




Industrial Safety Systems Sensor Systems and Services for Safety Technology

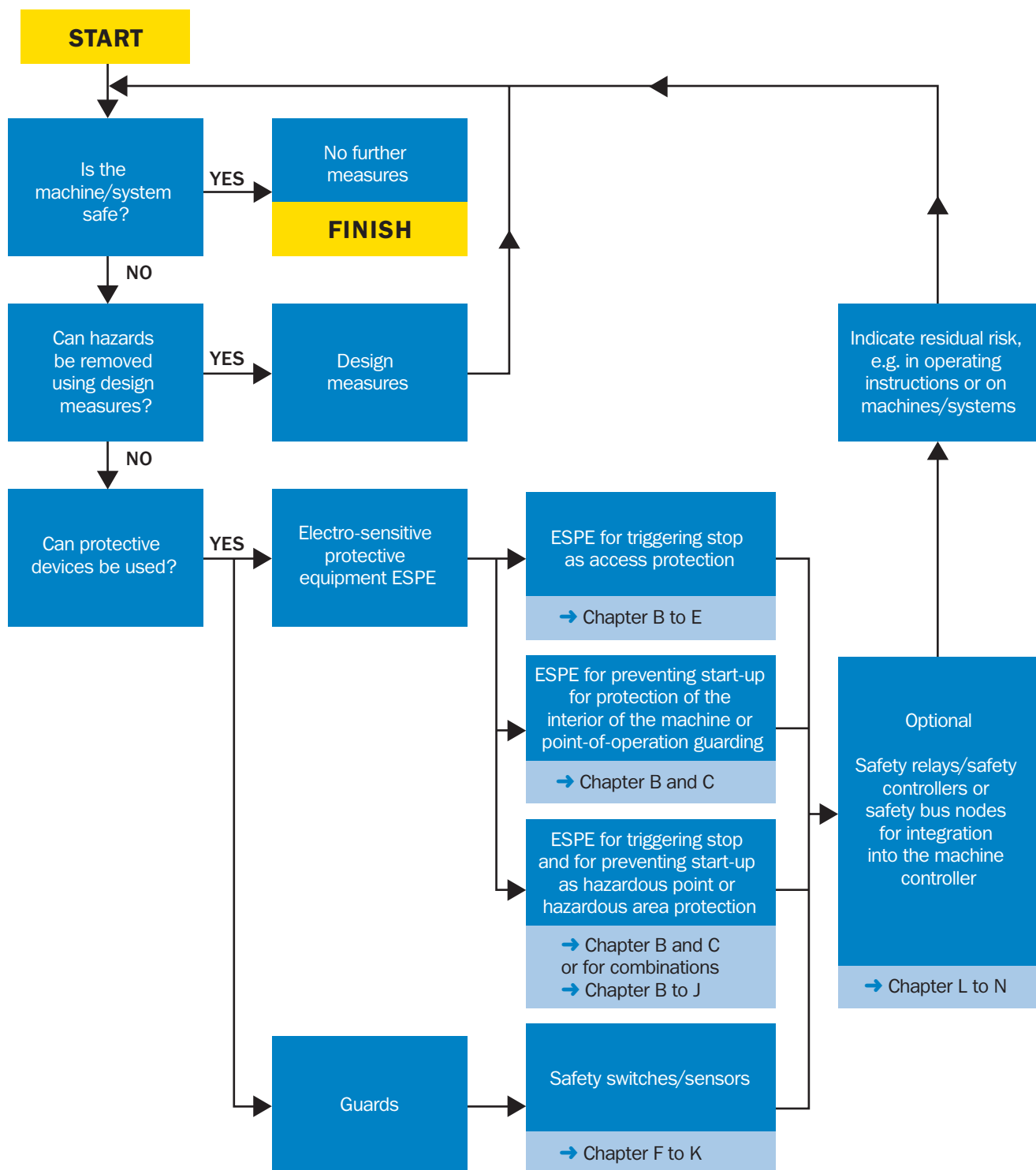
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SICK

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Electro-mechanical safety switches and safety sensors	Safety switches with separate actuator		Access protection at guards. With separate, coded actuator	F
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	Safety hinge switches		Access protection at hinged guards. Adjustable switching points	I
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	Safety operating devices		Rope-operated switches as per emergency stop legislation. Enabling switches for work in hazardous areas	K
Safety interfaces	Safety relays		Evaluation units for emergency stop buttons, safety switches, electro-sensitive protective equipment (ESPE), two-hand controls and pressure sensitive mats	L
	Safety controllers		Simple integration of safety sensors and standard sensors, control switches and actuators in up to two independent, complex safety applications	M
	Safety bus modules		Interfacing safety-relevant components to the safety bus systems PROFIsafe and AS-Interface Safety at Work	N
Safety software	Safexpert		Software for safety engineering. This software provides step-by-step guidance towards CE certification, support during risk analysis, and simplifies the process of documentation.	O
	Glossary			P

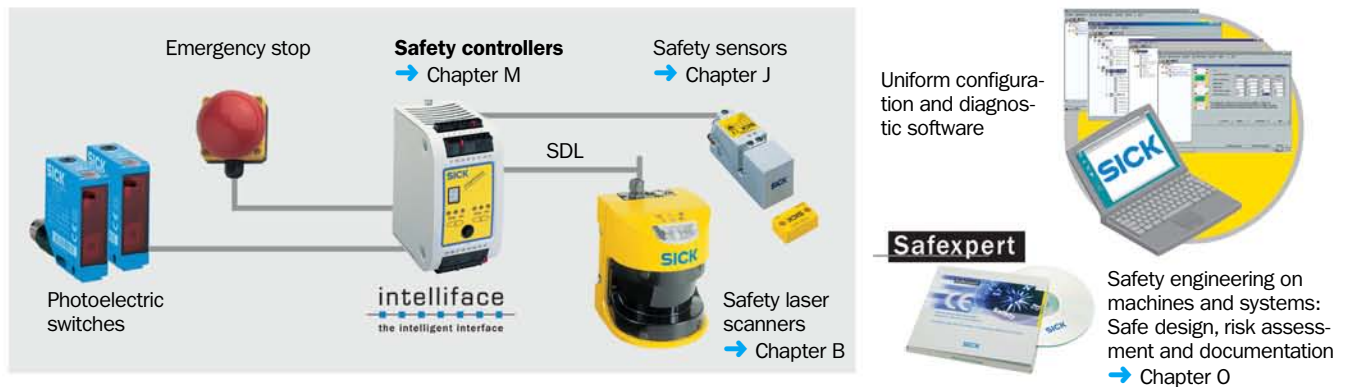
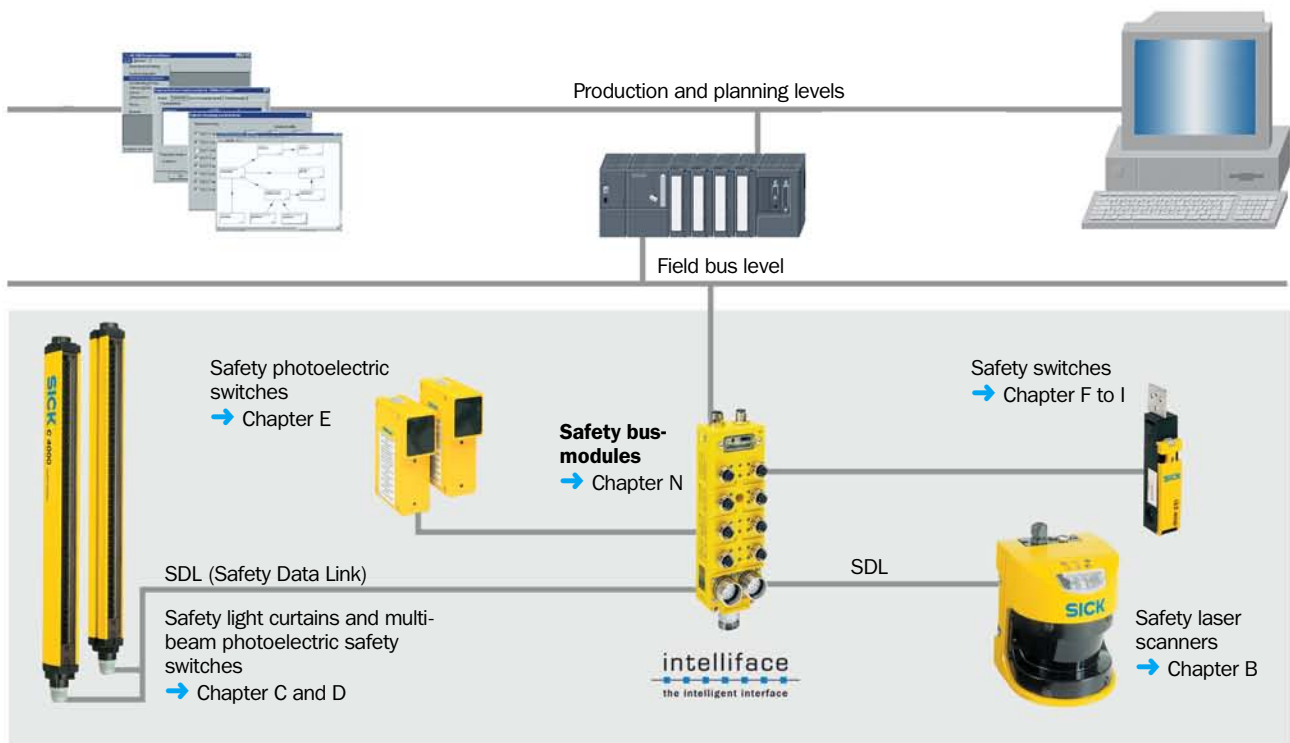
List of product families

Opto-electronic protective devices			
Safety laser scanners		Multibeam photoelectric safety switches	
S 3000 Professional	B-3	MSL	D-2
S 3000 Advanced	B-9	MSL coded version	D-11
S 3000 Standard	B-15	MSLZ	D-20
S 3000 Remote	B-21	MSLZ coded version	D-28
S 3000 Professional CMS	B-27	M 2000 Standard	D-37
S 300 product family	B-33	M 2000 Standard in IP 67 Housing	D-45
PLS	B-34	M 2000 RES/EDM	D-50
PLS short range	B-40	M 2000 cascable	D-58
Interface LSI	B-46	M 2000-A/P Standard	D-66
V 4000	B-52	M 2000-A/P RES/EDM	D-74
Safety light curtains		Single-beam photoelectric safety switches	
C 4000 Advanced	C-2	L 4000 / L 400	E-2
C 4000 Standard	C-17	WSU/WEU 26/2	E-11
C 4000 Micro	C-41	WS/WE 12-2	E-16
C 4000 Micro in IP 67 Housing	C-49	WS/WE 18-3	E-21
C 4000 Basic	C-54	WS/WE 24-2	E-26
C 4000 Entry/Exit	C-64	WS/WE 27-2	E-31
C 2000 Standard	C-70	VS/VE 18-2	E-37
C 2000 Standard in IP 67 Housing	C-81		
C 2000 RES/EDM	C-86		
C 2000 cascable	C-97		
LGT	C-107		
Electro-mechanical safety switches and safety sensors			
i10	F-2	i10 P	H-2
i11mini	F-7	i10 R	H-4
i12 S	F-12	i100 P	H-6
i16 S	F-17	i100 R	H-8
i17 S	F-21	i110 P	H-11
i100 S	F-25	i110 R	H-14
i110 S	F-31	i10 H	I-2
i1001	F-35	i110 H	I-5
i1002	F-41	RE 300	J-2
i10 Lock	G-2	RE 4000	J-7
i14 Lock	G-8	T 4000	J-12
i200 Lock	G-12	T 4000 Compact	J-17
i1001 Lock	G-16	IN 4000	J-21
i1002 Lock	G-22	E 100	K-2
		i110 RP	K-6
Safety interfaces			
UE 10-3 OS	L-3	UE 10-4 XT	L-67
UE 23-2 MF	L-9	UE 11-4 DX	L-70
UE 42-2 HD	L-13	UE 440	M-3
UE 43-2 MF	L-18	UE 470	M-3
UE 43-3 MF	L-23	UE 4120	N-2
UE 43-6 MF	L-28	UE 4150	N-8
UE 44-3 SL	L-32	UE 4155	N-15
UE 45-3 S1	L-37	UE 3212	On request
UE 48-2 OS	L-42	UE 4215	N-22
UE 48-3 OS	L-48	UE 4231	On request
LE 20	L-53	UE 4232	On request
LE 20 Muting	L-60		



Note:

The simplified risk analysis process shown here is only intended to provide a quick introduction to product selection. You will find information on the process, in accordance with ISO 12100, in → chapter A under Regulations and standards as well as → chapter O, Safexpert.



**SICK - leading position worldwide
in factory and process automation.**



**SICK - one of the world's
leading manufacturers of
sensors and sensor solutions
for industrial applications.**

SICK is a technology and market leader in factory and process automation. The company, founded in 1946 and with its headquarters in Waldkirch in Breisgau, today employs more than 3,600 employees and is active worldwide with subsidiaries, representatives and associated companies.



Years of continuous growth - with continuous expansion of its range of products and services

Factory automation

The products and solutions from SICK are as varied as the tasks for controlling production and logistical processes.

SICK sensors detect, count and classify objects and also detect their shape, position, colour, and surface differences.

SICK safety technology protects against hazards caused by machines and systems in production and transport processes - and is comprehensively effective in accident prevention and the protection of people.

SICK bar-code readers and bar-code reading systems take over sorting and routing in flows of industrial materials, in baggage and package distribution systems and in mail-order companies. 2-D code readers provide unambiguous identification of laboratory samples, electronic components and bulk printed matter.

SICK laser measurement systems provide important information on vehicle heights and shapes of loads, and monitor routes for automated guided transport systems.



Process automation

Components and systems for gas analysis, flow rate and level measurement systems, as well as for effluent systems, are the main analysis and process measurement products from SICK MAIHAK.



Success based on technological and user expertise.

The exchange of specialist knowledge is a key success factor in research and development.

Only in this way product ideas can be efficiently implemented in fully developed applications. At SICK more than 300 employees work in research and development.

Industrial Sensors



Encoders, ultrasonic sensors, inductive, capacitive and magnetic proximity sensors as well as magnetic cylinder sensors, photoelectric switches, contrast scanners and luminescence scanners, color sensors, fork sensors, light grids, distance sensors, data transmission systems, vision sensors, position finders and light section sensors.

Industrial Safety Systems



Photoelectric safety switches, safety light curtains, safety laser scanners, safety switches and safety software.

The range of services provided includes commissioning, safety inspections, repair and exchange service, stoppage measurements, technical advice, education and training.



SICK is present worldwide with more than 40 national and international subsidiaries, numerous representatives as well as associated companies.

Auto Ident



Stationary 2-D code readers and bar-code readers, hand-held readers for mobile and stationary use, omnidirectional bar-code reading systems, indoor and outdoor laser measurement systems, evaluation electronics, bus interfacing technology, software tools, engineering.

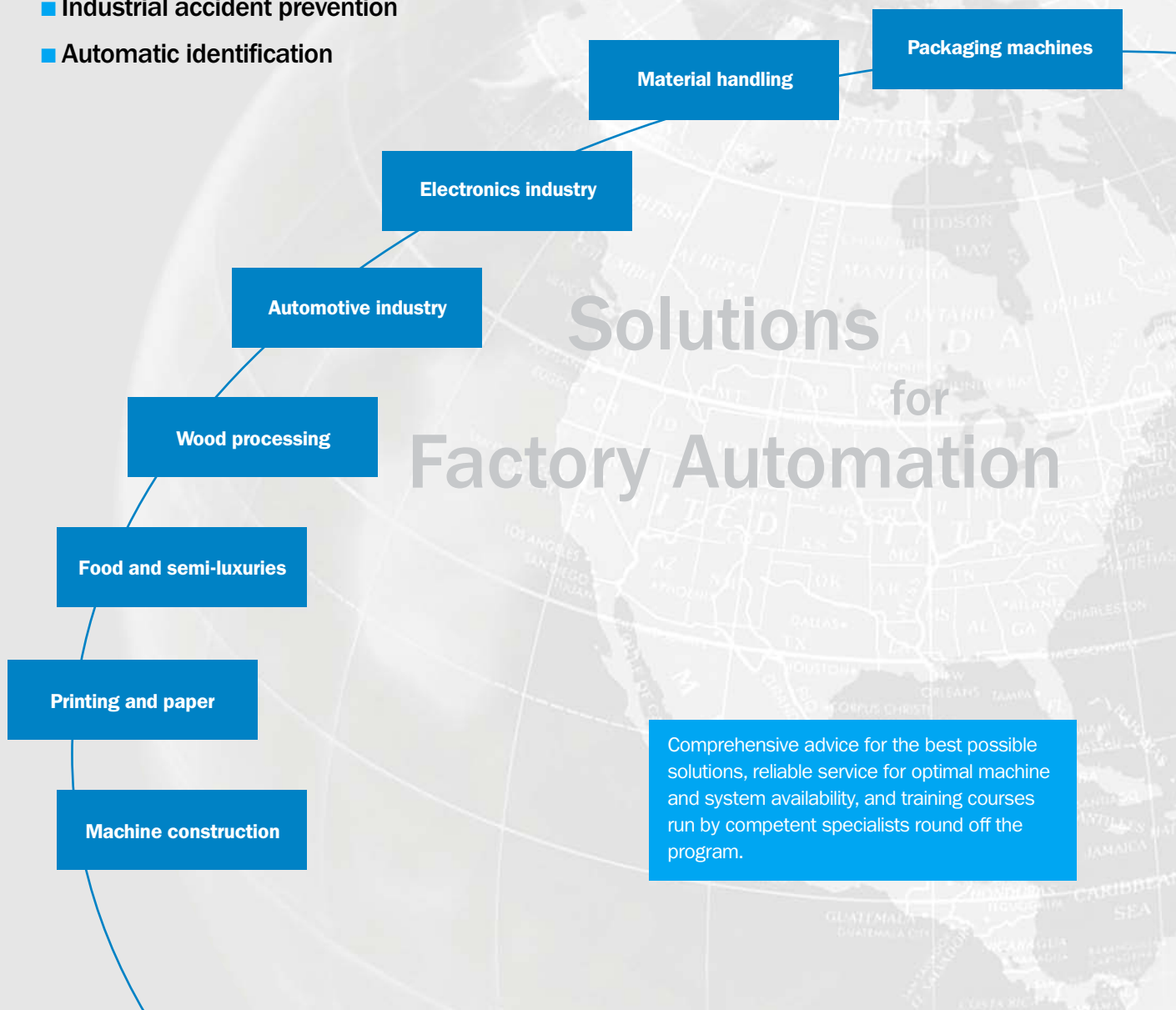


Solutions for factory automation.



Factory automation places very high requirements on machines and systems so that rationalisation potential can be effectively exploited for cost-effective manufacturing. For machine construction and systems engineering, SICK provides a wide range of components in the areas:

- Sensors
- Industrial accident prevention
- Automatic identification



At home in many sectors.

SICK is present with innovative, powerful products and product systems wherever industrial processes require optimisation. With its comprehensive services SICK, as a development partner for industry, offers efficient solutions for all aspects of factory and process automation.

Automotive industry

Competence, know-how and extensive experience characterise SICK's worldwide involvement in the automotive industry. With a complete range of industrial sensors, as well as systems and services, SICK contributes towards increasing the availability of machines and systems, improving productivity, and ensuring that manufacturing processes are safe and cost-effective.



Material handling/logistics



Sensor solutions from SICK are involved wherever flexible and efficient design of material flow and logistical processes are vital – e.g. in high-bay warehouses or logistics centres.



Packaging/food

Electro-sensitive sensors detect, position, classify and count a very wide range of objects – in the beverage, food and semi-luxury industries too. As a result, for example, biscuits are placed in the right packing, bottles are filled with precision, labels are correctly positioned. SICK sensors ensure that production processes run efficiently.



Electronics



Regardless of whether wafer detection, chip positioning or circuit-board inspections are involved – SICK sensors detect and perform final inspections in high-end applications – cost-effectively and with maximum precision.

Machine construction

Where effective prevention of accidents and protection of people have the highest priority, safety laser scanners, safety light curtains, photoelectric safety switches and safety switches from SICK provide protection of hazardous areas, hazardous points and access on machines and production systems. SICK has extensive experience based on many thousands of applications.



Industrial safety management



We support your machinery throughout its working life

In our highly competitive marketplace we need to fine-tune options to stay ahead of the game. By co-ordinating our performance with your requirements SICK offers you a complete support package, which is available to you for the entire service

life of your machine and which encompasses planning and commissioning through to maintenance, repair and updating of your system. Service — configured to suit your own requirements.

Services from SICK tailored to customer requirements

- Increase in machine availability
- Conforming to international technical safety standards
- Documented and traceable results
- Fast, competent and on-time support
- Reduced costs through optimised solutions
- Support of your safety organisation

High-quality accredited inspection services in compliance with EN 45004



This standard regulates the general criteria for the work carried out by a variety of types of inspection organisations.









The quality of our services largely depends on the training and skill of our employees and the structure of our processes and methodology.

It is important to constantly monitor and improve the processes and their quality, and adapt to meet our customers' requirements. Annual verification by independent external auditors ensures the maintenance of service quality.

Services performed by our subsidiaries are based upon standards valid throughout Europe. Country-specific standards are taken into account. The accredited inspection body at SICK AG in Germany guarantees Europe-wide procedures and quality of the inspections.

Services at a glance

A

		Page
	Safety consulting Our specialists will assist you in planning the safe operation of your system and provide help in implementing your safety requirements. We can thus eliminate any sources of danger from the outset, saving you time and money.	www.sick.de
 	Product services We can provide support during the commissioning period as well as for repair and maintenance. SICK safety specialists will ensure optimal and efficient operation of the equipment. Our device exchange service is rapid and cost-effective to ensure re-commissioning of your production line.	www.sick.de
  	Safety inspection Inspections minimise risks, reduce machine downtimes, and allow the maintenance of safety and quality standards. Our service contracts ensure that your safety equipment operates optimally at all operator-machine interfaces.	Initial inspection A-2
		Periodic inspection A-4
		Stoptime measurement A-7
	Upgrade services Complete packages, consisting of solution-oriented hardware and services, reduce machine downtimes and ensure the productivity of your machine.	www.sick.de
	Training & Education Our comprehensive training programme gets your staff “technically fit” to deal with any safety-related technical situations that may arise. We provide support to users and operators on product introduction, and can also offer support regarding efficient and technically correct use of SICK safety products.	A-9

→ Please contact your national subsidiary or agent to find out more about the services offered in your country, or select your contact at www.sick.com.

A



- Comply with current safety standards
- Reduce responsibility
- Maintain safety levels, availability and ongoing production

Initial inspection



Our competence – your safety!

The verification of safety functions is usually expensive and time-consuming: complex machine functions, increased documentation and tighter deadlines complicate acceptance. Final adjustments, e.g. of electro-sensitive protective equipment, often lead to hasty alterations and can thus increase the risk of accidents. Collaborate with our experts and exploit their application experience in your process with our

“initial inspection” service, offering you important advantages:

- Quality of test methods and competent execution by a service engineer trained to EN 45004
- Traceable and documented results for quality management
- Early detection of safety risks and thus increased availability of your machine or system
- Recognised safety, certified by our test seal

Scope of services

The initial inspection determines the operational safety of the SICK safety device for protecting against mechanical hazards of

the production system. The SICK inspection is carried out on the basis of current regulations.

Main test areas

- Does the SICK safety device function in line with the current use of the machine?
- Does the type of SICK safety device correspond with the hazards actually encountered?
- Does the SICK safety device correspond with the type required according to IEC 61496?
- Does integration of the SICK safety device, up to output signal transfer to the control system, correspond with the safety category complying with EN 954?
- Is it impossible to bypass the SICK safety device?

Test documentation

- The SICK test seal will be attached if the test is successful.
- A test report supplements your machine documentation regarding compliance with machine safety requirements.

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→ Periodic inspection	A-4
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Test seal for presses



Test seal for power-driven machinery

Preconditions

- The devices are assembled and ready for operation.
- The machine documentation must be available as it is part of the inspection.
- The machine operator must be available for the duration of the measurement, to set up system-specific operations and to start the system.
- The machine stoptime is required in order to determine the safety distance for the protective device. This can be made available in written form. Alternatively, we can offer "stoptime measurement" as a separate service
→ stoptime measurement page A-7.

Extended scope of service included in the initial inspection

- Some parameterisation and adjustments are carried out. Major alterations, e.g. programming or conversions, are charged according to expenditure.
- At the client's request, employees are instructed in operating the safety device, insofar that this is necessary and can be carried out quickly during the inspection.

Ordering information

Inspection for device type	Part number
WSU/WEU 26	1 690 006
LGT	1 681 266
AGS	1 690 015
LGS	1 690 017
MSL, MSLZ	1 681 043
M 2000	1 681 321
FGS	1 681 017
C 2000	1 681 319
PLS	1 681 019
S 3000 Standard	1 681 880
S 3000 Advanced	on request
S 3000 Professional	on request
S 3000 Remote	on request
C 4000 (host)	1 681 613
C 4000 (guest)	1 681 614
LVU 1406	1 690 004
LVS 1400	1 690 013
LVU 206 to 1106	1 690 002
LVS 300 to 1050	1 690 011
LSI-1PLS	on request
LSI-2PLS	on request
LSI-3PLS	on request
LSI-4PLS	on request
Equipment from other suppliers (AOPD, AOPDDR)	1 681 944 ¹⁾

¹⁾ Device types as per prior agreement

The above-mentioned details for placing orders relate to invoice costing based on lump sum charges. Information on prices and price breakdowns are given in the current price list.

Inspections are carried out on the basis of accredited inspection methods in Germany. Country-specific standards are taken into account. Please contact your national subsidiary or agent to find out more about the services offered in your country, or select your contact at www.sick.com.

A



- Comply with current safety standards
- Reduce responsibility
- Maintain safety levels, availability and ongoing production

Periodic inspection



Our competence – your safety!

Preventive protective measures not only increase employee safety, but also optimise the availability of your system and, therefore, improve your business success. The EU directive on the use of equipment stipulates the periodic inspection of safety devices.

Our “periodic inspection” service offers you important advantages:

- Experts and their application experience contribute to meeting your operational safety targets – permanently

- Quality of test methods and competent execution by a service engineer trained to EN 45004
- Traceable and documented results for quality management
- Early detection of safety risks, and thus increased availability of your machine or system
- Correct functionality of your safety devices, certified by our test seal

Scope of services

Periodic testing is based on the initial inspection. Following the first SICK inspection, you receive confirmation of the operational safety of the SICK safety device installed to protect against the mechanical hazards posed by the production systems,

according to the SICK safety standard. Apart from verifying the operational safety of the machine or system, the periodic inspection also includes the preventive maintenance of your safety device.

Main test areas

- Does the SICK safety device function in line with the current use of the machine?
- Does the type of SICK safety device correspond with the hazards actually encountered?
- Does the SICK safety device correspond with the type required according to IEC 61496?
- Does integration of the SICK safety device, up to output signal transfer to the control system, correspond with the safety category complying with EN 954?
- Is it impossible to bypass the SICK safety device?

Test documentation

- The SICK test seal will be attached if the test is successful.
- A test report supplements your machine documentation regarding compliance with machine safety requirements.

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Test seal for presses



Test seal for power-driven machinery

Preconditions

- The devices are assembled and ready for operation.
- The machine documentation must be available as it is part of the inspection.
- The machine operator must be available for the duration of the measurement, to set up system-specific operations and to start the system.
- The machine stoptime is required in order to determine the safety distance for the protective device. This can be made available in written form. Alternatively, we can offer "stoptime measurement" as a separate service
→ stoptime measurement page A-7.

Extended scope of service included in the periodic inspection

- Preventive maintenance of the safety device
- Readjustment of the safety device, if required
- Removal of contamination which may affect its functionality
- Removal of minor faults, where this is possible without requiring a significant length of time
- At the client's request, employees are instructed in operating the safety device, insofar that this is necessary and can be carried out quickly during the inspection.
- Some parameterisation and adjustments are carried out. Major alterations, e.g. programming or conversions, are charged according to expenditure.

Periodic inspection with a service contract



Unforeseen events can be reduced to a minimum by regular safety inspections following prior arrangement with you. For an entire production site, if desired.

Take advantage of the following additional benefits:

- Less organisational effort through agreed appointments and monitoring of the inspections
- Benefit of scheduled machine downtimes for the measurements and inspections
- Priority aid in case of faults

Discuss with us the options available for your production site.

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Ordering information

Inspection for device type	Part number
WSU/WEU 26	1 690 036
LGT	1 681 268
AGS	1 690 046
LGS	1 690 048
MSL, MSLZ	1 681 041
M 2000	1 681 313
FGS	1 681 021
C 2000	1 681 311
PLS	1 681 023
S 3000 Standard	1 681 882
S 3000 Advanced	on request
S 3000 Professional	on request
S 3000 Remote	on request
C 4000 (host)	1 681 624
C 4000 (guest)	1 681 625
LVU 1406	1 690 034
LVS 1400	1 690 044
LVU 206 bis 1106	1 690 032
LVS 300 bis 1050	1 690 042
LSI-1PLS	1 681 620
LSI-2PLS	1 681 621
LSI-3PLS	1 681 622
LSI-4PLS	1 681 623
Equipment from other suppliers (AOPD, AOPDDR)	1 681 945 ¹⁾

¹⁾ Device types as per prior agreement

The above-mentioned details for placing orders relate to invoice costing based on lump sum charges. Information on prices and price breakdowns are given in the current price list.

Inspections are carried out on the basis of accredited inspection methods in Germany. Country-specific standards are taken into account. Please contact your national subsidiary or agent to find out more about the services offered in your country, or select your contact at www.sick.com.

Stoptime measurement



A

- Comply with current safety standards
- Reduce responsibility
- Maintain safety levels, availability and ongoing production

Confidence in our quality!

If the requirements of the EU Machinery Directive are to be followed and non-contact safety devices are installed, there must be sufficient distance between the safety device and the hazardous area. For its calculation and safety assessment, the stoptime for presses and power-driven machinery must be determined. This stoptime must be included in the documentation and must, for presses, also be clearly visible on the machine.

Our “stoptime measurement” service offers you important advantages:

- Experts and their application experience contribute to meeting your operational safety targets – permanently
- Quality of test methods and competent execution by a service engineer trained to EN 45004
- Traceable and documented results for quality management
- Quality of measurement assured by calibrated measurement equipment and execution by SICK experts

Scope of services

Stoptime measurement calculates the safety distance according to specific machinery standards (Type C standard) or to EN 999; it is mandatory for a safety inspection. The safety distance for the

safety device is calculated by measuring the stoptime and using standardised calculation rules and application-dependent constants.

Measurement

- Measurement of the stoptime on 10 representative samples and determination of the current stoptime.
- Computing the minimum safety distance according to the calculation principles of a specific machinery standard (Type C standard) or EN 999.

Documentation

- A measurement report will be provided for your machine documentation.
- A label with the measurement data is attached directly to the machine.

SICK	
Measurement	on <input type="text"/>
No. <input type="text"/>	Pos. <input type="text"/>
Stoptime	<input type="text"/> ms
Safety distance	<input type="text"/> mm

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A

Preconditions

- The power-driven machinery or press must be equipped with the workpiece/tool for the intended use.
- The system or machine must be freely accessible for the measurement.
- The machine operator must be available for the duration of the measurement, to set up system-specific operations and to start the system.

Ordering information

Service	Remarks	Part number
Stoptime measurement	For each hazardous motion of the machine	1 681 946

Inspections are carried out on the basis of accredited inspection methods in Germany. Country-specific standards are taken into account. Please contact your national subsidiary or agent to find out more about the services offered in your country, or select your contact at www.sick.com.

Training & Education



Our knowledge — your advantage!

As a rule, the more experience you have, the more confidently you can handle an application. Transferring experience, and thus optimising applications, is an important component of SICK seminars and training courses. They are therefore all particularly practice-oriented.

The second emphasis of the training is to impart confidence. You will practice concrete product applications under the leadership of qualified trainers. You will thus

become increasingly confident during the course of the training, during which trainers will meet individual needs flexibly, and each participant can gain maximum benefit.

After the “learning experience” comes the “success experience”. As a well-trained employee you know the everyday professional demands made of you and can react to them flexibly. A success that pays.

User knowledge gained from practical experience for practical applications

- Being “fit”: being in control of equipment in an emergency, and thus reducing machine downtime
- Surety in decision-making through clarity of relevant rules, regulations and application specifications
- Increased levels of quality through on-going staff training
- Keeping technology in focus so that the right investment decisions are also made in the future



A

- Train employees
- Strengthen investment decisions
- Secure competitive advantage

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A

Seminars

**Enhancing knowledge**

Over the course of time, statutory and legislative requirements and/or standards change. Even technological change, moving away from traditional wiring technology using relays and multi-

pole cabling towards programmable safety modules and even entire networks using bus technology, brings about the need to make adjustments to meet these new innovations.

In series of seminars on the principles of technical safety current know-how on the following crucial topics is imparted:

- Essential information on relevant regulations regarding machine safety
- Standard-orientated selection of suitable safety devices
- Integration of safety equipment in the general control system
- Correct assessment of safety procedures based upon currently applicable directives, standards and legislation/regulations.

Target groups

- Design engineers
- Electrical engineers
- Technical managers
- Those responsible for machine safety

User training

**More confidence to select the right application**

SICK Training & Education programmes offer you an entire array of qualification measures. The customer training programmes are directed towards the products, in order to integrate these effectively into the planned application in an efficient and durable manner. You will receive the necessary tools to facilitate the setting up of any device and also carry out analyses and diagnostic investigations.

The general structure of a customer training programme embraces the various phases which arise during the selection and integration of a product:

- Selection
 - Safety aspects
 - Product properties and application possibilities
- Integration
 - Installation into the application and wiring
 - Programming
 - Commissioning
- Operating the system safely
 - Error/fault diagnostics and rectification

Target groups

- Employees in:
 - Maintenance
 - Servicing
 - Design
 - Planning

Customer-specific training programmes

**Match individual qualification requirements**

On request, SICK Training & Education will prepare a tailor-made qualification concept for your application. A programme which will contribute towards optimising operational quality and accelerate the transfer of knowledge on technical safety.

Ordering information

Seminars ¹⁾

Title	Part number
▪ Technical principles on safety	
Principles of machine related safety	1 681 692
Function, selection and application of safety devices	1 681 694
Safety technology for power-driven machinery	1 681 696
Safety technology for presses	1 681 698
Safety technology for power-driven machinery and presses	1 681 700
▪ Specialist seminars	
CE marking	1 682 111
Hazard analysis and risk assessment	1 681 913

User training ¹⁾

Title	Part number
▪ Safety light curtains and light beams	
C 4000 light curtain – basic training	1 681 681
Advanced functions of the C 4000 with UE 402 interface – advanced training	1 681 683
FGS light curtain with LCU safety interface	1 681 353
MSL multi-beam photoelectric switch with MSM muting module	1 681 357
▪ Safety scanners	
S 3000 laser scanner – basic training	1 681 916
S 3000 laser scanner – mobile applications	1 681 917
S 3000 laser scanner – device combination	1 681 918
PLS proximity laser scanner	1 681 359
LSI laser scanner interface	1 681 361
Product instruction on PLS proximity laser scanner (on-site)	1 681 680
Product instruction on S 3000 laser scanner (on-site)	1 681 919
▪ Safety interfaces	
Intelliface UE 4100 – bus node for PROFIsafe	1 681 691
Intelliface UE 440/470 – multifunctional safety controllers	1 681 923

¹⁾ If required, we can conduct our seminars and customer training programmes on your premises

→ Up-to-date detailed information can be obtained on the Internet at www.sick.de/training

Please contact your national subsidiary or agent for details on the services offered in your country, or select your contact at www.sick.com.



Application Finder

- SICK is continuously publishing examples of application solutions on the Internet (→ www.sick.com).
- The “Application Finder” will guide you to further solutions involving products from SICK’s Industrial Sensors, Industrial Safety Systems and Auto Ident Divisions.



Application overview

Task	Hazardous point protection
Industrial sector	Car and vehicle manufacture (incl. aircraft/ships/agricultural machinery)
Application location	Handling robots
Product family	C 4000

Application in detail

Task

Along with manual assembly stations, a cylinder head assembly line also includes fully automatic assembly stations with handling robots. Their working area is to be protected against access by the workers to prevent injuries to fingers and hands. The protective device is to be designed in such a way that when the robot is at a standstill, work processes, e.g. the insertion of parts, rectification of malfunctions and setup, are not hindered.

Implementation

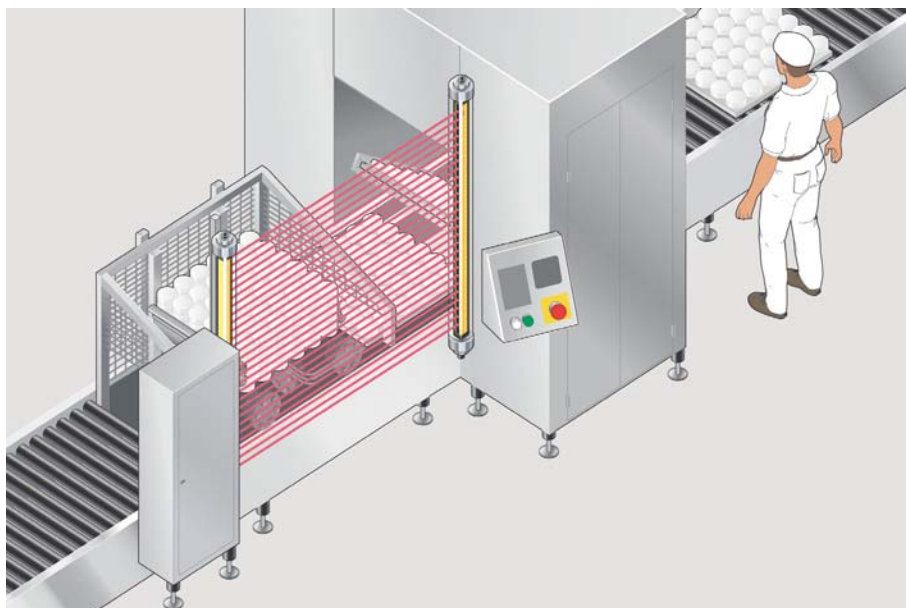
Using the C 4000 safety light curtain it was possible to implement hazardous point protection and protection against standing behind the protective device. To protect the assembly or handling stations, the cells are equipped with light curtains on the sides open to the workers. If a worker reaches into the cell while the robot is working, the light curtain is interrupted and

the assembly or handling process stopped. As it would be possible to stand behind the vertically arranged light curtain (as shown in the figure), a further light curtain is fitted at an angle beneath the vertical safety light curtain. The safety light curtains are connected together serially. The vertical light curtain acts as a guest and the light curtain fitted beneath it is the host. As a result, the two light curtains can be connected to the robot control system via a single input.

Customer benefits

The proven safety technology makes it possible to reliably implement hazardous point protection and protection against standing behind the protective device. The serial configuration (cascading), simplifies wiring and reduces the number of inputs required thus cutting the amount of space required in the control cabinet. Low cost installation is therefore possible.

Further information	Page
→ C 4000	C-2
→ Services	A-0



Application overview

Task	Hazardous point protection
Industrial sector	Food and beverages, luxury goods
Application location	Stacker
Product family	C 2000, IP 67 housing

Application in detail

Task

In the factory of a French Camembert manufacturer, a reliable solution was sought for protection against the crushing of the hands and fingers on a stack collector. The solution must also not interfere with the production process. The environment for the safety system has an atmospheric humidity of up to 85 % – at an ambient temperature of 25 °C. Also the equipment must be washed off once or twice a day using alkaline or acidic cleaning agents. Finally, cold water (5 to 10 °C) at a pressure of 40 bar is used for rinsing and cleaning.

Implementation

Since its installation the C 2000 in IP 67 housing has been found to be the ideal solution.

The protective housing is a PMMA acrylic tube with V4A stainless steel end caps. It is of compact design without trap points for dirt or contamination. A pressure equalisation membrane integrated into one of the end caps prevents the penetration of moisture and ensures that the window does not mist up. The cable entry is provided using proven PG cable glands.

The resistance of the materials used for the IP 67 housing series as well as the

cable was positively assessed in material compatibility tests performed by Ecolab (Henkel) for the cleaning products P 3 (P3-topax 56, P3-topax 66, P3-topax 91, P3-topactive 200, P3-topactive DES). The low pressure foam method (COP cleaning and disinfection) for the food processing industry is recommended.

The C 2000 is an electro-sensitive protective equipment of type 2 in accordance with IEC 61496. The parallel light beams generate a flat protective field in front of the dangerous area. Unauthorised or inadvertent reaching into the running machine results in the interruption of one or more light beams. The evaluation electronics for the C 2000 detect this situation within a few milliseconds and immediately generate a shutdown signal for the stack collector.

Customer benefits

Using the C 2000 in an IP 67 housing ensures reliable protection despite harsh ambient conditions. The machine protection meets not only the requirements in relation to hygiene, resistance to cleaning, availability and safety, but also the requirements in relation to ergonomics and productivity, as the stack collector is always accessible when shutdown.



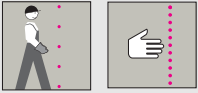
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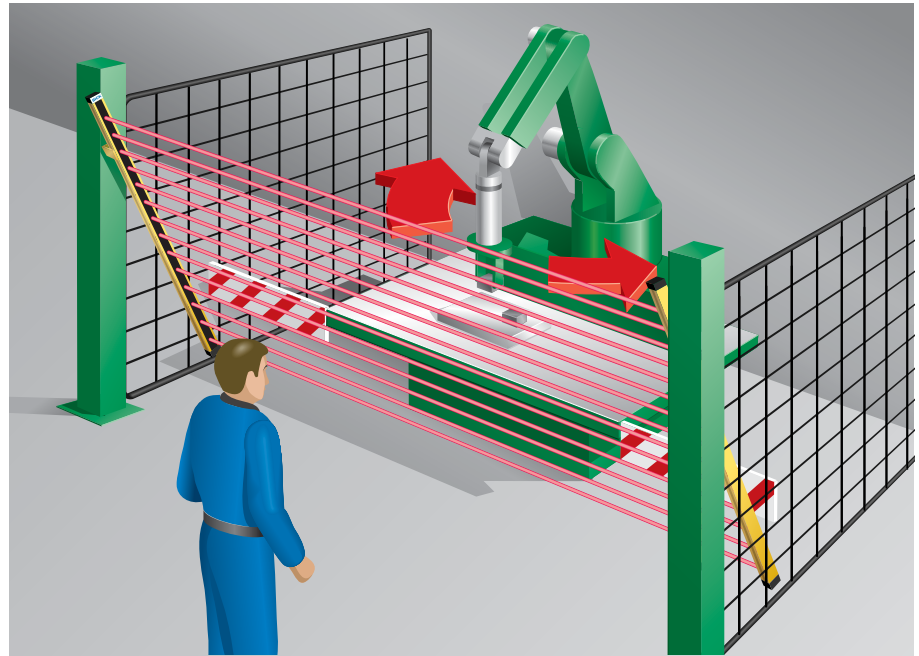
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Application overview

Task	Hazardous point protection with area protection
Industrial sector	Assembly, handling, robotics, automation
Application location	Robot station
Product family	C 4000

Application in detail

Task

The insertion station of an industrial robot is to be protected by electro-sensitive protective equipment. The user often needs to enter the hazardous area. A door or a grid would make it more difficult to insert and remove parts.

Implementation

There are two possible ways of providing protection here using C 4000 opto-electronic safety light curtains (type 4):

First possibility:

Hazardous point and area protection with two light curtains in a host-guest configuration. A light curtain arranged vertically in front of the cell stops the robot if the worker reaches into the protective field or the robot leaves its defined path due to an error and enters the worker's workplace. A second light curtain arranged horizontally above the floor is used for protection against standing behind the vertical light curtain.

The host-guest connection is electrical, so the two devices act like a "single" stand-alone light curtain. This configuration saves I/O interfaces on safe controls or relay evaluation modules. This also saves additional wiring for the guest.

Second possibility:

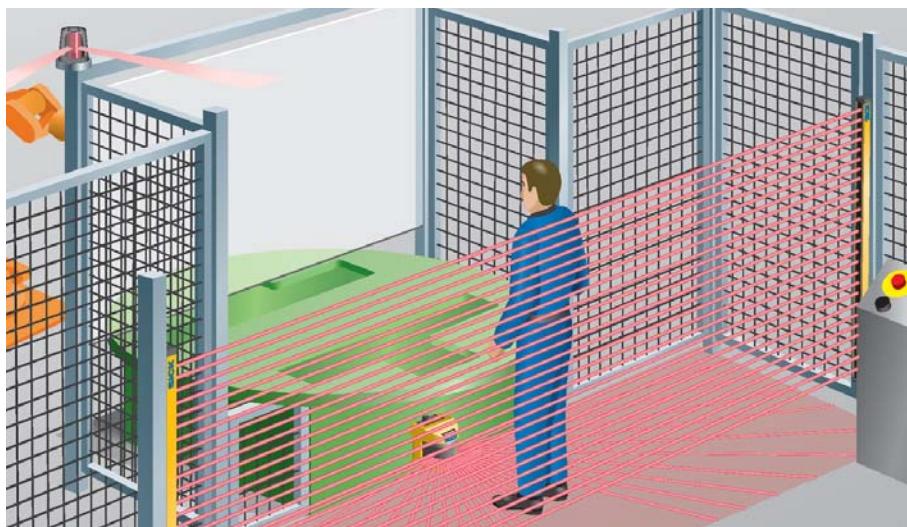
The light curtain is positioned at an angle (see figure). So it is not possible to stand behind the light curtain. The front edge of the protective field is defined by the safety distance. As this is the more cost-effective solution for the problem, it was implemented.

Customer benefits

Quicker and less awkward insertion and removal of parts than with hazardous area protection using a door or grid. As a consequence the productivity is increased. The work process is also easier to observe.

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→ C 4000	C-2
→ Services	A-0



Application overview

Task	Hazardous point protection with area protection
Industrial sector	Car and vehicle manufacture (incl. aircraft/ships/agricultural machinery)
Application location	Revolving machine
Product family	C 4000, S 3000
Type of switching amplifier	UE 4100



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Application in detail

Task

Small parts, such as bolts and straps, are welded to sheet metal body parts on a rotary table by a robot. The sheet metal parts are inserted in the rotary table by the robot, clamped and the table rotated by 180°. A worker then fits the small parts to the body part. The rotary table is then rotated by 180° again into the robot cell where the parts are welded automatically. To protect against the hazardous rotation of the table and welding process, the robot cell must be equipped with appropriate safety systems. All safety devices are to be analysed from a control room via PROFIBUS and relevant information displayed.

Implementation

Protection was achieved using the C 4000 safety light curtain and the S 3000 safety laser scanner. If the worker enters the hazardous area, the light curtain is interrupted and the rotary motion of the table or the welding process stopped. To protect the area between the rotary table and the light curtain, a safety laser scanner is also fitted. This device ensures that it is not possible to stand behind the C 4000. As it is possible to program the scanner's monitored area as required, the non-rectangular area between the rotary table and the light curtain can be monitored in its entirety. The two safety sensors, as well as

emergency stop switches and other sensors, are installed on the UE 4100 bus node.

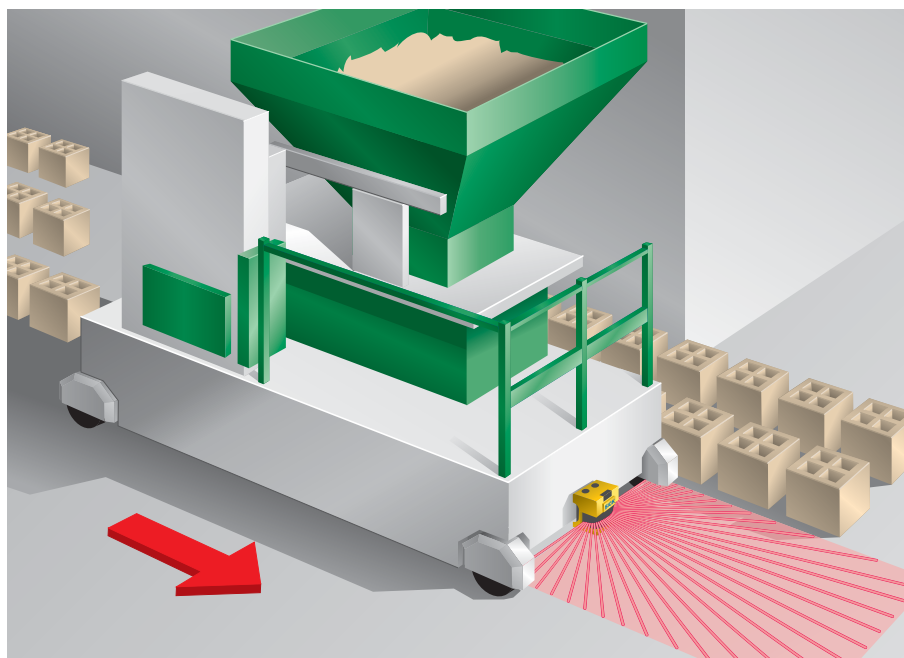
The complete safety application is solved using one bus node. The bus loading due to several users is reduced to a minimum.

Customer benefits

Due to the combination of light curtain and laser scanner, full protection of the robot rotary table is achieved. The programmable laser scanner enables the protection to be flexibly adapted to the space monitored.

The C 4000 and S 3000 safety devices have an expanded communication interface via which they can be connected to the UE 4100 Intelliface bus node. As a result, the devices can be completely analysed from a control room using the SICK Configuration & Diagnostic Software (CDS) without the need for any initial in-situ diagnostics.

With this expanded communication interface, electro-sensitive protective devices remain independent of the evaluation unit selected. I.e. safety laser scanners and safety light curtains are suitable both for a conventional solution with safety relays and for a solution with a safe bus node. Investments in new hardware due to changes in the boundary conditions are therefore not necessary.



Application overview

Task	Hazardous area protection
Industrial sector	Construction, stone, glass, ceramics, etc.
Application location	Stone setting machine
Product family	S 3000

Application in detail

Task

On a stone setting machine, material is placed in a hopper and a block is pressed into shape using an appropriate mould and set down to cure. As the blocks can vary in shape and size, rails cannot be used for moving the vehicle. For this reason only a freely moving vehicle can be used, equipped with the necessary navigation sensors and safety related systems to achieve the requirements of EN 1525. The ambient conditions are difficult as there is a large amount of dust in the air.

In systems of the past, mechanically guided vehicles were used, these predominantly have tactile personnel safety systems. Due to its inflexibility, this type of

stone setting machine was of limited economic viability.

Implementation

A S 3000 safety laser scanner (type 3) was fitted in both directions of vehicle movement. Along with the actual protection of the hazardous area, the scanner also sends the spatial contour to the vehicle's navigation computer over a data interface.

Customer benefits

Due to the use of the S 3000 safety laser scanner, the stone setting machine can operate fully automatically, this provides a significant increase in utilisation and thus improved cost effectiveness with increased safety.



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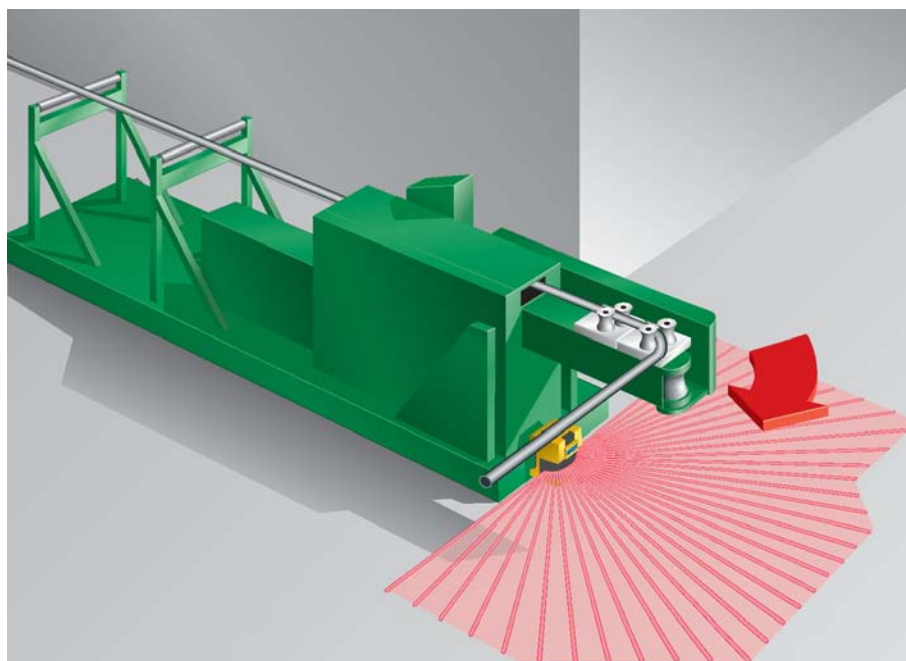
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Application overview

Task	Hazardous area protection
Industrial sector	Metal and steel production, processing
Application location	Pipe bending machine
Product family	S 3000

Application in detail

Task

Steel pipes of varying length, shape and diameter are processed on a pipe bending machine for the manufacture of furniture. There are hazards for the machine operator from the bending movement of the working head (risk of crushing) as well as the pivoting movement of the free end of the piece of pipe. A risk assessment in accordance with EN 1050 resulted in a categorisation of category 3 for the safety related parts of the machine controller. The protection measures of the past, mats, light curtains and physical barriers cause a significant hindrance for the machine operators when loading and removing material. These items are also subject to heavy mechanical wear.

Implementation

By using a S 3000 safety laser scanner, the system can be conveniently protected

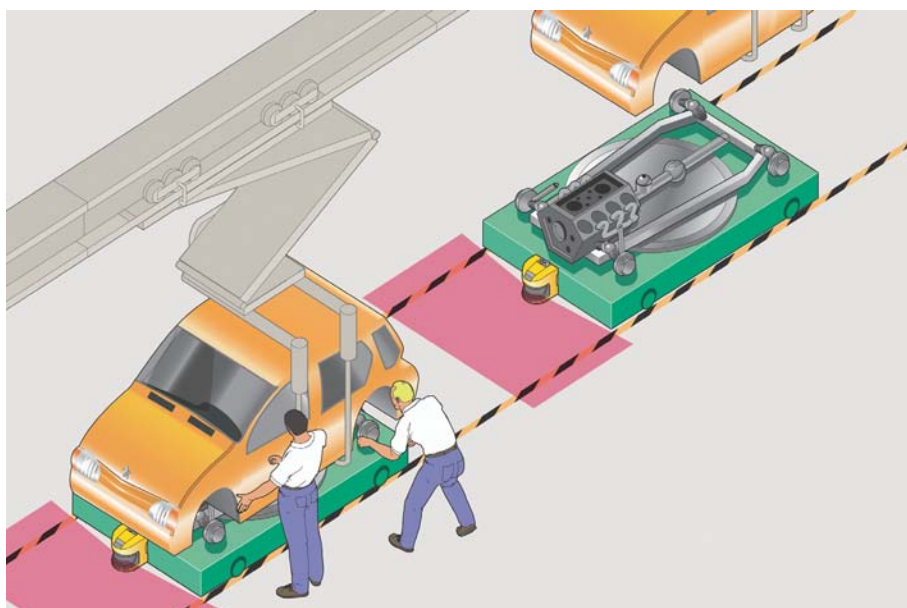
without hindering operation. The scanner sits underneath the bending head and covers a scanning range of 190°. The freely programmable protective field responsible for safe shutdown of the dangerous movement covers the entire hazardous area horizontally such that reaching over can also be prevented. A warning field of variable dimensions is used as a preliminary zone. If the operator enters this zone while the dangerous movement is taking place, a warning signal is output before the work step needs to be interrupted.

Customer benefits

The freely programmable protective field allows optimal adaptation to hazardous areas. Wear-free scanner technology guarantees straightforward integration, high availability, improved ergonomics and an increase in machine utilisation.

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→ S 3000	B-2
→ Services	A-0



Application overview

Task	Hazardous area protection
Industrial sector	Car and vehicle manufacture (incl. aircraft/ships/agricultural machinery)
Application location	Assembly line
Product family	S 3000

Application in detail

Task

During final assembly in a car factory, engine and body are transported to the "marriage" on automatically guided vehicles (AGVs). As personnel or other vehicles could cross the vehicle's path, the AGV must be protected, i.e. even at high velocities the AGV must stop reliably before a collision can occur. This aspect is particularly important during assembly, after fitting of the body, when workers must perform manual work. In the past this protection was provided by tactile bumpers. However these bumpers only provide protection at low velocities.

Implementation

A S 3000 Professional laser scanner was fitted to the front of the AGV to scan the surroundings within its programmed protective and warning fields. With its velocity-dependent protective field/warning field switching using incremental encoder signals, the device slows down the vehicle or stops it completely as soon as a person or object is detected. The incremental encoders are used for the velocity-dependent control of the protective field (high velocity results in a long braking distance that, in

turn, must be monitored by a long protective field). As soon as the scanner detects an object, the device reduces vehicle velocity or stops the AGV. Due to the use of digital switching inputs, it is also possible to change the protective field appropriately on left- or right-hand bends. Up to 8 protective fields and 8 monitoring fields can be programmed.

Customer benefits

Velocity-dependent protective field switching allows routes to be driven considerably faster, as the velocity is reduced and the protective field shortened before sharp bends (this feature allows tighter bends to be used). The vehicle can be accelerated on straight sections and the protective field adjusted to suit.

Fixed protective fields must always be set in such a way that there is no spurious switching due to the surroundings, so high velocities are generally not possible in such cases.

Use of the S 3000 Professional laser scanner has significantly improved both cost-effectiveness and the protection of people and property.



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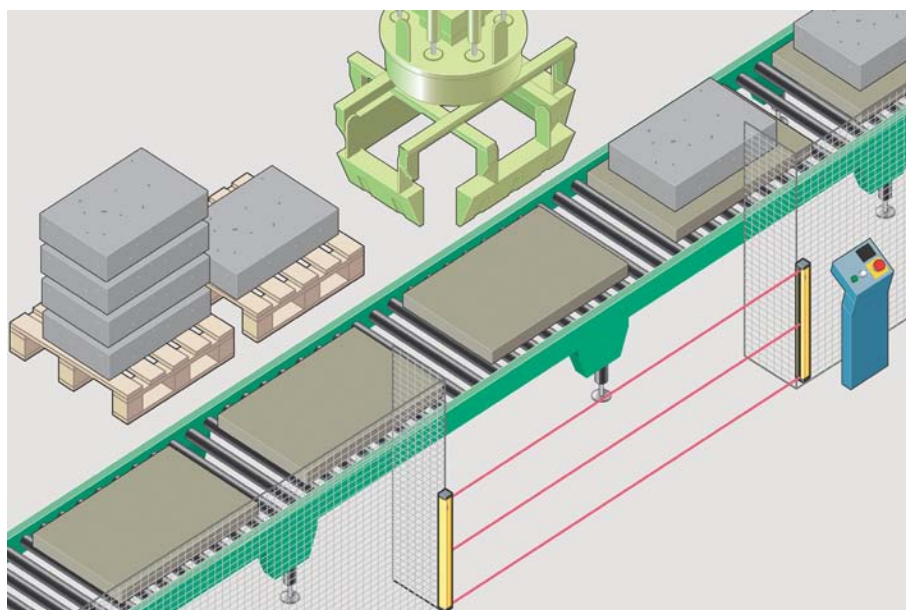
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Application overview

Task	Access protection
Industrial sector	Construction, stone, glass, ceramics, etc.
Application location	Stone setting machine
Product family	M 2000

Application in detail

Task

In the past, a block positioning crane has been protected with fences and numerous safety switches. When it was necessary to perform servicing, change moulds or troubleshoot problems on the machine, the fences had to be opened and even partially or completely dismantled. When the fences had been closed and re-assembled again, it was often necessary to re-fit and adjust more than a dozen safety switches.

A further problem was the vibration in the area around the crane caused by shaking the blocks in the mould; these vibrations caused "false alarms" at the limit switches and brought the crane to a standstill.

Implementation

The requirements were therefore less effort and fewer error messages, as well as improved access to the system. The machine tool and structural steelwork manufacturer found the solution in the M 2000 multi-beam photoelectric safety switch. In conjunction with the safe PLC, this testable access protection system represents an

easy-to-use, time-saving solution.

Classified in accordance with type 2 IEC 61496, the M 2000 provides scanning ranges of up to 70 m along with integrated external device monitoring and restart interlock functions.

As in this case it is possible to stand behind the photoelectric safety switch, a restart interlock function must be incorporated in the system. Prior to moving the crane and after every interruption of the M 2000 during a dangerous crane movement, a reset button (restart interlock function) must be activated.

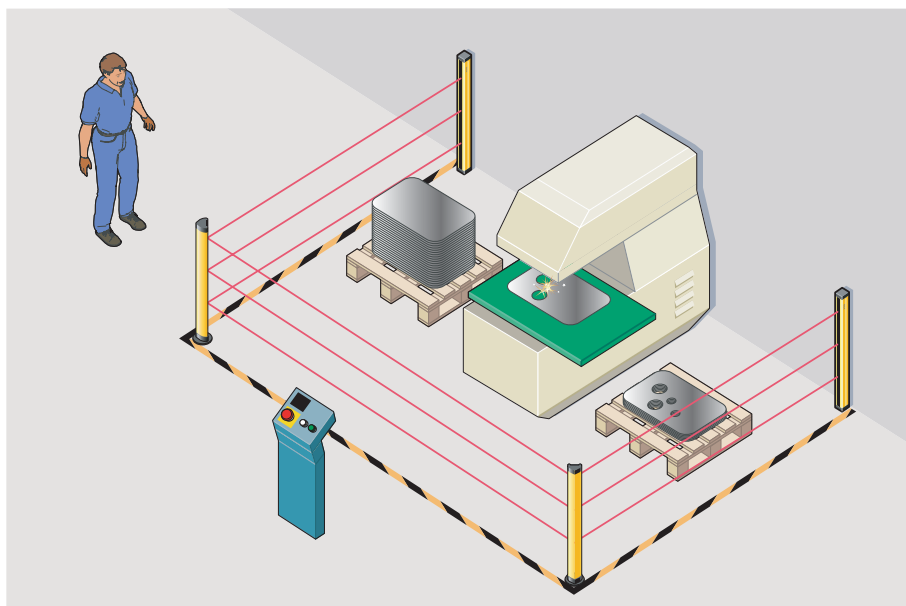
Customer benefits

The time-consuming assembly and dismantling of fences/safety doors and safety switches, as well as the false alarms from the limit switches, no longer occur.

With the use of the electro-sensitive multi-beam photoelectric safety switch, a robust, cost-effective solution has been found. Costs for hardware, control cabinet and cable laying have been saved.

Further information Page

→ M 2000	D-37
→ Services	A-0



Application overview

Task	Access protection
Industrial sector	Machine tools and production systems
Application location	Punching machine
Product family	MSL

Application in detail

Task

A punching machine must be protected from three sides. Pieces of sheet metal of various sizes are processed on the machine; the batch sizes also vary significantly. To operate the machine unhindered, access is required for loading and for tool and program changes. A mechanical fence would severely hinder productivity and was therefore not considered.

Implementation

A MSL multi-beam photoelectric safety switch with two deflector mirror columns was chosen for the access protection. The devices are permanently installed at the necessary safety distance from the hazardous point (tool) as per EN 999. On inter-

ruption of at least one light beam, the system sends a stop signal to the machine control. As people in the hazardous area cannot be detected, it is necessary to incorporate a restart interlock on the punching machine. It must not be possible to reach the related reset button from the hazardous area.

Customer benefits

Use of a cost-effective system comprising safety photoelectric switches and deflector mirror columns: only two sides need to be actively wired; easy-to-adjust deflector mirrors in robust columns. When the machine is shut down it is freely accessible, thus increasing productivity.



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Application overview

Task	Access protection
Industrial sector	Car and vehicle manufacture (incl. aircraft/ships/agricultural machinery)
Application location	Manufacturing cell
Product family	i1001 Lock

Application in detail

Task

To protect a handling robot in engine assembly the hazardous area is fenced. Access to the robot cell is only allowed via a door when the dangerous robot movements have come to a stop.

Implementation

Access protection on the robot cell is achieved using the i1001 Lock safety locking device. The safety locking device is fitted to the door frame, the actuator to the door.

After the door is closed, the handle actuator is inserted in the locking device and the two items joined together using a rotary movement. The i1001 Lock is mechanically locked. Only now can the robot start its assembly task.

Access to the robot cell is prevented using the locking mechanism on the safety locking device until the robot has completed its

handling action and has returned to its parking position. Only then is the lock released using a signal to the locking solenoid on the i1001 Lock. Then it is possible to re-open the door by turning the handle actuator.

Customer benefits

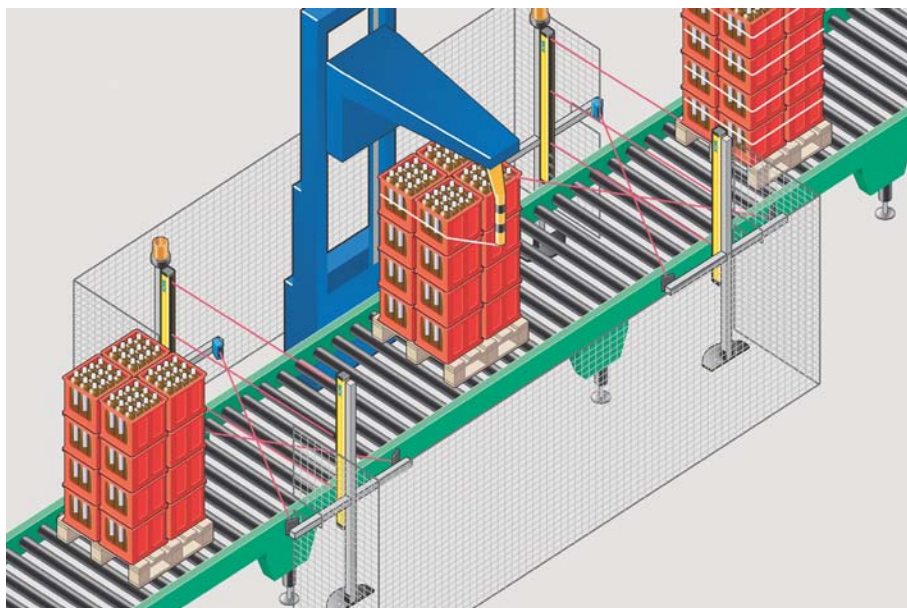
If it is necessary to complete a handling action before access is provided to a hazardous area, a safety locking device can be used.

The i1001 Lock, specially designed for harsh operating conditions, provides reliable access protection with long service life. Two LEDs indicate the current status of the door: whether it is open/closed and locked/unlocked.

The design of the i1001 Lock enables it to be used without problems even on heavy doors or in case of imprecise door mounting.

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→ i1001 Lock	G-16
→ Services	A-0



Application overview

Task	Access protection with differentiation between man and material (muting)
Industrial sector	Food and beverages, luxury goods
Application location	Palletiser
Product family	MSL, Safety Muting System (SMS)

Application in detail

Task

Horizontal binders for securing loads require only a few seconds to automatically bind loaded pallets. The velocity and binding forces produced in the process represent a high potential for injury to personnel if they enter the system when it is running. Many end users, e.g. in the beverage industry, rely on automation of this kind, making flexible machine protection a necessity.

Implementation

To protect the horizontal binder and at the same time to be able to incorporate it in the stationary conveyor systems, a SMS safety muting system with MSL multi-beam photoelectric safety switch was installed on the pallet infeed and outfeed. Type WL 23

photoelectric reflex switches are used as muting sensors. All components are mounted and connected together on a robust and height-adjustable frame. The user anchors the system using the robust baseplate, adjusts the height of the sensors to suit the specific requirements and connects the MSL to the machine controller.

Customer benefits

Using the SMS with MSL, reliable machine protection as well as flexible machine utilisation has been realised. Instead of numerous individual components from different suppliers, the user receives a partially pre-assembled and tested system designed to suit the specific requirements.



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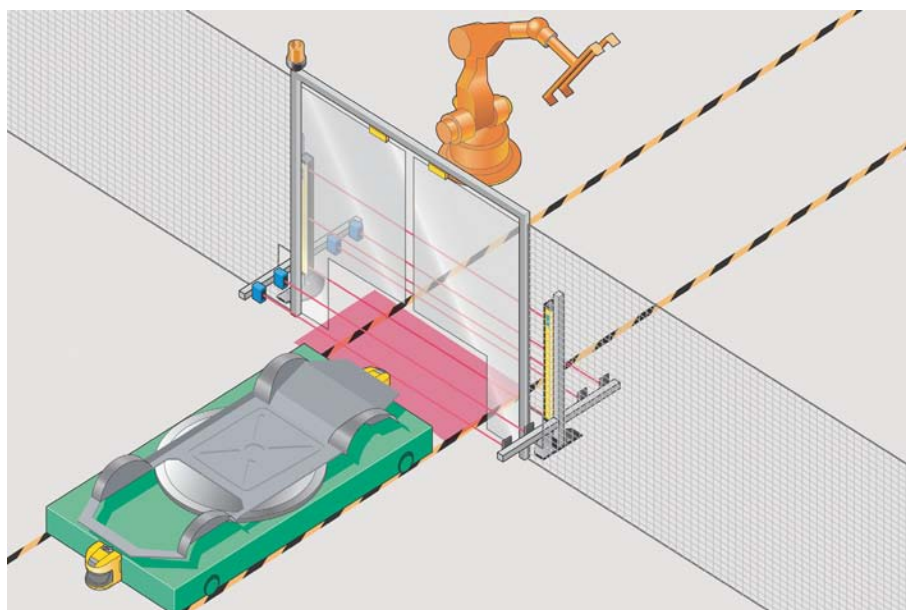
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Application overview

Task	Access protection with differentiation between man and material (muting)
Industrial sector	Car and vehicle manufacture (incl. aircraft/ships/agricultural machinery)
Application location	Robot station
Product family	MSL, T 4000 Compact

Application in detail

Task

Robot cells for the assembly of vehicle floor groups are linked using automated guided systems (AGSs). The guards for the assembly cells are equipped with gates for the entry and exit of the AGSs. These gates must be protected against the access of persons also when the AGSs are passing through the gate.

Implementation

It was possible to achieve access protection using sensor equipment consisting of the T 4000 C safety lock, the MSL multi-beam photoelectric safety switch and WL 24 photoelectric reflex switches. Access across the path of the AGS is protected by the MSL multi-beam photoelectric safety switch. To ensure that the AGS does not trigger a safety stop on driving through the photoelectric safety switch, two photoelectric reflex switches are arranged in front of and behind the photoelectric safety switch. When the AGS drives up to the gate, the two WL 24 photoelectric switches mounted in front of the photoe-

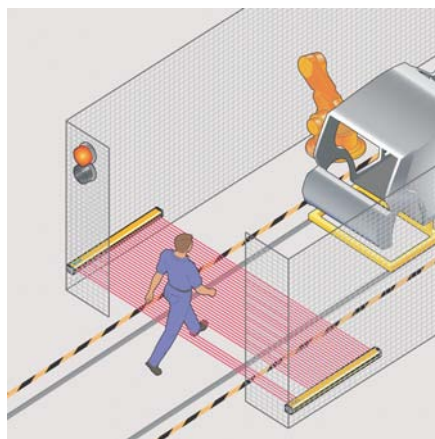
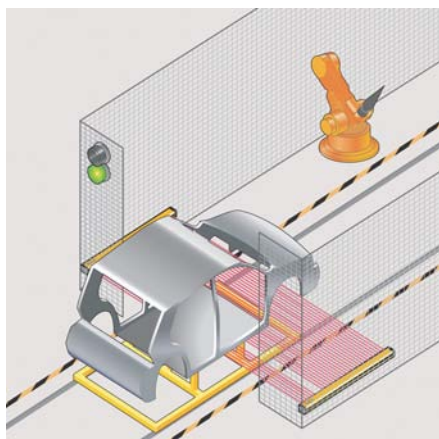
lectric safety switch are interrupted and provide the signal for deactivating the photoelectric safety switch. To check the access protection for tampering or faults, the plausibility of the signals at the photoelectric reflex switches is checked with time sampling.

To ensure that there is no risk of crushing between the AGS and fencing there is 500 mm clearance beside the loaded AGS in accordance with the regulations. To prevent people being able to pass through this space at the same time as the AGS, and so enter the robot cell undetected, the gate is equipped with hinged doors that are monitored using T 4000 C safety sensors. To enter the robot cell beside the AGS, a person would have to open the hinged door, an action that would result in a safety stop.

Customer benefits

The sensors used enable complete access protection to be provided. The individual components feature wear-free operation and straightforward installation.

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→ T 4000 Compact	J-17
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Application overview

Task	Access protection with differentiation man/material (muting alternative)
Industrial sector	Car and vehicle manufacture (incl. aircraft/ships/agricultural machinery)
Application location	Robot station
Product family	C 4000 Entry/Exit

Application in detail

Task

During shell manufacture at a car factory, shells are automatically transported into the dangerous area of a robot cell. If a person enters this area, the robot must be stopped immediately.

In the past the area was protected with a light curtain and several muting sensors; however these sensors can be difficult to mount.

Implementation

The C 4000 Entry/Exit safety light curtain with its dynamic, self-teaching blanking was used. The continuously active sensor is difficult to tamper with and therefore provides maximum safety up to category 4. It reliably detects objects, learns their distances and

monitors them. Invalid objects or asynchronous movements result in immediate shut down. The robot is stopped immediately as soon as a person enters the hazardous area. The protective field length of 900 mm ensures that it is not possible to inadvertently step over the protective device. The light curtain is also insensitive to flying welding sparks due to its internal analysis electronics.

Customer benefits

A cost-effective solution, as no additional sensors or further protection measures, e.g. muting sensors, muting lamps or hinged doors, are needed. The compact sensor pair is easy to mount and saves time, e.g. particularly during maintenance.



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Regulations and standards




This chapter is intended for designers and users of machines who specify and employ protective devices. On the pages that follow, we show you various ways you can protect machines with SICK protective devices while observing the applicable Euro-

pean and US regulations, directives and standards.

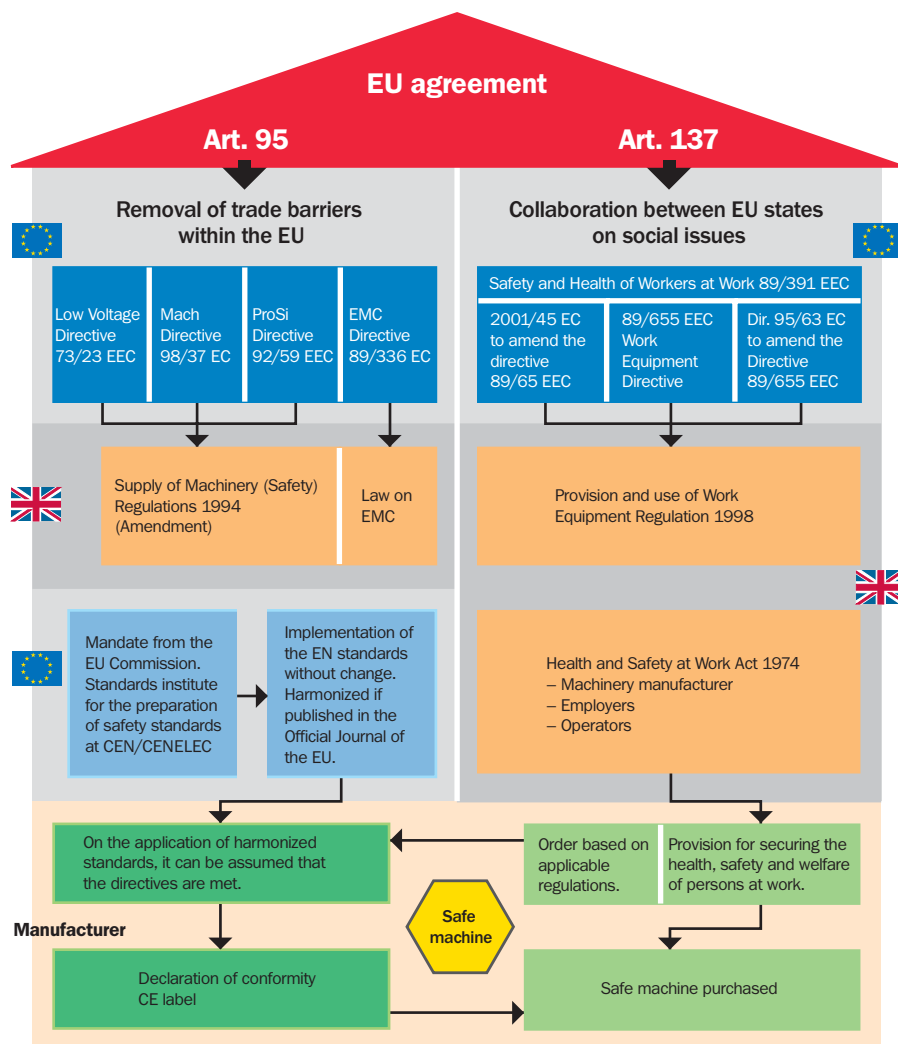
The examples provided are the result of our many years' practical experience and are typical applications.

No legal claims can be made on the basis of the information provided. Each machine requires a specific solution as a result of national and international regulations and standards.

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European directives, objectives and procedures



The directives agreed by the EU Commission/Council must be implemented in national law by the member states in order to allow implementation of the concept of free trade. Moreover, EU standards institutes have been authorised to prepare EU standards that define the legal requirements in more detail.

In the area of machine safety, harmonization has progressed very rapidly to protect the operators on machines and systems. Directives have been agreed and standards published.

In this chapter we will briefly explain:

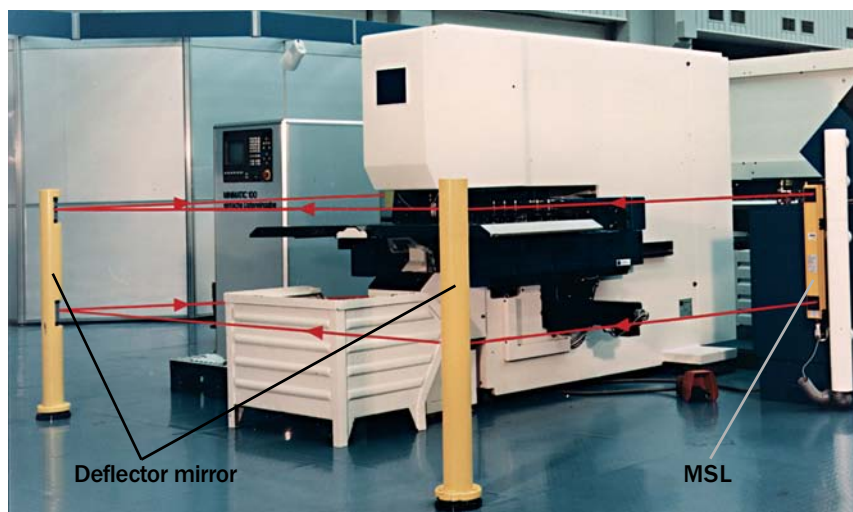
- The Machinery Directive 98/37 EC – applicable to machines as well as to safety components placed on the market individually, and also applicable to second-hand machinery and devices from other countries that are to be placed on the market in the EU for the first time (e.g. from the USA or Japan)
- The Work Equipment Directive 89/655 EEC – applicable to the use of machines and devices
- The most important standards and their current wording

The Machinery Directive 98/37/EC

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Access protection on three sides using SICK photoelectric switch MSL and deflector mirrors.



The Machinery Directive 98/37 EC is intended for manufacturers of machines and devices, and organisations placing machines and devices on the market. It defines tasks for meeting the health and safety requirements for new machines, with the intention of removing trade barriers within Europe and guaranteeing operators a high level 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 harmonized at European level are prepared by private institutions and must remain voluntary stipulations. On the other hand, it is assumed that a machine built in accordance with the harmonized standards published in the Official Journal of the EU 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.

You will find the original text of the Machinery Directive on the Internet, in the portal on European Union law, among other sites.

→ http://europa.eu.int/index_en.htm

What must machine manufacturers do?

The manufacturers must take into account the integration of safety during the design process. In practice this means that the designer must perform a hazard analysis and risk assessment during the development phase such that resulting measures can flow directly into the design.

To certify the conformity of the machine, the manufacturer must apply the CE label to every machine, and provide an EC Declaration of Conformity.

The Machinery Directive explains the complete process for conformity assessment. There are two categories of machines:

- Machines that are particularly hazardous are subject to special procedures. Annex IV of the Machinery Directive contains a list of the relevant machines. There is a similar list for electro-sensitive devices for protecting people, such as photoelectric switches and scanners.
- All other machines that are not listed in Annex IV are subject to the standard process.

The procedure for obtaining the EC Declaration of Conformity for machines and devices not listed in Annex IV.

If the machine/safety component is not listed in Annex IV, the manufacturer is responsible for applying the CE label without the involvement of a notified body. The manufacturer must first document the measurements and test results and be able to provide them to the national authorities on request.

A

The procedure for obtaining the EC Declaration of Conformity for machines and devices that are listed in Annex IV

- If harmonized standards exist for the machine or safety components, and these standards cover the entire range of requirements, the EC Declaration of Conformity can be obtained in one of three ways (see points 1-3).
- If there are no harmonized standards for the machine, or if the machine or parts of the machine was/were not built to the standards, the EC Declaration of Conformity can only be obtained with an EC-type examination (see point 3). The manufacturer must provide the machine and the corresponding

technical documentation to the notified Body (→ Page A-31) so that such a test can be performed. This body tests for compliance with the directives and prepares an EC-type examination certificate that contains the results of the tests.

In all cases the manufacturer is responsible for preparing the Declaration of Conformity for the product in question and thus accepts responsibility for the machines and protective devices being designed and built in accordance with the standards and directives.



The manufacturer sends the technical documentation (cf. Annex VI of the directive) to a notified Body, which confirms receipt and simply archives the documentation.



The manufacturer commissions the notified Body to check the documentation for compliance with the harmonized standards. If this is the case, the authority provides the manufacturer with a certificate proving compliance with these standards.



The manufacturer makes the application for an EC-type examination by a notified Body.
→ notified Body page A-31

The Work Equipment Directive 89/655 EEC (supplemented with the Directive 95/63 EC)

The directive is intended to ensure that minimum regulations are observed during the use of work equipment to improve health and safety.

The employer's obligations are defined in articles 3 to 8 of the directive:

Art. 3	General obligations
Art. 4	Rules concerning work equipment
Art. 4a	Inspection of work equipment
Art. 5	Work equipment involving specific risks
Art. 5a	Ergonomics and occupational health
Art. 6	Informing workers
Art. 7	Training of workers
Art. 8	Consultation of workers and workers' participation

You will find the complete text of the 89/655 EEC Work Equipment Directive on the Internet, in the portal on European Union law, among other sites.

→ <http://europa.eu.int/eur-lex>

Each member state is allowed to add its own national requirements: service/maintenance period, use of gloves, etc.

→ See also graphic (right half) on page A-28

Bodies

Bodies providing safety advice

Companies that want to check whether their machines are compliant with the applicable European directives and standards can obtain advice on safety aspects from e.g. the HSE and DTI.

Accredited Bodies

Accreditation is undertaken and monitored by the appropriate national institution.

The types of machine that the Body is entitled to test are defined as part of the accreditation.

Notified Bodies

Each EC member state has the obligation to nominate notified bodies as per the minimum requirements defined in the Machinery Directive, and to notify Brussels of these listed bodies.

Only these bodies are authorised to issue EC-type examination certificates for the machines and safety components listed in Annex IV. It is explicitly stated that these bodies are dedicated to specific areas of activity.

A list of the certification Bodies so far notified by EC member states may be obtained from the DTI London.

European safety standards

Harmonized European standards

The European Union's Commission authorises the CEN (European Committee for Standardisation) or CENELEC (European Committee for Electrotechnical Standardisation) to prepare a standard.

The technical specifications for compliance with the essential safety requirements in the directive are then defined in the related forum. As soon as the standard has been ratified, it is published in the Official Journal of the European Union. It is then considered a harmonized standard.

This type of standard is used as a reference and replaces all national standards on the same subject. The conformity of a safety component or a machine with a harmonized standard

forms a basis for assuming conformity with the underlying health and safety requirements defined in the Machinery Directive 98/37 EC.

The status of the standard is indicated by various abbreviations.

- A standard with the prefix EN... is recognised and can be applied
- A standard with the prefix prEN... is currently in preparation
- A document that also has TS in the prefix is a Technical Specification. These documents define technical requirements that are to be met by a product, a process or a service. A technical specification may be also used as a guide.



Automotive industry:
Area protection of an insertion station using a SICK laser scanner. The protective field is marked on the floor.



A

Different types of standard

There are three different types of standard:

A-type standards

(Basic safety standards) contain basic terminology, principles of design and general aspects that can be applied to all machinery.

B-type standards

(Group safety standards) address a safety aspect or safety equipment that can be used for a wide range of machinery.

- B1-type standards on special safety aspects (e.g. safety distances, surface temperature, noise), e.g. the electrical safety of machinery (EN 60204), the calculation of safety distances (EN 999).
- B2-type standards on safety equipment (e.g. two-hand controls, interlocking equipment, pressure-sensitive protective equipment, guards, electro-sensitive protective equipment IEC 61496 parts 1 and 2 / EN 61496 part 1, EN/TS 61496-2 part 2 and EN/TS 61496 part 3).

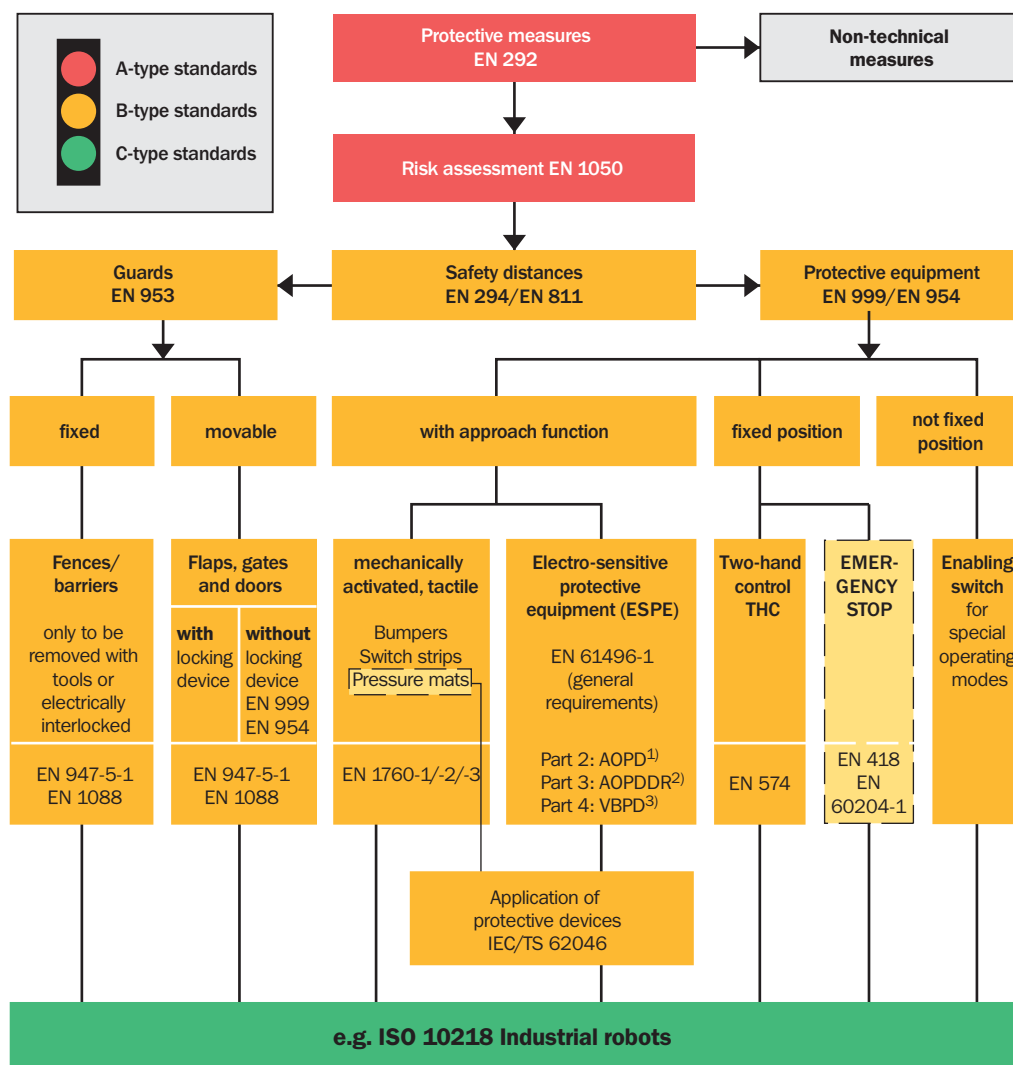
C-type standards

(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 B-type standard or an A-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.

Possible selections for protective devices on an industrial robot and related standards



¹⁾ Active Opto-electronic Protective Device

²⁾ Active Opto-electronic Protective Device responsive to Diffuse Reflection

³⁾ Vision-based Protective Device

Some examples of standards

A

Type of standard	European standards EN	International standards ISO / IEC	Title
Type A	EN 12100-1* EN 12100-2* * previously EN 292	ISO 12100-1 ISO 12100-2	Safety of machinery – basic concepts, general principles for design
	EN 1050	ISO 14121	Principles for risk assessment
Type B	EN 61496-1 CLC/TS 61496-2	IEC 61496-1 IEC 61496-2	Safety of machines – electro-sensitive protective equipment ▪ Part 1: General requirements and tests
	CLC/TS 61496-3	IEC 61496-3	▪ Part 2: Particular requirements for equipment using active opto-electronic protective devices ▪ Part 3: Particular requirements for Active Opto-electronic Protective Devices responsive to Diffuse Radiation (AOPDDR)
	EN 999	ISO 13855	The positioning of protective equipment in respect of approach speeds of parts of the human body
	EN 294	ISO 13852	Safety distances to prevent hazardous zones being reached by the upper limbs
	EN 349	ISO 13854	Safety of machinery – minimum gaps to avoid crushing of parts of the human body
	EN 811	ISO 13853	Safety of machinery – safety distances to prevent hazardous zones being reached by the lower limbs
	EN 954-1 EN 13849-2	ISO 13849-1 ISO 13849-2	Safety-related parts of control systems ▪ Part 1: General principles for design ▪ Part 2: Validation
	prEN 62061	IEC 62061	Functional safety of electrical, electronic and programmable control systems for machinery
	EN 61508-1 to -7	IEC 61508-1 to -7	Functional safety of safety-related electrical, electronic and programmable electronic systems
	EN 60204-1	IEC 60204-1	Electrical equipment of machines ▪ Part 1: General requirements
	EN 1088	ISO 14119	Safety of machinery. Interlocking devices associated with guards – principles for design and selection.
	EN 574	ISO 13851	Safety of machinery. Two-hand control devices – functional aspects, principles for design ¹⁾
	EN 418	ISO 13850	Emergency stop equipment – functional aspects, principles for design
	EN 1037	ISO 14118	Safety of machinery – prevention of unexpected start-up
		IEC/TS 62046	Safety of machinery – use of protective equipment to detect the presence of persons
Type C	EN 692		Mechanical presses
	EN 693		Hydraulic presses
	EN 13736		Pneumatic presses
	EN 12622		Safety of machine tools. Hydraulic press brakes
	EN 775	ISO 10218	Industrial robots
	EN 1010	ISO 1010	Printing and paper processing machines
	EN 11111	ISO 11111	Textile machines
	EN 81-1		Safety rules for the construction and installation of lifts ▪ Part 1: Electric lifts
	EN 280		Mobile elevating work platforms – design calculations, stability criteria, construction, safety, examinations and tests
	EN 1570		Safety requirements for lifting tables
	EN 1493		Vehicle lifts
	EN 1808		Safety requirements on suspended access equipment – design calculations, stability criteria, construction tests

¹⁾ Note: Please refer to PD 5304 “Machine safety” for further reference for machinery in the UK.

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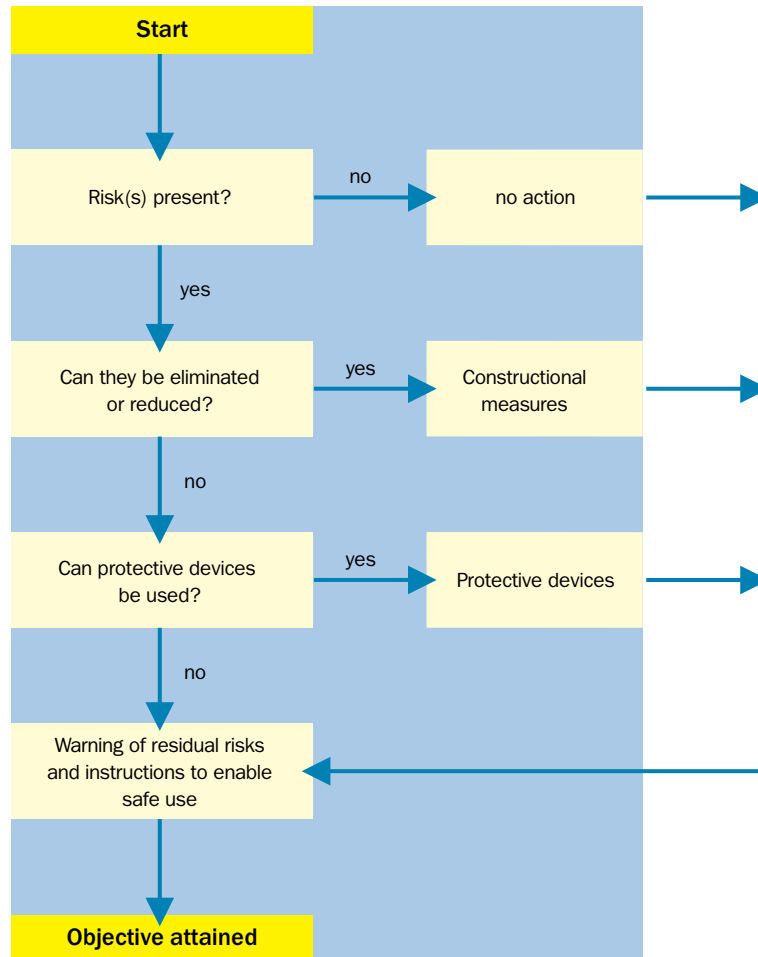
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Type of standard	European standards EN	International standards ISO / IEC	Title
Type C	EN 691		Woodworking machines – safety and health – common requirements
	EN 1870-1		Safety of woodworking machines – circular sawing machines ▪ Part 1: Circular saw benches (with and without sliding table) and dimension saws
	EN 1870-4		Safety of woodworking machines – circular sawing machines ▪ Part 4: Single- and multiblade rip-sawing machines with manual loading and/or unloading
	EN 848-1		Safety of woodworking machines – one side moulding machines with rotating tool ▪ Part 1: Single spindle vertical moulding machines
	EN 940		Safety of woodworking machines – combined woodworking machines
	EN 1218-1		Safety of woodworking machines – tenoning machines ▪ Part 1: Single end tenoning machines with sliding table
	EN 289		Rubber and plastics machinery. Compression and transfer moulding presses. Safety requirements for the design
	EN 422		Rubber and plastics machinery. Safety – blow moulding machines intended for the production of hollow articles – requirements for design and construction
	EN 1114-1		Rubber and plastics machines – extruders and extrusion lines ▪ Part 1: Safety requirements for extruders
	EN 1612-1		Rubber and plastics machines – reaction moulding machines ▪ Part 1: Safety requirements for metering and mixing units
	EN 528		Storing and retrieval equipment – safety
	EN 281		Self-propelled industrial trucks with driver's seat – rules for the design and layout of pedals
	EN 1459		Safety of machinery – industrial trucks – variable reach stackers
	EN 1525		Safety of industrial trucks – driverless trucks and their systems
	EN 1526		Safety of industrial trucks – additional requirements for automated functions on trucks
	prEN 1672-1		Food processing machinery – safety and hygiene requirements – basic concepts
	EN 972		Tannery machines – reciprocating roller machines – safety requirements
	EN 869		Safety requirements for high-pressure metal die-casting units
	EN 710		Safety requirements for foundry moulding and core-making machinery and plant and associated equipment
	EN 415-4		Palletisers and de-palletisers

→ Further information on this topic can be found on the VDMA's site, www.vdma.org, or the "Safety of Machinery in Europe", available from Beuth Verlag GmbH

Risk analysis

A



When designing a machine, the possible risks must be analysed and, where necessary, additional protective devices fitted to protect the operator from any residual risks that may exist. (Crushing, cutting, pulling, impacts, stabbing, penetration, vibration, grazing, etc.), cf. ISO 12100-1 (EN 292) and ISO 14121.

This risk assessment process is provided in Safexpert®, software for safety engineering, (→ Page 0-0). The list of hazards, trees for making selections for the risk assessment and the scheme for evaluating the control category (for measures related to the control) simplify the assessment. The user follows the requirements of the ISO 14121 and ISO 12100-1 (EN 292-1) standards directly. The hazards are isolated by

hazardous point and assessed in the appropriate life phases. The assessment of individual hazards allows the risk assessment to be simplified, and can contribute to the optimum selection of measures to reduce the risk.

The process diagram above shows whether it is advisable to use a protective device.

The remainder of this section is based on the assumption that some risks cannot be eliminated, and that it may be necessary to use an additional protective device.

A Why opto-electronic protective devices?

If the operator has to reach into a machine, and is therefore exposed to a hazard, the use of opto-electronic protective devices instead of mechanical guards (fixed guard, two-hand control, fences, etc.) may be considered.

- Access time is reduced (the operator does not need to wait for the guard to open)
- Productivity is increased (time saved during machine loading)
- Workplace ergonomics are improved
- In addition, operators and other people are equally protected

Warning:

An opto-electronic protective device can only be used if the operator is not exposed to any risk of injury from splashing material (e.g. molten material) or flying pieces of material. Also, the access time must be greater than the time required to stop the hazard.

Choosing an opto-electronic protective device

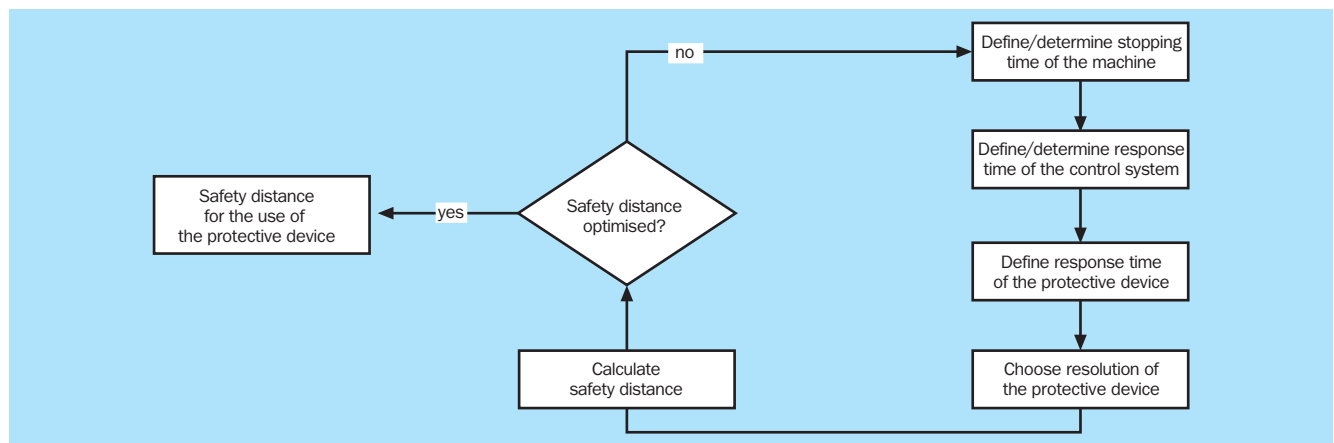
The basic criteria for the selection of an opto-electronic protective device depend on a variety of requirements, such as:

- The standards to be observed (e.g. EN 692/mechanical presses)
- The space available in front of the hazardous area
- Commercial criteria
- Ergonomic factors (e.g. periodic insertion of parts, or no need for periodic access)

After definition of the protective area, the safety distance (ESPE to the hazardous point) is defined using the following parameters:

- Stopping time of the machine
- Response time of the controller
- Response time of the ESPE
- Supplements to the safety distance calculated

Iterative process for the optimisation of the safety distance



Definition of the protective field

Depending on the installation and configuration, it is necessary to take the following points into consideration:

- The size of the protective field
- The various access points
- The accessible hazardous areas
- The risk of bypassing the protective device and of the undetected presence of people in the hazardous area

Definition of the function to be performed



Hazardous point protection:
Finger or hand detection

This type of protective device is advantageous because a shorter safety distance is possible and the operator can work more ergonomically (e.g. during insertion work on a press).



Access protection:
Detection of a person on access to the hazardous area

This type of protective device is used to protect the access to a hazardous area. The area is freely accessible when the machine is shut down.



Hazardous area protection:
Detection of the presence of an operator in the hazardous area

This type of protective device is suitable for machines on which, e.g. a hazardous area is enclosed by a guard and the entire area cannot be seen from the reset button.

It is also suitable for guarding the approaches to a hazardous area where it combines perimeter and presence sensing safeguarding (permanent detection of personnel or objects throughout the defined zone).

This type of protective device is also suitable for AGS (automated guided systems) and/or stackers, to protect the operator during movement of the vehicles or while docking these vehicles to a fixed station.



Protection of a mobile stone setting machine with SICK laser scanners

A

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 at a metal press requires different consideration compared to the protection of an operator who works on a machine on which the maximum 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 EN 954-1 standard 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 the injury (S)
- The frequency and/or duration of exposure to the hazard (F)
- The possibility of preventing the hazard (P)

The behaviour of the safety-related control in case of a fault is defined for each category (B, 1, 2, 3, 4 cf. table page A-39). 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 (Active Opto-electronic Protective Devices) and their interfaces must comply with the requirement of the category for the safety-related parts of the control under consideration, so that the safety function is ensured (e.g. machine stop and safe stop).

Selection of safety-related parts of control systems [EN 954-1]

Category

Category	B	1	2	3	4
S1	●	●	○	○	○
S2	●	●	●	○	○
F1	●	●	●	○	○
F2	●	●	●	○	○
P1	●	●	●	○	○
P2	●	●	●	○	○

S Degree of injury
S1 Light injury
S2 Serious injury, including death

F Frequency and/or duration of exposure to hazard
F1 Rare to more often and/or short duration of exposure
F2 Often to continuous and/or long duration of exposure

P Possibility of hazard avoidance
P1 Possible under certain circumstances
P2 Hardly possible

Components - devices

Company	Type	B/1	2	3	4	Application field
SICK	Light Grid C 2000	X	X			Point-of-operation guarding, Access guarding, H
SICK	Photoelectric Switch M 2000	X	X			Access guarding
SICK	Light Grid LGT	X	X			Point-of-operation guarding, Hazardous area gu
SICK	Photoelectric Switch MSL	X	X	X	X	Access guarding, Hazardous area guarding
SICK	Photoelectric Switch WSUWWEU	X	X	X	X	Access guarding
SICK	Interface Module LE 20	X	X			Interface module for WSUWE 27-2, VSUWE 18-2, (C
SICK	Through-Beam Photoelectric Sw	X	X			Access guarding
SICK	Light Curtain C4000	X	X	X	X	Point-of-operation guarding

Details

OK Cancel

Category selection of the safety-related parts of the control in Safexpert*

→ See "Choosing a SICK protective device" page A-46

Categories for the safety-related parts of controls (EN 954-1, ISO 13849 in preparation). Cf. figures page A-44

Categories	Concise list of requirements	System behaviour	Principles for achieving safety
B	The safety-related parts of controls and/or their protective devices, as well as their components, must be designed, built, assembled and combined in compliance with the applicable standards such that they can withstand the effects expected.	The occurrence of a fault can result in the loss of the safety function.	Predominantly characterised by the selection of components
1	The requirements of B must be met. Proven components and proven safety principles must be used.	The occurrence of a fault can result in the loss of the safety function, but the probability of occurrence is less than in B.	
2	The requirements of B must be met and proven safety principles used. The machine control must check the safety function at suitable intervals.	The occurrence of a fault can result in the loss of the safety function between checks. The loss of the safety function is detected by the check.	Predominantly characterised by the structure
3	The requirements of B must be met and proven safety principles used. Safety-related parts must be designed such that: <ul style="list-style-type: none"> ▪ a single fault in each of these parts does not result in the loss of the safety function, and ▪ whenever feasible within reasonable limits, the single fault is detected 	The safety function is always retained when the single fault occurs. Some, but not all faults are detected. Accumulation of undetected faults may lead to loss of the safety function.	
4	The requirements of B must be met and proven safety principles used. Safety-related parts must be designed such that: <ul style="list-style-type: none"> ▪ a single fault in each of these parts does not result in the loss of the safety function, and ▪ the single fault is detected before or when the safety function is required or, if such detection is not possible, an accumulation of faults must not lead to loss of the safety function. 	The safety function is always retained when faults occur. The faults are detected in good time to prevent loss of the safety function.	

A

Calculation of the safety distance

General formula for calculation from EN 999

$$S = (K \times T) + C$$

S Minimum distance in millimetres, measured from the hazardous area to the detection point, to the detection line, to the detection plane or to the protective field

K A parameter in millimetres per second, derived from data on approach speeds of the body or parts of the body

T Stopping/run-down time of the entire system in seconds

C Additional distance in millimetres that defines the intrusion into the hazardous area before the protective device is triggered

The calculation of the safety distance for an ESPE is described in the EN 999 standard. If the machine is subject to a specific standard (e.g. metal presses) or a special technical specification, then reference must be made to this document.

Every ESPE must be installed such that access to the hazardous area is reliably detected by the protective device. For finger and hand protection, or the protection of a hazardous area, it must not be possible for a person to be present in the hazardous area without being detected.

If the minimum distance calculated satisfies the industrial and ergonomic requirements, it must also be checked whether the installation and the configuration of the protective device is so designed that undetected presence of people in the hazardous area is impossible.

If, however, people can be present in the hazardous area without detection, the installation must be equipped with additional protective measures/protective devices. If the minimum distance is too large and is unacceptable on ergonomic grounds, it must be defined whether it is possible to either reduce the overall stopping time of the machine, or an ESPE with a better resolution is to be selected.

The measurement of the stopping/run-down time, a service provided by SICK, is important here and requires specific expertise.

→ See "SICK Services" page A-0.

Example:

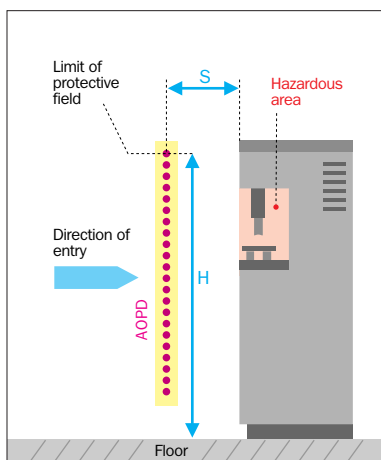
On perpendicular approach and with a total stopping time of 100 ms, a safety distance of 368 mm is to be maintained for an AOPD with a resolution of 35 mm. With a resolution of 14 mm, on the other hand, the safety distance is only 200 mm.

The following table is to be applied for presses in accordance with the EN 692 and EN 693 standards.

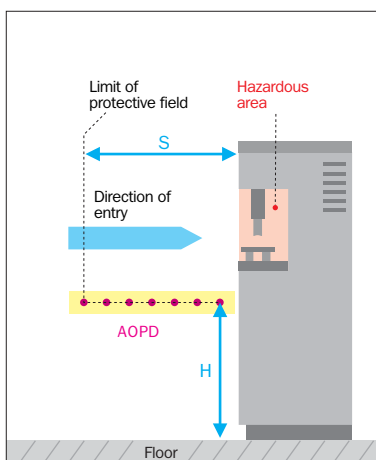
Taking into account the resolution of the AOPD, when calculating the minimum distance S, supplement C at least must be added (cf. EN 692).

Resolution of the ESPE d (mm)	Supplement C (mm)	Stroke triggering by AOPD/PSDI mode
d ≤ 14	0	permitted
14 < d ≤ 20	80	
20 < d ≤ 30	130	
30 < d ≤ 40	240	not permitted
d > 40	850	

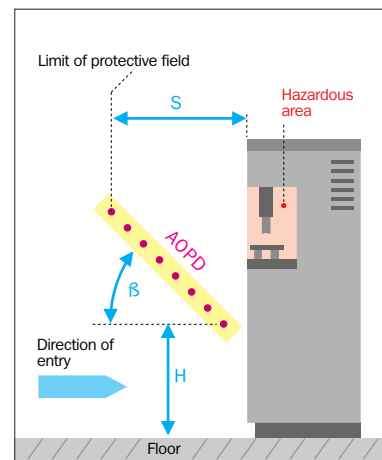
In general, one differentiates between three different approach types



Perpendicular approach/perpendicular entry into the protective field plane



Parallel approach/parallel entry into the protective field plane



Angular approach

The following table contains the formulae for calculating the safety distance **S**

Special examples can be found beginning on page A-42

Approach	Detection capability (resolution)	Minimum safety distance (mm)	Comments/notes										
perpendicular β = 90° (±5°)	d = ≤ 40 mm	S = 2000T + 8(d – 14) S must not be < 100 mm	NB: To prevent bypassing the AOPD, use EN 294. In practice this standard cannot always be applied because it considers the hand can be manipulated. In this case it is necessary to seek advice from the relevant authorities. Height of the bottom beam ≤ 300 mm Height of the uppermost beam ≥ 900 mm <table><tr><td>Number of beams</td><td>Recommended heights</td></tr><tr><td>4</td><td>300, 600, 900, 1200 mm</td></tr><tr><td>3</td><td>300, 700, 1100 mm</td></tr><tr><td>2</td><td>400, 900 mm</td></tr><tr><td>1</td><td>750 mm</td></tr></table>	Number of beams	Recommended heights	4	300, 600, 900, 1200 mm	3	300, 700, 1100 mm	2	400, 900 mm	1	750 mm
	Number of beams	Recommended heights											
	4	300, 600, 900, 1200 mm											
	3	300, 700, 1100 mm											
	2	400, 900 mm											
1	750 mm												
40 < d ≤ 70 mm	S = 1600T + 850												
d > 70 mm multi-beam	S = 1600T + 850												
single-beam	S = 1600T + 1200												
parallel β = 0° (±5°)	—	S = 1600T + (1200 – 0.4 x H) where 1200 – 0.4 x H > 850 mm	15 x (d – 50) ≤ H ≤ 1000 mm if H ≥ 300 mm, there is a risk of undetected access under the beam to be taken into account, where d ≤ H/15 + 50										
angular 5° < β < 85°	—	where β > 30°, cf. vertical approach where β < 30°, cf. parallel approach S then applies to the furthest beam whose height ≤ 1000 mm.	d ≤ H/15 + 50 is in respect to the lowest beam										

S Minimum distance

H Height

d Resolution

β Angle between detection plane and the direction of entry

T Time

In general, the following errors must be excluded when mounting protective devices:



Reaching over



Reaching under



Reaching under
from a crouched



Standing behind

A

Examples for machine protection

Area protection

It is a condition that

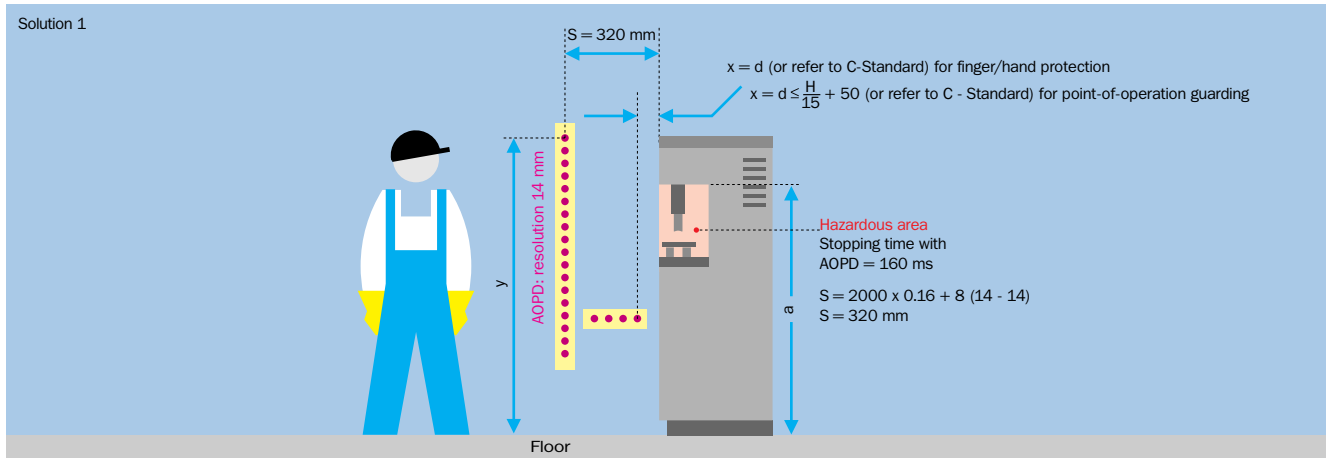
- the machine can only be reached via this access,
- there is a risk of serious injury,
- the operator needs to enter the hazardous area frequently.

Solution 1: Perpendicular approach

Hazardous point protection with point-of-operation guarding

The calculation, as shown in the diagram, yields a safety distance of $s = 320$ mm. By using an AOPD with a higher resolution, this is already a small safety distance. However the dis-

tance must not be less than 100 mm. To ensure that the person is detected anywhere in the hazardous area, two AOPDs are used: a vertical AOPD, positioned at the calculated safety distance (perpendicular approach), and a horizontal AOPD, to eliminate the hazard of standing behind the vertical AOPD.



a = Height of the hazardous area
d = Detection capability (resolution) of the AOPD
S = Safety distance

x = From end of the protective field to the mechanical point-of-operation guarding
y = 1800 mm, if the height of the hazardous area a = 1000 mm (as per EN 294, table 1)

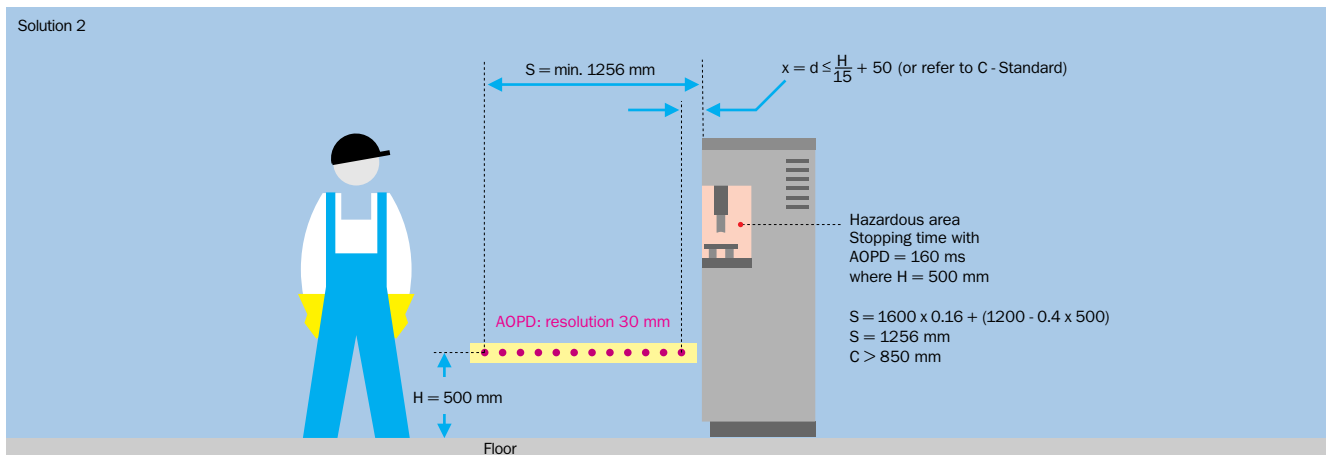
Solution 2: Parallel approach

Hazardous area protection

A horizontal AOPD is used.

The diagram below shows the calculation of the safety distance S and the positioning of the AOPD. If the installation height of the

AOPD is increased to 500 mm, the safety distance is reduced. However, it must still not be possible to access the hazardous area beneath the AOPD. In such cases it is necessary to install an additional protective device based on the risk assessment.



C = Additional distance in millimetres that defines the intrusion into the hazardous area before the protective device is triggered
d = Detection capability (resolution) of the AOPD
H = Installation height

S = Safety distance
x = From end of the protective field to the mechanical point-of-operation guarding

Result

The table below shows the results of these two solutions.
Operative requirements determine which of the two solutions is chosen.

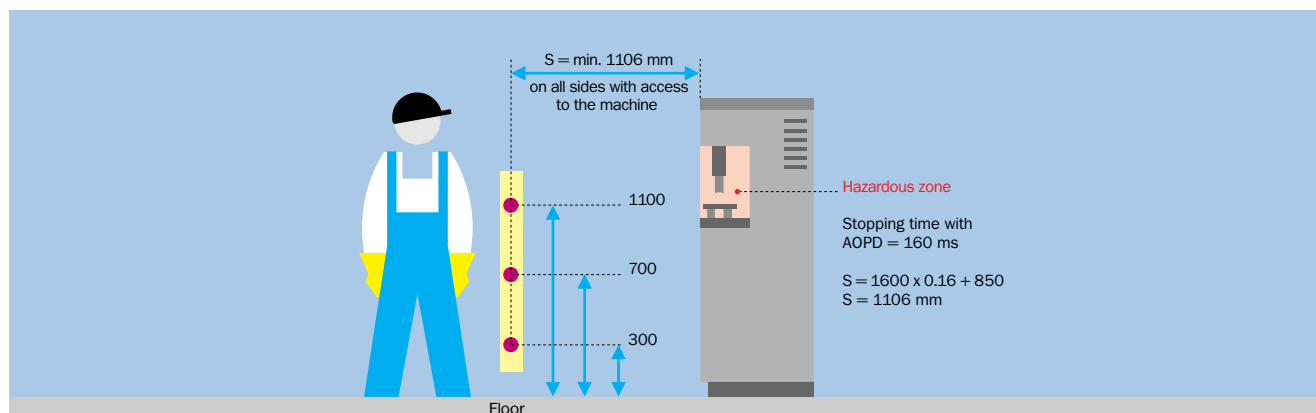
	Advantages	Disadvantages
Solution 1 S = 320 mm	<ul style="list-style-type: none"> Greater productivity, as the operator is closer The short distance between the vertical photoelectric switch and the hazardous area makes it possible to store material near the machine (short distances) 	<ul style="list-style-type: none"> Higher price for the protective device
Solution 2 S = 1256 mm	<ul style="list-style-type: none"> Lower price for the protective device Enables access to be protected independently of the height of the hazardous area 	<ul style="list-style-type: none"> The operator is much further away (long distances) It is difficult to store products on the floor, as the AOPD takes up a large amount of the space Lower productivity

Access protection

Access protection with 3 beams (at heights of 300 mm, 700 mm and 1100 mm) allows perpendicular approach, as described in the chapter "Calculation of the safety distance" (→ Page A-40). This solution permits the operator to stand between the hazardous area and the AOPD without detection. For this reason, additional safety measures must be taken to

reduce this risk. The control mechanism (e.g. reset button) must be positioned such that the entire hazardous area can be seen. It must not be possible to reach the button from the hazardous area.

Note: The control switch can have several functions.



H = Installation height

S = Safety distance

Press internal protection

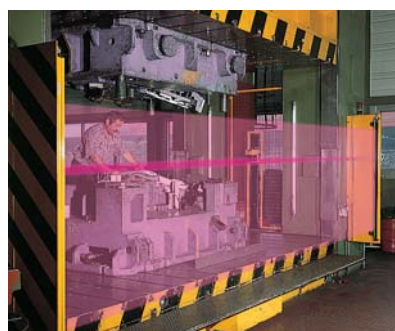
This type of protection is recommended for large presses that are accessible from the floor. In this special case, it is necessary to prevent the press starting while the operator is in the interior. This is a secondary protective device that under no circumstances can take over the function of the primary protection, for which an appropriate device is used (AOPD or two-hand control).

In this special case: The safety distance for the primary protective device with the task of stopping the press must be calculated while the secondary protective device detects the presence of a person in the press, and thus prevents the press starting up.



Spotting press

Hazardous point protection with safety light curtain (AOPD) and interior monitoring with safety laser scanner (AOPDR). Both sensors are activated on start-up. Then the SICK laser scanner is muted during the downward stroke.



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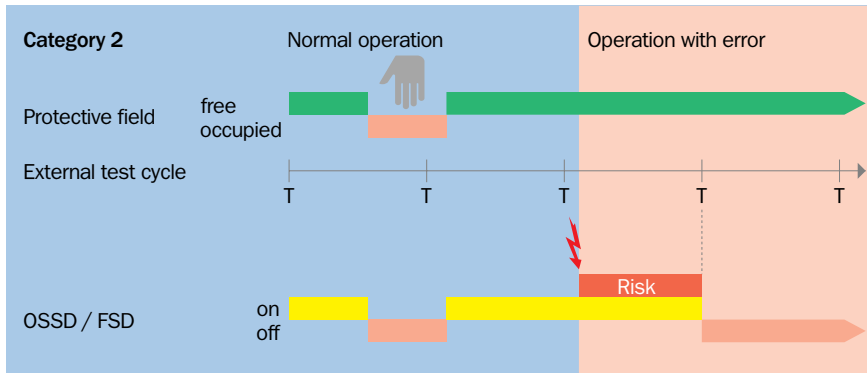
Connection to the controller

Machine interface

It is imperative that each protective device is correctly integrated in the machine control. This means that the part of the machine control responsible for safety (protective device, machine control and main stop elements) must meet the category that was found during the risk assessment as per EN 1050 and EN 954-1. The following figures explain the categories

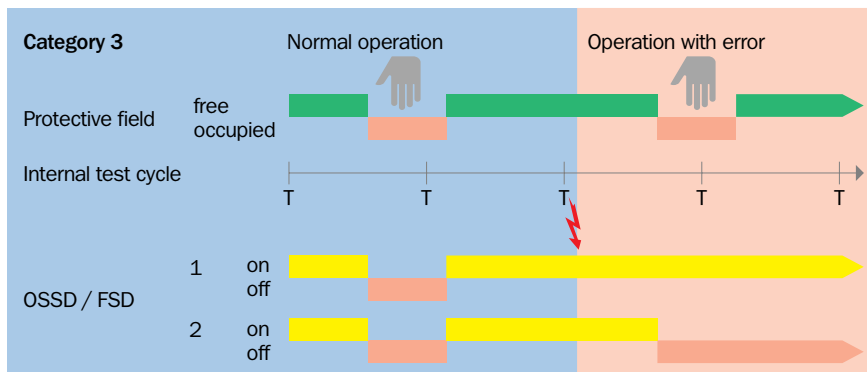
according to EN 954-1 that are suitable for an AOPD and the control. This risk assessment applies to the entire system including stopping elements.

If a protective device is activated under normal operating conditions, e.g. on interruption of the protective field, the machine is always stopped (independent of the category). The various categories differ in the detection of faults.



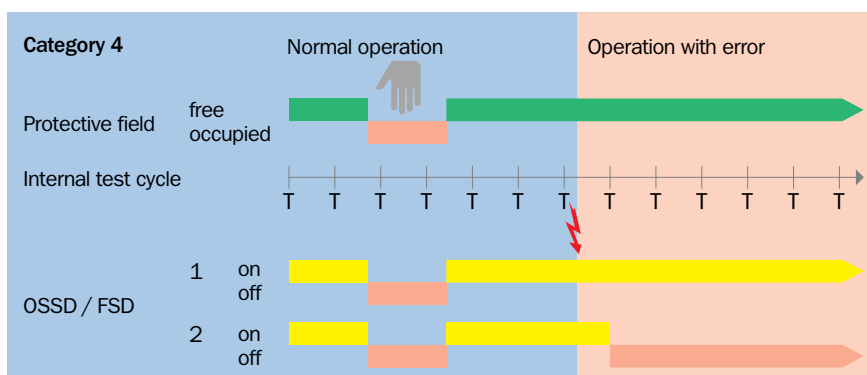
Category 2

Faults are detected during a check by the external test. In the period between the occurrence of the fault and the next test there is a risk.



Category 3

The fault is detected either when the hand enters the protective field or by internal checking.



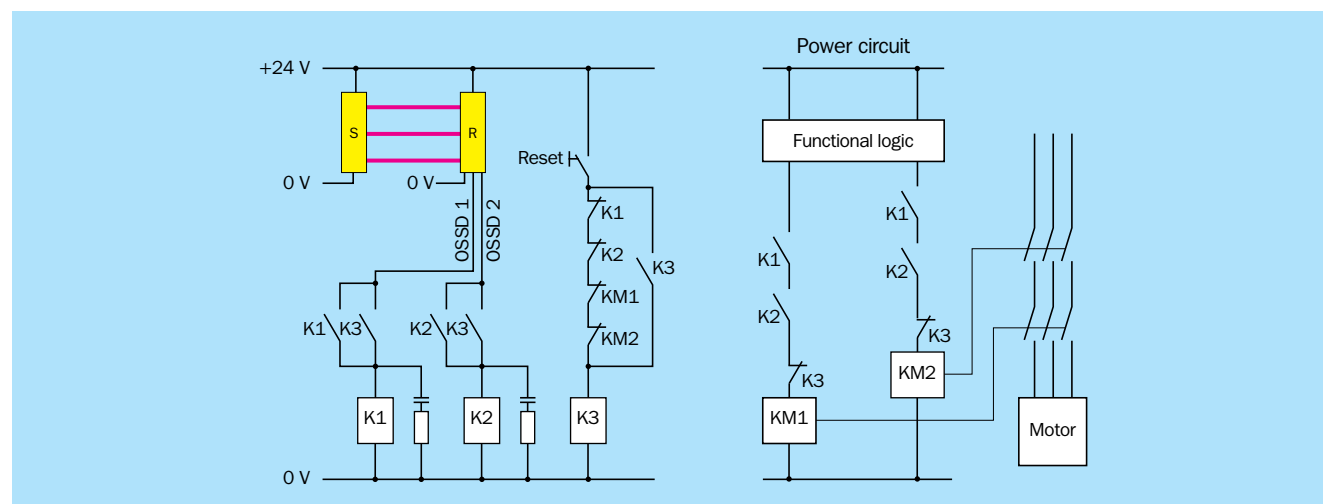
Category 4

The protective function is retained despite the fault. Unlike category 3, second and third faults must not result in the loss of the protective function if the first fault is not detected. Internal tests must be within the response time of the protective device.

Connection example for a protective device ESPE type 4 according to IEC 61496

With external reset

The figure shows a simple machine on which the AOPD reset function can also start the machine.



K1/K2 = FSD1/FSD2, KM1/KM2 = MPCE1/MPCE2

K1, K2 and K3 are the auxiliary contactors. KM1 and KM2 are main contactors. All contactors are positively driven. In this case the entire protective system has a redundant (dual-channel) design

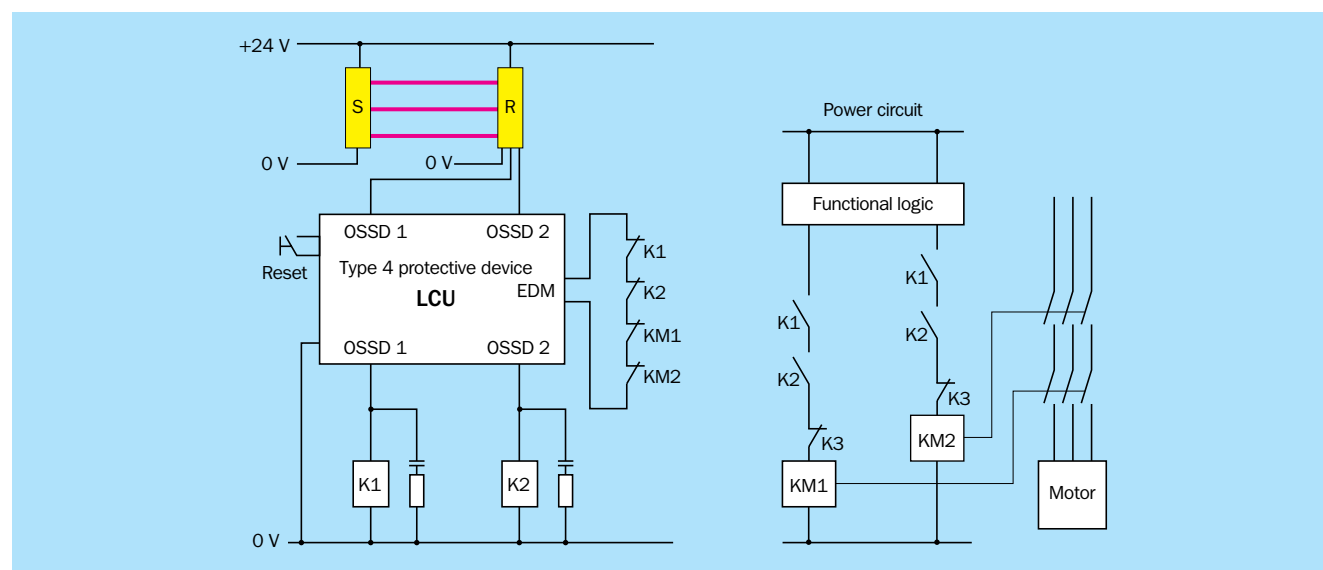
- The protective device (OSSDs)
- The auxiliary circuit (FSDs)
- The main circuit (MPCEs)

The contactors K1/K2 are monitored via K3. If one of the normally open contacts K1 or K2 “sticks”, its partner, the normally closed contact cannot close. As a consequence, the coil of K3 cannot be energised and therefore the contactors K1 and K2 can no longer be operated. The control circuit therefore remains open.

With internal reset

Another connection example of a protective device type 4 AOPD according to IEC 61496 with restart interlock and external device monitoring. Reset and external device monitoring are

dynamically monitored by the SICK protective device. Feature of this connection: reduced installation effort.



K1/K2 = FSD1/FSD2, KM1/KM2 = MPCE1/MPCE2

→ You will find further examples in the SICK connection diagrams handbook at www.sick.com

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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. EN 61496)

Further information can be found e.g. in EN 692.

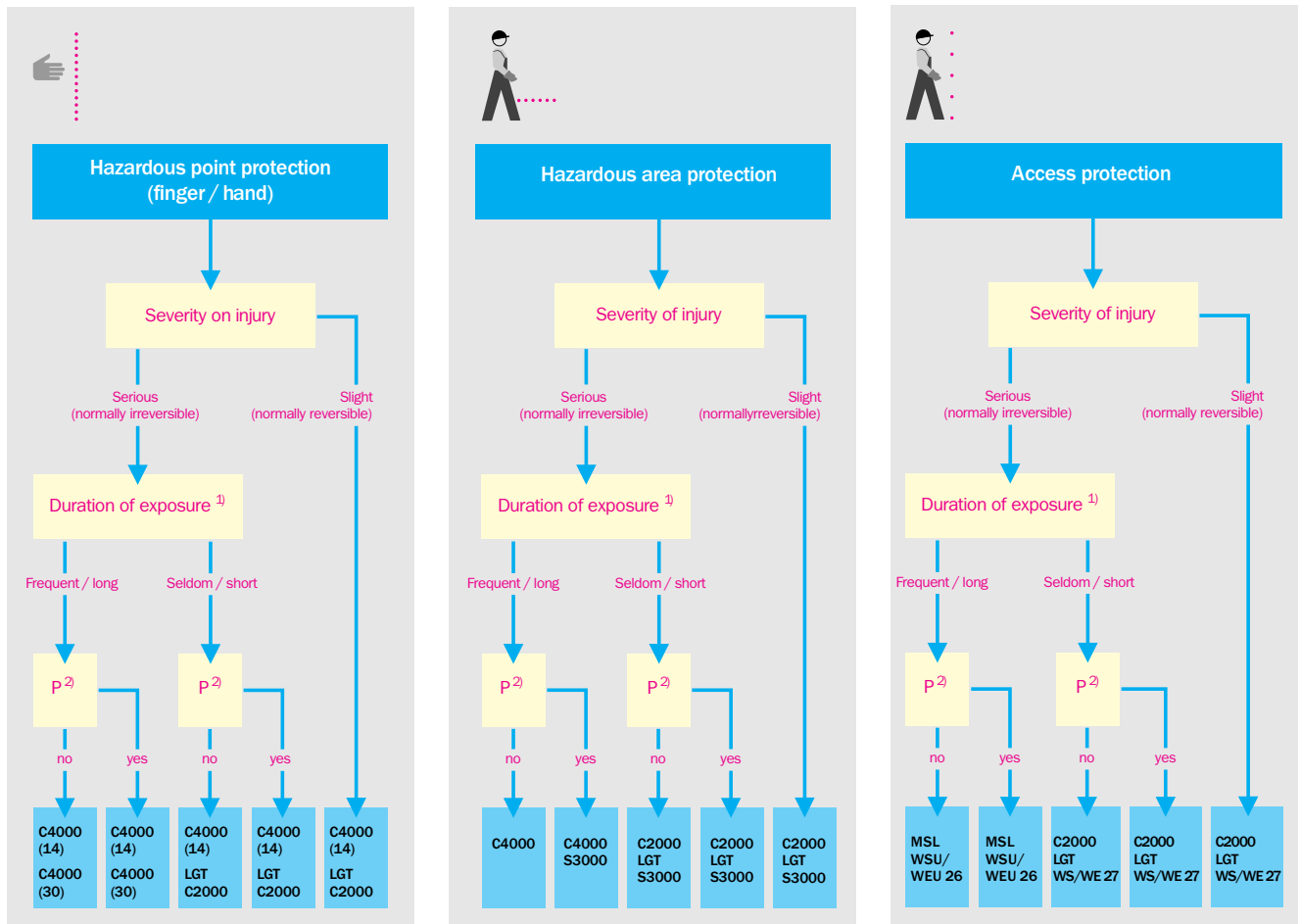
Nevertheless, it is necessary to check that the operator cannot be placed at risk during the working process. This situation limits use to small machines on which the hazardous area cannot be entered and there is point-of-operation protection (cf. the illustrations below).

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. EN 999, EN 692, EN 693).

Choosing a SICK protective device

→ Selection as per the risk analysis and chapter “Choosing an opto-electronic protective device” from page A-36



¹⁾ The duration of the exposure to the hazard (frequency/duration)
The expected duration of direct exposure must include the access frequency.

²⁾ Possibility of avoiding the hazard
Yes: means that the operator can avoid the hazard.

Note:

If there is a risk of irreversible injuries, we recommend using an AOPD of at least ESPE type 3 in accordance with IEC 61496.

Guards

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Requirements placed on guards are per the following standards:

- EN 12100 “Safety of machinery — Basic concepts, general principles for design”
- EN 953 “Safety of machinery. Guards. General requirements for the design and construction of fixed and movable guards”

General requirements

- Guards must be designed to be adequately robust and durable to ensure that they withstand the environmental conditions to be expected during operation. These properties must be retained during the entire period of use of the machines
- They must not cause any additional hazards
- It must not be possible to easily bypass the guards or render them ineffective
- The guards must be an adequate distance from the hazardous area if they have openings (see EN 294). This requirement also applies to openings in guards as well as between guard and machine frame, clamping plates, etc.
- Guards must not restrict observation of the working process more than necessary, insofar that observation is necessary
- Guards must be firmly held in place
- They must be retained either by systems that can only be opened with tools, or they must be interlocked with the dangerous movement
- As far as possible, they should not remain in the protective position if the fastening is undone

Ergonomic criteria

Ergonomic aspects are also significant during the design of guards. Guards will only be accepted by employees if they do not hinder setup, maintenance and other similar activities any more than necessary.

The following aspects affect the use of a guard:

- Easy opening and closing, lifting or moving
- Single-handed opening, closing, lifting and moving of the guard
- Handle to suit function
- Opened guards must allow convenient access
- Opened guards must be secured against slamming shut if slamming shut could cause injuries. Measures against slamming shut could, for example, be:
 - Guards with counterweight
 - Gas struts or helical springs
 - Locking devices that automatically keep the guards open

Fixed guards and interlocked guards

Guards that are not removed or opened very often or are only removed or opened for maintenance work — provided they are not interlocked with the dangerous movement — must be fastened to the machine such that they can only be undone with tools. Their removal must involve a dismantling process for which tools are required (see also supplementary measures in the related C-type standards).

Guards that are opened frequently, or for setup, must be interlocked with the dangerous movement such that after opening or removing the guard, dangerous movements come to a standstill in good time.

Guards are opened “frequently” if, for example, employees must open them at least once per shift.

Locks are necessary if hazards are to be expected on opening guards (e.g. very long run-down).

Guards in accordance with EN 12100 and EN 953		
Fixed	Movable	
Fences/barriers	Flaps, gates and doors	
Only to be removed with tools or electrically interlocked	With locking device	Without locking device EN 999 EN 954
EN 947-5-1 EN 1088	EN 947-5-1 EN 1088	

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Position switches with personnel protective function

For the interlocking of a guard, the position switches with a personnel protection function (safety limit switches) must meet special requirements (EN 60204-1, EN 1088 and EN 60947-5-1 “Control circuit devices and switching elements; electromechanical control circuit devices”).

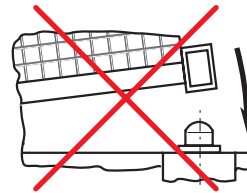
- Their placement and design must protect them against inadvertent operation, changes in position and damage: The switch and the control cam must be secured by shape (not force), e.g. using round holes, pins, stops
- They must be protected by their actuation method, or their integration in the control must be such that they cannot be easily bypassed. For this reason, the position switches must have normally closed contacts
- It must be possible to check the switches for correct operation and, if possible, they must be easily accessible for inspection
- The switches must not be used as a mechanical stop
- The position switches must be fitted such that they are protected against damage due to external effects
- The actuation stroke must be set to suit the positive opening travel in accordance with the manufacturer's instructions. The minimum plunger travel defined by the manufacturer must be observed in order to provide the necessary switching distance for the positive opening

Design of guards

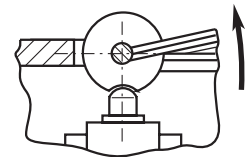
Interlocking with and without locking device

Interlocks establish a direct dependency between the function of the movable guards and the dangerous machine movements. Guards that are frequently removed or opened, or are removed or opened for setup, must be interlocked with the dangerous movement.

It must not be possible to manipulate the interlock using simple means. Simple means are, for instance: screws, needles, sheets of metal, coins, bent wire.



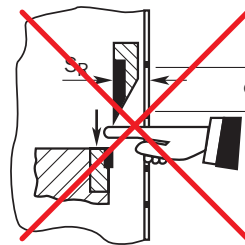
easy to manipulate



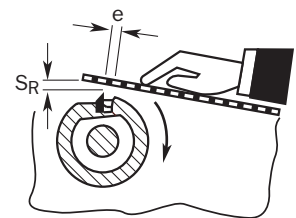
cannot be manipulated

Protection against reaching through

The dimensions of the guards are to take into account the physical size of the hazardous point and the size of the human body. The permissible mesh spacing on wire grilles depends on the distance of the protective grille from the hazardous point. The greater the gap, the farther the guard must be from the hazardous point (EN 294).



EN 294 not observed



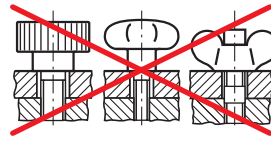
EN 294 observed

Correct fastening

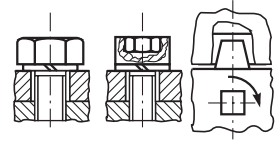
Guards that are only opened for maintenance work must be fastened such that they can only be undone with tools (e.g. spanner, screwdriver, key). Fastening elements must be designed such that they cannot be lost.

Quick-release joints, screw knobs, knurled screw and wing bolts are not permitted!

The guard should not remain in the protective position after the fastenings have been undone.



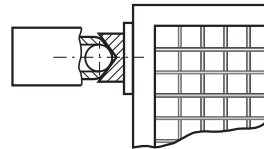
not permitted



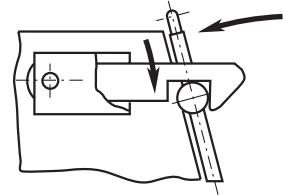
permitted

Stopping at the end position

As far as feasible, movable guards must be joined to the machine such that they can be securely held in the open position by hinges, guides, etc. Shaped mountings are to be preferred. Friction mountings (e.g. ball joints) are not recommended due to their diminishing effectiveness (wear).



permitted



better

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The key regulations and standards for the export of machines and systems to the USA are listed here.

This brief summary cannot replace detailed consideration of the national regulations/directives and standards.

To provide a consistent illustration of the process for the selection of a protective device, we have included repetitions from the EU part.

Regulations, directives, objectives and procedures

Health and safety in the workplace has been a serious topic in the United States for more than 30 years. In 1970, the United States Congress recognized that “personal injuries and illnesses arising out of work situations imposed a substantial burden upon, and were a hindrance to, interstate commerce in terms of lost production, wage loss, medical expenses and disability compensation payments.” (Occupational Safety and Health Act (OSHA) of 1970, section 2 (a)).

Based on these issues and others, Congress passed the Occupational Safety and

Health Act of 1970. This act encourages “employers and employees efforts to reduce the number of occupational safety and health hazards at their places of employment, and to stimulate employers and employees to institute new and to perfect existing programs for providing safe and healthy working conditions.” (OSHA Act of 1970, Section 2 (b) (1)).

As part of the OSHA Act of 1970, Congress established the Occupational Safety and Health Administration (OSHA) to enforce worker safety regulations associated with the Act.

OSHA Regulations and U.S. Consensus Standards

Worker safety regulations in the United States are enforced through the Occupational Safety and Health Administration (OSHA). The United States Congress, through the Occupational Safety and Health Act, established OSHA on December 29, 1970.

The goal of this act was to assure safe and healthy working conditions for working men and women by:

- Authorizing enforcement of the requirements developed under the Act
- By assisting and encouraging the States in their efforts to assure safe and healthy working conditions
- By providing for research, information, education and training in the field of occupational safety and health.

Occupational and Health Standards in the United States are defined in Title 29 of the Code of Federal Regulations Part 1910, which is broken down into a number of subparts. Subpart O deals specifically with Machinery and Machine Guarding and defines general requirements for all machines as well as requirements for certain specific types of machinery. A breakdown is presented in the following table. Selected passages of these subpart sections appear in the appendix at the end of this Safety Engineering section.

Title 29 of the U.S. Code of Federal Regulations, Part 1910, Subpart O

- | |
|--|
| ■ 1910.211 – Definitions |
| ■ 1910.212 – General requirements for all machines |
| ■ 1910.213 – Woodworking machinery requirements |
| ■ 1910.214 – Cooperage machinery |
| ■ 1910.215 – Abrasive wheel machinery |
| ■ 1910.216 – Mills and calenders in the rubber and plastics industries |
| ■ 1910.217 – Mechanical presses |
| ■ 1910.218 – Forging machines |
| ■ 1910.219 – Mechanical power transmission apparatus |

National standards

In addition, Section 18 of the OSHA Act of 1970, OSHA also encourages the States to develop and operate their own job safety and health programs. The following States have approved State Plans:

▪ Alaska	▪ New Mexico
▪ Arizona	▪ New York ¹⁾
▪ California	▪ North Carolina
▪ Connecticut ¹⁾	▪ Oregon
▪ Hawaii	▪ Puerto Rico
▪ Indiana	▪ South Carolina
▪ Iowa	▪ Tennessee
▪ Kentucky	▪ Utah
▪ Maryland	▪ Vermont
▪ Michigan	▪ Virgin Islands
▪ Minnesota	▪ Virginia
▪ Nevada	▪ Washington
▪ New Jersey ¹⁾	▪ Wyoming

¹⁾ The Connecticut, New Jersey and New York State Plans cover public sector (State and Local Government) employment only.

OSHA provides contact information and an OSHA profile for each of these State Plans which may include additional regulations. This information may be obtained at OSHA's internet web-site at:

→ www.osha-slc.gov/fso/osp

or

→ www.osha.gov/index.html

In addition to the referenced OSHA Standards above, OSHA also may enforce National Consensus Standards as though they are OSHA standards. The term "national consensus standard" means any occupational safety and health standard or modification thereof, which

1. has been adopted and promulgated by a nationally recognized, standards-producing organization under procedures whereby it can be determined by the Secretary of Labor that persons interested and affected by the scope or provisions of the standard have reached substantial agreement on its adoption;
2. was formulated in a manner which afforded an opportunity for diverse views to be considered;
3. has been designated as such a standard by the Secretary of Labor, after consultation with other appropriate Federal agencies; and
4. by an international standard that covers a subject which is not covered by a standard in the United States.

Selection of important ANSI standards

It is important to note that OSHA utilizes these national consensus standards to further define machine safeguarding requirements in addition to Subpart O.

For instance, in 1910.212(a)(3)(ii), the following statement is made:

"The point of operation of machines whose operation exposes an operator to injury, shall be guarded. The protective device shall be in conformity with any appropriate standards, or, in the absence of applicable specific standards, shall be so designed and constructed as to prevent the operator from having any part of his body in the danger zone during the operating cycle."

"Any appropriate standards" refers to national consensus standards that are generally accepted in industry. Where possible, OSHA promulgates these national consensus standards and

established federal standards as safety standards. The American National Standards Institute (ANSI), The National Fire Protection Agency (NFPA) and in some instances Underwriters Laboratories (UL) are national consensus standards bodies that are frequently referenced by OSHA.

Agencies recognized by OSHA as national consensus standards bodies include the National Fire Protection Agency (NFPA) and the American National Standards Institute (ANSI).

A summary of important ANSI and other safety standards is presented in the tables that follow.

Consult local, state and federal regulations for any additional requirements that may apply to your specific application.

A selection of important standards related to machinery and machine safety are presented in the table below:

Summary of important National Consensus Standards for safety at work

ANSI B11.1	Mechanical Power Presses – Safety Requirements for Construction, Care and Use
ANSI B11.2	Hydraulic Power Presses – Safety Requirements for Construction, Care and Use
ANSI B11.3	Power Press Brakes – Safety Requirements for Construction, Care and Use
ANSI B11.4	Machine Tools – Shears – Safety Requirements for Construction, Care and Use
ANSI B11.5	Machine Tools – Iron Workers – Safety Requirements for Construction, Care and Use
ANSI B11.6	Lathes – Safety Requirements for Construction, Care and Use
ANSI B11.7	Cold Headers and Cold Formers – Safety Requirements for Construction, Care and Use
ANSI B11.8	Drilling, Milling and Boring Machines – Safety Requirements for Construction, Care and Use
ANSI B11.9	Grinding Machines – Safety Requirements for Construction, Care and Use
ANSI B11.10	Metal Sawing Machines – Safety Requirements for Construction, Care and Use
ANSI B11.11	Gear-Cutting Machines – Safety Requirements for Construction, Care and Use

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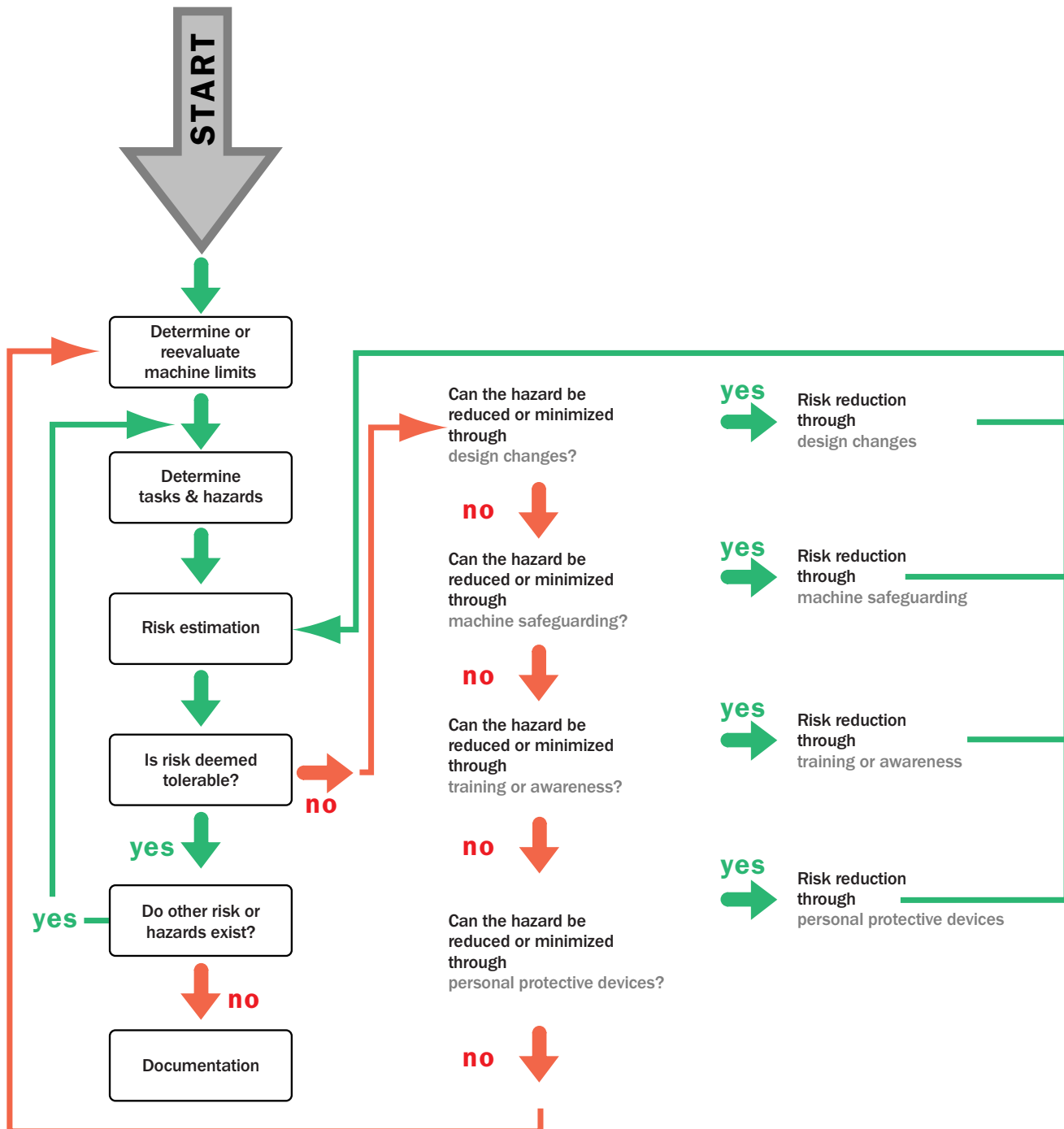
ANSI B11.12	Machine Tools — Roll-Forming and Roll-Bending Machines — Safety Requirements for Construction, Care and Use
ANSI B11.13	Machine Tools — Single- and Multiple-Spindle Automatic Bar and Chucking Machines — Safety Requirements for Construction, Care and Use
ANSI B11.14	Machine Tools — Coil-Slitting Machines — Safety Requirements for Construction, Care and Use
ANSI B11.15	Pipe, Tube and Shape-Bending Machines — Safety Requirements for Construction, Care and Use
ANSI B11.16	Metal Powder Compacting Presses — Safety Requirements for Construction, Care and Use
ANSI B11.17	Machine Tools — Horizontal Hydraulic Extrusion Presses — Safety Requirements for the Construction, Care and Use
ANSI B11.18	Machine Tools — Machines and Machinery Systems for Processing Strip, Sheet or Plate from Coiled Configuration — Requirements for Construction, Care and Use
ANSI B11.19	Performance Criteria for the Design, Construction, Care and Operation of Safeguarding When Referenced by Other B11 Machine Tool Safety Standards.
ANSI B11.20	Machine Tools — Manufacturing Systems / Cells — Safety Requirements for Construction, Care and Use
ANSI B11.21	Machine Tools using Lasers for Processing Materials — Safety Requirements for Construction, Care and Use
ANSI B11 TR.1	Ergonomic Guidelines for the Design, Installation and Use of Machine Tools
ANSI B11 TR.2	Mist Control on Machines Using Metal Working Fluids
ANSI B151.27	Safety Requirements for Robots Used with Horizontal Injection Molding Machines
ANSI B56.5	Safety Standard for Guided Industrial Vehicles and Automated Functions of Manned Industrial Vehicles
ANSI R15.06	Safety Requirements for Robots and Robot Systems
ANSI B65.1	Safety Standards for Printing Press Systems
The National Fire Protection Agency (NFPA)	
NFPA 70E	Electrical Safety Requirements for Employee Workplaces
Other National Consensus Standards	
ASME B15.1	Safety Standards for Mechanical Power Transmission Apparatus
Underwriters Labs (UL)	
UL508	Industrial Control Equipment

NOTE: This list of standards is not comprehensive, but rather a sampling of the more common machine safeguarding standards. Consult ANSI or other national consensus standards bodies for a complete listing.

Choosing protective devices

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Risk analysis process



During the design of a machine, the possible risks must be analyzed and, where necessary, additional protective devices fitted to protect the operator from existing residual risks (crushing, cutting, pulling, impacts, stabbing, penetration, vibration, grazing, etc.), cf. Title 29 U.S. Code of Federal Regulations, Part 1910 Subpart O, European standards EN 292 (ISO 12100) and EN 1050 (ISO 14121)

The flow diagram given above shows a method for deciding whether it is advisable to use a safeguarding device.

The remainder of this section is based on the assumption that some risks cannot be eliminated, and that it may be necessary to use an additional protective device.

A Why opto-electronic protective devices?

This section is based on the fact that some risks cannot be eliminated through design, and that it is necessary to use a protective device.

If an operator must often make interact with a machine and during this process is exposed to a hazard, it is advisable to fit a protective device to prevent exposing the operator to the dangerous machine movement.

When installed properly, a protective device prevents or detects entry into a hazardous area. When an entry is detected the protective device, in conjunction with the machine control system, prevents the initiation of hazardous motion or initiates an immediate stop of the machine, thus eliminating the existence of the hazard.

Opto-electronic protective devices are often preferred to other mechanical protective devices such as fixed guarding, two-hand controls and barrier devices due to the following advantages:

- Reduction of access time
The operator no longer has to wait for a guard to open.
- Increased productivity
The operator saves time in loading the machine.
- Improved ergonomics
Repetitive motion is minimized and perhaps eliminated.
- Protects other individuals
Some protective device(s) protect the operator, but provide little or no protection for other individuals who may be in or near the hazardous area.

Choosing an opto-electronic protective device

Once the decision is made to utilize an opto-electronic protective device, the next step in the process is the selection of a specific device. The principle criteria for choosing an opto-electronic

protective device are defined in the following four steps. Each step is interdependent and calls for an iterative approach.

Warning:

An opto-electronic protective device can only be used if the operator is not exposed to any risk of injury from splashing material (e.g. molten material) or flying pieces of material. Also, the access time must be greater than the time required to stop the hazard.

Step 1: Definition of the protective field

The first step in choosing which opto-electronic protective device is to define and assess the risks associated with the machine.

Depending on the installation and configuration, it is necessary to take the following points into consideration:

- The size of the protective field
- The different access points
- The accessible hazardous areas
- The risk of bypassing the protective device and of the undetected presence of people in the hazardous area

Step 2: Definition of the function to be performed

In the second step it is to be defined which function is to be provided by the protective device.

Protective function Nr. 1: Hazardous point protection

Hazardous point protection is safeguarding which occurs in close proximity to a machine tool where material is positioned and a process is performed. This safeguarding function is meant to detect a finger or hand entering a defined area, during a hazardous motion of the machine.

The primary functions of protective devices generally include, but are not limited to, the following:

- Remove the hazard before the hazardous point is reached
- Prevent unintentional machine starts

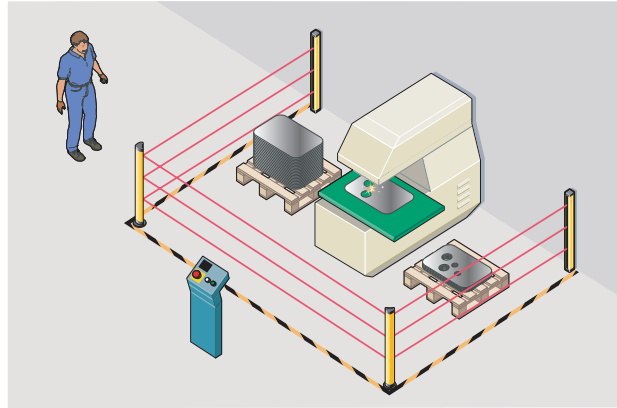


Protective function Nr. 2: Access protection/Entry-Exit protection

The access protection or entry-exit protection is used to detect the intrusion of an arm or a body in an area.

As soon as an intrusion is detected, the dangerous machine movement is stopped.

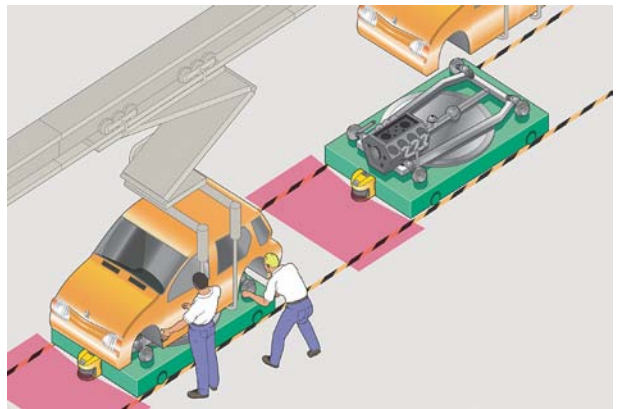
An additional requirement of this safeguarding function is that the operator is required to have a full view of the hazardous area at the control station. The control station, including the ability to restart the machine, must be located well outside of the hazardous area. (The start of the machine shall not be possible from inside of the hazardous area.) In addition, the operator must verify that no person is inside the hazardous area before restarting the machine.

**Protective function Nr. 3: Area protection**

The function of area protection is similar to access protection with the added function of sensing the presence of personnel inside the hazardous area. This type of safeguarding is suitable for machines where hazardous zones enclosed by fixed guarding are not visible from the control point.

It is also suitable for guarding the approaches to a hazardous zone where it combines perimeter and presence sensing safeguarding (permanent detection of personnel throughout the zone).

Such guarding is also suitable for automated guided vehicles (AGV) to protect operators during vehicle movement.

**Step 3: Compliance with category of the safety-related parts of the machine control system**

Several standards address the methods of assessing and estimating risks associated with the tasks and hazards of a machine [see EN 954 (ISO 13849), EN 1050 (ISO 14121, ANSI/RIA R15.06 and others)]. A review of EN 954 and EN 1050 is presented (see table on the following page).

While the essential requirements of the directive are aimed at a high level of safety, the resources must still be proportional to the risk produced.

The protection of an operator who inserts parts in a metal press and removes parts from the press requires a different viewpoint compared to the protection of an operator who works on a machine on which the maximum 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 EN 954-1 aids the designer 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 the duration of the exposure to the hazard
- The possible way of preventing the hazard

The behaviour of the safety-related control in case of a failure is defined for each category (B, 1, 2, 3, 4 cf. table page A-56). 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 (Active Opto-electronic Protective Devices) and their interface must comply with the requirement of the category for the safety-related parts of the control under consideration, so that the safety function is ensured (e.g. machine stop and safe stop).

