rating of the unit (EN 50178)	
External	3
Internal	2
Voltage rating	300 V AC
Test voltage U_{eff} (50 Hz) EN 60439-1	2.0 kV
Enclosure rating	
Housing	IP 40
Terminals	IP 20
Radio interference	DIN EN 61000-6-4
Screening against interference	DIN EN 61000-6-2
Ambient operating temperature	–25 °C ... +55 °C
Storage temperature	–25 °C ... +75 °C
Cross sections of electrical conductors	
Single strand wire (2 x, identical cross section)	0.14 mm^2 ... 0.75 mm^2
Single strand wire (1 x)	0.14 mm^2 ... 2.5 mm^2
Fine stranded wire with terminal crimps (2 x, identical cross section)	0.25 mm^2 ... 0.5 mm^2
Fine stranded wire with terminal crimps (1 x)	0.25 mm^2 ... 2.5 mm^2

Weight	0.2 kg

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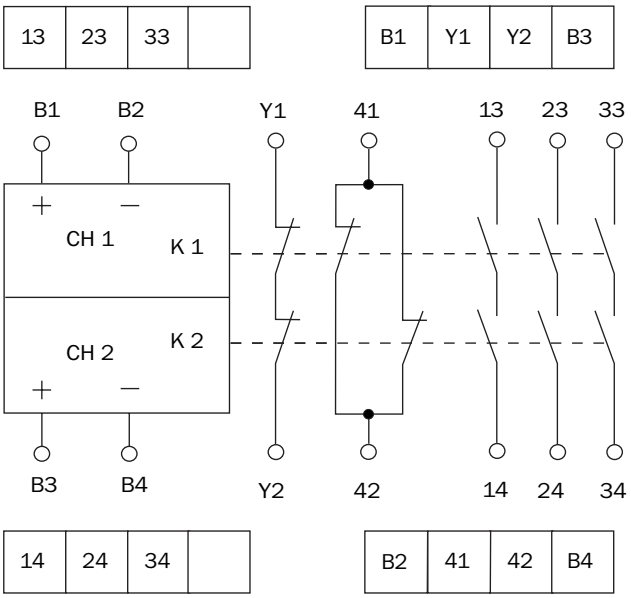
Internal circuitry



Function

If the semiconductor outputs of the installed safety device (e.g. C 4000, S 3000) are energised, then the safety output contacts will close.
When at least one of the semiconductor outputs of the safety device becomes de-energised, then the output contacts revert back to open circuit status.
If restart interlock is needed, then this is achieved in the safety device, for example C 4000 or S 3000.

External device monitoring (EDM)

Safety category 3 or 4 requires monitoring of contactors. This is provided in the connected protective device, for example in the C 4000 or S 3000. The normally closed contact (Y 1 -Y 2) in the UE 10-3 OS unit is, however, a part of this contactor monitoring system.

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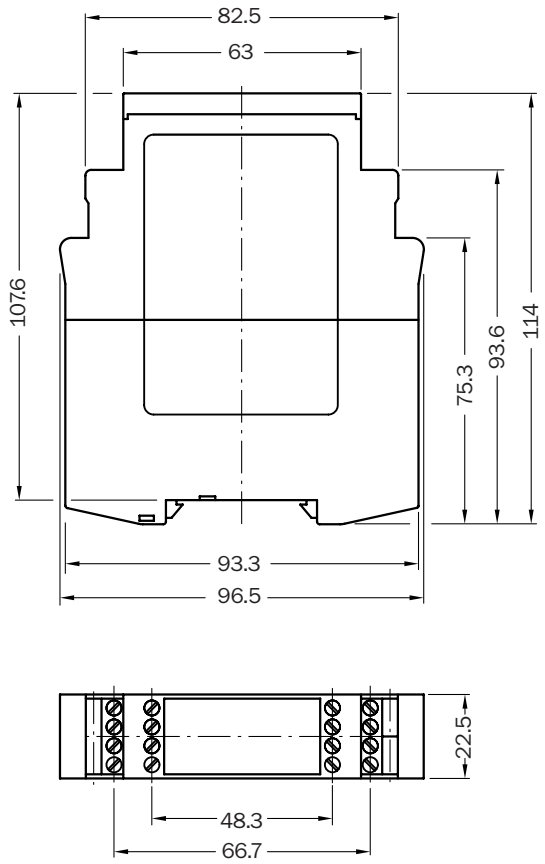
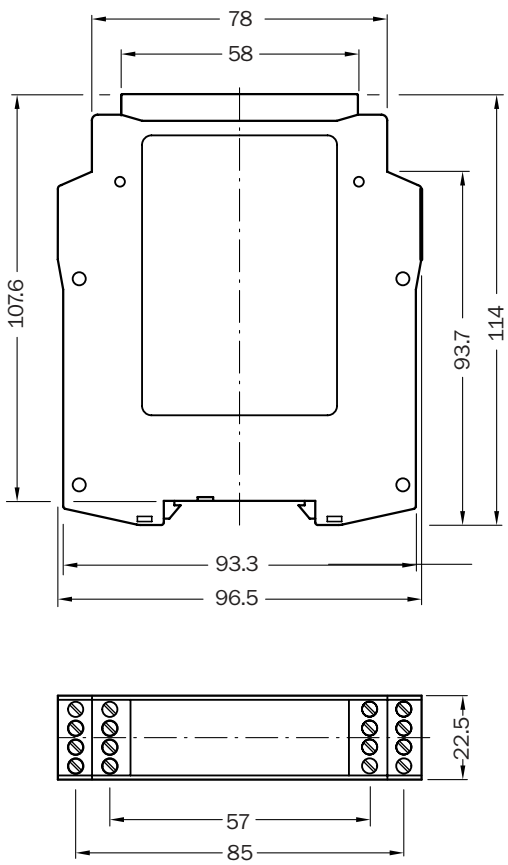
Dimensional drawings



Housing with screw-type terminals



Housing with plug-in terminals

Dimensions in mm

L

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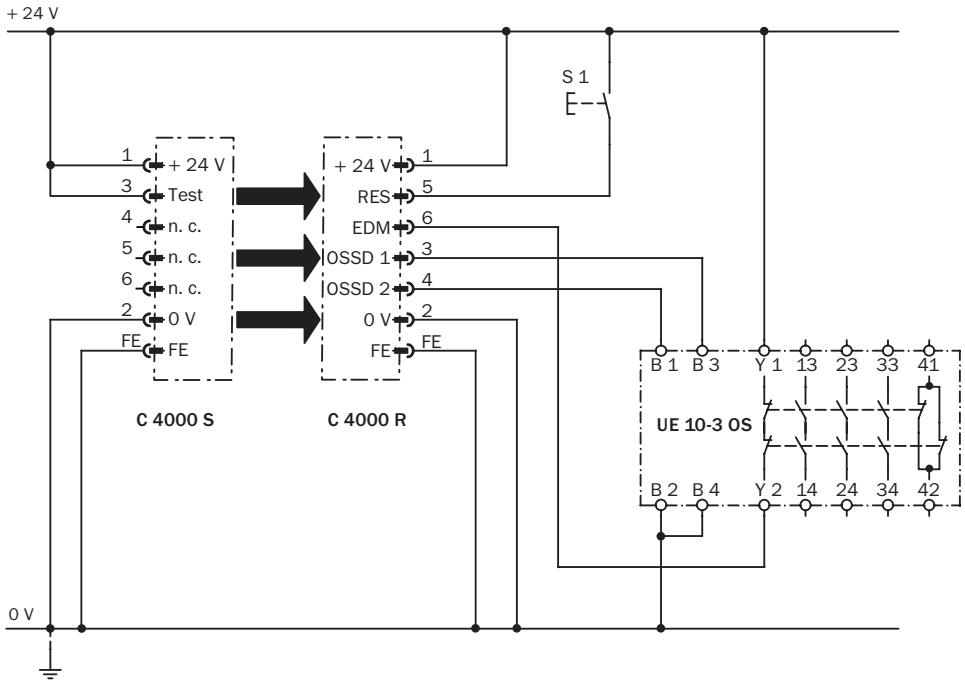
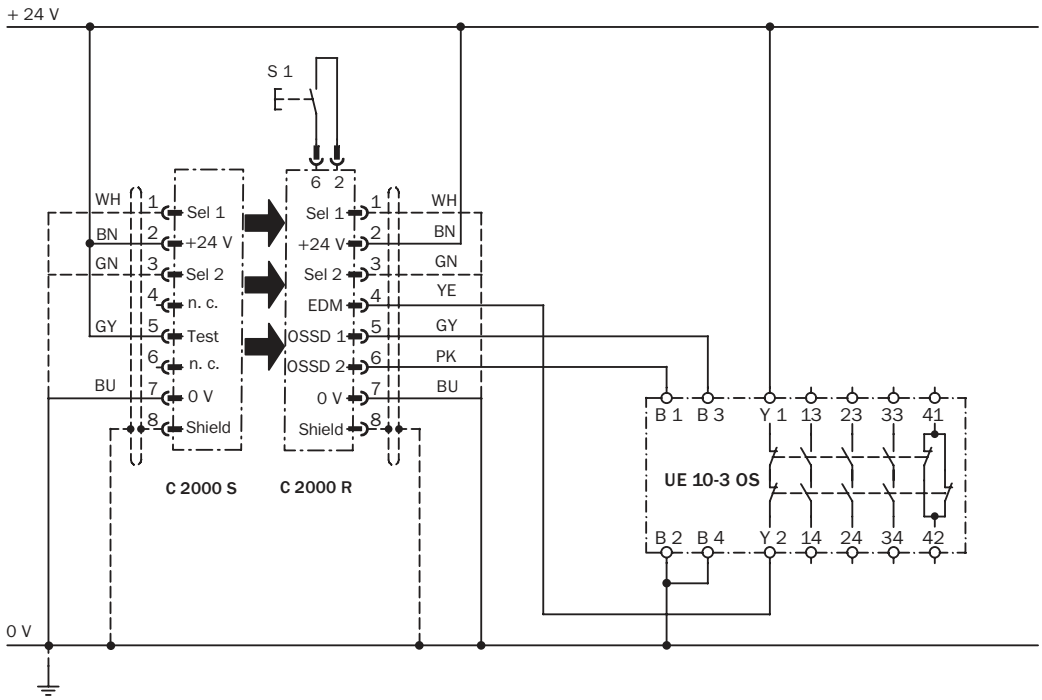
Connection diagrams

Safety light curtain C 4000 Standard/Advanced connected to UE 10-3 OS safety relay



Operating mode: with manual reset and external device monitoring (active)

Safety light curtain C 2000 (EDM/RES) connected to UE 10-3 OS safety relay



Operating mode: with manual reset and external device monitoring

Continued on next page

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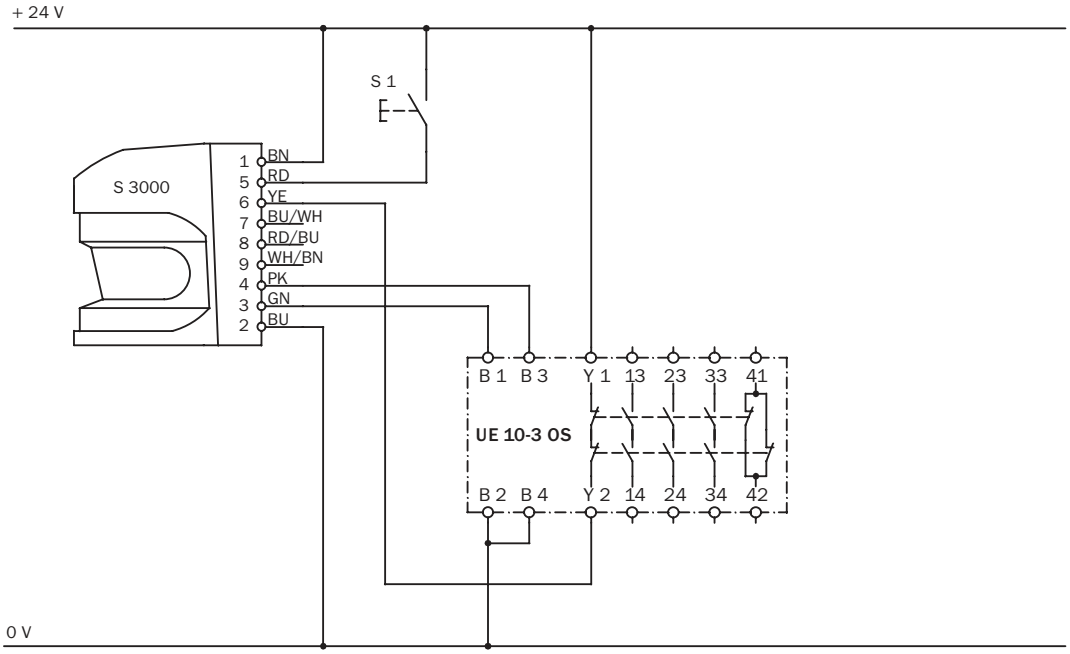
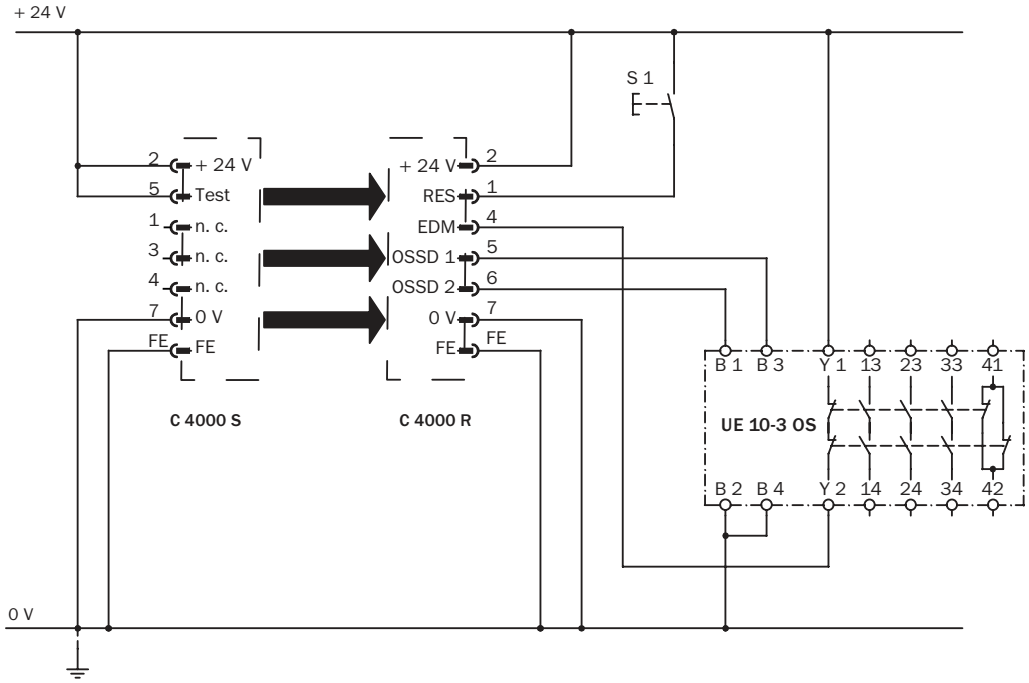
Safety laser scanner S 3000 Standard connected to UE 10-3 OS safety relay



Operating mode: with manual reset and external device monitoring

Safety light curtain C 4000 Micro connected to UE 10-3 OS safety relay



Operating mode: with manual reset and external device monitoring

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Overview of technical specifications

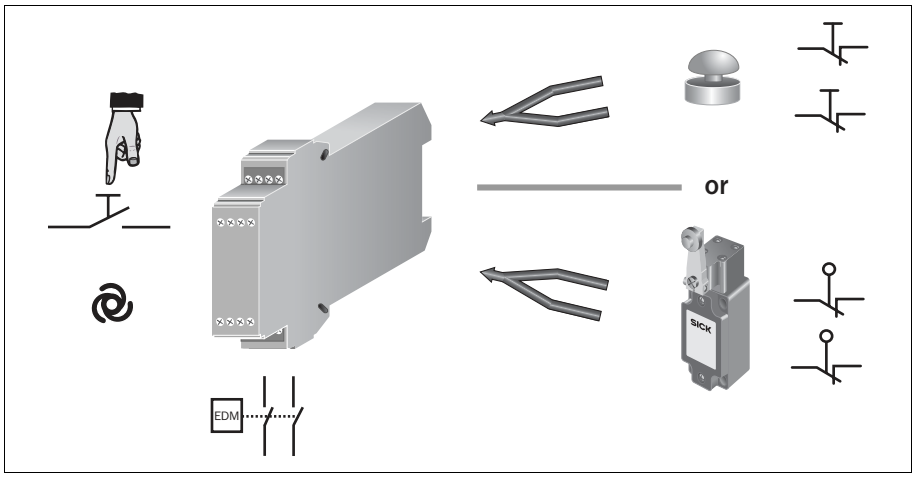
Control category according to EN 954-1	4 [1]
Number of enable current paths/signalling current paths	2 / 1
Input circuit	Single-channel
Housing width	22.5 mm

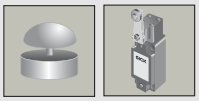
[1] The wires for the input and output signals shall be routed outside the control cabinet according to the safety category to be used.

Product description

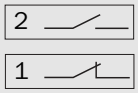
- 2 LEDs:
  - Supply voltage
  - Relay K 1, K 2
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion units
  - UE 10-4 XT
  - UE 11-4 DX
- External device monitoring (EDM)
- Screw-type terminals

Applications





- For emergency stops
- For safety switches



Ordering information

Supply voltage	Type	Part number
24 V DC	UE23-2MF2D3	6 026 146
115 ... 120 V AC	UE23-2MF2A4	6 026 147
230 V AC	UE23-2MF2A3	6 026 148

L

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→ Dimensional drawings	L-12
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Detailed technical specifications

General system data

Protection class according to EN 50178	II, double insulated
Safety category according to EN 954-1	4 [1]
Stop category according to EN 60204	0
Supply voltage/Input circuit V_S (A 1 - A 2)	
UE 23-2 MF 2 D2	24 V DC (20.4 V DC ... 26.4 V DC)
UE 23-2 MF 2 A4	115/120 V AC (98 V AC ... 132 V AC)
UE 23-2 MF 2 A3	230 V AC (196 V AC ... 253 V AC)
Power consumption	
AC	2.7 VA
DC	1.6 W
Residual ripple in DC mode (within the limits of V_S)	2.4 V_{SS}
Nominal frequency in AC mode	50 Hz ... 60 Hz

Control voltage (Y 1 - Y 2 - Y 3)

Control voltage	40 V DC
Control current	200 mA
Fuse	PTC resistor
Reset time	
Manual (Y 3)	70 ms
Automatic (Y 2)	600 ms
Galvanic separation (only on AC units)	Yes

Output circuits (13 - 14, 23 - 24, 31 - 32)

Response time (K 1 / K 2)	30 ms ... 80 ms
Relay contacts	2 NO, enable current paths, safety relevant 1 NC, signalling current path, not safety relevant
Contact type	Positively guided
Contact material	Silver alloy; gold-plated
Load capacity of contacts	
Switching voltage	10 V AC ... 230 V AC / 10 V DC ... 30 V DC
Switching current	10 mA ... 6 A
Total current across all contacts	12 A
Application category according to EN 60947-5-1	AC-15 U_e 230 V AC, I_e 4 A (360 c/h) AC-15 U_e 230 V AC, I_e 3 A (3600 c/h) DC-13 U_e 24 V DC, I_e 4 A (360 c/h) DC-13 U_e 24 V DC, I_e 2.5 A (3600 c/h)
Permitted switching frequency	3600 c/h
Service life, mechanical (relay contacts)	1 x 10^7 switching cycles
Service life, electrical (dependent on the load)	2 x 10^6 switching cycles

Operating data

Surge voltage rating ($U_{Imp.}$)	4 kV
Excess voltage category	III
Contamination rating of the unit (EN 50178)	
External	3
Internal	2
Voltage rating	300 V AC
Test voltage U_{eff} (50 Hz) EN 60439-1	2.0 kV

[1] The wires for the input and output signals shall be routed outside the control cabinet according to the safety category to be used

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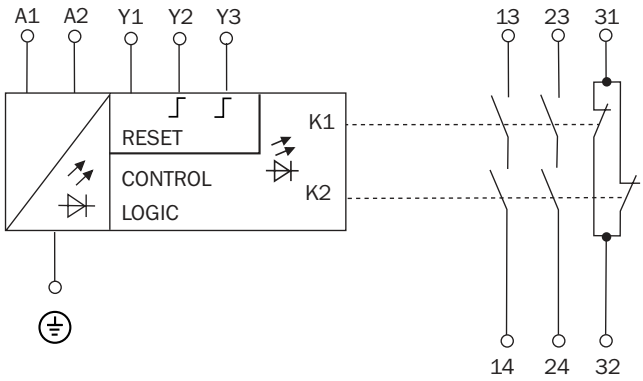
Enclosure rating	
Housing	IP 40
Terminals	IP 20
Radio interference	DIN EN 61000-6-4
Screening against interference	DIN EN 61000-6-2
Ambient operating temperature	–25 °C ... +55 °C
Storage temperature	–25 °C ... +75 °C
Cross sections of electrical conductors	
Single strand wire (2 x, identical cross section)	0.14 mm^2 ... 0.75 mm^2
Single strand wire (1 x)	0.14 mm^2 ... 2.5 mm^2
Fine stranded wire with terminal crimps (2 x, identical cross section)	0.25 mm^2 ... 0.5 mm^2
Fine stranded wire with terminal crimps (1 x)	0.25 mm^2 ... 2.5 mm^2

Weight	0.27 kg

Internal circuitry



Function

After applying the supply voltage (LED SUPPLY illuminates), the normally open contacts remain in the open state. If the connected sensor is not activated (i.e. the input circuits are closed), then the normally open contacts close immediately in automatic Reset (LED “K 1, K 2“ illuminates). In the case of manual reset, this only occurs after pressing the reset button.

External device monitoring (EDM)

The unit can take over the function of external device monitoring. The contactor monitoring system monitors the external relays through their normally closed contacts.

Manual reset

For manual resetting a pushbutton must be connected to terminals Y 1 and Y 3. This reset is monitored.

Automatic reset

For automatic resetting, Y 1 - Y 2 must be linked.

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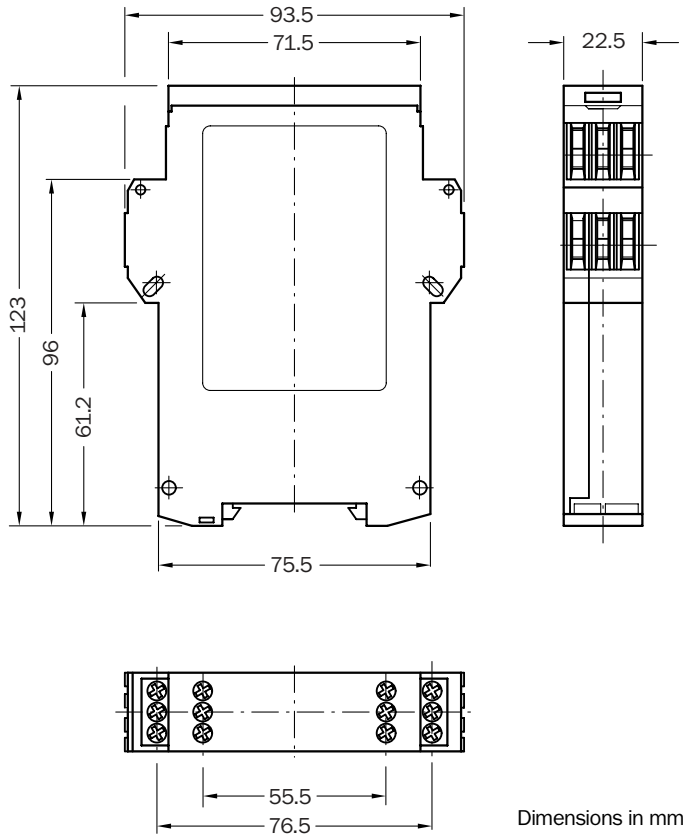
Dimensional drawings



Dimensions in mm

Housing with screw-type terminals

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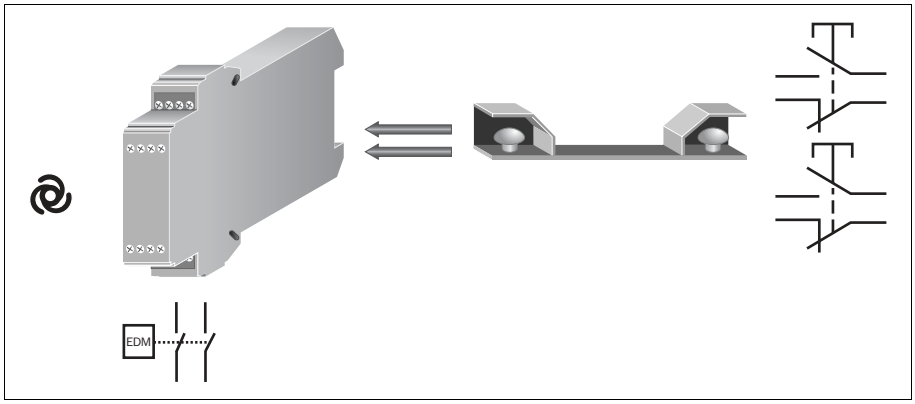
Overview of technical specifications

Control category according to EN 954-1	4
Requirements in accordance with EN 574	Type III C
Number of enable current paths/signalling current paths	2 / 1
Input circuit	Dual-channel
Housing width	22.5 mm

Product description

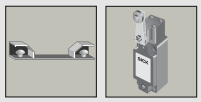
- 3 LEDs for:
  - Supply voltage
  - Relay K 1
  - Relay K 2
- Automatic start
- Increase in the number of outputs by way of the expansion unit UE 10-4 XT
- External device monitoring (EDM)
- Available with plug-in terminals (key coded)

Applications

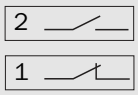


Ordering information

Connection type	Type	Part number
Screw-type terminals	UE42-2HD2D2	6 024 878
Plug-in terminals	UE42-2HD3D2	6 024 881



- For two-hand controls Typ III C in accordance with EN 574
- For safety switches



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→ Connection diagrams	L-17
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Detailed technical specifications

General system data

Supply voltage to A 1 / A 2	
Electrical output circuit > 25 V AC / 60 V DC	PELV
Electrical output circuit < 25 V AC / 60 V DC	PELV or SELV
Safety category according to EN 954-1	4
Supply voltage V_S (A 1 / A 2)	24 V AC/DC (20.4 V AC/DC ... 26.4 V AC/DC)
Power consumption	
AC	2.7 VA
DC	1.5 W
Residual ripple in DC mode (within the limits of V_S)	2.4 V_{SS}
Nominal frequency in AC mode	50 Hz ... 60 Hz

Control voltage (Y 11 - Y 21)

Control voltage	24 V DC
Control current	60 mA
Short-circuit current between Y 11 and A 2	1000 mA
Fuse	PTC resistor
Galvanic separation between A 1 / A 2 and Y 11 / Y 21	No

Input circuits (Y 12 - Y 14 and Y 22 - Y 23)

Input current	60 mA
Reset time	40 ms
Activation time tolerance between the two start buttons	500 ms
Minimum switch-off time	250 ms
Line resistance at the input circuit	< 70 Ω
Switch-on time (upon applying the supply voltage)	250 ms

Output circuits (13 - 14, 23 - 24, 31 - 32)

Response time (K 1 / K 2)	50 ms
Relay contacts	2 NO, enable current paths, safety relevant 1 NC, signalling current path, not safety relevant
Contact type	Positively guided
Contact material	Silver alloy; gold-plated
Load capacity of contacts	
Switching voltage	10 V AC ... 230 V AC / 10 V DC ... 30 V DC
Switching current	10 mA ... 6 A
Total current across all contacts	12 A
Application category according to EN 60947-5-1	AC-15 U_e 230 V AC, I_e 4 A (360 c/h) AC-15 U_e 230 V AC, I_e 3 A (3600 c/h) DC-13 U_e 24 V DC, I_e 4 A (360 c/h) DC-13 U_e 24 V DC, I_e 2.5 A (3600 c/h)
Permitted switching frequency	3600 c/h
Service life, mechanical (relay contacts)	1 x 10^7 switching cycles
Service life, electrical (dependent on the load)	2 x 10^6 switching cycles

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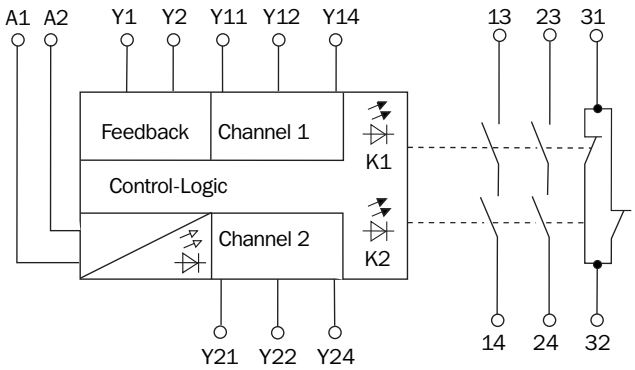
Operating data

Surge voltage rating ($U_{Imp.}$)	4 kV
Excess voltage category	III
Contamination rating of the unit (EN 50178)	
External	3
Internal	2
Voltage rating	300 V AC
Test voltage U_{eff} (50 Hz) EN 60439-1	2.0 kV
Enclosure rating	
Housing	IP 40
Terminals	IP 20
Radio interference	EN 60947-1 02/99
Screening against interference	EN 60947-1 02/99
Ambient operating temperature	–25 °C ... +55 °C
Storage temperature	–25 °C ... +75 °C
Cross sections of electrical conductors	
Single strand wire (2 x, identical cross section)	0.14 mm^2 ... 0.75 mm^2
Single strand wire (1 x)	0.14 mm^2 ... 2.5 mm^2
Fine stranded wire with terminal crimps (2 x, identical cross section)	0.25 mm^2 ... 0.5 mm^2
Fine stranded wire with terminal crimps (1 x)	0.25 mm^2 ... 2.5 mm^2

Weight	0.2 kg

Internal circuitry



Function

The UE 42-2 HD unit corresponds to EN 574 Type III C. A prerequisite for the release of the outputs is that the two inputs (e.g. two-hand pushbuttons) are actuated within 0.5 sec.
After applying the supply voltage to the terminals A 1 - A 2 the LED SUPPLY illuminates to indicate that electrical power is present. Pressing the two-hand pushbuttons S 1 and S 2 at the same time (see page L-17 – connection diagrams) closes the two normally open contacts. Releasing even one of the buttons will cause the circuits to adopt the open circuit status.
A renewed attempt to initiate starting is only possible if both start buttons are set to their nominal start position (for two-hand pushbuttons units: if both have been released) and the normally closed contact is closed.

External device monitoring (EDM)

The UE 42-2 HD can take over the function of external device monitoring. The normally closed contacts of the external relays are switched in series, connected to the terminals Y 1 - Y 2.

Automatic start

The UE 42-2 HD has an automatic start facility.

Monitoring of simultaneous activation

The pressing of the start buttons at the same time is monitored. Only when both start buttons are activated within 0.5 sec do normally open contacts close and the normally closed contact opens.

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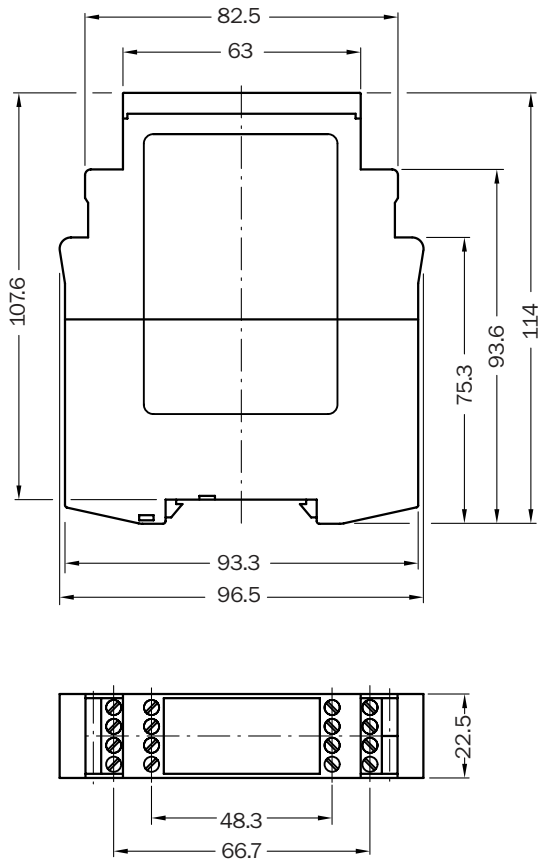
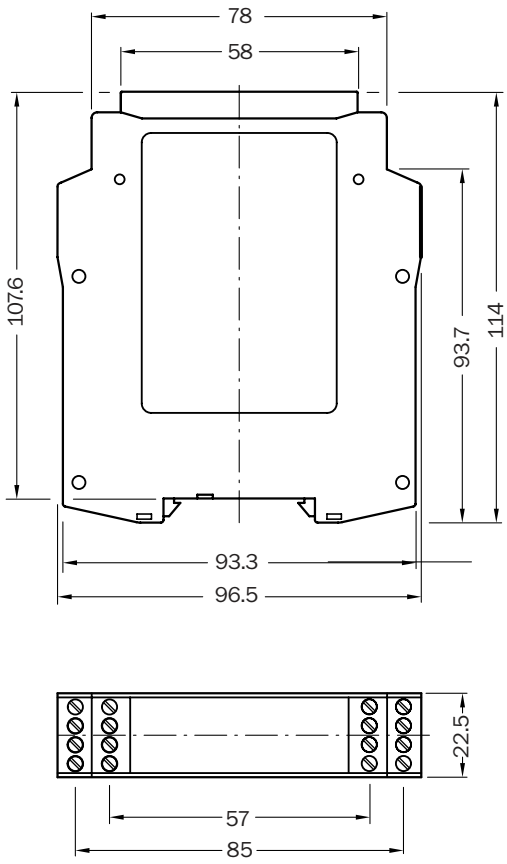
Dimensional drawings



Housing with screw-type terminals



Housing with plug-in terminals

Dimensions in mm

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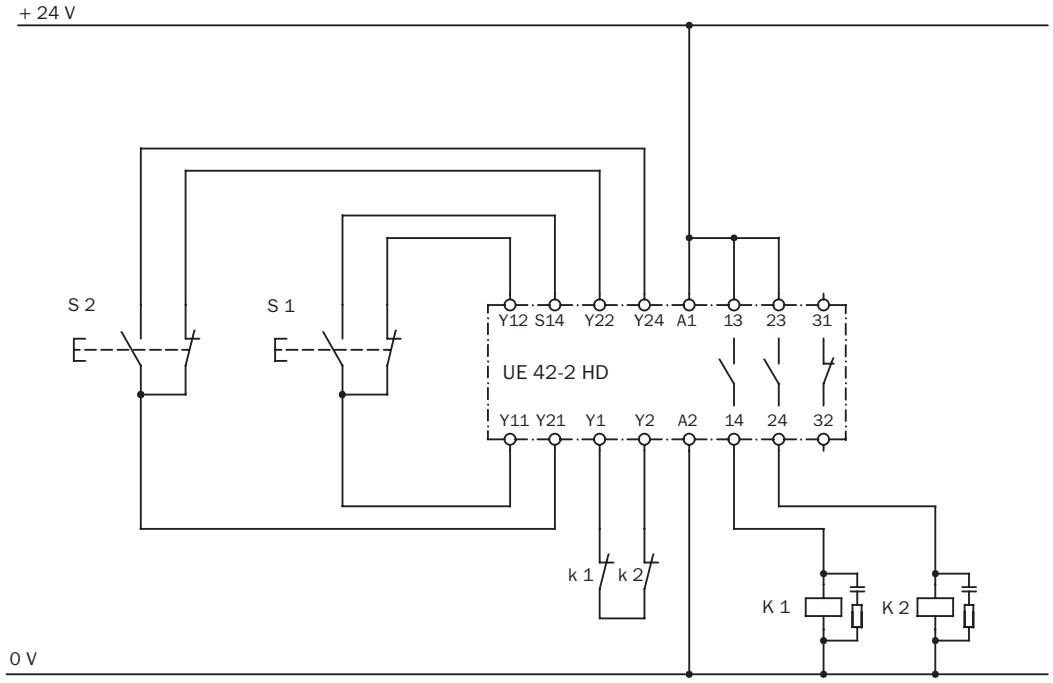
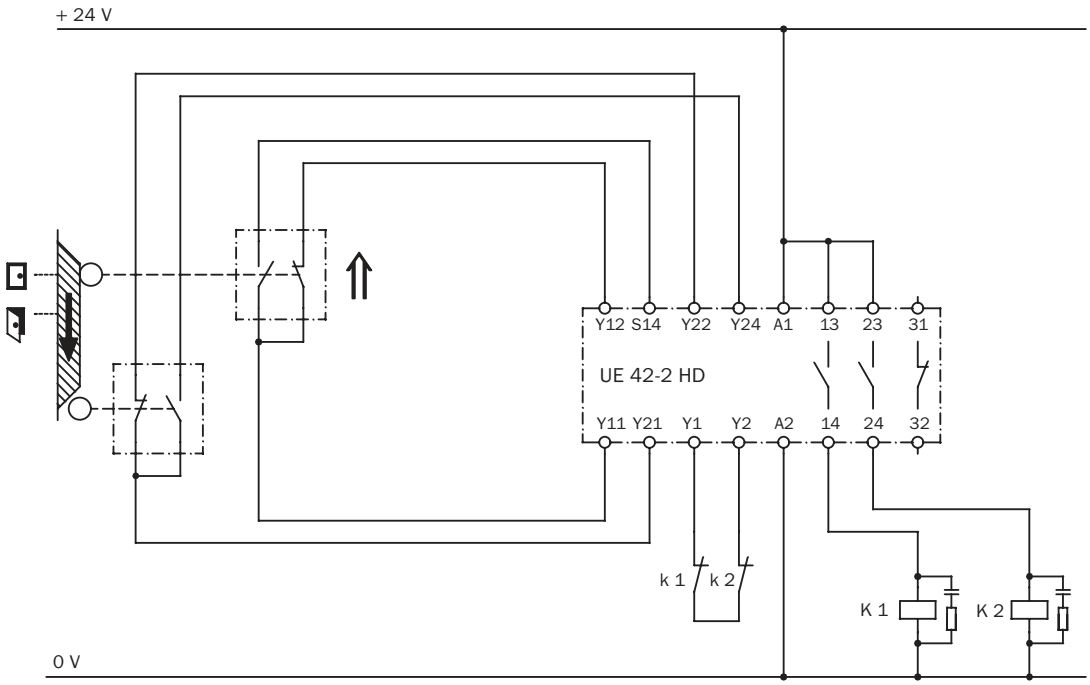
Connection diagrams