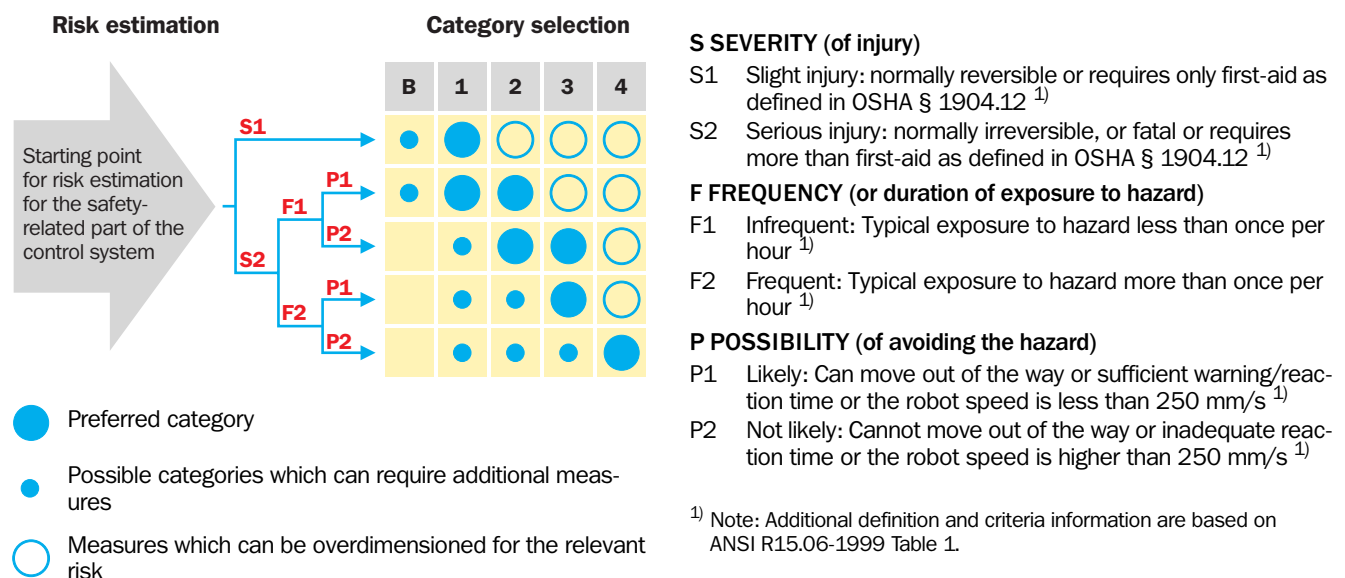
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Categories of the safety related parts of the control system (EN 954-1, ISO 13849 in preparation).

Categories	Concise list of the requirements	System behaviour	Principles for achieving safety
B	The safety-related parts of controls and/or their protective devices as well as their components must be designed, built, assembled and combined in compliance with the applicable standards such that they can withstand the effects expected.	The occurrence of a failure can result in the loss of the safety function.	Predominantly characterised by the selection of components
1	The requirements from B must be met. Proven components and proven safety principles must be used.	The occurrence of a failure can result in the loss of the safety function, but the probability of occurrence is less than in B.	
2	The requirements from B must be met and proven safety principles used. The safety function must be checked at suitable intervals by the machine control.	The occurrence of a failure can result in the loss of the safety function between checks. The loss of the safety function is detected by the check.	Predominantly characterised by the structure
3 ¹⁾	The requirements from B must be met and proven safety principles used. Safety-related parts must be designed such that: <ul style="list-style-type: none"> a single failure in each of these parts does not result in the loss of the safety function and whenever feasible within reasonable limits, the single failure is detected 	When the single failure occurs, the safety function is always retained. Some, but not all failures are detected. Accumulation of undetected failures may lead to loss of the safety function.	
4 ¹⁾	The requirements from B must be met and proven safety principles used. Safety-related parts must be designed such that: <ul style="list-style-type: none"> a single failure in each of these parts does not result in the loss of the safety function and the single failure is detected before the safety function is required or when the safety function is required, or if this detection is not possible, an accumulation of failures must not lead to the loss of the safety function. 	When failures occur, the safety function is always retained. The failures are detected in a timely manner to prevent the loss of the safety function.	

¹⁾ corresponds to Control Reliability

Category selection of the safety-related part of the control system



Step 4: Calculation of the safety distance

The calculation of the minimum safety distance for a protective device is described in the U.S. Code of Federal Regulations, Volume 29 (29CFR), Part 1910, Subpart O entitled "Machine Safeguarding" and in ANSI B11.19-2003, Annex D.

Minimum safety distance required

$$D_s = H_s \times (T_s + T_c + T_r + T_{bm}) + D_{pf}$$

Minimum safety distance required

D_s The minimum distance in inches (or mm) from the hazardous area to the detection point, plan or zone

Hand Speed Constant (approach speed)

H_s A parameter in mm/s or in/s, derived from data on approach speeds of the body or parts of the body. Often 1600 mm/s (63 in/s) is used for H_s

Components of the overall stopping time of the machine

T_s Stopping/run-down time of the machine tool measured at the final control element

T_c Response time of the control system

T_r Response time of the protective device and its interface

T_{bm} Additional response time for the brake monitor

Note: Any additional time delays must be accounted for in this calculation

Penetration factor

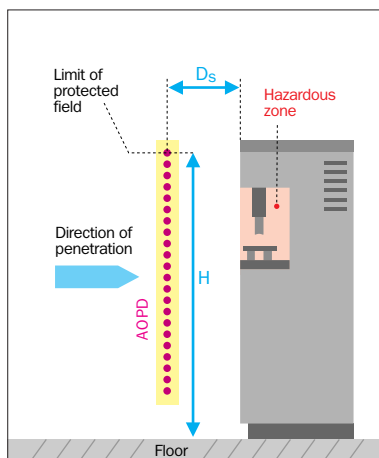
D_{pf} An additional distance added to the overall safety distance required. This value is based on intrusion toward the danger zone prior to actuation of the active opto-electronic protective device (AOPD). Values range from 6 mm to 1220 mm (0.25 in to 48 in) or more depending on application. For example on vertical protection with an opto-electronic protective device with an effective resolution of less than 64 mm (2.5 inches), D_{pf} can be determined approximately using the following formula:
 $D_{pf} \text{ (in)} = 3.4 \times (\text{effective resolution} - 0.276)$, but not less than 0

Users are also directed to refer to specific machine regulations and standards that may apply to their application. Several of these regulations and standards are presented in the appendix of the Safety Engineering section. Any protective device shall be installed in such a way that access to the hazardous zone without the person being detected by the device is impossible.

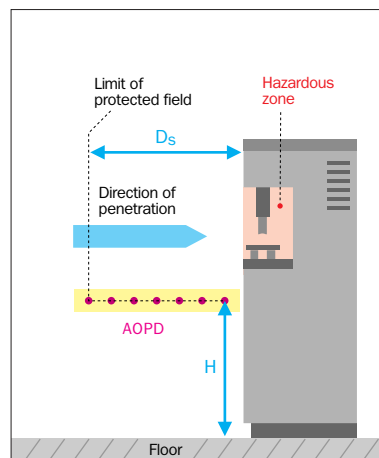
If the minimum safety distance calculated is acceptable from an operational, industrial and ergonomic point of view, one must nevertheless determine whether the installation and the configuration of the protective device is such that personnel has no access to the hazardous zone without being detected by the protective device.

If the minimum safety distance is too large and is unacceptable from an ergonomic point of view, it must be checked whether it is possible to reduce the overall response time of the machine or to increase the object detection capability (resolution) of the protective device.

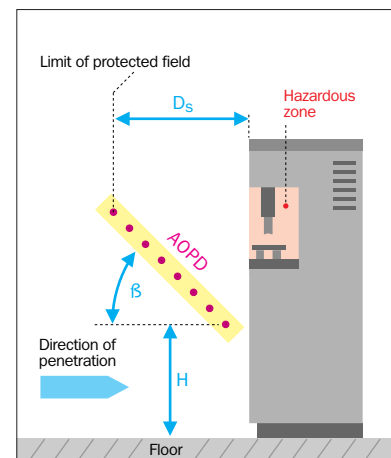
In general a differentiation is made between three different approaches



Perpendicular approach / perpendicular entering of the protective field orientation



Parallel approach/Entry parallel to the protective field orientation



Angular approach

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The following table contains the formulae for the calculation of the safety distance D_s .
You will find examples on the next page.

Approach	Object sensitivity (resolution)	Safety distance	Beam height (distance from floor)
perpendicular $\beta = 90^\circ (\pm 5^\circ)$	$d < 64 \text{ mm (2.5 in)}$	$D_s = H_s \times \sum T_{\text{total}} + D_{\text{pf}}$ where D_{pf} is determined by: $D_{\text{pf}} = 3.4 \cdot (\text{resolution} - 6.875 \text{ mm})$ $D_{\text{pf}} = 3.4 \cdot (\text{resolution} - 0.276 \text{ in})$	Height of the bottom beam $< 300 \text{ mm (12 in)}$ Height of highest beam $\geq 1200 \text{ mm (48 in)}$ ¹⁾
	$64 \text{ (2.5 in)} \leq d < 600 \text{ mm (24 in)}$	$D_{\text{pf}} = 900 \text{ mm (36 in)}$	Height of the bottom beam $< 300 \text{ mm (12 in)}$ Height of highest beam $\geq 1200 \text{ mm (48 in)}$ ¹⁾
	$d > 600 \text{ mm (24 in)}$	$D_{\text{pf}} = 1200 \text{ mm (48 in)}$	Height of the bottom beam $< 300 \text{ mm (12 in)}$ Height of highest beam $\geq 900 \text{ mm (36 in)}$ ¹⁾
parallel $\beta = 0^\circ (\pm 5^\circ)$	—	$D_s = H_s \times \sum T_{\text{total}} + D_{\text{pf}}$ where D_{pf} is determined by: $D_{\text{pf}} = 1200 \text{ mm (48 in)}$	Height of protective field $< 300 \text{ mm (12 in)}$
angular $5^\circ < \beta < 85^\circ$	—	If $\beta \geq 30^\circ$, use the perpendicular approach defined above. If $\beta < 30^\circ$, use the horizontal or parallel approach defined above. The safety distance D_s is based on the beam closest to the hazardous point.	

Per ANSI R15.06-1999

D_s Safety distance

H Height

d Resolution

β Angle between detection plane and the direction of entry

T Time

¹⁾ **Important note:**

Under no circumstance shall it be possible to reach the closest hazardous point. For calculation of the height of detection zone ref. ISO 13852, (EN 294), table 1.

Examples for machine protection

Area protection at an assembly line

This example shows two possible ways of addressing safeguarding needs for a machine with a hazardous point. These methods will take both a vertical approach and a horizontal approach to machine safeguarding into account.

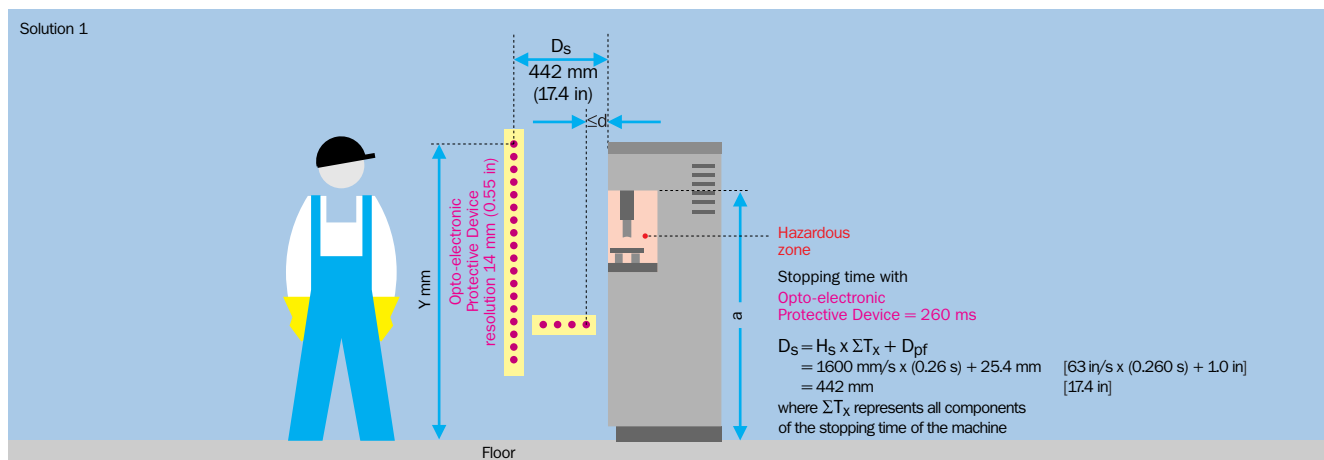
Solution 1: Perpendicular approach, hazardous point protection with area guarding

In the diagram below, a safety light curtain with 14 mm (0.55 in) resolution is mounted vertically to provide point-of-operation safeguarding. A second light curtain segment is mounted horizontally to prevent personnel from being present behind the vertical approach.

It is a condition that

- the machine can only be reached via this access,
- there is a risk of serious injury,
- the operator needs to enter the hazardous area frequently.

It is imperative that the vertical light curtain is mounted in such a way as to prevent personnel from reaching over, under or around the safety light curtain, thus reaching the hazardous point.

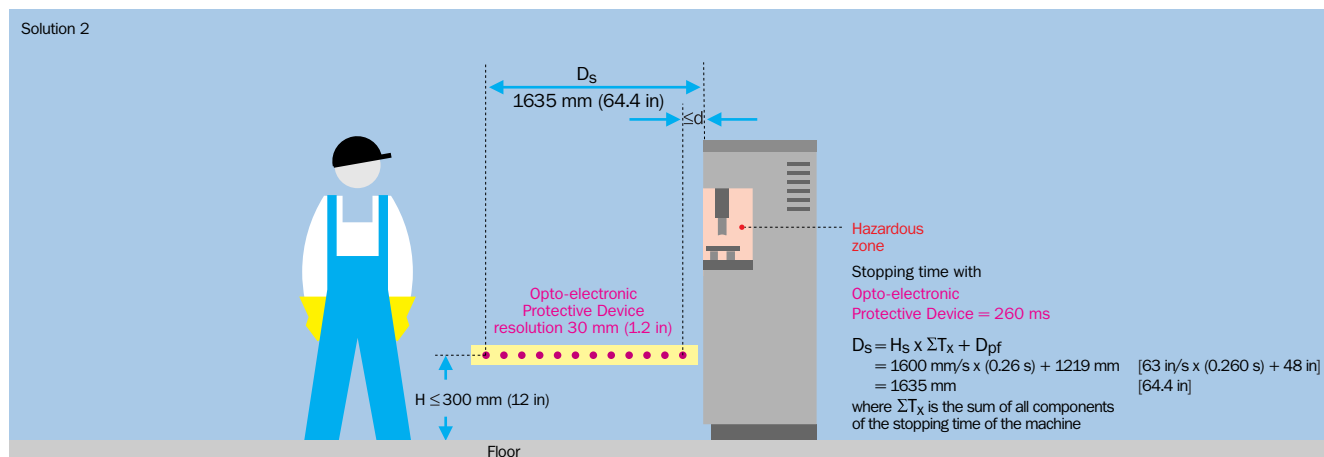


Solution 2: Parallel approach, area protection

In this approach, a horizontal opto-electronic protective device is used.

The diagram below shows the calculation of the safety distance D_s and the positioning of the opto-electronic protective device.

The maximum installation height of the opto-electronic protective device of 300 mm (12 inches) must not be exceeded. If these mounting considerations cannot be met, mechanical means have to prevent a person from entering the hazardous zone undetected by passing under the opto-electronic protective device.



Note:

The resolution of the opto-electronic protective device depends on the height of the detection zone to assure the presence sensing in the hazardous area: $15 \text{ (d - 50 mm)} \leq H_s \leq 1000 \text{ mm}$

Continued on next page

A

Result

The table below shows the results of these two solutions.
Operative requirements make the choice between the two solutions.

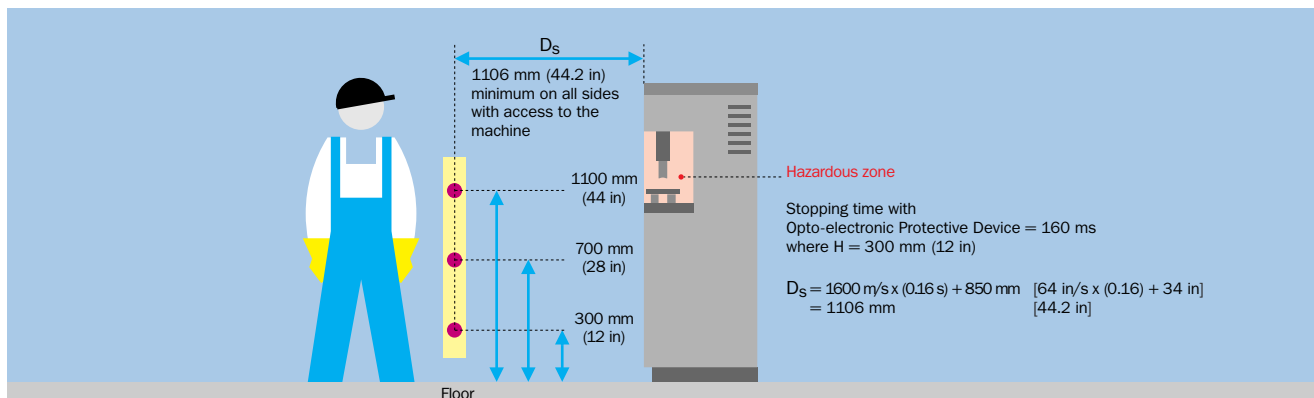
	Advantages	Disadvantages
Solution 1 $D_s = 442 \text{ mm (17.4 in)}$	<ul style="list-style-type: none"> Greater productivity, as the operator is closer The short distance between the vertical photoelectric switch and the hazardous area makes it possible to store material near the machine (short distances) 	<ul style="list-style-type: none"> Higher price for the protective device
Solution 2 $D_s = 1635 \text{ mm (64.4 in)}$	<ul style="list-style-type: none"> Lower price for the protective device Enables the access to be protected independent of the height of the hazardous area 	<ul style="list-style-type: none"> The operator is much further away (long distances) It is difficult to store products on the floor, as the photo-electric switch takes up a large amount of the space Lower productivity

Access protection

Access protection with 3 beams (at heights of 300 mm, 700 mm and 1100 mm) enable perpendicular approach, as described in the chapter “Calculation of the safety distance” (→ Page A-57). This solution permits the operator to be between the hazardous area and the AOPD without detection. For this reason, additional safety measures must be taken to

reduce this risk. The control mechanism (e.g. reset button) must be positioned such that the entire hazardous area can be seen. It must not be possible to reach the button from the hazardous area.

Note: The control switch can have several functions.



H = Installation height

D_s = Safety distance

Guarding the interior of a press

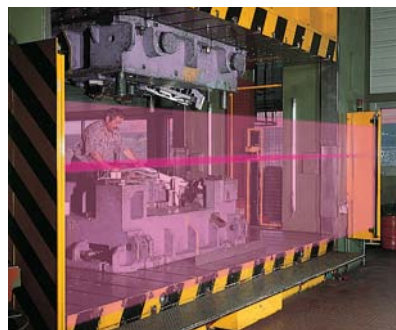
This type of protection is recommended for large presses that are accessible from the floor. In this special case, it is necessary to prevent the press starting while the operator is in the chamber. This is a secondary protective device that under no circumstances can take over the function of the primary protection for which an appropriate device is used (AOPD or two-hand control).

In this special case: The safety distance for the primary protective device (AOPD) with the task of stopping the press must be calculated, while the secondary protective device detects the presence of a person in the press and so prevents the press starting up.



Spotting press

Hazardous point protection with safety light curtain (AOPD) and chamber monitoring with safety laser scanner (AOPDR). Both sensors are activated at the start. Then the SICK laser scanner PLS is muted during the downward stroke.



Connection to the controller

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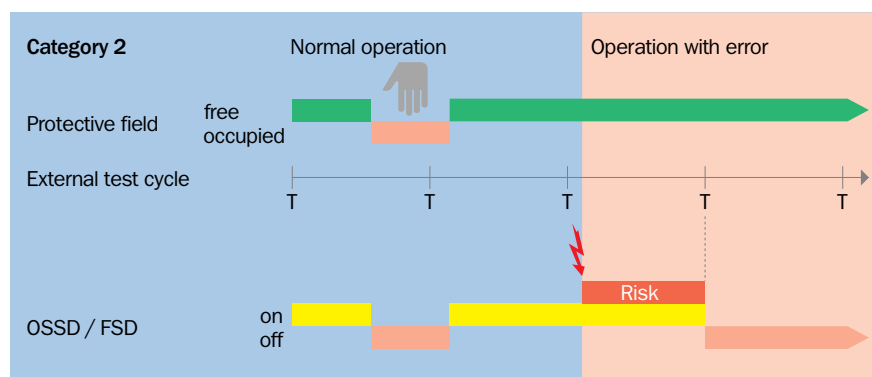
Machine interface

It is imperative that each protective device is correctly integrated in the machine control. This means that the part of the machine control responsible for safety (protective device, machine control and main stop elements) must meet the category (see A-56 and A-63) that was found during the risk assessment as per ANSI / R15.06-99, EN 1050 and EN 954-1. The following figures explain the categories as per EN 954-1 that are suitable for an AOPD and the control. This risk assessment applies to the entire system including stopping elements. It is important to note that the safety "system" is comprised of

more than just the protective device. The control or interface units, as well as any controlling elements, such as a stop valve, must also be taken into account.

If a protective device is activated under normal operating conditions, e.g., on interruption of the protective field, the machine is always stopped (independent of the category). The various categories differ in the detection of failures.

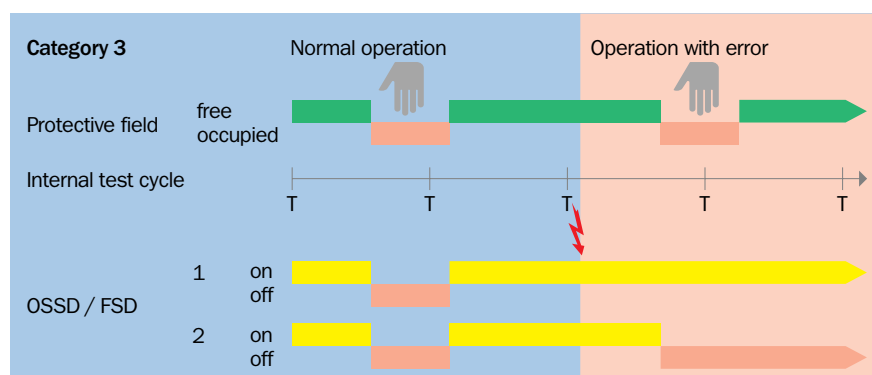
However, if a failure does occur in the protective device, it is dealt with differently, depending on the category of the protective device as defined further in the diagrams below.



Category 2

Loss of protective function between checking intervals possible.

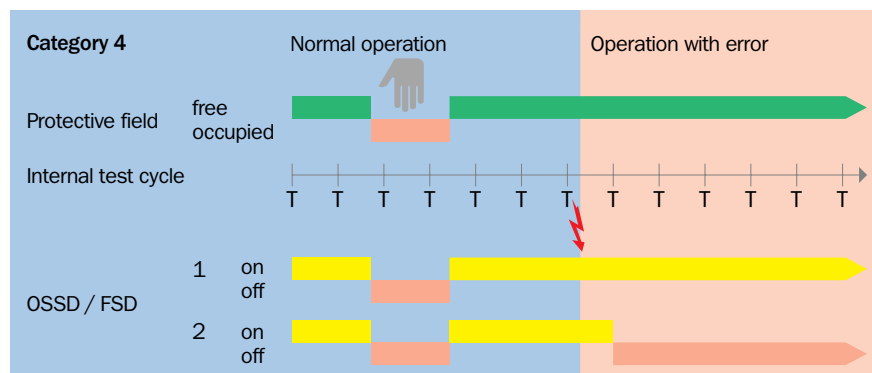
Failures are detected during a check by the external test. In the period between the occurrence of the failure and the next test there is a risk.



Category 3

A single failure assures the protective function as an output signal for stopping can still be generated (e.g., if a hand enters the protective field). The failure is detected either when the hand enters the protective field or by internal checking. Accumulation of failures may lead to loss of the protective function.

The system shall be designed so that a single failure in any of its parts does not lead to the loss of protective functions.



Category 4

A single failure still assures the protective function. In addition to category 3, the protective function must be assured in case of an accumulation of failures. Therefore, internal tests must be within the response time of the protective device.

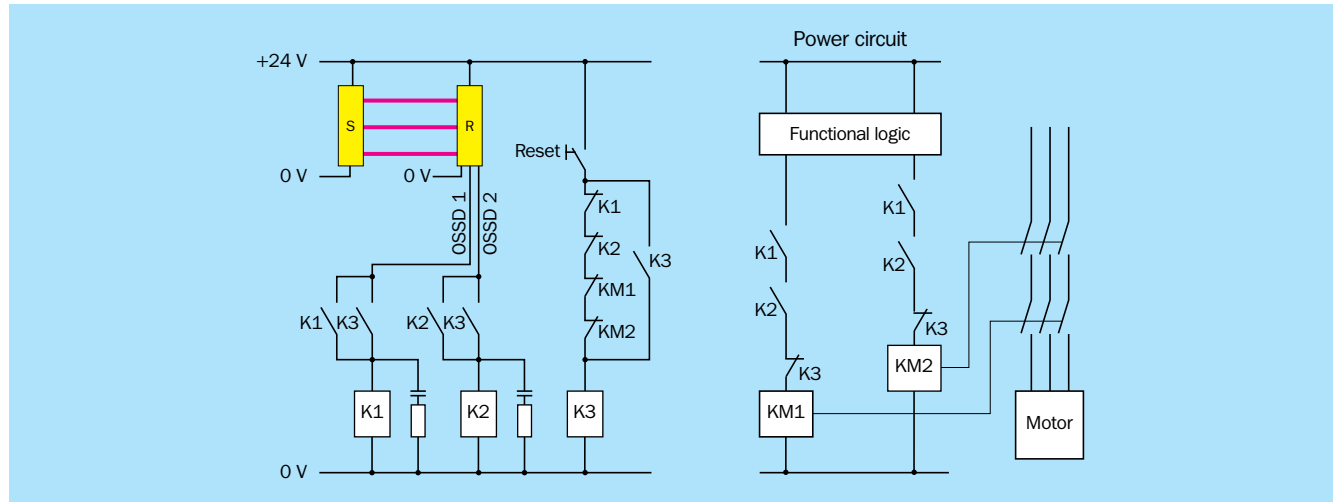
The single failure is detected at or before the next demand on the protective function. If the detection is not possible then an accumulation of failures shall not lead to a loss of the protective function.

A

Connection example for a protective device ESPE type 4 according to IEC 61496

With external Reset

The figure shows a simple machine on which the AOPD reset function can also start the machine.



K1/K2 = FSD1/FSD2, KM1/KM2 = MPCE1/MPCE2

K1, K2 and K3 are the auxiliary contactors. KM1 and KM2 are main contactors. All contactors are positively driven. In this case the entire protective system has a redundant (dual-channel) design

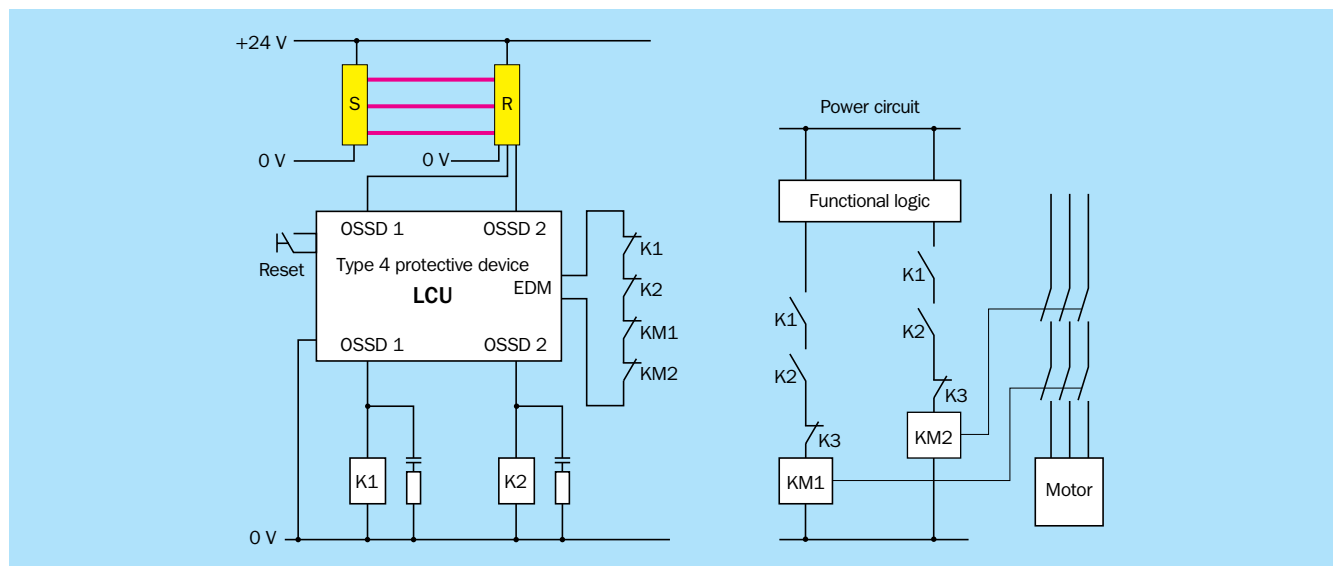
- The protective device (OSSDs)
- The auxiliary circuit (FSDs)
- The main circuit (MPCEs)

The contactors K1/K2 are monitored using K3. If one of the normally open contacts K1 or K2 "sticks", its partner, the normally closed contact cannot close. As a consequence, the coil of K3 cannot be energized and therefore the contactors K1 and K2 can no longer be operated. The control circuit therefore remains open.

With internal reset

Another connection example of a protective device type 4 AOPD according to IEC 61496 with restart interlock and external device monitoring. Reset and external device monitoring are

dynamically monitored by the SICK protective device. Feature of this connection: reduced installation effort.



K1/K2 = FSD1/FSD2, KM1/KM2 = MPCE1/MPCE2

Control reliability

“Control reliability” has been defined and implemented based on a variety of definitions. In the definitions presented below, the word “shall” denotes a mandatory requirement for compliance with a regulation or standard. The words “should” and “may” are intended to reflect recommendations and good work practices.

For example, OSHA 1910.211 defines “control reliability” as:

A control system designed and constructed so that a failure within the system does not prevent normal stopping action from being applied when required, but does prevent initiation of a successive cycle until the failure is corrected. The failure shall be detectable by means of a simple test or indicated by the control system.

The American National Standards Institute (ANSI) defines “control reliability” in Standard B11.19-2003 (3.14) as:

The capability of the machine control system, the protective device, other control components and related interfacing to achieve a safe state in the event of a failure within their safety-related functions.

ANSI B11.19-2003 (E.6.1) further states:

“Control Reliability”

- cannot prevent a repeat cycle in the event of a major mechanical failure or in the presence of multiple simultaneous component failures
- is not provided by simple redundancy. There must be monitoring to assure that redundancy is maintained.

ANSI B11.20 (E6.13) further clarifies the requirements of control reliability by stating the following:

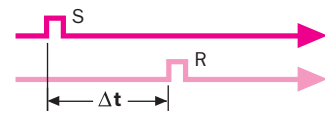
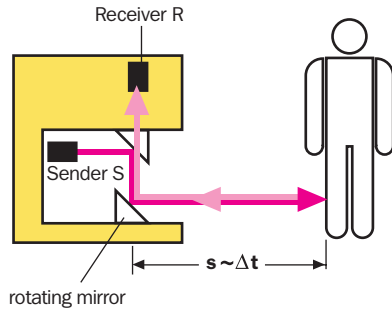
Control component failure protection of electrical, electronic, pneumatic or hydraulic systems frequently consists of multiple, independent parallel or series circuitry or components arranged to meet the requirements of 6.13 (a clause defining “control reliability”). Protection against the consequences of failure of control components should not depend solely upon simple redundancy. Component redundancy is the use of two or more control components in parallel or series circuits and is used to ensure reliable operation. However, failure of one of the redundant components can go undetected, allowing the appearance of safe operation. When the additional element of the redundant circuit subsequently fails, an unsafe condition can occur. Monitoring and response to such single failures is essential.

Based on these definitions, it is important to take control reliability into account in the development of safety-related electrical, electronic and pneumatic systems. Control reliable circuits should be hardware based and include monitoring at the system level. ANSI/RIA R15.06-1999 (4.5.4) provides a practical guide to implementing “control reliability” by requiring the following components:

- a) The monitoring shall generate a stop signal if a failure is detected. A warning shall be provided if a hazard remains after cessation of motion
- b) Following detection of a failure, a safe state shall be maintained until the fault is cleared
- c) Failures with a common cause (e.g. overvoltage) must be taken into account if the probability is high that such a failure may occur
- d) The single failure should be detected at time of failure. If not practical, the failure should be detected at the next demand upon the safety function.

Principle of operation of laser scanners

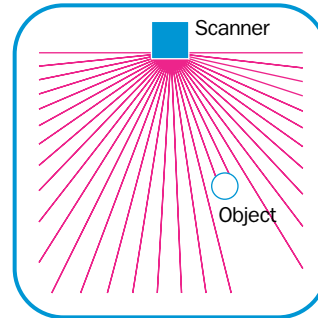
Laser scanners are compact systems that scan their surroundings with a beam ("optical radar"). If the emitted light pulses hit an object, the light is reflected and detected in the laser scanner's receiver. The time between the emission of a light pulse and the reception of the reflection represents the distance between the laser scanner and object (light time-of-flight measurement). An internal rotating mirror "moves" the light pulses in



Laser scanner principle of operation

a circle to produce 2-dimensional scanning.

So-called monitored areas can be defined within the field of view (scanning angle) and the device-specific scanning range of a laser scanner. If an object is detected in a monitored area, this situation is indicated by the laser scanner using 2 switching outputs (safe "stop" signal to the machine).



Fan-shaped scanning of the surroundings

Use of laser scanners

Laser scanners are predominantly used for area monitoring (hazardous area protection). Taking the appropriate standards into account it is, however, also possible to use these devices for protecting hazardous points and access.

A differentiation is made between:

- Stationary applications
 - Horizontal applications: e.g. pipe bending machines, machining centres, robot cells, press return area, etc.
 - Vertical applications: Entry/Exit, hand protection
- Mobile applications
 - Monitoring the movement of AGVs (automated guided vehicles), narrow aisle stackers, etc.

Advantages of the SICK safety laser scanners

Additional functions for plant and machine control

- Switchable monitored areas in accordance with the current process phase
- Monitoring external switching elements/contactors (EDM) saves costs and effort in the machine control
- High-current outputs for directly operated switching elements (contactors), making conversion of the switching signals using relay interfaces, etc. unnecessary
- Measured data on the surroundings as well as reflector detection to support vehicle steering (AGV). Only one sensor for safety and control
- Integrated restart interlock (RES) minimises the effort in the machine control

Product range

- A very wide range of application requirements can be addressed with a compatible product family, thus minimising stock-keeping and investment costs.

Experience

- Proven in use
- The highest quality standards guarantee stable serial production
- Consultation and service expertise

Services for productive safety

With services tailored specifically to your needs, SICK offers all-embracing support for the safety of your machine or system.







Address productivity and cost-effectiveness from the start: From selection and planning, through commissioning and inspection, to maintenance and modernisation.

→ For information about the services please refer to chapter A

Safety laser scanners

B



					Functions							
Safety application	Scanning range (m)	Scanning angle (°)	Switchable field sets ¹⁾	Incremental encoder connections	External device monitoring (EDM)	Host/guest operation	Safe interface to bus systems	Reflector mark detection	Expanded measured data output	Product	Page	
	5.5 / 7	190	8	2	✓	✓	✓	—	—	S 3000 Professional ²⁾	B-3	
			4	—	✓	✓	✓	—	—	S 3000 Advanced ²⁾	B-9	
			1	—	✓	✓	✓	—	—	S 3000 Standard ²⁾	B-15	
			8	—	✓	✓	✓	—	—	S 3000 Remote ^{2) 3)}	B-21	
			8	2	✓	✓	✓	✓	✓	S 3000 Professional CMS ²⁾	B-27	
	2	270	4	2	✓	✓	✓	—	—	S 300 product family	B-33	
	4	180	1	—	—	—	—	—	—	PLS	B-34	
	1.5	180	1	—	—	—	—	—	—	PLS short range	B-40	
	—	—	8	2	✓	—	—	—	—	Interface LSI	B-46	
Safety application										New product	Product	Page
		Safety camera system for personnel protection on press brakes								V 4000 Press Brake	B-52	

¹⁾ Field set comprising of protective field and warning field

²⁾ Special features of the S 3000 product family on page B-2

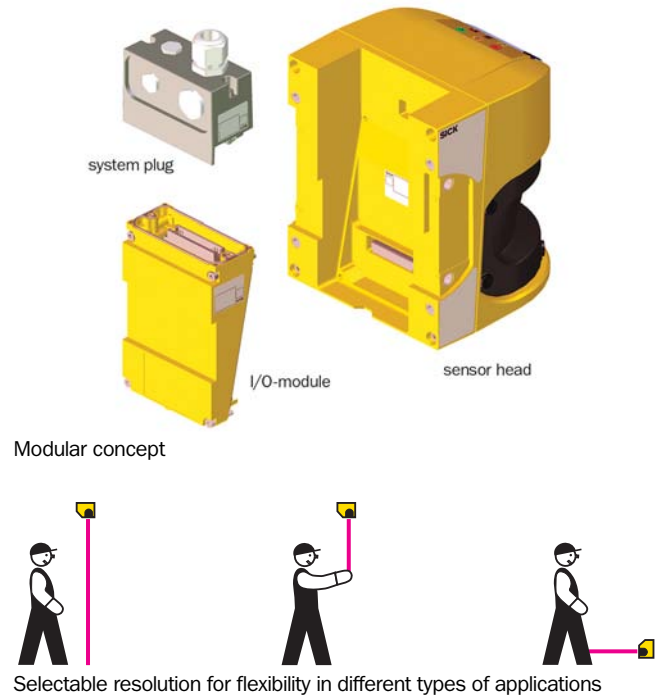
³⁾ S 3000 Remote can only be used in conjunction with another S 3000 or a UE 100 series safety controller

Special features of the S 3000 laser scanner

B

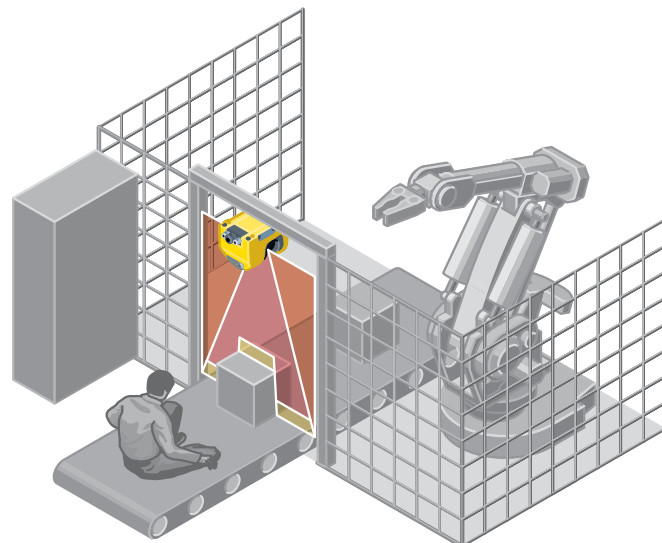
S 3000 - the modular system

- Modular concept
 - S 3000 solutions grow with your needs
 - Security of investment due to configurable variants
 - Easy to service
- Largest achievable scanning range is 7 m for safety applications
- Configuration memory in the system plug
- Selectable resolution makes it possible to adapt the devices to a very wide range of application requirements
- Certified for vertical use for access control or entry/exit applications, as well as hand protection
- 7-segment display
- Integrated external device monitoring (EDM)
- Safe interface to bus systems
- Up to 8 switchable protective/warning fields (field sets)
- Creation of host/guest systems with two S 3000 units
- Direct connection of incremental encoders
- Certified according to IEC/EN 61496-3 (type 3) and IEC/EN 61508 (SIL2)



Important applications

- Production lines
- Machining centres
- Entry/Exit stations
- Robot cells
- Free moving transport vehicles
- Narrow aisle vehicles



Overview of technical specifications

Protective field range (depending on type)	5.5 m / 7 m
Warning field range	49 m (20 m at 20 % reflectivity)
Number of field sets	8
Scanning angle	190°
Resolution (selectable)	30, 40, 50, 70, 150 mm
Response time	60 ms or 120 ms
Type	Type 3 according to IEC/EN 61496-3 SIL2 (IEC/EN 61508)

Product description

The S 3000 Professional can be used for a wide range of applications for the protection of machines and systems. The field sets can be conveniently defined using a PC or laptop.

- For complex applications with up to 8 protective fields/warning fields

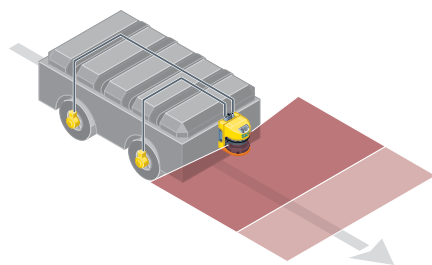
- Static and dynamic protective field switching
- Incremental encoder connections
- Possibility of connecting two S 3000 units to form a single system
- New uniform "Configuration & Diagnostic Software" CDS

In-system added value

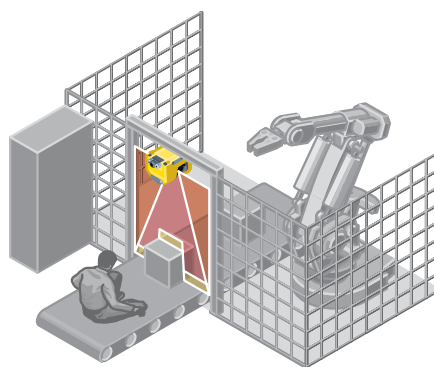
- Combination with SICK safety interfaces
- Safe interface to bus systems

Applications

- Freely moving transport vehicles
- Production lines
- Machining centres
- Entry/Exit stations (gates)
- Robot cells
- Narrow aisle vehicles



Velocity-dependent vehicle monitoring



Vertical access protection (entry/exit) with "contour as reference"



B



- Modular concept
- Scanning range 5.5 m or 7 m
- Configuration memory
- Selectable resolution
- Certified for vertical use
- 7-segment display
- Integrated external device monitoring (EDM)



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Ordering information

Delivery S 3000 systems:

- Sensor head with I/O module mounted
- Operating instructions and CDS (Configuration & Diagnostic Software) on CD-ROM
- Adhesive label "Important information"

The system plug has to be ordered separately!

→ Ordering information system plug and accessories Page B-8

S 3000 Professional systems

Description	Type	Part number
Protective field range 5.5 m	S 3000 Professional (incl. mounted I/O module)	1 019 600
Protective field range 7 m		1 023 892

Sensor heads

Description	Type	Part number
Protective field range 5.5 m	Sensor head medium range	2 022 972
Protective field range 7 m	Sensor head long range	2 026 747

I/O module

Description	Type	Part number
Professional	I/O module	2 022 827

Detailed technical specifications

→ You can find further data in the operating instructions. Download at www.sick.com

General data

Laser class	1 (21 CFR 1040.10 and 1040.11, DIN EN 60825:2001)
Enclosure rating according to EN 60529	IP 65
Protection class according to DIN VDE 0106, DIN EN 50178	II
Type according to IEC/EN 61496-3	Type 3
Functional safety of electrical, electronic and programmable electronic safety-related systems (IEC/EN 61508)	SIL2
Ambient operating temperature	–10 °C ... +50 °C
Sender	Pulsed laser diode, wavelength 905 nm
Housing	Aluminium die-cast RAL 1021 (yellow)
Material Colour	
Front screen	Polycarbonate Outside with scratch-resistant coating
Material Surface finish	
System plug	With ESD protected configuration memory
Dimensions (W x H x D)	155 mm x 185 mm x 160 mm
Total weight	3.3 kg

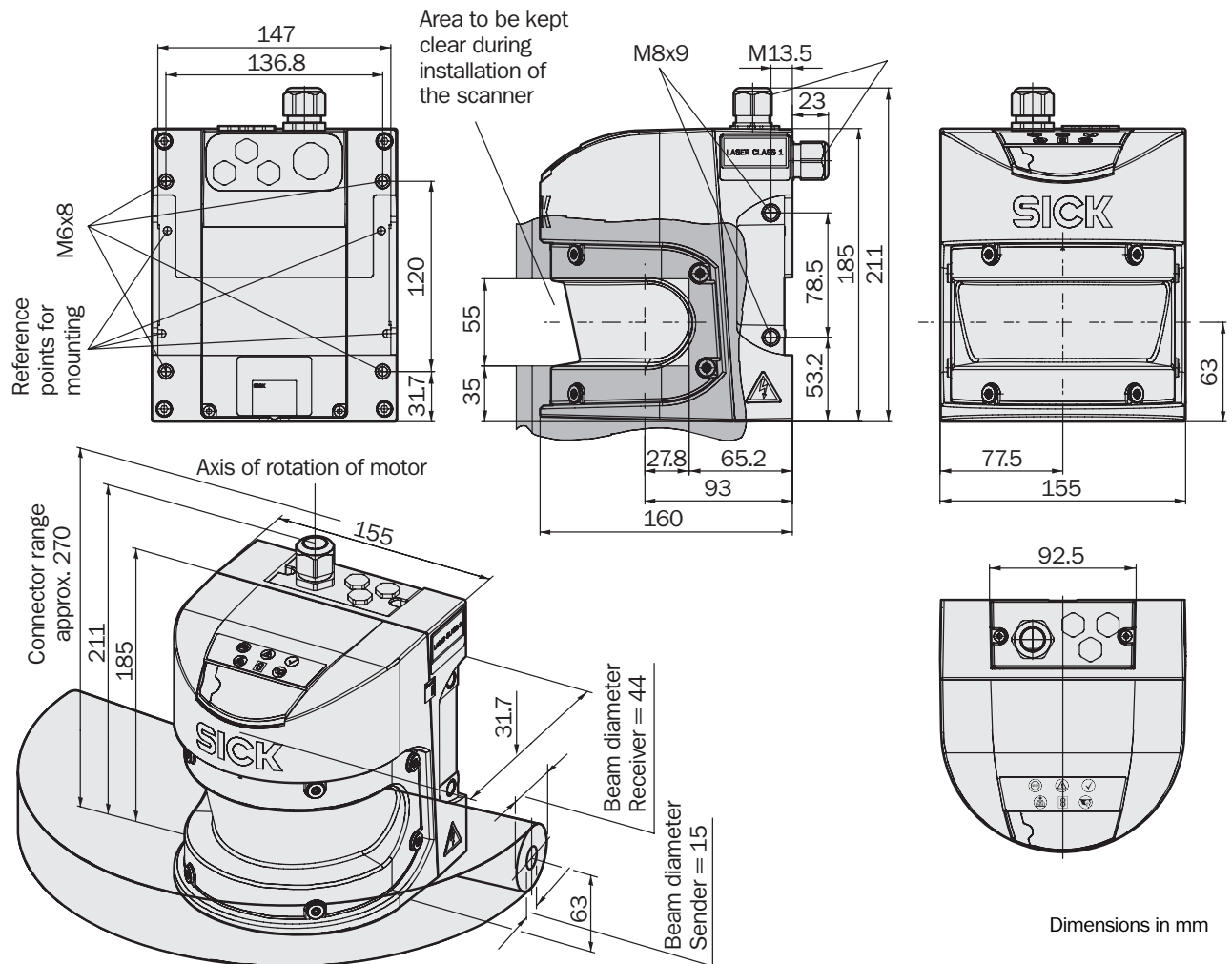
Functional data

Scanning angle	190°
Protective field range (depending on type)	5.5 m / 7 m
Reflectivity	1.8 % to several 1000 % (reflectors)
Response time	60 ms or 120 ms
Resolution (selectable)	30, 40, 50, 70, 150 mm
Angular resolution	0.50° / 0.25°
Protective field supplement	100 mm
Warning field range	49 m (20 m at 20 % reflectivity)
Distance measuring range	49 m
Number of multiple samplings (configurable via CDS)	2 ... 16
Restart after (configurable)	2 s ... 60 s

Electrical data

Electrical connection	Plug-in connection housing with screw type terminals
Supply voltage	24 V (16.8 V ... 28.8 V) DC
Power consumption at 24 V without output load	0.8 A
Power consumption with max. output load	2.3 A
Number of inputs	1 1 2 / 4 2
EDM	
Restart/Reset	
Static switching signals	
Dynamic encoder signals (incremental encoder)	2
Number of outputs	2 x 500 mA 1 x 100 mA 1 x 100 mA 1 x 100 mA
Safety outputs (OSSD)	
Warning field output	
Application diagnostic output	
Restart/Reset Required	
Configuration and diagnostics interface	RS-232 (9.6 / 19.2 / 38.4 kBaud)
Data interface	RS-422 (up to 500 kBaud)
EFI - safe SICK device communication (cable length at 500 kBaud and 0.34-mm² cables)	50 m

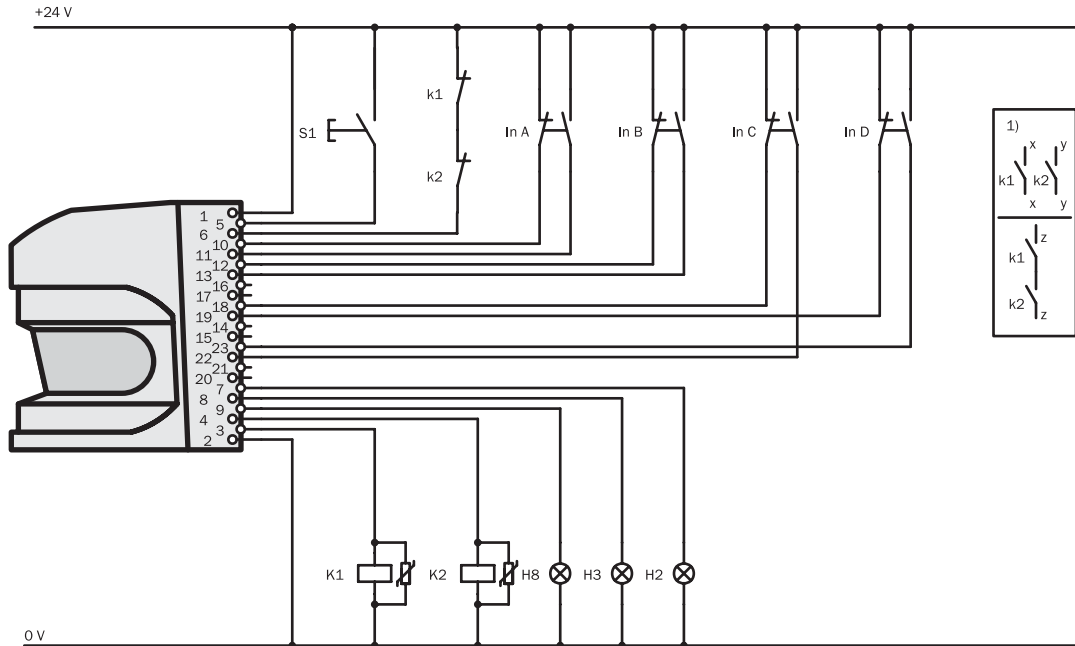
Dimensional drawings



Connection diagrams

→ You can find additional information to these connection diagrams as well as further connection diagrams at www.sick.com

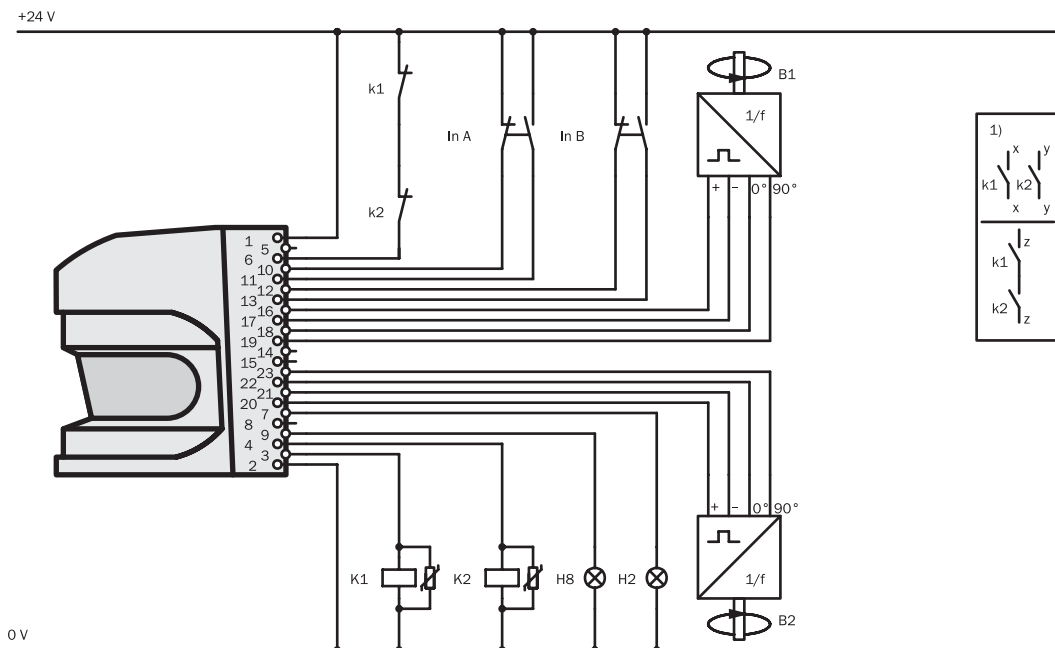
Protective field switching with four static inputs



- S 3000 Professional in conjunction with relays/contactors
- Operating mode: with restart interlock and external device monitoring (EDM)

- Static protective field switching by means of the control inputs A, B, C and D

Protective field switching with static and dynamic inputs



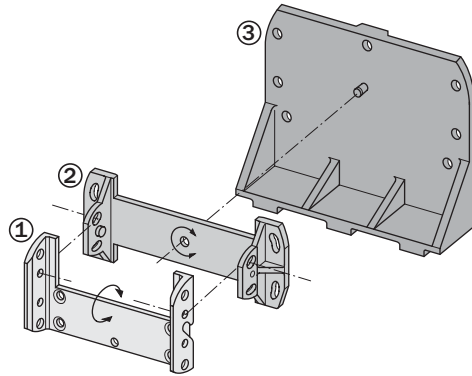
- S 3000 Professional in conjunction with relays/contactors
- Operating mode: without restart interlock with external device monitoring (EDM)

- Dynamic protective field switching using B1 and B2 as well as static protective field switching using the control inputs A and B

Accessories

Mounting kits

Description	Type	Part number
Mounting bracket for direct mounting at the rear on wall or machine. No adjustment facility	Mounting kit 1	2 015 623
Bracket only in conjunction with mounting kit 1. Mounting at the rear on wall or machine. Longitudinal and cross-wise adjustment possible	Mounting kit 2	2 015 624
Bracket only in conjunction with mounting kit 1 and 2. Mounting at the rear or below on wall, floor or machine. Longitudinal and cross-wise adjustment possible	Mounting kit 3	2 015 625



System plugs

Description	Type	Number of cores	Cable length	Part number
Cable outlet on the top, no usage of incremental encoders	Without cable	—	—	2 023 797
	Pre-assembled	17	5 m	2 027 174
			10 m	2 027 175
			20 m	2 027 816
Cable outlet on the top, for usage of incremental encoders	Without cable	—	—	2 023 310
	Pre-assembled	13	5 m	2 027 176
			10 m	2 027 177

Self assembly connection cables

Description	Length	Part number
13 core	100 m	6 025 729
17 core	100 m	6 025 730
EFI cable	50 m	6 026 675
M12 EMC-proof cable gland for EFI-connections	—	5 308 757

Service cables

Description	Length	Part number
Connection cable between the serial interface of the PC and the configuration interface	2 m	6 021 195
	8 m	2 027 649

Miscellaneous

Designation	Description	Part number
Software CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in multiple languages	2 026 875
Front screen	Spare parts set for front screen with replacement seal and screws	2 027 180
Plastic cleaner	Plastic cleaner and care product, anti-static, 1 litre	5 600 006
Lens cloth	Cloth for cleaning the front screen	4 003 353
Power supply 2.5 A	Power supply 24 V DC, 2.5 A	6 010 361
Power supply 4 A	Power supply 24 V DC, 4 A	6 010 362

→ For bus node accessories, please refer to page N-13 (UE 4150) or page N-20 (UE 4155)

Overview of technical specifications

Protective field range (depending on type)	5.5 m / 7 m
Warning field range	49 m (20 m at 20 % reflectivity)
Number of field sets	4
Scanning angle	190°
Resolution (selectable)	30, 40, 50, 70, 150 mm
Response time	60 ms or 120 ms
Type	Type 3 according to IEC/EN 61496-3 SIL2 (IEC/EN 61508)

Product description

S 3000 Advanced safety laser scanners are used for the horizontal and vertical protection of hazardous areas, hazardous points and accesses.

- For complex applications with up to 4 protective fields/warning fields

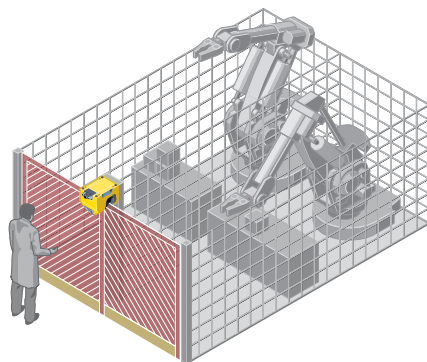
- Static protective field switching
- Possibility of connecting two S 3000 units to form a single system
- New uniform "Configuration & Diagnostic Software" CDS

In-system added value

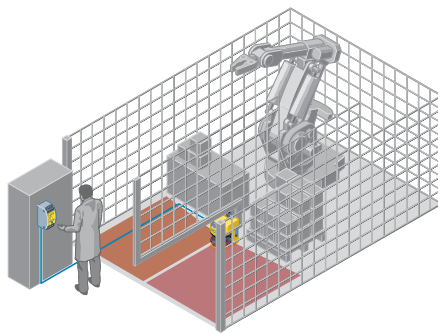
- Combination with SICK safety interfaces
- Safe interface to bus systems

Applications

- Freely moving transport vehicles
- Production lines
- Machining centres
- Entry/Exit stations (gates)
- Robot cells
- Narrow aisle vehicles



Access protection on a robot cell with several working areas with "contour as reference"



Protection of two separate working areas with one S 3000 and a SICK safety controller



B



- Modular concept
- Scanning range 5.5 m or 7 m
- Configuration memory
- Selectable resolution
- Certified for vertical use
- 7-segment display
- Integrated external device monitoring (EDM)



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Ordering information

Delivery S 3000 systems:

- Sensor head with I/O module mounted
- Operating instructions and CDS (Configuration & Diagnostic Software) on CD-ROM
- Adhesive label "Important information"

The system plug has to be ordered separately!

→ Ordering information system plug and accessories Page B-14

S 3000 Advanced Systems

Description	Type	Part number
Protective field range 5.5 m	S 3000 Advanced (incl. mounted I/O module)	1 023 547
Protective field range 7 m		1 023 891

Sensor heads

Description	Type	Part number
Protective field range 5.5 m	Sensor head medium range	2 022 972
Protective field range 7 m	Sensor head long range	2 026 747

I/O module

Description	Type	Part number
Advanced	I/O module	2 026 802

Detailed technical specifications

→ You can find further data in the operating instructions. Download at www.sick.com

General data

Laser class	1 (21 CFR 1040.10 and 1040.11, DIN EN 60825:2001)
Enclosure rating according to EN 60529	IP 65
Protection class according to DIN VDE 0106, DIN EN 50178	II
Type according to IEC/EN 61496-3	Type 3
Functional safety of electrical, electronic and programmable electronic safety-related systems (IEC/EN 61508)	SIL2
Ambient operating temperature	–10 °C ... +50 °C
Sender	Pulsed laser diode, wavelength 905 nm
Housing	Aluminium die-cast RAL 1021 (yellow)
Material Colour	
Front screen	Polycarbonate Outside with scratch-resistant coating
Material Surface finish	
System plug	With ESD protected configuration memory
Dimensions (W x H x D)	155 mm x 185 mm x 160 mm
Total weight	3.3 kg

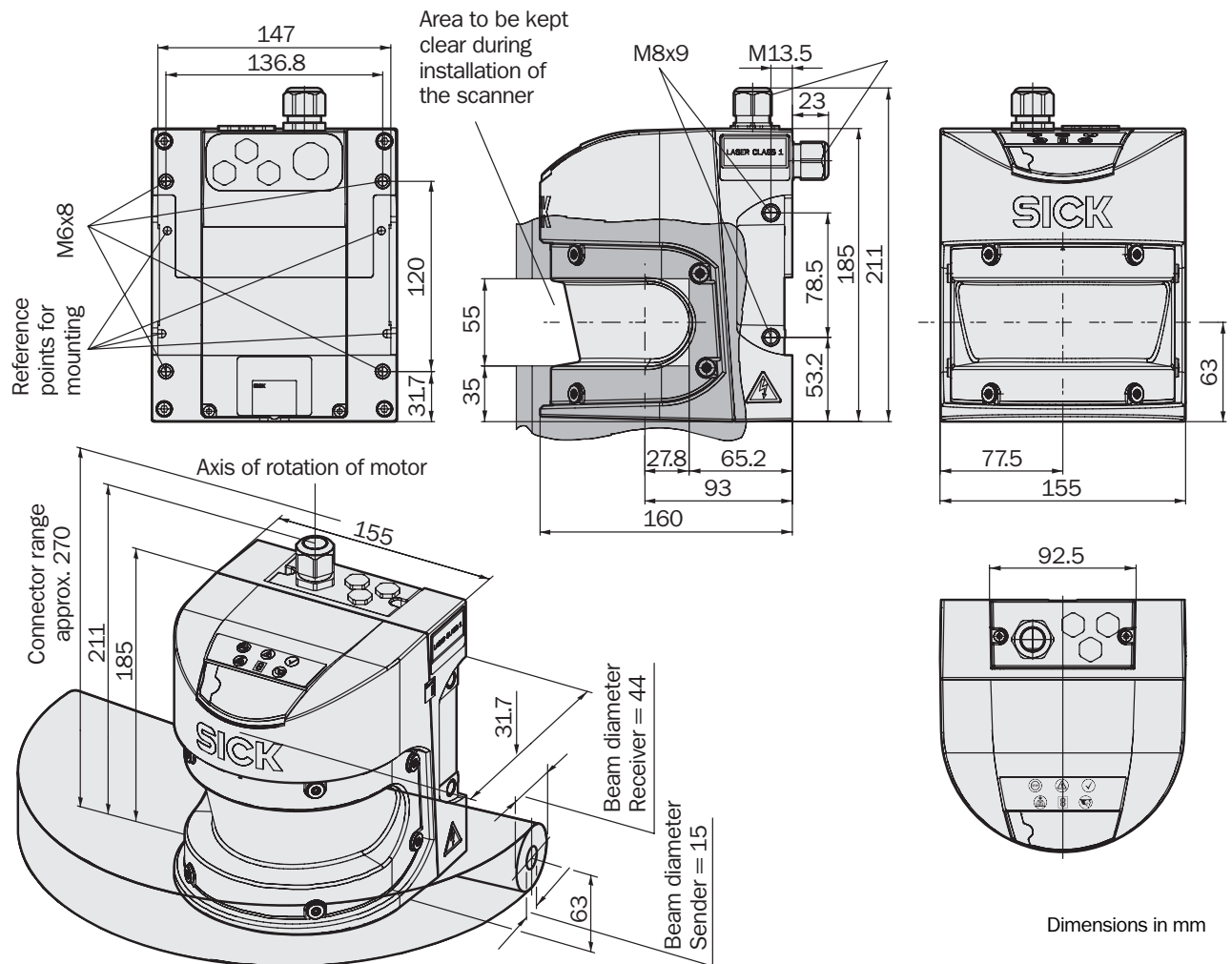
Functional data

Scanning angle	190°
Protective field range (depending on type)	5.5 m / 7 m
Reflectivity	1.8 % to several 1000 % (reflectors)
Response time	60 ms or 120 ms
Resolution (selectable)	30, 40, 50, 70, 150 mm
Angular resolution	0.50° / 0.25°
Protective field supplement	100 mm
Warning field range	49 m (20 m at 20 % reflectivity)
Distance measuring range	49 m
Number of multiple samplings (configurable via CDS)	2 ... 16
Restart after (configurable)	2 s ... 60 s

Electrical data

Electrical connection	Plug-in connection housing with screw type terminals
Supply voltage	24 V (16.8 V ... 28.8 V) DC
Power consumption at 24 V without output load	0.8 A
Power consumption with max. output load	2.3 A
Number of inputs	1 1 2
EDM	
Restart/Reset	
Static switching signals	
Number of outputs	2 x 500 mA 1 x 100 mA 1 x 100 mA 1 x 100 mA
Safety outputs (OSSD)	
Warning field output	
Application diagnostic output	
Restart/Reset Required	
Configuration and diagnostics interface	RS-232 (9.6 / 19.2 / 38.4 kBaud)
Data interface	RS-422 (up to 500 kBaud)
EFI – safe SICK device communication (cable length at 500 kBaud and 0.34-mm² cables)	50 m

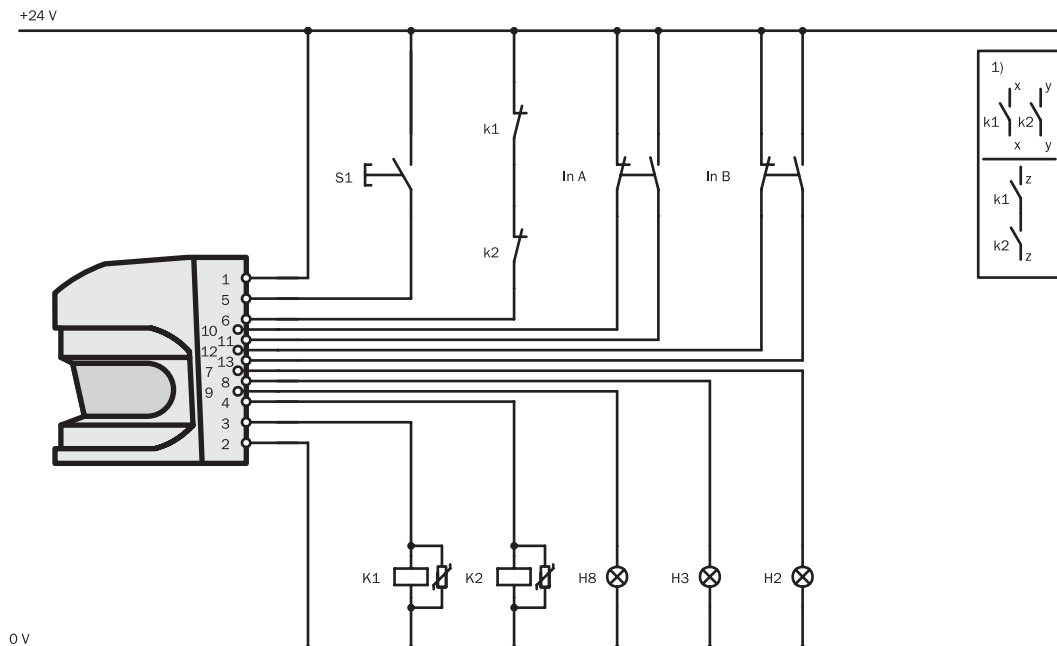
Dimensional drawings



Connection diagrams

→ You can find additional information to these connection diagrams as well as further connection diagrams at www.sick.com

Protective field switching with two static inputs

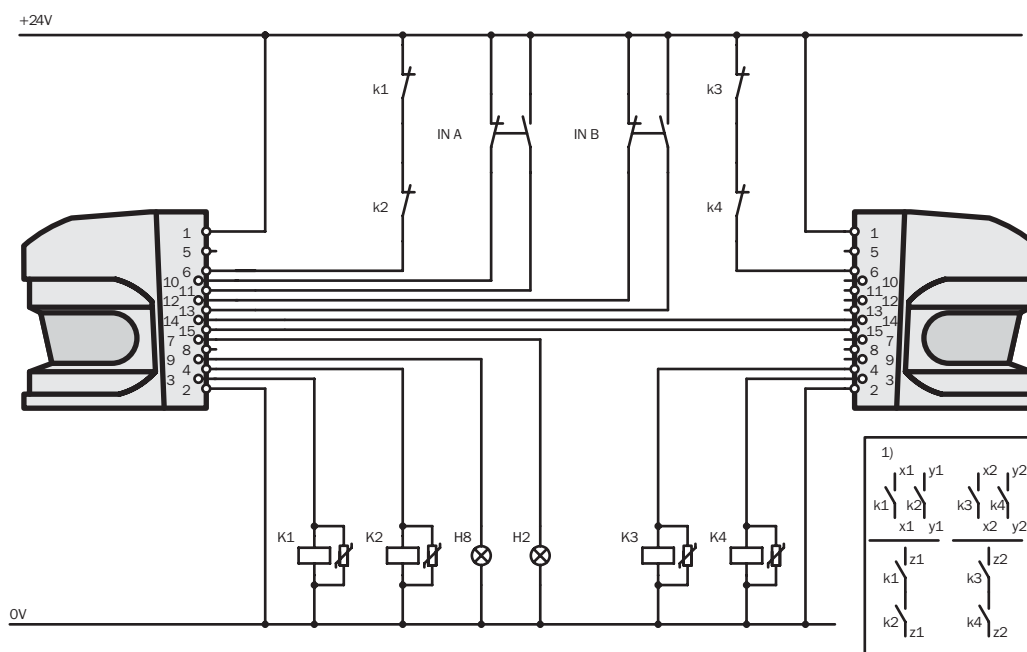


- S 3000 Advanced in conjunction with relays/contactors
- Operating mode: with restart interlock and external device

monitoring

- Protective field switching by means of control inputs A and B

Protective field switching between two S 3000 with static inputs



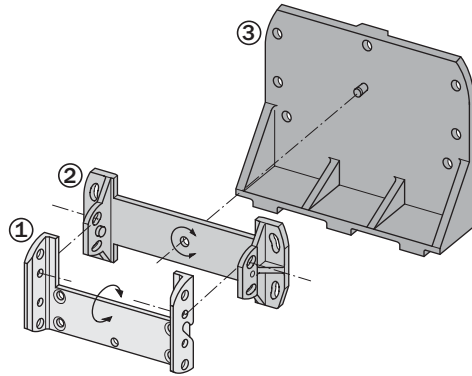
- S 3000 Advanced with S 3000 Advanced in conjunction with relays/contactors
- Operating mode: without restart interlock with external device monitoring

- Protective field switching by means of control input A and control input B on separate OSSD pairs (simultaneous monitoring)

Accessories

Mounting kits

Description	Type	Part number
Mounting bracket for direct mounting at the rear on wall or machine. No adjustment facility	Mounting kit 1	2 015 623
Bracket only in conjunction with mounting kit 1. Mounting at the rear on wall or machine. Longitudinal and cross-wise adjustment possible	Mounting kit 2	2 015 624
Bracket only in conjunction with mounting kit 1 and 2. Mounting at the rear or below on wall, floor or machine. Longitudinal and cross-wise adjustment possible	Mounting kit 3	2 015 625



System plugs

Description	Type	Number of cores	Cable length	Part number
Cable outlet on the top	Without cable	—	—	2 023 797
	Pre-assembled	13	5 m	2 027 172
			10 m	2 027 173
			20 m	2 027 815

Self assembly connection cables

Description	Length	Part number
13 core	100 m	6 025 729
EFI cable	50 m	6 026 675
M12 EMC-proof cable gland for EFI-connections	—	5 308 757

Service cables

Description	Length	Part number
Connection cable between the serial interface of the PC and the configuration interface	2 m	6 021 195
	8 m	2 027 649

Miscellaneous

Designation	Description	Part number
Software CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in multiple languages	2 026 875
Front screen	Spare parts set for front screen with replacement seal and screws	2 027 180
Plastic cleaner	Plastic cleaner and care product, anti-static, 1 litre	5 600 006
Lens cloth	Cloth for cleaning the front screen	4 003 353
Power supply 2.5 A	Power supply 24 V DC, 2.5 A	6 010 361
Power supply 4 A	Power supply 24 V DC, 4 A	6 010 362

→ For bus node accessories, please refer to page N-13 (UE 4150) or page N-20 (UE 4155)

Overview of technical specifications

Protective field range (depending on type)	5.5 m / 7 m
Warning field range	49 m (20 m at 20 % reflectivity)
Number of field sets	1
Scanning angle	190°
Resolution (selectable)	30, 40, 50, 70, 150 mm
Response time	60 ms or 120 ms
Type	Type 3 according to IEC/EN 61496-3 SIL2 (IEC/EN 61508)

Product description

Series S 3000 Standard safety laser scanners are used for the horizontal and vertical protection of hazardous areas, hazardous points and accesses as well as to protect automated guided vehicles.

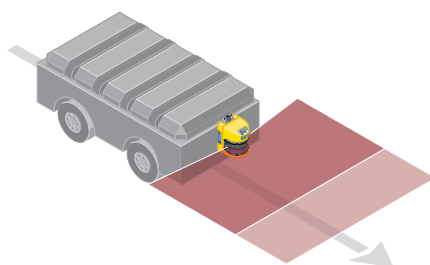
- 1 protective and warning field
- Possibility of connecting two S 3000 units to form a single system
- New uniform "Configuration & Diagnostic Software" CDS

In-system added value

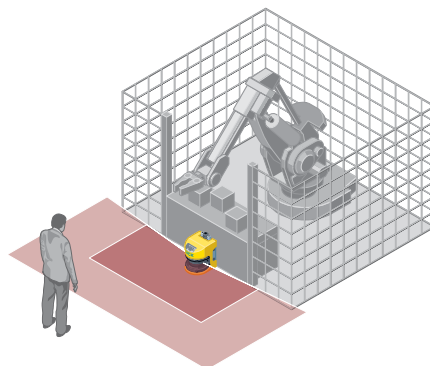
- Combination with SICK safety interfaces
- Safe interface to bus systems

Applications

- Freely moving transport vehicles
- Production lines
- Machining centres
- Entry/Exit stations (gates)
- Robot cells
- Narrow aisle vehicles



Hazardous area protection on an AGV with one direction of travel



Hazardous area protection on a robot cell



B



- Modular concept
- Scanning range 5.5 m or 7 m
- Configuration memory
- Selectable resolution
- Certified for vertical use
- 7-segment display
- Integrated external device monitoring (EDM)



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Ordering information

Delivery S 3000 systems:

- Sensor head with I/O module mounted
- Operating instructions and CDS (Configuration & Diagnostic Software) on CD-ROM
- Adhesive label "Important information"

The system plug has to be ordered separately!

→ Ordering information system plug and accessories page B-20

S 3000 Standard Systems

Description	Type	Part number
Protective field range 5.5 m	S 3000 Standard (incl. mounted I/O module)	1 023 546
Protective field range 7 m		1 023 890

Sensor heads

Description	Type	Part number
Protective field range 5.5 m	Sensor head medium range	2 022 972
Protective field range 7 m	Sensor head long range	2 026 747

I/O module

Description	Type	Part number
Standard	I/O module	2 026 801

Detailed technical specifications

→ You can find further data in the operating instructions. Download at www.sick.com

General data

Laser class	1 (21 CFR 1040.10 and 1040.11, DIN EN 60825:2001)
Enclosure rating according to EN 60529	IP 65
Protection class according to DIN VDE 0106, DIN EN 50178	II
Type according to IEC/EN 61496-3	Type 3
Functional safety of electrical, electronic and programmable electronic safety-related systems (IEC/EN 61508)	SIL2
Ambient operating temperature	−10 °C ... +50 °C
Sender	Pulsed laser diode, wavelength 905 nm
Housing	Aluminium die-cast RAL 1021 (yellow)
Material Colour	
Front screen	Polycarbonate Outside with scratch-resistant coating
Material Surface finish	
System plug	With ESD protected configuration memory
Dimensions (W x H x D)	155 mm x 185 mm x 160 mm
Total weight	3.3 kg

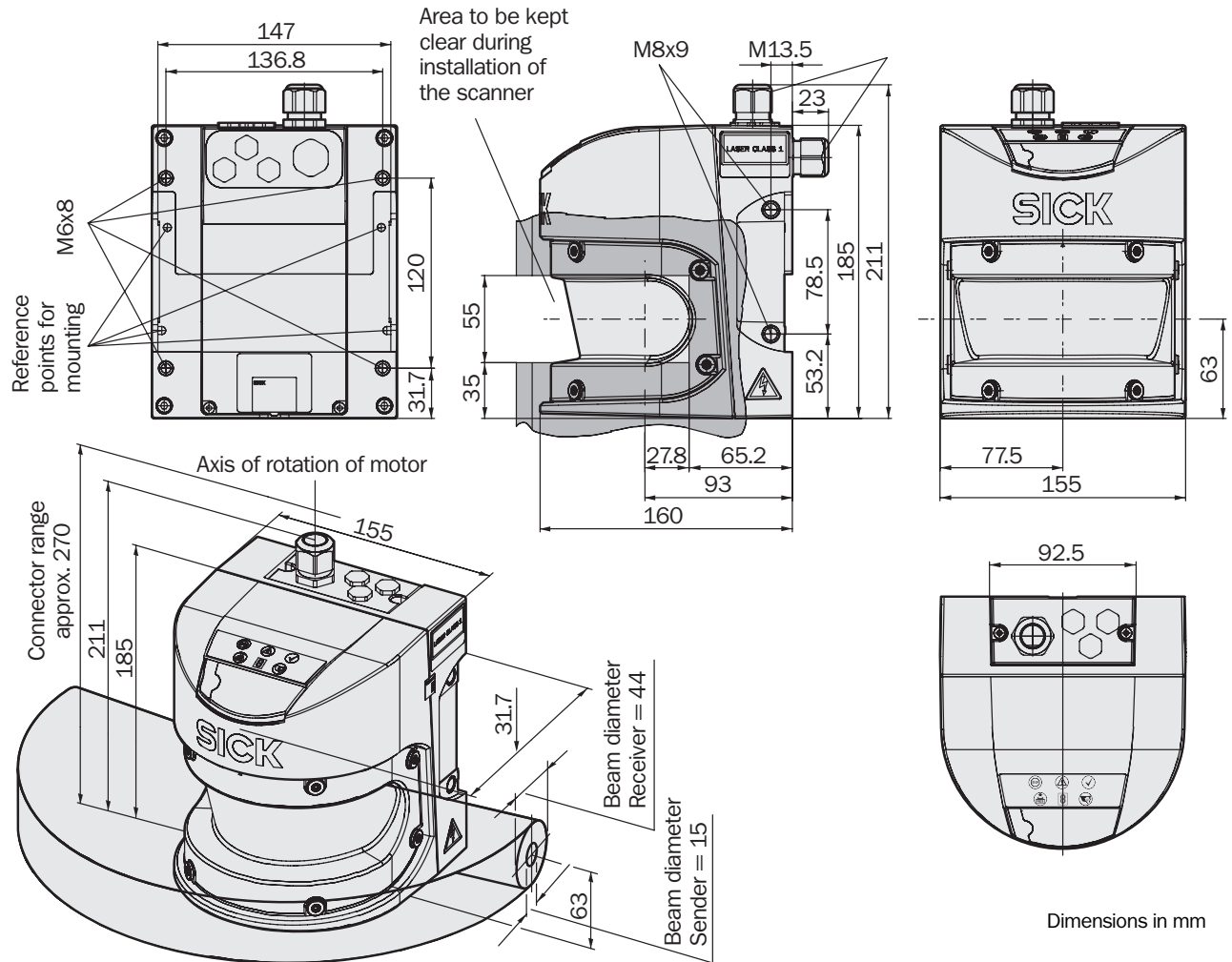
Functional data

Scanning angle	190°
Protective field range (depending on type)	5.5 m / 7 m
Reflectivity	1.8 % to several 1000 % (reflectors)
Response time	60 ms or 120 ms
Resolution (selectable)	30, 40, 50, 70, 150 mm
Angular resolution	0.50° / 0.25°
Protective field supplement	100 mm
Warning field range	49 m (20 m at 20 % reflectivity)
Distance measuring range	49 m
Number of multiple samplings (configurable via CDS)	2 ... 16
Restart after (configurable)	2 s ... 60 s

Electrical data

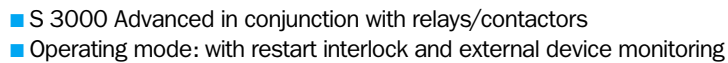
Electrical connection	Plug-in connection housing with screw type terminals
Supply voltage	24 V (16.8 V ... 28.8 V) DC
Power consumption at 24 V without output load	0.8 A
Power consumption with max. output load	2.3 A
Number of inputs	1 1
EDM Restart/Reset	
Number of outputs	2 x 500 mA 1 x 100 mA 1 x 100 mA 1 x 100 mA
Safety outputs (OSSD)	
Warning field output	
Application diagnostic output	
Restart/Reset Required	
Configuration and diagnostics interface	RS-232 (9.6 / 19.2 / 38.4 kBaud)
Data interface	RS-422 (up to 500 kBaud)
EFI – safe SICK device communication (cable length at 500 kBaud and 0.34-mm² cables)	50 m

Dimensional drawings



→ You can find additional information to these connection diagrams as well as further connection diagrams at www.sick.com

B

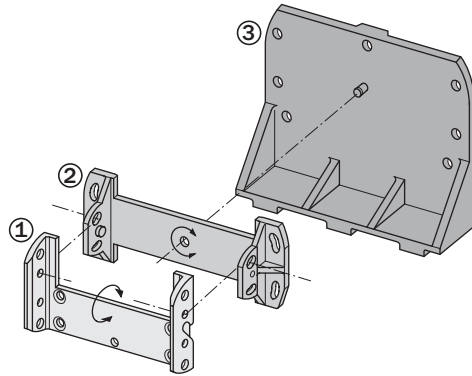


- S 3000 Standard in conjunction with UE10-3 OS
- Operating mode: with restart interlock and external device monitoring

Accessories

Mounting kits

Description	Type	Part number
Mounting bracket for direct mounting at the rear on wall or machine. No adjustment facility	Mounting kit 1	2 015 623
Bracket only in conjunction with mounting kit 1. Mounting at the rear on wall or machine. Longitudinal and cross-wise adjustment possible	Mounting kit 2	2 015 624
Bracket only in conjunction with mounting kit 1 and 2. Mounting at the rear or below on wall, floor or machine. Longitudinal and cross-wise adjustment possible	Mounting kit 3	2 015 625



System plugs

Description	Type	Number of cores	Cable length	Part number
Cable outlet on the top	Without cable	—	—	2 023 797
	Pre-assembled	9	5 m	2 027 170
			10 m	2 027 171
			20 m	2 027 814

Self assembly connection cables

Description	Length	Part number
9-pin	100 m	6 022 651
EFI cable	50 m	6 026 675
M12 EMC-proof cable gland for EFI-connections	—	5 308 757

Service cables

Description	Length	Part number
Connection cable between the serial interface of the PC and the configuration interface	2 m	6 021 195
	8 m	2 027 649

Miscellaneous

Designation	Description	Part number
Software CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in multiple languages	2 026 875
Front screen	Spare parts set for front screen with replacement seal and screws	2 027 180
Plastic cleaner	Plastic cleaner and care product, anti-static, 1 litre	5 600 006
Lens cloth	Cloth for cleaning the front screen	4 003 353
Power supply 2.5 A	Power supply 24 V DC, 2.5 A	6 010 361
Power supply 4 A	Power supply 24 V DC, 4 A	6 010 362

→ For bus node accessories, please refer to page N-13 (UE 4150) or page N-20 (UE 4155)

Overview of technical specifications

Note: S 3000 Remote can only be used in conjunction with another S 3000 or a UE 100 series safety controller.

Protective field range (depending on type)	5.5 m / 7 m
Warning field range	49 m (20 m at 20 % reflectivity)
Number of field sets	8 ¹⁾
Scanning angle	190°
Resolution (selectable)	30, 40, 50, 70, 150 mm
Response time	60 ms or 120 ms
Type	Type 3 according to IEC/EN 61496-3 SIL2 (IEC/EN 61508)

¹⁾ The number of field sets is dependent on the S 3000 variant to which the S 3000 Remote is connected

Product description

Autonomous vehicle systems can be protected cost-effectively to suit the specific case using S 3000 Remote.

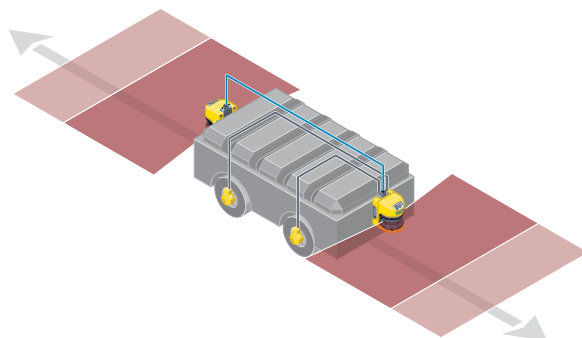
- Up to 8 protective/warning fields
- For complex applications with host/guest combinations
- For 2 directions of travel
- New uniform "Configuration & Diagnostic Software" CDS

In-system added value

- Combination with SICK safety interfaces
- Safe interface to bus systems

Applications

- Freely moving transport vehicles
- Production lines
- Machining centres
- Entry/Exit stations (gates)
- Robot cells
- Narrow aisle vehicles



S 3000 Professional and S 3000 Remote: Complex application with bidirectional travel (velocity-dependent protective field/warning field switching using incremental encoders)



B



- Modular concept
- Scanning range 5.5 m or 7 m
- Configuration memory
- Selectable resolution
- Certified for vertical use
- 7-segment display
- Integrated external device monitoring (EDM)



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Ordering information

Delivery S 3000 systems:

- Sensor head with I/O module mounted
- Operating instructions and CDS (Configuration & Diagnostic Software) on CD-ROM
- Adhesive label "Important information"

The system plug has to be ordered separately!

→ Ordering information system plug and accessories Page B-26

S 3000 Remote systems

Description	Type	Part number
Protective field range 5.5 m	S 3000 Remote (incl. mounted I/O module)	1 023 548
Protective field range 7 m		1 023 893

Sensor heads

Description	Type	Part number
Protective field range 5.5 m	Sensor head medium range	2 022 972
Protective field range 7 m	Sensor head long range	2 026 747

I/O module

Description	Type	Part number
Remote	I/O module	2 026 803

Detailed technical specifications

→ You can find further data in the operating instructions. Download at www.sick.com

General data

Laser class	1 (21 CFR 1040.10 and 1040.11, DIN EN 60825:2001)
Enclosure rating according to EN 60529	IP 65
Protection class according to DIN VDE 0106, DIN EN 50178	II
Type according to IEC/EN 61496-3	Type 3
Functional safety of electrical, electronic and programmable electronic safety-related systems (IEC/EN 61508)	SIL2
Ambient operating temperature	–10 °C ... +50 °C
Sender	Pulsed laser diode, wavelength 905 nm
Housing	Material Aluminium die-cast Colour RAL 1021 (yellow)
Front screen	Material Polycarbonate Surface finish Outside with scratch-resistant coating
System plug	With ESD protected configuration memory
Dimensions (W x H x D)	155 mm x 185 mm x 160 mm
Total weight	3.3 kg

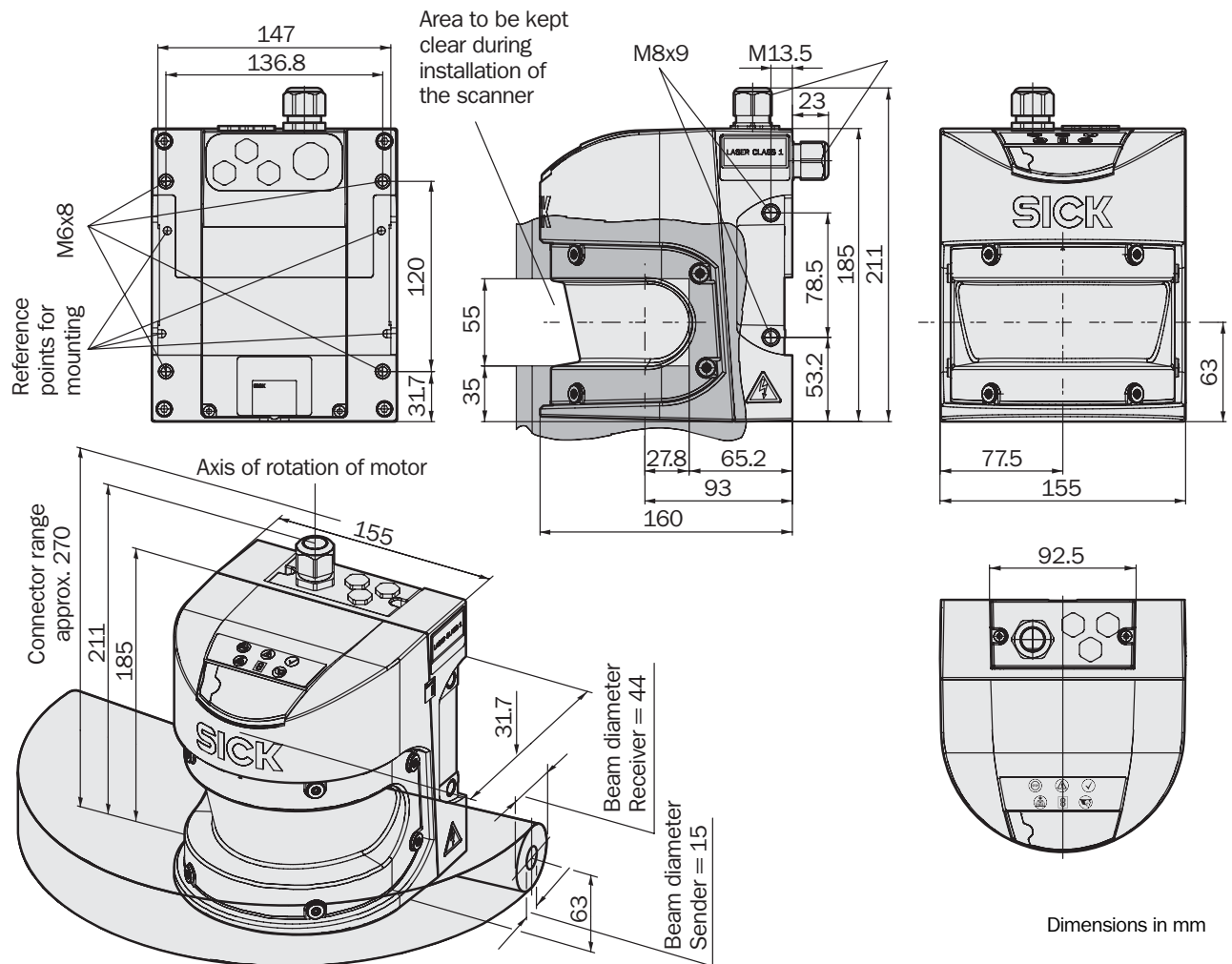
Functional data

Scanning angle	190°
Protective field range (depending on type)	5.5 m / 7 m
Reflectivity	1.8 % to several 1000 % (Reflectors)
Response time	60 ms or 120 ms
Resolution (selectable)	30, 40, 50, 70, 150 mm
Angular resolution	0.50° / 0.25°
Protective field supplement	100 mm
Warning field range	49 m (20 m at 20 % reflectivity)
Distance measuring range	49 m
Number of multiple samplings (configurable via CDS)	2 ... 16
Restart after (configurable)	2 s ... 60 s

Electrical data

Electrical connection	Plug-in connection housing with screw type terminals
Supply voltage	24 V (16.8 V ... 28.8 V) DC
Power consumption at 24 V without output load	0.8 A
Power consumption with max. output load	2.3 A
Number of inputs	EDM 1 Restart/Reset 1
Number of outputs	Safety outputs (OSSD) 2 x 500 mA Warning field output 1 x 100 mA Application diagnostic output 1 x 100 mA Restart/Reset Required 1 x 100 mA
Configuration and diagnostics interface	RS-232 (9.6 / 19.2 / 38.4 kBaud)
Data interface	RS-422 (up to 500 kBaud)
EFI – safe SICK device communication (cable length at 500 kBaud and 0.34-mm² cables)	50 m

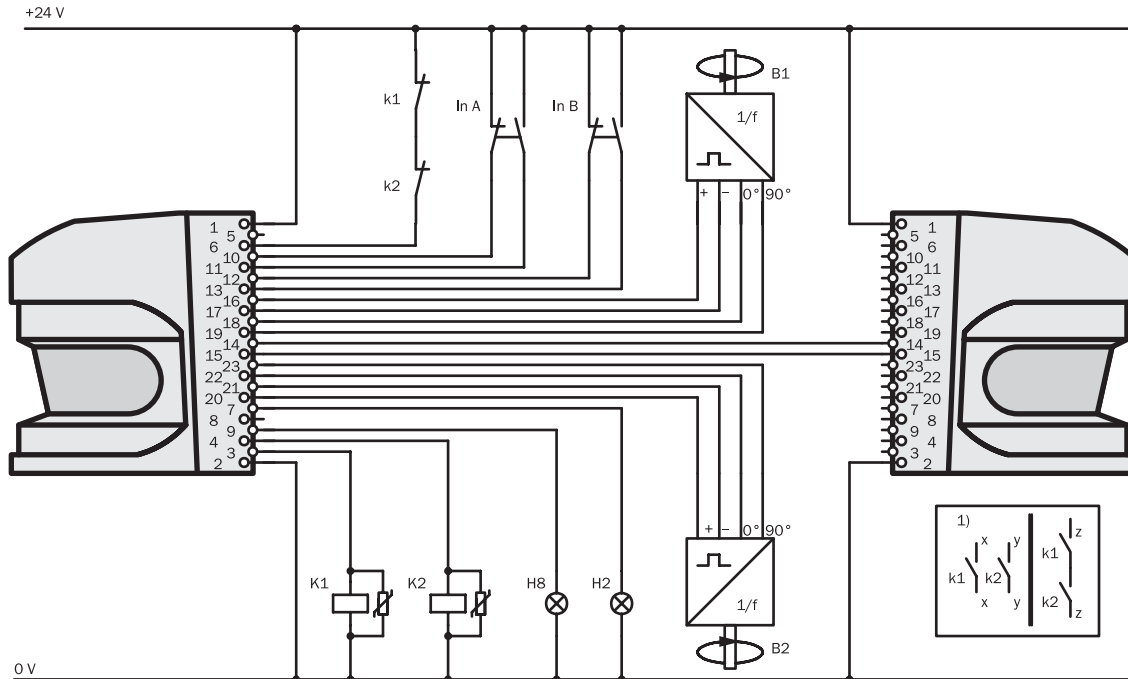
Dimensional drawings



Connection diagram

→ You can find additional information to this connection diagram as well as further connection diagrams at www.sick.com

Protective field switching between two S 3000 with static and dynamic inputs



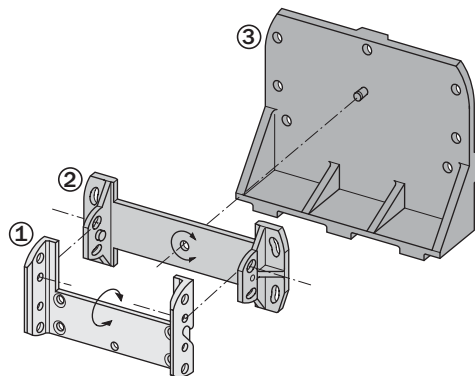
- S 3000 Professional (left) and Remote (right) in conjunction with relays/contactors
- Operating mode: without restart interlock with external device monitoring

- Direction of travel-dependent dynamic protective field switching by means of B1 and B2 as well as static protective field switching by means of the control inputs A and B with sensor communication via EFI

Accessories

Mounting kits

Description	Type	Part number
Mounting bracket for direct mounting at the rear on wall or machine. No adjustment facility	Mounting kit 1	2 015 623
Bracket only in conjunction with mounting kit 1. Mounting at the rear on wall or machine. Longitudinal and cross-wise adjustment possible	Mounting kit 2	2 015 624
Bracket only in conjunction with mounting kit 1 and 2. Mounting at the rear or below on wall, floor or machine. Longitudinal and cross-wise adjustment possible	Mounting kit 3	2 015 625



System plugs

Description	Type	Number of cores	Cable length	Part number
Cable outlet on the top	Without cable	—	—	2 023 797
	Pre-assembled	9	5 m	2 027 170
			10 m	2 027 171
			20 m	2 027 814

Self assembly connection cables

Description	Length	Part number
9-pin	100 m	6 022 651
EFI cable	50 m	6 026 675
M12 EMC-proof cable gland for EFI-connections	—	5 308 757

Service cables

Description	Length	Part number
Connection cable between the serial interface of the PC and the configuration interface	2 m	6 021 195
	8 m	2 027 649

Miscellaneous

Designation	Description	Part number
Software CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in multiple languages	2 026 875
Front screen	Spare parts set for front screen with replacement seal and screws	2 027 180
Plastic cleaner	Plastic cleaner and care product, anti-static, 1 litre	5 600 006
Lens cloth	Cloth for cleaning the front screen	4 003 353
Power supply 2.5 A	Power supply 24 V DC, 2.5 A	6 010 361
Power supply 4 A	Power supply 24 V DC, 4 A	6 010 362

→ For bus node accessories, please refer to page N-13 (UE 4150) or page N-20 (UE 4155)

Overview of technical specifications

Protective field range (depending on type)	5.5 m / 7 m
Warning field range	49 m (20 m at 20 % reflectivity)
Number of field sets	8
Scanning angle	190°
Resolution (selectable)	30, 40, 50, 70, 150 mm
Response time	60 ms or 120 ms
Type	Type 3 according to IEC/EN 61496-3 SIL2 (IEC/EN 61508)

Product description

With S 3000 Professional CMS (Contour Measurement and Safety) it is possible for the first time to combine the protection of people and the acquisition of surrounding contours. This system opens up new ways of productively achieving your objectives in the logistics and material handling sector.

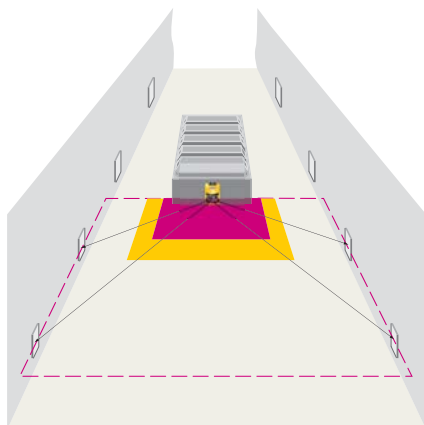
- Personnel protection and acquisition of the surrounding contour in one scanner
- Measured data output via RS-422 interface in real-time
- Reflector mark detection up to 30 m
- Velocity transfer for odometry
- 8 switchable protective/warning fields
- Static and dynamic protective field switching
- Incremental encoder connections
- Possibility of connecting two S 3000 units to form a single system
- New uniform "Configuration & Diagnostic Software" CDS

In-system added value

- Combination with SICK safety interfaces
- Safe interface to bus systems

Applications

- Freely moving transport vehicles



Personnel protection and acquisition of the surrounding contour with integrated reflector detection



B



- Modular concept
- Scanning range 5.5 m or 7 m
- Configuration memory
- Selectable resolution
- Certified for vertical use
- 7-segment display
- Integrated external device monitoring (EDM)



Further information	Page
→ Features	B-2
→ Ordering information	B-28
→ Technical specifications	B-28
→ Dimensional drawings	B-30
→ Connection diagram	B-31
→ Accessories	B-32
→ Services	A-0

Ordering information

Delivery S 3000 systems:

- Sensor head with I/O module mounted
- Operating instructions, message list and CDS (Configuration & Diagnostic Software) on CD-ROM
- Adhesive label "Important information"

The system plug has to be ordered separately!

→ Ordering information system plug and accessories page B-32

S 3000 Professional CMS systems

Description	Type	Part number
Protective field range 5.5 m	S 3000 Professional CMS (incl. mounted I/O module)	1 026 401
Protective field range 7 m		1 026 402

Sensor heads

Description	Type	Part number
Protective field range 5.5 m	Sensor head medium range	2 022 972
Protective field range 7 m	Sensor head long range	2 026 747

I/O module

Description	Type	Part number
Professional CMS	I/O module	2 030 915

Detailed technical specifications

→ You can find further data in the operating instructions. Download at www.sick.com

General data

Laser class	1 (21 CFR 1040.10 and 1040.11, DIN EN 60825:2001)
Enclosure rating according to EN 60529	IP 65
Protection class according to DIN VDE 0106, DIN EN 50178	II
Type according to IEC/EN 61496-3	Type 3
Functional safety of electrical, electronic and programmable electronic safety-related systems (IEC/EN 61508)	SIL2
Ambient operating temperature	-10 °C ... +50 °C
Sender	Pulsed laser diode, wavelength 905 nm
Housing	Aluminium die-cast RAL 1021 (yellow)
Material Colour	
Front screen	Polycarbonate Outside with scratch-resistant coating
Material Surface finish	
System plug	With ESD protected configuration memory
Dimensions (W x H x D)	155 mm x 185 mm x 160 mm
Total weight	3.3 kg

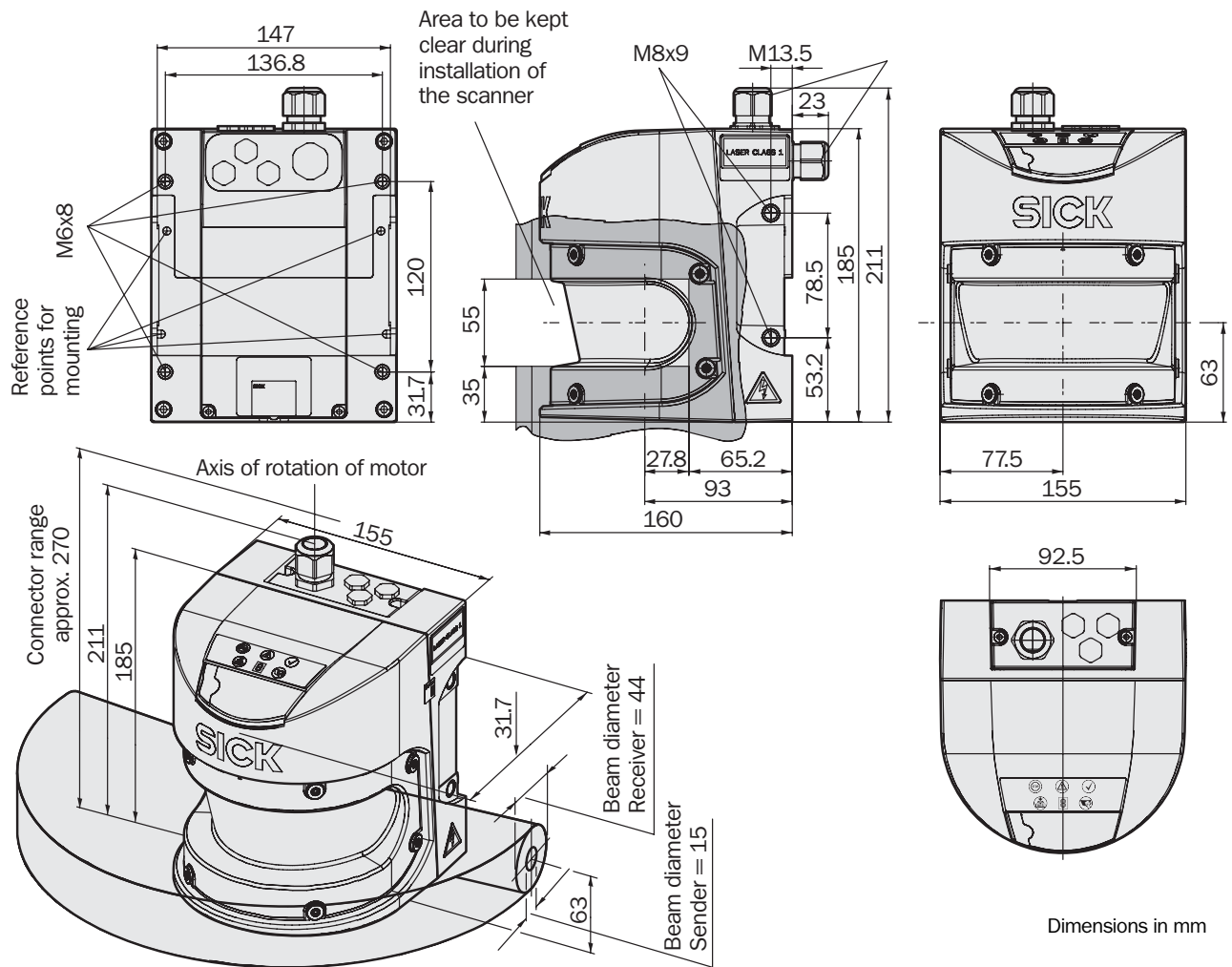
Functional data

Scanning angle	190°
Protective field range (depending on type)	5.5 m / 7 m
Reflectivity	1.8 % to several 1000 % (reflectors)
Response time	60 ms or 120 ms
Resolution (selectable)	30, 40, 50, 70, 150 mm
Angular resolution	0.50° / 0.25°
Protective field supplement	100 mm
Warning field range	49 m (20 m at 20 % reflectivity)
Distance measuring range	49 m
Reflector mark detection on Diamond Grade 3000	30 m
Number of multiple samplings (configurable via CDS)	2 ... 16
Restart after (configurable)	2 s ... 60 s

Electrical data

Electrical connection	Plug-in connection housing with screw type terminals
Supply voltage	24 V (16.8 V ... 28.8 V) DC
Power consumption at 24 V without output load	0.8 A
Power consumption with max. output load	2.3 A
Number of inputs	
EDM	1
Restart/Reset	1
static switching signals	2 / 4
dynamic encoder signals (incremental encoder)	2
Number of outputs	
Safety outputs (OSSD)	2 x 500 mA
Warning field output	1 x 100 mA
Application diagnostic output	1 x 100 mA
Restart/Reset Required	1 x 100 mA
Configuration and diagnostics interface	RS-232 (9.6 / 19.2 / 38.4 kBaud)
Data interface	RS-422 (up to 500 kBaud)
EFI – safe SICK device communication (cable length at 500 kBaud and 0.34-mm² cables)	50 m

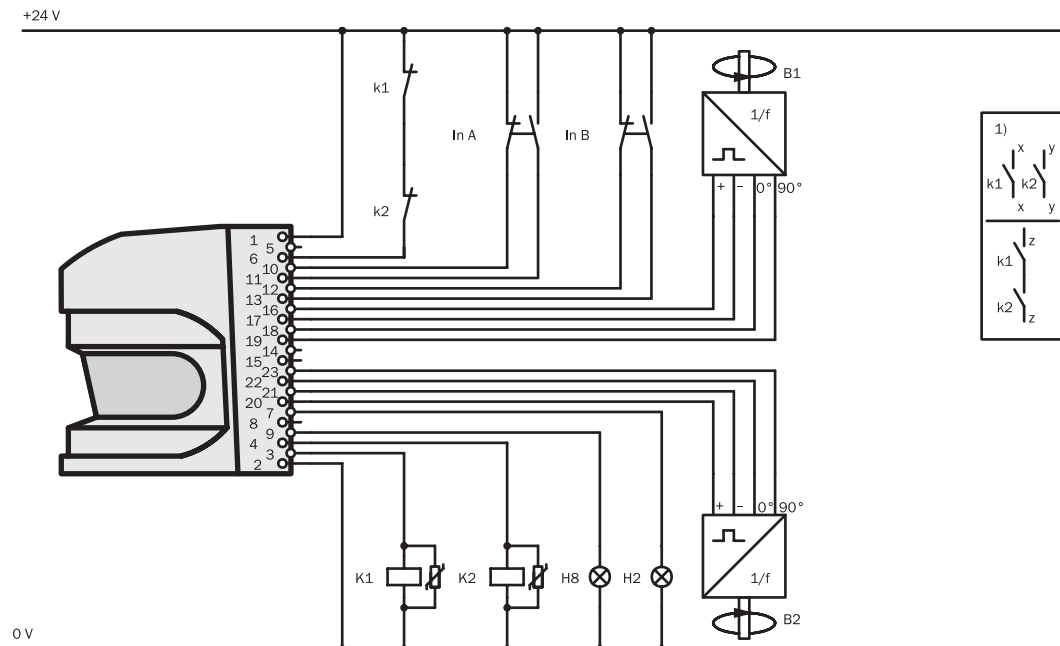
Dimensional drawings



Connection diagram

→ You can find additional information to this connection diagram as well as further connection diagrams at www.sick.com

Protective field switching with static and dynamic inputs



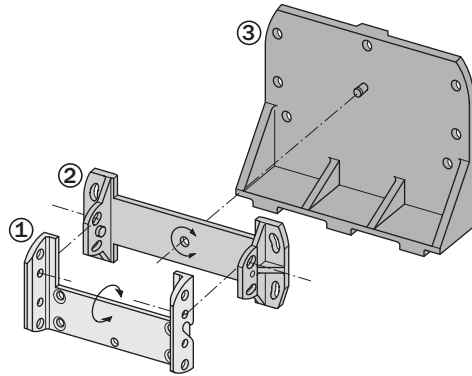
- S 3000 Professional CMS in conjunction with relays/contactors
- Operating mode: without restart interlock with external device monitoring (EDM)

- Dynamic protective field switching using B1 and B2 as well as static protective field switching using the control inputs A and B

Accessories

Mounting kits

Description	Type	Part number
Mounting bracket for direct mounting at the rear on wall or machine. No adjustment facility	Mounting kit 1	2 015 623
Bracket only in conjunction with mounting kit 1. Mounting at the rear on wall or machine. Longitudinal and cross-wise adjustment possible	Mounting kit 2	2 015 624
Bracket only in conjunction with mounting kit 1 and 2. Mounting at the rear or below on wall, floor or machine. Longitudinal and cross-wise adjustment possible	Mounting kit 3	2 015 625



System plugs

Description	Type	Number of cores	Cable length	Part number
Cable outlet on the top, no usage of incremental encoders	Without cable	—	—	2 023 797
	Pre-assembled	17	5 m	2 027 174
			10 m	2 027 175
			20 m	2 027 816
Cable outlet on the top, for usage of incremental encoders	Without cable	—	—	2 023 310
	Pre-assembled	13	5 m	2 027 176
			10 m	2 027 177

Self assembly connection cables

Description	Length	Part number
13 core	100 m	6 025 729
17 core	100 m	6 025 730
EFI cable	50 m	6 026 675
M12 EMC-proof cable gland for EFI-connections	—	5 308 757

Service cables

Description	Length	Part number
Connection cable between the serial interface of the PC and the configuration interface	2 m	6 021 195
	8 m	2 027 649

Miscellaneous

Designation	Description	Part number
Software CDS	CDS (Configuration & Diagnostic Software) on CD-ROM incl. online documentation, operating instructions and message list, in several languages	2 026 875
Front screen	Spare parts set for front screen with replacement seal and screws	2 027 180
Plastic cleaner	Plastic cleaner and care product, anti-static, 1 litre	5 600 006
Lens cloth	Cloth for cleaning the front screen	4 003 353
Power supply 2.5 A	Power supply 24 V DC, 2.5 A	6 010 361
Power supply 4 A	Power supply 24 V DC, 4 A	6 010 362

→ For bus node accessories, please refer to page N-13 (UE 4150) or page N-20 (UE 4155)

Overview of technical specifications

Protective field range	2 m
Warning field range	6 m with 20 % reflectivity
Resolution (selectable)	30, 40, 50, 70 mm
Scanning angle	270°
Response time	80 ms
Dimensions (L x W x H)	105 mm x 100 mm x 148 mm
Type	Type 3 (IEC 61496-3), SIL2 (IEC 61508)

Variants	Field sets (consisting of protective/ warning fields)
S 300 Standard	1
S 300 Advanced	2
S 300 Professional	4

Product description

The S 300 laser scanner is the ideal solution for all applications in which the hazardous area to be monitored has a radius of less than 2 m.

Its ultra-compact housing and low power consumption make this device the first choice for small freely-moving transport vehicles, among other applications.

Like the S 3000, its field sets can be conveniently defined via a PC and stored in the S 300.

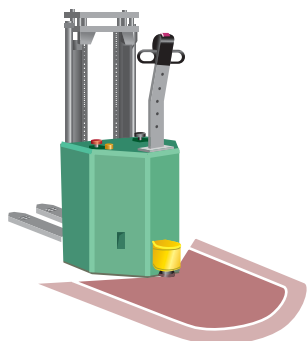
- 3 variants with up to 4 switchable field sets
- Static and dynamic switching of field sets
- Incremental encoder inputs
- Connection possibilities between S 300 and S 300 / S 3000
- New uniform CDS Configuration & Diagnostic Software

In-system added value

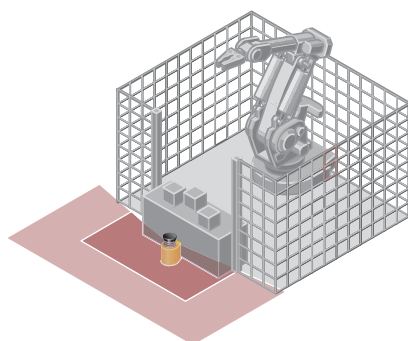
- Can be combined with SICK safety interfaces
- Safe connection to bus systems

Applications

- Freely-moving transport vehicles
- Processing centres
- Robot cells
- Entry/exit stations (locks)



Protecting the hazardous area of a freely-moving transport vehicle



Protecting the hazardous area of a robot cell



New product

Available by mid-2005

B



- Ultra-compact
- Configuration memory
- Selectable resolution
- 7-segment indicator
- Integrated external device monitoring
- Certified for vertical use



Further information

→ Services

Page

A-0



B



- Protective field range 4 m
- Freely programmable protective fields and warning fields



Overview of technical specifications

Protective field range	4 m
Warning field range	50 m (15 m at 20 % reflectivity)
Number of field sets	1
Scanning angle	180°
Resolution	70 mm
Response time	Min. 80 ms
Type	Type 3 according to IEC/EN 61496-1

Product description

The PLS is a compact sensor that requires only minimal mounting effort. Ideal both for mobile and stationary use.

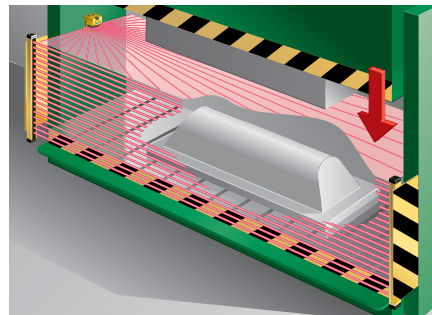
- Active safety system, no reflectors necessary
- Monitored areas remain freely accessible/can be driven through
- User-friendly software for commissioning and diagnostics
- Mature system proven time and again

In-system added value

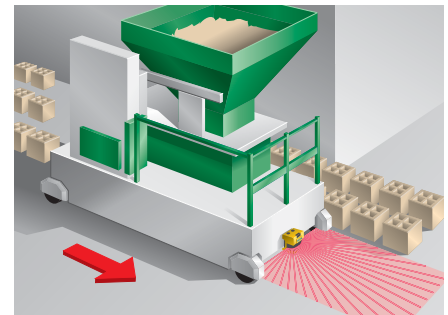
- Function expansion by means of laser scanner interface LSI

Applications

- Freely moving transport vehicles
- Production lines
- Machining centres
- Robot cells
- Narrow aisle vehicles



Internal protection on a spotting press



Hazardous area protection on a mobile stone-setting machine

Further information	Page
→ Dimensional drawings	B-36
→ Connection diagram	B-37
→ Accessories	B-38
→ Interface LSI	B-46
→ Services	A-0

Ordering information

Delivery PLS systems:

- Laser scanner PLS
- User software
- Documentation
- Connection kit 1 (if connection kit 2 to 7 not ordered)

→ Ordering information accessories Page B-38

Description	Type	Part number
<ul style="list-style-type: none"> ■ Protective field range up to 4 m ■ Certified according to IEC/EN 61496-1 	PLS101-312	1 016 066
<ul style="list-style-type: none"> ■ Scanning range up to 50 m ■ Not certified for personnel protection 	PLS201-313	1 016 189

Detailed technical specifications

→ You can find further data in the technical description. Download at www.sick.com

General data

Laser class	1
Enclosure rating according to EN 60529	IP 65
Protection class	II, totally isolated
Type according to IEC/EN 61496-1	Type 3
Ambient operating temperature	0 °C ... +50 °C
Sender	Pulsed laser diode, wavelength 905 nm
Housing	Aluminium die-cast RAL 1021 (yellow)
Material Colour	
Front screen	Polycarbonate Outside with scratch-resistant coating
Material Surface finish	
Dimensions (W x H x D)	155 mm x 185 mm x 156 mm
Total weight	4.5 kg

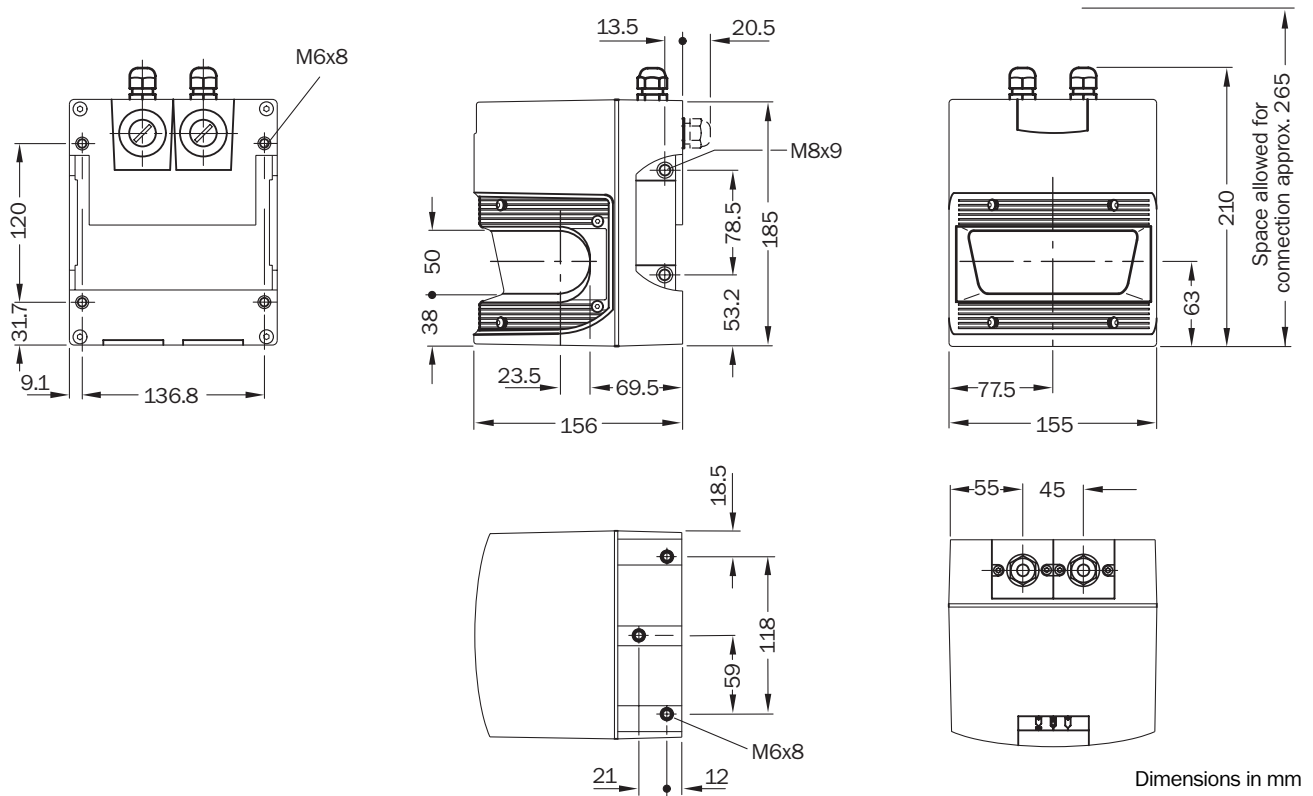
Functional data

Scanning angle	180°
Protective field range	4 m
Reflectivity	1.8 % (diffuse)
Response time	Min. 80 ms
Resolution	70 mm
Angular resolution	0.50°
Protective field supplement	94 mm 131 mm
to 2 m to 4 m	
Warning field range	50 m (15 m at 20 % reflectivity)
Distance measuring range	50 m
Number of multiple samplings	2 ... 16
Restart after (configurable)	2 s ... 60 s

Electrical data

Electrical connection		Plug-in connection housing can be screwed in place
Supply voltage		24 V (16.8 V ... 28.8 V) DC
Power consumption at 24 V without output load		17 W
Number of inputs	Restart/Reset	1
Number of outputs	Safety outputs (OSSD)	2 x 250 mA
	Warning field output	1 x 100 mA
Data interface		RS-232 / RS-422

Dimensional drawings

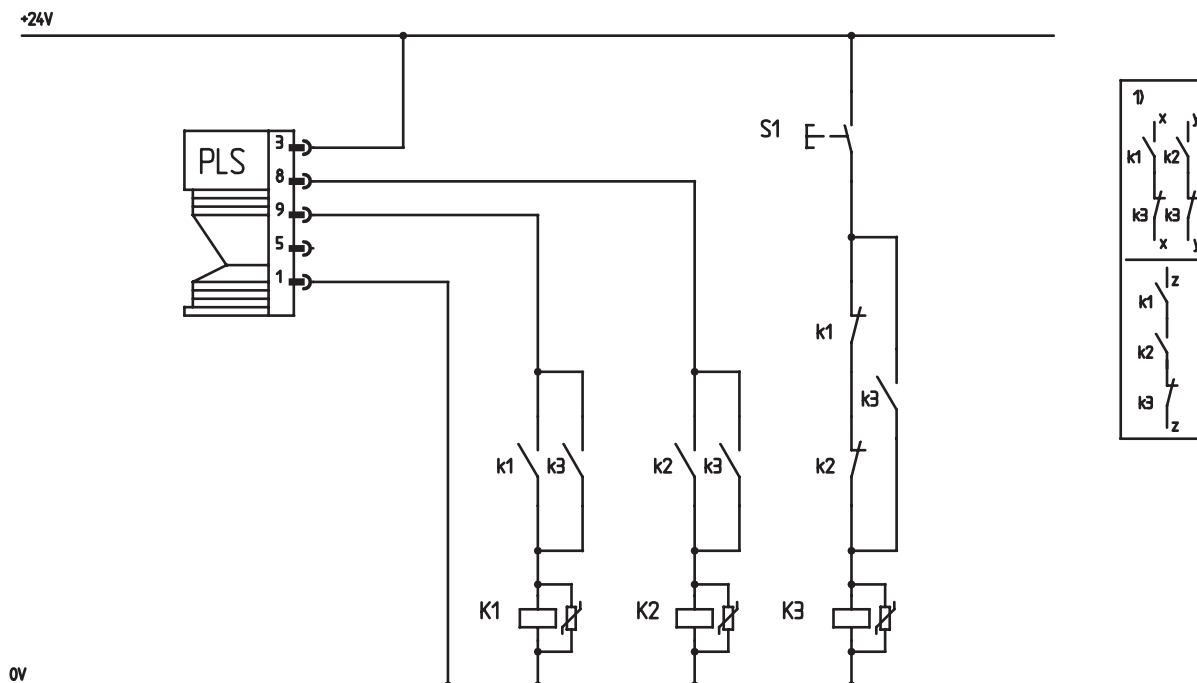


Connection diagram

→ You can find more connection diagrams at www.sick.com

PLS with restart interlock and external device monitoring

B



Task

Integration of the PLS in a relay/contactor control. Operating mode with restart interlock and external device monitoring. PLS in operating mode "without restart interlock" as this is carried out externally.

Function

If the contactors K1 and K2 are de-energised, on pressing S1 the K3 contactor is energised and remains energised. If an object is not detected in the active protective field, the OSSD1 and OSSD2 outputs are live, the K1 and K2 contactors are energised via the normally open contacts on K3 and remain energised. K3 is de-energised by releasing the S1 button. Only then are the output circuits closed. On detection of an object in the active protective field, the K1 and K2 contactors are de-energised by the OSSD1 and OSSD2 outputs.

Possible faults

The incorrect functioning of one of the K1 or K2 contactors does not result in the loss of the shutdown function. If K3 is continuously energised by a fault, the output circuit is open.

Note

The related operating instructions for the integrated devices must be observed!

Comments

- ¹⁾ Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

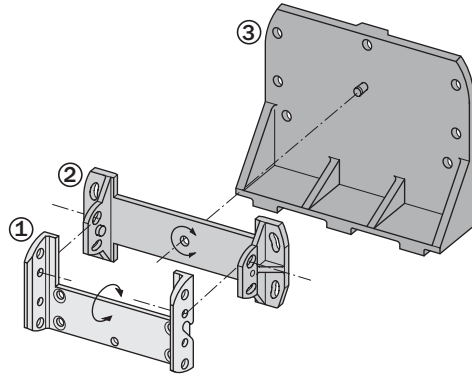
Accessories

→ If you want to use one or more PLS units in conjunction with an LSI (Laser Scanner Interface), you will find the necessary accessories with the LSI on page B-51.

B

Mounting kits

Description	Type	Part number
Mounting bracket for direct mounting at the rear on wall or machine. No adjustment facility	Mounting kit 1	2 015 623
Bracket only in conjunction with mounting kit 1. Mounting at the rear on wall or machine. Longitudinal and cross-wise adjustment possible	Mounting kit 2	2 015 624
Bracket only in conjunction with mounting kit 1 and 2. Mounting at the rear or below on wall, floor or machine. Longitudinal and cross-wise adjustment possible	Mounting kit 3	2 015 625



Connection kits

Instead of connection kit 1, which is normally included in the delivery, you can order a connection kit 2 to 7 on which the supply connector is already fitted with a cable (cable outlet upward).

Description	Cable length	Type	Part number
With supply and interface connector without cable	—	Connection kit 1	2 016 184
With cable	3 m	Connection kit 2	2 016 185
	5 m	Connection kit 3	2 016 186
	10 m	Connection kit 4	2 016 187
	15 m	Connection kit 5	2 016 188
	20 m	Connection kit 6	2 016 189
	30 m	Connection kit 7	2 016 190

Interface cables

Description	Cable length	Part number
For RS-232	3 m	2 016 401
	5 m	2 016 402
	10 m	2 016 403
For RS-422	3 m	2 019 130
	5 m	2 019 131
	10 m	2 019 132

Documentation and PLS/LSI user software

Description	Language	Part number
Technical Description with user software for WIN 95 / WIN 98 / WIN NT	English	2 021 900
	French	2 021 901
	German	2 021 899
	Spanish	2 019 902

Miscellaneous

Designation	Description	Part number
Front screen	Spare parts set for front screen with replacement seal and screws	2 022 271
Plastic cleaner	Plastic cleaner and care product, anti-static, 1 litre	5 600 006
Lens cloth	Cloth for cleaning the front screen	4 003 353
Power supply 2.5 A	Power supply 24 V DC, 2.5 A	6 010 361
Power supply 4 A	Power supply 24 V DC, 4 A	6 010 362

→ For safety relays please refer to pages L-42ff.



B



- Protective field range 1.5 m
- Freely programmable protective field and warning field
- Proven PLS technology



Overview of technical specifications

Protective field range	1.5 m
Warning field range	50 m (15 m at 20 % reflectivity)
Number of field sets	1
Scanning angle	180°
Resolution	50 mm
Response time	Min. 80 ms
Type	Type 3 according to IEC/EN 61496-1

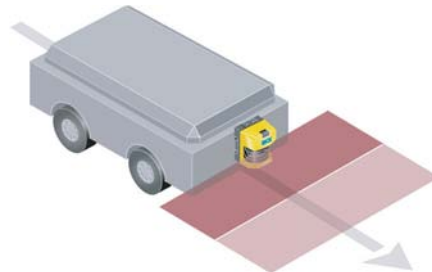
Product description

Efficient hazardous area protection is not a question of budget. This is demonstrated by the PLS short range - developed for the cost-effective and precise monitoring of small areas as well as for the protection of objects in the near range.

- Active safety system, no reflectors necessary
- Monitored areas remain freely accessible/can be driven through
- Proven, easy-to-use software for commissioning and diagnostics
- Compatible with accessories and mounting system for PLS

Applications

- Stationary and mobile near range protection
- Point-of-operation guarding
- Bumper replacement



Hazardous area protection on a vehicle

Ordering information

Delivery PLS short range:

- Laser scanner PLS short range
- User software
- Documentation
- Connection kit 1 (if connection kit 2 to 7 not ordered)

Description	Type	Part number
Protective field range up to 1.5 m	PLS109-317	1 022 253

Further information	Page
→ Dimensional drawings	B-42
→ Connection diagram	B-43
→ Accessories	B-44
→ Services	A-0

Detailed technical specifications

→ You can find further data in the technical description. Download at www.sick.com

B

General data

Laser class	1
Enclosure rating according to EN 60529	IP 65
Protection class	II, totally isolated
Type according to IEC/EN 61496-1	Type 3
Ambient operating temperature	0 °C ... +50 °C
Sender	Pulsed laser diode, wavelength 905 nm
Housing	Material Aluminium die-cast
	Colour RAL 1021 (yellow)
Front screen	Material Polycarbonate
	Surface finish Outside with scratch-resistant coating
Dimensions (W x H x D)	155 mm x 185 mm x 156 mm
Total weight	4.5 kg

Functional data

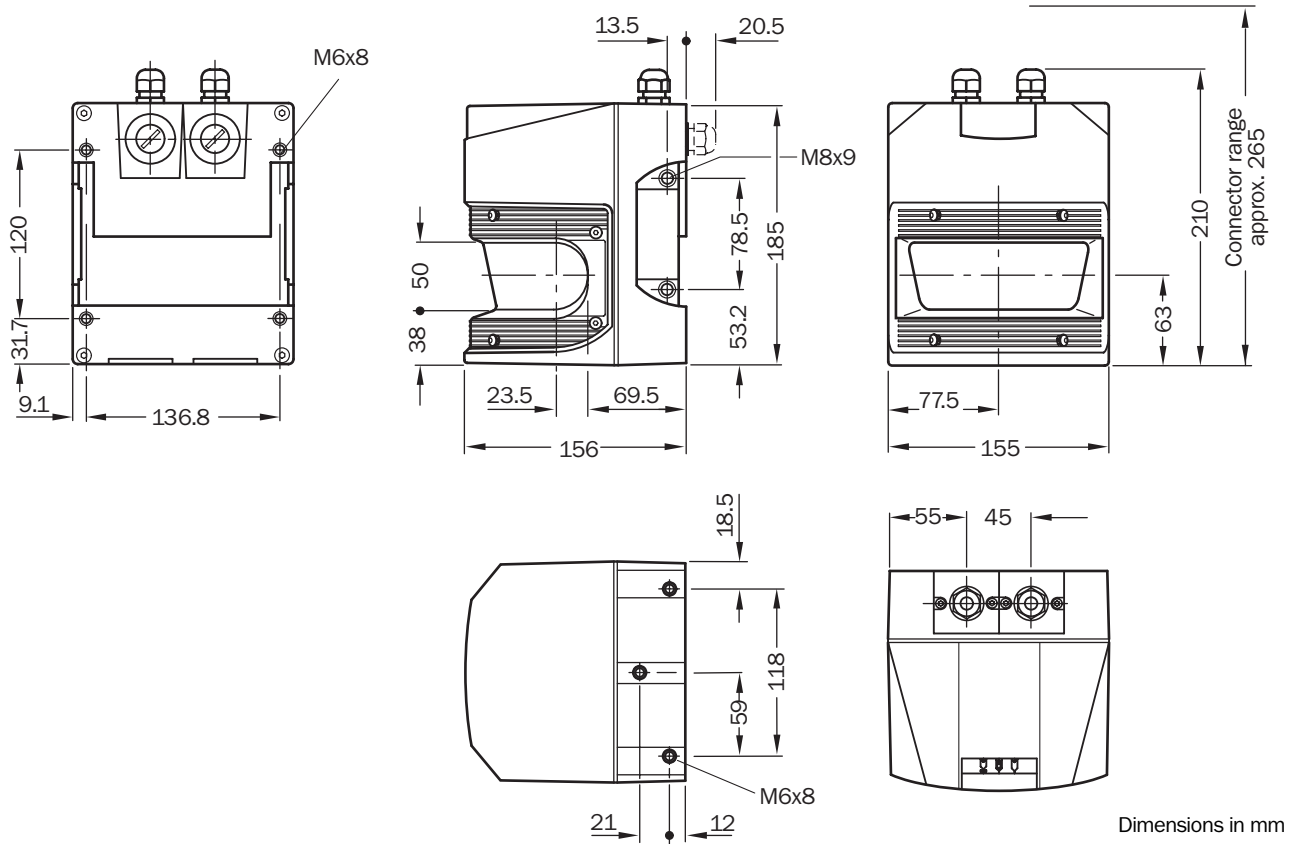
Scanning angle	180°
Protective field range	1.5 m
Reflectivity	1.8 % (diffuse)
Response time	Min. 80 ms
Resolution	50 mm
Angular resolution	0.50°
Protective field supplement	94 mm
Warning field range	50 m (15 m at 20 % reflectivity)
Distance measuring range	50 m
Number of multiple samplings	2 ... 16
Restart (configurable)	Immediately or after 2 s

Electrical data

Electrical connection	Plug-in connection housing can be screwed in place
Supply voltage	24 V (16.8 V ... 28.8 V) DC
Power consumption at 24 V without output load	17 W
Number of outputs	Safety outputs (OSSD) 2 x 150 mA
	Warning field output 1 x 100 mA
Data interface	RS-232 / RS-422
Note	Cannot be used in conjunction with an LSI interface

Dimensional drawings

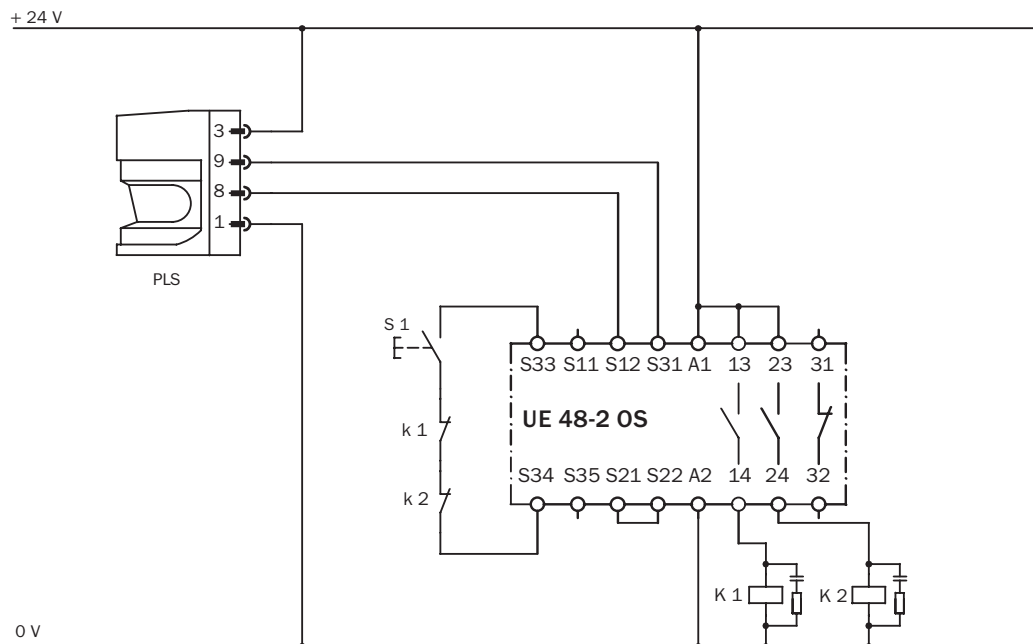
B



Connection diagram

→ You can find more connection diagrams at www.sick.com

Integration of PLS short range into the machine controller using UE 48-2 OS



Task

Integration of PLS short range using UE 48-2 OS into a controller. Operating mode “without restart interlock” as it is realised using the UE 48-2 OS.

Function

If an object is not detected in the active protective field and the K1 and K2 contactors are de-energised, the OSSDs on the UE 48-2 OS are switched on. The OSSDs of the UE 48-2 OS (terminals 13-14 and 23-24) activate the contactors K1 and K2. On detection of an object in the active protective field, the PLS short range deactivates the inputs on the UE 48-2 OS. The UE 48-2 OS de-energises the K1 and K2 contactors.

Possible faults

The incorrect functioning of one of the K1 or K2 contactors does not result in the loss of the shutdown function. Jamming of the S1 button prevents output circuit to enable.

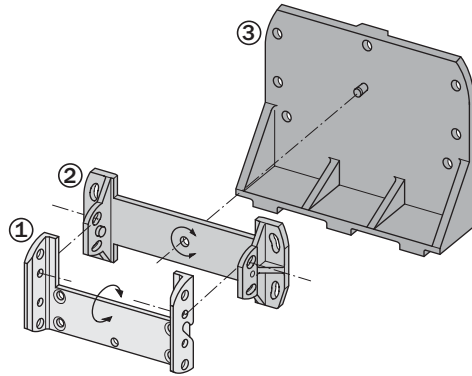
Note

The related operating instructions for the integrated devices must be observed!

Accessories

Mounting kits

Description	Type	Part number
Mounting bracket for direct mounting at the rear on wall or machine. No adjustment facility	Mounting kit 1	2 015 623
Bracket only in conjunction with mounting kit 1. Mounting at the rear on wall or machine. Longitudinal and cross-wise adjustment possible	Mounting kit 2	2 015 624
Bracket only in conjunction with mounting kit 1 and 2. Mounting at the rear or below on wall, floor or machine. Longitudinal and cross-wise adjustment possible	Mounting kit 3	2 015 625



Connection kits

Instead of connection kit 1, which is normally included in the delivery, you can order a connection kit 2 to 7 on which the supply connector is already fitted with a cable (cable outlet upward).

Description	Cable length	Type	Part number
With supply and interface connector without cable	—	Connection kit 1	2 016 184
With cable	3 m	Connection kit 2	2 016 185
	5 m	Connection kit 3	2 016 186
	10 m	Connection kit 4	2 016 187
	15 m	Connection kit 5	2 016 188
	20 m	Connection kit 6	2 016 189
	30 m	Connection kit 7	2 016 190

Interface cables

Description	Cable length	Part number
for RS-232	3 m	2 016 401
	5 m	2 016 402
	10 m	2 016 403
for RS-422	3 m	2 019 130
	5 m	2 019 131
	10 m	2 019 132

Documentation and PLS user software

Description	Language	Part number
Technical Description with user software for WIN 95 / WIN 98 / WIN NT	German	2 019 704
	English	2 019 705
	French	2 019 707

B

Miscellaneous

Designation	Description	Part number
Front screen	Spare parts set for front screen with replacement seal and screws	2 022 271
Plastic cleaner	Plastic cleaner and care product, anti-static, 1 litre	5 600 006
Lens cloth	Cloth for cleaning the front screen	4 003 353
Power supply 2.5 A	Power supply 24 V DC, 2.5 A	6 010 361
Power supply 4 A	Power supply 24 V DC, 4 A	6 010 362

→ For safety relays please refer to pages L-42ff.



B



- Static and dynamic protective field switching
- Integrated external device monitoring (EDM)
- Incremental encoder connections
- Simultaneous monitoring



Overview of technical specifications

Number of field sets	8
Number of monitoring cases	15
Number of independent OSSD pairs	2
Response time	190 ms
Type	Type 3 according to IEC/EN 61496-1

Product description

The Interface LSI provides the safe connection to your machine or system. Mobile or stationary applications are conveniently configured at the click of a mouse. The advantages offered by the PLS safety laser scanner are multiplied by using the LSI interface.

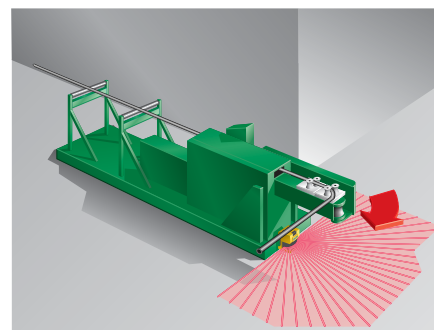
- Up to 8 freely programmable field sets can be controlled by up to 4 PLS.
- Static and dynamic protective field switching
- Incremental encoder connections
- Velocity- and direction-dependent signal control
- Monitoring cases in any sequence

Applications

- Freely moving transport vehicles
- Production lines
- Machining centres
- Robot cells
- Narrow aisle vehicles



Hazardous area protection on a narrow aisle stacker



Hazardous area protection on a pipe bending machine

Further information	Page
→ Dimensional drawings	B-48
→ Connection diagrams	B-49
→ Accessories	B-51
→ Services	A-0

Ordering information

Delivery LSI interface:

- Interface LSI
- Documentation
- Connection kit A (if connection kit B to G not ordered)

You will not receive any user software with the LSI. The PLS/LSI user software is used for programming an individual PLS or an LSI system. Included within the PLS delivery.

→ Ordering information accessories Page B-51

Description	Type	Part number
For the connection of max. 2 PLS 101-3XX	LSI101-112	1 016 063
For the connection of max. 4 PLS 101-3XX	LSI101-114	1 016 065

Detailed technical specifications

→ You can find further data in the technical description. Download at www.sick.com

General data

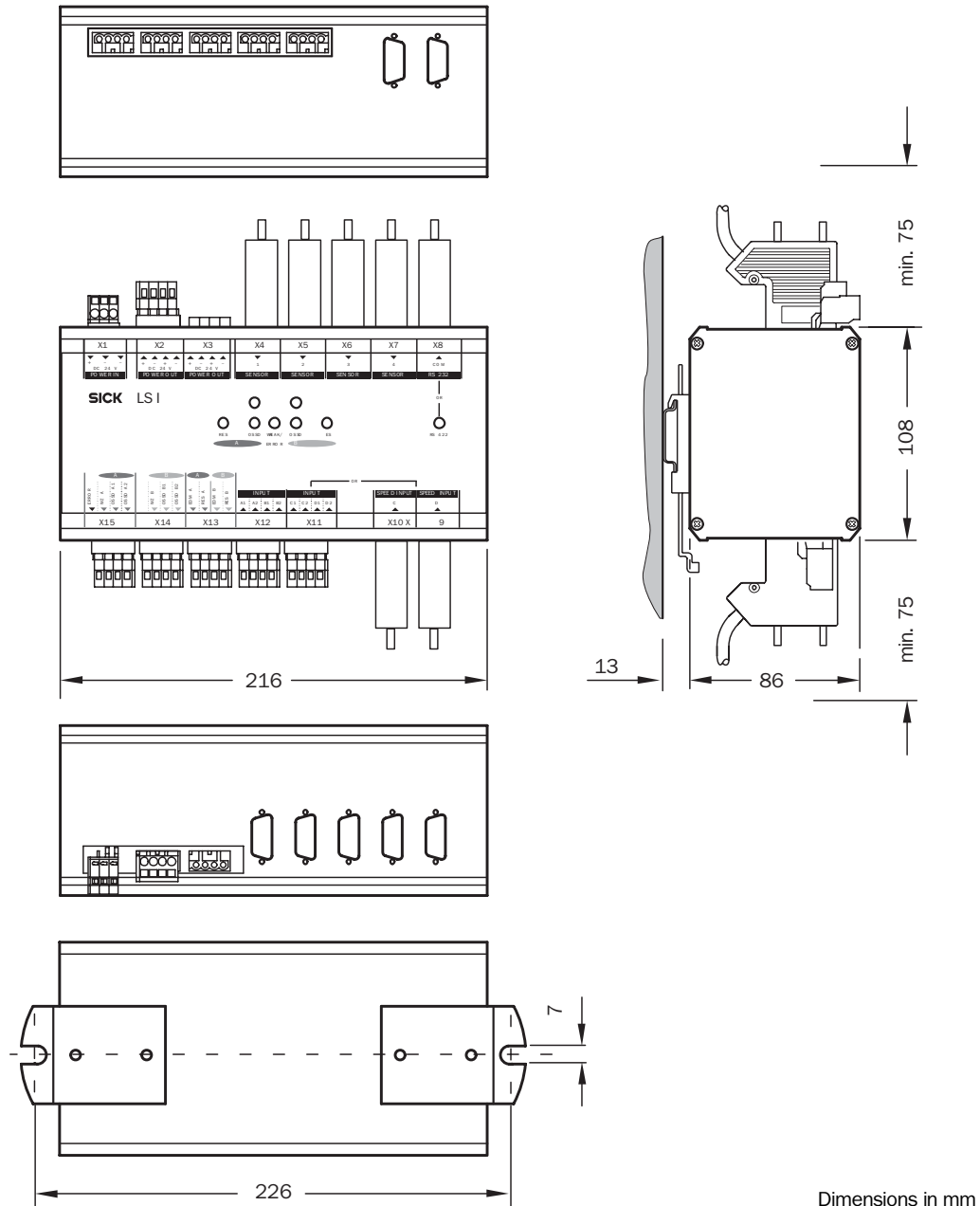
Enclosure rating	IP 20 (installation in control cabinet with min. IP 54 specified)
Protection class	III, safety extra-low voltage
Type according to IEC/EN 61496-1	Type 3
Ambient operating temperature	0 °C ... +50 °C
Dimensions (dimensions without terminals and plugs) (W x H x D)	216 mm x 108 mm x 86 mm
Total weight	1.25 kg

Electrical data

Supply voltage	24 V (16.8 V ... 28.8 V) DC										
Power consumption	<table> <tr> <td>without PLS and load</td><td>15 W</td></tr> <tr> <td>with 1 PLS and max. load</td><td>63 W</td></tr> <tr> <td>with 2 PLS and max. load</td><td>80 W</td></tr> <tr> <td>with 3 PLS and max. load</td><td>97 W</td></tr> <tr> <td>with 4 PLS and max. load</td><td>114 W</td></tr> </table>	without PLS and load	15 W	with 1 PLS and max. load	63 W	with 2 PLS and max. load	80 W	with 3 PLS and max. load	97 W	with 4 PLS and max. load	114 W
without PLS and load	15 W										
with 1 PLS and max. load	63 W										
with 2 PLS and max. load	80 W										
with 3 PLS and max. load	97 W										
with 4 PLS and max. load	114 W										
PLS connection	See technical specifications PLS										
Number of inputs	<table> <tr> <td>EDM</td><td>2</td></tr> <tr> <td>Restart/Reset</td><td>2</td></tr> <tr> <td>Static switching signals</td><td>2 / 4</td></tr> <tr> <td>Dynamic encoder signals (incremental encoder)</td><td>2</td></tr> </table>	EDM	2	Restart/Reset	2	Static switching signals	2 / 4	Dynamic encoder signals (incremental encoder)	2		
EDM	2										
Restart/Reset	2										
Static switching signals	2 / 4										
Dynamic encoder signals (incremental encoder)	2										
Number of outputs	<table> <tr> <td>Safety outputs (OSSD)</td><td>4 x 250 mA</td></tr> <tr> <td>Warning field output</td><td>2 x 100 mA</td></tr> <tr> <td>Application diagnostic output</td><td>1 x 100 mA</td></tr> </table>	Safety outputs (OSSD)	4 x 250 mA	Warning field output	2 x 100 mA	Application diagnostic output	1 x 100 mA				
Safety outputs (OSSD)	4 x 250 mA										
Warning field output	2 x 100 mA										
Application diagnostic output	1 x 100 mA										
Data interface	RS-232 / RS-422										

Dimensional drawings

B

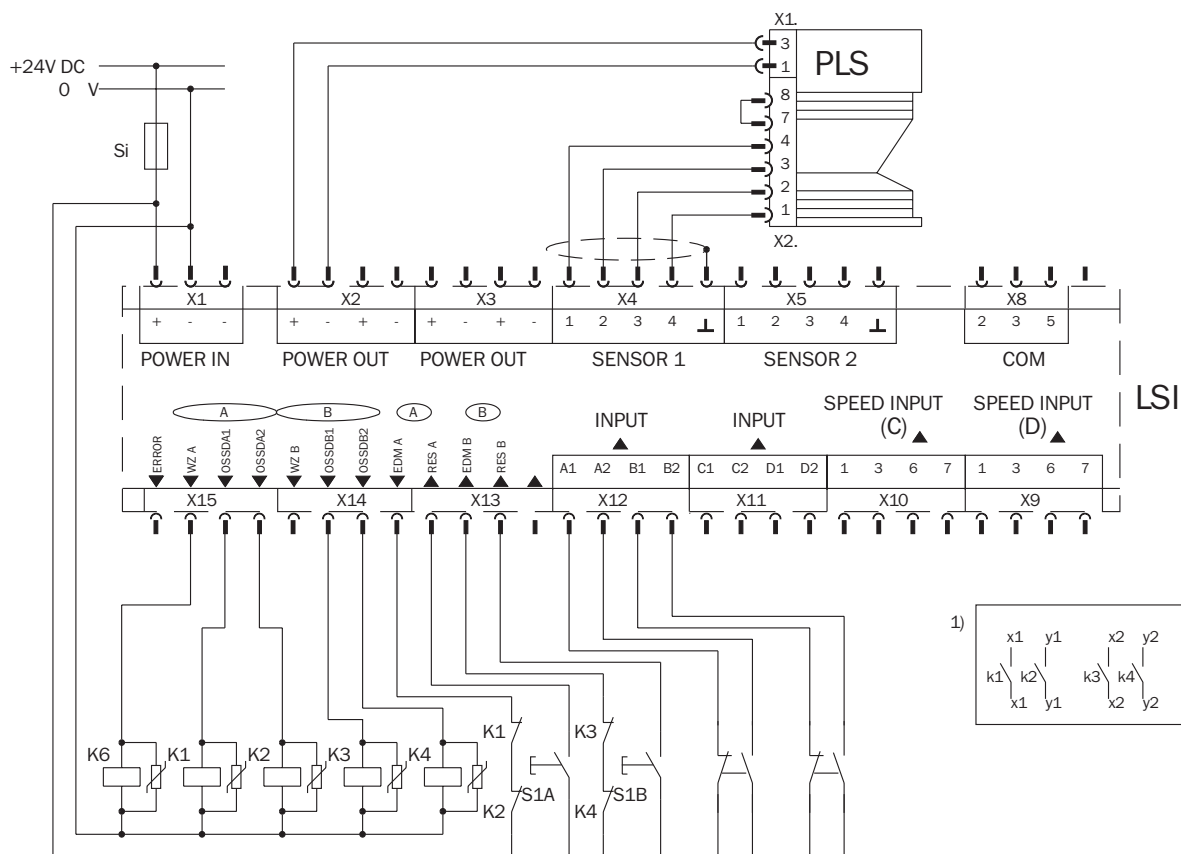


Connection diagrams

→ You can find more connection diagrams at www.sick.com

Use of a PLS/LSI system on a pipe bending machine

B

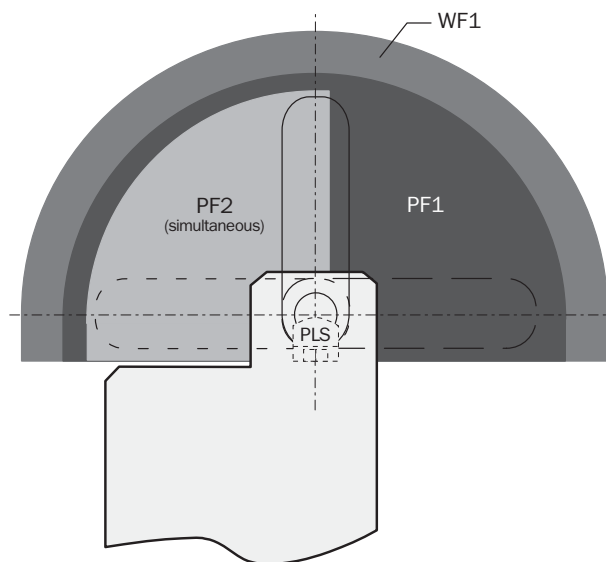


The LSI system is configured as follows:

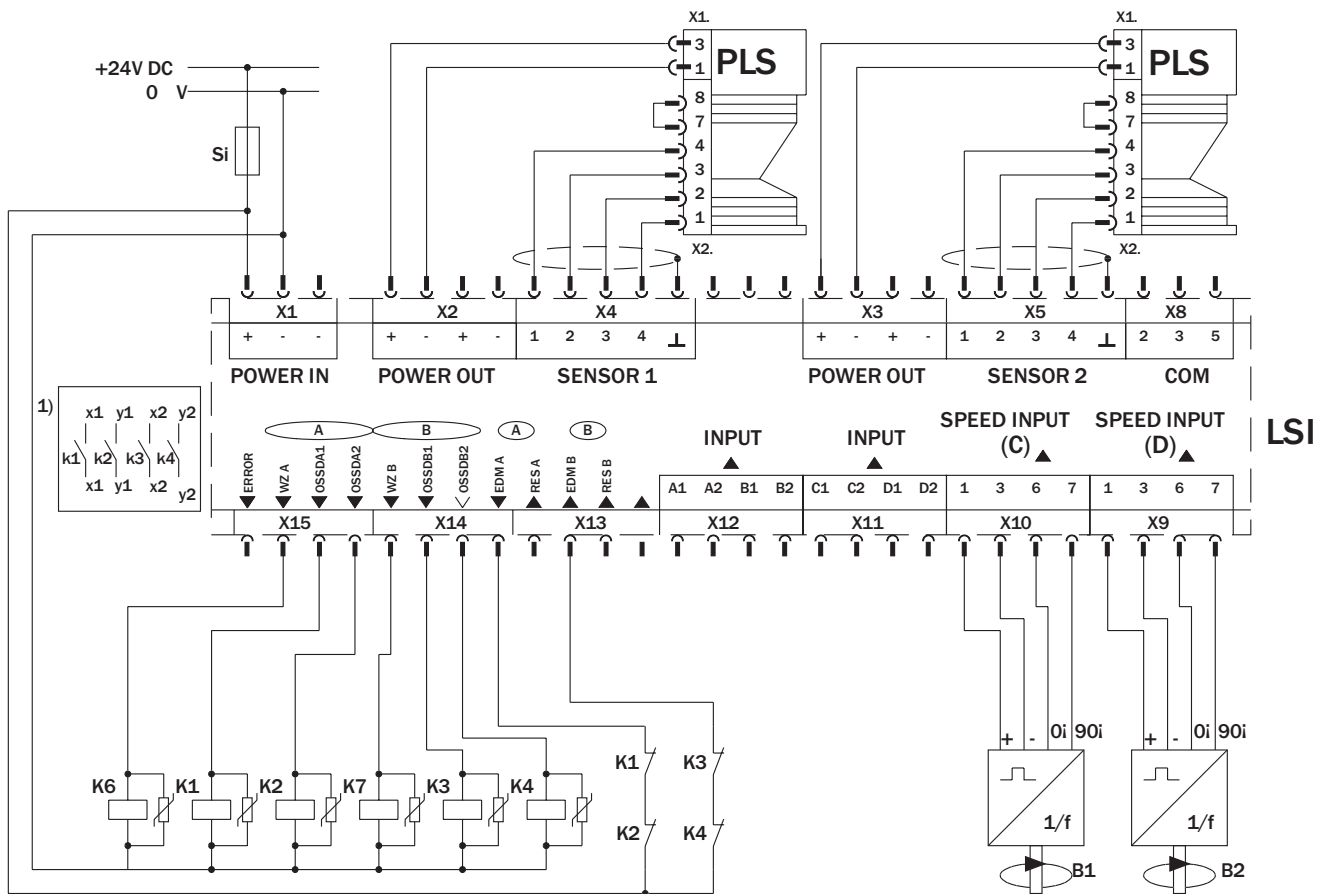
- One PLS sensor connected
- Two protective fields PF1 and PF2 (simultaneous) and one warning field WF1
- Two OSSD outputs and one warning field output
- Three monitoring cases that can be activated using the binary inputs
- Monitoring cases in any sequence

Comments

- ¹⁾ Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.



Use of a PLS/LSI system on an AGV, forward and backward movement

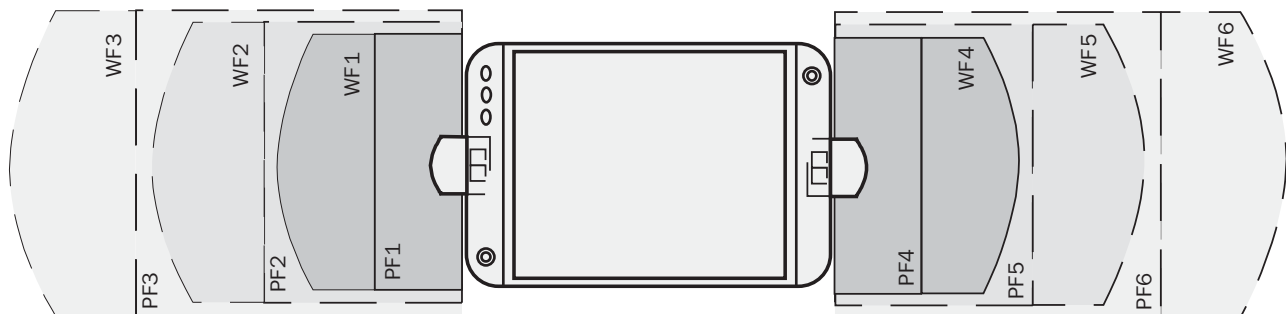


The LSI system is configured as follows:

- Two PLS sensors connected
- Six monitored areas (the protective and warning fields are configured in steps, as shown in the figure)
- Two incremental encoders connected
- Two OSSD outputs and two warning field outputs
- Six monitoring cases (three for forward movement, three for backward movement)
- Monitoring cases in any sequence

Comments

- 1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.



Protective and warning fields for forward movement

Protective and warning fields for backward movement

Accessories

Connection kits

Description	Design	Type	Part number
Connection kit with ■ 1 PLS supply connector ■ 1 PLS interface connector ■ 1 threaded interface connector for sensor connection on LSI	Without cable	Connection kit A	2 019 065
	3 m cable	Connection kit B	2 019 066
	5 m cable	Connection kit C	2 019 067
	10 m cable	Connection kit D	2 019 068
	15 m cable	Connection kit E	2 019 069
	20 m cable	Connection kit F	2 019 070
	30 m cable	Connection kit G	2 025 902
WAGO plug set, 8 parts	—	Terminal strip set	2 018 946
SUB-D connection plug	With screwed connections	SUB-D connection plug (RS-232/RS-422), EMC protected	6 011 808
	Connections as for soldered version		2 019 097

Interface cables

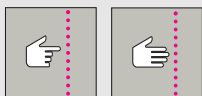
Description	Cable length	Part number
For RS-232	3 m	2 016 401
	5 m	2 016 402
	10 m	2 016 403
For RS-422	3 m	2 019 130
	5 m	2 019 131
	10 m	2 019 132

Documentation

Description	Language	Part number
Technical Description LSI, without data medium	English	8 008 310
	French	8 008 311
	German	8 008 309
	Spanish	8 009 033

Power supplies

Designation	Design	Part number
Power supply	24 V DC, 2.5 A	6 010 361
	24 V DC, 4 A	6 010 362
	24 V DC, 10 A	6 011 156



B

New product

Available from January 2005



- Press brake protection
- Camera-based
- 7-segment display
- Integrated external device monitoring (EDM)
- Easy configuration via CDS



Overview of technical specifications

Safety volume range	0 ... 7.5 m
Response time	10 ms
Type	Type 4 according to IEC/EN 61496-1 and -2
Enclosure rating	IP 54

Product description

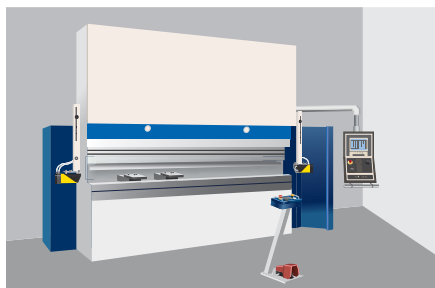
The V 4000 Press Brake is a camera-based system for personnel protection on press brakes. The V 4000 Press Brake is an all-inclusive sensor and evaluation system consisting of a sender and a receiver, mounted on the upper beam of the press and protects the punch during the fast downward movement. It creates a safety volume below the punch line and its output signal switching device (OSSD) provides a signal to switch off power at the source of the hazard as soon as an barred object (such as a hand or finger) is detected. The press brake monitoring system is easy to configure since it uses existing linear scales to calculate machine-relevant information such as the upper beam's position, velocity, direction and stopping distance.

- Camera-based system able to constantly monitor and adjust safety volume
- Maximize machine availability with self-optimizing algorithms
- Comprehensive self diagnostics
- Easy integration into the machine controls
- Fast and simple configuration and installation
- High immunity against vibrations and misalignments
- Optimized guard-only modes for most common bending tasks
- No unnecessary machine stops, reducing machine hydraulic stress

Applications

→ Further information on application finder www.sick.de

- Press brakes



V 4000 Press Brake system mounted on a press brake

Ordering information

Sender		Receiver	
Type	Part number	Type	Part number
V 4000 Press Brake sender	1 025 765	V 4000 Press Brake receiver	1 025 766

Further information	Page
→ Dimensional drawings	B-54
→ Accessories	B-55
→ Services	A-0

Detailed technical specifications

→ You can find more detailed data in the operating instructions. Download at www.sick.com

General system data

Laser protection class	1M (21 CFR 1040.10 and 1040.11, IEC 60825-1:2001)
Enclosure rating according to EN 60529	IP 54
Protection class according to DIN VDE 0106, DIN EN 50178	III
Type according IEC/EN 61 496-1/-2	Type 4
Operating temperature	0 °C ... +50 °C
Protective volume range	0 m ... 7.5 m
Protective volume height	6 mm ... 26 mm
Protective volume width	40 mm
Resolution	Minimum 10 mm Maximum 14 mm
Synchronisation	Electrical
Supply voltage V_S	24 V (19.2 V ... 28.8 V)
Electrical connection	Plug-in connection housing with screw terminal connections
Maximum cable length ¹⁾	30 m
Minimum cable cross-section	0.14 mm ²

Sender

Power consumption	Max. 0.2 A
--------------------------	------------

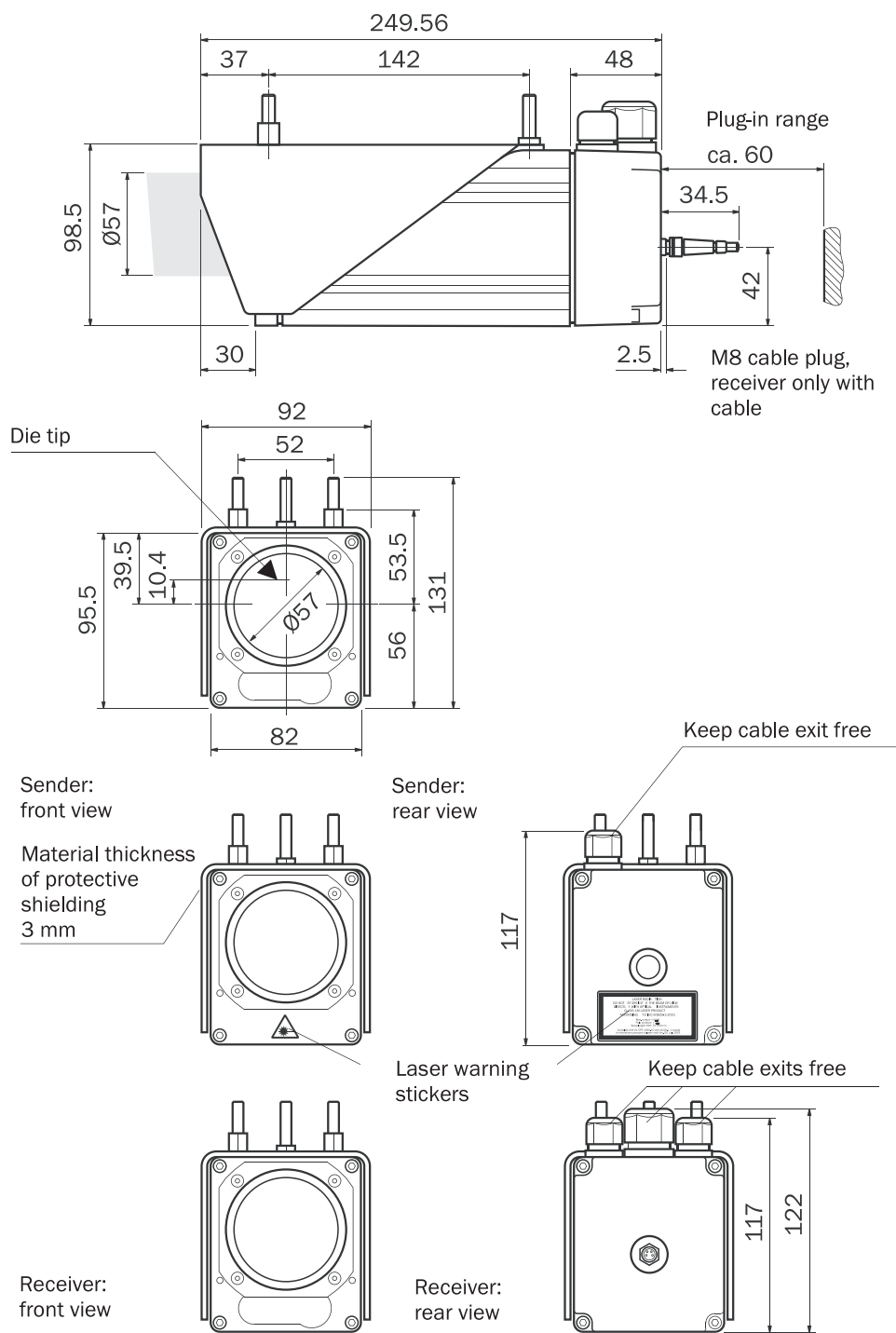
Receiver

Output signal switching devices (OSSDs)	2 PNP semiconductors
Response time T1	10 ms
Switching voltage HIGH (active, U_{eff})	24 V (min. $V_S - 2.7$ V ... max. V_S)
Switching voltage LOW (inactive)	0 V (0 V ... 3.5 V)
Switching current	0 mA ... 500 mA
Power consumption	Max. 0.5 A (without OSSD)
Signalling output for "teach-in request" and "request for target speed" V_{slow}	PNP semiconductors
Switching voltage HIGH (active)	24 V (min. $V_S - 3.3$ V ... max. V_S)
Switching voltage LOW (inactive)	High resistance
Switching current	0 mA ... 200 mA

¹⁾ Depending on load, power supply and cable cross-section. The technical specifications must be observed

Dimensional drawings

B



Dimensions in mm

Accessories

Designation	Description	Part number
Spare part connector V 4000 Press Brake	■ 2 pieces	2 032 052
PBI (press brake interface)		1 026 798
Spare part connector PBI	■ 2 pieces ■ With extractor for PBI	2 032 051
Set of masks	■ Receiver mask ■ Sender mask ■ Press crosshead mask	2 030 829
Test piece	■ For external device monitoring	4 040 724
Magnetic plate	■ For covering female die opening beneath the workpiece	4 040 736

Assembly accessories

Designation	Description	Part number
Mounting kit 1	■ Alignment plate ■ 2 pieces	2 031 126
Mounting kit 2	■ Retaining arm ■ 2 pieces	2 031 745

Connection

Designation	Description	Part number
Connecting cables (shielded) for self-configuration	■ Cross section 0.34 mm ² ■ Usable as trailing cable ■ Variable length	■ Sender - receiver, 4 cores 6 029 221
		■ Receiver - PBI, 4 cores 6 029 222
		■ Receiver - control cabinet, 18 cores 6 029 223
Power supply	■ 24 V DC, 2.5 A	6 010 361
Connecting cable between the serial interface of the PC and the configuration interface	■ Service cable	■ 2 m 6 021 195
		■ 8 m 2 027 649

Miscellaneous

Designation	Description	Part number
Software CDS	CDS (Configuration & Diagnostic Software) on CD incl. online-documentation and operating instructions in all available languages	2 032 314
Plastic cleaner	Plastic cleaner and care product, anti-static, 1 litre	5 600 006
Lens cloth	Cloth for cleaning front lens	4 003 353

Principle of operation of safety light curtains

Safety light curtains are used for finger protection, hand protection and access protection. They comprise a sender unit and a receiver unit and are electro-sensitive. Depending on the type, various machine functions are integrated or can be selected

using safety interfaces (e.g. intelliface): Restart interlock, external device monitoring, fixed/floating blanking, PSDI function, bypass function, operating mode selection etc.

Applications for safety light curtains

Presses, automatic placement machines, robot insertion stations, transfer lines, palletiser systems, textile and wood processing machines, etc.

Tell us your application!

We will show you the most cost-effective solution.

Advantages of the SICK safety light curtains

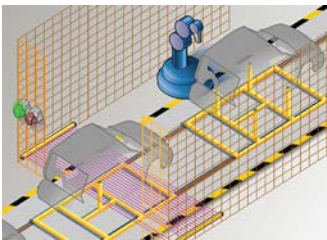
Only invest in what you actually need!

Effective protection for man and machine - irrespective of the safety task you want to address, SICK can provide a comprehensive solution with a wide range of safety light curtains.

- Cost-saving complete systems with integrated functions for a wide range of requirements
- Rapid commissioning

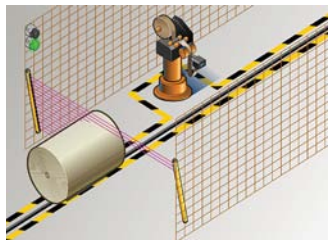
- Individual adaptation using CDS user software or customer-specific pre-settings from the factory
- Can be used with large temperature fluctuations as well as in wet areas due to IP 67 housing
- Reduced engineering and stock-holding costs due to universal interface for various automation environments
- Integrated PSDI mode with defined PSDI window provides up to 30% higher productivity

Cost-effective



Access protection:
A safety light curtain without additional sensors and mechanics

Available



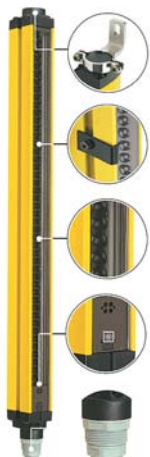
Access protection with differentiation between man and material using "blanking"

Safe



Classic finger/hand protection:
Defined PSDI window hinders unintentional cycle start caused by reaching over or reaching under

Mounting and operation made easy



Comprehensive range of mounting solutions and accessories provides a wide range of installation options

Heavy-duty additional front screen for use with welding sparks

Additional package enables ATEX applications in explosion-protected zones 2 and 22 (II cat. 3G/3D)



7-segment display for device status with display that can be rotated by 180°

All peripheral technologies can be incorporated using a universal interface: from the relay through safe control to the bus.

Services for productive safety

With services tailored specifically to your needs, SICK offers all-embracing support for the safety of your machine or system.




Address productivity and cost-effectiveness from the start: From selection and planning, through commissioning and inspection, to maintenance and modernisation.

→ For information about the services please refer to chapter A

Safety light curtains



C

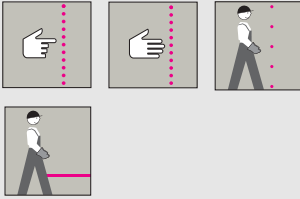
Safety application	Type according to IEC 61496	Resolution (mm)	Functions								Product	Page
			External device monitoring	Restart interlock	Beam coding	Operating mode selection ¹⁾	PSDI mode ¹⁾	Blanking	Safe interface to bus systems	ATEX II 3G/3D ³⁾		
 	Type 4	14 / 20 / 30 / 40	✓	✓	✓	✓	✓	✓	✓ ²⁾	✓	C 4000 Advanced	C-2
			✓	✓	✓	✓	✓	–	✓ ²⁾	✓	C 4000 Standard	C-17
		14 / 30	✓	✓	–	–	–	–	✓	–	C 4000 Micro	C-41
			✓	✓	–	–	–	–	✓	–	C 4000 Micro in IP 67 housing	C-49
			✓	–	–	–	–	–	✓	–	C 4000 Basic	C-54
	Type 4	20	✓	✓	–	✓	–	–	✓ ²⁾	✓	C 4000 Entry/Exit	C-64
 	Type 2	20 / 30 / 40	✓	–	✓	–	–	–	✓	–	C 2000 Standard	C-70
		30	✓	–	✓	–	–	–	✓	–	C 2000 Standard in IP 67 housing	C-81
		20 / 30 / 40	✓	✓	✓	–	–	–	✓	–	C 2000 RES/EDM	C-86
			✓	–	✓	–	–	–	✓	–	C 2000 cascable	C-97
	Type 2 ⁴⁾	30	✓	✓	–	–	–	✓	✓	–	LGT	C-107

¹⁾ With UE 402

²⁾ Products in the UE 1000 series with SDL interface expand the functionality of the devices and allow diagnostics and configuration

³⁾ With ATEX package

⁴⁾ Checked according to prEN 50100



- External device monitoring (EDM)
- Restart interlock (RES)
- Beam coding
- Teach-in blanking
- Floating blanking
- Fixed blanking
- Reduced resolution
- Up to 3 systems can be cascaded
- Configuration and diag-



Further information	Page
→ Technical specifications	C-7
→ Dimensional drawings	C-8
→ Connection diagram	C-10
→ Accessories	C-11
→ Services	A-0

Overview of technical specifications

Protective field height (depending on type)	300 mm ... 1800 mm
Scanning range (depending on type)	0 m ... 6 m / 0 m ... 19 m
Resolution (depending on type)	14 mm / 20 mm / 30 mm / 40 mm
Type	Type 4 according to IEC 61496, SIL3 (IEC/EN 61508)
Enclosure rating	IP 65

Product description

The C 4000 Advanced safety light curtain is used wherever hazardous points and hazardous areas require reliable and cost-effective protection. Fast, convenient, easy to service and user-friendly:

- Blanking functions allow defined objects to be present in the protective field, e.g. cables, benches.
- Shorter setup times and increased availability by means of rapid Teach-in of blanking areas.
- Numerous combinations of several blanking areas.
- Emergency stop button or reset button directly at the extension connection.
- Configuration and diagnostics via RS-232 interface.
- Alignment and diagnostics via 7-segment display
- Application diagnostic output for status information (e.g. contamination).

In-system added value

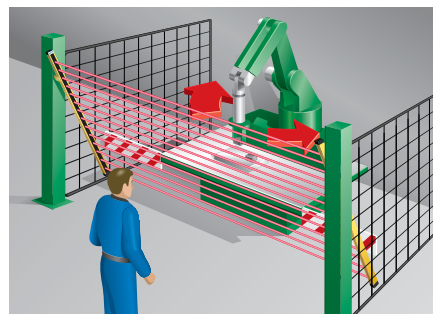
- Combination with SICK interfaces
- Safe integration in bus systems with UE 1000 series

Combination with	Bypass	PSDI	PSDI window	Teach-in	Operating mode switching	Configuration memory	Further information
UE 402	✓	✓	✓	✓	✓	—	C-12
UE 440	✓	—	—	✓	✓	✓	M-3
UE 470	✓	✓	—	✓	✓	✓	M-3
UE 4155	✓	✓	✓	✓	✓	—	N-15

Applications

→ You can find more applications using the application finder at www.sick.com

- Material handling
- Plastic
- Transforming machine tools
- Electronics industry
- Automotive industry
- Robotic
- Print- and paper industry
- Wood industry
- Palletisers



Hazardous point protection on an industrial robot

Ordering information

C 4000 Advanced without extension connection

→ Ordering Information C 4000 Advanced with extension connection see page C-5

Housing cross-section	48 mm x 40 mm
Functions	Restart interlock, external device monitoring, beam coding, fixed blanking, floating blanking, reduced resolution, PSDI (with UE 402), bypass (with UE 402), operating mode switching (with UE 402)
Consisting of	Sender and receiver unit
Usage	Single system and last system in a cascade
Connection types	System connection: Hirschmann plug M26 x 11 + FE Configuration connection: M8 x 4

C

Resolution 14 mm, scanning range 0 m ... 6 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301CA010	1 018 591	C40E-0301CB010	1 018 781
450	C40S-0401CA010	1 018 347	C40E-0401CB010	1 018 782
600	C40S-0601CA010	1 018 593	C40E-0601CB010	1 018 783
750	C40S-0701CA010	1 018 595	C40E-0701CB010	1 018 784
900	C40S-0901CA010	1 018 597	C40E-0901CB010	1 018 785
1050	C40S-1001CA010	1 018 599	C40E-1001CB010	1 018 786
1200	C40S-1201CA010	1 018 601	C40E-1201CB010	1 018 787
1350	C40S-1301CA010	1 018 603	C40E-1301CB010	1 018 788
1500	C40S-1501CA010	1 018 605	C40E-1501CB010	1 018 789
1650	C40S-1601CA010	1 018 607	C40E-1601CB010	1 018 790
1800	C40S-1801CA010	1 018 609	C40E-1801CB010	1 018 791

Resolution 20 mm, scanning range 0 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0302CA010	1 018 613	C40E-0302CB010	1 018 792
450	C40S-0402CA010	1 018 615	C40E-0402CB010	1 018 793
600	C40S-0602CA010	1 018 617	C40E-0602CB010	1 018 794
750	C40S-0702CA010	1 018 619	C40E-0702CB010	1 018 795
900	C40S-0902CA010	1 018 621	C40E-0902CB010	1 018 796
1050	C40S-1002CA010	1 018 623	C40E-1002CB010	1 018 797
1200	C40S-1202CA010	1 018 625	C40E-1202CB010	1 018 798
1350	C40S-1302CA010	1 018 627	C40E-1302CB010	1 018 799
1500	C40S-1502CA010	1 018 629	C40E-1502CB010	1 018 800
1650	C40S-1602CA010	1 018 631	C40E-1602CB010	1 018 801
1800	C40S-1802CA010	1 018 633	C40E-1802CB010	1 018 802

Continued on next page

Resolution 30 mm, scanning range 0 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0303CA010	1 018 635	C40E-0303CB010	1 018 803
450	C40S-0403CA010	1 018 637	C40E-0403CB010	1 018 804
600	C40S-0603CA010	1 018 639	C40E-0603CB010	1 018 805
750	C40S-0703CA010	1 018 641	C40E-0703CB010	1 018 806
900	C40S-0903CA010	1 018 643	C40E-0903CB010	1 018 807
1050	C40S-1003CA010	1 018 645	C40E-1003CB010	1 018 809
1200	C40S-1203CA010	1 018 647	C40E-1203CB010	1 018 810
1350	C40S-1303CA010	1 018 649	C40E-1303CB010	1 018 811
1500	C40S-1503CA010	1 018 651	C40E-1503CB010	1 018 812
1650	C40S-1603CA010	1 018 653	C40E-1603CB010	1 018 813
1800	C40S-1803CA010	1 018 655	C40E-1803CB010	1 018 814

Resolution 40 mm, scanning range 0 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0304CA010	1 018 657	C40E-0304CB010	1 018 815
450	C40S-0404CA010	1 018 659	C40E-0404CB010	1 018 816
600	C40S-0604CA010	1 018 661	C40E-0604CB010	1 018 817
750	C40S-0704CA010	1 018 663	C40E-0704CB010	1 018 818
900	C40S-0904CA010	1 018 665	C40E-0904CB010	1 018 819
1050	C40S-1004CA010	1 018 667	C40E-1004CB010	1 018 820
1200	C40S-1204CA010	1 018 669	C40E-1204CB010	1 018 821
1350	C40S-1304CA010	1 018 671	C40E-1304CB010	1 018 822
1500	C40S-1504CA010	1 018 673	C40E-1504CB010	1 018 823
1650	C40S-1604CA010	1 018 675	C40E-1604CB010	1 018 824
1800	C40S-1804CA010	1 018 677	C40E-1804CB010	1 018 825

C 4000 Advanced with extension connection

→ Ordering information C 4000 Advanced without extension connection page C-3

Housing cross-section	48 mm x 40 mm
Functions	Restart interlock, external device monitoring, beam coding, fixed blanking, floating blanking, reduced resolution, PSDI (with UE 402), bypass or emergency stop, operating mode switching (with UE 402)
Consisting of	Sender and receiver unit
Usage	First system in a cascade, middle system in a cascade
Connection types	System connection: Hirschmann plug M26 x 11 + FE Extension connection: Hirschmann socket M26 x 11 + FE Configuration connection: M8 x 4

C

Resolution 14 mm, scanning range 0 m ... 6 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301DA010	1 018 690	C40E-0301DB010	1 018 827
450	C40S-0401DA010	1 018 349	C40E-0401DB010	1 018 828
600	C40S-0601DA010	1 018 692	C40E-0601DB010	1 018 829
750	C40S-0701DA010	1 018 694	C40E-0701DB010	1 018 830
900	C40S-0901DA010	1 018 696	C40E-0901DB010	1 018 831
1050	C40S-1001DA010	1 018 698	C40E-1001DB010	1 018 832
1200	C40S-1201DA010	1 018 700	C40E-1201DB010	1 018 833
1350	C40S-1301DA010	1 018 702	C40E-1301DB010	1 018 834
1500	C40S-1501DA010	1 018 704	C40E-1501DB010	1 018 835
1650	C40S-1601DA010	1 018 706	C40E-1601DB010	1 018 836
1800	C40S-1801DA010	1 018 708	C40E-1801DB010	1 018 837

Resolution 20 mm, scanning range 0 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0302DA010	1 018 710	C40E-0302DB010	1 018 838
450	C40S-0402DA010	1 018 712	C40E-0402DB010	1 018 839
600	C40S-0602DA010	1 018 714	C40E-0602DB010	1 018 840
750	C40S-0702DA010	1 018 716	C40E-0702DB010	1 018 841
900	C40S-0902DA010	1 018 718	C40E-0902DB010	1 018 842
1050	C40S-1002DA010	1 018 720	C40E-1002DB010	1 018 843
1200	C40S-1202DA010	1 018 722	C40E-1202DB010	1 018 844
1350	C40S-1302DA010	1 018 724	C40E-1302DB010	1 018 845
1500	C40S-1502DA010	1 018 726	C40E-1502DB010	1 018 846
1650	C40S-1602DA010	1 018 728	C40E-1602DB010	1 018 847
1800	C40S-1802DA010	1 018 730	C40E-1802DB010	1 018 848

Continued on next page

Resolution 30 mm, scanning range 0 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0303DA010	1 018 733	C40E-0303DB010	1 018 849
450	C40S-0403DA010	1 018 735	C40E-0403DB010	1 018 850
600	C40S-0603DA010	1 018 737	C40E-0603DB010	1 018 851
750	C40S-0703DA010	1 018 739	C40E-0703DB010	1 018 852
900	C40S-0903DA010	1 018 741	C40E-0903DB010	1 018 853
1050	C40S-1003DA010	1 018 743	C40E-1003DB010	1 018 854
1200	C40S-1203DA010	1 018 745	C40E-1203DB010	1 018 855
1350	C40S-1303DA010	1 018 747	C40E-1303DB010	1 018 856
1500	C40S-1503DA010	1 018 749	C40E-1503DB010	1 018 857
1650	C40S-1603DA010	1 018 751	C40E-1603DB010	1 018 858
1800	C40S-1803DA010	1 018 753	C40E-1803DB010	1 018 859

Resolution 40 mm, scanning range 0 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0304DA010	1 018 755	C40E-0304DB010	1 018 860
450	C40S-0404DA010	1 018 757	C40E-0404DB010	1 018 861
600	C40S-0604DA010	1 018 759	C40E-0604DB010	1 018 862
750	C40S-0704DA010	1 018 762	C40E-0704DB010	1 018 863
900	C40S-0904DA010	1 018 765	C40E-0904DB010	1 018 864
1050	C40S-1004DA010	1 018 767	C40E-1004DB010	1 018 865
1200	C40S-1204DA010	1 018 769	C40E-1204DB010	1 018 866
1350	C40S-1304DA010	1 018 771	C40E-1304DB010	1 018 867
1500	C40S-1504DA010	1 018 773	C40E-1504DB010	1 018 868
1650	C40S-1604DA010	1 018 775	C40E-1604DB010	1 018 869
1800	C40S-1804DA010	1 018 777	C40E-1804DB010	1 018 870

Detailed technical specifications

→ You can find more detailed data in the operating instructions. Download at www.sick.com

General system data

Scanning range (depending on type)	0 m ... 6 m / 0 m ... 19 m
Protective field height (depending on type)	300 mm ... 1800 mm
Resolution (depending on type)	14 mm ... 40 mm
Protection class	III
Enclosure rating	IP 65
Supply voltage V_S	24 V (19.2 V ... 28.8 V) DC
Type	Type 4 according to IEC 61496, SIL3 (IEC/EN 61508)
Synchronization	Optical, without separate synchronisation

C

Receiver unit

Switching outputs (OSSDs)	2 PNP semiconductors, short-circuit protected, cross-circuit monitored
Response time (depending on type)	9 ms ... 56 ms (single system, without beam coding, without blanking)
Switching voltage	$V_S - 2.25 \text{ V}$ 3.5 V
Switching current max.	500 mA
Power consumption	$\leq 3 \text{ A}$

Sender unit

Power consumption	$\leq 2 \text{ A}$
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Operating data

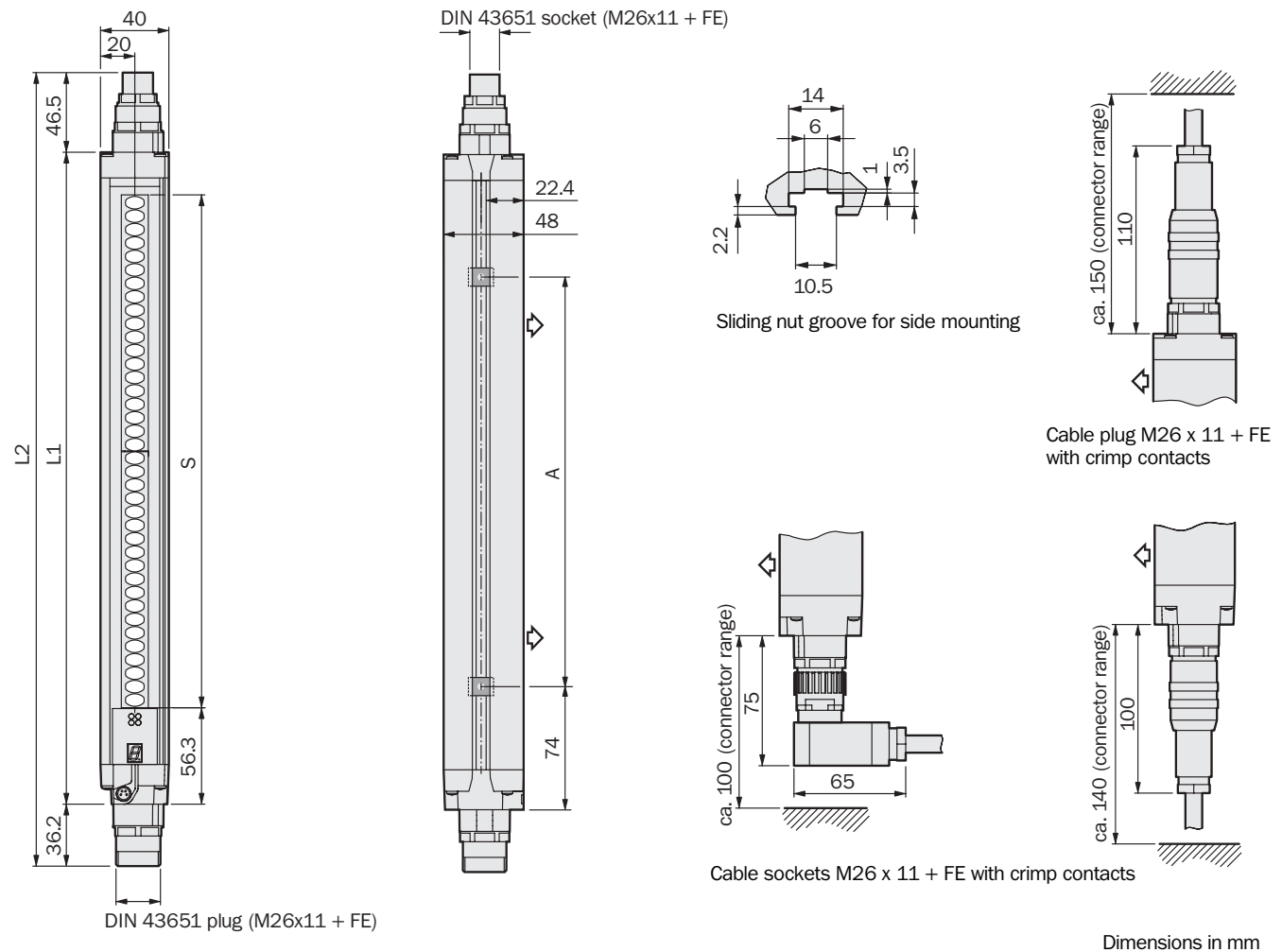
Connection type	Hirschmann plug M26 x 11 + FE
Connection type extension connection	Hirschmann socket M26 x 11 + FE
Connection type configuration connection	M8 x 4
Cable length	Max. 50 m
Wire cross-section	0.75 mm ²
Ambient operating temperature from ... to	0 °C ... +55 °C
Storage temperature from ... to	-25 °C ... +70 °C
Air humidity from ... to	15 % ... 95 %
Housing cross-section	48 mm x 40 mm
Vibration resistance	5 g, 10 Hz ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29
Weight (depending on type)	0.82 kg ... 3.71 kg

C 4000 Advanced without extension connection



Dimensions in mm

C 4000 Advanced with extension connection

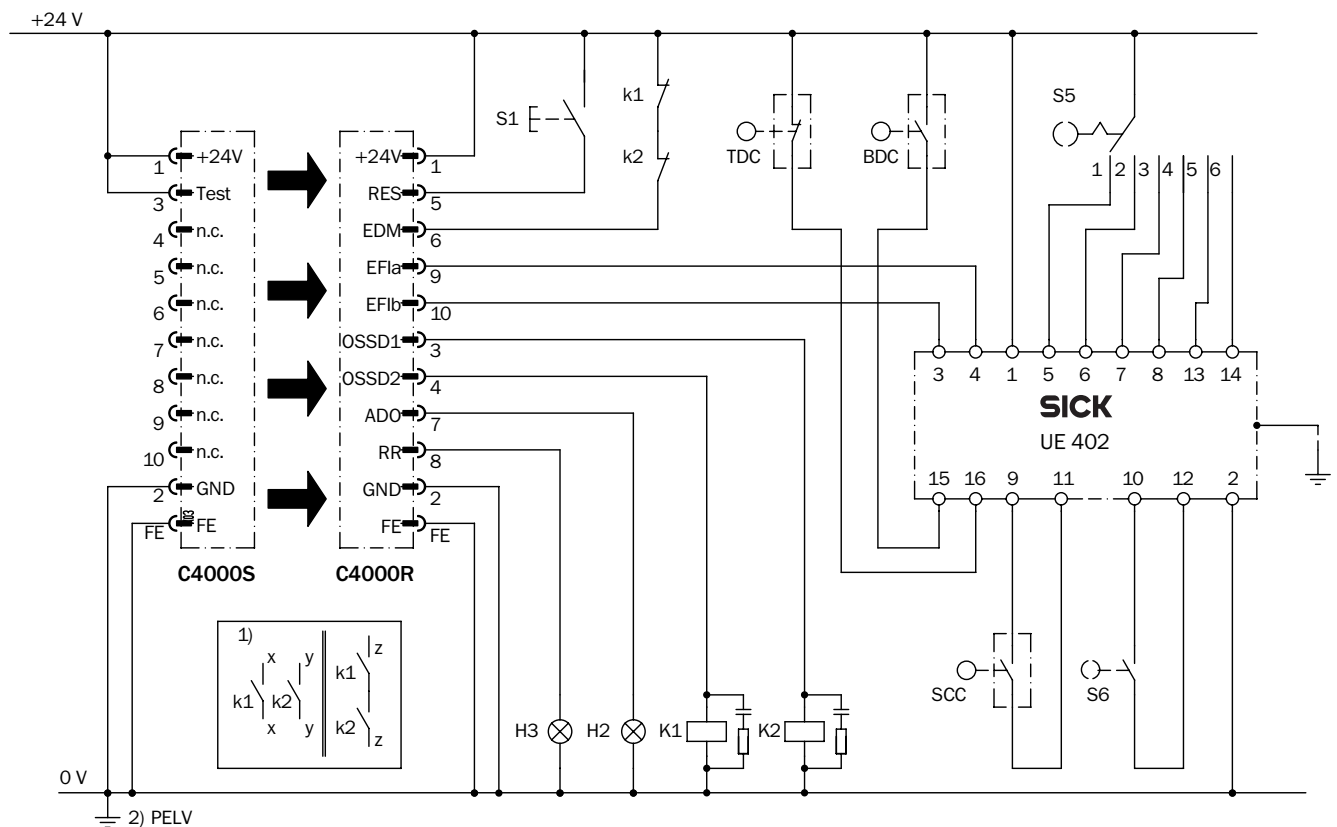


Protective field height S	L1	L2	A
300	381	464	224
450	532	614	374
600	682	765	524
750	833	915	674
900	984	1066	824
1050	1134	1216	974
1200	1283	1366	1124
1350	1435	1517	1274
1500	1586	1669	1424
1650	1736	1818	1574
1800	1887	1969	1724

Dimensions in mm

Connection diagram

→ You can find more connection diagrams at www.sick.com



Task

Integration of a safety light curtain C 4000 Advanced with UE 402 in a controller. 6 configurable operating modes with restart interlock and external device monitoring. PSDI mode with TDC, BDC, SCC. Teachable blanking areas.

Function

If no object is detected in the active protective field and the contacts K1 and K2 are in the de-energised position, the lamp H3 flashes as a prompt to operate control switch S1. The OSSDs are switched on when S1 is operated (button is pressed and released). These outputs activate contacts K1 and K2. On the detection of an object in an active protective field, the OSSDs deactivate contacts K1 and K2.

Possible errors

The incorrect functioning of one of the contacts K1 or K2 will not result in failure of the stop-off function. Cross-circuits and short-circuits of the OSSDs are detected and lead to the inhibited state (lock-out). Jamming of the S1 button prevents enabling of the output circuit.

Comments

- 1) Output circuits. These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, this integration must be two-channel (x-/y paths). 1-channel insertion in the control (z path) is only possible with a 1-channel control and taking the risk analysis into account.
- 2) PELV in accordance with the requirements in EN 60204-1 / 6.4

Please see the operating instructions for the related devices to obtain information on the effects of the functions with configurable parameters. This information is to be observed.

Accessories

Mounting systems

Description	Type of fastening	Packing unit	Remark	Part number
Mounting kit 2	Pivoting, swivel mount	4	For all protective field heights	2 019 659
Mounting kit 6	Pivoting, side bracket	4	For all protective field heights	2 019 506
Mounting kit 11	Replacement bracket	4	Suitable for replacement of FGS	2 021 646
Stainless steel bracket	Pivoting	4	For all protective field heights	2 023 708
Reinforced stainless steel bracket	Pivoting	4	For all protective field heights	2 026 850

Sliding nuts/sliding blocks

Description	Packing unit	Remark	Part number
Sliding block (sliding nut)	4	Supplied with delivery	2 017 550

Cable sockets

Connection type	Connection type	Direction of the cable outlet	Part number
Hirschmann cable socket M26 x 11 + FE	Crimp contacts	Straight	6 020 757
		Angled	6 020 758

Cable plugs

Connection type	Connection type	Direction of the cable outlet on the plug	Part number
Hirschmann cable plug M26 x 11 + FE	Crimp contacts	Straight	6 021 191
		Angled	6 021 192

Connection cables

Connection type	Direction of the cable outlet	Cable length	Part number
Hirschmann cable socket M26 x 11 + FE	Straight	2.5 m	2 022 544
		5 m	2 022 545
		7.5 m	2 022 546
		10 m	2 022 547
		15 m	2 022 548
		20 m	2 022 549
		30 m	2 022 550

Continued on next page

Cascade connection cables

Connection type	Direction of the cable outlet on the plug	Cable length	Part number
Connector	Plug straight/socket straight	0.25 m	2 022 278
		0.5 m	2 021 838
		1 m	2 022 279
		1.5 m	2 022 280
		2 m	2 022 281
		2.5 m	2 022 282
		3 m	2 022 283
	Plug straight/socket angled	0.25 m	2 022 284
		0.5 m	2 022 285
		1 m	2 022 286
		1.5 m	2 022 287
		2 m	2 022 288
		2.5 m	2 022 289
		3 m	2 022 290

Cable without plug/socket

Remark	Part number
Cable unshielded (fitting for EFI connections) max. 100 m	6 0214 37

Configuration connection cables

Remark	Cable length	Part number
For connecting the configuration connection to the PC	2 m	6 021 195
	8 m	2 027 649

Interfaces

Designation	Enclosure rating	Description	Type	Part number
Safety interface	IP 20	For the C 4000 Standard/Advanced functions: PSDI mode, bypass, operating mode switching	UE402	1 023 577
		For opto-electronic protective devices	UE10-30S2D0	6 024 917
			UE10-30S3D0	6 024 918

Power supply units

Input voltage from ... to	Output voltage	Maximum output current	Part number
120 V ... 230 V AC	24 V DC	2.5 A	6 010 361
		4 A	6 010 362

Device columns

Length	Suitable for protective field height	Remark	Part number
1200 mm	300 mm ... 900 mm	Incl. mounting kit	2 021 330
1500 mm	300 mm ... 1200 mm	Incl. mounting kit	2 021 331
1700 mm	300 mm ... 1350 mm	Incl. mounting kit	2 021 332

Additional front screens

Suitable for protective field height	Part number
300 mm	2 022 412
450 mm	2 022 413
600 mm	2 022 414
750 mm	2 022 415
900 mm	2 022 416
1050 mm	2 022 417
1200 mm	2 022 418
1350 mm	2 022 419
1500 mm	2 022 420
1650 mm	2 022 421
1800 mm	2 022 422

C

Deflector mirrors

Description	Suitable for protective field height	Part number
PNS75-034	300 mm	1 019 414
PNS75-049	450 mm	1 019 415
PNS75-064	600 mm	1 019 416
PNS75-079	750 mm	1 019 417
PNS75-094	900 mm	1 019 418
PNS75-109	1050 mm	1 019 419
PNS75-124	1200 mm	1 019 420
PNS75-139	1350 mm	1 019 421
PNS75-154	1500 mm	1 019 422
PNS75-169	1650 mm	1 019 423
PNS75-184	1800 mm	1 019 424
PNS125-034	300 mm	1 019 425
PNS125-049	450 mm	1 019 426
PNS125-064	600 mm	1 019 427
PNS125-079	750 mm	1 019 428
PNS125-094	900 mm	1 019 429
PNS125-109	1050 mm	1 019 430
PNS125-124	1200 mm	1 019 431
PNS125-139	1350 mm	1 019 432
PNS125-154	1500 mm	1 019 433
PNS125-169	1650 mm	1 019 434
PNS125-184	1800 mm	1 019 435

Continued on next page

Sliding nuts for deflector mirrors

Suitable for	Packing unit	Part number
PNS 75 and PNS 125	6	2 030 600

Explosion protection

Description	Remark	Part number
ATEX Package	For use in zone 2/22, 3G 3D	2 029 961

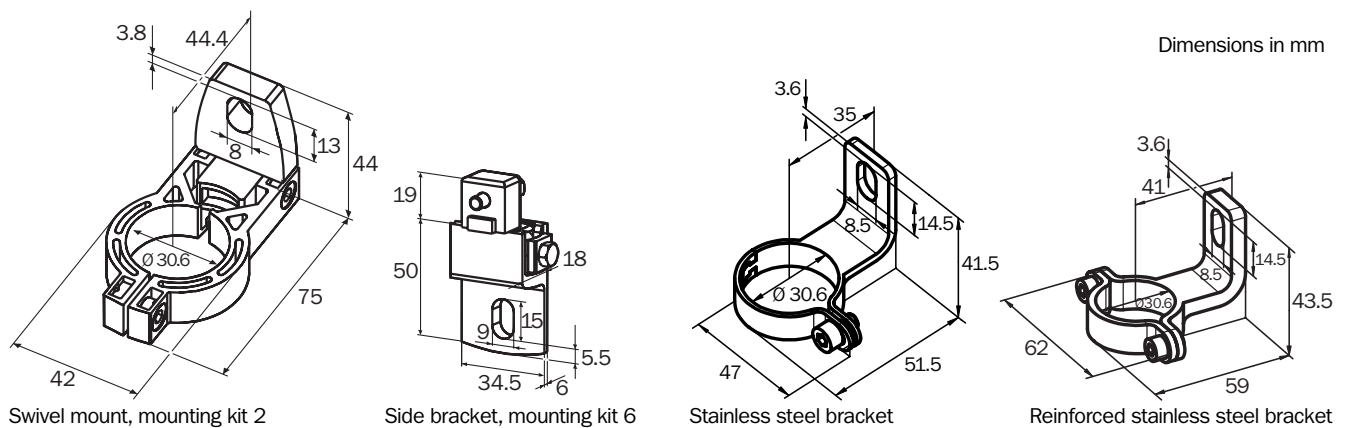
Laser alignment aid

Description	Maximum scanning range	Type of light	Part number
Laser alignment aid AR 60	60 m	Red light	1 015 741
Adapter AR 60 / C 4000	–	–	4 032 461

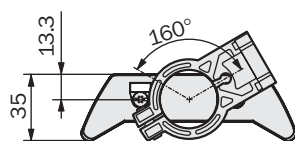
Configuration software

Description	Remark	Part number
CDS	Software CDS (Configuration & Diagnostic Software) on CD-ROM incl. online documentation	2 026 875

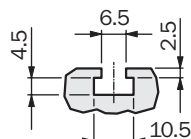
Dimensional drawings mounting accessories



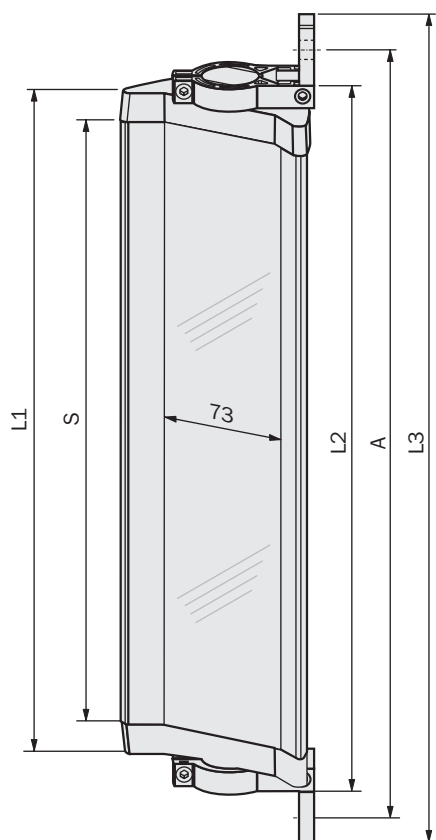
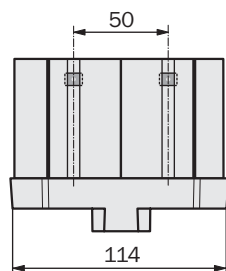
Dimensional drawings deflector mirror PNS 75



Mounting with
swivel mount bracket
(Part No. 2 019 659)



Sliding nut groove for
side mounting

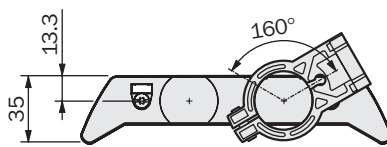


Dimensions in mm

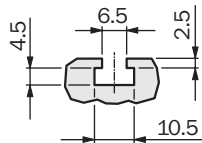
Mirror height S	L1	L2	L3	A
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340
1390	1422	1446	1510	1490
1540	1572	1596	1660	1640
1690	1722	1746	1810	1790
1840	1872	1896	1960	1940

Dimensions in mm

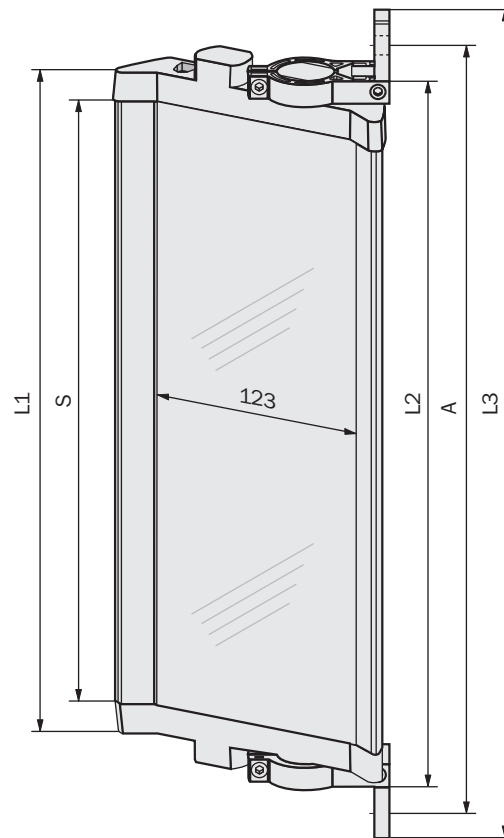
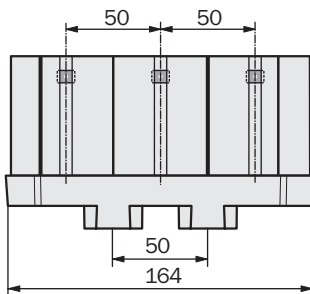
Dimensional drawings deflector mirror PNS 125



Mounting with
swivel mount bracket
(Part No. 2 019 659)



Sliding nut groove for
side mounting



Dimensions in mm

Mirror height S	L1	L2	L3	A
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340
1390	1422	1446	1510	1490
1540	1572	1596	1660	1640
1690	1722	1746	1810	1790
1840	1872	1896	1960	1940

Dimensions in mm

Overview of technical specifications

Protective field height (depending on type)	300 mm ... 1800 mm
Scanning range (depending on type)	0 m ... 6 m / 0 m ... 19 m
Resolution (depending on type)	14 mm / 20 mm / 30 mm / 40 mm
Type	Type 4 according to IEC 61496, SIL3 (IEC/EN 61508)
Enclosure rating	IP 65

Product description

The C 4000 Standard safety light curtain is used wherever hazardous points and hazardous areas require reliable and cost-effective protection. Fast, convenient, easy to service and user-friendly:

- Alignment and diagnostics via 7-segment display

- Application diagnostic output for status information (e.g. contamination)
- Configuration and diagnostics via RS-232 interface
- Emergency stop button or reset button directly at the extension connection
- Rapid commissioning due to pre-configured devices

In-system added value

- Combination with SICK interfaces

- Safe integration in bus systems with UE 1000 series

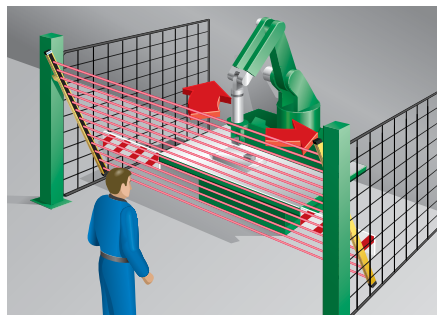
Combination with	Bypass	PSDI	PSDI window	Teach-in	Operating mode switching	Configuration memory	Further information
UE 402	✓	✓	✓	✓	✓	—	C-36
UE 440	✓	—	—	✓	✓	✓	M-3
UE 470	✓	✓	—	✓	✓	✓	M-3
UE 4155	✓	✓	✓	✓	✓	—	N-15

Applications

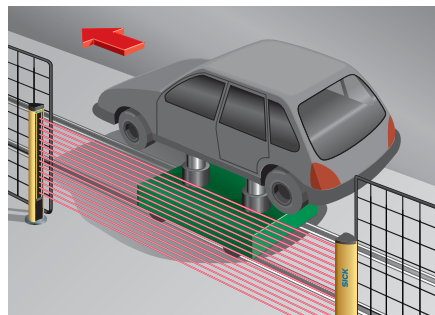
→ You can find more applications using the application finder at www.sick.com

- Automotive industry
- Transforming machine tools
- Plastic
- Electronics industry

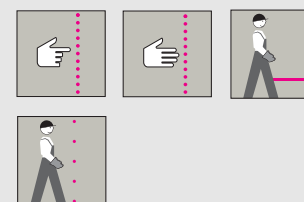
- Robotic
- Print- and paper industry
- Wood industry
- Palletisers



Hazardous point protection on an industrial robot



Hazardous point protection on an assembly line



- External device monitoring (EDM)
- Restart interlock (RES)
- Beam coding
- Up to 3 systems can be cascaded
- Configuration and diagnostics via PC



Further information	Page
→ Ordering information	C-18
→ Technical specifications	C-30
→ Dimensional drawing	C-31
→ Connection diagrams	C-31
→ Accessories	C-35
→ Services	A-0

Ordering information

C 4000 Standard without extension connection

→ Ordering information C 4000 Standard with extension connection see page C-20

Housing cross-section	48 mm x 40 mm
Functions	Restart interlock, external device monitoring, beam coding, PSDI (with UE 402), bypass (with UE 402), operating mode switching (with UE 402)
Consisting of	Sender and receiver unit
Usage	Single system and last system in a cascade
Connection types	System connection: Hirschmann plug M26 x 11 + FE Configuration connection: M8 x 4

Resolution 14 mm, scanning range 0 m ... 6 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301CA010	1 018 591	C40E-0301CA010	1 018 592
450	C40S-0401CA010	1 018 347	C40E-0401CA010	1 018 348
600	C40S-0601CA010	1 018 593	C40E-0601CA010	1 018 594
750	C40S-0701CA010	1 018 595	C40E-0701CA010	1 018 596
900	C40S-0901CA010	1 018 597	C40E-0901CA010	1 018 598
1050	C40S-1001CA010	1 018 599	C40E-1001CA010	1 018 600
1200	C40S-1201CA010	1 018 601	C40E-1201CA010	1 018 602
1350	C40S-1301CA010	1 018 603	C40E-1301CA010	1 018 604
1500	C40S-1501CA010	1 018 605	C40E-1501CA010	1 018 606
1650	C40S-1601CA010	1 018 607	C40E-1601CA010	1 018 608
1800	C40S-1801CA010	1 018 609	C40E-1801CA010	1 018 610

Resolution 20 mm, scanning range 0 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0302CA010	1 018 613	C40E-0302CA010	1 018 614
450	C40S-0402CA010	1 018 615	C40E-0402CA010	1 018 616
600	C40S-0602CA010	1 018 617	C40E-0602CA010	1 018 618
750	C40S-0702CA010	1 018 619	C40E-0702CA010	1 018 620
900	C40S-0902CA010	1 018 621	C40E-0902CA010	1 018 622
1050	C40S-1002CA010	1 018 623	C40E-1002CA010	1 018 624
1200	C40S-1202CA010	1 018 625	C40E-1202CA010	1 018 626
1350	C40S-1302CA010	1 018 627	C40E-1302CA010	1 018 628
1500	C40S-1502CA010	1 018 629	C40E-1502CA010	1 018 630
1650	C40S-1602CA010	1 018 631	C40E-1602CA010	1 018 632
1800	C40S-1802CA010	1 018 633	C40E-1802CA010	1 018 634

Resolution 30 mm, scanning range 0 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0303CA010	1 018 635	C40E-0303CA010	1 018 636
450	C40S-0403CA010	1 018 637	C40E-0403CA010	1 018 638
600	C40S-0603CA010	1 018 639	C40E-0603CA010	1 018 640
750	C40S-0703CA010	1 018 641	C40E-0703CA010	1 018 642
900	C40S-0903CA010	1 018 643	C40E-0903CA010	1 018 644
1050	C40S-1003CA010	1 018 645	C40E-1003CA010	1 018 646
1200	C40S-1203CA010	1 018 647	C40E-1203CA010	1 018 648
1350	C40S-1303CA010	1 018 649	C40E-1303CA010	1 018 650
1500	C40S-1503CA010	1 018 651	C40E-1503CA010	1 018 652
1650	C40S-1603CA010	1 018 653	C40E-1603CA010	1 018 654
1800	C40S-1803CA010	1 018 655	C40E-1803CA010	1 018 656

Resolution 40 mm, scanning range 0 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0304CA010	1 018 657	C40E-0304CA010	1 018 658
450	C40S-0404CA010	1 018 659	C40E-0404CA010	1 018 660
600	C40S-0604CA010	1 018 661	C40E-0604CA010	1 018 662
750	C40S-0704CA010	1 018 663	C40E-0704CA010	1 018 664
900	C40S-0904CA010	1 018 665	C40E-0904CA010	1 018 666
1050	C40S-1004CA010	1 018 667	C40E-1004CA010	1 018 668
1200	C40S-1204CA010	1 018 669	C40E-1204CA010	1 018 670
1350	C40S-1304CA010	1 018 671	C40E-1304CA010	1 018 672
1500	C40S-1504CA010	1 018 673	C40E-1504CA010	1 018 674
1650	C40S-1604CA010	1 018 675	C40E-1604CA010	1 018 676
1800	C40S-1804CA010	1 018 677	C40E-1804CA010	1 018 678

C 4000 Standard with angled system connection, without extension connection

Housing cross-section	48 mm x 40 mm
Functions	Restart interlock, external device monitoring, beam coding, PSDI (with UE 402), bypass (with UE 402), operating mode switching (with UE 402)
Consisting of	Sender and receiver unit
Usage	Single system and last system in a cascade
Connection types	System connection: Hirschmann plug M26 x 11 + FE Configuration connection: M8 x 4

Resolution (mm)	Scanning range (m)	Protective field height (mm)	Sender unit		Receiver unit	
			Type	Part number	Type	Part number
14	0 ... 6	300	C40S-0301CA020	1 022 267	C40E-0301CA020	1 022 268
		450	C40S-0401CA020	1 026 737	C40E-0401CA020	1 026 738
30	0 ... 19	300	C40S-0303CA020	1 026 733	C40E-0303CA020	1 026 734
		450	C40S-0403CA020	1 026 735	C40E-0403CA020	1 026 736

C 4000 Standard with extension connection

→ Ordering information C 4000 Standard without extension connection see page C-18

Housing cross-section	48 mm x 40 mm
Functions	Restart interlock, external device monitoring, beam coding, PSDI (with UE 402), Bypass or emergency stop, operating mode switching (with UE 402)
Consisting of	Sender and receiver unit
Usage	First system in a cascade, middle system in a cascade
Connection types	System connection: Hirschmann plug M26 x 11 + FE Extension connection: Hirschmann socket M26 x 11 + FE Configuration connection: M8 x 4

Resolution 14 mm, scanning range 0 m ... 6 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301DA010	1 018 690	C40E-0301DA010	1 018 691
450	C40S-0401DA010	1 018 349	C40E-0401DA010	1 018 350
600	C40S-0601DA010	1 018 692	C40E-0601DA010	1 018 693
750	C40S-0701DA010	1 018 694	C40E-0701DA010	1 018 695
900	C40S-0901DA010	1 018 696	C40E-0901DA010	1 018 697
1050	C40S-1001DA010	1 018 698	C40E-1001DA010	1 018 699
1200	C40S-1201DA010	1 018 700	C40E-1201DA010	1 018 701
1350	C40S-1301DA010	1 018 702	C40E-1301DA010	1 018 703
1500	C40S-1501DA010	1 018 704	C40E-1501DA010	1 018 705
1650	C40S-1601DA010	1 018 706	C40E-1601DA010	1 018 707
1800	C40S-1801DA010	1 018 708	C40E-1801DA010	1 018 709

Resolution 20 mm, scanning range 0 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0302DA010	1 018 710	C40E-0302DA010	1 018 711
450	C40S-0402DA010	1 018 712	C40E-0402DA010	1 018 713
600	C40S-0602DA010	1 018 714	C40E-0602DA010	1 018 715
750	C40S-0702DA010	1 018 716	C40E-0702DA010	1 018 717
900	C40S-0902DA010	1 018 718	C40E-0902DA010	1 018 719
1050	C40S-1002DA010	1 018 720	C40E-1002DA010	1 018 721
1200	C40S-1202DA010	1 018 722	C40E-1202DA010	1 018 723
1350	C40S-1302DA010	1 018 724	C40E-1302DA010	1 018 725
1500	C40S-1502DA010	1 018 726	C40E-1502DA010	1 018 727
1650	C40S-1602DA010	1 018 728	C40E-1602DA010	1 018 729
1800	C40S-1802DA010	1 018 730	C40E-1802DA010	1 018 731

Resolution 30 mm, scanning range 0 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0303DA010	1 018 733	C40E-0303DA010	1 018 734
450	C40S-0403DA010	1 018 735	C40E-0403DA010	1 018 736
600	C40S-0603DA010	1 018 737	C40E-0603DA010	1 018 738
750	C40S-0703DA010	1 018 739	C40E-0703DA010	1 018 740
900	C40S-0903DA010	1 018 741	C40E-0903DA010	1 018 742
1050	C40S-1003DA010	1 018 743	C40E-1003DA010	1 018 744
1200	C40S-1203DA010	1 018 745	C40E-1203DA010	1 018 746
1350	C40S-1303DA010	1 018 747	C40E-1303DA010	1 018 748
1500	C40S-1503DA010	1 018 749	C40E-1503DA010	1 018 750
1650	C40S-1603DA010	1 018 751	C40E-1603DA010	1 018 752
1800	C40S-1803DA010	1 018 753	C40E-1803DA010	1 018 754

Resolution 40 mm, scanning range 0 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0304DA010	1 018 755	C40E-0304DA010	1 018 756
450	C40S-0404DA010	1 018 757	C40E-0404DA010	1 018 758
600	C40S-0604DA010	1 018 759	C40E-0604DA010	1 018 760
750	C40S-0704DA010	1 018 762	C40E-0704DA010	1 018 763
900	C40S-0904DA010	1 018 765	C40E-0904DA010	1 018 766
1050	C40S-1004DA010	1 018 767	C40E-1004DA010	1 018 768
1200	C40S-1204DA010	1 018 769	C40E-1204DA010	1 018 770
1350	C40S-1304DA010	1 018 771	C40E-1304DA010	1 018 772
1500	C40S-1504DA010	1 018 773	C40E-1504DA010	1 018 774
1650	C40S-1604DA010	1 018 775	C40E-1604DA010	1 018 776
1800	C40S-1804DA010	1 018 777	C40E-1804DA010	1 018 778

C 4000 Standard without extension connection, with pre-configuration C

Based on C 4000 Standard	With the following pre-configuration			
	C	D	E	F
Restart interlock	External	External	Internal	Internal
External device monitoring	Selected	Selected	Selected	Selected
Beam coding	Non-coded	Non-coded	Non-coded	Non-coded
Scanning range	Short	Long	Short	Long

Resolution 14 mm, scanning range 0 m ... 2.5 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301CA010	1 018 591	C40E-0301CC010	1 022 358
450	C40S-0401CA010	1 018 347	C40E-0401CC010	1 022 359
600	C40S-0601CA010	1 018 593	C40E-0601CC010	1 022 360
750	C40S-0701CA010	1 018 595	C40E-0701CC010	1 022 361
900	C40S-0901CA010	1 018 597	C40E-0901CC010	1 022 362
1050	C40S-1001CA010	1 018 599	C40E-1001CC010	1 022 363
1200	C40S-1201CA010	1 018 601	C40E-1201CC010	1 022 364
1350	C40S-1301CA010	1 018 603	C40E-1301CC010	1 022 365
1500	C40S-1501CA010	1 018 605	C40E-1501CC010	1 022 366
1650	C40S-1601CA010	1 018 607	C40E-1601CC010	1 022 367
1800	C40S-1801CA010	1 018 609	C40E-1801CC010	1 022 368

Resolution 20 mm, scanning range 0 m ... 6 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0302CA010	1 018 613	C40E-0302CC010	1 022 369
450	C40S-0402CA010	1 018 615	C40E-0402CC010	1 022 370
600	C40S-0602CA010	1 018 617	C40E-0602CC010	1 022 371
750	C40S-0702CA010	1 018 619	C40E-0702CC010	1 022 372
900	C40S-0902CA010	1 018 621	C40E-0902CC010	1 022 373
1050	C40S-1002CA010	1 018 623	C40E-1002CC010	1 022 374
1200	C40S-1202CA010	1 018 625	C40E-1202CC010	1 022 375
1350	C40S-1302CA010	1 018 627	C40E-1302CC010	1 022 376
1500	C40S-1502CA010	1 018 629	C40E-1502CC010	1 022 377
1650	C40S-1602CA010	1 018 631	C40E-1602CC010	1 022 378
1800	C40S-1802CA010	1 018 633	C40E-1802CC010	1 022 379

Resolution 30 mm, scanning range 0 m ... 6 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0303CA010	1 018 635	C40E-0303CC010	1 022 380
450	C40S-0403CA010	1 018 637	C40E-0403CC010	1 022 381
600	C40S-0603CA010	1 018 639	C40E-0603CC010	1 022 382
750	C40S-0703CA010	1 018 641	C40E-0703CC010	1 022 383
900	C40S-0903CA010	1 018 643	C40E-0903CC010	1 022 384
1050	C40S-1003CA010	1 018 645	C40E-1003CC010	1 022 385
1200	C40S-1203CA010	1 018 647	C40E-1203CC010	1 022 386
1350	C40S-1303CA010	1 018 649	C40E-1303CC010	1 022 387
1500	C40S-1503CA010	1 018 651	C40E-1503CC010	1 022 388
1650	C40S-1603CA010	1 018 653	C40E-1603CC010	1 022 389
1800	C40S-1803CA010	1 018 655	C40E-1803CC010	1 022 390

Resolution 40 mm, scanning range 0 m ... 6 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0304CA010	1 018 657	C40E-0304CC010	1 022 391
450	C40S-0404CA010	1 018 659	C40E-0404CC010	1 022 392
600	C40S-0604CA010	1 018 661	C40E-0604CC010	1 022 393
750	C40S-0704CA010	1 018 663	C40E-0704CC010	1 022 394
900	C40S-0904CA010	1 018 665	C40E-0904CC010	1 022 395
1050	C40S-1004CA010	1 018 667	C40E-1004CC010	1 022 396
1200	C40S-1204CA010	1 018 669	C40E-1204CC010	1 022 397
1350	C40S-1304CA010	1 018 671	C40E-1304CC010	1 022 398
1500	C40S-1504CA010	1 018 673	C40E-1504CC010	1 022 399
1650	C40S-1604CA010	1 018 675	C40E-1604CC010	1 022 400
1800	C40S-1804CA010	1 018 677	C40E-1804CC010	1 022 401

C 4000 Standard without extension connection, with pre-configuration D

Based on C 4000 Standard	With the following pre-configuration			
	C	D	E	F
Restart interlock	External	External	Internal	Internal
External device monitoring	Selected	Selected	Selected	Selected
Beam coding	Non-coded	Non-coded	Non-coded	Non-coded
Scanning range	Short	Long	Short	Long

Resolution 14 mm, scanning range 2 m ... 6 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301CA010	1 018 591	C40E-0301CD010	1 022 402
450	C40S-0401CA010	1 018 347	C40E-0401CD010	1 022 403
600	C40S-0601CA010	1 018 593	C40E-0601CD010	1 022 404
750	C40S-0701CA010	1 018 595	C40E-0701CD010	1 022 405
900	C40S-0901CA010	1 018 597	C40E-0901CD010	1 022 406
1050	C40S-1001CA010	1 018 599	C40E-1001CD010	1 022 407
1200	C40S-1201CA010	1 018 601	C40E-1201CD010	1 022 408
1350	C40S-1301CA010	1 018 603	C40E-1301CD010	1 022 409
1500	C40S-1501CA010	1 018 605	C40E-1501CD010	1 022 410
1650	C40S-1601CA010	1 018 607	C40E-1601CD010	1 022 411
1800	C40S-1801CA010	1 018 609	C40E-1801CD010	1 022 412

Resolution 20 mm, scanning range 5 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0302CA010	1 018 613	C40E-0302CD010	1 022 413
450	C40S-0402CA010	1 018 615	C40E-0402CD010	1 022 414
600	C40S-0602CA010	1 018 617	C40E-0602CD010	1 022 415
750	C40S-0702CA010	1 018 619	C40E-0702CD010	1 022 416
900	C40S-0902CA010	1 018 621	C40E-0902CD010	1 022 417
1050	C40S-1002CA010	1 018 623	C40E-1002CD010	1 022 418
1200	C40S-1202CA010	1 018 625	C40E-1202CD010	1 022 419
1350	C40S-1302CA010	1 018 627	C40E-1302CD010	1 022 420
1500	C40S-1502CA010	1 018 629	C40E-1502CD010	1 022 421
1650	C40S-1602CA010	1 018 631	C40E-1602CD010	1 022 422
1800	C40S-1802CA010	1 018 633	C40E-1802CD010	1 022 423

Resolution 30 mm, scanning range 5 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0303CA010	1 018 635	C40E-0303CD010	1 022 424
450	C40S-0403CA010	1 018 637	C40E-0403CD010	1 022 425
600	C40S-0603CA010	1 018 639	C40E-0603CD010	1 022 426
750	C40S-0703CA010	1 018 641	C40E-0703CD010	1 022 427
900	C40S-0903CA010	1 018 643	C40E-0903CD010	1 022 428
1050	C40S-1003CA010	1 018 645	C40E-1003CD010	1 022 429
1200	C40S-1203CA010	1 018 647	C40E-1203CD010	1 022 430
1350	C40S-1303CA010	1 018 649	C40E-1303CD010	1 022 431
1500	C40S-1503CA010	1 018 651	C40E-1503CD010	1 022 432
1650	C40S-1603CA010	1 018 653	C40E-1603CD010	1 022 433
1800	C40S-1803CA010	1 018 655	C40E-1803CD010	1 022 434

Resolution 40 mm, scanning range 5 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0304CA010	1 018 657	C40E-0304CD010	1 022 435
450	C40S-0404CA010	1 018 659	C40E-0404CD010	1 022 436
600	C40S-0604CA010	1 018 661	C40E-0604CD010	1 022 437
750	C40S-0704CA010	1 018 663	C40E-0704CD010	1 022 438
900	C40S-0904CA010	1 018 665	C40E-0904CD010	1 022 439
1050	C40S-1004CA010	1 018 667	C40E-1004CD010	1 022 440
1200	C40S-1204CA010	1 018 669	C40E-1204CD010	1 022 441
1350	C40S-1304CA010	1 018 671	C40E-1304CD010	1 022 442
1500	C40S-1504CA010	1 018 673	C40E-1504CD010	1 022 443
1650	C40S-1604CA010	1 018 675	C40E-1604CD010	1 022 444
1800	C40S-1804CA010	1 018 677	C40E-1804CD010	1 022 445

C 4000 Standard without extension connection, with pre-configuration E

Based on C 4000 Standard	With the following pre-configuration			
	C	D	E	F
Restart interlock	External	External	Internal	Internal
External device monitoring	Selected	Selected	Selected	Selected
Beam coding	Non-coded	Non-coded	Non-coded	Non-coded
Scanning range	Short	Long	Short	Long

Resolution 14 mm, scanning range 0 m ... 2.5 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301CA010	1 018 591	C40E-0301CE010	1 022 446
450	C40S-0401CA010	1 018 347	C40E-0401CE010	1 022 447
600	C40S-0601CA010	1 018 593	C40E-0601CE010	1 022 448
750	C40S-0701CA010	1 018 595	C40E-0701CE010	1 022 449
900	C40S-0901CA010	1 018 597	C40E-0901CE010	1 022 450
1050	C40S-1001CA010	1 018 599	C40E-1001CE010	1 022 451
1200	C40S-1201CA010	1 018 601	C40E-1201CE010	1 022 452
1350	C40S-1301CA010	1 018 603	C40E-1301CE010	1 022 453
1500	C40S-1501CA010	1 018 605	C40E-1501CE010	1 022 454
1650	C40S-1601CA010	1 018 607	C40E-1601CE010	1 022 455
1800	C40S-1801CA010	1 018 609	C40E-1801CE010	1 022 456

Resolution 20 mm, scanning range 0 m ... 6 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0302CA010	1 018 613	C40E-0302CE010	1 022 457
450	C40S-0402CA010	1 018 615	C40E-0402CE010	1 022 458
600	C40S-0602CA010	1 018 617	C40E-0602CE010	1 022 459
750	C40S-0702CA010	1 018 619	C40E-0702CE010	1 022 460
900	C40S-0902CA010	1 018 621	C40E-0902CE010	1 022 461
1050	C40S-1002CA010	1 018 623	C40E-1002CE010	1 022 462
1200	C40S-1202CA010	1 018 625	C40E-1202CE010	1 022 463
1350	C40S-1302CA010	1 018 627	C40E-1302CE010	1 022 464
1500	C40S-1502CA010	1 018 629	C40E-1502CE010	1 022 465
1650	C40S-1602CA010	1 018 631	C40E-1602CE010	1 022 466
1800	C40S-1802CA010	1 018 633	C40E-1802CE010	1 022 467

Resolution 30 mm, scanning range 0 m ... 6 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0303CA010	1 018 635	C40E-0303CE010	1 022 468
450	C40S-0403CA010	1 018 637	C40E-0403CE010	1 022 469
600	C40S-0603CA010	1 018 639	C40E-0603CE010	1 022 470
750	C40S-0703CA010	1 018 641	C40E-0703CE010	1 022 471
900	C40S-0903CA010	1 018 643	C40E-0903CE010	1 022 472
1050	C40S-1003CA010	1 018 645	C40E-1003CE010	1 022 473
1200	C40S-1203CA010	1 018 647	C40E-1203CE010	1 022 474
1350	C40S-1303CA010	1 018 649	C40E-1303CE010	1 022 475
1500	C40S-1503CA010	1 018 651	C40E-1503CE010	1 022 476
1650	C40S-1603CA010	1 018 653	C40E-1603CE010	1 022 477
1800	C40S-1803CA010	1 018 655	C40E-1803CE010	1 022 478

Resolution 40 mm, scanning range 0 m ... 6 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0304CA010	1 018 657	C40E-0304CE010	1 022 479
450	C40S-0404CA010	1 018 659	C40E-0404CE010	1 022 480
600	C40S-0604CA010	1 018 661	C40E-0604CE010	1 022 481
750	C40S-0704CA010	1 018 663	C40E-0704CE010	1 022 482
900	C40S-0904CA010	1 018 665	C40E-0904CE010	1 022 483
1050	C40S-1004CA010	1 018 667	C40E-1004CE010	1 022 484
1200	C40S-1204CA010	1 018 669	C40E-1204CE010	1 022 485
1350	C40S-1304CA010	1 018 671	C40E-1304CE010	1 022 486
1500	C40S-1504CA010	1 018 673	C40E-1504CE010	1 022 487
1650	C40S-1604CA010	1 018 675	C40E-1604CE010	1 022 488
1800	C40S-1804CA010	1 018 677	C40E-1804CE010	1 022 489

C 4000 Standard without extension connection, with pre-configuration F

Based on C 4000 Standard	With the following pre-configuration			
	C	D	E	F
Restart interlock	External	External	Internal	Internal
External device monitoring	Selected	Selected	Selected	Selected
Beam coding	Non-coded	Non-coded	Non-coded	Non-coded
Scanning range	Short	Long	Short	Long

Resolution 14 mm, scanning range 2 m ... 6 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301CA010	1 018 591	C40E-0301CF010	1 022 490
450	C40S-0401CA010	1 018 347	C40E-0401CF010	1 022 491
600	C40S-0601CA010	1 018 593	C40E-0601CF010	1 022 492
750	C40S-0701CA010	1 018 595	C40E-0701CF010	1 022 493
900	C40S-0901CA010	1 018 597	C40E-0901CF010	1 022 494
1050	C40S-1001CA010	1 018 599	C40E-1001CF010	1 022 495
1200	C40S-1201CA010	1 018 601	C40E-1201CF010	1 022 496
1350	C40S-1301CA010	1 018 603	C40E-1301CF010	1 022 497
1500	C40S-1501CA010	1 018 605	C40E-1501CF010	1 022 498
1650	C40S-1601CA010	1 018 607	C40E-1601CF010	1 022 499
1800	C40S-1801CA010	1 018 609	C40E-1801CF010	1 022 500

Resolution 20 mm, scanning range 5 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0302CA010	1 018 613	C40E-0302CF010	1 022 501
450	C40S-0402CA010	1 018 615	C40E-0402CF010	1 022 502
600	C40S-0602CA010	1 018 617	C40E-0602CF010	1 022 503
750	C40S-0702CA010	1 018 619	C40E-0702CF010	1 022 504
900	C40S-0902CA010	1 018 621	C40E-0902CF010	1 022 505
1050	C40S-1002CA010	1 018 623	C40E-1002CF010	1 022 506
1200	C40S-1202CA010	1 018 625	C40E-1202CF010	1 022 507
1350	C40S-1302CA010	1 018 627	C40E-1302CF010	1 022 508
1500	C40S-1502CA010	1 018 629	C40E-1502CF010	1 022 509
1650	C40S-1602CA010	1 018 631	C40E-1602CF010	1 022 510
1800	C40S-1802CA010	1 018 633	C40E-1802CF010	1 022 511

Resolution 30 mm, scanning range 5 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0303CA010	1 018 635	C40E-0303CF010	1 022 512
450	C40S-0403CA010	1 018 637	C40E-0403CF010	1 022 513
600	C40S-0603CA010	1 018 639	C40E-0603CF010	1 022 514
750	C40S-0703CA010	1 018 641	C40E-0703CF010	1 022 515
900	C40S-0903CA010	1 018 643	C40E-0903CF010	1 022 516
1050	C40S-1003CA010	1 018 645	C40E-1003CF010	1 022 517
1200	C40S-1203CA010	1 018 647	C40E-1203CF010	1 022 518
1350	C40S-1303CA010	1 018 649	C40E-1303CF010	1 022 519
1500	C40S-1503CA010	1 018 651	C40E-1503CF010	1 022 520
1650	C40S-1603CA010	1 018 653	C40E-1603CF010	1 022 521
1800	C40S-1803CA010	1 018 655	C40E-1803CF010	1 022 522

Resolution 40 mm, scanning range 5 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0304CA010	1 018 657	C40E-0304CF010	1 022 523
450	C40S-0404CA010	1 018 659	C40E-0404CF010	1 022 524
600	C40S-0604CA010	1 018 661	C40E-0604CF010	1 022 525
750	C40S-0704CA010	1 018 663	C40E-0704CF010	1 022 526
900	C40S-0904CA010	1 018 665	C40E-0904CF010	1 022 527
1050	C40S-1004CA010	1 018 667	C40E-1004CF010	1 022 528
1200	C40S-1204CA010	1 018 669	C40E-1204CF010	1 022 529
1350	C40S-1304CA010	1 018 671	C40E-1304CF010	1 022 530
1500	C40S-1504CA010	1 018 673	C40E-1504CF010	1 022 531
1650	C40S-1604CA010	1 018 675	C40E-1604CF010	1 022 532
1800	C40S-1804CA010	1 018 677	C40E-1804CF010	1 022 533

Detailed technical specifications

→ You can find more detailed data in the operating instructions. Download at www.sick.com

General system data

Scanning range (depending on type)	0 m ... 6 m / 0 m ... 19 m
Protective field height (depending on type)	300 mm ... 1800 mm
Resolution (depending on type)	14 mm ... 40 mm
Protection class	III
Enclosure rating	IP 65
Supply voltage V_S	24 V (19.2 V ... 28.8 V) DC
Type	Type 4 according to IEC 61496, SIL3 (IEC/EN 61508)
Synchronization	Optical, without separate synchronisation

Receiver unit

Switching outputs (OSSDs)	2 PNP semiconductors, short-circuit protected, cross-circuit monitored
Response time (depending on type)	9 ms ... 56 ms (single system, without beam coding, without blanking)
Switching voltage	$V_S - 2.25 \text{ V}$ 3.5 V
Switching current max.	500 mA
Power consumption	$\leq 3 \text{ A}$

Sender unit

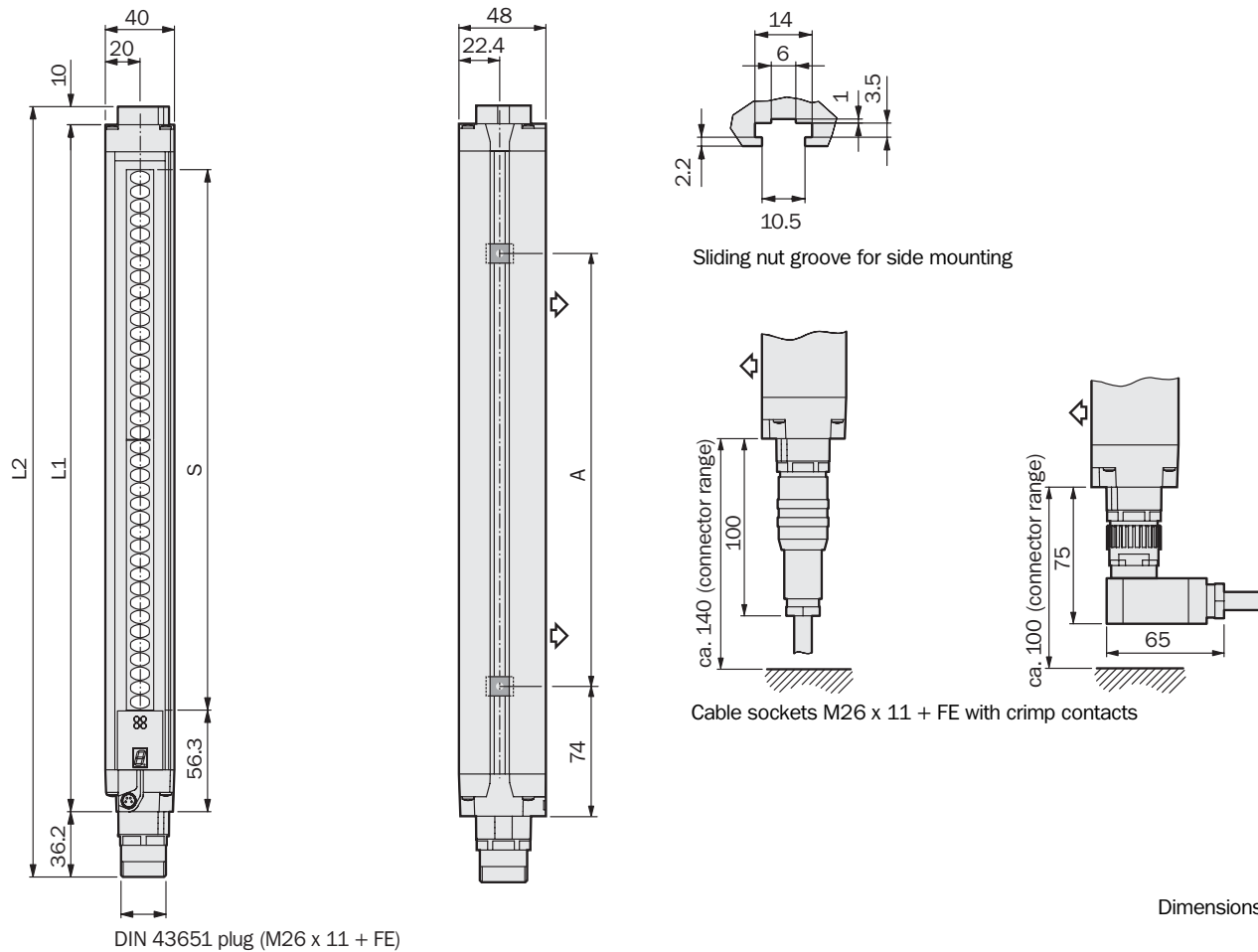
Power consumption	$\leq 2 \text{ A}$
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Operating data

Connection type	Hirschmann plug M26 x 11 + FE
Connection type extension connection	Hirschmann socket M26 x 11 + FE
Connection type configuration connection	M8 x 4
Cable length	Max. 50 m
Wire cross-section	0.75 mm ²
Ambient operating temperature from ... to	0 °C ... +55 °C
Storage temperature from ... to	-25 °C ... +70 °C
Air humidity from ... to	15 % ... 95 %
Housing cross-section	48 mm x 40 mm
Vibration resistance	5 g, 10 Hz ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29
Weight (depending on type)	0.82 kg ... 3.71 kg

Dimensional drawings

C 4000 Standard without extension connection

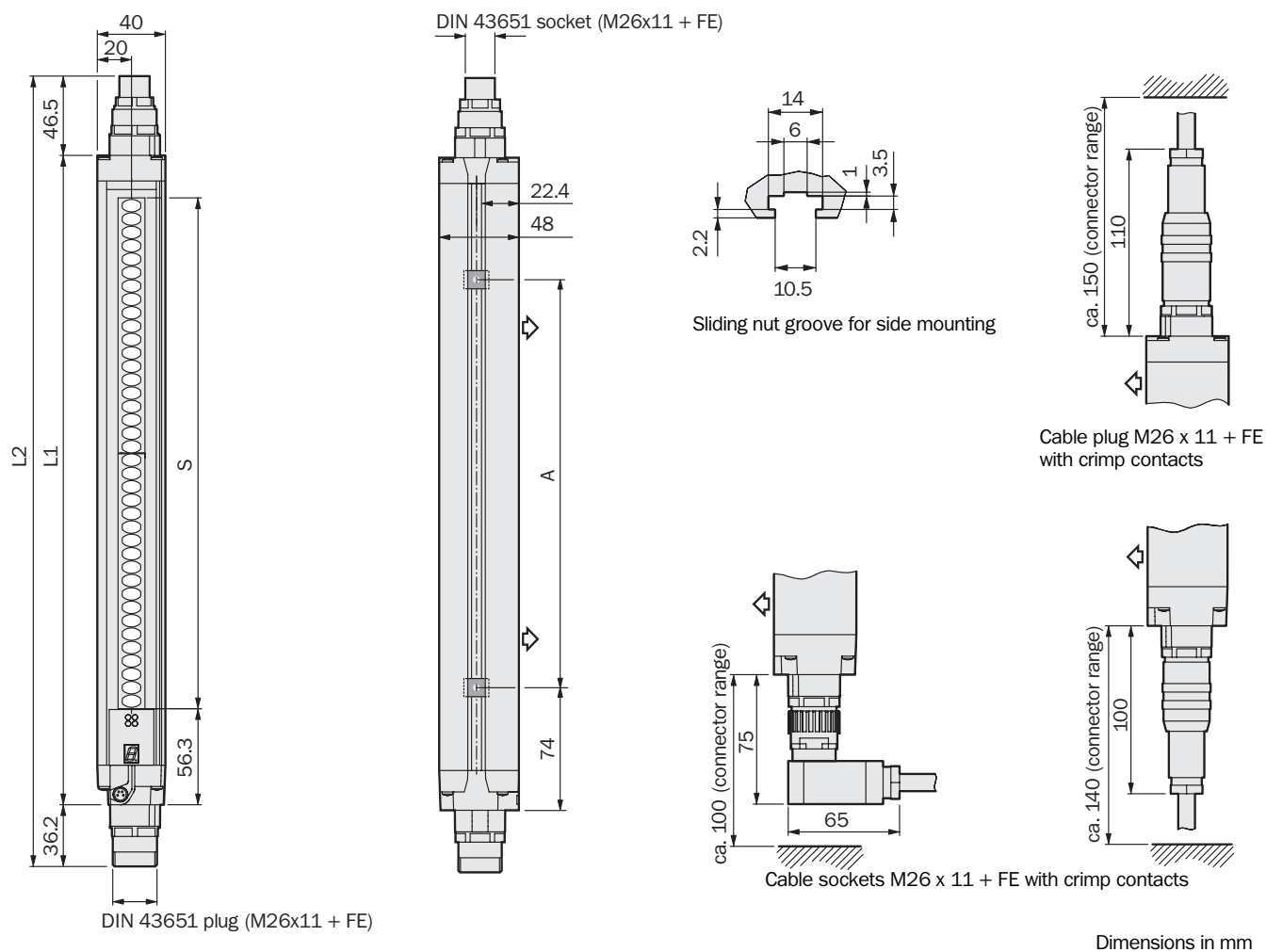


Protective field height S	L1	L2	A
300	381	427	224
450	532	578	374
600	682	728	524
750	833	879	674
900	984	1030	824
1050	1134	1180	974
1200	1283	1329	1124
1350	1435	1481	1274
1500	1586	1632	1424
1650	1736	1782	1574
1800	1887	1933	1724

Dimensions in mm

C 4000 Standard with extension connection

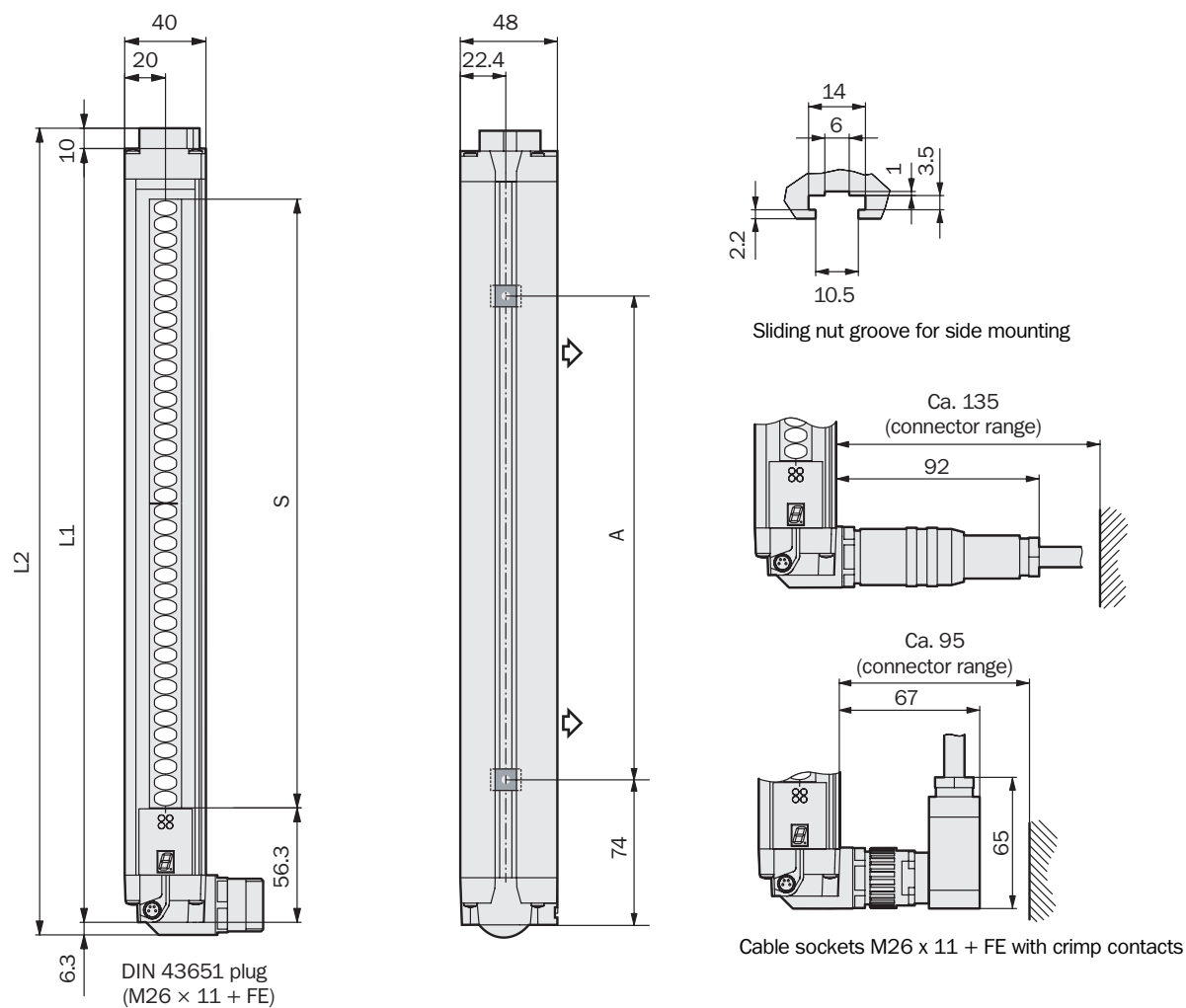
C



Protective field height S	L1	L2	A
300	381	464	224
450	532	614	374
600	682	765	524
750	833	915	674
900	984	1066	824
1050	1134	1216	974
1200	1283	1366	1124
1350	1435	1517	1274
1500	1586	1669	1424
1650	1736	1818	1574
1800	1887	1969	1724

Dimensions in mm

C 4000 Standard with angled system connection, without extension connection



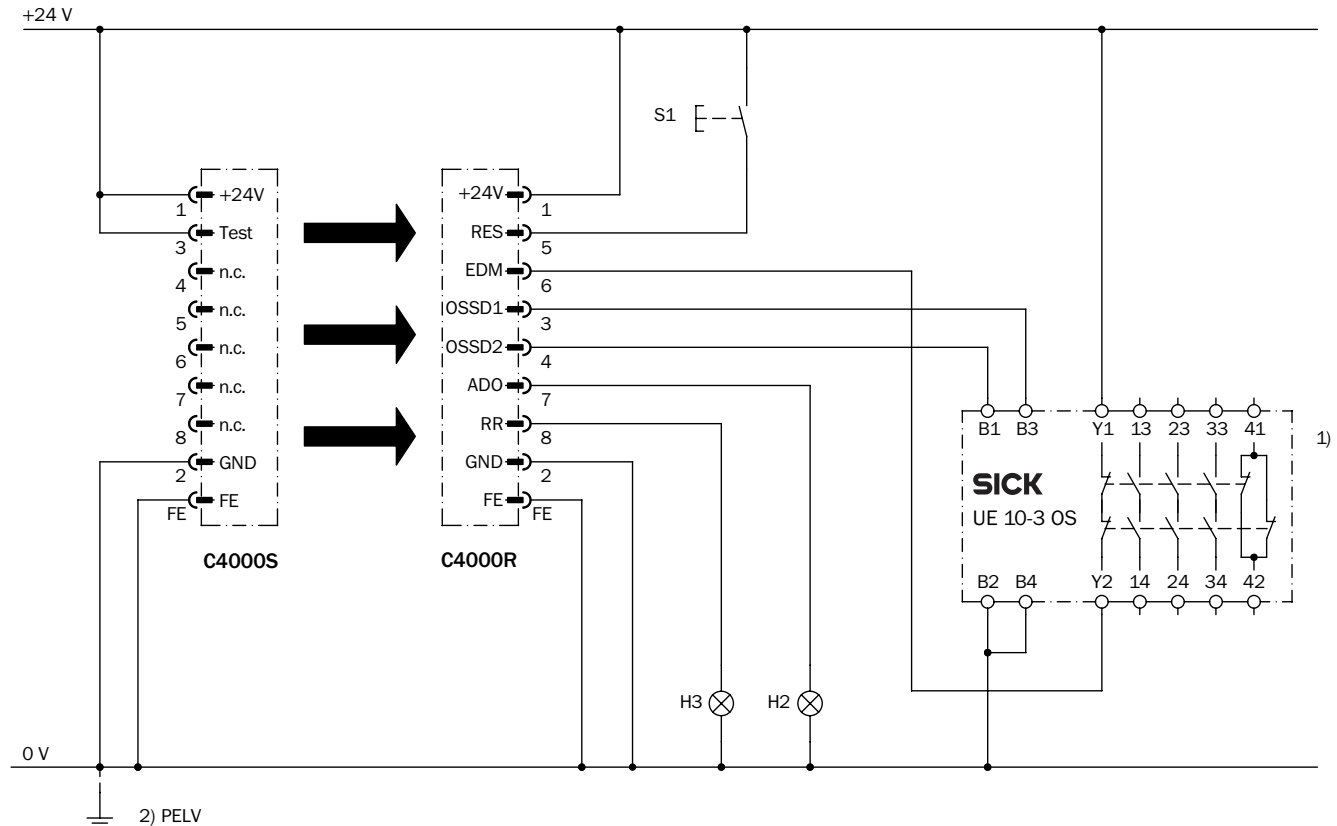
Protective field height S	L1	L2	A
300	381	397	224
450	532	548	374

Dimensions in mm

Connection diagram

→ You can find more connection diagrams at www.sick.com

C 4000 Standard connected to UE 10-3 OS safety relay



Task

Connection of a safety light curtain C 4000 Standard to UE 10-3 OS. Operating mode with restart interlock and external device monitoring.

Function

When the light path is clear and the UE 10 is de-energised and functioning correctly, the yellow LED on the receiver and the lamp H3 flash. The system is ready to be switched on. The system is enabled by operating S1 (button is pressed and released). Outputs OSSD1 and OSSD2 are live, the UE 10 is switched on. On interruption of one of the light beams, the UE 10 is switched off by the outputs OSSD1 and OSSD2.

Possible errors

Cross-circuits and short-circuits of the OSSDs are detected and lead to the inhibited state (lock-out). The incorrect functioning of the UE 10 will be detected and will not result in failure of the switch-off function. Jamming of the S1 button prevents enabling of the output circuit. Lamp H2 is illuminated if there is contamination (adjustable parameter).

Comments

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, this integration must be two-channel (x-/y paths). 1-channel insertion in the control (z path) is only possible with a 1-channel control and taking the risk analysis into account.

2) PELV in accordance with the requirements in EN 60204-1 / 6.4

The relevant operating instructions for integrated devices must be observed.

Accessories

Mounting systems

Description	Type of fastening	Packing unit	Remark	Part number
Mounting kit 2	Pivoting, swivel mount	4	For all protective field heights	2 019 659
Mounting kit 6	Pivoting, side bracket	4	For all protective field heights	2 019 506
Mounting kit 11	Replacement bracket	4	Suitable for replacement of FGS	2 021 646
Stainless steel bracket	Pivoting	4	For all protective field heights	2 023 708
Reinforced stainless steel bracket	Pivoting	4	For all protective field heights	2 026 850

Sliding nuts/sliding blocks

Description	Packing unit	Remark	Part number
Sliding block (sliding nut)	4	Supplied with delivery	2 017 550

Cable sockets

Connection type	Connection type	Direction of the cable outlet	Part number
Hirschmann cable socket M26 x 11 + FE	Crimp contacts	Straight	6 020 757
		Angled	6 020 758

Cable plugs

Connection type	Connection type	Direction of the cable outlet on the plug	Part number
Hirschmann cable plug M26 x 11 + FE	Crimp contacts	Straight	6 021 191
		Angled	6 021 192

Connection cables

Connection type	Direction of the cable outlet	Cable length	Part number
Hirschmann cable socket M26 x 11 + FE	Straight	2.5 m	2 022 544
		5 m	2 022 545
		7.5 m	2 022 546
		10 m	2 022 547
		15 m	2 022 548
		20 m	2 022 549
		30 m	2 022 550

Continued on next page

Cascade connection cables

Connection type	Direction of the cable outlet on the plug	Cable length	Part number
Connector	Plug straight/socket straight	0.25 m	2 022 278
		0.5 m	2 021 838
		1 m	2 022 279
		1.5 m	2 022 280
		2 m	2 022 281
		2.5 m	2 022 282
		3 m	2 022 283
	Plug straight/socket angled	0.25 m	2 022 284
		0.5 m	2 022 285
		1 m	2 022 286
		1.5 m	2 022 287
		2 m	2 022 288
		2.5 m	2 022 289
		3 m	2 022 290

Cable without plug/socket

Remark	Part number
Cable unshielded (fitting for EFI connections) max. 100 m	6 0214 37

Configuration connection cables

Remark	Cable length	Part number
For connecting the configuration connection to the PC	2 m	6 021 195
	8 m	2 027 649

Interfaces

Designation	Enclosure rating	Description	Type	Part number
Safety interface	IP 20	For the C 4000 Standard/Advanced functions: PSDI mode, bypass, operating mode switching	UE402	1 023 577
		For opto-electronic protective devices	UE10-30S2D0	6 024 917
			UE10-30S3D0	6 024 918

Power supply units

Input voltage from ... to	Output voltage	Maximum output current	Part number
120 V ... 230 V AC	24 V DC	2.5 A	6 010 361
		4 A	6 010 362

Device columns

Length	Suitable for protective field height	Remark	Part number
1200 mm	300 mm ... 900 mm	Incl. mounting kit	2 021 330
1500 mm	300 mm ... 1200 mm	Incl. mounting kit	2 021 331
1700 mm	300 mm ... 1350 mm	Incl. mounting kit	2 021 332

Additional front screens

Suitable for protective field height	Part number
300 mm	2 022 412
450 mm	2 022 413
600 mm	2 022 414
750 mm	2 022 415
900 mm	2 022 416
1050 mm	2 022 417
1200 mm	2 022 418
1350 mm	2 022 419
1500 mm	2 022 420
1650 mm	2 022 421
1800 mm	2 022 422

C

Deflector mirrors

Description	Suitable for protective field height	Part number
PNS75-034	300 mm	1 019 414
PNS75-049	450 mm	1 019 415
PNS75-064	600 mm	1 019 416
PNS75-079	750 mm	1 019 417
PNS75-094	900 mm	1 019 418
PNS75-109	1050 mm	1 019 419
PNS75-124	1200 mm	1 019 420
PNS75-139	1350 mm	1 019 421
PNS75-154	1500 mm	1 019 422
PNS75-169	1650 mm	1 019 423
PNS75-184	1800 mm	1 019 424
PNS125-034	300 mm	1 019 425
PNS125-049	450 mm	1 019 426
PNS125-064	600 mm	1 019 427
PNS125-079	750 mm	1 019 428
PNS125-094	900 mm	1 019 429
PNS125-109	1050 mm	1 019 430
PNS125-124	1200 mm	1 019 431
PNS125-139	1350 mm	1 019 432
PNS125-154	1500 mm	1 019 433
PNS125-169	1650 mm	1 019 434
PNS125-184	1800 mm	1 019 435

Continued on next page

Sliding nuts for deflector mirrors

Suitable for	Packing unit	Part number
PNS 75 and PNS 125	6	2 030 600

Explosion protection

Description	Remark	Part number
ATEX Package	For use in zone 2/22, 3G 3D	2 029 961

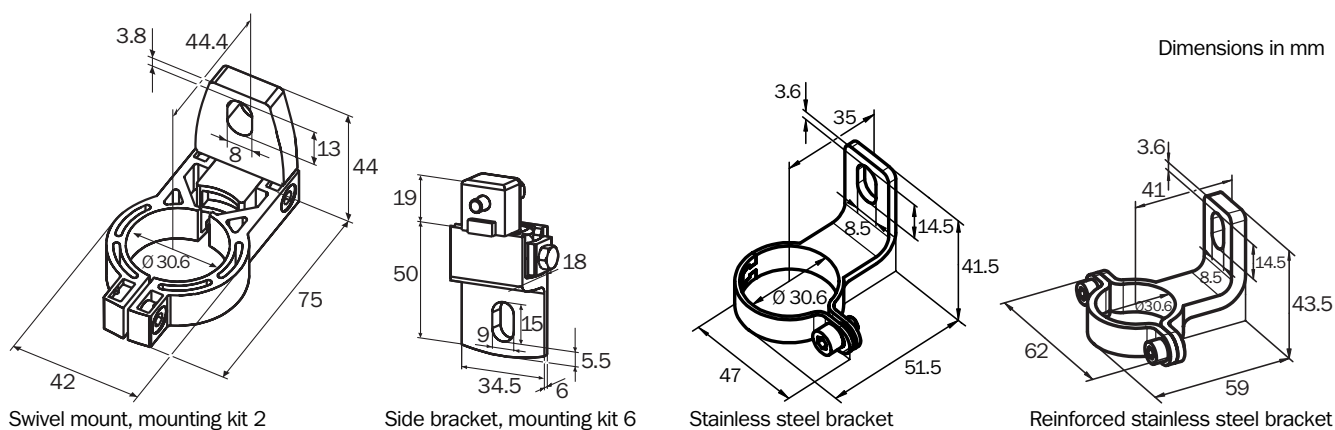
Laser alignment aid

Description	Maximum scanning range	Type of light	Part number
Laser alignment aid AR 60	60 m	Red light	1 015 741
Adapter AR 60 / C 4000	–	–	4 032 461

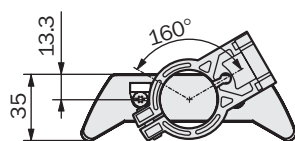
Configuration software

Description	Remark	Part number
CDS	Software CDS (Configuration & Diagnostic Software) on CD-ROM incl. online documentation	2 026 875

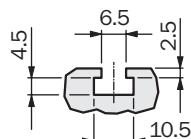
Dimensional drawings mounting accessories



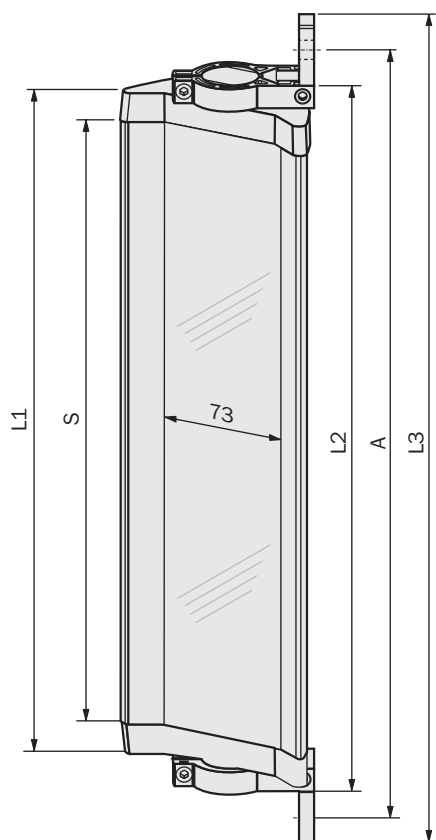
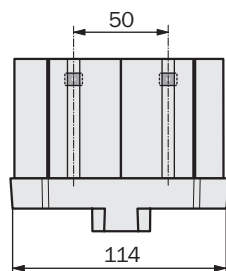
Dimensional drawings deflector mirror PNS 75



Mounting with
swivel mount bracket
(Part No. 2 019 659)



Sliding nut groove for
side mounting

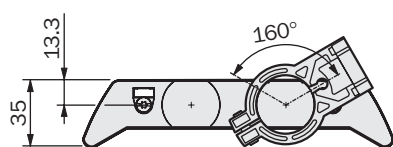


Dimensions in mm

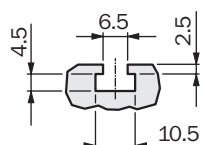
Mirror height S	L1	L2	L3	A
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340
1390	1422	1446	1510	1490
1540	1572	1596	1660	1640
1690	1722	1746	1810	1790
1840	1872	1896	1960	1940

Dimensions in mm

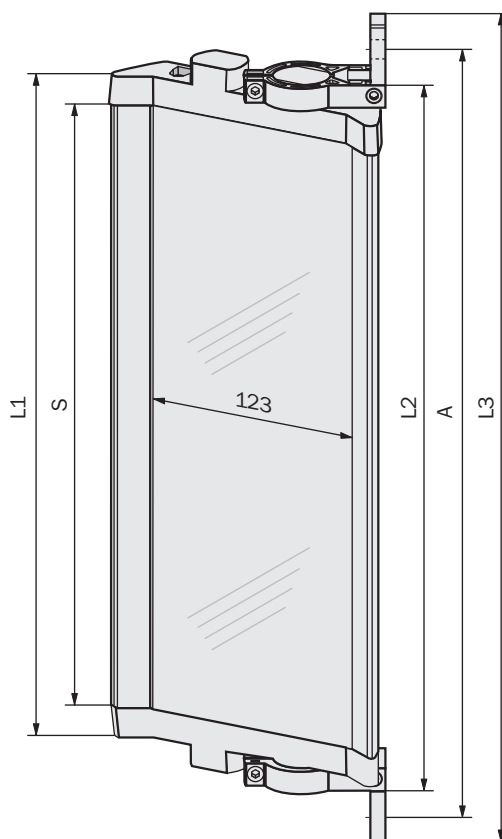
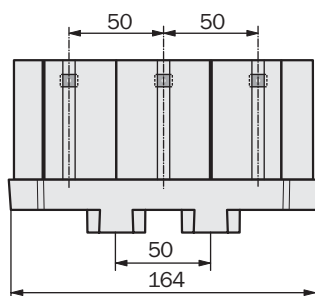
Dimensional drawings deflector mirror PNS 125



Mounting with
swivel mount bracket
(Part No. 2 019 659)



Sliding nut groove for
side mounting



Dimensions in mm

Mirror height S	L1	L2	L3	A
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340
1390	1422	1446	1510	1490
1540	1572	1596	1660	1640
1690	1722	1746	1810	1790
1840	1872	1896	1960	1940

Dimensions in mm

Overview of technical specifications

Protective field height (depending on type)	150 mm ... 1200 mm
Scanning range (depending on type)	0 m ... 2.5 m / 1 m ... 5 m / 0 m ... 6 m
Resolution (depending on type)	14 mm / 30 mm
Type	Type 4 according to IEC 61496, SIL3 (IEC/EN 61508)
Enclosure rating	IP 65

Product description

The C 4000 Micro safety light curtain is used wherever hazardous points and hazardous areas require reliable and cost-effective protection.

- Simplified machine integration in small spaces due to small, compact design
- Space-saving cable entry due to M12 connections

In-system added value

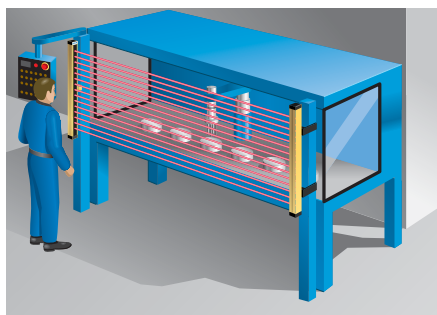
- Combination with SICK interfaces
- Safe interface to bus systems

Combination with	PSDI	Further information
UE 470	✓	M-3

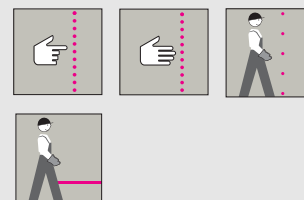
Applications

→ You can find more applications using the application finder at www.sick.com

- Electronics industry
- Packaging machinery
- Food and beverage industry
- Handling machinery
- Special machinery



Hazardous point protection on a handling machine



- Small, compact housing
- External device monitoring (EDM)
- Restart interlock (RES)



Weitere Informationen	Seite
→ Ordering information	C-42
→ Technical specifications	C-43
→ Dimensional drawings	C-44
→ Connection diagrams	C-44
→ Accessories	C-45
→ Services	A-0

Ordering information

C 4000 Micro

Housing cross-section	33.5 mm x 28.5 mm
Functions	Restart interlock, external device monitoring
Consisting of	Sender and receiver unit, operating instructions on CD-ROM
Usage	Single system
Connection types	System connection: M12 x 7 + FE

Resolution 14 mm, scanning range 0 m ... 2.5m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
150	C41S-0101AA300	1 024 054	C41E-0101AG300	1 024 055
300	C41S-0301AA300	1 023 458	C41E-0301AG300	1 023 459
450	C41S-0401AA300	1 023 460	C41E-0401AG300	1 023 461
600	C41S-0601AA300	1 023 462	C41E-0601AG300	1 023 463
750	C41S-0701AA300	1 023 464	C41E-0701AG300	1 023 465
900	C41S-0901AA300	1 023 466	C41E-0901AG300	1 023 467
1050	C41S-1001AA300	1 023 468	C41E-1001AG300	1 023 469
1200	C41S-1201AA300	1 023 470	C41E-1201AG300	1 023 471

Resolution 14 mm, scanning range 1 m ... 5 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
150	C41S-0101AA300	1 024 054	C41E-0101BG300	1 024 037
300	C41S-0301AA300	1 023 458	C41E-0301BG300	1 023 486
450	C41S-0401AA300	1 023 460	C41E-0401BG300	1 023 487
600	C41S-0601AA300	1 023 462	C41E-0601BG300	1 023 488
750	C41S-0701AA300	1 023 464	C41E-0701BG300	1 023 489
900	C41S-0901AA300	1 023 466	C41E-0901BG300	1 023 490
1050	C41S-1001AA300	1 023 468	C41E-1001BG300	1 023 491
1200	C41S-1201AA300	1 023 470	C41E-1201BG300	1 023 492

Resolution 30 mm, scanning range 0 m ... 6 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
150	C41S-0103AA300	1 023 563	C41E-0103AG300	1 023 860
300	C41S-0303AA300	1 023 472	C41E-0303AG300	1 023 473
450	C41S-0403AA300	1 023 474	C41E-0403AG300	1 023 475
600	C41S-0603AA300	1 023 476	C41E-0603AG300	1 023 477
750	C41S-0703AA300	1 023 478	C41E-0703AG300	1 023 479
900	C41S-0903AA300	1 023 480	C41E-0903AG300	1 023 481
1050	C41S-1003AA300	1 023 482	C41E-1003AG300	1 023 483
1200	C41S-1203AA300	1 023 484	C41E-1203AG300	1 023 485

Detailed technical specifications

→ You can find more detailed data in the operating instructions. Download at www.sick.com

General system data

Scanning range (depending on type)	0 m ... 2.5 m / 1 m ... 5 m / 0 m ... 6 m
Protective field height (depending on type)	150 mm ... 1200 mm
Resolution (depending on type)	14 mm / 30 mm
Protection class	III
Enclosure rating	IP 65
Supply voltage V_S	24 V (19.2 V ... 28.8 V) DC
Type	Type 4 according to IEC 61496, SIL3 (IEC/EN 61508)
Synchronization	Optical, without separate synchronisation

Receiver unit

Switching outputs (OSSDs)	2 PNP semiconductors, short-circuit protected, cross-circuit monitored
Switching voltage	$V_S - 2.25 \text{ V}$ 3.5 V
Switching current max.	500 mA
Power consumption	$\leq 1.45 \text{ A}$

Sender unit

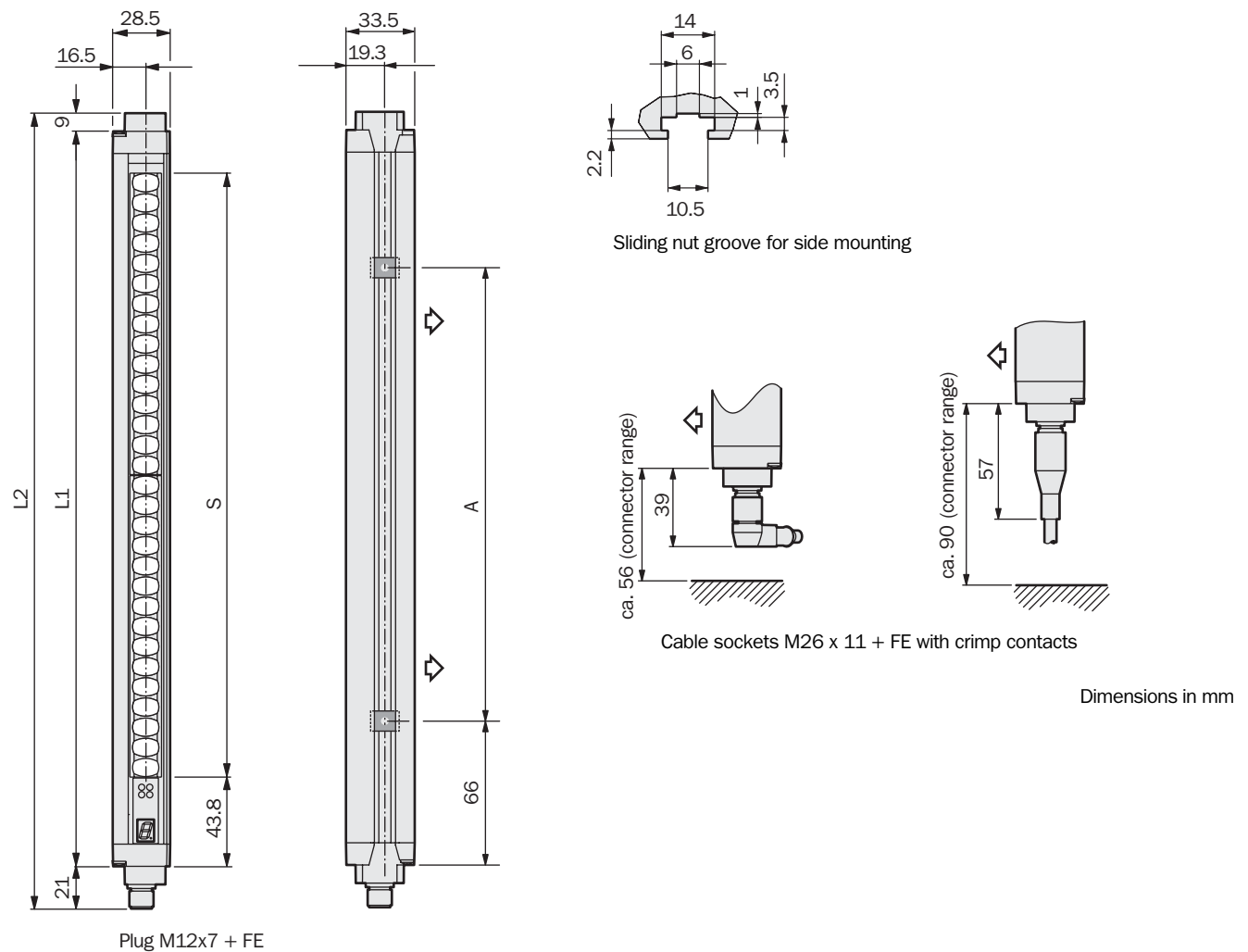
Power consumption (depending on type)	$\leq 0.35 \text{ A}$
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Operating data

Connection type	M12 x 7 + FE
Cable length	Max. 15 m
Wire cross-section	0.25 mm ²
Ambient operating temperature from ... to	0 °C ... +55 °C
Storage temperature from ... to	-25 °C ... +70 °C
Air humidity from ... to	15 % ... 95 %
Housing cross-section	33.5 mm x 28.5 mm
Vibration resistance	5 g, 10 Hz ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29
Weight (depending on type)	0.37 kg ... 1.25 kg

Dimensional Drawings

C 4000 Micro



Protective field height S	L1	L2	A
150	276	246	—
300	364	394	224
450	515	545	374
600	666	696	524
750	816	846	674
900	967	997	824
1050	1117	1147	974
1200	1266	1296	1124

Dimensions in mm

Connection diagrams

→ You can find connection diagrams at www.sick.com

Accessories

Mounting systems

Description	Type of fastening	Packing unit	Remark	Part number
Mounting kit 1	Pivoting, swivel mount	4	For all protective field heights	2 019 649
Mounting kit 6	Pivoting, side bracket	4	For all protective field heights	2 019 506
Mounting kit 10	Replacement bracket	4	Suitable for replacement of FGS	2 021 645
Stainless steel bracket	Pivoting	4	For all protective field heights	2 030 288

Sliding nuts/sliding blocks

Description	Packing unit	Remark	Part number
Sliding block (sliding nut)	4	Supplied with delivery	2 017 550

Connection cables

Connection type	Direction of the cable outlet	Cable length	Part number
Cable socket M12 x 7 + FE	Straight	2.5 m	6 020 537
		5 m	6 020 354
		7.5 m	6 020 353
		10 m	6 020 352
		15 m	6 020 872
	Angled	5 m	6 021 342
		15 m	6 021 343

Interfaces

Designation	Enclosure rating	Description	Type	Part number
Safety relay	IP 20	For opto-electronic protective devices	UE10-30S2D0	6 024 917
			UE10-30S3D0	6 024 918

Device columns

Length	Suitable for protective field height	Remark	Part number
1200 mm	300 mm ... 900 mm	Incl. mounting kit	2 021 330
1500 mm	300 mm ... 1200 mm	Incl. mounting kit	2 021 331
1700 mm	300 mm ... 1350 mm	Incl. mounting kit	2 021 332

Additional front screens

Suitable for protective field height	Part number
300 mm	2 022 405
450 mm	2 022 406
600 mm	2 022 407
750 mm	2 022 408
900 mm	2 022 409
1050 mm	2 022 410
1200 mm	2 022 411

Continued on next page

Deflector mirrors

Description	Suitable for protective field height	Part number
PNS75-034	300 mm	1 019 414
PNS75-049	450 mm	1 019 415
PNS75-064	600 mm	1 019 416
PNS75-079	750 mm	1 019 417
PNS75-094	900 mm	1 019 418
PNS75-109	1050 mm	1 019 419
PNS75-124	1200 mm	1 019 420
PNS125-034	300 mm	1 019 425
PNS125-049	450 mm	1 019 426
PNS125-064	600 mm	1 019 427
PNS125-079	750 mm	1 019 428
PNS125-094	900 mm	1 019 429
PNS125-109	1050 mm	1 019 430
PNS125-124	1200 mm	1 019 431

Sliding nuts for deflector mirrors

Suitable for	Packing unit	Part number
PNS 75 and PNS 125	6	2 030 600

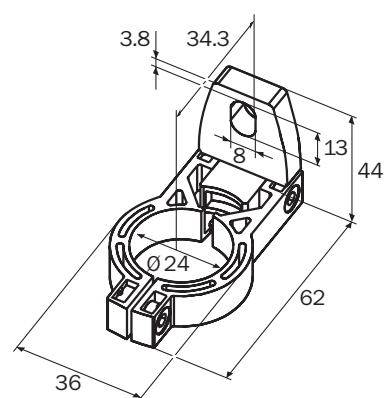
Laser alignment aid

Description	Maximum scanning range	Light type	Part number
Laser alignment aid AR 60	60 m	Red light	1 015 741
Adapter AR 60 / C 4000 Micro	–	–	4 032 462

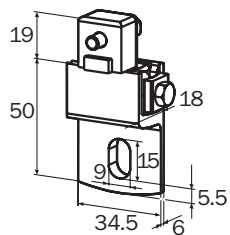
Documentation

Description	Remark	Part number
Operating instructions C 4000 Micro/Basic on CD-ROM	Supplied with delivery	2 026 783

Dimensional drawings mounting accessories

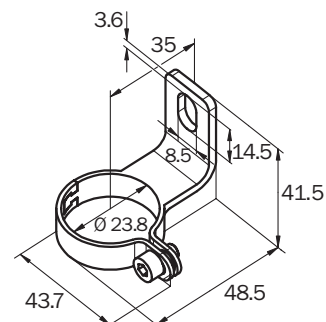


Swivel mount, mounting kit 1



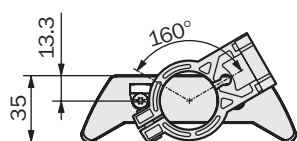
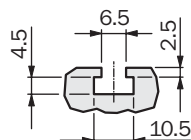
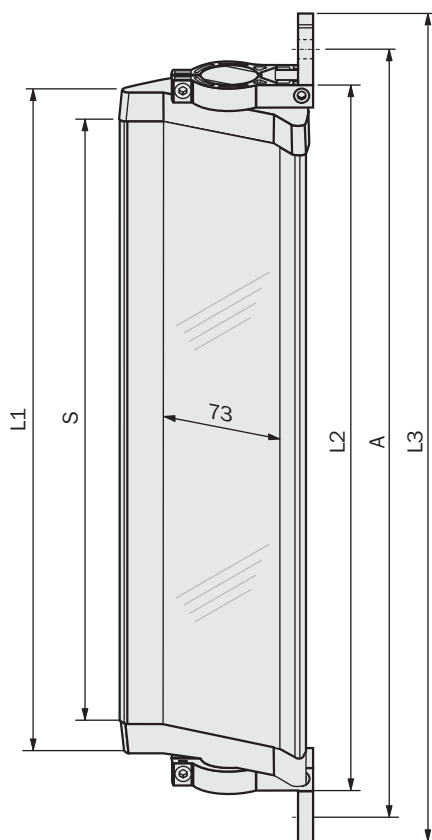
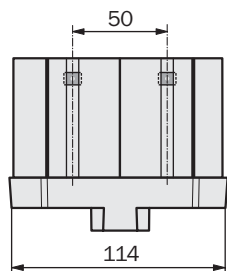
Side bracket, mounting kit 6

Dimensions in mm



Stainless steel bracket

Dimensional drawings deflector mirror PNS 75

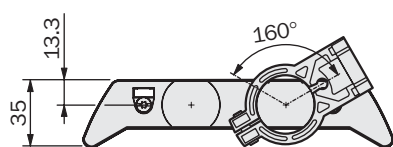
Mounting with
swivel mount bracket
(Part No. 2 019 659)Sliding nut groove for
side mounting

Dimensions in mm

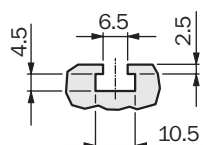
Mirror height S	L1	L2	L3	A
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340

Dimensions in mm

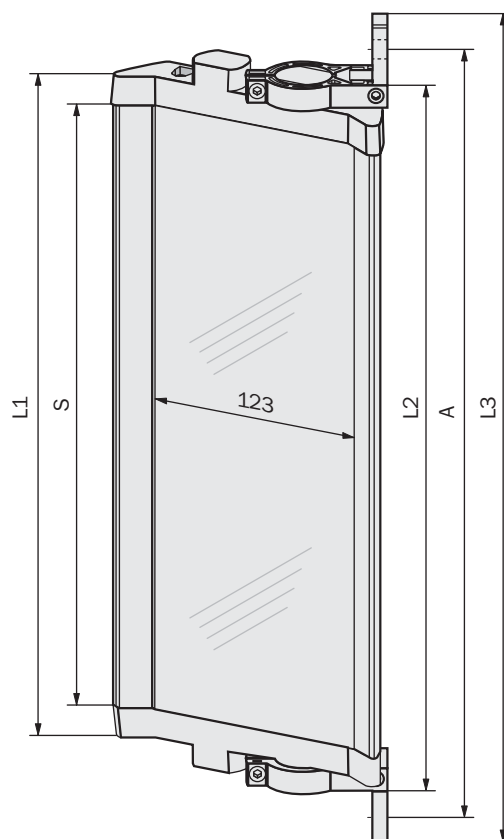
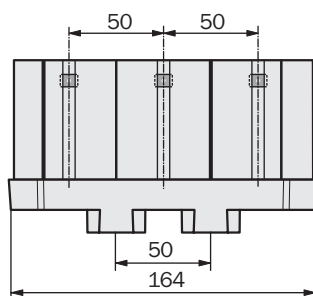
Dimensional drawings deflector mirror PNS 125



Mounting with
swivel mount bracket
(Part No. 2 019 659)



Sliding nut groove for
side mounting



Dimensions in mm

Mirror height S	L1	L2	L3	A
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340

Dimensions in mm

Overview of technical specifications

Resistant materials	V4A, PMMA, PA, PVC
Enclosure rating	IP 66, IP 67
Protective field height (depending on type)	150 mm ... 1200 mm
Scanning range (depending on type)	0 m ... 1.8 m / 1 m ... 4 m / 0 m ... 4.5 m
Resolution (depending on type)	14 mm / 30 mm
Type	Type 4 according to IEC 61496-1, Type 2 according to IEC 61496-2

Product description

The IP 67 housing in conjunction with the safety light curtain C 4000 Micro achieves the enclosure rating IP 67. A high level of resistance against the usual cleaning agents is achieved by using suitable materials (V4A, PMMA, PA, PVC).

A compensating element (membrane) prevents the plastic tubes misting up and the entry of liquids. The cable is fed into the device through the proven PG connector.

In-system added value

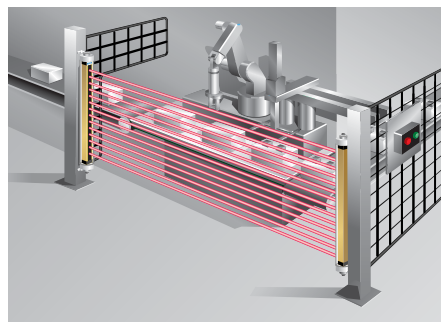
- Combination with SICK interfaces
- Safe interface to bus systems

Combination with	PSDI	Further information
UE 470	✓	M-2

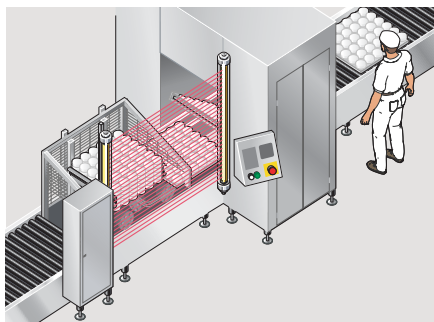
Applications

→ For more applications please refer to the application finder at www.sick.com

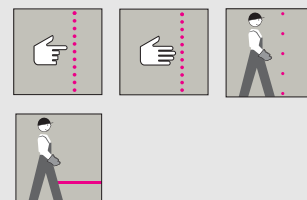
- Packaging industry
- Food industry
- Chemical industry
- Pharmaceutical industry
- Clean-room systems



Hazardous point protection on a processing centre in the hygiene area



Hazardous point protection on a cheese-making machine



C

- High durability
- Compact design
- On-site diagnostics
- External device monitoring (EDM)
- Restart interlock (RES)



Further information	Page
→ Ordering information	C-50
→ Technical specifications	C-51
→ Dimensional drawings	C-52
→ Accessories	C-53
→ Services	A-0

Ordering information

IP 67 housing with integrated sender or receiver unit C 4000 Micro, including 15 m PVC cable

Resolution 14 mm, scanning range 0 m ... 1.8 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
150	C45S-0101AA220	1 025 720	C45E-0101AG220	1 025 721
300	C45S-0301AA220	1 025 722	C45E-0301AG220	1 025 723
450	C45S-0401AA220	1 025 727	C45E-0401AG220	1 025 728
600	C45S-0601AA220	1 025 732	C45E-0601AG220	1 025 733
750	C45S-0701AA220	1 025 737	C45E-0701AG220	1 025 738
900	C45S-0901AA220	1 025 742	C45E-0901AG220	1 025 743
1050	C45S-1001AA220	1 025 747	C45E-1001AG220	1 025 748
1200	C45S-1201AA220	1 025 753	C45E-1201AG220	1 025 754

Resolution 14 mm, scanning range 1 m ... 4 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
150	C45S-0101AA220	1 025 720	C45E-0101BG220	1 025 719
300	C45S-0301AA220	1 025 722	C45E-0301BG220	1 025 726
450	C45S-0401AA220	1 025 727	C45E-0401BG220	1 025 731
600	C45S-0601AA220	1 025 732	C45E-0601BG220	1 025 736
750	C45S-0701AA220	1 025 737	C45E-0701BG220	1 025 741
900	C45S-0901AA220	1 025 742	C45E-0901BG220	1 025 746
1050	C45S-1001AA220	1 025 747	C45E-1001BG220	1 025 752
1200	C45S-1201AA220	1 025 753	C45E-1201BG220	1 025 757

Resolution 30 mm, scanning range 0 m ... 4.5 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
150	C45S-0103AA220	1 025 717	C45E-0103AG220	1 025 718
300	C45S-0303AA220	1 025 724	C45E-0303AG220	1 025 725
450	C45S-0403AA220	1 025 729	C45E-0403AG220	1 025 730
600	C45S-0603AA220	1 025 734	C45E-0603AG220	1 025 735
750	C45S-0703AA220	1 025 739	C45E-0703AG220	1 025 740
900	C45S-0903AA220	1 025 744	C45E-0903AG220	1 025 745
1050	C45S-1003AA220	1 025 749	C45E-1003AG220	1 025 750
1200	C45S-1203AA220	1 025 755	C45E-1203AG220	1 025 756

Detailed technical specifications

→ You can find more detailed data in the operating instructions. Download at www.sick.com

C 4000 Micro in IP 67 housing

→ C 4000 specific data see C 4000 Micro page C-43

Scanning range (depending on type)	0 m ... 1.8 m / 1 m ... 4 m / 0 m ... 4.5 m
Protective field height (depending on type)	150 mm ... 1200 mm
Resolution (depending on type)	14 mm / 30 mm
Type	Type 4 according to IEC 61496-1, Type 2 according to IEC 61496-2
Enclosure rating	IP 66, IP 67
Materials	
End caps	Stainless steel (V4A)
Plastic tube	PMMA
Compensating element (membrane)	PA 6
PG connector	PA 6
Ambient operating temperature	0 °C ... +55 °C
Storage temperature	-25 °C ... +70 °C

C

Dimensional drawings

C

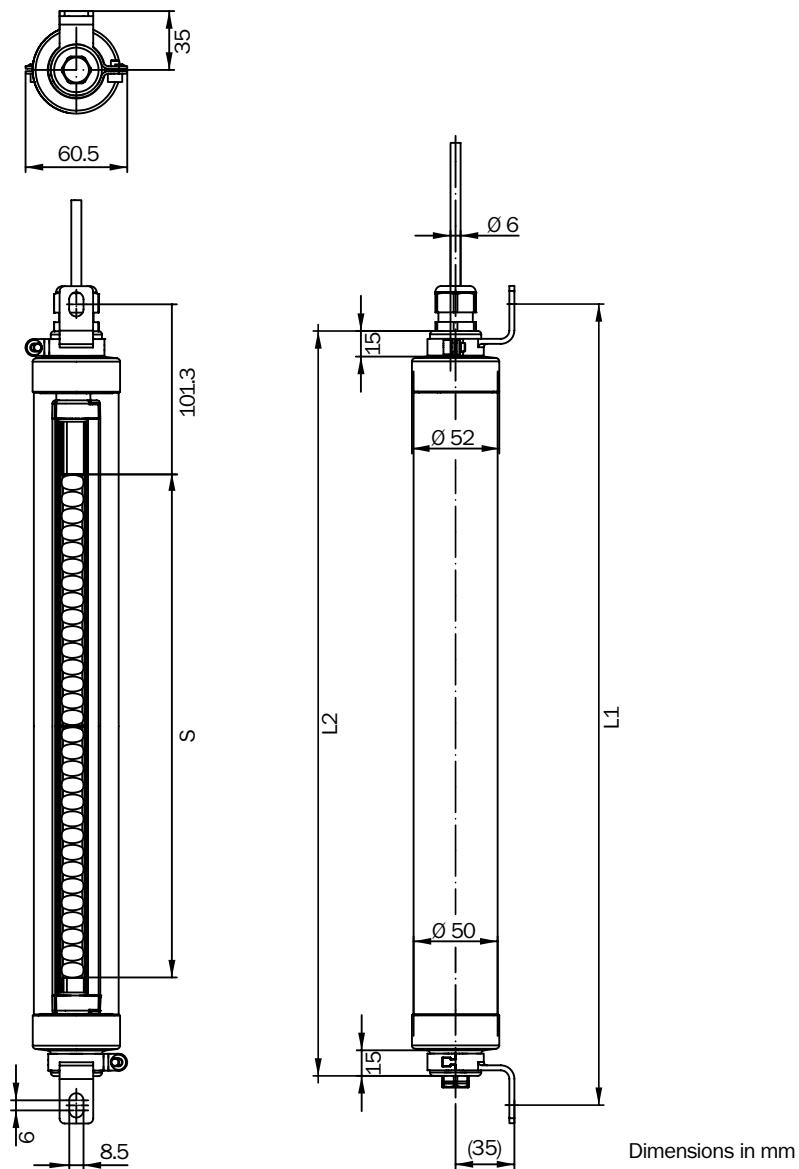


Illustration with stainless steel bracket (not supplied with delivery)

Protective field height S	L 1	L 2
150	357	324
300	476	443
450	626	593
600	777	744
750	927	894
900	1078	1045
1050	1228	1195
1200	1382	1349

Dimensions in mm

Accessories

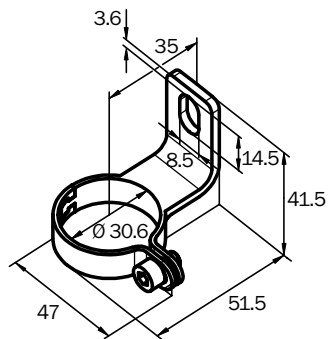
Mounting systems

Designation	Comment	Packing unit	Part number
Stainless steel bracket	Pivoting	4	2 023 708
Reinforced stainless steel bracket	Pivoting	4	2 026 850
Stainless steel support bracket	Pivoting	2	2 026 849
Mounting key	For M12 cable socket on device replacement	1	4 034 690
Venting membrane	—	1	5 309 082

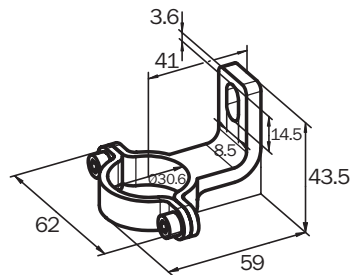
Interfaces

Designation	Description	Type	Part number
Safety relay	For opto-electronic protective devices	UE10-30S2D0	6 024 917
		UE10-30S3D0	6 024 918

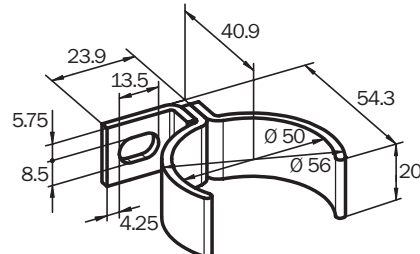
Dimensional drawings mounting accessories



Stainless steel bracket



Reinforced stainless steel bracket

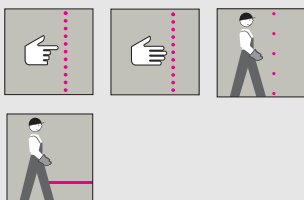


Stainless steel support bracket



Mounting key

Dimensions in mm



C



- External device monitoring (EDM)



Overview of technical specifications

Protective field height (depending on type)	300 mm ... 1800 mm
Scanning range (depending on type)	0 m ... 2.5 m / 1 m ... 5 m / 0 m ... 6 m
Resolution (depending on type)	14 mm / 30 mm
Type	Type 4 according to IEC 61496, SIL3 (IEC/EN 61508)
Enclosure rating	IP 65

Product description

The C 4000 Basic safety light curtain is used wherever hazardous points and hazardous areas require reliable and cost-effective protection. It is a robust device

designed for use in simple applications. Alignment and diagnostics via 7-segment display

In-system added value

- Combination with SICK interfaces

- Safe integration in bus systems with UE 1000 series

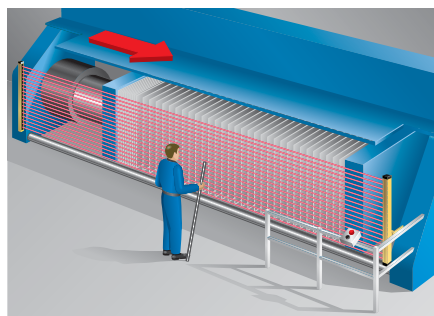
Combination with	Restart interlock	PSDI	Further information
UE 48-2 OS	✓	—	L-42
UE 440	✓	—	M-3
UE 470	✓	✓	M-3

Applications

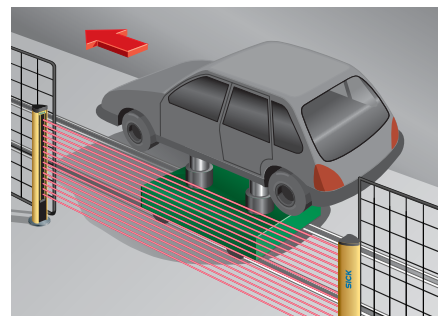
→ You can find more applications using the application finder at www.sick.com

- Automotive industry
- Machine tool industry

- Environmental engineering



Hazardous point protection on a diaphragm press



Access protection on an assembly line

Further information	Page
→ Technical specifications	C-57
→ Dimensional drawings	C-58
→ Connection diagrams	C-59
→ Accessories	C-59
→ Services	A-0

Ordering information

C 4000 Basic

Housing cross-section	48 mm x 40 mm
Functions	External device monitoring
Consisting of	Sender and receiver unit
Usage	Single system
Connection types	System connection: Hirschmann plug M26 x 6 + FE

C

Resolution 14 mm, scanning range 0 m ... 2.5 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301AA030	1 022 195	C40E-0301AH030	1 022 196
450	C40S-0401AA030	1 022 198	C40E-0401AH030	1 022 199
600	C40S-0601AA030	1 022 200	C40E-0601AH030	1 022 201
750	C40S-0701AA030	1 022 202	C40E-0701AH030	1 022 203
900	C40S-0901AA030	1 022 204	C40E-0901AH030	1 022 205
1050	C40S-1001AA030	1 022 206	C40E-1001AH030	1 022 207
1200	C40S-1201AA030	1 022 208	C40E-1201AH030	1 022 209
1350	C40S-1301AA030	1 022 210	C40E-1301AH030	1 022 211
1500	C40S-1501AA030	1 022 212	C40E-1501AH030	1 022 213
1650	C40S-1601AA030	1 022 214	C40E-1601AH030	1 022 215
1800	C40S-1801AA030	1 022 216	C40E-1801AH030	1 022 217

Resolution 14 mm, scanning range 1 m ... 5 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301AA030	1 022 195	C40E-0301BH030	1 022 240
450	C40S-0401AA030	1 022 198	C40E-0401BH030	1 022 241
600	C40S-0601AA030	1 022 200	C40E-0601BH030	1 022 242
750	C40S-0701AA030	1 022 202	C40E-0701BH030	1 022 243
900	C40S-0901AA030	1 022 204	C40E-0901BH030	1 022 244
1050	C40S-1001AA030	1 022 206	C40E-1001BH030	1 022 245
1200	C40S-1201AA030	1 022 208	C40E-1201BH030	1 022 246
1350	C40S-1301AA030	1 022 210	C40E-1301BH030	1 022 247
1500	C40S-1501AA030	1 022 212	C40E-1501BH030	1 022 248
1650	C40S-1601AA030	1 022 214	C40E-1601BH030	1 022 249
1800	C40S-1801AA030	1 022 216	C40E-1801BH030	1 022 250

Continued on next page

Resolution 30 mm, scanning range 0 m ... 6 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0303AA030	1 022 218	C40E-0303AH030	1 022 219
450	C40S-0403AA030	1 022 220	C40E-0403AH030	1 022 221
600	C40S-0603AA030	1 022 222	C40E-0603AH030	1 022 223
750	C40S-0703AA030	1 022 224	C40E-0703AH030	1 022 225
900	C40S-0903AA030	1 022 226	C40E-0903AH030	1 022 227
1050	C40S-1003AA030	1 022 228	C40E-1003AH030	1 022 229
1200	C40S-1203AA030	1 022 230	C40E-1203AH030	1 022 231
1350	C40S-1303AA030	1 022 232	C40E-1303AH030	1 022 233
1500	C40S-1503AA030	1 022 234	C40E-1503AH030	1 022 235
1650	C40S-1603AA030	1 022 236	C40E-1603AH030	1 022 237
1800	C40S-1803AA030	1 022 238	C40E-1803AH030	1 022 239

Detailed technical specifications

→ You can find more detailed data in the operating instructions. Download at www.sick.com

General system data

Scanning range (depending on type)	0 m ... 2.5 m / 1 m ... 5 m / 0 m ... 6 m
Protective field height (depending on type)	300 mm ... 1800 mm
Resolution (depending on type)	14 mm / 30 mm
Protection class	III
Enclosure rating	IP 65
Supply voltage V_S	24 V (19.2 V ... 28.8 V) DC
Type	Type 4 according to IEC 61496, SIL3 (IEC/EN 61508)
Synchronization	Optical, without separate synchronisation

Receiver

Switching outputs (OSSDs)	2 PNP semiconductors, short-circuit protected, cross-circuit monitored
Response time (depending on type)	9 ms ... 26 ms
Switching voltage	$V_S - 2.25 \text{ V}$
HIGH_{min} LOW_{max}	3.5 V
Switching current max.	500 mA
Power consumption	≤1.45 A

Sender unit

Power consumption	≤0.35 A
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Operating data

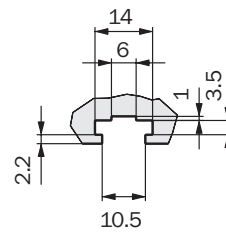
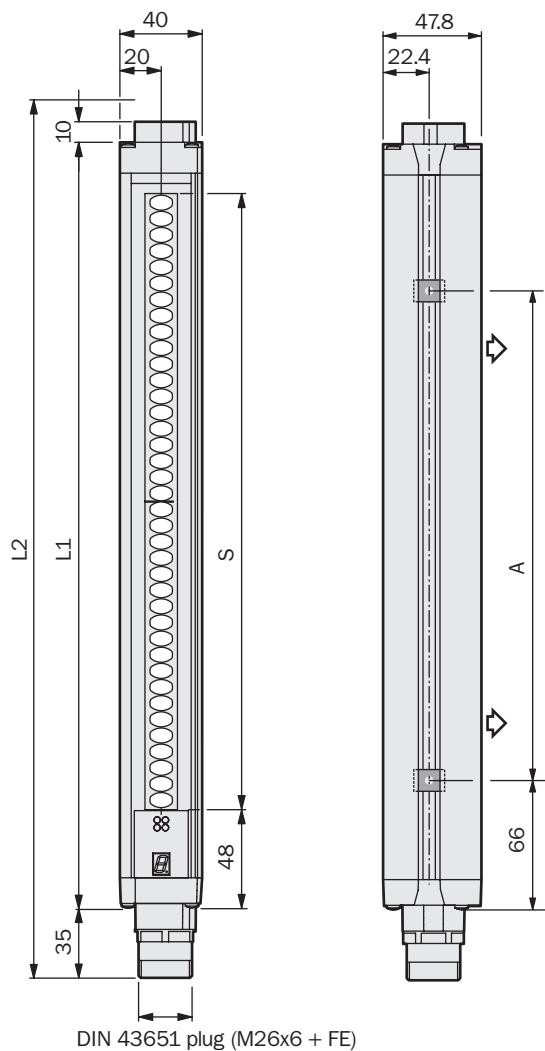
Connection type	Hirschmann plug M26 x 6 + FE
Cable length	Max. 50 m
Wire cross-section	0.75 mm ²
Ambient operating temperature from ... to	0 °C ... +55 °C
Storage temperature from ... to	-25 °C ... +70 °C
Air humidity from ... to	15 % ... 95 %
Housing cross-section	48 mm x 40 mm
Vibration resistance	5 g, 10 Hz ... 55 Hz IEC 60068-2-6
Shock resistance	10 g, 16 ms IEC 60068-2-29
Weight (depending on type)	0.82 kg ... 3.71 kg

C

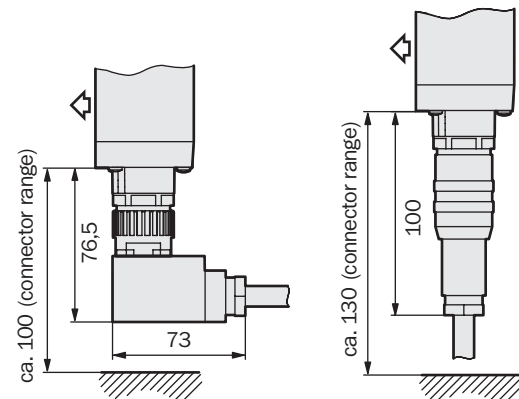
Dimensional drawings

C 4000 Basic

C



Sliding nut groove for side mounting

Angled cable socket
M26 x 11 + FE with screw
contactsStraight cable socket
M26 x 11 + FE with screw
contacts

Dimensions in mm

Protective field height S	L1	L2	A
300	372	417	224
450	523	568	374
600	674	718	524
750	824	869	674
900	975	1020	824
1050	1125	1170	974
1200	1274	1319	1124
1350	1426	1471	1274
1500	1577	1622	1424
1650	1727	1772	1574
1800	1878	1923	1724

Dimensions in mm

Connection diagrams

→ You can find sample connection diagrams at www.sick.com

Accessories

Mounting systems

Description	Type of fastening	Packing unit	Remark	Part number
Mounting kit 2	Pivoting, swivel mount	4	For all protective field heights	2 019 659
Mounting kit 6	Pivoting, side bracket	4	For all protective field heights	2 019 506
Mounting kit 11	Replacement bracket	4	Suitable for replacement of FGS	2 021 646
Stainless steel bracket	Pivoting	4	For all protective field heights	2 023 708
Reinforced stainless steel bracket	Pivoting	4	For all protective field heights	2 026 850

Sliding nuts/sliding blocks

Description	Packing unit	Remark	Part number
Sliding block (sliding nut)	4	Supplied with delivery	2 017 550

Cable sockets

Connection type	Connection type	Direction of the cable outlet	Part number
Hirschmann cable socket M26 x 6 + FE	Crimp contacts	Straight	6 006 612
	Screw connection	Angled	6 007 363

Connection cables

Connection type	Direction of the cable outlet	Cable length	Part number
Hirschmann cable socket M26 x 6 + FE	Straight	2.5 m	2 023 993
		5 m	2 023 994
		7.5 m	2 023 995
		10 m	2 023 996
		15 m	2 023 997
		20 m	2 023 998
		30 m	2 023 999

Interfaces

Designation	Enclosure rating	Description	Type	Part number
Safety relay	IP 20	For opto-electronic protective devices	UE10-30S2D0	6 024 917
			UE10-30S3D0	6 024 918
		With screw type terminals	UE48-20S2D2	6 024 915
		With plug-in terminals	UE48-20S3D2	6 024 916
		With screw type terminals	UE48-30S3D2	6 025 089
		With plug-in terminals	UE48-30S3D2	6 025 097

Continued on next page

Device columns

Length	Suitable for protective field height	Remark	Part number
1200 mm	300 mm ... 900 mm	Incl. mounting kit	2 021 330
1500 mm	300 mm ... 1200 mm	Incl. mounting kit	2 021 331
1700 mm	300 mm ... 1350 mm	Incl. mounting kit	2 021 332

Additional front screens

Suitable for protective field height	Part number
300 mm	2 022 412
450 mm	2 022 413
600 mm	2 022 414
750 mm	2 022 415
900 mm	2 022 416
1050 mm	2 022 417
1200 mm	2 022 418
1350 mm	2 022 419
1500 mm	2 022 420
1650 mm	2 022 421
1800 mm	2 022 422

Deflector mirrors

Description	Suitable for protective field height	Part number
PNS75-034	300 mm	1 019 414
PNS75-049	450 mm	1 019 415
PNS75-064	600 mm	1 019 416
PNS75-079	750 mm	1 019 417
PNS75-094	900 mm	1 019 418
PNS75-109	1050 mm	1 019 419
PNS75-124	1200 mm	1 019 420
PNS75-139	1350 mm	1 019 421
PNS75-154	1500 mm	1 019 422
PNS75-169	1650 mm	1 019 423
PNS75-184	1800 mm	1 019 424
PNS125-034	300 mm	1 019 425
PNS125-049	450 mm	1 019 426
PNS125-064	600 mm	1 019 427
PNS125-079	750 mm	1 019 428
PNS125-094	900 mm	1 019 429
PNS125-109	1050 mm	1 019 430
PNS125-124	1200 mm	1 019 431
PNS125-139	1350 mm	1 019 432
PNS125-154	1500 mm	1 019 433
PNS125-169	1650 mm	1 019 434
PNS125-184	1800 mm	1 019 435

Sliding nuts for deflector mirrors

Suitable for	Packing unit	Part number
PNS 75 and PNS 125	6	2 030 600

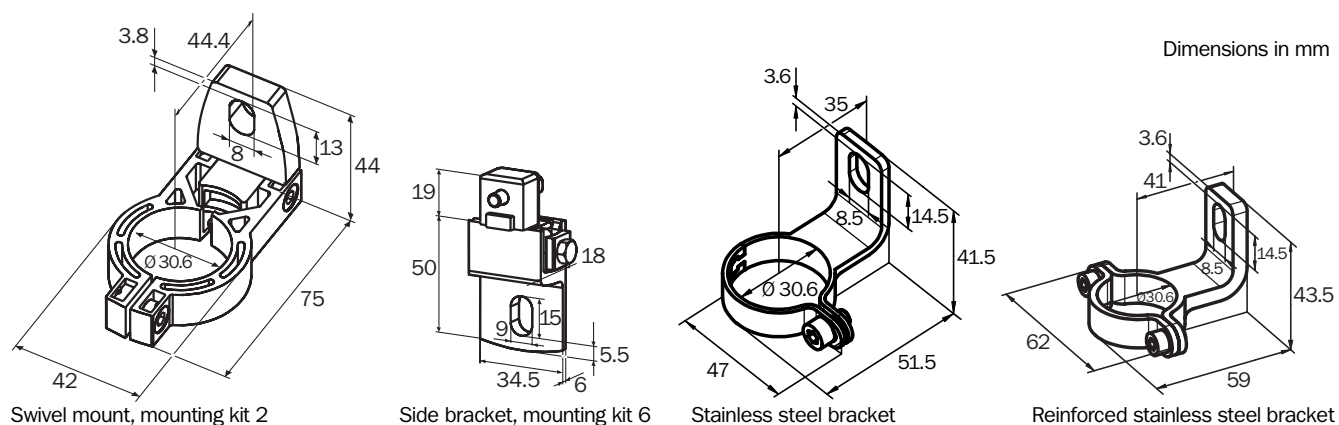
Laser alignment aid

Description	Maximum scanning range	Type of light	Part number
Laser alignment aid AR 60	60 m	Red light	1 015 741
Adapter AR 60 / C 4000	—	—	4 032 461

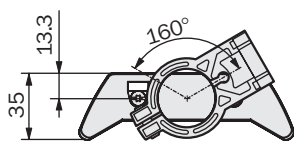
Documentation

Description	Remark	Part number
Operating instructions C 4000 Micro/Basic on CD-ROM	Supplied with delivery	2 026 783

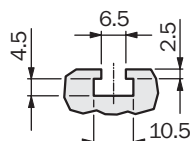
Dimensional drawings mounting accessories



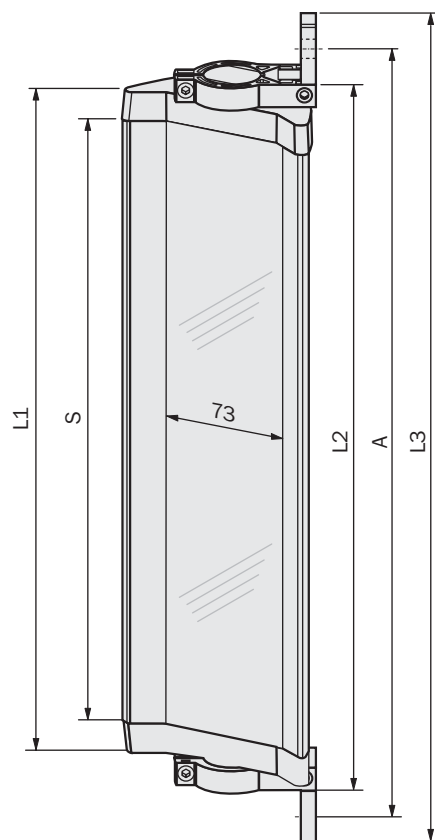
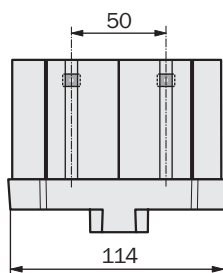
Dimensional drawings deflector mirror PNS 75



Mounting with
swivel mount bracket
(Part No. 2 019 659)



Sliding nut groove for
side mounting

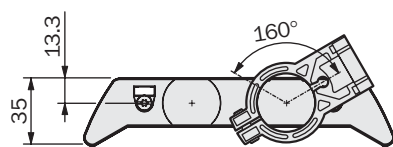


Dimensions in mm

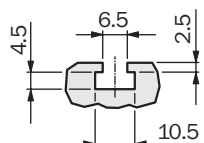
Mirror height S	L1	L2	L3	A
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340
1390	1422	1446	1510	1490
1540	1572	1596	1660	1640
1690	1722	1746	1810	1790
1840	1872	1896	1960	1940

Dimensions in mm

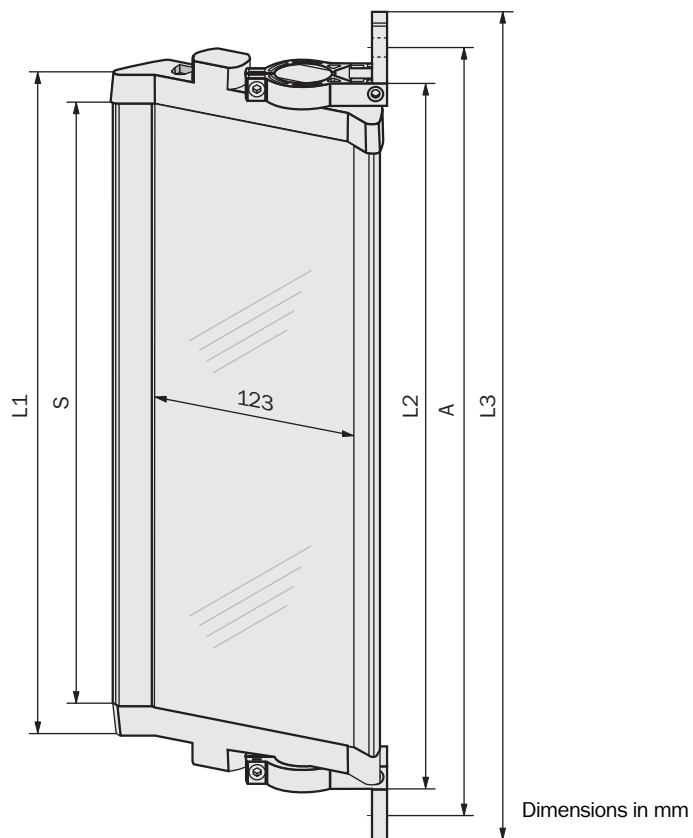
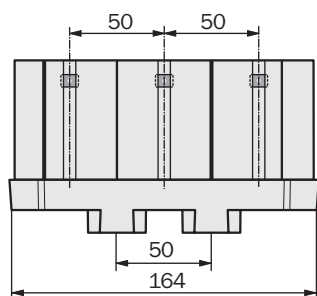
Dimensional drawings deflector mirror PNS 125



Mounting with
swivel mount bracket
(Part No. 2 019 659)



Sliding nut groove for
side mounting



Mirror height S	L1	L2	L3	A
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340
1390	1422	1446	1510	1490
1540	1572	1596	1660	1640
1690	1722	1746	1810	1790
1840	1872	1896	1960	1940

Dimensions in mm



C



- Self-teach dynamic blanking
- External device monitoring (EDM)
- Restart interlock (RES)
- Configuration and diagnostics via PC
- Beam coding
- Multiple sampling to increase availability



Overview of technical specifications

Protective field height (depending on type)	900 mm ... 1500 mm
Scanning range	0.5 m ... 19 m
Resolution	20 mm
Type	Type 4 according to IEC 61496, SIL3 (IEC/EN 61508)
Enclosure rating	IP 65

Product description

The C 4000 Entry/Exit safety light curtain is used wherever material is to be automatically transported into the dangerous area in a machine and, at the same time, access by people must be reliably excluded:

- Maximum safety due to continuously active light curtain - tampering is very difficult
- Cost-effective due to savings on additional sensor systems or other protection measures, e.g. muting sensors, muting lamp, hinged doors etc.