Two-hand control with UE 42-2 HD safety relay, dual-channel system



Operating mode: with automatic start and external device monitoring (EDM)

Two saftey switches connected to UE 42-2 HD safety relay, dual-channel system



Operating mode: with automatic reset and external device monitoring (EDM)

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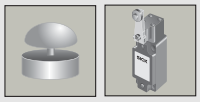
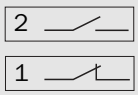


- For emergency stops
- For safety switches



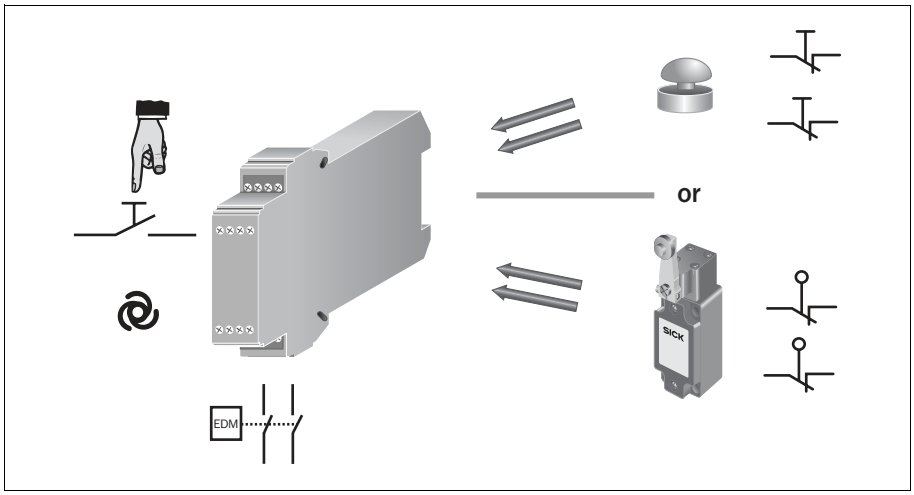
Overview of technical specifications

Control category according to EN 954-1	4
Number of enable current paths/signalling current paths	2 / 1
Input circuit	Dual-channel
Housing width	22.5 mm

Product description

- Cross circuit detection on dual-channel wired systems
- 3 LEDs:
  - Supply voltage
  - Relay K 1
  - Relay K 2
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion units
  - UE 10-4 XT
  - UE 11-4 DX
- External device monitoring (EDM)
- Available with plug-in terminals (key coded)

Applications



Ordering information

Connection type	Type	Part number
Screw-type terminals	UE43-2MF2D2	6 024 893
Plug-in terminals	UE43-2MF3D2	6 024 894

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Detailed technical specifications

General system data

Supply voltage to A 1 / A 2	
Electrical output circuit > 25 V AC / 60 V DC	PELV
Electrical output circuit < 25 V AC / 60 V DC	PELV or SELV
Safety category according to EN 954	4
Stop category according to EN 60204	0
Supply voltage V_S (A 1 / A 2)	24 V AC/DC (20.4 V AC/DC ... 26.4 V AC/DC)
Power consumption	
AC	4.6 VA
DC	2.1 W
Residual ripple in DC mode (within the limits of V_S)	2.4 V_{SS}
Nominal frequency in AC mode	50 Hz ... 60 Hz

Control voltage S 33 / S 11 and S 21

Control voltage	17.4 V DC ... 22 V DC
Control current	40 mA ... 100 mA
Short-circuit current between S 33 / S 11 and S 21	2000 mA
Fuse	PTC resistor
Reaction time by cross connection	3 s
Activation time upon detection of cross connection	3 s
Galvanic separation between A 1 / A 2 and S 21, S 11, S 33	No

Input circuits (S 12, S 31, S 22, S 34, S 35)

Input current S 12 and S 31 / S 22	40 mA ... 100 mA
Input current S 34 / S 35	5 mA ... 50 mA
Reset time	
Manual (S 34)	40 ms
Automatic (S 35)	200 ms ... 500 ms
Activation time of reset button	50 ms
Line resistance at the input circuit	< 35 Ω
Synchronisation time	500 ms

Output circuits (13 - 14, 23 - 24, 31 - 32)

Response time (K 1 / K 2)	25 ms
Minimum time outputs will stay off	40 ms
Relay contacts	2 NO, enable current paths, safety relevant 1 NC, signalling current path, not safety relevant
Contact type	Positively guided
Contact material	Silver alloy; gold-plated
Load capacity of contacts	
Switching voltage	10 V AC ... 230 V AC / 10 V DC ... 30 V DC
Switching current	10 mA ... 6 A
Total current across all contacts	12 A
Application category according to EN 60947-5-1	AC-15 U_e 230 V AC, I_e 4 A (360 c/h) AC-15 U_e 230 V AC, I_e 3 A (3600 c/h) DC-13 U_e 24 V DC, I_e 4 A (360 c/h) DC-13 U_e 24 V DC, I_e 2.5 A (3600 c/h)
Service life, mechanical (relay contacts)	1 x 10^7 switching cycles
Service life, electrical (dependent on the load)	1 x 10^5 switching cycles

Continued on next page

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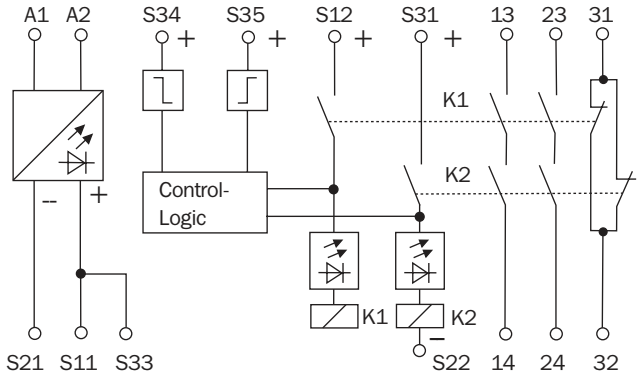
Operating data

Surge voltage rating ($U_{Imp.}$)	4 kV
Excess voltage category	III
Contamination rating of the unit (EN 50178)	
External	3
Internal	2
Voltage rating	300 V AC
Test voltage U_{eff} (50 Hz) EN 60439-1	2.0 kV
Enclosure rating	
Housing	IP 40
Terminals	IP 20
Radio interference	DIN EN 61000-6-4
Screening against interference	DIN EN 61000-6-2
Ambient operating temperature	–25 °C ... +55 °C
Storage temperature	–25 °C ... +75 °C
Cross sections of electrical conductors	
Single strand wire (2 x, identical cross section)	0.14 mm^2 ... 0.75 mm^2
Single strand wire (1 x)	0.14 mm^2 ... 2.5 mm^2
Fine stranded wire with terminal crimps (2 x, identical cross section)	0.25 mm^2 ... 0.5 mm^2
Fine stranded wire with terminal crimps (1 x)	0.25 mm^2 ... 2.5 mm^2

Weight	0.2 kg

Internal circuitry



Function

After applying the supply voltage (LED SUPPLY illuminates), the normally open contacts remain in the opened state. If the connected sensor is not activated (i.e. the input circuits are closed), then the normally open contacts close immediately in automatic reset (LED K 1 and K 2 illuminate). In the case of manual reset, this only occurs after pressing and releasing the reset button. Activation of the sensor (opening of one or both input circuits) effects the opening of the normally open outputs.

External device monitoring (EDM)

The UE 43-2 MF unit can take over the function of external device monitoring. The contactor monitoring system monitors the external relays by means of their normally closed contacts.

Manual reset

For manual resetting a pushbutton must be connected to terminals S 33 - S 34. Reset is monitored.

Automatic reset

For automatic resetting, S 12 - S 35 must be linked.

Cross circuit detection

Cross circuit is detected on dual-channel wired systems if these are wired with opposing polarity.

Monitoring of synchronisation

Only if input 2 closes by no later than 0.5 sec after input 1 do the output circuits close. If input 2 closes before input 1, the monitoring of synchronisation will not be effected, and the output circuits will close. This monitoring only takes place in automatic reset.

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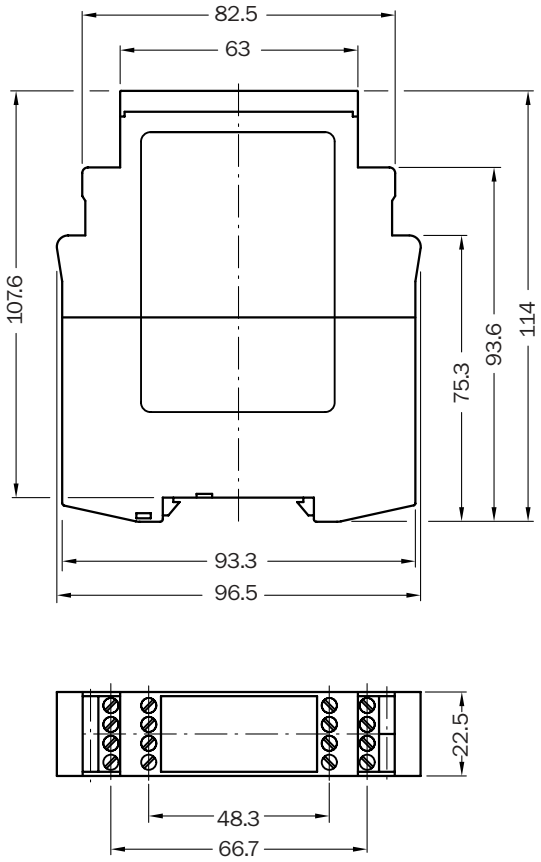
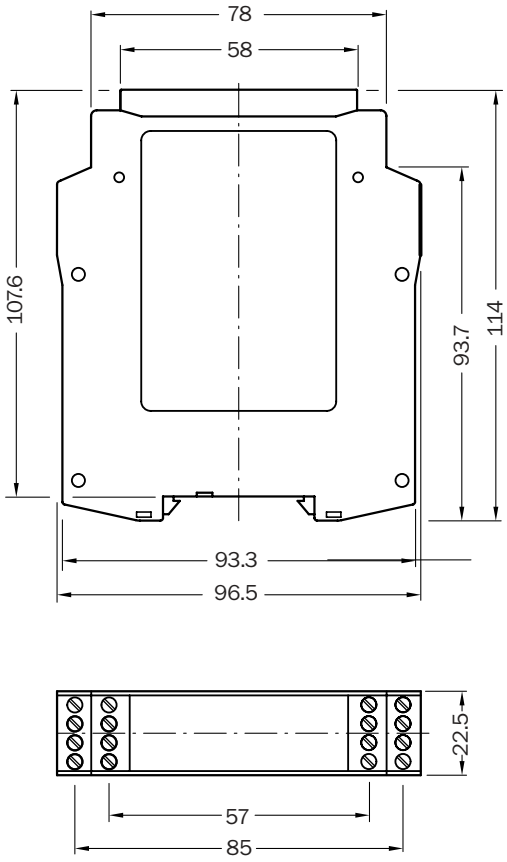
Dimensional drawings



Housing with screw-type terminals



Housing with plug-in terminals

Dimensions in mm

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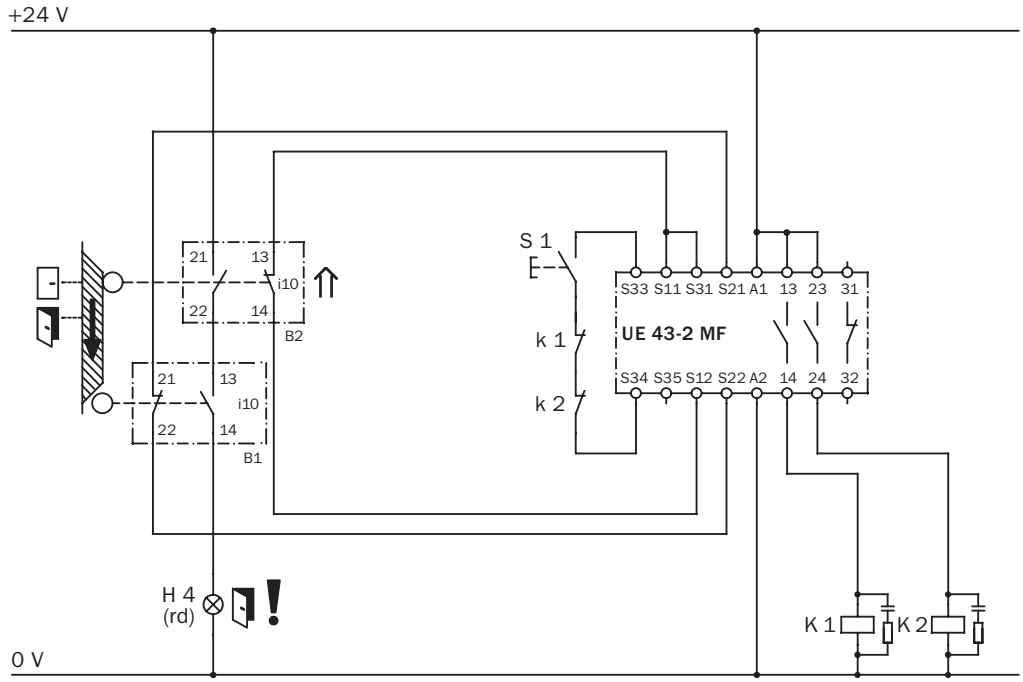
Connection diagram

Two safety switches i10 to UE 43-2 MF safety relay, dual-channel system



Operating mode: with manual reset and external device monitoring (EDM)

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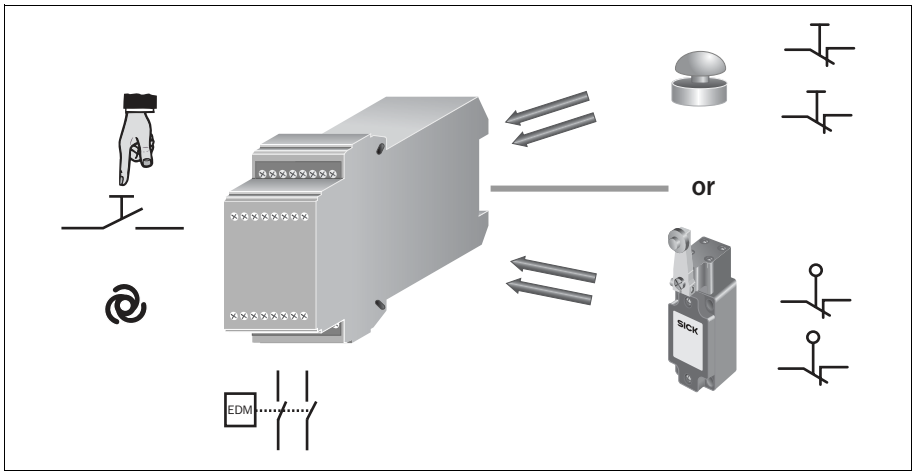
Overview of technical specifications

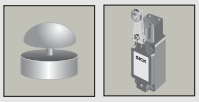
Control category according to EN 954-1	4
Number of enable current paths/signalling current paths	3 / 1
Input circuit	Single- or dual-channel
Housing width	45 mm

Product description

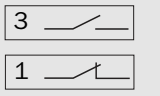
- Cross circuit detection on dual-channel wired systems
- 3 LEDs:
  - Supply voltage
  - Relay K 2
  - Relay K 3
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion units
  - UE 10-4 XT
  - UE 11-4 DX
- External device monitoring (EDM)

Applications





- For emergency stops
- For safety switches



Ordering information

Supply voltage	Type	Part number
24 V DC	UE43-3MF2D3	6 024 897
24 V AC	UE43-3MF2A0	6 024 898
115 V AC	UE43-3MF2A1	6 024 899
120 V AC	UE43-3MF2A2	6 024 900
230 V AC	UE43-3MF2A3	6 024 901

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→ Services	A-0

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Detailed technical specifications

General system data

Supply voltage to A 1 / A 2 for DC units	
Electrical output circuit > 25 V AC / 60 V DC	PELV
Electrical output circuit < 25 V AC / 60 V DC	PELV or SELV
Supply voltage to A 1 / A 2 for AC units	Use of earth conductor terminal
Safety category according to EN 954-1	4
Stop category according to EN 60204	0
Supply voltage V_S	
UE 43-3 MF 2 D3	24 V DC (20.4 V DC ... 26.4 V DC)
UE 43-3 MF 2 A0	24 V AC (20.4 V AC ... 26.4 V AC)
UE 43-3 MF 2 A1	115 V AC (97.75 V AC ... 126.5 V AC)
UE 43-3 MF 2 A2	120 V AC (102.0 V AC ... 132.0 V AC)
UE 43-3 MF 2 A3	230 V AC (195.5 V AC ... 253.0 V AC)
Power consumption	
AC	2.5 W / 3.2 VA
DC	1.0 W
Residual ripple in DC mode (within the limits of V_S)	2.4 V_{SS}
Nominal frequency in AC mode	50 Hz ... 60 Hz

Control voltage Y 11 and Y 21

Control voltage	24 V DC
Control current	40 mA
Short-circuit current between Y 11 and A 2	1000 mA
Fuse	
AC units	Short circuit resistant transformer
DC units	PTC resistor
Reaction time by cross connection	3 s
Galvanic separation between A 1 / A 2 and Y 11 - Y 21 - PE (only on AC units)	Yes

Input circuits (Y 12 and Y 31 - Y 22)

Input current Y 12 and Y 31	15 mA
Input current Y 13 and Y 14 (reset circuit)	40 mA
Reset time	
Manual (Y 13)	150 ms ... 250 ms
Automatic (Y 14)	0.8 s ... 1.2 s
Synchronisation time	500 ms
Line resistance at the input circuit	< 70 Ω
Input time upon applying supply voltage	100 ms

Output circuits (13 - 14, 23 - 24, 33 - 34, 41 - 42)

Response time (K 2 / K 3)	50 ms
Relay contacts	3 NO, enable current paths, safety relevant 1 NC, signalling current path, not safety relevant
Contact type	Positively guided
Contact material	Silver alloy; gold-plated
Load capacity of contacts	
Switching voltage	10 V AC ... 230 V AC / 10 V DC ... 30 V DC
Switching current	10 mA ... 6 A
Total current across all contacts	18 A
Application category according to EN 60947-5-1	AC-15 U_e 230 V AC, I_e 6 A (3600 c/h) DC-13 U_e 24 V DC, I_e 6 A (360 c/h) DC-13 U_e 24 V DC, I_e 3 A (3600 c/h)

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Permitted switching frequency	3600 c/h
Service life, mechanical (relay contacts)	1 x 10^7 switching cycles
Service life, electrical (dependent on the load)	2 x 10^6 switching cycles

Operating data

Surge voltage rating ($U_{Imp.}$)	4 kV
Excess voltage category	III
Contamination rating of the unit (EN 50178)	
External	3
Internal	2
Voltage rating	300 V AC
Test voltage U_{eff} (50 Hz) EN 60439-1	2.0 kV
Enclosure rating	
Housing	IP 40
Terminals	IP 20
Radio interference	DIN EN 61000-6-4
Screening against interference	DIN EN 61000-6-2
Ambient operating temperature	–25 °C ... +55 °C
Storage temperature	–25 °C ... +75 °C
Cross sections of electrical conductors	
Single strand wire (2 x, identical cross section)	0.75 mm^2 ... 2.5 mm^2
Single strand wire (1 x)	0.75 mm^2 ... 2.5 mm^2
Fine stranded wire with terminal crimps (2 x, identical cross section)	0.5 mm^2 ... 1.5 mm^2
Fine stranded wire with terminal crimps (1 x)	0.5 mm^2 ... 1.5 mm^2

Weight	
AC units	0.36 kg
DC units	0.30 kg

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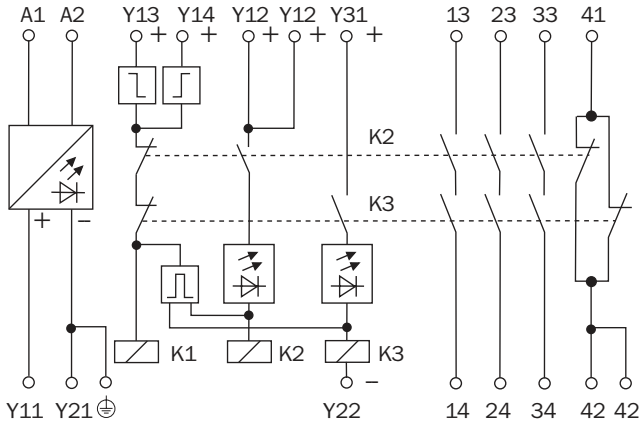
Internal circuitry



Function

After applying the supply voltage (LED SUPPLY illuminates) the normally open contacts remain open. If the connected sensor is not activated (i.e. the input circuits are closed), the normally open contacts close immediately in automatic reset (LED K 2 and K 3 illuminate). In the case of manual resetting, this is only effected upon pressing and releasing the reset button.

Activation of the sensor (opening of one or both input circuits) effects the opening of the normally open contacts (LED K 2 and K 3 off).

External device monitoring (EDM)

The UE 43-3 MF unit can take over the external device monitoring. The contactor monitoring system monitors the external relays by way of their normally closed contacts.

Manual reset

For manual resetting a pushbutton must be connected to terminals Y 12 and Y 13. Reset is monitored.

Automatic reset

For automatic resetting Y 12 - Y 14 must be linked.

Cross circuit detection

Cross circuit is detected on dual-channel wired systems, if these are wired with opposing polarity.

Monitoring of synchronisation

Only if input 2 closes by no later than 0.5 sec after input 1 do the output circuits close. If input 2 closes before input 1, the monitoring of synchronisation will not be effected, and the output circuits will close. This monitoring only takes place in automatic reset.

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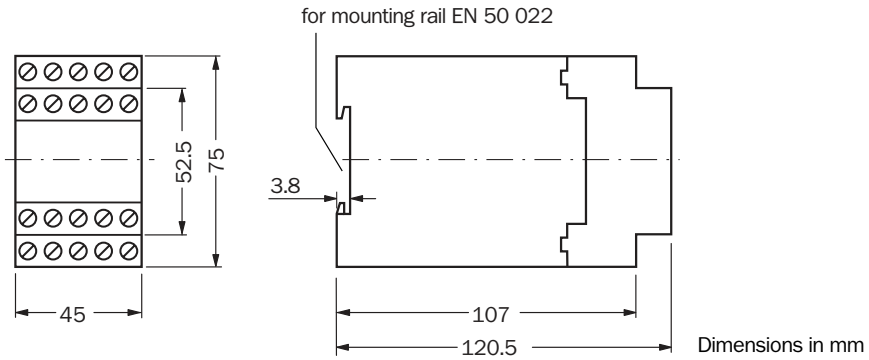
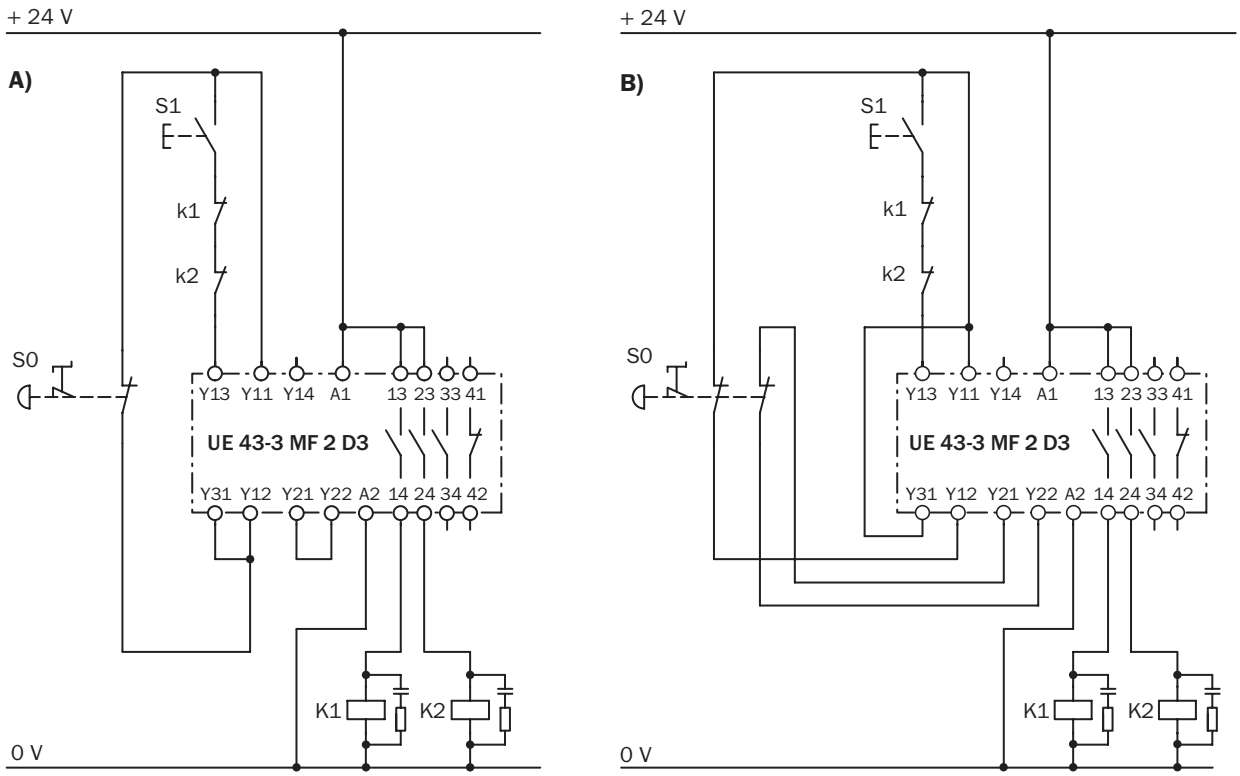
Dimensional drawings



Housing with screw-type terminals

Connection diagram

Emergency stop switch connected to UE43-3MF2D3 safety relay



Operating mode: with manual reset and external device monitoring
A) single-channel system
B) dual-channel system

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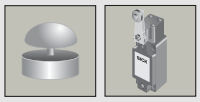


- For emergency stops
- For safety switches

6

4

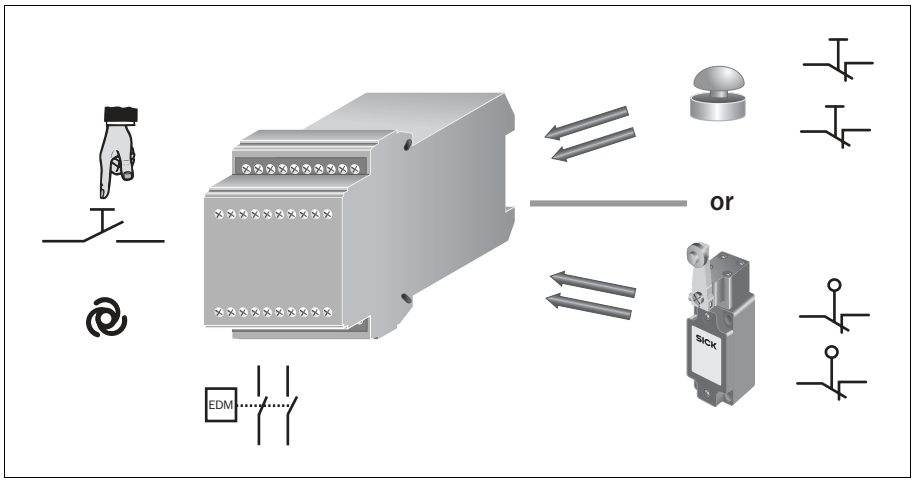
Overview of technical specifications

Control category according to EN 954-1	4
Number of enable current paths/signalling current paths	6 / 4
Input circuit	Single- or dual-channel
Housing width	90 mm

Product description

- Cross circuit detection on dual-channel wired systems
- 6 LEDs:
  - Supply voltage
  - Input circuit CH 1
  - Input circuit CH 2
  - Relay K 1
  - Relay K 2
  - Relay K 3 RESET
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion modules
  - UE 10-4 XT
  - UE 11-4 DX
- External device monitoring (EDM)

Applications



Ordering information

Supply voltage	Type	Part number
24 V DC	UE43-6MF2D3	6 024 902
120 V AC	UE43-6MF2A2	6 024 905
230 V AC	UE43-6MF2A3	6 024 906

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Detailed technical specifications

General system data

Supply voltage to A 1 / A 2 for DC units	
Electrical output circuit > 25 V AC / 60 V DC	PELV
Electrical output circuit < 25 V AC / 60 V DC	PELV or SELV
Supply voltage to A 1 / A 2 for AC units	Use of earth conductor terminal
Safety category according to EN 954-1	4
Stop category according to EN 60204	0
Supply voltage V_S (A 1 / A 2)	
UE 43-6 MF 2 D3	24 V DC (20.4 V DC ... 26.4 V DC)
UE 43-6 MF 2 A2	120 V AC (102.0 V AC ... 132.0 V AC)
UE 43-6 MF 2 A3	230 V AC (195.5 V AC ... 253.0 V AC)
Power consumption	
AC	4.2 W / 4.5 VA
DC	2.4 W
Residual ripple in DC mode (within the limits of V_S)	2.4 V_{SS}
Nominal frequency in AC mode	50 Hz ... 60 Hz

Control voltage S 11 and S 21

Control voltage	24 V DC
Control current	40 mA
Short circuit current (between Y 11 and A 2)	1000 mA
Fuse	
AC units	Short-circuit resistant transformer
DC units	PTC resistor
Reaction time by cross connection (DC unit)	3 s
Galvanic separation between A 1 - 2 and Y 11 - Y 21 - PE (only on AC units)	Yes

Input circuits (S 12 - S 22 and Y 3 - S 22)

Input current	40 mA
Reset time	
Manual	350 ms
Automatic	500 ms
Synchronisation time	500 ms
Line resistance at the input circuit	< 85 Ω
Switch-on time upon applying the supply voltage (AC units)	100 ms

Output circuits (13 - 14, 23 - 24, 33 - 34, 43 - 44, 53 - 54, 63 - 64, 71 - 72, 81 - 82, 91 - 92, 01 - 02)

Response time (K 1 / K 2)	60 ms
Relay contacts	6 NO, enable current paths, safety relevant 4 NC, signalling current paths, not safety relevant
Contact type	Positively guided
Contact material	Silver alloy; gold-plated
Load capacity of contacts	
Switching voltage	10 V AC ... 230 V AC / 10 V DC ... 30 V DC
Switching current	10 mA ... 6 A
Total current across all contacts	24 A
Application category according to EN 60947-5-1	AC-15 U_e 230 V AC, I_e 3 A (3600 c/h) DC-13 U_e 24 V DC, I_e 6 A (360 c/h) DC-13 U_e 24 V DC, I_e 2 A (3600 c/h)
Permitted switching frequency	3600 c/h
Service life, mechanical (relay contacts)	1 x 10^7 switching cycles
Service life, electrical (dependent on the load)	2 x 10^6 switching cycles

Continued on next page

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Operating data

Surge voltage rating ($U_{Imp.}$)	4 kV
Excess voltage category	III
Contamination rating of the unit (EN 50178)	
External	3
Internal	2
Voltage rating	300 V AC
Test voltage U_{eff} (50 Hz) EN 60439-1	2.0 kV
Enclosure rating	
Housing	IP 40
Terminals	IP 20
Radio interference	DIN EN 61000-6-4
Screening against interference	DIN EN 61000-6-2
Ambient operating temperature	–25 °C ... +55 °C
Storage temperature	–25 °C ... +75 °C
Cross sections of electrical conductors	
Single strand wire (2 x, identical cross section)	0.75 mm^2 ... 2.5 mm^2
Single strand wire (1 x)	0.75 mm^2 ... 2.5 mm^2
Fine stranded wire with terminal crimps (2 x, identical cross section)	0.5 mm^2 ... 1.5 mm^2
Fine stranded wire with terminal crimps (1 x)	0.5 mm^2 ... 1.5 mm^2

Weight	0.8 kg

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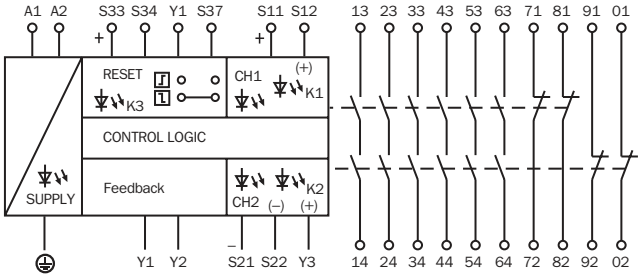
Internal circuitry



Function

After applying the supply voltage (LED SUPPLY illuminates), the normally open contacts remain open. If the connected sensor is not activated, the LEDs CH 1 and CH 2 illuminate. In the case of automatic resetting, the normally open contacts close immediately (LEDs K 1 and K 2 illuminate). With manual resetting the normally open contacts only close upon pressing and releasing the reset button.

The activation of the sensor (opening of one or both input circuits) effects the opening of the normally open contacts (LEDs K 1 and K 2 off).

External device monitoring (EDM)

The UE 43-6 MF unit can take over the external device monitoring. The contactor monitoring system monitors the external relays by way of their normally closed contacts.

Manual reset

For manual reset a pushbutton is to be connected between contacts S 12 and S 34 and Y 1 - S 37 must be jumpered. This reset is monitored.

Automatic reset

S 12 - S 34 must be jumpered. Y 1 - Y 37 is not jumpered.

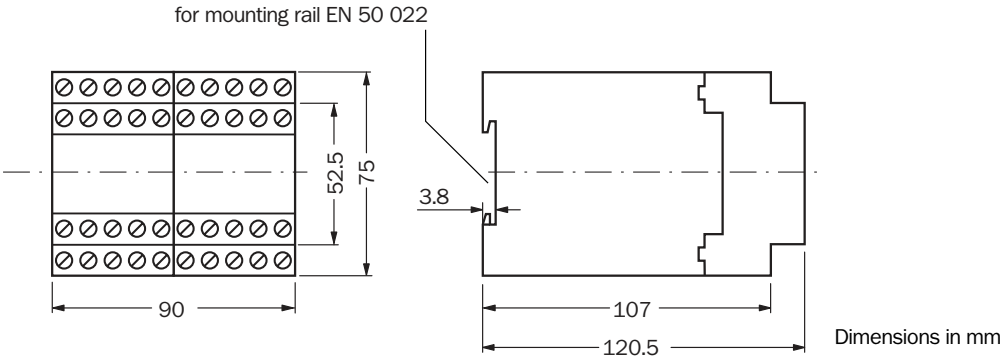
Cross circuit detection

Cross circuit is detected on dual-channel wired systems, if these are wired with opposing polarity.

Monitoring of synchronisation

Only if input 2 closes by no later than 0.5 sec after input 1 do the output circuits close. If input 2 closes before input 1, the monitoring of synchronisation will not be effected, and the output circuits will close. This monitoring only takes place in automatic reset.

Dimensional drawings



Dimensions in mm

Housing with screw-type terminals

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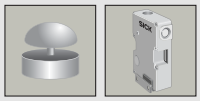
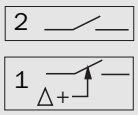


- For emergency stops
- For safety switches
- For safety switches with mechanical locking



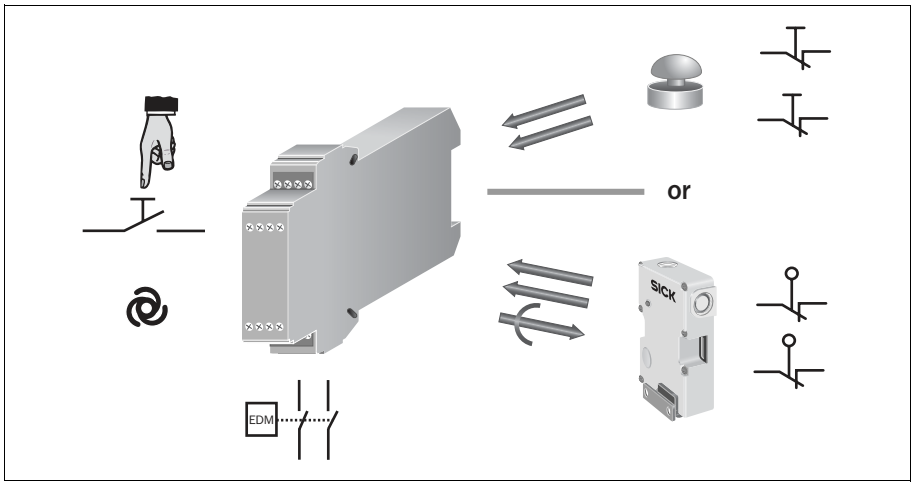
Overview of technical specifications

Control category according to EN 954-1	4
Number of enable current paths/signalling current paths	2 / 0
Number of on-delayed response time enable current paths	1
Input circuit	Single- or dual-channel
Housing width	22.5 mm

Product description

- Cross circuit detection on dual-channel wired systems
- Outputs:
  - 2 normally open contacts
  - 1 on-delayed response time enable current path, adjustable from 0.15 ... 3 s or 1.5 ... 30 s
- 3 LEDs:
  - Supply voltage
  - Relay K 1 / K 2 (without delay)
  - Relay K 3 / K 4 (delayed)
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion modules
  - UE 10-4 XT
  - UE 11-4 DX
- External device monitoring (EDM)
- Available with plug-in terminals (key coded)

Applications



Ordering information

On-delay time	Connection type	Type	Part number
0.15 s ... 3 s	Screw-type terminals	UE44-3SL2D33	6 024 907
	Plug-in terminals	UE44-3SL3D33	6 024 908
1.5 s ... 30 s	Screw-type terminals	UE44-3SL2D330	6 024 909
	Plug-in terminals	UE44-3SL3D330	6 024 910

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Detailed technical specifications

General system data

Supply voltage to A 1 / A 2 for DC units	
Electrical output circuit > 25 V AC / 60 V DC	PELV
Electrical output circuit < 25 V AC / 60 V DC	PELV or SELV
Safety category according to EN 954-1	4
Stop category according to EN 60204	0
Supply voltage V_S	24 V DC (20.4 V DC ... 26.4 V DC)
Power consumption	1.8 W
Residual ripple in DC mode (within the limits of V_S)	2.4 V_{SS}

Control voltage S 11 - S 33 and S 21

Control voltage	22 V DC
Control current	60 mA
Short-circuit current between S 11 and A 2	2200 mA
Fuse	PTC resistor
Reaction time by cross connection	2 s
Galvanic separation between A 1 / A 2 and S 11 - S 21	No

Input circuits (S 12 and S 31)

Input current S 12 and S 31	25 mA ... 100 mA
Input current S 34 / S 35 (reset circuit)	40 mA ... 50 mA
Reset time	
Manual (S 34)	30 ms
Automatic (S 35)	750 ms
Synchronisation time	500 ms
Activation time of reset button	250 ms
Line resistance at the input circuit	< 85 Ω

Output circuits (13 - 14, 23 - 24, 37 - 38)

Response time (K 1 / K 2)	25 ms
On-delay time (K 3 / K 4)	
UE 44-3 SL xD3 3	0.15 s ... 3 s
UE 44-3 SL xD3 30	1.5 s ... 30 s
Relay contacts	2 NO, enable current paths, safety Cat. 4 1 NO, enable current path, on-delayed, safety Cat. 3
Contact type	Positively guided
Contact material	Silver alloy; gold-plated
Load capacity of contacts	
Switching voltage	10 V AC ... 230 V AC / 10 V DC ... 30 V DC
Switching current	10 mA ... 6 A
Total current across all contacts	12 A
Application category according to EN 60947-5-1	AC-15 U_e 230 V AC, I_e 4 A (3600 c/h) DC-13 U_e 24 V DC, I_e 5 A (360 c/h) DC-13 U_e 24 V DC, I_e 3 A (3600 c/h)
Permitted switching frequency	3600 c/h
Service life, mechanical (relay contacts)	5 x 10^6 switching cycles
Service life, electrical (dependent on the load)	2 x 10^6 switching cycles

Operating data

Surge voltage rating ($U_{Imp.}$)	4 kV
Excess voltage category	III

Continued on next page

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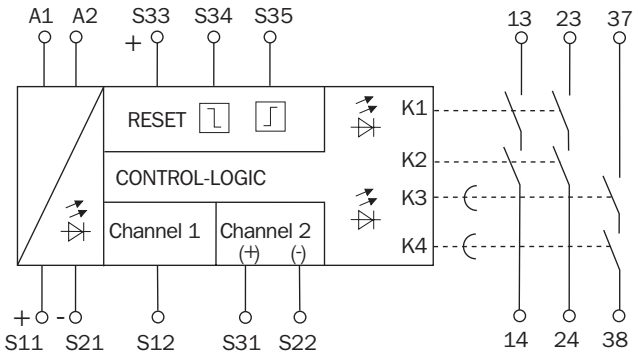
Contamination rating of the unit (EN 50178)	
External	3
Internal	2
Voltage rating	300 V AC
Test voltage U_{eff} (50 Hz) EN 60439-1	2.0 kV
Enclosure rating	
Housing	IP 40
Terminals	IP 20
Radio interference	EN 60947-1 02/99
Screening against interference	EN 60947-1 02/99
Ambient operating temperature	–25 °C ... +55 °C
Storage temperature	–25 °C ... +75 °C
Cross sections of electrical conductors	
Single strand wire (2 x, identical cross section)	0.14 mm^2 ... 0.75 mm^2
Single strand wire (1 x)	0.14 mm^2 ... 2.5 mm^2
Fine stranded wire with terminal crimps (2 x, identical cross section)	0.25 mm^2 ... 0.5 mm^2
Fine stranded wire with terminal crimps (1 x)	0.25 mm^2 ... 2.5 mm^2

Weight	0.2 kg

Internal circuitry



Function

After applying the supply voltage (LED SUPPLY illuminates), the normally open contacts (13 - 14 / 23 - 24) remain open. After completion of the on-delay set on the relay, the delay circuit (37 - 38) closes, and the LED K 3 / K 4 illuminates. If the connected sensor is not activated (i.e. the input circuits are closed), the normally open contacts (13 - 14 / 23 - 24) close immediately during automatic reset, the LED K 1 / K 2 illuminates, and the delay circuit (37 - 38) opens (LED K 3 / K 4 off). In the case of manual reset, this only occurs after pressing and releasing the reset button.

The activation of the sensor (opening of one or both input circuits) effects the opening of both normally open contacts (13 - 14 / 23 - 24), with LED K 1 / K 2 being off, and a time delayed closing of the third circuit (37 - 38), with LED K 3 / K 4 illuminating.

External device monitoring (EDM)

The unit can take over external device monitoring. The contactor monitoring system monitors the external relays by way of their normally closed contacts.

Manual reset

For manual resetting, a pushbutton is to be connected between 24 V DC supply and terminal S 34. This reset is monitored. For applications with mechanical locking safety switches, only channel 2 must be closed during manual reset.

Automatic reset

For automatic resetting S 12 - S 35 must be linked. For applications with mechanical locking safety switches, only channel 1 must be closed during automatic reset.

Cross circuit detection

Cross circuit is detected on dual-channel wired systems, if these are wired with opposing polarity.

Monitoring of synchronisation

Only if input 2 closes by no later than 0.5 sec after input 1 do the output circuits close. If input 2 closes before input 1, the monitoring of synchronisation will not be effected, and the output circuits will close. This monitoring only takes place in automatic reset.

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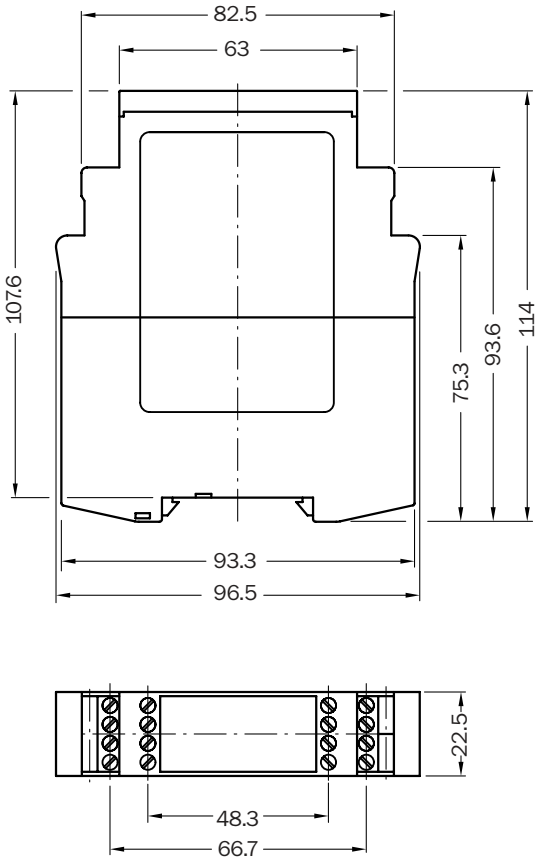
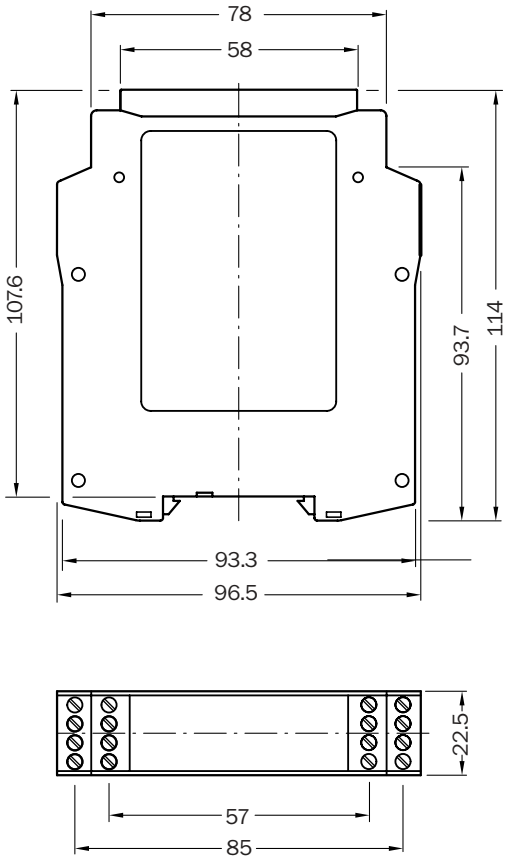
Dimensional drawings



Housing with screw-type terminals



Housing with plug-in terminals

Dimensions in mm

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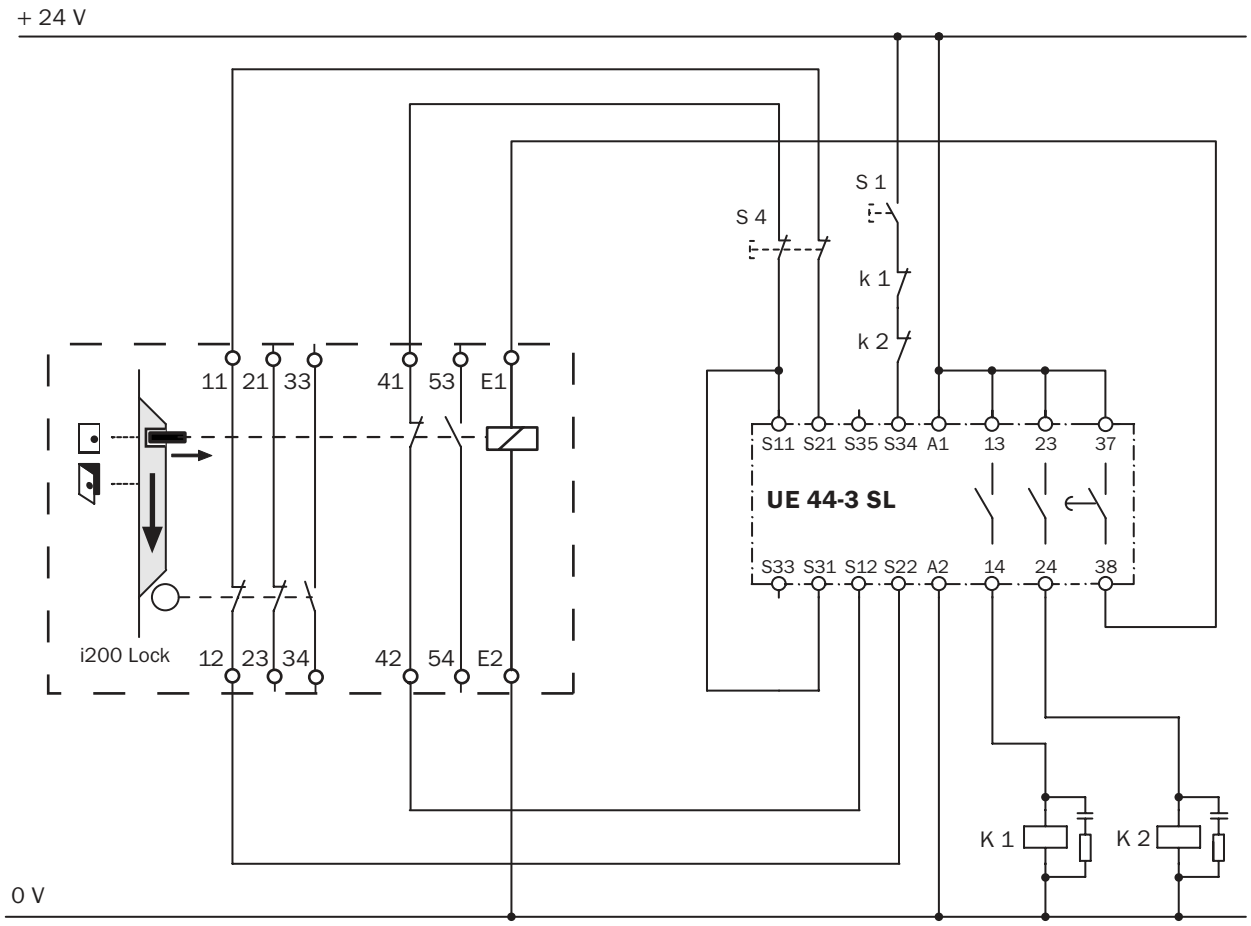
Connection diagram

i200 Lock safety switch (with mechanical locking) connected to UE 44-3 SL safety relay



Operating mode: with manual reset and external device monitoring (EDM)

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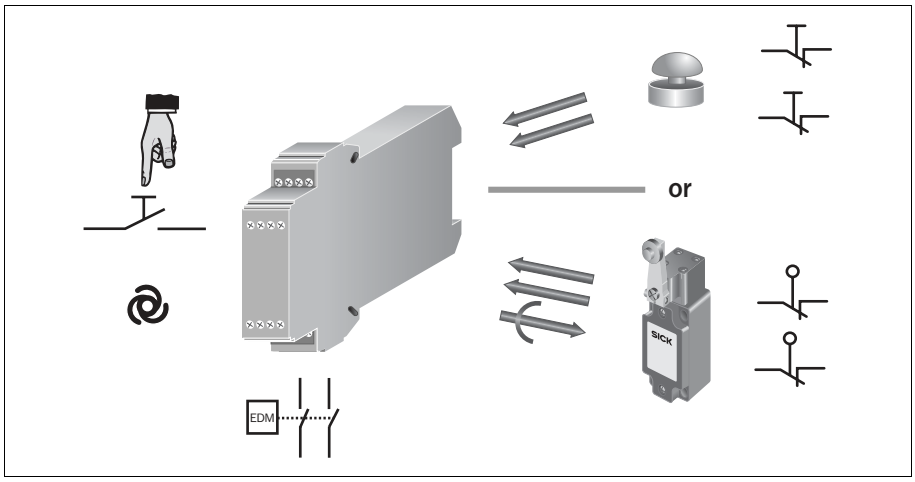
Overview of technical specifications

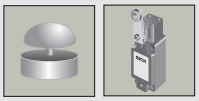
Control category according to EN 954-1	4
Number of enable current paths/signalling current paths	2 / 0
Number of off-delayed normally open contacts	1
Input circuit	Single- or dual-channel
Housing width	22.5 mm

Product description

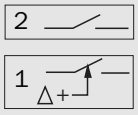
- Cross circuit detection on dual-channel wired systems
- Outputs:
  - 2 normally open contacts
  - 1 normally open contact with off-delay, adjustable from 0.15 ... 3 s or 1.5 ... 30 s
- 3 LEDs:
  - Supply voltage
  - Relay K 1 / K 2 (without delay)
  - Relay K 3 / K 4 (delayed)
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion modules
  - UE 10-4 XT
  - UE 11-4 DX
- External device monitoring (EDM)
- Available with plug-in terminals (key coded)

Applications





- For emergency stops
- For safety switches



Ordering information

Off-delay time	Connection type	Type	Part number
0.15 s ... 3 s	Screw-type terminals	UE45-3S12D33	6 024 911
	Plug-in terminals	UE45-3S13D33	6 024 912
1.5 s ... 30 s	Screw-type terminals	UE45-3S12D330	6 024 913
	Plug-in terminals	UE45-3S13D330	6 024 914

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→ Dimensional drawings	L-40
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→ Expansion modules	L-67 L-70
→ Services	A-0

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Detailed technical specifications

General system data

Supply voltage to A 1 / A 2	
Electrical output circuit > 25 V AC / 60 V DC	PELV
Electrical output circuit < 25 V AC / 60 V DC	PELV or SELV
Safety category according to EN 954-1	4
Stop category according to EN 60204	0/1
Supply voltage V_S	24 V DC (20.4 V DC ... 26.4 V DC)
Power consumption	2.6 W
Residual ripple in DC mode (within the limits of V_S)	2.4 V_{SS}

Control voltage S 11 / S 33 and S 21

Control voltage	24 V DC
Control current	60 mA
Short-circuit current between S 11 and A 2	2200 mA
Fuse	PTC resistor
Reaction time by cross connection	2 s
Galvanic separation between A 1 / A 2 and S 11 / S 21	No

Input circuits (S 12 and S 31)

Input current S 12 and S 31	25 mA ... 100 mA
Input current S 34 / S 35 (reset circuit)	40 mA ... 50 mA
Reset time	
Manual (S 34)	30 ms
Automatic (S 35)	600 ms
Synchronisation time	500 ms
Activation time of reset button	200 ms
Line resistance at the input circuit	< 85 Ω

Output circuits (13 - 14, 23 - 24, 37 - 38)

Response time (K 1 / K 2)	25 ms
Off-delay time (K 3 / K 4)	
UE 45-3 S1 xD3 3	0.15 s ... 3 s
UE 45-3 S1 xD3 30	1.5 s ... 30 s
Relay contacts	2 NO, enable current paths, safety Cat. 4 1 NO, enable current path, off-delayed, safety Cat. 3
Contact type	Positively guided
Contact material	Silver alloy; gold-plated
Load capacity of contacts	
Switching voltage	10 V AC ... 230 V AC / 10 V DC ... 30 V DC
Switching current	10 mA ... 6 A
Total current across all contacts	12 A
Application category according to EN 60947-5-1	AC-15 U_e 230 V AC, I_e 4 A (3600 c/h) DC-13 U_e 24 V DC, I_e 5 A (360 c/h) DC-13 U_e 24 V DC, I_e 3 A (3600 c/h)
Permitted switching frequency	3600 c/h
Service life, mechanical (relay contacts)	5 x 10^6 switching cycles
Service life, electrical (dependent on the load)	2 x 10^6 switching cycles

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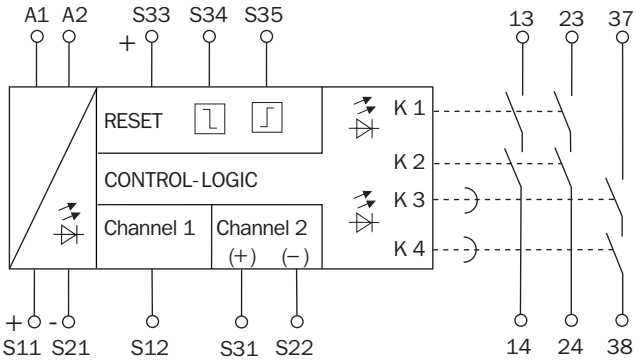
Operating data

Surge voltage rating ($U_{Imp.}$)	4 kV
Excess voltage category	III
Contamination rating of the unit (EN 50178)	
External	3
Internal	2
Voltage rating	300 V AC
Test voltage U_{eff} (50 Hz) EN 60439-1	2.0 kV
Enclosure rating	
Housing	IP 40
Terminals	IP 20
Radio interference	EN 60947-1 02/99
Screening against interference	EN 60947-1 02/99
Ambient operating temperature	–25 °C ... +55 °C
Storage temperature	–25 °C ... +75 °C
Cross sections of electrical conductors	
Single strand wire (2 x, identical cross section)	0.14 mm^2 ... 0.75 mm^2
Single strand wire (1 x)	0.14 mm^2 ... 2.5 mm^2
Fine stranded wire with terminal crimps (2 x, identical cross section)	0.25 mm^2 ... 0.5 mm^2
Fine stranded wire with terminal crimps (1 x)	0.25 mm^2 ... 2.5 mm^2

Weight	0.2 kg

Internal circuitry



Function

After applying the supply voltage (LED SUPPLY illuminates), the normally open contacts remain open. If the connected sensor is not activated (i.e. the input circuits are closed), the normally open contacts close immediately during automatic resetting, LED K 1 / K 2 and K 3 / K 4 illuminate. In the case of manual resetting, this only occurs after pressing and releasing the reset button.

The activation of the sensor (opening of one or both input circuits) effects the opening of both normally open contacts (13 - 14 / 23 - 24) immediately, and a time delayed closing of the third circuit (37 - 38), with LED K 1 / K 2 immeditely going off and K 3 / K 4 going off later.

External device monitoring (EDM)

The unit can take over external device monitoring. The contactor monitoring system monitors the external relays by way of their normally closed contacts.

Manual reset

For manual resetting, a pushbutton must be connected to terminals S 33 - S 34. This reset is monitored.

Automatic reset

For automatic resetting S 33 - S 35 must be linked.

Cross circuit detection

Cross circuit is detected on dual-channel wired systems, if these are wired with opposing polarity.

Monitoring of synchronisation

Only if input 2 closes by no later than 0.5 sec after input 1 do the output circuits close. If input 2 closes before input 1, the monitoring of synchronisation will not be effected, and the output circuits will close. This monitoring only takes place in automatic reset.

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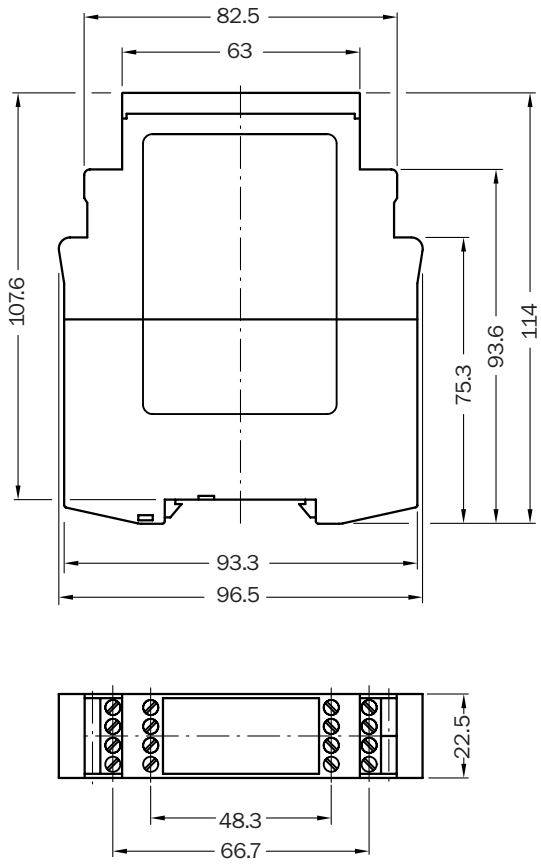
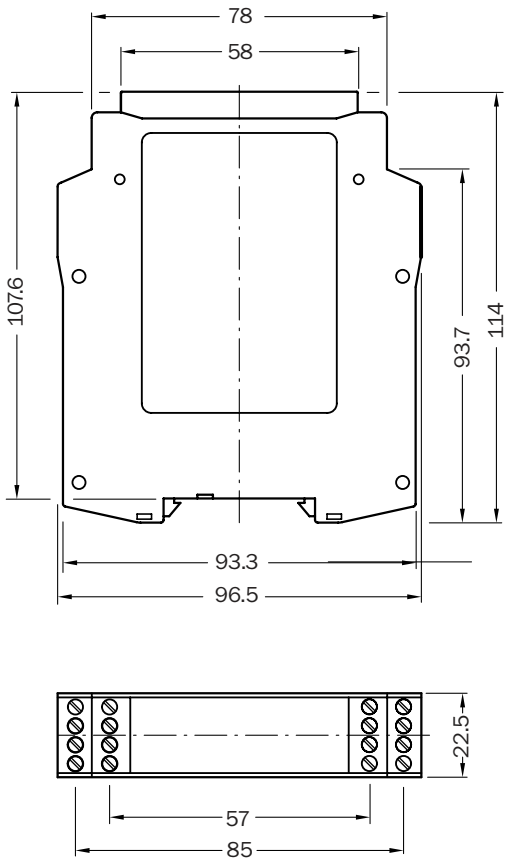
Dimensional drawings



Housing with screw-type terminals



Housing with plug-in terminals

Dimensions in mm

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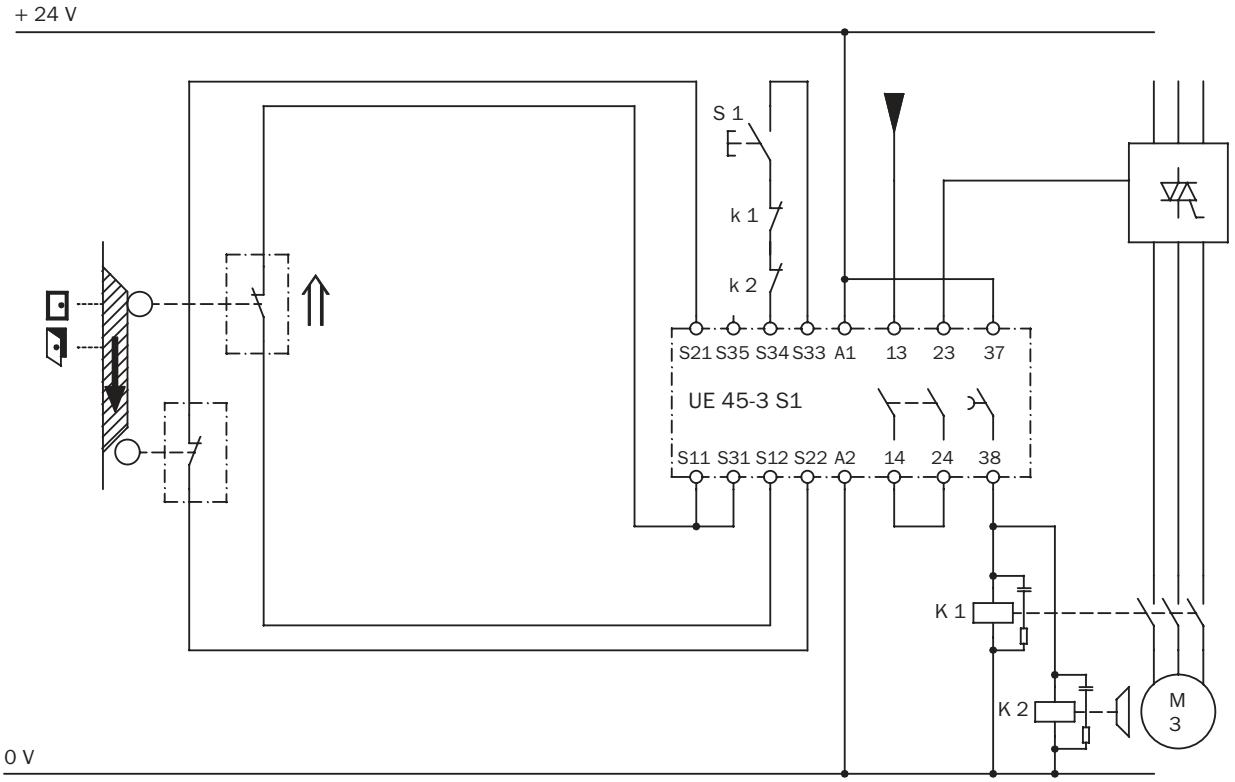
Connection diagram

Two safety switches connected to UE 45-3 S1 safety relay



Operating mode: with manual reset and external device monitoring (EDM)

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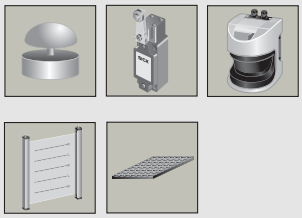
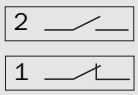


- For emergency stops
- For safety switches
- For safety laser scanners
- For safety light curtains
- For photoelectric safety switches
- For pressure sensitive mats in accordance with EN 1760 using 4-wire technology



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→ Dimensional drawings	L-45
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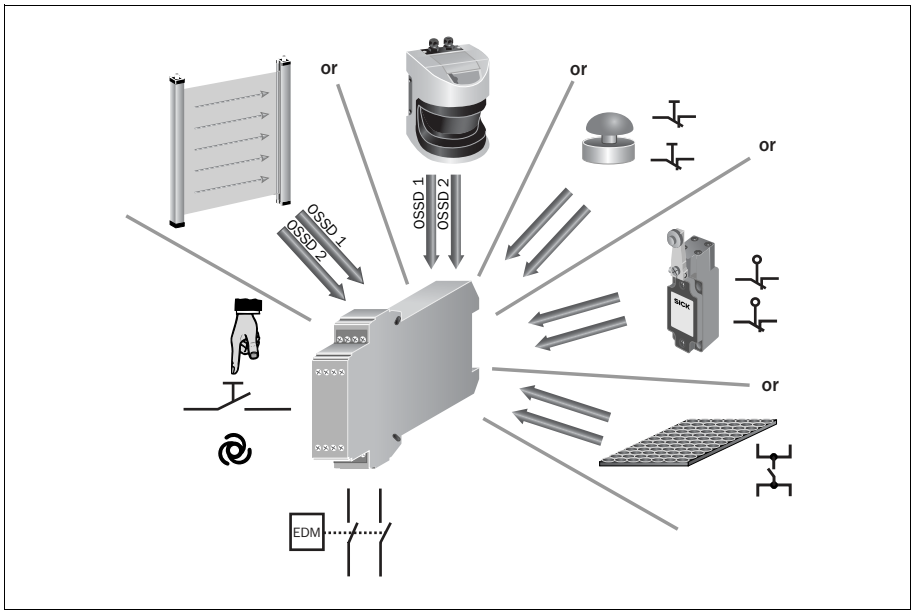
Overview of technical specifications

Control category according to EN 954-1	4
Number of enable current paths/signalling current paths	2 / 1
Input circuit	Single- or dual-channel
Housing width	22.5 mm

Product description

- Cross circuit detection on dual-channel wired systems
- 3 LEDs:
  - Supply voltage
  - Relay K 1
  - Relay K 2
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion modules
  - UE 10-4 XT
  - UE 11-4 DX
- External device monitoring (EDM)
- Available with plug-in terminals (key coded)

Applications



In-system added value

Units employing monitored semiconductor outputs (OSSD), such as

- FGS
- PLS
- C 2000
- M 2000
- C 4000
- S 3000
- LSI
- MSL
- T 4000 Compact

Ordering information

Connection type	Type	Part number
Screw-type terminals	UE48-2OS2D2	6 024 915
Plug-in terminals	UE48-2OS3D2	6 024 916

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Detailed technical specifications

General system data

Supply voltage to A 1 / A 2	
Electrical output circuit > 25 V AC / 60 V DC	PELV
Electrical output circuit < 25 V AC / 60 V DC	PELV or SELV
Safety category according to EN 954	4
Stop category according to EN 60204	0
Supply voltage V_S (A 1 / A 2)	24 V AC/DC (20.4 V AC/DC ... 26.4 V AC/DC)
Power consumption	
AC mode	4.6 VA
DC mode	2.1 W
Residual ripple in DC mode (within the limits of V_S)	2.4 V_{SS}
Nominal frequency in AC mode	50 Hz ... 60 Hz

Control voltage S 33 / S 11 and S 21

Control voltage	17.4 V DC ... 22 V DC
Control current	40 mA ... 100 mA
Short-circuit current between S 33 / S 11 and S 21	300 mA
Fuse	Electronic fuse
Reaction time by cross connection	50 ms
Activation time upon detection of cross connection	50 ms
Galvanic separation between A 1 / A 2 and S 21, S 11, S 33	No

Input circuits (S 12, S 31, S 22, S 34, S 35)

Input voltage (S 12 and S 31)	
HIGH	17.4 V DC ... 26.4 V DC
LOW	–3 V DC ... +5 V DC
Input current S 12 and S 31 / S 22	40 mA ... 100 mA
Input current S 34 / S 35	5 mA ... 50 mA
Reset time	
Manual (S 34)	40 ms
Automatic (S 35)	80 ms
Activation time of reset button	50 ms
Minimum switch-off time/minimum switch-on time	7 ms
Permitted test pulse time/test frequency	1000 µs / 10 s^{-1}
Line resistance at the input circuit	< 35 Ω

Output circuits (13 - 14, 23 - 24, 31 - 32 / 33 - 34)

Response time (K 1 / K 2)	25 ms
Minimum time outputs will stay off	70 ms ... 130 ms
Relay contacts	2 NO, enable current paths, safety relevant 1 NC, signalling current path, not safety relevant
Contact type	Positively guided
Contact material	Silver alloy; gold-plated
Load capacity of contacts	
Switching voltage	10 V AC ... 230 V AC / 10 V DC ... 30 V DC
Switching current	10 mA ... 6 A
Total current across all contacts	12 A
Application category according to EN 60947-5-1	AC-15 U_e 230 V AC, I_e 4 A (360 c/h) AC-15 U_e 230 V AC, I_e 3 A (3600 c/h) DC-13 U_e 24 V DC, I_e 4 A (360 c/h) DC-13 U_e 24 V DC, I_e 2.5 A (3600 c/h)

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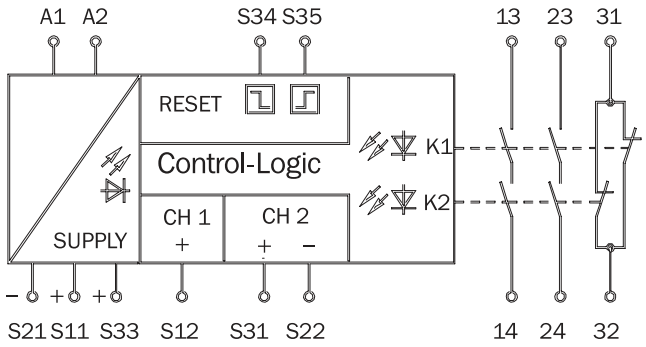
Permitted switching frequency	3600 c/h
Service life, mechanical (relay contacts)	1 x 10^7 switching cycles
Service life, electrical (dependent on the load)	2 x 10^6 switching cycles

Operating data

Surge voltage rating ($U_{Imp.}$)	4 kV
Excess voltage category	III
Contamination rating of the unit (EN 50178)	
External	3
Internal	2
Voltage rating	300 V AC
Test voltage U_{eff} (50 Hz) EN 60439-1	2.0 kV
Enclosure rating	
Housing	IP 40
Terminals	IP 20
Radio interference	DIN EN 61000-6-4
Screening against interference	DIN EN 61000-6-2
Ambient operating temperature	–25 °C ... +55 °C
Storage temperature	–25 °C ... +75 °C
Cross sections of electrical conductors	
Single strand wire (2 x, identical cross section)	0.14 mm^2 ... 0.75 mm^2
Single strand wire (1 x)	0.14 mm^2 ... 2.5 mm^2
Fine stranded wire with terminal crimps (2 x, identical cross section)	0.25 mm^2 ... 0.5 mm^2
Fine stranded wire with terminal crimps (1 x)	0.25 mm^2 ... 2.5 mm^2

Weight	0.2 kg

Internal circuitry



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Function

After applying the supply voltage (LED SUPPLY illuminates), the normally open contacts remain open. If the connected sensor is not activated or the protective field of the connected opto-electronic protective device is not broken (i.e. the input circuits are closed), then the normally open contacts close immediately in automatic reset, LED K 1 and K 2 illuminate. In the case of manual resetting, this only occurs after pressing and releasing the reset button. The activation of the sensor or incursion into the protective field of the non-contact safety device (open state of one of the two input circuits) effects the opening of the normally open contacts (LED K 1 and K 2 off).

External device monitoring (EDM)

The unit can take over external device monitoring. The contactor monitoring system monitors the external relays by way of their normally closed contacts.

Manual reset

For manual resetting, a pushbutton must be connected to terminals S 33 - S 34. This reset is monitored.

Automatic reset

- For ESPEs: S 33 - S 35 must be linked
- For applications with potential free contacts on the input circuit S 12 - S 35 must be linked.

Cross circuit detection

Cross circuit is detected on dual-channel wired systems, if these are wired with opposing polarity.