- Very high availability due to self-teach distance monitoring
- Reduced mounting effort due to compact pair of sensors
- Functions can be activated without additional control device

In-system added value

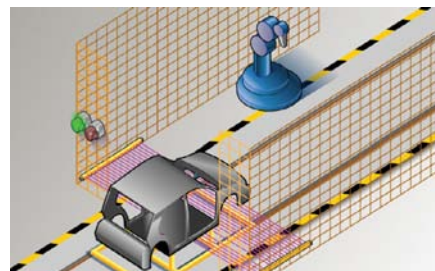
- Combination with SICK interfaces
- Safe integration in bus systems with UE 1000 series

Combination with	Bypass	Operating mode switching	Configuration memory	Further information
UE 402	✓	✓	—	C-68
UE 440	✓	✓	✓	M-3
UE 470	✓	✓	✓	M-3
UE 4155	✓	✓	—	N-15

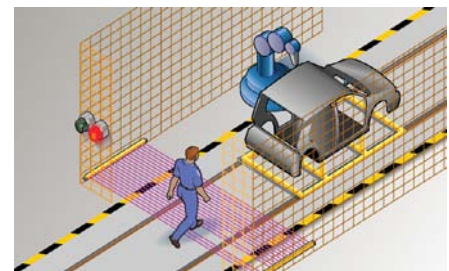
Applications

→ You can find more applications using the application finder at www.sick.com

- Automotive industry
- Material handling



Horizontal safety light curtain. No additional muting sensors required



Invalid objects or asynchronous movements result in shut down

Further information	Page
→ Technical specifications	C-66
→ Dimensional drawings	C-67
→ Accessories	C-68
→ Services	A-0

Ordering information

Housing cross-section	48 mm x 40 mm
Functions	Restart interlock, external device monitoring, beam coding, self-teach dynamic blanking, operating mode switching (with UE 402)
Consisting of	Sender and receiver unit
Usage	Single system and last system in a cascade
Connection types	System connection: Hirschmann plug M26 x 11 + FE

C

Resolution 20 mm, scanning range 0.5 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
900	C40S-0902CI010	1 023 968	C40E-0902CI010	1 023 969
1050	C40S-1002CI010	1 024 044	C40E-1002CI010	1 024 045
1200	C40S-1202CI010	1 024 046	C40E-1202CI010	1 024 047
1350	C40S-1302CI010	1 024 048	C40E-1302CI010	1 024 049
1500	C40S-1502CI010	1 024 050	C40E-1502CI010	1 024 051

Detailed technical specifications

→ You can find more detailed data in the operating instructions. Download at www.sick.com

General system data

Scanning range	0.5 m ... 19 m
Protective field height (depending on type)	900 mm ... 1500 mm
Resolution	20 mm
Protection class	III
Enclosure rating	IP 65
Supply voltage V_S	24 V (19.2 V ... 28.8 V) DC
Type	Type 4 according to IEC 61496, SIL3 (IEC/EN 61508)
Synchronization	Optical, without separate synchronisation

Receiver

Switching outputs (OSSDs)	2 PNP semiconductors, short-circuit protected, cross-circuit monitored
Response time (depending on type)	15 ms ... 38 ms (without beam coding, multiple sampling: 2 times)
Switching voltage	$V_S - 2.25 \text{ V}$ 3.5 V
Switching current max.	500 mA
Power consumption	≤1.8 A

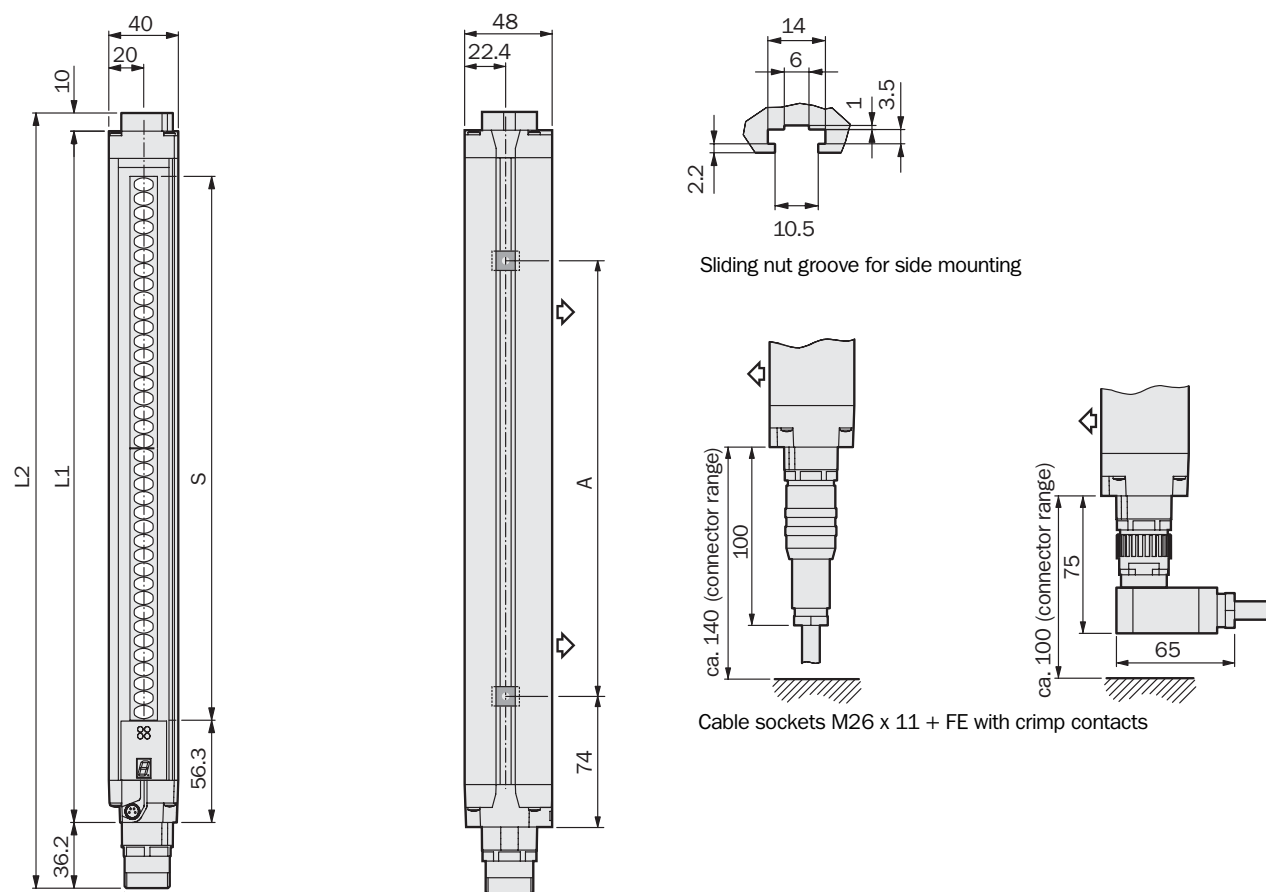
Sender unit

Power consumption	≤1 A
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Operating data

Connection type	Hirschmann plug M26 x 11 + FE
Connection type configuration connection	M8 x 4
Cable length	Max. 50 m
Wire cross-section	0.75 mm²
Ambient operating temperature from ... to	0 °C ... +55 °C
Storage temperature from ... to	-25 °C ... +70 °C
Air humidity from ... to	15 % ... 95 %
Housing cross-section	48 mm x 40 mm
Vibration resistance	5 g, 10 Hz ... 55 Hz IEC 60068-2-6
Shock resistance	10 g, 16 ms IEC 60068-2-29
Weight (depending on type)	1.96 kg ... 3.14 kg

Dimensional drawings



DIN 43651 plug (M26 x 11 + FE)

Dimensions in mm

Protective field height S	L1	L2	A
900	984	1030	824
1050	1134	1180	974
1200	1283	1329	1124
1350	1435	1481	1274
1500	1586	1632	1424

Dimensions in mm

Accessories

Mounting systems

Description	Type of fastening	Packing unit	Remark	Part number
Mounting kit 2	Pivoting, swivel mount	4	For all protective field heights	2 019 659
Mounting kit 6	Pivoting, side bracket	4	For all protective field heights	2 019 506
Mounting kit 11	Replacement bracket	4	Suitable for replacement of FGS	2 021 646
Stainless steel bracket	Pivoting	4	For all protective field heights	2 023 708
Reinforced stainless steel bracket	Pivoting	4	For all protective field heights	2 026 850

Sliding nuts/sliding blocks

Description	Packing unit	Remark	Part number
Sliding block (sliding nut)	4	Supplied with delivery	2 017 550

Cable sockets

Connection type	Connection type	Direction of the cable outlet	Part number
Hirschmann cable socket M26 x 11 + FE	Crimp contacts	Straight	6 020 757
		Angled	6 020 758

Cable plugs

Connection type	Connection type	Direction of the cable outlet on the plug	Part number
Hirschmann cable plug M26 x 11 + FE	Crimp contacts	Straight	6 021 191
		Angled	6 021 192

Connection cables

Connection type	Direction of the cable outlet	Cable length	Part number
Hirschmann cable socket M26 x 11 + FE	Straight	2.5 m	2 022 544
		5 m	2 022 545
		7.5 m	2 022 546
		10 m	2 022 547
		15 m	2 022 548
		20 m	2 022 549
		30 m	2 022 550

Configuration connection cables

Remark	Cable length	Part number
For connecting the configuration connection to the PC	2 m	6 021 195
	8 m	2 027 649

Interfaces

Designation	Enclosure rating	Description	Type	Part number
Safety interface	IP 20	For the C 4000 Entry/Exit functions: bypass, operating mode switching	UE402	1 023 577
		For opto-electronic protective devices	UE10-30S2D0	6 024 917
			UE10-30S3D0	6 024 918

Power supply units

Input voltage from ... to	Output voltage	Maximum output current	Part number
120 V ... 230 V AC	24 V DC	2.5 A	6 010 361
		4 A	6 010 362

Device columns

Length	Suitable for protective field height	Remark	Part number
1200 mm	300 mm ... 900 mm	Incl. mounting kit	2 021 330
1500 mm	300 mm ... 1200 mm	Incl. mounting kit	2 021 331
1700 mm	300 mm ... 1350 mm	Incl. mounting kit	2 021 332

C

Additional front screens

Suitable for protective field height	Part number
900 mm	2 022 416
1050 mm	2 022 417
1200 mm	2 022 418
1350 mm	2 022 419
1500 mm	2 022 420

Explosion protection

Description	Remark	Part number
ATEX Package	For use in zone 2/22, 3G 3D	2 029 961

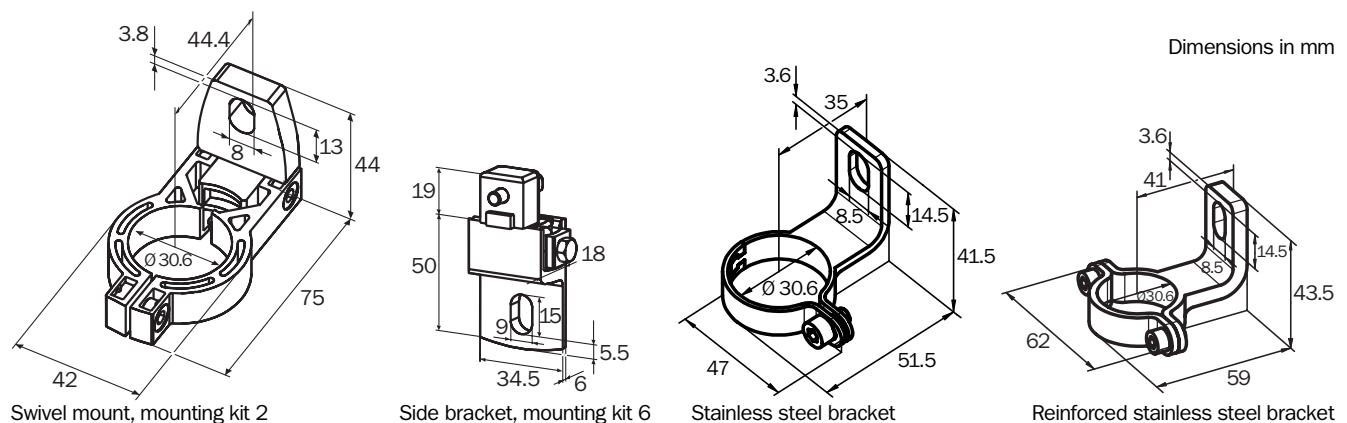
Laser alignment aid

Description	Maximum scanning range	Type of light	Part number
Laser alignment aid AR 60	60 m	Red light	1 015 741
Adapter AR 60 / C 4000	—	—	4 032 461

Configuration software

Description	Remark	Part number
CDS	Software CDS (Configuration & Diagnostic Software) on CD-ROM incl. online documentation	2 026 875

Dimensional drawings mounting accessories





- External device monitoring (EDM)
- Self-testing
- 7-segment display
- Diagnostics
- Alignment aid
- Beam coding



Further information	Page
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→ Dimensional drawings	C-74
→ Connection diagram	C-76
→ Accessories	C-77
→ Dimensional drawings accessories	C-80
→ Services	A-0

Overview of technical specifications

Protective field width (depending on type)	0 m ... 6 m / 2.5 m ... 19 m
Protective field height (depending on type)	150 mm ... 1800 mm
Resolution (depending on type)	20 mm / 30 mm / 40 mm
Type	Type 2 according to EN 61496
Enclosure rating	IP 65

Product description

With its high signal reserve, the C 2000 Standard safety light curtain is also reliable under harsh industrial conditions. Functions and status information integrated in the device allow rapid commissioning and prevent unnecessary machine downtimes. The modular concept achieves maximum

machine security while taking into account economic considerations by precisely coordinating the characteristics of the device to the requirements. Interfaces and service concepts complete the product range to provide an ideal solution for the sector.

In-system added value

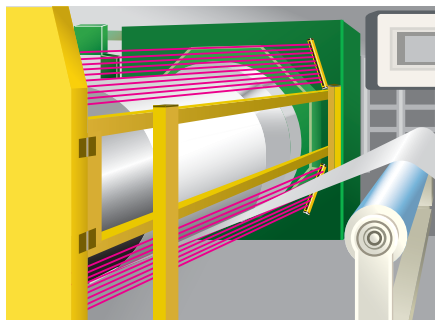
- Combination with SICK interfaces
- Safe interface to bus systems

Combination with	Restart interlock	Muting	Further information
LE 20	✓	—	L-53
LE 20 Muting	✓	✓	L-60
UE 48-2 OS	✓	—	L-42
UE 48-3 OS	✓	—	L-48

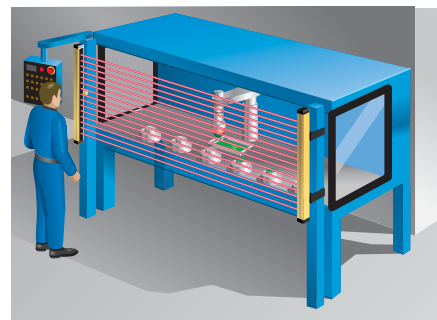
Applications

→ For more applications please refer to the application finder at www.sick.com

- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry



Textile industry: C 2000 Standard on a warping machine



Printing industry: C 2000 Standard on a pad printing machine

Ordering information

C 2000 Standard

- With external device monitoring (EDM)
- For usage as a standalone system
- Consisting of sender and receiver unit

→ Accessories see page C-77

Scanning range 0 ... 6 m

Resolution (mm)	Housing cross-section (mm)	Protective field height (mm)	Sender unit		Receiver unit	
			Type	Part number	Type	Part number
20	34 x 29	150	C20S-015102A11	1 016 563	C20E-015302A11	1 016 564
		300	C20S-030102A11	1 016 448	C20E-030302A11	1 016 449
		450	C20S-045102A11	1 016 573	C20E-045302A11	1 016 459
		600	C20S-060102A11	1 016 574	C20E-060302A11	1 016 575
		750	C20S-075102A11	1 016 579	C20E-075302A11	1 016 580
		900	C20S-090102A11	1 016 584	C20E-090302A11	1 016 585
		1050	C20S-105102A11	1 016 589	C20E-105302A11	1 016 590
		1200	C20S-120102A11	1 016 464	C20E-120302A11	1 016 465
30	34 x 29	150	C20S-015103A11	1 016 475	C20E-015303A11	1 016 476
		300	C20S-030103A11	1 016 568	C20E-030303A11	1 016 569
		450	C20S-045103A11	1 016 454	C20E-045303A11	1 016 455
		600	C20S-060103A11	1 016 477	C20E-060303A11	1 016 478
		750	C20S-075103A11	1 016 479	C20E-075303A11	1 016 480
		900	C20S-090103A11	1 016 481	C20E-090303A11	1 016 482
		1050	C20S-105103A11	1 016 483	C20E-105303A11	1 016 484
		1200	C20S-120103A11	1 016 594	C20E-120303A11	1 016 595
	48 x 40	1350	C20S-135103A12	1 016 600	C20E-135303A12	1 016 601
		1500	C20S-150103A12	1 016 605	C20E-150303A12	1 016 606
		1650	C20S-165103A12	1 016 610	C20E-165303A12	1 016 611
		1800	C20S-180103A12	1 016 615	C20E-180303A12	1 016 616
	34 x 29	150	C20S-015104A11	1 016 565	C20E-015304A11	1 016 566
		300	C20S-030104A11	1 016 570	C20E-030304A11	1 016 571
		450	C20S-045104A11	1 016 456	C20E-045304A11	1 016 457
		600	C20S-060104A11	1 016 576	C20E-060304A11	1 016 577
		750	C20S-075104A11	1 016 581	C20E-075304A11	1 016 582
		900	C20S-090104A11	1 016 586	C20E-090304A11	1 016 587
		1050	C20S-105104A11	1 016 591	C20E-105304A11	1 016 592
		1200	C20S-120104A11	1 016 596	C20E-120304A11	1 016 597
40	48 x 40	1350	C20S-135104A12	1 016 603	C20E-135304A12	1 016 604
		1500	C20S-150104A12	1 016 608	C20E-150304A12	1 016 609
		1650	C20S-165104A12	1 016 613	C20E-165304A12	1 016 614
		1800	C20S-180104A12	1 016 618	C20E-180304A12	1 016 619

Continued on next page

Scanning range 2.5 ... 19 m

Resolution (mm)	Housing cross- section (mm)	Protective field height (mm)	Sender unit		Receiver unit	
			Type	Part number	Type	Part number
20	34 x 29	150	C20S-015202A11	1 016 631	C20E-015302A11	1 016 564
		300	C20S-030202A11	1 016 632	C20E-030302A11	1 016 449
		450	C20S-045202A11	1 016 458	C20E-045302A11	1 016 459
		600	C20S-060202A11	1 016 633	C20E-060302A11	1 016 575
		750	C20S-075202A11	1 016 634	C20E-075302A11	1 016 580
		900	C20S-090202A11	1 016 635	C20E-090302A11	1 016 585
		1050	C20S-105202A11	1 016 636	C20E-105302A11	1 016 590
		1200	C20S-120202A11	1 016 466	C20E-120302A11	1 016 465
30	34 x 29	150	C20S-015203A11	1 016 567	C20E-015303A11	1 016 476
		300	C20S-030203A11	1 016 572	C20E-030303A11	1 016 569
		450	C20S-045203A11	1 016 460	C20E-045303A11	1 016 455
		600	C20S-060203A11	1 016 578	C20E-060303A11	1 016 478
		750	C20S-075203A11	1 016 583	C20E-075303A11	1 016 480
		900	C20S-090203A11	1 016 588	C20E-090303A11	1 016 482
		1050	C20S-105203A11	1 016 593	C20E-105303A11	1 016 484
		1200	C20S-120203A11	1 016 599	C20E-120303A11	1 016 595
	48 x 40	1350	C20S-135203A12	1 016 602	C20E-135303A12	1 016 601
		1500	C20S-150203A12	1 016 607	C20E-150303A12	1 016 606
		1650	C20S-165203A12	1 016 612	C20E-165303A12	1 016 611
		1800	C20S-180203A12	1 016 617	C20E-180303A12	1 016 616
40	34 x 29	150	C20S-015204A11	1 016 637	C20E-015304A11	1 016 566
		300	C20S-030204A11	1 016 638	C20E-030304A11	1 016 571
		450	C20S-045204A11	1 016 462	C20E-045304A11	1 016 457
		600	C20S-060204A11	1 016 639	C20E-060304A11	1 016 577
		750	C20S-075204A11	1 016 640	C20E-075304A11	1 016 582
		900	C20S-090204A11	1 016 641	C20E-090304A11	1 016 587
		1050	C20S-105204A11	1 016 642	C20E-105304A11	1 016 592
		1200	C20S-120204A11	1 016 643	C20E-120304A11	1 016 597
	48 x 40	1350	C20S-135204A12	1 016 644	C20E-135304A12	1 016 604
		1500	C20S-150204A12	1 016 646	C20E-150304A12	1 016 609
		1650	C20S-165204A12	1 016 647	C20E-165304A12	1 016 614
		1800	C20S-180204A12	1 016 648	C20E-180304A12	1 016 619

Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at www.sick.com

General system data

Protective field width (depending on type)	0 m ... 6 m / 2.5 m ... 19 m
Protective field height (depending on type)	150 mm ... 1800 mm
Resolution (depending on type)	20 mm / 30 mm / 40 mm
Enclosure rating	IP 65
Type	Type 2 according to EN 61496
Synchronisation	Optical, without separate synchronisation
Supply voltage V_S	24 V (19.2 V ... 28.8 V) DC

Sender unit

Power consumption	Max. 6.2 W
-------------------	------------

Receiver unit

Switching outputs (OSSDs)	2 PNP semiconductors (short-circuit protected, cross-circuit monitored)
Response time (depending on type)	Max. 7 ms ... 34 ms
Switching voltage	$V_S - 2.25 \text{ V}$ 1 V
Switching current	Max. 500 mA
Power consumption	Max. 8 W

Operating data

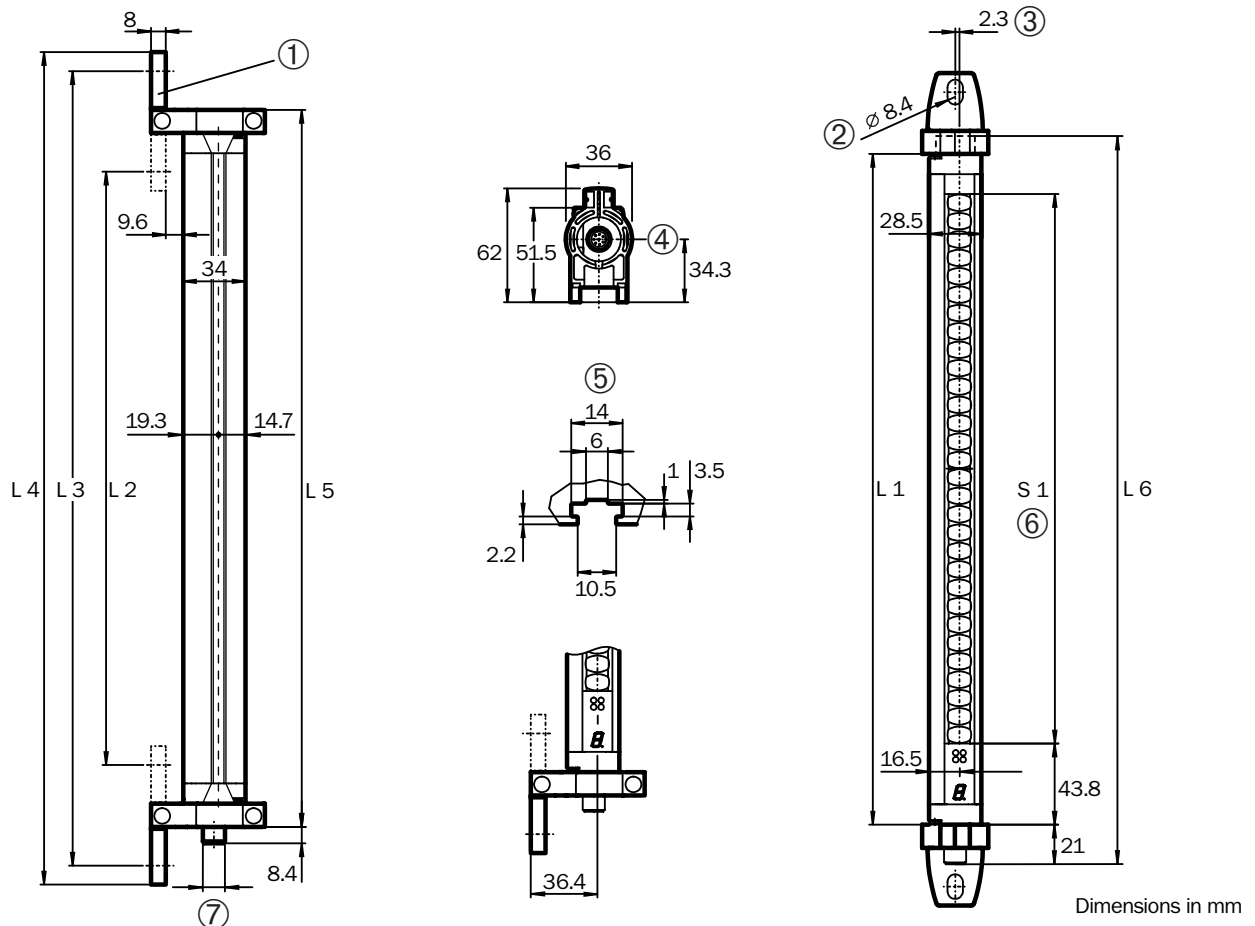
Type of connection	M12 plug, 8-pin
Connection cable wire cross-section	Max. 0.25 mm ²
Connection cable length	Max. 15 m
Ambient operating temperature T_A	0 °C ... +55 °C
Storage temperature T_S	-25 °C ... +70 °C
Air humidity	15 % ... 95 %
Housing cross-section (depending on type) for protective field heights of 150 mm to 1200 mm for protective field heights of 1350 mm to 1800 mm	34 mm x 29 mm 48 mm x 40 mm
Vibration resistance	5 g, 10 ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29
Weight (depending on type)	0.27 kg ... 3.88 kg

C

Dimensional drawings

→ You will find more dimensional drawings in the technical description/operating instructions. Download at www.sick.com

Protective field heights 150 mm ... 1200 mm



Sender unit with swivel mount, small housing profile (receiver unit mirror image)

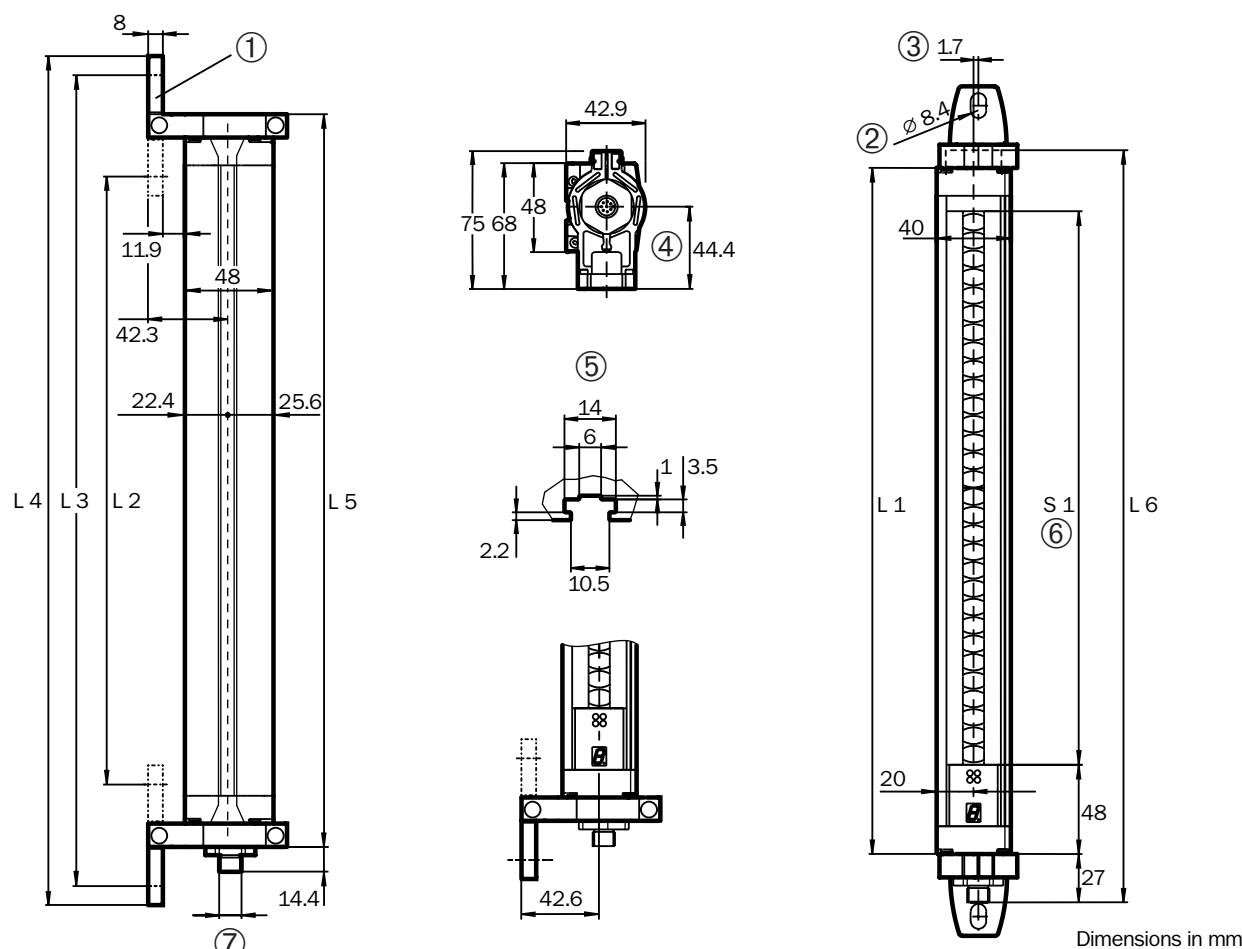
- ① Mounting clamp
- ② Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
- ③ Centre of light beam offset
- ④ Adjustment
- ⑤ Sliding nut groove for side mounting
- ⑥ Protective field height
- ⑦ Plug M12 x 1

S 1	L 1	L 2	L 3	L 4	L 5	L 6
150	246	204	313	334	271	276
300	364	322	432	452	390	394
450	515	473	582	603	540	545
600	666	623	733	754	691	696
750	816	774	884	904	841	846
900	967	924	1034	1055	992	997
1050	1117	1075	1185	1205	1142	1147
1200	1266	1224	1334	1354	1292	1298

S1 = protective field height

Dimensions in mm

Protective field heights 1350 mm ... 1800 mm



Sender unit with swivel mount, large housing profile (receiver unit mirror image)

- ① Mounting clamp
- ② Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
- ③ Centre of light beam offset
- ④ Adjustment
- ⑤ Sliding nut groove for side mounting
- ⑥ Protective field height
- ⑦ Plug M12 x 1

S 1	L 1	L 2	L 3	L 4	L 5	L 6
1350	1426	1384	1494	1514	1452	1463
1500	1577	1535	1644	1665	1602	1614
1650	1727	1685	1795	1815	1752	1764
1800	1878	1836	1945	1966	1903	1915

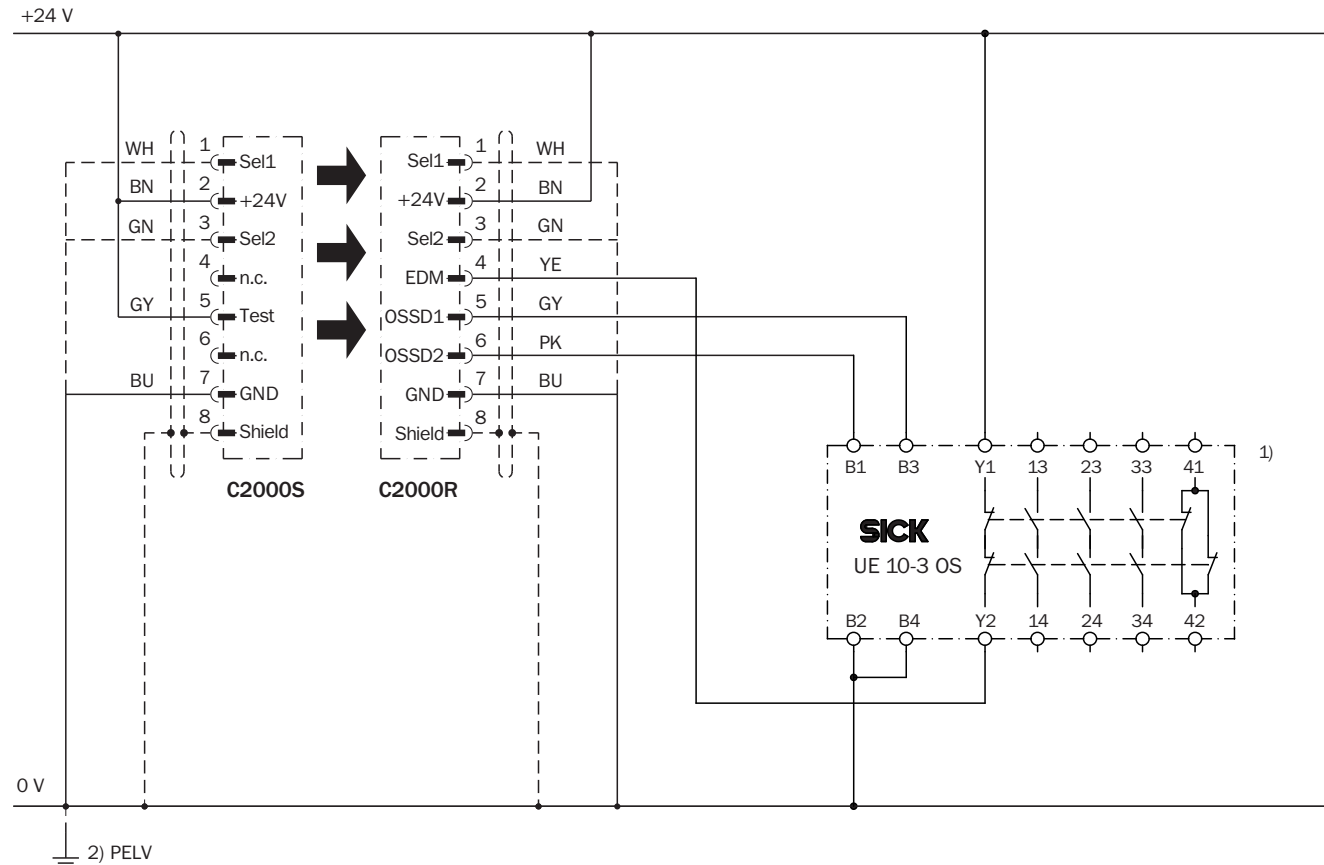
S1 = protective field height

Dimensions in mm

Connection diagram

→ You can find more connection diagrams at www.sick.com

C 2000 Standard on safety relay UE 10



Task

Interfacing a C 2000 Standard safety light curtain to UE 10-3 OS. Operating mode without restart interlock with external device monitoring.

Function

The system is enabled when the light path is clear and the UE 10 is de-energised and functioning correctly. The OSSD1 and OSSD2 outputs are live, the UE 10 is switched on. On the interruption of one of the light beams, the UE 10 is deactivated by the OSSD1 and OSSD2 outputs.

Possible faults

Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of the UE 10 will be detected and will not result in the loss of the shutdown function.

Comments

- 1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.
- 2) PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed.

Accessories

Mounting accessories

→ Dimensional drawings mounting accessories see page C-80

Designation	Description	Part number
Mounting kit 1	<ul style="list-style-type: none"> 4 pieces Pivoting Swivel mount For protective field height 150 mm ... 1200 mm 	2 019 649
Mounting kit 2	<ul style="list-style-type: none"> 4 pieces Pivoting Swivel mount For protective field height 1350 mm ... 1800 mm 	2 019 659
Mounting kit 6	<ul style="list-style-type: none"> 4 pieces Pivoting Side bracket 	2 019 506
Stainless steel bracket	<ul style="list-style-type: none"> 4 pieces Pivoting For protective field height 150 mm ... 1200 mm 	2 030 288
	<ul style="list-style-type: none"> 4 pieces Pivoting For protective field height 1350 mm ... 1800 mm 	2 023 708
Reinforced stainless steel bracket	<ul style="list-style-type: none"> 4 pieces Pivoting Vibration resistance 5 g, 10 Hz ... 55 Hz Shock resistance 10 g, 16ms For protective field height 1350 mm ... 1800 mm 	2 026 850

Connector technology

System connection	Designation	Description	Connection cable	Part number
M12 plug	M12 cable socket	<ul style="list-style-type: none"> 8-pin Straight 	2.5 m	6 020 537
			5.0 m	6 020 354
			7.5 m	6 020 353
			10.0 m	6 020 352
			15.0 m	6 020 872
		<ul style="list-style-type: none"> 8-pin Angled 	5.0 m	6 021 342
			15.0 m	6 021 343

Continued on next page

Interfaces

Designation	Description	Connection	Type	Part number
Safety evaluation unit LE 20	<ul style="list-style-type: none">IP 202 PNP OSSDs, 500 mA	<ul style="list-style-type: none">With screw terminal connector16-pin	LE20-2612	1 016 503
		<ul style="list-style-type: none">With terminal plug springAngled16-pin	LE20-2614	1 016 505
Safety evaluation unit LE 20 Muting		<ul style="list-style-type: none">With screw terminal connector15- and 16-pin	LE20-2622	1 016 502
		<ul style="list-style-type: none">With terminal plug spring15- and 16-pin	LE20-2624	1 016 501
Safety relay	<ul style="list-style-type: none">For opto-electronic protective devices	—	UE10-30S2D0	6 024 917
	<ul style="list-style-type: none">For opto-electronic protective devices	—	UE10-30S3D0	6 024 918
	<ul style="list-style-type: none">With screw type terminals	—	UE10-20S2D0	2 019 772
	<ul style="list-style-type: none">With spring terminals	—	UE10-20S4D0	2 019 771
	<ul style="list-style-type: none">Without terminals	—	UE10-20S1D0	6 020 342
	<ul style="list-style-type: none">With screw type terminals	—	UE48-20S2D2	6 024 915
	<ul style="list-style-type: none">With plug-in terminals	—	UE48-20S3D2	6 024 916
	<ul style="list-style-type: none">With screw type terminals	—	UE48-30S2D2	6 025 089
	<ul style="list-style-type: none">With plug-in terminals	—	UE48-30S3D2	6 025 097

Device columns ¹⁾

Designation	Description	Part number
Device column with front screen	<ul style="list-style-type: none"> For C 2000 Standard (protective field height 150 mm ... 1050 mm) For C 2000 cascable and RES/EDM (protective field height 150 mm ... 900 mm) 1200 mm high Including mounting kit 1 (2 pieces) 	2 021 333
	<ul style="list-style-type: none"> For C 2000 (protective field height 150 mm ... 1200 mm) 1500 mm high Including mounting kit 1 (2 pieces) 	2 021 242
	<ul style="list-style-type: none"> For C 2000 (protective field height 150 mm ... 1200 mm) 1700 mm high Including mounting kit 1 (2 pieces) 	2 021 337
	<ul style="list-style-type: none"> For C 2000 (protective field height 1350 mm ... 1500 mm) 1700 mm high Including mounting kit 2 (2 pieces) 	2 021 332

¹⁾ Warning, reduction of the scanning range!Additional front screens ¹⁾

Designation	For protective field height (mm)	Part number
Additional front screen (weld spark guard)	300	2 022 405
	450	2 022 406
	600	2 022 407
	750	2 022 408
	900	2 022 409
	1050	2 022 410
	1200	2 022 411

¹⁾ Warning, reduction of the scanning range!

Additional front screens Heavy Duty ¹⁾

Designation	For protective field height (mm)	Part number
Additional front screen Heavy Duty (weld spark guard) with bracket	1350	2 026 860
	1500	2 026 861
	1650	2 026 862
	1800	2 026 863

¹⁾ Warning, reduction of the scanning range!

Deflector mirrors ¹⁾ (incl. mounting kit 2)

Designation	For protective field height (mm)	Type	Part number
For overall protective field width 0 m ... 4 m	300	PNS75-034	1 019 414
	450	PNS75-049	1 019 415
	600	PNS75-064	1 019 416
	750	PNS75-079	1 019 417
	900	PNS75-094	1 019 418
	1050	PNS75-109	1 019 419
	1200	PNS75-124	1 019 420
	1350	PNS75-139	1 019 421
	1500	PNS75-154	1 019 422
	1650	PNS75-169	1 019 423
	1800	PNS75-184	1 019 424
For overall protective field width 4 m ... 15 m	300	PNS125-034	1 019 425
	450	PNS125-049	1 019 426
	600	PNS125-064	1 019 427
	750	PNS125-079	1 019 428
	900	PNS125-094	1 019 429
	1050	PNS125-109	1 019 430
	1200	PNS125-124	1 019 431
	1350	PNS125-139	1 019 432
	1500	PNS125-154	1 019 433
	1650	PNS125-169	1 019 434
	1800	PNS125-184	1 019 435

¹⁾ Warning, reduction of the scanning range!

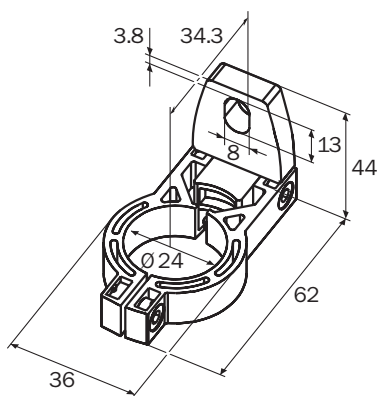
Laser alignment aid

Designation	Description	Type	Part number
Laser alignment aid	■ Does not require connection to power supply	AR 60	1 015 741
Adapter for AR 60	■ For large housing profile	—	4 032 461
	■ For small housing profile	—	4 032 462

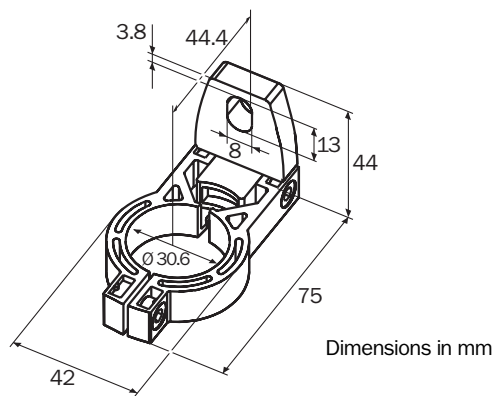
→ For dimensional drawings of the device columns and deflector mirrors please refer to the operating instructions/technical description.
Download at www.sick.com

Dimensional drawings mounting accessories

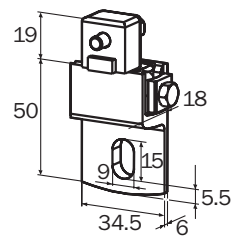
C



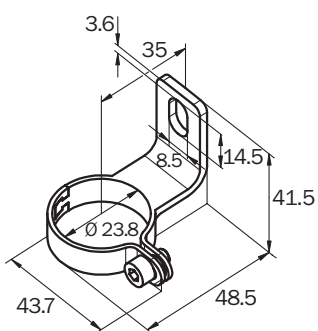
Swivel mount
Mounting kit 1
for protective field height 150 mm ... 1200 mm



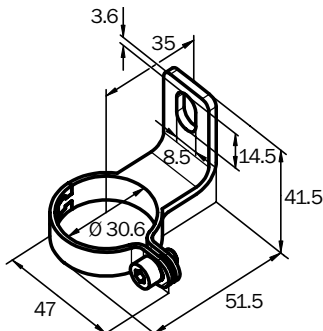
Swivel mount
Mounting kit 2
for protective field height 1350 mm ... 1800 mm



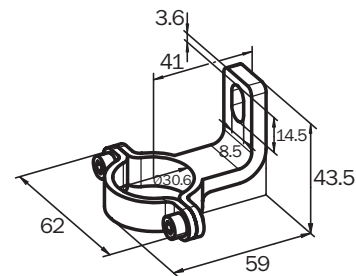
Side bracket
Mounting kit 6



Stainless steel bracket
for protective field height 150 mm ... 1200 mm



Stainless steel bracket
for protective field height 1350 mm ... 1800 mm



Reinforced stainless steel bracket for
protective field height 1350 mm ... 1800 mm

Overview of technical specifications

Resistant materials	Stainless steel (V4A), PMMA, PA, PVC
Enclosure rating	IP 67
Protective field width (depending on type)	0 m ... 4.5 m / 2.5 m ... 14.5 m
Protective field height (depending on type)	150 mm ... 1200 mm
Resolution (depending on type)	30 mm
Type	Type 2 according to EN 61496

Product description

The IP 67 housing in conjunction with the safety light curtain C 2000 achieves the enclosure rating IP 67. A high level of resistance against the usual cleaning agents is achieved by using suitable materials (V4A, PMMA, PA, PVC).

A compensating element (membrane) prevents the plastic tubes misting up and the entry of liquids. The cable is fed into the device through the proven PG connector.

In-system added value

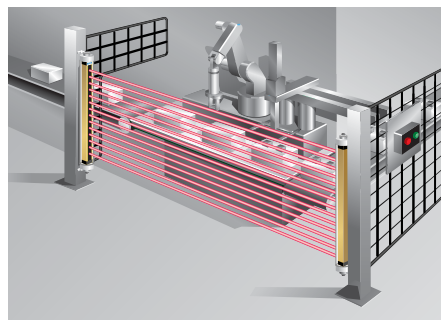
- Combination with SICK interfaces
- Safe interface to bus systems

Combination with	Restart interlock	Muting	Further information
LE 20	✓	—	L-53
LE 20 Muting	✓	✓	L-60
UE 48-2 OS	✓	—	L-42
UE 48-3 OS	✓	—	L-48

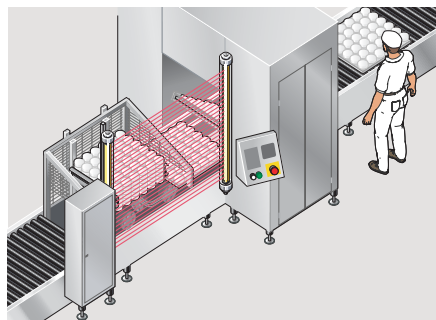
Applications

→ For more applications please refer to the application finder at www.sick.com

- Packaging industry
- Food industry
- Chemical industry
- Pharmaceutical industry
- Clean-room systems



Hazardous point protection on a processing centre in the hygiene area



Hazardous point protection on a cheese-making machine



- High durability
- Compact design
- External device monitoring (EDM)
- Self-testing
- On-site diagnostics
- Beam coding



Further information	Page
→ Ordering information	C-82
→ Technical specifications	C-82
→ Dimensional drawings	C-83
→ Connection diagram	C-76
→ Accessories	C-84
→ Dimensional drawings accessories	C-85
→ Services	A-0

Ordering information

IP 67 housing with integrated sender or receiver unit C 2000 Standard, including 15 m PVC cable

→ Accessories see page C-84

Scanning range 0 ... 4.5 m

C

Resolution (mm)	Protective field height (mm)	Sender unit		Receiver unit	
		Type	Part number	Type	Part number
30	150	C25S-015103C11	1 024 184	C25E-015303C11	1 024 185
	300	C25S-030103C11	1 024 187	C25E-030303C11	1 024 188
	450	C25S-045103C11	1 024 190	C25E-045303C11	1 024 191
	600	C25S-060103C11	1 024 193	C25E-060303C11	1 024 194
	750	C25S-075103C11	1 024 196	C25E-075303C11	1 024 197
	900	C25S-090103C11	1 024 199	C25E-090303C11	1 024 200
	1050	C25S-105103C11	1 024 202	C25E-105303C11	1 024 203
	1200	C25S-120103C11	1 024 205	C25E-120303C11	1 024 206

Scanning range 2.5 ... 14.5 m

Resolution (mm)	Protective field height (mm)	Sender unit		Receiver unit	
		Type	Part number	Type	Part number
30	150	C25S-015203C11	1 024 186	C25E-015303C11	1 024 185
	300	C25S-030203C11	1 024 189	C25E-030303C11	1 024 188
	450	C25S-045203C11	1 024 192	C25E-045303C11	1 024 191
	600	C25S-060203C11	1 024 195	C25E-060303C11	1 024 194
	750	C25S-075203C11	1 024 198	C25E-075303C11	1 024 197
	900	C25S-090203C11	1 024 201	C25E-090303C11	1 024 200
	1050	C25S-105203C11	1 024 204	C25E-105303C11	1 024 203
	1200	C25S-120203C11	1 024 207	C25E-120303C11	1 024 206

Detailed technical specifications

→ You can find further data in the operating instructions/technical description. Download at www.sick.com

C 2000 Standard in IP 67 housing

→ C 2000 specific data see C 2000 Standard page C-73

Protective field width (depending on type)	0 m ... 4.5 m / 2.5 m ... 14.5 m
Protective field height (depending on type)	150 mm ... 1200 mm
Resolution	30 mm
Enclosure rating	IP 66, IP 67
Type	Type 2 according to EN 61496
Materials	
End caps	Stainless steel (V4A)
Plastic tube	PMMA
Compensating element (membrane)	PA 6
PG connector	PA 6
Ambient operating temperature T_A	0 °C ... +55 °C
Storage temperature T_S	-25 °C ... +70 °C

C



Protective field height S	L 1	L 2
150	357	324
300	476	443
450	626	593
600	777	744
750	927	894
900	1078	1045
1050	1228	1195
1200	1382	1349

8 010 889/15-10-04

Connection diagram

- Connection diagram C 2000 Standard on safety relay UE 10 see page C-76
- You can find more connection diagrams at www.sick.com

Accessories

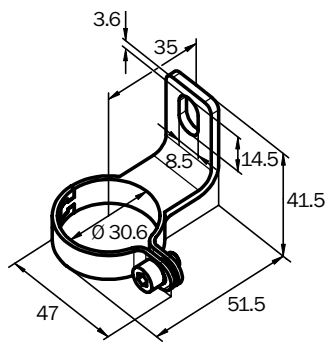
Mounting accessories

Designation	Description	Part number
Stainless steel bracket	<ul style="list-style-type: none"> ▪ 4 pieces ▪ Pivoting 	2 023 708
Reinforced stainless steel bracket	<ul style="list-style-type: none"> ▪ 4 pieces ▪ Pivoting ▪ Vibration resistance 5 g, 10 Hz ... 55 Hz ▪ Shock resistance 10 g, 16ms 	2 026 850
Stainless steel support bracket	<ul style="list-style-type: none"> ▪ 2 pieces ▪ Vibration resistance 5 g, 10 Hz ... 55 Hz ▪ Shock resistance 10 g, 16ms 	2 026 849
Mounting key	▪ For M12 cable socket on device replacement	4 034 690
Venting membrane	—	5 309 082

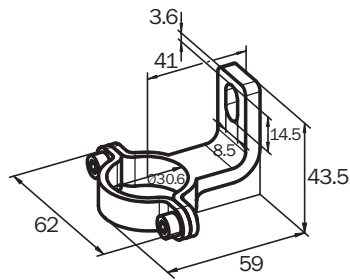
Interfaces

Designation	Description	Connection	Type	Part number
Safety evaluation unit LE 20	▪ IP 20 ▪ 2 PNP OSSDs, 500 mA	▪ With screw terminal connector ▪ 16-pin	LE20-2612	1 016 503
		▪ With terminal plug spring ▪ Angled ▪ 16-pin	LE20-2614	1 016 505
Safety evaluation unit LE 20 Muting		▪ With screw terminal connector ▪ 15- and 16-pin	LE20-2622	1 016 502
		▪ With terminal plug spring ▪ 15- and 16-pin	LE20-2624	1 016 501
Safety relay	▪ For opto-electronic protective devices	—	UE10-30S2D0	6 024 917
	▪ For opto-electronic protective devices	—	UE10-30S3D0	6 024 918
	▪ With screw type terminals	—	UE10-20S2D0	2 019 772
	▪ With spring terminals	—	UE10-20S4D0	2 019 771
	▪ Without terminals	—	UE10-20S1D0	6 020 342
	▪ With screw type terminals	—	UE48-20S2D2	6 024 915
	▪ With plug-in terminals	—	UE48-20S3D2	6 024 916
	▪ With screw type terminals	—	UE48-30S2D2	6 025 089
	▪ With plug-in terminals	—	UE48-30S3D2	6 025 097

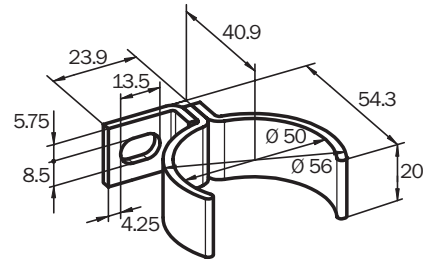
Dimensional drawings mounting accessories



Stainless steel bracket



Reinforced stainless steel bracket



Stainless steel support bracket

Dimensions in mm



Mounting key

C



C



- Restart interlock (RES)
- External device monitoring (EDM)
- Self-testing
- 7-segment display
- Diagnostics
- Alignment aid
- Beam coding



Further information	Page
→ Technical specifications	C-89
→ Dimensional drawings	C-90
→ Connection diagram	C-92
→ Accessories	C-93
→ Dimensional drawings accessories	C-96
→ Services	A-0

Overview of technical specifications

Protective field width (depending on type)	0 m ... 6 m / 2.5 m ... 19 m
Protective field height (depending on type)	300 mm ... 1800 mm
Resolution (depending on type)	20 mm / 30 mm / 40 mm
Type	Type 2 according to EN 61496
Enclosure rating	IP 65

Product description

With its high signal reserve, the C 2000 RES/EDM safety light curtain is also reliable under harsh industrial conditions. Functions and status information integrated in the device allow rapid commissioning and prevent unnecessary machine downtimes. The modular concept achieves maximum machine security while taking into account economic considerations by precisely co-

ordinating the characteristics of the device to the requirements. Interfaces and service concepts complete the product range to provide an ideal solution for the sector. Compared to traditional solutions the integrated restart interlock in the C 2000 RES/EDM offers the advantages of shorter cable runs and quicker commissioning.

In-system added value

- Combination with SICK interfaces
- Safe interface to bus systems

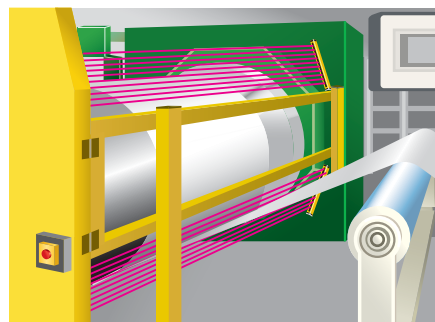
Combination with	Restart interlock	Muting	Further information
LE 20 Muting	✓	✓	L-60

Applications

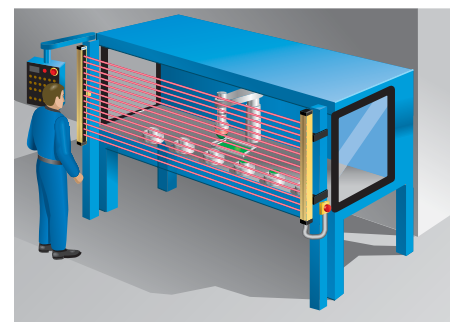
→ For more applications please refer to the application finder at www.sick.com

- Storage and conveyor technology
- Wood industry
- Textile industry

- Stone production
- Electronics industry
- Packaging industry



C 2000 RES/EDM on a warping machine



C 2000 RES/EDM on a pad printing machine

Ordering information

C 2000 RES/EDM

- With restart interlock (RES) and external device monitoring (EDM)
- For usage as a standalone system
- Consisting of sender and receiver unit

→ Accessories see page C-93

Scanning range 0 ... 6 m

Resolution (mm)	Housing cross-section (mm)	Protective field height (mm)	Sender unit		Receiver unit	
			Type	Part number	Type	Part number
20	34 x 29	300	C20S-030102A11	1 016 448	C20E-030302A21	1 018 073
		450	C20S-045102A11	1 016 573	C20E-045302A21	1 018 079
		600	C20S-060102A11	1 016 574	C20E-060302A21	1 018 056
		750	C20S-075102A11	1 016 579	C20E-075302A21	1 018 096
		900	C20S-090102A11	1 016 584	C20E-090302A21	1 018 105
		1050	C20S-105102A11	1 016 589	C20E-105302A21	1 018 114
		1200	C20S-120102A11	1 016 464	C20E-120302A21	1 016 970
30	34 x 29	300	C20S-030103A11	1 016 568	C20E-030303A21	1 016 974
		450	C20S-045103A11	1 016 454	C20E-045303A21	1 018 081
		600	C20S-060103A11	1 016 477	C20E-060303A21	1 018 089
		750	C20S-075103A11	1 016 479	C20E-075303A21	1 018 098
		900	C20S-090103A11	1 016 481	C20E-090303A21	1 018 107
		1050	C20S-105103A11	1 016 483	C20E-105303A21	1 018 116
		1200	C20S-120103A11	1 016 594	C20E-120303A21	1 018 124
	48 x 40	1350	C20S-135103A12	1 016 600	C20E-135303A22	1 018 058
		1500	C20S-150103A12	1 016 605	C20E-150303A22	1 018 134
		1650	C20S-165103A12	1 016 610	C20E-165303A22	1 018 140
		1800	C20S-180103A12	1 016 615	C20E-180303A22	1 018 147
40	34 x 29	300	C20S-030104A11	1 016 570	C20E-030304A21	1 016 973
		450	C20S-045104A11	1 016 456	C20E-045304A21	1 018 083
		600	C20S-060104A11	1 016 576	C20E-060304A21	1 018 091
		750	C20S-075104A11	1 016 581	C20E-075304A21	1 018 100
		900	C20S-090104A11	1 016 586	C20E-090304A21	1 018 109
		1050	C20S-105104A11	1 016 591	C20E-105304A21	1 018 118
		1200	C20S-120104A11	1 016 596	C20E-120304A21	1 018 126
	48 x 40	1350	C20S-135104A12	1 016 603	C20E-135304A22	1 018 130
		1500	C20S-150104A12	1 016 608	C20E-150304A22	1 018 136
		1650	C20S-165104A12	1 016 613	C20E-165304A22	1 018 142
		1800	C20S-180104A12	1 016 618	C20E-180304A22	1 018 149

Continued on next page

Scanning range 2.5 ... 19 m

Resolution (mm)	Housing cross- section (mm)	Protective field height (mm)	Sender unit		Receiver unit	
			Type	Part number	Type	Part number
20	34 x 29	300	C20S-030202A11	1 016 632	C20E-030302A21	1 018 073
		450	C20S-045202A11	1 016 458	C20E-045302A21	1 018 079
		600	C20S-060202A11	1 016 633	C20E-060302A21	1 018 056
		750	C20S-075202A11	1 016 634	C20E-075302A21	1 018 096
		900	C20S-090202A11	1 016 635	C20E-090302A21	1 018 105
		1050	C20S-105202A11	1 016 636	C20E-105302A21	1 018 114
		1200	C20S-120202A11	1 016 466	C20E-120302A21	1 016 970
30	34 x 29	300	C20S-030203A11	1 016 572	C20E-030303A21	1 016 974
		450	C20S-045203A11	1 016 460	C20E-045303A21	1 018 081
		600	C20S-060203A11	1 016 578	C20E-060303A21	1 018 089
		750	C20S-075203A11	1 016 583	C20E-075303A21	1 018 098
		900	C20S-090203A11	1 016 588	C20E-090303A21	1 018 107
		1050	C20S-105203A11	1 016 593	C20E-105303A21	1 018 116
		1200	C20S-120203A11	1 016 599	C20E-120303A21	1 018 124
	48 x 40	1350	C20S-135203A12	1 016 602	C20E-135303A22	1 018 058
		1500	C20S-150203A12	1 016 607	C20E-150303A22	1 018 134
		1650	C20S-165203A12	1 016 612	C20E-165303A22	1 018 140
		1800	C20S-180203A12	1 016 617	C20E-180303A22	1 018 147
40	34 x 29	300	C20S-030204A11	1 016 638	C20E-030304A21	1 016 973
		450	C20S-045204A11	1 016 462	C20E-045304A21	1 018 083
		600	C20S-060204A11	1 016 639	C20E-060304A21	1 018 091
		750	C20S-075204A11	1 016 640	C20E-075304A21	1 018 100
		900	C20S-090204A11	1 016 641	C20E-090304A21	1 018 109
		1050	C20S-105204A11	1 016 642	C20E-105304A21	1 018 118
		1200	C20S-120204A11	1 016 643	C20E-120304A21	1 018 126
	48 x 40	1350	C20S-135204A12	1 016 644	C20E-135304A22	1 018 130
		1500	C20S-150204A12	1 016 646	C20E-150304A22	1 018 136
		1650	C20S-165204A12	1 016 647	C20E-165304A22	1 018 142
		1800	C20S-180204A12	1 016 648	C20E-180304A22	1 018 149

Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at www.sick.com

General system data

Protective field width (depending on type)	0 m ... 6 m / 2.5 m ... 19 m
Protective field height (depending on type)	300 mm ... 1800 mm
Resolution (depending on type)	20 mm / 30 mm / 40 mm
Enclosure rating	IP 65
Type	Type 2 according to EN 61496
Synchronisation	Optical, without separate synchronisation
Supply voltage V_S	24 V (19.2 V ... 28.8 V) DC

Sender unit

Power consumption	Max. 6.2 W
-------------------	------------

Receiver unit

Switching outputs (OSSDs)	2 PNP semiconductors (short-circuit protected, cross-circuit monitored)
Response time (depending on type)	Max. 7 ms ... 34 ms
Switching voltage	$V_S - 2.25 \text{ V}$ 1 V
Switching current	Max. 500 mA
Power consumption	Max. 8 W

Operating data

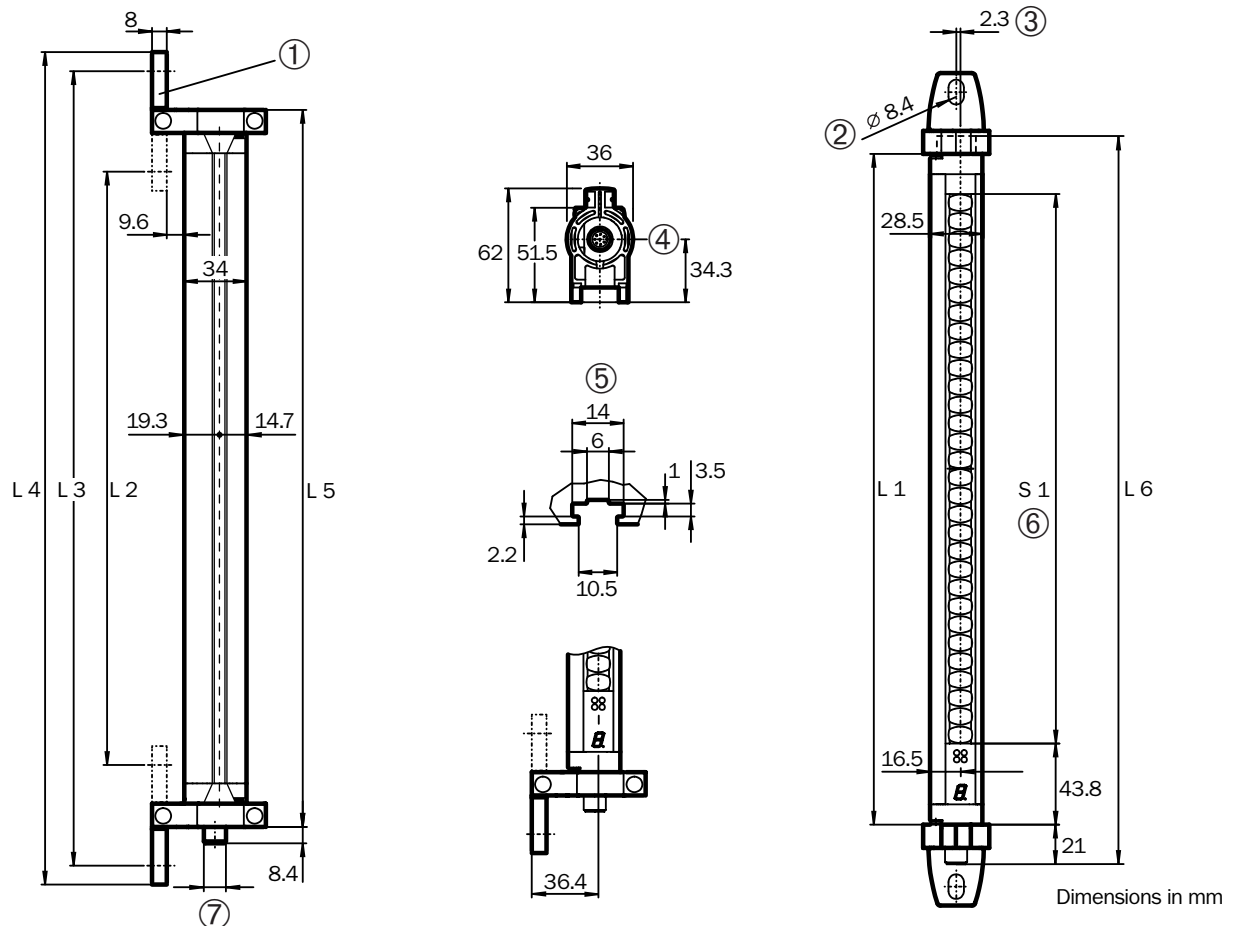
Type of connection	M12 plug, 8-pin
Connection cable wire cross-section	Max. 0.25 mm ²
Connection cable length	Max. 15 m
Ambient operating temperature T_A	0 °C ... +55 °C
Storage temperature T_S	-25 °C ... +70 °C
Air humidity	15 % ... 95 %
Housing cross-section (depending on type) for protective field heights of 300 mm to 1200 mm for protective field heights of 1350 mm to 1800 mm	34 mm x 29 mm 48 mm x 40 mm
Vibration resistance	5 g, 10 ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 m according to IEC 60068-2-29
Weight (depending on type)	0.27 kg ... 3.88 kg

C

Dimensional drawings

→ You will find more dimensional drawings in the technical description/operating instructions. Download at www.sick.com

Protective field heights 300 mm ... 1200 mm



Sender unit with swivel mount, small housing profile (receiver unit not mirror image. Dimensions as C 2000 cascadable, see page C-101)

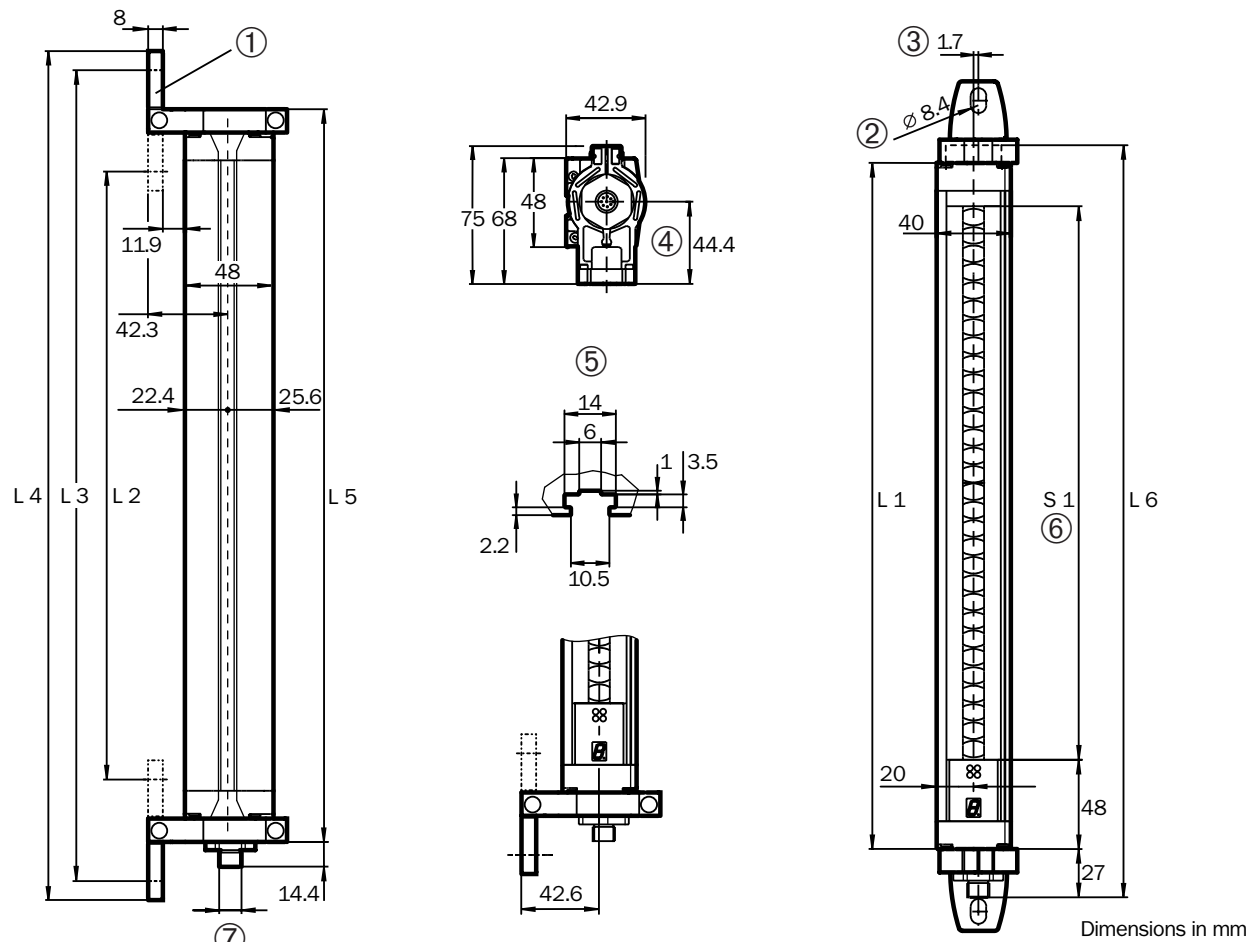
- ① Mounting clamp
- ② Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
- ③ Centre of light beam offset
- ④ Adjustment
- ⑤ Sliding nut groove for side mounting
- ⑥ Protective field height
- ⑦ Plug M12 x 1

S 1	L 1	L 2	L 3	L 4	L 5	L 6
300	364	322	432	452	390	394
450	515	473	582	603	540	545
600	666	623	733	754	691	696
750	816	774	884	904	841	846
900	967	924	1034	1055	992	997
1050	1117	1075	1185	1205	1142	1147
1200	1266	1224	1334	1354	1292	1298

S1 = protective field height

Dimensions in mm

Protective field heights 1350 mm ... 1800 mm



Sender unit with swivel mount, large housing profile (receiver unit not mirror image, see C 2000 cascable, page C-102)

- ① Mounting clamp
- ② Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
- ③ Centre of light beam offset
- ④ Adjustment
- ⑤ Sliding nut groove for side mounting
- ⑥ Protective field height
- ⑦ Plug M12 x 1

S 1	L 1	L 2	L 3	L 4	L 5	L 6
1350	1426	1384	1494	1514	1452	1463
1500	1577	1535	1644	1665	1602	1614
1650	1727	1685	1795	1815	1752	1764
1800	1878	1836	1945	1966	1903	1915

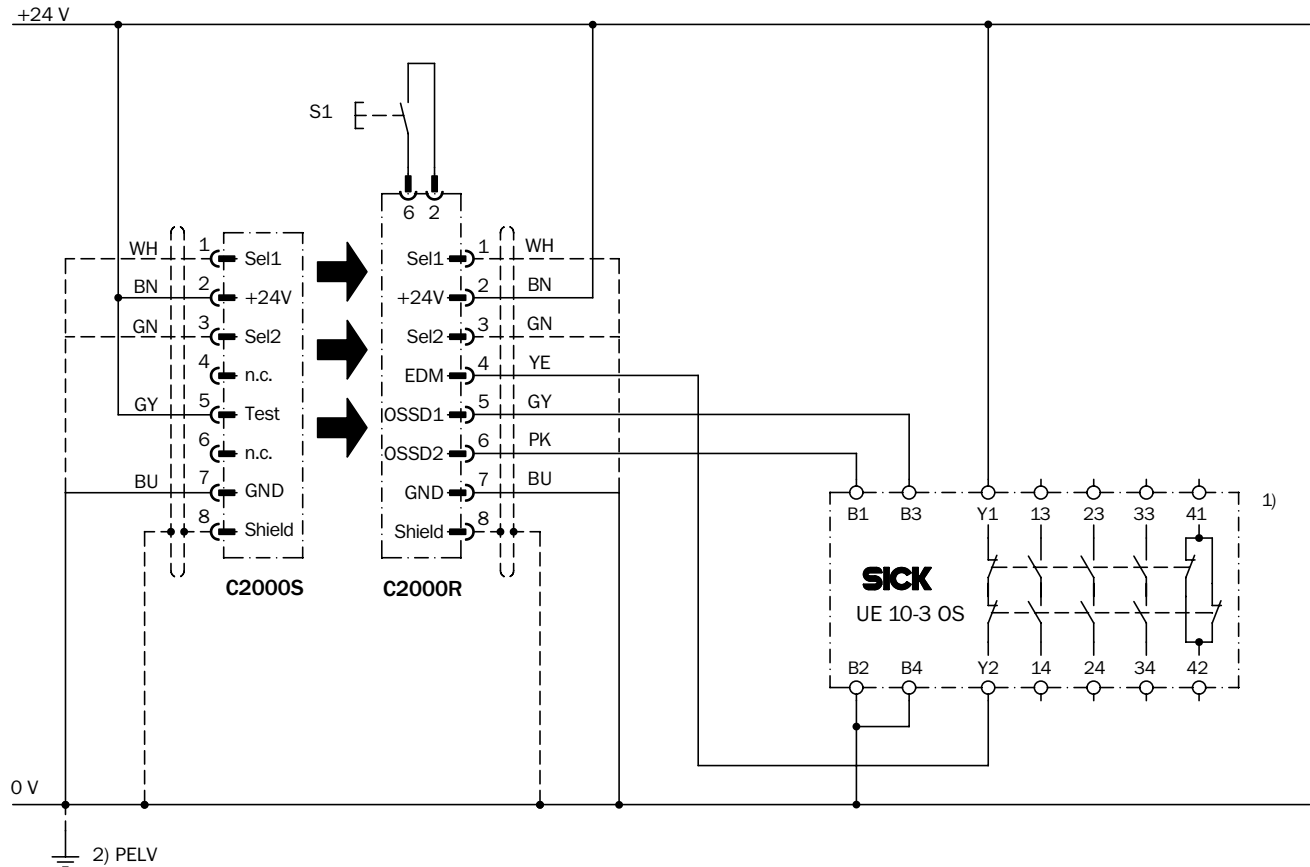
S1 = protective field height

Dimensions in mm

Connection diagram

→ You can find more connection diagrams at www.sick.com

C 2000 RES/EDM on safety relay UE 10



Task

Interfacing a C 2000 RES/EDM safety light curtain to UE 10-3 OS. Operating mode with restart interlock and external device monitoring.

Function

The yellow LED on the receiver flashes when the light path is clear and the UE 10 is de-energised and functioning correctly. The system is ready to be switched on. The system is enabled by pressing S1 (button is pressed and released). The OSSD1 and OSSD2 outputs are live, the UE 10 is switched on. On the interruption of one of the light beams, the UE 10 is deactivated by the OSSD1 and OSSD2 outputs.

Possible faults

Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of the UE 10 will be detected and will not result in the loss of the shutdown function. Jamming of the S1 button prevents output circuit to enable.

Comments

- 1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.
- 2) PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed.

Accessories

Mounting accessories

→ Dimensional drawings mounting accessories see page C-96

Designation	Description	Part number
Mounting kit 1	<ul style="list-style-type: none"> 4 pieces Pivoting Swivel mount For protective field height 300 mm ... 1200 mm 	2 019 649
Mounting kit 2	<ul style="list-style-type: none"> 4 pieces Pivoting Swivel mount For protective field height 1350 mm ... 1800 mm 	2 019 659
Mounting kit 6	<ul style="list-style-type: none"> 4 pieces Pivoting Side bracket 	2 019 506
Stainless steel bracket	<ul style="list-style-type: none"> 4 pieces Pivoting For protective field height 300 mm ... 1200 mm 	2 030 288
	<ul style="list-style-type: none"> 4 pieces Pivoting For protective field height 1350 mm ... 1800 mm 	2 023 708
Reinforced stainless steel bracket	<ul style="list-style-type: none"> 4 pieces Pivoting Vibration resistance 5 g, 10 Hz ... 55 Hz Shock resistance 10 g, 16ms For protective field height 1350 mm ... 1800 mm 	2 026 850

Connector technology

System connection	Designation	Description	Connection cable	Part number
M12 plug	M12 cable socket	<ul style="list-style-type: none"> 8-pin Straight 	2.5 m	6 020 537
			5.0 m	6 020 354
			7.5 m	6 020 353
			10.0 m	6 020 352
			15.0 m	6 020 872
		<ul style="list-style-type: none"> 8-pin Angled 	5.0 m	6 021 342
			15.0 m	6 021 343
Extension connection	M12 cable plug	<ul style="list-style-type: none"> Straight For the connection of a control switch 	5.0 m	6 021 204
			15.0 m	6 021 205
		<ul style="list-style-type: none"> Angled For the connection of a control switch 	5.0 m	6 021 830
			15.0 m	6 021 831
	Plug	<ul style="list-style-type: none"> Pre-assembled For deactivation of the integrated restart interlock M12 	—	6 021 238

Continued on next page

Interfaces

Designation	Description	Connection	Type	Part number
Safety evaluation unit LE 20	<ul style="list-style-type: none">IP 202 PNP OSSDs, 500 mA	<ul style="list-style-type: none">With screw terminal connector16-pin	LE20-2612	1 016 503
		<ul style="list-style-type: none">With terminal plug springAngled16-pin	LE20-2614	1 016 505
Safety evaluation unit LE 20 Muting		<ul style="list-style-type: none">With screw terminal connector15- and 16-pin	LE20-2622	1 016 502
		<ul style="list-style-type: none">With terminal plug spring15- and 16-pin	LE20-2624	1 016 501
Safety relay	<ul style="list-style-type: none">For opto-electronic protective devices	—	UE10-30S2D0	6 024 917
	<ul style="list-style-type: none">For opto-electronic protective devices	—	UE10-30S3D0	6 024 918
	<ul style="list-style-type: none">With screw type terminals	—	UE10-20S2D0	2 019 772
	<ul style="list-style-type: none">With spring terminals	—	UE10-20S4D0	2 019 771
	<ul style="list-style-type: none">Without terminals	—	UE10-20S1D0	6 020 342

Device columns ¹⁾

Designation	Description	Part number
Device column with front screen	<ul style="list-style-type: none"> For C 2000 Standard (protective field height 150 mm ... 1050 mm) For C 2000 cascable and RES/EDM (protective field height 150 mm ... 900 mm) 1200 mm high Including mounting kit 1 (2 pieces) 	2 021 333
	<ul style="list-style-type: none"> For C 2000 (protective field height 150 mm ... 1200 mm) 1500 mm high Including mounting kit 1 (2 pieces) 	2 021 242
	<ul style="list-style-type: none"> For C 2000 (protective field height 150 mm ... 1200 mm) 1700 mm high Including mounting kit 1 (2 pieces) 	2 021 337
	<ul style="list-style-type: none"> For C 2000 (protective field height 1350 mm ... 1500 mm) 1700 mm high Including mounting kit 2 (2 pieces) 	2 021 332

¹⁾ Warning, reduction of the scanning range!

Additional front screens ¹⁾

Designation	For protective field height (mm)	Part number
Additional front screen (weld spark guard)	300	2 022 405
	450	2 022 406
	600	2 022 407
	750	2 022 408
	900	2 022 409
	1050	2 022 410
	1200	2 022 411

¹⁾ Warning, reduction of the scanning range!

Additional front screens Heavy Duty ¹⁾

Designation	For protective field height (mm)	Part number
Additional front screen Heavy Duty (weld spark guard) with bracket	1350	2 026 860
	1500	2 026 861
	1650	2 026 862
	1800	2 026 863

¹⁾ Warning, reduction of the scanning range!

Deflector mirrors ¹⁾ (incl. mounting kit 2)

Designation	For protective field height (mm)	Type	Part number
For overall protective field width 0 m ... 4 m	300	PNS75-034	1 019 414
	450	PNS75-049	1 019 415
	600	PNS75-064	1 019 416
	750	PNS75-079	1 019 417
	900	PNS75-094	1 019 418
	1050	PNS75-109	1 019 419
	1200	PNS75-124	1 019 420
	1350	PNS75-139	1 019 421
	1500	PNS75-154	1 019 422
	1650	PNS75-169	1 019 423
	1800	PNS75-184	1 019 424
For overall protective field width 4 m ... 15 m	300	PNS125-034	1 019 425
	450	PNS125-049	1 019 426
	600	PNS125-064	1 019 427
	750	PNS125-079	1 019 428
	900	PNS125-094	1 019 429
	1050	PNS125-109	1 019 430
	1200	PNS125-124	1 019 431
	1350	PNS125-139	1 019 432
	1500	PNS125-154	1 019 433
	1650	PNS125-169	1 019 434
	1800	PNS125-184	1 019 435

¹⁾ Warning, reduction of the scanning range!

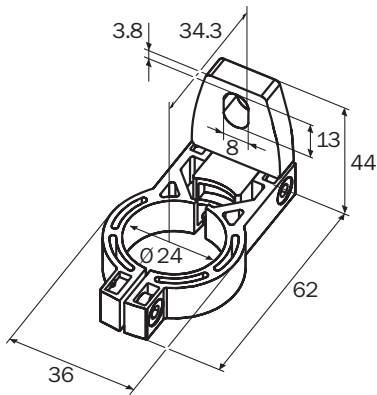
Laser alignment aid

Designation	Description	Type	Part number
Laser alignment aid	■ Does not require connection to power supply	AR 60	1 015 741
Adapter for AR 60	■ For large housing profile	—	4 032 461
	■ For small housing profile	—	4 032 462

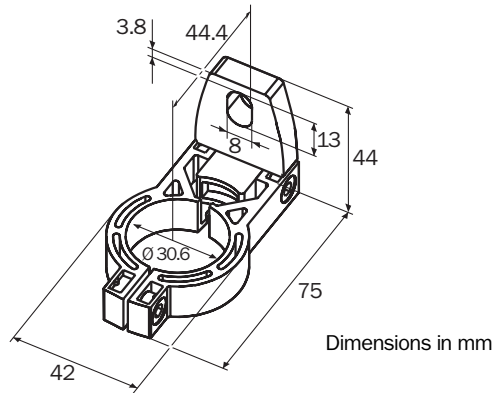
➔ For dimensional drawings of the device columns and deflector mirrors please refer to the operating instructions/technical description.
Download at www.sick.com

Dimensional drawings mounting accessories

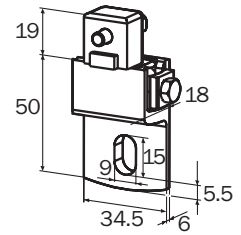
C



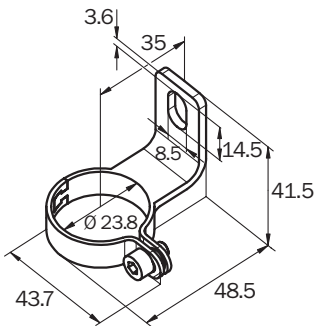
Swivel mount
Mounting kit 1
for protective field height 150 mm ... 1200 mm



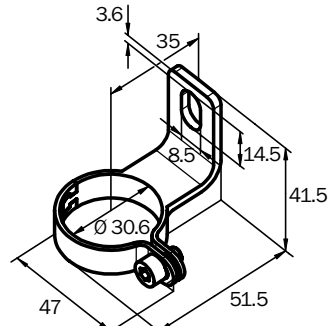
Swivel mount
Mounting kit 2
for protective field height 1350 mm ... 1800 mm



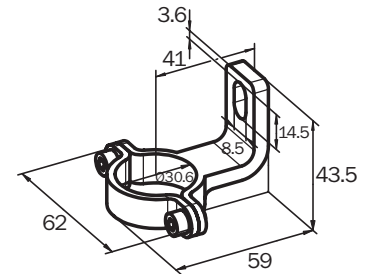
Side bracket
Mounting kit 6



Stainless steel bracket
for protective field height 150 mm ... 1200 mm



Stainless steel bracket
for protective field height 1350 mm ... 1800 mm



Reinforced stainless steel bracket for
protective field height 1350 mm ... 1800 mm

Overview of technical specifications

Protective field width (depending on type)	0 m ... 6 m / 2.5 m ... 19 m
Protective field height (depending on type)	300 mm ... 1800 mm
Number of beams in complete system	Max. 180 beams
Resolution (depending on type)	20 mm / 30 mm / 40 mm
Type	Type 2 according to EN 61496
Enclosure rating	IP 65

Product description

With its high signal reserve, the C 2000 cascadable safety light curtain is also reliable under harsh industrial conditions. Functions and status information integrated in the device allow rapid commissioning and prevent unnecessary machine downtimes. The modular concept achieves maximum machine security while taking into account

economic considerations by precisely coordinating the characteristics of the device to the requirements. Interfaces and service concepts complete the product range to provide an ideal solution for the sector. With the cascadable variants, safety light curtains can be flexibly adapted to the existing installation situation.

In-system added value

■ Combination with SICK interfaces

Combination with	Restart interlock	Muting	Further information
LE 20	✓	—	L-53
LE 20 Muting	✓	✓	L-60
UE 48-2 OS	✓	—	L-42
UE 48-3 OS	✓	—	L-48

■ Safe interface to bus systems

Applications

→ For more applications please refer to the application finder at www.sick.com



C 2000 cascadable on a pad printing machine

- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry



C

- Cascade
 - Max. 3 devices
 - Max. 3 m cable length
- External device monitoring (EDM)
- Self-testing
- 7-segment display
- Diagnostics
- Alignment aid
- Beam coding



Further information	Page
→ Ordering information	C-98
→ Technical specifications	C-100
→ Dimensional drawings	C-101
→ Connection diagram	C-103
→ Accessories	C-104
→ Dimensional drawings accessories	C-106
→ Services	A-0

Ordering information

C 2000 cascable

- With external device monitoring (EDM)
- For usage as cascaded device
- Consisting of sender and receiver unit

→ Accessories page C-104

C

Scanning range 0 ... 6 m

Resolution (mm)	Housing cross- section (mm)	Protective field height (mm)	Sender unit		Receiver unit	
			Type	Part number	Type	Part number
20	34 x 29	300	C20S-030102A21	1 018 072	C20E-030302A21	1 018 073
		450	C20S-045102A21	1 018 078	C20E-045302A21	1 018 079
		600	C20S-060102A21	1 018 055	C20E-060302A21	1 018 056
		750	C20S-075102A21	1 018 095	C20E-075302A21	1 018 096
		900	C20S-090102A21	1 018 104	C20E-090302A21	1 018 105
		1050	C20S-105102A21	1 018 113	C20E-105302A21	1 018 114
		1200	C20S-120102A21	1 018 122	C20E-120302A21	1 016 970
30	34 x 29	300	C20S-030103A21	1 018 074	C20E-030303A21	1 016 974
		450	C20S-045103A21	1 018 080	C20E-045303A21	1 018 081
		600	C20S-060103A21	1 018 087	C20E-060303A21	1 018 089
		750	C20S-075103A21	1 018 097	C20E-075303A21	1 018 098
		900	C20S-090103A21	1 018 106	C20E-090303A21	1 018 107
		1050	C20S-105103A21	1 018 115	C20E-105303A21	1 018 116
		1200	C20S-120103A21	1 018 123	C20E-120303A21	1 018 124
	48 x 40	1350	C20S-135103A22	1 018 057	C20E-135303A22	1 018 058
		1500	C20S-150103A22	1 018 133	C20E-150303A22	1 018 134
		1650	C20S-165103A22	1 018 139	C20E-165303A22	1 018 140
		1800	C20S-180103A22	1 018 145	C20E-180303A22	1 018 147
40	34 x 29	300	C20S-030104A21	1 016 967	C20E-030304A21	1 016 973
		450	C20S-045104A21	1 018 082	C20E-045304A21	1 018 083
		600	C20S-060104A21	1 018 090	C20E-060304A21	1 018 091
		750	C20S-075104A21	1 018 099	C20E-075304A21	1 018 100
		900	C20S-090104A21	1 018 108	C20E-090304A21	1 018 109
		1050	C20S-105104A21	1 018 117	C20E-105304A21	1 018 118
		1200	C20S-120104A21	1 018 125	C20E-120304A21	1 018 126
	48 x 40	1350	C20S-135104A22	1 018 129	C20E-135304A22	1 018 130
		1500	C20S-150104A22	1 018 135	C20E-150304A22	1 018 136
		1650	C20S-165104A22	1 018 141	C20E-165304A22	1 018 142
		1800	C20S-180104A22	1 018 148	C20E-180304A22	1 018 149

Scanning range 2.5 ... 19 m

Resolution (mm)	Housing cross- section (mm)	Protective field height (mm)	Sender unit		Receiver unit	
			Type	Part number	Type	Part number
20	34 x 29	300	C20S-030202A21	1 018 075	C20E-030302A21	1 018 073
		450	C20S-045202A21	1 018 084	C20E-045302A21	1 018 079
		600	C20S-060202A21	1 018 092	C20E-060302A21	1 018 056
		750	C20S-075202A21	1 018 101	C20E-075302A21	1 018 096
		900	C20S-090202A21	1 018 110	C20E-090302A21	1 018 105
		1050	C20S-105202A21	1 018 119	C20E-105302A21	1 018 114
		1200	C20S-120202A21	1 016 964	C20E-120302A21	1 016 970
30	34 x 29	300	C20S-030203A21	1 016 968	C20E-030303A21	1 016 974
		450	C20S-045203A21	1 018 085	C20E-045303A21	1 018 081
		600	C20S-060203A21	1 018 093	C20E-060303A21	1 018 089
		750	C20S-075203A21	1 018 102	C20E-075303A21	1 018 098
		900	C20S-090203A21	1 018 111	C20E-090303A21	1 018 107
		1050	C20S-105203A21	1 018 120	C20E-105303A21	1 018 116
		1200	C20S-120203A21	1 018 127	C20E-120303A21	1 018 124
	48 x 40	1350	C20S-135203A22	1 018 131	C20E-135303A22	1 018 058
		1500	C20S-150203A22	1 018 137	C20E-150303A22	1 018 134
		1650	C20S-165203A22	1 018 143	C20E-165303A22	1 018 140
		1800	C20S-180203A22	1 018 150	C20E-180303A22	1 018 147
40	34 x 29	300	C20S-030204A21	1 018 077	C20E-030304A21	1 016 973
		450	C20S-045204A21	1 018 086	C20E-045304A21	1 018 083
		600	C20S-060204A21	1 018 094	C20E-060304A21	1 018 091
		750	C20S-075204A21	1 018 103	C20E-075304A21	1 018 100
		900	C20S-090204A21	1 018 112	C20E-090304A21	1 018 109
		1050	C20S-105204A21	1 018 121	C20E-105304A21	1 018 118
		1200	C20S-120204A21	1 018 128	C20E-120304A21	1 018 126
	48 x 40	1350	C20S-135204A22	1 018 132	C20E-135304A22	1 018 130
		1500	C20S-150204A22	1 018 138	C20E-150304A22	1 018 136
		1650	C20S-165204A22	1 018 144	C20E-165304A22	1 018 142
		1800	C20S-180204A22	1 018 151	C20E-180304A22	1 018 149

C

Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at www.sick.com

General system data

Protective field width (depending on type)	0 m ... 6 m / 2.5 m ... 19 m
Protective field height (depending on type)	300 mm ... 1800 mm
Resolution (depending on type)	20 mm / 30 mm / 40 mm
Enclosure rating	IP 65
Type	Type 2 according to EN 61496
Synchronisation	Optical, without separate synchronisation
Supply voltage V_S	24 V (19.2 V ... 28.8 V) DC

Sender unit

Power consumption	Max. 6.2 W
-------------------	------------

Receiver unit

Switching outputs (OSSDs)	2 PNP semiconductors (short-circuit protected, cross-circuit monitored)
Response time (depending on type)	Max. 7 ms ... 34 ms
Switching voltage	$V_S - 2.25 \text{ V}$ 1 V
Switching current	Max. 500 mA
Power consumption	Max. 8 W

Operating data

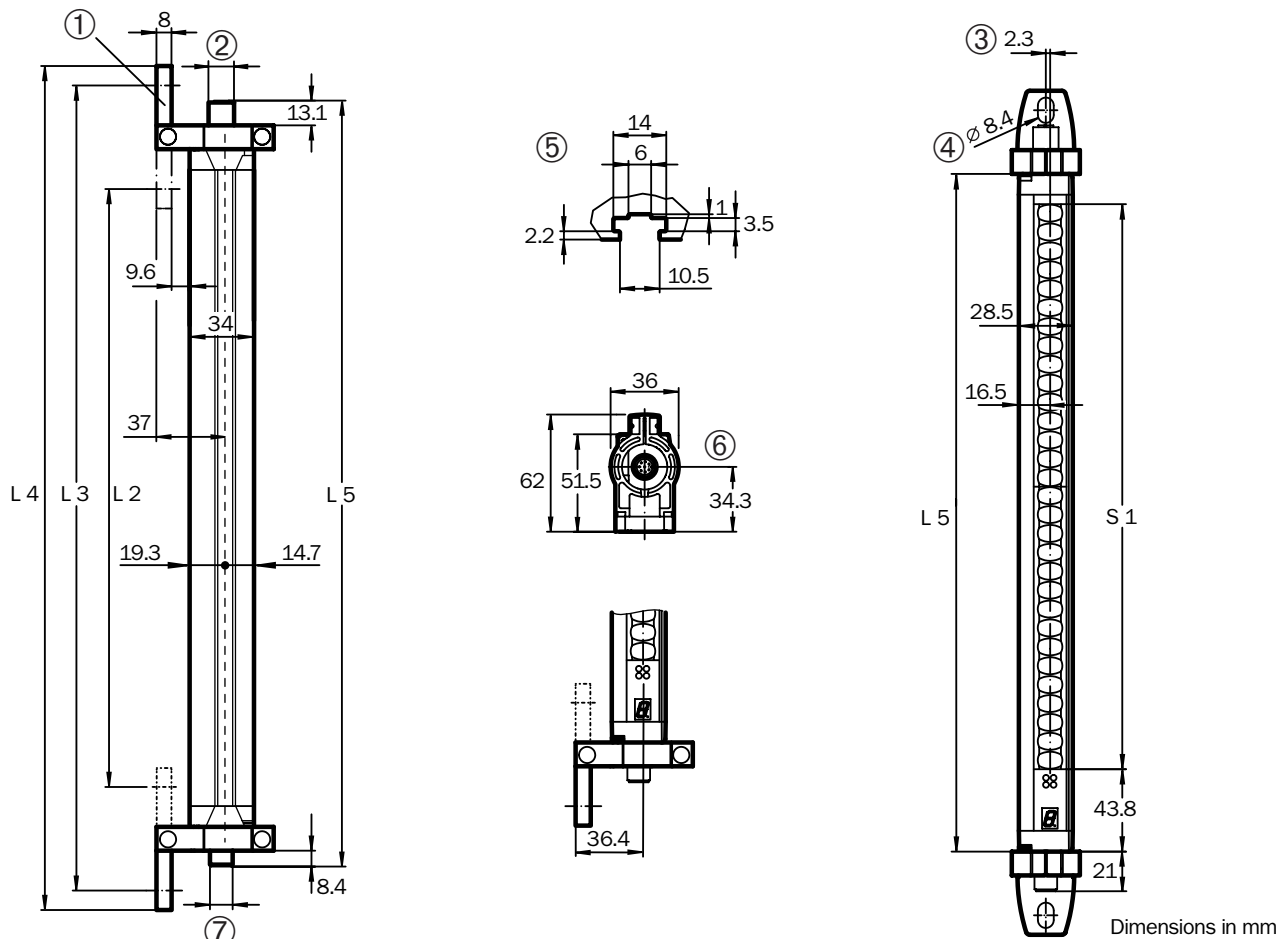
Type of connection	M12 plug, 8-pin
Connection cable wire cross-section	Max. 0.25 mm ²
Connection cable length	Max. 15 m
Ambient operating temperature T_A	0 °C ... +55 °C
Storage temperature T_S	-25 °C ... +70 °C
Air humidity	15 % ... 95 %
Housing cross-section (depending on type) for protective field heights of 300 mm to 1200 mm for protective field heights of 1350 mm to 1800 mm	34 mm x 29 mm 48 mm x 40 mm
Vibration resistance	5 g, 10 ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29
Weight (depending on type)	0.27 kg ... 3.88 kg

Dimensional drawings

→ You will find more dimensional drawings in the technical description/operating instructions. Download at www.sick.com

Protective field heights 300 mm ... 1200 mm

C



Sender unit with swivel mount, small housing profile (receiver unit mirror image)

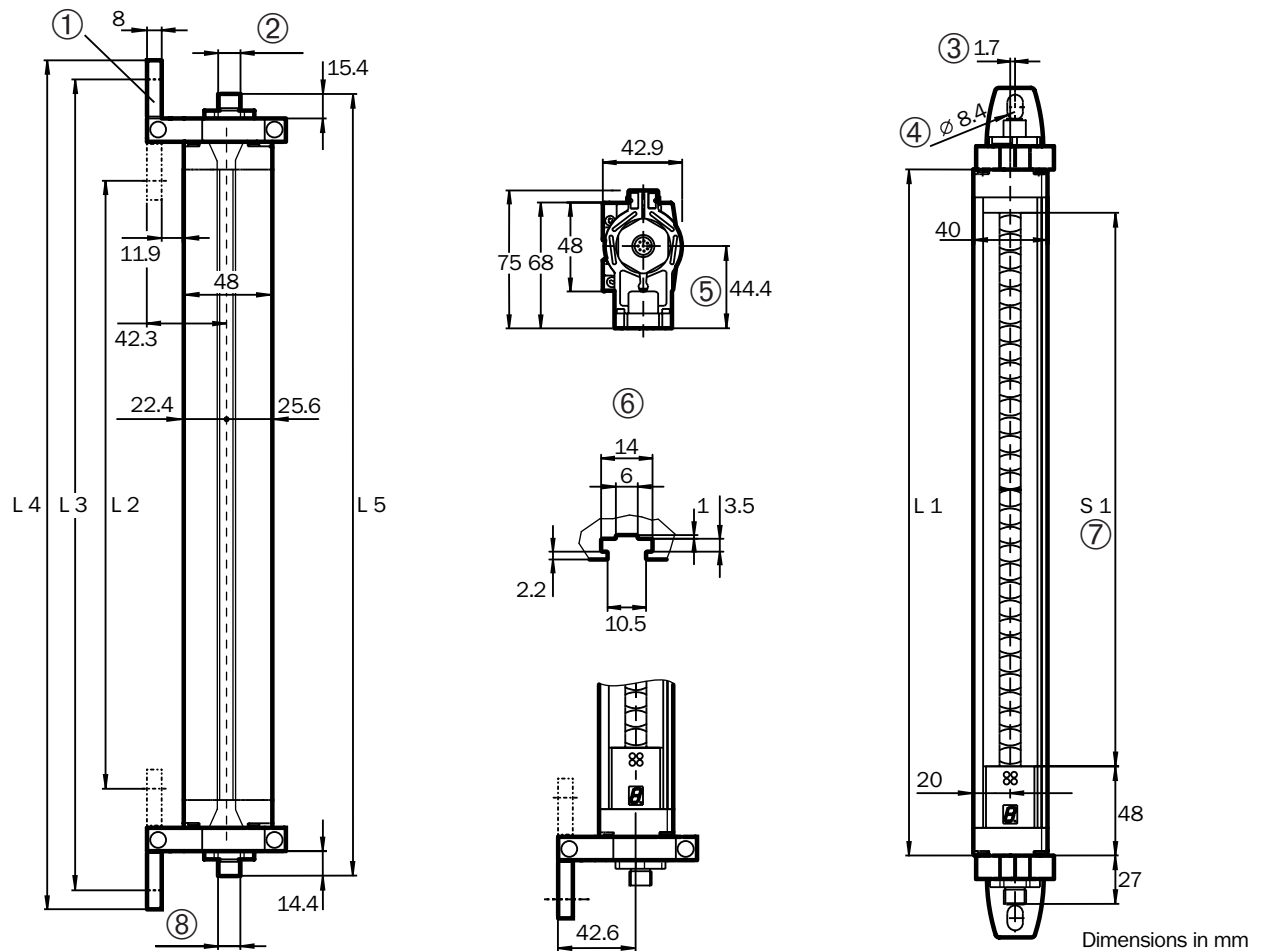
- ① Mounting clamp
- ② Plug M12 x 1
- ③ Centre of light beam offset
- ④ Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
- ⑤ Sliding nut groove for side mounting
- ⑥ Adjustment
- ⑦ Plug M12 x 1

S 1	L 1	L 2	L 3	L 4	L 5
300	364	322	432	452	411
450	515	473	582	603	562
600	666	623	733	754	712
750	816	774	884	904	863
900	967	924	1034	1055	1013
1050	1117	1075	1185	1205	1164
1200	1266	1224	1334	1354	1313

S1 = protective field height

Dimensions in mm

Protective field heights 1350 mm ... 1800 mm



Sender unit with swivel mount, large housing profile (receiver unit mirror image)

- ① Mounting clamp
- ② M12 x 1 socket
- ③ Centre of light beam offset
- ④ Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
- ⑤ Adjustment
- ⑥ Sliding nut groove for side mounting
- ⑦ Protective field height
- ⑧ Plug M12 x 1

S 1	L 1	L 2	L 3	L 4	L 5
1350	1426	1384	1494	1514	1481
1500	1577	1535	1644	1665	1632
1650	1727	1685	1795	1815	1782
1800	1878	1836	1945	1966	1933

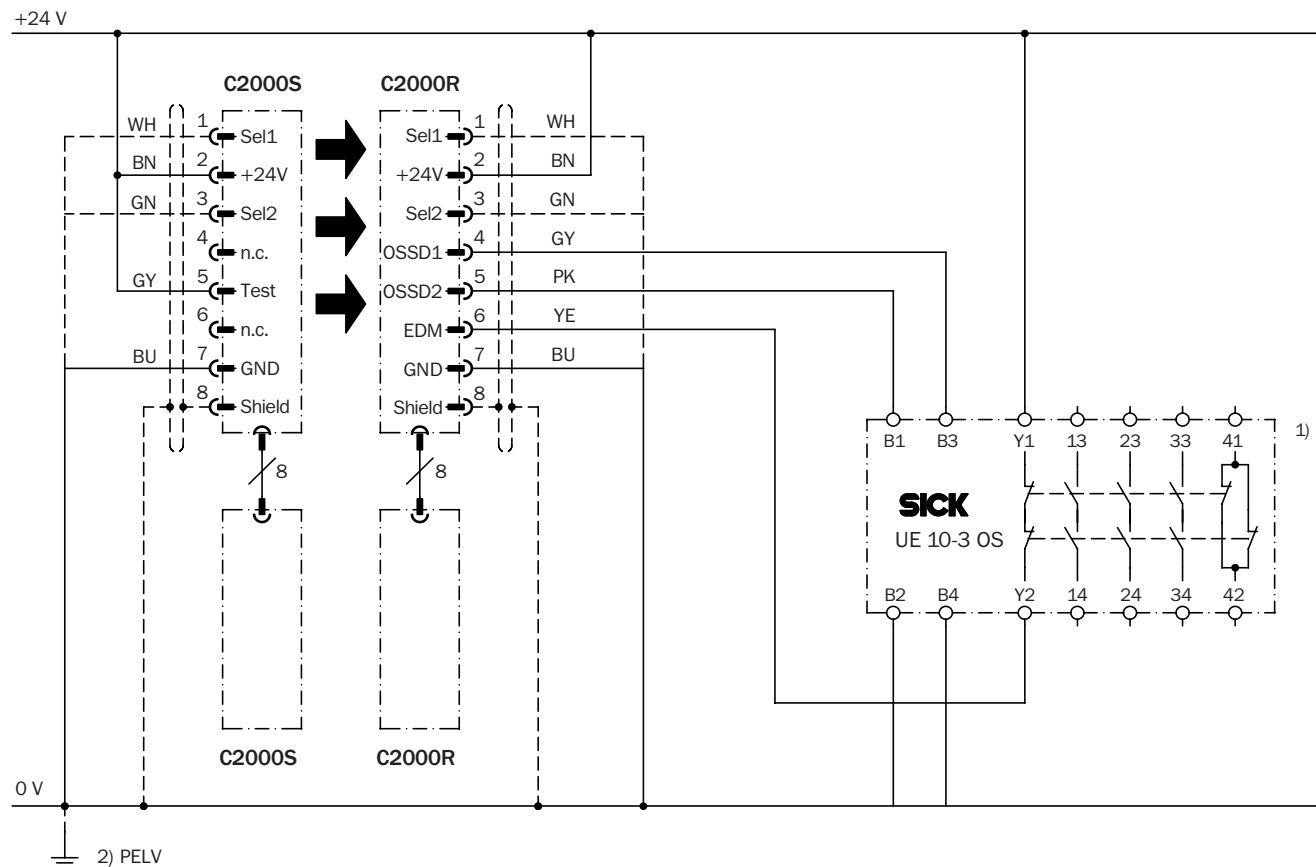
S1 = protective field height

Dimensions in mm

Connection diagram

→ You can find more connection diagrams at www.sick.com

C 2000 cascable on safety relay UE 10



Task

Interfacing two cascaded C 2000 safety light curtains to UE 10-3 OS. Operating mode without restart interlock with external device monitoring. Restart interlock is realised via the machine control.

Function

The system is enabled when the light path is clear and the UE 10 is de-energised and functioning correctly. The OSSD1 and OSSD2 outputs are live, the UE 10 is switched on. On the interruption of one of the light beams, the UE 10 is deactivated by the OSSD1 and OSSD2 outputs.

Possible faults

Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of the UE 10 will be detected and will not result in the loss of the shutdown function.

Comments

¹⁾ Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

²⁾ PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed.

Accessories

Mounting accessories

→ Dimensional drawings mounting accessories see page C-106

Designation	Description	Part number
Mounting kit 1	<ul style="list-style-type: none"> 4 pieces Pivoting Swivel mount For protective field height 300 mm ... 1200 mm 	2 019 649
Mounting kit 2	<ul style="list-style-type: none"> 4 pieces Pivoting Swivel mount For protective field height 1350 mm ... 1800 mm 	2 019 659
Mounting kit 6	<ul style="list-style-type: none"> 4 pieces Pivoting Side bracket 	2 019 506
Stainless steel bracket	<ul style="list-style-type: none"> 4 pieces Pivoting For protective field height 300 mm ... 1200 mm 	2 030 288
	<ul style="list-style-type: none"> 4 pieces Pivoting For protective field height 1350 mm ... 1800 mm 	2 023 708
Reinforced stainless steel bracket	<ul style="list-style-type: none"> 4 pieces Pivoting Vibration resistance 5 g, 10 Hz ... 55 Hz Shock resistance 10 g, 16ms For protective field height 1350 mm ... 1800 mm 	2 026 850

Connector technology

System connection	Designation	Description	Connection cable	Part number
M12 plug	M12 cable socket	<ul style="list-style-type: none"> 8-pin Straight 	2.5 m	6 020 537
			5.0 m	6 020 354
			7.5 m	6 020 353
			10.0 m	6 020 352
			15.0 m	6 020 872
		<ul style="list-style-type: none"> 8-pin Angled 	5.0 m	6 021 342
			15.0 m	6 021 343
Extension connection	Cable sockets/plugs	<ul style="list-style-type: none"> Pre-assembled M12 8-pin Straight 	0.25 m	6 021 000
			0.5 m	6 021 001
			1 m	6 021 002
			1.5 m	6 021 003
			2 m	6 021 004
			2.5 m	6 021 005
			3 m	6 021 006

Interfaces

Designation	Description	Connection	Type	Part number
Safety evaluation unit LE 20	<ul style="list-style-type: none">IP 202 PNP OSSDs, 500 mA	<ul style="list-style-type: none">With screw terminal connector16-pin	LE20-2612	1 016 503
		<ul style="list-style-type: none">With terminal plug springAngled16-pin	LE20-2614	1 016 505
Safety evaluation unit LE 20 Muting		<ul style="list-style-type: none">With screw terminal connector15- and 16-pin	LE20-2622	1 016 502
<ul style="list-style-type: none">With terminal plug spring15- and 16-pin		LE20-2624	1 016 501	
Safety relay	<ul style="list-style-type: none">For opto-electronic protective devices	—	UE10-30S2D0	6 024 917
	<ul style="list-style-type: none">For opto-electronic protective devices	—	UE10-30S3D0	6 024 918
	<ul style="list-style-type: none">With screw type terminals	—	UE10-20S2D0	2 019 772
	<ul style="list-style-type: none">With spring terminals	—	UE10-20S4D0	2 019 771
	<ul style="list-style-type: none">Without terminals	—	UE10-20S1D0	6 020 342
	<ul style="list-style-type: none">With screw type terminals	—	UE48-20S2D2	6 024 915
	<ul style="list-style-type: none">With plug-in terminals	—	UE48-20S3D2	6 024 916
	<ul style="list-style-type: none">With screw type terminals	—	UE48-30S2D2	6 025 089
	<ul style="list-style-type: none">With plug-in terminals	—	UE48-30S3D2	6 025 097

Device columns ¹⁾

→ For dimensional drawings of the device columns please refer to the operating instructions/technical description. Download at www.sick.com

Designation	Description	Part number
Device column with front screen	<ul style="list-style-type: none"> For C 2000 Standard (protective field height 300 mm ... 1050 mm) For C 2000 cascable and RES/EDM (protective field height 150 mm ... 900 mm) 1200 mm high Including mounting kit 1 (2 pieces) 	2 021 333
	<ul style="list-style-type: none"> For C 2000 (protective field height 150 mm ... 1200 mm) 1500 mm high Including mounting kit 1 (2 pieces) 	2 021 242
	<ul style="list-style-type: none"> For C 2000 (protective field height 150 mm ... 1200 mm) 1700 mm high Including mounting kit 1 (2 pieces) 	2 021 337
	<ul style="list-style-type: none"> For C 2000 (protective field height 1350 mm ... 1500 mm) 1700 mm high Including mounting kit 2 (2 pieces) 	2 021 332

¹⁾ Warning, reduction of the scanning range!

Laser alignment aid

Designation	Description	Type	Part number
Laser alignment aid	<ul style="list-style-type: none"> Does not require connection to power supply 	AR 60	1 015 741
Adapter for AR 60	<ul style="list-style-type: none"> For large housing profile 	—	4 032 461
	<ul style="list-style-type: none"> For small housing profile 	—	4 032 462

Continued on next page

Additional front screens ¹⁾

Designation	For protective field height (mm)	Part number
Additional front screen (weld spark guard)	300	2 022 405
	450	2 022 406
	600	2 022 407
	750	2 022 408
	900	2 022 409
	1050	2 022 410
	1200	2 022 411

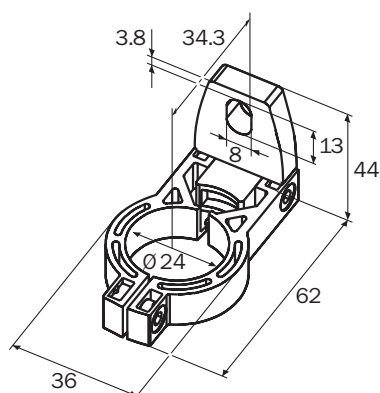
¹⁾ Warning, reduction of the scanning range!

Additional front screens Heavy Duty ¹⁾

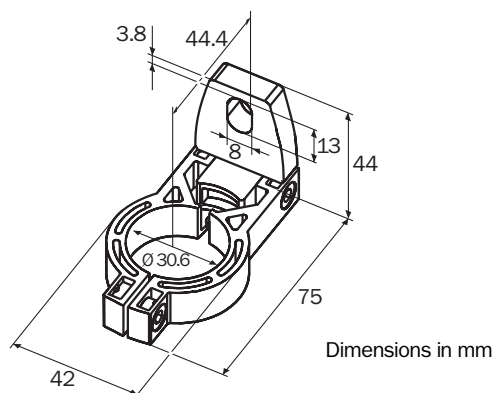
Designation	For protective field height (mm)	Part number
Additional front screen Heavy Duty (weld spark guard) with bracket	1350	2 026 860
	1500	2 026 861
	1650	2 026 862
	1800	2 026 863

¹⁾ Warning, reduction of the scanning range!

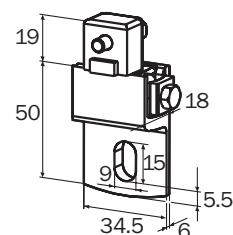
Dimensional drawings mounting accessories



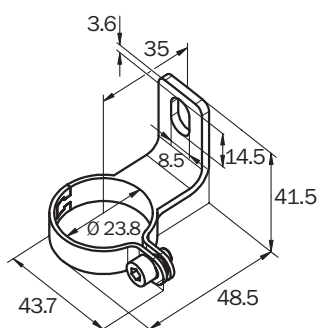
Swivel mount
Mounting kit 1
for protective field height 150 mm ... 1200 mm



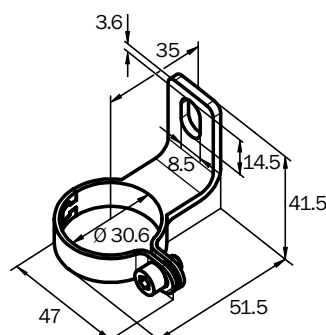
Swivel mount
Mounting kit 2
for protective field height 1350 mm ... 1800 mm



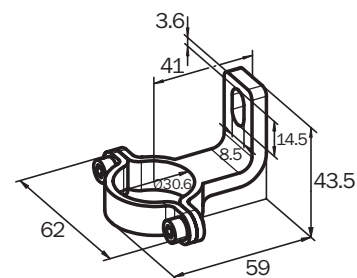
Side bracket
Mounting kit 6



Stainless steel bracket
for protective field height 150 mm ... 1200 mm



Stainless steel bracket
for protective field height 1350 mm ... 1800 mm



Reinforced stainless steel bracket for
protective field height 1350 mm ... 1800 mm

Overview of technical specifications

Protective field width	0.1 m ... 6 m
Protective field height (depending on type)	150 mm ... 900 mm
Resolution	30 mm
Type	Type 2 according to EN 50100
Enclosure rating	
Sender/receiver unit	IP 65
Control unit	IP 54

Product description

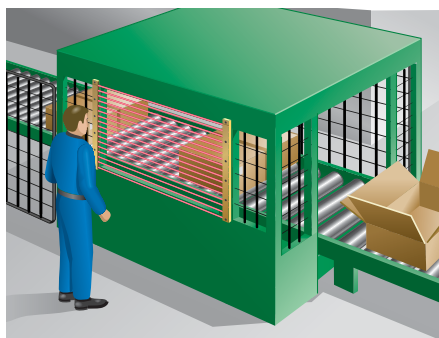
Due to its compact design, the LGT safety light curtain is suitable for applications on small machines, where space is limited. Functions and status information integrated in the control unit allow rapid com-

missioning and prevent unnecessary machine downtimes. Sector-oriented service concepts round off the product range and can be combined to form a customer-specific package of solutions.

Applications

→ For more applications please refer to the application finder at www.sick.com

- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry



Packaging industry: LGT on a packaging machine



- Restart interlock (RES)
- External device monitoring (EDM)
- 7-segment display
- Diagnostics
- Blanking
- Small design



Further information	Page
→ Ordering information	C-108
→ Technical specifications	C-109
→ Dimensional drawings	C-110
→ Services	A-0

Ordering information

LGT

LGT consisting of:

- Sender unit (LGTS) and receiver unit (LGTE)
- Control unit (LGTN)

Sender and receiver units

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
150	LGTS015-051	1 013 413	LGTE015-051	1 013 414
300	LGTS030-111	1 013 415	LGTE030-111	1 013 416
450	LGTS045-171	1 013 417	LGTE045-171	1 013 418
600	LGTS060-231	1 013 419	LGTE060-231	1 013 420
750	LGTS075-291	1 013 421	LGTE075-291	1 013 422
900	LGTS090-351	1 013 423	LGTE090-351	1 013 424

Control units

Designation	Description	Type	Part number
Control unit	■ DC 24 V	LGTN101-511	6 010 683
	■ AC 115 / 230 V + DC 24 V	LGTN101-311	6 010 521
	■ DC 24 V ■ For installation in control cabinets	LGTN101-521	6 008 527
	■ AC 115 / 230 V + DC 24 V ■ For installation in control cabinets	LGTN101-321	6 008 526

Accessories

Designation	Connection cable	Part number
Connection cable with socket	2.5 m	6 009 923
	5 m	6 009 924
	10 m	6 009 926
	15 m	6 008 410
	20 m	6 008 411
Snap-on clip	—	4 028 654

Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at www.sick.com

General system data

Protective field width		0.1 m ... 6 m
Protective field height (depending on type)		150 mm ... 900 mm
Resolution		30 mm
Enclosure rating	Sender/receiver unit Control unit LGTN	IP 65 IP 54
Type		Type 2 according to EN 50100
Synchronisation		Electrical synchronisation
Supply voltage V_s¹⁾	Direct current Residual ripple	24 V (19.2 V ... 28.8 V) DC 5 V _{pp}
	Alternating current Frequency	115 V (92 V ... 126.5 V) AC / 230 V (184 V ... 253 V) AC 50 Hz (48 Hz ... 62 Hz)
Power consumption		Max. 13 W / 16 VA
Response time (depending on type)		Max. 50 ms
Master relay	Resistive switching capacity Inductive switching capacity	Max. 4 A, 45 V DC Max. 4 A, 25 V DC
Auxiliary relay	Resistive switching capacity Inductive switching capacity	Max. 8 A, 55 V DC Max. 8 A, 15 V DC

Operating data

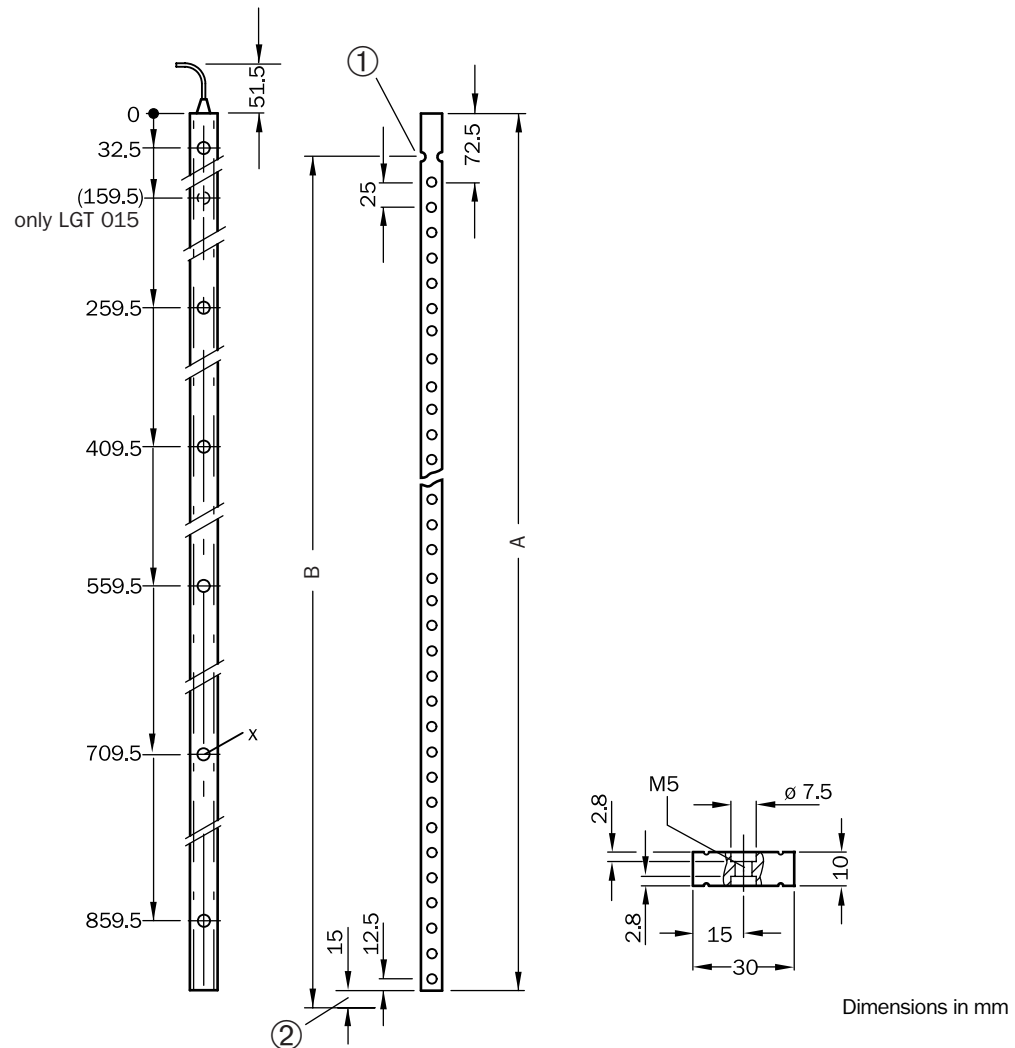
Type of connection	PG11
Connection cable length	Max. 10 m
Ambient operating temperature T_A	−10 °C ... +55 °C
Storage temperature T_S	−25 °C ... +70 °C
Air humidity	15 % ... 95 %
Housing cross-section	10 mm x 30 mm
Vibration resistance	5 g, 10 ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29

¹⁾ A power supply unit with safe isolation (SELV, PELV circuit) is to be used

Dimensional drawings

Sender unit LGTS and receiver unit LGTE

C

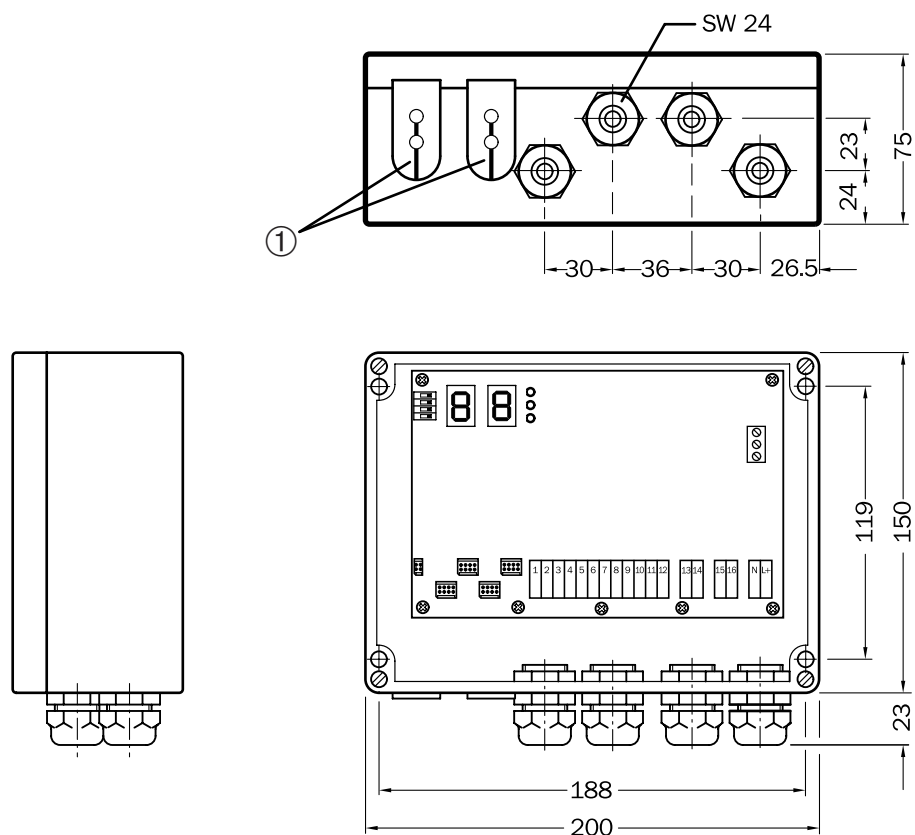


① The upper limit of the protective field is indicated by a cut-out in the housing

② The lower limit of the protective field is 15 mm from the end of the housing

LGT type	Number of beams	Housing length A (mm)	Protective field height B (mm)
015	5	185	155
030	11	335	305
045	17	485	455
060	23	635	605
075	29	785	755
090	35	935	905

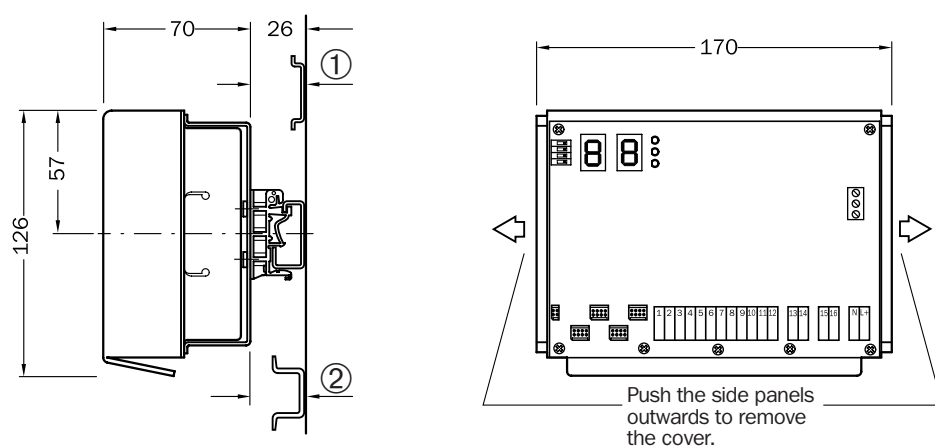
Control unit LGTN with housing



① To insert cable: remove bush and push apart

Dimensions in mm

Control unit LGTN for installation in control cabinets



- ① For mounting on low 20 mm mounting rail
- ② For mounting on high 28 mm mounting rail

Dimensions in mm

Principle of operation of multi-beam photoelectric safety switches

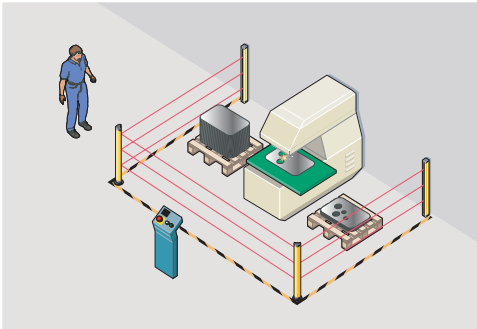
Multi-beam photoelectric safety switches are electro-sensitive protective devices comprising a sender unit and a receiver unit or a sender/receiver unit on the active side and one or more deflector mirrors on the passive side. If one or more light beams

are interrupted, the multi-beam photoelectric safety switch provides a shutdown signal that is suitable for interrupting the dangerous state on a machine or system.

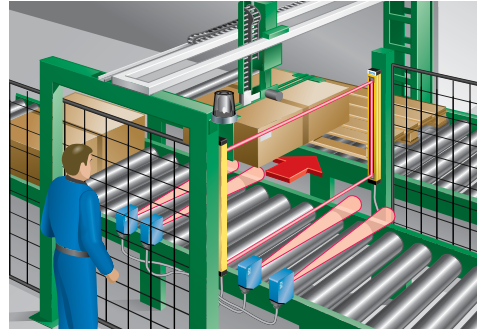
Applications for multi-beam photoelectric safety switches

Multi-beam photoelectric safety switches are used wherever access to a hazardous area must be protected or the hazardous area itself must be monitored.

In some applications, the protective device must be able to unambiguously differentiate between man and material.



Machine tool industry: MSL with mirror columns on a punching machine



Access protection with muting on a transfer station

Advantages of the SICK multi-beam photoelectric safety switches

SICK's range of multi-beam photoelectric safety switches provides a reliable, cost-effective solution for almost every hazardous area protection and access protection application. Custom solutions are produced using standard components that are flexible in use: From simple access protection to the complex muting application with override function.

The MSL can be used for access protection and for hazardous area protection (horizontal use) if a type 4 multi-beam photoelectric safety switch is required. The MSM muting module expands the functionality of this standard product: In sectors such as warehouse systems and conveyor systems, the MSL

with MSM not only complies with safety requirements, but also provides highly efficient automatic material transport. The M 2000 is the right choice for applications where a type 2 multi-beam photoelectric safety switch is desired. Product variants with differing functionalities are available for countless applications. The use of SICK interfaces (e.g. the LE 20 Muting) also offers numerous advantages. The M 2000 variants in IP 67 housings were designed for environments in which very high demands are made of the enclosure rating (IP 67) and the material strength.

Mounting and operation made easy

SICK provides a comprehensive range of accessories for multi-beam photoelectric safety switches. These accessories make it possible to integrate the devices in the machine control and

also to mount the devices rapidly, reliably and safely. Device and mirror columns complete the range.

Services for productive safety

With services tailored specifically to your needs, SICK offers all-embracing support for the safety of your machine or system.



Address productivity and cost-effectiveness from the start: From selection and planning, through commissioning and inspection, to maintenance and modernisation.

→ For information about the services please refer to chapter A

Multi-beam photoelectric safety switches



D

Safety application	Type according to IEC 61496	Number of beams	Scanning range (m)	Functions						Product	Page
				Sender/receiver system	Active/passive system	Muting	Beam coding	Restart interlock	External device monitoring		
 	Type 4 ¹⁾	2 ... 35	0.5 ... 20 15 ... 70	✓	—	✓ ⁴⁾	—	✓	✓	MSL	D-2
		2 ... 12	0.5 ... 70	✓	—	✓ ⁵⁾	✓	✓	✓	MSL coded version	D-11
		1 ²⁾ , 2 ²⁾	Max. 7.5 ³⁾	—	✓	✓ ⁴⁾	—	✓	✓	MSLZ	D-20
				—	✓	✓ ⁵⁾	✓	✓	✓	MSLZ coded version	D-28
	Type 2	2 ... 9 2 ... 4	0 ... 25 0 ... 70	✓	—	✓ ⁶⁾	✓	—	✓	M 2000 Standard	D-37
				✓	—	✓ ⁶⁾	✓	—	✓	M 2000 Standard in IP 67 housing	D-45
				✓	—	✓ ⁶⁾	✓	✓	✓	M 2000 RES/EDM	D-50
		2 ... 9	0 ... 25	✓	—	✓ ⁶⁾	✓	—	✓	M 2000 cascable	D-58
		1 ²⁾	0 ... 6	—	✓	✓ ⁶⁾	—	—	✓	M 2000-A/P Standard	D-66
				—	✓	✓ ⁶⁾	—	✓	✓	M 2000-A/P RES/EDM	D-74

¹⁾ According to prEN 50100

²⁾ Passive side using deflector mirror

³⁾ Depending on type and mirror

⁴⁾ Muting using safety module MSM with integrated override

⁵⁾ Muting using safety module MSM

⁶⁾ Muting using safety evaluation unit LE 20 Muting



- Actively monitored semiconductor outputs
- Restart interlock (RES)
- External device monitoring (EDM)
- Output weak signal
- Modular safety muting (MSM)



Further information	Page
→ Technical specifications	D-4
→ Dimensional drawings	D-5
→ Connection diagrams	D-7
→ Accessories	D-7
→ Services	A-0

Overview of technical specifications

Number of beams (depending on type)	2 ... 35
Scanning range (depending on type)	20 m / 70 m
Beam separation (depending on type)	50 mm ... 500 mm
Type	Type 4 according to EN 50100
Enclosure rating	IP 65

Product description

MSL multi-beam photoelectric safety switches from SICK are electro-sensitive protective equipment. They are 2-part through beam configurations, consisting of a sender and receiver unit and are suitable for access protection and hazardous area protection. The devices were designed for industrial applications and benefit from the following advantages:

- No mechanically wearing parts
- Stable modular construction
- Simple installation

Special features of the MSL multi-beam photoelectric safety switch are listed below:

- Plug-in terminal chamber with PG screws or different device connectors
- Short response time (20 ms)
- Large signal reserve (factor 2)
- Optical synchronisation of sender and receiver unit
- Multiple protection by means of deflector mirrors and columns
- Operating modes:
 - External device monitoring
 - Restart interlock
- Muting as a supplementary module

In-system added value

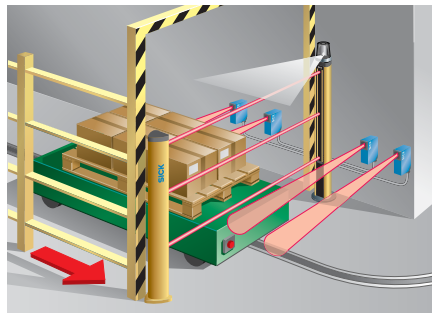
- Combination with SICK interfaces
- Safe integration in bus systems

Applications

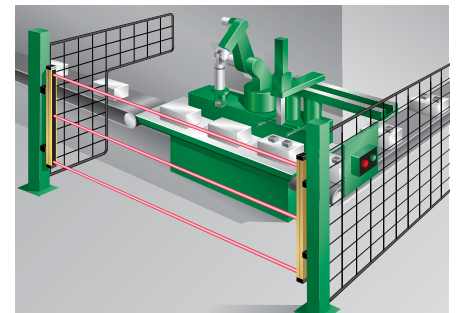
→ You can find more applications using the application finder at www.sick.com

Provides access protection of hazardous areas on machining centres in mechanical engineering applications, robot systems

(such as welding lines in the automotive industry) and automated conveying, storage and transport systems



Access protection with muting on a system with floor transporter



Access protection on a robot machining station

Ordering information

→ Accessories see page D-7

MSL for access protection

Number of beams	Beam separation (mm)	Scanning range (m)	Muting	Muting with over-ride	Receiver unit		Sender unit	
					Type	Part number	Type	Part number
2	500	20	–	–	MSLE02-15011	1 012 296	MSLS02-15021	1 013 748
			✓	✓	MSLE02-15061A	1 015 701	MSLS02-15021	1 013 748
		70	–	–	MSLE02-15011	1 012 296	MSLS02-15011	1 012 295
			✓	✓	MSLE02-15061A	1 015 701	MSLS02-15011	1 012 295
3	220	20	–	–	MSLE03-12211	1 013 764	MSLS03-12221	1 013 749
			✓	✓	MSLE03-12261A	1 015 851	MSLS03-12221	1 013 749
		70	–	–	MSLE03-12211	1 013 764	MSLS03-12211	1 013 763
			✓	✓	MSLE03-12261A	1 015 851	MSLS03-12211	1 013 763
	400	20	–	–	MSLE03-14011	1 013 747	MSLS03-14021	1 013 750
			✓	✓	MSLE03-14061A	1 015 700	MSLS03-14021	1 013 750
		70	–	–	MSLE03-14011	1 013 747	MSLS03-14011	1 013 746
			✓	✓	MSLE03-14061A	1 015 700	MSLS03-14011	1 013 746

MSL for hazardous area protection

Number of beams	Beam separation (mm)	Scanning range (m)	Muting	Muting with over-ride	Receiver unit		Sender unit	
					Type	Part number	Type	Part number
20	70	20	–	–	MSLE20-10711	1 015 703	MSLS20-10721	1 016 067
		70	–	–	MSLE20-10711	1 015 703	MSLS20-10711	1 015 702
23	70	20	–	–	MSLE23-10711	1 015 867	MSLS23-10721	1 015 924
		70	–	–	MSLE23-10711	1 015 867	MSLS23-10711	1 015 866
14	50	20	–	–	MSLE14-10511	1 016 536	MSLS14-10521	1 016 529
		70	–	–	MSLE14-10511	1 016 536	MSLS14-10511	1 016 522
17	50	20	–	–	MSLE17-10511	1 016 537	MSLS17-10521	1 016 530
		70	–	–	MSLE17-10511	1 016 537	MSLS17-10511	1 016 523
20	50	20	–	–	MSLE20-10511	1 016 538	MSLS20-10521	1 016 531
		70	–	–	MSLE20-10511	1 016 538	MSLS20-10511	1 016 524
23	50	20	–	–	MSLE23-10511	1 016 392	MSLS23-10521	1 016 391
		70	–	–	MSLE23-10511	1 016 392	MSLS23-10511	1 016 390
26	50	20	–	–	MSLE26-10511	1 016 539	MSLS26-10521	1 016 532
		70	–	–	MSLE26-10511	1 016 539	MSLS26-10511	1 016 525
29	50	20	–	–	MSLE29-10511	1 016 540	MSLS29-10521	1 016 533
		70	–	–	MSLE29-10511	1 016 540	MSLS29-10511	1 016 526
32	50	20	–	–	MSLE32-10511	1 016 541	MSLS32-10521	1 016 534
		70	–	–	MSLE32-10511	1 016 541	MSLS32-10511	1 016 527
35	50	20	–	–	MSLE35-10511	1 016 542	MSLS35-10521	1 016 535
		70	–	–	MSLE35-10511	1 016 542	MSLS35-10511	1 016 528

Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at www.sick.com

General system data

Number of beams (depending on type)	2 ... 35
Beam separation (depending on type)	50 mm ... 500 mm
Protection class	I
Enclosure rating	IP 65
Supply voltage V_S	24 V (19.2 V ... 28.8 V) DC
Type	Type 4 according to EN 50100
Synchronization	Optical, without separate synchronization cable

Receiver unit

Maximum response time	20 ms
Output voltage from ... to	$V_S - 3 \text{ V} \dots V_S$
Maximum output current	500 mA
Maximum power consumption without MSM	<5 W (without load)
Maximum power consumption with MSM	<10 W (without load, without sensors and without muting indicator lamp)
Maximum output current output weak signal	≤100 mA

Sender unit

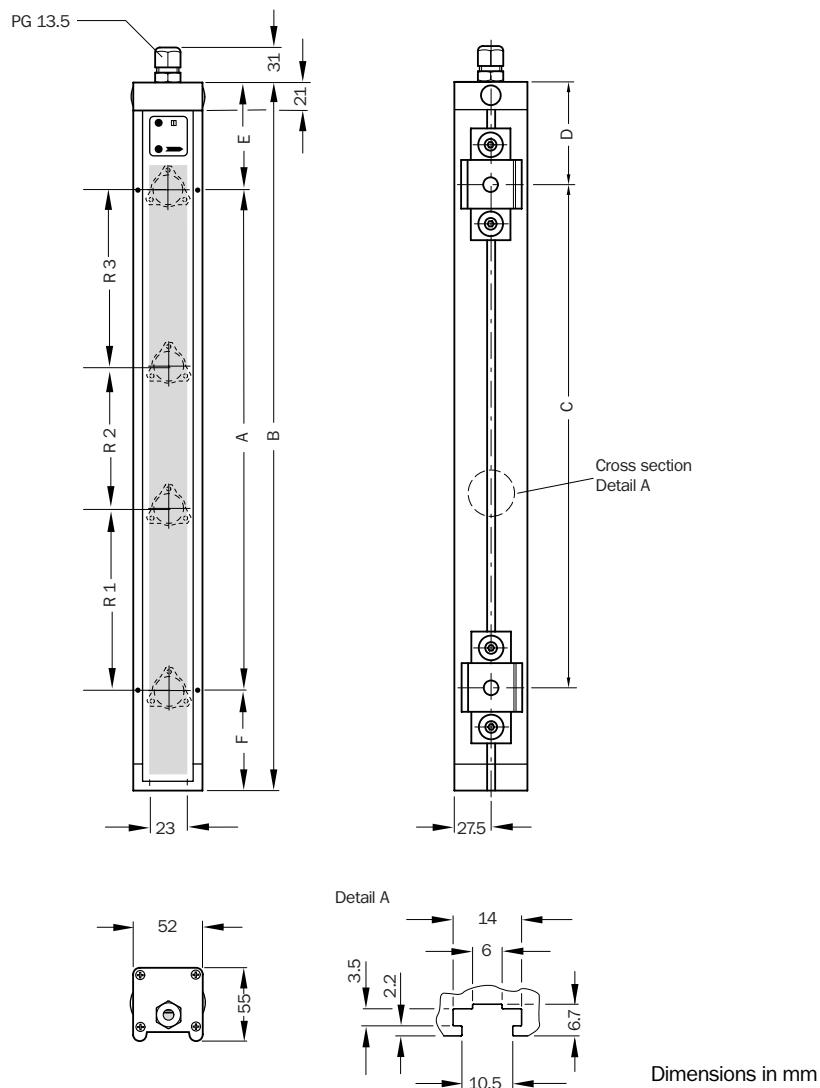
Scanning range (depending on type)	20 m / 70 m
Maximum power consumption	<7 W

Operating data

Maximum cable cross-section with sleeve	1 mm ²
Maximum cable cross-section without sleeve	1.5 mm ²
Ambient operating temperature from ... to	0 °C ... +55 °C
Storage temperature from ... to	-25 °C ... +70 °C
Air humidity from ... to	15 % ... 95 %
Vibration resistance	5 g, 10 Hz ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g according to IEC 60068-2-29

Dimensional drawings

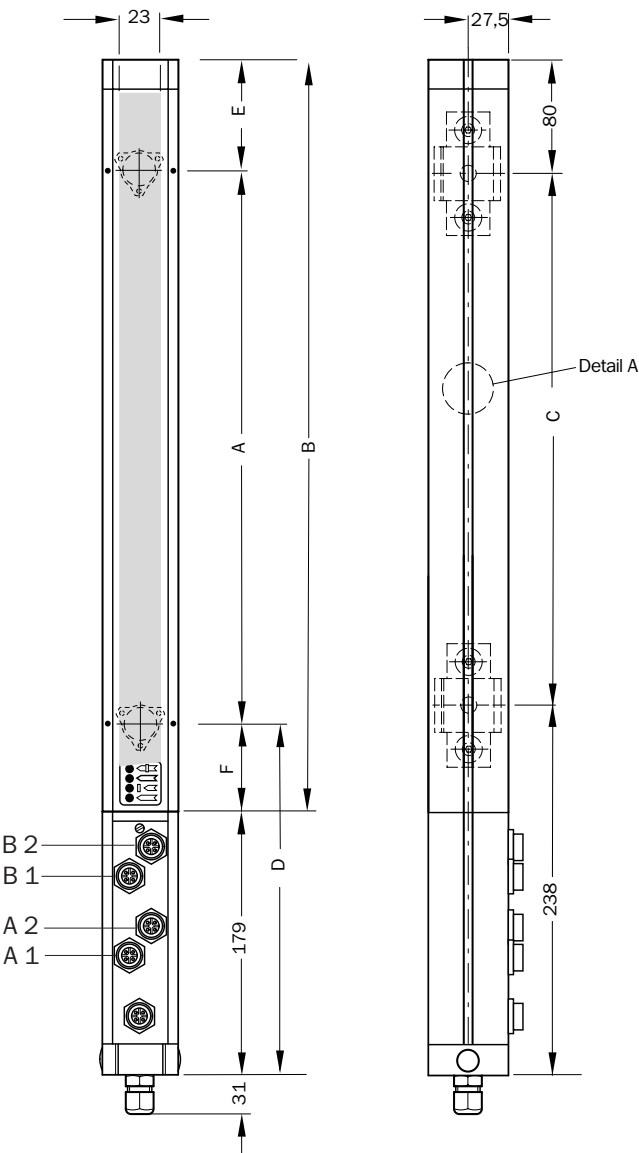
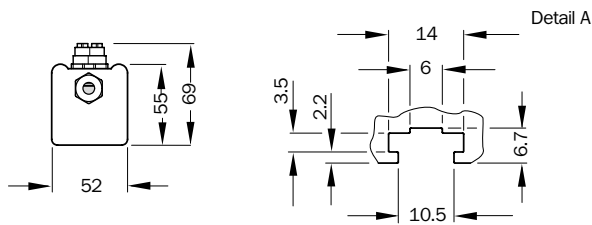
MSL



Type	A	B	C	D	E	F	R 1	R 2	R 3
MSL 02-150	500	684	524	80	107	77	500	—	—
MSL 03-122	440	597	437	80	107	50	220	—	—
MSL 03-140	800	985	825	80	107	78	400	—	—
MSL 20-107	1330	1585	1425	80	107	148	70	—	—
MSL 23-107	1540	1736	1576	80	107	89	70	—	—
MSL 14-105	650	835	675	80	107	78	50	—	—
MSL 17-105	800	985	825	80	107	78	50	—	—
MSL 20-105	950	1135	975	80	107	78	50	—	—
MSL 23-105	1100	1285	1125	80	107	78	50	—	—
MSL 26-105	1250	1435	1275	80	107	78	50	—	—
MSL 29-105	1400	1586	1426	80	107	79	50	—	—
MSL 32-105	1550	1736	1576	80	107	79	50	—	—
MSL 35-105	1700	1886	1726	80	107	79	50	—	—

Dimensions in mm

MSL with MSM muting expansion module



Dimensions in mm

Type	A	B	C	D	E	F
MSL 02-x50	500	663	524	265	77	86
MSL 03-x22	440	576	437	265	50	86
MSL 03-x40	800	964	825	265	78	86

Dimensions in mm

Connection diagrams

→ You can find connection diagrams at www.sick.com

Accessories

Mounting systems

Description	Type of fastening	Packing unit	Part number
Mounting kit 1	Rigid	4	7 021 352
Mounting kit 2	Adjustable	4	2 017 751
Mounting kit 3	Adjustable, vibration-absorbing	4	2 017 752

Sliding nuts/sliding blocks

Description	Packing unit	Remark	Part number
Sliding block (sliding nut)	4	Supplied with delivery	2 017 550
	1	–	5 305 719

Plug-in terminal chambers

Description	Number of poles	For system part	Direction of the cable outlet on the plug	Enclosure rating	Remark	Part number
Harting terminal chamber	8	Receiver	Straight	IP 65	–	2 018 550
			Angled	IP 65	–	2 018 551
		Sender	Straight	IP 65	–	2 018 549
			Angled	IP 65	–	2 019 081
Hirschmann terminal chamber	7	Receiver	Straight	IP 67	Output weak signal not connected	2 018 539
		Sender	Straight	IP 67	–	7 021 354
	12	Receiver	Straight	IP 67	–	2 018 584
Interconnectron terminal chambe	9	Sender	Straight	IP 65	–	2 017 536
	12	Receiver	Straight	IP 65	–	2 017 537
			Angled	IP 65	–	2 017 755

Cable sockets

Description	Enclosure rating	Connection type	Direction of the cable outlet on the plug	Cable diameter	Part number
Harting cable socket M26 x 8	IP 65	Crimped	Straight	11 mm ... 15 mm	6 011 105
				15 mm ... 20.5 mm	6 011 058
Hirschmann cable socket M26 x 7	IP 65	Crimped	Straight	–	6 006 612
			Angled	–	6 006 613
Hirschmann cable socket M26 x 11 + FE	IP 65	Crimp contacts	Straight	–	6 020 757
			Angled	–	6 020 758
Interconnectron cable socket M26 x 9	IP 65	Crimped	Straight	–	6 008 440
Interconnectron cable socket M26 x 12	IP 65	Crimped	Straight	–	6 008 441

Connection cables muting sensor to MSM

Number of poles	Enclosure rating	Type of connection to the muting sensor	Cable length	Remark	Part number
4	IP 65	Cable socket	2 m	Suitable for muting sensor WT 24, WL 24, WT 260	6 008 649
			5 m	Suitable for muting sensor WT 24, WL 24, WT 260	6 008 650
			2 m	Suitable for muting sensor WL 12, WL 14, WL 18, WL 23 and WL 27	6 021 092
			5 m	Suitable for muting sensor WL 12, WL 14, WL 18, WL 23 and WL 27	6 021 093
		Cable connection	2 m	–	6 010 974
			5 m	–	6 010 976
			10 m	–	6 008 652

Angled plug for MSM

Number of poles	Direction of the cable outlet on the plug	Enclosure rating	Part number
4	Angled	IP 65	6 008 651

Muting indicator lamps

Type of muting indicator	Type of connection to the indicator	Cable length	Delivery	Part number
Indicator lamp (bulb)	Cable connection	2 m	Incl. connection cable and mounting kit	2 017 768
		10 m	Incl. connection cable	2 018 504
LED lamp	Cable connection	2 m	Incl. connection cable and mounting kit	2 019 909
		10 m	Incl. connection cable and mounting kit	2 019 910

Muting accessories, miscellaneous

Description	Part number
Exchange bulb, muting indicator lamp	6 008 654
Replacement housing, muting indicator lamp	6 008 645
Protective cap for quick-disconnect socket on MSM	6 011 170

Power supplies

Input voltage from ... to	Output voltage	Maximum output current	Part number
120 V ... 230 V AC	24 V AC	2.5 A	6 010 361
		4 A	6 010 362

Mirror columns ¹⁾

Front cover material	Length	Deflection angle	Beam separation	Part number
Front metal sheet	1121 mm	90°	500 mm	1 015 041
			400 mm	1 015 040

¹⁾ Warning, reduction of the scanning range!

Device columns and muting device columns

Description	Length	Beam separation	Front cover material	Muting	Type of muting indicator	Remark	Part number
Device column	1221 mm	400 mm	Front metal sheet	–	–	Incl. mounting kit	2 018 153
		500 mm	Front metal sheet	–	–	Incl. mounting kit	2 018 154
		–	Front screen ¹⁾	–	–	Incl. mounting kit	2 018 608
	1721 mm	–	Front screen ¹⁾	–	–	Incl. mounting kit	2 018 767
Muting device column	1286 mm	500 mm	Front metal sheet	✓	Indicator lamp (bulb)	Incl. lamps, lamp cable and mounting kit	2 018 741
			Front metal sheet	✓	LED lamp	Incl. lamps, lamp cable and mounting kit	2 022 998
	1521 mm	400 mm	Front metal sheet	✓	–	Incl. mounting kit	2 018 781
	1586 mm	400 mm	Front metal sheet	✓	Indicator lamp (bulb)	Incl. lamps, lamp cable and mounting kit	2 018 729
					LED lamp	Incl. lamps, lamp cable and mounting kit	2 022 995

¹⁾ Warning, reduction of the scanning range!

➔ For dimensional drawings of the device columns and mirror columns please refer to the “Easy Order – MSL and Accessories”.
Download at www.sick.com

Other mirror parts

Description	Height	Remark	Part number
Mirror insert	–	Complete for mounting in mirror column	2 018 537
Adapter plate	3 mm	Suitable for floor mounting of mirror or device column	4 031 053

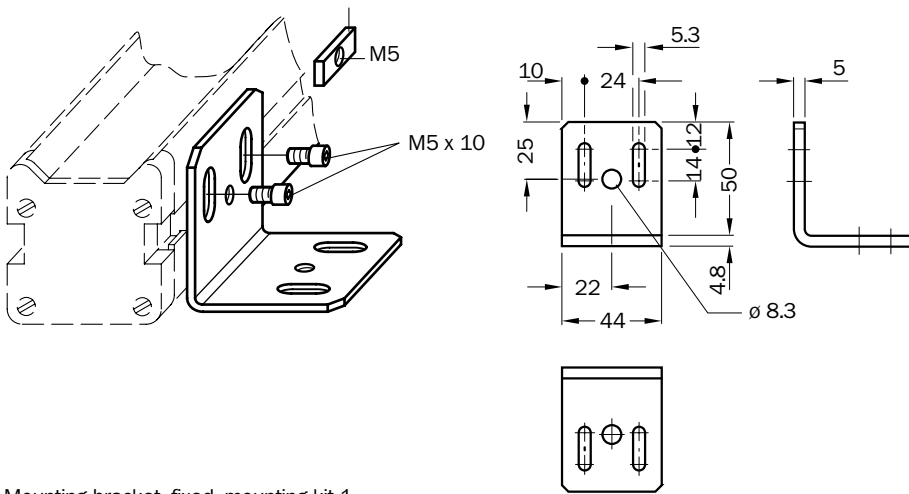
Muting modules

Description	Muting with override	Part number
MSM01-1A	–	1 013 769
MSM02-1A	✓	1 015 699

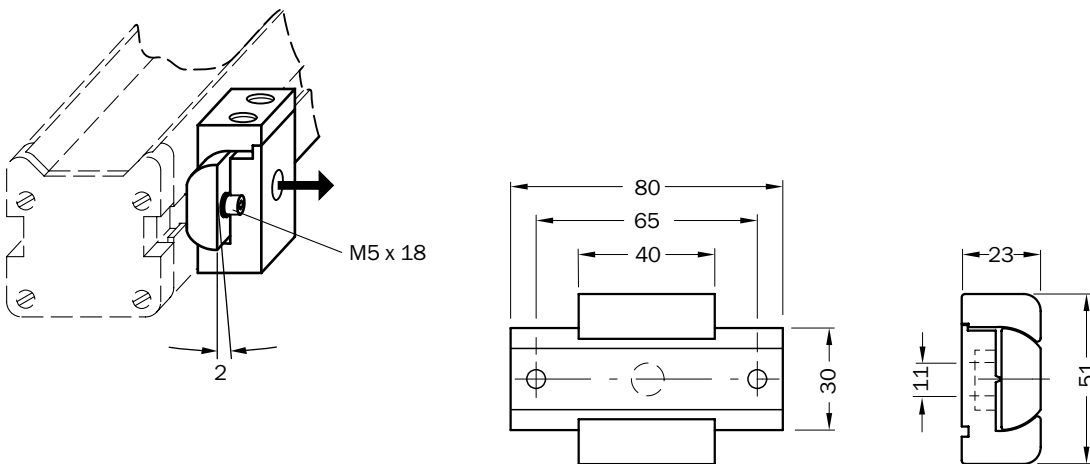
Laser alignment aid

Description	Maximum scanning range	Type of light	Part number
Laser alignment aid AR 60	60 m	Red light	1 015 741
Adapter AR 60 / MSL, click-on	–	–	4 030 282
Adapter AR 60 / MSL, screwable	–	–	2 016 629

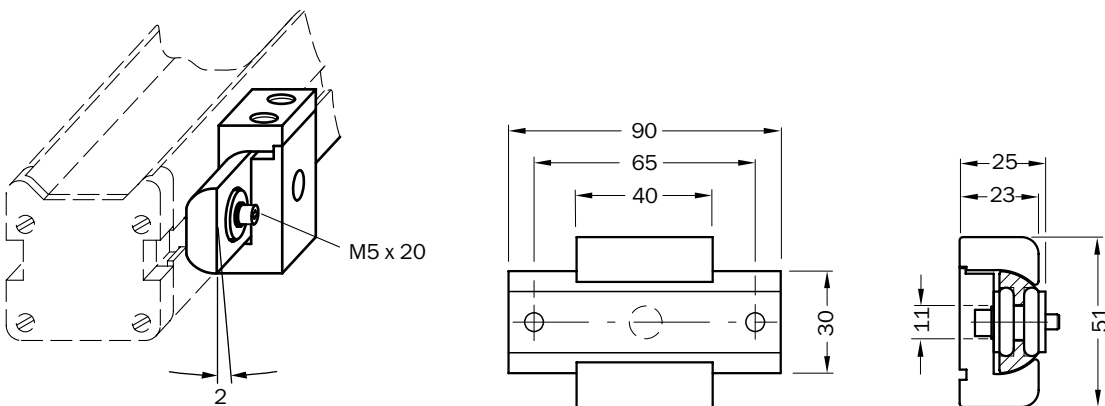
Dimensional drawings mounting accessories



Mounting bracket, fixed, mounting kit 1



Mounting bracket, pivotable, mounting kit 2



Mounting bracket, pivotable, vibration-absorbing, mounting kit 3

Dimensions in mm

Overview of technical specifications

Number of beams (depending on type)	2 ... 12
Scanning range	70 m
Beam separation (depending on type)	120 mm ... 500 mm
Type	Type 4 according to EN 50100
Enclosure rating	IP 65

Product description

MSL multi-beam photoelectric safety switches from SICK are electro-sensitive protective equipment. They are 2-part through beam configurations, consisting of a sender and receiver unit and are suitable for access protection and hazardous area protection. The devices were designed for industrial applications and benefit from the following advantages:

- No mechanically wearing parts
- Stable modular construction
- Simple installation

Special features of the MSL coded version multi-beam photoelectric safety switch are listed below:

- Plug-in terminal chamber with PG screws or different device connectors
- Short response time (20 ms)
- Large signal reserve (factor 2)
- Optical synchronisation of sender and receiver unit
- Multiple protection by means of deflector mirrors and columns
- Operating modes:
 - External device monitoring
 - Restart interlock
 - Beam coding
- Muting as a supplementary module

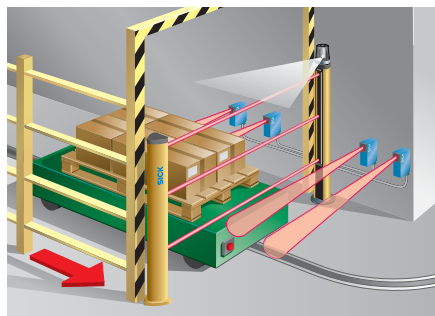
In-system added value

- Combination with SICK interfaces
- Safe integration in bus systems

Applications

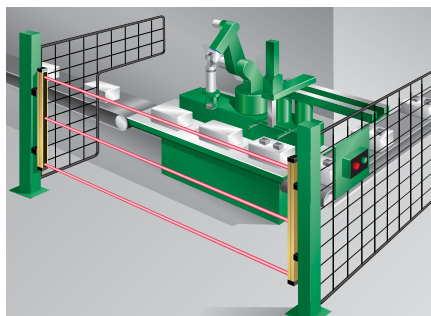
→ You can find more applications using the application finder at www.sick.com

Provides access protection of hazardous areas on machining centres in mechanical engineering applications, robot systems



Access protection with muting on a system with floor transporter

(such as welding lines in the automotive industry) and automated conveying, storage and transport systems



Access protection on a robot machining station



D

- Actively monitored semiconductor outputs
- Restart interlock (RES)
- External device monitoring (EDM)
- Output weak signal
- Modular safety muting (MSM)



Further information	Page
→ Ordering information	D-12
→ Technical specifications	D-13
→ Dimensional drawings	D-14
→ Connection diagrams	D-16
→ Accessories	D-16
→ Services	A-0

Ordering information

→ Accessories see page D-16

Number of beams	Beam separation (mm)	Scanning range (m)	Muting	Muting with override	Receiver unit		Sender unit	
					Type	Part number	Type	Part number
2	500	70	–	–	MSLE02-25011	1 015 620	MSLS02-25071	1 015 619
			✓	–	MSLE02-25051A	1 015 635	MSLS02-25071	1 015 619
3	220	70	–	–	MSLE03-22211	1 015 624	MSLS03-22271	1 015 623
			✓	–	MSLE03-22251A	1 015 637	MSLS03-22271	1 015 623
	400	70	–	–	MSLE03-24011	1 015 618	MSLS03-24071	1 015 617
			✓	–	MSLE03-24051A	1 015 636	MSLS03-24071	1 015 617
4	120	70	–	–	MSLE04-21211	1 015 626	MSLS04-21271	1 015 625
5	220	70	–	–	MSLE05-22211	1 015 622	MSLS05-22271	1 015 621
6	220	70	–	–	MSLE06-22211	1 015 628	MSLS06-22271	1 015 627
7	120	70	–	–	MSLE07-21211	1 015 630	MSLS07-21271	1 015 629
	130	70	–	–	MSLE07-21311	1 015 639	MSLS07-21371	1 015 638
8	120	70	–	–	MSLE08-21211	1 015 632	MSLS08-21271	1 015 631
12	120	70	–	–	MSLE12-21211	1 015 634	MSLS12-21271	1 015 633

Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at www.sick.com

General system data

Number of beams (depending on type)	2 ... 12
Beam separation (depending on type)	120 mm ... 500 mm
Protection class	I
Enclosure rating	IP 65
Supply voltage V_S	24 V (19.2 V ... 28.8 V) DC
Type	Type 4 according to EN 50100
Synchronization	Optical, without separate synchronization cable

Receiver unit

Maximum response time	15 ms
Output voltage from ... to	$V_S - 3 \text{ V} \dots V_S$
Maximum output current	500 mA
Maximum power consumption without MSM	<5 W (without load)
Maximum power consumption with MSM	<10 W (without load, without sensors and without muting indicator lamp)
Maximum output current output weak signal	≤200 mA

Sender unit

Scanning range (depending on type)	70 m
Maximum power consumption	<7 W

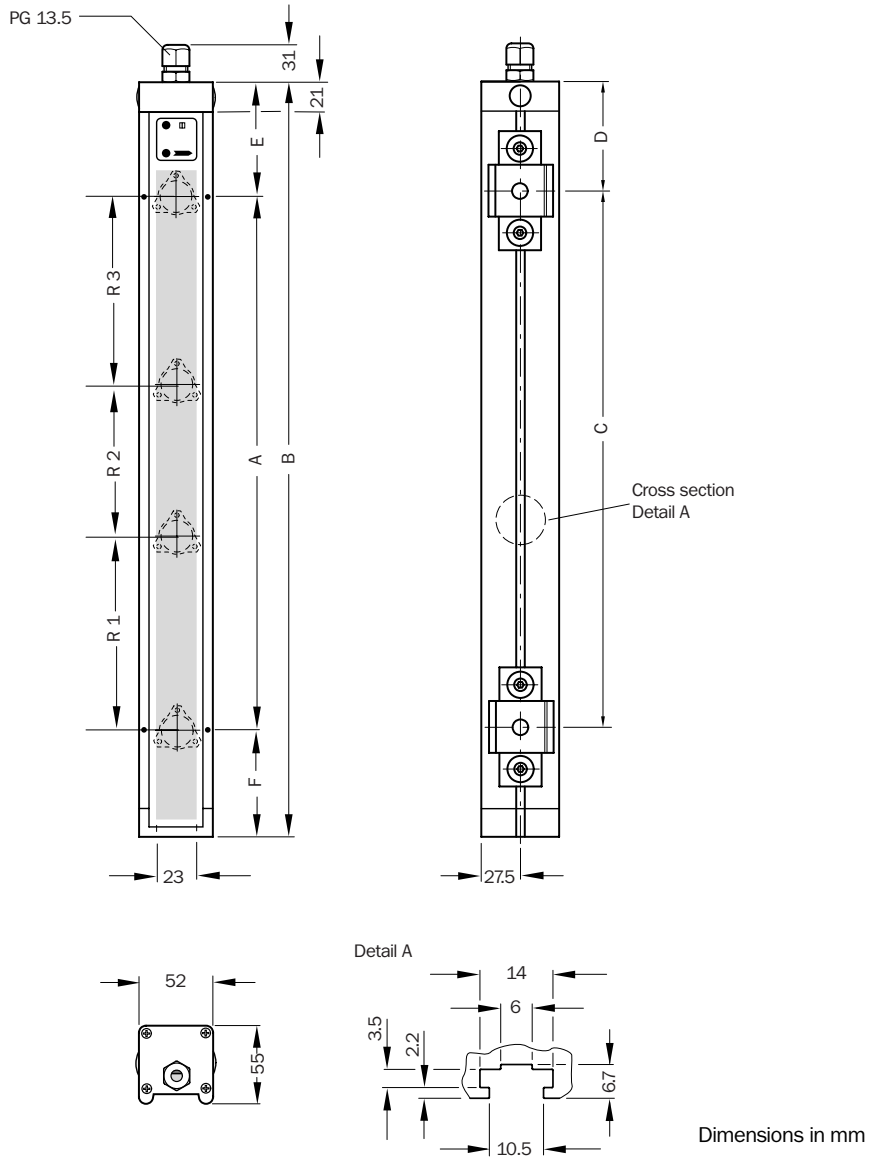
Operating data

Maximum cable cross-section with sleeve	1 mm ²
Maximum cable cross-section without sleeve	1.5 mm ²
Ambient operating temperature from ... to	0 °C ... +55 °C
Storage temperature from ... to	-25 °C ... +70 °C
Air humidity from ... to	15 % ... 95 %
Vibration resistance	5 g, 10 Hz ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g according to IEC 60068-2-29

D

Dimensional drawings

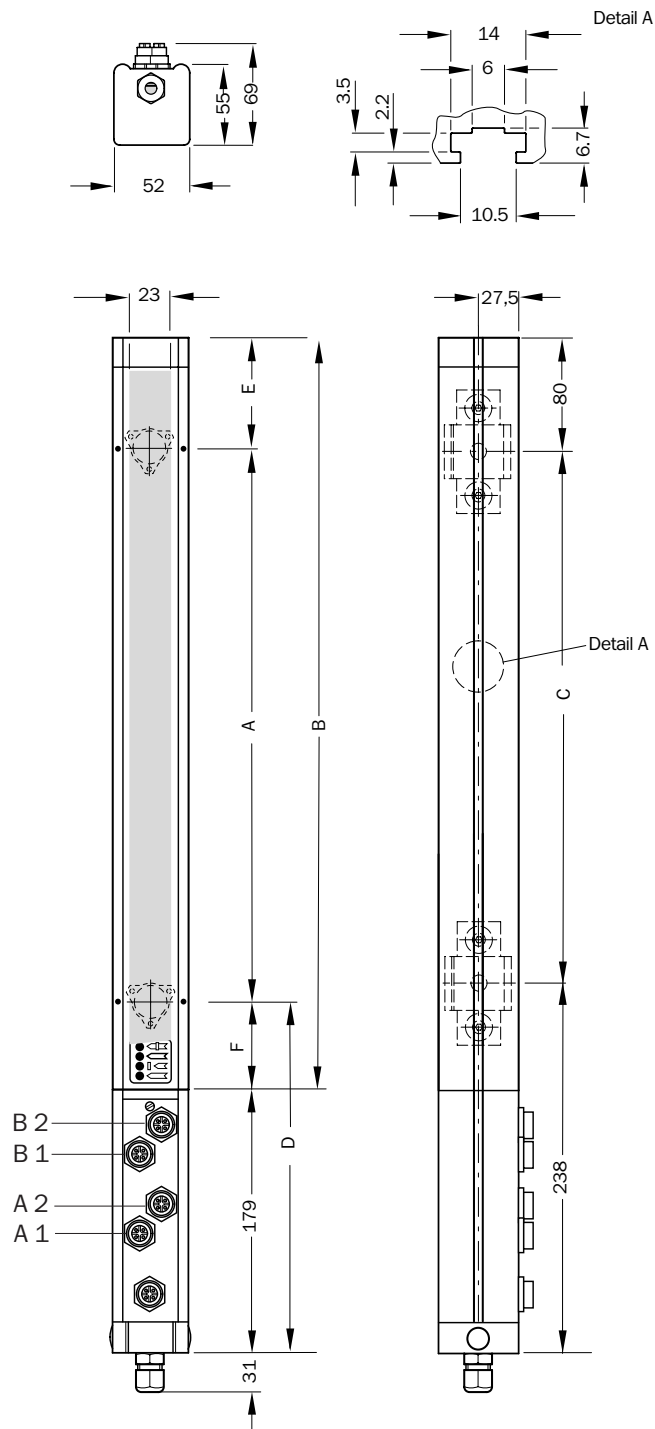
MSL coded version



Type	A	B	C	D	E	F	R 1	R 2	R 3
MSL 02-250	500	684	524	80	107	77	500	—	—
MSL 03-222	440	597	437	80	107	50	220	—	—
MSL 03-240	800	985	825	80	107	78	400	—	—
MSL 04-212	360	534	374	80	107	67	120	—	—
MSL 05-222	880	1041	881	80	107	54	220	—	—
MSL 06-222	1100	1285	1125	80	107	78	220	—	—
MSL 07-212	720	880	720	80	107	53	120	—	—
MSL 07-213	780	985	825	80	107	98	130	—	—
MSL 08-212	840	1041	881	80	107	94	120	—	—
MSL 12-212	1320	1486	1326	80	107	59	120	—	—

Dimensions in mm

MSL coded version with MSM muting expansion module



Dimensions in mm

Type	A	B	C	D	E	F
MSL 02-x50	500	663	524	265	77	86
MSL 03-x22	440	576	437	265	50	86
MSL 03-x40	800	964	825	265	78	86

Dimensions in mm

Connection diagrams

→ You can find connection diagrams at www.sick.com

Accessories

Mounting systems

Description	Type of fastening	Packing unit	Part number
Mounting kit 1	Rigid	4	7 021 352
Mounting kit 2	Adjustable	4	2 017 751
Mounting kit 3	Adjustable, vibration-absorbing	4	2 017 752

Sliding nuts/sliding blocks

Description	Packing unit	Remark	Part number
Sliding block (sliding nut)	4	Supplied with delivery	2 017 550
	1	–	5 305 719

Plug-in terminal chambers

Description	Number of poles	For system part	Direction of the cable outlet on the plug	Enclosure rating	Remark	Part number
Harting terminal chamber	8	Receiver	Straight	IP 65	–	2 018 550
			Angled	IP 65	–	2 018 551
		Sender	Straight	IP 65	–	2 018 549
			Angled	IP 65	–	2 019 081
Hirschmann terminal chamber	7	Receiver	Straight	IP 67	Output weak signal not connected	2 018 539
		Sender	Straight	IP 67	–	7 021 354
	12	Receiver	Straight	IP 67	–	2 018 584
Interconnectron terminal chamber	9	Sender	Straight	IP 65	–	2 017 536
	12	Receiver	Straight	IP 65	–	2 017 537
			Angled	IP 65	–	2 017 755

Cable sockets

Description	Enclosure rating	Connection type	Direction of the cable outlet on the plug	Cable diameter	Part number
Harting cable socket M26 x 8	IP 65	Crimped	Straight	11 mm ... 15 mm	6 011 105
				15 mm ... 20.5 mm	6 011 058
Hirschmann cable socket M26 x 7	IP 65	Crimped	Straight	–	6 006 612
			Angled	–	6 006 613
Hirschmann cable socket M26 x 11 + FE	IP 65	Crimp contacts	Straight	–	6 020 757
			Angled	–	6 020 758
Interconnectron cable socket M26 x 9	IP 65	Crimped	Straight	–	6 008 440
Interconnectron cable socket M26 x 12	IP 65	Crimped	Straight	–	6 008 441

Connection cables muting sensor to MSM

Number of poles	Enclosure rating	Type of connection to the muting sensor	Cable length	Remark	Part number
4	IP 65	Cable socket	2 m	Suitable for muting sensor WT 24, WL 24, WT 260	6 008 649
			5 m	Suitable for muting sensor WT 24, WL 24, WT 260	6 008 650
			2 m	Suitable for muting sensor WL 12, WL 14, WL 18, WL 23 and WL 27	6 021 092
			5 m	Suitable for muting sensor WL 12, WL 14, WL 18, WL 23 and WL 27	6 021 093
		Cable connection	2 m	–	6 010 974
			5 m	–	6 010 976
			10 m	–	6 008 652

Angled plug for MSM

Number of poles	Direction of the cable outlet on the plug	Enclosure rating	Part number
4	Angled	IP 65	6 008 651

Muting indicator lamps

Type of muting indicator	Type of connection to the indicator	Cable length	Delivery	Part number
Indicator lamp (bulb)	Cable connection	2 m	Incl. connection cable and mounting kit	2 017 768
		10 m	Incl. connection cable	2 018 504
LED lamp	Cable connection	2 m	Incl. connection cable and mounting kit	2 019 909
		10 m	Incl. connection cable and mounting kit	2 019 910

Muting accessories, miscellaneous

Description	Part number
Exchange bulb, muting indicator lamp	6 008 654
Replacement housing, muting indicator lamp	6 008 645
Protective cap for quick-disconnect socket on MSM	6 011 170

Power supplies

Input voltage from ... to	Output voltage	Maximum output current	Part number
120 V ... 230 V AC	24 V AC	2.5 A	6 010 361
		4 A	6 010 362

Mirror columns ¹⁾

Front cover material	Length	Deflection angle	Beam separation	Part number
Front metal sheet	1121 mm	90°	500 mm	1 015 041
			400 mm	1 015 040

¹⁾ Warning, reduction of the scanning range!