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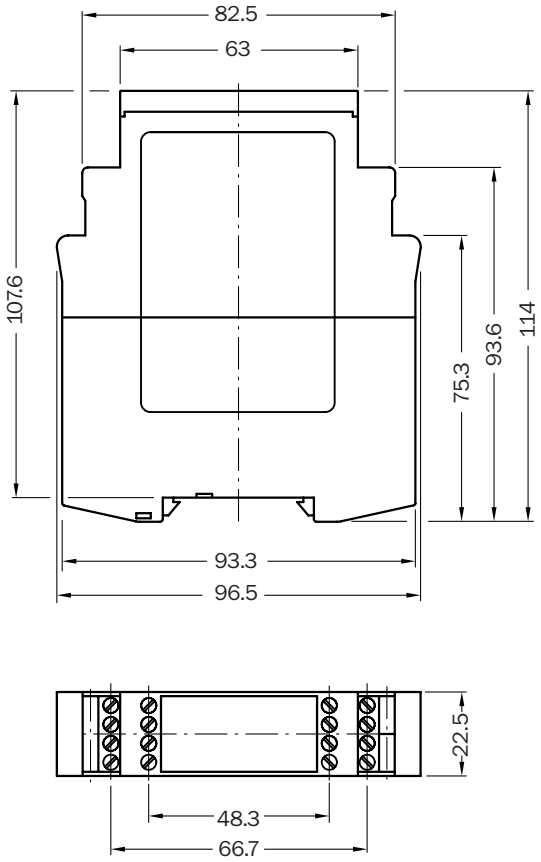
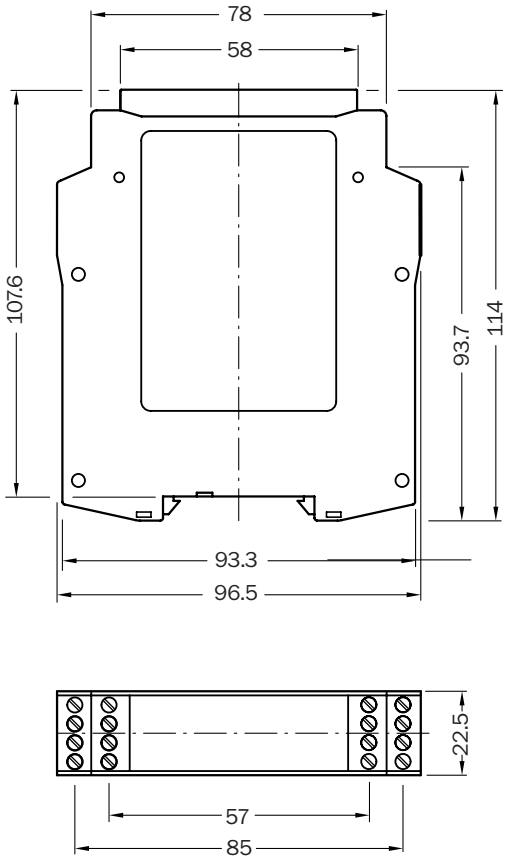
Dimensional drawings



Housing with screw-type terminals



Housing with plug-in terminals

Dimensions in mm

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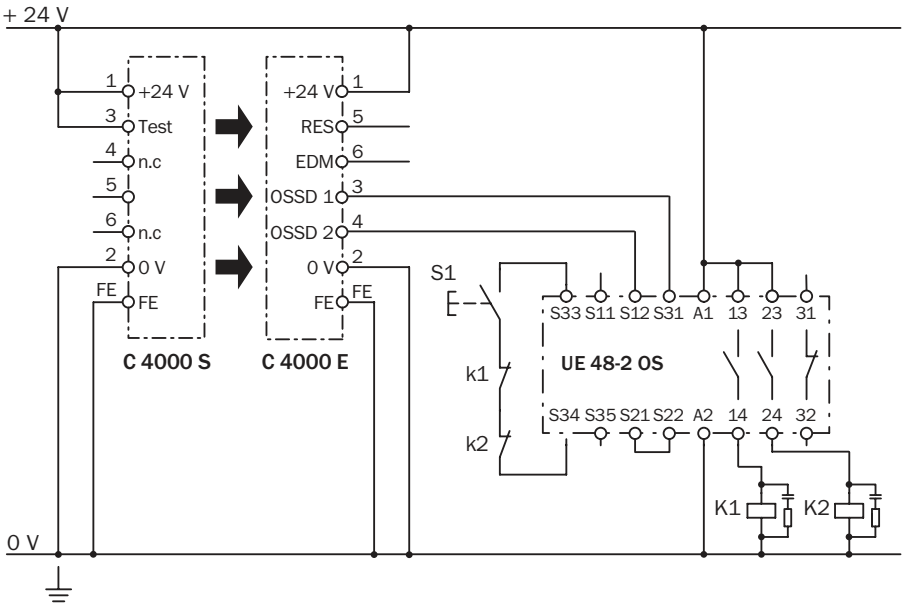
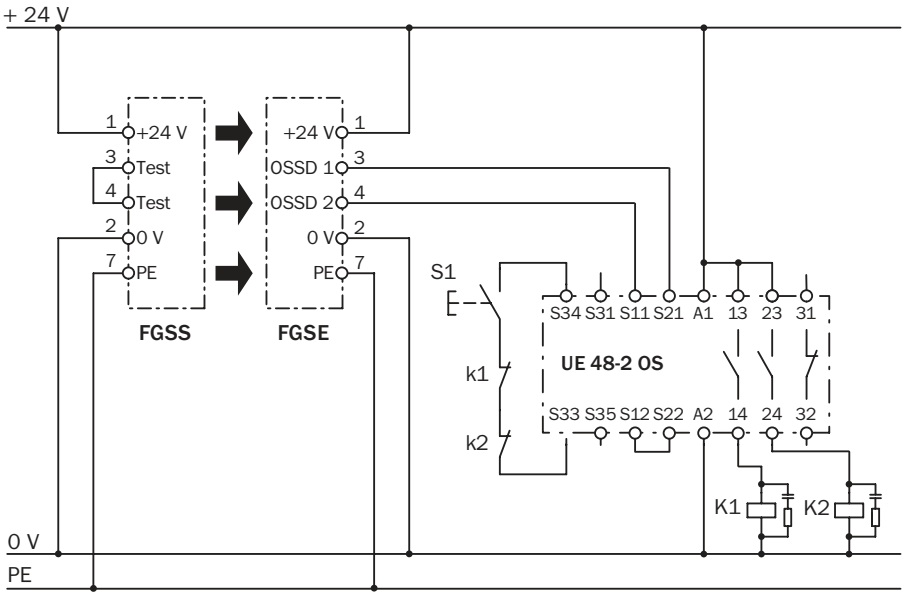
Connection diagrams

Safety light curtain C 4000 Basic to UE 48-2 OS safety relay



Operating mode: with manual reset and external device monitoring (EDM)

Safety light curtain FGS connected to UE 48-2 OS safety relay



Operating mode: with manual reset and external device monitoring (EDM)

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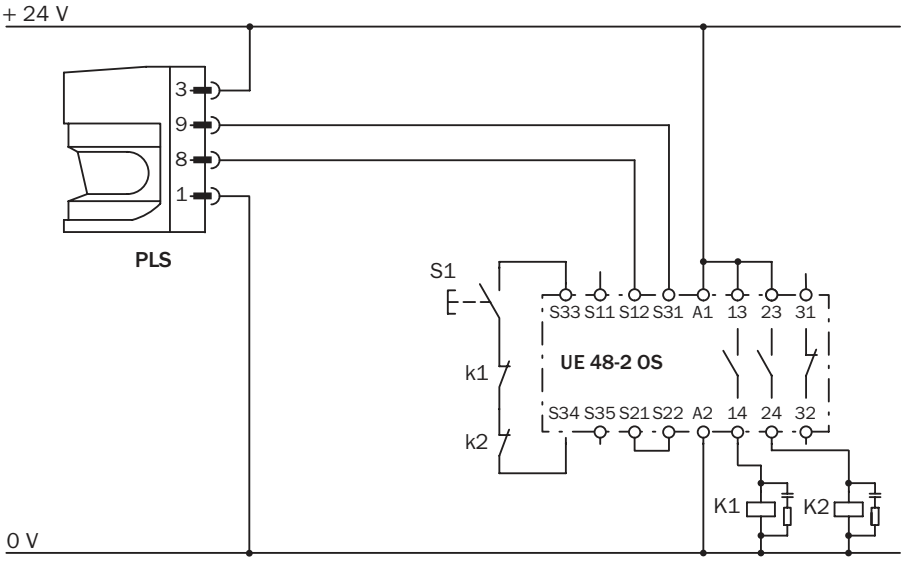
Safety laser scanner PLS connected to UE 48-2 OS safety relay



Operating mode: with manual reset and external device monitoring (EDM)

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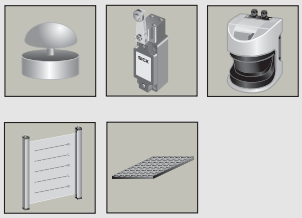


- For emergency stops
- For safety switches
- For safety laser scanners
- For safety light curtains
- For photoelectric safety switches
- For pressure sensitive mats in accordance with EN 1760 using 4-wire technology

3

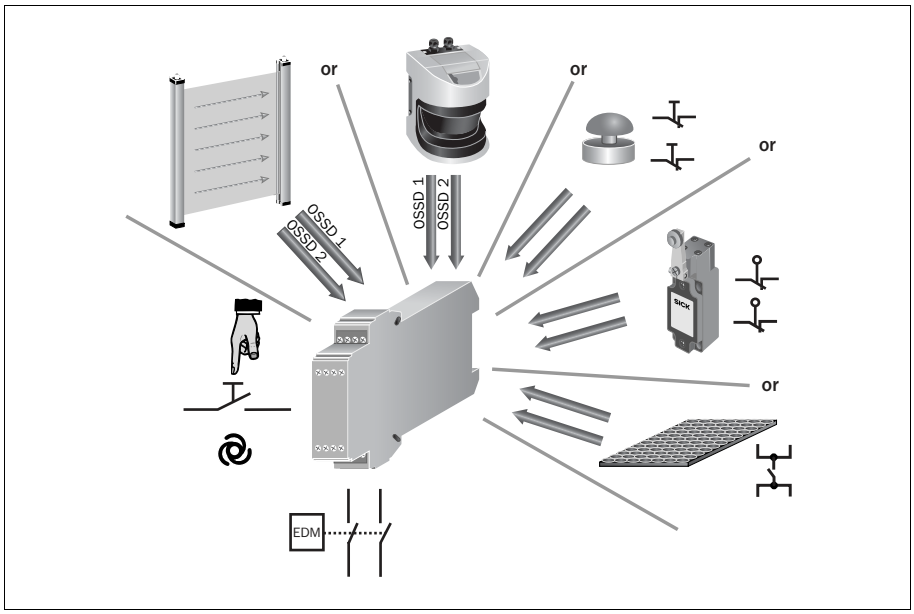
Overview of technical specifications

Control category according to EN 954-1	4
Number of enable current paths/signalling current paths	3 / 0
Input circuit	Single- or dual-channel
Housing width	22.5 mm

Product description

- Cross circuit detection on dual-channel wired systems
- 3 LEDs:
  - Supply voltage
  - Relay K 1
  - Relay K 2
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion modules
  - UE 10-4 XT
  - UE 11-4 DX
- External device monitoring (EDM)
- Available with plug-in terminals (key coded)

Applications



In-system added value

Units employing monitored semiconductor outputs (OSSD), such as

- FGS
- PLS
- C 2000
- M 2000
- C 4000
- S 3000
- LSI
- MSL
- T 4000 Compact

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Further information	Page
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Ordering information

Connection type	Type	Part number
Screw-type terminals	UE48-3OS2D2	6 025 089
Plug-in terminals	UE48-3OS3D2	6 025 097

Detailed technical specifications

General system data

Supply voltage to A 1 / A 2	
Electrical output circuit > 25 V AC / 60 V DC	PELV
Electrical output circuit < 25 V AC / 60 V DC	PELV or SELV
Safety category according to EN 954	4
Stop category according to EN 60204	0
Supply voltage V_S (A 1 / A 2)	24 V AC/DC (20.4 V AC/DC ... 26.4 V AC/DC)
Power consumption	
AC mode	4.6 VA
DC mode	2.1 W
Residual ripple in DC mode (within the limits of V_S)	2.4 V_{SS}
Nominal frequency in AC mode	50 Hz ... 60 Hz

Control voltage S 33 / S 11 and S 21

Control voltage	17.4 V DC ... 22 V DC
Control current	40 mA ... 100 mA
Short-circuit current between S 33 / S 11 and S 21	300 mA
Fuse	Electronic fuse
Reaction time by cross connection	50 ms
Activation time upon detection of cross connection	50 ms
Galvanic separation between A 1 / A 2 and S 21, S 11, S 33	No

Input circuits (S 12, S 31, S 22, S 34, S 35)

Input voltage (S 12 and S 31)	
HIGH	17.4 V DC ... 26.4 V DC
LOW	–3 V DC ... +5 V DC
Input current S 12 and S 31 / S 22	40 mA ... 100 mA
Input current S 34 / S 35	5 mA ... 50 mA
Reset time	
Manual (S 34)	40 ms
Automatic (S 35)	80 ms
Activation time of reset button	50 ms
Minimum switch-off time/minimum switch-on time	7 ms
Permitted test pulse time/test frequency	1000 µs / 10 s^{-1}
Line resistance at the input circuit	< 35 Ω

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Output circuits (13 - 14, 23 - 24, 31 - 32 / 33 - 34)

Response time (K 1 / K 2)	25 ms
Minimum time outputs will stay off	70 ms ... 130 ms
Relay contacts	3 NO, enable current paths, safety relevant
Contact type	Positively guided
Contact material	Silver alloy; gold-plated
Load capacity of contacts	
Switching voltage	10 V AC ... 230 V AC / 10 V DC ... 30 V DC
Switching current	10 mA ... 6 A
Total current across all contacts	12 A
Application category according to EN 60947-5-1	AC-15 U_e 230 V AC, I_e 4 A (360 c/h) AC-15 U_e 230 V AC, I_e 3 A (3600 c/h) DC-13 U_e 24 V DC, I_e 4 A (360 c/h) DC-13 U_e 24 V DC, I_e 2.5 A (3600 c/h)
Permitted switching frequency	3600 c/h
Service life, mechanical (relay contacts)	1 x 10^7 switching cycles
Service life, electrical (dependent on the load)	2 x 10^6 switching cycles

Operating data

Surge voltage rating ($U_{Imp.}$)	4 kV
Excess voltage category	III
Contamination rating of the unit (EN 50178)	
External	3
Internal	2
Voltage rating	300 V AC
Test voltage U_{eff} (50 Hz) EN 60439-1	2.0 kV
Enclosure rating	
Housing	IP 40
Terminals	IP 20
Radio interference	DIN EN 61000-6-4
Screening against interference	DIN EN 61000-6-2
Ambient operating temperature	–25 °C ... +55 °C
Storage temperature	–25 °C ... +75 °C
Cross sections of electrical conductors	
Single strand wire (2 x, identical cross section)	0.14 mm^2 ... 0.75 mm^2
Single strand wire (1 x)	0.14 mm^2 ... 2.5 mm^2
Fine stranded wire with terminal crimps (2 x, identical cross section)	0.25 mm^2 ... 0.5 mm^2
Fine stranded wire with terminal crimps (1 x)	0.25 mm^2 ... 2.5 mm^2

Weight	0.2 kg

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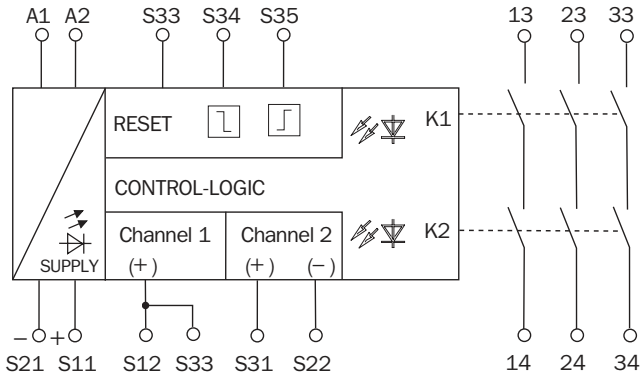
Internal circuitry



Function

After applying the supply voltage (LED SUPPLY illuminates), the normally open contacts remain open. If the connected sensor is not activated or the protective field of the connected opto-electronic protective device is not broken (i.e. the input circuits are closed), then the normally open contacts close immediately in automatic reset, LED K 1 and K 2 illuminate. In the case of manual resetting, this only occurs after pressing and releasing the reset button. The activation of the sensor or incursion into the protective field of the non-contact safety device (open state of one of the two input circuits) effects the opening of the normally open contacts (LED K 1 and K 2 off).

External device monitoring (EDM)

The unit can take over external device monitoring. The contactor monitoring system monitors the external relays by way of their normally closed contacts.

Manual reset

For manual resetting, a pushbutton must be connected to terminals S 33 - S 34. This reset is monitored.

Automatic reset

- For ESPEs: S 33 - S 35 must be linked.
- For applications with potential free contacts on the input circuit S 12 - S 35 must be linked.

Cross circuit detection

Cross circuit is detected on dual-channel wired systems, if these are wired with opposing polarity.

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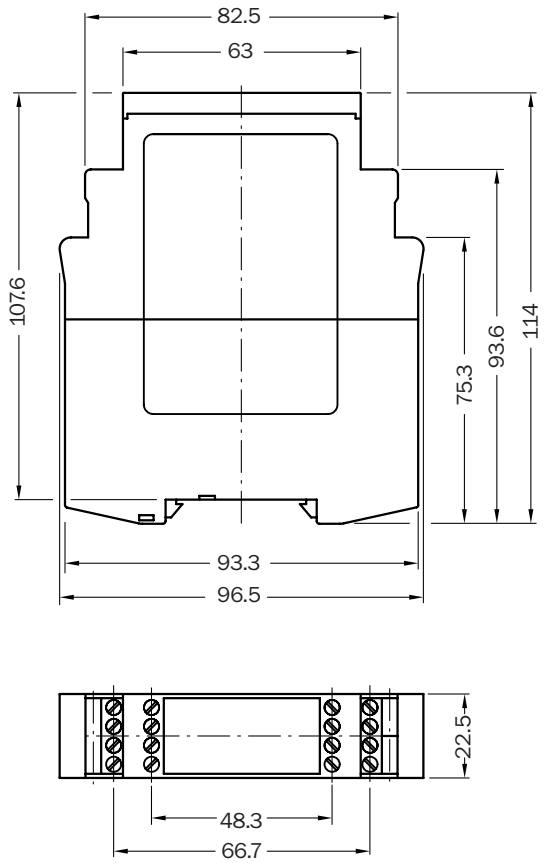
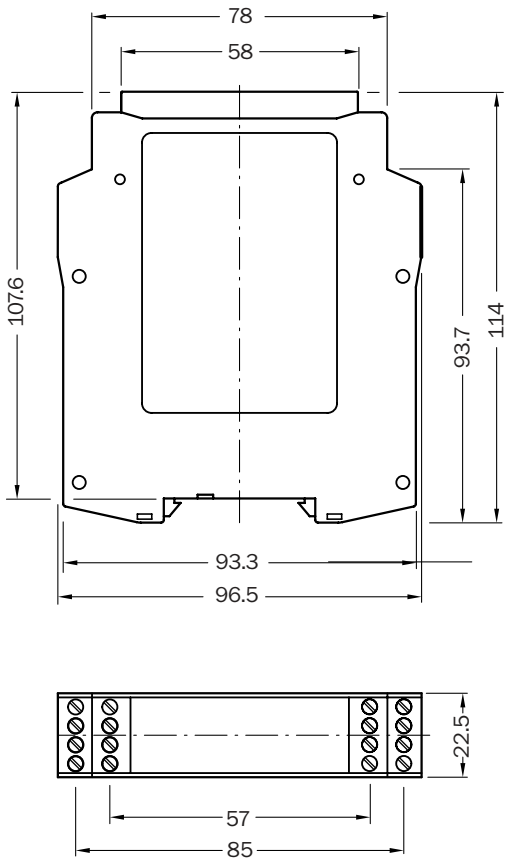
Dimensional drawings



Housing with screw-type terminals



Housing with plug-in terminals

Dimensions in mm

Connection diagrams

→ Connection diagrams see safety relay UE 48-2 OS starting on page L-46

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Overview of technical specifications

Control category according to EN 954-1	2
Type of connectable opto-electronic protective devices	C 2000, M 2000, single-beam photoelectric safety switches
Number of connectable C 2000, M 2000 systems	3 (cascaded)
Number of connectable single-beam photoelectric safety switches	1 ... 6
Number of safe outputs (OSSDs)	2
Maximum switching current	500 mA
Response time	14 ms

Product description

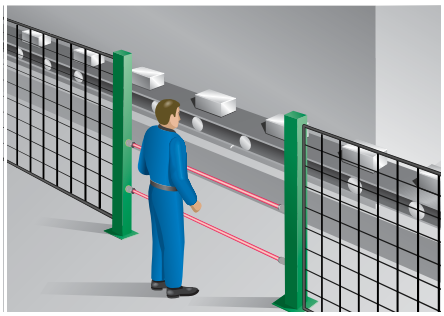
- 2 OSSDs, PNP, monitored and short-circuit protected
- External test pulse not required
- Functions individually selectable

In-system added value

Evaluation unit for:
- C 2000
- M 2000
- Up to 6 testable single-beam photoelectric safety switch pairs

Applications

Hazardous area protection using the VS/VE 18 and the LE 20 on an automated guided vehicle (AGV)



Access protection with VS/VE 18 and LE 20

- Restart interlock
- External device monitoring (EDM)
- Self testing
- 7-segment diagnostic display

Ordering information

Connection type	Enclosure rating	Type	Part number
Screw terminal connector	IP 20	LE20-2612	1 016 503
	IP 65	LE20-1612	1 016 500
Spring clamp terminal connector	IP 20	LE20-2614	1 016 505
	IP 65	LE20-1614	1 016 499

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Detailed technical specifications

Electrical data

Supply voltage V_S	24 V DC –30 %/+20 %, 5 % ripple [1)]
Power-up delay (after power On)	2 s approx.
Current consumption I_{max}	100 mA
Power consumption	4 W
Response time	5 ms
Response time of entire system (dependent on system configuration)	To be calculated from the following values: ▪ C 2000/M 2000: approx. 7 ms to 25 ms, dependent on protective field height and resolution ▪ Single-beam photoelectric safety switches: max. 9 ms ▪ LE 20: 5 ms ▪ Relay module: 5 ms
Response time for test input	Max. 30 ms
Reset time	Max. 50 ms
Connecting cables	0.5 mm^2, length max. 30 m 2.5 mm^2, length max. 150 m
Inputs: signal level on/off	HIGH: 15 V ... V_S LOW: 0 V ... 10 V
Test extern	HIGH: external test inactive LOW: external test active Pulse duration > 30 ms
Self-test cycle time	2 s

Outputs

Outputs OSSD 1, OSSD 2 (the levels refer to connectionto the system connector)	PNP, monitored and short-circuit-proof
Switching current I_{max}	500 mA
Switching voltage V_{max}	V_S – 2.0 V at 500 mA
Switching capacity P_{max}	13.2 W
Inductive switching capacity $P_{max\ ind}$	1 VA
Protective field free V	V_{max}
Protective field interrupted V	0 V
Residual current at signal level "0" I	0.1 mA
Max. capacitive load	200 nF at I: 50 mA 2.5 µF at I: 500 mA
Test period test rate	2 s
Test pulse width	150 µs approx.
Test A, Test B (inactive/active)	V_S – 2.65 V/0 V Total current Test A + Test B < 10 mA Max. capacitive load 10 µF

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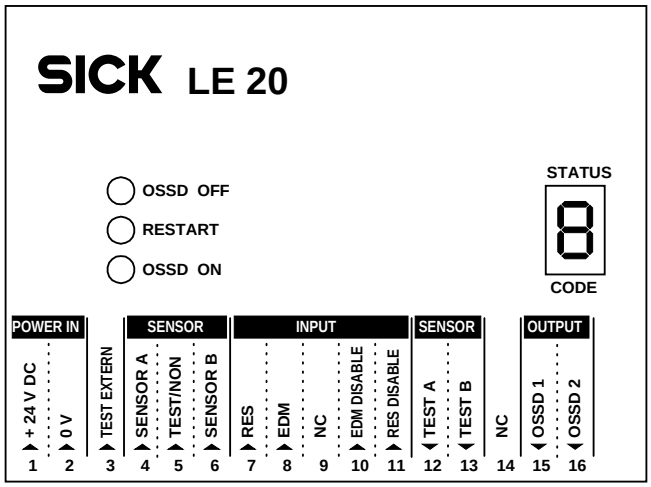
Operating data

Protection class	III [2]
Enclosure rating	IP 20, IP 65 optional
Safety category according to EN 61496	Type 2
Ambient operating temperature	–20 °C ... +60 °C
Storage temperature	–25 °C ... +75 °C
Air humidity (non condensing)	15 % ... 95 %
Vibration resistance	5g, 10 Hz ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29

[1] The upper and lower power supply limits must not be infringed.
The external power supply to the devices must be capable of withstanding a short-term power failure of 20 ms in accordance with EN 60204.
Suitable power supply units are available from SICK as accessories

[2] The circuits connected to the inputs and outputs must conform to the creepage and clearance distances specified in the relevant standards with regard to safe isolation in accordance with PELV (EN 60204, 6.4)

Internal circuitry



The LE 20 safety evaluation unit is able to carry out a periodic safety test of the connected photoelectric switches, and provides the photoelectric switch system with the additional reset interlock and external device monitoring safety functions.

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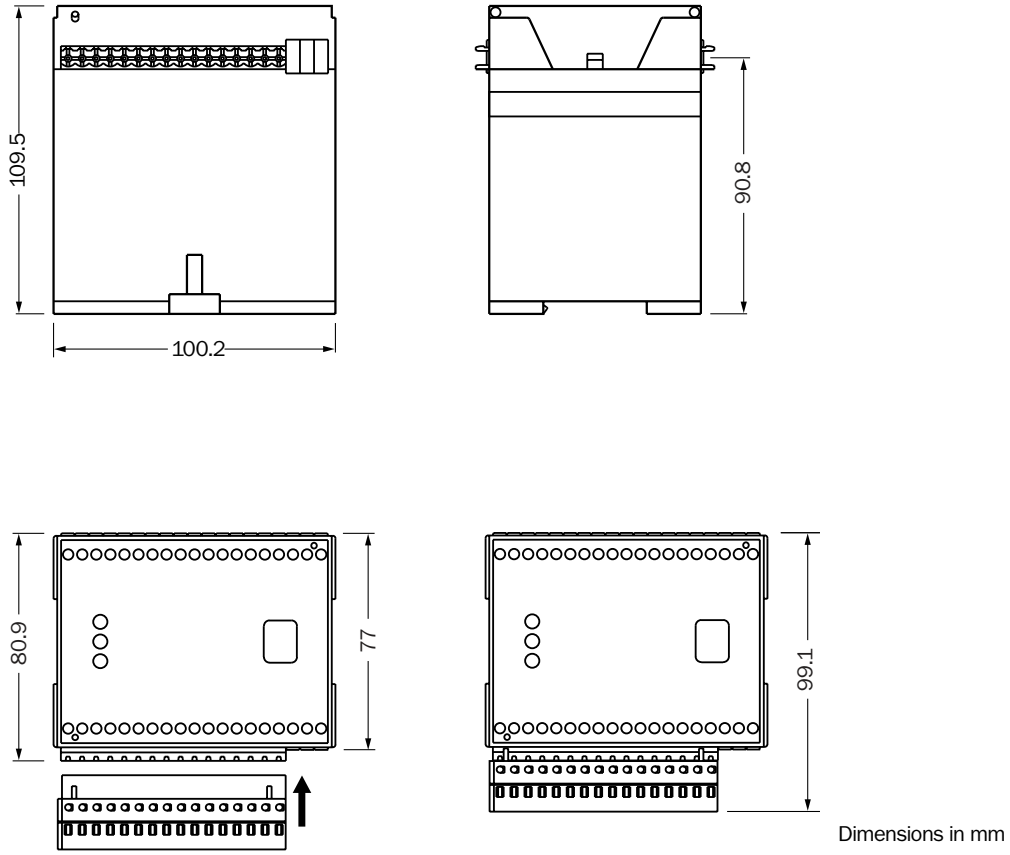
Dimensional drawings



Dimensions in mm

Mechanical dimensions, LE 20 with screw clamps, IP 20

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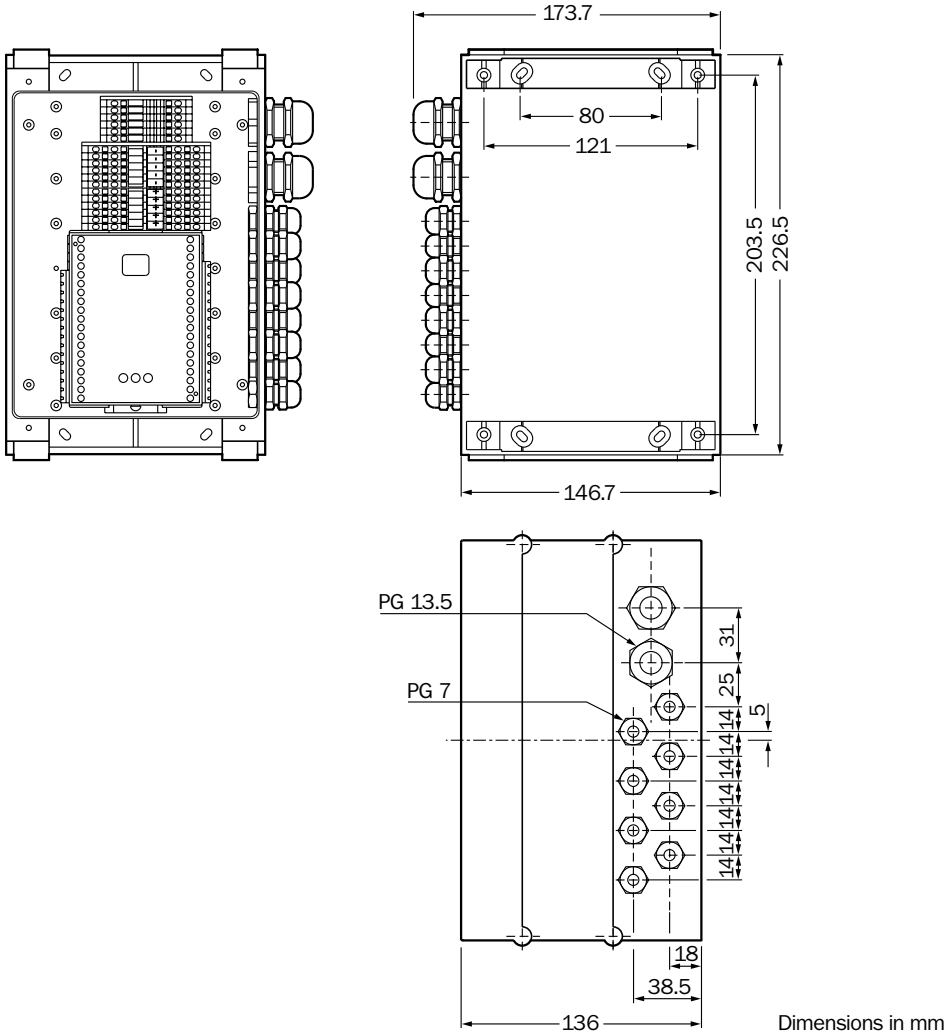

Dimensions in mm

Mechanical dimensions, IP-65 housing for LE 20

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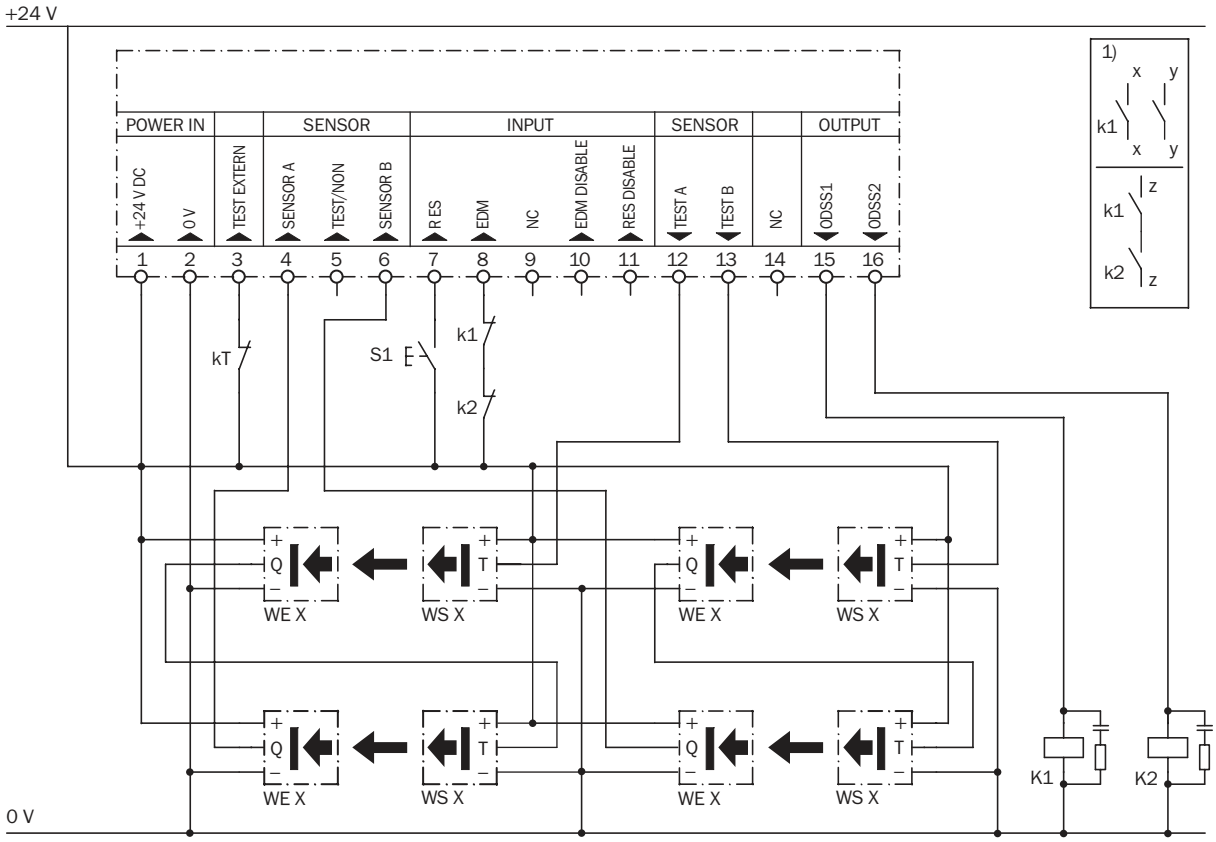
Connection diagrams

Safety relay LE 20 with 4 single-beam photoelectric safety switches WS/WE 27-2, WS/WE 18-2 or WS/WE 12-2



These contacts must be integrated into the control system such that when the output circuit is open the hazardous state is eliminated.

In safety categories 4 and 3 they must be integrated in two-channel configuration (x, y paths). Single-channel insertion into the control system (z path) is only possible with single-channel control and taking account of the risk analysis.

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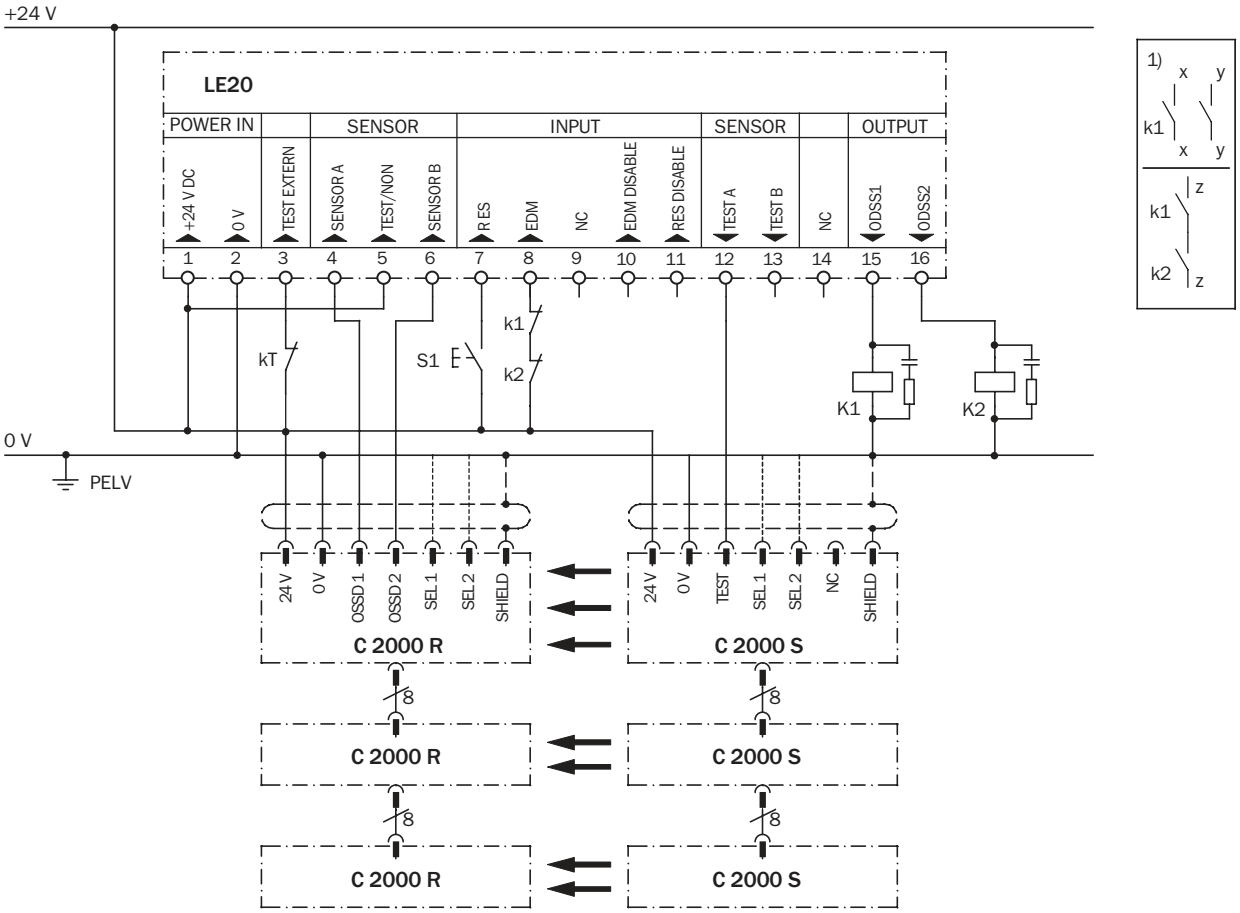
Safety relay LE 20 with a cascade: C 2000 - C 2000 - C 2000



These contacts must be integrated into the control system such that when the output circuit is open the hazardous state is eliminated.

In safety categories 4 and 3 they must be integrated in two-channel configuration (x, y paths). Single-channel insertion into the control system (z path) is only possible with single-channel control and taking account of the risk analysis.

Ordering information accessories

Interfaces

Description	Connection type	Type	Part number
Safety relay UE 10-2 OS	With screw terminal connector	UE10-2OS2D0	2 019 772
	With spring clamp terminal connector	UE10-2OS4D0	2 019 771

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- Muting
- Restart interlock
- External device monitoring (EDM)
- Self testing
- 7-segment diagnostic display

Overview of technical specifications

Control category according to EN 954-1	2
Type of connectable opto-electronic protective devices	C 2000, M 2000, single-beam photoelectric safety switches
Number of connectable C 2000, M 2000 systems	3 (cascaded)
Number of connectable single-beam photoelectric safety switches	1 ... 6
Number of safe outputs (OSSDs)	2
Maximum switching current	500 mA
Response time	14 ms

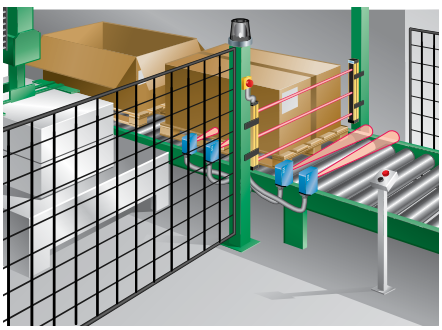
Product description

- 2 OSSDs, PNP, monitored and short-circuit protected
- External test pulse not required
- Functions individually selectable
- Up to 4 muting inputs, sensor or PLC signals possible
- Muting monitoring functions: sequence and concurrence operation possible
- Integrated override function

In-system added value

Evaluation unit for:
- C 2000
- M 2000
- Up to 6 testable single-beam photoelectric safety switch pairs

Applications



Access protection with differentiation between man and material (muting)

Ordering information

Connection type	Enclosure rating	Type	Part number
Screw terminal connector	IP 20	LE20-2622	1 016 502
	IP 65	LE20-1622	1 016 498
Spring clamp terminal connector	IP 20	LE20-2624	1 016 501
	IP 65	LE20-1624	1 016 497

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Detailed technical specifications

Electrical data

Supply voltage V_S	24 V DC –30 %/+20 %, 5 % ripple [1]
Power-up delay (after power On)	2 s approx.
Current consumption I_{max}	150 mA
Power consumption	4 W (without muting and override lamps)
Response time	5 ms
Response time of entire system (dependent on system configuration)	To be calculated from the following constants: ▪ C 2000/M 2000: approx. 7 ms to 25 ms, dependent on protective field height and resolution ▪ Single-beam photoelectric safety switches: max. 9 ms ▪ LE 20: 5 ms ▪ Relay module: 5 ms
Response time for test input	Max. 30 ms
Reset time	Max. 50 ms
Connecting cables	0.5 mm^2, length max. 30 m 2.5 mm^2, length max. 150 m
Inputs: signal level on/off	HIGH: 15 V ... V_S LOW: 0 V ... 10 V
Test extern	HIGH: external test inactive LOW: external test active Pulse duration > 30 ms
Concurrence monitoring	Time window selectable: 3 s or ∞
Self-test cycle time	2 s

Outputs

Outputs OSSD 1, OSSD 2 (the levels refer to connectionto the system connector)	PNP, monitored and short-circuit-proof
Switching current I_{max}	500 mA
Switching voltage V_{max}	V_S – 2.0 V at 500 mA
Switching capacity P_{max}	13.2 W
Inductive switching capacity $P_{max\ ind}$	1 VA
Protective field free V	U_{max}
Protective field interrupted V	0 V
Residual current at signal level "0" I	0.1 mA
Max. capacitive load	200 nF bei I = 50 mA 2.5 µF bei I = 500 mA
Test period test rate	2 s
Test pulse width	150 µs approx.
Test A, Test B (inactive/akctive)	V_S – 2.65 V/0 V Total current Test A + Test B < 10 mA Max. capacitive load 10 µF
Override Lamp	24 V DC, 1 ... 10 W
Lamp 1, 2	24 V DC, 1 ... 10 W

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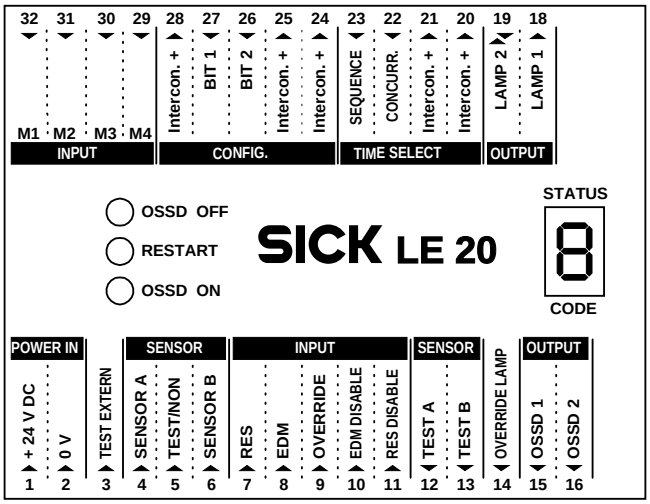
Operating data

Protection class	III [2]
Enclosure rating	IP 20, IP 65 optional
Safety category according to EN 61496	Type 2
Ambient operating temperature	–20 °C ... +60 °C
Storage temperature	–25 °C ... +75 °C
Air humidity (non condensing)	15 % ... 95 %
Vibration resistance	5g, 10 Hz ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29

[1] The upper and lower power supply limits must not be infringed.
The external power supply to the devices must be capable of withstanding a short-term power failure of 20 ms in accordance with EN 60204.
Suitable power supply units are available from SICK as accessories

[2] The circuits connected to the inputs and outputs must conform to the creepage and clearance distances specified in the relevant standards with regard to safe isolation in accordance with PELV (EN 60204, 6.4)

Internal circuitry



The LE 20 safety evaluation unit is able to carry out a periodic safety test of the connected photoelectric switches, and provides the photoelectric switch system with the additional reset interlock and external device monitoring safety functions.

The expanded LE 20 Muting version uses additional muting sensors to distinguish objects entering the danger zone past the photoelectric switches from human beings, and allows the objects to pass without stopping the machine.

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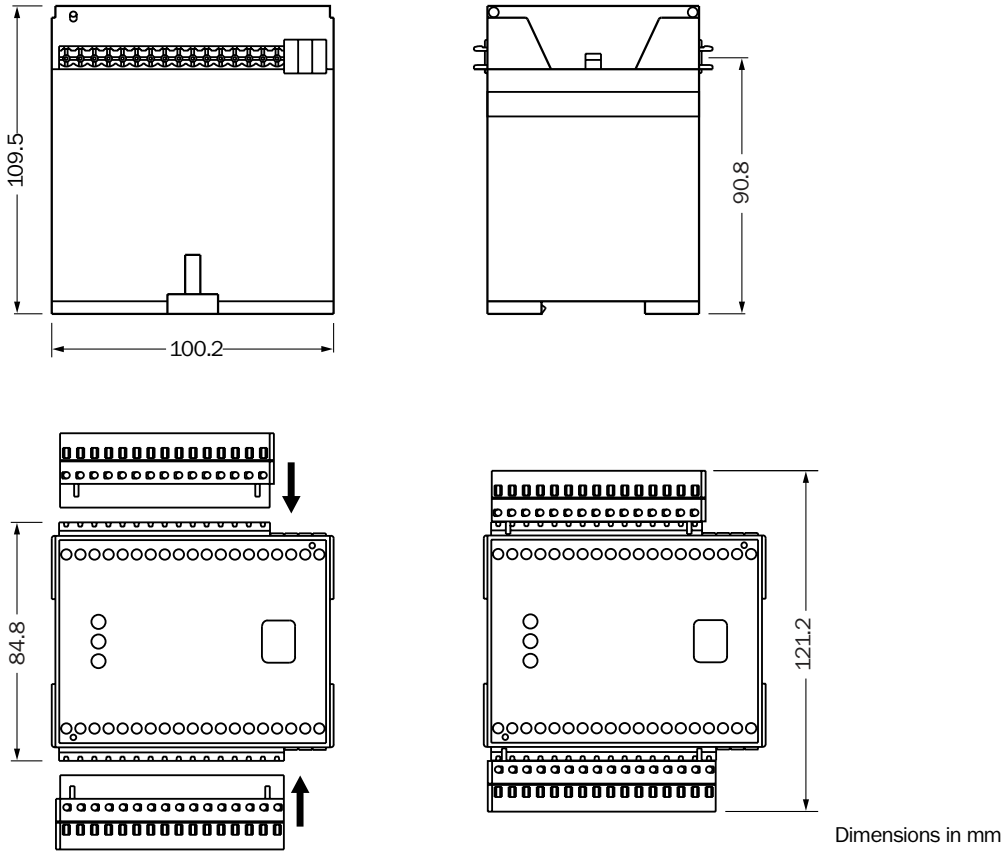
Dimensional drawings



Dimensions in mm

Mechanical dimensions, LE 20-Muting with screw clamps, IP 20

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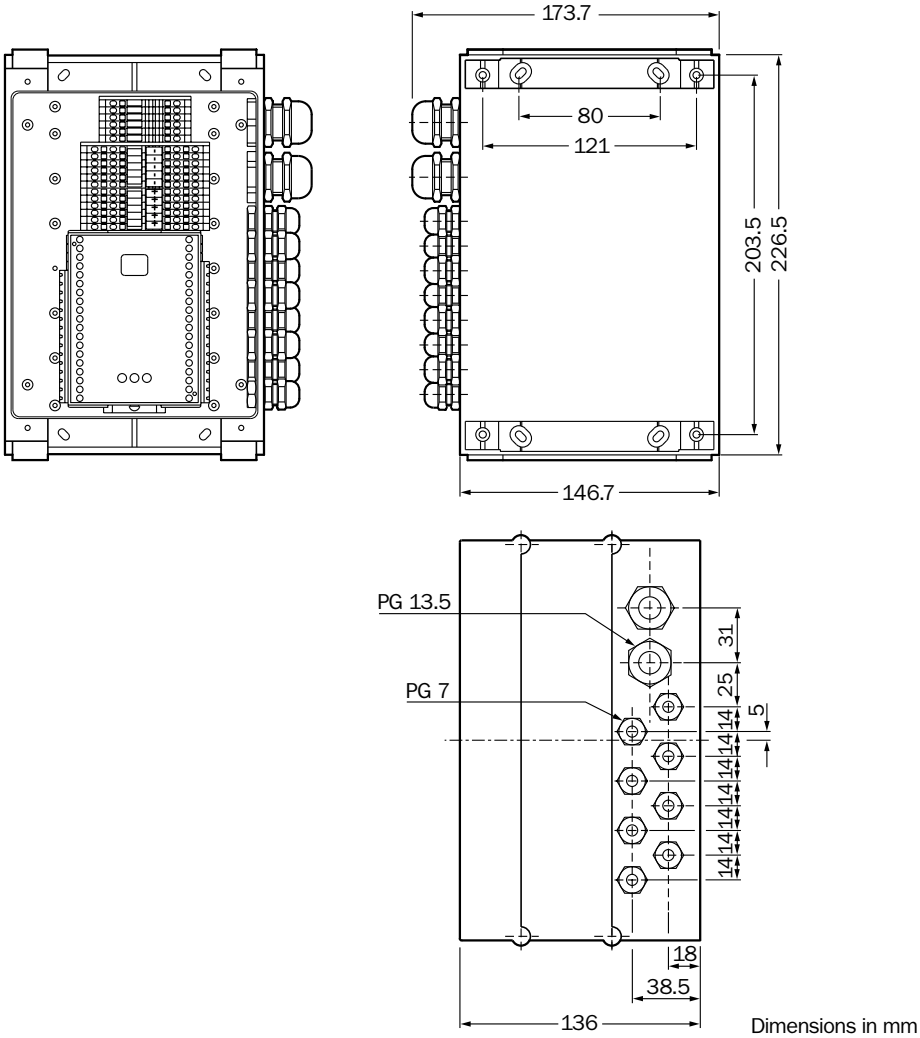

Dimensions in mm

Mechanical dimensions, IP-65 housing for LE 20-Muting

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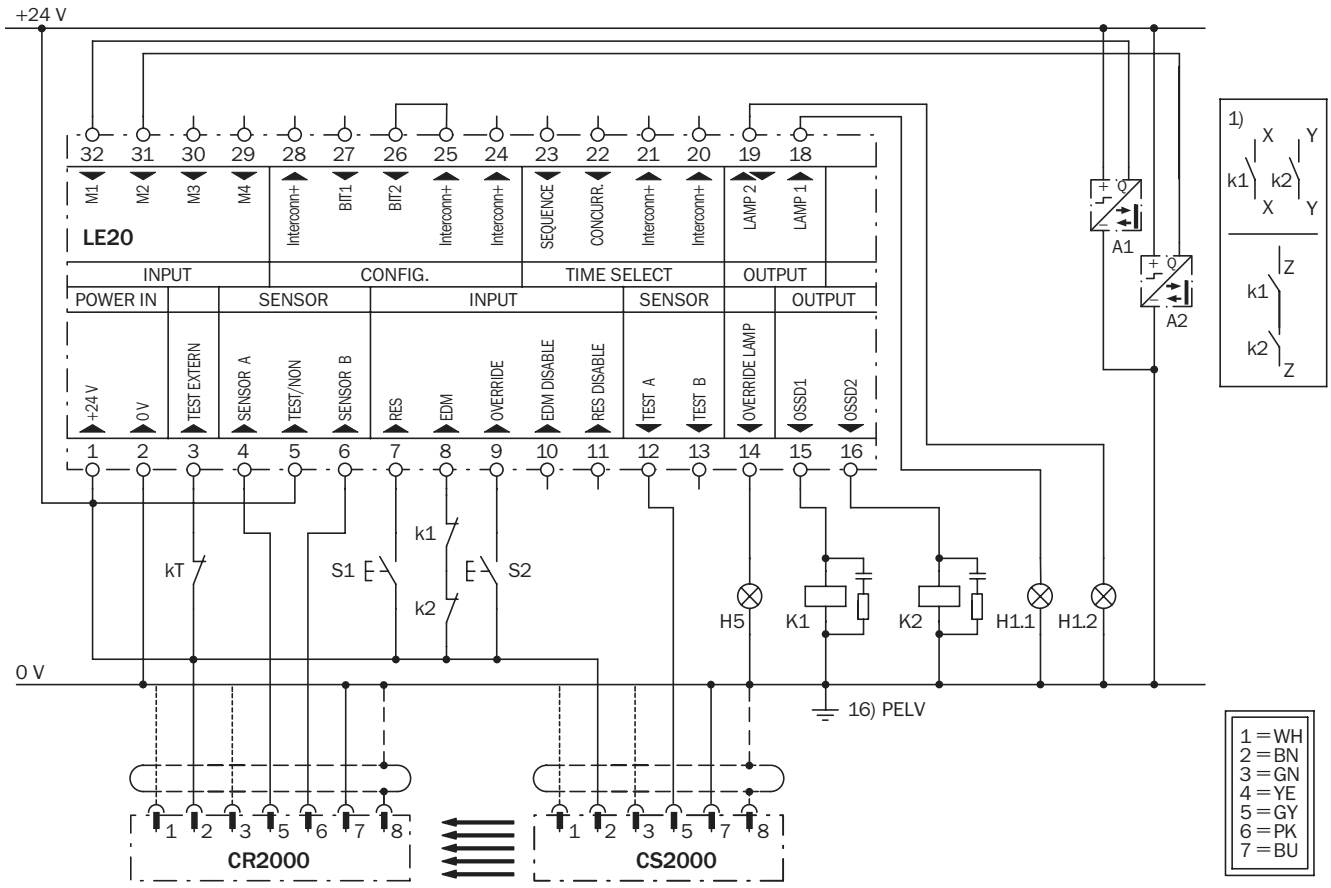
Connection diagrams

Safety relay LE 20 Muting with C 2000, 2 muting sensors and 2 muting indicator lamps



These contacts must be integrated into the control system such that when the output circuit is open the hazardous state is eliminated.

In safety categories 4 and 3 they must be integrated in two-channel configuration (x,y paths). Single-channel insertion into the control system (z path) is only possible with single-channel control and taking account of the risk analysis.

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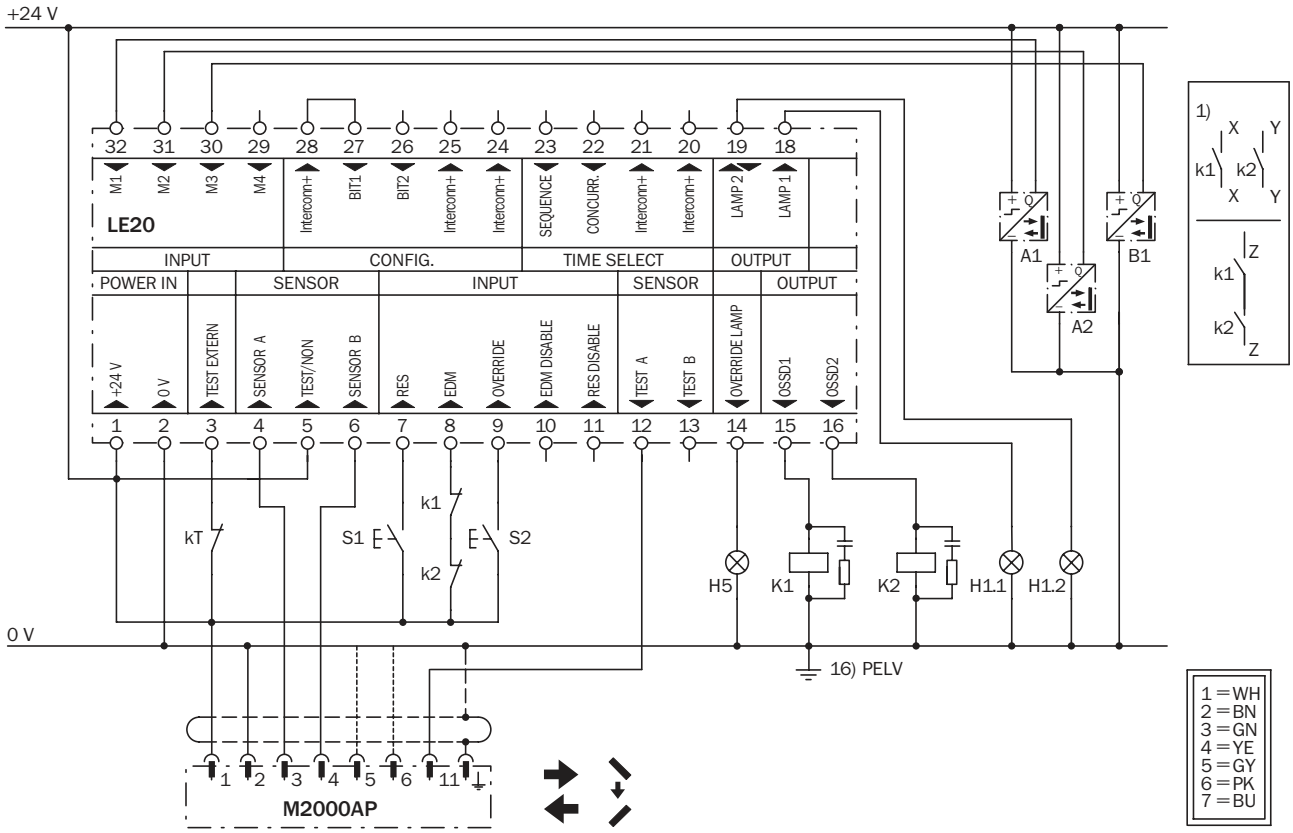
Safety relay LE 20 Muting with M 2000-A/P and 3 muting sensors



These contacts must be integrated into the control system such that when the output circuit is open the hazardous state is eliminated.

In safety categories 4 and 3 they must be integrated in two-channel configuration (x,y paths). Single-channel insertion into the control system (z path) is only possible with single-channel control and taking account of the risk analysis.

Ordering information accessories

Interfaces

Description	Connection type	Type	Part number
Safety relay UE 10-2 OS	▪ With screw terminal connector	UE10-2OS2D0	2 019 772
	▪ With spring clamp terminal connector	UE10-2OS4D0	2 019 771

Muting indicator lamps

Description	Delivery/cable length	Part number
Muting indicator lamp, bulp	▪ Including mounting kit	2 020 743
Muting indicator lamp, LED lamp	▪ Cable length 2 m	2 019 909
	▪ Cable length 10 m	2 019 910

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Overview of technical specifications

Control category according to EN 954-1	Same as main unit
Number of enable current paths	4
Number of signalling current paths	2
Housing width	22.5 mm

Product description

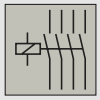
- The UE 10-4 XT expansion module serve to:
  - Increase the number of output contacts of a main unit
  - NC contact for external device monitoring (EDM)
- 2 LEDs:
  - Relay K 1
  - Relay K 2
- Available with plug-in terminals (key coded)

In-system added value

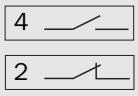
- Applicable with UE 10 - UE 48 units

Ordering information

Connection type	Type	Part number
Screw-type terminals	UE10-4XT2D2	6 024 919
Plug-in terminals	UE10-4XT3D2	6 024 920



- Expansion module
- External device monitoring (EDM)



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→ Technical specifications	L-68
→ Internal circuitry	L-69
→ Dimensional drawings	L-69
→ Services	A-0

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Detailed technical specifications

General system data

Supply voltage to A 1 - A 2	
Electrical output circuit > 25 V AC / 60 V DC	PELV
Electrical output circuit < 25 V AC / 60 V DC	PELV or SELV
Supply voltage V_S (A 1 - A 2)	24 V AC/DC (20.4 V AC/DC ... 26.4 V AC/DC)
Power consumption	
AC mode	2.7 VA
DC mode	1.5 W
Residual ripple in DC mode (within the limits of V_S)	2.4 V_{SS}
Nominal frequency in AC mode	50 Hz ... 60 Hz
Switch-on time (upon applying the supply voltage)	25 ms

Output circuits (13 - 14, 23 - 24, 33 - 34, 43 - 44, 51 - 52, 61 - 62, Y 1 - Y 2)

Response time (K 1 / K 2)	40 ms
Relay contacts	4 NO, enable current paths, safety relevant 2 NC, signalling current paths, not safety relevant 1 NC, contactor monitoring
Contact type	Positively guided
Contact material	Silver alloy; gold-plated
Load capacity of contacts	
Switching voltage enable current paths	10 V AC ... 230 V AC / 10 V DC ... 30 V DC
Switching voltage contactor monitoring	10 V DC ... 24 V DC
Switching current enable current paths	10 mA ... 6 A
Switching current signalling current paths	10 mA ... 2 A
Switching current contactor monitoring	10 mA ... 0.1 A
Total current across all contacts	12 A
Application category according to EN 60947-5-1	AC-15 U_e 230 V AC, I_e 6 A (3600 c/h) DC-13 U_e 24 V DC, I_e 6 A (360 c/h) DC-13 U_e 24 V DC, I_e 3 A (3600 c/h)
Permitted switching frequency	3600 c/h
Service life, mechanical (relay contacts)	1 x 10^7 switching cycles
Service life, electrical (dependent on the load)	2 x 10^6 switching cycles

Operating data

Surge voltage rating ($U_{Imp.}$)	4 kV
Excess voltage category	III
Contamination rating of the unit (EN 50178)	
External	3
Internal	2
Voltage rating	300 V AC
Test voltage U_{eff} (50 Hz) EN 60439-1	2.0 kV
Enclosure rating	
Housing	IP 40
Terminals	IP 20
Radio interference	EN 60947-1 02/99
Screening against interference	EN 60947-1 02/99
Ambient operating temperature	–25 °C ... +55 °C
Storage temperature	–25 °C ... +75 °C
Cross sections of electrical conductors	
Single strand wire (2 x, identical cross section)	0.14 mm^2 ... 0.75 mm^2
Single strand wire (1 x)	0.14 mm^2 ... 2.5 mm^2
Fine stranded wire with terminal crimps (2 x, identical cross section)	0.25 mm^2 ... 0.5 mm^2
Fine stranded wire with terminal crimps (1 x)	0.25 mm^2 ... 2.5 mm^2

Weight	0.2 kg

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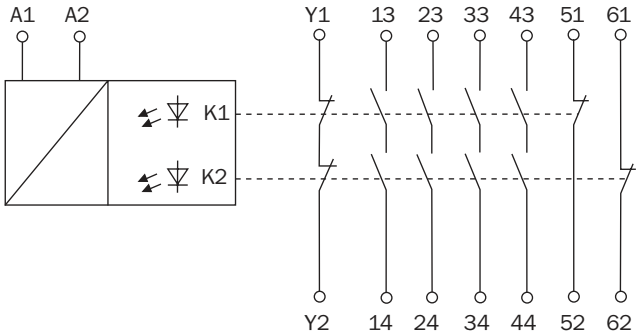
Internal circuitry



Function

The supply voltage of the expansion module is linked to an output contact of a main unit.

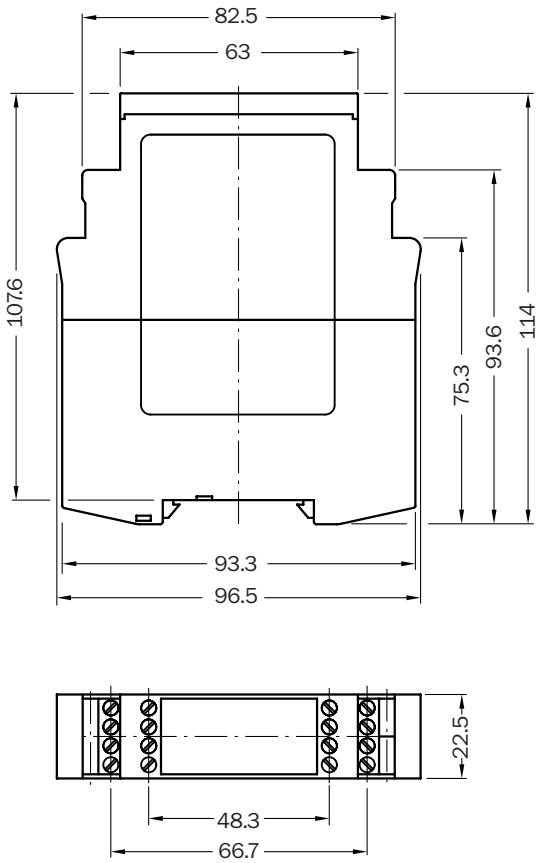
Upon applying the supply voltage to terminals A 1 and A 2, relays K 1 and K 2 are energised (the LEDs for both relays illuminate): The 4 ouput contacts close, the two normally closed contacts and the EDM (feedback) circuit switch to open circuit status.

When the output contacts of the standard unit opens (e.g. by activation of the emergency stop), the relays K 1 and K 2 de-energise: The normally open contacts open, and the two normally closed contacts close.

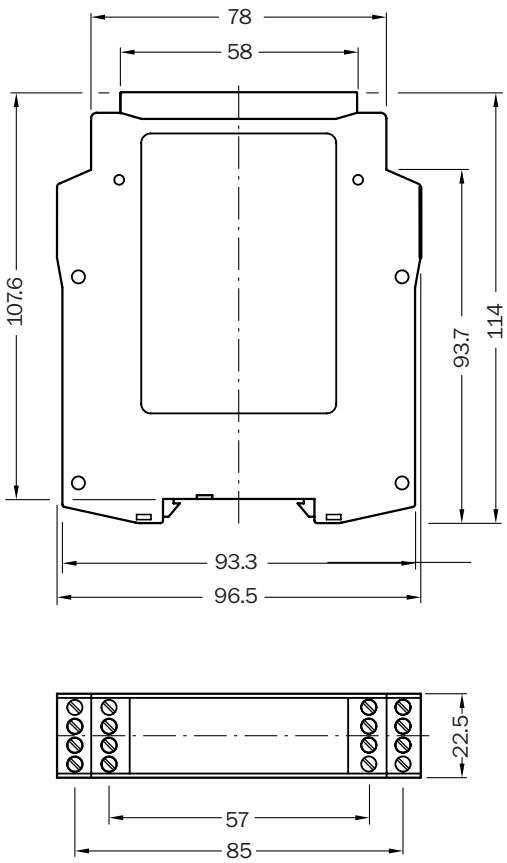
External device monitoring (EDM)

If external device monitoring is implemented in the connected main unit, then the normally closed contacts (Y 1 - Y 2) prevent the resetting of the main unit, when K 1 and/or K 2 do not de-energise.

Dimensional drawings



Housing with screw-type terminals



Housing with plug-in terminals

Dimensions in mm

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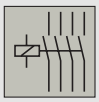
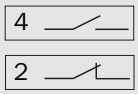


- Expansion module
- External device monitoring (EDM)



Overview of technical specifications

Control category according to EN 954-1	Same as main unit
Number of enable current paths	4
Number of off-delayed normally open contacts	2
Housing width	22.5 mm

Product description

- The UE 11-4 DX expansion module serve to:
  - Increase the number of output contacts of a main unit
  - UE 11-4 DX has off-delayed outputs (0.5 s, 1 s, 2 s or 3 s, depending on model)
  - NC contact for external device monitoring (EDM)
- 2 LEDs:
  - Relay K 1
  - Relay K 2
- Available with plug-in terminals

In-system added value

- Applicable with UE 10 - UE 48 units

Ordering information

Delay	Connection type	Type	Part number
0.5 s	Screw-type terminals	UE11-4DX2D30.5	6 024 921
	Plug-in terminals	UE11-4DX3D30.5	6 024 925
1 s	Screw-type terminals	UE11-4DX2D31	6 024 922
	Plug-in terminals	UE11-4DX3D31	6 024 926
2 s	Screw-type terminals	UE11-4DX2D32	6 024 923
	Plug-in terminals	UE11-4DX3D32	6 024 927
3 s	Screw-type terminals	UE11-4DX2D33	6 024 924
	Plug-in terminals	UE11-4DX3D33	6 024 928

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Detailed technical specifications

General system data

Supply voltage to A 1 - A 2	
Electrical output circuit > 25 V AC / 60 V DC	PELV
Electrical output circuit < 25 V AC / 60 V DC	PELV or SELV
Supply voltage V_S (A 1 - A 2)	24 V DC(20.4 V DC ... 26.4 V DC)
Power consumption	2.0 W
Residual ripple in DC mode (within the limits of V_S)	2.4 V_{SS}
Switch-on time (upon applying the supply voltage)	75 ms

Output circuits (17 - 18, 27 - 28, 37 - 38, 47 - 48, 55 - 56, 65 - 66, Y 1 - Y 2) off-delayed

Switch-off delay time (depending on type)	0.5 s, 1 s, 2 s or 3 s
Influence of the supply voltage	0.5 (%/% ΔU_N)
Influence of ambient temperature	0.4 (%/K)
Mean value of error (% + ± 10 ms)	± 20
Dispersion (% + ± 10 ms)	± 2
Relay contacts	4 NO, enable current paths, safety relevant 2 NC, signalling current paths, not safety relevant 1 NC, contactor monitoring
Contact type	Positively guided
Contact material	Silver alloy; gold-plated
Load capacity of contacts	
Switching voltage enable current paths	10 V AC ... 230 V AC / 10 V DC ... 30 V DC
Switching voltage contactor monitoring	10 V DC ... 24 V DC
Switching current enable current paths	10 mA ... 6 A
Switching current signalling current paths	10 mA ... 2 A
Switching current contactor monitoring	10 mA ... 0.1 A
Total current across all contacts	12 A
Application category according to EN 60947-5-1	AC-15 U_e 230 V AC, I_e 6 A (3600 c/h) DC-13 U_e 24 V DC, I_e 6 A (360 c/h) DC-13 U_e 24 V DC, I_e 3 A (3600 c/h)
Permitted switching frequency	3600 c/h
Service life, mechanical (relay contacts)	1 x 10^7 switching cycles
Service life, electrical (dependent on the load)	2 x 10^6 switching cycles

Operating data

Surge voltage rating ($U_{Imp.}$)	4 kV
Excess voltage category	III
Contamination rating of the unit (EN 50178)	
External	3
Internal	2
Voltage rating	300 V AC
Test voltage U_{eff} (50 Hz) EN 60439-1	2.0 kV
Enclosure rating	
Housing	IP 40
Terminals	IP 20
Radio interference	EN 60947-1 02/99
Screening against interference	EN 60947-1 02/99
Ambient operating temperature	–25 °C ... +55 °C
Storage temperature	–25 °C ... +75 °C
Cross sections of electrical conductors	
Single strand wire (2 x, identical cross section)	0.14 mm^2 ... 0.75 mm^2
Single strand wire (1 x)	0.14 mm^2 ... 2.5 mm^2
Fine stranded wire with terminal crimps (2 x, identical cross section)	0.25 mm^2 ... 0.5 mm^2
Fine stranded wire with terminal crimps (1 x)	0.25 mm^2 ... 2.5 mm^2

Weight	0.2 kg

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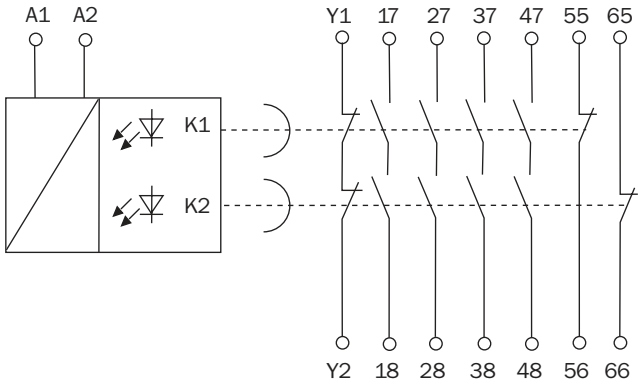
Internal circuitry



Function

The supply voltage of the expansion module is switched by way of a output contact of a standard unit.

Upon applying the supply voltage to terminals A 1 and A 2, relays K 1 and K 2 are energised (the LEDs for both relays illuminate): The 4 output contacts close, the two normally closed contacts and the EDM (feedback) circuit switch to open circuit status.

When the output contacts of the standard unit opens (e.g. by activation of the emergency stop switch), the relays K 1 and K 2 de-energise after a unit specific delay. These fixed switch-off delay times of 0.5 s, 1 s, 2 s and 3 s are according to the type.

This is achieved by means of capacitors, so that even in the event of power supply failure the off-delay runs it full duration in each instance. Only after the delay period has expired do the relays K 1 and K 2 return to their neutral rest position. With the combination of UE 11-4 DX (with off-delayed) and a standard unit, stop category 1 (EN 418) can be realised.

External device monitoring (EDM)

If external device monitoring is implemented in the upstream installed standard unit, then the normally closed contacts (Y 1 - Y 2) prevents the resetting of the standard unit, when K 1 and / or K 2 do not deenergise.