Continued on next page

Device columns and muting device columns

Description	Length	Beam separation	Front cover material	Muting	Type of muting indicator	Remark	Part number
Device column	1221 mm	400 mm	Front metal sheet	–	–	Incl. mounting kit	2 018 153
		500 mm	Front metal sheet	–	–	Incl. mounting kit	2 018 154
		–	Front screen ¹⁾	–	–	Incl. mounting kit	2 018 608
	1721 mm	–	Front screen ¹⁾	–	–	Incl. mounting kit	2 018 767
Muting device column	1286 mm	500 mm	Front metal sheet	✓	Indicator lamp (bulb)	Incl. lamps, lamp cable and mounting kit	2 018 741
			Front metal sheet	✓	LED lamp	Incl. lamps, lamp cable and mounting kit	2 022 998
	1521 mm	400 mm	Front metal sheet	✓	–	Incl. mounting kit	2 018 781
	1586 mm	400 mm	Front metal sheet	✓	Indicator lamp (bulb)	Incl. lamps, lamp cable and mounting kit	2 018 729
					LED lamp	Incl. lamps, lamp cable and mounting kit	2 022 995

¹⁾ Warning, reduction of the scanning range!

→ For dimensional drawings of the device columns and mirror columns please refer to the “Easy Order – MSL and Accessories”.
Download at www.sick.com

Other mirror parts

Description	Height	Remark	Part number
Mirror insert	–	Complete for mounting in mirror column	2 018 537
Adapter plate	3 mm	Suitable for floor mounting of mirror or device column	4 031 053

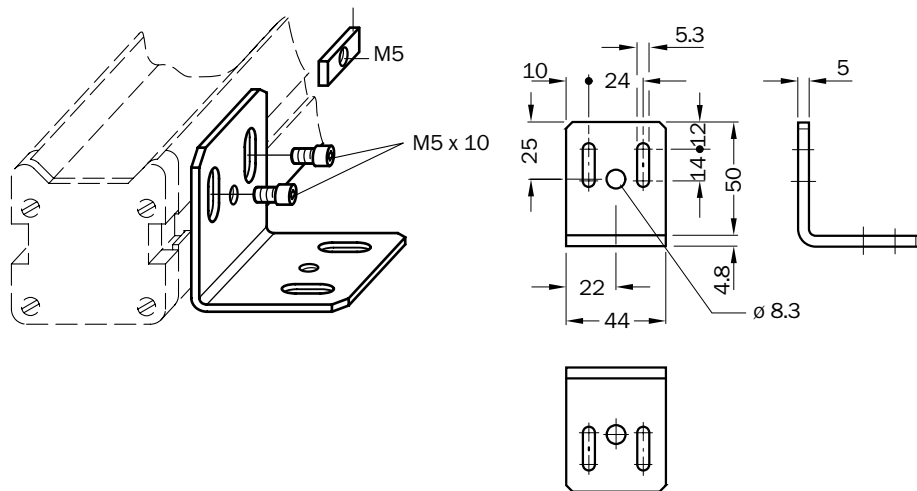
Muting module

Description	Muting with override	Part number
MSM01-1A	–	1 013 769

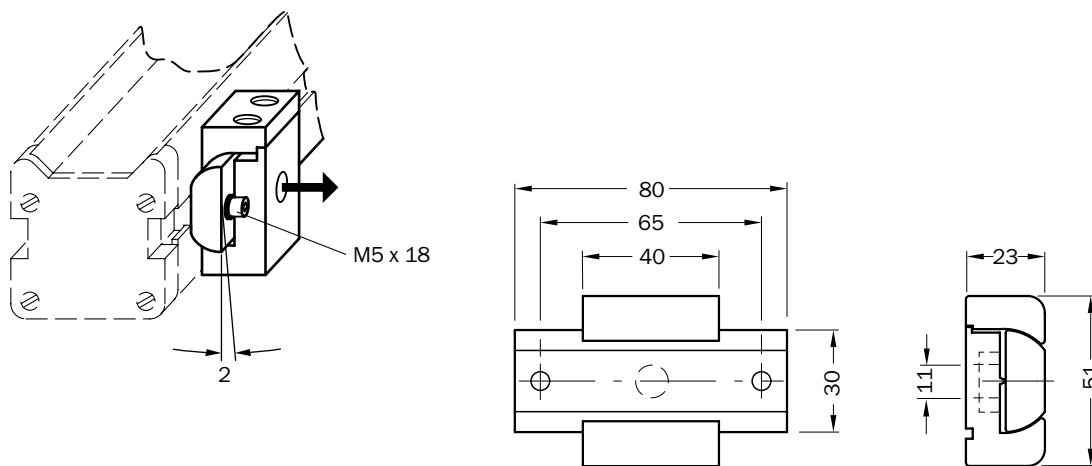
Laser alignment aid

Description	Maximum scanning range	Type of light	Part number
Laser alignment aid AR 60	60 m	Red light	1 015 741
Adapter AR 60 / MSL, click-on	–	–	4 030 282
Adapter AR 60 / MSL, screwable	–	–	2 016 629

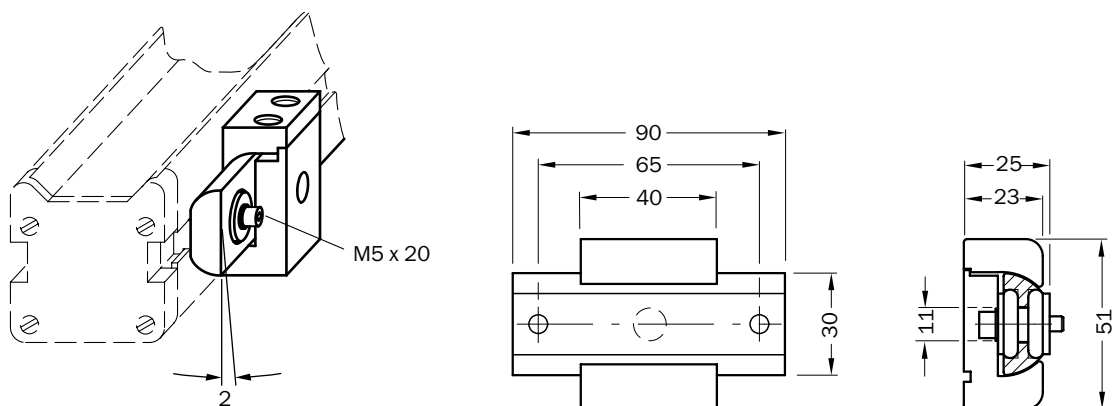
Dimensional drawings mounting accessories



Mounting bracket, fixed, mounting kit 1



Mounting bracket, pivotable, mounting kit 2



Mounting bracket, pivotable, vibration-absorbing, mounting kit 3

Dimensions in mm



- Actively monitored semiconductor outputs
- Integral evaluation circuit
- Only one active side, so less wiring
- Modular safety muting (MSM)



Further information	Page
→ Dimensional drawings	D-22
→ Connection diagrams	D-24
→ Accessories	D-24
→ Services	A-0

Overview of technical specifications

Number of beams (depending on type)	1 / 2
Scanning range	Max. 7.5 m
Beam separation (depending on type)	500 mm / 400-170-400 mm
Type	Type 4 according to EN 50100
Enclosure rating	IP 65

Product description

The MSLZ multi-beam photoelectric safety switch comprises a sender/receiver unit on the active side (Z) and one or more deflector mirrors on the passive side. It is suitable for access protection of hazardous areas. The devices were designed for industrial applications and benefit from the following advantages:

- No mechanically wearing parts
- Stable modular construction
- Simple installation

Special features of the MSLZ multi-beam photoelectric safety switch are listed below:

- Plug-in terminal chamber with PG screws or different device connectors
- Short response time (20 ms)
- Large signal reserve (factor 2)
- Only one active side, simpler wiring
- Operating modes:
 - External device monitoring
 - Restart interlock
- Muting as a supplementary module

In-system added value

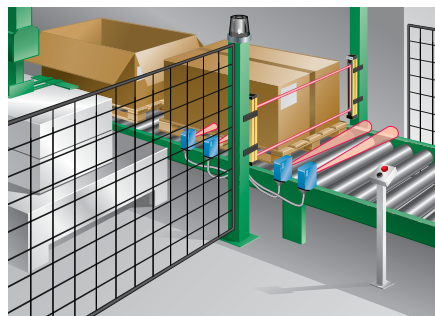
- Combination with SICK interfaces
- Safe integration in bus systems

Applications

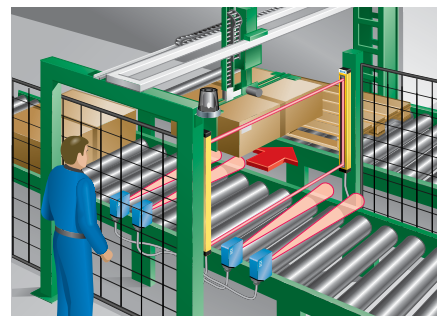
→ You can find more applications using the application finder at www.sick.com

Provides access protection of hazardous areas on machining centres in mechanical engineering applications, robot systems

(such as welding lines in the automotive industry) and automated conveying, storage and transport systems



Access protection with muting on a packaging machine



Access protection with muting on a transfer station

Ordering information

→ Accessories see page D-24

Number of beams	Beam separation (mm)	Scanning range (m)	Muting	Muting with override	Sender/receiver in one housing		Mirror	
					Type	Part number	Type	Part number
1	500	6.1	✓	–	MSLZ01-15061A	1 015 569	PSZ01-1501	1 015 693
				✓	MSLZ01-15021A	1 015 803	PSZ01-1501	1 015 693
			–	–	MSLZ01-15031	1 013 771	PSZ01-1501	1 015 693
2	400-170-400	4.5	✓	✓	MSLZ02-10321A	1 019 177	PSZ02-1011S01	1 019 225
			–	–	MSLZ02-10331	1 019 176	PSZ02-1011S01	1 019 225

D

Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at www.sick.com

General system data

Number of beams (depending on type)	1 / 2
Beam separation (depending on type)	500 mm / 400-170-400 mm
Protection class	I
Enclosure rating	IP 65
Supply voltage V_S	24 V (19.2 V ... 28.8 V) DC
Type	Type 4 according to EN 50100
Synchronization	Optical, without separate synchronization cable

Sender/receiver in one housing

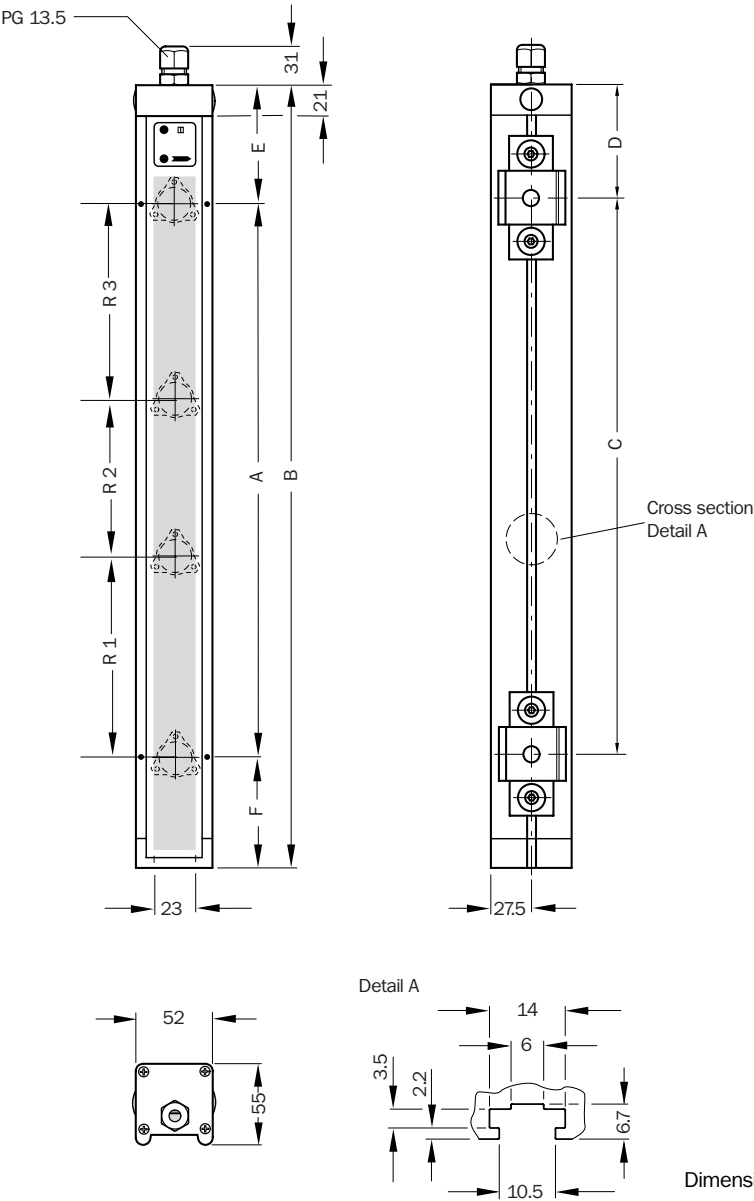
Maximum response time	20 ms
Output voltage from ... to	$V_S - 3 \text{ V} \dots V_S$
Maximum output current	500 mA
Maximum power consumption without MSM	<12 W (without load)
Maximum power consumption with MSM	<17 W (without load, without sensors and without muting indicator lamp)
Maximum output current output weak signal	≤100 mA

Operating data

Maximum cable cross-section with sleeve	1 mm²
Maximum cable cross-section without sleeve	1.5 mm²
Ambient operating temperature from ... to	0 °C ... +55 °C
Storage temperature from ... to	–25 °C ... +70 °C
Air humidity from ... to	15 % ... 95 %
Vibration resistance	5 g, 10 Hz ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g according to IEC 60068-2-29

Dimensional drawings

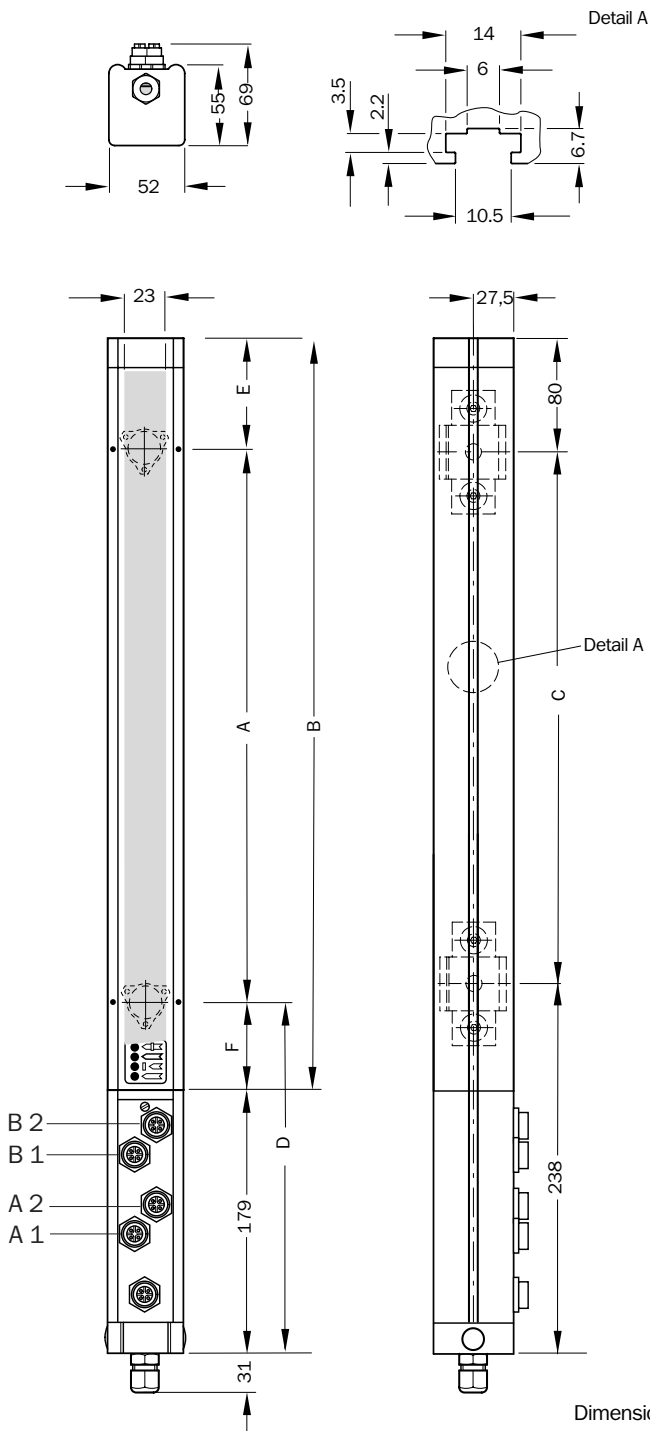
MSLZ



Type	A	B	C	D	E	F	R 1	R 2	R 3
MSLZ 01-150	500	684	524	80	97	87	500	—	—
MSLZ 02-103	970	1285	1125	80	107	208	400	170	400

Dimensions in mm

MSLZ with MSM muting expansion module



Dimensions in mm

Type	A	B	C	D	E	F
MSLZ 01-x50	500	663	524	255	87	76

Dimensions in mm

Connection diagrams

→ You can find connection diagrams at www.sick.com

Accessories

Mounting systems

Description	Type of fastening	Packing unit	Part number
Mounting kit 1	Rigid	4	7 021 352
Mounting kit 2	Adjustable	4	2 017 751
Mounting kit 3	Adjustable, vibration-absorbing	4	2 017 752

Sliding nuts/sliding blocks

Description	Packing unit	Remark	Part number
Sliding block (sliding nut)	4	Supplied with delivery	2 017 550
	1	–	5 305 719

Plug-in terminal chambers

Description	Number of poles	Direction of the cable outlet on the plug	Enclosure rating	Remark	Part number
Harting terminal chamber	8	Straight	IP 65	–	2 018 550
		Angled	IP 65	–	2 018 551
Hirschmann terminal chamber	7	Straight	IP 67	Output weak signal not connected	2 018 539
	12	Straight	IP 67	–	2 018 584
Interconnectron terminal chamber	12	Straight	IP 65	–	2 017 537
		Angled	IP 65	–	2 017 755

Cable sockets

Description	Enclosure rating	Connection type	Direction of the cable outlet on the plug	Cable diameter	Part number
Harting cable socket M26 x 8	IP 65	Crimped	Straight	11 mm ... 15 mm	6 011 105
				15 mm ... 20.5 mm	6 011 058
Hirschmann cable socket M26 x 7	IP 65	Crimped	Straight	–	6 006 612
			Angled	–	6 006 613
Hirschmann cable socket M26 x 11 + FE	IP 65	Crimp contacts	Straight	–	6 020 757
			Angled	–	6 020 758
Interconnectron cable socket M26 x 12	IP 65	Crimped	Straight	–	6 008 441

Connection cables muting sensor to MSM

Number of poles	Enclosure rating	Type of connection to the muting sensor	Cable length	Remark	Part number
4	IP 65	Cable socket	2 m	Suitable for muting sensor WT 24, WL 24, WT 260	6 008 649
			5 m	Suitable for muting sensor WT 24, WL 24, WT 260	6 008 650
			2 m	Suitable for muting sensor WL 12, WL 14, WL 18, WL 23 and WL 27	6 021 092
			5 m	Suitable for muting sensor WL 12, WL 14, WL 18, WL 23 and WL 27	6 021 093
		Cable connection	2 m	–	6 010 974
			5 m	–	6 010 976
			10 m	–	6 008 652

Angled plug for MSM

Number of poles	Direction of the cable outlet on the plug	Enclosure rating	Part number
4	Angled	IP 65	6 008 651

Muting indicator lamps

Type of muting indicator	Type of connection to the indicator	Cable length	Delivery	Part number
Indicator lamp (bulb)	Cable connection	2 m	Incl. connection cable and mounting kit	2 017 768
		10 m	Incl. connection cable	2 018 504
LED lamp	Cable connection	2 m	Incl. connection cable and mounting kit	2 019 909
		10 m	Incl. connection cable and mounting kit	2 019 910

Muting accessories, miscellaneous

Description	Part number
Exchange bulb, muting indicator lamp	6 008 654
Replacement housing, muting indicator lamp	6 008 645
Protective cap for quick-disconnect socket on MSM	6 011 170

Power supplies

Input voltage from ... to	Output voltage	Maximum output current	Part number
120 V ... 230 V AC	24 V AC	2.5 A	6 010 361
		4 A	6 010 362

Mirror column ¹⁾

Front cover material	Length	Deflection angle	Beam separation	Part number
Front metal sheet	1121 mm	90°	500 mm	1 015 042

¹⁾ Warning, reduction of the scanning range!

Continued on next page

Device columns and muting device columns

Description	Length	Beam separation	Front cover material	Muting	Type of muting indicator	Remark	Part number
Device column	1221 mm	500 mm	Front metal sheet	–	–	Incl. mounting kit	2 018 154
		–	Front screen ¹⁾	–	–	Incl. mounting kit	2 018 608
	1721 mm	–	Front screen ¹⁾	–	–	Incl. mounting kit	2 018 767
Muting device column	1286 mm	500 mm	Front metal sheet	✓	LED lamp	Incl. lamps, lamp cable and mounting kit	2 022 998
	1586 mm	400 mm	Front metal sheet	✓	Indicator lamp (bulb)	Incl. lamps, lamp cable and mounting kit	2 018 741

¹⁾ Warning, reduction of the scanning range!

→ For dimensional drawings of the device columns and mirror columns please refer to the “Easy Order – MSL and Accessories”.
Download at www.sick.com

Deflector mirror

Description	Scanning range	Remark	Part number
PSK45	7.5 m (with MSLZ01-150) 4.5 m (with MSLZ02-103)	Incl. mounting set, not suitable for column mounting	5 306 053

Other mirror parts

Description	Height	Remark	Part number
Mirror insert	–	Complete for mounting in mirror column	2 018 537
Adapter plate	3 mm	Suitable for floor mounting of mirror or device column	4 031 053

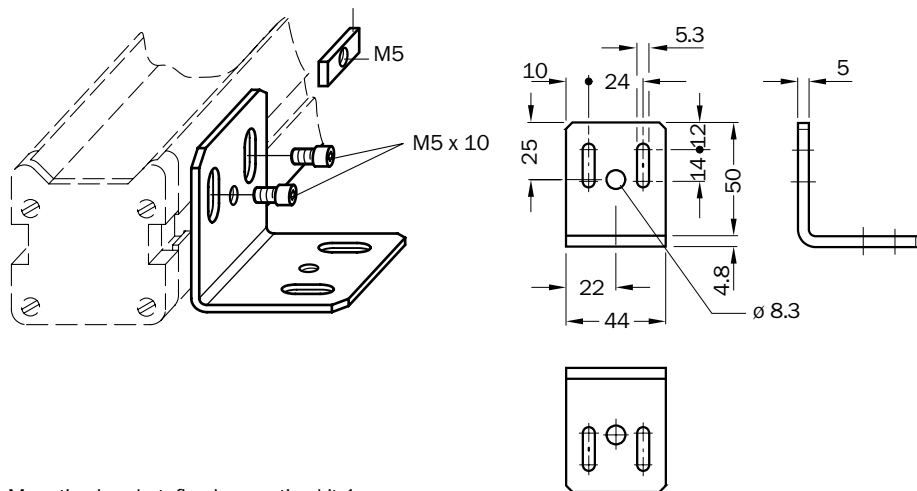
Muting modules

Description	Muting with override	Part number
MSM01-1A	–	1 013 769
MSM02-1A	✓	1 015 699

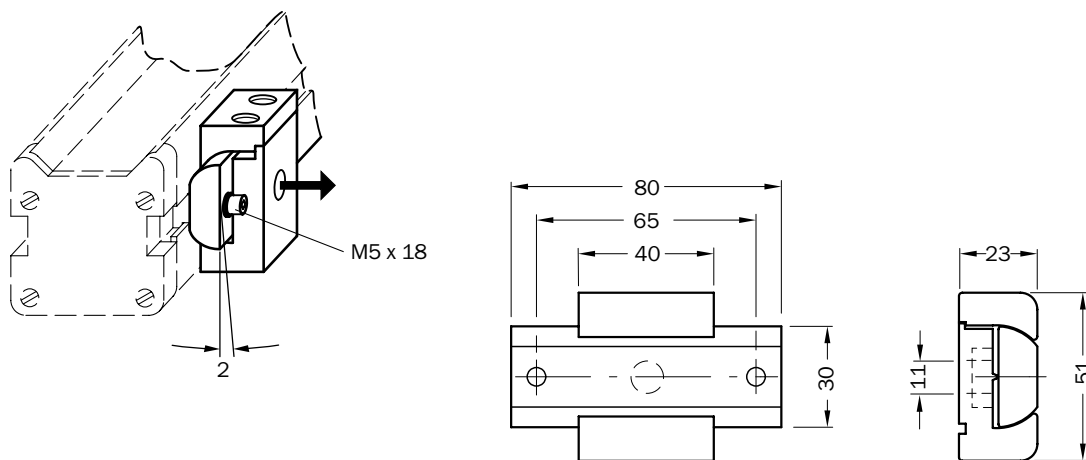
Laser alignment aid

Description	Maximum scanning range	Type of light	Part number
Laser alignment aid AR 60	60 m	Red light	1 015 741
Adapter AR 60 / MSL, click-on	–	–	4 030 282
Adapter AR 60 / MSL, screwable	–	–	2 016 629

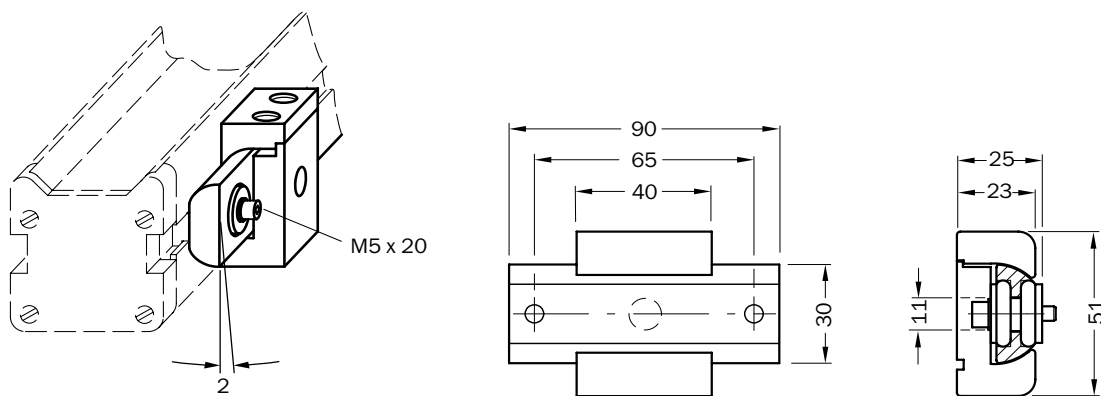
Dimensional drawings mounting accessories



Mounting bracket, fixed, mounting kit 1



Mounting bracket, pivotable, mounting kit 2



Mounting bracket, pivotable, vibration-absorbing, mounting kit 3

Dimensions in mm



- Actively monitored semiconductor outputs
- Integral evaluation circuit
- Only one active side, so less wiring
- Modular safety muting (MSM)



Overview of technical specifications

Number of beams (depending on type)	1 / 2
Scanning range	Max. 7.5 m
Beam separation (depending on type)	500 mm / 400-170-400 mm
Type	Type 4 according to EN 50100
Enclosure rating	IP 65

Product description

The MSLZ coded version multi-beam photoelectric safety switch comprises a sender/receiver unit on the active side (Z) and one or more deflector mirrors on the passive side. It is suitable for access protection of hazardous areas. The devices were designed for industrial applications and benefit from the following advantages:

- No mechanically wearing parts
- Stable modular construction
- Simple installation

Special features of the MSLZ coded version multi-beam photoelectric safety switch are listed below:

- Plug-in terminal chamber with PG screws or different device connectors
- Short response time (20 ms)
- Large signal reserve (factor 2)
- Only one active side, simpler wiring
- Operating modes:
 - External device monitoring
 - Restart interlock
 - Beam coding
- Muting as a supplementary module

In-system added value

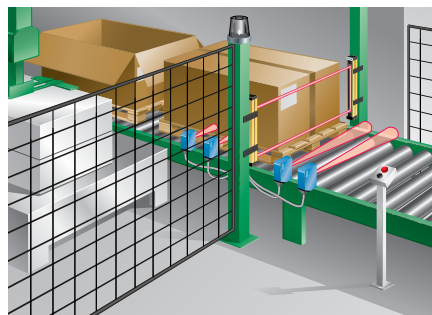
- Combination with SICK interfaces
- Safe integration in bus systems

Applications

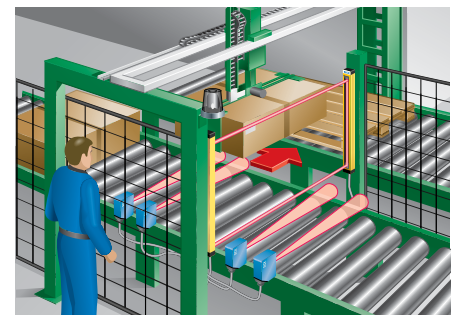
→ You can find more applications using the application finder at www.sick.com

Provides access protection of hazardous areas on machining centres in mechanical engineering applications, robot systems

(such as welding lines in the automotive industry) and automated conveying, storage and transport systems



Access protection with muting on a packaging machine



Access protection with muting on a transfer station

Further information	Page
→ Dimensional drawings	D-30
→ Connection diagrams	D-32
→ Accessories	D-32
→ Services	A-0

Ordering information

→ Accessories see page D-32

Number of beams	Beam separation (mm)	Scanning range (m)	Muting	Muting with override	Sender/receiver in one housing		Mirror	
					Type	Part number	Type	Part number
1	500	6.1	–	–	MSLZ01-25031	1 015 670	PSZ01-1501	1 015 693
			✓	–	MSLZ01-25061A	1 015 671	PSZ01-1501	1 015 693
2	400-170-400	4.5	–	–	MSLZ02-20331	1 016 264	PSZ02-1011S01	1 019 225

D

Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at www.sick.com

General system data

Number of beams (depending on type)	1 / 2
Beam separation (depending on type)	500 mm / 400-170-400 mm
Protection class	I
Enclosure rating	IP 65
Supply voltage V_S	24 V (19.2 V ... 28.8 V) DC
Type	Type 4 according to EN 50100
Synchronization	Optical, without separate synchronization cable

Sender/receiver in one housing

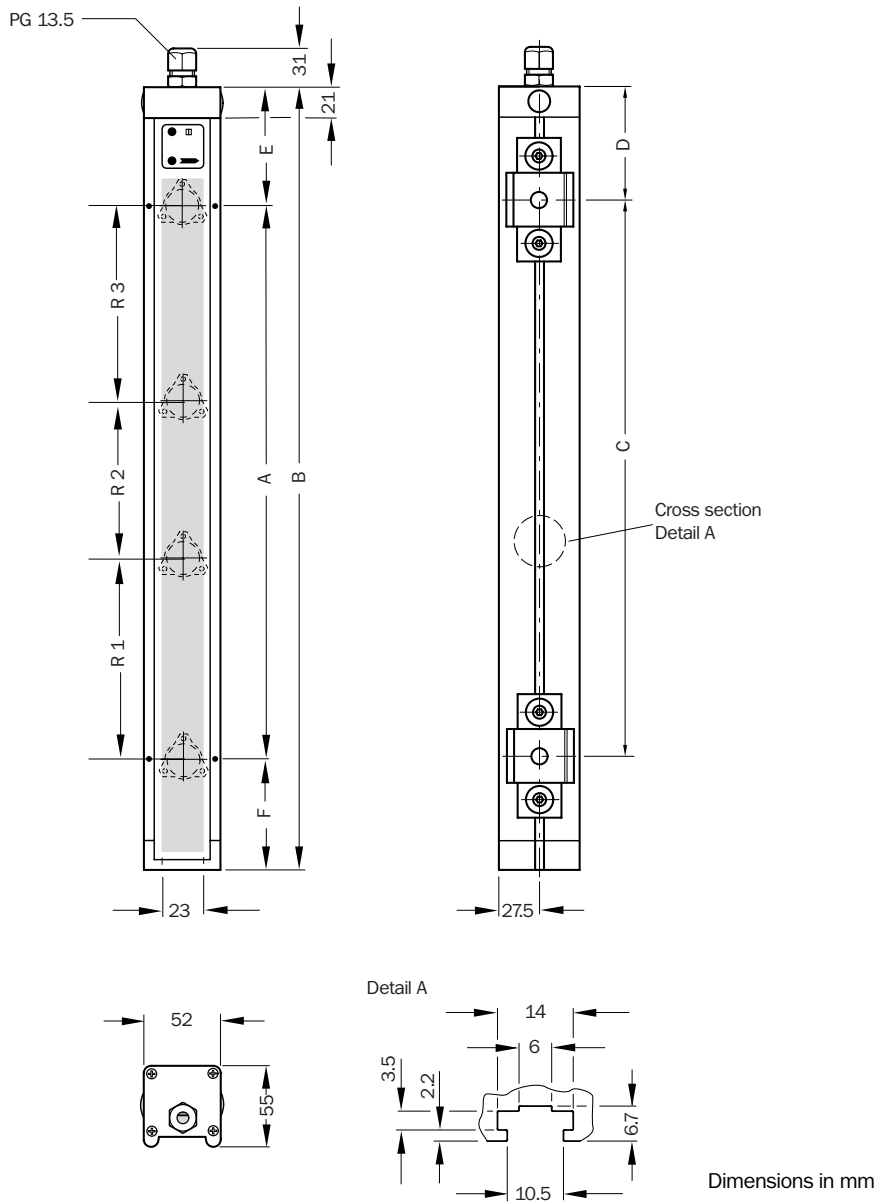
Maximum response time	15 ms
Output voltage from ... to	$V_S - 3 \text{ V} \dots V_S$
Maximum output current	500 mA
Maximum power consumption without MSM	<12 W (without load)
Maximum power consumption with MSM	<17 W (without load, without sensors and without muting indicator lamp)
Maximum output current output weak signal	≤200 mA

Operating data

Maximum cable cross-section with sleeve	1 mm²
Maximum cable cross-section without sleeve	1.5 mm²
Ambient operating temperature from ... to	0 °C ... +55 °C
Storage temperature from ... to	–25 °C ... +70 °C
Air humidity from ... to	15 % ... 95 %
Vibration resistance	5 g, 10 Hz ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g according to IEC 60068-2-29

Dimensional drawings

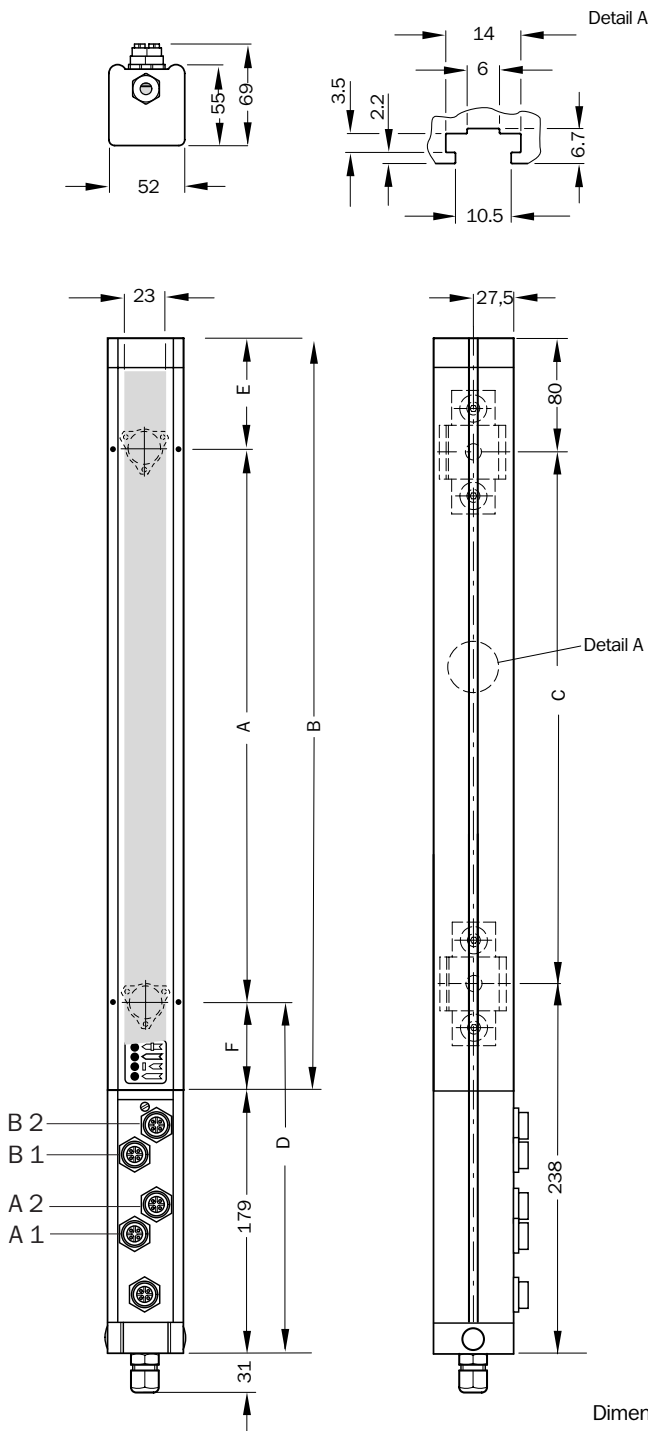
MSLZ coded version



Type	A	B	C	D	E	F	R 1	R 2	R 3
MSLZ 01-250	500	684	524	80	97	87	500	–	–
MSLZ 02-203	970	1285	1125	80	107	208	400	170	400

Dimensions in mm

MSLZ with MSM muting expansion module



Dimensions in mm

Type	A	B	C	D	E	F
MSLZ 01-x50	500	663	524	255	87	76

Dimensions in mm

Connection diagrams

→ You can find connection diagrams at www.sick.com

Accessories

Mounting systems

Description	Type of fastening	Packing unit	Part number
Mounting kit 1	Rigid	4	7 021 352
Mounting kit 2	Adjustable	4	2 017 751
Mounting kit 3	Adjustable, vibration-absorbing	4	2 017 752

Sliding nuts/sliding blocks

Description	Packing unit	Remark	Part number
Sliding block (sliding nut)	4	Supplied with delivery	2 017 550
	1	–	5 305 719

Plug-in terminal chambers

Description	Number of poles	Direction of the cable outlet on the plug	Enclosure rating	Remark	Part number
Harting terminal chamber	8	Straight	IP 65	–	2 018 550
		Angled	IP 65	–	2 018 551
Hirschmann terminal chamber	7	Straight	IP 67	Output weak signal not connected	2 018 539
	12	Straight	IP 67	–	2 018 584
Interconnectron terminal chamber	12	Straight	IP 65	–	2 017 537
		Angled	IP 65	–	2 017 755

Cable sockets

Description	Enclosure rating	Connection type	Direction of the cable outlet on the plug	Cable diameter	Part number
Harting cable socket M26 x 8	IP 65	Crimped	Straight	11 mm ... 15 mm	6 011 105
				15 mm ... 20.5 mm	6 011 058
Hirschmann cable socket M26 x 7	IP 65	Crimped	Straight	–	6 006 612
			Angled	–	6 006 613
Hirschmann cable socket M26 x 11 + FE	IP 65	Crimp contacts	Straight	–	6 020 757
			Angled	–	6 020 758
Interconnectron cable socket M26 x 12	IP 65	Crimped	Straight	–	6 008 441

Connection cables muting sensor to MSM

Number of poles	Enclosure rating	Type of connection to the muting sensor	Cable length	Remark	Part number
4	IP 65	Cable socket	2 m	Suitable for muting sensor WT 24, WL 24, WT 260	6 008 649
			5 m	Suitable for muting sensor WT 24, WL 24, WT 260	6 008 650
			2 m	Suitable for muting sensor WL 12, WL 14, WL 18, WL 23 and WL 27	6 021 092
			5 m	Suitable for muting sensor WL 12, WL 14, WL 18, WL 23 and WL 27	6 021 093
		Cable connection	2 m	–	6 010 974
			5 m	–	6 010 976
			10 m	–	6 008 652

Angled plug for MSM

Number of poles	Direction of the cable outlet on the plug	Enclosure rating	Part number
4	Angled	IP 65	6 008 651

Muting indicator lamps

Type of muting indicator	Type of connection to the indicator	Cable length	Delivery	Part number
Indicator lamp (bulb)	Cable connection	2 m	Incl. connection cable and mounting kit	2 017 768
		10 m	Incl. connection cable	2 018 504
LED lamp	Cable connection	2 m	Incl. connection cable and mounting kit	2 019 909
		10 m	Incl. connection cable and mounting kit	2 019 910

Muting accessories, miscellaneous

Description	Part number
Exchange bulb, muting indicator lamp	6 008 654
Replacement housing, muting indicator lamp	6 008 645
Protective cap for quick-disconnect socket on MSM	6 011 170

Power supplies

Input voltage from ... to	Output voltage	Maximum output current	Part number
120 V ... 230 V AC	24 V AC	2.5 A	6 010 361
		4 A	6 010 362

Mirror column ¹⁾

Front cover material	Length	Deflection angle	Beam separation	Part number
Front metal sheet	1121 mm	90°	500 mm	1 015 042

¹⁾ Warning, reduction of the scanning range!

Continued on next page

Device columns and muting device columns

Description	Length	Beam separation	Front cover material	Muting	Type of muting indicator	Remark	Part number
Device column	1221 mm	500 mm	Front metal sheet	–	–	Incl. mounting kit	2 018 154
		–	Front screen ¹⁾	–	–	Incl. mounting kit	2 018 608
	1721 mm	–	Front screen ¹⁾	–	–	Incl. mounting kit	2 018 767
Muting device column	1286 mm	500 mm	Front metal sheet	✓	LED lamp	Incl. lamps, lamp cable and mounting kit	2 022 998
	1586 mm	400 mm	Front metal sheet	✓	Indicator lamp (bulb)	Incl. lamps, lamp cable and mounting kit	2 018 741

¹⁾ Warning, reduction of the scanning range!

→ For dimensional drawings of the device columns and mirror columns please refer to the “Easy Order – MSL and Accessories”.
Download at www.sick.com

Deflector mirror

Description	Scanning range	Remark	Part number
PSK45	7.5 m (with MSLZ01-250) 4.5 m (with MSLZ02-203)	Incl. mounting set, not suitable for column mounting	2 018 537

Other mirror parts

Description	Height	Remark	Part number
Mirror insert	–	Complete for mounting in mirror column	2 018 537
Adapter plate	3 mm	Suitable for floor mounting of mirror or device column	4 031 053

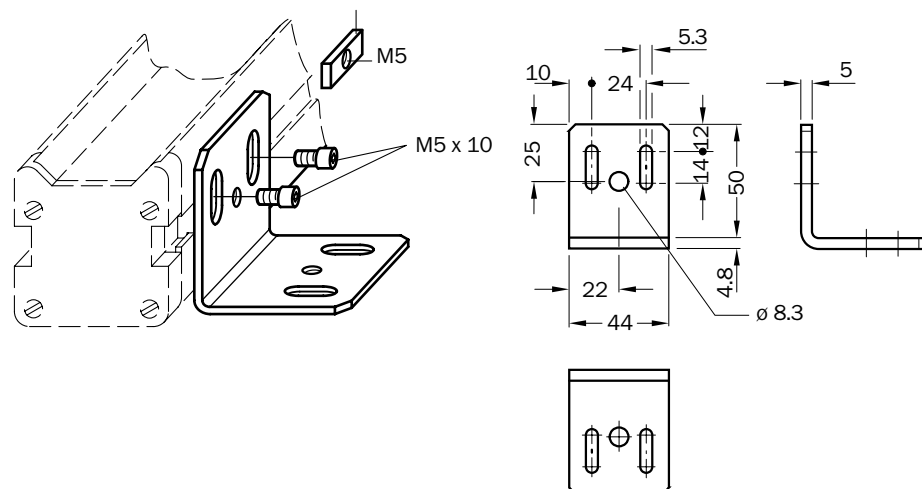
Muting module

Description	Muting with override	Part number
MSM01-1A	–	1 013 769

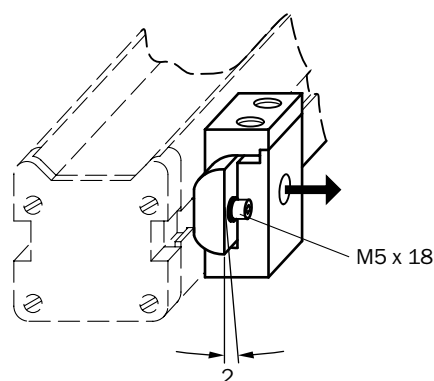
Laser alignment aid

Description	Maximum scanning range	Type of light	Part number
Laser alignment aid AR 60	60 m	Red light	1 015 741
Adapter AR 60/MSL, click-on	–	–	4 030 282
Adapter AR 60/MSL, screwable	–	–	2 016 629

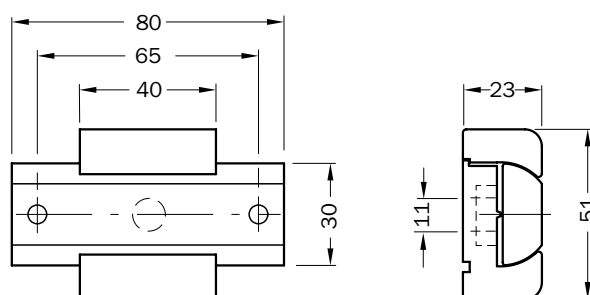
Dimensional drawings mounting accessories



Mounting bracket, fixed, mounting kit 1

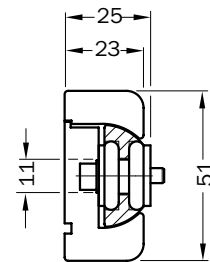
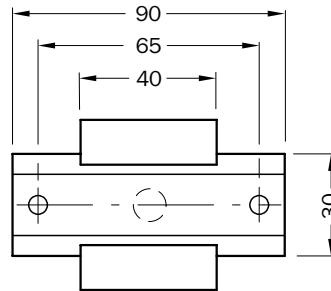
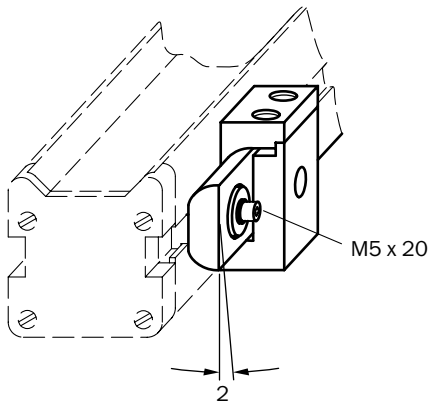


Mounting bracket, pivotable, mounting kit 2



Dimensions in mm

Continued on next page



Mounting bracket, pivotable, vibration-absorbing, mounting kit 3

Dimensions in mm

Overview of technical specifications

Scanning range (depending on type)	0 m ... 25 m / 0 m ... 70 m
Number of beams (depending on type)	2 ... 9
Beam separation or resolution (depending on type)	116 mm / 170 mm / 300 mm / 400 mm / 500 mm
Type	Type 2 according to EN 61496
Enclosure rating	IP 65

Product description

With its high signal reserve, the M 2000 Standard multi-beam photoelectric safety switch is also reliable under harsh industrial conditions. Functions and status information integrated in the device allow rapid commissioning and prevent unnecessary machine downtimes. The modular concept

achieves maximum machine security while taking into account economic considerations by precisely co-ordinating the characteristics of the device to the requirements. Interfaces and service concepts complete the product range to provide an ideal solution for the sector.

In-system added value

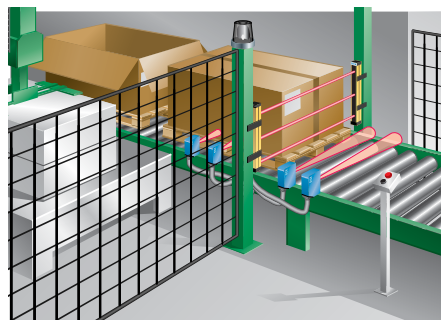
- Combination with SICK interfaces
- Safe interface to bus systems

Combination with	Restart interlock	Muting	Further information
LE 20	✓	—	L-53
LE 20 Muting	✓	✓	L-60
UE 48-2 OS	✓	—	L-42
UE 48-3 OS	✓	—	L-48

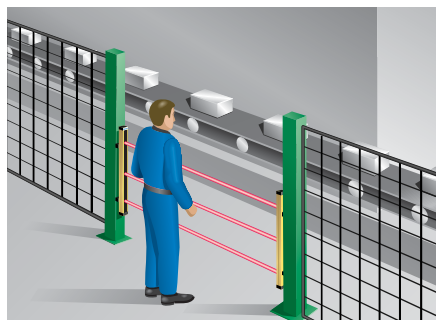
Applications

→ For more applications please refer to the application finder at www.sick.com

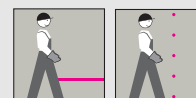
- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry



Packaging industry: M 2000 Standard with LE 20 on a packaging machine



Storage and conveyor technology: M 2000 on a conveyor belt system



- External device monitoring (EDM)
- Self-testing
- 7-segment display
- Diagnostics
- Alignment aid
- Beam coding



Further information	Page
→ Ordering information	D-38
→ Technical specifications	D-39
→ Dimensional drawings	D-40
→ Connection diagram	D-41
→ Accessories	D-42
→ Dimensional drawings accessories	D-44
→ Services	A-0

Ordering information

M 2000 Standard

- With external device monitoring ¹⁾ (EDM)
- Consisting of sender and receiver unit

→ Accessories see page D-42

Scanning range 0 ... 25 m

Number of beams	Beam separation / Resolution (mm)	Connection plug	Sender unit		Receiver unit	
			Type	Part number	Type	Part number
2	500	Hirschmann 6-pin + PE	M20S-02150A120	1 016 405	M20E-02150A120	1 016 421
		M12, 8-pin	M20S-02150A122	1 018 186	M20E-02150A122	1 018 187
3	400	Hirschmann 6-pin + PE	M20S-03140A120	1 016 428	M20E-03140A120	1 016 429
		M12, 8-pin	M20S-03140A122	1 018 188	M20E-03140A122	1 018 189
4	300	Hirschmann 6-pin + PE	M20S-04130A120	1 016 509	M20E-04130A120	1 016 510
		M12, 8-pin	M20S-04130A122	1 018 190	M20E-04130A122	1 018 191
6	170	Hirschmann 6-pin + PE	M20S-061A3A120	1 016 446	M20E-061A3A120	1 016 447
		M12, 8-pin	M20S-061A3A122	1 018 192	M20E-061A3A122	1 018 193
7	170	Hirschmann 6-pin + PE	M20S-071A3A120	1 016 434	M20E-071A3A120	1 016 435
		M12, 8-pin	M20S-071A3A122	1 018 194	M20E-071A3A122	1 018 195
8	116	Hirschmann 6-pin + PE	M20S-081A2A120	1 016 438	M20E-081A2A120	1 016 439
		M12, 8-pin	M20S-081A2A122	1 018 196	M20E-081A2A122	1 018 197
	170	Hirschmann 6-pin + PE	M20S-081A3A120	1 016 440	M20E-081A3A120	1 016 441
		M12, 8-pin	M20S-081A3A122	1 018 198	M20E-081A3A122	1 018 199
9	170	Hirschmann 6-pin + PE	M20S-091A3A120	1 016 442	M20E-091A3A120	1 016 443
		M12, 8-pin	M20S-091A3A122	1 018 200	M20E-091A3A122	1 018 201

Scanning range 0 ... 70 m

Number of beams	Beam separation (mm)	Connection plug	Sender unit		Receiver unit	
			Type	Part number	Type	Part number
2	500	Hirschmann 6-pin + PE	M20S-02250A120	1 018 172	M20E-02250A120	1 018 173
		M12, 8-pin	M20S-02250A122	1 018 174	M20E-02250A122	1 018 175
3	400	Hirschmann 6-pin + PE	M20S-03240A120	1 018 176	M20E-03240A120	1 018 177
		M12, 8-pin	M20S-03240A122	1 018 178	M20E-03240A122	1 018 179
4	300	Hirschmann 6-pin + PE	M20S-04230A120	1 018 180	M20E-04230A120	1 018 181
		M12, 8-pin	M20S-04230A122	1 018 182	M20E-04230A122	1 018 183

¹⁾ External device monitoring only available with devices with M12 plug!

Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at www.sick.com

General system data

Scanning range (depending on type)	0 m ... 25 m / 0 m ... 70 m
Number of beams (depending on type)	2 ... 9
Beam separation or resolution (depending on type)	116 mm / 170 mm / 300 mm / 400 mm / 500 mm
Enclosure rating	IP 65
Type	Type 2 according to EN 61496
Synchronisation	Optical, without separate synchronisation
Supply voltage V_S	24 V (19.2 V ... 28.8 V) DC

Sender unit

Power consumption	Max. 3.7 W
-------------------	------------

Receiver unit

Switching outputs (OSSDs)	2 PNP semiconductors (short-circuit protected, cross-circuit monitored)
Response time (depending on type)	Max. 8 ms
Switching voltage	$V_S - 2.25 \text{ V}$ 1 V
Switching current	Max. 500 mA
Power consumption	Max. 5 W

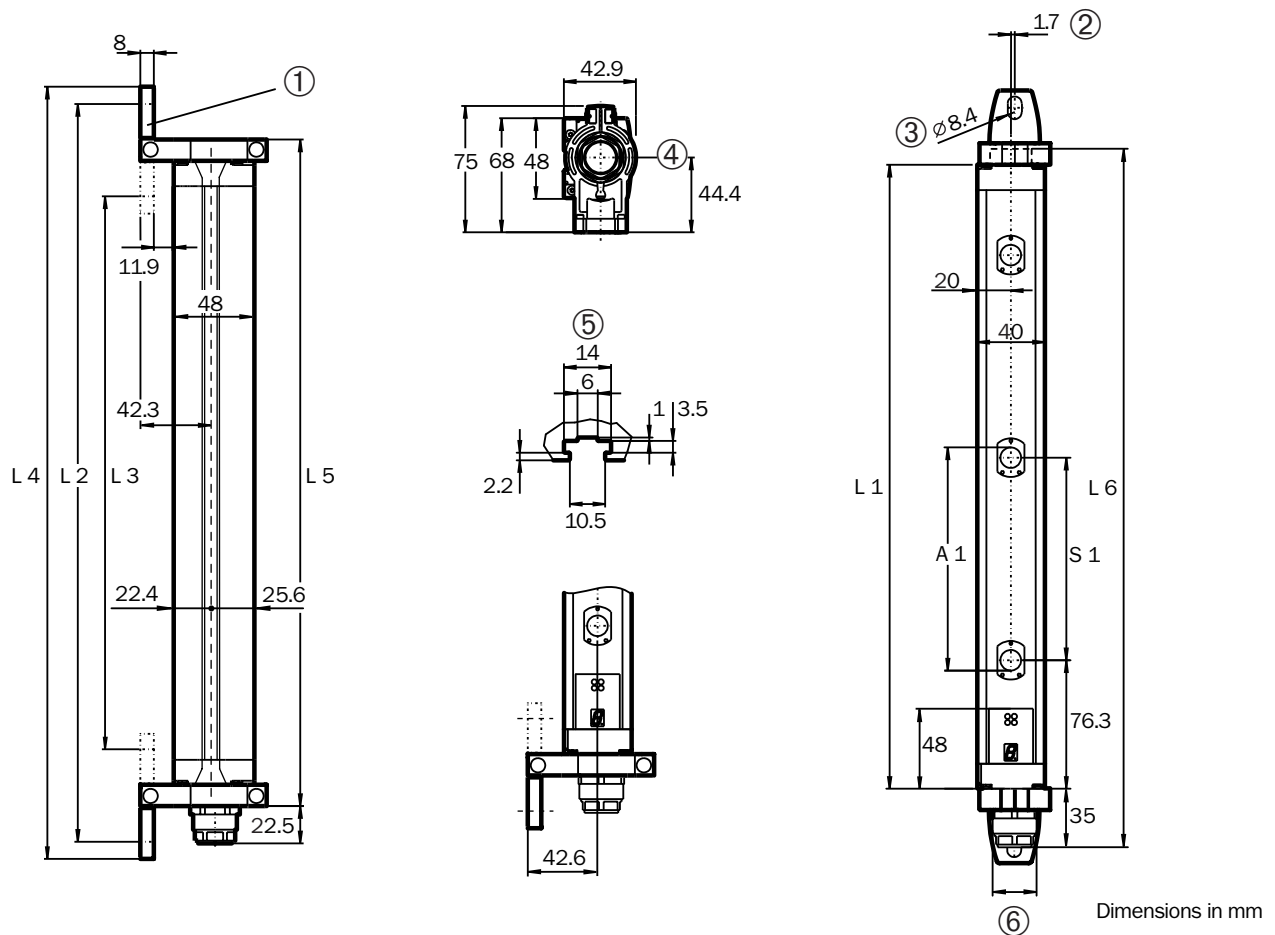
Operating data

Type of connection (depending on type)	Hirschmann plug 6-pin + PE M12 plug, 8-pin
Connection cable wire cross-section	Hirschmann plug M12 plug Max. 1 mm ² Max. 0.25 mm ²
Connection cable length	for wire cross-section 1 mm ² for wire cross-section 0.25 mm ² Max. 60 m Max. 15 m
Ambient operating temperature T_A	0 °C ... +55 °C
Storage temperature T_S	-25 °C ... +70 °C
Air humidity	15 % ... 95 %
Housing cross-section	48 mm x 40 mm
Vibration resistance	5 g, 10 ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29
Weight (depending on type)	1.25 kg ... 2.86 kg

D

Dimensional drawings

→ You will find more dimensional drawings in the technical description/operating instructions. Download at www.sick.com



Sender unit with swivel mount (receiver unit mirror image)

- ① Mounting clamp
- ② Centre of light beam offset
- ③ Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
- ④ Adjustment
- ⑤ Sliding nut groove for side mounting
- ⑥ Plug PG13.5 according to DIN 43651

N	S 1	A 1	L 1	L 2	L 3	L 4	L 5	L 6
2	500	—	630	697	588	718	655	675
3	400	—	931	998	888	1019	956	976
4	300	—	1031	1098	989	1119	1056	1076
8	—	116	851	919	809	939	877	896
6	—	170	916	983	874	1004	941	960
7	—	170	1073	1140	1031	1161	1098	1118
8	—	170	1231	1298	1189	1319	1256	1275
9	—	170	1388	1455	1346	1476	1413	1433

N Number of beams

S 1 Beam separation

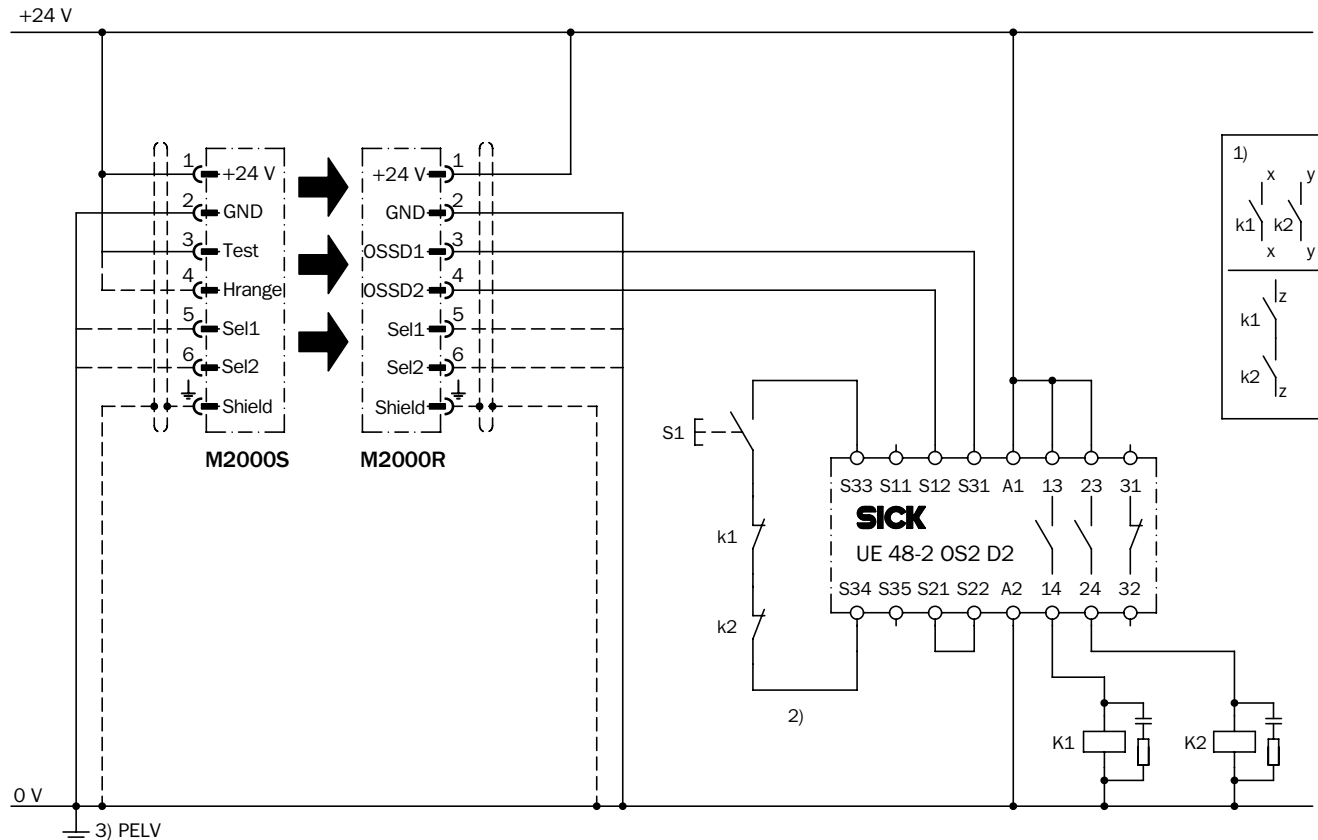
A 1 Resolution

Dimensions in mm

Connection diagram

→ You can find more connection diagrams at www.sick.com

M 2000 Standard on safety relay UE 48



Task

Interfacing an M 2000 Standard multi-beam photoelectric safety switch to UE 48-2 OS. Operating mode with restart interlock and external device monitoring.

Function

If the light path is clear, the OSSD1 and OSSD2 outputs are live. The system is ready to switch on if K1 and K2 are de-energised. By pressing S1 (button is pressed and released) the UE 48 relay is energised and its contacts 13-14 and 23-24 activate K1 and K2. On interruption of one of the light beams, the UE 48 is de-energised by the OSSD1 and OSSD2 outputs and K1 and K2 are deactivated.

Possible faults

Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of one of the K1 or K2 contactors will be detected and does not result in the loss of the shutdown function. Jamming of the S1 button will prevent the UE 48 from enabling.

Comments

- 1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.
- 2) The external device monitoring is only static.
- 3) PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed.

Accessories

Mounting accessories

→ Dimensional drawings mounting accessories see page D-44

Designation	Description	Part number
Mounting kit 2	<ul style="list-style-type: none"> 4 pieces Pivoting Swivel mount 	2 019 659
Mounting kit 6	<ul style="list-style-type: none"> 4 pieces Pivoting Side bracket 	2 019 506
Stainless steel bracket	<ul style="list-style-type: none"> 4 pieces Pivoting Large housing profile 	2 023 708
Reinforced stainless steel bracket	<ul style="list-style-type: none"> 4 pieces Pivoting Vibration resistance 5 g, 10 Hz ... 55 Hz Shock resistance 10 g, 16 ms 	2 026 850

Connector technology

System connection	Designation	Description	Connection cable	Part number
Hirschmann plug	Hirschmann cable socket	<ul style="list-style-type: none"> 6-pin + PE Straight 	—	6 006 612
		<ul style="list-style-type: none"> 6-pin + PE Angled with screw connections 	—	6 007 363
M12 plug	M12 cable socket	<ul style="list-style-type: none"> 8-pin Straight 	2.5 m	6 020 537
			5.0 m	6 020 354
			7.5 m	6 020 353
			10.0 m	6 020 352
			15.0 m	6 020 872
		<ul style="list-style-type: none"> 8-pin Angled 	5.0 m	6 021 342
			15.0 m	6 021 343

Interfaces

Designation	Description	Connection	Type	Part number
Safety evaluation unit LE 20	<ul style="list-style-type: none">IP 202 PNP OSSDs, 500 mA	<ul style="list-style-type: none">With screw terminal connector16-pin	LE20-2612	1 016 503
		<ul style="list-style-type: none">With terminal plug springAngled16-pin	LE20-2614	1 016 505
Safety evaluation unit LE 20 Muting		<ul style="list-style-type: none">With screw terminal connector15- and 16-pin	LE20-2622	1 016 502
		<ul style="list-style-type: none">With terminal plug spring15- and 16-pin	LE20-2624	1 016 501
Safety relay	<ul style="list-style-type: none">For opto-electronic protective devices	—	UE10-30S2D0	6 024 917
	<ul style="list-style-type: none">For opto-electronic protective devices	—	UE10-30S3D0	6 024 918
	<ul style="list-style-type: none">With screw type terminals	—	UE10-20S2D0	2 019 772
	<ul style="list-style-type: none">With spring terminals	—	UE10-20S4D0	2 019 771
	<ul style="list-style-type: none">Without terminals	—	UE10-20S1D0	6 020 342
	<ul style="list-style-type: none">With screw type terminals	—	UE48-20S2D2	6 024 915
	<ul style="list-style-type: none">With plug-in terminals	—	UE48-20S3D2	6 024 916
	<ul style="list-style-type: none">With screw type terminals	—	UE48-30S2D2	6 025 089
	<ul style="list-style-type: none">With plug-in terminals	—	UE48-30S3D2	6 025 097

D

Device columns

Designation	Description	Part number
Device column without front screen	<ul style="list-style-type: none"> 2-beam, 500 mm beam separation Including mounting kit 	2 021 328
	<ul style="list-style-type: none"> 3-beam, 400 mm beam separation Including mounting kit 	2 021 329
Device column with front screen ¹⁾	<ul style="list-style-type: none"> Length 1200 mm Including mounting kit 	2 021 330
	<ul style="list-style-type: none"> Length 1500 mm Including mounting kit 	2 021 331
	<ul style="list-style-type: none"> Length 1700 mm Including mounting kit 	2 021 332

¹⁾ Warning, reduction of the scanning range!

Device columns for outdoor use

Designation	Description	Part number
Device column with heating 220 V	<ul style="list-style-type: none"> Suitable for M20-02x50Axxx With brackets and cable socket Without photoelectric safety switch 	2 023 707
	<ul style="list-style-type: none"> Suitable for M20-03x40Axxx With brackets and cable socket Without photoelectric safety switch 	2 025 441

Continued on next page

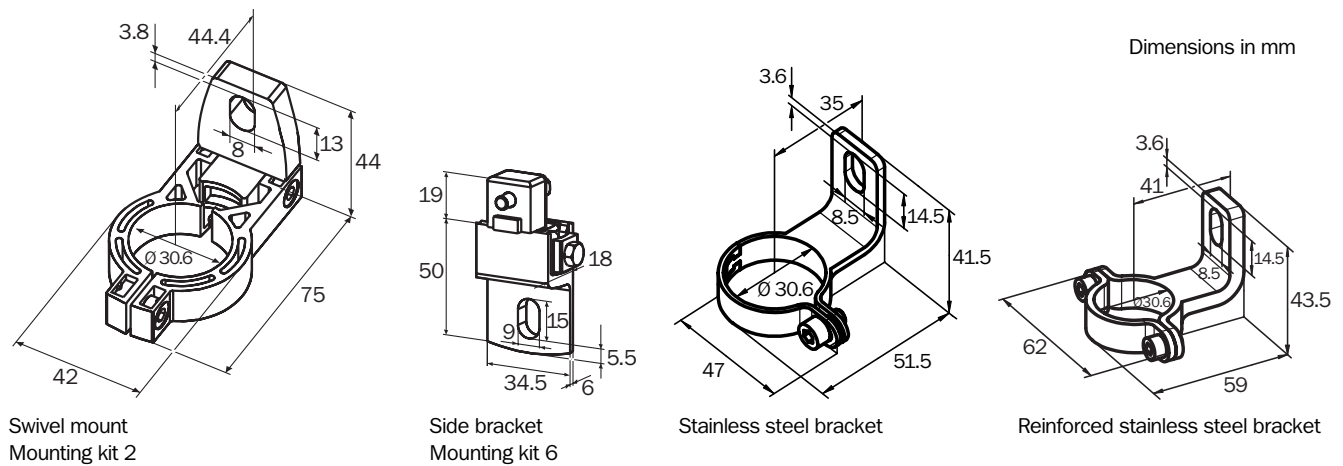
Mirror columns ¹⁾

Designation	Description	Part number
Mirror column, fully assembled with mirrors	▪ Suitable for M20x-02xxxxx, 2-beam, 500 mm beam separation	1 015 041
	▪ Suitable for M20x-03xxxxx, 3-beam, 400 mm beam separation	1 015 040
	▪ Suitable for M20x-04xxxxx, 4-beam, 300 mm beam separation	1 019 115

¹⁾ Warning, reduction of the scanning range!

→ For dimensional drawings of the device columns and mirror columns please refer to the operating instructions/technical description.
Download at www.sick.com

Dimensional drawings mounting accessories



Overview of technical specifications

Resistant materials	Stainless steel (V4A), PMMA, PA, PVC
Enclosure rating	IP 67
Scanning range	0 m ... 19 m
Number of beams (depending on type)	2 / 3 / 4
Beam separation (depending on type)	300 mm / 400 mm / 500 mm
Type	Type 2 according to EN 61496

Product description

The IP 67 housing in conjunction with the multi-beam photoelectric safety switch M 2000 achieves the enclosure rating IP 67. The materials used (V4A, PMMA, PA, PVC) have a high level of resistance against common cleaning agents.

A compensating element (membrane) prevents the plastic tubes misting up and the entry of liquids.

The cable is fed into the device through the proven PG connector.

In-system added value

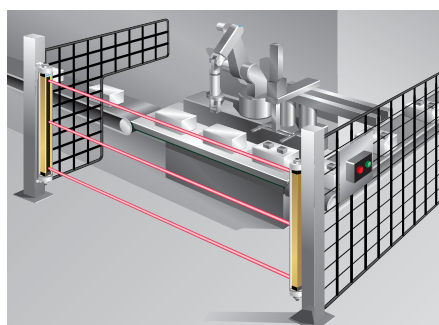
- Combination with SICK interfaces
- Safe interface to bus systems

Combination with	Restart interlock	Muting	Further information
LE 20	✓	—	L-53
LE 20 Muting	✓	✓	L-60
UE 48-2 OS	✓	—	L-42
UE 48-3 OS	✓	—	L-48

Applications

→ For more applications please refer to the application finder at www.sick.com

- Packaging industry
- Food industry
- Chemical industry
- Pharmaceutical industry
- Clean-room systems



Access protection on a processing centre in the hygiene area



- High durability
- Compact design
- External device monitoring (EDM)
- Self-testing
- On site diagnostics
- Beam coding



Further information	Page
→ Ordering information	D-46
→ Technical specifications	D-46
→ Dimensional drawings	D-47
→ Connection diagram	D-41
→ Accessories	D-48
→ Dimensional drawings accessories	D-49
→ Services	A-0

Ordering information

IP 67 housing with integrated sender or receiver unit M 2000, including 15 m PVC cable

→ Accessories see page D-48

Scanning range 0 ... 19 m

Number of beams	Beam separation (mm)	Sender unit		Receiver unit	
		Type	Part number	Type	Part number
2	500	M25S-02150C112	1 024 208	M25E-02150C112	1 024 209
3	400	M25S-03140C112	1 024 210	M25E-03140C112	1 024 211
4	300	M25S-04130C112	1 024 212	M25E-04130C112	1 024 213

Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at www.sick.com

M 2000 Standard in IP 67 housing

→ M 2000 specific data see M 2000 Standard, page D-46

Scanning range	0 m ... 19 m
Number of beams (depending on type)	2 / 3 / 4
Beam separation (depending on type)	300 mm / 400 mm / 500 mm
Enclosure rating	IP 66, IP 67
Type	Type 2 according to EN 61496
Materials	<div> <div>End caps</div> <div>Plastic tube</div> <div>Compensating element (membrane)</div> <div>PG connector</div> </div> Stainless steel PMMA PA 6 PA 6
Ambient operating temperature T_A	0 °C ... +55 °C
Storage temperature T_S	-25 °C ... +70 °C

D



Number of beams	Beam separation S 1	L 1	L 2
2	500	777	744
3	400	1078	1045
4	300	1228	1195

8 010 889/15-10-04

Connection diagram

- Connection diagram M 2000 Standard on safety relay UE 48 see page D-41
- You can find more connection diagrams at www.sick.com

Accessories

Mounting accessories

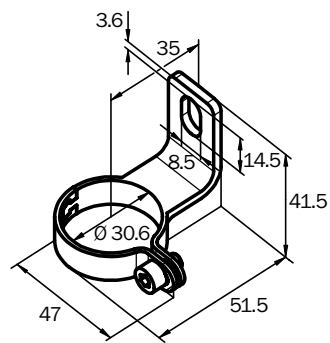
- Dimensional drawings mounting accessories see page D-49

Designation	Description	Part number
Stainless steel bracket	<ul style="list-style-type: none"> ▪ 4 pieces ▪ Pivoting 	2 023 708
Reinforced stainless steel bracket	<ul style="list-style-type: none"> ▪ 4 pieces ▪ Pivoting ▪ Vibration resistance 5 g, 10 Hz ... 55 Hz ▪ Shock resistance 10 g, 16 ms 	2 026 850
Stainless steel support bracket	<ul style="list-style-type: none"> ▪ 2 pieces ▪ Vibration resistance 5 g, 10 Hz ... 55 Hz ▪ Shock resistance 10 g, 16 ms 	2 026 849
Mounting key	▪ For M12 cable socket on device replacement	4 034 690
Venting membrane	—	5 309 082

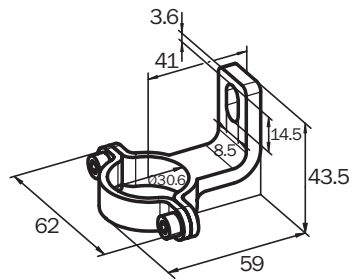
Interfaces

Designation	Description	Connection	Type	Part number
Safety evaluation unit LE 20	<ul style="list-style-type: none">▪ IP 20▪ 2 PNP OSSDs, 500 mA	<ul style="list-style-type: none">▪ With screw terminal connector▪ 16-pin	LE20-2612	1 016 503
		<ul style="list-style-type: none">▪ With terminal plug spring▪ Angled▪ 16-pin	LE20-2614	1 016 505
Safety evaluation unit LE 20 Muting		<ul style="list-style-type: none">▪ With screw terminal connector▪ 15- and 16-pin	LE20-2622	1 016 502
		<ul style="list-style-type: none">▪ With terminal plug spring▪ 15- and 16-pin	LE20-2624	1 016 501
Safety relay	<ul style="list-style-type: none">▪ For opto-electronic protective devices	—	UE10-30S2D0	6 024 917
	<ul style="list-style-type: none">▪ For opto-electronic protective devices	—	UE10-30S3D0	6 024 918
	<ul style="list-style-type: none">▪ With screw type terminals	—	UE10-20S2D0	2 019 772
	<ul style="list-style-type: none">▪ With spring terminals	—	UE10-20S4D0	2 019 771
	<ul style="list-style-type: none">▪ Without terminals	—	UE10-20S1D0	6 020 342
	<ul style="list-style-type: none">▪ With screw type terminals	—	UE48-20S2D2	6 024 915
	<ul style="list-style-type: none">▪ With plug-in terminals	—	UE48-20S3D2	6 024 916
	<ul style="list-style-type: none">▪ With screw type terminals	—	UE48-30S2D2	6 025 089
	<ul style="list-style-type: none">▪ With plug-in terminals	—	UE48-30S3D2	6 025 097

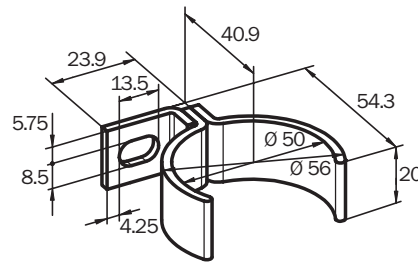
Dimensional drawings mounting accessories



Stainless steel bracket



Reinforced stainless steel bracket



Stainless steel support bracket

Dimensions in mm



Mounting key

D



- Restart interlock (RES)
- External device monitoring (EDM)
- Self-testing
- 7-segment display
- Diagnostics
- Alignment aid
- Beam coding



Further information	Page
→ Technical specifications	D-52
→ Dimensional drawings	D-53
→ Connection diagram	D-54
→ Accessories	D-55
→ Dimensional drawings accessories	D-57
→ Services	A-0

Overview of technical specifications

Scanning range (depending on type)	0 m ... 25 m / 0 m ... 70 m
Number of beams (depending on type)	2 ... 9
Beam separation or resolution (depending on type)	116 mm / 170 mm / 300 mm / 400 mm / 500 mm
Type	Type 2 according to EN 61496
Enclosure rating	IP 65

Product description

With its high signal reserve, the M 2000 RES/EDM multi-beam photoelectric safety switch is also reliable under harsh industrial conditions. Functions and status information integrated in the device allow rapid commissioning and prevent unnecessary machine downtimes. The modular concept achieves maximum machine security while taking into account economic considera-

tions by precisely co-ordinating the characteristics of the device to the requirements. Interfaces and service concepts complete the product range to provide an ideal solution for the sector.

The integrated restart interlock in the M 2000 RES/EDM offers the advantages of shorter cable runs and quicker commissioning compared to traditional solutions.

In-system added value

- Combination with SICK interfaces
- Safe interface to bus systems

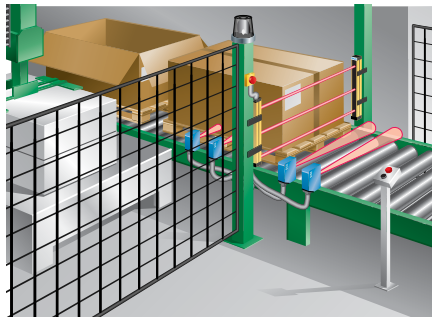
Combination with	Restart interlock	Muting	Further information
LE 20 Muting	✓	✓	L-60

Applications

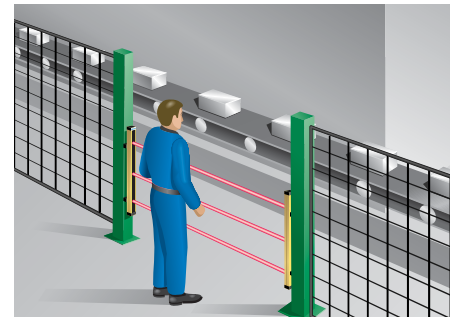
→ For more applications please refer to the application finder at www.sick.com

- Storage and conveyor technology
- Wood industry
- Textile industry

- Stone production
- Electronics industry
- Packaging industry



Packaging industry: M 2000 RES/EDM with LE 20 on a packaging machine



Storage and conveyor technology: M 2000 on a conveyor belt system

Ordering information

M 2000 RES/EDM

- With restart interlock (RES) and external device monitoring (EDM)
- For usage as a standalone system
- Consisting of sender and receiver unit

→ Accessories see page D-55

Scanning range 0 ... 25 m

Number of beams	Beam separation / Resolution (mm)	Connection plug Sender unit / Receiver unit	Sender unit		Receiver unit	
			Type	Part number	Type	Part number
2	500	Hirschmann 6-pin + PE / 11-pin + PE	M20S-02150A120	1 016 405	M20E-02150A221	1 018 032
		M12, 8-pin	M20S-02150A122	1 018 186	M20E-02150A222	1 018 213
3	400	Hirschmann 6-pin + PE / 11-pin + PE	M20S-03140A120	1 016 428	M20E-03140A221	1 018 034
		M12, 8-pin	M20S-03140A122	1 018 188	M20E-03140A222	1 018 215
4	300	Hirschmann 6-pin + PE / 11-pin + PE	M20S-04130A120	1 016 509	M20E-04130A221	1 018 217
		M12, 8-pin	M20S-04130A122	1 018 190	M20E-04130A222	1 018 219
6	170	Hirschmann 6-pin + PE / 11-pin + PE	M20S-061A3A120	1 016 446	M20E-061A3A221	1 018 221
		M12, 8-pin	M20S-061A3A122	1 018 192	M20E-061A3A222	1 018 223
7	170	Hirschmann 6-pin + PE / 11-pin + PE	M20S-071A3A120	1 016 434	M20E-071A3A221	1 018 225
		M12, 8-pin	M20S-071A3A122	1 018 194	M20E-071A3A222	1 018 227
8	116	Hirschmann 6-pin + PE / 11-pin + PE	M20S-081A2A120	1 016 438	M20E-081A2A221	1 018 229
		M12, 8-pin	M20S-081A2A122	1 018 196	M20E-081A2A222	1 018 231
	170	Hirschmann 6-pin + PE / 11-pin + PE	M20S-081A3A120	1 016 440	M20E-081A3A221	1 018 233
		M12, 8-pin	M20S-081A3A122	1 018 198	M20E-081A3A222	1 018 235
9	170	Hirschmann 6-pin + PE / 11-pin + PE	M20S-091A3A120	1 016 442	M20E-091A3A221	1 018 036
		M12, 8-pin	M20S-091A3A122	1 018 200	M20E-091A3A222	1 018 237

Scanning range 0 ... 70 m

Number of beams	Beam separation (mm)	Connection plug Sender unit / Receiver unit	Sender unit		Receiver unit	
			Type	Part number	Type	Part number
2	500	Hirschmann 6-pin + PE / 11-pin + PE	M20S-02250A120	1 018 172	M20E-02250A221	1 018 206
		M12, 8-pin	M20S-02250A122	1 018 174	M20E-02150A222	1 018 207
3	400	Hirschmann 6-pin + PE / 11-pin + PE	M20S-03240A120	1 018 176	M20E-03240A221	1 018 208
		M12, 8-pin	M20S-03240A122	1 018 178	M20E-03240A222	1 018 209
4	300	Hirschmann 6-pin + PE / 11-pin + PE	M20S-04230A120	1 018 180	M20E-04230A221	1 018 210
		M12, 8-pin	M20S-04230A122	1 018 182	M20E-04230A222	1 018 211

Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at www.sick.com

General system data

Scanning range (depending on type)	0 m ... 25 m / 0 m ... 70 m
Number of beams (depending on type)	2 ... 9
Beam separation or resolution (depending on type)	116 mm / 170 mm / 300 mm / 400 mm / 500 mm
Enclosure rating	IP 65
Type	Type 2 according to EN 61496
Synchronisation	Optical, without separate synchronisation
Supply voltage V_S	24 V (19.2 V ... 28.8 V) DC

Sender unit

Power consumption	Max. 3.7 W
-------------------	------------

Receiver unit

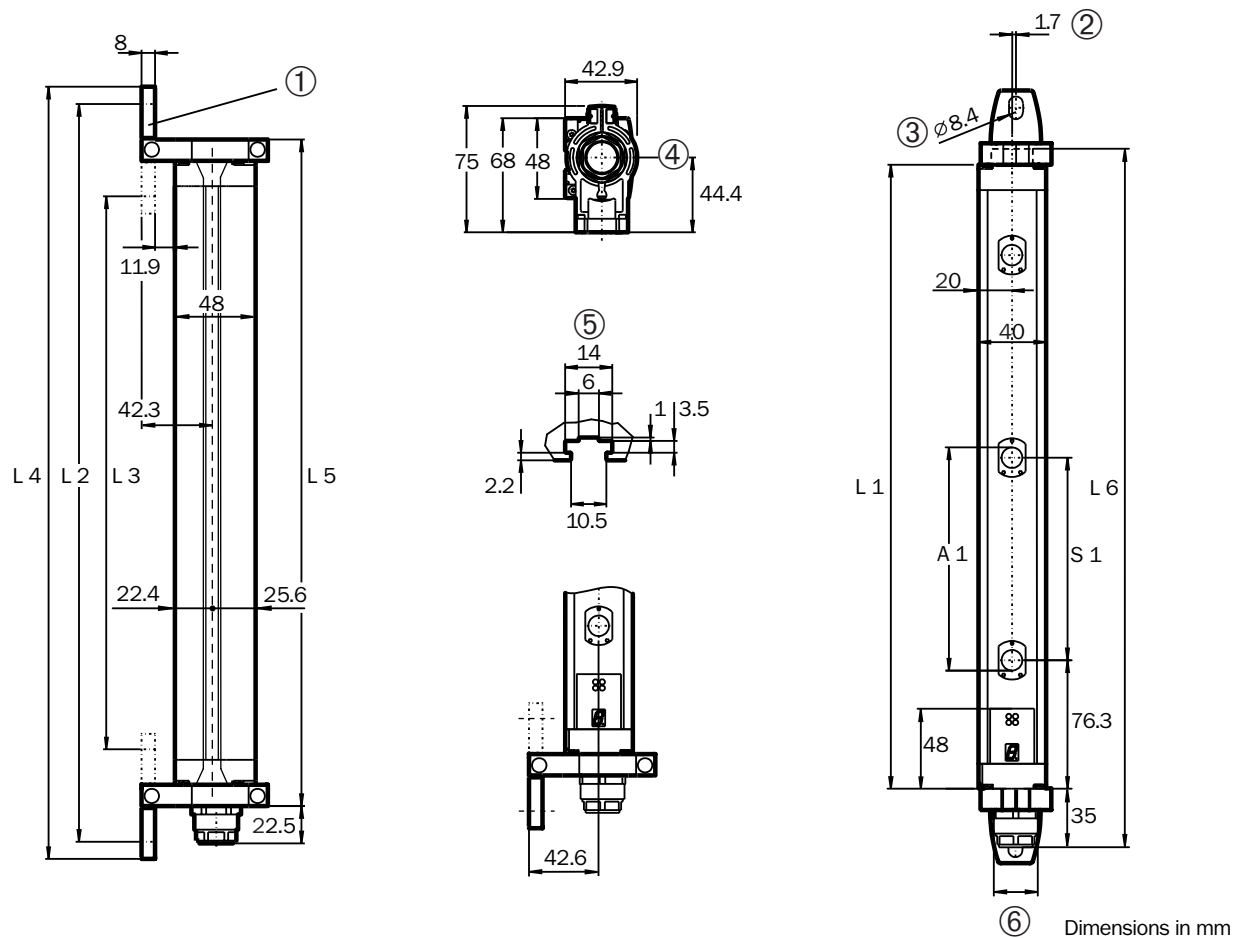
Switching outputs (OSSDs)	2 PNP semiconductors (short-circuit protected, cross-circuit monitored)
Response time (depending on type)	Max. 8 ms
Switching voltage	$V_S - 2.25 \text{ V}$ 1 V
Switching current	Max. 500 mA
Power consumption	Max. 5 W

Operating data

Type of connection (depending on type)	Hirschmann plug (sender unit: 6-pin + PE, receiver unit: 11-pin + PE) M12 plug, 8-pin
Connection cable wire cross-section	Hirschmann plug M12 plug Max. 1 mm ² Max. 0.25 mm ²
Connection cable length	for wire cross-section 1 mm ² for wire cross-section 0.25 mm ² Max. 60 m Max. 15 m
Ambient operating temperature T_A	0 °C ... +55 °C
Storage temperature T_S	-25 °C ... +70 °C
Air humidity	15 % ... 95 %
Housing cross-section	48 mm x 40 mm
Vibration resistance	5 g, 10 ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29
Weight (depending on type)	1.25 kg ... 2.86 kg

Dimensional drawings

→ You will find more dimensional drawings in the technical description/operating instructions. Download at www.sick.com



Sender unit with swivel mount (receiver unit not mirror image. Dimensions as M 2000 cascable, see page D-61)

- ① Mounting clamp
- ② Centre of light beam offset
- ③ Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
- ④ Adjustment
- ⑤ Sliding nut groove for side mounting
- ⑥ Plug PG13.5 according to DIN 43651

N	S 1	A 1	L 1	L 2	L 3	L 4	L 5	L 6
2	500	—	630	697	588	718	655	675
3	400	—	931	998	888	1019	956	976
4	300	—	1031	1098	989	1119	1056	1076
8	—	116	851	919	809	939	877	896
6	—	170	916	983	874	1004	941	960
7	—	170	1073	1140	1031	1161	1098	1118
8	—	170	1231	1298	1189	1319	1256	1275
9	—	170	1388	1455	1346	1476	1413	1433

N Number of beams

S 1 Beam separation

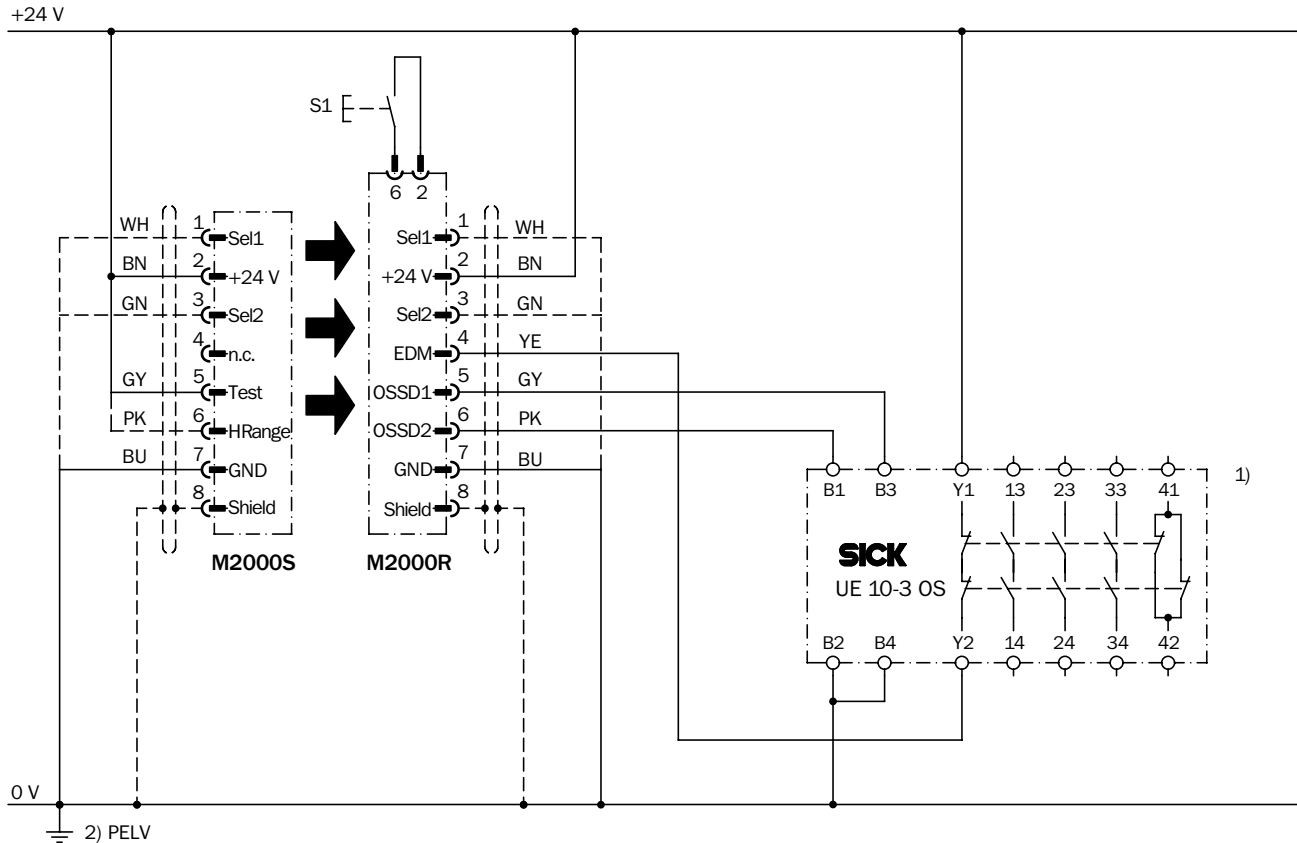
A 1 Resolution

Dimensions in mm

Connection diagram

→ You can find more connection diagrams at www.sick.com

M 2000 RES/EDM on safety relay UE 10



Task

Interfacing an M 2000 RES/EDM multi-beam photoelectric safety switch to UE 10-3 OS. Operating mode with restart interlock and external device monitoring.

Function

The yellow LED on the receiver flashes when the light path is clear and the UE 10 is de-energised and functioning correctly. The system is ready to be switched on. The system is enabled by pressing S1 (button is pressed and released). The OSSD1 and OSSD2 outputs are live, the UE 10 is switched on. On the interruption of one of the light beams, the UE 10 is deactivated by the OSSD1 and OSSD2 outputs.

Possible faults

Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of the UE 10 will be detected and will not result in the loss of the shutdown function. Jamming of the S1 button prevents output circuit to enable.

Comments

¹⁾ Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

²⁾ PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed.

Accessories

Mounting accessories

→ Dimensional drawings mounting accessories see page D-57

Designation	Description	Part number
Mounting kit 2	<ul style="list-style-type: none"> 4 pieces Pivoting Swivel mount 	2 019 659
Mounting kit 6	<ul style="list-style-type: none"> 4 pieces Pivoting Side bracket 	2 019 506
Stainless steel bracket	<ul style="list-style-type: none"> 4 pieces Pivoting Large housing profile 	2 023 708
Reinforced stainless steel bracket	<ul style="list-style-type: none"> 4 pieces Pivoting Vibration resistance 5 g, 10 Hz ... 55 Hz Shock resistance 10 g, 16 ms 	2 026 850

Connector technology

Connection	Designation	Description	Connection cable	Part number
System connection Hirschmann plug	Hirschmann cable socket	<ul style="list-style-type: none"> 6-pin + PE Straight 	—	6 006 612
		<ul style="list-style-type: none"> 6-pin + PE Angled with screw connections 	—	6 007 363
		<ul style="list-style-type: none"> 11-pin + PE Straight 	—	6 020 757
		<ul style="list-style-type: none"> 11-pin + PE Angled 	—	6 020 758
System connection M12 plug	M12 cable socket	<ul style="list-style-type: none"> 8-pin Straight 	2.5 m	6 020 537
			5.0 m	6 020 354
			7.5 m	6 020 353
			10.0 m	6 020 352
			15.0 m	6 020 872
		<ul style="list-style-type: none"> 8-pin Angled 	5.0 m	6 021 342
Extension connection	M12 cable plug	<ul style="list-style-type: none"> For the connection of a control switch 8-pin Straight 	5 m	6 021 204
		<ul style="list-style-type: none"> For the connection of a control switch 8-pin Angled 	15 m	6 021 205
			5 m	6 021 830
			15 m	6 021 831
	M12 plug	<ul style="list-style-type: none"> For deactivation of the integrated restart interlock Pre-assembled 	—	6 021 238

Continued on next page

Interfaces

Designation	Description	Connection	Type	Part number
Safety evaluation unit LE 20	<ul style="list-style-type: none">IP 202 PNP OSSDs, 500 mA	<ul style="list-style-type: none">With screw terminal connector16-pin	LE20-2612	1 016 503
		<ul style="list-style-type: none">With terminal plug springAngled16-pin	LE20-2614	1 016 505
Safety evaluation unit LE 20 Muting		<ul style="list-style-type: none">With screw terminal connector15- and 16-pin	LE20-2622	1 016 502
		<ul style="list-style-type: none">With terminal plug spring15- and 16-pin	LE20-2624	1 016 501
Safety relay		<ul style="list-style-type: none">For opto-electronic protective devices	—	UE10-30S2D0
	<ul style="list-style-type: none">For opto-electronic protective devices	—	UE10-30S3D0	6 024 918
	<ul style="list-style-type: none">With screw type terminals	—	UE10-20S2D0	2 019 772
	<ul style="list-style-type: none">With spring terminals	—	UE10-20S4D0	2 019 771
	<ul style="list-style-type: none">Without terminals	—	UE10-20S1D0	6 020 342

Device columns

Designation	Description	Part number
Device column without front screen	<ul style="list-style-type: none"> 2-beam, 500 mm beam separation Including mounting kit 	2 021 328
	<ul style="list-style-type: none"> 3-beam, 400 mm beam separation Including mounting kit 	2 021 329
Device column with front screen ¹⁾	<ul style="list-style-type: none"> Length 1200 mm Including mounting kit 	2 021 330
	<ul style="list-style-type: none"> Length 1500 mm Including mounting kit 	2 021 331
	<ul style="list-style-type: none"> Length 1700 mm Including mounting kit 	2 021 332

¹⁾ Warning, reduction of the scanning range!

Device columns for outdoor use

Designation	Description	Part number
Device column with heating 220 V	<ul style="list-style-type: none"> Suitable for M20-02x50Axxx With brackets and cable socket Without photoelectric safety switch 	2 023 707
	<ul style="list-style-type: none"> Suitable for M20-03x40Axxx With brackets and cable socket Without photoelectric safety switch 	2 025 441

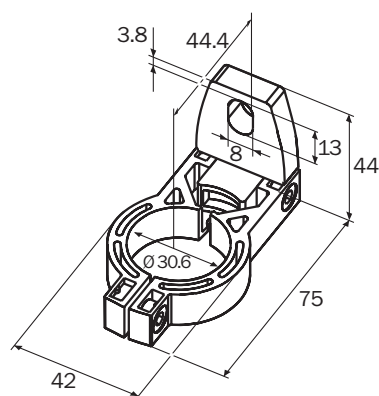
Mirror columns ¹⁾

Designation	Description	Part number
Mirror column, fully assembled with mirrors	<ul style="list-style-type: none"> Suitable for M20x-02xxxx, 2-beam, 500 mm beam separation 	1 015 041
	<ul style="list-style-type: none"> Suitable for M20Z-02xxxxxx, 2-beam, 500 mm beam separation Fully assembled with mirrors 45° 	1 015 042
	<ul style="list-style-type: none"> Suitable for M20x-03xxxx, 3-beam, 400 mm beam separation 	1 015 040
	<ul style="list-style-type: none"> Suitable for M20x-04xxxx, 4-beam, 300 mm beam separation 	1 019 115

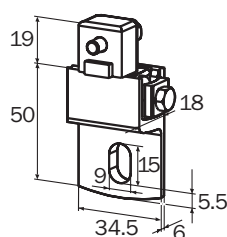
¹⁾ Warning, reduction of the scanning range!

→ For dimensional drawings of the device columns and mirror columns please refer to the operating instructions/technical description.
Download at www.sick.com

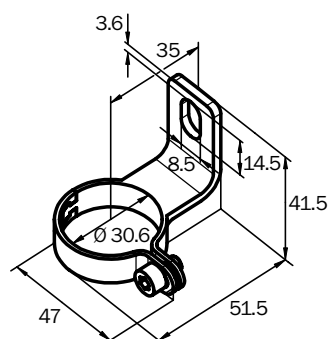
Dimensional drawings mounting accessories



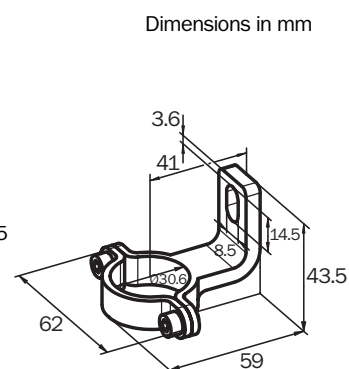
Swivel mount
Mounting kit 2



Side bracket
Mounting kit 6



Stainless steel bracket



Reinforced stainless steel bracket

Dimensions in mm



- Cascade
 - Max. 3 devices
 - Max. 3 m cable length
- External device monitoring (EDM)
- Self-testing
- 7-segment display
- Diagnostics
- Alignment aid
- Beam coding



Further information	Page
→ Technical specifications	D-60
→ Dimensional drawings	D-61
→ Connection diagram	D-62
→ Accessories	D-63
→ Dimensional drawings accessories	D-65
→ Services	A-0

Overview of technical specifications

Scanning range	0 m ... 25 m
Number of beams	2 ... 9
Beam separation or resolution (depending on type)	116 mm / 170 mm / 300 mm / 400 mm / 500 mm
Type	Type 2 according to EN 61496
Enclosure rating	IP 65

Product description

With its high signal reserve, the M 2000 cascadable multi-beam photoelectric safety switch is also reliable under harsh industrial conditions. Functions and status information integrated in the device allow rapid commissioning and prevent unnecessary machine downtime. The modular concept achieves maximum machine security while taking into account economic consid-

erations by precisely co-ordinating the characteristics of the device to the requirements. Interfaces and service concepts complete the product range to provide an ideal solution for the sector.

With the cascadable variants, photoelectric safety switches can be flexibly adapted to the existing installation.

In-system added value

- Combination with SICK interfaces
- Safe interface to bus systems

Combination with	Restart interlock	Muting	Further information
LE 20	✓	—	L-53
LE 20 Muting	✓	✓	L-60
UE 48-2 OS	✓	—	L-42
UE 48-3 OS	✓	—	L-48

Applications

→ For more applications please refer to the application finder at www.sick.com

- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry

Ordering information

M 2000 cascadable

- With integrated external device monitoring function (EDM)
- For usage as cascaded device
- Consisting of sender and receiver unit

→ Accessories see page D-63

Scanning range 0 ... 25 m

Number of beams	Beam separation / Resolution (mm)	Connection plug Sender unit / Receiver unit	Sender unit		Receiver unit	
			Type	Part number	Type	Part number
2	500	Hirschmann 6-pin + PE / 11-pin + PE	M20S-02150A220	1 018 031	M20E-02150A221	1 018 032
		M12, 8-pin	M20S-02150A222	1 018 212	M20E-02150A222	1 018 213
3	400	Hirschmann 6-pin + PE / 11-pin + PE	M20S-03140A220	1 018 033	M20E-03140A221	1 018 034
		M12, 8-pin	M20S-03140A222	1 018 214	M20E-03140A222	1 018 215
4	300	Hirschmann 6-pin + PE / 11-pin + PE	M20S-04130A220	1 018 216	M20E-04130A221	1 018 217
		M12, 8-pin	M20S-04130A222	1 018 218	M20E-04130A222	1 018 219
6	170	Hirschmann 6-pin + PE / 11-pin + PE	M20S-061A3A220	1 018 220	M20E-061A3A221	1 018 221
		M12, 8-pin	M20S-061A3A222	1 018 222	M20E-061A3A222	1 018 223
7	170	Hirschmann 6-pin + PE / 11-pin + PE	M20S-071A3A220	1 018 224	M20E-071A3A221	1 018 225
		M12, 8-pin	M20S-071A3A222	1 018 226	M20E-071A3A222	1 018 227
8	116	Hirschmann 6-pin + PE / 11-pin + PE	M20S-081A2A220	1 018 228	M20E-081A2A221	1 018 229
		M12, 8-pin	M20S-081A2A222	1 018 230	M20E-081A2A222	1 018 231
	170	Hirschmann 6-pin + PE / 11-pin + PE	M20S-081A3A220	1 018 232	M20E-081A3A221	1 018 233
		M12, 8-pin	M20S-081A3A222	1 018 234	M20E-081A3A222	1 018 235
9	170	Hirschmann 6-pin + PE / 11-pin + PE	M20S-091A3A220	1 018 035	M20E-091A3A221	1 018 036
		M12, 8-pin	M20S-091A3A222	1 018 236	M20E-091A3A222	1 018 237

D

Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at www.sick.com

General system data

Scanning range	0 m ... 25 m
Number of beams	2 ... 9
Beam separation or resolution (depending on type)	116 mm / 170 mm / 300 mm / 400 mm / 500 mm
Enclosure rating	IP 65
Type	Type 2 according to EN 61496
Synchronisation	Optical, without separate synchronisation
Supply voltage V_S	24 V (19.2 V ... 28.8 V) DC

Sender unit

Power consumption	Max. 3.7 W
-------------------	------------

Receiver unit

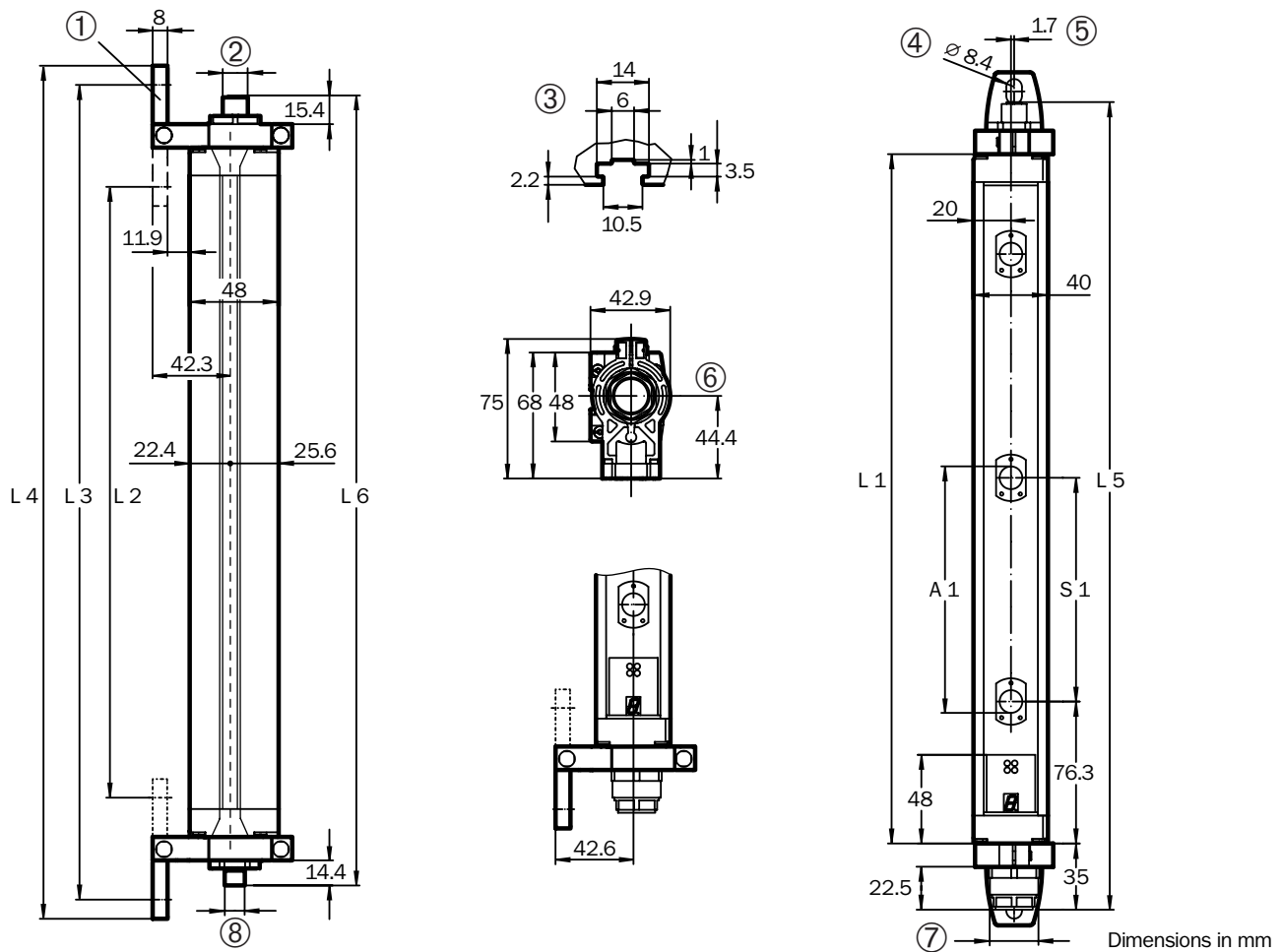
Switching outputs (OSSDs)	2 PNP semiconductors (short-circuit protected, cross-circuit monitored)
Response time (depending on type)	Max. 8 ms
Switching voltage	$V_S - 2.25 \text{ V}$ 1 V
Switching current	Max. 500 mA
Power consumption	Max. 5 W

Operating data

Type of connection (depending on type)	Hirschmann plug (sender unit: 6-pin + PE, receiver unit: 11-pin + PE) M12 plug, 8-pin
Connection cable wire cross-section	Hirschmann plug M12 plug Max. 1 mm ² Max. 0.25 mm ²
Connection cable length	for wire cross-section 1 mm ² for wire cross-section 0.25 mm ² Max. 60 m Max. 15 m
Ambient operating temperature T_A	0 °C ... +55 °C
Storage temperature T_S	-25 °C ... +70 °C
Air humidity	15 % ... 95 %
Housing cross-section	48 mm x 40 mm
Vibration resistance	5 g, 10 ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29
Weight (depending on type)	1.25 kg ... 2.86 kg

Dimensional drawings

→ You will find more dimensional drawings in the technical description/operating instructions. Download at www.sick.com



Sender unit with swivel mount (receiver unit mirror image)

- ① Mounting clamp
- ② M12 x 1 socket (standard)
- ③ Sliding nut groove for side mounting
- ④ Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
- ⑤ Centre of light beam offset
- ⑥ Adjustment
- ⑦ Plug PG13.5 according to DIN 43651
- ⑧ Plug M12 x 1

N	S 1	A 1	L 1	L 2	L 3	L 4	L 5	L 6
2	500	—	630	588	697	718	694	686
3	400	—	931	888	998	1019	995	987
4	300	—	1031	989	1098	1119	1095	1087
8	—	116	851	809	919	939	915	907
6	—	170	916	874	983	1004	979	971
7	—	170	1073	1031	1140	1161	1137	1129
8	—	170	1231	1189	1298	1319	1294	1286
9	—	170	1388	1346	1455	1476	1452	1444

N Number of beams A 1 Resolution

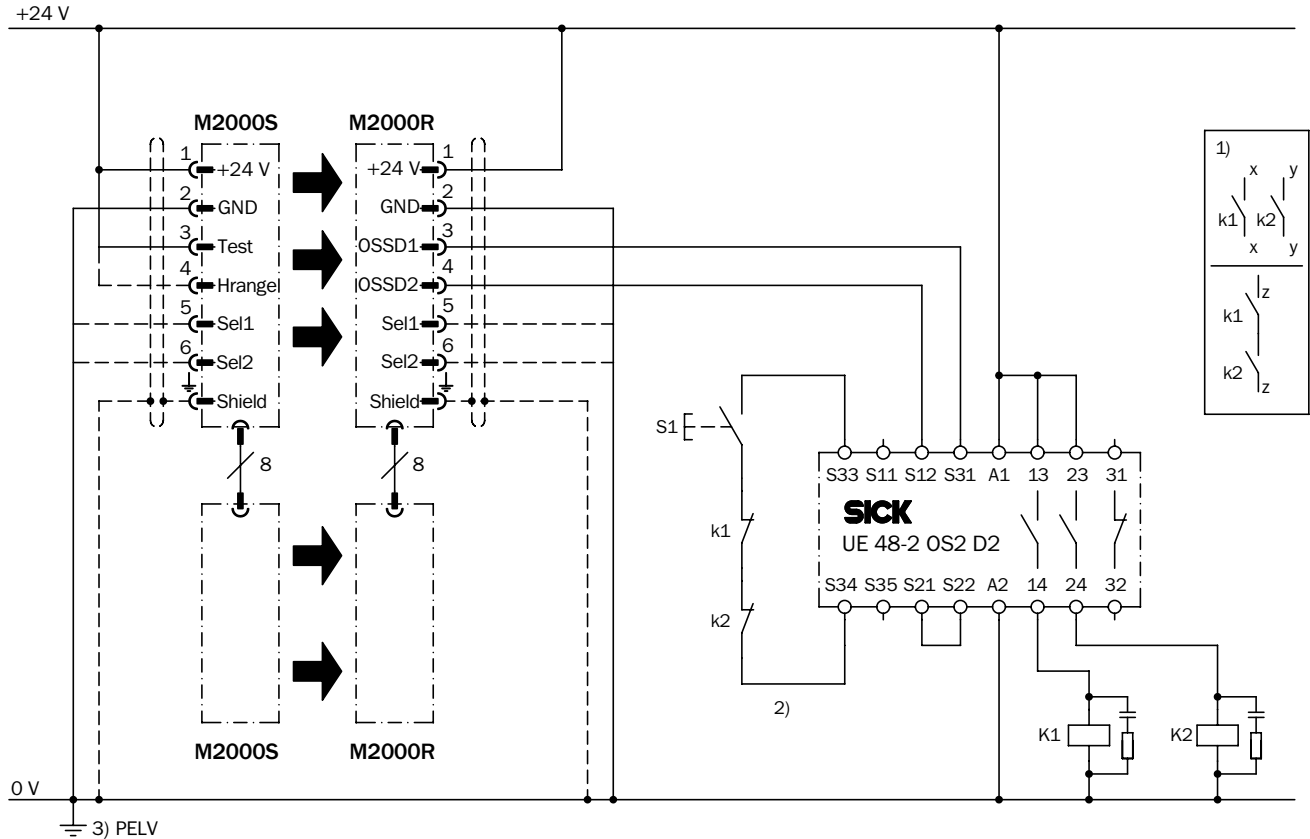
S 1 Beam separation

Dimensions in mm

Connection diagram

→ You can find more connection diagrams at www.sick.com

M 2000 cascadable on safety relay UE 48



Task

Interfacing two M 2000 cascadable multi-beam photoelectric safety switches to UE 48-2 OS. Operating mode with restart interlock and external device monitoring.

Function

If the light path is clear, the OSSD1 and OSSD2 outputs are live. The system is ready to switch on if K1 and K2 are de-energised. By pressing S1 (button is pressed and released) the UE 48 relay is energised and its contacts 13-14 and 23-24 activate K1 and K2.

On interruption of one of the light beams, the UE 48 is de-energised by the OSSD1 and OSSD2 outputs and K1 and K2 are deactivated.

Possible faults

Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of one of the K1 or K2 contactors will be detected and does not result in the loss of the shutdown function. Jamming of the S1 button will prevent the UE 48 from enabling.

Comments

- 1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.
- 2) The external device monitoring is only static.
- 3) PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed.

Accessories

Mounting accessories

→ Dimensional drawings mounting accessories see page D-65

Designation	Description	Part number
Mounting kit 2	<ul style="list-style-type: none"> 4 pieces Pivoting Swivel mount 	2 019 659
Mounting kit 6	<ul style="list-style-type: none"> 4 pieces Pivoting Side bracket 	2 019 506
Stainless steel bracket	<ul style="list-style-type: none"> 4 pieces Pivoting Large housing profile 	2 023 708
Reinforced stainless steel bracket	<ul style="list-style-type: none"> 4 pieces Pivoting Vibration resistance 5 g, 10 Hz ... 55 Hz Shock resistance 10 g, 16 ms 	2 026 850

Connector technology

Connection	Designation	Description	Connection cable	Part number
System connection Hirschmann plug	Hirschmann cable socket	<div><div></div> 6-pin + PE</div> <div><div></div> Straight</div>	—	6 006 612
		<div><div></div> 6-pin + PE</div> <div><div></div> Angled with screw connections</div>	—	6 007 363
System connection M12 plug	M12 cable socket	<div><div></div> 8-pin</div> <div><div></div> Straight</div>	2.5 m	6 020 537
			5.0 m	6 020 354
			7.5 m	6 020 353
			10.0 m	6 020 352
			15.0 m	6 020 872
		<div><div></div> 8-pin</div> <div><div></div> Angled</div>	5.0 m	6 021 342
			15.0 m	6 021 343
Extension connection	M12 cable sockets and plugs	<div><div></div> Pre-assembled</div> <div><div></div> 8-pin</div> <div><div></div> Straight</div>	0.25 m	6 021 000
			0.5 m	6 021 001
			1 m	6 021 002
			1.5 m	6 021 003
			2 m	6 021 004
			2.5 m	6 021 005
			3 m	6 021 006

Continued on next page

Interfaces

Designation	Description	Connection	Type	Part number
Safety evaluation unit LE 20	<ul style="list-style-type: none">IP 202 PNP OSSDs, 500 mA	<ul style="list-style-type: none">With screw terminal connector16-pin	LE20-2612	1 016 503
		<ul style="list-style-type: none">With terminal plug springAngled16-pin	LE20-2614	1 016 505
Safety evaluation unit LE 20 Muting		<ul style="list-style-type: none">With screw terminal connector15- and 16-pin	LE20-2622	1 016 502
<ul style="list-style-type: none">With terminal plug spring15- and 16-pin		LE20-2624	1 016 501	
Safety relay	<ul style="list-style-type: none">For opto-electronic protective devices	—	UE10-30S2D0	6 024 917
	<ul style="list-style-type: none">For opto-electronic protective devices	—	UE10-30S3D0	6 024 918
	<ul style="list-style-type: none">With screw type terminals	—	UE10-20S2D0	2 019 772
	<ul style="list-style-type: none">With spring terminals	—	UE10-20S4D0	2 019 771
	<ul style="list-style-type: none">Without terminals	—	UE10-20S1D0	6 020 342
	<ul style="list-style-type: none">With screw type terminals	—	UE48-20S2D2	6 024 915
	<ul style="list-style-type: none">With plug-in terminals	—	UE48-20S3D2	6 024 916
	<ul style="list-style-type: none">With screw type terminals	—	UE48-30S2D2	6 025 089
	<ul style="list-style-type: none">With plug-in terminals	—	UE48-30S3D2	6 025 097

Device columns

Designation	Description	Part number
Device column without front screen	<ul style="list-style-type: none"> 2-beam, 500 mm beam separation Including mounting kit 	2 021 328
	<ul style="list-style-type: none"> 3-beam, 400 mm beam separation Including mounting kit 	2 021 329
Device column with front screen ¹⁾	<ul style="list-style-type: none"> Length 1200 mm Including mounting kit 	2 021 330
	<ul style="list-style-type: none"> Length 1500 mm Including mounting kit 	2 021 331
	<ul style="list-style-type: none"> Length 1700 mm Including mounting kit 	2 021 332

¹⁾ Warning, reduction of the scanning range!

Device columns for outdoor use

Designation	Description	Part number
Device column with heating 220 V	<ul style="list-style-type: none"> Suitable for M20-02x50Axxx With brackets and cable socket Without photoelectric safety switch 	2 023 707
	<ul style="list-style-type: none"> Suitable for M20-03x40Axxx With brackets and cable socket Without photoelectric safety switch 	2 025 441

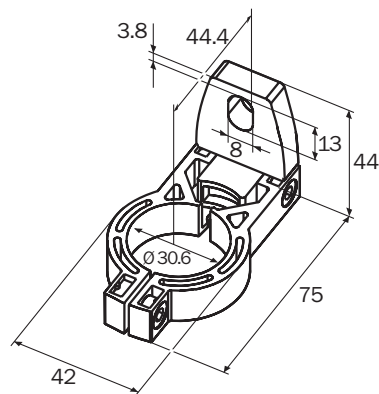
Mirror columns ¹⁾

Designation	Description	Part number
Mirror column, fully assembled with mirrors	<ul style="list-style-type: none"> Suitable for M20x-02xxxx, 2-beam, 500 mm beam separation 	1 015 041
	<ul style="list-style-type: none"> Suitable for M20Z-02xxxxxx, 2-beam, 500 mm beam separation Fully assembled with mirrors 45° 	1 015 042
	<ul style="list-style-type: none"> Suitable for M20x-03xxxx, 3-beam, 400 mm beam separation 	1 015 040
	<ul style="list-style-type: none"> Suitable for M20x-04xxxx, 4-beam, 300 mm beam separation 	1 019 115

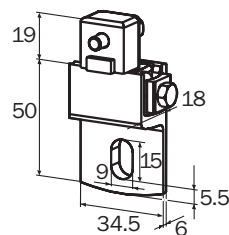
¹⁾ Warning, reduction of the scanning range!

→ For dimensional drawings of the device columns and mirror columns please refer to the operating instructions/technical description.
Download at www.sick.com

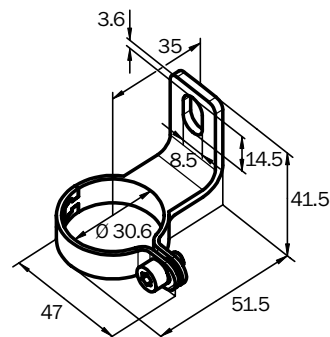
Dimensional drawings mounting accessories



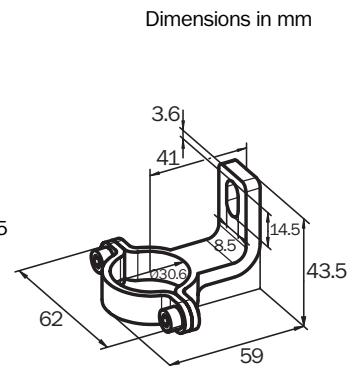
Swivel mount
Mounting kit 2



Side bracket
Mounting kit 6



Stainless steel bracket



Reinforced stainless steel bracket

Dimensions in mm



- External device monitoring (EDM)
- Self-testing
- 7-segment display
- Diagnostics
- Alignment aid



Further information	Page
→ Dimensional drawings	D-68
→ Connection diagram	D-69
→ Accessories	D-71
→ Dimensional drawings accessories	D-73
→ Services	A-0

Overview of technical specifications

Scanning range	0 m ... 6 m
Number of beams	1
Beam separation	500 mm
Type	Type 2 according to EN 61496
Enclosure rating	IP 65

Product description

The M 2000-A/P Standard multi-beam photoelectric safety switch comprises a sender/receiver unit on the active side (A) and one or more deflector mirrors on the passive side (P). With their high signal reserve, they are also reliable under harsh industrial conditions.

Functions and status information integrated in the device allow rapid commissioning and prevent unnecessary machine downtime.

Interfaces and service concepts complete the product range to provide an ideal solution.

In-system added value

- Combination with SICK interfaces
- Safe interface to bus systems

Combination with	Restart interlock	Muting	Further information
LE 20	✓	—	L-53
LE 20 Muting	—	✓	L-60
UE 48-2 OS	✓	—	L-42
UE 48-3 OS	✓	—	L-48

Applications

→ For more applications please refer to the application finder at www.sick.com

- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry

Ordering information

M 2000-A/P Standard

- With external device monitoring ¹⁾ (EDM)
- Comprising a sender/receiver unit as the active side and a deflector mirror as the passive side

→ Accessories see page D-71

Scanning range 0 ... 6 m

Number of beams	Beam separation (mm)	Connection plug	Sender and receiver unit		Deflector mirror	
			Type	Part number	Type	Part number
1	500	Hirschmann 11-pin + PE	M20Z-02550A121	1 016 513	PSR01-1501	1 016 677
		M12, 8-pin	M20Z-02550A122	1 018 361		

¹⁾ External device monitoring only available with devices with M12 plug!

Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at www.sick.com

General system data

Scanning range	0 m ... 6 m
Number of beams	1
Beam separation	500 mm
Enclosure rating	IP 65
Type	Type 2 according to EN 61496
Synchronisation	Optical, without separate synchronisation
Supply voltage V_S	24 V (19.2 V ... 28.8 V) DC

Sender/receiver unit

Switching outputs (OSSDs)	2 PNP semiconductors (short-circuit protected, cross-circuit monitored)
Response time (depending on type)	Max. 7 ms
Switching voltage	$V_S - 2.25 \text{ V}$ 1 V
Switching current	Max. 500 mA
Power consumption	Max. 7.5 W

Operating data

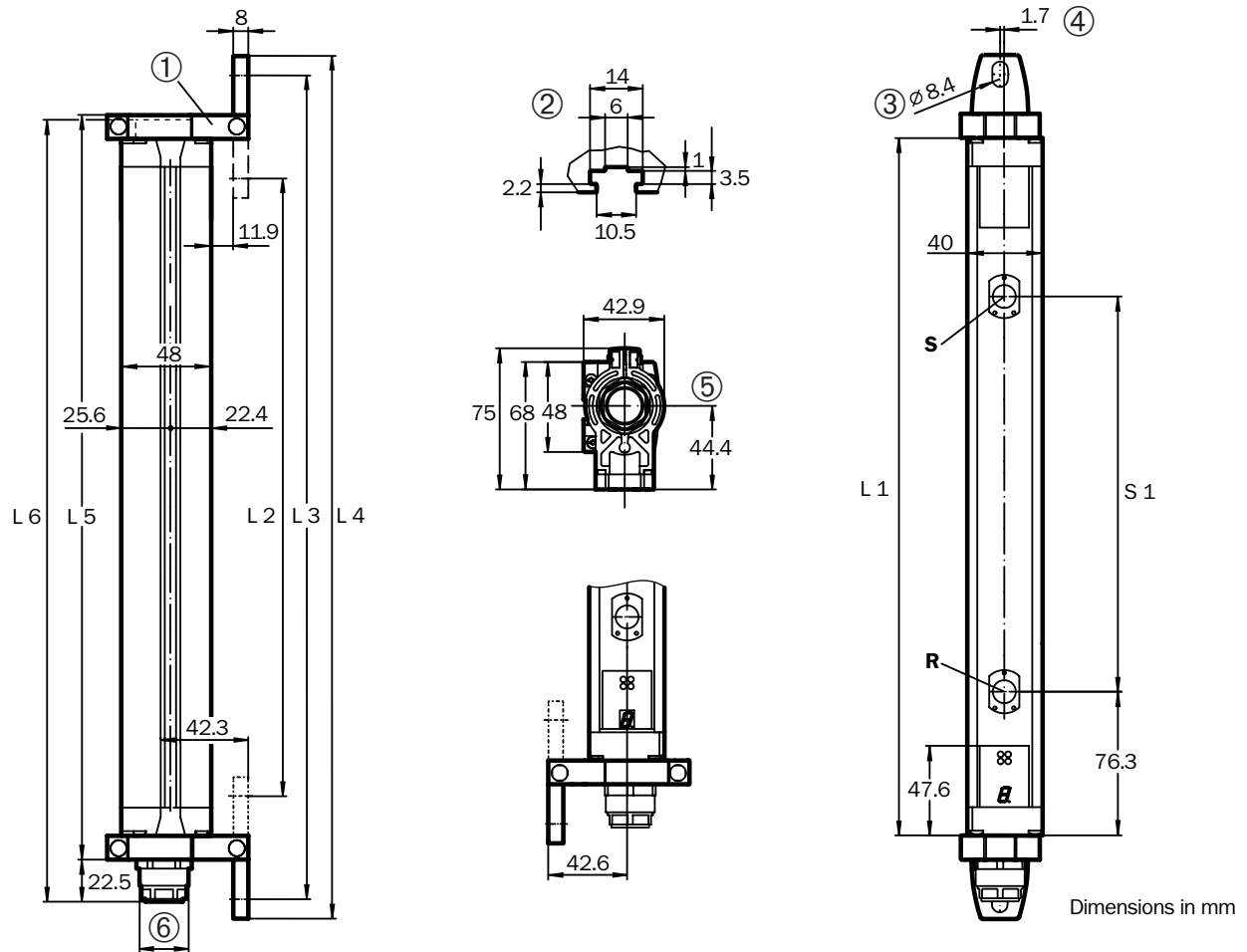
Type of connection (depending on type)	Hirschmann plug 11-pin + PE M12 plug, 8-pin
Connection cable wire cross-section	Max. 1 mm ² Max. 0.25 mm ²
Connection cable length	Max. 60 m Max. 15 m

Continued on next page

Ambient operating temperature T_A	0 °C ... +55 °C
Storage temperature T_S	-25 °C ... +70 °C
Air humidity	15 % ... 95 %
Housing cross-section	48 mm x 40 mm
Vibration resistance	5 g, 10 ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29
Weight	1.41 kg

Dimensional drawings

→ You will find more dimensional drawings in the technical description/operating instructions. Download at www.sick.com



Sender/receiver unit with swivel mount

- ① Mounting clamp
- ② Sliding nut groove for side mounting
- ③ Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
- ④ Adjustment
- ⑤ Centre of light beam offset
- ⑥ Hirschmann plug DIN 43651

S Sender **R** Receiver

N	S 1	L 1	L 2	L 3	L 4	L 5	L 6
2	500	653	611	720	741	678	700

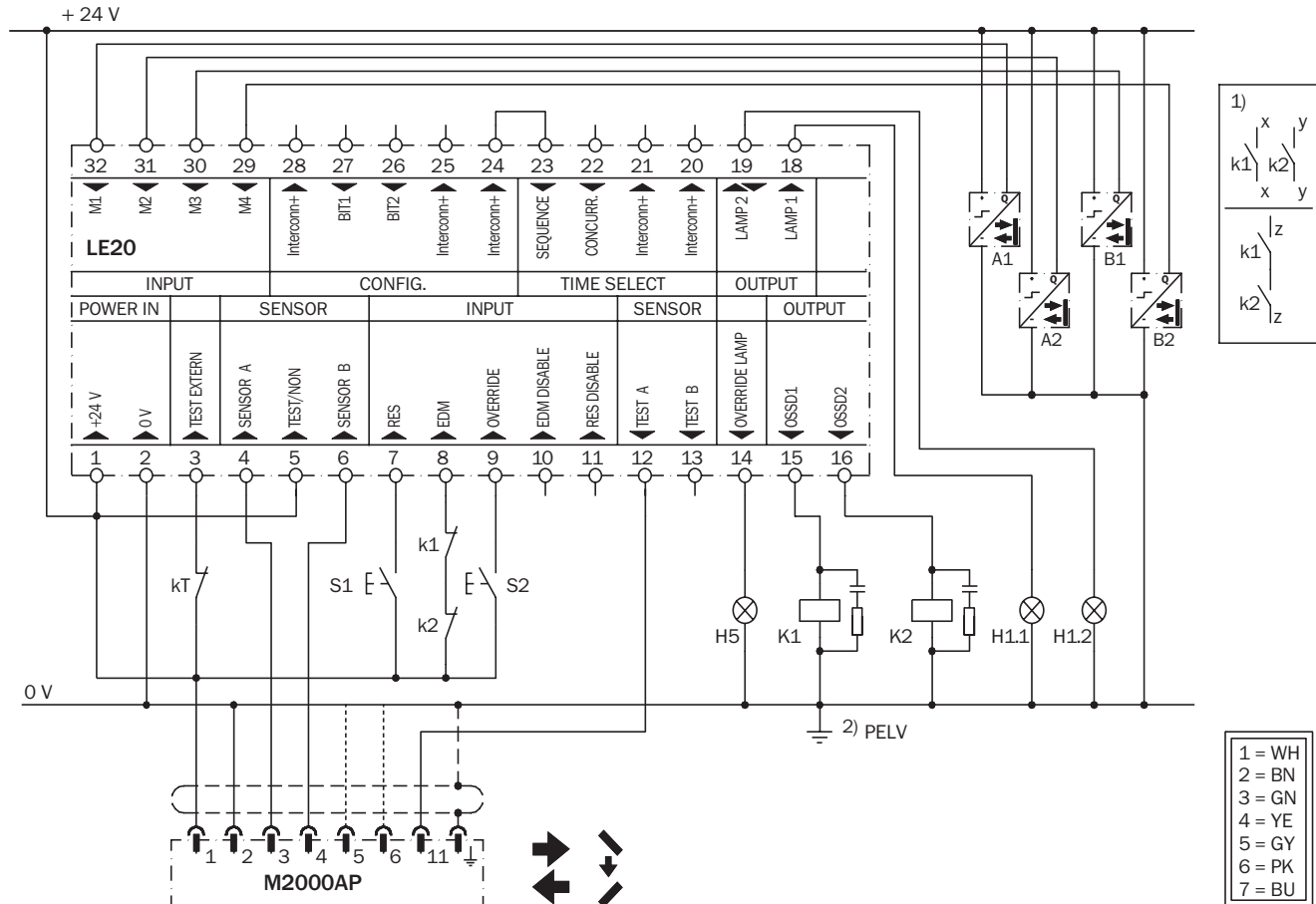
N Number of beams **S 1** Beam separation

Dimensions in mm

Connection diagram

→ You can find more connection diagrams at www.sick.com

M 2000-A/P Standard on safety evaluation unit LE 20 Muting



See next page for a description of the connection diagram

Task

Integration of an M 2000-A/P Standard multi-beam photoelectric safety switch in a control system via an LE 20. Muting using 4 photoelectric proximity switches (light switching PNP) and override circuit. Concurrence monitoring of the muting sensors, operating mode with restart interlock and external device monitoring.

Function

If the light beams are clear and the K1 and K2 contactors are de-energised, the OSSDs on the LE 20 are switched on by pressing S1 (button is pressed and released). The OSSDs of the LE 20 (terminals 15 and 16) activate the contactors K1 and K2. If a light beam is interrupted, the LE 20 deactivates the contactors K1 and K2.

Muting

The protective field must be clear, and the OSSDs on the LE 20 switched on, to allow initiation of the muting function. Muting is prevented if photoelectric proximity switch pair A or B is not activated within 3 seconds. The muting inputs must remain activated without interruption for the duration of the muting, also on switching from A1 & A2 to B1 & B2.

Override

If, after a power failure or a muting error, the object to be muted is present in the light beam, the object can be moved out of the protective field by operating the S 2000 button. This is only possible if a valid combination of muting signals is present at the LE 20. This situation is indicated by illumination of the override lamp H5.

Possible faults

The incorrect functioning of one of the K1 or K2 contactors does not result in the loss of the shutdown function. The outputs of the LE 20 are monitored PNP semiconductor outputs. Jamming of the S1 button prevents output circuit to enable. Failure of a muting sensor is detected so that renewed muting is prevented. Muting cannot be initiated if the muting lamp H1.1 is not connected or is faulty, or if there is a short-circuit in this circuit. If a replacement indicator (H1.2) is connected, it will indicate the failure of the muting lamp H1.1 by flashing, and muting can be initiated. Jamming of the S2 button will be detected after no more than 30 minutes and will bring the override to an end.

Comments

- 1) Output circuits. These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.
- 2) PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed.

Accessories

Mounting accessories

→ Dimensional drawings mounting accessories see page D-73

Designation	Description	Part number
Mounting kit 2	<ul style="list-style-type: none"> 4 pieces Pivoting Swivel mount 	2 019 659
Mounting kit 6	<ul style="list-style-type: none"> 4 pieces Pivoting Side bracket 	2 019 506
Mounting kit 9	<ul style="list-style-type: none"> 2 pieces swivel mount, pivoting for sender/receiver unit M 2000-A/P/active 2 pieces side brackets, pivoting for deflector mirror PSR01-1501 	2 021 569
Stainless steel bracket	<ul style="list-style-type: none"> 4 pieces Pivoting Large housing profile 	2 023 708
Reinforced stainless steel bracket	<ul style="list-style-type: none"> 4 pieces Pivoting Vibration resistance 5 g, 10 Hz ... 55 Hz Shock resistance 10 g, 16 ms 	2 026 850

Connector technology

Connection	Designation	Description	Connection cable	Part number
System connection Hirschmann plug	Hirschmann cable socket	<ul style="list-style-type: none"> 11-pin + PE Straight 	—	6 020 757
		<ul style="list-style-type: none"> 11-pin + PE Angled 	—	6 020 758
System connection M12 plug	M12 cable socket	<ul style="list-style-type: none"> 8-pin Straight 	2.5 m	6 020 537
			5.0 m	6 020 354
			7.5 m	6 020 353
			10.0 m	6 020 352
			15.0 m	6 020 872
		<ul style="list-style-type: none"> 8-pin Angled 	5.0 m	6 021 342
			15.0 m	6 021 343

Continued on next page

Interfaces

Designation	Description	Connection	Type	Part number
Safety evaluation unit LE 20	<ul style="list-style-type: none">IP 202 PNP OSSDs, 500 mA	<ul style="list-style-type: none">With screw terminal connector16-pin	LE20-2612	1 016 503
		<ul style="list-style-type: none">With terminal plug springAngled16-pin	LE20-2614	1 016 505
Safety evaluation unit LE 20 Muting		<ul style="list-style-type: none">With screw terminal connector15- and 16-pin	LE20-2622	1 016 502
<ul style="list-style-type: none">With terminal plug spring15- and 16-pin		LE20-2624	1 016 501	
Safety relay	<ul style="list-style-type: none">For opto-electronic protective devices	—	UE10-30S2D0	6 024 917
	<ul style="list-style-type: none">For opto-electronic protective devices	—	UE10-30S3D0	6 024 918
	<ul style="list-style-type: none">With screw type terminals	—	UE10-20S2D0	2 019 772
	<ul style="list-style-type: none">With spring terminals	—	UE10-20S4D0	2 019 771
	<ul style="list-style-type: none">Without terminals	—	UE10-20S1D0	6 020 342
	<ul style="list-style-type: none">With screw type terminals	—	UE48-20S2D2	6 024 915
	<ul style="list-style-type: none">With plug-in terminals	—	UE48-20S3D2	6 024 916
	<ul style="list-style-type: none">With screw type terminals	—	UE48-30S2D2	6 025 089
	<ul style="list-style-type: none">With plug-in terminals	—	UE48-30S3D2	6 025 097

Device columns

Designation	Description	Part number
Device column without front screen	<ul style="list-style-type: none"> 2-beam, 500 mm beam separation Including mounting kit 	2 021 328
Device column with front screen ¹⁾	<ul style="list-style-type: none"> Length 1200 mm Including mounting kit 	2 021 330
	<ul style="list-style-type: none"> Length 1500 mm Including mounting kit 	2 021 331
	<ul style="list-style-type: none"> Length 1700 mm Including mounting kit 	2 021 332

¹⁾ Warning, reduction of the scanning range!

Mirror column ¹⁾

Designation	Description	Part number
Mirror column, fully assembled with mirrors 45°	<ul style="list-style-type: none"> Suitable for M20Z-02xxxxxx, 2-beam, 500 mm beam separation 	1 015 042

¹⁾ Warning, reduction of the scanning range!

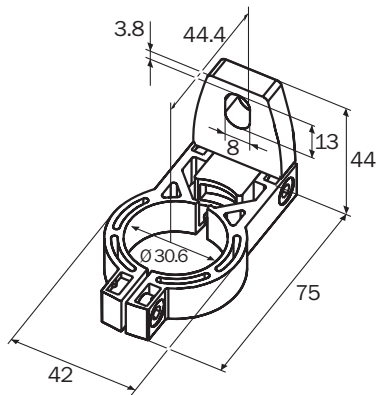
Deflector mirror ¹⁾

Designation	Description	Part number
Deflector mirror PSR01-S04	<ul style="list-style-type: none"> Suitable for M20Z-02550xxxx with end caps for swivel mount bracket (large housing) and front screen 	1 025 227

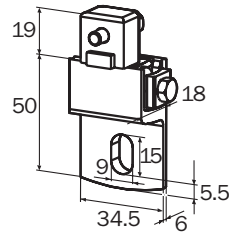
¹⁾ Warning, reduction of the scanning range!

→ For dimensional drawings of the device columns, mirror columns and deflector mirrors please refer to the operating instructions/technical description. Download at www.sick.com

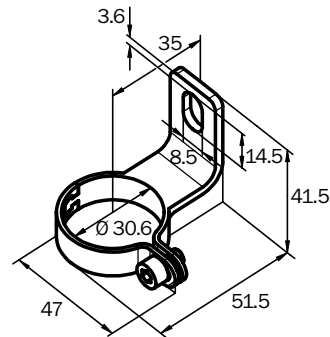
Dimensional drawings mounting accessories



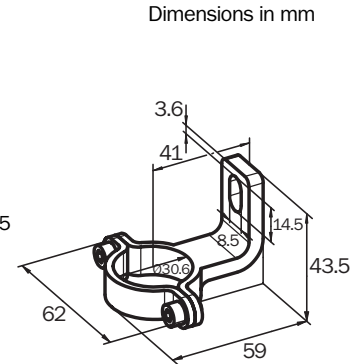
Swivel mount
Mounting kit 2
Mounting kit 9



Side bracket
Mounting kit 6
Mounting kit 9



Stainless steel bracket



Reinforced stainless steel bracket

Dimensions in mm

D



- Restart interlock (RES)
- External device monitoring (EDM)
- Self-testing
- 7-segment display
- Diagnostics
- Alignment aid



Further information	Page
→ Dimensional drawings	D-76
→ Connection diagram	D-77
→ Accessories	D-78
→ Dimensional drawings accessories	D-79
→ Services	A-0

Overview of technical specifications

Scanning range	0 m ... 6 m
Number of beams	1
Beam separation	500 mm
Type	Type 2 according to EN 61496
Enclosure rating	IP 65

Product description

The M 2000-A/P RES/EDM multi-beam photoelectric safety switch comprises a sender/receiver unit on the active side (A) and one or more deflector mirrors on the passive side (P). With their high signal reserve, they are also reliable under harsh industrial conditions. Functions and status information integrated in the device allow rapid commis-

sioning and prevent unnecessary machine downtime. Interfaces and service concepts complete the product range to provide an ideal solution for the sector.

The integrated restart interlock in the M 2000-A/P RES/EDM offers the advantages of shorter cable runs and quicker commissioning compared to traditional solutions.

In-system added value

- Combination with SICK interfaces
- Safe interface to bus systems

Combination with	Muting	Further information
LE 20 Muting	✓	L-60

Applications

→ For more applications please refer to the application finder at www.sick.com

- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry

Ordering information

M 2000-A/P RES/EDM

■ Comprising a sender/receiver unit as the active side and a deflector mirror as the passive side

→ Accessories see page D-78

Scanning range 0 ... 6 m

Number of beams	Beam separation (mm)	Connection plug	Sender and receiver unit		Deflector mirror	
			Type	Part number	Type	Part number
1	500	Hirschmann 11-pin + PE	M20Z-02550A221	1 018 239	PSR01-1501	1 016 677
		M12, 8-pin	M20Z-02550A222	1 018 362		

D

Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at www.sick.com

General system data

Scanning range	0 m ... 6 m
Number of beams	1
Beam separation	500 mm
Enclosure rating	IP 65
Type	Type 2 according to EN 61496
Synchronisation	Optical, without separate synchronisation
Supply voltage V_S	24 V (19.2 V ... 28.8 V) DC

Sender/receiver unit

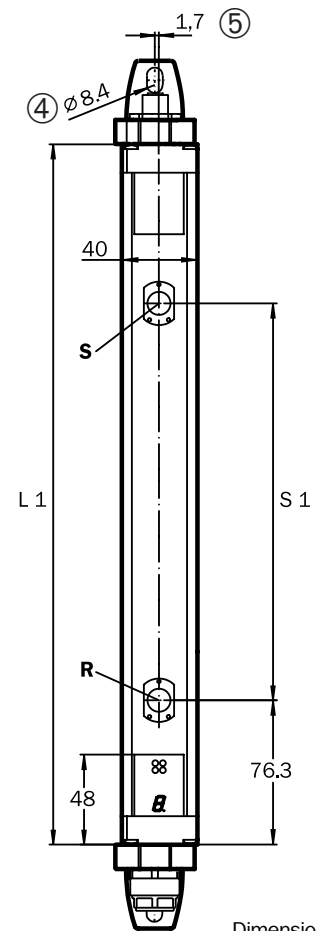
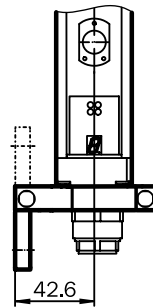
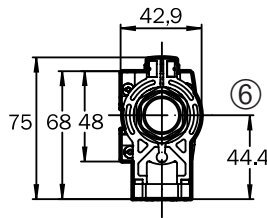
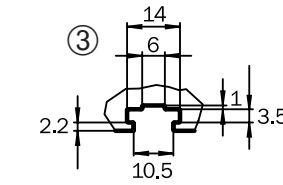
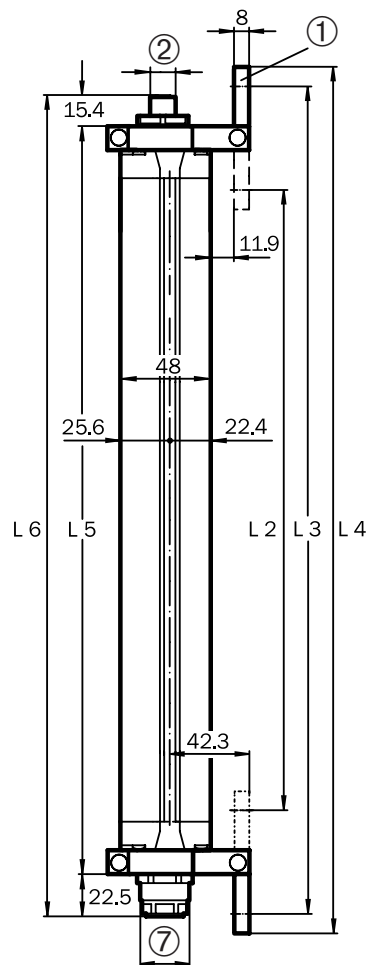
Switching outputs (OSSDs)	2 PNP semiconductors (short-circuit protected, cross-circuit monitored)
Response time (depending on type)	Max. 7 ms
Switching voltage	$V_S - 2.25 \text{ V}$ 1 V
Switching current	Max. 500 mA
Power consumption	Max. 7.5 W

Operating data

Type of connection (depending on type)	Hirschmann plug 11-pin + PE M12 plug, 8-pin
Connection cable wire cross-section	Hirschmann plug M12 plug Max. 1 mm ² Max. 0.25 mm ²
Connection cable length	for wire cross-section 1 mm ² for wire cross-section 0.25 mm ² Max. 60 m Max. 15 m
Ambient operating temperature T_A	0 °C ... +55 °C
Storage temperature T_S	-25 °C ... +70 °C
Air humidity	15 % ... 95 %
Housing cross-section	48 mm x 40 mm
Vibration resistance	5 g, 10 ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29
Weight (depending on type)	1.25 kg ... 2.86 kg

Dimensional drawings

→ You will find more dimensional drawings in the technical description/operating instructions. Download at www.sick.com



Dimensions in mm

Sender/receiver unit with swivel mount

- ① Mounting clamp
- ② M12 x 1 socket (standard)
- ③ Sliding nut groove for side mounting
- ④ Hex screw M8, DIN 933 with washer. DIN 9021 (not supplied with delivery)
- ⑤ Centre of light beam offset
- ⑥ Adjustment
- ⑦ Plug PG13.5 according to DIN 43651

S Sender

R Receiver

N	S 1	L 1	L 2	L 3	L 4	L 5	L 6
2	500	653	611	720	741	678	716

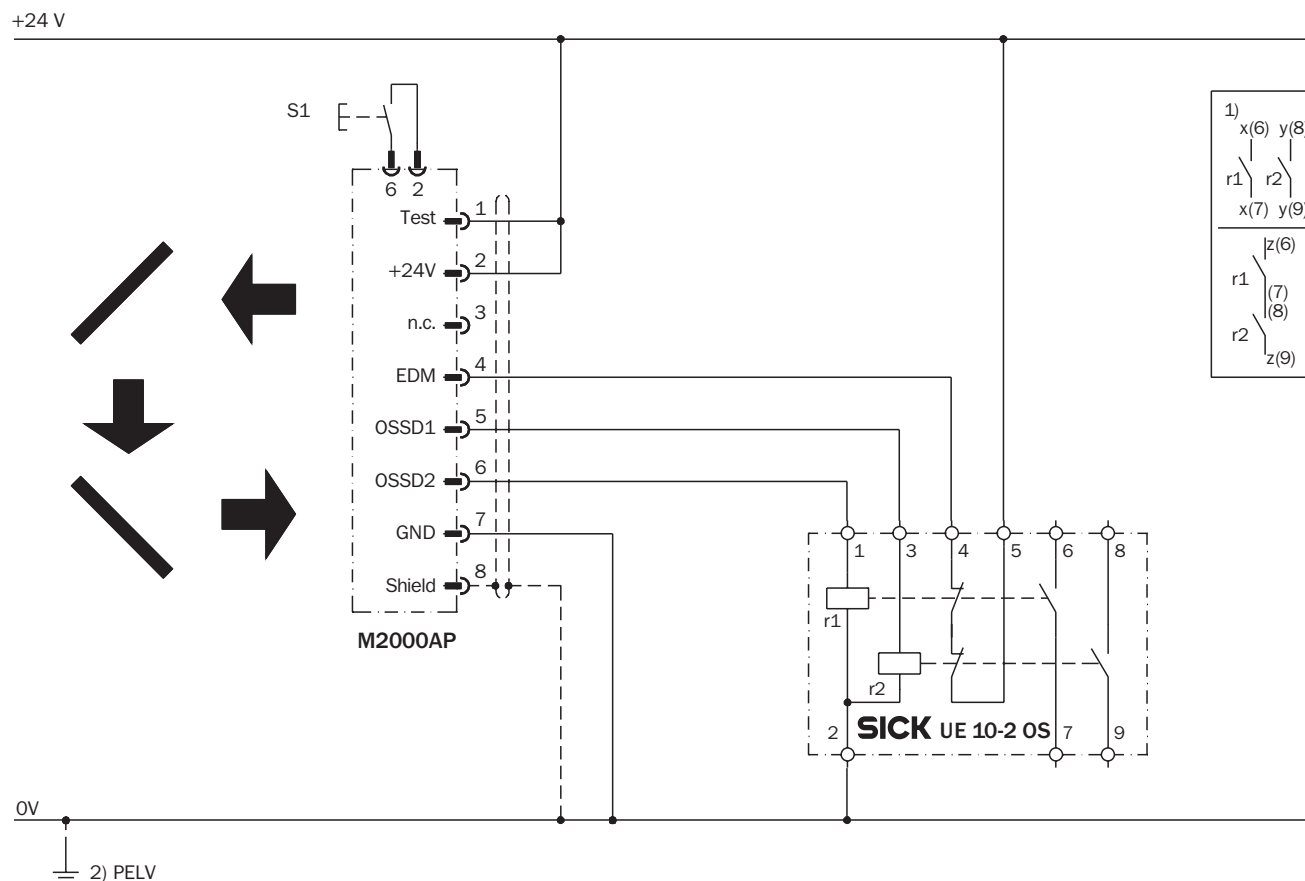
N Number of beams **S 1** Beam separation

Dimensions in mm

Connection diagram

→ You can find more connection diagrams at www.sick.com

M 2000-A/P RES/EDM on safety relay UE 10



Task

Interfacing an M 2000-A/P RES/EDM multi-beam photoelectric safety switch to UE10-2OS. Operating mode with restart interlock and external device monitoring.

Function

The yellow LED on the M 2000-A/P RES/EDM flashes when the light path is clear and the UE 10 is de-energised and functioning correctly. The system is ready to be switched on. The system is enabled by pressing S1 (button is pressed and released). The OSSD1 and OSSD2 outputs are live, the UE 10 is switched on. On interruption of one of the light beams, the UE 10 is de-energised by the OSSD1 and OSSD2 outputs.

Possible faults

Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of the UE10 will be detected and will not result in the loss of the shutdown function. Jamming of the S1 button prevents output circuit to enable.

Comments

- 1) Output circuits. These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.
- 2) PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed.