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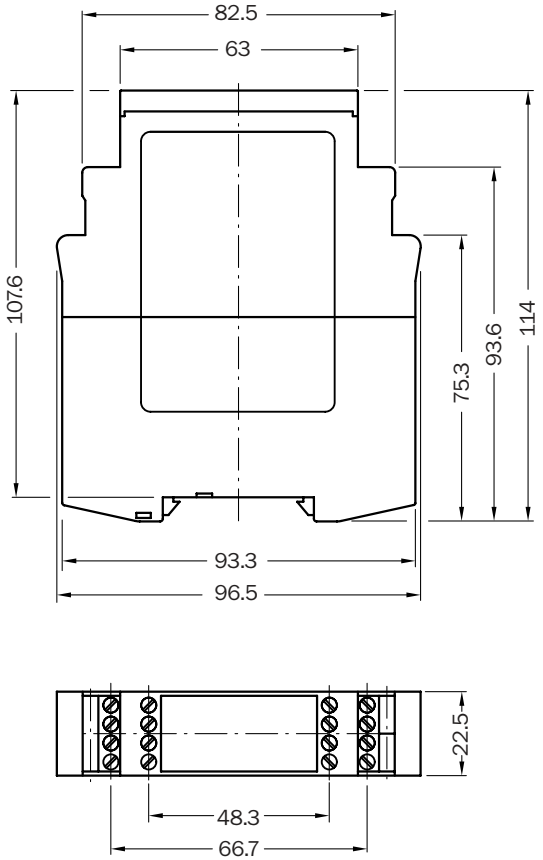
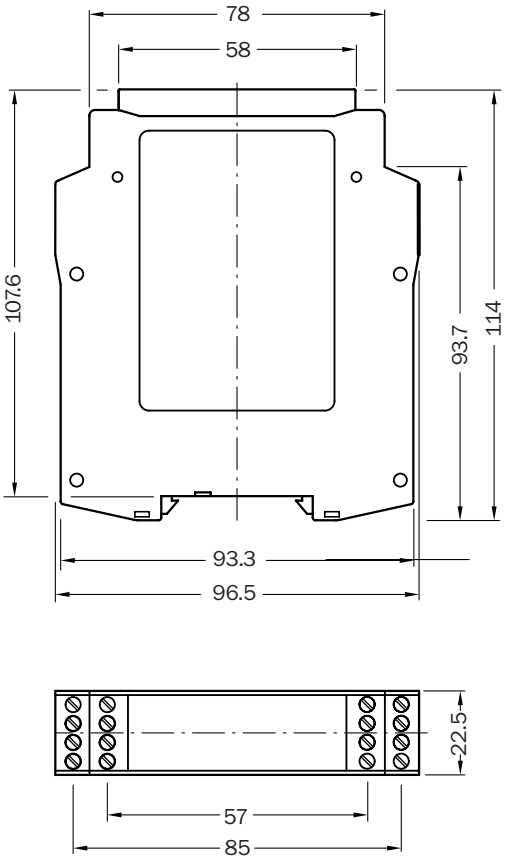
Dimensional drawings



Housing with screw-type terminals



Housing with plug-in terminals

Dimensions in mm

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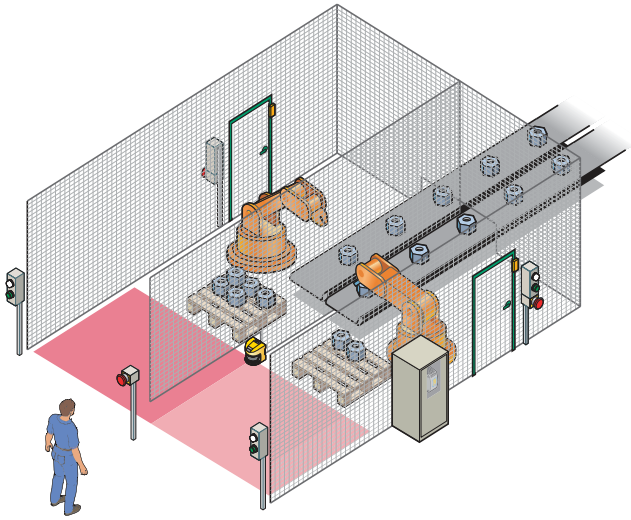
Applications

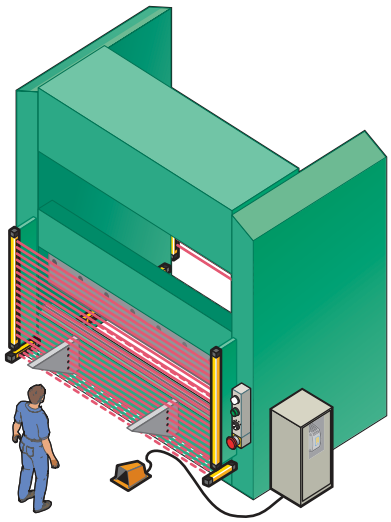


Realise two applications (dependent/independent) with one UE 440 solution

Simultaneous hazardous area monitoring with S 3000 and UE 440

The hazardous areas on two robot cells are secured using a UE 440 safety controller in conjunction with a S 3000 safety laser scanner. For this purpose two safety applications are configured in the UE 440.

The S 3000 laser scanner monitors the two hazardous areas with 2 simultaneous protective fields.
When there is an object in one of the protective fields, the monitored semiconductor output for the related safety application is shutdown.
The side access doors to the robot cells are monitored by safety door switches.
The emergency stop function and the reset function are also realised using the UE 440.



Access and hazardous area protection using C 4000 safety light curtain and safety controller UE 470

Hydraulic and eccentric presses with C 4000 and UE 470

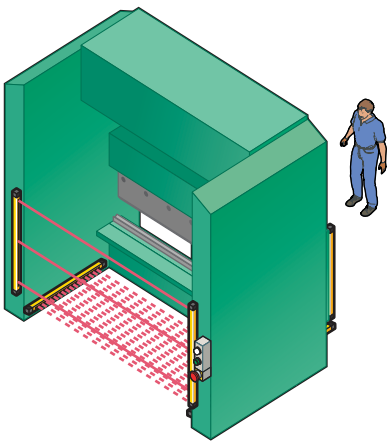
- Certified safety function blocks, e.g. single break/double break PSDI mode, protective operation
- Evaluation of signals related to pressing action:
  - Top dead centre (TDC)
  - Bottom dead centre (BDC)
  - Stop control contact (SCC)

Press Protection with M 2000, C 4000 and UE 470

The hazardous point on a press is protected using a UE 470 safety controller with a C 4000 safety light curtain.
All signals directly related to pressing action such as TDC, BDC and SCC are evaluated. The press is shut down depending on the safety sensors connected.

For the safety application, the indication of
- Single/double break PSDI mode
- Reset required
- Reset
- EDM and
- Emergency stop

is configured in the UE 470.



The access to the press from the rear is protected with an M 2000 Host/Guest System, the C 2000 Guest mounted horizontally is used for point-of-operation guarding.

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Safety controllers

intelliface
the intelligent interface

Control category/safety integrity level according to EN 954-1/IEC 61508	Applications/Functions: Emergency stop	Safety switch	Opto-electronic protective device	External device monitoring (EDM)	Manual reset	Automatic reset	Signals related to pressing actions [1]	Expanded functions through the use of the safe SICK device communication [2]	Product	Page
Category 4/SIL 3	✔	✔	✔	✔	✔	✔	–	✔	UE 440	M-3
	✔	✔	✔	✔	✔	✔	✔	✔	UE 470	M-3

[1] Bottom dead centre, top dead centre and stop control contact

[2] Enhanced function interface, safe SICK device communication

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Main features

Automatic configuration download

Stored configuration information from light curtains and laser scanners when commissioning or exchanging devices.
User benefit: clear time saving, since no new configuring is required.

C 4000- or laser scanner sensor solutions

Connection of complex sensor systems such as C 4000 safety light curtains or laser scanners.

Direct diagnostics via 7-segment display

Visual diagnosis via LEDs and 7-segment display. Additional RS-232-interface for detailed diagnosis.
User benefit: fast correction of faults.

Five operating modes

For simple electrical and mechanical integration in the machine. Convenient operation via connectable rotary switches. Variable adaptation of connected sensors to individual requirements with up to five user modes (several protective fields or hazardous areas).
User benefit: shorter set-up and idle time when changing operating mode.

Tactile sensors or opto-electronic protective devices

Simple connection of sensors and additional system components (also from various levels) such as protective doors, emergency stop and two-hand controls.

RS-232 Interface for CDS configuration

The CDS user software permits safety-related links and the configuration of connected hazardous points or areas or protective and warning fields to be converted by PC.
User benefit: a standard configurable and diagnostics interface for all new SICK safety devices means fast commissioning and time saving during diagnostics.

Two safe semiconductor output pairs

Separate EDM and Reset functions for both output pairs.
User benefit: two different safety circuits can be monitored independently of each other.

Logic and/or linking

Simple selection and realisation of the most diverse link logic systems in accordance with machinery requirements.

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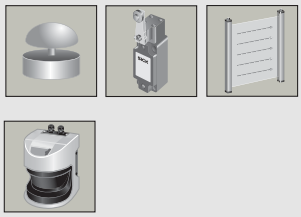
Overview of technical specifications

Control category according to EN 954-1	4
Safety integrity level according to IEC 61508	SIL3
Number of inputs	15, three dual-channel
Number of EFI interfaces	2
Number of safety applications	2
Number of operating modes	5
Number of safety outputs	2 pairs of semiconductor outputs
Number of application diagnostics outputs	4 semiconductor outputs
Enclosure rating	IP 20
Protection class	III (SELV)
Stopping category	0 or 1
Operating voltage	24 V DC ±20 %
Maximum power consumption	4.5 A
Response time	< 10 ms
Input delay (adjustable)	0 ms ... 90 ms
Discrepancy time (adjustable)	10 s ... 30 s
Dimensions (W x H x D)	65 mm x 120 mm x 100 mm



Product description

- Two independent or dependent safety applications
- Intelligent communication interface for electro-sensitive protective equipment
- 2 pairs of safe semiconductor outputs (category 4) with separate EDM and reset
- 4 wear-free semiconductor outputs
- Stopping category 0 and 1
- Reduced wiring effort due to logical linking of the safety sensors (AND, OR, NAND ...)
- Secure against tampering due to different password levels

In-system added value

- 5 operating modes
- Integrated configuration memory: automatic configuration download on sensor replacement
- Simple configuration via drag and drop with uniform user software CDS for SICK safety devices
- Simple replication of the application by uploading and downloading data sets
- 2 ESPE interfaces category 4 for C 4000/S 3000
- Function expansion for intelligent SICK sensors (simultaneous protective field monitoring S 3000)

- Autoconfiguration using parameter memory
- Direct diagnostics
- CDS interface
- Simple drag and drop programming
- Space saving

Ordering information

Type	Signals related to pressing actions [1]	Part number
UE440-A0410	–	1 023 859
UE470-A0410	✔	1 023 862

[1] Bottom dead centre, top dead centre and stop control contact

→ Detailed information about the product can be found at www.sick.com

Further information	Page
→ Services	A-0

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Definition

SDL connections (safety data link)
To connect safety components to SICK device communication

PROFIBUS
Is an open communication protocol in accordance with EN 50170-2 for deployment in the entire field

PROFIsafe
Profile for safety-related data transmission via the PROFIBUS network

AS-interface
Actuator-**S**ensor-interface, a manufacturer-independent system for the connection of analogue and binary terminal devices (sensors, actuators, control switches) at the lowest field level

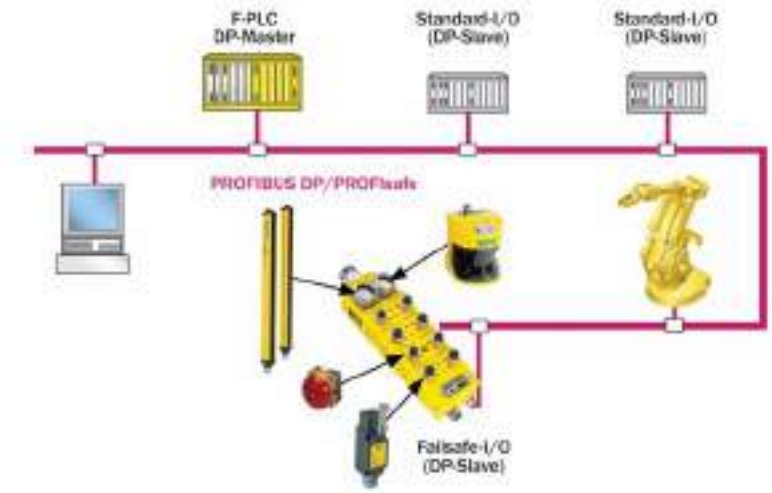
AS-interface Safety at Work
Extension of the AS-interface system with safety components by means of the use of AS-interface safety monitor and safe AS-interface busnodes

AS-interface safe busnode
Fail-safe busnodes in the AS-interface Safety at Work system, e.g. the safe busnode UE 4215

AS-interface Safety at Work Safety Monitor
One or more safety monitors integrated in the AS-interface system monitor the safe AS-interface busnodes and shut down the dangerous state of the machine in case of the activation of the safety component or in case of a failure

Field-signal connections
To connect active safety components (with OSSDs) and passive components (with voltage-free contacts)

Easy communication in PROFIBUS networks



Seamless solution by SICK with the example of AS-interface

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Safety bus modules

intelliface
the intelligent interface

Fieldbus	Number of field-signal connections	Number of SDL connections	Usage of the expanded functions in the safety sensors on the SDL	Product	Page
PROFIBUS DP/ PROFIsafe	16 (single-channel) resp. 8 (dual-channel)	0	–	UE 4120	N-2
		2	–	UE 4150	N-8
		2	✔	UE 4155	N-15

Fieldbus	AS-interface component	Type of output of the connectable safety sensors	Number of safety outputs (pairs)	Product	Page
AS-interface Safety at Work	Safety Slave	Contact outputs	–	UE 3212	On request
		Actively monitored semiconductor (OSSDs)	–	UE 4215	N-22
	Safety Monitor	–	1	UE 4231	On request
		–	2	UE 4232	On request

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- Control cabinet free manufacture
- Central diagnosis
- Less wiring expenditure

Overview of technical specifications

Number of field-signal connections	16 (single-channel) resp. 8 (dual-channel)
Number of SDL connections	0
Enclosure rating	IP 67
Control category according to EN 954-1	4
Safety integrity level according to IEC 61508	SIL3

Product description

- Convenient configuration and diagnostics using the Windows software CDS (configuration & diagnostic software)
- Offline configuration of the system without FPLC is possible
- Support for PROFIsafe V1.20 10/2002
- Support for PROFIBUS DP V1:
  - Cyclic communication with DP-Master Class 1 (central control)
  - Acyclic communication with DP-Master Class 2 (configuration and diagnosis tool)

Applications

- Electro-sensitive protective equipment
- Emergency stop button
- Electro-mechanical safety switches
- Safety operating devices
- Control switches with lamps
- Operating mode selector switches
- Muting sensors
- Muting lamp
- Safety sensor T 4000 Compact

Ordering information

Description	Type	Part number
Safety bus module including configuration & diagnostic software and operating instructions on CD-ROM	UE4120-01BC600	1 024 176

Further information	Page
→ Definition	N-0
→ Dimensional drawings	N-4
→ Device overview and connections	N-4
→ Connection diagrams	N-5
→ Accessories	N-6
→ Services	A-0

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Detailed technical specifications

General system data

Protection class (IEC 61140:1997)	III
Enclosure rating (IEC 60529)	IP 67
Control category according to EN 954-1	4
Safety integrity level according to IEC 61508	SIL3
Housing dimensions	See dimensional drawings on page N-4
Weight	570 g

Field-signal inputs

Input voltage	
HIGH [1]	24 V (11 V ... 28.8 V)
LOW	0 V (–28.8 V ... 8 V)
Input current	
HIGH	12 mA (6 mA ... 15 mA)
LOW	0 mA (–1 mA ... 3 mA)
Input delay (configurable)	0 ms ... 90 ms

Field-signal outputs switched-on

Output voltage HIGH (without load)	V_S
Switching current	0 mA ... 700 mA
Minimum current for fault monitoring on field-signal connections 7 and 8 [2]	20 mA (7 mA ... 40 mA)
Peak current in the case of a short-circuit	2.4 A
Internal resistance	0.5 Ω

Field-signal outputs switched-off

Internal resistance (at 0 V)	23 kΩ

PROFIBUS connection

Baud rate	9.6 kBit/s ... 12 MBit/s
Address range	3 ... 125
Recovery detection	070F hex

Operating data

Supply voltage V_S at device [3]	24 V (19.2 V ... 28.8 V)
Residual ripple [4]	5 V_{SS}
Maximum power consumption through power-supply connection	9 A
Maximum power consumption	3.8 W
Power-up delay after connecting the supply voltage	2 s ... 10 s
Operating temperature	0 °C ... +50 °C
Storage temperature	–25 °C ... +70 °C
Air humidity (non condensing)	15 % ... 95 %
Rigidity	10 g, 10 Hz ... 300 Hz according to IEC 60068-2-6
Shock resistance	25 g, 6 ms according to IEC 60068-2-29

[1] As per IEC 61131-2, type 2

[2] Only when the connection is configured as an output for a muting lamp

[3] The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1

[4] Within the limits of V_S

N

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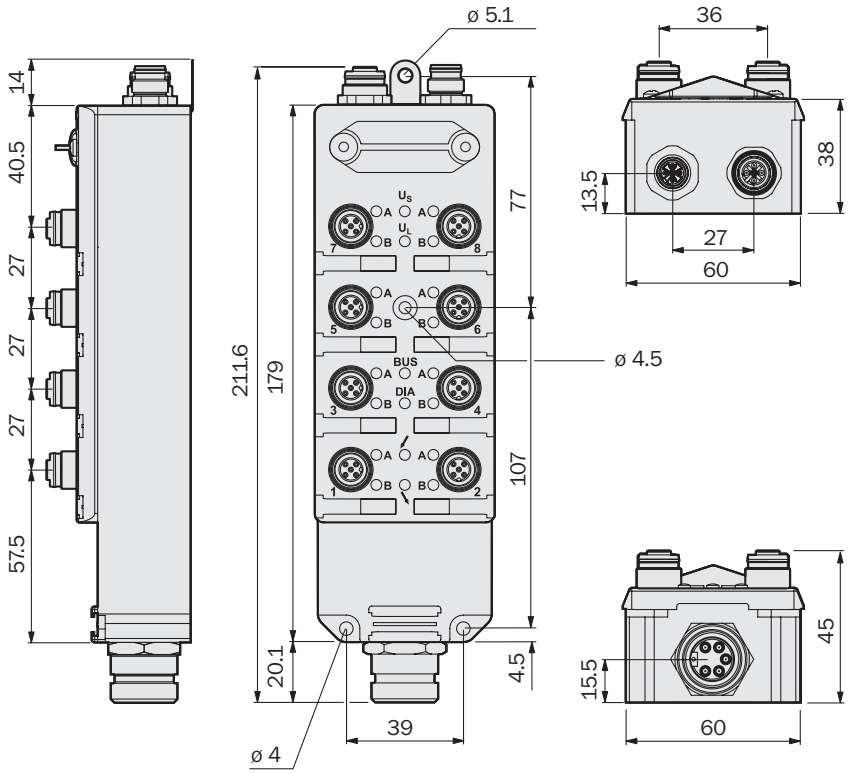
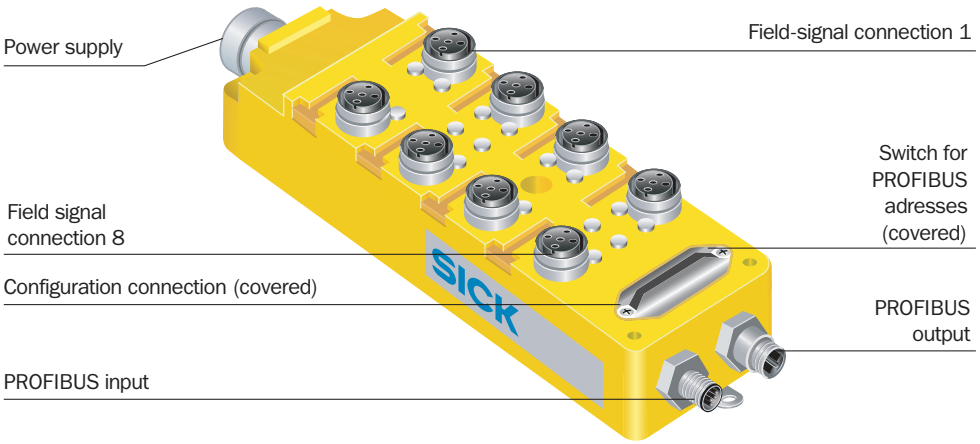
Dimensional drawings



Dimensions in mm

Device overview and connections



Power supply

- Common voltage supply for UE 4120 and the safety components connected to the field-signal connections

Field-signal connections

- To connect OSSDs and passive components, e.g. switches fitted with volt-free contacts
- 1 field-signal connection = 2 channels (2 safety inputs and 2 outputs)
- Connections can be shared by a two-way splitter

Configuration connection

- To directly connect a PC to the SICK CDS in order to configure the system

PROFIBUS connection

- Input and output according to PROFIBUS specification

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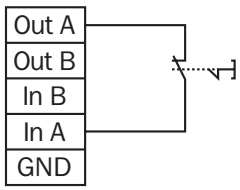
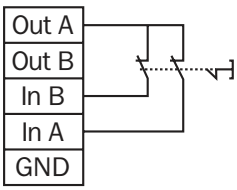
Connection diagrams

Emergency stop, emergency shutdown, safety door on the field-signal connection

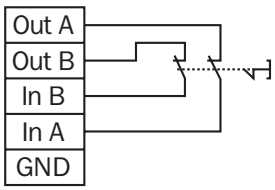
Single-channel



Dual-channel with common testing

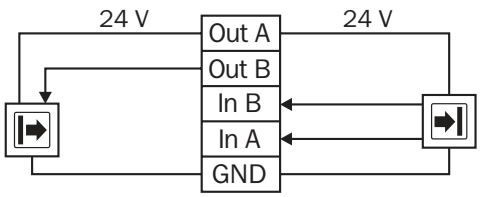


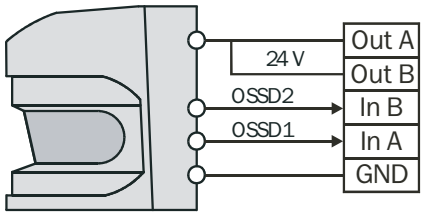
Dual-channel with isolated testing



Depending on the control category required, you can realise the emergency stop using a single-channel, dual-channel with common testing or dual-channel with isolated testing.
The classification of components fitted with contacts (e.g. safety door switches and emergency stops) into a control category depends both on the connection type (single-channel/dual-channel) and on the execution (single/redundant, testing type). You must therefore always select the appropriate switching element for the required control category and switching type.

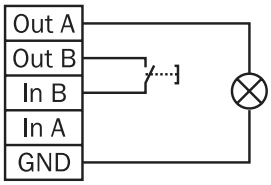
Electro-sensitive protective equipment (ESPE) on the field-signal connection





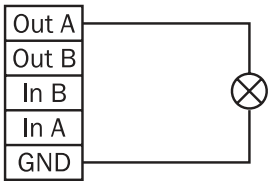
In the connection of electro-sensitive protective equipment (ESPE), sender and receiver can be considered as a system's input and output.
You can use output Out B to test the sender. The switching outputs of the receiver are present on inputs In A and In B.

Control switch with indicator display on the field-signal connection



The indicator display (Out A) is being controlled via an FPLC.

Muting lamp on the field-signal connection



It is only permitted to connect a muting lamp to channel A of field-signal outputs 7 and 8, as only these outputs have fault monitoring.

N

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Accessories

Connection type

Field-signal connections

Name	Description	Model	Cable length	Part number
Plug M12 x 5	▪ Without connecting cable ▪ Screwed ▪ For wire cross-section max. 0.75 mm²	Straight, screened	–	6 024 741
		Straight		6 022 083
		Angled		6 022 082
	▪ With connecting cable ▪ Wire-end prepared for stripping	Straight, screened	2 m	6 024 860
			5 m	6 024 861
			10 m	6 024 862
		Straight	2 m	6 026 133
			5 m	6 026 134
			10 m	6 026 135
Two-way splitter M12 x 5	▪ For the simultaneous connection of, e.g., two emergency-stop buttons (single-channel) on one field-signal connection	–	–	6 024 744
Protective cap M12	▪ For field-signal connection ▪ 10 pieces	–	–	5 309 189

PROFIBUS connection

Name	Description	Model	Part number
Plug M12 x 5	▪ Without connecting cable ▪ Screwed ▪ B-coded ▪ For wire cross-section max. 0.75 mm²	Straight	6 021 354
Socket M12 x 5			6 021 353
Plug M12 x 4 with terminating resistor	▪ B-coded		6 021 156

Power supply

Name	Description	Model	Part number
Socket 7/8" x 5	▪ Screwed ▪ For wire cross-section max. 1.5 mm²	Straight	6 024 745

Configuration connection

Name	Description	Cable length	Part number
Connection cable	▪ M8 x 4 / D-Sub 9-pin (DIN 41642) ▪ For connecting the configuration interface and the serial interface of the PC	2 m	6 021 195
		8 m	2 027 649

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Configuration software

CDS (configuration & diagnostic software)

Name	Description	Part number
Software CDS	▪ Incl. online documentation and multilingual operating instructions ▪ On CD-ROM	2 026 875

Function packages

Name	Description	Part number
UE 4100 for I/O	▪ Expands the number of CDS functions by adding predefined applications for the field-signal inputs	2 026 873
PROFIBUS communication driver	▪ Enables the configuration and diagnosis of the safety bus module and of the connected SDL devices via the acyclic services of the PROFIBUS (CDS connection as a master class 2)	2 026 874

Other accessories

Designation plates

Name	Description	Part number
Designation plates	▪ In the 9 x 20 mm frame ▪ 40 pieces	5 310 775

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- Control cabinet free manufacture
- Central diagnosis
- Less wiring expenditure
- Safety data link (SDL) to SICK safety components

Overview of technical specifications

Number of field-signal connections	16 (single-channel) resp. 8 (dual-channel)
Number of SDL connections	2
Enclosure rating	IP 67
Control category according to EN 954-1	4
Safety integrity level according to IEC 61508	SIL3

Product description

- Convenient configuration and diagnostics using the Windows software CDS (configuration & diagnostic software)
- Offline configuration of the system without FPLC is possible
- Support for PROFIsafe V1.20 10/2002
- Support for PROFIBUS DP V1:
  - Cyclic communication with DP-Master Class 1 (central control)
  - Acyclic communication with DP-Master Class 2 (configuration and diagnosis tool)
- 2 SDL connections to connect active SICK safety components
- Configuration and diagnosis of all the components connected to the SDL connection via the configuration connection of the UE 4150

Applications

- Electro-sensitive protective equipment
- Emergency stop button
- Electro-mechanical safety switches
- Safety operating devices
- Control switches with lamps
- Operating mode selector switches
- Muting sensors
- Muting lamp
- Safety sensor T 4000 Compact

Further information	Page
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→ Device overview and connections	N-11
→ Connection diagrams	N-12
→ Accessories	N-13
→ Services	A-0

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Ordering information

Description	Type	Part number
Safety bus module including configuration & diagnostic software and operating instructions on CD-ROM	UE4150-01BC700	1 019 557

Detailed technical specifications

General system data

Protection class (IEC 61140:1997)	III
Enclosure rating (IEC 60529)	IP 67
Control category according to EN 954-1	4
Safety integrity level according to IEC 61508	SIL3
Housing dimensions	See dimensional drawings on page N-10
Weight	620 g

Field-signal inputs

Input voltage	
HIGH [1]	24 V (11 V ... 28.8 V)
LOW	0 V (–28.8 V ... 8 V)
Input current	
HIGH	12 mA (6 mA ... 15 mA)
LOW	0 mA (–1 mA ... 3 mA)
Input delay (configurable)	0 ms ... 90 ms

Field-signal outputs switched-on

Output voltage HIGH (without load)	V_S
Switching current	0 mA ... 700 mA
Minimum current for fault monitoring on field-signal connections 7 and 8 [2]	20 mA (7 mA ... 40 mA)
Peak current in the case of a short-circuit	2.4 A
Internal resistance	0.5 Ω

Field-signal outputs switched-off

Internal resistance (at 0 V)	23 kΩ

SDL connections, power supply

Maximum current	1.4 A
Maximum internal resistance	0.3 Ω

SDL connections, OSSD inputs

Input voltage	
HIGH	24 V (13 V ... 28.8 V)
LOW	–17 V ... 12 V
Input current	
HIGH	6 mA (1.8 mA ... 8 mA)
LOW	–6 mA ... 1.6 mA
Test pulse data	
Maximum test pulse rate	500 1/s
Maximum test pulse width	700 µs
Discrepancy time	3 ms ... 6 ms

Continued on next page

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PROFIBUS connection

Baud rate	9.6 kBit/s ... 12 MBit/s
Address range	3 ... 125
Recovery detection	071A hex

Operating data

Supply voltage V_S at device [3]	24 V (19.2 V ... 28.8 V)
Residual ripple [4]	5 V_{SS}
Maximum power consumption through power-supply connection	9 A
Maximum power consumption	3.8 W
Power-up delay after connecting the supply voltage	2 s ... 10 s
Operating temperature	0 °C ... +50 °C
Storage temperature	–25 °C ... +70 °C
Air humidity (non condensing)	15 % ... 95 %
Rigidity	10 g, 10 Hz ... 300 Hz according to IEC 60068-2-6
Shock resistance	25 g, 6 ms according to IEC 60068-2-29

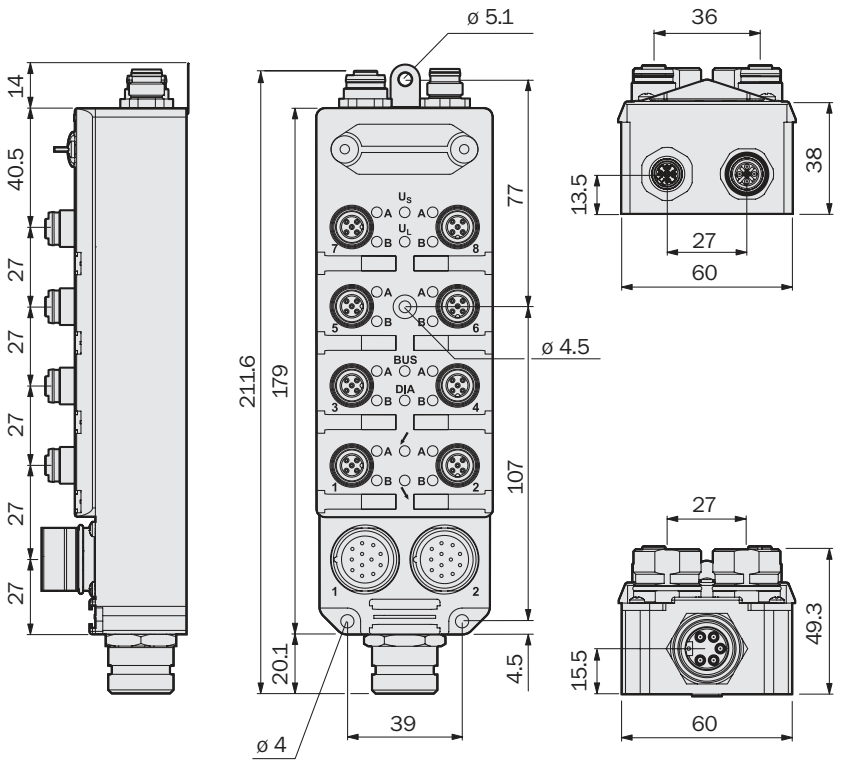
[1] As per IEC 61131-2, type 2

[2] Only when the connection is configured as an output for a muting lamp

[3] The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1

[4] Within the limits of V_S

Dimensional drawings



Dimensions in mm

N

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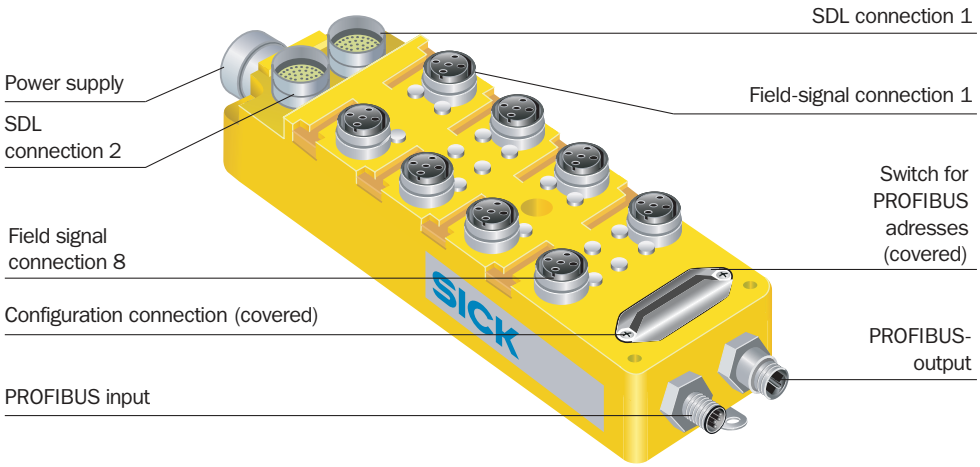
Device overview and connections



Power supply

- Common supply voltage for the safety bus module and the safety components connected to the SDL and field-signal connections

SDL connections

- To connect safety components with SICK device communication and/or OSSDs

Field-signal connections

- To connect OSSDs and passive components, e.g. switches fitted with volt-free contacts
- 1 field-signal connection = 2 channels (2 safety inputs and 2 outputs)
- Connections can be shared by a two-way splitter

Configuration connection

- To directly connect a PC to the SICK CDS in order to configure the system

PROFIBUS connection

- Input and output according to PROFIBUS specification

N

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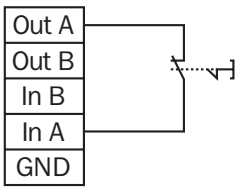
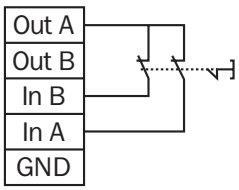
Connection diagrams

Emergency stop, emergency shutdown, safety door on the field-signal connection

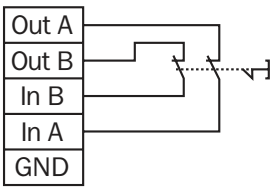
Single-channel



Dual-channel with common testing

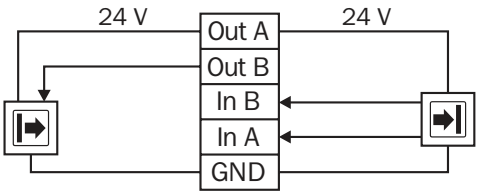


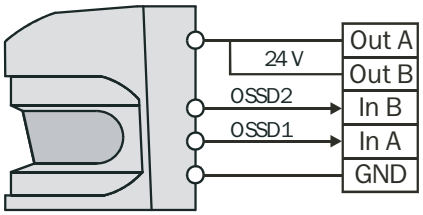
Dual-channel with isolated testing



Depending on the control category required, you can realise the emergency stop using a single-channel, dual-channel with common testing or dual-channel with isolated testing.
The classification of components fitted with contacts (e.g. safety door switches and emergency stops) into a control category depends both on the connection type (single-channel/dual-channel) and on the execution (single/redundant, testing type). You must therefore always select the appropriate switching element for the required control category and switching type.

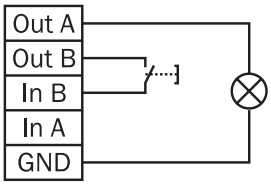
Electro-sensitive protective equipment (ESPE) on the field-signal connection





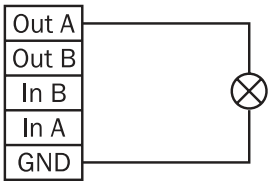
In the connection of electro-sensitive protective equipment (ESPE), sender and receiver can be considered as a system's input and output.
You can use output Out B to test the sender. The switching outputs of the receiver are present on inputs In A and In B.

Control switch with indicator display on the field-signal connection



The indicator display (Out A) is being controlled via an FPLC.

Muting lamp on the field-signal connection



It is only permitted to connect a muting lamp to channel A of field-signal outputs 7 and 8, as only these outputs have fault monitoring.