Accessories

Mounting accessories

Designation	Description	Part number
Mounting kit 2	<ul style="list-style-type: none"> 4 pieces Pivoting Swivel mount 	2 019 659
Mounting kit 6	<ul style="list-style-type: none"> 4 pieces Pivoting Side bracket 	2 019 506
Mounting kit 9	<ul style="list-style-type: none"> 2 pieces swivel mount, pivoting for sender/receiver unit M 2000-A/P/active 2 pieces side brackets, pivoting for deflector mirror PSR01-1501 	2 021 569
Stainless steel bracket	<ul style="list-style-type: none"> 4 pieces Pivoting Large housing profile 	2 023 708
Reinforced stainless steel bracket	<ul style="list-style-type: none"> 4 pieces Pivoting Vibration resistance 5 g, 10 Hz ... 55 Hz Shock resistance 10 g, 16 ms 	2 026 850

Connector technology

Connection	Designation	Description	Connection cable	Part number
System connection Hirschmann plug	Hirschmann cable socket	<ul style="list-style-type: none"> 11-pin + PE Straight 	—	6 020 757
		<ul style="list-style-type: none"> 11-pin + PE Angled 	—	6 020 758
System connection M12 plug	M12 cable socket	<ul style="list-style-type: none"> 8-pin Straight 	2.5 m	6 020 537
			5.0 m	6 020 354
			7.5 m	6 020 353
			10.0 m	6 020 352
			15.0 m	6 020 872
		<ul style="list-style-type: none"> 8-pin Angled 	5.0 m	6 021 342
			15.0 m	6 021 343

Interfaces

Designation	Description	Connection	Type	Part number
Safety evaluation unit LE 20	<ul style="list-style-type: none">IP 202 PNP OSSDs, 500 mA	<ul style="list-style-type: none">With screw terminal connector16-pin	LE20-2612	1 016 503
		<ul style="list-style-type: none">With terminal plug springAngled16-pin	LE20-2614	1 016 505
Safety evaluation unit LE 20 Muting		<ul style="list-style-type: none">With screw terminal connector15- and 16-pin	LE20-2622	1 016 502
		<ul style="list-style-type: none">With terminal plug spring15- and 16-pin	LE20-2624	1 016 501
Safety relay		<ul style="list-style-type: none">For opto-electronic protective devices	—	UE10-30S2D0
	<ul style="list-style-type: none">For opto-electronic protective devices	—	UE10-30S3D0	6 024 918
	<ul style="list-style-type: none">With screw type terminals	—	UE10-20S2D0	2 019 772
	<ul style="list-style-type: none">With spring terminals	—	UE10-20S4D0	2 019 771
	<ul style="list-style-type: none">Without terminals	—	UE10-20S1D0	6 020 342

Device columns

Designation	Description	Part number
Device column without front screen	<ul style="list-style-type: none"> 2-beam, 500 mm beam separation Including mounting kit 	2 021 328
Device column with front screen ¹⁾	<ul style="list-style-type: none"> Length 1200 mm Including mounting kit 	2 021 330
	<ul style="list-style-type: none"> Length 1500 mm Including mounting kit 	2 021 331
	<ul style="list-style-type: none"> Length 1700 mm Including mounting kit 	2 021 332

¹⁾ Warning, reduction of the scanning range!

Device columns for outdoor use

Designation	Description	Part number
Device column with heating 220 V	<ul style="list-style-type: none"> Suitable for M20-02x50Axxx and M 20Z-02x50Axxx With brackets and cable socket Without photoelectric safety switch 	2 023 707
	<ul style="list-style-type: none"> Suitable for M20-03x40Axxx With brackets and cable socket Without photoelectric safety switch 	2 025 441

Mirror column ¹⁾

Designation	Description	Part number
Mirror column, fully assembled with mirrors 45°	<ul style="list-style-type: none"> Suitable for M20Z-02xxxxxx, 2-beam, 500 mm beam separation 	1 015 042

¹⁾ Warning, reduction of the scanning range!

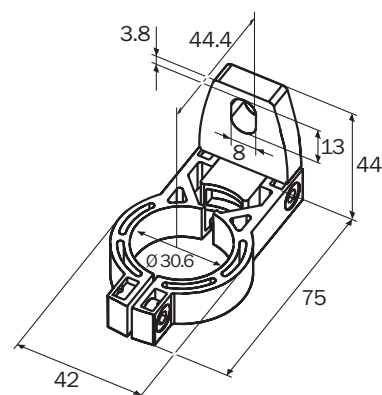
Deflector mirror ¹⁾

Designation	Description	Part number
Deflector mirror PSR01-S04	<ul style="list-style-type: none"> Suitable for M 20Z-02550xxx with end caps for swivel mount bracket (large housing) and front screen 	1 025 227

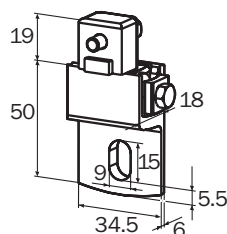
¹⁾ Warning, reduction of the scanning range!

→ For dimensional drawings of the device columns, mirror columns and deflector mirrors please refer to the operating instructions/technical description. Download at www.sick.com

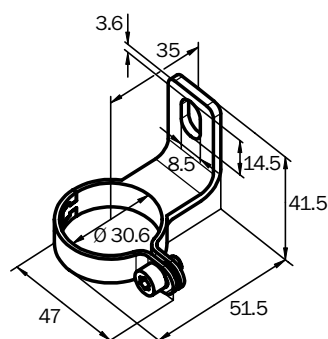
Dimensional drawings mounting accessories



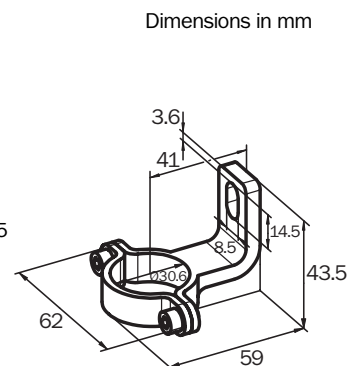
Swivel mount
Mounting kit 2
Mounting kit 9



Side bracket
Mounting kit 6
Mounting kit 9



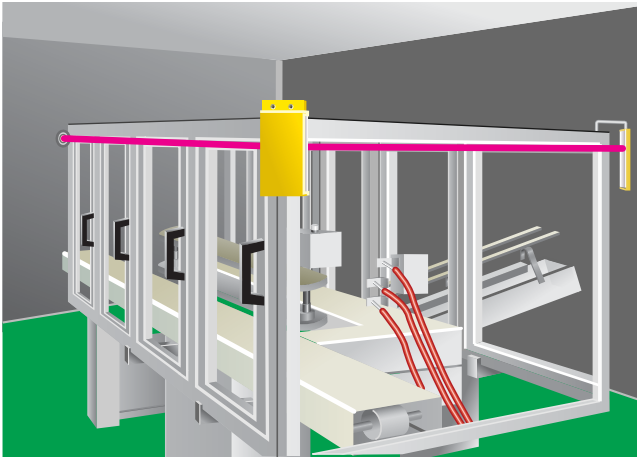
Stainless steel bracket



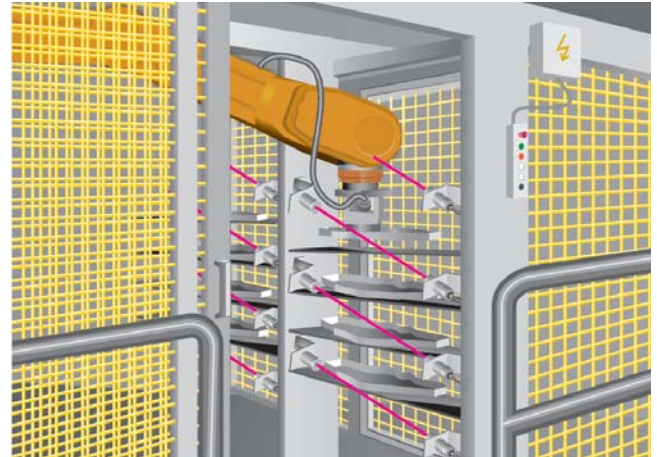
Reinforced stainless steel bracket

Dimensions in mm

Electro-sensitive access protection of hazardous areas with type 2 and type 4 single-beam photoelectric safety switches



Door monitoring on a packaging machine



Monitoring robot presence at a loading station

SICK's single-beam photoelectric safety switches consist either of testable senders and receivers, or of testable senders and receivers combined with an evaluation unit. These devices impress both with their large scanning range and the variety of shapes and sizes available. They also offer maximum safety performance as they comply with control categories type 2 or type 4 in accordance with EN 61496.

The possible applications are very wide-ranging: Whether on robots, processing machines, machining centres, palletising systems, high-bay warehouses or transfer lines - with products from SICK you will profit from a customer-friendly solution of the highest quality.

Double benefit for low stock-keeping costs

You profit twice with SICK devices, as you can also use the photoelectric safety switches for your automation applications. You only need to keep one type of through-beam photoelectric switch in stock and can thus reduce your costs.

Also safe in extreme situations

All single-beam photoelectric safety switches from SICK have an IP 67 enclosure rating and are therefore very well equipped to withstand extreme conditions such as heat (up to +60 °C), cold (to -40 °C) or humidity. SICK also provides solutions for changing ambient conditions and the outdoor area.

Flexible technology that adapts as required

SICK photoelectric safety switches offer you more flexibility than ever before. You will profit from the very wide range of shapes, sizes and types and will have a very large choice of housing materials. Whether rectangular or cylindrical photoelectric switches, at SICK you will always find the right solution for your application.

Impressive performance, optimum price

You will also profit from an optimum price-performance ratio. SICK products are optimally matched to one another.

Services for productive safety

With services tailored specifically to your needs, SICK offers all-embracing support for the safety of your machine or system.

Address productivity and cost-effectiveness from the start: From selection and planning, through commissioning and inspection, to maintenance and modernisation.

→ For information about the services please refer to chapter A

Single-beam photoelectric safety switches



E

Safety application	Type according to IEC/EN 61496	Number of sensors	Scanning range (m)	Ambient operating temperature (°C)	Type	Construction size (mm), (H x W x D or Ø x L)	Functions			Product	Page
							Muting	Restart interlock	External device monitoring		
	Type 4	8 ¹⁾	0 ... 5 0 ... 10 0 ... 60	-20 ... +55	Cylindrical	M18 x 108 M18 x 98 M30 x 100	—	✓ ¹⁾	✓ ¹⁾	L 4000 / L 400	E-2
		1	0.5 ... 18 15 ... 70	-25 ... +55	Rectangular	156 x 50 x 116	—	✓ ⁴⁾	✓ ⁴⁾	WSU/WEU 26/2	E-11
	Type 2	6 ²⁾	0 ... 10/12 ³⁾	-40 ... +60	Rectangular	49 x 15 x 41.5	✓ ²⁾	✓ ²⁾	✓ ²⁾	WS/WE 12-2	E-16
			0 ... 12/18 ³⁾	-25 ... +60	Rectangular	75.5 x 17.6 x 33.5	✓ ²⁾	✓ ²⁾	✓ ²⁾	WS/WE 18-3	E-21
			0 ... 40/50 ³⁾	-40 ... +60	Rectangular	87.5 x 27 x 65	✓ ²⁾	✓ ²⁾	✓ ²⁾	WS/WE 24-2	E-26
			0 ... 25/35 ³⁾	-40 ... +60	Rectangular	80 x 24 x 53.5	✓ ²⁾	✓ ²⁾	✓ ²⁾	WS/WE 27-2	E-31
			0 ... 16/22 ³⁾	-40 ... +60	Cylindrical	M18 x 80	✓ ²⁾	✓ ²⁾	✓ ²⁾	VS/VE 18-2	E-37

¹⁾ With UE 401

²⁾ With LE 20 / LE 20 Muting

³⁾ Typical / maximum

⁴⁾ With LCU-X



E

- Restart interlock
- External device monitoring
- Max. 8 sensor pairs
- Simple alignment
- Simple diagnostics and service



Overview of technical specifications

Scanning range (depending on type)	0 m ... 60 m
Construction sizes (depending on type)	M18 / M30
Enclosure rating	IP 67
Ambient operating temperature	-20 °C ... +55 °C
Type	Type 4 according to EN 61496 (only in conjunction with UE 401)

Product description

The L 4000 photoelectric safety switch system comprises the UE 401 safety evaluation unit, to which up to 4 L 4000/L 400 sensors (sender/receiver combinations) can be connected as single pairs or up to 8 sensors can be connected in cascade. The UE 401 safety evaluation device is the connecting link between sensors and machine controller. Colour LEDs provide in-situ information on operational status. The indication of status

and error messages on the 7-segment display of the UE 401 safety evaluation unit allows rapid diagnostics. The possibility of connecting 4 individual sensor pairs or 8 sensors, the range of versions providing the right scanning range for the specific application, the suitability for outdoor applications, and the use of deflector mirrors also allow for the solution of complex protection tasks.

In-system added value

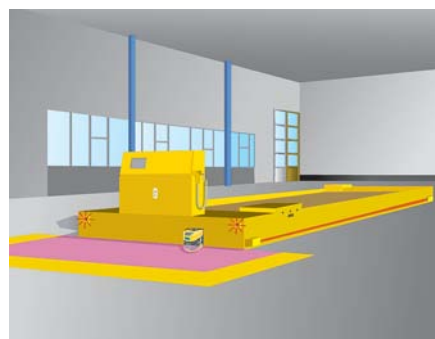
- Combination with SICK interfaces
- Safe interface to bus systems

Combination with	Switching outputs		Further information
	N/O contact	N/C contact	
UE 10-3 OS	3	1	L-3
UE 10-2 OS	2	—	L-59

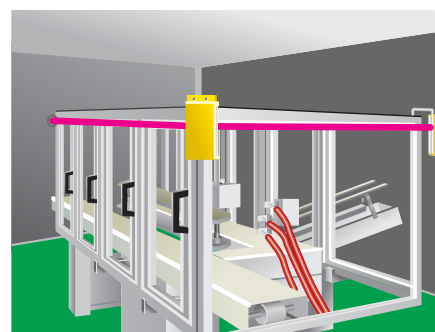
Applications

→ For more applications please refer to the application finder at www.sick.com

- Robots
- Processing machines
- Machining centres
- Palletiser systems
- High-bay warehouses
- Transfer lines



Lateral protection on an automated guided vehicle



Door monitoring on a packaging machine

Further information	Page
→ Technical specifications	E-4
→ Dimensional drawings	E-6
→ Connection diagram	E-8
→ Accessories	E-9
→ Services	A-0

Ordering information

The L 4000 photoelectric safety switch system, consisting of:

- Safety evaluation device UE 401
- Sensor pair(s) L 400 or L 4000

→ Accessories see page E-9

Evaluation device

Description	Type	Part number
Safety evaluation device UE 401	UE401-A0010	6 027 343

L 4000 sensors

- Construction size M30, angled
- M12 plug, 4-pin

Scanning range	Description	Housing	For	Type	Part number
0 m ... 60 m	Axial optics	Metal	Sender	L40S-33MA2A	6 027 335
			Receiver	L40E-33MA2A	6 027 336

L 400 sensors

- Construction size M18, straight
- M12 plug, 4-pin

Scanning range	Description	Housing	For	Type	Part number
0 m ... 10 m	Axial optics	Plastic	Sender	L40S-21KA1A	6 027 337
		Metal		L40S-21MA1A	6 027 339
0 m ... 5 m	Radial optics	Metal		L40S-11MA1A	6 027 341
0 m ... 10 m	Axial optics	Plastic	Receiver	L40E-21KA1A	6 027 338
		Metal		L40E-21MA1A	6 027 340
0 m ... 5 m	Radial optics	Metal		L40E-11MA1A	6 027 342

E

Detailed technical specifications

→ You can find more detailed data in the operating instructions. Download at www.sick.com

Safety evaluation device UE 401

Sensor connection	Up to 8 sensor pairs
Response time	Max. 30 ms
Protection class	III
Enclosure rating	IP 20
Type	Type 4 according to IEC 61496
Supply voltage	24 V (19.2 V ... 28.8 V) DC
Power consumption	Max. 3.6 W at 28.8 V
Switching outputs (OSSDs)	2 PNP semiconductors (short-circuit protected, cross-circuit monitored)
Switching voltage HIGH (active, U_{eff})	24 V (17.5 V ... 28.8 V) DC
Switching voltage LOW (inactive)	Max. 1.3 V
Switching current	Max. 0.5 A
Type of connection	Interchangeable, coded screw-type terminals
Cable lengths	Max. 100 m between evaluation device, sender, receiver and signal sources, with wire cross-section 0.25 mm ²
Wire cross-section	0.25 mm ² ... 2.5 mm ²
Ambient operating temperature	−20 °C ... +55 °C
Air humidity (non-dewing)	15 % ... 95 %
Storage temperature	−25 °C ... +75 °C
Housing fastening	Snap-in fastening for mounting rail 35 mm, DIN EN 500022
Vibration resistance	5 g, 10 ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29
Weight	160 g

L 4000 sensor

Scanning range	0 m ... 60 m
Light beam diameter	26 mm
Aperture angle/receive angle	Max. ±2.5
Light sender/type of light	LED / visible red light (660 nm)
Protection class	III
Enclosure rating	IP 67
Type	Type 4 according to IEC 61496 (only in conjunction with safety evaluation device UE 401)
Supply voltage	24 V (19.2 V ... 28.8 V) DC
Power consumption	<div>Sender</div> <div>Receiver</div>
Type of connection	M12 plug, 4-pin, angled
Construction size	M30
Housing material	Brass nickel-plated
Lens material	Glass

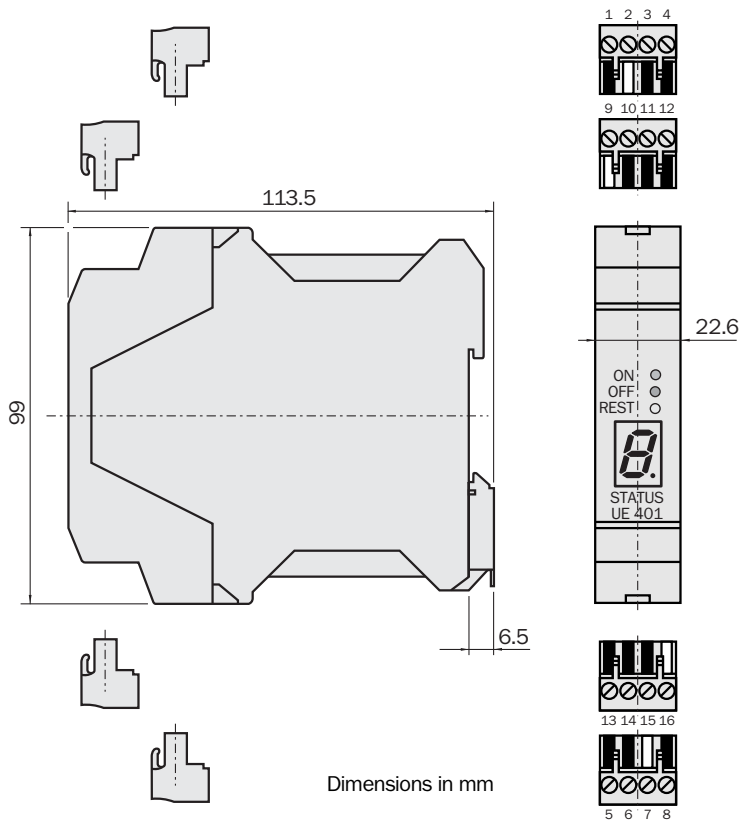
Ambient operating temperature	–20 °C ... +55 °C
Air humidity (non-dewing)	15 % ... 95 %
Storage temperature	–25 °C ... +75 °C
Vibration resistance	5 g, 10 ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29
Weight	212 g

L 400 sensor

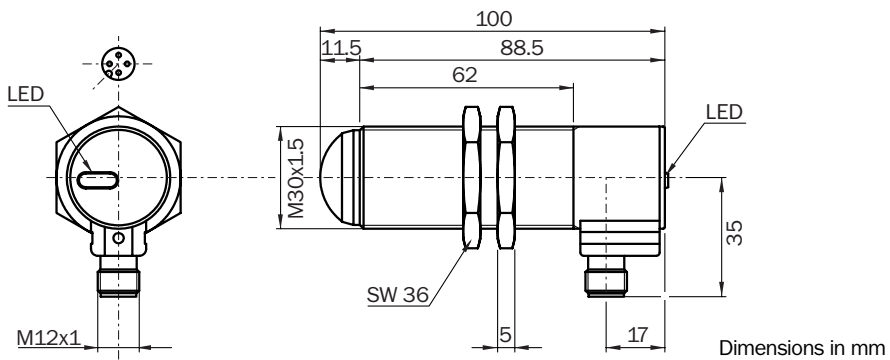
Scanning range (depending on type)	Axial optics	0 m ... 10 m
	Radial optics	0 m ... 5 m
Light beam diameter		12 mm
Aperture angle/receive angle		Max. ±2.5
Light sender/type of light		LED, visible red light (660 nm)
Protection class		III
Enclosure rating		IP 67
Type		Type 4 according to IEC 61496 (only in conjunction with safety evaluation device UE 401)
Supply voltage		24 V (19.2 V ... 28.8 V) DC
Power consumption	Sender	Max. 60 mA
	Receiver	Max. 30 mA
Type of connection		M12 plug, 4-pin, straight
Construction size		M18
Housing material		Plastic or brass nickel-plated
Lens material		Glass
Ambient operating temperature		–20 °C ... +55 °C
Air humidity (non-dewing)		15 % ... 95 %
Storage temperature		–25 °C ... +75 °C
Vibration resistance		5 g, 10 ... 55 Hz according to IEC 60068-2-6
Shock resistance		10 g, 16 ms according to IEC 60068-2-29
Weight	Plastic housing	30 g
	Metal housing	67 g

Dimensional drawings

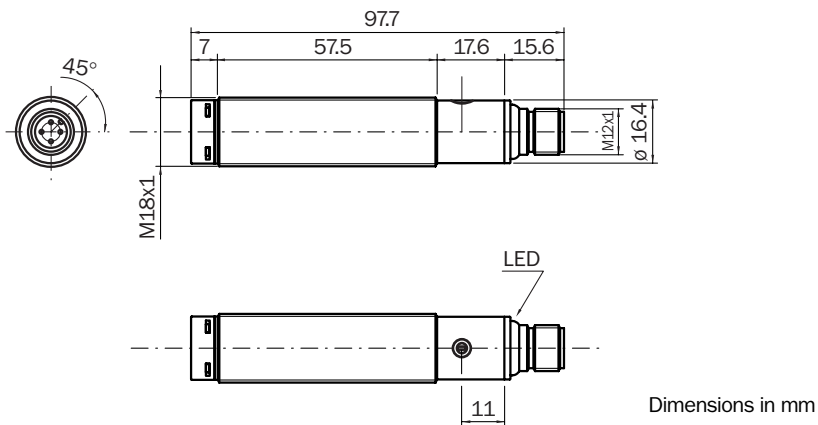
Safety evaluation device UE 401



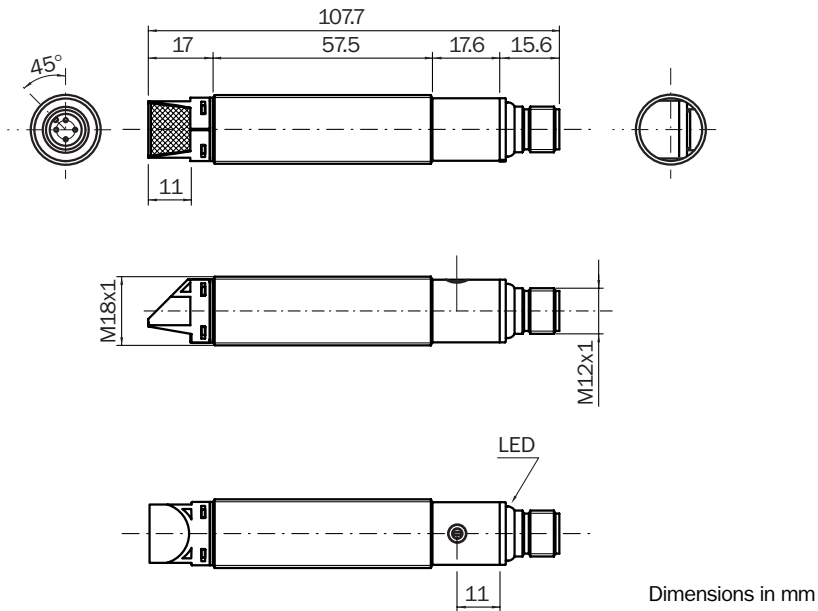
L 4000 sensor



L 400 sensor, axial optics



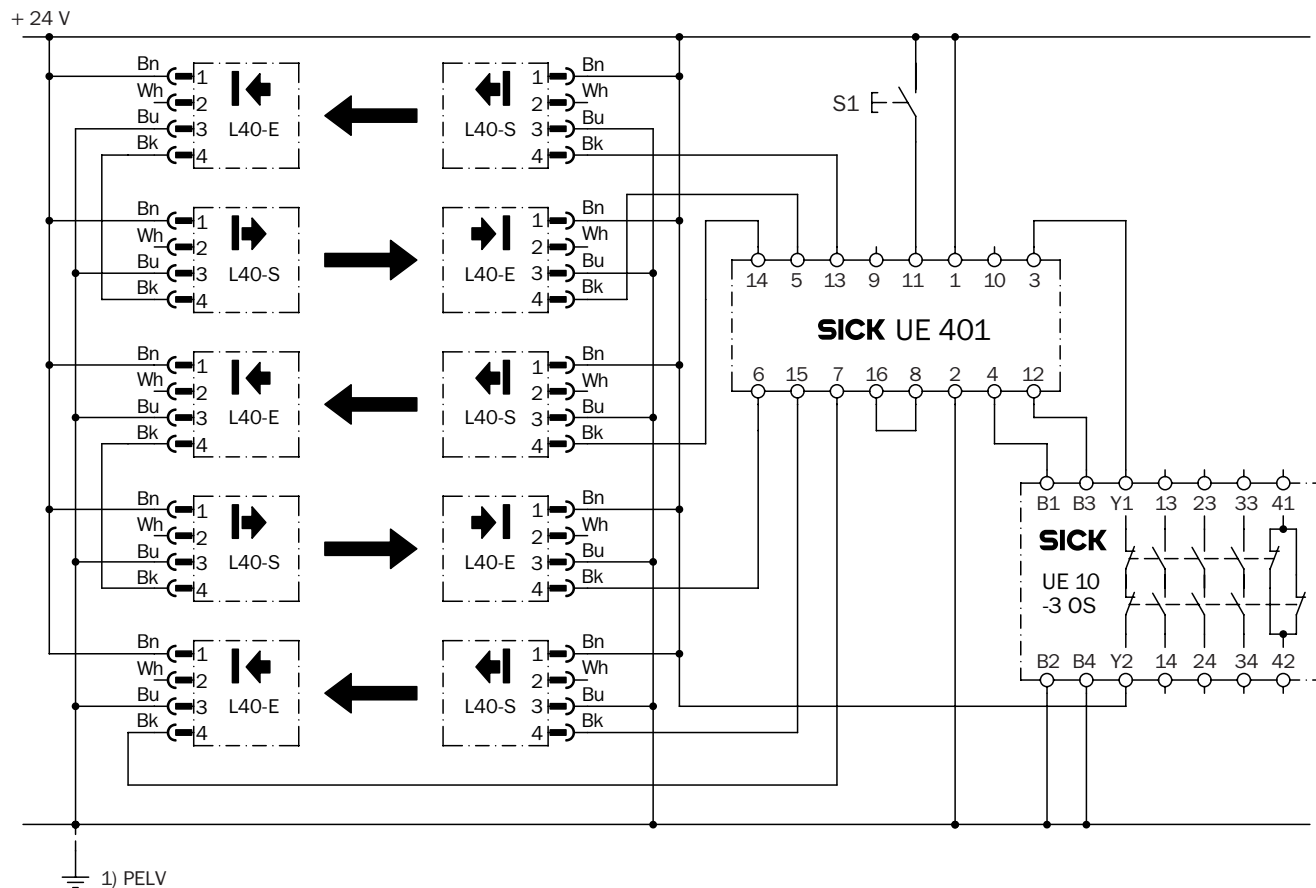
L 400 sensor, radial optics



Connection diagram

→ You can find more connection diagrams at www.sick.com

5 x L 4000 (2 pairs cascaded) on UE 401 with UE 10-3 OS



Task

Integration of five single-beam photoelectric safety switches L 400 / L 4000 (2 pairs cascaded) with safety evaluation device UE 401 and safety relay UE 10-3 OS. Operating mode with restart interlock and external device monitoring.

Function

When the light path is clear and the UE 10 is de-energised and functioning correctly, the yellow LED on the UE 401 flashes. The system is ready to be switched on. The system is enabled by pressing S1 (button is pressed and released). The OSSD1 and OSSD2 outputs are live, the UE 10 is switched on. On the interruption of one of the light beams, the UE 10 is deactivated by the OSSD1 and OSSD2 outputs.

Possible faults

Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of the UE 10 will be detected and will not result in the loss of the shutdown function. Jamming of the S1 button prevents output circuit to enable.

Comments

¹⁾ PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed!

Accessories

Interfaces

Designation	Description	Switching outputs	Type	Part number
Safety relay	For opto-electronic protective devices	3 N/O contacts	UE10-30S2D0	6 024 917
		1 N/C contact	UE10-30S3D0	6 024 918
	With screw type terminals	2 N/O contacts	UE10-20S2D0	2 019 772
	With spring terminals		UE10-20S4D0	2 019 771
	Without terminals		UE10-20S1D0	6 020 342

Mounting accessories

Designation	Description	Type	Part number
Mounting bracket	M18	BEF-WN-M18	5 308 446
	M30	BEF-WN-M30	5 308 445
Mounting bracket	M30 Pivoting With fastening thread M6	BEF-HA-M30-A	5 311 527
	M30 Pivoting With fixing holes for M4	BEF-HA-M30-R	5 311 528
	M18 Pivoting With fixing holes 4 mm	BEF-HA-M18-R	5 313 513

Connector technology

Designation	Design	Description	Type	Part number
Cable socket M12	4-pin straight	Can be preformed	DOS-1204-G	6 007 302
		Cable 2 m PVC	DOL-1204-G02M	6 009 382
		Cable 5 m PVC	DOL-1204-G05M	6 009 866
		Cable 10 m PVC	DOL-1204-G10M	6 010 543
		Cable 5 m PUR halogen-free	DOL-1204-G05MC	6 025 901
	4-pin angled	Can be preformed	DOS-1204-W	6 007 303
		Cable 2 m PVC	DOL-1204-W02M	6 009 383
		Cable 5 m PVC	DOL-1204-W05M	6 009 867
		Cable 10 m PVC	DOL-1204-W10M	6 010 541
		Cable 5 m PUR halogen-free	DOL-1204-W05MC	6 025 904
Cable plug M12	4-pin straight	Can be preformed	STE-1204-G	6 009 932

Continued on next page

Deflector mirrors

Designation	Description	Type	Part number
Deflector mirror ¹⁾	▪ Mirror surface 96 mm x 124 mm	PSK1	1 005 229
	▪ Mirror surface 105 mm x 160 mm	PNS105-1	1 004 076
	▪ Mirror surface 75 mm x 80 mm ▪ Including mounting adapter (2 pc. swivel mount)	PNS75-008	1 026 647
	▪ For 90° beam deflection ▪ Including mounting kit	PSK45	5 306 053
Bracket	▪ For PSK 1	BEF-GH	2 009 292
Spring fastening		—	2 012 473

¹⁾ Warning, reduction of the scanning range!

Other accessories

Designation	Description	Part number
AR 60 adapter	▪ For L 4000, M30	5 311 529
	▪ For L 400, M18	5 313 533
Replacement terminal strip	▪ For UE401-A0010	6 025 841

E

Overview of technical specifications

Scanning range (depending on type)	0.5 m ... 18 m / 15 m ... 70 m
Supply voltage (depending on type)	24 V DC / 230 V AC / 115 V AC
Enclosure rating	
with connection plug	IP 65
with PG connector	IP 67
Type	Type 4 according to EN 61496 part 1 and EN 50100 part 2
Construction size (H x W x D)	156 mm x 50 mm x 116 mm

Product description

The photoelectric safety switch WSU/WEU 26/2 is used for access protection of hazardous areas on machines or plants. The devices are permanently mounted in the access area with the necessary safety

distance from the nearest hazardous point and send a shutdown signal to the machine or system when the light beam is interrupted.

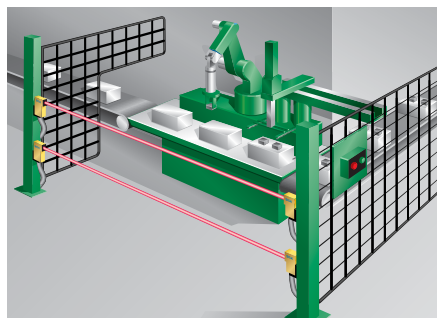
In-system added value

- Combination with SICK interfaces
- Safe interface to bus systems

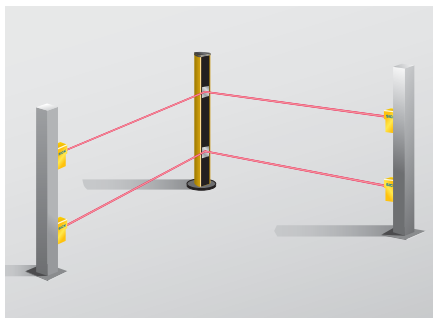
Applications

→ For more applications please refer to the application finder at www.sick.com

- Robots
- Machining centres
- Processing machines
- Palletiser systems
- High-bay warehouses
- Transfer lines



Access protection on a machining centre



Access protection with mirror deflection



E

- Universal in application
- Relay outputs
- Universal power supply
- Robust design
- Large scanning range
- Front screen heating



Further information	Page
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→ Accessories	E-15
→ Services	A-0

Ordering information

→ Accessories see page E-15

Photoelectric safety switch WSU/WEU 26/2

Scanning range	Supply voltage	Type of connection	Sender unit		Receiver unit	
			Type	Part number	Type	Part number
0.5 m ... 18 m	230 V AC	PG	WSU26/2-110	1 015 615	WEU26/2-110	1 015 616
		Plug, 6-pin + PE	WSU26/2-111	1 015 712	WEU26/2-111	1 015 713
		Plug, 6-pin + PE ¹⁾	WSU26/2-113	1 015 716	WEU26/2-113	1 015 715
		Plug, 6-pin + PE ¹⁾	—	—	WEU26/2-112	1 015 714
		Plug, 15-pin + PE	WSU26/2-114	1 015 834	WEU26/2-114	1 015 835
15 m ... 70 m	230 V AC	PG	WSU26/2-210	1 015 731	WEU26/2-210	1 015 743
		Plug, 6-pin + PE	WSU26/2-211	1 015 733	WEU26/2-211	1 015 744
		Plug, 6-pin + PE ¹⁾	WSU26/2-213	1 015 736	WEU26/2-213	1 015 748
		Plug, 6-pin + PE ¹⁾	—	—	WEU26/2-212	1 015 746
		Plug, 15-pin + PE	WSU26/2-214	1 015 840	WEU26/2-214	1 015 841
0.5 m ... 18 m	115 V AC	PG	WSU26/2-120	1 015 717	WEU26/2-120	1 015 718
		Plug, 6-pin + PE	WSU26/2-121	1 015 719	WEU26/2-121	1 015 720
		Plug, 6-pin + PE ¹⁾	WSU26/2-123	1 015 723	WEU26/2-123	1 015 722
		Plug, 6-pin + PE ¹⁾	—	—	WEU26/2-122	1 015 721
		Plug, 15-pin + PE	WSU26/2-124	1 015 836	WEU26/2-124	1 015 837
15 m ... 70 m	115 V AC	PG	WSU26/2-220	1 015 738	WEU26/2-220	1 015 749
		Plug, 6-pin + PE	WSU26/2-221	1 015 740	WEU26/2-221	1 015 750
		Plug, 6-pin + PE ¹⁾	WSU26/2-223	1 015 737	WEU26/2-223	1 015 505
		Plug, 6-pin + PE ¹⁾	—	—	WEU26/2-222	1 015 751
		Plug, 15-pin + PE	WSU26/2-224	1 015 842	WEU26/2-224	1 015 843
0.5 m ... 18 m	24 V DC	PG	WSU26/2-130	1 015 724	WEU26/2-130	1 015 725
		Plug, 6-pin + PE	WSU26/2-131	1 015 726	WEU26/2-131	1 015 727
		Plug, 6-pin + PE ¹⁾	WSU26/2-133	1 015 730	WEU26/2-133	1 015 729
		Plug, 6-pin + PE ¹⁾	—	—	WEU26/2-132	1 015 728
		Plug, 15-pin + PE	WSU26/2-134	1 015 838	WEU26/2-134	1 015 839
15 m ... 70 m	24 V DC	PG	WSU26/2-230	1 015 745	WEU26/2-230	1 015 504
		Plug, 6-pin + PE	WSU26/2-231	1 015 747	WEU26/2-231	1 015 753
		Plug, 6-pin + PE ¹⁾	WSU26/2-233	1 015 739	WEU26/2-233	1 015 755
		Plug, 6-pin + PE ¹⁾	—	—	WEU26/2-232	1 015 754
		Plug, 15-pin + PE	WSU26/2-234	1 015 844	WEU26/2-234	1 015 845

¹⁾ Alternative internal wiring of the normally closed and normally open contacts (see technical description)

Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at www.sick.com

General system data

Scanning range (depending on type)	0.5 m ... 18 m / 15 m ... 70 m
Number of beams	1
Synchronisation	Optical, without separate synchronisation cable
Light beam diameter	23 mm
Aperture angle/receive angle	4°
Wavelength of sender	950 nm
Protection class	I
Enclosure rating	IP 65 IP 67
Connection plug PG connector	
Operating mode	Protective operation without start and restart interlock
Supply voltage V_S (depending on type)	24 V (19.2 V ... 28.8 V) DC 230 V (195.5 V ... 253 V) AC 115 V (97.75 V ... 126 V) AC
Type	Type 4 according to EN 61496 part 1 and EN 50100 part 2
AC supply frequency	Min. 48 Hz

Sender unit

Test output	For volt-free switch
Output current	10 mA
Power consumption	24 V DC version 4 W 115 V AC version 7 VA 230 V AC version 7 VA
Weight (depending on type)	

Receiver unit

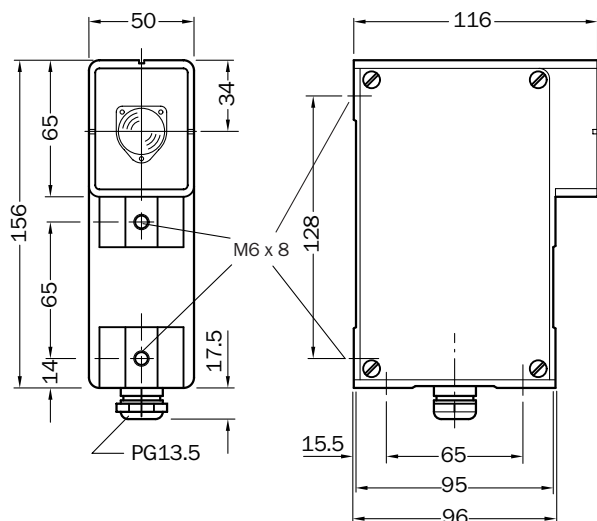
Switching outputs	Relay, max. switching frequency 0.2/s (1 switching operation in 5 s)
Response time	Max. 22 ms
Switching current	0.02 A ... 2 A
Switching voltage	24 V DC ... 250 V AC
Switching capacity (DC/AC)	Max. 144 W / 1380 VA
Mechanical service life (switching operations)	Max. 10^7
Electrical service life (switching operations)	DC with 2 A switching current Max. 8×10^4 AC with 2 A switching current Max. 5×10^4
Power consumption	
	24 V DC version 6 W 115 V AC version 10 VA 230 V AC version 10 VA
Weight (depending on type)	1.0 kg to 1.4 kg

Operating data

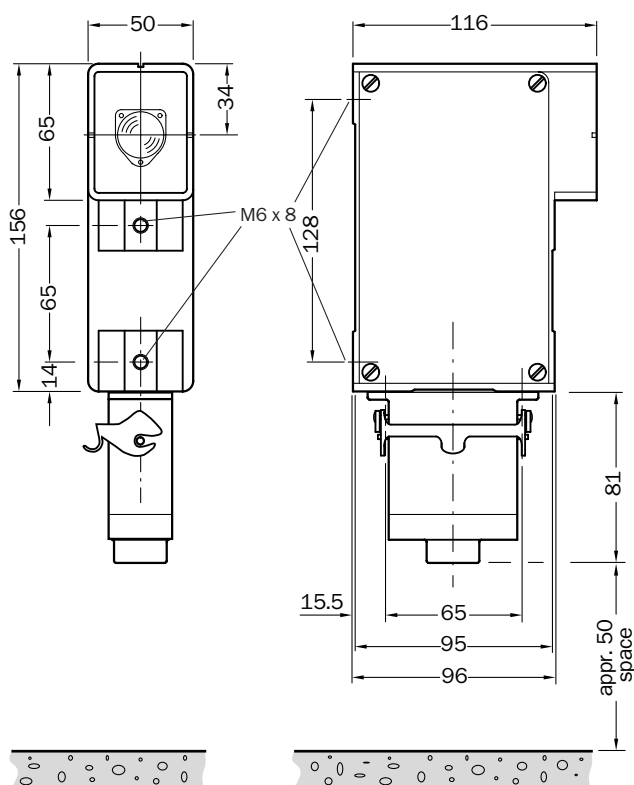
Type of connection (depending on type)	Connection cable (PG 13.5), connection plug
Ambient operating temperature	-25 °C ... +55 °C
Storage temperature	-25 °C ... +70 °C
Air humidity (non-dewing)	15 % ... 95 %
Vibration resistance	5 g, 10 ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29

Dimensional drawings

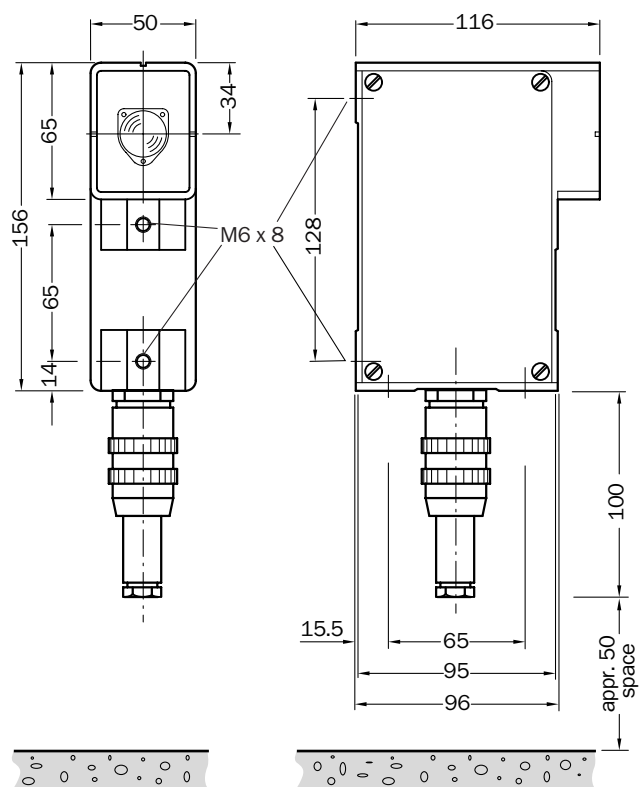
Dimensional drawing WSU/WEU 26/2-xx0



Dimensional drawing WSU/WEU 26/2-xx4



Dimensional drawing WSU 26/2-xx1 and -xx3 and WEU 26/2-xx1, -xx2 u. -xx3



Dimensions in mm

Connection diagrams

→ For connection diagrams please refer to the technical description. Download at www.sick.com

Accessories

Mounting accessories

Designation	Description	Part number
Mounting bracket	▪ For WSU/WEU 26/2	2 007 900

Connector technology

Designation	Description	Part number
Cable socket	▪ Straight ▪ 6-pin + PE (plastic)	6 006 612
	▪ Angled ▪ 6-pin + PE (plastic)	6 006 613
	▪ Straight cable outlet PG 13.5 ▪ 15-pin + PE (plastic)	2 019 075
	▪ Lateral cable outlet PG 16 ▪ 15-pin + PE (plastic)	2 019 076

Deflector mirrors

Designation	Description	Type	Part number
Deflector mirror ¹⁾	▪ Mirror surface 96 mm x 124 mm	PSK1	1 005 229
	▪ Mirror surface 105 mm x 160 mm	PNS105-1	1 004 076
	▪ Mirror surface 75 mm x 80 mm ▪ Including mounting adapter (2 pc. swivel mount)	PNS75-008	1 026 647
	▪ For 90° beam deflection ▪ Including mounting kit	PSK45	5 306 053
Bracket	▪ For PSK 1	BEF-GH	2 009 292
Spring fastening		—	2 012 473

¹⁾ Warning, reduction of the scanning range!

Other accessories

Designation	Description	Type	Part number
PG expansion	▪ With 2 cable entries PG 21	—	5 305 978
	▪ PG expansion PG 13/21	—	5 306 052
Dust protection tube	—	—	1 003 556
Snow protection tube	—	—	1 003 619
Arc-suppressor	▪ 0.22 µF/220 Ω for 110 V AC ... 220 V AC	RC-A	6 001 224
	▪ 2.2 µF/100 Ω for 24 V AC/DC ... 48 V AC/DC	RC-AD	6 001 225



- Compact design
- Infrared light
- Insensitive to external light sources
- Die-cast housing



Overview of technical specifications

Scanning range (typical/maximum)	0 m ... 10 m / 0 m ... 12 m
Light sender/type of light	LED / infrared
Ambient operating temperature	–40 °C ... +60 °C
Enclosure rating	IP 67
Type	Type 2 according to EN 61496 (only in conjunction with suitable testing device)
Construction size (H x W x D)	49 mm x 15 mm x 41,5 mm

Product description

The SICK single-beam photoelectric safety switch WS/WE 12-2 consists of a testable sender and receiver combined with an evaluation unit.

In-system added value

- Combination with SICK interfaces
- Safe interface to bus systems

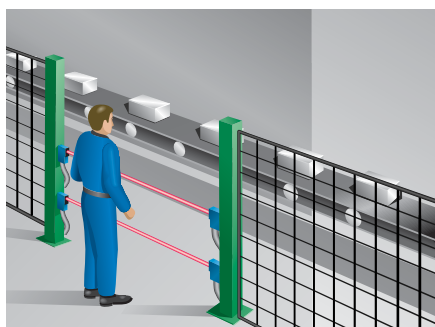
Combination with	Type according to EN 61496	Switching outputs	Muting	Further information
LE 20	2	2 PNP semiconductors ¹⁾	—	L-53
LE 20 Muting	2	2 PNP semiconductors ¹⁾	✓	L-60
UE 10-3 OS	—	Relay (3 N/O contacts, 1 N/C contact)	—	L-3
UE 10-2 OS	—	Relay, 2 N/O contacts	—	L-59

¹⁾ Short-circuit protected, cross-circuit monitored

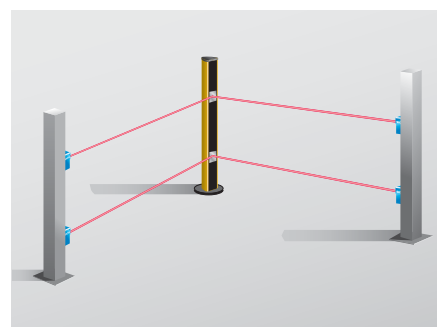
Applications

→ For more applications please refer to the application finder at www.sick.com

- Machining centres
- Processing machines
- Palletiser systems
- High-bay warehouses
- Transfer lines



Access protection on a conveyor system



Access protection with mirror deflection

Further information	Page
→ Dimensional drawings	E-18
→ Connection diagram	E-19
→ Accessories	E-20
→ Services	A-0

Ordering information

→ Accessories see page E-20

Single-beam photoelectric safety switch WS/WE 12-2

Designation	Description	Connection	Type	Part number
Light sender and light receiver	<ul style="list-style-type: none"> Scanning range 10 m PNP Q and \bar{Q} 	Connection cable 2 m	WS/WE12-2P160	1 018 046
		Device plug M12, 4-pin	WS/WE12-2P460	1 018 047
Light receiver	<ul style="list-style-type: none"> Scanning range 10 m PNP Q and \bar{Q} 	Connection cable 2 m	WE12-2P160	2 021 440
		Device plug M12, 4-pin	WE12-2P460	2 021 442
Light sender	<ul style="list-style-type: none"> Scanning range 10 m 	Connection cable 2 m	WS12-2D160	2 021 439
		Device plug M12, 4-pin	WS12-2D460	2 021 441

Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description for the safety evaluation unit LE 20.
Download at www.sick.com

General system data

Scanning range (typical/maximum)	0 m ... 10 m / 0 m ... 12 m
Light spot diameter	Approx. 500 mm in 10 m distance
Aperture and receive angle (typically/maximum)	$\pm 1,5^\circ$ / $\pm 5^\circ$
Light sender	LED
Type of light	Infrared light (880 nm), pulsating, average service life 100 000 h (at $T_A = 25^\circ\text{C}$)
Protection class	II
Circuit protection	Reverse polarity protected V_S connections, short-circuit protected output Q and \bar{Q} , interference suppression
Enclosure rating	IP 67
Type	Type 2 according to EN 61496 (only in conjunction with suitable testing device)
Supply voltage V_S	24 V DC (–30 % ... +20 %)

Sender unit

Test input TI	Sender on Sender off	TI to V_S TI to 0 V
Power consumption		Max. 35 mA

Receiver unit

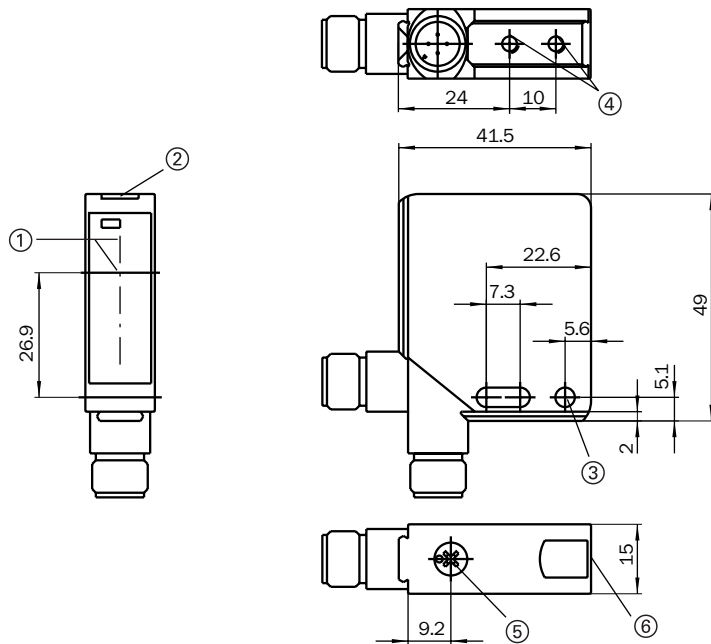
Switching outputs	PNP, Q and \bar{Q}
Response time/switching sequence	Max. 500 μs / max. 1000/s
Output current I_O	Max. 100 mA
Power consumption	Max. 25 mA

Operating data

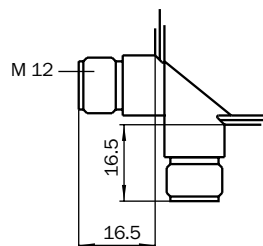
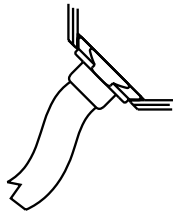
Type of connection	Plug-in connection, 4-pin or cable 2 m
Ambient operating temperature T_A	–40 °C ... +60 °C
Storage temperature T_S	–40 °C ... +75 °C
Weight	Cable version Plug version
	200 g 120 g

Dimensional drawings

WS/WE 12-2 P 460



WS/WE 12-2 P 160



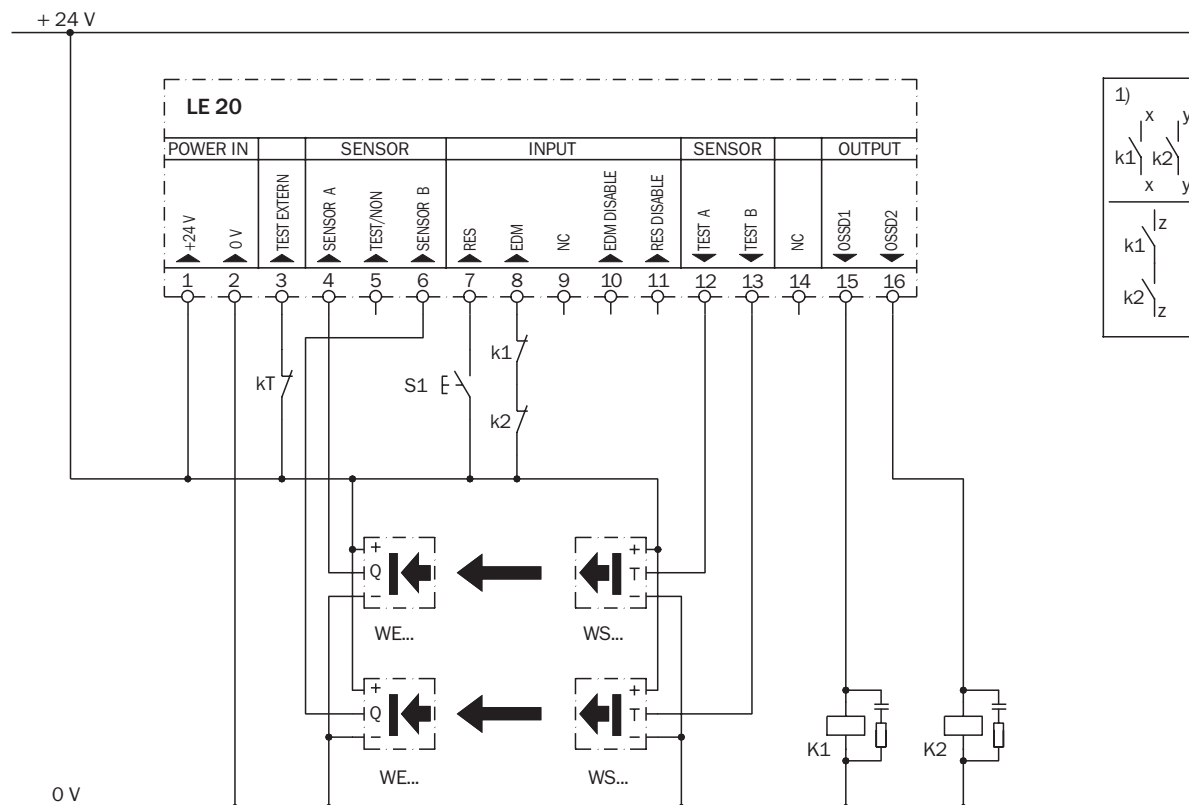
Dimensions in mm

- ① Centre of optical axis
- ② LED
- ③ Fixing holes Ø 4.2 mm
- ④ Fastening thread M4, 4 mm deep
- ⑤ Sensitivity adjuster (WE)
- ⑥ Alignment sight

Connection diagram

→ You can find more connection diagrams at www.sick.com

2 x WS/WE 12-2 on safety evaluation unit LE 20



Task

Integration of two single-beam photoelectric safety switches (only approved types as per technical description) with LE 20 in a relay/contact control. Operating mode with restart interlock and external device monitoring.

Function

If the light path is clear and the contactors K1 and K2 are de-energised, the OSSDs in the LE 20 are switched on by pressing S1 (button is pressed and released). The OSSDs of the LE 20 (terminals 15 and 16) activate the contactors K1 and K2. On interruption of one of the light beams, the LE 20 deactivates the contactors K1 and K2. The contact (kT) is connected to terminal 3 and is tested by the control system. If this contact is opened, the LE 20 deactivates the contactors K1 and K2. If testing is not possible, terminal 5 is to be connected to +24 V DC potential and dual-channel integration in the control is necessary.

Possible faults

The incorrect functioning of one of the K1 or K2 contactors does not result in the loss of the shutdown function. Jamming of the S1 button prevents output circuit to enable.

Comments

- Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking into account the risk analysis.

The related operating instructions for the integrated devices must be observed!

Accessories

Interfaces

Designation	Description	Connection	Type	Part number	
Safety evaluation unit LE 20	<ul style="list-style-type: none">IP 202 PNP OSSDs, 500 mA	<ul style="list-style-type: none">With screw terminal connector16-pin	LE20-2612	1 016 503	
		<ul style="list-style-type: none">With terminal plug springAngled16-pin	LE20-2614	1 016 505	
Safety evaluation unit LE 20 Muting		<ul style="list-style-type: none">With screw terminal connector15- and 16-pin	LE20-2622	1 016 502	
		<ul style="list-style-type: none">With terminal plug spring15- and 16-pin	LE20-2624	1 016 501	
Safety relay		<ul style="list-style-type: none">For opto-electronic protective devices	—	UE10-30S2D0	6 024 917
		<ul style="list-style-type: none">For opto-electronic protective devices	—	UE10-30S3D0	6 024 918
	<ul style="list-style-type: none">With screw type terminals	—	UE10-20S2D0	2 019 772	
	<ul style="list-style-type: none">With spring terminals	—	UE10-20S4D0	2 019 771	
	<ul style="list-style-type: none">Without terminals	—	UE10-20S1D0	6 020 342	

Mounting accessories

Designation	Description	Type	Part number
Mounting bracket	<ul style="list-style-type: none"> Small for WS/WE 12-2 	BEF-WK-W12	2 012 938

Connector technology

Designation	Description	Type	Part number
Cable socket M12	<ul style="list-style-type: none"> 4-pin Straight 	DOS-1204-G	6 007 302
	<ul style="list-style-type: none"> 4-pin Straight Cable 2 m, PVC 	DOL-1204-G02M	6 009 382

Deflector mirrors

Designation	Description	Type	Part number
Deflector mirror ¹⁾	<ul style="list-style-type: none"> Mirror surface 96 mm x 124 mm 	PSK1	1 005 229
	<ul style="list-style-type: none"> Mirror surface 105 mm x 160 mm 	PNS105-1	1 004 076
	<ul style="list-style-type: none"> Mirror surface 75 mm x 80 mm Including mounting adapter (2 pc. swivel mount) 	PNS75-008	1 026 647
	<ul style="list-style-type: none"> For 90° beam deflection Including mounting kit 	PSK45	5 306 053
	—	—	—
Bracket	<ul style="list-style-type: none"> For PSK 1 	BEF-GH	2 009 292
Spring fastening		—	2 012 473

¹⁾ Warning, reduction of the scanning range!

Overview of technical specifications

Scanning range (typical/maximum)	0 m ... 12 m / 0 m ... 18 m
Light sender/type of light	LED / visible red light
Ambient operating temperature	–40 °C ... +60 °C
Enclosure rating	IP 67
Type	Type 2 according to EN 61496 (only in conjunction with suitable testing device)
Construction size (H x W x D)	75.5 mm x 17.6 mm x 33.5 mm

Product description

The SICK single-beam photoelectric safety switch WS/WE 18-3 consists of a testable sender and receiver combined with an evaluation unit.

In-system added value

■ Combination with SICK interfaces

■ Safe interface to bus systems

Combination with	Type according to EN 61496	Switching outputs	Number of sensors	Restart interlock	External device monitoring	Muting	Further information
LE 20	2	2 PNP semiconductors ¹⁾	6	✓	✓	–	L-53
LE 20 Muting	2	2 PNP semiconductors ¹⁾	6	✓	✓	✓	L-60
UE 10-3 OS	–	Relay (3 N/O contacts, 1 N/C contact)	–	–	✓	–	L-3
UE 10-2 OS	–	Relay, 2 N/O contacts	–	–	✓	–	L-59

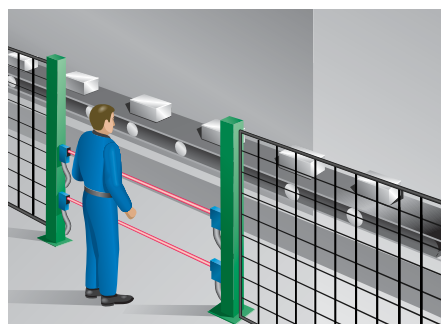
¹⁾ Short-circuit protected, cross-circuit monitored

Applications

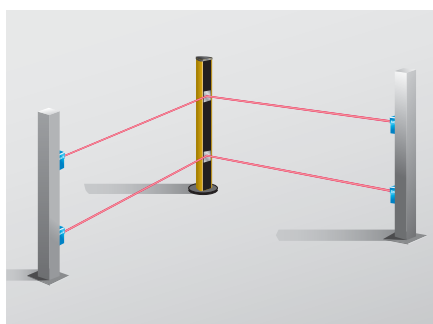
→ For more applications please refer to the application finder at www.sick.com

■ Machining centres
■ Processing machines
■ Palletiser systems

■ High-bay warehouses
■ Transfer lines



Access protection on a conveyor system



Access protection with mirror deflection



■ Compact design
■ Red light
■ Plastic housing, ABS



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→ Technical specifications	E-22
→ Dimensional drawings	E-23
→ Connection diagram	E-24
→ Accessories	E-25
→ Services	A-0

Ordering information

→ Accessories see page E-25

Single-beam photoelectric safety switch WS/WE 18-3

Designation	Description	Connection	Type	Part number
Light sender and light receiver	<ul style="list-style-type: none"> Scanning range 12 m PNP Q and \bar{Q} 	Device plug M12, 4-pin	WS/WE18-3P460	1 026 751
Light receiver			WE18-3P460	2 031 732
Light sender	<ul style="list-style-type: none"> Scanning range 12 m 		WS18-3D460	2 031 731

Detailed technical specifications

→ You can find more detailed data in the operating instructions. Download at www.sick.com

General system data

Scanning range (typical/maximum)	0 m ... 12 m / 0 m ... 18 m
Light spot diameter	Approx. 300 mm in 10 m distance
Aperture and receive angle (typically/maximum)	$\pm 1,5^\circ / \pm 5^\circ$
Light sender	LED
Type of light	Visible red light, average service life 100 000 h (at $T_A = 25^\circ\text{C}$)
Protection class	II
Circuit protection	Reverse polarity protected V_S connections, short-circuit protected output Q and \bar{Q} , interference suppression
Enclosure rating	IP 67
Type	Type 2 according to EN 61496 (only in conjunction with suitable testing device)
Supply voltage V_S	24 V DC (–30 % ... +20 %)

Sender unit

Test input TI	Sender on Sender off	TI to V_S TI to 0 V
Power consumption		Max. 35 mA

Receiver unit

Switching outputs	PNP, Q and \bar{Q}
Response time/switching sequence	Max. 500 μs / max. 1000/s
Output current I_O	Max. 100 mA
Power consumption	Max. 20 mA

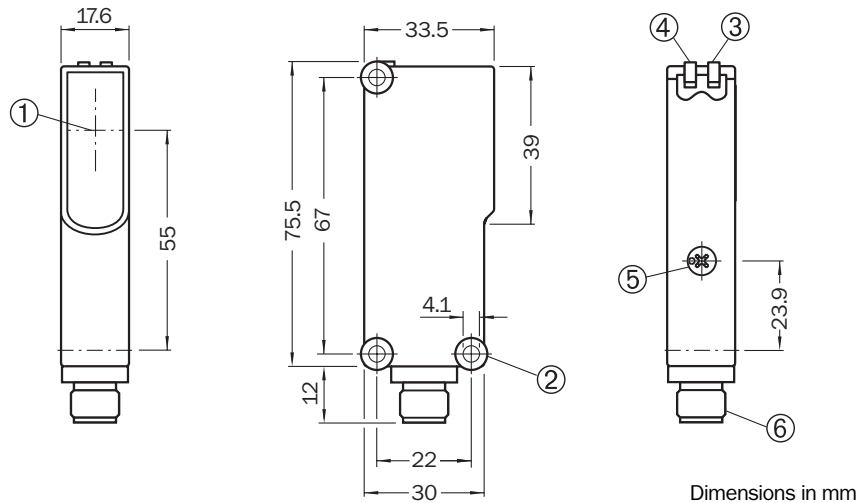
Operating data

Type of connection	Plug-in connection M12, 4-pin
Ambient operating temperature T_A	–40 °C ... +60 °C
Storage temperature T_S	–40 °C ... +75 °C
Weight	120 g

Dimensional drawings

WS 18-3 D460

WE 18-3 P460

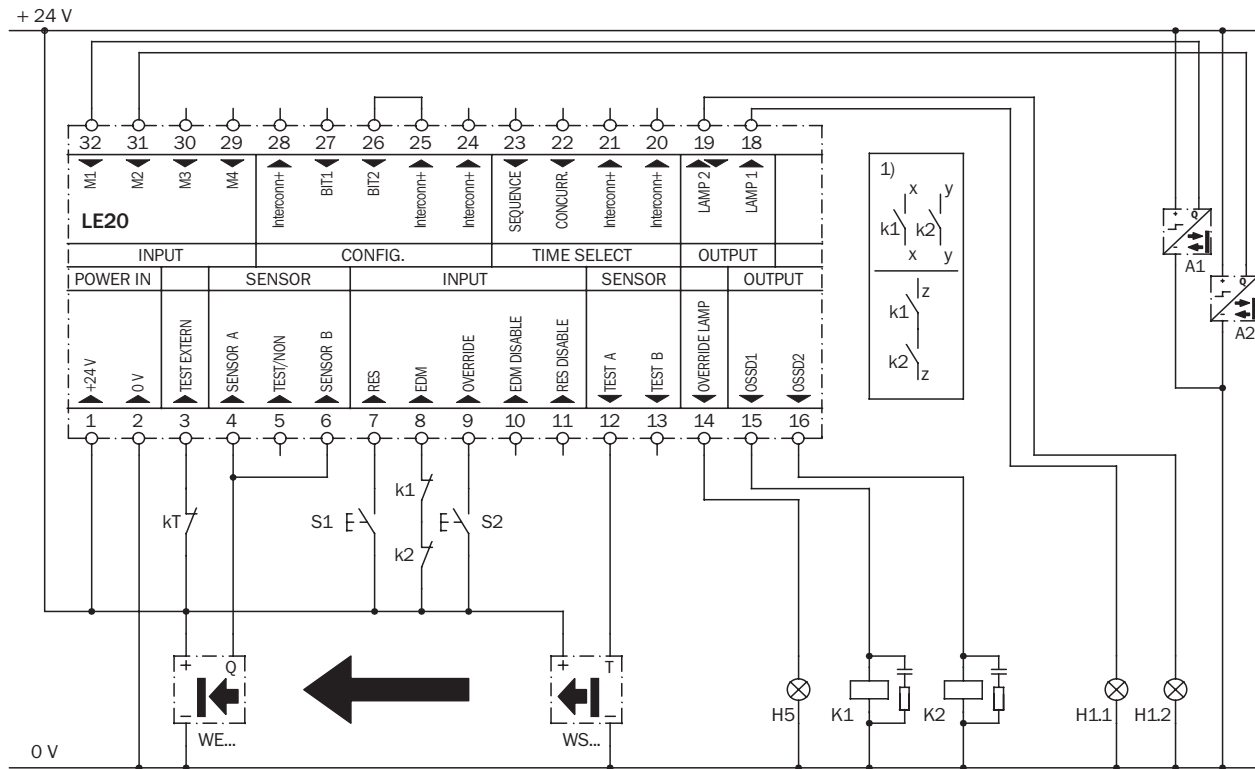


- ① Centre of optical axis
- ② Fastening hole
- ③ LED, yellow; Light reception status
- ④ LED, green; Operating voltage active
- ⑤ Sensitivity adjuster on WE
- ⑥ Device plug M12, 4-pin

Connection diagram

→ You can find more connection diagrams at www.sick.com

WS/WE 18-3 on safety evaluation unit LE 20 Muting



Task

Integration of the single-beam photoelectric safety switch in a control via an LE 20. Muting using 2 photoelectric proximity switches (light switching PNP) and override circuit. Concurrence monitoring of the muting sensors, operating mode with restart interlock and external device monitoring.

Function

If the light beam is clear and the contactors K1 and K2 are de-energised, the OSSDs in the LE 20 are switched on by pressing S1 (button is pressed and released). The OSSDs of the LE 20 (terminals 15 and 16) activate the contactors K1 and K2. If the light beam is interrupted, the LE 20 deactivates the contactors K1 and K2.

Muting

The protective field must be clear, and the OSSDs on the LE 20 switched on, to allow initiation of the muting function. Muting is prevented if photoelectric proximity switch pair A is not activated within 3 seconds. The muting inputs must remain activated without interruption for the duration of the muting.

Override

If, after a power failure or a muting error, the object to be muted is present in the light beam, the object can be moved out of the protective field by operating the S2 button. This is only possible if both muting signals (A1 and A2) are present at the LE 20. This situation is indicated by illumination of the override lamp H5.

Possible faults

The incorrect functioning of one of the K1 or K2 contactors does not result in the loss of the shutdown function. The outputs of the LE 20 are monitored PNP semiconductor outputs. Jamming of the S1 button prevents output circuit to enable. Failure of a muting sensor is detected so that renewed muting is prevented. Muting cannot be initiated if the muting lamp H1.1 is not connected or is faulty, or if there is a short-circuit in this circuit. If a replacement indicator (H1.2) is connected, it will indicate the failure of the muting lamp H1.1 by flashing and muting can be initiated. Jamming of the S2 button will be detected after no more than 30 minutes and will bring the override to an end.

Comments

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking into account the risk analysis.

The related operating instructions for the integrated devices must be observed.

Accessories

Interfaces

Designation	Description	Connection	Type	Part number
Safety evaluation unit LE 20	<ul style="list-style-type: none">▪ IP 20▪ 2 PNP OSSDs, 500 mA	<ul style="list-style-type: none">▪ With screw terminal connector▪ 16-pin	LE20-2612	1 016 503
		<ul style="list-style-type: none">▪ With terminal plug spring▪ Angled▪ 16-pin	LE20-2614	1 016 505
Safety evaluation unit LE 20 Muting		<ul style="list-style-type: none">▪ With screw terminal connector▪ 15- and 16-pin	LE20-2622	1 016 502
		<ul style="list-style-type: none">▪ With terminal plug spring▪ 15- and 16-pin	LE20-2624	1 016 501
Safety relay		<ul style="list-style-type: none">▪ For opto-electronic protective devices	—	UE10-30S2D0
	<ul style="list-style-type: none">▪ For opto-electronic protective devices	—	UE10-30S3D0	6 024 918
	<ul style="list-style-type: none">▪ With screw type terminals	—	UE10-20S2D0	2 019 772
	<ul style="list-style-type: none">▪ With spring terminals	—	UE10-20S4D0	2 019 771
	<ul style="list-style-type: none">▪ Without terminals	—	UE10-20S1D0	6 020 342

Mounting accessories

Designation	Description	Type	Part number
Mounting bracket	For WS/WE 18-3	BEF-WN-W18	2 009 317

Connector technology

Designation	Description	Type	Part number
Cable socket M12	<ul style="list-style-type: none"> 4-pin Straight 	D0S-1204-G	6 007 302
	<ul style="list-style-type: none"> 4-pin Straight Cable 2 m, PVC 	D0L-1204-G02M	6 009 382

Deflector mirrors

Designation	Description	Type	Part number
Deflector mirror ¹⁾	Mirror surface 96 mm x 124 mm	PSK1	1 005 229
	Mirror surface 105 mm x 160 mm	PNS105-1	1 004 076
	Mirror surface 75 mm x 80 mm	PNS75-008	1 026 647
	Including mounting adapter (2 pc. swivel mount)		
	For 90° beam deflection	PSK45	5 306 053
	Including mounting kit		
Bracket	For PSK 1	BEF-GH	2 009 292
Spring fastening		—	2 012 473

¹⁾ Warning, reduction of the scanning range!



E

- Integrated heating
- High scanning range
- Die-cast housing
- Compact design
- Red light



Overview of technical specifications

Scanning range (typical/maximum)	0 m ... 40 m / 0 m ... 50 m
Light sender/type of light	LED / visible red light
Ambient operating temperature	-40 °C ... +60 °C
Enclosure rating	IP 67
Type	Type 2 according to EN 61496 (only in conjunction with suitable testing device)
Construction size (H x W x D)	87.5 mm x 27 mm x 65 mm

Product description

The SICK single-beam photoelectric safety switch WS/WE 24-2 consists of a testable sender and receiver combined with an evaluation unit.

In-system added value

■ Combination with SICK interfaces

■ Safe interface to bus systems

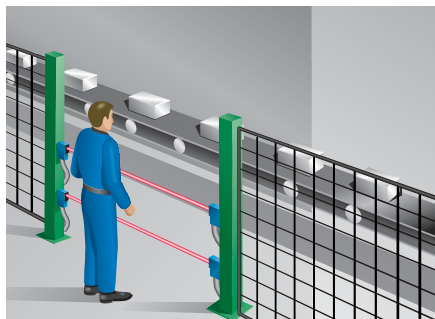
Combination with	Type according to EN 61496	Switching outputs	Number of sensors	Restart interlock	External device monitoring	Muting	Further information
LE 20	2	2 PNP semiconductors ¹⁾	6	✓	✓	—	L-53
LE 20 Muting	2	2 PNP semiconductors ¹⁾	6	✓	✓	✓	L-60
UE 10-3 OS	—	Relay (3 N/O contacts, 1 N/C contact)	—	—	✓	—	L-3
UE 10-2 OS	—	Relay, 2 N/O contacts	—	—	✓	—	L-59

¹⁾ Short-circuit protected, cross-circuit monitored

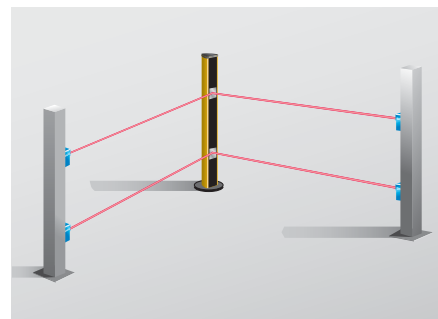
Applications

→ For more applications please refer to the application finder at www.sick.com

- Machining centres
- Processing machines
- Palletiser systems
- High-bay warehouses
- Transfer lines



Access protection on a conveyor system



Access protection with mirror deflection

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Ordering information

→ Accessories see page E-30

Single-beam photoelectric safety switch WS/WE 24-2

Designation	Description	Connection	Type	Part number
Light sender and light receiver without heating	<div><div>▪ Scanning range 40 m</div><div>▪ PNP</div><div>▪ Q and \overline{Q}</div></div>	Cable gland	WS/WE24-2P250	1 018 049
		Device plug M12, 4-pin	WS/WE24-2P450	1 018 051
Light sender and light receiver with heating		Cable gland	WS/WE24-2P260	1 018 050
		Device plug M12, 4-pin	WS/WE24-2P460	1 018 052
Light receiver without heating	<div><div>▪ Scanning range 40 m</div><div>▪ PNP</div><div>▪ Q and \overline{Q}</div></div>	Cable gland	WE24-2P250	2 021 449
		Device plug M12, 4-pin	WE24-2P450	2 021 453
Light receiver with heating		Cable gland	WE24-2P260	2 021 451
		Device plug M12, 4-pin	WE24-2P460	2 021 455
Light sender without heating	<div><div>▪ Scanning range 40 m</div></div>	Cable gland	WS24-2D250	2 021 448
		Device plug M12, 4-pin	WS24-2D450	2 021 452
Light sender with heating		Cable gland	WS24-2D260	2 021 450
		Device plug M12, 4-pin	WS24-2D460	2 021 454

Detailed technical specifications

→ You can find more detailed data in the operating instructions. Download at www.sick.com

General system data

Scanning range (typical/maximum)	0 m ... 40 m / 0 m ... 50 m
Light spot diameter	Approx. 600 mm in 50 m distance
Aperture and receive angle (typically/maximum)	$\pm 4^\circ$ / $\pm 5^\circ$
Light sender	LED
Type of light	Visible red light (660 nm), pulsating, average service life 100 000 h (with $T_A = 25^\circ\text{C}$)
Protection class	II
Circuit protection	Reverse polarity protected V_S connections, short-circuit protected output Q and \bar{Q} , interference suppression
Enclosure rating	IP 67
Type	Type 2 according to EN 61496 (only in conjunction with suitable testing device)
Supply voltage V_S	24 V DC ($\pm 20\%$)

Sender unit

Test input TI	Sender on Sender off	TI to V_S or not connected TI to 0 V
Power consumption	WS 24-2 D250/D450 WS 24-2 D260/D460	Max. 50 mA Max. 70 mA

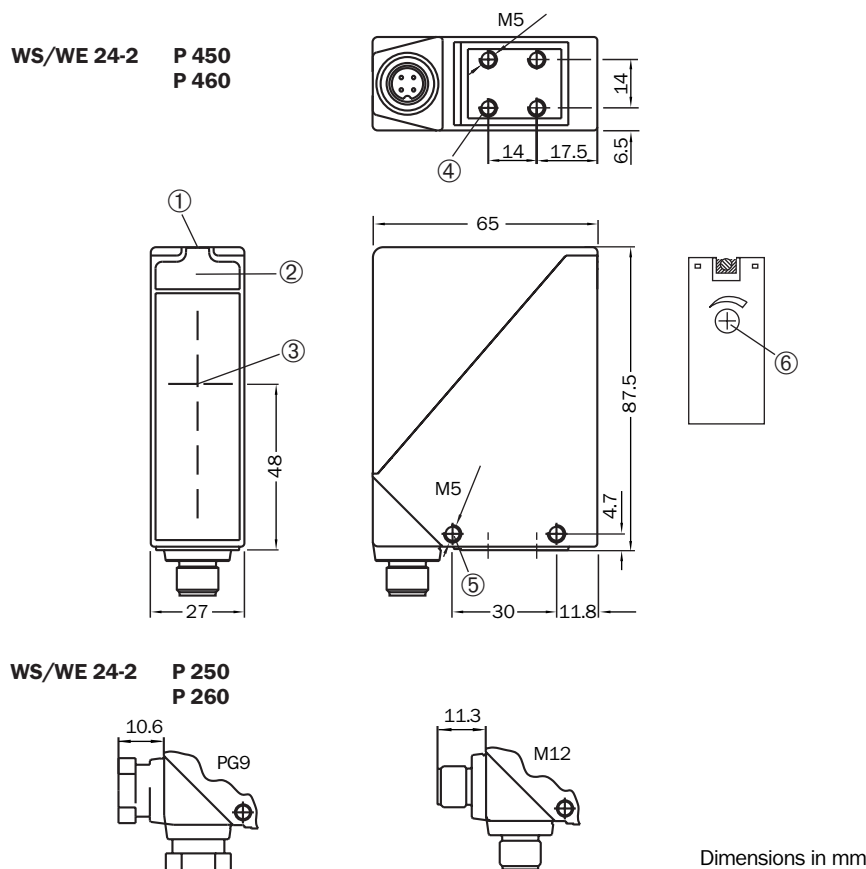
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Receiver unit

Switching outputs	PNP, Q and \bar{Q}
Response time/switching sequence	Max. 500 μ s / max. 1000/s
Output current I_O	Max. 100 mA
Power consumption	
WE 24-2 D250/D450	Max. 150 mA
WE 24-2 D260/D460	Max. 170 mA

Operating data

Type of connection	Connector M12, 4-pin or cable gland
Ambient operating temperature T_A	-40 °C ... +60 °C
Storage temperature T_S	-40 °C ... +75 °C
Weight	Approx. 330 g
Front screen heating	WS/WE 24-2 P260 and WS/WE 24-2 P460

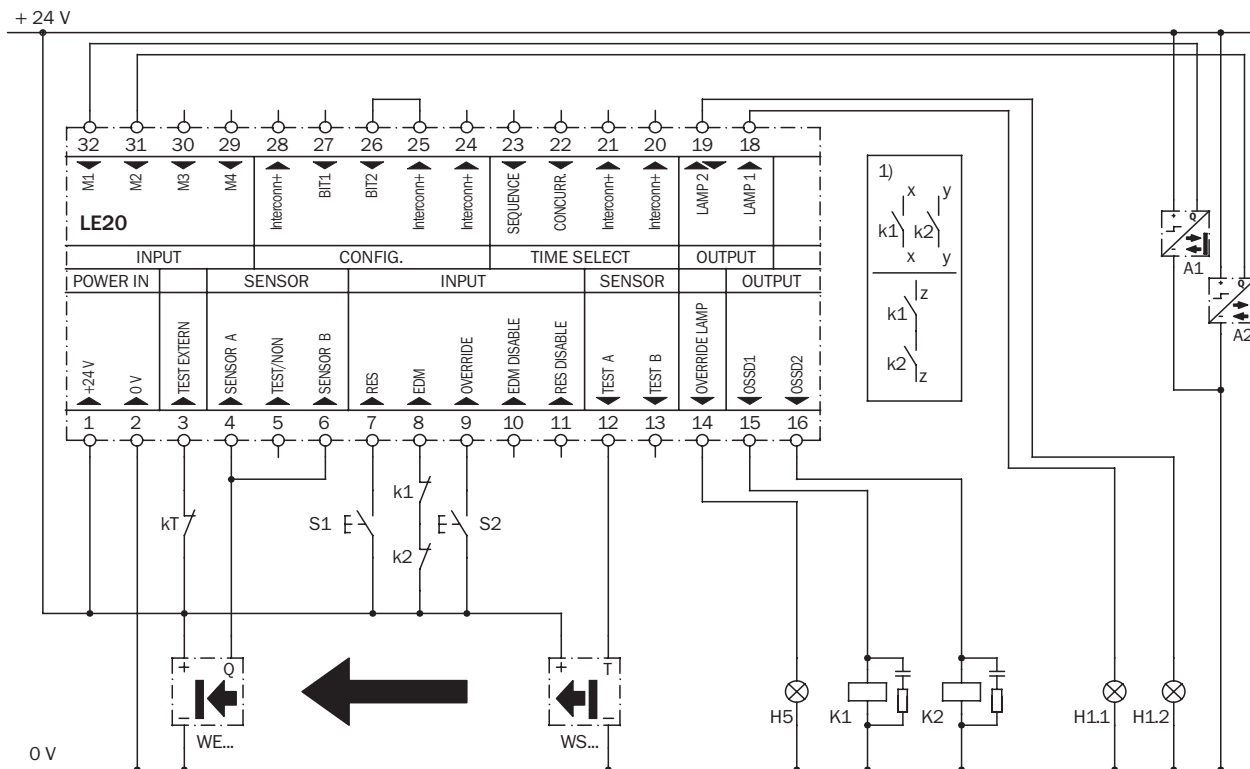
E**Dimensional drawings**

- ① Alignment sight
- ② LED
- ③ Sender/receiver optical axis
- ④ Fastening thread M5, 6 mm deep
- ⑤ Fastening thread M5, through hole
- ⑥ Sensitivity adjuster (WE)

Connection diagram

→ You can find more connection diagrams at www.sick.com

WS/WE 24-2 on safety evaluation unit LE 20 Muting



Task

Integration of the single-beam photoelectric safety switch in a control via an LE 20. Muting using 2 photoelectric proximity switches (light switching PNP) and override circuit. Concurrence monitoring of the muting sensors. Operating mode with restart interlock and external device monitoring.

Function

If the light beam is clear and the contactors K1 and K2 are de-energised, the OSSDs in the LE 20 are switched on by pressing S1 (button is pressed and released). The OSSDs of the LE 20 (terminals 15 and 16) activate the contactors K1 and K2. If the light beam is interrupted, the LE 20 deactivates the contactors K1 and K2.

Muting

The protective field must be clear, and the OSSDs on the LE 20 switched on, to allow initiation of the muting function. Muting is prevented if photoelectric proximity switch pair A is not activated within 3 seconds. The muting inputs must remain activated without interruption for the duration of the muting.

Override

If, after a power failure or a muting error, the object to be muted is present in the light beam, the object can be moved out of the protective field by operating the S2 button. This is only possible if both muting signals (A1 and A2) are present at the LE 20. This situation is indicated by illumination of the override lamp H5.

Possible faults

The incorrect functioning of one of the K1 or K2 contactors does not result in the loss of the shutdown function. The outputs of the LE 20 are monitored PNP semiconductor outputs. Jamming of the S1 button prevents output circuit to enable. Failure of a muting sensor is detected so that renewed muting is prevented. Muting cannot be initiated if the muting lamp H1.1 is not connected or is faulty, or if there is a short-circuit in this circuit. If a replacement indicator (H1.2) is connected, it will indicate the failure of the muting lamp H1.1 by flashing and muting can be initiated. Jamming of the S2 button will be detected after no more than 30 minutes and will bring the override to an end.

Comments

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking into account the risk analysis.

The related operating instructions for the integrated devices must be observed.

Accessories

Interfaces

Designation	Description	Connection	Type	Part number	
Safety evaluation unit LE 20	<ul style="list-style-type: none">IP 202 PNP OSSDs, 500 mA	<ul style="list-style-type: none">With screw terminal connector16-pin	LE20-2612	1 016 503	
		<ul style="list-style-type: none">With terminal plug springAngled16-pin	LE20-2614	1 016 505	
Safety evaluation unit LE 20 Muting		<ul style="list-style-type: none">With screw terminal connector15- and 16-pin	LE20-2622	1 016 502	
		<ul style="list-style-type: none">With terminal plug spring15- and 16-pin	LE20-2624	1 016 501	
Safety relay		<ul style="list-style-type: none">For opto-electronic protective devices	—	UE10-30S2D0	6 024 917
		<ul style="list-style-type: none">For opto-electronic protective devices	—	UE10-30S3D0	6 024 918
	<ul style="list-style-type: none">With screw type terminals	—	UE10-20S2D0	2 019 772	
	<ul style="list-style-type: none">With spring terminals	—	UE10-20S4D0	2 019 771	
	<ul style="list-style-type: none">Without terminals	—	UE10-20S1D0	6 020 342	

Mounting accessories

Designation	Description	Type	Part number
Mounting bracket	<ul style="list-style-type: none"> Large for WS/WE 24-2 	BEF-WG-W24	4 026 324

Connector technology

Designation	Description	Type	Part number
Cable socket M12	<ul style="list-style-type: none"> 4-pin Straight 	DOS-1204-G	6 007 302
	<ul style="list-style-type: none"> 4-pin Straight Cable 2 m, PVC 	DOL-1204-G02M	6 009 382

Deflector mirrors

Designation	Description	Type	Part number
Deflector mirror ¹⁾	<ul style="list-style-type: none"> Mirror surface 96 mm x 124 mm 	PSK1	1 005 229
	<ul style="list-style-type: none"> Mirror surface 105 mm x 160 mm 	PNS105-1	1 004 076
	<ul style="list-style-type: none"> Mirror surface 75 mm x 80 mm Including mounting adapter (2 pc. swivel mount) 	PNS75-008	1 026 647
	<ul style="list-style-type: none"> For 90° beam deflection Including mounting kit 	PSK45	5 306 053
	—	—	—
Bracket	<ul style="list-style-type: none"> For PSK 1 	BEF-GH	2 009 292
Spring fastening		—	2 012 473

¹⁾ Warning, reduction of the scanning range!

Overview of technical specifications

Scanning range (typical/maximum)	0 m ... 25 m / 0 m ... 35 m
Light sender/type of light	LED / visible red light
Ambient operating temperature	–40 °C ... +60 °C
Enclosure rating	IP 67
Type	Type 2 according to EN 61496 (only in conjunction with suitable testing device)
Construction size (H x W x D)	80 mm x 24 mm x 53,5 mm

Product description

The SICK single-beam photoelectric safety switch WS/WE 27-2 consists of a testable sender and receiver combined with an evaluation unit.

In-system added value

- Combination with SICK interfaces
- Safe interface to bus systems

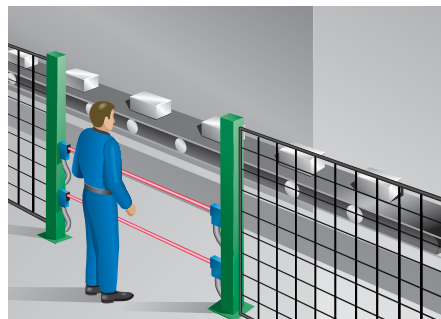
Combination with	Type according to EN 61496	Switching outputs	Number of sensors	Restart interlock	External device monitoring	Muting	Further information
LE 20	2	2 PNP semiconductors ¹⁾	6	✓	✓	–	L-53
LE 20 Muting	2	2 PNP semiconductors ¹⁾	6	✓	✓	✓	L-60
UE 10-3 OS	–	Relay (3 N/O contacts, 1 N/C contact)	–	–	✓	–	L-3
UE 10-2 OS	–	Relay, 2 N/O contacts	–	–	✓	–	L-59

¹⁾ Short-circuit protected, cross-circuit monitored

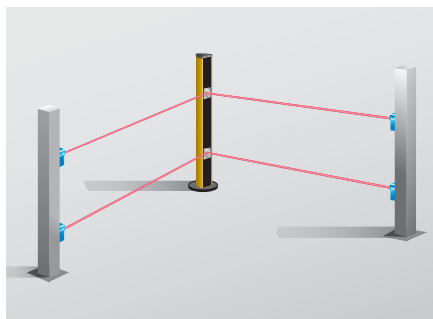
Applications

→ For more applications please refer to the application finder at www.sick.com

- Machining centres
- Processing machines
- Palletiser systems
- High-bay warehouses
- Transfer lines



Access protection on a conveyor system



Access protection with mirror deflection



- Integrated heating
- High scanning range
- Plastic housing, ABS
- Compact design
- Red light



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Ordering information

→ Accessories see page E-36

Single-beam photoelectric safety switch WS/WE 27-2

Designation	Description	Connection	Type	Part number
Light sender and light receiver without heating	▪ Scanning range 35 m ▪ PNP ▪ Q and \bar{Q}	Device plug M12, 4-pin	WS/WE27-2F460	1 019 561
		Device plug, 7-pin	WS/WE27-2F730	1 015 124
Device plug M12, 4-pin		WS/WE2-2F450S05	1 016 025	
Device plug, 7-pin		WS/WE27-2F750	1 015 752	
Light receiver without heating	▪ Scanning range 35 m ▪ PNP ▪ Q and \bar{Q}	Device plug M12, 4-pin	WE27-2F460	2 021 708
Device plug, 7-pin		WE27-2F730	2 017 895	
Light receiver with heating		Device plug M12, 4-pin	WE2-2F450S05	2 018 933
		Device plug, 7-pin	WE27-2F750	2 018 619
Light sender without heating	▪ Scanning range 35 m	Device plug M12, 4-pin	WS27-2D460	2 021 365
Light sender with heating		Device plug, 7-pin	WS27-2D730	2 017 894
		Device plug M12, 4-pin	WS27-2D450S05	2 018 932
		Device plug, 7-pin	WS27-2D750	2 018 618

Detailed technical specifications

→ You can find more detailed data in the operating instructions. Download at www.sick.com

General system data

Scanning range (typical/maximum)	0 m ... 25 m / 0 m ... 35 m
Light spot diameter	Approx. 1200 mm in 25 m distance
Aperture and receive angle (typically/maximum)	$\pm 4^\circ$ / $\pm 5^\circ$
Light sender	LED
Type of light	Visible red light (660 nm), pulsating, average service life 100 000 h (at $T_A = 25^\circ\text{C}$)
Protection class	II
Circuit protection	Reverse polarity protected V_S connections, short-circuit protected output Q and \bar{Q} , interference suppression
Enclosure rating	IP 67
Type	Type 2 according to EN 61496 (only in conjunction with suitable testing device)
Supply voltage V_S	24 V DC (−30 % ... +20 %)

Sender unit

Test input TI	Sender on Sender off	TI to V_S TI to 0 V
Power consumption	WS 27-2 D460 and WS 27-2 D730 WS 27-2 D450S05 und WS 27-2 D750	Max. 35 mA Max. 50 mA

Receiver unit

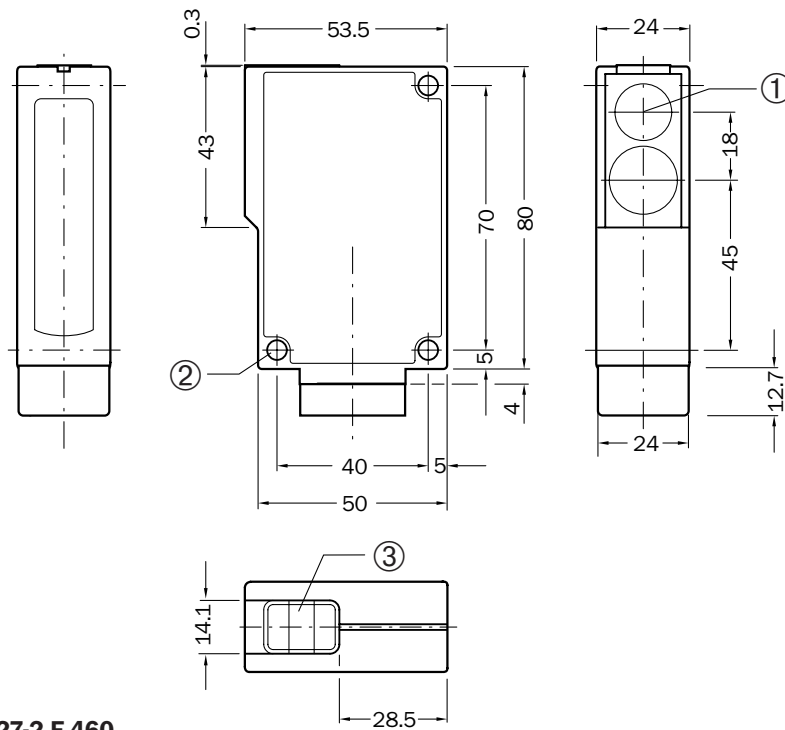
Switching outputs	PNP, Q and \bar{Q}
Response time/switching sequence	Max. 500 μ s / max. 1000/s
Output current I_O	Max. 100 mA
Power consumption	
WE 27-2 D460 and WE 27-2 D730	Max. 35 mA
WE 27-2 D450S05 and WE 27-2 D750	Max. 45 mA

Operating data

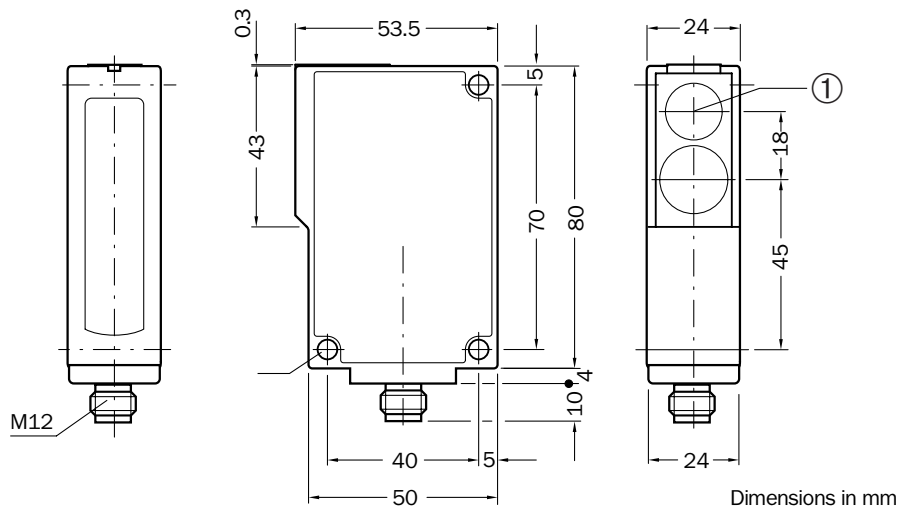
Type of connection	Plug-in connection M12, 4-pin, plug-in connection 7-pin
Ambient operating temperature T_A	–40 °C ... +60 °C
Storage temperature T_S	–40 °C ... +75 °C
Weight	Approx. 100 g
Front screen heating	WS/WE 27-2 F450S05 and WS/WE 27-2 F750

Dimensional drawings

WS/WE 27-2 F 730
WS/WE 27-2 F 750



WS/WE 27-2 F 460
WS/WE 27-2 F 450 S 05

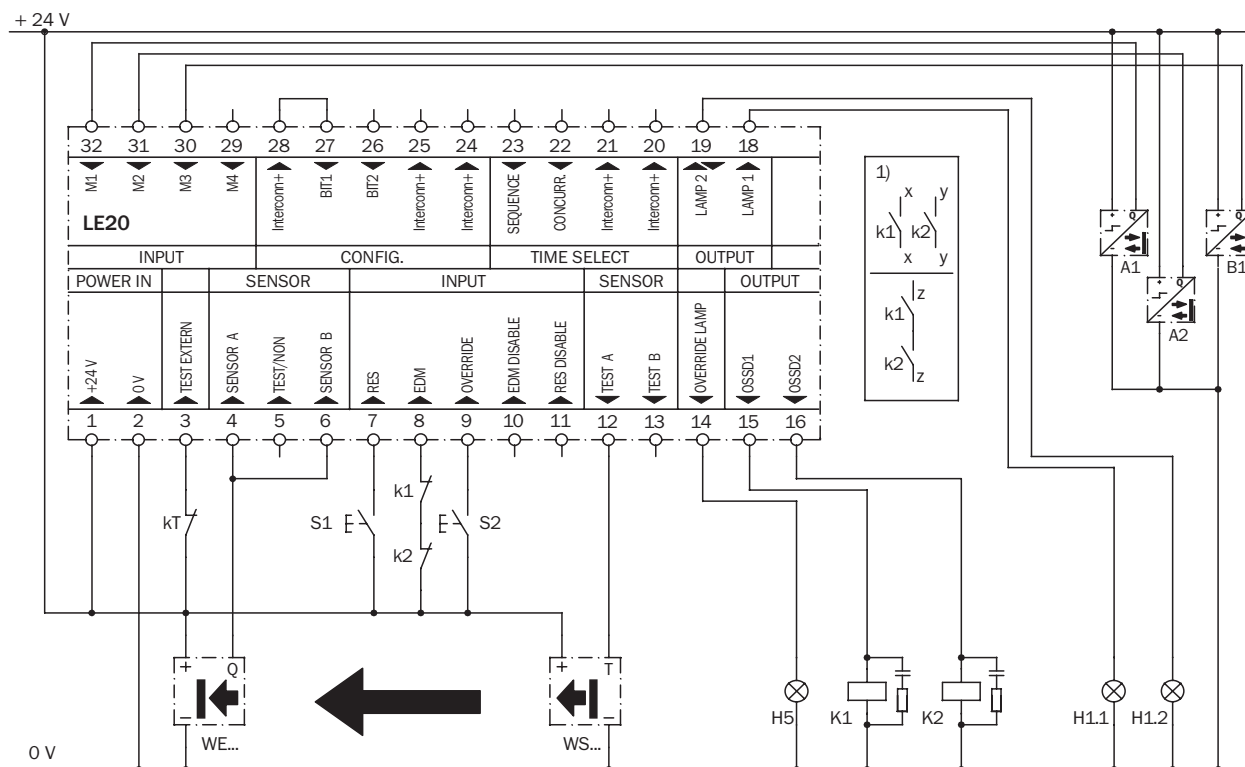


- ① Centre of optical axis
- ② Fastening hole Ø 5.2 mm
- ③ LED

Connection diagram

→ You can find more connection diagrams at www.sick.com

WS/WE 27-2 on safety evaluation unit LE 20 Muting



Task

Integration of the single-beam photoelectric safety switch in a control via an LE 20. Muting using 3 photoelectric proximity switches (light switching PNP) and override circuit. Concurrence monitoring of the muting sensors A1-A2, operating mode with restart interlock and external device monitoring.

Function

If the light beam is clear and the contactors K1 and K2 are de-energised, the OSSDs in the LE 20 are switched on by pressing S1 (button is pressed and released). The OSSDs of the LE 20 (terminals 15 and 16) activate the contactors K1 and K2. If the light beam is interrupted, the LE 20 deactivates the contactors K1 and K2.

Muting

The protective field must be clear, and the OSSDs on the LE 20 switched on, to allow initiation of the muting function. If photoelectric proximity switch pair A is not activated within 3 seconds, the muting is prevented. The muting inputs must remain activated without interruption for the duration of the muting, also on switching from B1 to A1 & A2.

Override

If, after a power failure or a muting error, the object to be muted is in the light beam, the object can be moved out of the protective field by operating the S2 button. This is only possible if a

valid combination of muting signals is present at the LE 20. This situation is indicated by illumination of the override lamp H5.

Possible faults

The incorrect functioning of one of the K1 or K2 contactors does not result in the loss of the shutdown function. The outputs of the LE 20 are monitored PNP semiconductor outputs. Jamming of the S1 button prevents output circuit to enable. Failure of a muting sensor is detected so that renewed muting is prevented. Muting cannot be initiated if the muting lamp H1.1 is not connected or is faulty, or if there is a short-circuit in this circuit. If a replacement indicator (H1.2) is connected, it will indicate the failure of the muting lamp H1.1 by flashing and muting can be initiated. Jamming of the S2 button will be detected after no more than 30 minutes and will bring the override to an end.

Comments

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking into account the risk analysis.

The related operating instructions for the integrated devices must be observed.

Accessories

Interfaces

Designation	Description	Connection	Type	Part number
Safety evaluation unit LE 20	<ul style="list-style-type: none">IP 202 PNP OSSDs, 500 mA	<ul style="list-style-type: none">With screw terminal connector16-pin	LE20-2612	1 016 503
		<ul style="list-style-type: none">With terminal plug springAngled16-pin	LE20-2614	1 016 505
Safety evaluation unit LE 20 Muting		<ul style="list-style-type: none">With screw terminal connector15- and 16-pin	LE20-2622	1 016 502
		<ul style="list-style-type: none">With terminal plug spring15- and 16-pin	LE20-2624	1 016 501
Safety relay	<ul style="list-style-type: none">For opto-electronic protective devices	—	UE10-30S2D0	6 024 917
	<ul style="list-style-type: none">For opto-electronic protective devices	—	UE10-30S3D0	6 024 918
	<ul style="list-style-type: none">With screw type terminals	—	UE10-20S2D0	2 019 772
	<ul style="list-style-type: none">With spring terminals	—	UE10-20S4D0	2 019 771
	<ul style="list-style-type: none">Without terminals	—	UE10-20S1D0	6 020 342

Mounting accessories

Designation	Description	Type	Part number
Mounting bracket	<ul style="list-style-type: none"> For WS/WE 27-2 	BEF-WN-W27	2 009 122

Connector technology

Designation	Description	Type	Part number
Cable socket M12	<ul style="list-style-type: none"> 4-pin Straight 	DOS-1204-G	6 007 302
	<ul style="list-style-type: none"> 4-pin Straight Cable 2 m, PVC 	DOL-1204-G02M	6 009 382
Rectangular plug-in system cable socket	<ul style="list-style-type: none"> 7-pin With coding for DC 	DOS-2107-W	6 006 823

Deflector mirrors

Designation	Description	Type	Part number
Deflector mirror ¹⁾	<ul style="list-style-type: none"> Mirror surface 96 mm x 124 mm 	PSK1	1 005 229
	<ul style="list-style-type: none"> Mirror surface 105 mm x 160 mm 	PNS105-1	1 004 076
	<ul style="list-style-type: none"> Mirror surface 75 mm x 80 mm Including mounting adapter (2 pc. swivel mount) 	PNS75-008	1 026 647
	<ul style="list-style-type: none"> For 90° beam deflection Including mounting kit 	PSK45	5 306 053
Bracket	<ul style="list-style-type: none"> For PSK 1 	BEF-GH	2 009 292
Spring fastening		—	2 012 473

¹⁾ Warning, reduction of the scanning range!

Overview of technical specifications

Scanning range (typical/maximum)	0 m ... 16 m / 0 m ... 22 m
Light sender/type of light	LED / visible red light
Ambient operating temperature	-25 °C ... +70 °C
Enclosure rating	IP 67
Type	Type 2 according to EN 61496 (only in conjunction with LE 20)
Construction size (Ø x L)	M18 x 98 mm (straight connection) M18 x 86 mm (angled connection)

Product description

The SICK single-beam photoelectric safety switch VS/VE 18-2 consists of a testable sender and receiver combined with an evaluation unit.

In-system added value

- Combination with SICK interfaces
- Safe interface to bus systems

Combination with	Type according to EN 61496	Switching outputs	Number of sensors	Restart interlock	External device monitoring	Muting	Further information
LE 20	2	2 PNP semiconductors ¹⁾	6	✓	✓	—	L-53
LE 20 Muting	2	2 PNP semiconductors ¹⁾	6	✓	✓	✓	L-60
UE 10-3 OS	—	Relay (3 N/O contacts, 1 N/C contact)	—	—	✓	—	L-3
UE 10-2 OS	—	Relay, 2 N/O contacts	—	—	✓	—	L-59

¹⁾ Short-circuit protected, cross-circuit monitored

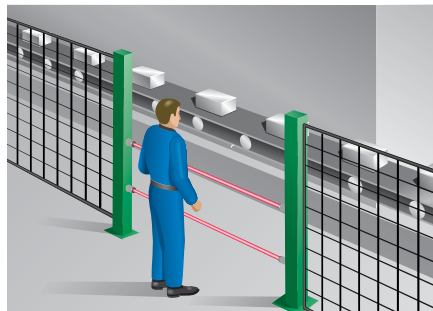
Applications

→ For more applications please refer to the application finder at www.sick.com

- Machining centres
- Processing machines
- Palletiser systems
- High-bay warehouses
- Transfer lines



Lateral protection on an automated guided vehicle



Access protection on a conveyor system



- Metal housing
- High scanning range
- Cylindrical design
- Red light



Further information	Page
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→ Technical specifications	E-38
→ Dimensional drawings	E-39
→ Connection diagram	E-40
→ Accessories	E-41
→ Services	A-0

Ordering information

→ Accessories see page E-41

Single-beam photoelectric safety switch VS/VE 18-2

Designation	Description	Connection	Type	Part number
Light sender and light receiver	<ul style="list-style-type: none"> Scanning range 16 m Metal housing 	M12, 4-pin, angled	VS/VE18-204550	6 011 845
		M12, 4-pin, straight	VS/VE18-204450	6 011 846
Light receiver	<ul style="list-style-type: none"> Scanning range 16 m Metal housing 	M12, 4-pin, angled	VE18-204550	6 011 850
		M12, 4-pin, straight	VE18-204450	6 011 848
Light sender	<ul style="list-style-type: none"> Scanning range 16 m Metal housing 	M12, 4-pin, angled	VS18-2D5550	6 011 847
		M12, 4-pin, straight	VS18-2D5450	6 011 849

E Detailed technical specifications

→ You can find more detailed data in the operating instructions. Download at www.sick.com

General system data

Scanning range (typical/maximum)	0 m ... 16 m / 0 m ... 22 m
Light spot diameter	Approx. 1200 mm in 25 m distance
Aperture and receive angle (typically/maximum)	$\pm 4^\circ / \pm 5^\circ$
Light sender	LED
Type of light	Visible red light (660 nm), pulsating, average service life 100 000 h (at $T_A = 25^\circ\text{C}$)
Protection class	III
Circuit protection	Reverse polarity protected V_S connections, short-circuit protected output, interference suppression
Enclosure rating	IP 67
Type	Type 2 according to EN 61496 (only in conjunction with LE 20)
Supply voltage V_S	24 V DC (–30 % ... +20 %)

Sender unit

Power consumption	
VS 18-2 D5450/D5550	Max. 35 mA

Receiver unit

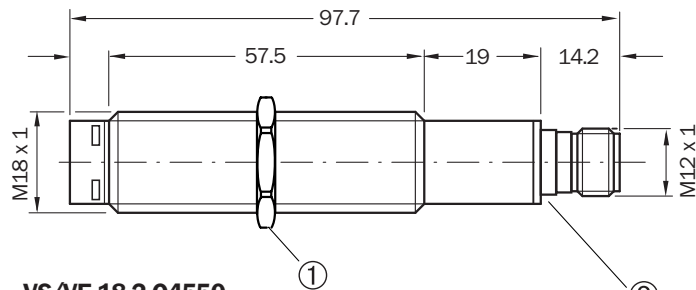
Switching outputs	PNP
Response time/switching sequence	Max. 2 ms / max. 250/s
Output current I_O	Max. 100 mA
Power consumption	
VE 18-2 04450/04550	Max. 25 mA

Operating data

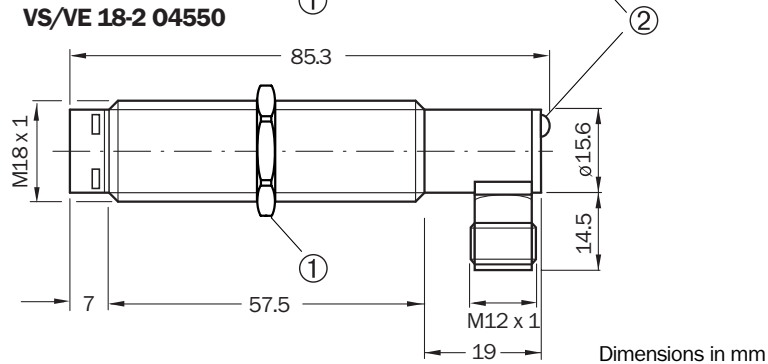
Type of connection	M12, 4-pin, straight/angled
Ambient operating temperature T_A	–25 °C ... +70 °C
Weight	Approx. 250 g

Dimensional drawings

VS/VE 18-2 04450



VS/VE 18-2 04550



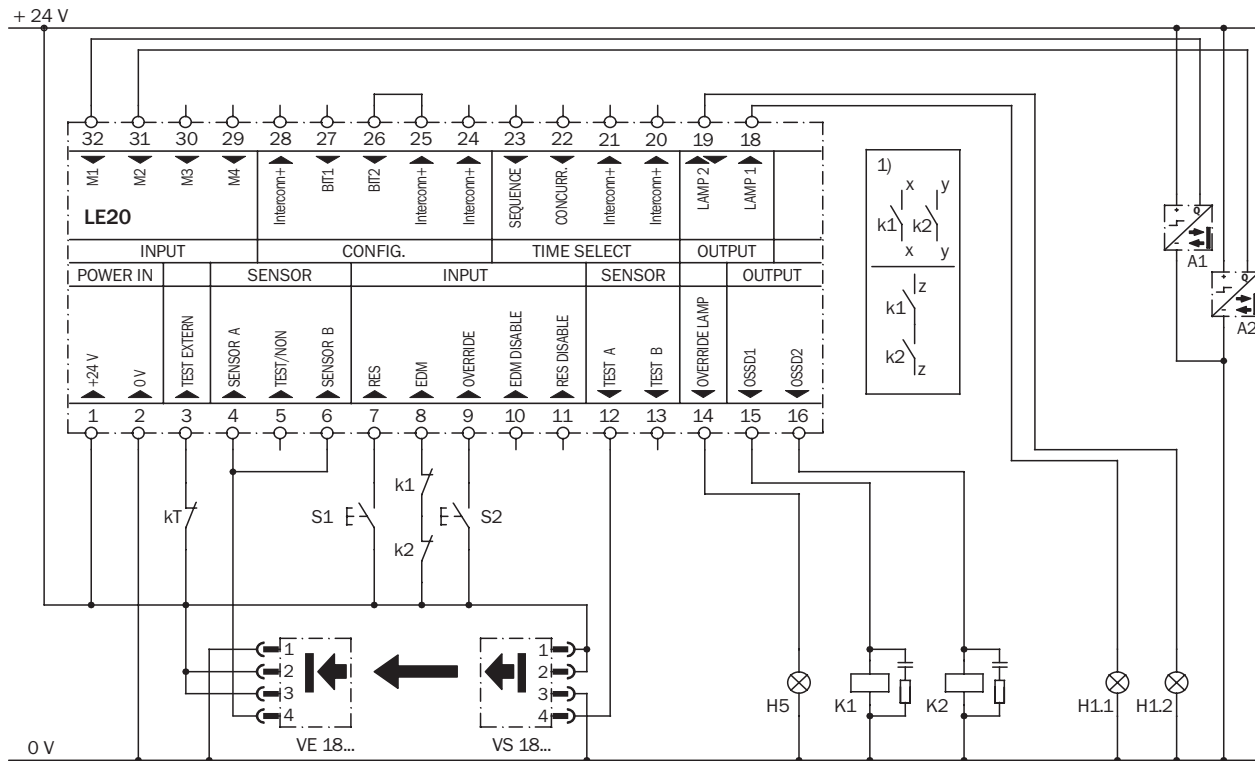
① Mounting nut M18

② LED

Connection diagram

→ You can find more connection diagrams at www.sick.com

VS/VE 18-2 on safety evaluation unit LE 20 Muting



Task

Integration of the VS/VE 18-2 04450 or VS/VE 18-2 04550 single-beam photoelectric safety switch in a control via an LE 20. Muting using 2 photoelectric proximity switches (light switching PNP) and override circuit. Concurrence monitoring of the muting sensors. Operating mode with restart interlock and external device monitoring.

Function

If the light beam is clear and the contactors K1 and K2 are de-energised, the OSSDs in the LE 20 are switched on by pressing S1 (button is pressed and released). The OSSDs of the LE 20 (terminals 15 and 16) activate the contactors K1 and K2. If the light beam is interrupted, the LE 20 deactivates the contactors K1 and K2.

Muting

The protective field must be clear, and the OSSDs on the LE 20 switched on, to allow initiation of the muting function. Muting is prevented if photoelectric proximity switch pair A is not activated within 3 seconds. The muting inputs must remain activated without interruption for the duration of the muting.

Override

If, after a power failure or a muting error, the object to be muted is in the light beam, the object can be moved out of the protective field by operating the button S2. This is only possible if both muting signals (A1 and A2) are present at the LE 20. This situation is indicated by illumination of the override lamp H5.

Possible faults

The incorrect functioning of one of the K1 or K2 contactors does not result in the loss of the shutdown function. The outputs of the LE 20 are monitored PNP semiconductor outputs. Jamming of the S1 button prevents output circuit to enable. Failure of a muting sensor is detected so that renewed muting is prevented. Muting cannot be initiated if the muting lamp H1.1 is not connected or is faulty, or if there is a short-circuit in this circuit. If a replacement indicator (H1.2) is connected, it will indicate the failure of the muting lamp H1.1 by flashing and muting can be initiated. Jamming of the S2 button will be detected after no more than 30 minutes and will bring the override to an end.

Comments

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking into account the risk analysis.

The related operating instructions for the integrated devices must be observed.

Accessories

Interfaces

Designation	Description	Connection	Type	Part number
Safety evaluation unit LE 20	<ul style="list-style-type: none">IP 202 PNP OSSDs, 500 mA	<ul style="list-style-type: none">With screw terminal connector16-pin	LE20-2612	1 016 503
		<ul style="list-style-type: none">With terminal plug springAngled16-pin	LE20-2614	1 016 505
Safety evaluation unit LE 20 Muting		<ul style="list-style-type: none">With screw terminal connector15- and 16-pin	LE20-2622	1 016 502
		<ul style="list-style-type: none">With terminal plug spring15- and 16-pin	LE20-2624	1 016 501
Safety relay		<ul style="list-style-type: none">For opto-electronic protective devices	—	UE10-30S2D0
	<ul style="list-style-type: none">For opto-electronic protective devices	—	UE10-30S3D0	6 024 918
	<ul style="list-style-type: none">With screw type terminals	—	UE10-20S2D0	2 019 772
	<ul style="list-style-type: none">With spring terminals	—	UE10-20S4D0	2 019 771
	<ul style="list-style-type: none">Without terminals	—	UE10-20S1D0	6 020 342

Mounting accessories

Designation	Description	Type	Part number
Mounting bracket	For VS/VE 18-2	BEF-M18	5 308 446

Connector technology

Designation	Description	Type	Part number
Cable socket M12	<ul style="list-style-type: none"> 4-pin Straight 	DOS-1204-G	6 007 302
	<ul style="list-style-type: none"> 4-pin Straight Cable 2 m, PVC 	DOL-1204-G02M	6 009 382

Deflector mirrors

Designation	Description	Type	Part number
Deflector mirror ¹⁾	Mirror surface 96 mm x 124 mm	PSK1	1 005 229
	Mirror surface 105 mm x 160 mm	PNS105-1	1 004 076
	<ul style="list-style-type: none"> Mirror surface 75 mm x 80 mm Including mounting adapter (2 pc. swivel mount) 	PNS75-008	1 026 647
	<ul style="list-style-type: none"> For 90° beam deflection Including mounting kit 	PSK45	5 306 053
Bracket	For PSK 1	BEF-GH	2 009 292
Spring fastening		—	2 012 473

¹⁾ Warning, reduction of the scanning range!

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.

Number of actuation directions

Safety switches can be actuated in different axes. The setting of the actuating direction is facilitated by the head, which can be rotated through 90 or 180 degrees. Up to 5 actuation directions can be implemented, depending on the type.

Type of actuator

The majority of safety switches have appropriately coded tongue-operated actuators that prevent simple manipulation of the switch.

The i1000 series has an additional handle-operated actuator with coded spindle. It is not actuated by applying a force but by applying a torque.

Safety switches with separate actuator



F

Safety application	Number of positive action normally closed contacts/ normally open contacts ¹⁾	Housing material ¹⁾	Number x size of cable gland	Locking force	Type of actuator ¹⁾	Product	Page
	1 / 1 2 / 0	Plastic	1 x M20	10 N	Tongue operated	i10	F-2
	1 / 0 2 / 1		1 x M16 or 3 x M16	10 N		i11 mini	F-7
	1 / 1 2 / 1		1 x M16	—		i12 S	F-12
	1 / 1 2 / 0		3 x M20	30 N		i16 S	F-17
	2 / 1		3 x M20	—		i17 S	F-21
	3 / 1	Metal	1 x M20	—	Tongue operated	i100 S	F-25
	3 / 1 2 / 2		1 x M20	5 N		i110 S	F-31
	2 / 1		1 x PG13.5	—	Handle operated	i1001	F-35
	2 / 1		1 x PG13.5	—	Tongue operated	i1002	F-41

¹⁾ Explanation see page F-0



F

- Housing material glass-fibre reinforced thermoplastic
- Five actuating directions
- Cable gland M20
- 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 / 0
Type of actuator	Tongue operated
Housing material	Plastic
Number of cable entries	1
Size of the cable gland	M20
Locking force	10 N

Product description

- Safety switches with separate coded actuator
- Various actuator versions available
- 2-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-A113	6 022 530
2	0	i10-A203	6 022 529

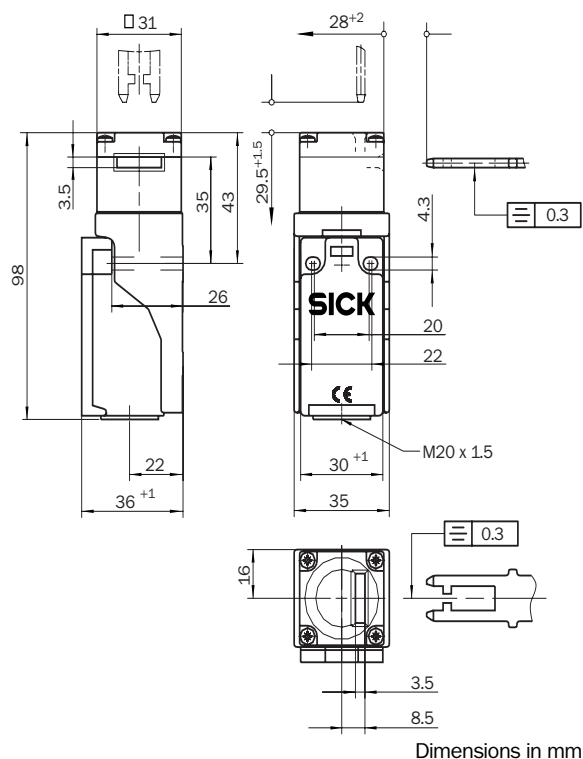
Please order actuator separately

Further information	Page
→ Actuators	F-4
→ Lockout bar	F-6
→ Other accessories	F-6
→ Services	A-0

Detailed technical specifications

Type	i10-A113	i10-A203
Housing material	Glass-fibre reinforced thermoplastic	
Enclosure rating	IP 67	
Mechanical life (relay contacts)	10 ⁶ switching cycles	
Ambient operating temperature from ... to	-20 °C ... +80 °C	
Maximum approach speed	333 mm/s	
Switching principle	Slow-action-switch	
Number of positive action normally closed contacts	1	2
Number of normally open contacts	1	0
Usage category in compliance with IEC 947-5-1	AC-15/DC-13	
Rated operating current (voltage)	4 A (230 V AC), 4 A (24 V DC)	
Rated insulation voltage U _i	400 V	
Impulse withstand voltage U _{imp}	2500 V AC	
Minimum switching voltage	24 V DC	
Minimum switching current (switching voltage)	30 mA (24 V DC)	
Contact material	Silver alloy, gold flashed	
Connection type	Cable gland	
Maximum connection cable cross-section	1.5 mm ²	
Short circuit protection	T6/F10	
Weight	0.15 kg	0.14 kg

Dimensional drawings



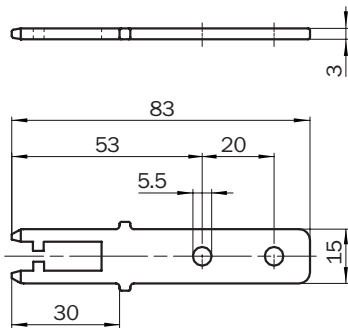
Switching elements

Actuator inserted	Actuator removed	
\ominus 21 22 \ominus 13 14	\ominus 21 22 \ominus 13 14	11, 1 positive action NC contact + 2 NO contacts
\ominus 21 22 \ominus 11 12	\ominus 21 22 \ominus 11 12	20, 2 positive action NC contacts

Actuators

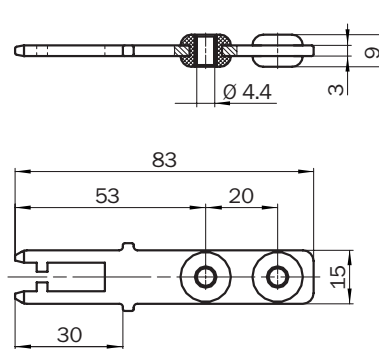
Actuation option	Way of actuation	Minimum door radius	Type	Part number
Straight	Rigid	1000 mm	iE10-S1	5 306 527
	Rubber-mounted	1000 mm	iE10-S2	5 306 530
Angled	Rigid	1000 mm	iE10-A1	5 306 535
Radius	Semi flexible	90 mm	iE10-R1	5 306 528
		100 mm	iE10-R2	5 306 529

iE10-S1



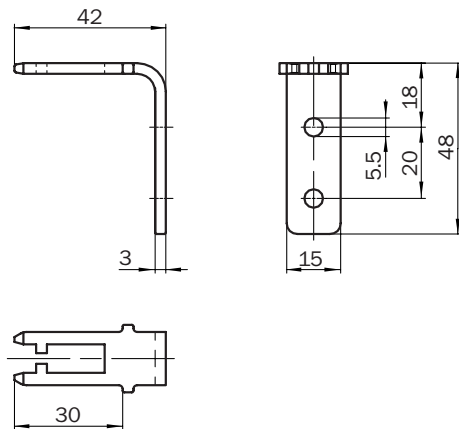
2 safety screws included.
Min. door radius 1000 mm.

iE10-S2



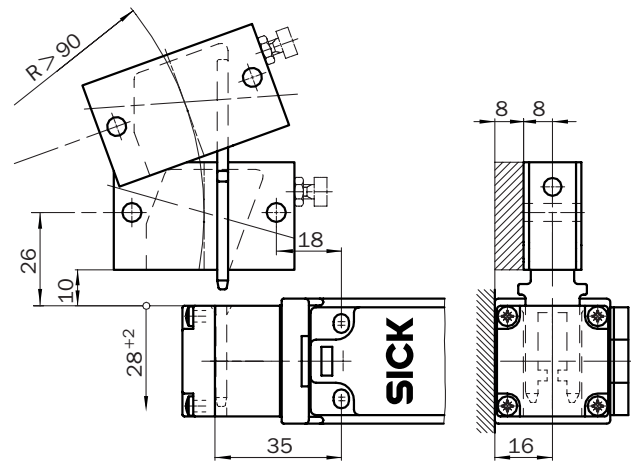
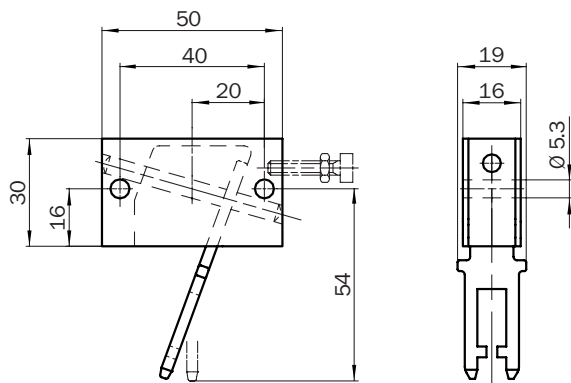
2 safety screws included.
Min. door radius 1000 mm.

iE10-A1



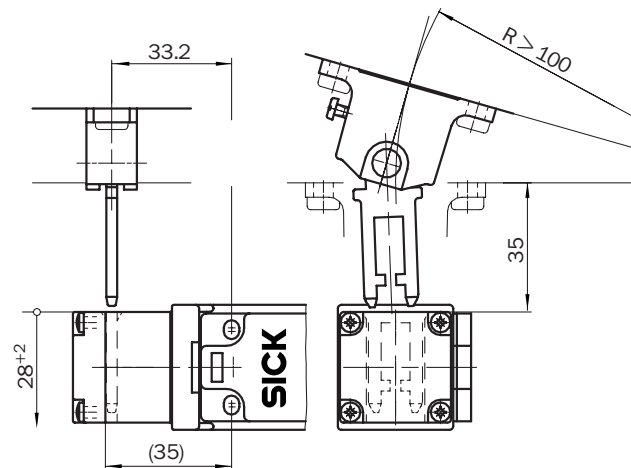
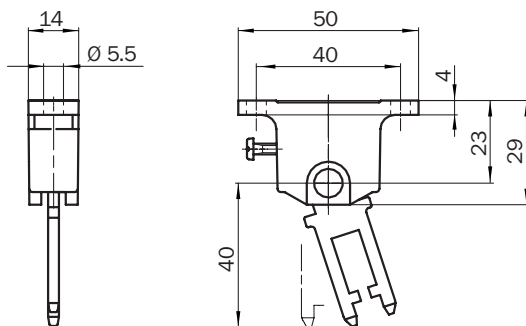
2 safety screws included.
Min. door radius 1000 mm.

iE10-R1



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

iE10-R2



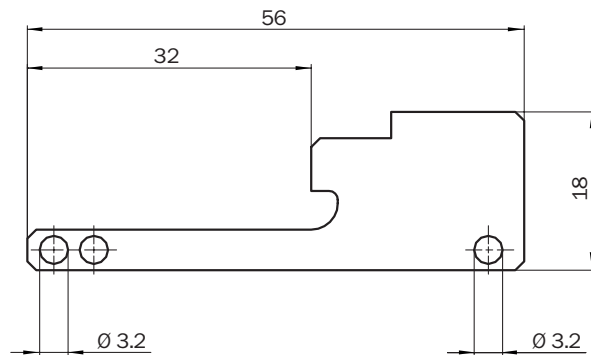
2 safety screws included.
Min. door radius 100 mm.

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Lockout bar

Type	Part number
iE10-S3	5 306 536

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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Other accessories

Cable gland

Type	Part number
Cable gland M20	5 309 164

Overview of technical specifications

Number of positive action normally closed contacts (depending on type)	1 / 2
Number of normally open contacts (depending on type)	0 / 1
Type of actuator	Tongue operated
Housing material	Plastic
Number of cable entries (depending on type)	1 / 3
Size of the cable gland	M16
Locking force	10 N

Product description

- Safety switches with separate coded actuator
- Miniature design - ideal for direct mounting on framework
- 1- 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	0	i11-S103 mini	6 022 584
2	1	i11-S213 mini	6 022 583

Please order actuator separately



- Housing material glass-fibre reinforced thermoplastic
- Five actuating directions
- Cable gland M16
- Enclosure rating IP 67



F

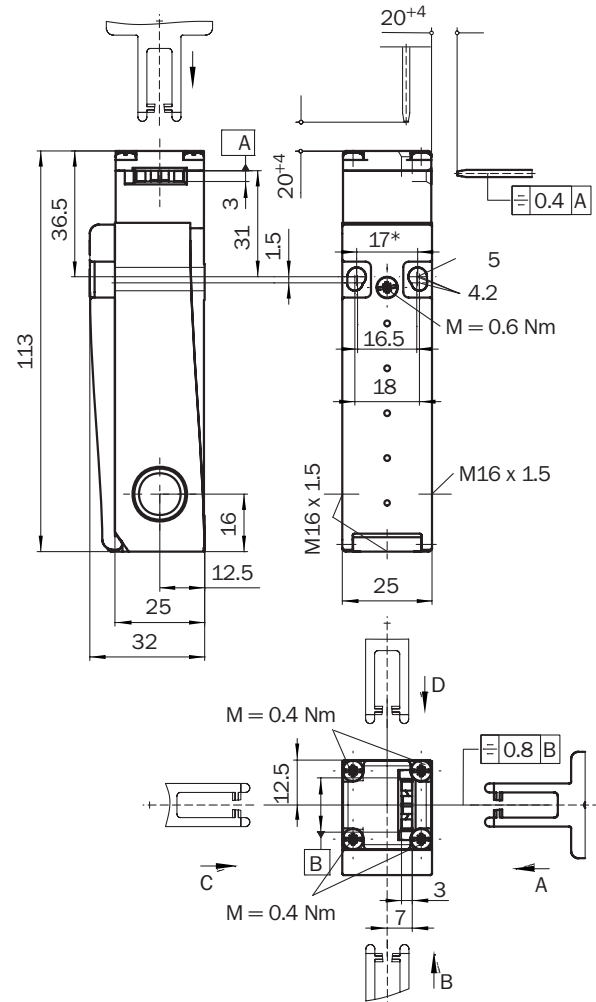
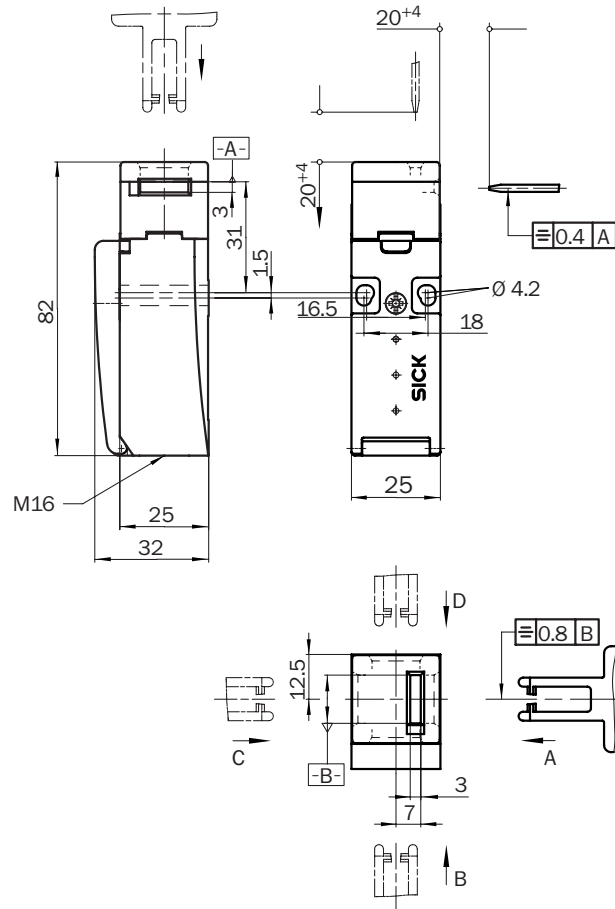
Further information	Page
→ Technical specifications	F-8
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→ Switching elements	F-9
→ Actuators	F-10
→ Other accessories	F-11
→ Services	A-0

Detailed technical specifications

Type	i11-S103 mini	i11-S213 mini
Housing material	Glass-fibre reinforced thermoplastic	
Enclosure rating	IP 67	
Mechanical life (relay contacts)	10 ⁶ switching cycles	
Ambient operating temperature from ... to	-20 °C ... +80 °C	
Maximum approach speed	333 mm/s	
Actuation force	6 N	
Switching principle	Slow-action-switch	
Number of positive action normally closed contacts	1	2
Number of normally open contacts	0	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}	2500 V AC	
Minimum switching voltage	12 V DC	
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 mm ²	
Short circuit protection	T10/F20	
Weight	0.1 kg	

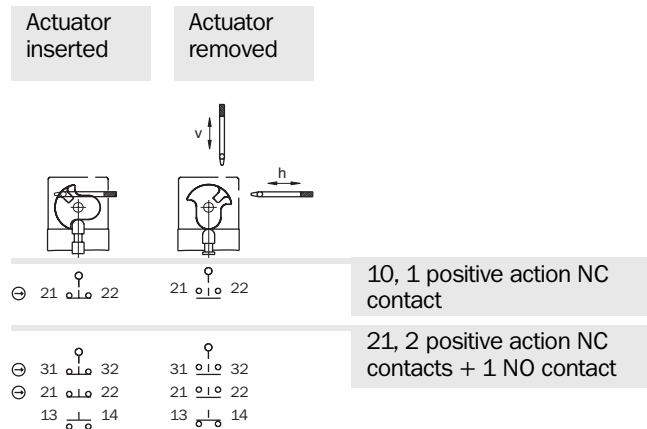
F

i11-S213 mini



Dimensions in mm

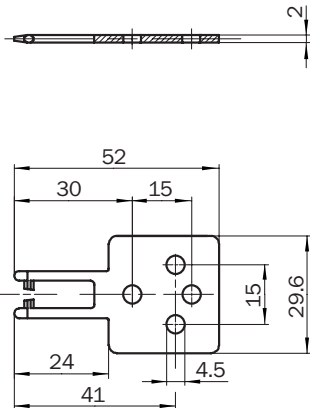
Switching elements



Actuators

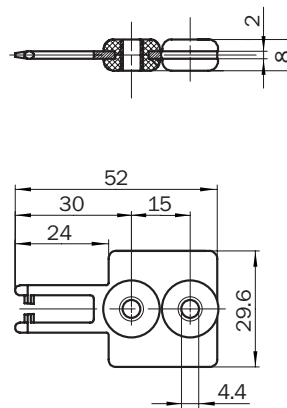
Actuation option	Way of actuation	Minimum door radius	Type	Part number
Straight	Rigid	150 mm	iE11-S1	5 306 537
	Rubber-mounted, in line	150 mm	iE11-S2	5 306 539
	Rubber-mounted, transversal	150 mm	iE11-S3	5 306 540
Angled	Rigid	150 mm	iE11-A1	5 306 538
	Rubber-mounted, transversal	150 mm	iE11-A2	5 306 541

iE11-S1



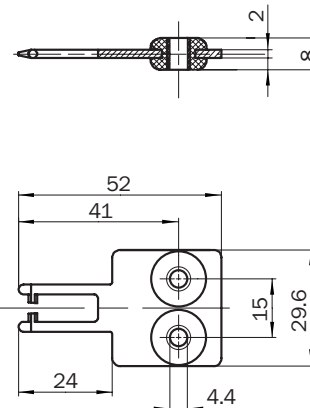
2 safety screws M4 x 14 included

iE11-S2



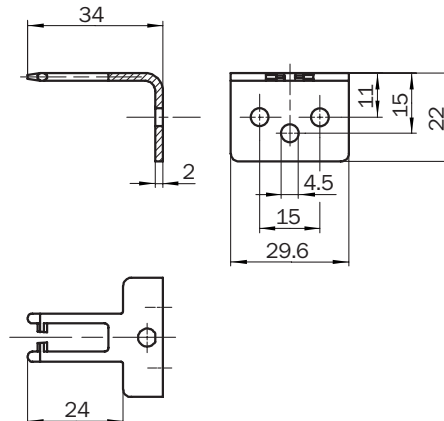
2 safety screws M4 x 14 included

iE11-S3



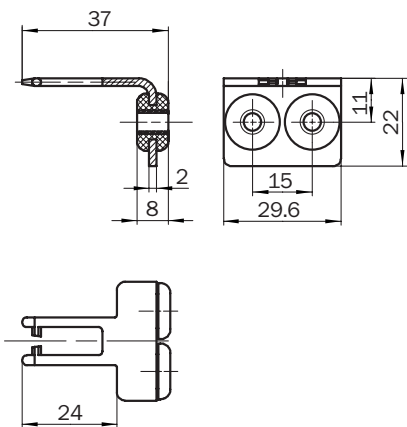
2 safety screws M4 x 14 included

iE11-A1



2 safety screws M4 x 14 included

iE11-A2



2 safety screws M4 x 14 included

Other accessories

Cable gland

Type	Part number
Cable gland M16	5 309 163

F



F

- Housing material glass-fibre reinforced thermoplastic
- Five actuating directions
- Cable gland M16
- Two designs: miniature design 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 / 2
Type of actuator	Tongue operated
Housing material	Plastic
Number of cable entries	1
Size of the cable gland	M16

Product description

- Safety switches with separate coded actuator
- 2-, or 3-pole contact element
- One version as miniature design - ideal for direct mounting on framework
- Small door radius (60mm) possible

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	i12-SA113	6 025 057
2	1	i12-SB213	6 025 059

Please order actuator separately

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→ Actuators	F-15
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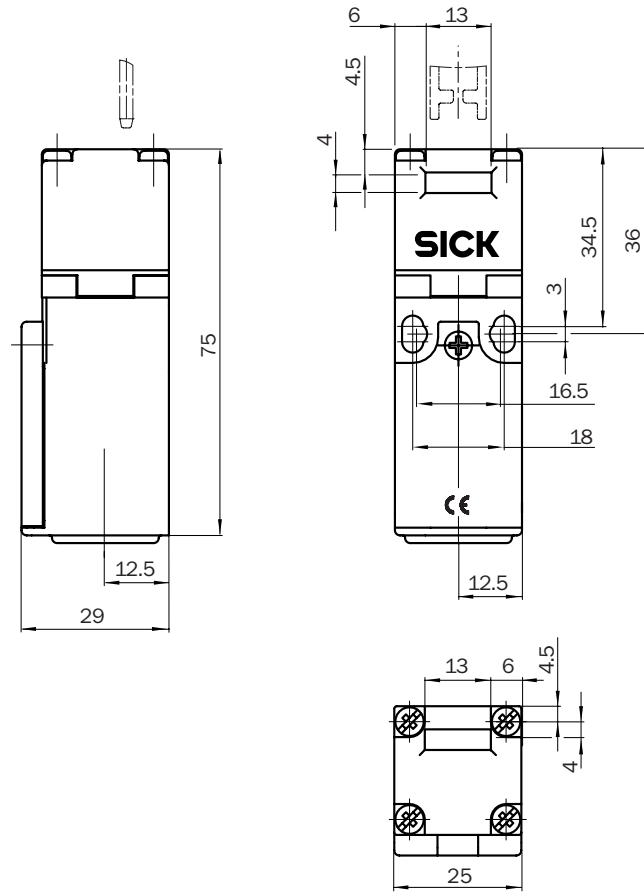
Detailed technical specifications

Type	i12-SA113	i12-SB213
Housing material	Glass-fibre reinforced thermoplastic	
Enclosure rating	IP 67	
Mechanical life (relay contacts)	10 ⁶ switching cycles	
Ambient operating temperature from ... to	-20 °C ... +80 °C	
Maximum approach speed	160 mm/s	
Actuation force	6 N	
Switching principle	Slow-action-switch	
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)	3 A (240 V AC), 6 A (120 V AC), 1.1 A (250 V DC), 2.2 A (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	
Maximum connection cable cross-section	1.5 mm ²	
Short circuit protection	T10/F10	
Weight	0.08 kg	0.11 kg

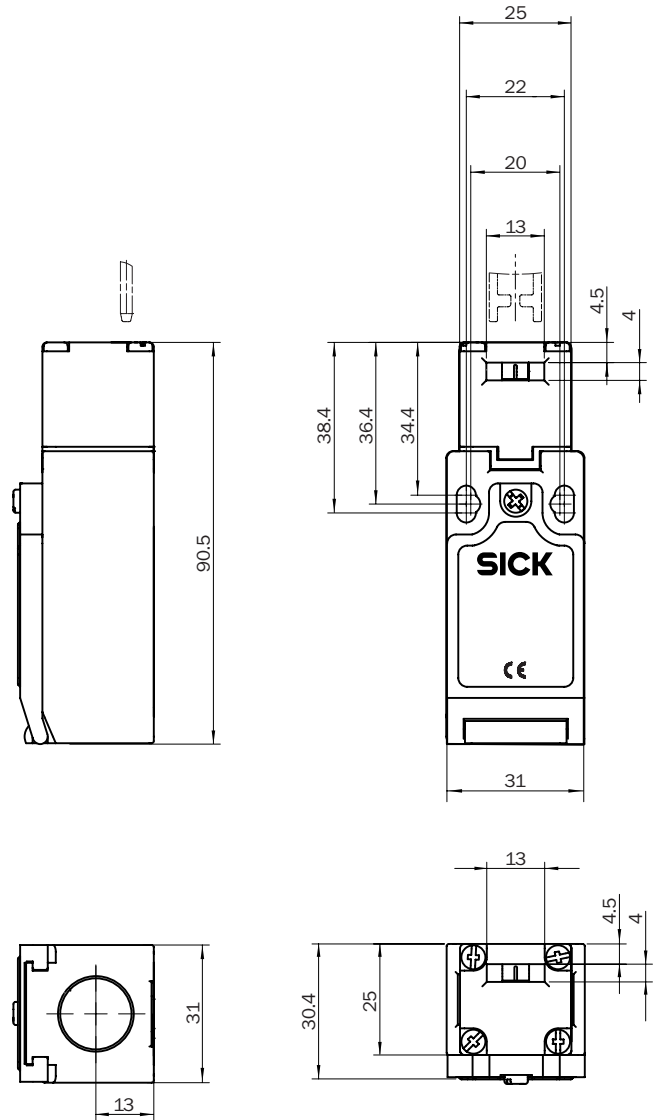
F

Dimensional drawings

i12-SA113



i12-SB213



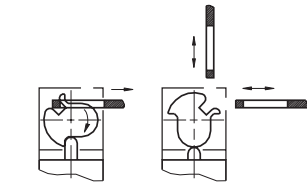
Dimensions in mm

F

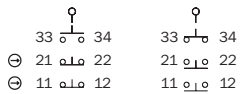
Switching elements

Actuator
inserted

Actuator
removed



11, 1 positive action NC
contact + 1 NO contact

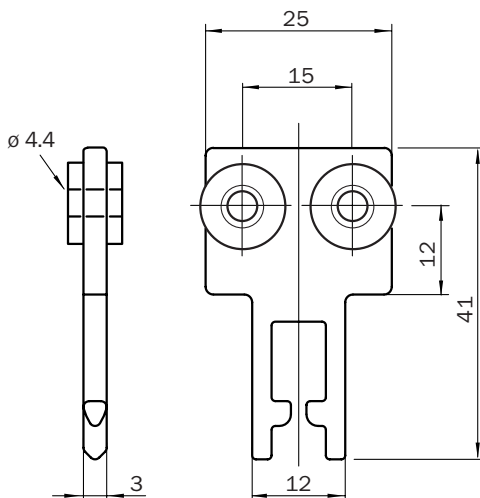


21, 2 positive action NC
contacts + 1 NO contact

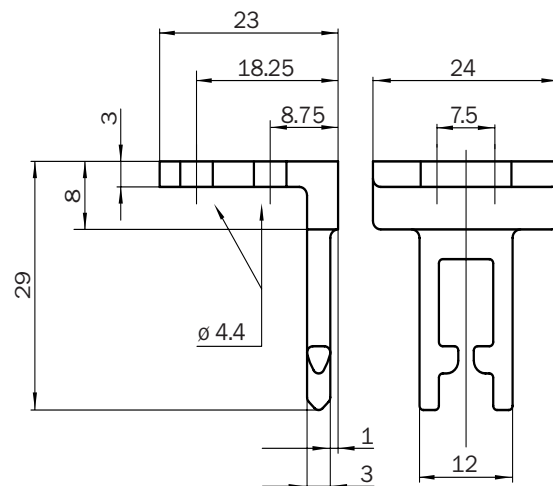
Actuators

Actuation option	Way of actuation	Minimum door radius	Type	Part number
Straight	Rigid	150 mm	iE12-S1	5 311 131
Angled	Rigid	150 mm	iE12-A1	5 311 132
Radius	Semi flexible	60 mm	iE12-F1	5 308 842

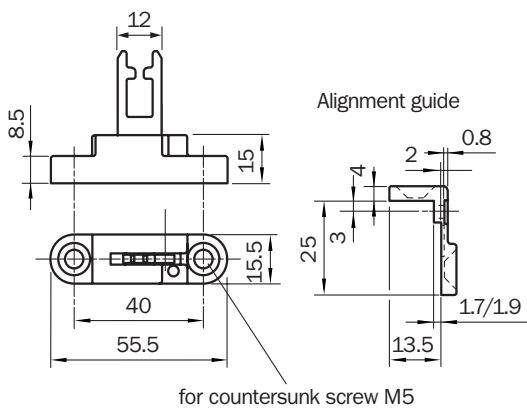
iE12-S1



iE12-A1



iE12-F1



Other accessories

Cable gland

Type	Part number
Cable gland M16	5 309 163

F

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
Type of actuator	Tongue operated
Housing material	Plastic
Number of cable entries	3
Size of the cable gland	M20
Locking force	30 N

Product description

- Safety switches with separate coded actuator
- Easy conversion of actuating direction through rotatable head
- 2-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

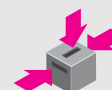
Positive action normally closed	Normally open	Type	Part number
1	1	i16-SA113	6 025 065
2	0	i16-SA203	6 025 063

Please order actuator separately



- Housing material glass-fibre reinforced thermoplastic
- Three actuating directions
- 30 N locking force
- Cable gland 3 x M20
- Enclosure rating IP 67

F

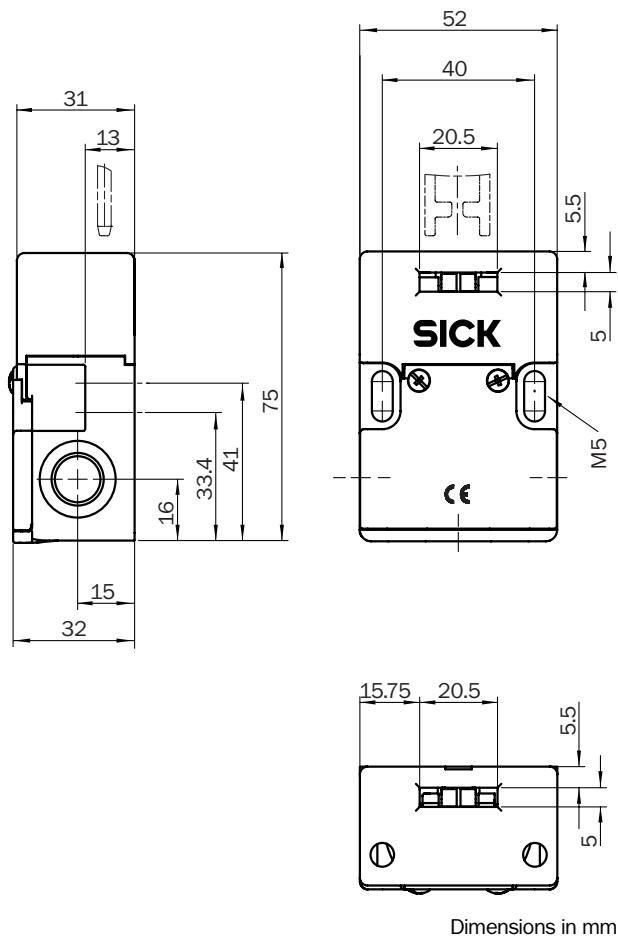


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→ Catch and retainer kit	F-20
→ Other accessories	F-20
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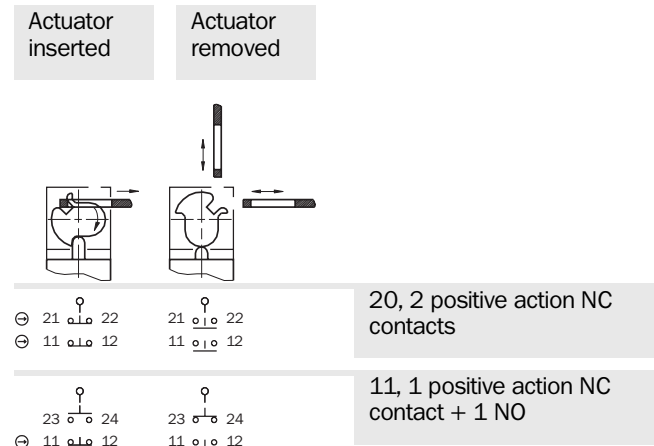
Detailed technical specifications

Type	i16-SA113	i16-SA203
Housing material	Glass-fibre reinforced polybutylene terephthalate (PBT)	
Enclosure rating	IP 67	
Mechanical life (relay contacts)	10 ⁶ switching cycles	
Ambient operating temperature from ... to	−20 °C ... +80 °C	
Maximum approach speed	160 mm/s	
Actuation force	30 N	
Switching principle	Slow-action-switch	
Number of positive action normally closed contacts	1	2
Number of normally open contacts	1	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	500 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)	
Contact material	Silver, nickel	
Connection type	Cable gland	
Maximum connection cable cross-section	1.5 mm ²	
Short circuit protection	T10/F10	
Weight	0.14 kg	

Dimensional drawings



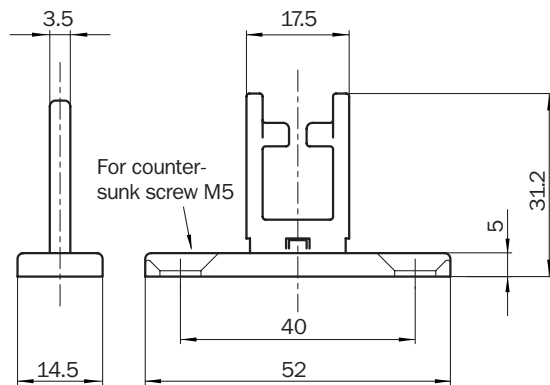
Switching elements



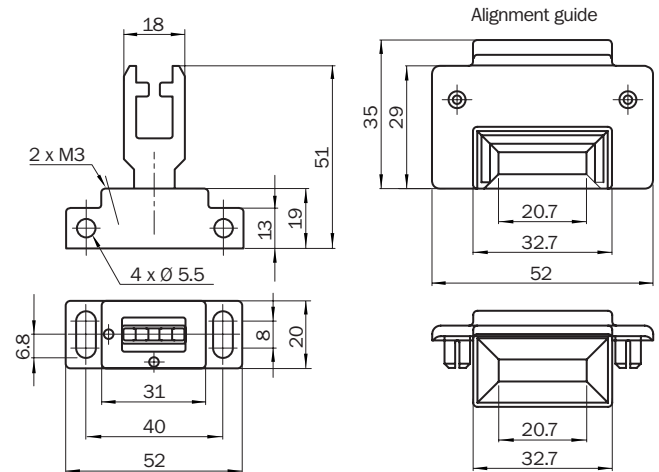
Actuators

Actuation option	Way of actuation	Minimum door radius	Type	Part number
Straight	Rigid	175 mm	iE16-S1	5 311 128
	Fully flexible	60 mm	iE16-F1	5 311 129
Radius	Semi flexible	60 mm	iE16-F2	5 311 278

iE16-S1

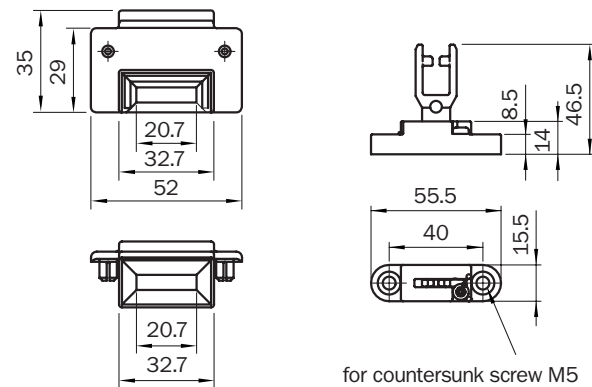


iE16-F1



The actuator facilitates movement in both horizontal and vertical planes.

iE16-F2

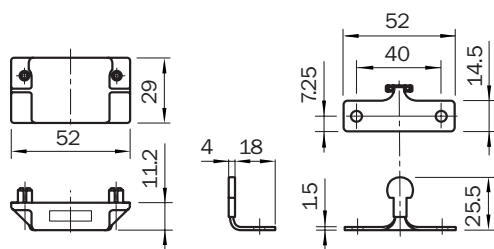


The actuator facilitates movement in the horizontal plane only.

Catch and retainer kit

Type	Part number
iE16-SCR	5 310 780

E16-SCR



An increase in the locking force by 50 N.
Only in connection with rigid actuators.

Other accessories

Cable gland

Type	Part number
Cable gland M20	5 309 164

Overview of technical specifications

Number of positive action normally closed contacts	2
Number of normally open contacts	1
Type of actuator	Tongue operated
Housing material	Plastic
Number of cable entries	3
Size of the cable gland	M20

Product description

- Safety switch with separate coded actuator
- Easy conversion of actuating direction through rotatable head
- 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	i17-SA213	6 025 067

Please order actuator separately



- Housing material glass-fibre reinforced thermoplastic
- Three actuating directions
- Cable gland 3 x M20
- Enclosure rating IP 67



F

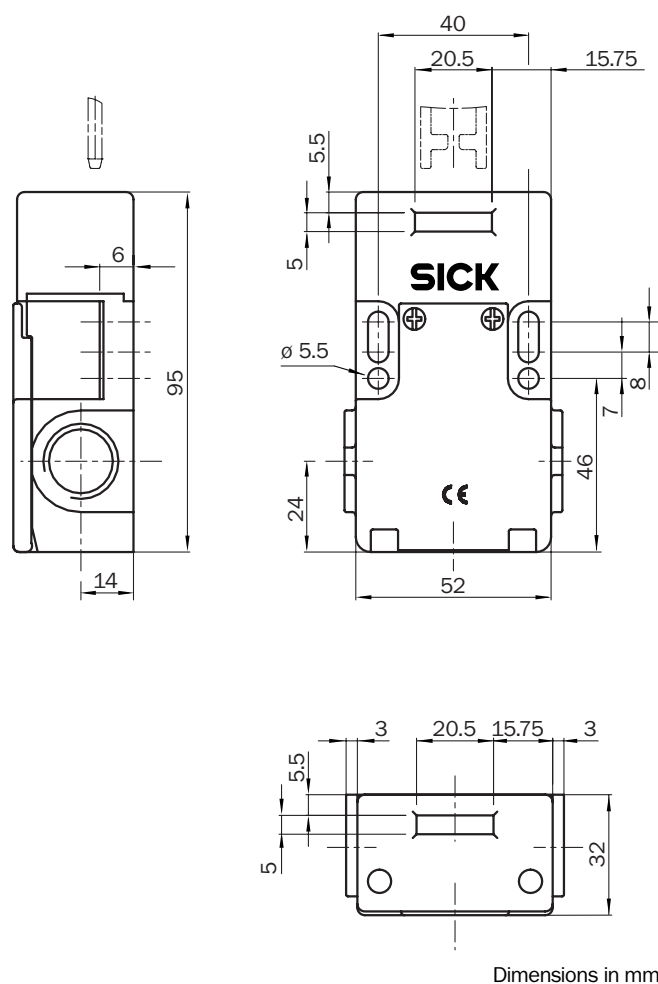
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→ Services	A-0

Detailed technical specifications

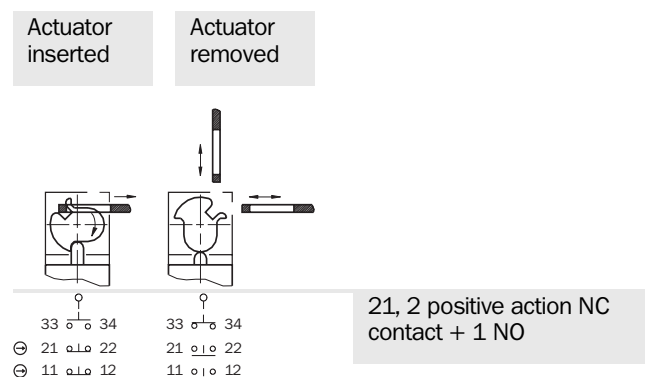
Housing material	Glass-fibre reinforced thermoplastic
Enclosure rating	IP 67
Mechanical life (relay contacts)	10 ⁶ switching cycles
Ambient operating temperature from ... to	−20 °C ... +80 °C
Maximum approach speed	1000 mm/s
Actuation force	12 N
Switching principle	Slow-action-switch
Number of positive 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)	2 A (250 V AC), 5 A (100 V AC), 0.5 A (250 V AC), 2 A (24 V DC)
Rated insulation voltage U_i	500 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)
Contact material	Silver, nickel
Connection type	Cable gland
Maximum connection cable cross-section	1.5 mm ²
Short circuit protection	T10/F10
Weight	0.16 kg

F

Dimensional drawings



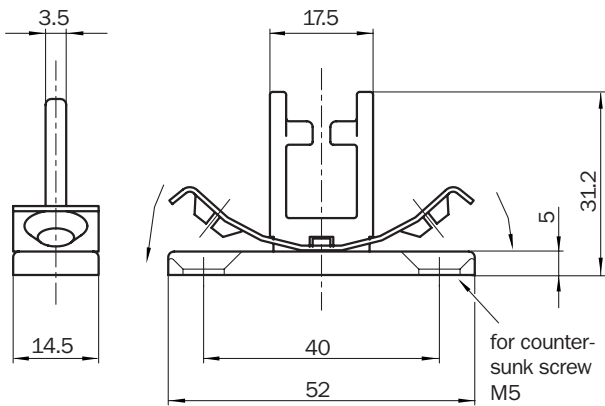
Switching elements



Actuators

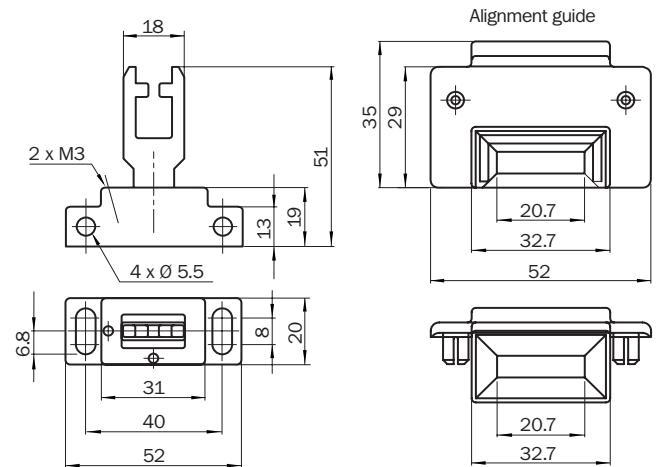
Actuation option	Way of actuation	Minimum door radius	Type	Part number
Straight	Rigid	175 mm	iE17-S1	5 311 130
	Fully flexible	60 mm	iE16-F1	5 311 129
Radius	Semi flexible	60 mm	iE16-F2	5 311 278

iE17-S1



The actuator facilitates movement in the horizontal plane only.

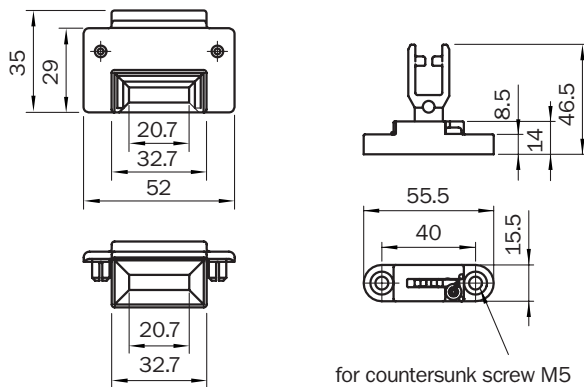
iE16-F1



The actuator facilitates movement in both horizontal and vertical planes.