N

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Accessories

Connection type

Field-signal connections

Name	Description	Model	Cable length	Part number
Plug M12 x 5	▪ Without connecting cable ▪ Screwed ▪ For wire cross-section max. 0.75 mm²	Straight, screened	–	6 024 741
		Straight		6 022 083
		Angled		6 022 082
	▪ With connecting cable ▪ Wire-end prepared for stripping	Straight, screened	2 m	6 024 860
			5 m	6 024 861
			10 m	6 024 862
		Straight	2 m	6 026 133
			5 m	6 026 134
			10 m	6 026 135
Two-way splitter M12 x 5	▪ For the simultaneous connection of, e.g., two emergency-stop buttons (single-channel) on one field-signal connection	–	–	6 024 744
Protective cap M12	▪ For field-signal connection ▪ 10 pieces	–	–	5 309 189

SDL connections

Name	Description	Model	Cable length	Part number
Interconnectron plug M23 x 12	▪ Without connecting cable ▪ Crimped ▪ For wire cross-section 0.08 mm² ... 0.82 mm²	–	–	6 024 742
	▪ With connecting cable ▪ For safety bus module on Hirschmann cable socket M26 x 11 + FE (e.g. to connect the safety light curtain C 4000) ▪ With Hirschmann cable socket M26 x 11 + FE ▪ Wire cross-section 12 x 0.75 mm²	Straight	2.5 m	2 029 131
			5 m	2 025 634
			10 m	2 025 635
			15 m	2 025 636
	▪ With connecting cable ▪ For the connection of the safety laser scanner S 3000 ▪ Wire-end prepared for stripping ▪ Wire cross-section 12 x 0.75 mm²	Straight	2.5 m	
			5 m	2 029 338
			10 m	2 029 339
			15 m	2 029 340
Protective cap M23	▪ For SDL connection	–	–	5 310 774

PROFIBUS connection

Name	Description	Model	Part number
Plug M12 x 5	▪ Without connecting cable ▪ Screwed ▪ B-coded ▪ For wire cross-section max. 0.75 mm²	Straight	6 021 354
Socket M12 x 5			6 021 353
Plug M12 x 4 with terminating resistor	▪ B-coded		6 021 156

Continued on next page

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Power supply

Name	Description	Model	Part number
Socket 7/8" x 5	▪ Screwed ▪ For wire cross-section max. 1.5 mm^2	Straight	6 024 745

Configuration connection

Name	Description	Cable length	Part number
Connection cable	▪ M8 x 4 / D-Sub 9-pin (DIN 41642) ▪ For connecting the configuration interface and the serial interface of the PC	2 m	6 021 195
		8 m	2 027 649

Configuration software

CDS (configuration & diagnostic software)

Name	Description	Part number
Software CDS	▪ Incl. online documentation and multilingual operating instructions ▪ On CD-ROM	2 026 875

Function packages

Name	Description	Part number
UE 4100 for I/O	▪ Expands the number of CDS functions by adding predefined applications for the field-signal inputs	2 026 873
PROFIBUS communication driver	▪ Enables the configuration and diagnosis of the safety bus module and of the connected SDL devices via the acyclic services of the PROFIBUS (CDS connection as a master class 2)	2 026 874

Other accessories

Designation plates

Name	Description	Part number
Designation plates	▪ In the 9 x 20 mm frame ▪ 40 pieces	5 310 775

N

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Overview of technical specifications

Number of field-signal connections	16 (single-channel) resp. 8 (dual-channel)
Number of SDL connections	2
Enclosure rating	IP 67
Control category according to EN 954-1	4
Safety integrity level according to IEC 61508	SIL3

Product description

- Convenient configuration and diagnostics using the Windows software CDS (configuration & diagnostic software)
- Offline configuration of the system without FPLC is possible
- Support for PROFIsafe V1.20 10/2002
- Support for PROFIBUS DP V1:
  - Cyclic communication with DP-Master Class 1 (central control)
  - Acyclic communication with DP-Master Class 2 (configuration and diagnosis tool)
- 2 SDL connections to connect active SICK safety components
- Configuration and diagnosis of all the components connected to the SDL connection via the configuration connection of the UE 4155
- Usage of the expanded functions of the safety components with SICK device communication

Applications

- Electro-sensitive protective equipment
- Emergency stop button
- Electro-mechanical safety switches
- Safety operating devices
- Control switches with lamps
- Operating mode selector switches
- Muting sensors
- Muting lamp
- Safety sensor T 4000 Compact

- Control cabinet free manufacture
- Central diagnosis
- Less wiring expenditure
- Safety data link (SDL) to SICK safety components

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→ Technical specifications	N-16
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→ Services	A-0

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Ordering information

Description	Type	Part number
▪ Safety bus module including configuration & diagnostic software and operating instructions on CD-ROM ▪ Usage of the expanded functions of the safe SICK device communication ▪ Function packages for C 4000 and S 3000	UE4155-01BC700	1 024 057

Detailed technical specifications

General system data

Protection class (IEC 61140:1997)	III
Enclosure rating (IEC 60529)	IP 67
Control category according to EN 954-1	4
Safety integrity level according to IEC 61508	SIL3
Housing dimensions	See dimensional drawings on page N-18
Weight	620 g

Field-signal inputs

Input voltage	
HIGH [1]	24 V (11 V ... 28.8 V)
LOW	0 V (–28.8 V ... 8 V)
Input current	
HIGH	12 mA (6 mA ... 15 mA)
LOW	0 mA (–1 mA ... 3 mA)
Input delay (configurable)	0 ms ... 90 ms

Field-signal outputs switched-on

Output voltage HIGH (without load)	V_S
Switching current	0 mA ... 700 mA
Minimum current for fault monitoring on field-signal connections 7 and 8 [2]	20 mA (7 mA ... 40 mA)
Peak current in the case of a short-circuit	2.4 A
Internal resistance	0.5 Ω

Field-signal outputs switched-off

Internal resistance (at 0 V)	23 kΩ

SDL connections, power supply

Maximum current	1.4 A
Maximum internal resistance	0.3 Ω

SDL connections, OSSD inputs

Input voltage	
HIGH	24 V (13 V ... 28.8 V)
LOW	–17 V ... 12 V
Input current	
HIGH	6 mA (1.8 mA ... 8 mA)
LOW	–6 mA ... 1.6 mA
Test pulse data	
Maximum test pulse rate	500 1/s
Maximum test pulse width	700 µs
Discrepancy time	3 ms ... 6 ms

N

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PROFIBUS connection

Baud rate	9.6 kBit/s ... 12 MBit/s
Address range	3 ... 125
Recovery detection	071A hex

Operating data

Supply voltage V_S at device [3]	24 V (19.2 V ... 28.8 V)
Residual ripple [4]	5 V_{SS}
Maximum power consumption through power-supply connection	9 A
Maximum power consumption	3.8 W
Power-up delay after connecting the supply voltage	2 s ... 10 s
Operating temperature	0 °C ... +50 °C
Storage temperature	–25 °C ... +70 °C
Air humidity (non condensing)	15 % ... 95 %
Rigidity	10 g, 10 Hz ... 300 Hz according to IEC 60068-2-6
Shock resistance	25 g, 6 ms according to IEC 60068-2-29

[1] As per IEC 61131-2, type 2

[2] Only when the connection is configured as an output for a muting lamp

[3] The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1

[4] Within the limits of V_S

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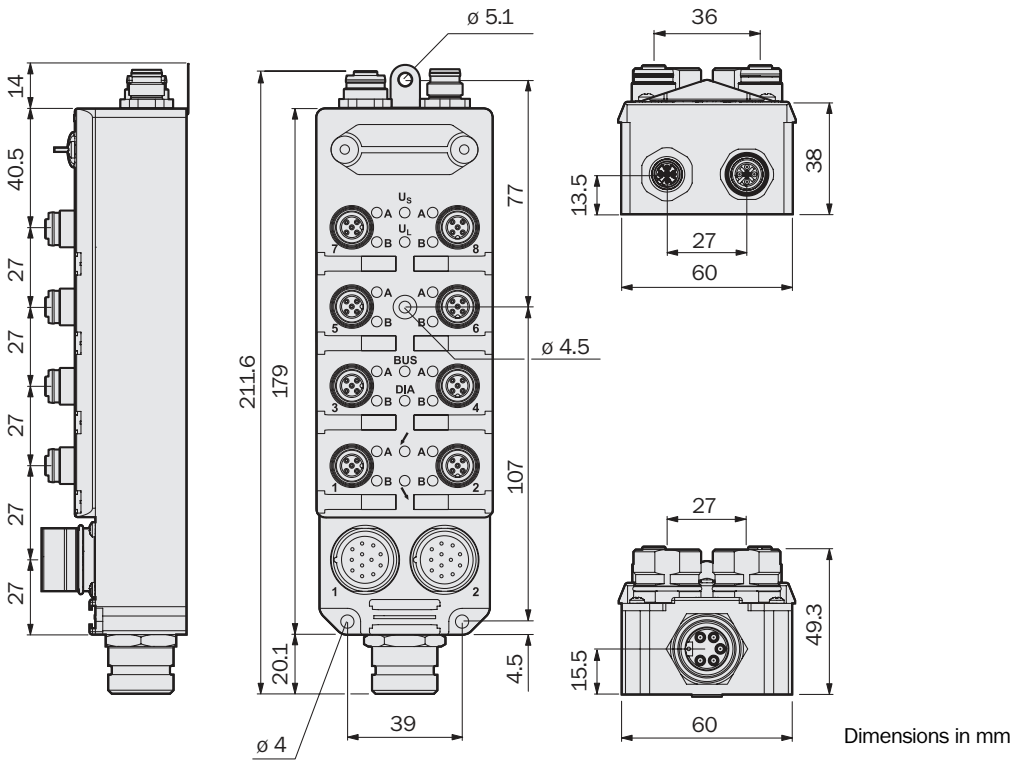
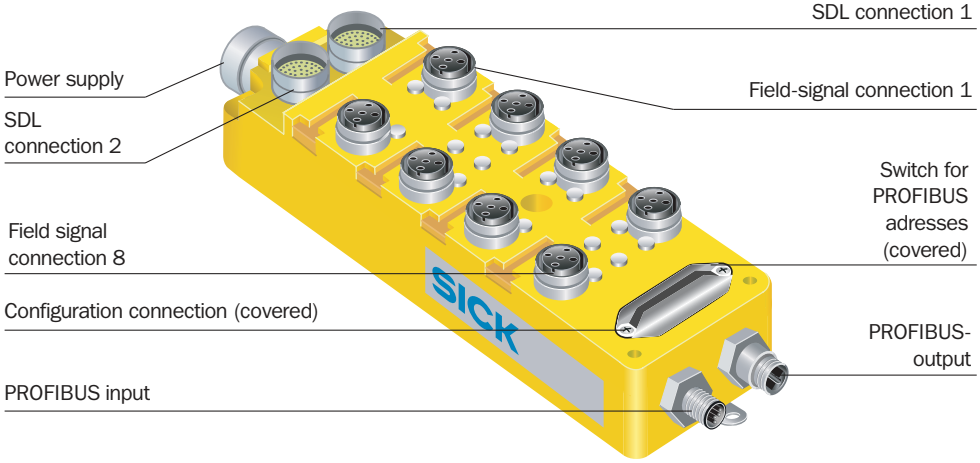
Dimensional drawings



Dimensions in mm

Device overview and connections



Power supply

- Common supply voltage for the safety bus module and the safety components connected to the SDL and field-signal connections

SDL connections

- To connect safety components with SICK device communication and/or OSSDs

Field-signal connections

- To connect OSSDs and passive components, e.g. switches fitted with volt-free contacts
- 1 field-signal connection = 2 channels (2 safety inputs and 2 outputs)
- Connections can be shared by a two-way splitter

Configuration connection

- To directly connect a PC to the SICK CDS in order to configure the system

PROFIBUS connection

- Input and output according to PROFIBUS specification

N

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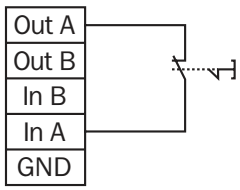
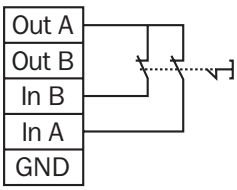
Connection diagrams

Emergency stop, emergency shutdown, safety door on the field-signal connection

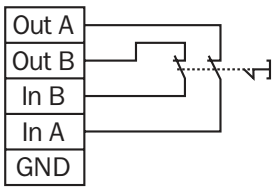
Single-channel



Dual-channel with common testing

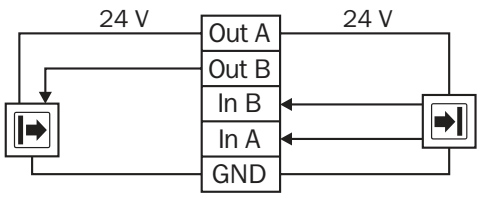


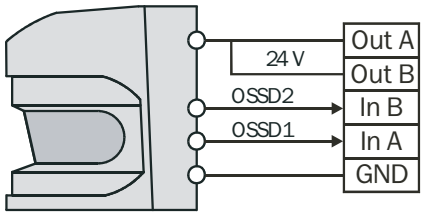
Dual-channel with isolated testing



Depending on the control category required, you can realise the emergency stop using a single-channel, dual-channel with common testing or dual-channel with isolated testing.
The classification of components fitted with contacts (e.g. safety door switches and emergency stops) into a control category depends both on the connection type (single-channel/dual-channel) and on the execution (single/redundant, testing type). You must therefore always select the appropriate switching element for the required control category and switching type.

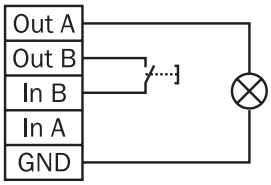
Electro-sensitive protective equipment (ESPE) on the field-signal connection





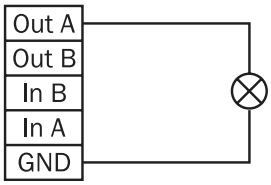
In the connection of electro-sensitive protective equipment (ESPE), sender and receiver can be considered as a system's input and output.
You can use output Out B to test the sender. The switching outputs of the receiver are present on inputs In A and In B.

Control switch with indicator display on the field-signal connection



The indicator display (Out A) is being controlled via an FPLC.

Muting lamp on the field-signal connection



It is only permitted to connect a muting lamp to channel A of field-signal outputs 7 and 8, as only these outputs have fault monitoring.

N

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Accessories

Connection type

Field-signal connections

Name	Description	Model	Cable length	Part number
Plug M12 x 5	▪ Without connecting cable ▪ Screwed ▪ For wire cross-section max. 0.75 mm²	Straight, screened	–	6 024 741
		Straight		6 022 083
		Angled		6 022 082
	▪ With connecting cable ▪ Wire-end prepared for stripping	Straight, screened	2 m	6 024 860
			5 m	6 024 861
			10 m	6 024 862
		Straight	2 m	6 026 133
			5 m	6 026 134
			10 m	6 026 135
Two-way splitter M12 x 5	▪ For the simultaneous connection of, e.g., two emergency-stop buttons (single-channel) on one field-signal connection	–	–	6 024 744
Protective cap M12	▪ For field-signal connection ▪ 10 pieces	–	–	5 309 189

SDL connections

Name	Description	Model	Cable length	Part number
Interconnectron plug M23 x 12	▪ Without connecting cable ▪ Crimped ▪ For wire cross-section 0.08 mm² ... 0.82 mm²	–	–	6 024 742
	▪ With connecting cable ▪ For safety bus module on Hirschmann cable socket M26 x 11 + FE (e.g. to connect the safety light curtain C 4000) ▪ With Hirschmann cable socket M26 x 11 + FE ▪ Wire cross-section 12 x 0.75 mm²	Straight	2.5 m	2 029 131
			5 m	2 025 634
			10 m	2 025 635
			15 m	2 025 636
	▪ With connecting cable ▪ For the connection of the safety laser scanner S 3000 ▪ Wire-end prepared for stripping ▪ Wire cross-section 12 x 0.75 mm²	Straight	2.5 m	2 029 337
			5 m	2 029 338
			10 m	2 029 339
			15 m	2 029 340
Protective cap M23	▪ For SDL connection	–	–	5 310 774

PROFIBUS connection

Name	Description	Model	Part number
Plug M12 x 5	▪ Without connecting cable ▪ Screwed ▪ B-coded ▪ For wire cross-section max. 0.75 mm²	Straight	6 021 354
Socket M12 x 5			6 021 353
Plug M12 x 4 with terminating resistor	▪ B-coded		6 021 156

N

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Power supply

Name	Description	Model	Part number
Socket 7/8" x 5	▪ Screwed ▪ For wire cross-section max. 1.5 mm^2	Straight	6 024 745

Configuration connection

Name	Description	Cable length	Part number
Connection cable	▪ M8 x 4 / D-Sub 9-pin (DIN 41642) ▪ For connecting the configuration interface and the serial interface of the PC	2 m	6 021 195
		8 m	2 027 649

Configuration software

CDS (configuration & diagnostic software)

Name	Description	Part number
Software CDS	▪ Incl. online documentation and multilingual operating instructions ▪ On CD-ROM	2 026 875

Function packages

Name	Description	Part number
UE 4100 for C 4000	▪ Expands the number of CDS functions when operating the safety bus module with safety light curtain C 4000 ▪ Enables cross-routing of field-signal connections to the SDL connections	2 026 871
UE 4100 for S 3000	▪ Expands the number of CDS functions when operating the safety bus module with safety laser scanner S 3000 ▪ Enables cross-routing of field-signal connections to the SDL connections	2 026 872
UE 4100 for I/O	▪ Expands the number of CDS functions by adding predefined applications for the field-signal inputs	2 026 873
PROFIBUS communication driver	▪ Enables the configuration and diagnosis of the safety bus module and of the connected SDL devices via the acyclic services of the PROFIBUS (CDS connection as a master class 2)	2 026 874

Other accessories

Designation plates

Name	Description	Part number
Designation plates	▪ In the 9 x 20 mm frame ▪ 40 pieces	5 310 775

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- Control cabinet free manufacture
- Less wiring expenditure

TÜV

Overview of technical specifications

AS-interface component	Safety Slave
Type of output of the connectable safety sensors	Actively monitored semiconductor (OSSDs)
Enclosure rating	IP 67
Control category according to EN 954-1	4

Product description

- Connection for electro-sensitive protective equipment (ESPE) with self-monitoring semiconductor outputs (OSSDs)
- Connection for the sender unit of an ESPE system
- AS-interface (yellow AS-interface cable)
- External power supply for ESPE over 24 V ribbon cable (black AS-interface cable)
- AS-interface version 2.1

Applications

- Connection for ESPE with self-monitored semiconductor outputs
- Connection for the sender and receiver of an ESPE system

Ordering information

Description	Type	Part number
Safety bus module UE 4215 [1]	UE4215-14CA200	1 025 687

[1] Requires AS-interface module lower part, see page N-26

Further information	Page
→ Definition	N-0
→ Dimensional drawings	N-24
→ Device overview and connections	N-24
→ Connection diagrams	N-25
→ Accessories	N-26
→ Services	A-0

N

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Detailed technical specifications

General system data

Protection class	III
Enclosure rating	IP 67
Control category according to EN 954-1	4
Maximum power-up delay after the application of all power supplies	200 ms
Weight	85 g

AS-interface

Operating voltage	26.5 V ... 30 V
Power consumption	20 mA (max. 60 mA)
AS-interface profile	S-0.B.E
AS-interface master version	2.1
Data bits IN	
Input channel I1	AS-interface Safety at Work code sequence on D0, D1
Input channel I2	AS-interface Safety at Work code sequence on D2, D3
Data bits Out	Not used
Maximum number UE 4215 per AS-interface master	31
AS-interface certification	Certificate No. 53001, test laboratory STZ Leipzig

Socket AUX PWR, connection of ESPE-sender

Operating voltage V_S	24 V (16.8 V ... 28.8 V)
Residual ripple [1]	5 V_{SS}
Maximum output current pin 1 (AUX L+) and 4 (AUX L+)	1.4 A
Maximum internal resistance	0.3 Ω

Socket I1/2

Maximum output current Pin 1 (AUX L+)	1.4 A
Maximum internal resistance Pin 1 (AUX L+)	0.3 Ω
OSSD inputs	
Input voltage HIGH	24 V (13.5 V ... 28.8 V)
Input current HIGH	20 mA (11 mA ... 24 mA)
Input voltage LOW	0V (–28.8 V ... 5.4V)
Input current LOW	0 mA (–6 mA ... 2.6 mA)
OSSD test pulses	
Test pulse rate	0 ... 25 1/s
Test pulse width	0 µs ... 550 µs
Maximale response time of the safe busnode UE 4215	22 ms
Minimale switch-off time der BWS	51 ms
Maximum cable capacitance	100 pF

Surroundings

Operating temperature	–25 °C ... +70 °C
Storage temperature	–40 °C ... +85 °C
Air humidity (non condensing)	15 % ... 95 %
Rigidity	10 g, 10 Hz ... 300 Hz according to IEC 60068-2-6
Shock resistance	25 g, 6 ms according to IEC 60068-2-29

[1] Within the limits of V_S

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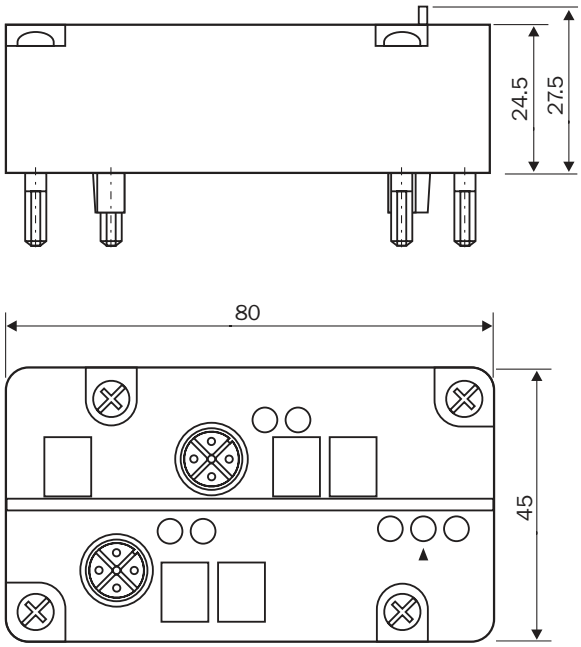
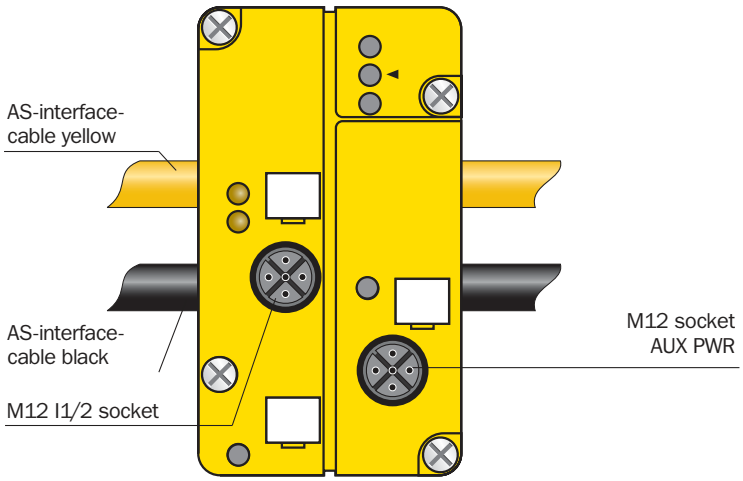
Dimensional drawings



Dimensions in mm

Device overview and connections



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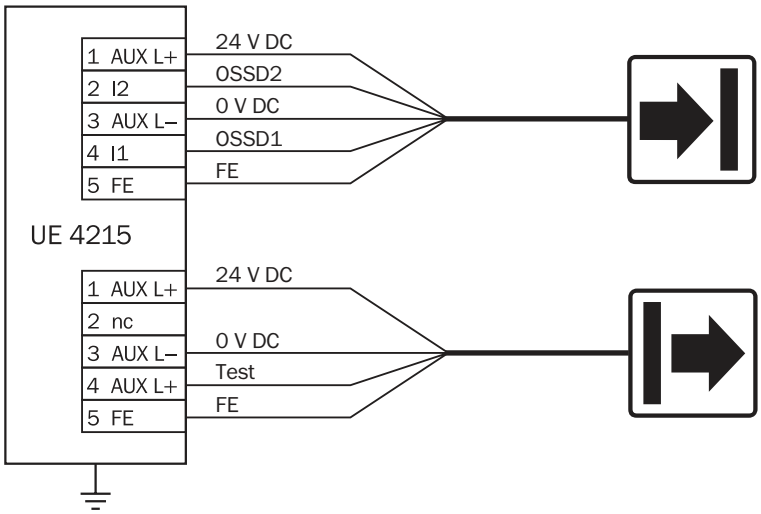
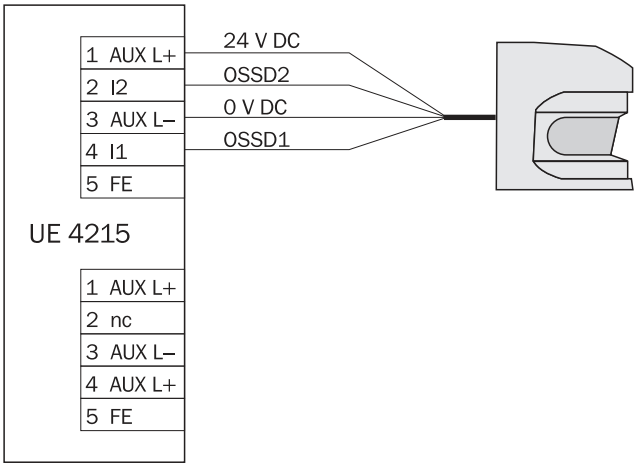
Connection diagrams

Connection of safety light curtains with self-monitored semiconductor outputs (OSSDs)



Connection of a safety laser scanner



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Accessories

Connection type

Name	Description	Model	Cable length	Part number
Plug M12 x 5	▪ Without connecting cable ▪ Screwed ▪ For wire cross-section max. 0.75 mm^2	Straight	–	6 022 083
		Angled	–	6 022 082
	▪ With unscreened connecting cable ▪ Wire-end prepared for stripping	Straight	2 m	6 026 133
			5 m	6 026 134
			10 m	6 026 135
	▪ With connecting cable ▪ For the connection to safety light curtain C 4000 ▪ Hirschmann cable socket M26 x 11 + FE	Plug and socket straight	2 m	2 030 357
			5 m	2 030 365
			10 m	2 030 366
Socket M12 x 8	▪ With unscreened connecting cable ▪ Wire-end prepared for stripping ▪ For the connection of C 2000, C 4000 Micro and M 2000	Straight	2.5 m	6 020 537
			5 m	6 020 354
			7.5 m	6 020 353
			10 m	6 020 352

AS-interface module lower parts

Name	Description	Part number
AS-interface module lower part	▪ FKE-A-E, with addressing socket and earthing	6 025 058
	▪ FKE-A, with addressing socket	6 022 397
	▪ FKE, without addressing socket	6 022 395

Other accessories

Name	Description	Part number
Claw sliding nut	▪ For direct earthing of MSL, C 2000, M 2000, C 4000 required when using the AS-interface module lower parts FKE or FKE-A	4 031 411

N

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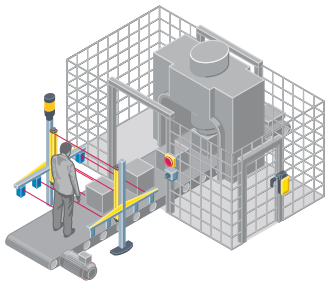
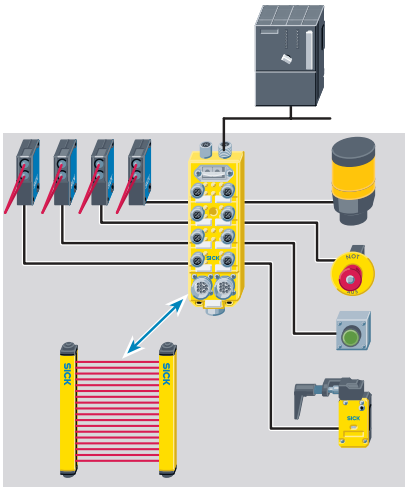
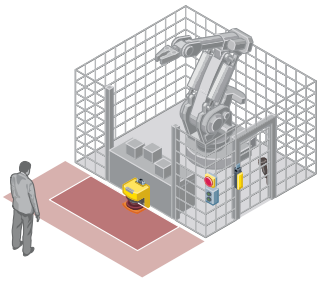
Application examples for safety bus modules

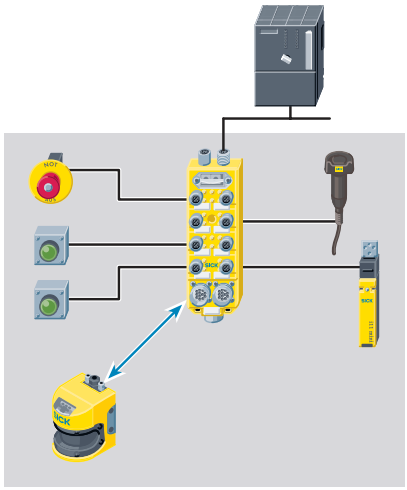
Muting



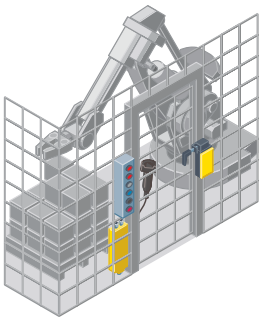


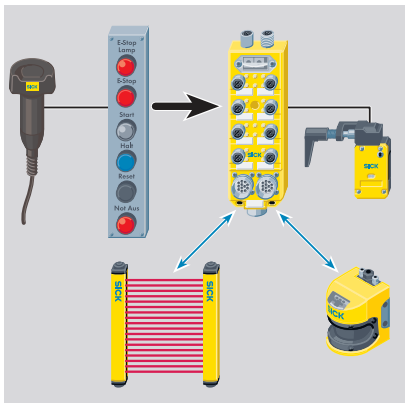
Robot cell





Access door





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- Simplified documentation including operating instructions
- Structure for implementing the directives and standards
- Hazard analysis and risk assessment
- Full text of directives and standards
- Network enabled

Product description

Safexpert is a software package for safety engineering. This package guides you, step by step, towards CE certification, provides support during risk analysis and simplifies the documentation process.
Safexpert assists in achieving high levels of safety.

Add-on modules:
- Operating instructions assistant
- Check and Acceptance assistant
- Packages of full-text standards

Benefit

Simplified documentation
- CE labelling and documentation in a single step
- Parallel preparation of the operating instructions
- Simplified adaptation of the documentation and the hazard analysis on changes or modifications to the machine

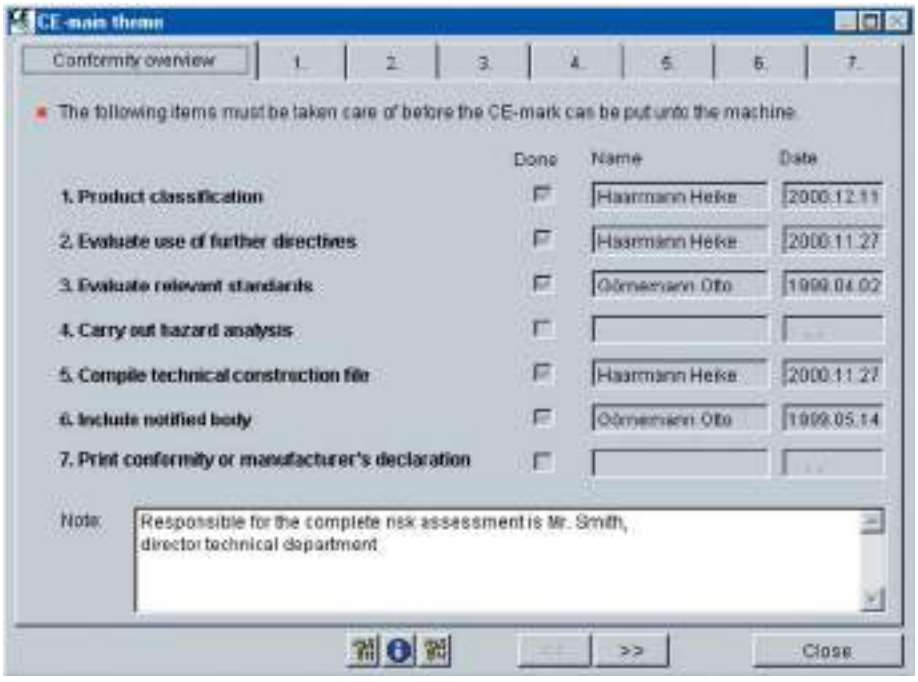
Save time and costs
- Re-using solutions saves up to 70 % of time required
- Retain an overview, even with a large number of parallel projects

More safety
- Structure for implementing the Machinery Directive
- The status check ensures that no unresolved points are forgotten
- Consistent hazard analysis
- Greater security on liability issues

"By using Safexpert we save up to 70 % on the CE effort and can therefore process a large number of projects in parallel. This situation shortens the total time taken to complete the projects and the machines are available quicker."

Siemens VDO Automotive

CE guidelines



At the end of these 7 steps you can print out the hazard analysis and the declaration of conformity directly.

Further information	Page
→ Selection aid	0-2
→ Ordering information	0-2
→ Services	A-0

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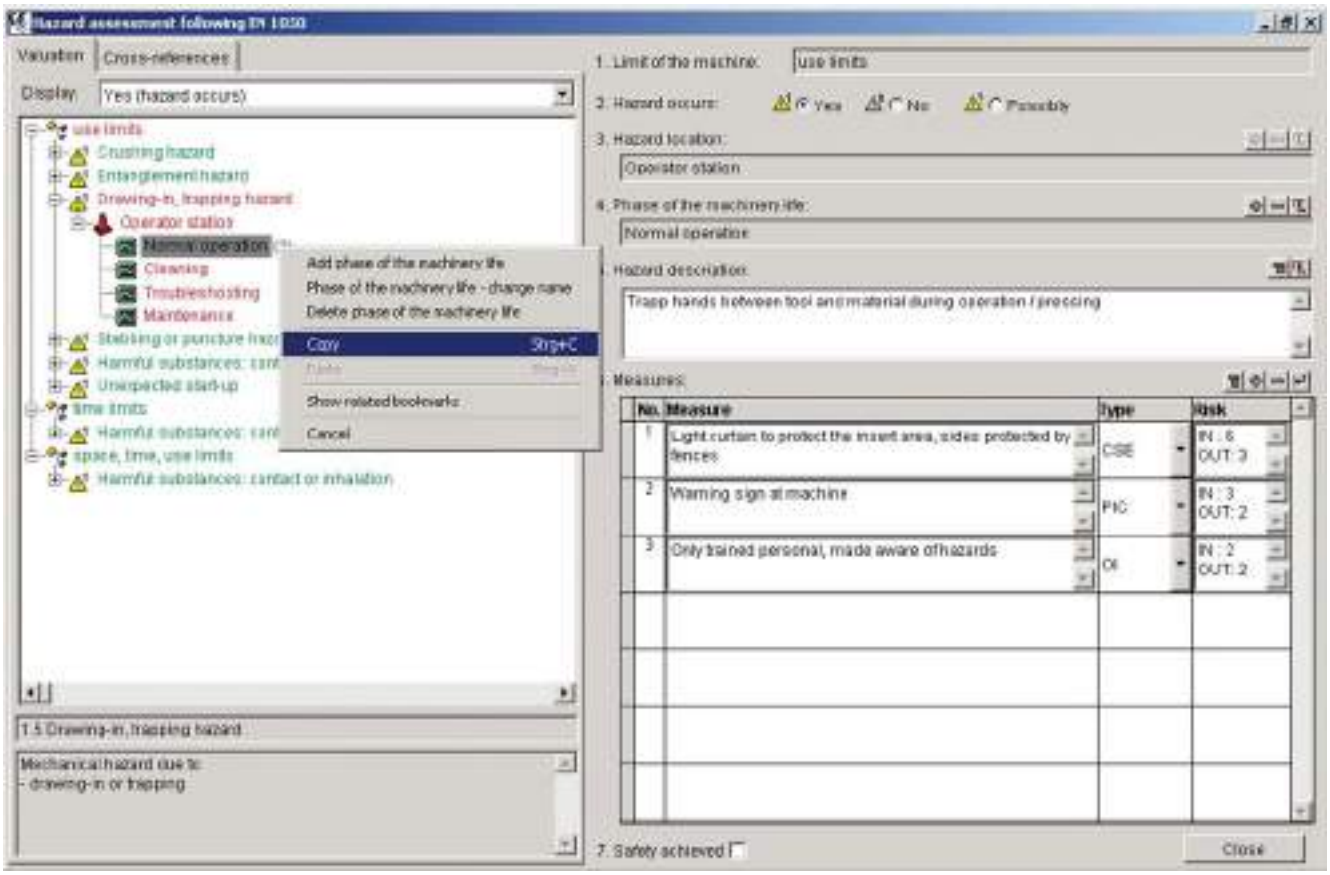
8 010 889/15-10-04

Hazard analysis (HA)



The program mirrors the procedure in the Machinery Directive and in the EN ISO 12100-1/-2 and EN 1050 (ISO 14121) standards. It is also possible to determine the category for safety devices in accordance with EN 954-1 (ISO 13849-1).

The decision trees are saved and only need to be clicked on. All information entered is automatically added to the relevant reports.