F

iE16-F2

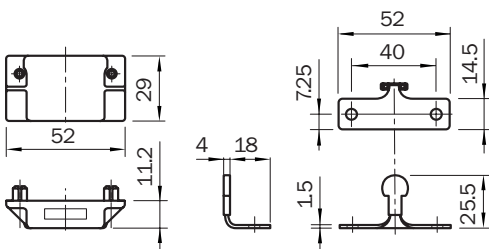


The actuator facilitates movement in the horizontal plane only.

Catch and retainer kit

Type	Part number
iE16-SCR	5 310 780

iE16-SCR



An increase in the locking force by 50 N.
Only in connection with rigid actuators.

Other accessories

Cable gland

Type	Part number
Cable gland M20	5 309 164

Overview of technical specifications

Number of positive action normally closed contacts	3
Number of normally open contacts	1
Type of actuator	Tongue operated
Housing material	Metal
Number of cable entries	1
Size of the cable gland	M20

Product description

- Safety switches with separate coded actuator
- 4-pole contact element
- Self-cleaning head element - elimination of contamination through actuator 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	Part number
3	1	i100-S313	6 022 590

Please order actuator separately



F

- Housing material die-cast light alloy
- Four actuating directions
- Cable gland M20
- Enclosure rating IP 67
- Three-dimensional coded actuator
- Design according to EN 50041

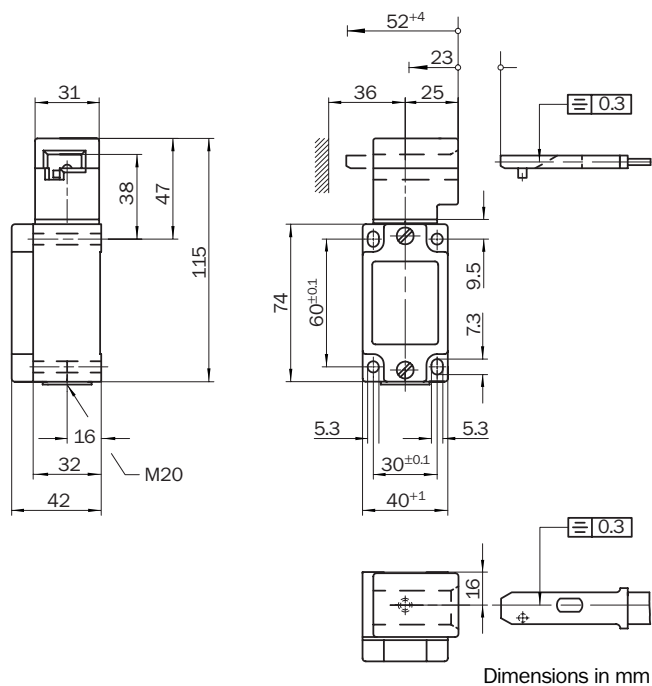


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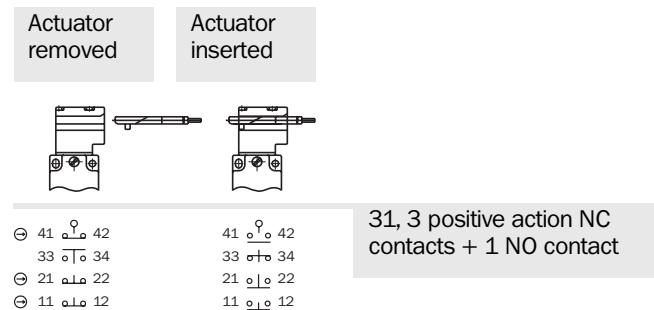
Detailed technical specifications

Housing material	Die-cast light alloy
Surface treatment	Anodized
Enclosure rating	IP 67
Mechanical life (relay contacts)	2 x 10 ⁶ switching cycles
Ambient operating temperature from ... to	-25 °C ... +80 °C
Maximum approach speed	333 mm/s
Actuation force	35 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 voltage	12 V DC
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 mm ²
Short circuit protection	T10/F20
Weight	0.37 kg

Dimensional drawings



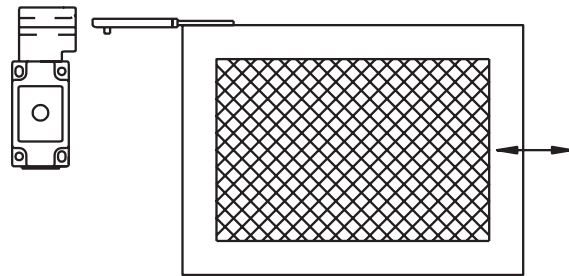
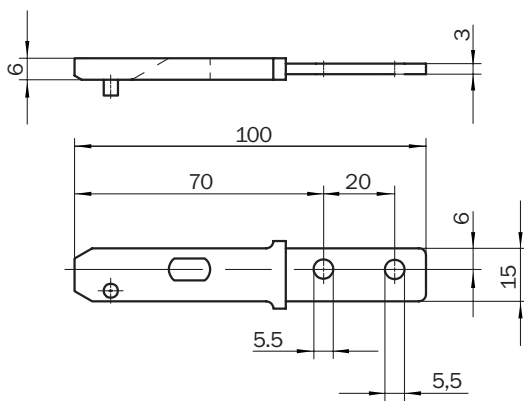
Switching elements



Actuators

Actuation option	Way of actuation	Minimum door radius	Type	Part number
Straight	Rigid	1000 mm	iE100-S1	5 306 497
Radius, door hinged on left	Semi flexible	400 mm	iE100-R1	5 306 498
Radius, door hinged on right	Semi flexible	400 mm	iE100-R2	5 306 499
Radius, safety flap hinged at bottom	Semi flexible	165 mm	iE100-R3	5 306 500
Radius, safety flap hinged at top	Semi flexible	165 mm	iE100-R4	5 306 526

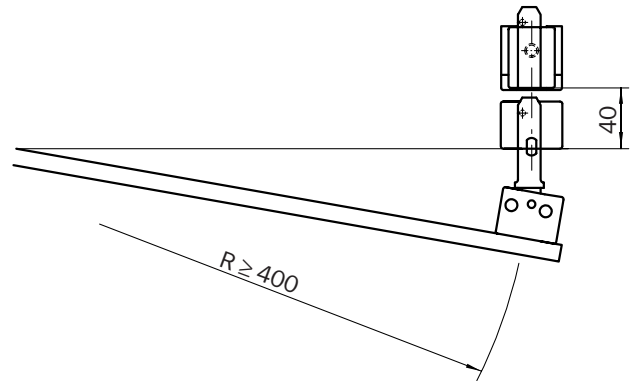
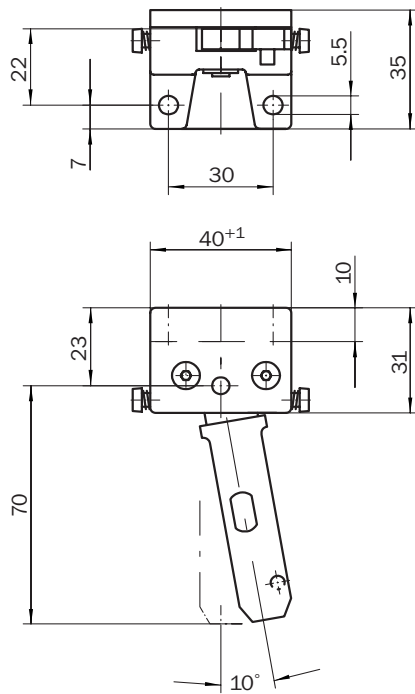
iE100-S1 straight



F

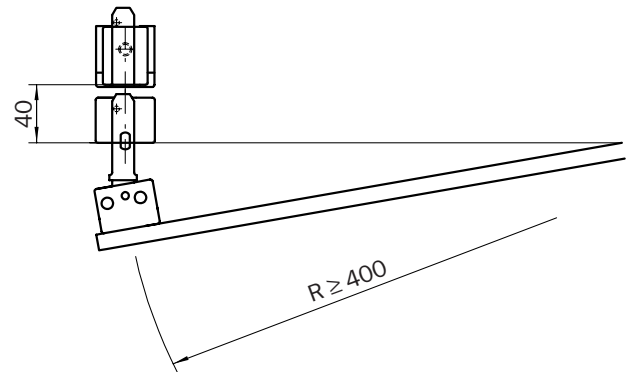
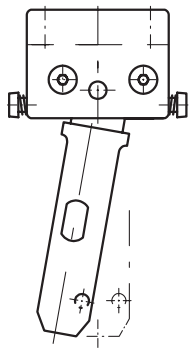
Min. door radius 1000 mm.
With two safety screws for each actuator.

iE100-R1 radius, door hinged on left



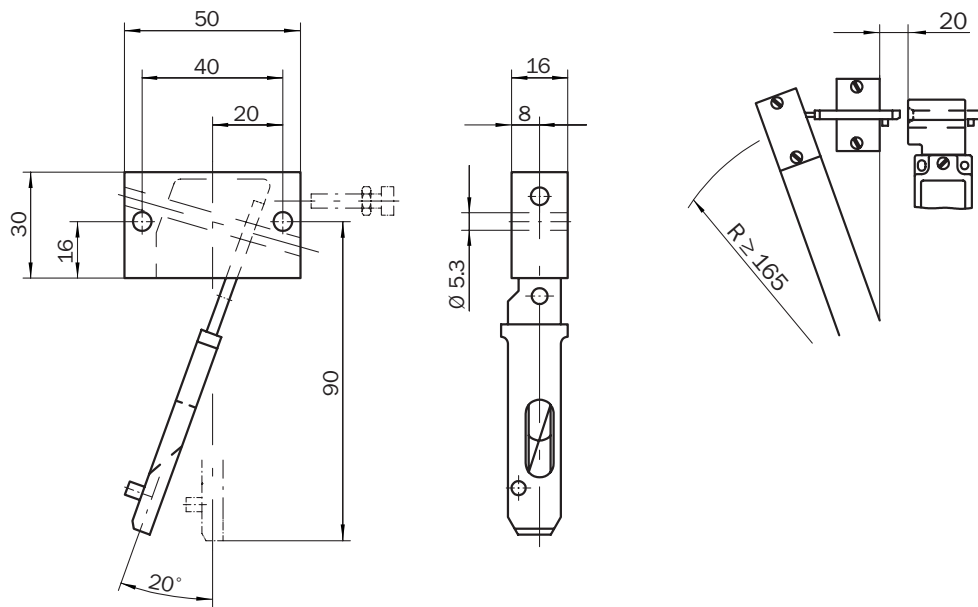
2 safety screws included.
Min. door radius 400 mm.

iE100-R2 radius, door hinged on right



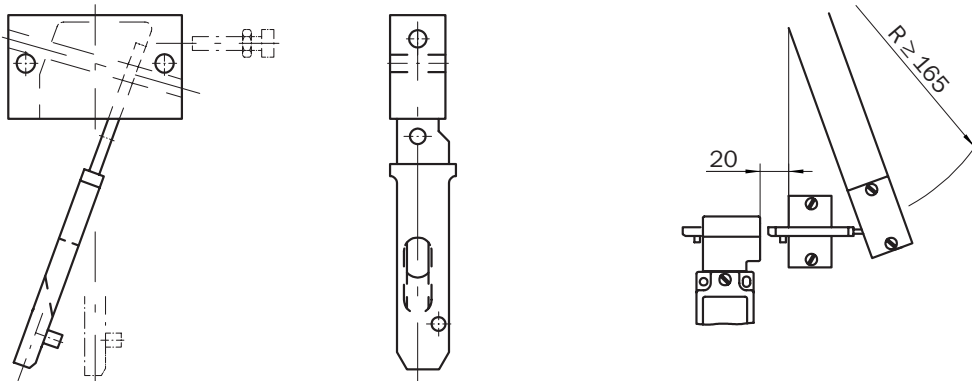
2 safety screws included.
Min. door radius 400 mm.

iE100-R3 radius, safety flap hinged at bottom



2 safety screws included.
Min. door radius 165 mm.

iE100-R4 radius, safety flap hinged at top



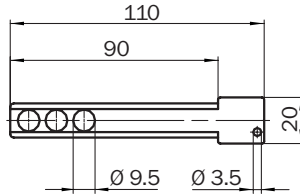
2 safety screws included.
Min. door radius 165 mm.

F

Lockout bar

Type	Part number
iE100-S2	5 306 534

iE100-S2



The lockout bar can be inserted in the safety switch instead of the actuator when the safety guard is in open condition and can then be secured to prevent removal by standard commercially available padlocks (max. 3 pcs.). This guarantees reliable protection for persons who have to enter potentially hazardous areas.

F

Other accessories

Cable gland

Type	Part number
Cable gland M20	5 309 164

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
Type of actuator	Tongue operated
Housing material	Metal
Number of cable entries	1
Size of the cable gland	M20
Locking force	5 N

Product description

- Safety switches with separate coded actuator
- Small door radius (175 mm) possible even with standard actuator
- 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	Type	Part number
2	2	i110-SA223	6 025 074
3	1	i110-SA313	6 025 073

Please order actuator separately



F

- Housing material die-cast zinc
- Five actuating directions
- Cable gland M20
- Enclosure rating IP 67
- Design according to EN 50 041



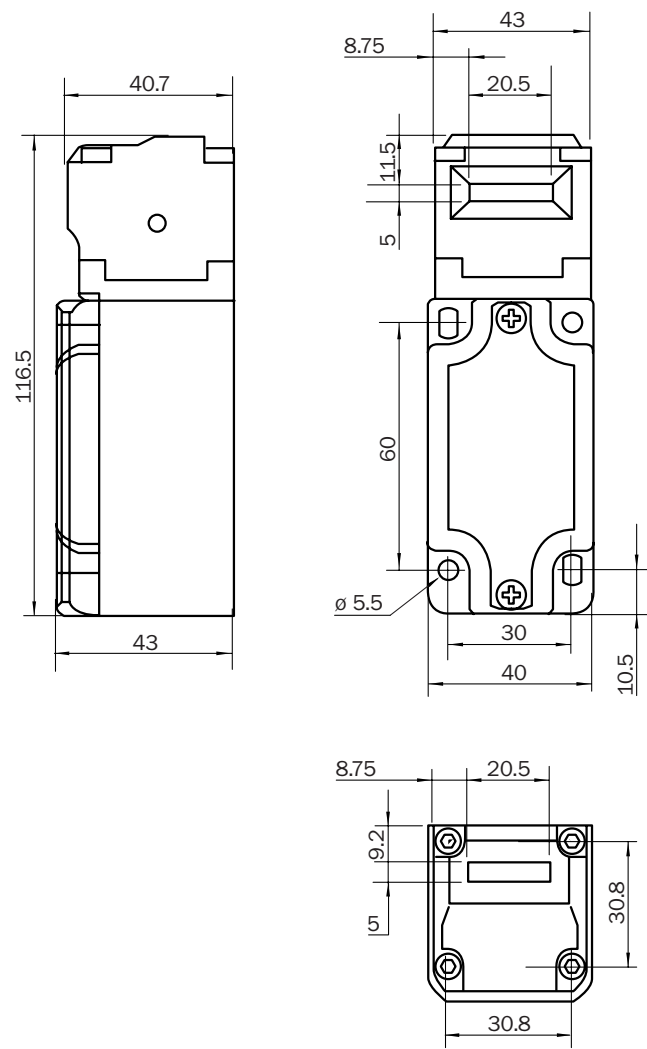
Further information	Page
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Detailed technical specifications

Type	i110-SA223	i110-SA313
Housing material	Zinc die-cast	
Surface treatment	Varnished	
Enclosure rating	IP 67	
Mechanical life (relay contacts)	10 ⁶ switching cycles	
Ambient operating temperature from ... to	−20 °C ... +80 °C	
Maximum approach speed	100 mm/s	
Actuation force	12 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), 0.5 A (250 V DC), 2 A (24 V DC)	
Rated insulation voltage U _i	500 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)	
Contact material	Silver, nickel	
Connection type	Cable gland	
Maximum connection cable cross-section	1.5 mm ²	
Short circuit protection	T10/F10	
Weight	0.34 kg	

F

Dimensional drawings



Dimensions in mm

Switching elements

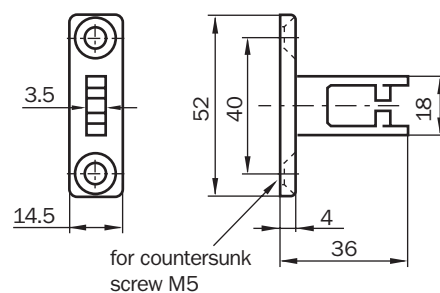
Actuator inserted	Actuator removed		
		31	31, 3 positive action NC contacts + 1 NO
43 5-6 44 33 1-2 34 21 1-2 22 11 1-2 12	43 5-6 44 33 1-2 34 21 1-2 22 11 1-2 12		
		22	22, 2 positive action NC contacts + 2 NO
43 5-6 44 33 1-2 34 21 1-2 22 11 1-2 12	43 5-6 44 33 1-2 34 21 1-2 22 11 1-2 12		

F

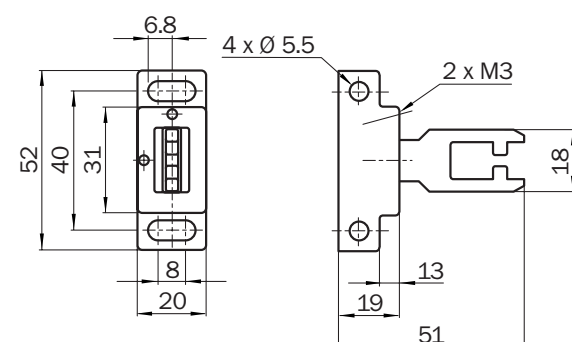
Actuators

Actuation option	Way of actuation	Minimum door radius	Type	Part number
Straight	Rigid	175 mm	iE110-S1	5 311 134
	Fully flexible	60 mm	iE110-F1	5 311 135

iE110-S1



iE110-F1



Other accessories

Cable gland

Type	Part number
Cable gland M20	5 309 164

F

Overview of technical specifications

Number of positive action normally closed contacts	2
Number of normally open contacts	1
Type of actuator	Handle operated
Housing material	Metal
Number of cable entries	1
Size of the cable gland	PG13.5

Product description

- Safety switch with separate handle-operated actuator
- 3-pole contact element
- 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	Supply voltage	Type	Part number
2	1	24 V DC	i1001-24	6 021 016

Actuator supplied with delivery



- Housing material powder-coated die-cast zinc
- Cable gland PG13.5
- Four actuating directions
- Enclosure rating IP 67
- LED function indicator
- Handle-operated actuator

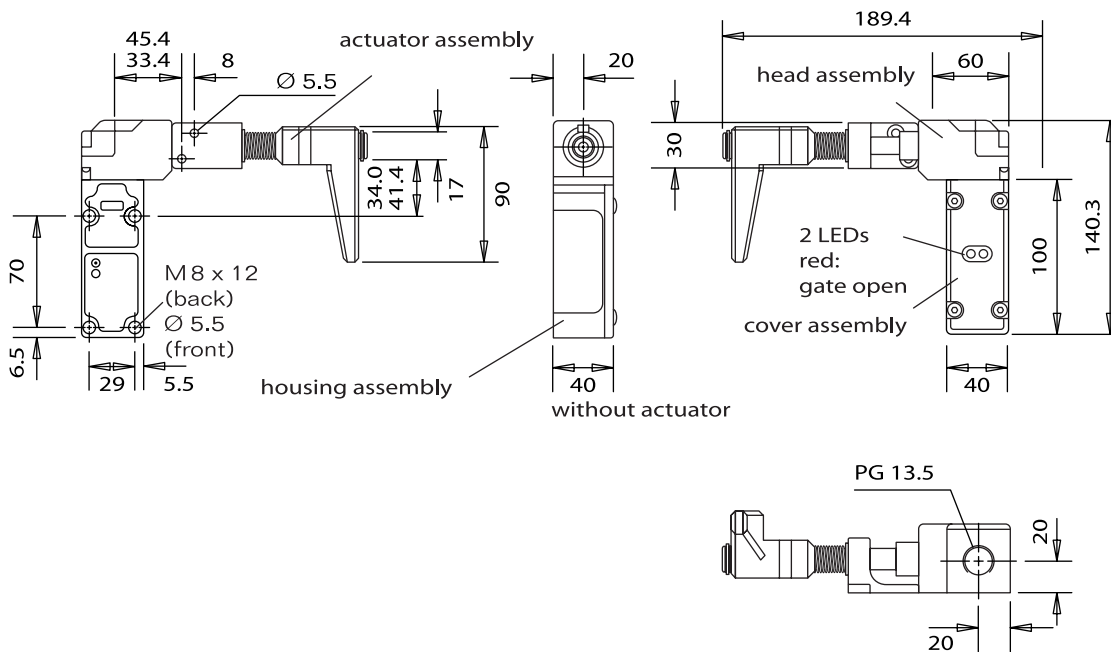


Further information	Page
→ Technical specifications	F-36
→ Dimensional drawings	F-36
→ Internal circuitry	F-37
→ Trapped key systems	F-37
→ Actuator	F-39
→ Lockout bar	F-39
→ Other accessories	F-40
→ Services	A-0

Detailed technical specifications

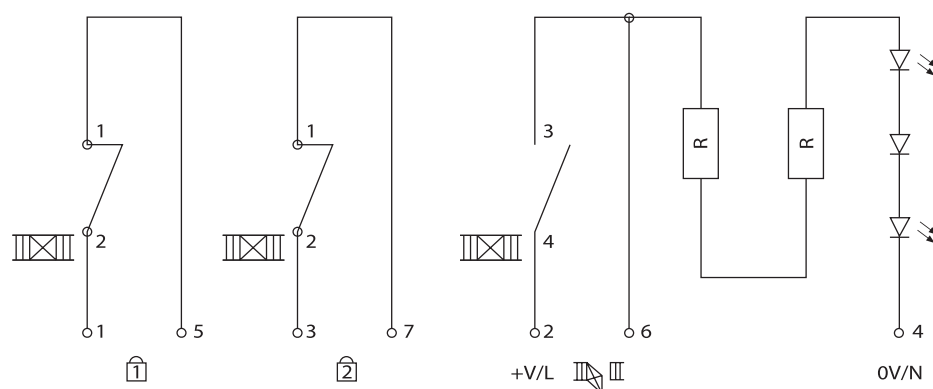
Housing material	Zinc alloy and stainless steel
Surface treatment	Varnished
Enclosure rating	IP 67
Mechanical life (relay contacts)	10 ⁶ switching cycles
Ambient operating temperature from ... to	−5 °C ... +40 °C
Maximum approach speed	333 mm/s
Switching principle	Slow-action-switch
Number of positive action normally closed contacts	2
Number of normally open contacts	1
Usage category in compliance with IEC 947-5-1	DC-13
Rated operating current (voltage)	10 A (24 V DC)
Impulse withstand voltage U_{imp}	2500 V AC
Contact material	90 % silver and 10 % nickel
Connection type	Cable gland
Maximum connection cable cross-section	2.5 mm ²
Weight	1.37 kg

Dimensional drawings



Dimensions in mm

Internal circuitry

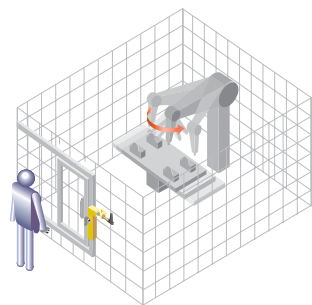


Trapped key systems

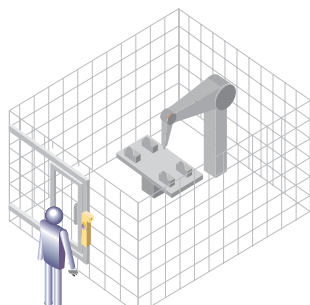
Accessory type	Coding	Delivery	Type	Part number
Access key adapter	1	Key supplied with delivery	iE1000-AK1	5 308 302
	2	Key supplied with delivery	iE1000-AK2	5 308 303
Safety key adapter	1	Key supplied with delivery	iE1000-SK1	5 308 297
	2	Key supplied with delivery	iE1000-SK2	5 308 298
Enabling unit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

Additional types on request

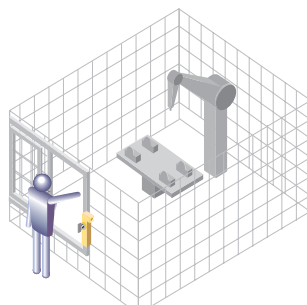
Access key adapter



Plant in action, no key inserted



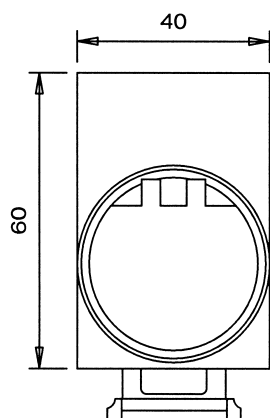
Key is inserted, plant comes to a standstill



Door can now be opened

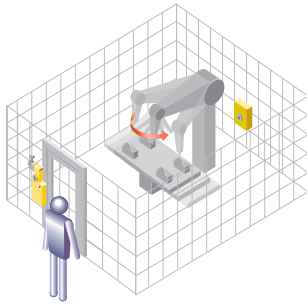
Access function

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

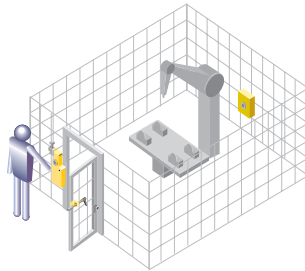


The access key adapter is installed between the head and the housing of the safety switch. If no key present in the adapter, the door is in the closed position. The door can only be opened if the safety key is inserted and turned (enabling access).

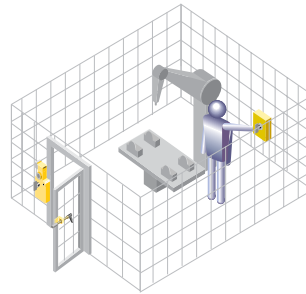
Safety key adapter



Plant in action, door closed, key inserted



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

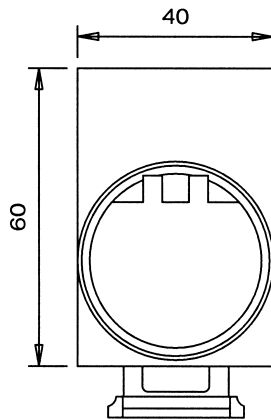


Person enters, key inserted inside, plant runs in enable mode

Enable function

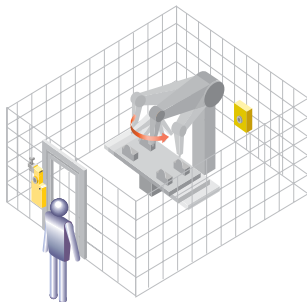
■ Application example

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.

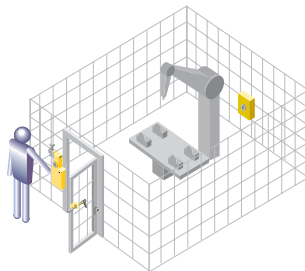


The safety key adapter is installed between the head and the housing of the safety switch. The key is securely held in the unit and the door is kept in the closed position. Only when the safety key is turned and withdrawn access is possible.

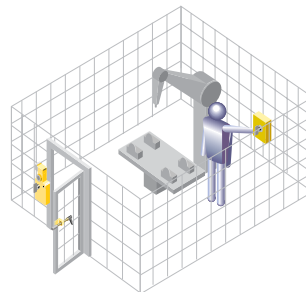
Enabling unit



Plant in action, door closed, key inserted



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

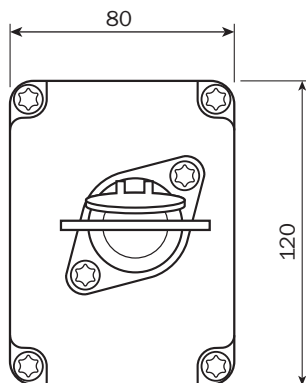


Person enters, key inserted inside, plant runs in enable mode

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.

Actuator

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

iE1001-R1



F

Lockout bar

Type	Part number
iE1002-R1	5 308 313

iE1002-R1



Other accessories

Keys

Prevention of unintentional machine starts	Access function	Enabling function	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

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

F

Overview of technical specifications

Number of positive action normally closed contacts	2
Number of normally open contacts	1
Type of actuator	Tongue operated
Housing material	Metal
Number of cable entries	1
Size of the cable gland	PG13.5

Product description

- Safety switch with remote multi-coded actuator
- 3-pole contact element
- 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 contacts	Supply voltage	Type	Part number
2	1	24 V DC	i1002-24	6 021 010

Actuator supplied with delivery



F

- Housing material powder-coated die-cast zinc
- Four actuating directions
- Cable gland PG13.5
- Enclosure rating IP 67
- LED function indicator
- Separate actuator

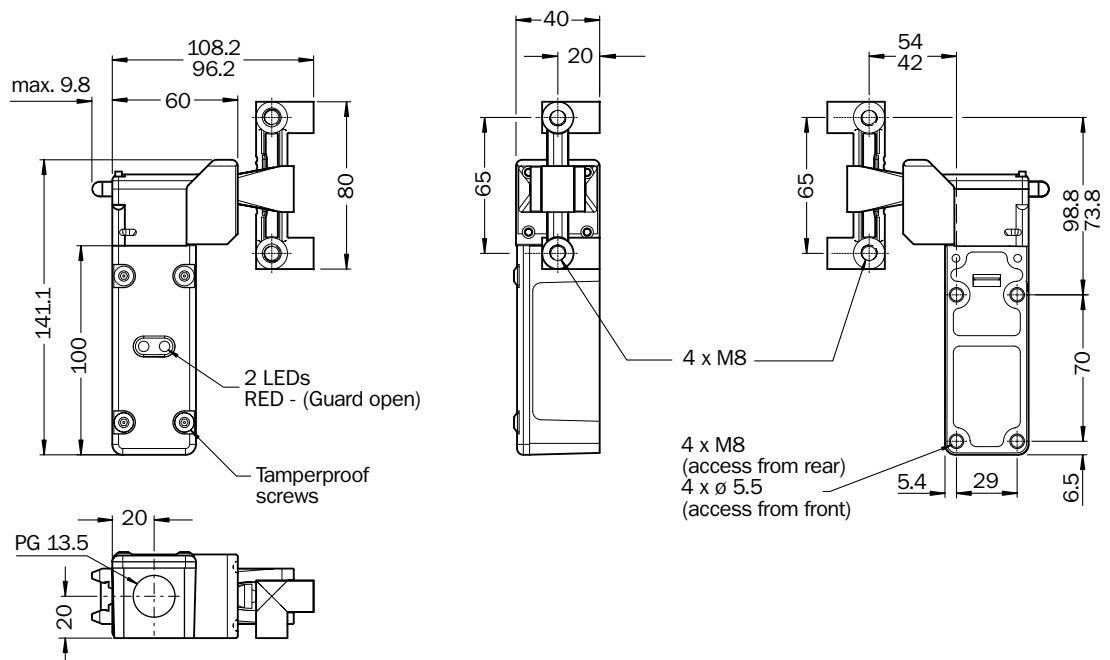


Further information	Page
→ Technical specifications	F-42
→ Dimensional drawings	F-42
→ Internal circuitry	F-43
→ Trapped key systems	F-43
→ Actuator	F-45
→ Lockout bar	F-46
→ Other accessories	F-47
→ Services	A-0

Detailed technical specifications

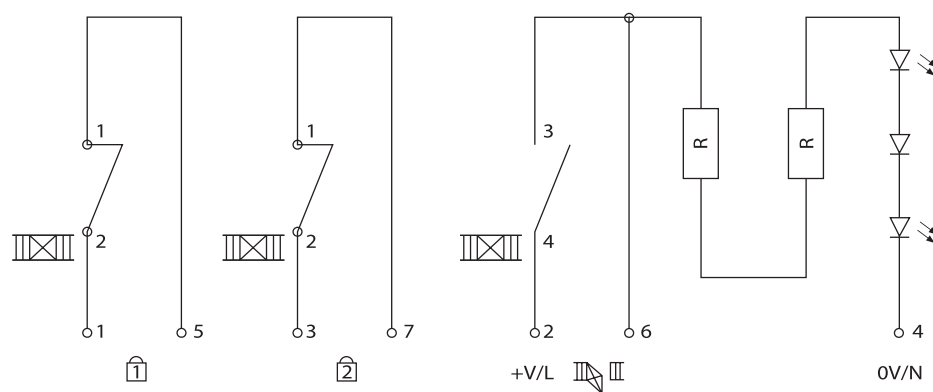
Housing material	Zinc alloy and stainless steel
Surface treatment	Varnished
Enclosure rating	IP 67
Mechanical life (relay contacts)	10 ⁶ switching cycles
Ambient operating temperature from ... to	–5 °C ... +40 °C
Maximum approach speed	333 mm/s
Actuation force	5 N
Switching principle	Slow-action-switch
Number of positive action normally closed contacts	2
Number of normally open contacts	1
Usage category in compliance with IEC 947-5-1	DC-13
Rated operating current (voltage)	10 A (24 V DC)
Impulse withstand voltage U_{imp}	2500 V AC
Contact material	90 % silver and 10 % nickel
Connection type	Cable gland
Maximum connection cable cross-section	2.5 mm ²
Weight	1.11 kg

Dimensional drawings



Dimensions in mm

Internal circuitry



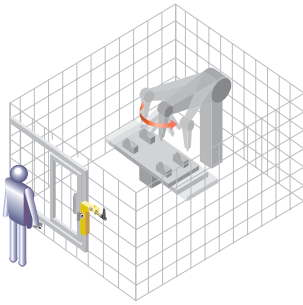
Trapped key systems

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

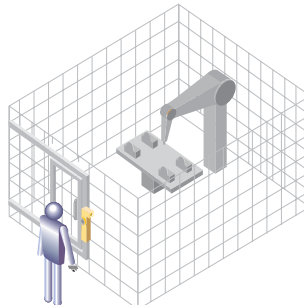
Additional types on request

F

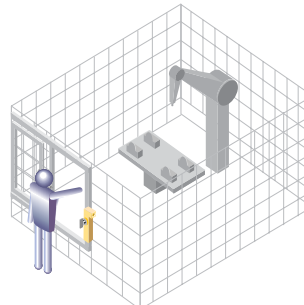
Access key adapter



Plant in action, no key inserted



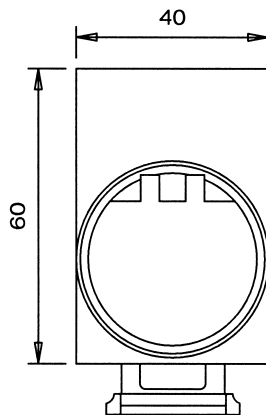
Key is inserted, plant comes to a standstill



Door can now be opened

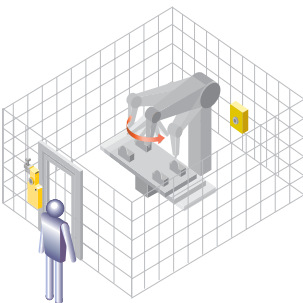
Access function

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

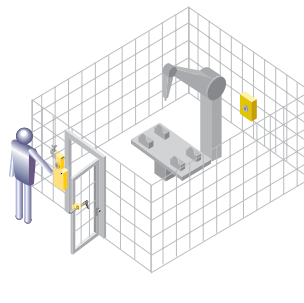


The access key adapter is installed between the head and the housing of the safety switch. If no key present in the adapter, the door is in the closed position. The door can only be opened if the safety key is inserted and turned (enabling access).

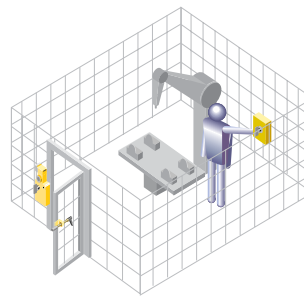
Safety key adapter



Plant in action, door closed, key inserted



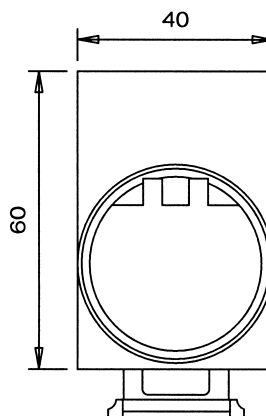
Key is removed, plant comes to standstill, door can be opened



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

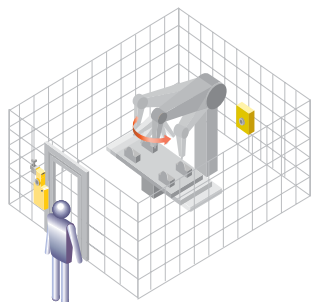
Enable function

■ 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.

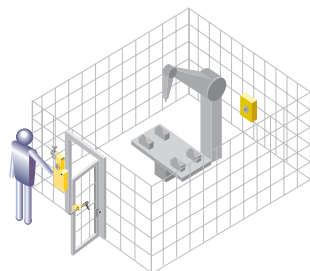


The safety key adapter is installed between the head and the housing of the safety switch. The key is securely held in the unit and the door is kept in the closed position. Only when the safety key is turned and withdrawn access is possible.

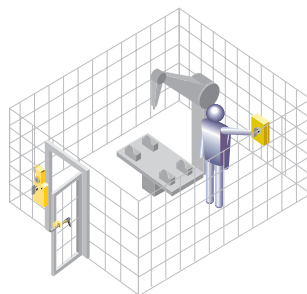
Enabling unit



Plant in action, door closed, key inserted



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



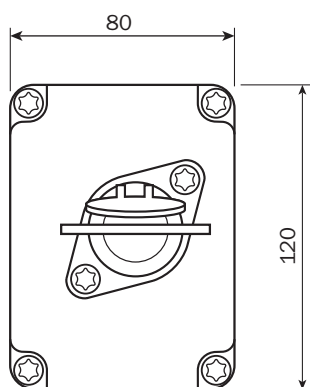
Person enters, key inserted inside, plant runs in enable mode

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.



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



F

Other accessories

Keys

Prevention of unintentional machine starts	Access function	Enabling function	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

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

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.

Door signalling contact

The three possible states of a safety locking device are "Door locked and closed", "Door unlocked and closed" and "Door unlocked and open". Depending on the version, there is a contact element for the third state, which is activated when the door is opened. Both positive action normally closed contact/normally open contact combinations and normally closed contacts without positive action, are used as door signalling contacts.

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.

Locking force

The locking force gives the maximum force which can act on the locking mechanism. Depending on the type, the maximum locking force is only achieved by using additional fixing screws that are included in the supply (e.g. i200-Lock).

Locking type

Safety locking devices are equipped either with a mechanical or electric locking device.

For the mechanical locking device, the locking is activated after inserting the actuator. It can be released by applying the voltage to the locking magnet.

For the electric locking device, the voltage must be applied to the locking magnet after inserting the actuating element in order to activate the locking.

Type of actuator

The majority of safety switches have appropriately coded tongue-operated actuators that prevent simple manipulation of the switch.

The i1000 series has an additional handle-operated actuator with coded spindle. It is not actuated by applying a force but by applying a torque.


Mechanical unlocking mechanism

The locking device can be unlocked, e.g. on a power failure, using the mechanical unlocking mechanism.

Safety locking devices



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Safety application	Number of positive action normally closed contacts/ normally open contacts ¹⁾	Housing material ¹⁾	Type of actuator ¹⁾	Door signalling contacts ¹⁾	Number x size of cable gland	Locking force ¹⁾	Locking type ¹⁾ mechanical (m)/electrical (e)	Product	Page
	2 / 1	Plastic	Tongue operated	✓	3 x M20	1200 N	m / e	i10 Lock	G-2
	2 / 1 3 / 0	Plastic	Tongue operated	—	1 x M20	1200 N	m	i14 Lock	G-8
	4 / 1 3 / 2	Plastic	Tongue operated	✓	3 x M20	2000 N	m / e	i200 Lock	G-12
	4 / 2	Metal	Handle operated	✓	1 x PG13.5	2500 N	m	i1001 Lock	G-16
	4 / 2	Metal	Tongue operated	✓	1 x PG13.5	2500 N	m	i1002 Lock	G-22

¹⁾ Explanation see page G-0



- Housing material glass-fibre reinforced thermoplastic
- Locking force 1200 N
- Five actuating directions
- Cable gland 3 x M20
- Enclosure rating IP 67
- Mechanical unlocking mechanism



Overview of technical specifications

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

Product description

- Safety switches with separate coded actuator and guard locking
- 4-pole contact element
- Small design - ideal for direct mounting on framework
- Various actuator versions 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

Further information	Page
→ Dimensional drawings	G-4
→ Switching elements	G-4
→ Actuators	G-4
→ Lockout bar	G-6
→ Locks	G-7
→ Other accessories	G-7
→ Services	A-0

Positive action normally closed	Normally open	Door monitoring			Solenoid operating voltage	Locking type	Type	Part number
		Positive action normally closed	Normally open	Normally closed				
2	1	0	0	1	24 V DC	Electrical	i10-E0233 Lock	6 022 585
					230 V AC	Electrical	i10-E2233 Lock	6 022 586
					24 V DC	Mechanical	i10-M0233 Lock	6 022 580
	0	0	1	1	24 V DC	Mechanical	i10-M0253 Lock	6 027 397
					230 V AC	Mechanical	i10-M2233 Lock	6 022 582

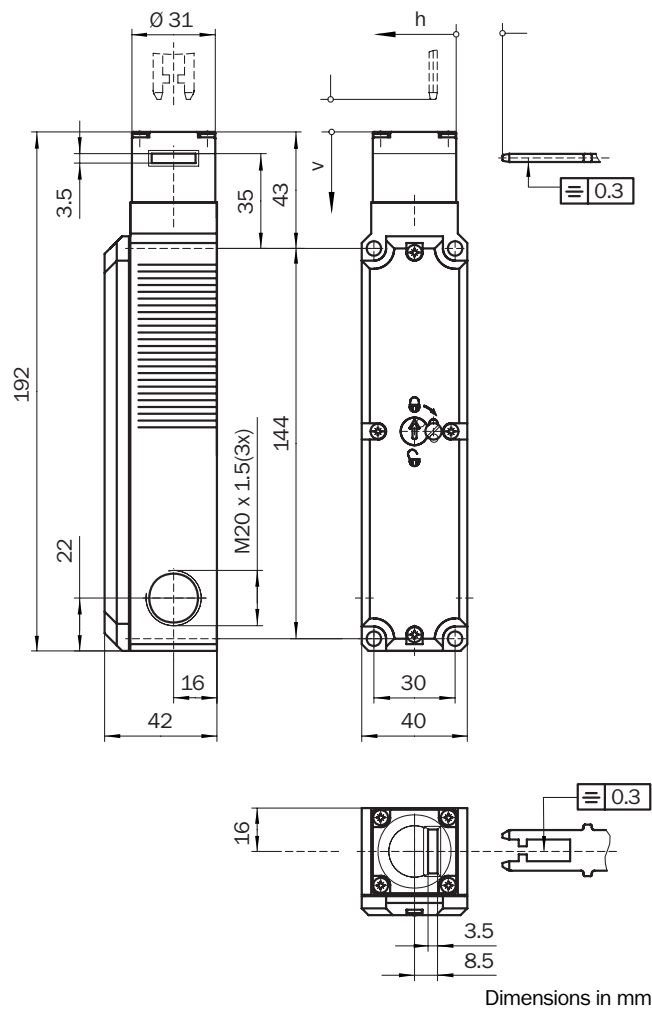
Please order actuator separately

Detailed technical specifications

Type	i10-E0233 Lock		i10-E2233 Lock	i10-M0233 Lock	i10-M0253 Lock	i10-M2233 Lock
Housing material	Glass-fibre reinforced thermoplastic					
Enclosure rating	IP 67					
Mechanical life (relay contacts)	10 ⁶ switching cycles					
Ambient operating temperature from ... to	−20 °C ... +55 °C					
Maximum approach speed	333 mm/s					
Locking force	1200 N					
Switching principle	Slow-action-switch					
Number of positive action normally closed contacts	2					
Number of normally open contacts	1	1	1	0	1	
Number of positive action normally closed door monitoring contacts	0					
Number of normally open door monitoring contacts	0	0	0	1	0	
Number of normally closed door monitoring contacts	1					
Usage category in compliance with IEC 947-5-1	AC-15/DC-13					
Rated operating current (voltage)	6 mA (230 V AC), 6 mA (24 V DC)					
Rated insulation voltage U _i	250 V					
Impulse withstand voltage U _{imp}	2500 V					
Minimum switching voltage	12 V DC					
Minimum switching current (switching voltage)	10 mA (24 V DC)					
Solenoid operating voltage	24 V (20.4 V ... 26.4 V) DC	230 V (195.5 V ... 253 V) AC		24 V (20.4 V ... 26.4 V) DC		230 V (195.5 V ... 253 V) AC
Duty cycle	100 %					
Contact material	Silver alloy, gold flashed					
Connection type	Cable gland					
Maximum connection cable cross-section	1.5 mm²					
Short circuit protection	6A gG					
Weight	0.46 kg					



Dimensional drawings



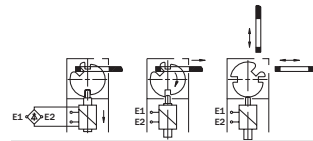
Switching elements

Actuator inserted

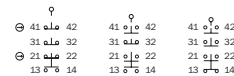
Actuator removed

locked

unlocked



23, 2 positive action NC contacts + 1 NO contact + 1 NC as door contact

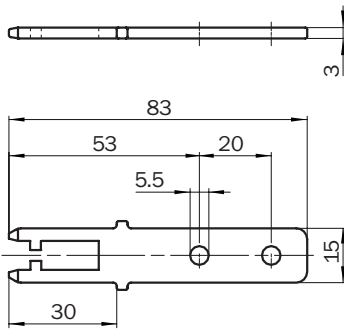


25, 2 positive action NC contacts + 1 NO contact as door contact + 1 NC as door contact

Actuators

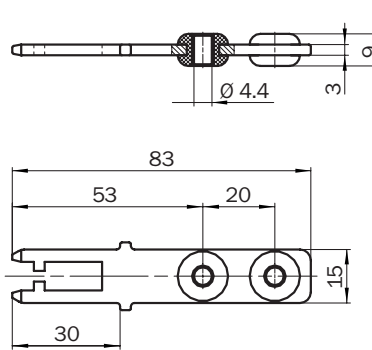
Actuation option	Way of actuation	Minimum door radius	Type	Part number
Straight	Rigid	1000 mm	iE10-S1	5 306 527
	Rubber-mounted	1000 mm	iE10-S2	5 306 530
Angled	Rigid	1000 mm	iE10-A1	5 306 535
Radius	Semi flexible	90 mm	iE10-R1	5 306 528
		100 mm	iE10-R2	5 306 529

iE10-S1



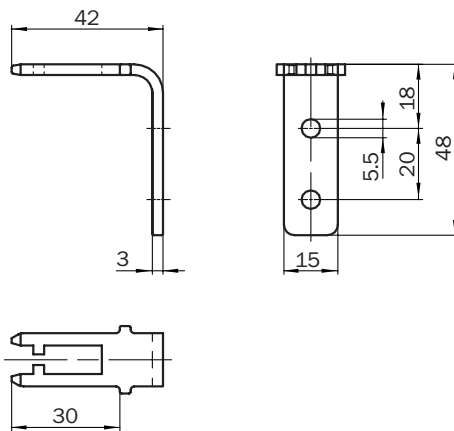
2 safety screws included.
Min. door radius 1000 mm.

iE10-S2



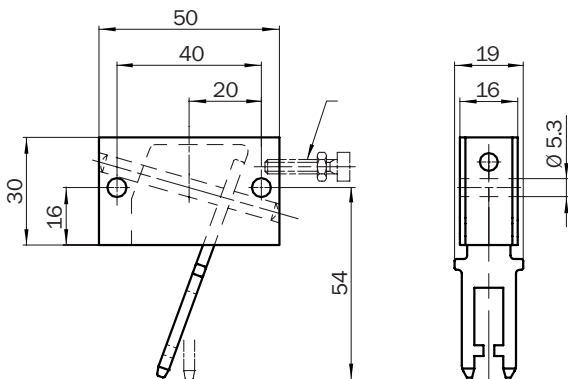
2 safety screws included.
Min. door radius 1000 mm.

iE10-A1

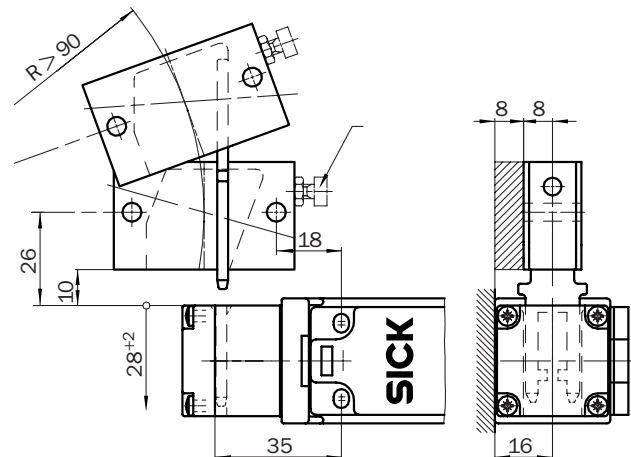


2 safety screws included.
Min. door radius 1000 mm.

iE10-R1

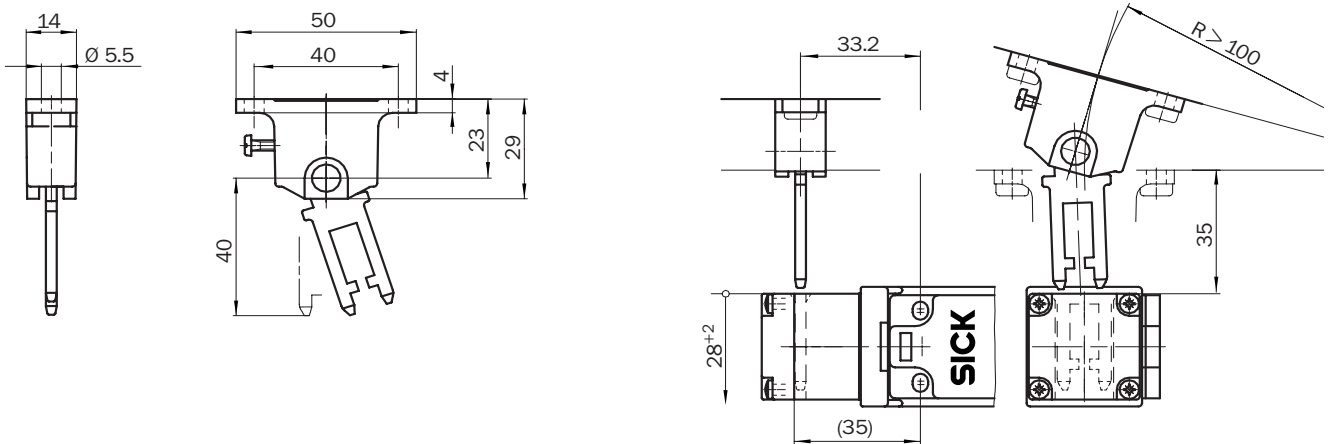


2 safety screws included.
Min. door radius 90 mm.



Continued on next page

iE10-R2

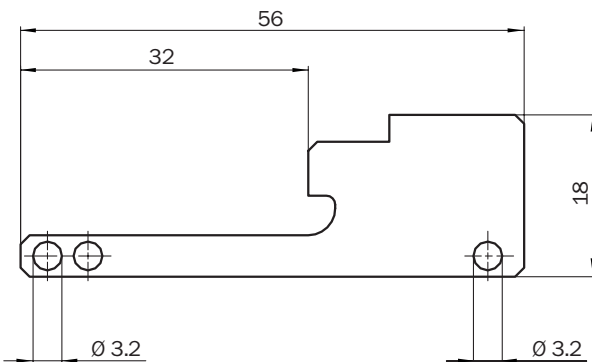


2 safety screws included.
Min. door radius 100 mm.

Lockout bar

Type	Part number
iE10-S3	5 306 536

iE10-S3

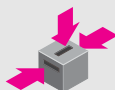


The locking bar can be inserted into the safety switch in place of the actuator when the safety guard is in the open condition and can be secured to prevent its removal by standard commercially available padlocks (max. 2 pcs.). This guarantees reliable protection for persons who have to enter potentially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



G

- 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



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
- Easy conversion of actuating direction through rotatable head
- 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 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			Solenoid operating voltage	Locking type	Type	Part number
		Positive action normally closed	Normally open	Normally closed				
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

Further information Page

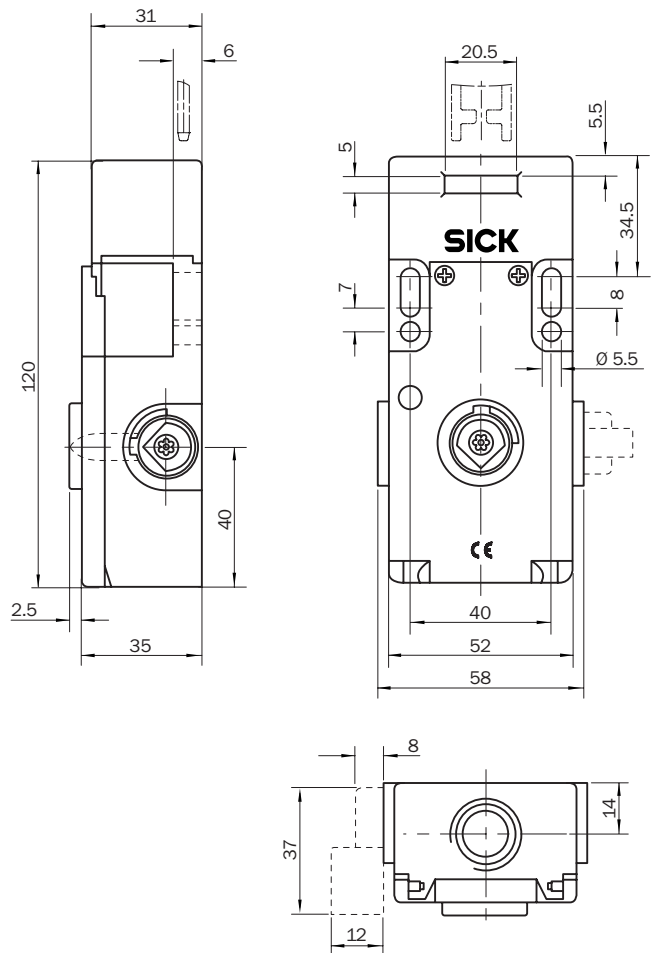
→ Dimensional drawings	G-10
→ Switching elements	G-10
→ Actuator	G-10
→ Other accessories	G-11
→ Services	A-0

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					



Dimensional drawings



Dimensions in mm

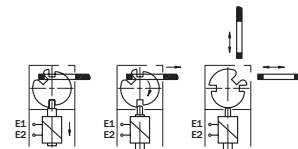
Switching elements

Actuator inserted

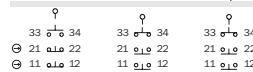
Actuator removed

locked

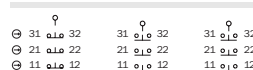
unlocked



21, 2 positive action NC contacts + 1 NO contact



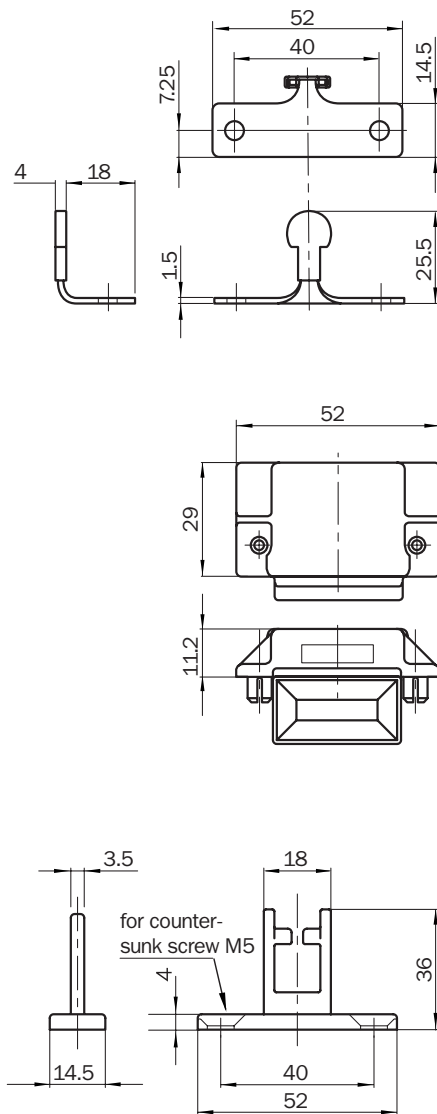
30, 3 positive action NC contacts



Actuators

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

iE14-S1



Other accessories

Key

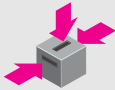
Mechanical unlocking mechanism	Type	Part number
✓	iE14-E01	5 311 282

Cable gland

Type	Part number
Cable gland M20	5 309 164



- 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



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 PROFI-safe or AS-I Safety at Work. → see N-0

Ordering information

Positive action normally closed	Normally open	Door monitoring			Solenoid operating voltage	Locking type	Type	Part number
		Positive action normally closed	Normally open	Normally closed				
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

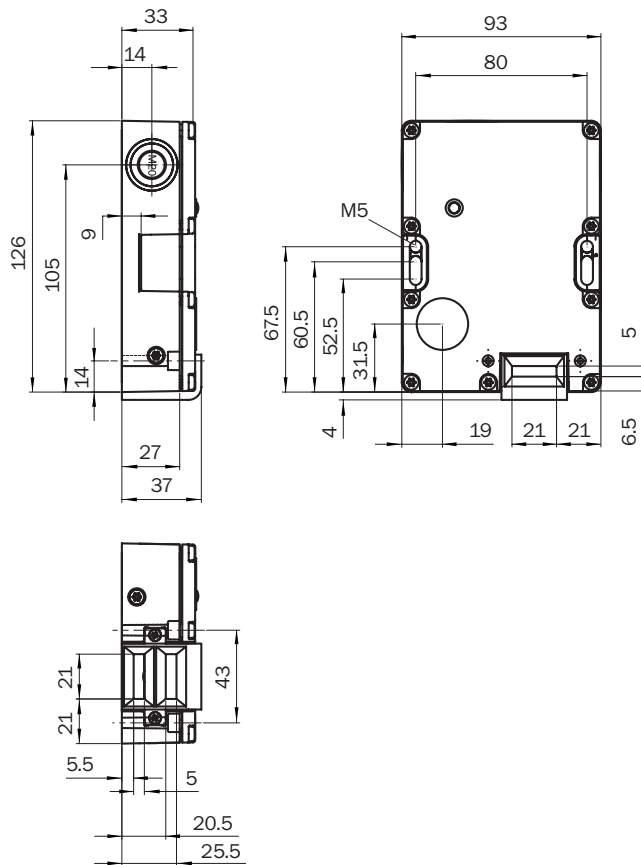
Further information	Page
→ Dimensional drawings	G-14
→ Switching elements	G-14
→ Actuators	G-14
→ Bolt	G-15
→ Other accessories	G-15
→ Services	A-0

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						



Dimensional drawings



Dimensions in mm

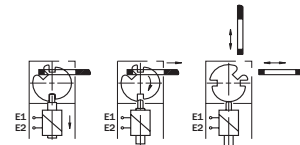
Switching elements

Actuator inserted

Actuator removed

locked

un-locked



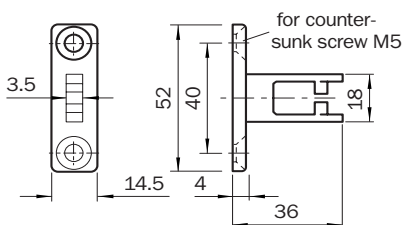
32, 3 positive action NC contacts + 2 NO contacts

41, 4 positive action NC contacts + 1 NO contact

Actuators

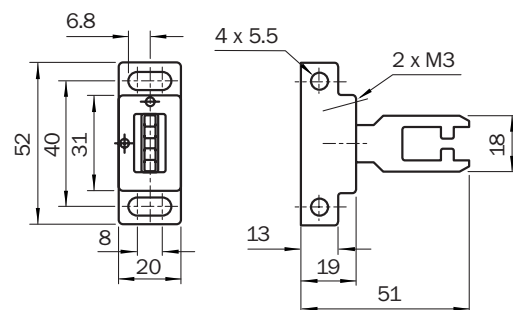
Actuation option	Way of actuation	Minimum door radius	Type	Part number
Straight	Rigid	80 mm	iE200-S1	5 308 758
	Fully flexible	175 mm	iE200-F1	5 308 759

iE200-S1



Min. door radius 175 mm

iE200-F1

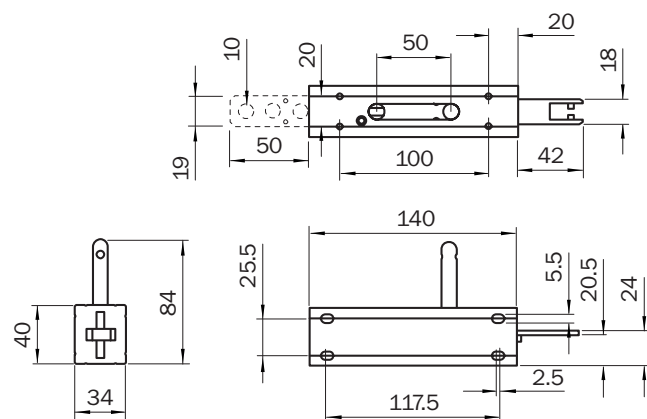


Min. door radius 80 mm

Bolt

Type	Part number
iE200-B1	5 308 760

iE200-B1



Other accessories

Cable gland

Type	Part number
Cable gland M20	5 309 164



- Housing material powder-coated die-cast zinc
- Locking force 2500 N
- Four actuating directions
- Cable gland PG13.5
- LED function indicator
- Handle 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 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			Solenoid operating voltage	Locking type	Type	Part number
		Positive action normally closed	Normally open	Normally closed				
2	1	2	1	0	24 V DC	Mechanical	i1001-24 Lock	6 021 013

Actuator supplied with delivery

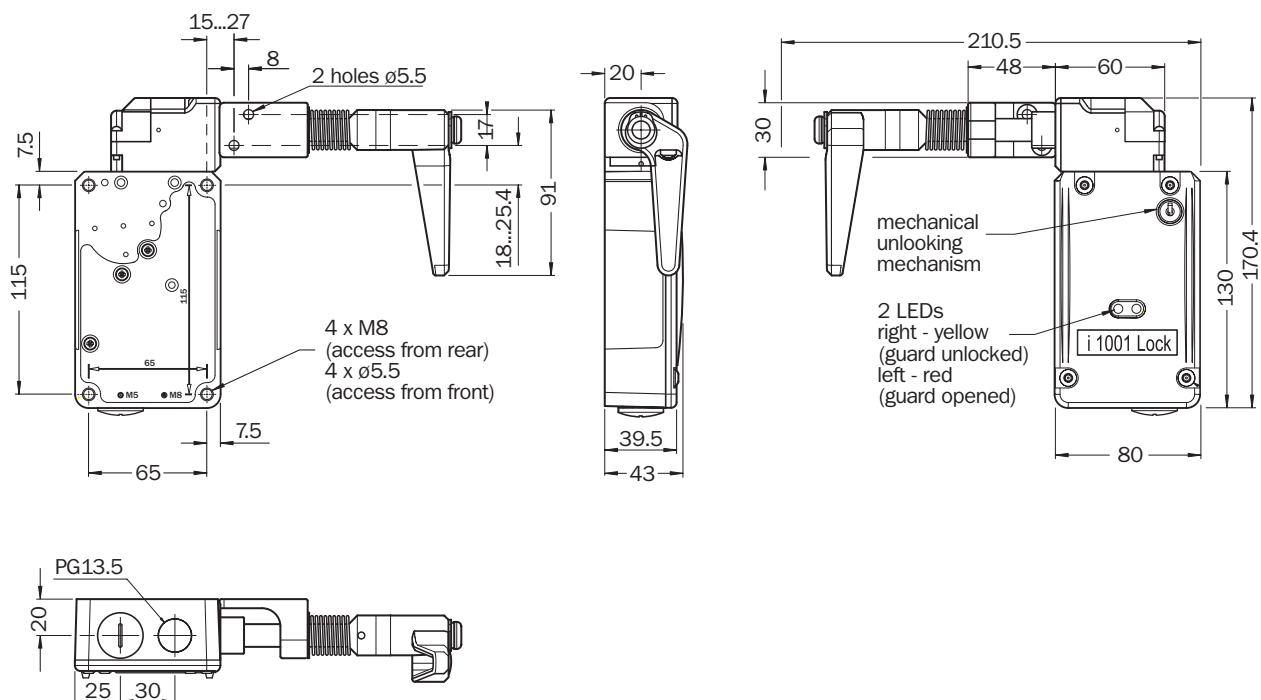
Further information	Page
→ Internal circuitry	G-18
→ Trapped key systems	G-18
→ Actuator	G-20
→ Lockout bar	G-21
→ Other accessories	G-21
→ Services	A-0

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 mm ²
Weight	2.25 kg

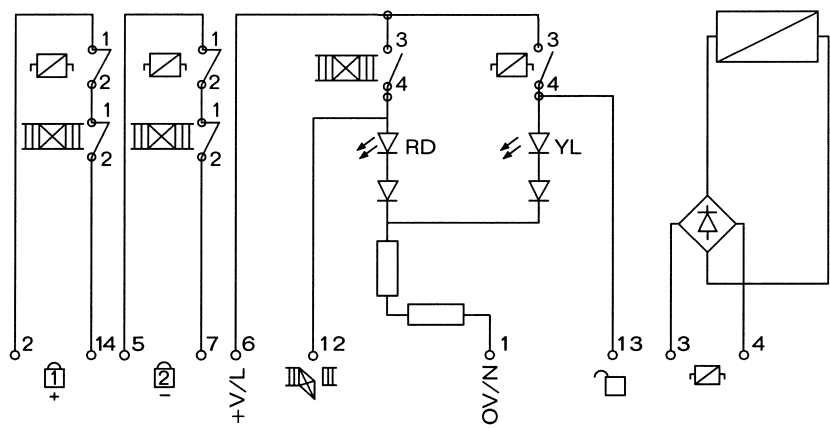
G

Dimensional drawings



Dimensions in mm

Internal circuitry



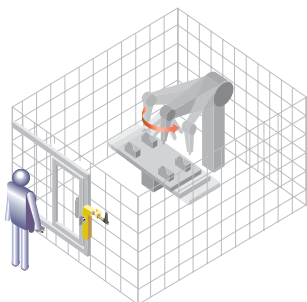
Trapped key systems

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

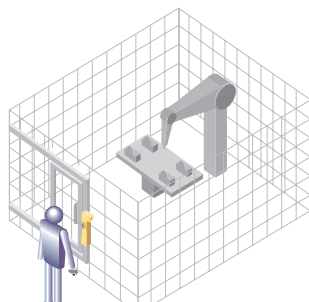
Additional types on request

G

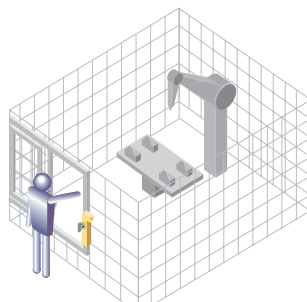
Access key adapter



Plant in action, no key inserted



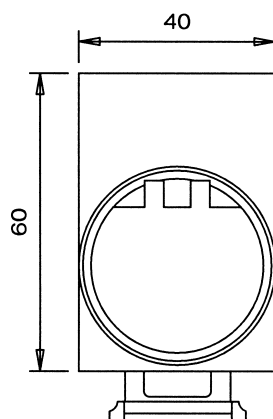
Key is inserted, plant comes to a standstill



Door can now be opened

Access function

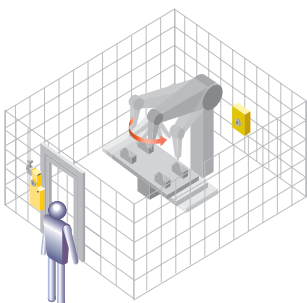
■ Application example
Basic unit + head unit + access key adapter. Only those with an access key can gain access to the machine.



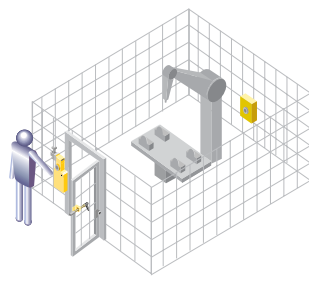
The access key adapter is installed between the head and the housing of the safety switch. If no key is present in the adapter, the door is in the closed position. The door can only be opened if the safety key is inserted and turned (enabling access).

G

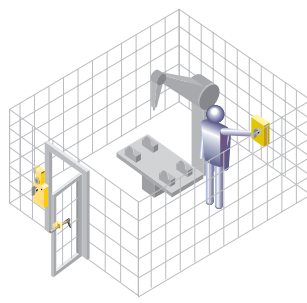
Safety key adapter



Plant in action, door closed, key inserted



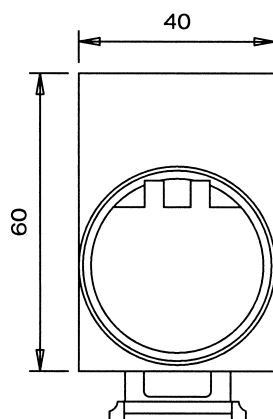
Key is removed, plant comes to standstill, door can be opened



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

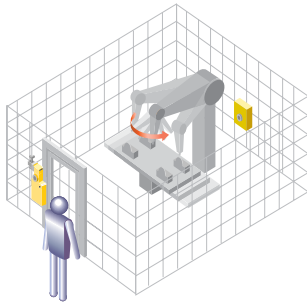
Enable function

■ 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.

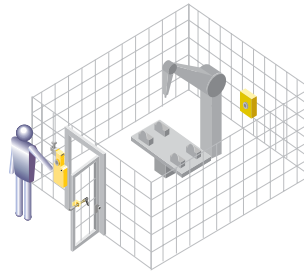


The safety key adapter is installed between the head and the housing of the safety switch. The key is securely held in the unit and the door is kept in the closed position. Only when the safety key is turned and withdrawn access is possible.

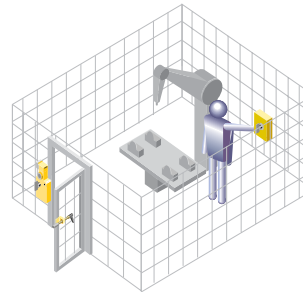
Enabling unit



Plant in action, door closed, key inserted



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



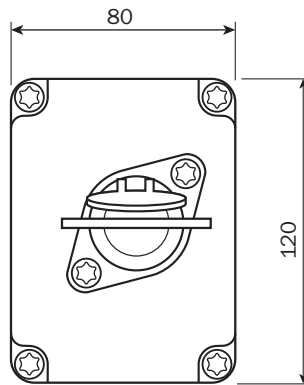
Person enters, key inserted inside, plant runs in enable mode

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.



Actuator

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

iE1001-R1



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



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



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

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 PROFI-safe or AS-I Safety at Work. → see N-0

Ordering information

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

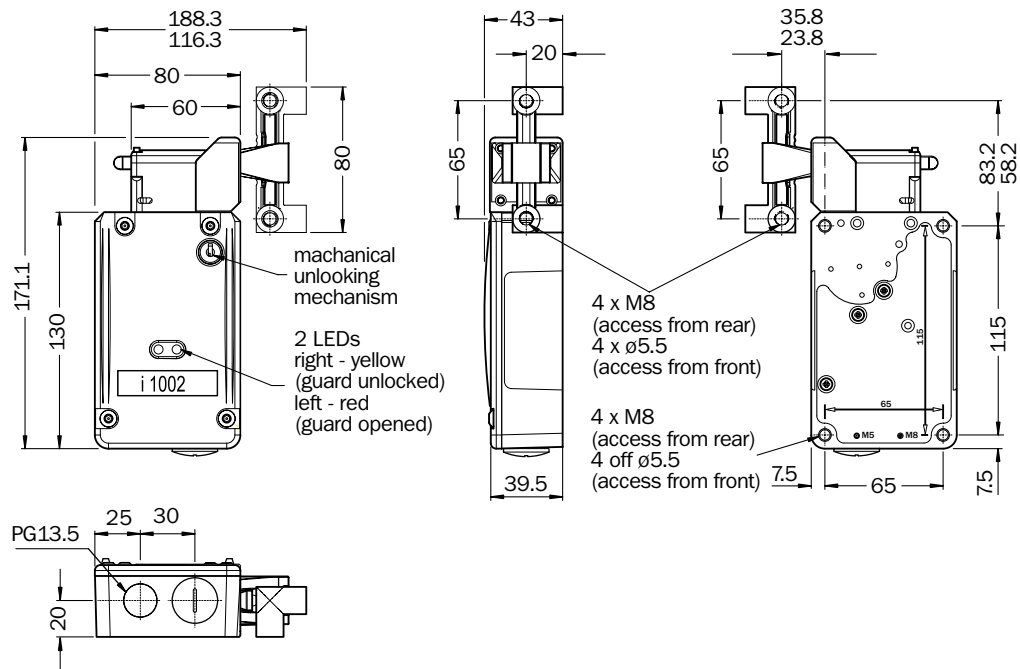
Actuator supplied with delivery

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 mm ²
Weight	1.98 kg

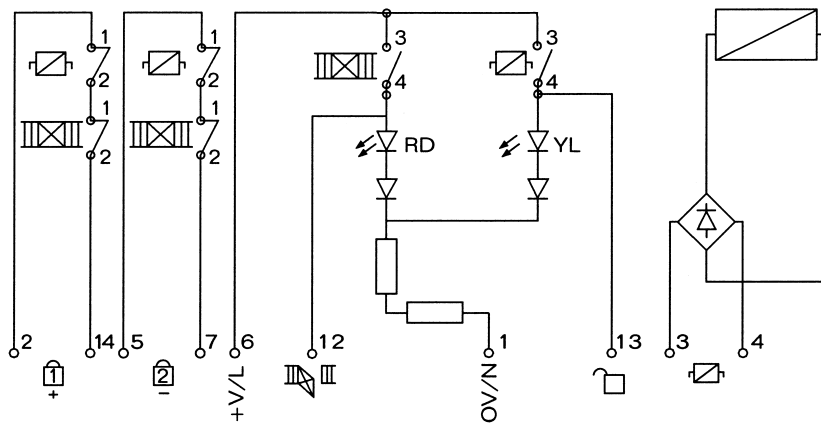


Dimensional drawings



Dimensions in mm

Internal circuitry

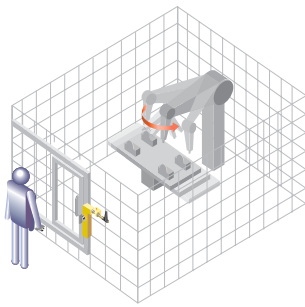


Trapped key systems

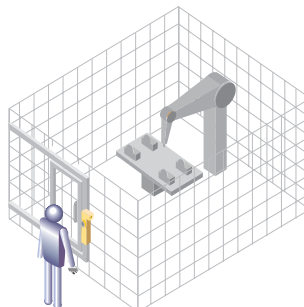
Accessory type	Coding	Delivery	Type	Part number
Access key adapter	1	Key supplied with delivery	iE1000-AK1	5 308 302
	2	Key supplied with delivery	iE1000-AK2	5 308 303
Safety key adapter	1	Key supplied with delivery	iE1000-SK1	5 308 297
	2	Key supplied with delivery	iE1000-SK2	5 308 298
Enabling unit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

Additional types on request

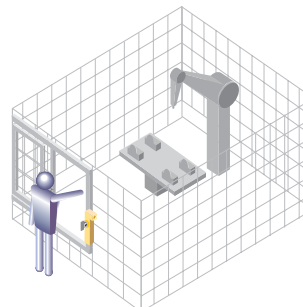
Access key adapter



Plant in action, no key inserted



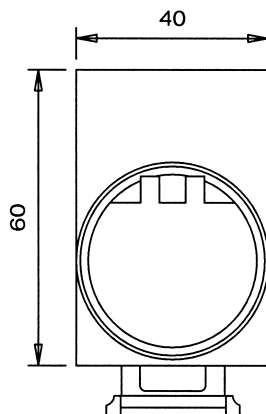
Key is inserted, plant comes to a standstill



Door can now be opened

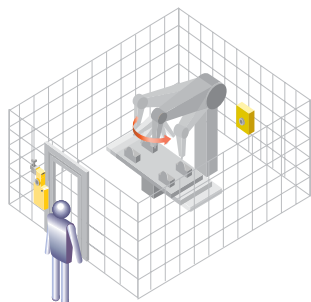
Access function

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

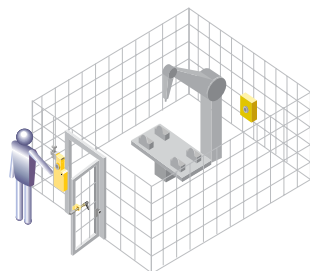


The access key adapter is installed between the head and the housing of the safety switch. If no key present in the adapter, the door is in the closed position. The door can only be opened if the safety key is inserted and turned (enabling access).

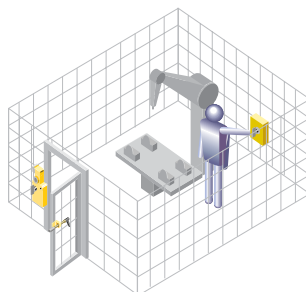
Safety key adapter



Plant in action, door closed, key inserted



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

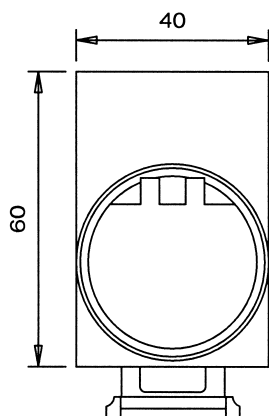


Person enters, key inserted inside, plant runs in enable mode

Enable function

■ Application example

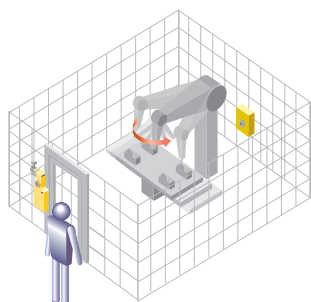
Basic unit + head unit + safety key adapter. In enable mode no person can set the machine in motion from outside. The machine is started from inside with the safety key.



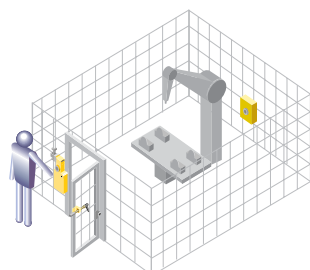
The safety key adapter is installed between the head and the housing of the safety switch. The key is securely held in the unit and the door is kept in the closed position. Only when the safety key is turned and withdrawn access is possible.

G

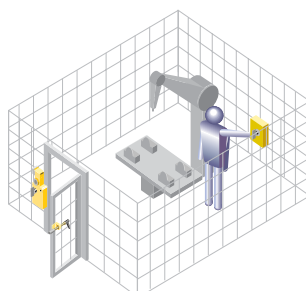
Enabling unit



Plant in action, door closed, key inserted



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

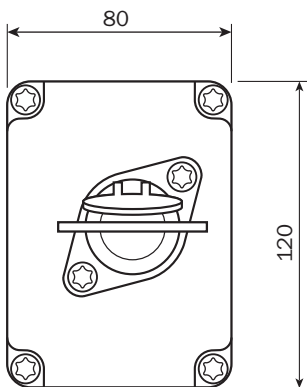


Person enters, key inserted inside, plant runs in enable mode

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.

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



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

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.

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		Slow-action-switch/ snap-action-switch	Roller plunger	IP 66	i110 P	H-11
	2 / 2			Turning lever		i110 R	H-14
	3 / 1						

¹⁾ Explanation see page H-0



- 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 PROFI-safe or AS-I Safety at Work. → see N-0

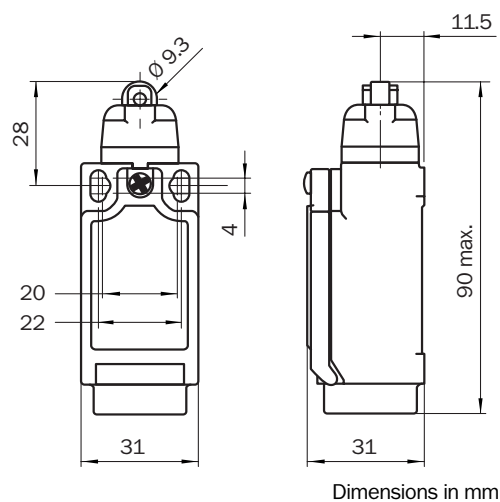
Ordering information

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

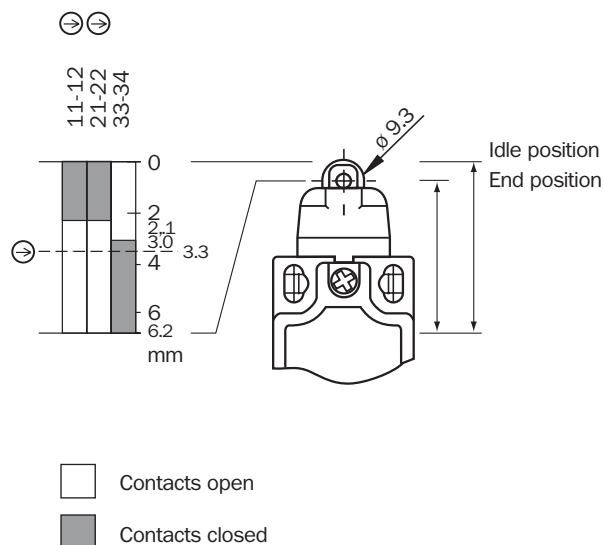
Detailed technical specifications

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 mm ²
Short circuit protection	F15
Weight	0.11 kg

Dimensional drawings



Actuator travel diagram



Accessories

Cable gland

Type	Part number
Cable gland M20	5 309 164



- 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	Turning lever
Housing material	Plastic
Enclosure rating	IP 66

Product description

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

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 PROFI-safe or AS-I Safety at Work.

→ see N-0

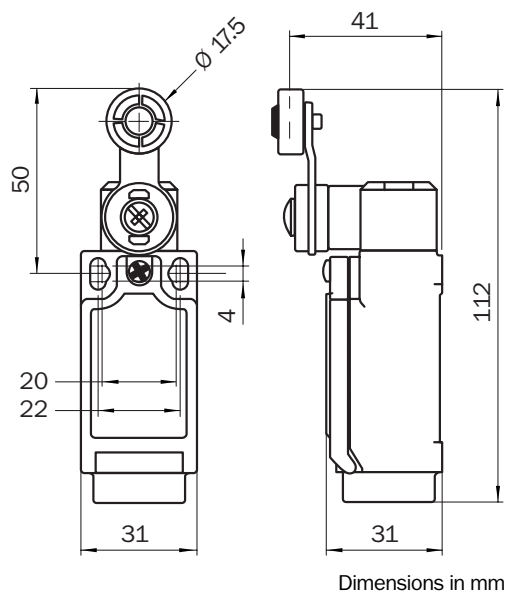
Ordering information

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

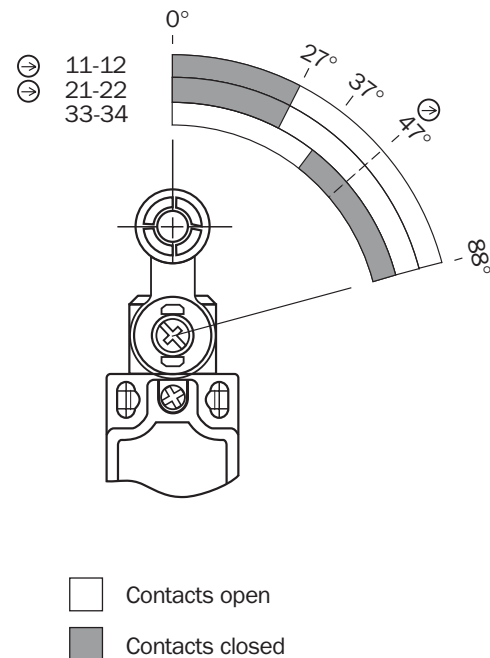
Detailed technical specifications

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 mm ²
Short circuit protection	F15
Weight	0.11 kg

Dimensional drawings



Actuator travel diagram



Accessories

Cable gland

Type	Part number
Cable gland M20	5 309 164



- 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 PROFI-safe 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

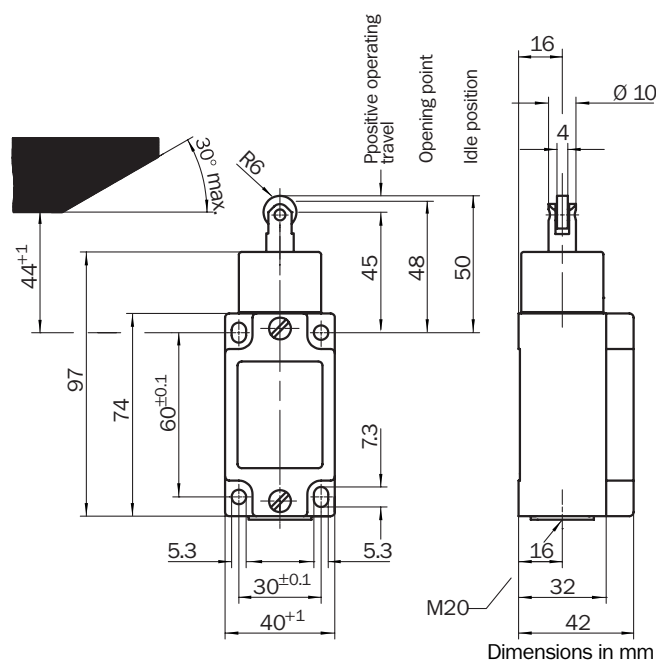
→ Services

A-0

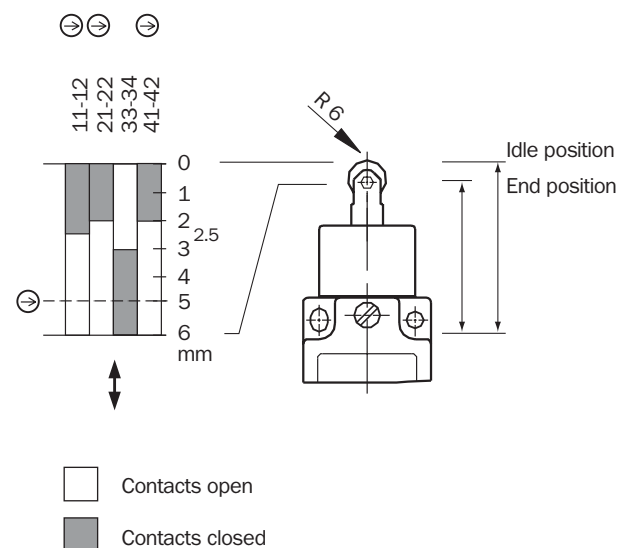
Detailed technical specifications

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 mm ²
Short circuit protection	T10/F20
Weight	0.33 kg

Dimensional drawings



Actuator travel diagram



Accessories

Cable gland

Type	Part number
Cable gland M20	5 309 164



- 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



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

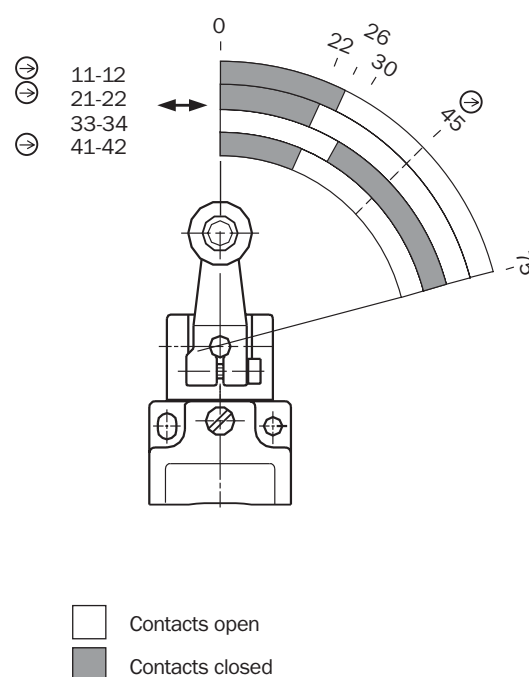
Positive action normally closed	Normally open	Switching principle	Type	Part number
3	1	Slow-action-switch	i100-R313	6 022 588

Further information Page

→ Accessories	H-10
→ Services	A-0

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

Actuator travel diagram



Accessories

Cable gland

Type	Part number
Cable gland M20	5 309 164

H

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

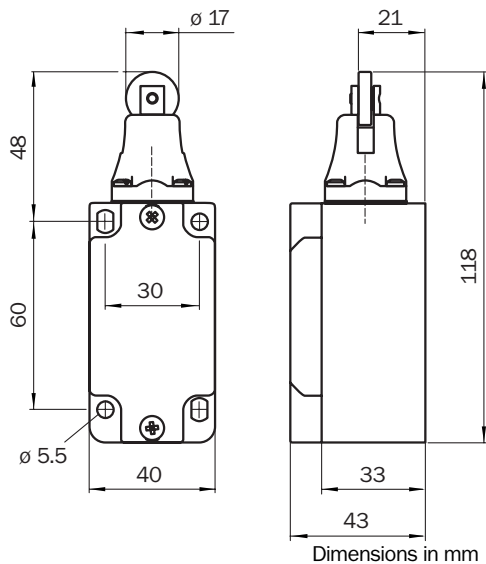


Further information	Page
→ Technical specifications	H-12
→ Dimensional drawings	H-12
→ Actuator travel diagrams	H-13
→ Accessories	H-13
→ Services	A-0

Detailed technical specifications

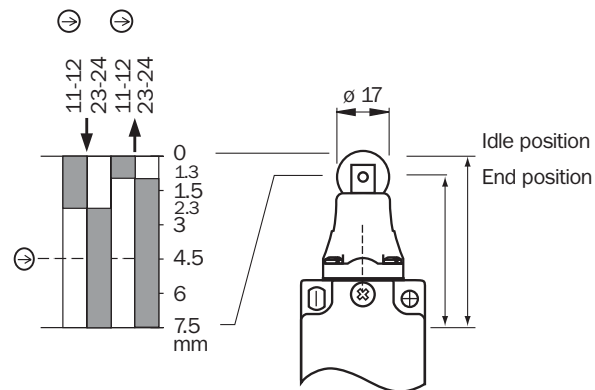
Type	i110-PA123	i110-PA223	i110-PA313
Housing material	Zinc die-cast		
Surface treatment	Varnished		
Enclosure rating	IP 66		
Mechanical life (relay contacts)	10 x 10 ⁶ switching cycles		
Ambient operating temperature from ... to	-25 °C ... +80 °C		
Approach speed from ... to	3 m/min ... 15 m/min		
Switching 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 mm ²		
Short circuit protection	F15		
Weight	0.43 g		

Dimensional drawings



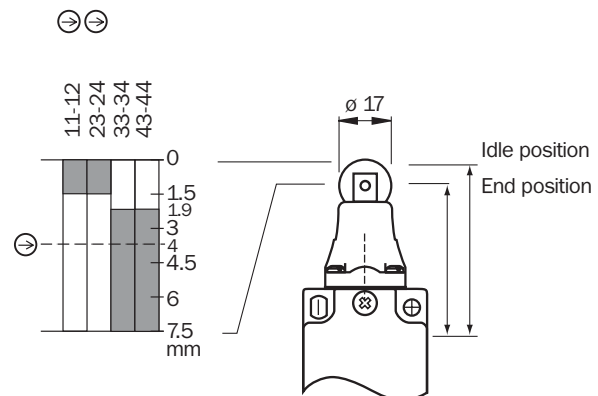
Actuator travel diagrams

i110-PA123



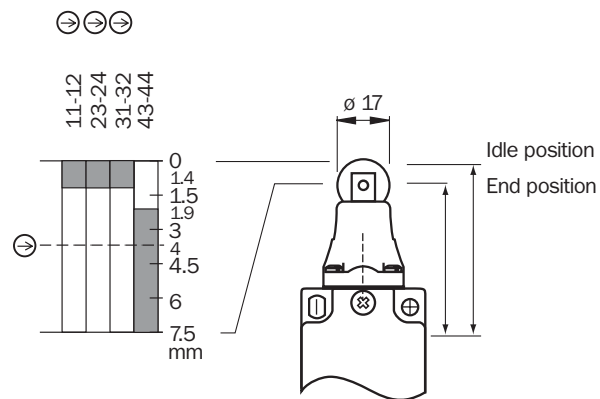
□ Contacts open
■ Contacts closed

i110-PA223



□ Contacts open
■ Contacts closed

i110-PA313



□ Contacts open
■ Contacts closed

Accessories

Cable gland

Type	Part number
Cable gland M20	5 309 164



- 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



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

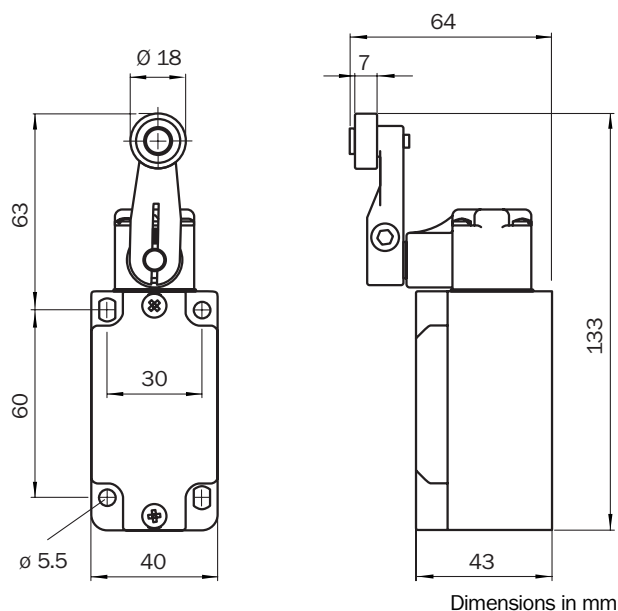
Ordering information

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

Detailed technical specifications

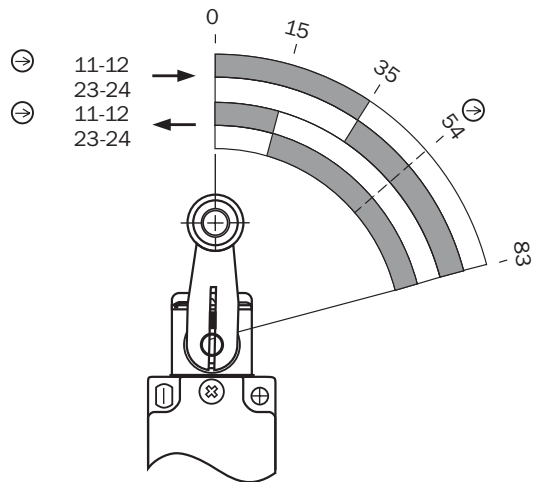
Type	i110-RA123	i110-RA223	i110-RA313
Housing material	Zinc die-cast		
Surface treatment	Varnished		
Enclosure rating	IP 66		
Mechanical life (relay contacts)	10 x 10 ⁶ switching cycles		
Ambient operating temperature from ... to	-25 °C ... +80 °C		
Approach speed from ... to	3 m/min ... 15 m/min		
Switching 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 mm ²		
Short circuit protection	F15		
Weight	0.52 kg		

Dimensional drawings



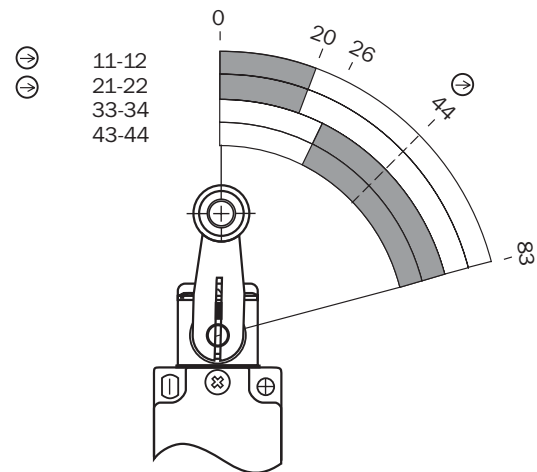
Actuator travel diagrams

i110-RA123



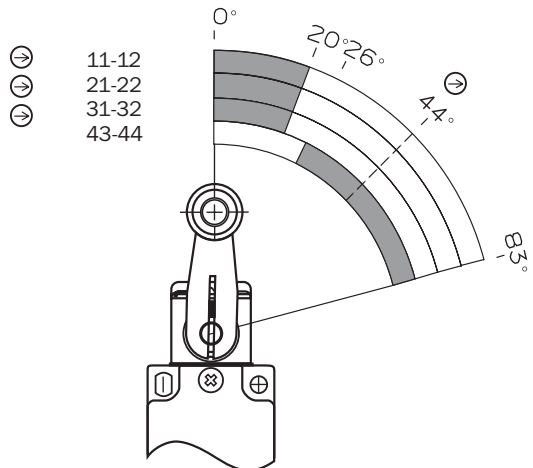
□ Contacts open
 ■ Contacts closed

i110-RA223



□ Contacts open
 ■ Contacts closed

i110-RA313



□ Contacts open
 ■ Contacts closed

H

Accessories

Cable gland

Type	Part number
Cable gland M20	5 309 164



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.

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	Plastic	Solid	55 mm	IP 67	i10 H	I-2
	2 / 1			85 mm			
	2 / 1	Metal	Hollow shaft	36.5 mm	IP 66	i110 H	I-5

¹⁾ Explanation see page I-0



- 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

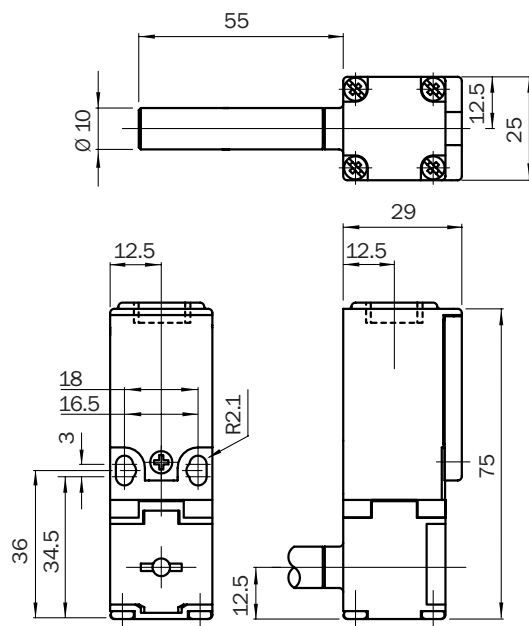
→ Switching elements	I-4
→ Mounting	I-4
→ Accessories	I-4
→ Services	A-0

Detailed technical specifications

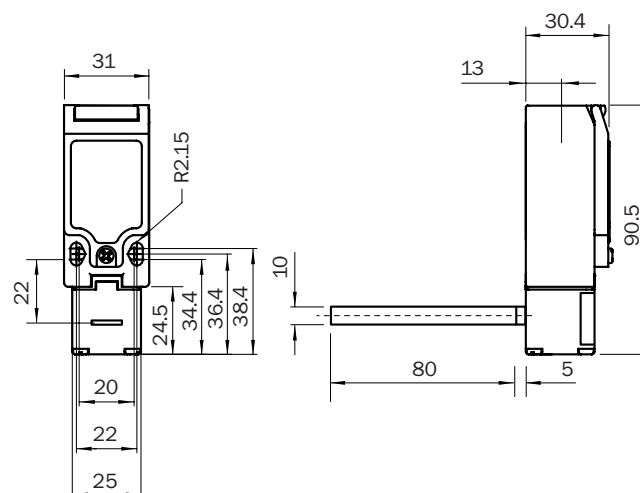
Type	i10-HA113	i10-HB213
Housing material	GFRP reinforced polyester	
Enclosure rating	IP 67	
Mechanical life (relay contacts)	10 ⁶ switching cycles	
Ambient operating temperature from ... to	-20 °C ... +80 °C	
Minimum actuation torque	0.02 Nm	0.035 Nm
Switching principle	Slow-action-switch	
Switching 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

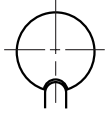
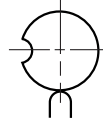
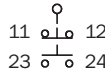
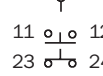
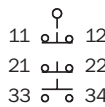
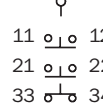


i10-HB213

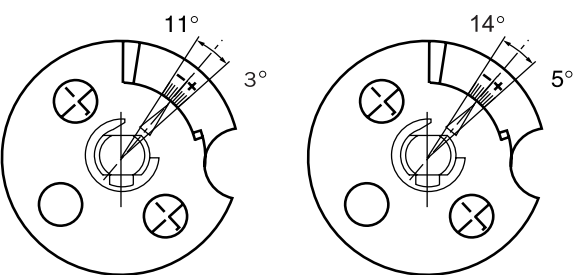


Dimensions in mm

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

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

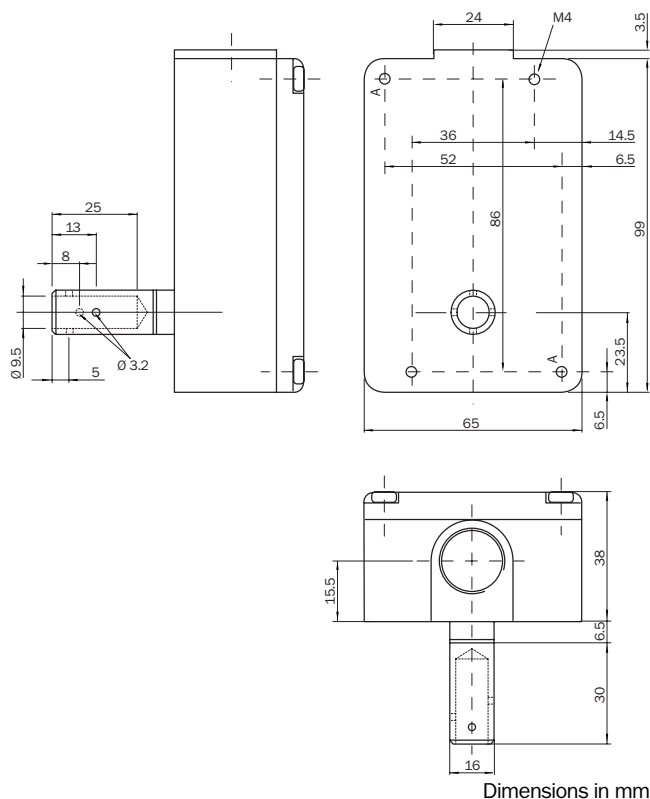


Further information	Page
→ Technical specifications	I-6
→ Dimensional drawings	I-6
→ Switching elements	I-6
→ Mounting	I-7
→ Accessories	I-7
→ Services	A-0

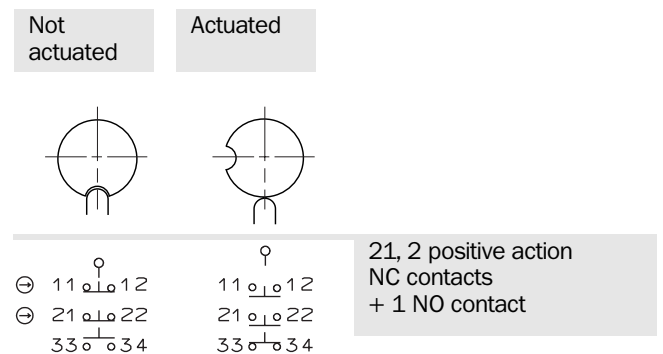
Detailed technical specifications

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 mm ²
Short circuit protection	T6
Weight	0.45 kg

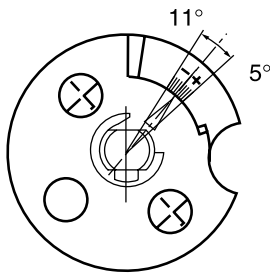
Dimensional drawings



Switching elements



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

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.

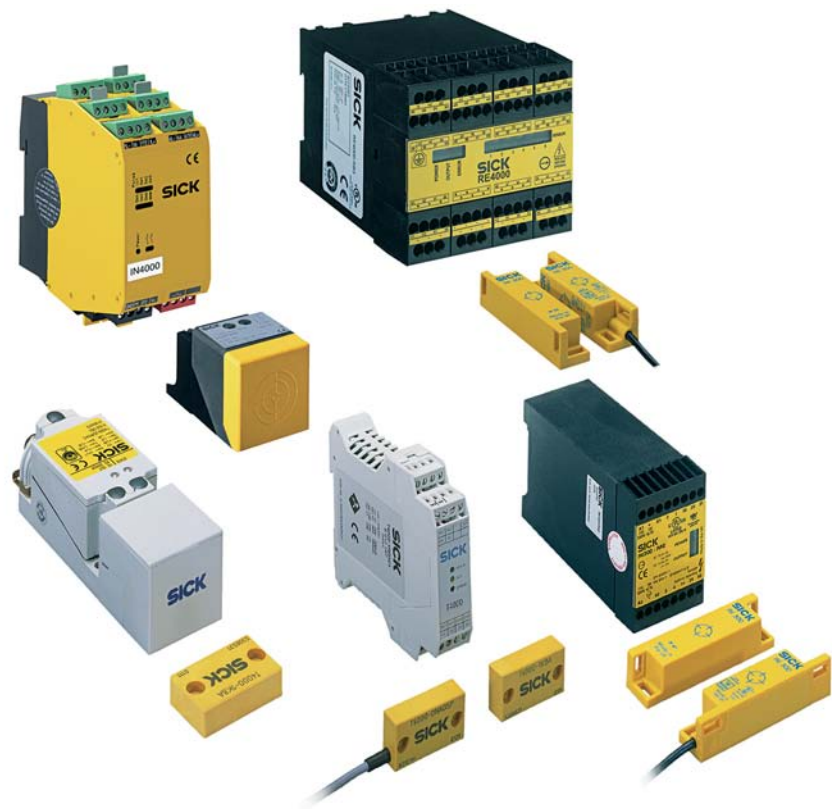
External device monitoring (EDM)


See glossary page P-3

Restart interlock

See glossary page P-9

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



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



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
→ Dimensional drawings	J-4
→ Response range	J-5
→ Internal circuitry	J-5
→ Mounting	J-6
→ Services	A-0

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.

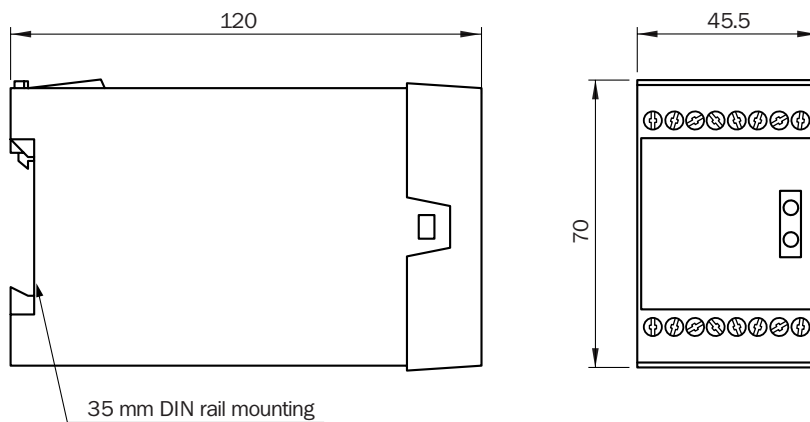
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Sensor & actuator

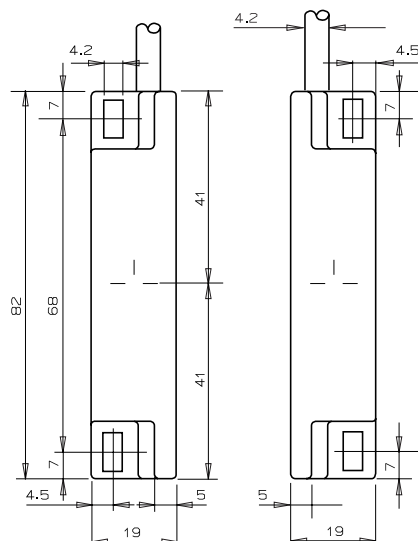
Type	RE300-DA03P	RE300-DA10P
Sensor principle	Reed	
Housing material	ABS shape	
Enclosure rating	IP 67	
Ambient operating temperature from ... to	-10 °C ... +55 °C	
Shock resistance	30 g, 11 ms according to IEC 60068-2	
Vibration resistance	10 Hz ... 55 Hz, 0.5 mm according to IEC 60068-2	
Weight	0.168 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

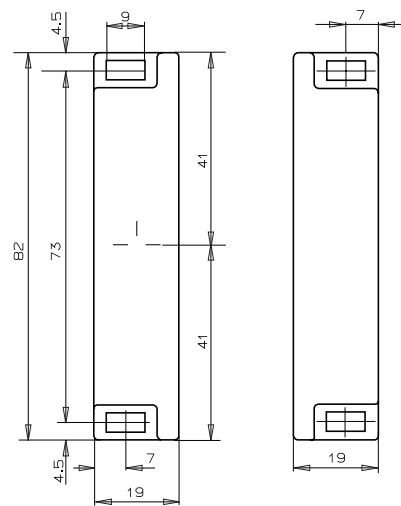
Evaluation unit



Sensor

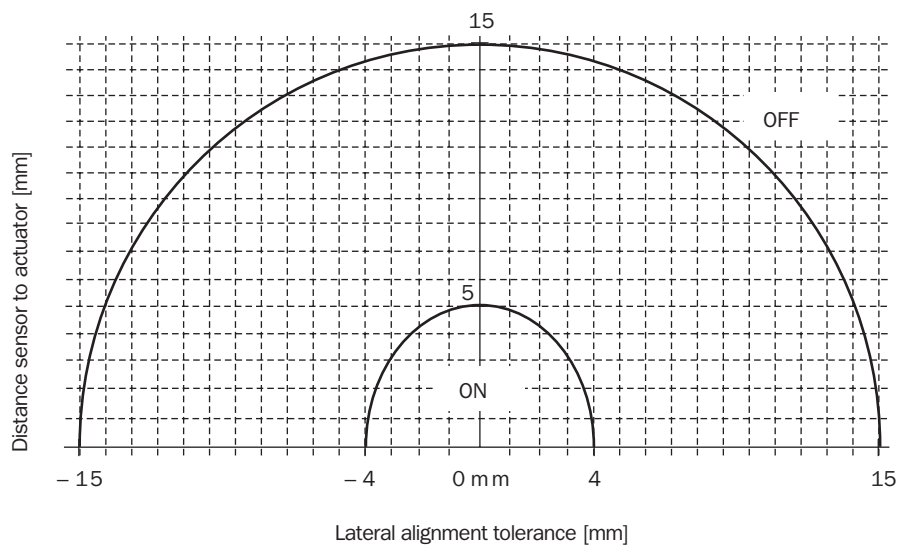
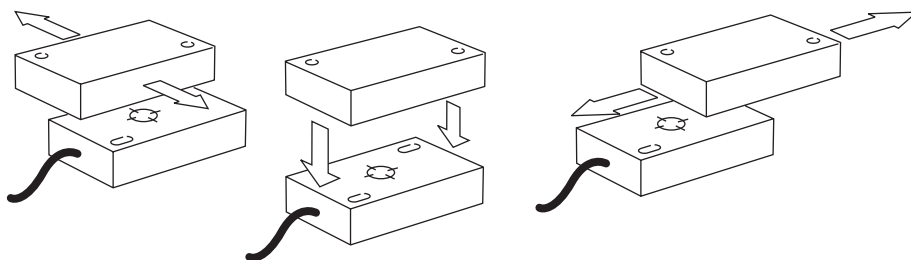


Actuator

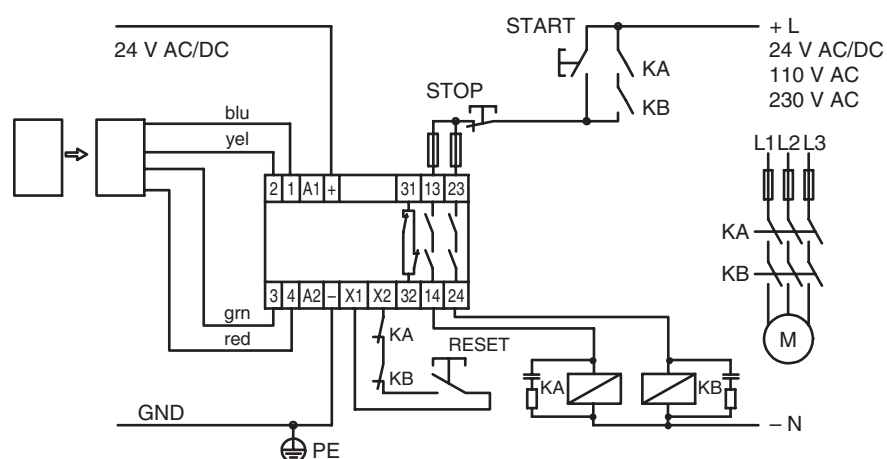


Dimensions in mm

Response range

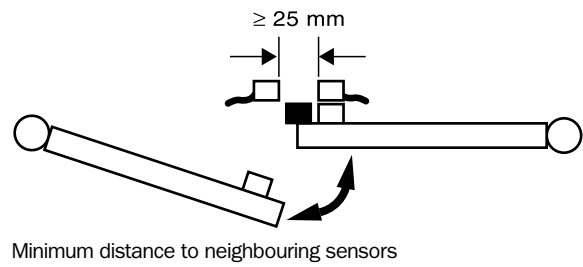
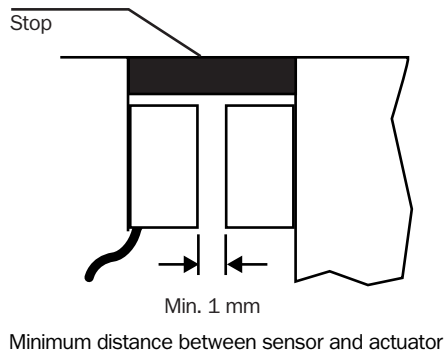


Internal circuitry



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

Mounting



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



J

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

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.

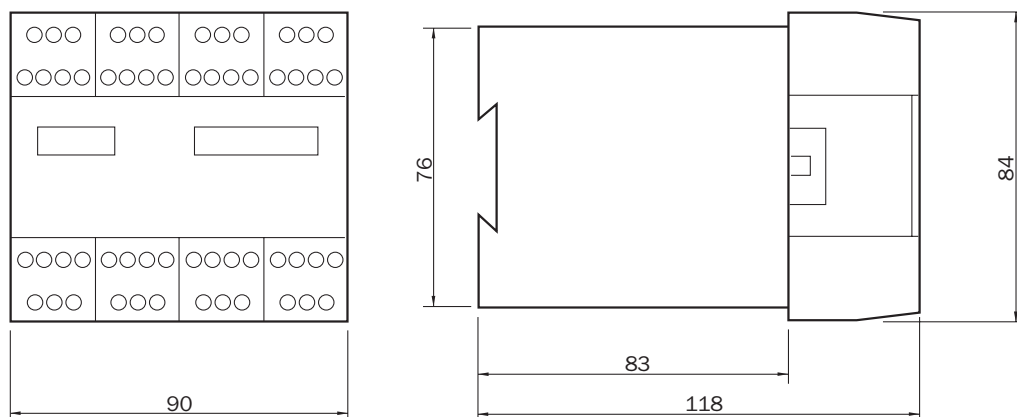
²⁾ PELV earthed safety extra-low voltage. On usage of +V/-V terminals, the -V/PE terminal must be connected to the PE earth conductor.

Sensor & actuator

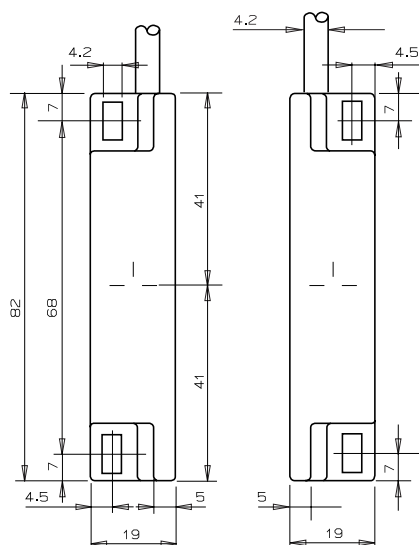
Type	RE300-DA03P	RE300-DA10P
Sensor principle	Reed	
Housing material	ABS shape	
Enclosure rating	IP 67	
Ambient operating temperature from ... to	-10 °C ... +55 °C	
Shock resistance	30 g, 11 ms according to IEC 60068-2	
Vibration resistance	10 Hz ... 55 Hz, 0.5 mm according to IEC 60068-2	
Weight	0.168 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

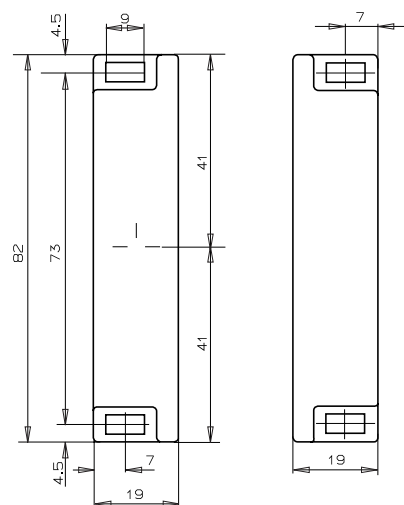
Evaluation unit



Sensor

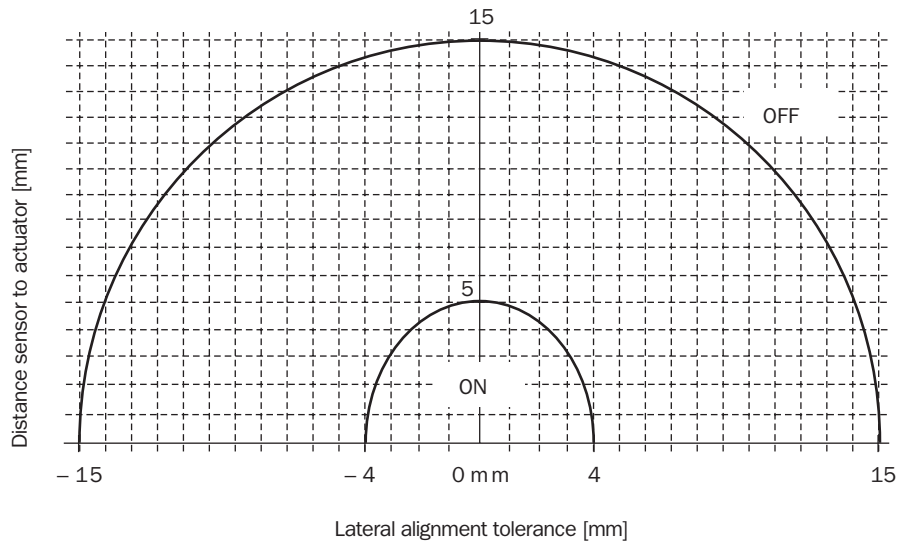
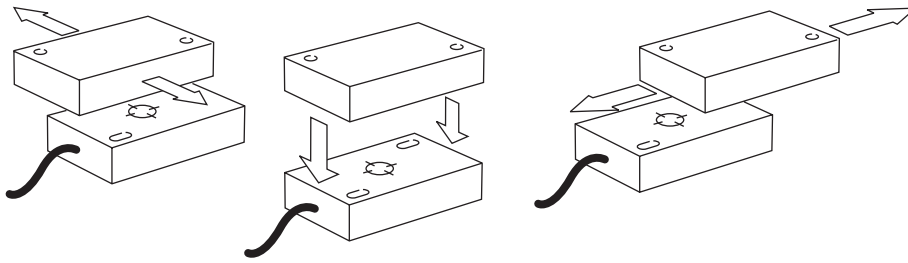


Actuator

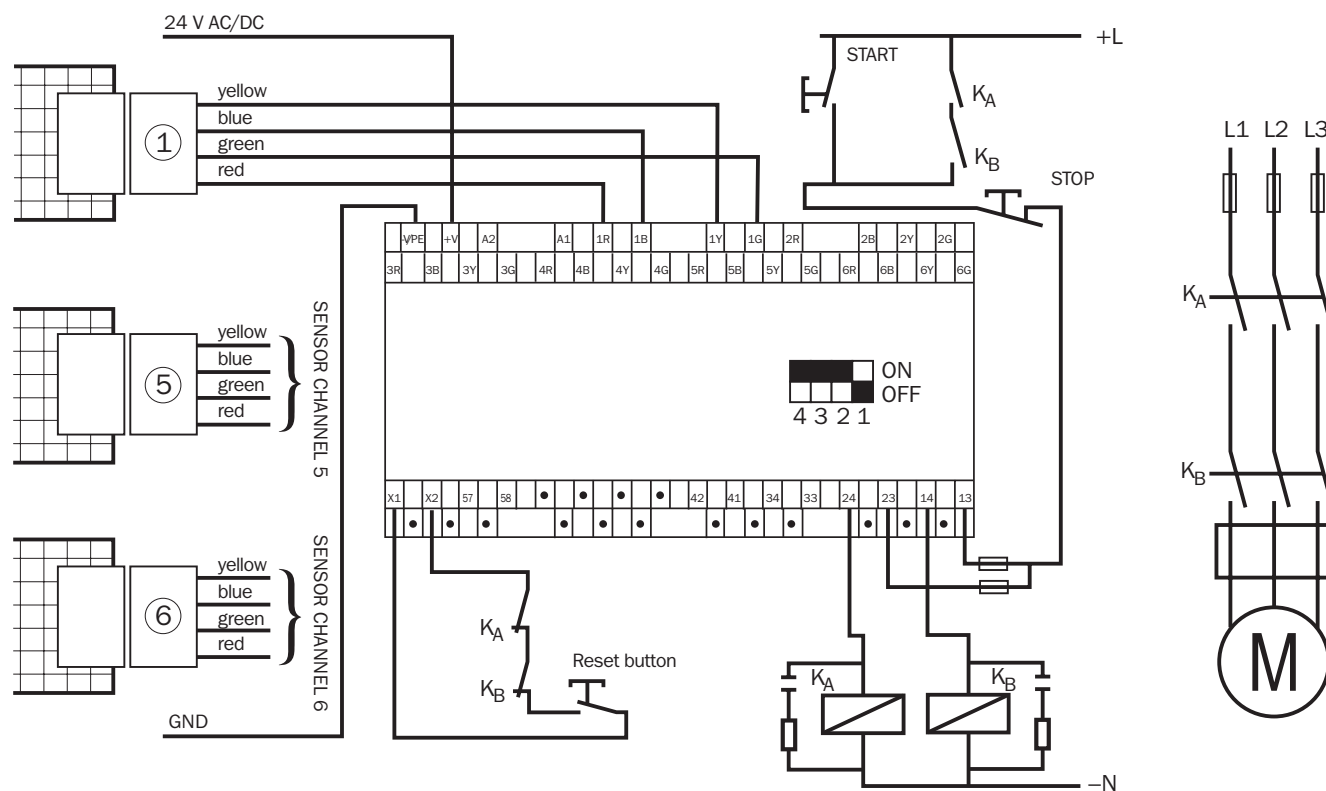


Dimensions in mm

Response range

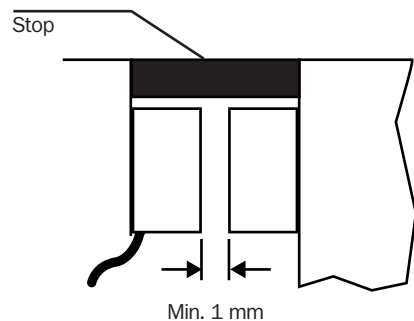


Internal circuitry

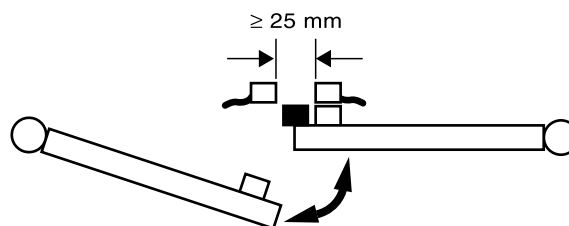


Example wiring for 24 V AC/DC with 3 sensors, with external device monitoring and static reset

Mounting



Minimum distance between sensor and actuator



Minimum distance to neighbouring sensors



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



Further information	Page
→ Dimensional drawings	J-14
→ Response range	J-15
→ Internal circuitry	J-16
→ Accessories	J-16
→ Services	A-0

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

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

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		

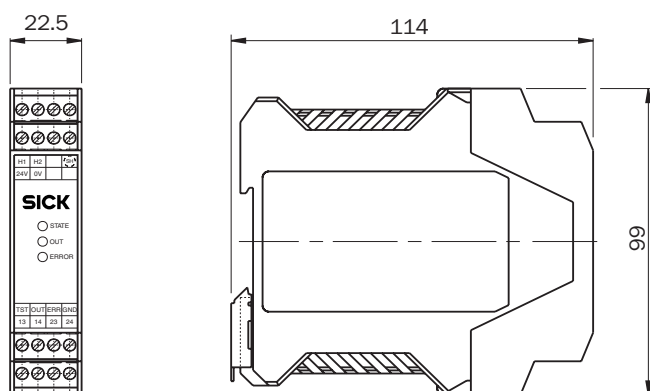
¹⁾ These values only apply for the protruding and flush installation of the sensor and the actuator in aluminium.

Actuator

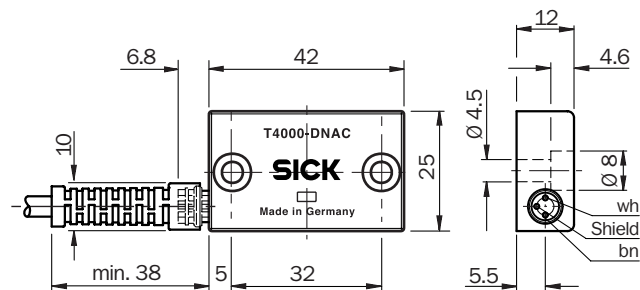
Housing material	Fortron, glass-fibre reinforced thermoplastic
Enclosure rating	IP 67
Ambient operating temperature from ... to	-25 °C ... +70 °C
Weight	0.03 kg
Monitoring time minimum dwell time	0.5 s

Dimensional drawings

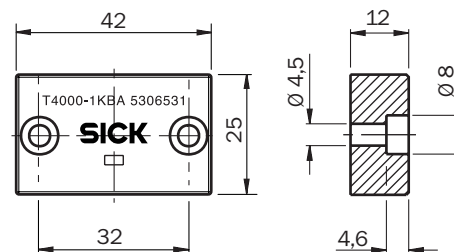
Evaluation unit



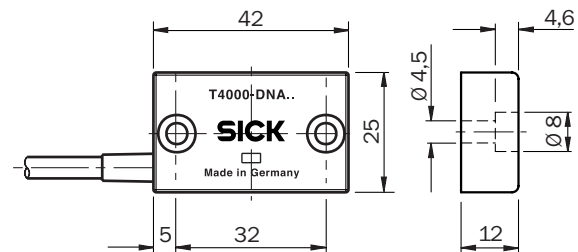
Sensor, connector



Actuator



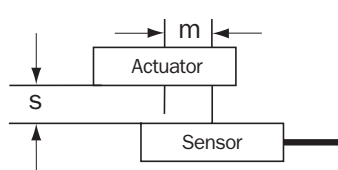
Sensor, cable



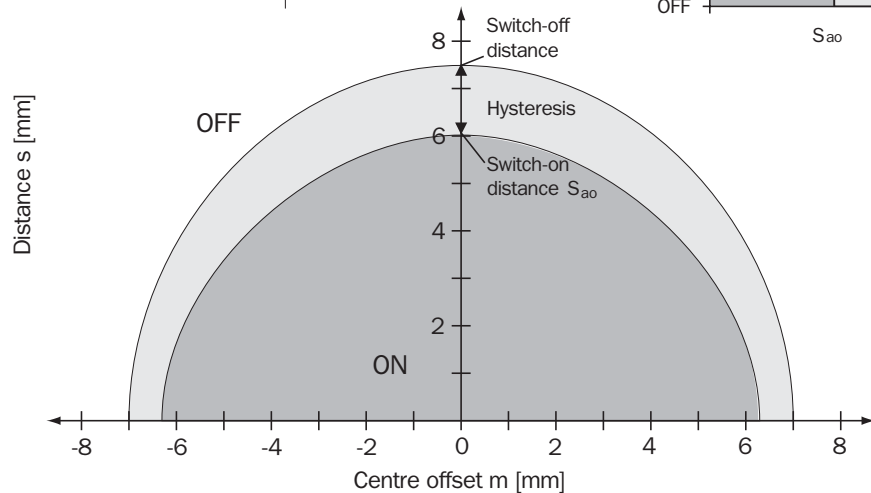
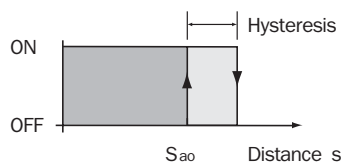
Dimensions in mm

Response range

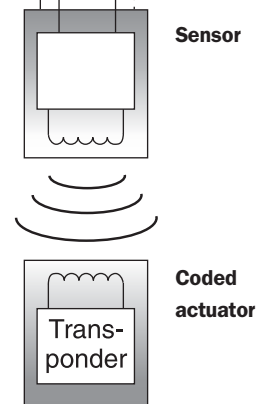
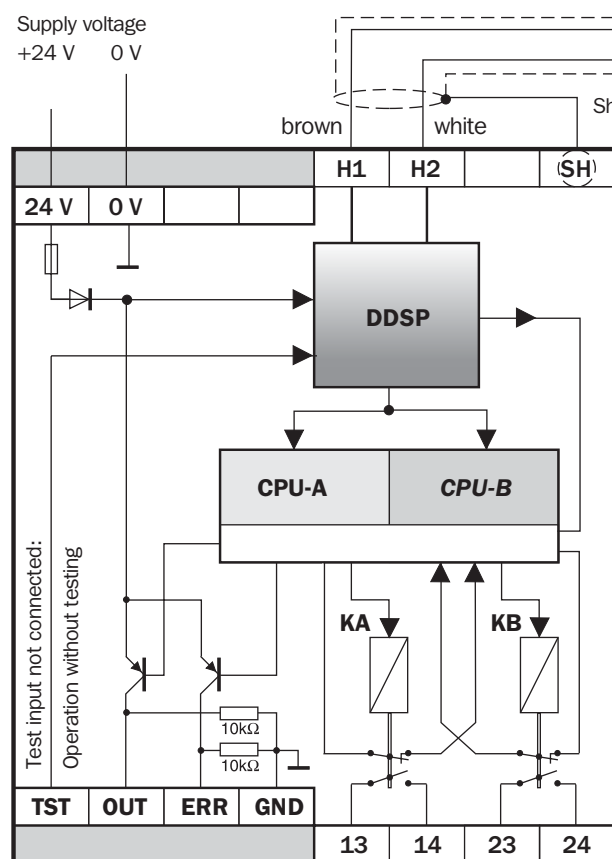
Observe the safe
switch-off distance
 $s_{ar} = 23 \text{ mm}$
Relay outputs are
safely deactivated



Output state



Internal circuitry



DDSP:

Double Dynamic Safety-Path 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

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

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)
- SICK UE 440 and UE 470 safety controllers
- SICK UE 4100 PROFIsafe bus modules

→ see L-0

→ see M-0

→ 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



Further information	Page
→ Technical specifications	J-18
→ Dimensional drawings	J-19
→ Response range	J-19
→ Internal circuitry	J-20
→ Accessories	J-20
→ Services	A-0

Detailed technical specifications

Evaluation unit & sensor

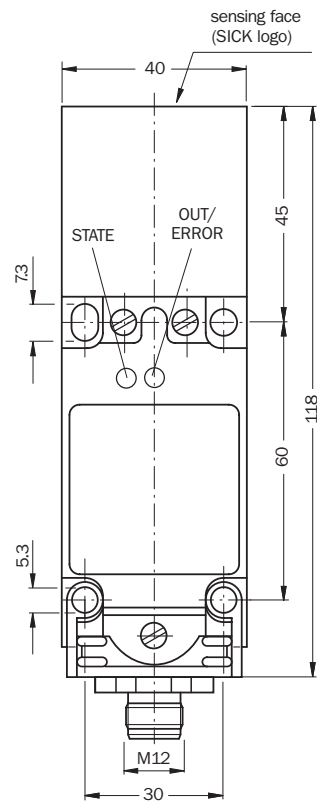
Sensor principle	Transponder
Control category according to EN 954-1	3
Classification in compliance with IEC/EN 60947-5-3	PDF-M
Housing material	Plastic PTB V0 GF20
Enclosure rating	IP 67
Ambient operating temperature from ... to	0 °C ... +55 °C
Protection class	2
Shock resistance	30 g, 11 ms according 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

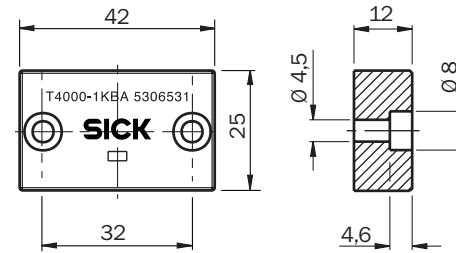
Housing material	Fortron, glass-fibre reinforced thermoplastic
Enclosure rating	IP 67
Ambient operating temperature from ... to	–25 °C ... +70 °C
Weight	0.03 kg
Monitoring time minimum dwell time	0.5 s

Dimensional drawings

Evaluation unit & sensor

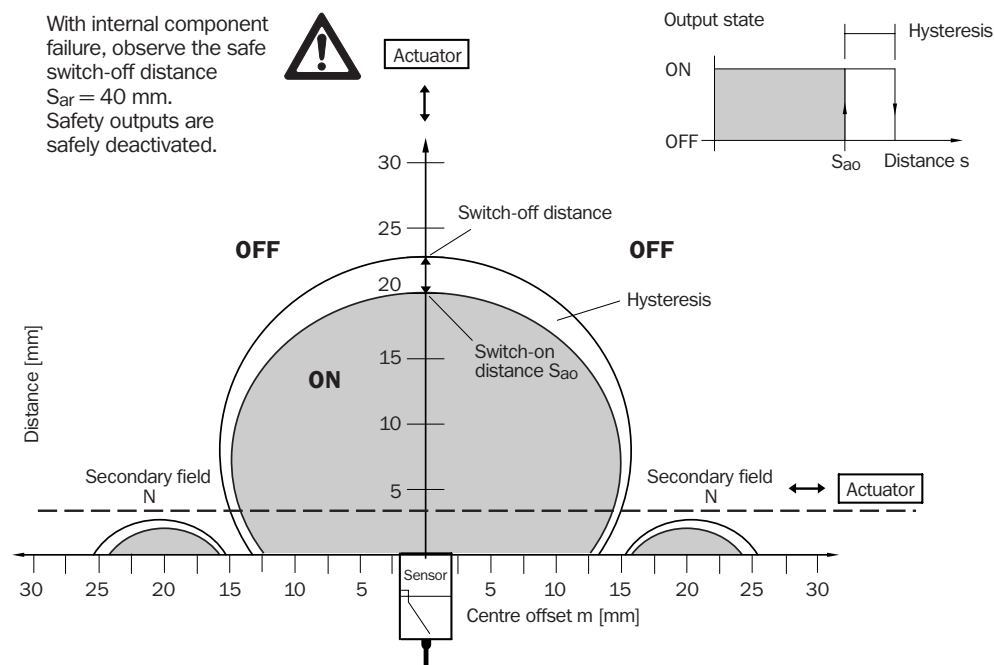


Actuator



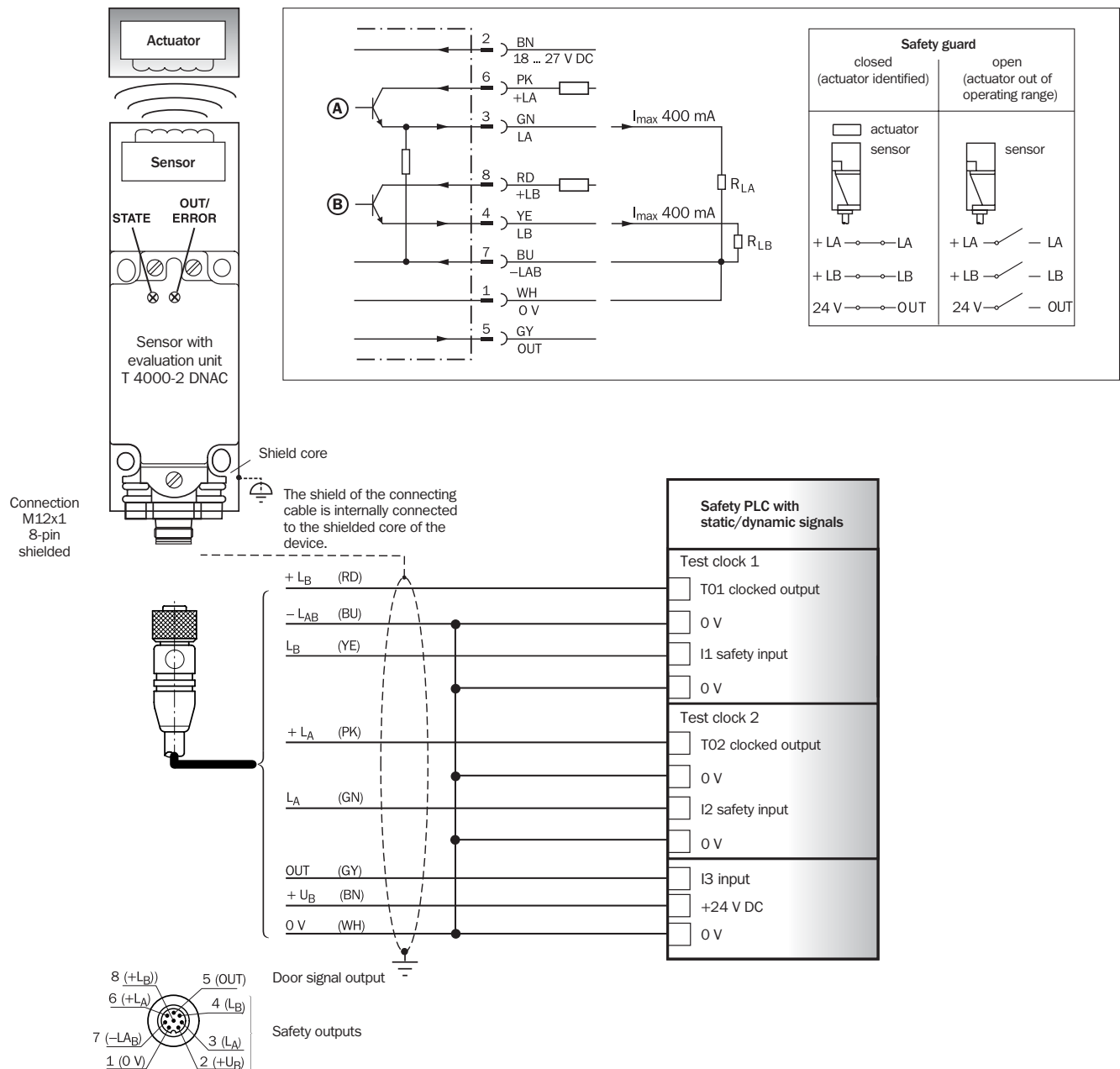
Dimensions in mm

Response range



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.

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

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



Further information	Page
→ Technical specifications	J-22
→ Dimensional drawings	J-23
→ Response range	J-23
→ Internal circuitry	J-24
→ Accessories	J-25
→ Services	A-0

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	—

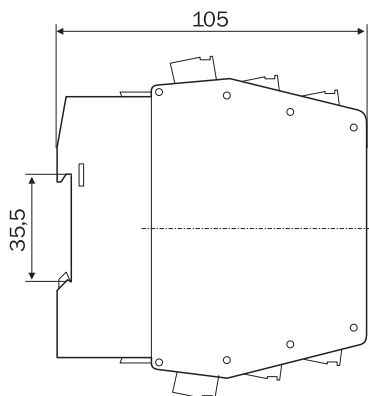
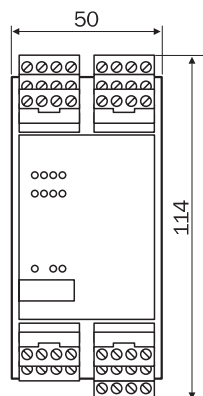
Sensor

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

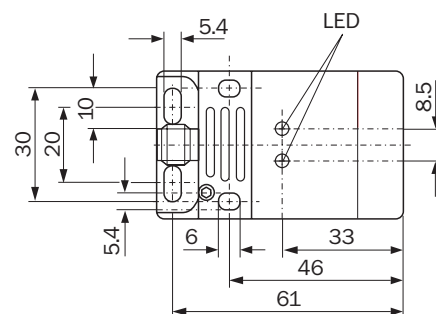
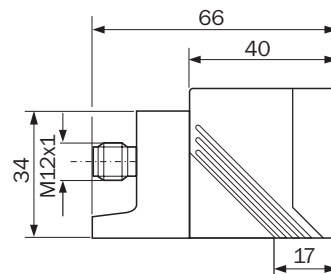
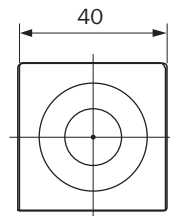
¹⁾ Dependent on material. The indicated values refer to steel ST37

Dimensional drawings

Evaluation unit

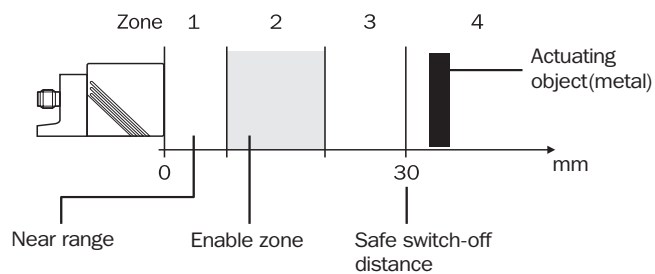


Sensor



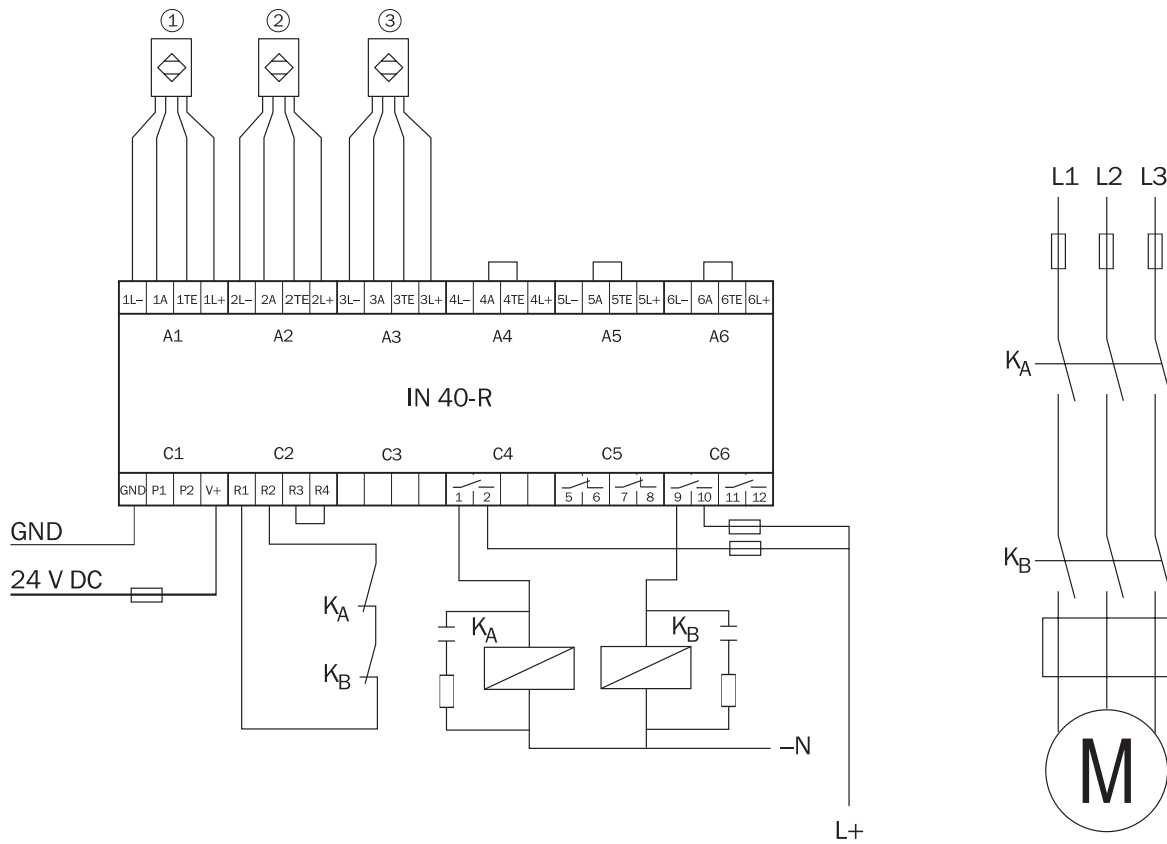
Dimensions in mm

Response range

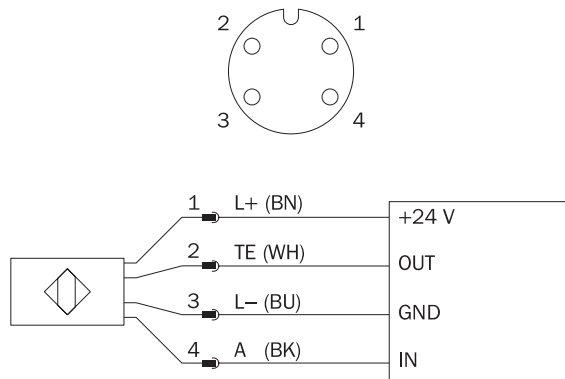


Internal circuitry

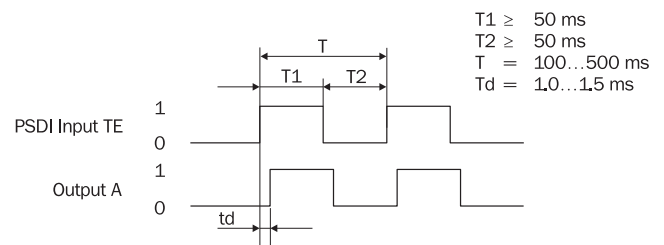
Evaluation unit



Sensor connections



Sensor timing



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

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.

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



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



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
- Plus/minus buttons for additional control of direction of movement
- 4 volt free contacts

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

Further information Page

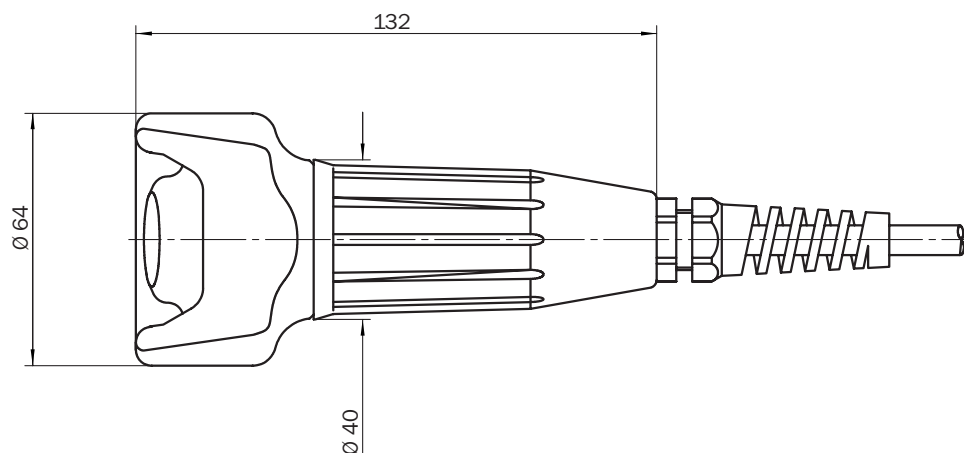
→ Actuator travel diagrams	K-4
→ Accessories	K-5
→ Services	A-0

Detailed technical specifications

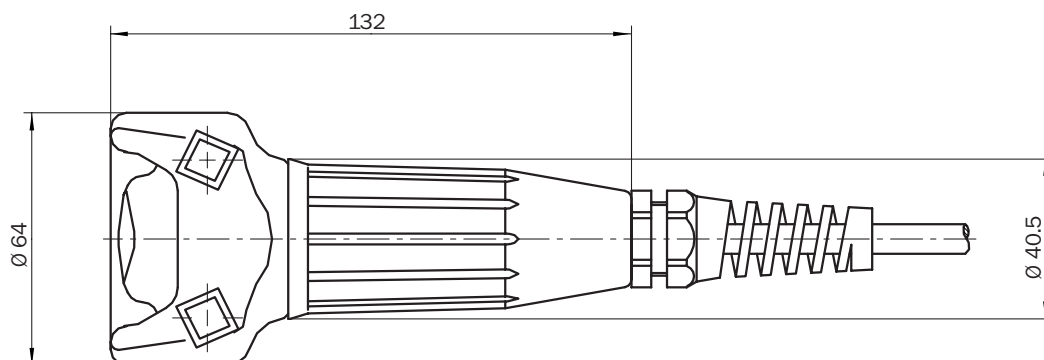
Type	E100-A2A22S05A	E100-A2A22S10A	E100-A2A22W05A	E100-B2A22S05A	E100-B2A22S10A
Housing material	Plastic				
Enclosure rating	IP 67	IP 67	IP 67	IP 65	IP 65
Mechanical life (relay contacts)	10 ⁶ switching cycles				
Ambient operating temperature from ... to	-5 °C ... +60 °C				
Switching principle	Slow-action-switch				
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 mm ²				
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



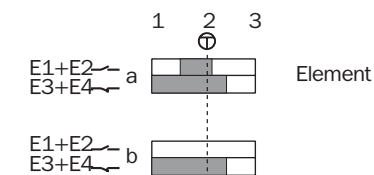
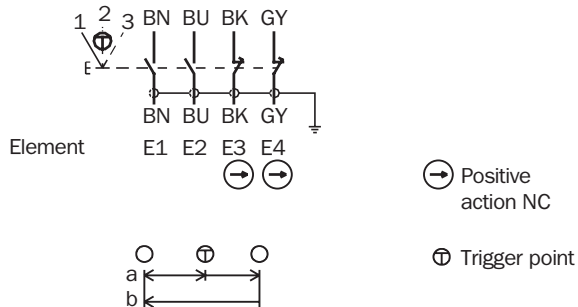
Dimensions in mm

Actuator travel diagrams

E 100 A

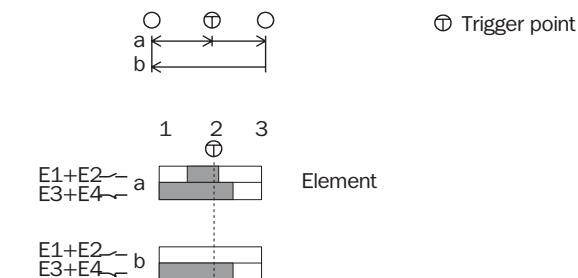
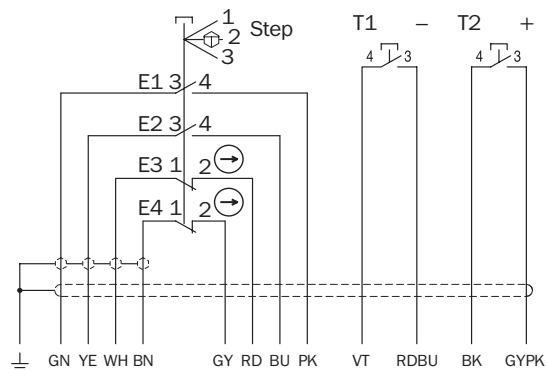
2 NO

2 positive action NC



- Contacts open
- Contacts closed

E 100 B



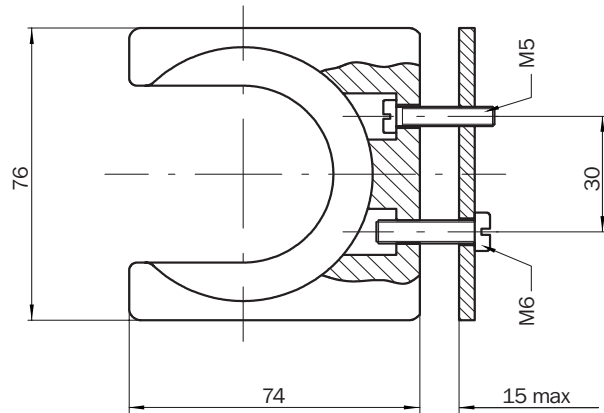
- Contacts open
- Contacts closed

Accessories

Safety switch accessories, miscellaneous

Type	Part number
Fixing bracket	5 308 209

Fixing bracket





- 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

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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

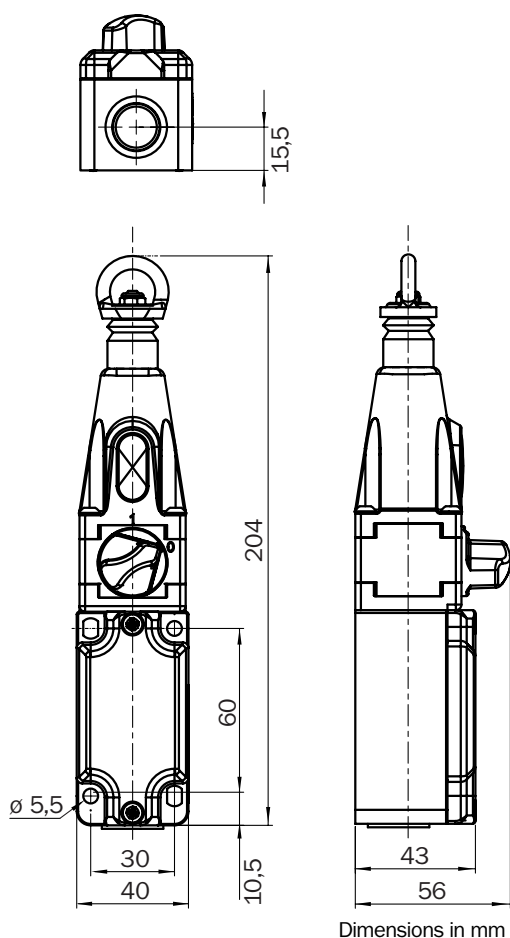
Ordering information

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

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 mm ²	
Short circuit protection	T6	
Weight	0.84 kg	

Dimensional drawings

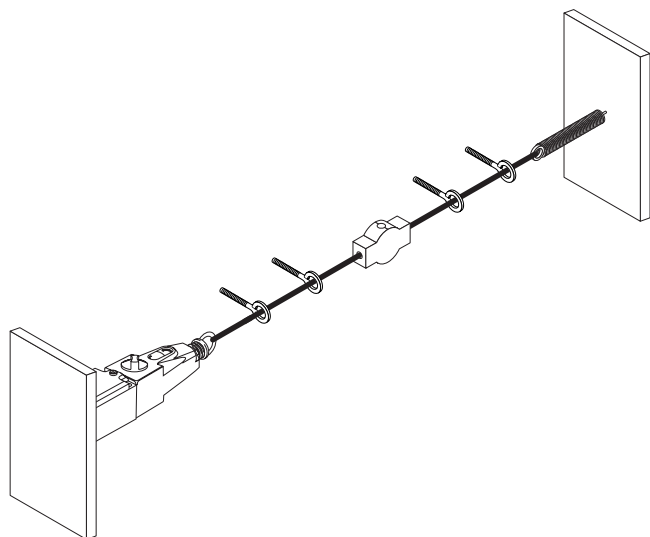
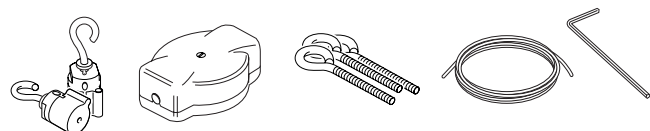


Switching elements

Rope stack	Rope tensioned	Rope pulled	
43 44 31 32 21 22 11 12	43 44 31 32 21 22 11 12	43 44 31 32 21 22 11 12	31, 3 positive action NC contacts, 1 NO contact
43 44 33 34 21 22 11 12	43 44 33 34 21 22 11 12	43 44 33 34 21 22 11 12	22, 2 positive action NC contacts, 2 NO contacts

Rope accessories

Accessory type	Cord length	Type	Part number
Rope accessory set	5 m	iE110-PO5	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



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 allen key

Rope accessory set iE110-P10

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

Rope accessory set iE110-P20

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

Rope accessory set iE110-P30

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

Tensioner set iE110-PTR

2 rope grippers, 1 tensioner, 1 allen key






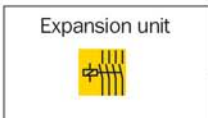
Other accessories

Cable gland

Type	Part number
Cable gland M20	5 309 164

K

Selection table

Main Application	Mode	Features		UE-Unit	Page
	Single Channel Input		$\frac{2}{1}$	UE 23-2 MF	L-9
	Dual Channel Input	Stop Cat. 0	$\frac{2}{1}$	UE 43-2 MF	L-18
			$\frac{3}{1}$	UE 43-3 MF	L-23
			$\frac{6}{4}$	UE 43-6 MF	L-28
			$\frac{3}{0}$	UE 45-3 S1 2 3 1 Output up to 3 s Off-Delay	L-37
		Stop Cat. 1	$\frac{3}{0}$	UE 45-3 S1 2 30 1 Output up to 30 s Off-Delay	L-37
 1)	Dual Channel Input	Stop Cat. 0	$\frac{3}{0}$	UE 44-3 SL 2 3 1 Output up to 3 s On-Delay	L-32
			$\frac{3}{0}$	UE 44-3 SL 2 30 1 Output up to 30 s On-Delay	L-32
	Dual Channel Input	Stop Cat. 0	$\frac{2}{1}$	UE 42-2 HD	L-13
	Dual Channel Input	Stop Cat. 0	$\frac{3}{1}$	UE 10-3 OS	L-3
	Dual Channel Input	Stop Cat. 0	$\frac{2}{1}$	UE 48-2 OS	L-42
			$\frac{3}{0}$	UE 48-3 OS	L-48
<hr/>					
Expansion unit 			$\frac{4}{2}$	UE 10-4 XT	L-67
			$\frac{4}{2}$	UE 11-4 DX Off-Delay 0.5, 1, 2 or 3 s	L-70

1) Safety switch with mechanical locking

Safety relays



intelliface
the intelligent interface

Applications									Technical specifications				Type of unit		Product	Page
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		
—	—	—	—	✓	—	—	—	—	— 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










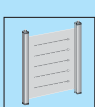
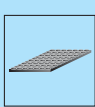
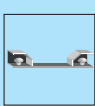

⁴⁾ One normally open contact off-delayed

⁵⁾ Testable

⁶⁾ Same as main unit

⁷⁾ 4 normally open contacts / 2 normally closed contacts with off-delay function

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

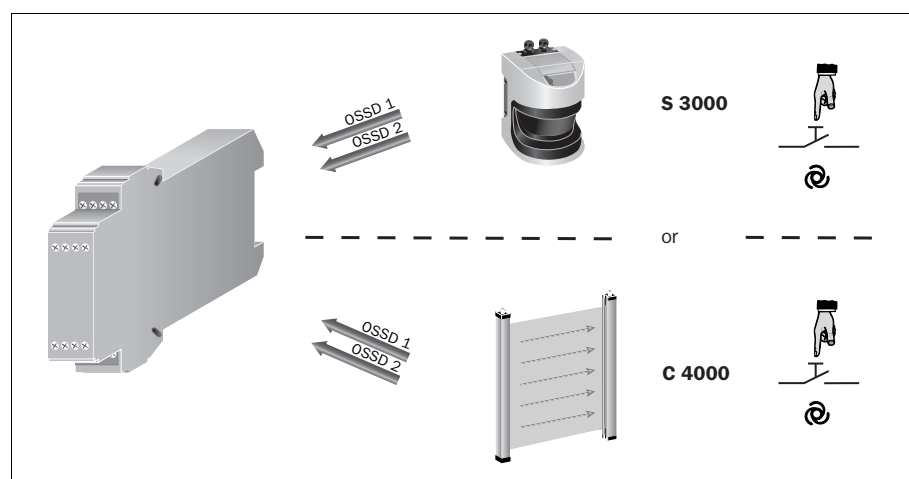
Overview of technical specifications

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



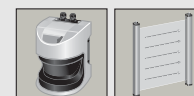
In-system added value

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

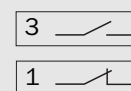
- Opto-electronic protective devices with monitored semiconductor outputs, integral external device monitoring (EDM) and restart interlock, such as
 - C 4000
 - C/M 2000
 - MSL
 - S 3000
- Safety systems with monitored semiconductor outputs, integral external device monitoring and restart interlock,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



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

Detailed technical specifications

General system data

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

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)

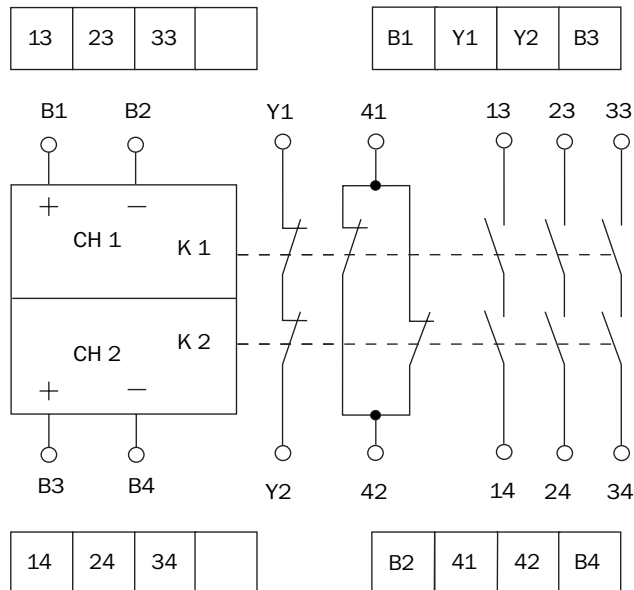
Response time (K 1 / K 2)	20 ms
Relay contacts	3 NO, enable current paths, safety relevant 1 NC, signalling current path, not safety relevant 1 NC, contactor monitoring
Contact type	Positively guided
Contact material	Silver alloy; gold-plated
Load capacity of contacts	
Switching voltage enable current 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.