System requirements

- Windows 95, 98, 2000, NT, XP
  (Windows is a registered trademark of Microsoft Corporation)
- 32 MB RAM
- Monitor ≥ 800 x 600 pixel

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Selection aid

	Licences		
Functions	**Basic**	**Compact**	**Professional**
Safety project management	✔	✔	✔
CE guidelines - 7 steps to the CE guidelines	✔	✔	✔
Hazard analysis incl. hazard list in accordance with EN 1050	✔	✔	✔
Standards and directives information system	–	✔	✔
Collection of graphics characters	–	✔	✔
Example of EU-compliant operating instructions template	–	✔	✔
The “Standard” package of standards with the original texts of 9 standards	–	–	✔

Add-on modules

The modules can be combined with all licences:

- **Operating instructions assistant**
  The add-on module for the operating instructions with operating instructions template
- **Check and Acceptance assistant**
  The Check and Acceptance assistant provides support in the execution of tests, and the acceptance of machines and plants, with maximum uniformity and concise documentation
- **The “Standard” and “Standard Plus” packages of standards**
  Full text of approx. 45 standards

Ordering information

Licences

Designation	Description	Part number
Safexpert 5.0 Basic	▪ English ▪ Single-place licence	2 033 331
	▪ English ▪ Multi-place licence	2 033 333
Safexpert 5.0 Compact	▪ English ▪ Single-place licence	2 033 335
	▪ English ▪ Multi-place licence	2 033 337
Safexpert 5.0 Professional	▪ English ▪ Single-place licence	2 033 339
	▪ English ▪ Multi-place licence	2 033 341
Upgrade to newer versions	▪ From Safexpert 4.0 to Safexpert 4.2 ▪ Single-place licence	2 031 557
	▪ From Safexpert 4.2 to Safexpert 5.0 ▪ Multi-place licence	2 033 342

Note: The Basic version cannot be combined with Compact or Professional

Upgrade

Safexpert Master Module for the expansion from Basic to Compact	▪ English ▪ Single-place licence	2 031 552
	▪ English ▪ Multi-place licence	2 031 554

Note: Expanding for Compact to Professional see next page “Standards“

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Modules and add-ons

Designation	Description	Part number
Operating instructions assistant	▪ English ▪ Single-place licence	2 031 544
	▪ English ▪ Multi-place licence	2 031 546
Check and Acceptance assistant	▪ English ▪ Single-place licence	2 031 548
	▪ English ▪ Multi-place licence	2 031 550

Standards

Standards for expanding Compact to Professional

Designation	Description	Part number
Safexpert Standard	▪ English ▪ Nine standards: (EN 292-1, -2); EN 294, EN 349, EN 418, EN 954-1, EN 999, EN 1050, EN ISO 12100-1, -2, EN 60204-1	6 021 373

Further A-type and B-type standards from the “Safe Machinery” area (ICS 13.110) [1)]

Designation	Description	Part number
Standard Plus and Standard	▪ Without Safexpert ▪ English	6 022 507
Standard Plus as supplement to Safexpert Professional	▪ English	6 022 511
Standard Plus Update	▪ Update 07-2004 ▪ English	2 031 996

[1)] Without preliminary or electrotechnical standards

Safety of machinery - Basic concepts, general principles for design

Designation	Description	Part number
EN ISO 12100-1	▪ English	2 031 415
EN ISO 12100-2		2 031 417

C-type standards, single standards and explanations

Designation	Description	Part number
EN 692	▪ Mechanical presses - Safety ▪ English	6 024 687
EN 693	▪ Hydraulic presses - Safety ▪ English	6 024 689
EN 775	▪ Industrial robots - Safety ▪ English	6 024 691

Update service for the database of titles of standards and directives

Designation	Description	Part number
Yearly update service	▪ Document register system, Europe ▪ English	6 021 380

8 010 889/15-10-04

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Term	Explanation
A	
Actuation duration (reset button)	Time that a reset button must be operated to reset the safety relay.
Actuator, actor	Actuator: component, e.g. servomotor, clutch, solenoid valve or similar, for intervening in the process.
ADO	Application Diagnostic Output Configurable signal output that indicates a specific status of the protective device.
Ambient temperature, max.	The highest permissible temperature of the ambient air, or another medium, at which the full functionability of an item of equipment is still guaranteed.
Ambient temperature, min.	The lowest permissible temperature of the ambient air, or another medium, at which the full functionability of an item of equipment is still guaranteed.
ANSI	American National Standards Institute Promotes and manages American industrial standards. ➜ www.ansi.org
AOPD	Active Opto-electronic Protective Device Text from IEC 61496-2: A device with a sensor function produced by opto-electronic sender and receiver units. A stop signal is generated when an opaque object within the defined protective field interrupts the light emitted by the device. In EN 692 Mechanical presses, EN 693 Hydraulic presses and EN 12622 Hydraulic press brakes the abbreviation AOS is used as a synonym for AOPD.
AOPDDR	Active Opto-electronic Protective Device responsive to Diffuse Reflection Term from IEC 61496-3: Device with a sensor function produced by opto-electronic sender and receiver elements, that detects the diffuse reflection of light, generated by the device, by an object in a defined two-dimensional protective field.
AS-i	Actuator-Sensor Interface Open bus system for the lowest automation level. Enables sensors, actuators and integrated systems to be easily connected to the first control level. Master-slave principle, up to 248 binary outputs per network, analogue I/Os possible, electronic address setting over the bus connection, unscreened 2-core ribbon cable, information and power supply on one cable, reverse-polarity protected connection technology. ➜ www.as-interface.com
AS-Interface Safety at Work	Extension of the AS-interface system with safety-related components by using a combination of AS-interface safety monitor and safe AS-interface bus nodes.
AS-Interface Safety at Work Safety Monitor	One or more safety monitors integrated in the AS-interface system monitor safe AS-interface bus nodes and shut down the protected part of the machine such that the dangerous state of the machine is brought to an end.
A-type standards	(Basic safety standards) contain basic terminology, principles of design, and general aspects that apply to all machinery, devices and systems.
B	
Beam coding	Beam coding ensures that the receiver only detects and evaluates light from the sender allocated to the receiver.
Beam separation	Distance between the centres of the beams on a multi-beam photoelectric safety switch.
Blanking	An optional function on an AOPD unit that permits the presence in the protective field of an object, larger than the detection capability or physical resolution of the AOPD, without the OSSDs switching to the off state. The object is therefore blanked. With fixed position blanking, the position of the blanked object does not change during operation. With floating blanking the blanked objects can move in the protective field during operation. In both cases the ability of the AOPD unit to detect objects in the remaining protective field is unchanged.

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Term	Explanation
Blanking (continued)	Blanking of a specific section of the protective field for a safety light curtain. This section is then inactive. There are two types of blanking: ▪ Fixed blanking permits a specific, fixed part of the protective field to be blanked. This function is selected, e.g. if a fixed part of a unit protrudes into the protective field. ▪ Floating blanking permits a specific number of light beams from the safety light curtain to be interrupted without the output of a stop signal. This function is selected if the permitted interruption of the protective field does not relate to a fixed position in the protective field, e.g. if a cable or hose is moved through the protective field.
Blind zone	Zone in front of a sensor in which an object or a reflector is not detected. The blind zone always starts at 0 mm.
BSI	British Standards Institution Standards institute in the UK ➜ www.bsi.org.uk
B-type standards	(Group safety standards) address a safety aspect or a type of safety-related equipment that can be used for a wide range of machinery, devices and systems. ▪ B1-type standards address special safety aspects, e.g. the electrical safety of machinery (IEC 60204), the calculation of safety distances (ISO 13855). ▪ B2-type standards address safety equipment, e.g. two-hand controls, interlocking equipment, pressure-sensitive protective equipment, guards, electro-sensitive protective equipment (IEC 61496 parts 1, 2 and 3)
Bus system, bus	Common cable for the transmission of data and control information between different components and systems using a defined protocol. A differentiation is to be made between parallel and serial buses. ▪ Parallel bus systems have a large number of wires on which data, address or control information can be transmitted as parallel bits. They are used as plug-in bus systems for the connection of plug-in modules and as peripheral buses for connecting computers to their local I/O devices. ▪ Serial bus systems transmit data between components distributed over a wide area in a system as serial bits using a common medium (two-core or multi-core cable, coaxial cable or fibre-optic cable) and as a result drastically reduce the wiring effort compared to conventional wiring. Familiar examples are: DeviceNet, Profibus, Interbus, CAN, AS-i et al.
C	
Cascadable	Describes the feature, particularly on light curtains, that allows a basic device (host) to be connected by a cable to a following device (guest).
CDS	Configuration & Diagnostic Software Configuration and diagnostics software for SICK safety systems.
CE label	This label on products comprises the letters CE and indicates conformity with all EU directives that apply to the labelled product. The label states that the person or legal entity that applied the label, or had it applied, has ensured that the product complies with all the Union's directives for complete harmonization and has been subjected to all the stipulated conformity assessment procedures.
CEN	Comité Européen de Normalisation European Committee for Standardisation. Promotes technical harmonization in Europe in collaboration with European partners, e.g. CENELEC and globally active bodies. Is specifically responsible for the area of non-electrical standards. ➜ www.cenorm.be
CENELEC	Comité Européen de Normalisation Electrotechnique European Committee for Electrotechnical Standardisation. Responsible for the harmonization of electrotechnical standards within the European Union and the entire European Economic Region, EER. ➜ www.cenelec.be
Concurrence monitoring	Simultaneous operation of the start buttons is monitored and is stipulated for two-hand controls. The output contacts are only switched if the state of both start buttons changes within 0.5 s.

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Term	Explanation
Contamination control	Prior to the failure of the sensor, indicates an unsatisfactory signal reserve due to maladjustment or contamination (for optical sensors).
Cross-circuit/short-circuit detection	Detection of cross-circuit/short-circuit, or a reduction in the insulation resistance between contact and contact, or short-circuit between core and core, or more than one single conductor cable.
CSA	Canadian Standards Association The Canadian Standards Association prepares standards for improving public safety and health, protecting the environment and easing trade. CSA tests and certifies the electrical properties and the safety of products. It is designated by ➜ OSHA as a national, recognised test laboratory for testing all products that fall under the responsibility of OSHA. ➜ www.csa.ca
C-type standards	(Machinery safety standards) contain all safety requirements for a specific machine or a type of machine. If this standard exists, it has priority over the A-type or B-type standard. Nevertheless, a C-type standard can refer to a A-type standard or an B-type standard. If there is no C-type standard for a machine, conformity can be achieved based on the A-type or B-type standard. In all circumstances the requirements of the Machinery Directive must be met.
D	
Dangerous state	State that can result in injuries to people. Safety sensors prevent this hazard if the protective device is used correctly.
DeviceNet™	Simple CAN-based communication system for networking industrial automation equipment with higher-ranking control equipment. The transmission medium is two twisted, screened pairs of wires inside one cable. One pair is used for communication and the other for the supply of power to the equipment connected. ➜ www.odva.org
E	
EDM	External device monitoring Term from IEC 61496-3: A means with which the item of electro-sensitive protective equipment (ESPE) monitors the status of the parts of the control outside the ESPE. ➜ Monitoring function for downstream devices
EFI	Enhanced Function Interface Safe SICK device interface for the transmission of safety relevant signals. A bus interface to a safe fieldbus is possible using the SICK UE 1000 device family.
EMC	Electromagnetic Compatibility Ability of an item of equipment to work satisfactorily in its electromagnetic environment and at the same time not to excessively interfere with this environment, in which there are other items of equipment.
Enclosure ratings	Enclosure ratings describe a machine's or sensor's level of protection against physical contact and penetration of foreign bodies and water. The enclosure rating code starts with the letters IP (ingress protection); the first digit indicates the level of protection against accidental contact and foreign bodies. The second digit describes the protection against the penetration of water. The higher the digit, the greater the protection provided. In industry, enclosure ratings from IP 65 have become established as the standard. SICK sensors predominantly have an enclosure rating of IP 67.
Entry/Exit	Innovative muting alternative for access protection: Muting sensors and muting lamps are no longer required. Additional protection measures (e.g. hinged doors) are not required as a rule.

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Term	Explanation
ESD	Electrostatic Discharge Electrostatic discharge: Equalisation of charge between differently electrostatically charged fixed, gaseous or liquid media. The currents generated during discharge can damage or destroy electronic components, or impair the function of electronic devices. These effects on devices are covered by legislation on electromagnetic compatibility. When handling electronic components, assemblies and devices, discharges from the body during e.g. transport, mounting, testing, repair and service, are of significance. ➜ www.darc.de/gesetze/pdf/emvg.pdf
ESPE	Electro-Sensitive Protective Equipment Text from IEC 61496-1: Electro-sensitive protective equipment (ESPE). These items of equipment can be based on the following physical principles: opto-electronics, ultrasonics, inductive sensor systems, infrared movement sensors, etc. ESPE comprise the following elements: a sensor function, a control/monitoring function, switching outputs (OSSD). They are used to protect people at machines and systems on which there is a risk of injury. They cause the machine or system to adopt a safe state before a person can be exposed to a hazardous situation.
External device monitoring	➜ EDM
F	
Fieldbus	Bus system in close proximity to the process for the direct connection of intelligent sensors and actuators. On a fieldbus, smaller quantities of data are transmitted digitally between sensors and actuators and control equipment. The data must be transmitted as quickly as possible, i.e. the data should be transmitted close to real time. In addition, a fixed minimum and maximum response time must be guaranteed.
FPLC	Fail-safe Programmable Logic Controller
FSD	Final Switching Device The component in the safety-related control system on the machine that interrupts the circuit to the Machine Primary Control Element (MPCE) if the switching output (OSSD) changes to the off state.
G	
Guards	A fundamental differentiation is made between “fixed” and “movable” guards. ▪ Fixed guards are used for hazardous points where it is unnecessary, or only seldom necessary, to make changes. As a rule, they are fixed in place and can only be removed with tools. ▪ Movable guards are used if it is necessary to make changes at the hazardous point to operate the machine, to rectify malfunctions or during setup. These guards are monitored using ➜ safety switches.
H	
Hazardous area	Text from ISO 12100-1: A hazardous area is any area in a machine and/or around a machine in which a person can be subjected to a hazard.
I	
Interbus	Bus system with technical characteristics specifically designed for use in industrial sensor/actuator systems and homogeneous networking from the control level to the last position switch. ➜ www.interbusclub.com
Interface	Connection point between two devices or systems. The devices/systems on each side of an interface are connected together using an interface cable via which data, addresses, and control signals are exchanged. In this context, the term interface covers the entirety of the functional, electrical and design conditions (coding, signal level, pin assignments) that characterise the connection point between the devices or systems. Depending on the type of data transmission, a differentiation must be made between parallel (e.g. Centronics, IEEE 488) and serial interfaces (e.g. V.24, RS-422, RS-423, RS-485), which are designed for different transmission speeds and transmission distances.

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Term	Explanation
IP enclosure rating	IEC 60529 describes standardised degrees of protection with which the housing of a product complies if the product is correctly installed. ➜ enclosure rating
ISO	International Organization for Standardization Worldwide federation of national standards institutes in 148 countries. The term ISO is not an acronym for the name of the organisation, but comes from the first three letters of the Greek word “isos”, which roughly means “equal” in the sense of equivalence. ➜ www.iso.ch
L	
Laser	Light Amplification by Stimulated Emission of Radiation Amplifier for electromagnetic waves in the visible light spectrum
Laser protection class	Categorisation of laser equipment into classes. In the classes 1 to 4, limits are set for photochemical hazards for the accessible radiation.
LED	Light Emitting Diode (luminescence diode).
Light curtain	An AOPD with a resolution ≤ 116 mm. (A resolution ≤ 40 mm is suitable for finger and hand protection).
Light spot	Light spot dimension, determining the sensor’s resolution.
Locking device monitoring	Identifies whether the locking device is monitored and can therefore be incorporated in the safety circuit.
Locking force	Maximum force with which a guard can be safely locked.
M	
Machinery Directive	The Machinery Directive 98/37 EC is addressed at the designers of new machines. It defines the tasks for complying with the health and safety requirements for new machines so that they can be sold and freely marketed in the European Union’s member states, and so that operators are guaranteed a high degree of protection. The harmonized European standards define the possible ways and means of implementing these objectives. The Machinery Directive is integrated in national law and therefore binding. The standards are, however, not binding. On the other hand, it is assumed that a machine built in accordance with the harmonized standards will meet the essential requirements in the directive. As required by European law, the directive and its amendments must be implemented in every member country. The directive came into force on 1 January 1995 for machines and on 1 January 1997 for safety components.
Manipulation	Manipulation is the conscious deactivation or bypassing of protective devices and their components. Safety switches and equipment must be designed so that functions used to provide protection cannot be changed or bypassed manually or using simple means. Simple means are, e.g. screwdriver, ball-point pen, nail, piece of wire, adhesive tape, etc. Means that are not simple are those that require more than one work step with tools. The removal of parts, turning away of safety switches from their protective position, the use of a second actuator or bridging the contacts is not bypassing with simple means. The intentional and conscious deactivation of protective devices is considered gross negligence in case of accidents, and will thus result in serious consequences. During design, consideration should be given to the feasibility of straightforward, correct operation of machines and system despite the protective devices. If this aspect is not considered, the safety measures may be bypassed.
Master	Central bus user that controls bus access. All other bus users work as slaves.
Master/slave principle	The master element defines the instructions, slave elements follow the instructions from the master. For example, with decentralised bus control an automation device, as the master element, assigns the access rights for the other components (slave elements).

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Term	Explanation
Mechanical installation conditions for proximity sensors	A proximity sensor can be installed flush if any attenuating material can be placed around the active face without affecting the key device features. A proximity sensor cannot be installed flush if a specific clear zone is required around its active face. Quasi-flush applies to sensors that have the appearance of a flush sensor (i.e. not the typical plastic cap on the sensor with clear zone), but still have clear zone switching distances. These sensors can mostly not be installed 100 % flush or even recessed, but need a small clear zone (protrusion).
Mechanical unlocking mechanism	Is used to unlock a safety switch from the outside.
Minimum shutdown time	Minimum time necessary to detect an infringement of the protective field on the input circuit on the relay. At values below this minimum figure, an incorrect situation will not be detected, or the relay will switch to the error state.
Minimum switch-off time	The time for an internal check on the relay contacts.
Minimum switch-on time	Minimum time that a signal must be present on the input circuit before a reset can be performed (change from LOW to HIGH).
Monitoring function for downstream devices	The external monitoring device (➜ EDM) must provide the necessary means for the connection to the signals from the external devices (e.g. MPCE(s), FSD(s), muting devices) so that the EDM can unambiguously monitor the status of such devices. The safety device must change to the interlocked state if an incorrect state is detected in one of the devices to be monitored by the EDM.
Mounting of safety switches	The mounting and mounting method for safety switches are crucial for the safe monitoring of guards, their function and operational safety. Guards and their components, e.g. safety switches, must be seen in direct relation to the feasibility of manipulation. Therefore precautions should be taken in the design to exclude this possibility as far as possible. Along with due consideration of general regulations, such as mounting all components related to safety in guards, a further reduction in the risk can be achieved by preventive design measures: ▪ Mounting safety switches behind the guards or inside the system. ▪ Locking the actuator insertion openings on the safety switches (for type 2) when the guard is opened (lockout bar). ▪ Moving the actuator in a so-called C-rail. This prevents the use of a “second” actuator.
MPCE	Machine Primary Control Element Text from IEC 61496-1: Element in the main circuit: The element that interrupts the main circuit to stop the machine.
Muting	Text from IEC 61496-1: Muting function: Time limited bridging of the protective function with additional sensors to differentiate between people and objects.
Muting of an AOPD	Bridging a protective device for a time can be relevant for safety. For example, the standard EN 415-4 (1993) for packaging machines addresses the problem of palletisers and de-palletisers (machines in which all work on the pallet load is performed automatically and only by the machine). At the entry and exit to the chamber (where under normal operating conditions there is a hazard), it is necessary to bridge the AOPD when the pallet moves past. On the other hand it is also necessary to detect the entry of people. The muting system must be able to differentiate between the pallet and the operator. The muting conditions that are defined in the standard EN 415-4 state that: ▪ Muting is only allowed to be activated during the period of time in the working cycle when the loaded pallet blocks access to the hazardous area. ▪ Muting must be automatic. ▪ Muting must not be dependent on a single electrical signal. ▪ Muting must not be entirely dependent on software signals. ▪ Muting signals occurring during an invalid combination must not permit any muting state, and it must be ensured that the protective function is retained. ▪ The muting state is lifted immediately after the pallet has passed through and the protective device is reactivated.

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Term	Explanation
Muting-dependent manual bridging	An optional function on an ESPE, also called override. This function permits activation of the muting function, and thus the bridging of the ESPE, by the manual operation of a control switch for the purpose of, e.g. clearing blockages in the muting area on a roller conveyor. The override function must only be able to be activated when at least one muting sensor is active. The manually initiated override is deactivated automatically after either a correct muting sequence or a pre-set time. Source: IEC 61496-1: 2001 FDIS; A.7.1.5
N	
NC	Normally Closed N/C contact
NO	Normally Open N/O contact
No load current	Current that is drawn by a sensor with 3 or 4 connections without a load connected.
Number of beams	Number of beams of a multi-beam photoelectric safety switch.
Number of protective fields	Number of the switchable protective fields of an AOPDDR
O	
Operating range	The scanning range is the maximum possible distance (specified detection distance) between sender and receiver (through-beam photoelectric switch) or between sensor and reflector (photoelectric reflex switch) at which stable function can be guaranteed.
Operating voltage, max.	The maximum operating voltage is the upper limit for the voltage used to supply the equipment with power for operation. The specified maximum operating voltage must not be exceeded, especially not by the maximum peaks on any residual ripple.
Operating voltage, min.	The minimum operating voltage is the lower limit for the voltage used to supply the equipment with power for operation so that the equipment continues to function. The voltage must not drop below the specified minimum operating voltage, especially not by the minimum peaks on any residual ripple.
OSHA	Occupational Safety & Health Administration Authority for health and work safety. Responsible for work safety regulations in the USA. OSHA has the task, by means of the preparation and implementation of directives, to safeguard the health and safety of the American worker, to provide means for training and further training, and to promote the continuous improvement of health and work safety. ➜ www.osha.gov
OSSD	Output Signal Switching Device The part of the item of electro-sensitive protective equipment (ESPE) that is connected to the machine control, and that changes to the off state when the sensor section is triggered during correct operation.
Output current, max.	Maximum permissible load current on the output.
Output current, min.	Minimum load current necessary on the output.
Output signal switching device	➜ OSSD
Output switching element OSSD	➜ OSSD
Outputs, safe	➜ OSSD
Override	➜ Muting-dependent manual bridging
P	
PDF	Proximity Device with defined behaviour under Fault conditions
PDF category	Describes the behaviour of a proximity device under fault conditions.

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Term	Explanation
PELV	Protective Extra Low Voltage Protective extra low voltage with safe isolation (see DIN VDE 0100-410/01.97, section 410). The protective measure PELV differs from ➜ SELV (Safety Extra Low Voltage) only in the type of connection to earth. A PELV circuit is present if, for example, the secondary side is earthed for operational reasons. The highest permissible nominal voltage for the protective measures SELV and PELV is max. 50 V AC and 120 V DC.
Positively driven opening on safety switches	Positively driven opening on safety switches signifies that there must be positive, shape-based transmission of force between actuator and switching element. The actuating mechanism must be so designed that even on mechanical failure, e.g. on the fracture of a spring or contact welding, the contacts open reliably and remain open in the actuated state. ➜ Further stipulations are defined in the standards IEC 947-5-1, EN 60947, VDE 0660 part 200.
Power-up delay	Time that the safety module requires to become ready for operation after application of the supply voltage.
PROFIBUS **PROFIBUS DP**	In complex manufacturing processes, the total costs for sensors and actuators depend not only on the purchase price, but crucially also on the installation costs. Using decentral automation systems with bus technology, these costs can be significantly reduced. Universal fieldbus terminals and couplers enable SICK sensors to be rapidly adapted to all common system environments. It is possible to integrate, among others, photoelectric proximity switches, photoelectric reflex switches and through-beam photoelectric switches, color sensors, contrast and luminescence scanners, distance measuring systems, as well as bar-code reading systems. For safety engineering, SafetyBUS p• provides a bus solution for the bidirectional communication between safety systems – such as the C 4000 light curtain or the S 3000 laser scanner – and the controls on machines. While bus systems like PROFIBUS-DP, Interbus, DeviceNet and CANopen cover the higher field level in automation structures, AS-i, the Actuator-Sensor interface, is suitable for use at the lowest field level in decentral control concepts. Instead of complex parallel wiring, numerous different sensors and actuators can be simply, rapidly and cost-effectively connected together. It is possible to integrate the AS-i bus in a higher level control, e.g. a PLC or a computer, without problems. Up to 31 slaves can be connected to a two-core cable, and up to four binary users can be connected to each slave. It is therefore possible to supply up to 124 sensors with one bus. All sensors with AS-i support, for example SICK's photoelectric switches and photoelectric proximity switches, contain an application-specific integrated circuit, the AS-i chip. This component is also fitted in an external AS-i module with a dedicated address and support for four conventional sensors and actuators so that standard components can also be incorporated.
PROFIsafe	Profile for safety-related data transmission via the PROFIBUS network
Protective field	The area in which the test object specified by the manufacturer is detected by the item of electro-sensitive protective equipment (ESPE). ▪ Safety light grid/light curtain: The protective field lies between the sender unit and receiver unit. The field is defined by the protective field height and the protective field width. ▪ Safety laser scanner: the protective field secures the hazardous area on a machine or vehicle. The field is defined by the scanning range, scanning angle, response time and resolution of the device used (see technical specifications). The size and shape of the protective field can be configured with the aid of the ➜ CDS.
Protective field height for safety light curtains	Height of the active protective field along the longitudinal axis of the light curtain.
Protective field range	On devices with separate sender unit and receiver unit, this is the distance between the sender and receiver; on reflex devices, the distance between the sensor and reflector.
Protective field width for safety light curtains	Is given by the length of the light path between sender and receiver. To guarantee the safe protective function, the maximum permissible protective field width must not be exceeded.

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Term	Explanation
PSDI control	An optional function on an item of ESPE with which the ESPE triggers the dangerous machine movement as well as its protective function. The following types of actuation are common: ▪ In the single break PDSI mode the machine movement is started by interrupting and clearing the protective device's protective field. ▪ In the double break PSDI mode the machine movement is started by interrupting and clearing the protective device's protective field twice in succession.
PSDI mode	This term refers to manual intervention at hazardous points during the machine working cycle. Hereby the protective measures must achieve a high level of safety for monitoring the protective device and for signal processing. If these conditions are met, the start command can be given in this operating mode if the protective device returns correctly to the protective setting.
R	
Radiation source	Source for beam generation using semiconductor LEDs or conventional gas discharge lamps.
Reactivation delay	Delay until a sensor's protective function is effective (response time of all relays).
Reduced resolution	An optional function on ESPE (particularly light curtains) with which several objects up to a certain size, that occasionally cause interruptions, can be tolerated in the protective field without OSSDs switching to the off state, provided a certain number of neighbouring light beams remain clear.
Reflector distance, min.	Minimal permissible distance between photoelectric reflex switch and reflector
RES	Reset inhibit ➜ Restart interlock
Reset time	Time between operating the reset (in the "safe" state) and the "enabled" state. The time starts: ▪ with manual reset on release of the reset button (except UE 23-2 MF safety relay). ▪ with automatic reset on closing of the input circuits (e.g. closing the protected door).
Response delay time	Time by which the response of the safety contacts is delayed. The times can be adjusted on switching devices with response delay.
Response time	The maximum time between the occurrence of the event that caused the triggering of the sensor and the achievement of the off state at the output switching elements (OSSDs).
Response time ESPE	The maximum time between the occurrence of the event that results in the triggering of the sensor and the achievement of the off state at the switching outputs (OSSDs)
Restart interlock	Text from IEC 61496-1: A device for preventing an automatic machine restart after triggering of the sensor function during a dangerous part of the machine cycle, or after a change in the operating mode or the actuation method for the machine, or after a change to the start control equipment on the machine. ▪ Operating modes include: inching, single stroke, automatic. ▪ Start control equipment includes: Foot switch, two-hand control, single break PSDI triggering or double break PSDI triggering by the ESPE's sensor function. ▪ Restart interlock (RES): The machine stops and the restart interlock (RES) is engaged on interruption of at least one light beam. This interlock ensures that the machine can only be restarted if the light path is clear and the reset button has been pressed and released again.

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Term	Explanation
Risk assessment	Compliance with category of the safety-related parts of the machine control system. While the essential requirements of the directive are aimed at a high level of safety, the resources must nevertheless be proportional to the risk involved. The protection of an operator who manually inserts and removes parts in a metal press must not be considered in the same way as the protection of an operator who works on a machine where the worst-case risk is the trapping of a finger. Furthermore, one and the same machine can have different access points with varying levels of risk. For this reason, different measures can be adopted for different parts of the safety-related control for a machine. Against this background, the standard ISO 13849-1 aids designers in the definition of the categories for the various parts of the safety-related control based on the following parameters: ▪ The possible severity of injury ▪ The frequency and/or duration of exposure to the hazard ▪ The possibility of preventing the hazard The behaviour of the safety-related control in case of a fault is defined for each category. If identical technology is assumed (pneumatic, electronic, mechanical, hydraulic, etc.), these categories represent a sequential scale. For example, category 4 is higher than category 3. On the other hand, the categories are not intended to be used to compare different technologies. The categories are also not intended to be used in any given order or hierarchical arrangement in relation to safety requirements. Nevertheless, the AOPDs and their interface must comply with the requirement of the category of the safety-related parts of the control under consideration, so that the safety function is ensured (e.g. machine stop and safe stop).
Risk estimation	It is necessary to estimate the risk to determine the measures required to achieve the protection objectives and the resulting solutions. The necessary safety solutions are defined taking into account the risk parameters and the severity of the hazard.
S	
Safe outputs	➜ OSSD
Safety operating devices	These switches are manually operated control switches designed for work in the hazardous areas of machines and systems. In the “manual operating mode” the protective action of movable guards is lifted under certain conditions. Authorised personnel enter hazardous areas with the safety operating device to carry out programming, setup, observation, repair, test or service work.
Safety switches	Safety switches are items of safety equipment for monitoring movable guards. On opening, they must safely open the circuit and keep it open until the guard is closed again. Safety switches with solenoid locks are locking devices that, in conjunction with the control, forcibly keep movable guards in the protective position until the dangerous states are brought to an end.
Safety switches category 1	Safety switches on which switching element and actuating element form a single unit.
Safety switches category 2	Safety switches on which switching element and actuating element do not form a single design unit, though on operation they are moved together or separated by the function.
SafetyBUS p®	Fieldbus system manufactured by Pilz for the serial transmission of safety-related information. Safety systems and safety products such as photoelectric switches, light curtains, safety switches or emergency stop circuits can be connected decentrally and safely with this bus. Interfacing is performed using decentral I/Os. Devices with an integrated bus node can be connected directly to the bus. Areas of use include machine tool manufacture and systems engineering, process technology and the automotive industry, in particular. ➜ www.safetybus.de

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Term	Explanation
SCC	Standard Council of Canada The Canadian Standard Council is a federal authority with the task of effectively and efficiently promoting standardisation. The organisation reports to Parliament via the Minister of Trade and Commerce and monitors national Canadian standards. ➜ www.scc.ca
SDL	Safety Data Link SICK safety interface (connection for OSSDs and EFI)
Selection of several protective fields	An AOPDDR can have several switchable protective fields.
Self-monitoring	Text from ISO 12100-1: Self-monitoring ensures that safety functions implemented by protective measures are also executed if the functionality of a component or element is reduced, or the process conditions have changed such that there are hazards. Self-monitoring detects a fault either immediately or performs periodic checks so that the fault is detected before the safety function is called up again. In both cases, the protective measure can be triggered immediately or delayed until a specific event occurs. (e.g. the start of a working cycle on the machine).
SELV	Safety Extra Low Voltage Protection by safety extra-low voltage (see DIN VDE 0100-410/01.97). The protective measure SELV, differs from ➜ PELV (Protective Extra Low Voltage) only in the type of connection to earth. SELV circuits must not be earthed on the secondary side or connected to other voltage systems. The maximum permissible nominal voltage for the protective measures SELV and PELV is 50 V AC and 120 V DC. To ensure that this is the case, it must be demonstrated during the voltage measurement that the maximum values are not exceeded, and that there is adequate insulation resistance between all conductors and earth.
Sensor detection capability (resolution)	The limit for the sensor parameter defined by the manufacturer that causes the item of electro-sensitive protective equipment (ESPE) to trigger.
SIL	Safety Integrity Level Requirement class in relation to the functional safety of control systems as per IEC 61508. There are four levels specifying the requirements for the safety integrity of the safety functions allocated to an electromechanical, electronic or programmable electronic safety system (E/E/PE). ▪ Lowest level SIL1: Not more than one hazardous failure of the safety function in 10 years. ▪ Highest level SIL4: Not more than one hazardous failure of the safety function in 10,000 years.
Single break/double break PSDI mode	This operating mode is advantageous if parts must be manually inserted or removed periodically. In this mode the machine cycle is automatically re-initiated after the protective field becomes clear again after one or two interruptions. The reset device is to be operated under the following conditions: ▪ On machine start ▪ On restart if the AOPD is interrupted during a dangerous movement ▪ To initiate a restart after a period of more than 30 s (cf. IEC 61496) ➜ Further information e.g. EN 692 Nevertheless, it is necessary to check that the operator cannot be placed at risk during the working process. This situation limits use to small machines on which the hazardous area cannot be entered and there is point-of-operation protection. All other sides of the machine must also be protected using suitable measures. If this operating mode is used, the resolution of the AOPD must be less than or equal to 30 mm (cf. ISO 13855, EN 692, EN 693). In general the following errors must be excluded when mounting protective devices: Reaching over, reaching under, reaching around, standing behind.
Slave	Participant in a network that can participate in the exchange of data only after contact from the master.
Standard housing	Defines whether the housing for a position switch complies with DIN 43693.

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Term	Explanation
Standards	During the design of the safety equipment and the related components, specific regulations, standards, directives and recommendations must be taken into account.
Switch-off delay	Time by which the shutdown of the output contacts is delayed. This time is either fixed or adjustable depending on the device type.
Switching element function	Design of the switching element as normally closed contact, normally open contact, positive action normally closed contact or changeover contact.
Switching elements	The switching elements on safety switches have actuating elements driven by a shaped fitting. The switching element related to the safety function must be positively driven or, in the case of spring-action switching elements, must guarantee safe opening of the normally closed contacts when the positive separation point is reached. A differentiation is made as follows depending on the switching behaviour: ▪ Slow-action switching element that opens or closes depending on the speed of its actuation. ▪ Snap-action switching element that opens or closes independent of the speed of its actuation.
Switching frequency	Number of sensor switching operations in a defined time interval.
Switching principle of safety switches	▪ Slow-action switch: has a switching element that opens and closes depending on the speed of its actuation. ▪ Snap-action switch: has a switching element that opens and closes independent of the speed of its actuation.
Switching voltage OSSD HIGH, max.	Maximum switching voltage of the OSSD in the status HIGH.
Switching voltage OSSD LOW, min.	Minimum switching voltage of the OSSD in the status LOW.
Synchronisation	To avoid mutual interference between neighbouring sensors a synchronisation input is used to start a measuring cycle.
Synchronisation time monitoring	The switching of the input circuits within a defined time is monitored (only on automatic reset). Enabling takes place only if input circuit 2 closes at most 0.5 s *after* input circuit 1. If input circuit 2 closes *before* input circuit 1, the control is not active.
T	
Time function	The time function can be useful for improving provision of the acquired signal to other connected devices: ▪ Activation delay: Rapid bursts are suppressed. ▪ Release delay: Lengthens the signal by the set period of time. ▪ One shot delay: The signal provided has a defined signal length irrespective of the length of the input signal.
Transmission medium	Medium via which the interface transmits the data.
TÜV	Technischer Überwachungsverein ➜ www.tuevs.de
Type	The machine or system manufacturer must perform a risk analysis as per the Machinery Directive. The standard ISO 13849-1 will help the manufacturer to define the control category for the safety-related parts of the control. Each of the safety sensors shown meets the particular requirements of the defined control category in accordance with ISO 13849-1.
Type of electrical connection	Mechanical design of the electrical connection on the item of equipment. Designed as plug-in connection, soldered connection, crimp connection, screw connection, spring-action terminal, wire-wrap connection, cable entry via gland or plug.

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Term	Explanation
V	
VDE	Verband der Elektrotechnik, Elektronik und Informationstechnik e. V. ➜ www.vde.de
VDMA	Verband Deutscher Maschinen- und Anlagenbau e. V. ➜ www.vdma.org
Voltage type	Design of the sensor as DC, AC or AC/DC.
W	
Warning field output on safety laser scanners	The part of the electro-sensitive protective equipment (ESPE) that is connected to the machine control and that changes to the off state when the warning field for the sensor section is triggered during correct operation.
Warning field with safety laser scanners	The warning field can be placed in front of the protective field and thus in front of the actual hazardous area. Objects in the warning field trigger, e.g. a warning signal. The size and shape of the warning field can be configured with the aid of the ➜ CDS.

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Contact:

Australia
Phone +61 3 9497 4100
1800 33 48 02 – tollfree
E-Mail sales@sick.com.au

Belgium/Luxembourg
Phone +32 (0)2 466 55 66
E-Mail info@sick.be

Brasil
Phone +55 11 5091-4900
E-Mail sac@sick.com.br

Ceská Republika
Phone +420 2 57 91 18 50
E-Mail sick@sick.cz

China
Phone +852-2763 6966
E-Mail ghk@sick.com.hk

Danmark
Phone +45 45 82 64 00
E-Mail sick@sick.dk

Deutschland
Phone +49 (0)2 11 53 01-0
E-Mail info@sick.de

España
Phone +34 93 480 31 00
E-Mail info@sick.es

France
Phone +33 1 64 62 35 00
E-Mail info@sick.fr

Great Britain
Phone +44 (0)1727 831121
E-Mail info@sick.co.uk

India
Phone +91 (11) 2696 7651
E-Mail ayograj@tecnovaglobal.com

Italia
Phone +39 02 27 40 93 19
E-Mail info@sick.it

Japan
Phone +81 (0)3 3358 1341
E-Mail info@sick.jp

Korea
Phone +82-2 786 6321/4
E-Mail kang@sickkorea.net

Nederlands
Phone +31 (0)30 229 25 44
E-Mail info@sick.nl

Norge
Phone +47 67 81 50 00
E-Mail austefjord@sick.no

Österreich
Phone +43 (0)22 36 62 28 8-0
E-Mail office@sick.at

Polska
Phone +48 22 837 40 50
E-Mail info@sick.pl

Republika Slowenija
Phone +386 (0)1-47 69 990
E-Mail selanm@sick.com

Russia
Phone +7 95 775 05 30
E-Mail info@sick-automation.ru

Schweiz
Phone +41 41 619 29 39
E-Mail contact@sick.ch

Singapore
Phone +65 6744 3732
E-Mail admin@sicksgp.com.sg

Suomi
Phone +358-9-25 15 800
E-Mail sick@sick.fi

Sverige
Phone +46 8 680 64 50
E-Mail info@sick.se

Taiwan
Phone +886 2 2365-6292
E-Mail sickgrc@ms6.hinet.net

Türkiye
Phone +90 216 388 95 90 pbx
E-Mail info@sick.com.tr

USA/Canada/México
Phone +1(952) 941-6780
1800-325-7425 – tollfree
E-Mail info@sickusa.com

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