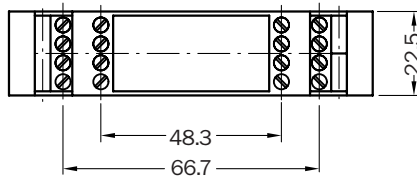
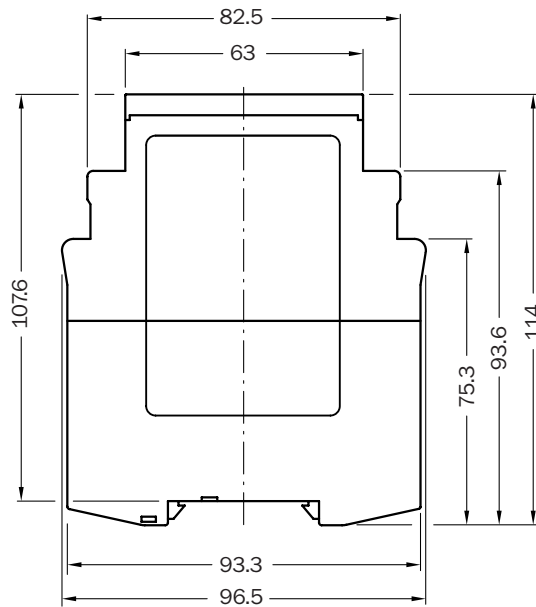
When at least one of the semiconductor outputs of the safety device becomes de-energised, then the output contacts revert back to open circuit status.

If restart interlock is needed, then this is achieved in the safety device, for example C 4000 or S 3000.

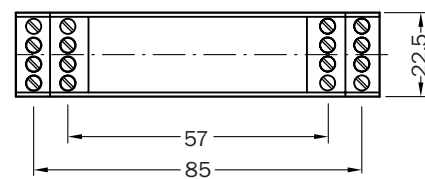
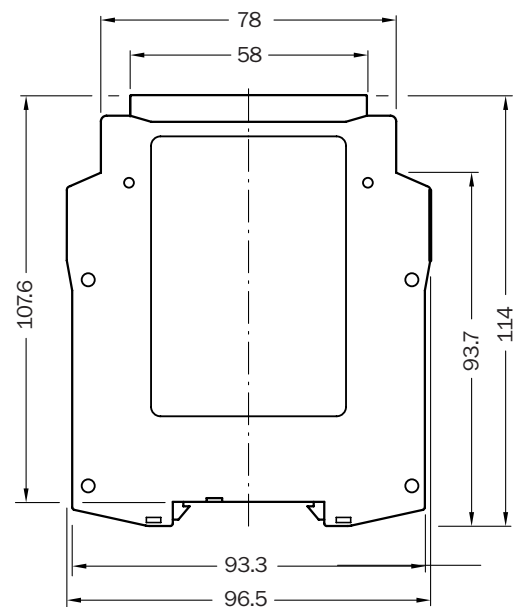
External device monitoring (EDM)

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.

Dimensional drawings



Housing with screw-type terminals

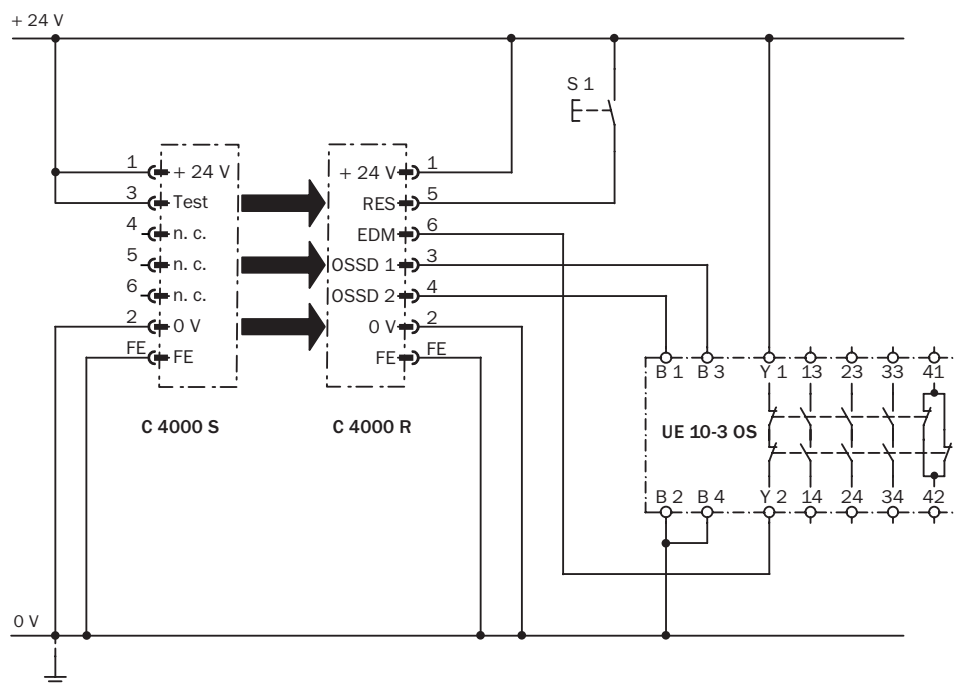


Housing with plug-in terminals

Dimensions in mm

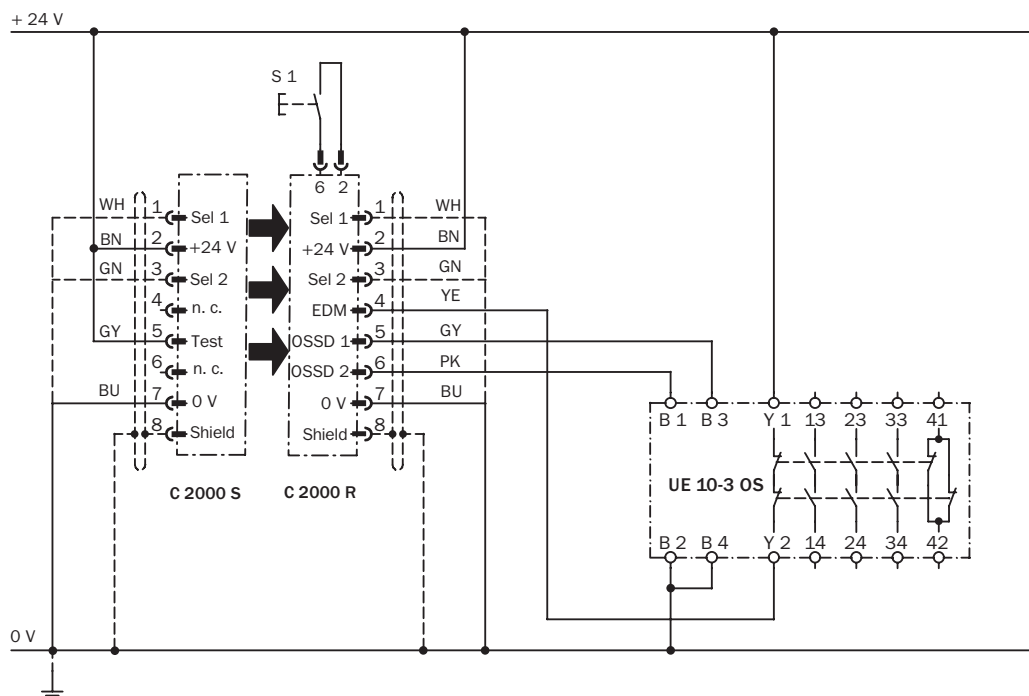
Connection diagrams

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)

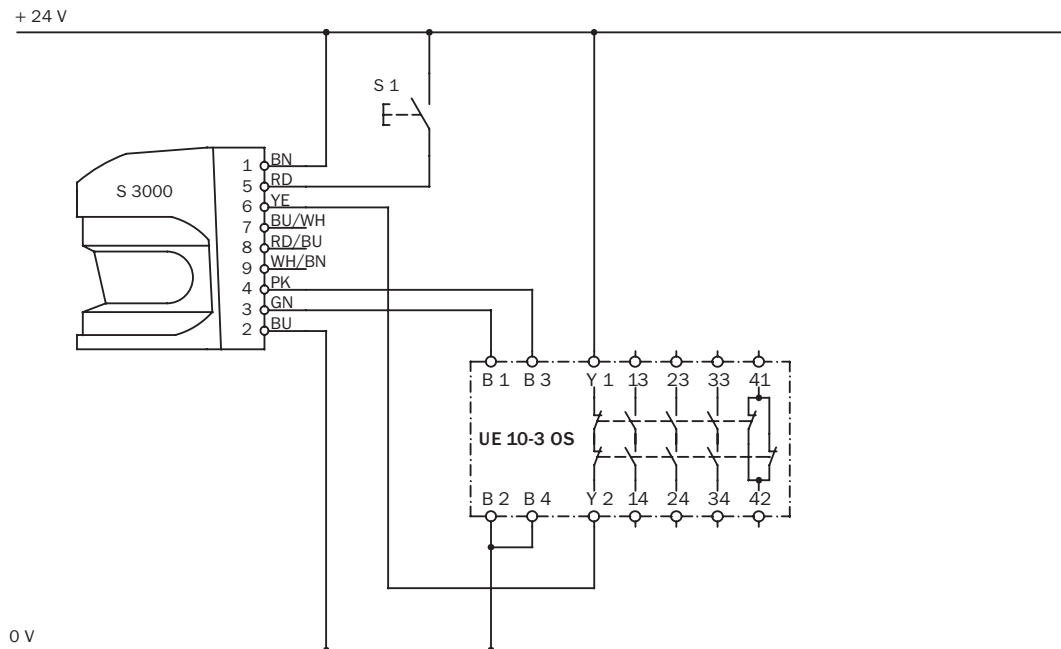
Safety light curtain C 2000 (EDM/RES) connected to UE 10-3 OS safety relay



Operating mode: with manual reset and external device monitoring

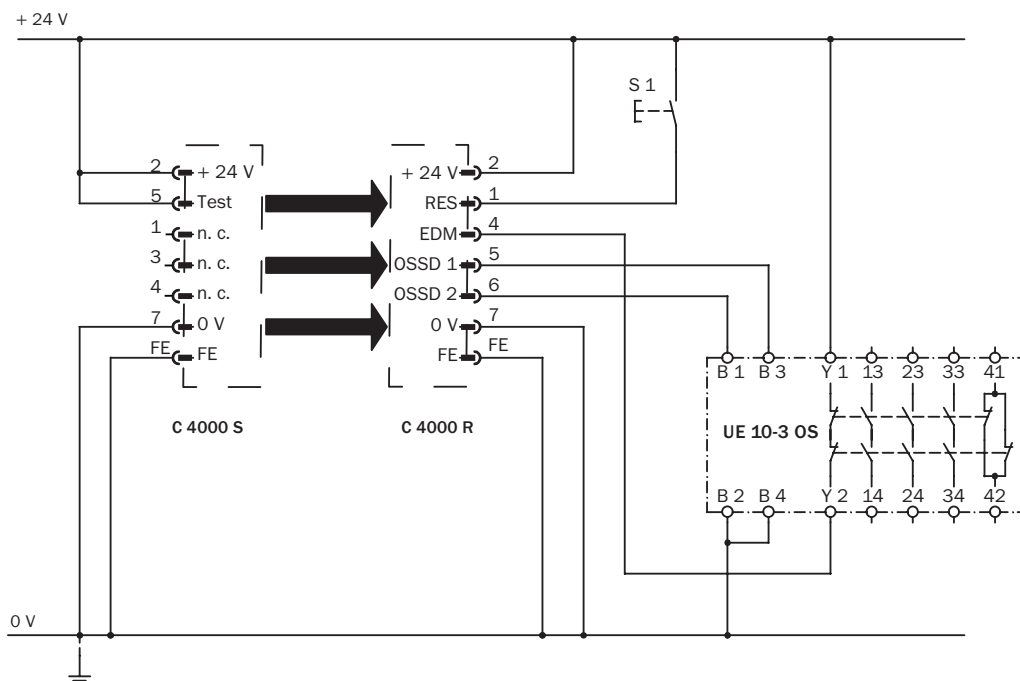
Continued on next page

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

Overview of technical specifications

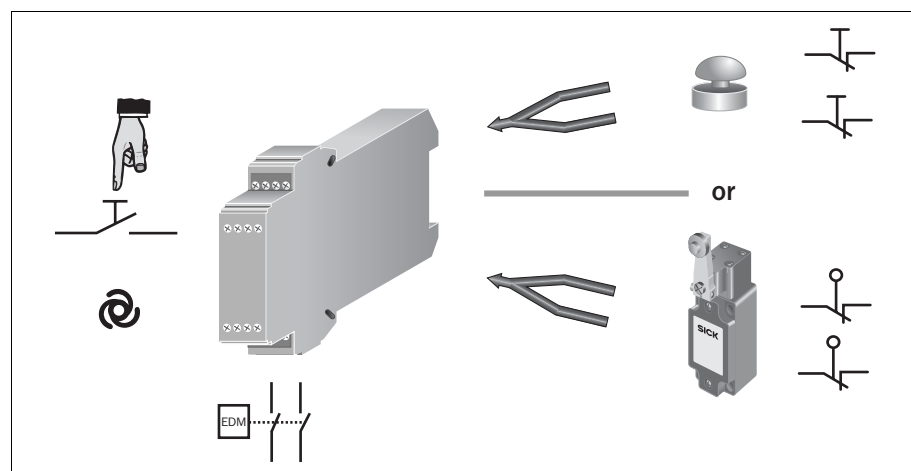
Control category according to EN 954-1	4 ¹⁾
Number of enable current paths/signalling current paths	2 / 1
Input circuit	Single-channel
Housing width	22.5 mm

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

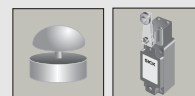
- 2 LEDs:
 - Supply voltage
 - Relay K 1, K 2
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion units
 - UE 10-4 XT
 - UE 11-4 DX
- External device monitoring (EDM)
- Screw-type terminals

Applications

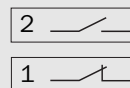


Ordering information

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



- For emergency stops
- For safety switches



Further information	Page
→ Symbols	L-2
→ Technical specifications	L-10
→ Internal circuitry	L-11
→ Dimensional drawings	L-12
→ Expansion modules	L-67 L-70
→ Services	A-0

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 UE 23-2 MF 2 A4 UE 23-2 MF 2 A3
Power consumption	24 V DC (20.4 V DC ... 26.4 V DC) 115/120 V AC (98 V AC ... 132 V AC) 230 V AC (196 V AC ... 253 V AC)
	AC DC
	2.7 VA 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) Automatic (Y 2)
	70 ms 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 Switching current Total current across all contacts
	10 V AC ... 230 V AC / 10 V DC ... 30 V DC 10 mA ... 6 A 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

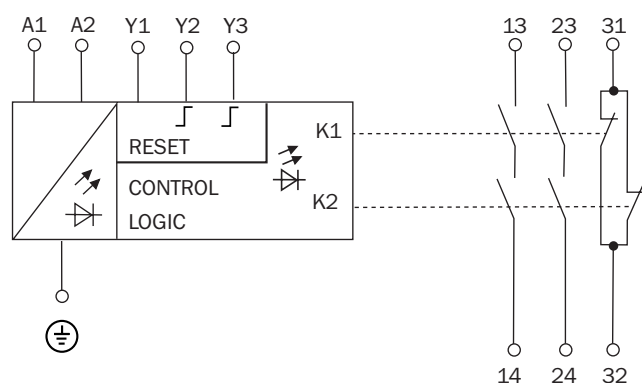
Operating data

Surge voltage rating (U _{Imp})	4 kV
Excess voltage category	III
Contamination rating of the unit (EN 50178)	External Internal
	3 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

Enclosure rating	Housing Terminals	IP 40 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.

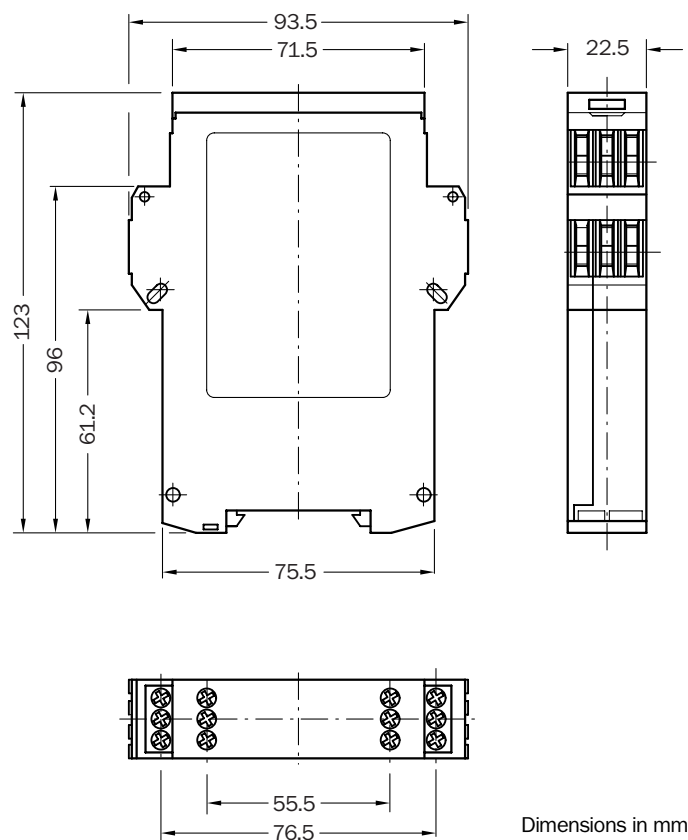
Manual reset

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.

Dimensional drawings



Housing with screw-type terminals

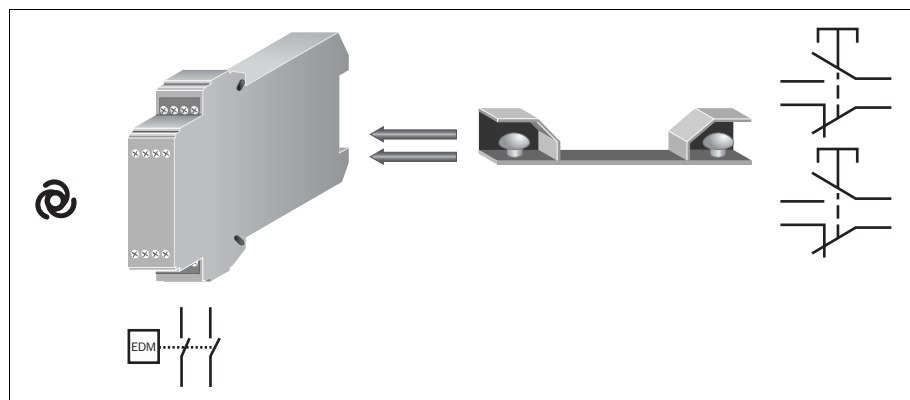
Overview of technical specifications

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

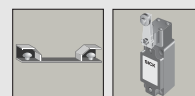
- 3 LEDs for:
 - Supply voltage
 - Relay K 1
 - Relay K 2
- Automatic start
- Increase in the number of outputs by way of the expansion unit UE 10-4 XT
- External device monitoring (EDM)
- Available with plug-in terminals (key coded)

Applications

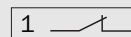
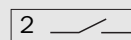


Ordering information

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



Further information	Page
→ Symbols	L-2
→ Technical specifications	L-14
→ Internal circuitry	L-15
→ Dimensional drawings	L-16
→ Connection diagrams	L-17
→ Expansion modules	L-67 L-70
→ Services	A-0

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

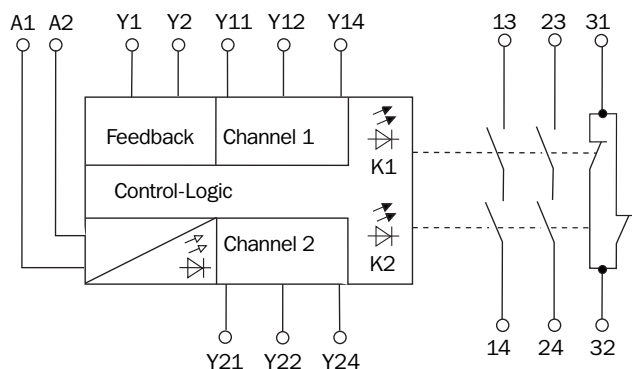
Output circuits (13 - 14, 23 - 24, 31 - 32)

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

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.

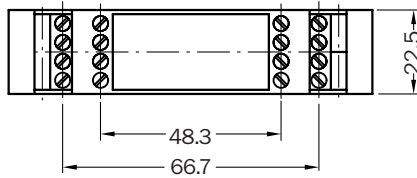
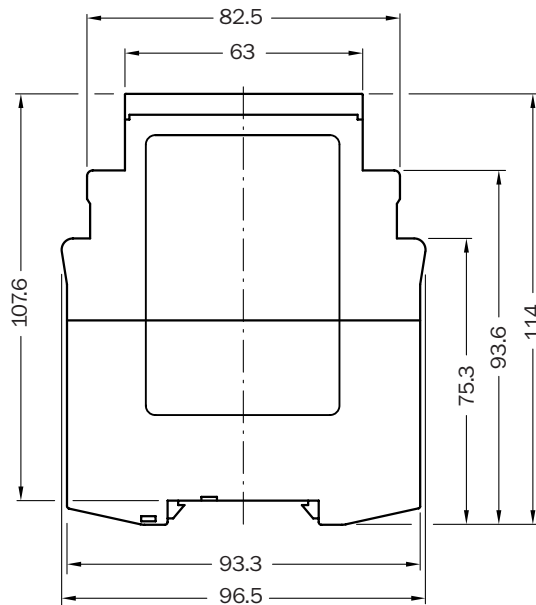
Automatic start

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

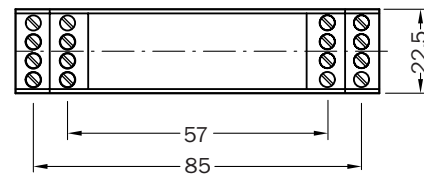
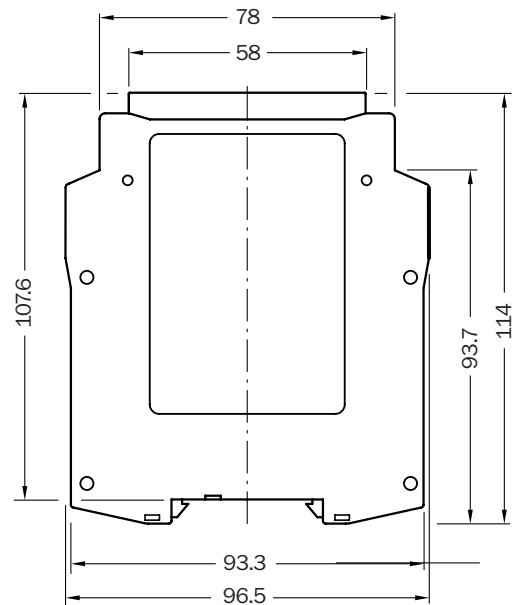
Monitoring of simultaneous activation

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.

Dimensional drawings



Housing with screw-type terminals

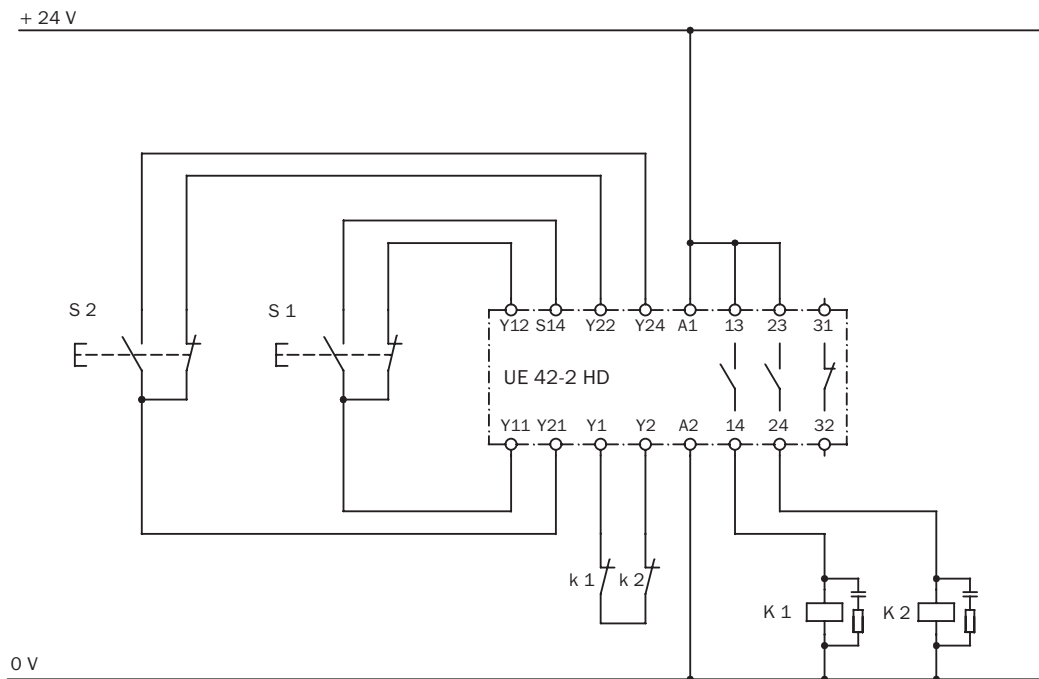


Housing with plug-in terminals

Dimensions in mm

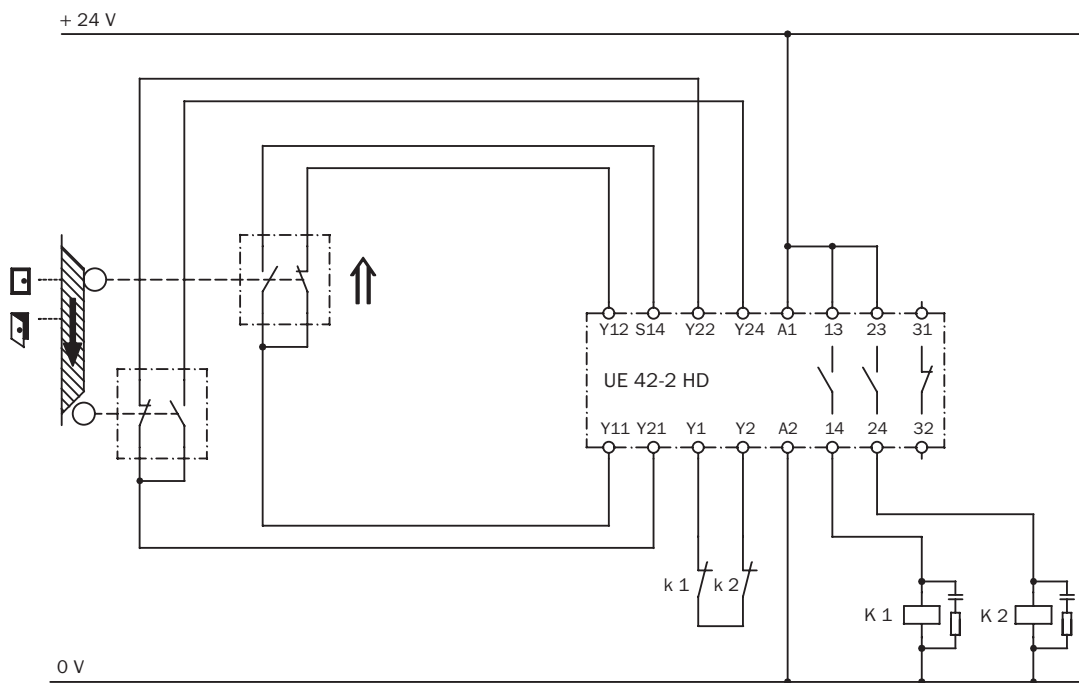
Connection diagrams

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

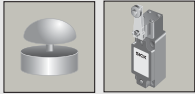


Operating mode: with automatic start and external device monitoring (EDM)

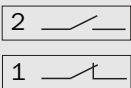
Two safety switches connected to UE 42-2 HD safety relay, dual-channel system



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



- For emergency stops
- For safety switches



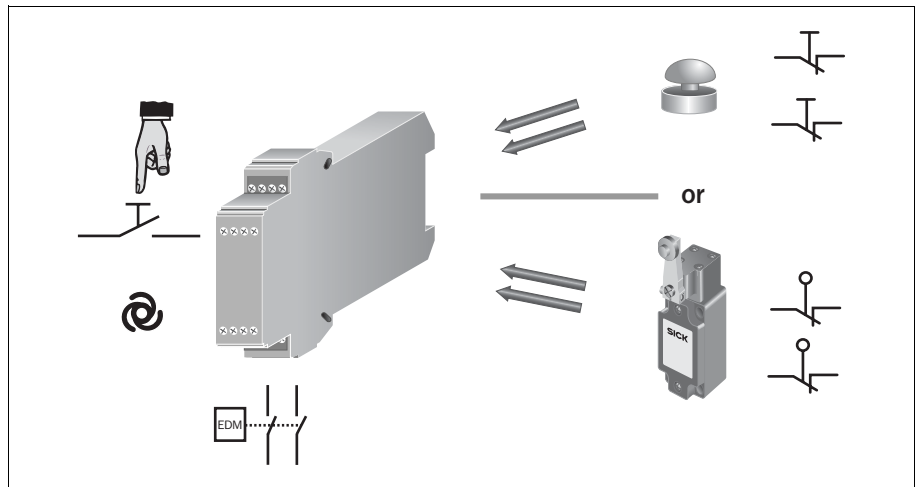
Overview of technical specifications

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

Further information	Page
→ Symbols	L-2
→ Internal circuitry	L-20
→ Dimensional drawings	L-21
→ Connection diagram	L-22
→ Expansion modules	L-67 L-70
→ Services	A-0

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)

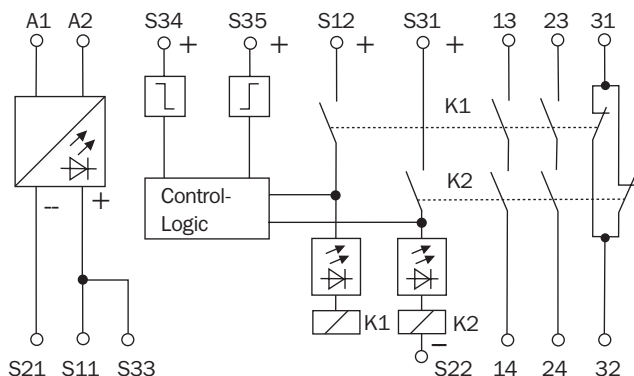
Response time (K 1 / K 2)	25 ms
Minimum time outputs will stay off	40 ms
Relay contacts	2 NO, enable current paths, safety relevant 1 NC, signalling current path, not safety relevant
Contact type	Positively guided
Contact material	Silver alloy; gold-plated
Load capacity of contacts	
Switching voltage	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

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.

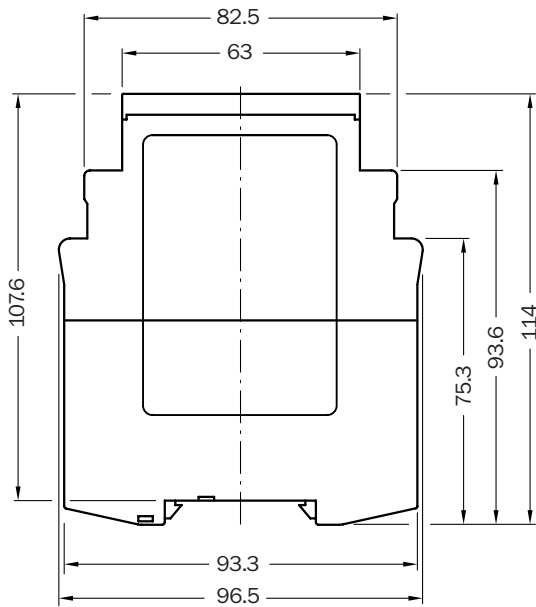
Cross circuit detection

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

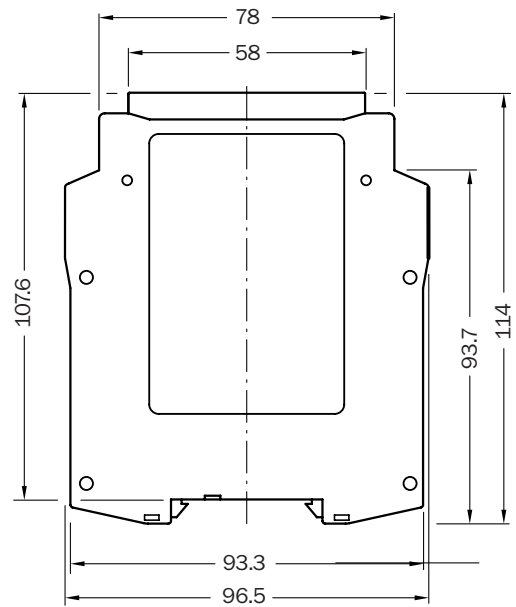
Monitoring of synchronisation

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.

Dimensional drawings



Housing with screw-type terminals

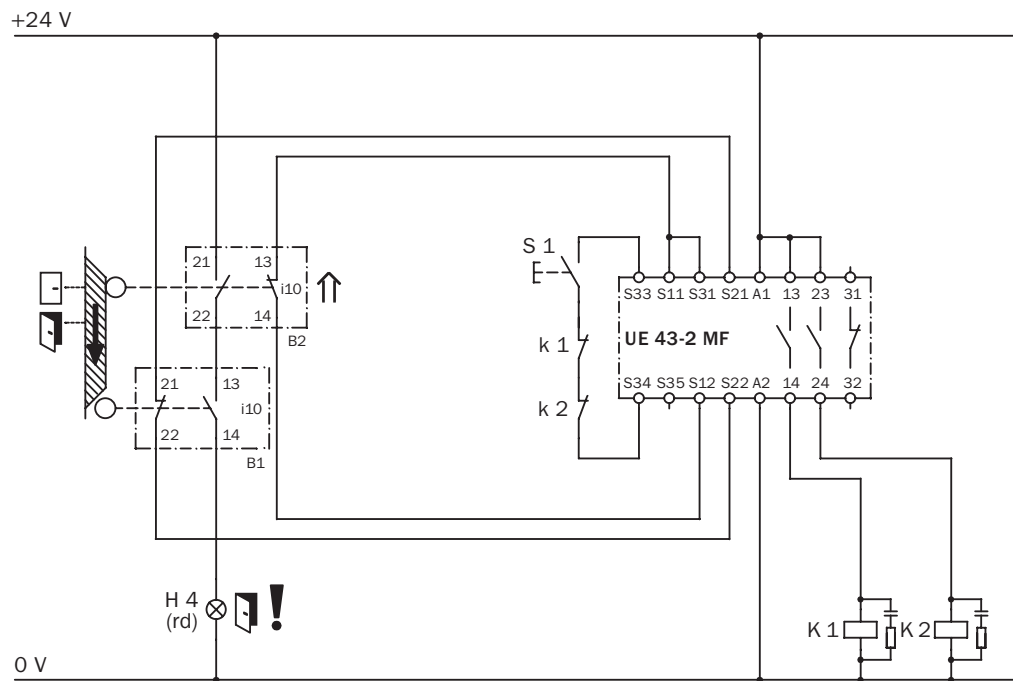


Housing with plug-in terminals

Dimensions in mm

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)

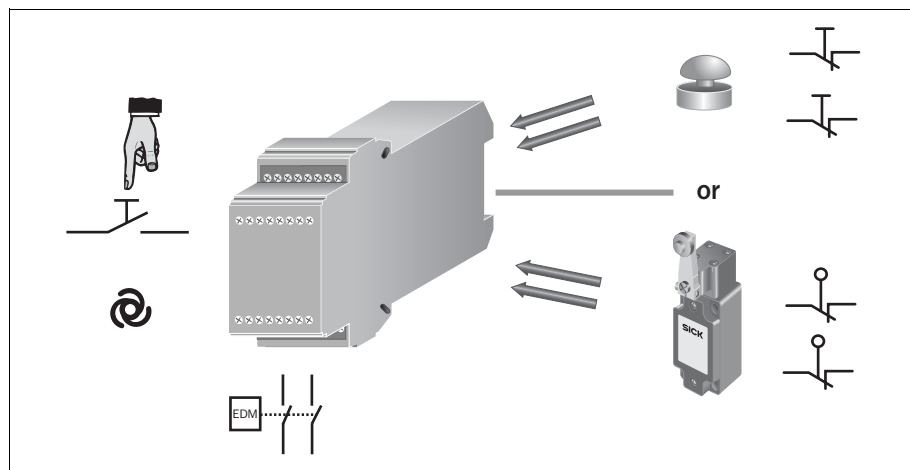
Overview of technical specifications

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

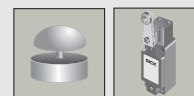
- Cross circuit detection on dual-channel wired systems
- 3 LEDs:
 - Supply voltage
 - Relay K 2
 - Relay K 3
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion units
 - UE 10-4 XT
 - UE 11-4 DX
- External device monitoring (EDM)

Applications

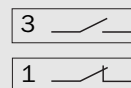


Ordering information

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



- For emergency stops
- For safety switches



Further information	Page
→ Symbols	L-2
→ Technical specifications	L-24
→ Internal circuitry	L-26
→ Dimensional drawings	L-27
→ Connection diagram	L-27
→ Expansion modules	L-67 L-70
→ Services	A-0

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 UE 43-3 MF 2 A0 UE 43-3 MF 2 A1 UE 43-3 MF 2 A2 UE 43-3 MF 2 A3	24 V DC (20.4 V DC ... 26.4 V DC) 24 V AC (20.4 V AC ... 26.4 V AC) 115 V AC (97.75 V AC ... 126.5 V AC) 120 V AC (102.0 V AC ... 132.0 V AC) 230 V AC (195.5 V AC ... 253.0 V AC)
Power consumption	AC DC	2.5 W / 3.2 VA 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 DC units
	Short circuit resistant transformer 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) Automatic (Y 14)
	150 ms ... 250 ms 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 Switching current Total current across all contacts
	10 V AC ... 230 V AC / 10 V DC ... 30 V DC 10 mA ... 6 A 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)

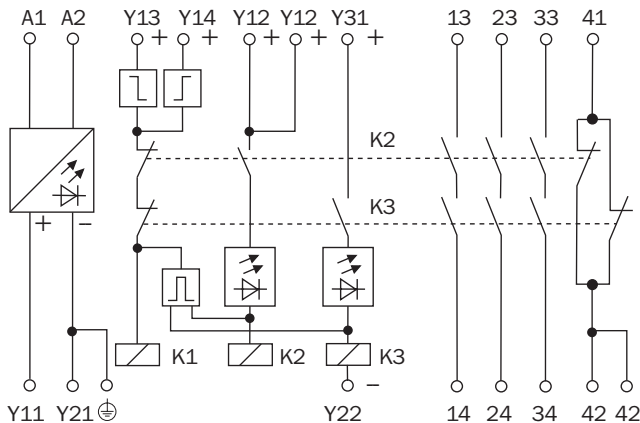
Permitted switching frequency	3600 c/h
Service life, mechanical (relay contacts)	1×10^7 switching cycles
Service life, electrical (dependent on the load)	2×10^6 switching cycles

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	

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.

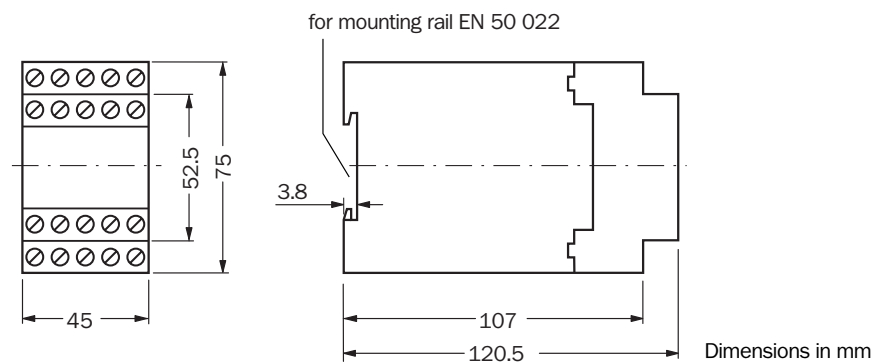
Cross circuit detection

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.

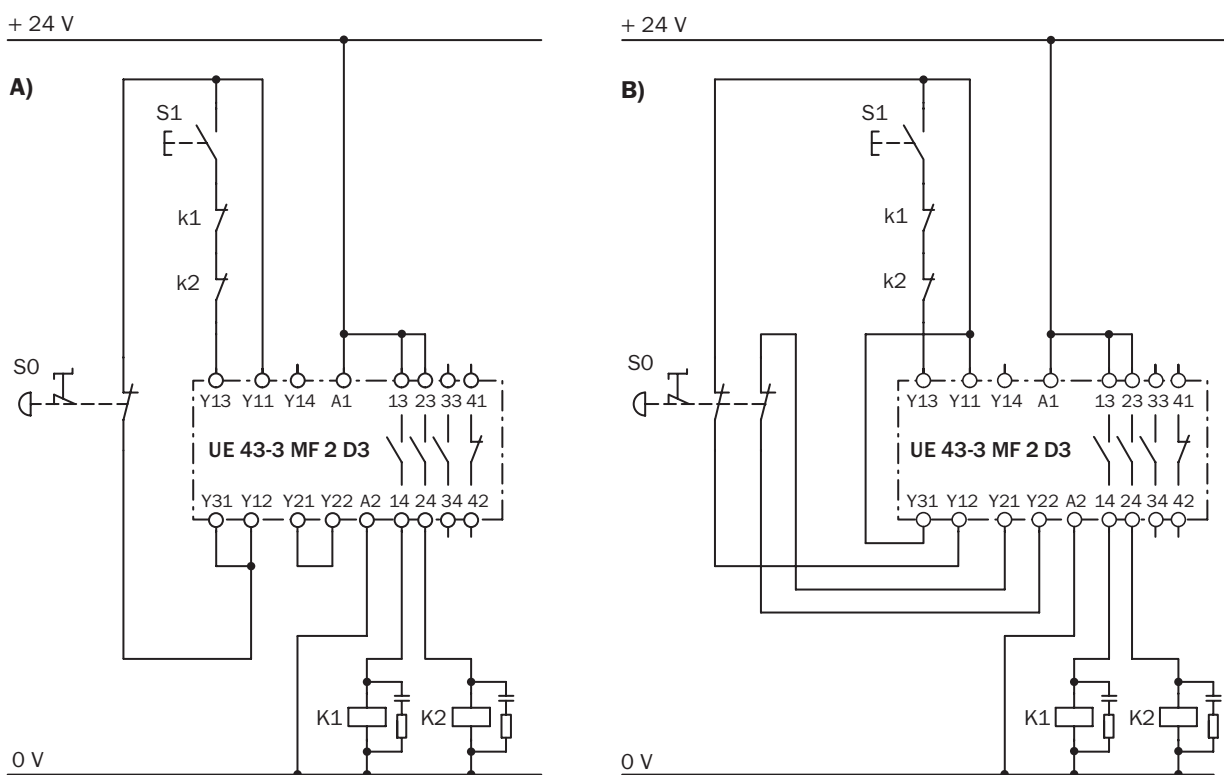
Dimensional drawings



Housing with screw-type terminals

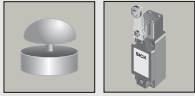
Connection diagram

Emergency stop switch connected to UE43-3MF2D3 safety relay

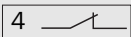
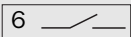


Operating mode: with manual reset and external device monitoring

- A) single-channel system
- B) dual-channel system



- For emergency stops
- For safety switches



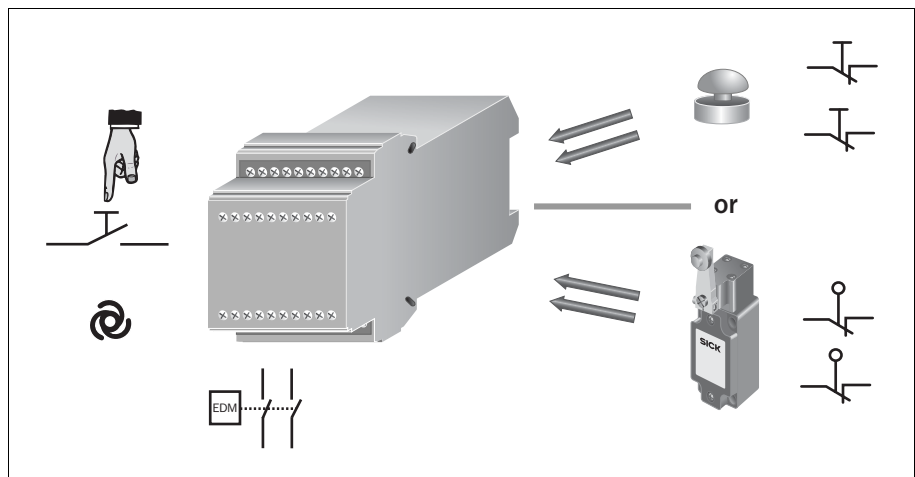
Overview of technical specifications

Control category according to EN 954-1	4
Number of enable current paths/signalling current paths	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

Further information	Page
→ Symbols	L-2
→ Internal circuitry	L-31
→ Dimensional drawings	L-31
→ Expansion modules	L-67 L-70
→ Services	A-0

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 Electrical output circuit < 25 V AC / 60 V DC	PELV
	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)

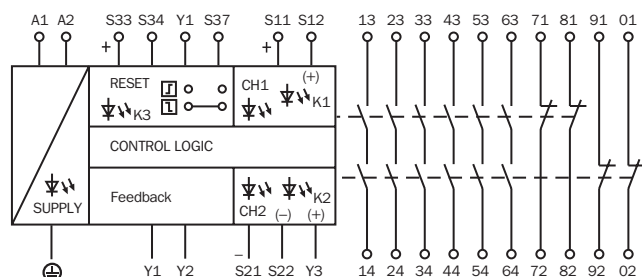
Response time (K 1 / K 2)	60 ms
Relay contacts	6 NO, enable current paths, safety relevant 4 NC, signalling current paths, not safety relevant
Contact type	Positively guided
Contact material	Silver alloy; gold-plated
Load capacity of contacts	
Switching voltage	10 V AC ... 230 V AC / 10 V DC ... 30 V 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

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

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.

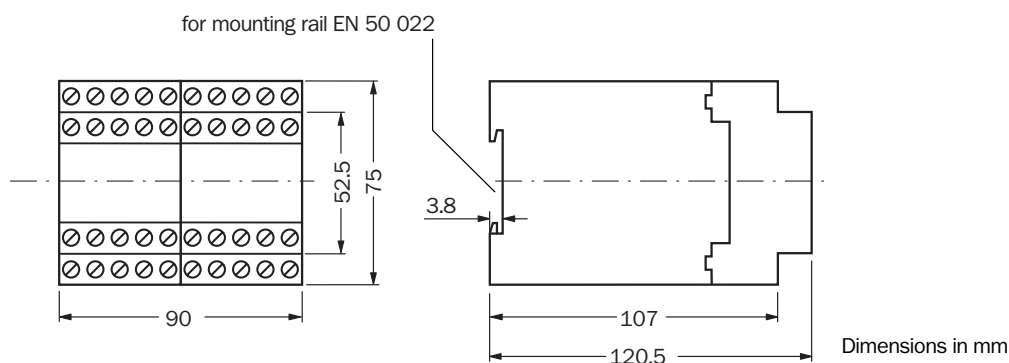
Cross circuit detection

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

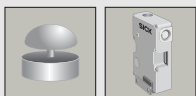
Monitoring of synchronisation

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.

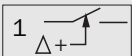
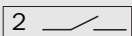
Dimensional drawings



Housing with screw-type terminals



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



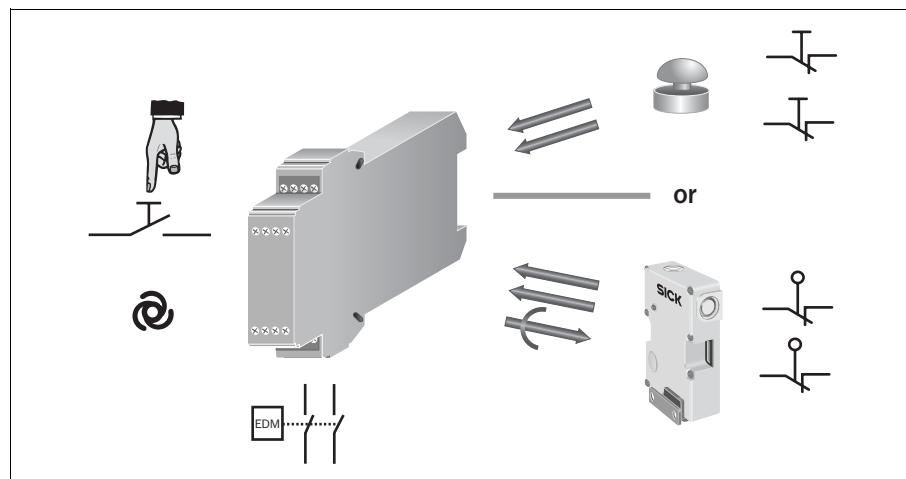
Overview of technical specifications

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

Further information	Page
→ Symbols	L-2
→ Internal circuitry	L-34
→ Dimensional drawings	L-35
→ Connection diagram	L-36
→ Expansion modules	L-67 L-70
→ Services	A-0

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 Electrical output circuit < 25 V AC / 60 V DC	PELV 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) Automatic (S 35)	30 ms 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 UE 44-3 SL xD3 30	0.15 s ... 3 s 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 Switching current Total current across all contacts	10 V AC ... 230 V AC / 10 V DC ... 30 V DC 10 mA ... 6 A 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

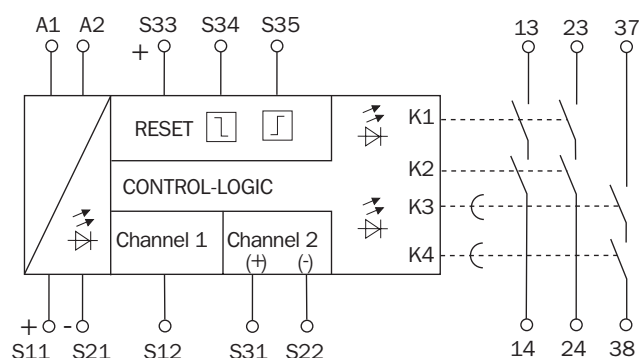
Operating data

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

Continued on next page

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.

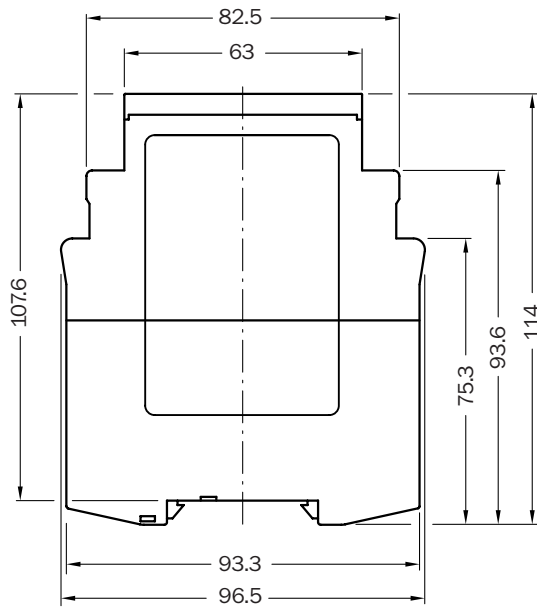
Cross circuit detection

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

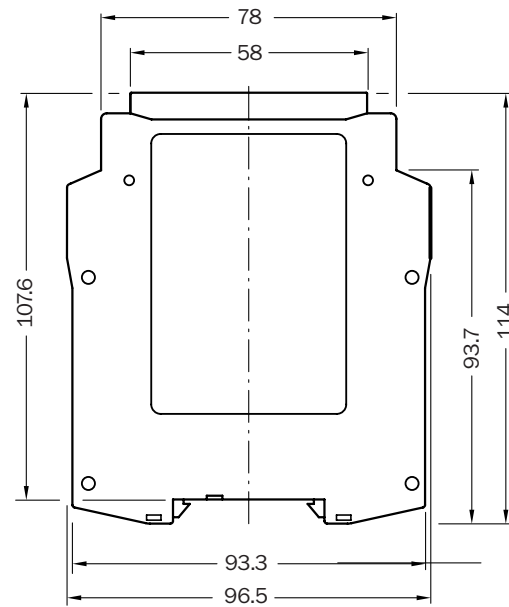
Monitoring of synchronisation

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.

Dimensional drawings



Housing with screw-type terminals

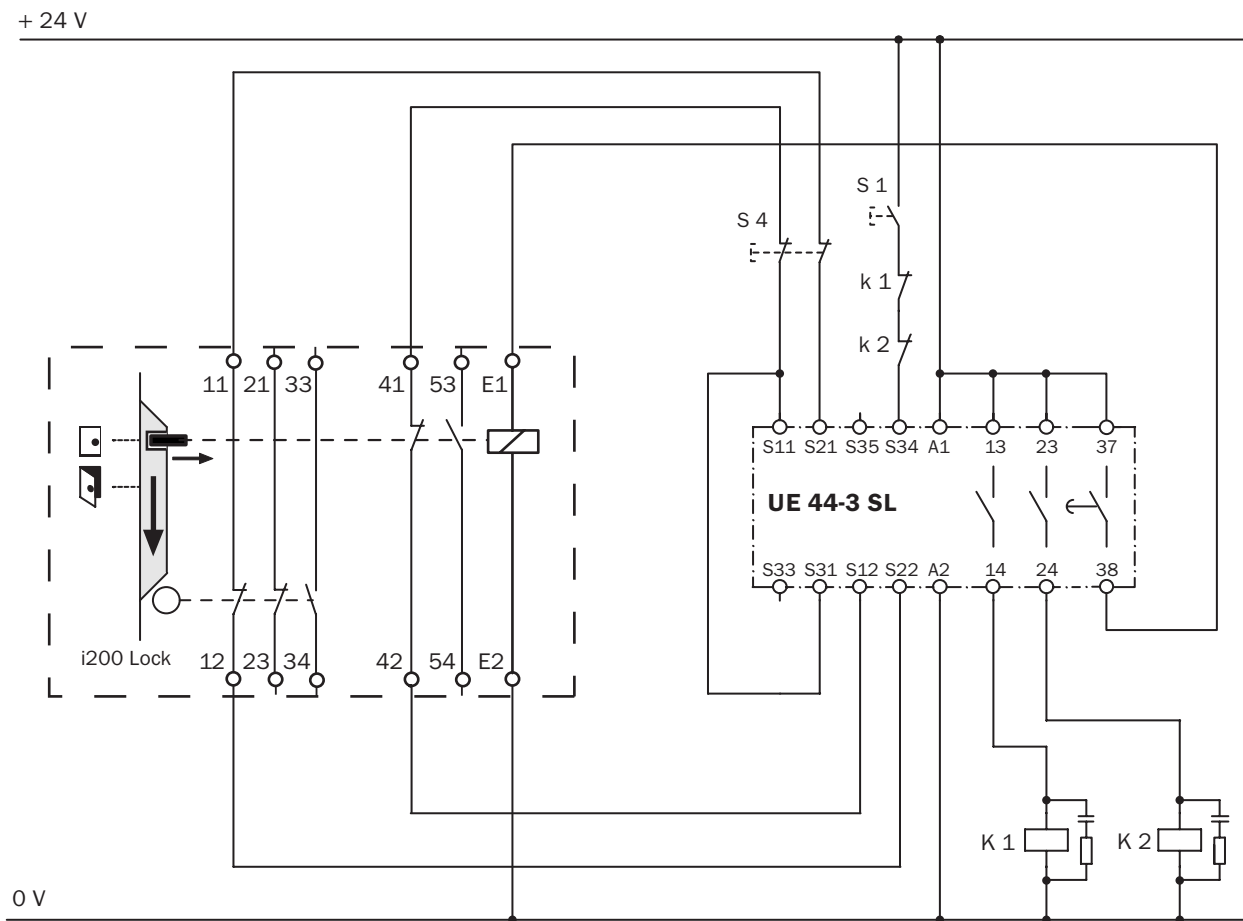


Housing with plug-in terminals

Dimensions in mm

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)

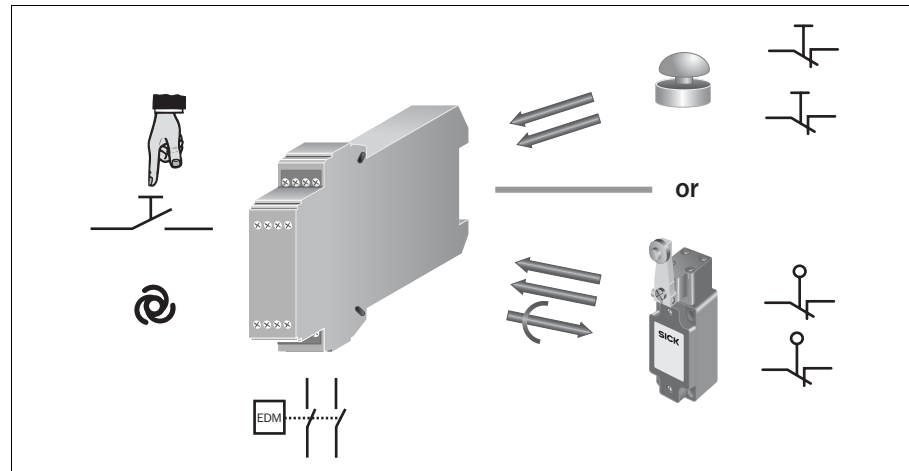
Overview of technical specifications

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

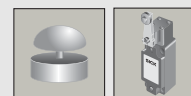
- Cross circuit detection on dual-channel wired systems
- Outputs:
 - 2 normally open contacts
 - 1 normally open contact with off-delay, adjustable from 0.15 ... 3 s or 1.5 ... 30 s
- 3 LEDs:
 - Supply voltage
 - Relay K 1 / K 2 (without delay)
 - Relay K 3 / K 4 (delayed)
- Manual reset
- Automatic 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

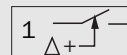
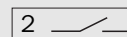


Ordering information

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



- For emergency stops
- For safety switches



Further information	Page
→ Symbols	L-2
→ Technical specifications	L-38
→ Internal circuitry	L-39
→ Dimensional drawings	L-40
→ Connection diagram	L-41
→ Expansion modules	L-67 L-70
→ Services	A-0

Detailed technical specifications

General system data

Supply voltage to A 1 / A 2	Electrical output circuit > 25 V AC / 60 V DC Electrical output circuit < 25 V AC / 60 V DC	PELV 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) Automatic (S 35)
	30 ms 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)

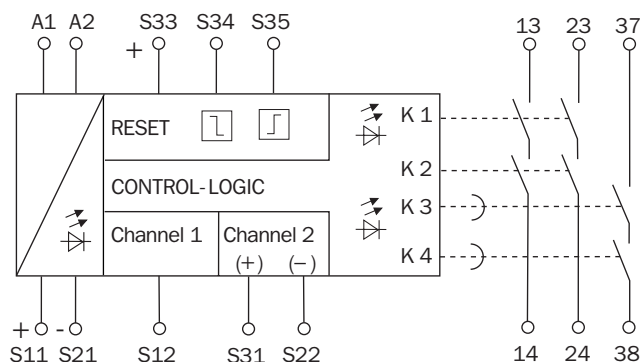
Response time (K 1 / K 2)	25 ms
Off-delay time (K 3 / K 4)	UE 45-3 S1 xD3 3 UE 45-3 S1 xD3 30
	0.15 s ... 3 s 1.5 s ... 30 s
Relay contacts	2 NO, enable current paths, safety Cat. 4 1 NO, enable current path, off-delayed, safety Cat. 3
Contact type	Positively guided
Contact material	Silver alloy; gold-plated
Load capacity of contacts	Switching voltage Switching current Total current across all contacts
	10 V AC ... 230 V AC / 10 V DC ... 30 V DC 10 mA ... 6 A 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
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

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 immediately 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.

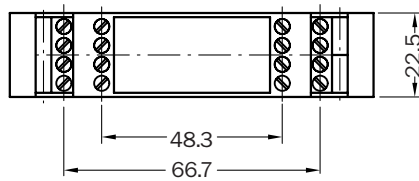
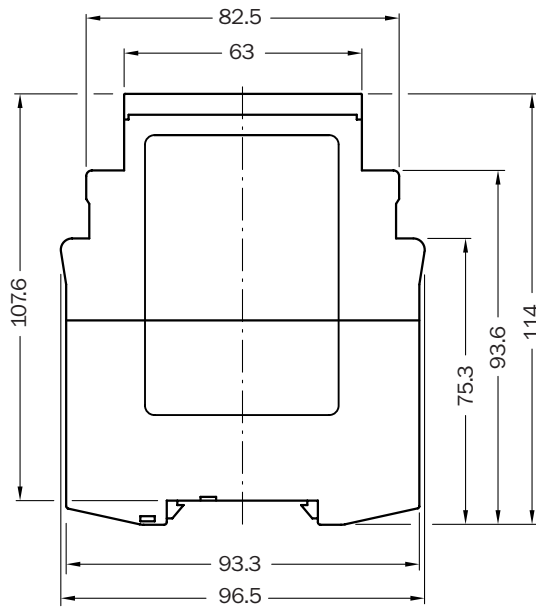
Cross circuit detection

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

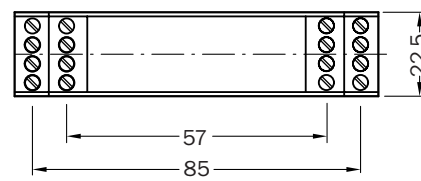
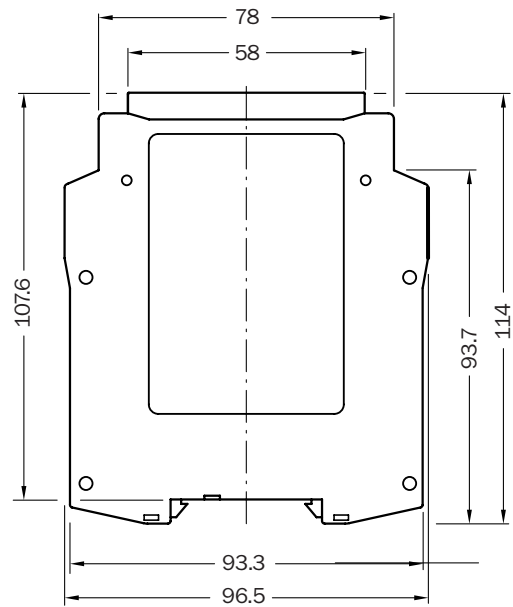
Monitoring of synchronisation

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.

Dimensional drawings



Housing with screw-type terminals

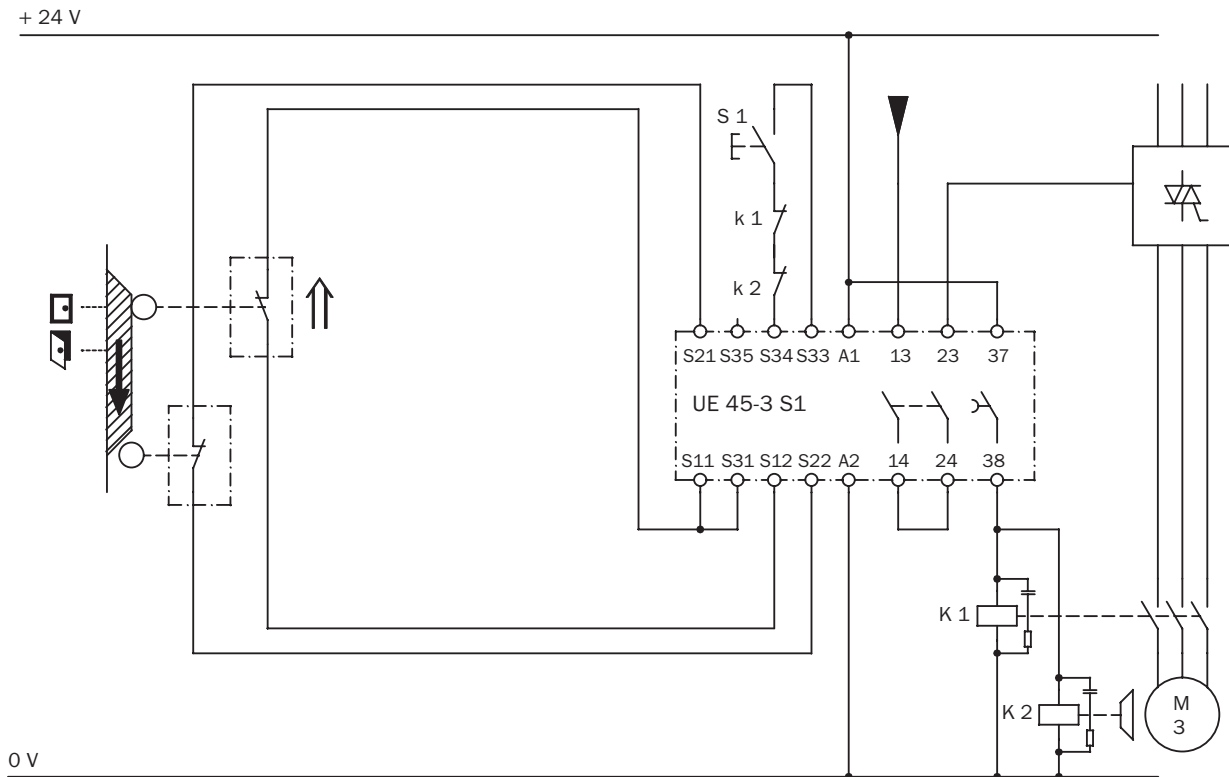


Housing with plug-in terminals

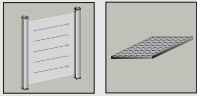
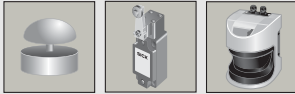
Dimensions in mm

Connection diagram

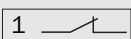
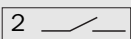
Two safety switches connected to UE 45-3 S1 safety relay



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



- 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



Further information	Page
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→ Dimensional drawings	L-45
→ Connection diagrams	L-46
→ Expansion modules	L-67 L-70
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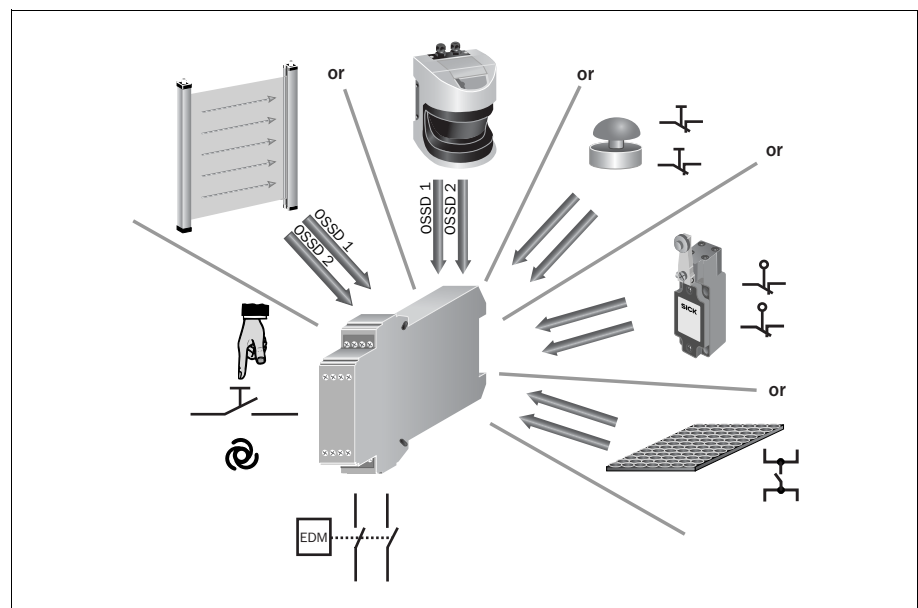
Overview of technical specifications

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	UE48-20S2D2	6 024 915
Plug-in terminals	UE48-20S3D2	6 024 916

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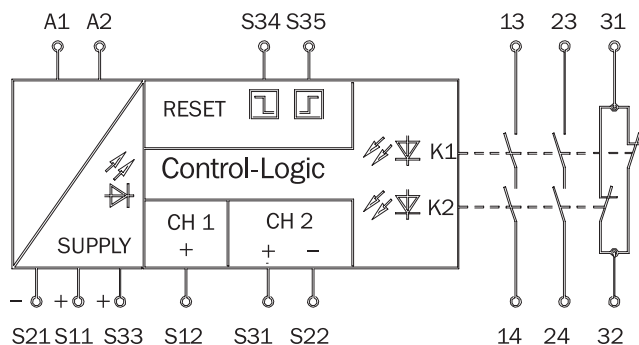
Permitted switching frequency	3600 c/h
Service life, mechanical (relay contacts)	1 x 10 ⁷ switching cycles
Service life, electrical (dependent on the load)	2 x 10 ⁶ switching cycles

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
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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.

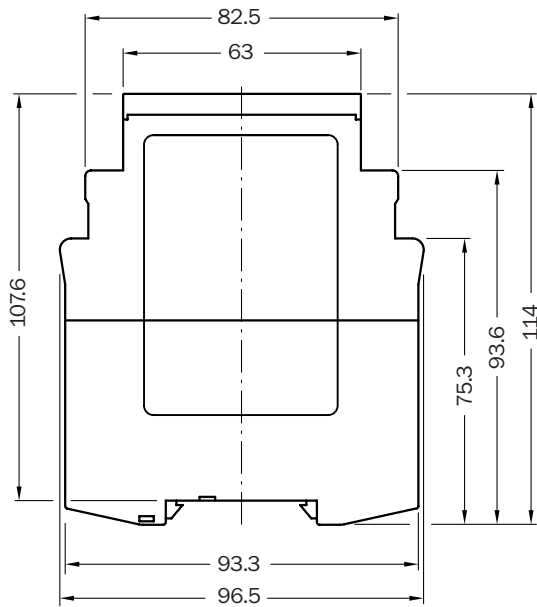
Automatic reset

- 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.

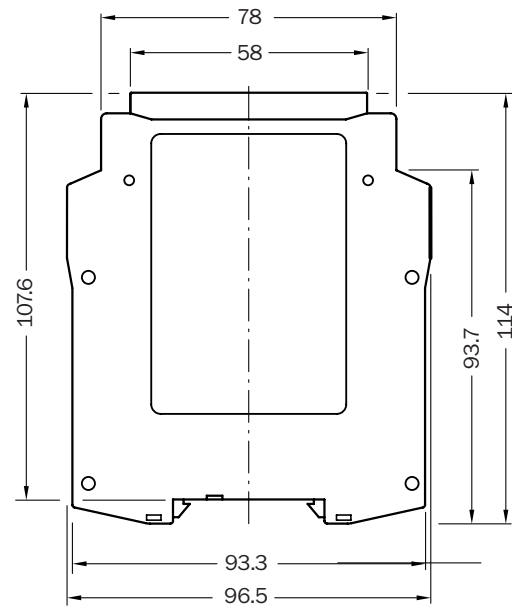
Cross circuit detection

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

Dimensional drawings



Housing with screw-type terminals

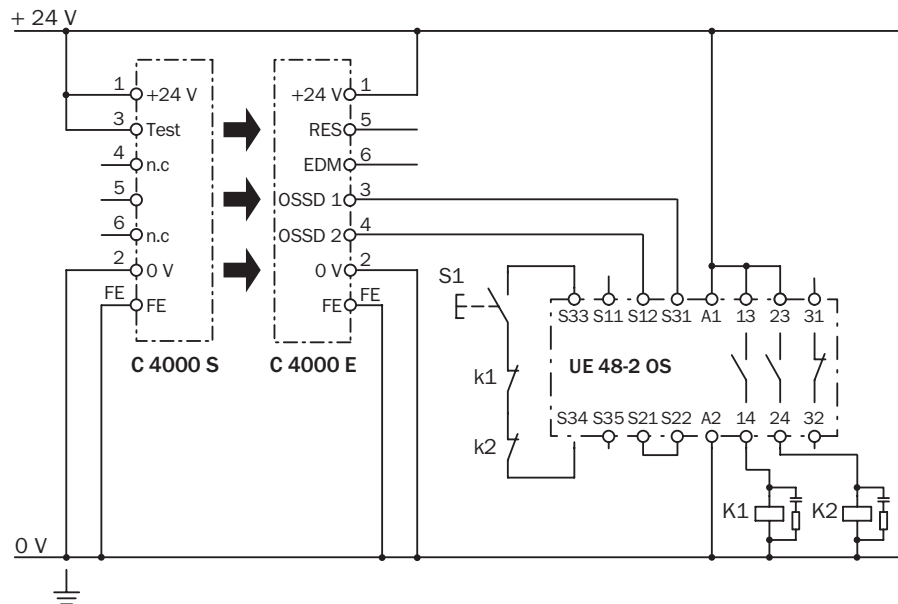


Housing with plug-in terminals

Dimensions in mm

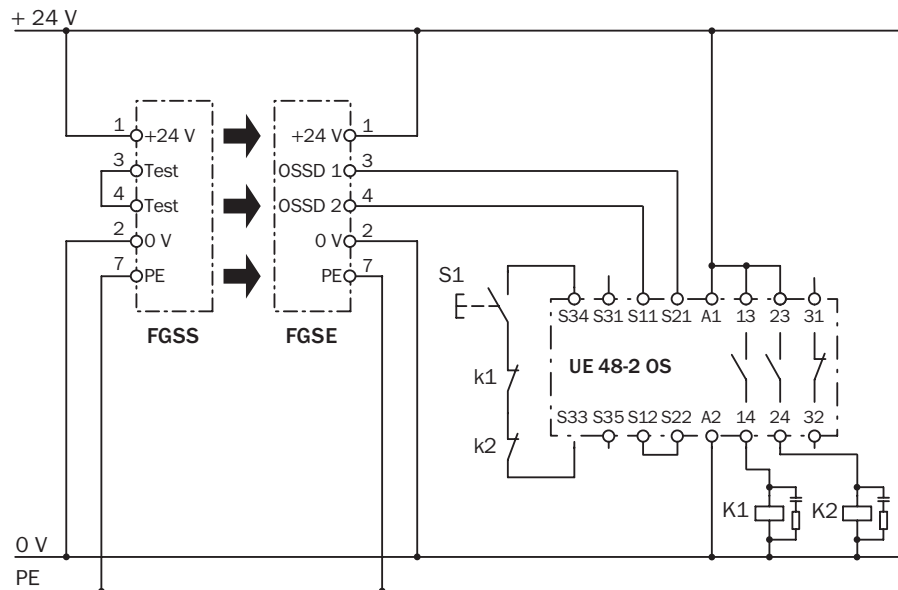
Connection diagrams

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



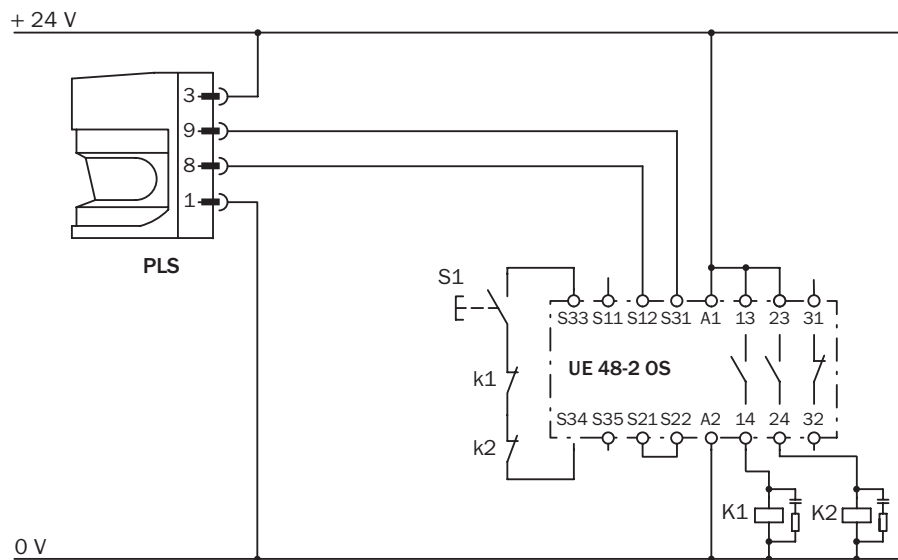
Operating mode: with manual reset and external device monitoring (EDM)

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

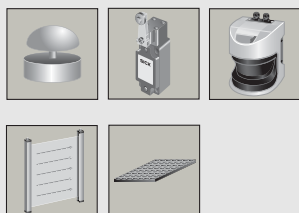


Operating mode: with manual reset and external device monitoring (EDM)

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



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



- 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 —



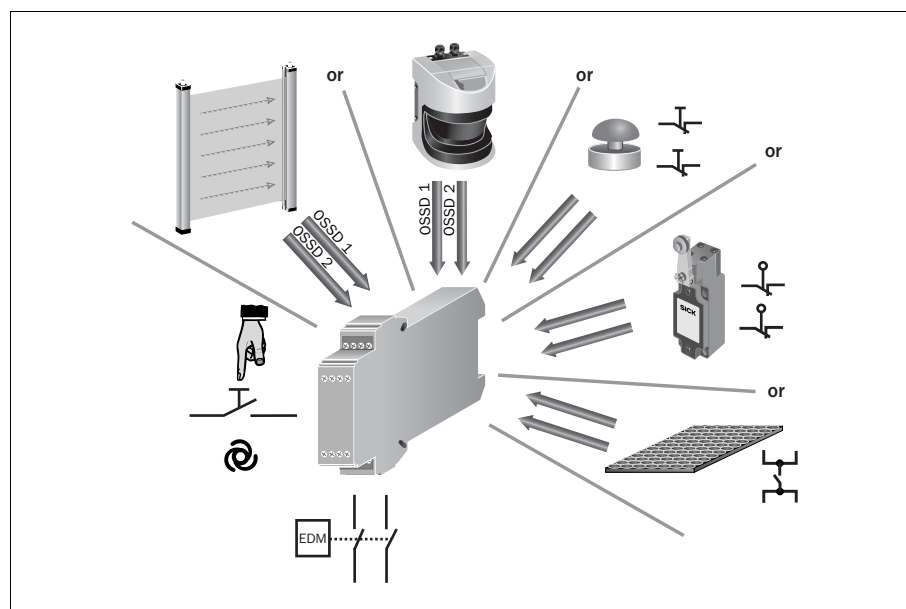
Overview of technical specifications

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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→ Internal circuitry	L-51
→ Dimensional drawings	L-52
→ Connection diagrams	L-46
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Ordering information

Connection type	Type	Part number
Screw-type terminals	UE48-30S2D2	6 025 089
Plug-in terminals	UE48-30S3D2	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 μ s / 10 s ⁻¹
Line resistance at the input circuit	< 35 Ω

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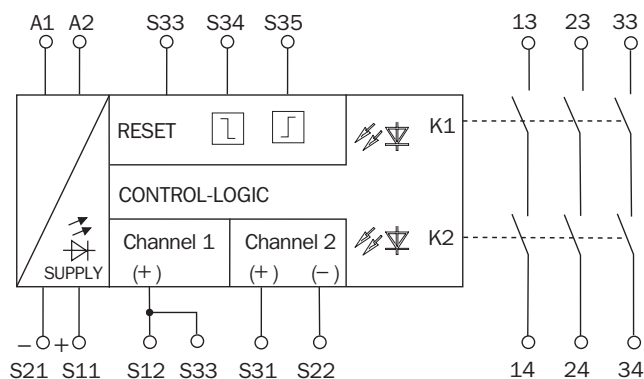
Output circuits (13 - 14, 23 - 24, 31 - 32 / 33 - 34)

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

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.

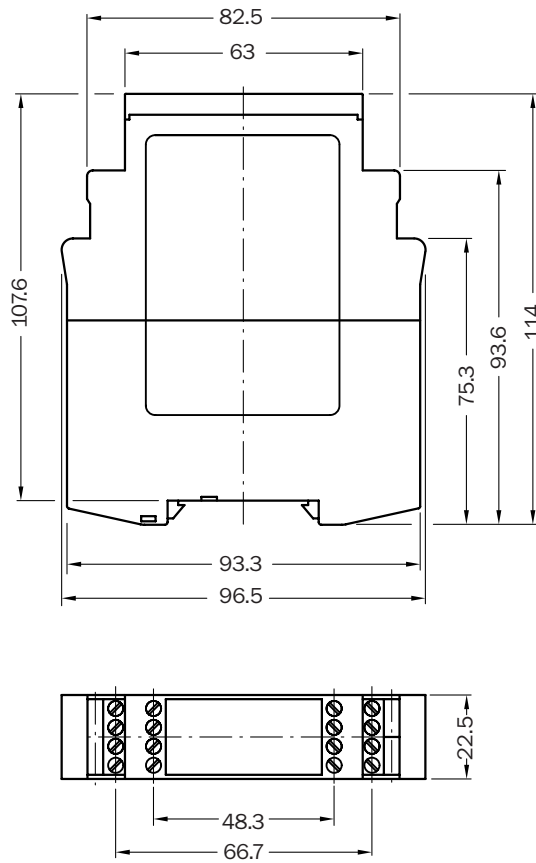
Automatic reset

- 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.

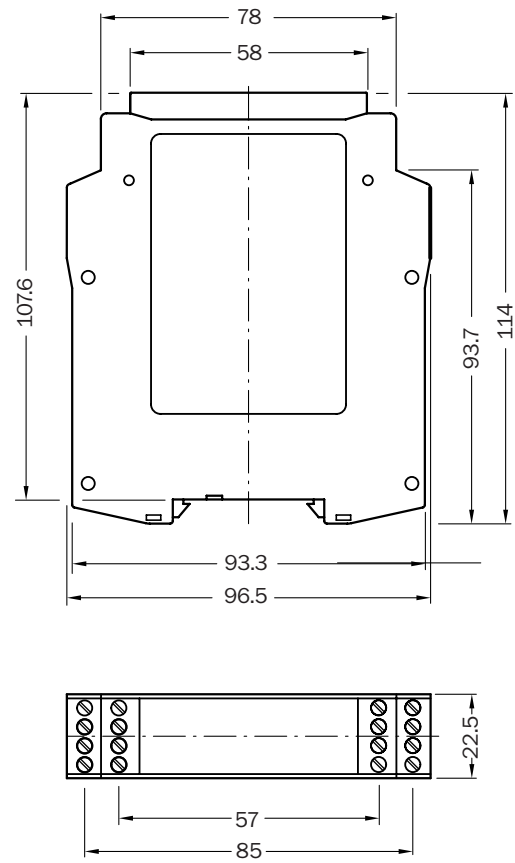
Cross circuit detection

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

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

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

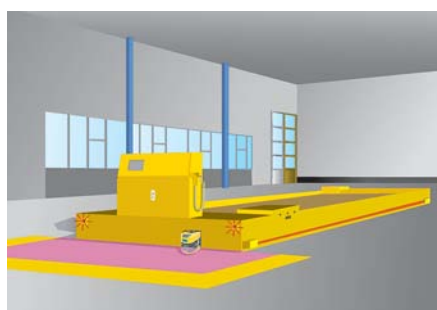
- 2 OSSDs, PNP, monitored and short-circuit protected
- External test pulse not required
- Functions individually selectable

In-system added value

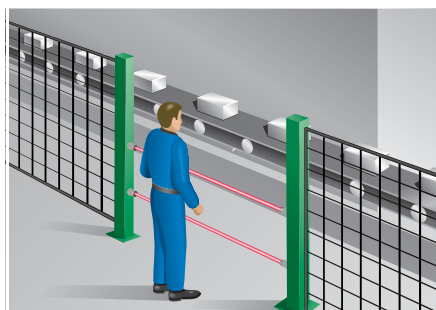
Evaluation unit for:

- 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

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



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



Further information	Page
→ Technical specifications	L-54
→ Internal circuitry	L-55
→ Dimensional drawings	L-56
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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: <ul style="list-style-type: none"> ▪ 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 connection to the system connector)	PNP, monitored and short-circuit-proof
Switching current I_{\max} Switching voltage V_{\max} Switching capacity P_{\max} Inductive switching capacity $P_{\max \text{ ind}}$ Protective field free V Protective field interrupted V Residual current at signal level "0" I Max. capacitive load	500 mA $V_S - 2.0 \text{ V}$ at 500 mA 13.2 W 1 VA V_{\max} 0 V 0.1 mA 200 nF at I: 50 mA 2.5 μF at I: 500 mA
Test period test rate Test pulse width	2 s 150 μs approx.
Test A, Test B (inactive/active)	$V_S - 2.65 \text{ V}/0 \text{ V}$ Total current Test A + Test B < 10 mA Max. capacitive load 10 μF

L

Operating data

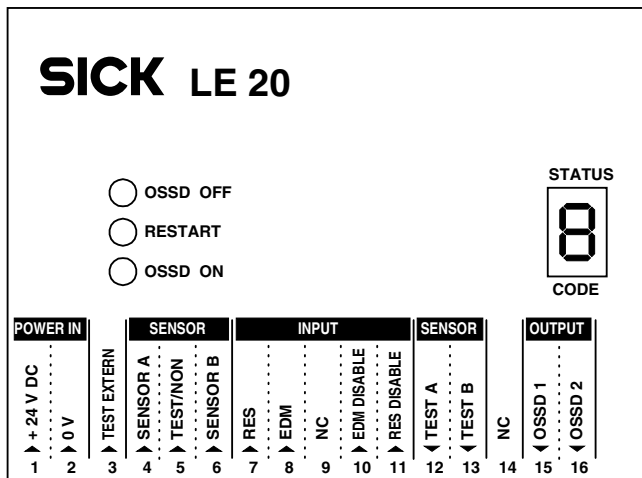
Protection class	III ²⁾
Enclosure rating	IP 20, IP 65 optional
Safety category according to EN 61496	Type 2
Ambient operating temperature	–20 °C ... +60 °C
Storage temperature	–25 °C ... +75 °C
Air humidity (non condensing)	15 % ... 95 %
Vibration resistance	5g, 10 Hz ... 55 Hz according to IEC 60068-2-6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

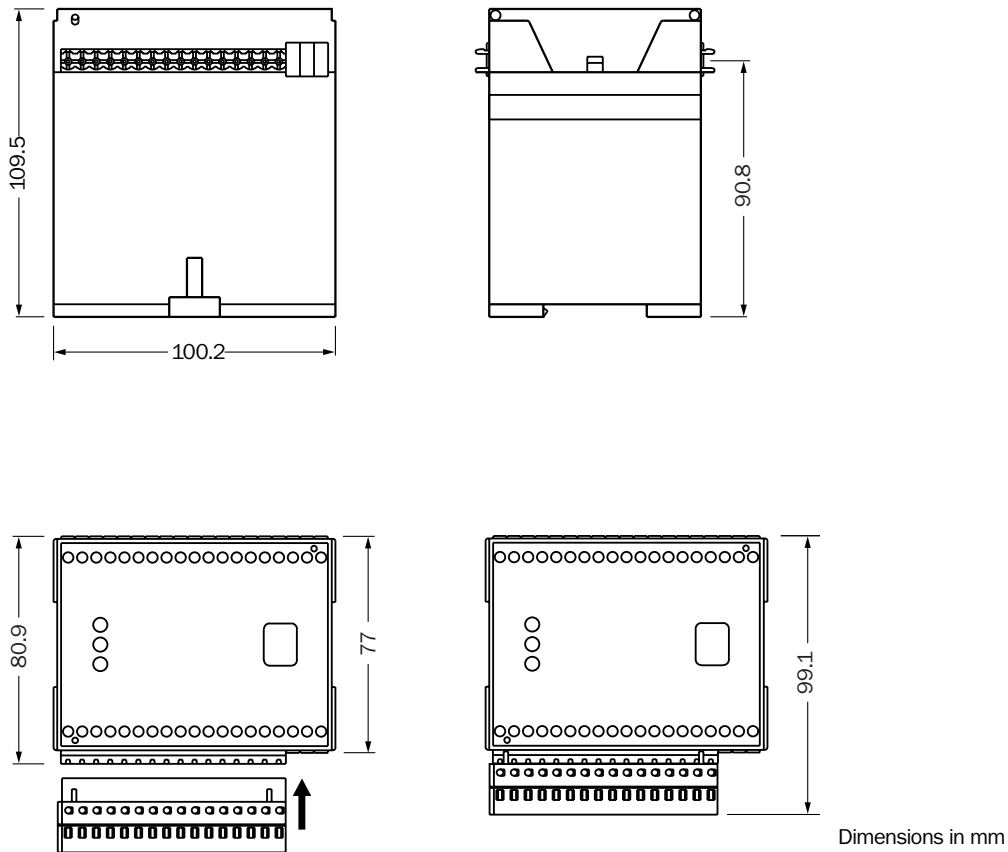
²⁾ The circuits connected to the inputs and outputs must conform to the creepage and clearance distances specified in the relevant standards with regard to safe isolation in accordance with PELV (EN 60204, 6.4)

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.

Dimensional drawings



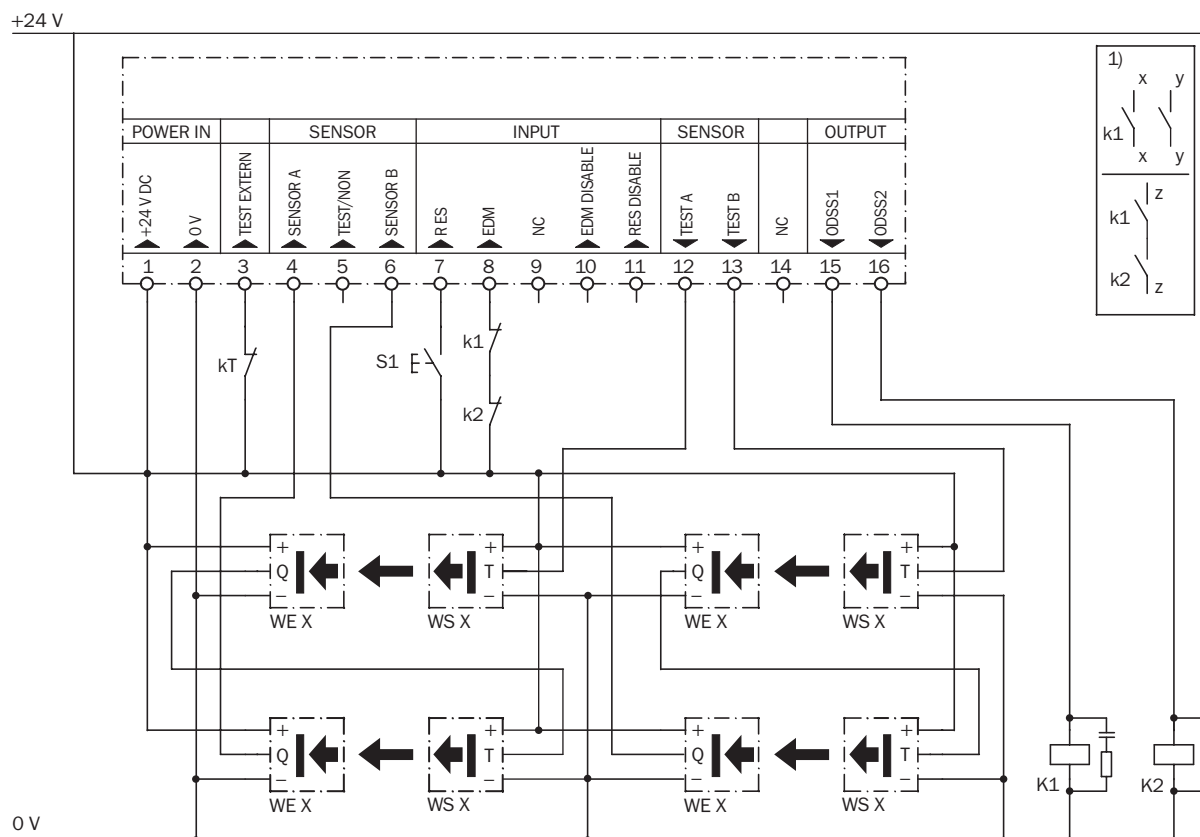
Mechanical dimensions, LE 20 with screw clamps, IP 20



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Connection diagrams

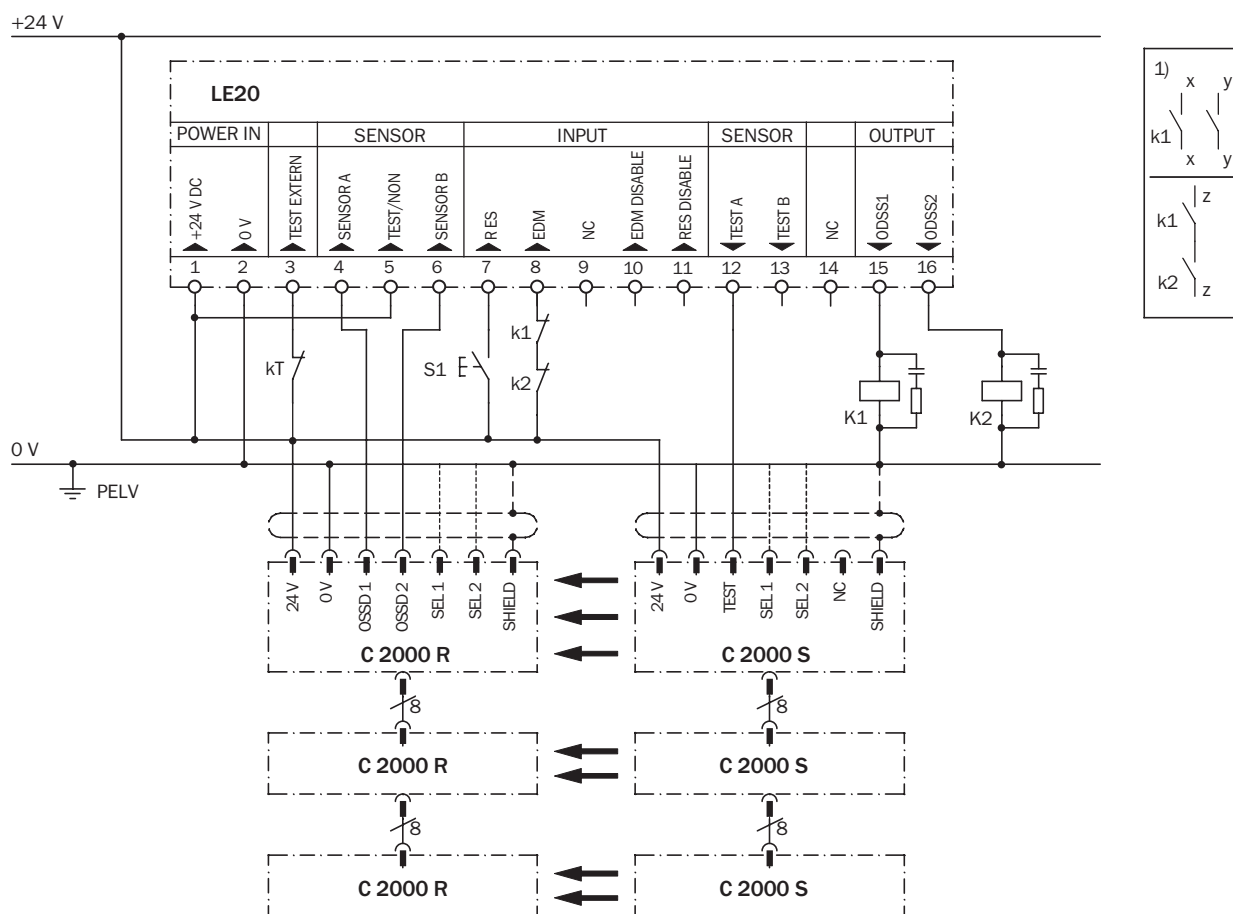
Safety relay LE 20 with 4 single-beam photoelectric safety switches WS/WE 27-2, WS/WE 18-2 or WS/WE 12-2



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.

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	UE10-20S2DO	2 019 772
	With spring clamp terminal connector	UE10-20S4DO	2 019 771



- 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

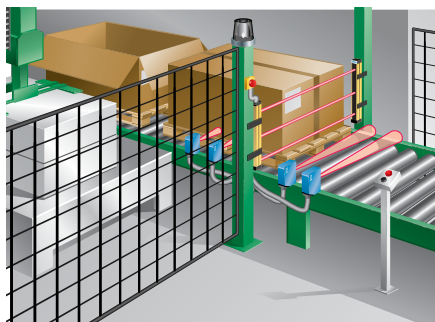
- 2 OSSDs, PNP, monitored and short-circuit protected
- External test pulse not required
- Functions individually selectable
- Up to 4 muting inputs, sensor or PLC signals possible
- Muting monitoring functions: sequence and concurrence operation possible
- Integrated override function

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

Further information	Page
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→ Dimensional drawings	L-63
→ Connection diagrams	L-65
→ Accessories	L-66
→ Services	A-0

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: <ul style="list-style-type: none"> ▪ 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 connection to the system connector)	PNP, monitored and short-circuit-proof
Switching current I_{\max} Switching voltage V_{\max} Switching capacity P_{\max} Inductive switching capacity $P_{\max \text{ ind}}$ Protective field free V Protective field interrupted V Residual current at signal level "0" I Max. capacitive load	500 mA $V_S - 2.0 \text{ V at } 500 \text{ mA}$ 13.2 W 1 VA U_{\max} 0 V 0.1 mA 200 nF bei $I = 50 \text{ mA}$ 2.5 µF bei $I = 500 \text{ mA}$
Test period test rate Test pulse width	2 s 150 µs approx.
Test A, Test B (inactive/active)	$V_S - 2.65 \text{ V/0 V}$ 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

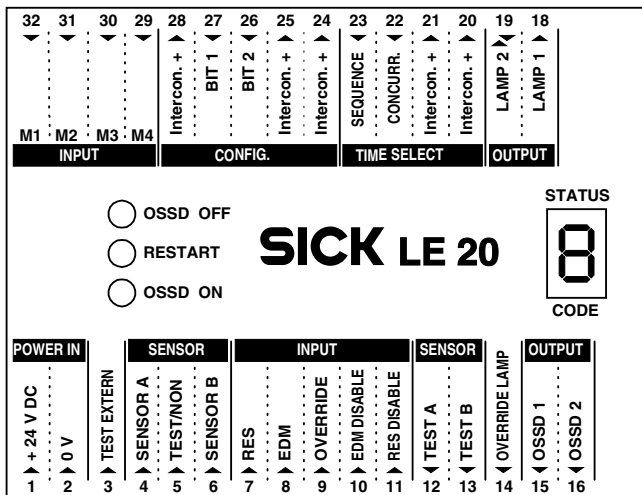
Protection class	III ²⁾
Enclosure rating	IP 20, IP 65 optional
Safety category according to EN 61496	Type 2
Ambient operating temperature	–20 °C ... +60 °C
Storage temperature	–25 °C ... +75 °C
Air humidity (non condensing)	15 % ... 95 %
Vibration resistance	5g, 10 Hz ... 55 Hz according to IEC 60068-2-6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

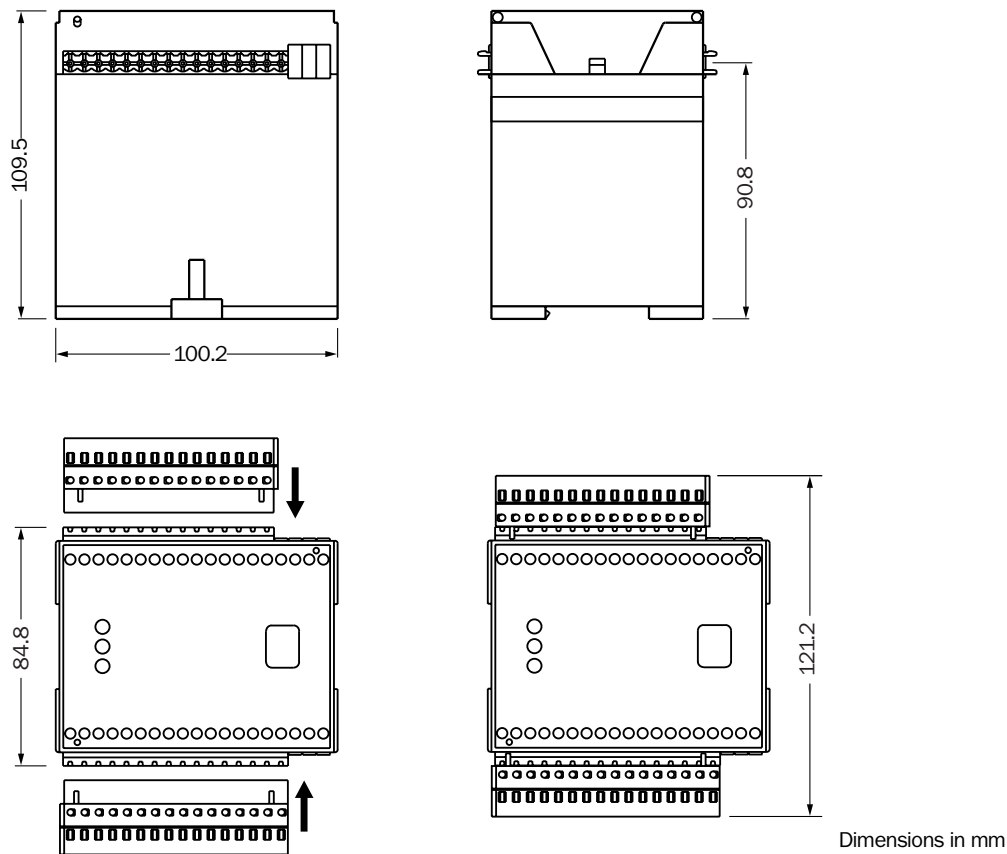
Internal circuitry



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.

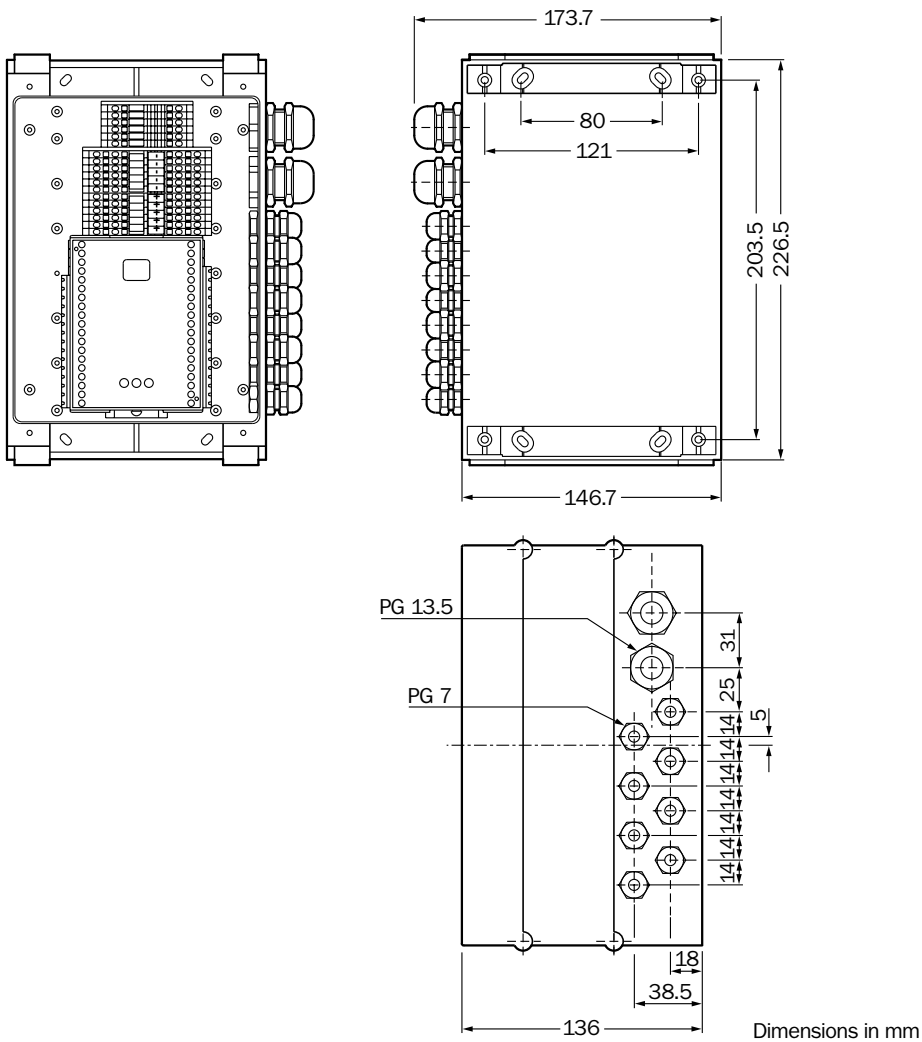
The expanded LE 20 Muting version uses additional muting sensors to distinguish objects entering the danger zone past the photoelectric switches from human beings, and allows the objects to pass without stopping the machine.

Dimensional drawings



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

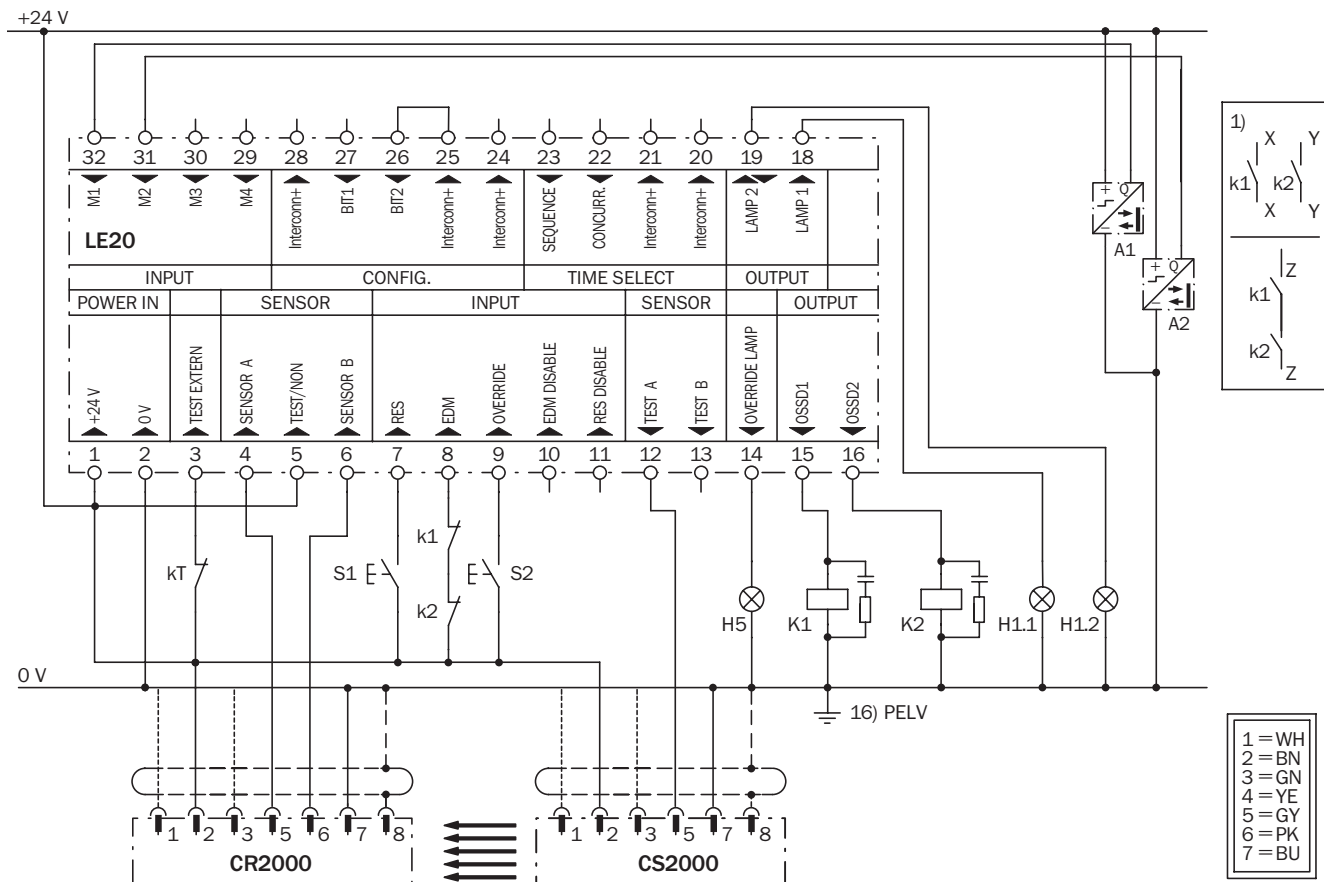
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Mechanical dimensions, IP-65 housing for LE 20-Muting

Connection diagrams

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

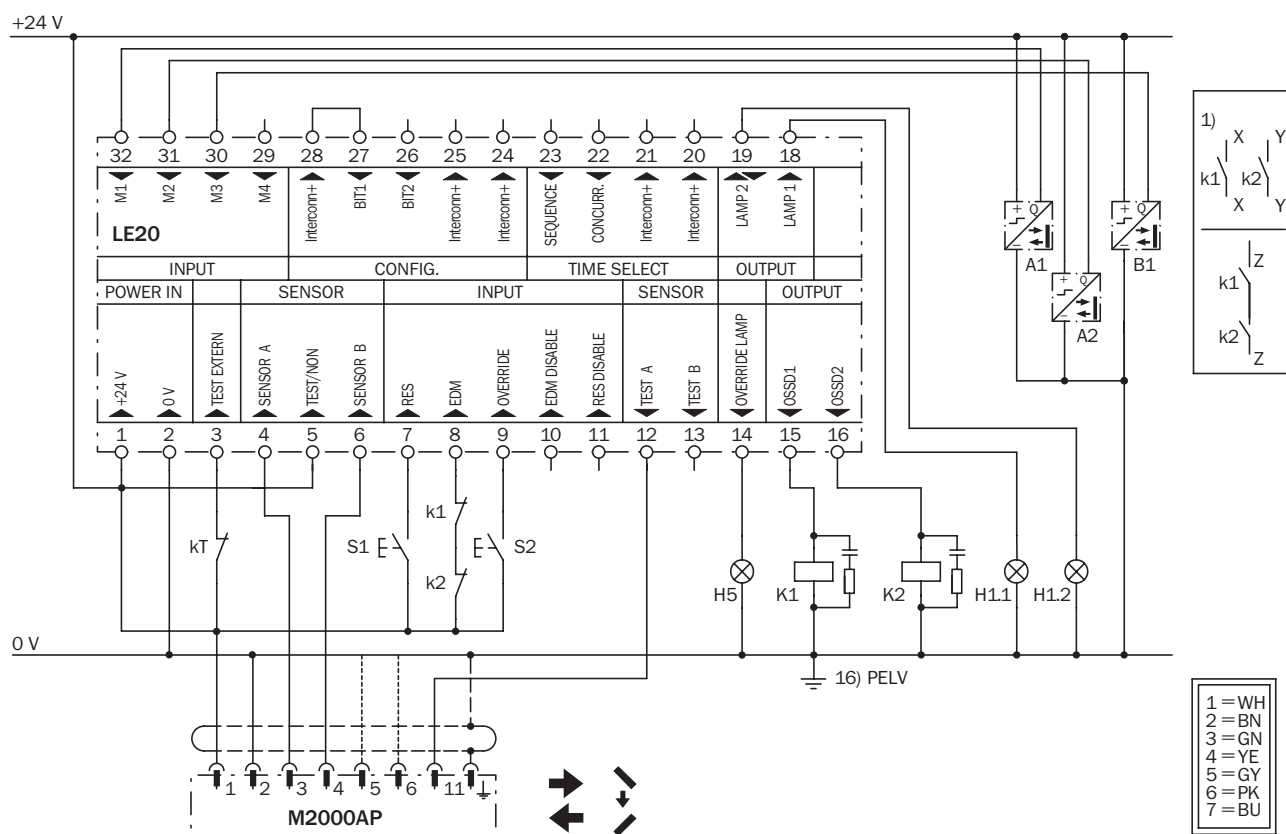


These contacts must be integrated into the control system such that when the output circuit is open the hazardous state is eliminated.

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.

Continued on next page

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	UE10-20S2D0	2 019 772
	With spring clamp terminal connector	UE10-20S4D0	2 019 771

Muting indicator lamps

Description	Delivery/cable length	Part number
Muting indicator lamp, bulb	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

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

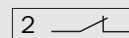
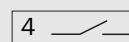
- Applicable with UE 10 - UE 48 units

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)



Further information	Page
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→ Technical specifications	L-68
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→ Dimensional drawings	L-69
→ Services	A-0

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)

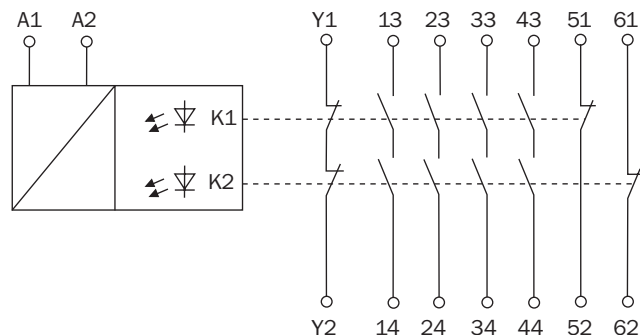
Response time (K 1 / K 2)		40 ms
Relay contacts		4 NO, enable current paths, safety relevant 2 NC, signalling current paths, not safety relevant 1 NC, contactor monitoring
Contact type		Positively guided
Contact material		Silver alloy; gold-plated
Load capacity of contacts	Switching voltage enable current 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.

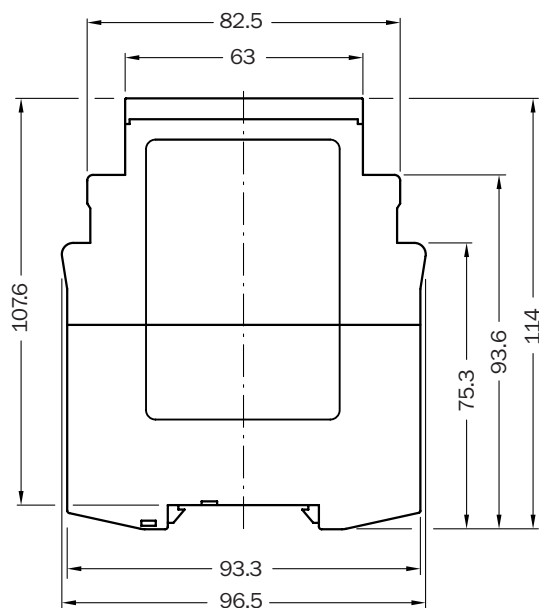
Upon applying the supply voltage to terminals A 1 and A 2, relays K 1 and K 2 are energised (the LEDs for both relays illuminate): The 4 output contacts close, the two normally closed contacts and the EDM (feedback) circuit switch to open circuit status.

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

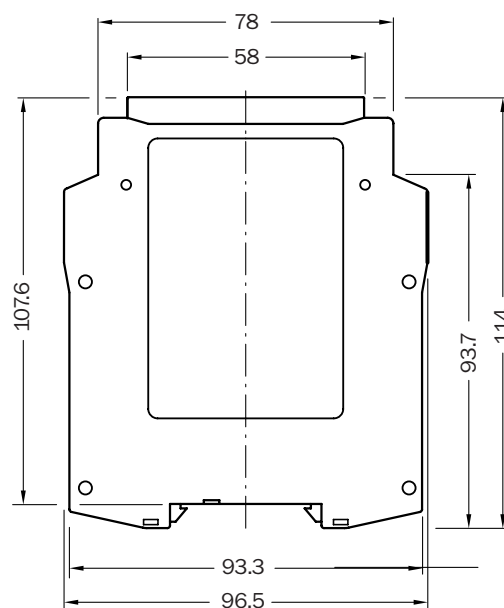
External device monitoring (EDM)

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

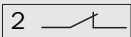
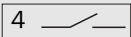


Housing with plug-in terminals

Dimensions in mm



- 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

Further information	Page
→ Symbols	L-2
→ Internal circuitry	L-72
→ Dimensional drawings	L-73
→ Services	A-0

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

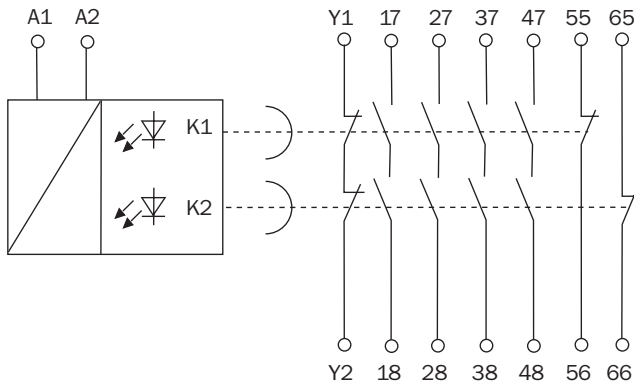
Switch-off delay time (depending on type)	0.5 s, 1 s, 2 s or 3 s
Influence of the supply voltage	0.5 (%/‰ ΔU_N)
Influence of ambient temperature	0.4 (%/K)
Mean value of error (% + ± 10 ms)	± 20
Dispersion (% + ± 10 ms)	± 2
Relay contacts	4 NO, enable current paths, safety relevant 2 NC, signalling current 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
---------------	--------

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.

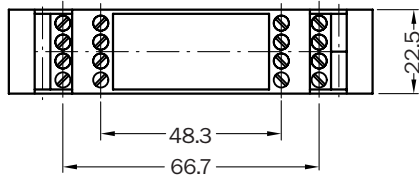
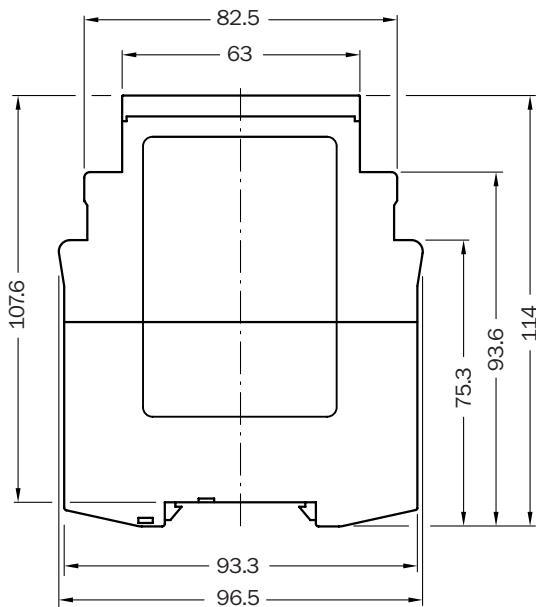
When the output contacts of the standard unit opens (e.g. by activation of the emergency stop switch), the relays K 1 and K 2 de-energise after a unit specific delay. These fixed switch-off delay times of 0.5 s, 1 s, 2 s and 3 s are according to the type.

This is achieved by means of capacitors, so that even in the event of power supply failure the off-delay runs its 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.

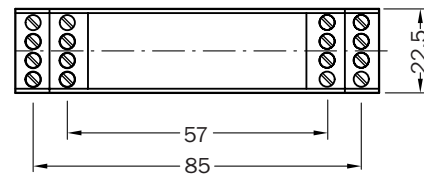
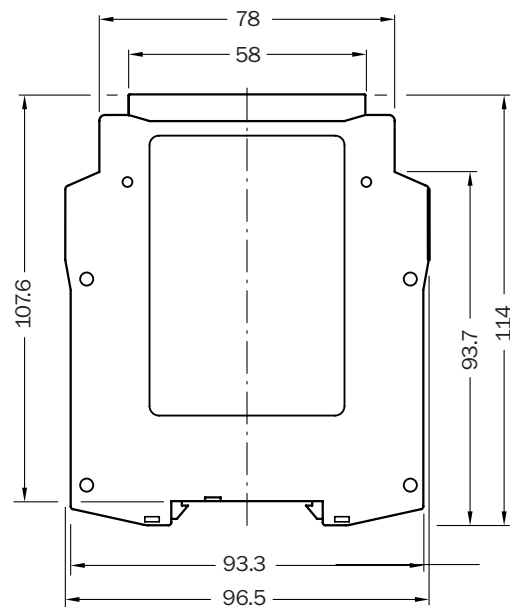
External device monitoring (EDM)

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.

Dimensional drawings



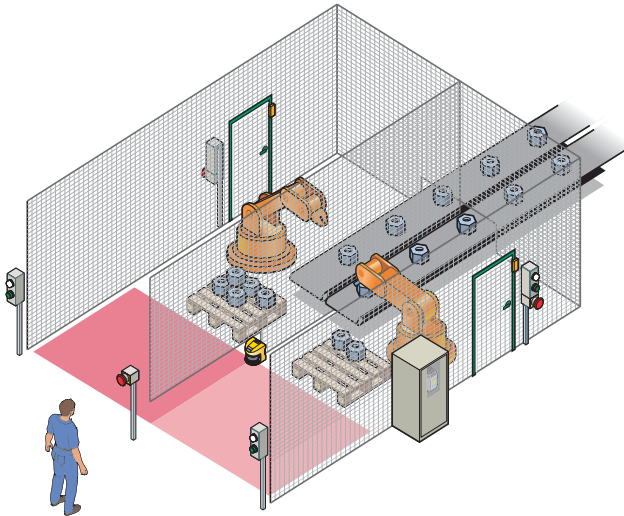
Housing with screw-type terminals



Housing with plug-in terminals

Dimensions in mm

Applications



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

Simultaneous hazardous area monitoring with S 3000 and UE 440

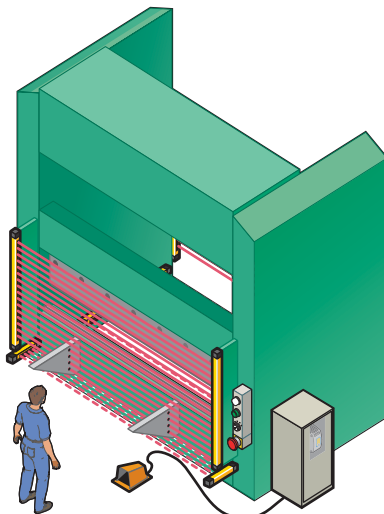
The hazardous areas on two robot cells are secured using a UE 440 safety controller in conjunction with a S 3000 safety laser scanner. For this purpose two safety applications are configured in the UE 440.

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)

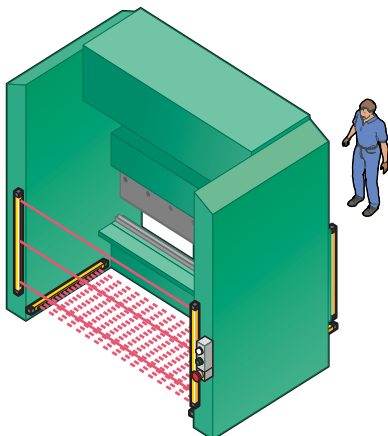
Press Protection with M 2000, C 4000 and UE 470

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.

Safety controllers



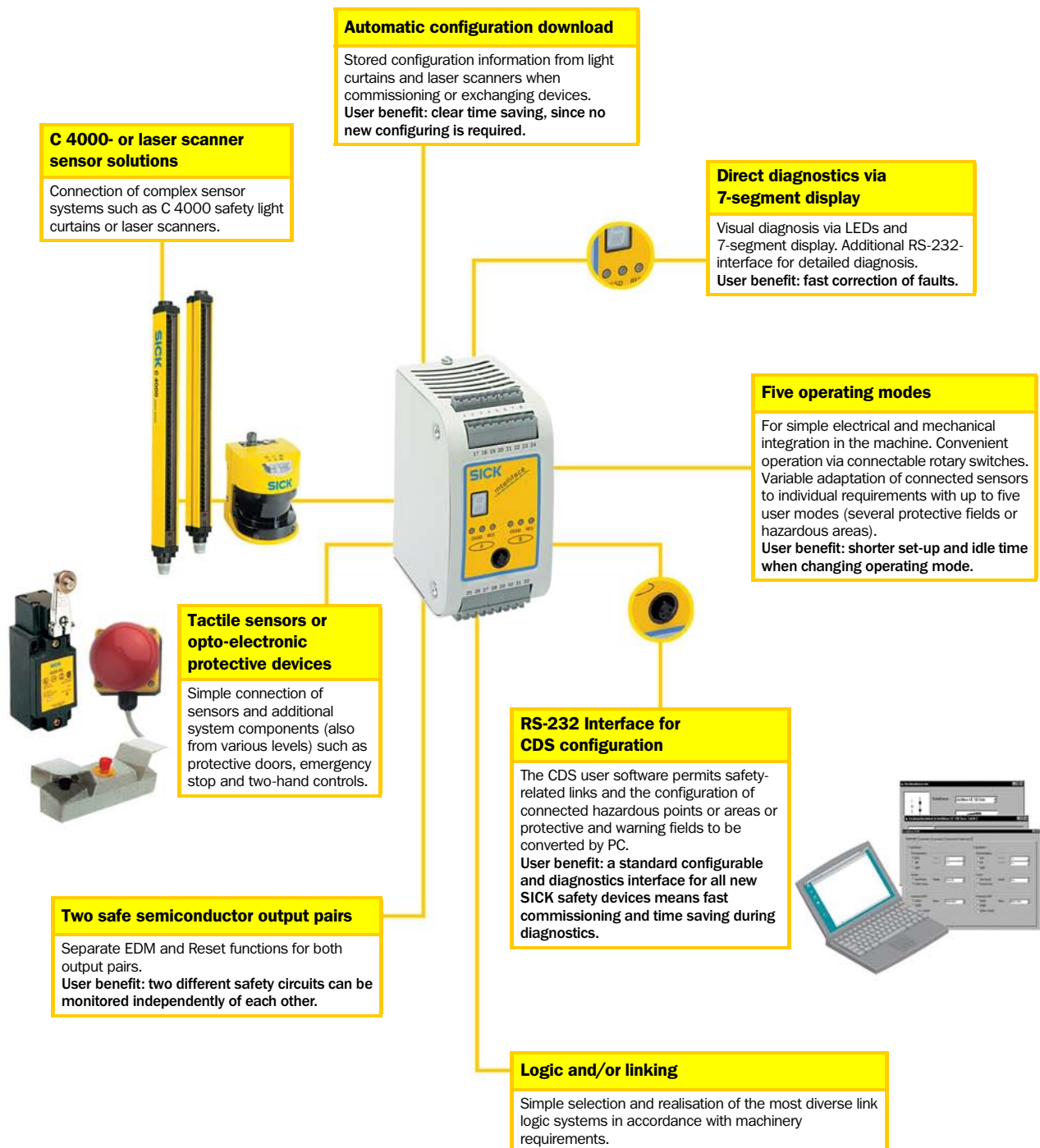
intelliface
the intelligent interface

Control category/safety integrity level according to EN 954-1/IEC 61508	Applications/Functions								Product	Page
	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⁾		
Category 4/SIL 3	✓	✓	✓	✓	✓	✓	—	✓	UE 440	M-3
	✓	✓	✓	✓	✓	✓	✓	✓	UE 470	M-3

¹⁾ Bottom dead centre, top dead centre and stop control contact

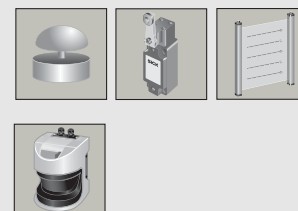
²⁾ Enhanced function interface, safe SICK device communication

Main features



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 $\pm 20\%$
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

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

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)

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

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-Sensor-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

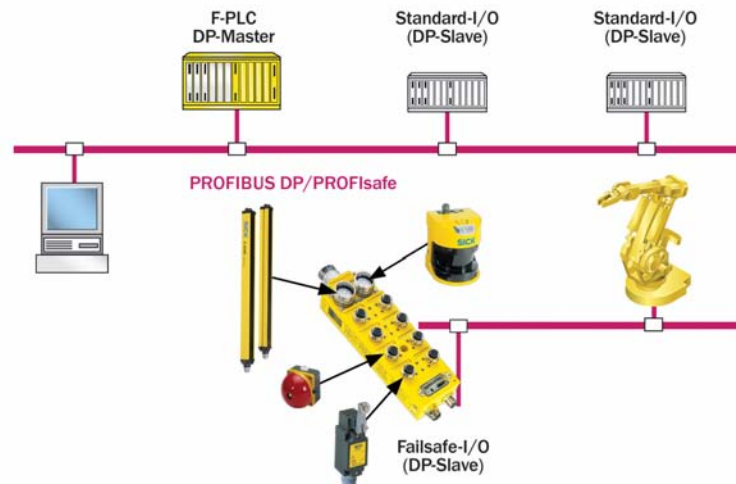
AS-interface Safety at Work Safety Monitor

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

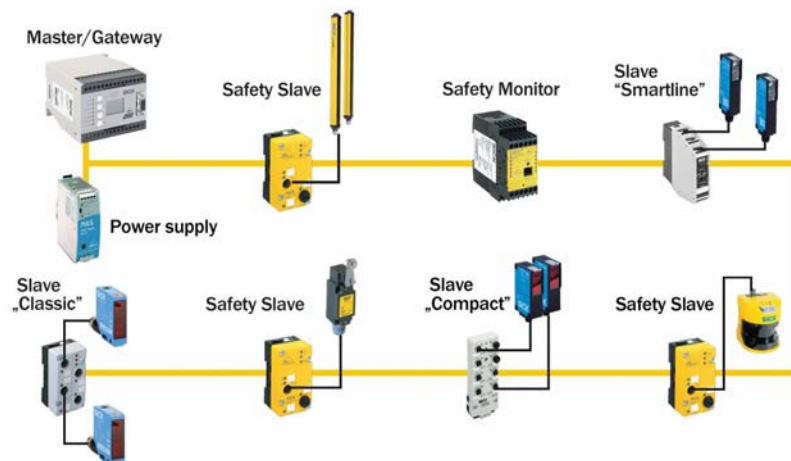
Field-signal connections

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




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



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



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

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

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⁾ LOW	24 V (11 V ... 28.8 V) 0 V (–28.8 V ... 8 V)
Input current	HIGH LOW	12 mA (6 mA ... 15 mA) 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 k Ω
------------------------------	---------------

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

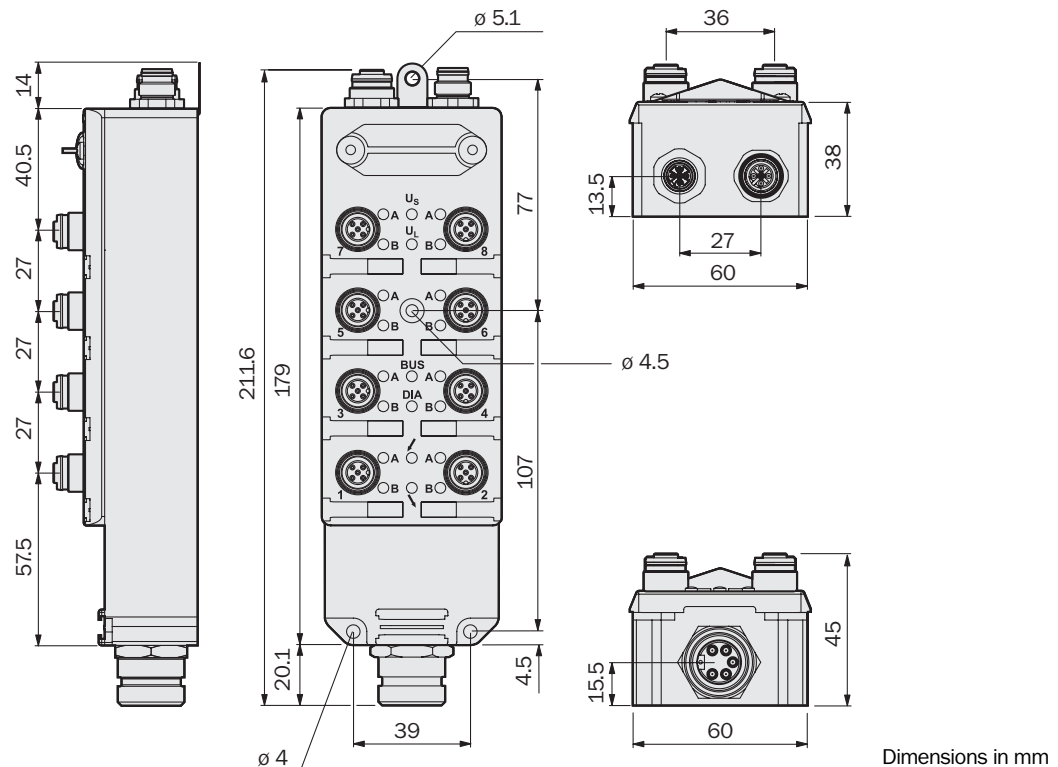
¹⁾ As per IEC 61131-2, type 2

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

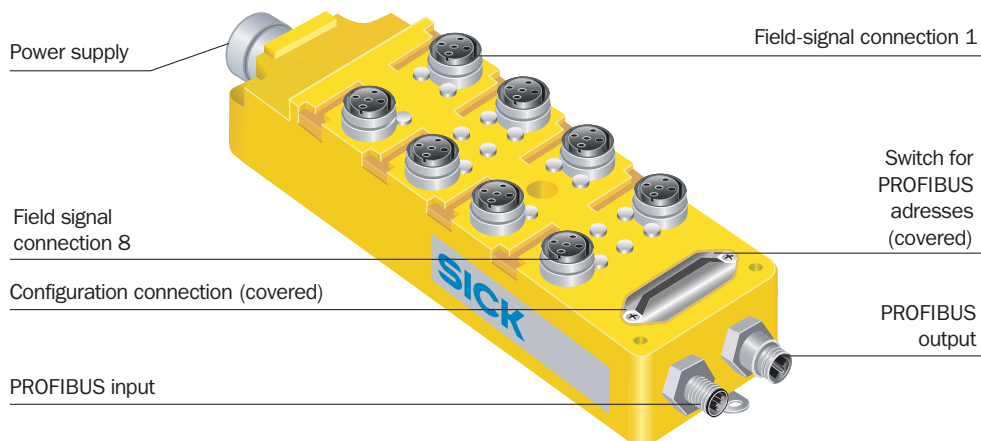
³⁾ The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1

⁴⁾ Within the limits of V_S

Dimensional drawings



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

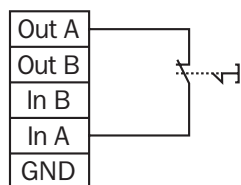
PROFIBUS connection

- Input and output according to PROFIBUS specification

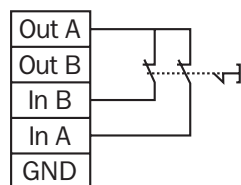
Connection diagrams

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

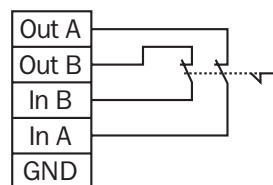
Single-channel



Dual-channel with common testing



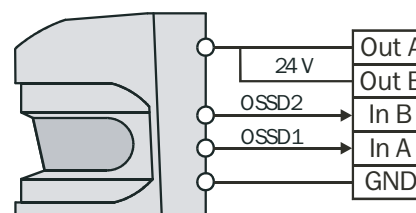
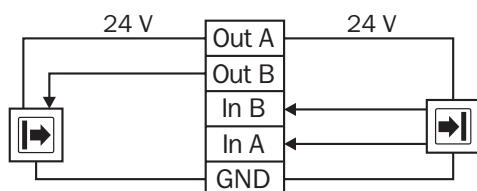
Dual-channel with isolated testing



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.

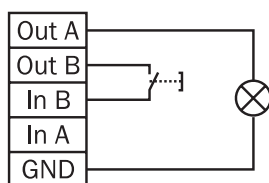
Electro-sensitive protective equipment (ESPE) on the field-signal connection



In the connection of electro-sensitive protective equipment (ESPE), sender and receiver can be considered as a system's input and output.

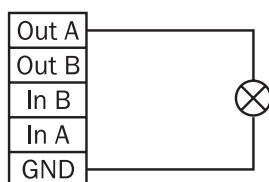
You can use output Out B to test the sender. The switching outputs of the receiver are present on inputs In A and In B.

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.

Accessories

Connection type

Field-signal connections

Name	Description	Model	Cable length	Part number
Plug M12 x 5	<ul style="list-style-type: none"> 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
	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> For the simultaneous connection of, e.g., two emergency-stop buttons (single-channel) on one field-signal connection 	—	—	6 024 744
Protective cap M12	<ul style="list-style-type: none"> For field-signal connection 10 pieces 	—	—	5 309 189

PROFIBUS connection

Name	Description	Model	Part number
Plug M12 x 5	<ul style="list-style-type: none"> Without connecting cable Screwed 	Straight	6 021 354
Socket M12 x 5	<ul style="list-style-type: none"> B-coded For wire cross-section max. 0.75 mm² 		6 021 353
Plug M12 x 4 with terminating resistor	<ul style="list-style-type: none"> B-coded 		6 021 156

Power supply

Name	Description	Model	Part number
Socket 7/8" x 5	<ul style="list-style-type: none"> Screwed For wire cross-section max. 1.5 mm² 	Straight	6 024 745

Configuration connection

Name	Description	Cable length	Part number
Connection cable	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none">Incl. online documentation and multilingual operating instructionsOn CD-ROM	2 026 875

Function packages

Name	Description	Part number
UE 4100 for I/O	<ul style="list-style-type: none">Expands the number of CDS functions by adding predefined applications for the field-signal inputs	2 026 873
PROFIBUS communication driver	<ul style="list-style-type: none">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	<ul style="list-style-type: none">In the 9 x 20 mm frame40 pieces	5 310 775



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



Further information	Page
→ Definition	N-0
→ Dimensional drawings	N-10
→ Device overview and connections	N-11
→ Connection diagrams	N-12
→ Accessories	N-13
→ Services	A-0

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 PROFI-safe 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

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⁾ LOW	24 V (11 V ... 28.8 V) 0 V (–28.8 V ... 8 V)
Input current	HIGH LOW	12 mA (6 mA ... 15 mA) 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
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SDL connections, power supply

Maximum current	1.4 A
Maximum internal resistance	0.3 Ω

SDL connections, OSSD inputs

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

Continued on next page

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

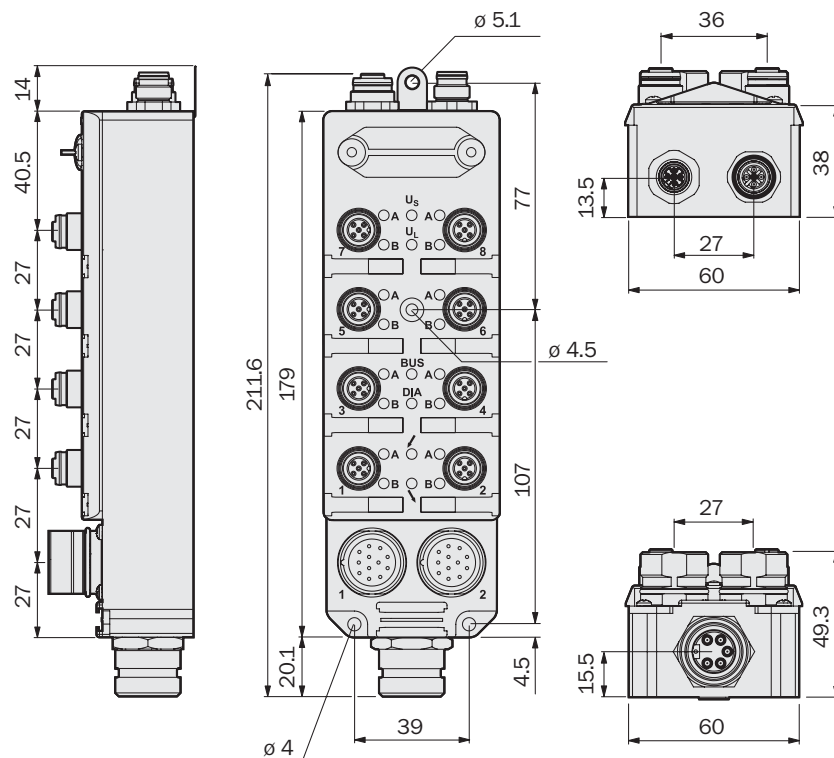
¹⁾ As per IEC 61131-2, type 2

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

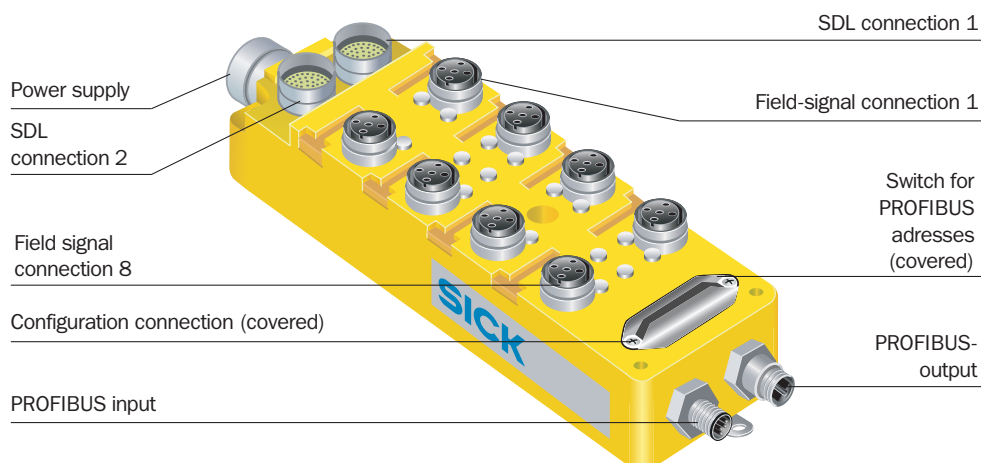
⁴⁾ Within the limits of V_S

Dimensional drawings



Dimensions in mm

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

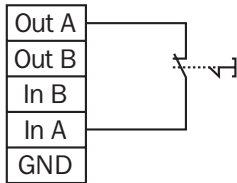
PROFIBUS connection

- Input and output according to PROFIBUS specification

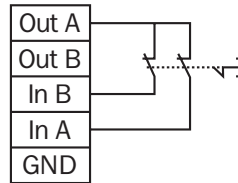
Connection diagrams

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

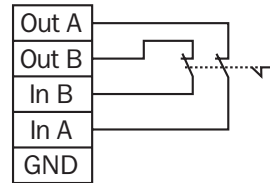
Single-channel



Dual-channel with common testing



Dual-channel with isolated testing

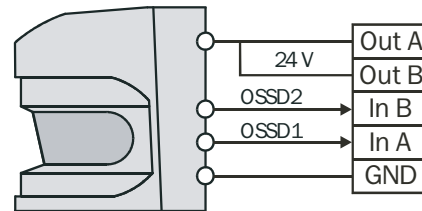
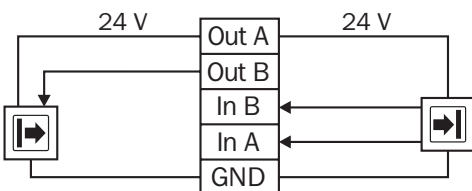


Depending on the control category required, you can realise the emergency stop using a single-channel, dual-channel with common testing or dual-channel with isolated testing.

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.

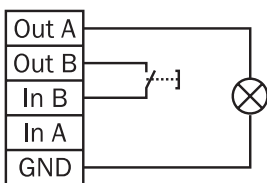
Electro-sensitive protective equipment (ESPE) on the field-signal connection



In the connection of electro-sensitive protective equipment (ESPE), sender and receiver can be considered as a system's input and output.

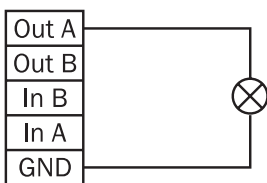
You can use output Out B to test the sender. The switching outputs of the receiver are present on inputs In A and In B.

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.

Accessories

Connection type

Field-signal connections

Name	Description	Model	Cable length	Part number
Plug M12 x 5	<ul style="list-style-type: none"> 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
	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> For the simultaneous connection of, e.g., two emergency-stop buttons (single-channel) on one field-signal connection 	—	—	6 024 744
Protective cap M12	<ul style="list-style-type: none"> For field-signal connection 10 pieces 	—	—	5 309 189

SDL connections

Name	Description	Model	Cable length	Part number
Interconnecton plug M23 x 12	<ul style="list-style-type: none"> Without connecting cable Crimped For wire cross-section 0.08 mm² ... 0.82 mm² 	—	—	6 024 742
	<ul style="list-style-type: none"> 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
	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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			6 021 156

Continued on next page

Power supply

Name	Description	Model	Part number
Socket 7/8" x 5	<ul style="list-style-type: none"> Screwed For wire cross-section max. 1.5 mm² 	Straight	6 024 745

Configuration connection

Name	Description	Cable length	Part number
Connection cable	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Incl. online documentation and multilingual operating instructions On CD-ROM 	2 026 875

Function packages

Name	Description	Part number
UE 4100 for I/O	<ul style="list-style-type: none"> Expands the number of CDS functions by adding predefined applications for the field-signal inputs 	2 026 873
PROFIBUS communication driver	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> In the 9 x 20 mm frame 40 pieces 	5 310 775

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



Further information	Page
→ Definition	N-0
→ Ordering information	N-16
→ Technical specifications	N-16
→ Dimensional drawings	N-18
→ Device overview and connections	N-18
→ Connection diagrams	N-19
→ Accessories	N-20
→ Services	A-0

N

Ordering information

Description	Type	Part number
<ul style="list-style-type: none"> 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⁾ LOW	24 V (11 V ... 28.8 V) 0 V (–28.8 V ... 8 V)
Input current	HIGH LOW	12 mA (6 mA ... 15 mA) 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 LOW	24 V (13 V ... 28.8 V) –17 V ... 12 V
Input current	HIGH LOW	6 mA (1.8 mA ... 8 mA) –6 mA ... 1.6 mA
Test pulse data	Maximum test pulse rate Maximum test pulse width	500 1/s 700 μs
Discrepancy time		3 ms ... 6 ms

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

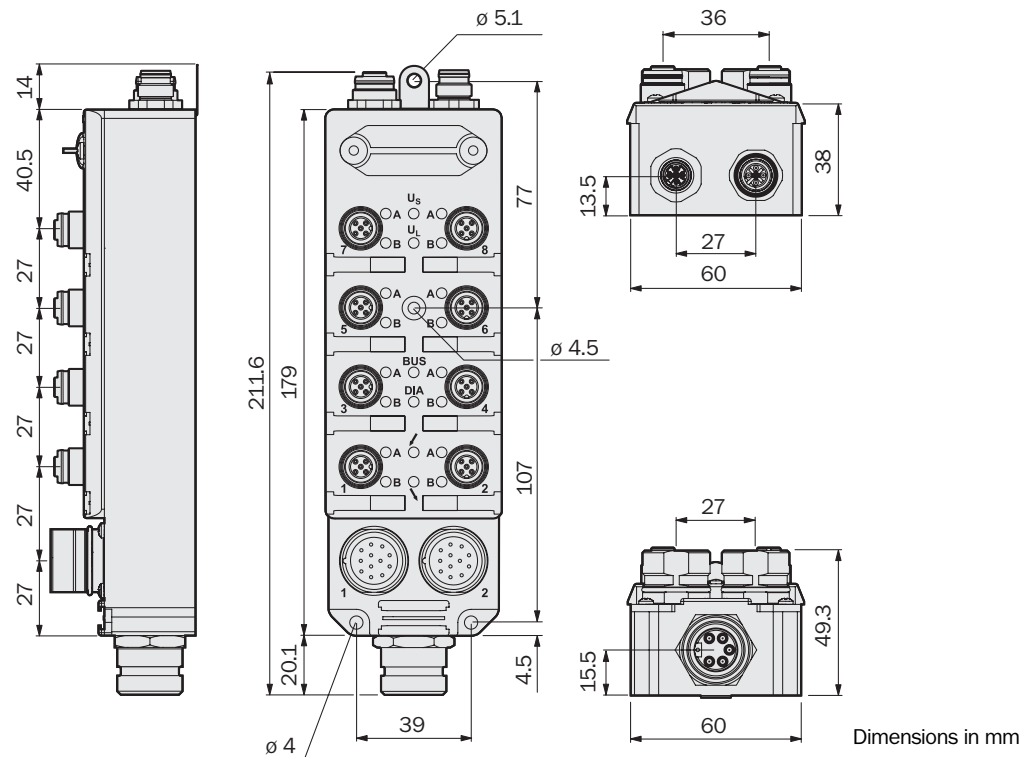
¹⁾ As per IEC 61131-2, type 2

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

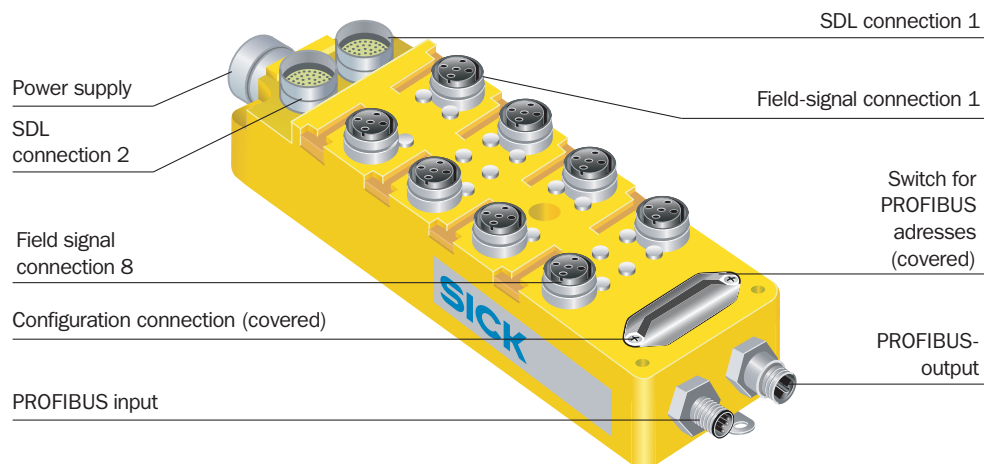
³⁾ The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1

⁴⁾ Within the limits of V_S

Dimensional drawings



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

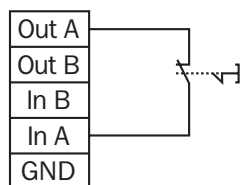
PROFIBUS connection

- Input and output according to PROFIBUS specification

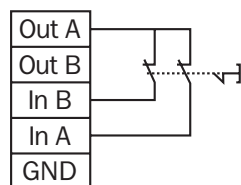
Connection diagrams

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

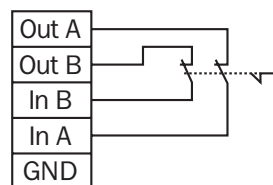
Single-channel



Dual-channel with common testing



Dual-channel with isolated testing

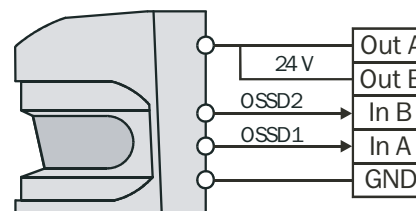
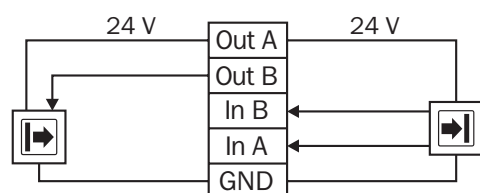


Depending on the control category required, you can realise the emergency stop using a single-channel, dual-channel with common testing or dual-channel with isolated testing.

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.

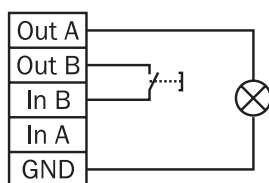
Electro-sensitive protective equipment (ESPE) on the field-signal connection



In the connection of electro-sensitive protective equipment (ESPE), sender and receiver can be considered as a system's input and output.

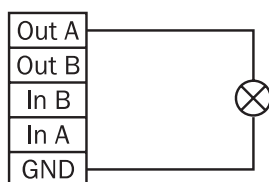
You can use output Out B to test the sender. The switching outputs of the receiver are present on inputs In A and In B.

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.

Accessories

Connection type

Field-signal connections

Name	Description	Model	Cable length	Part number
Plug M12 x 5	<ul style="list-style-type: none"> 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
	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> For the simultaneous connection of, e.g., two emergency-stop buttons (single-channel) on one field-signal connection 	—	—	6 024 744
Protective cap M12	<ul style="list-style-type: none"> For field-signal connection 10 pieces 	—	—	5 309 189

SDL connections

Name	Description	Model	Cable length	Part number
Interconnectron plug M23 x 12	<ul style="list-style-type: none"> Without connecting cable Crimped For wire cross-section 0.08 mm² ... 0.82 mm² 	—	—	6 024 742
	<ul style="list-style-type: none"> 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
	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> For SDL connection 	—	—	5 310 774

PROFIBUS connection

Name	Description	Model	Part number
Plug M12 x 5	<ul style="list-style-type: none"> Without connecting cable Screwed 	Straight	6 021 354
Socket M12 x 5	<ul style="list-style-type: none"> B-coded For wire cross-section max. 0.75 mm² 		6 021 353
Plug M12 x 4 with terminating resistor	<ul style="list-style-type: none"> B-coded 		6 021 156

Power supply

Name	Description	Model	Part number
Socket 7/8" x 5	<ul style="list-style-type: none"> Screwed For wire cross-section max. 1.5 mm² 	Straight	6 024 745

Configuration connection

Name	Description	Cable length	Part number
Connection cable	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Incl. online documentation and multilingual operating instructions On CD-ROM 	2 026 875

Function packages

Name	Description	Part number
UE 4100 for C 4000	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Expands the number of CDS functions by adding predefined applications for the field-signal inputs 	2 026 873
PROFIBUS communication driver	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> In the 9 x 20 mm frame 40 pieces 	5 310 775



- Control cabinet free manufacture
- Less wiring expenditure

TÜV

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

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

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	AS-interface Safety at Work code sequence on D0, D1 AS-interface Safety at Work code sequence on D2, D3
Input channel I1 Input channel I2	
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

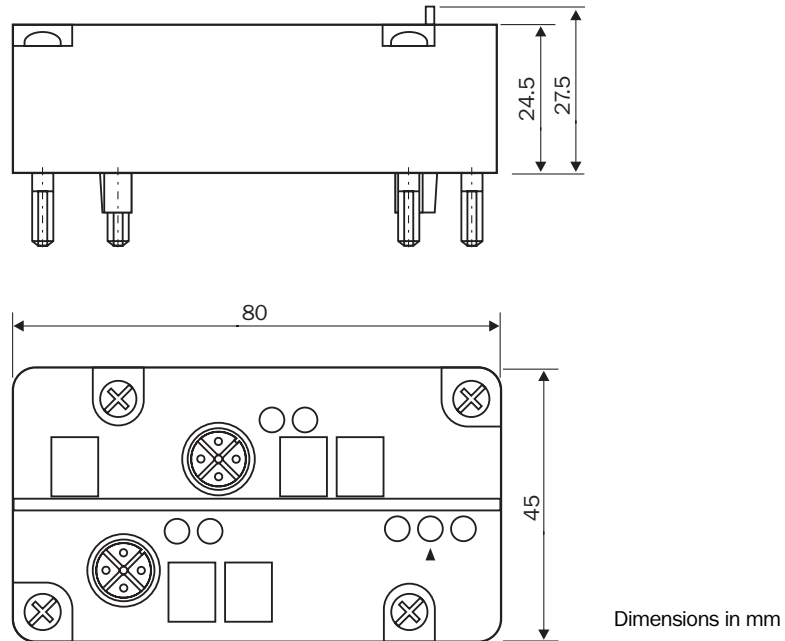
Maximum output current Pin 1 (AUX L+)	1.4 A
Maximum internal resistance Pin 1 (AUX L+)	0.3 Ω
OSSD inputs	Input voltage HIGH Input current HIGH Input voltage LOW Input current LOW
OSSD test pulses	Test pulse rate Test pulse width
Maximale response time of the safe busnode UE 4215	22 ms
Minimale switch-off time der BWS	51 ms
Maximum cable capacitance	100 pF

Surroundings

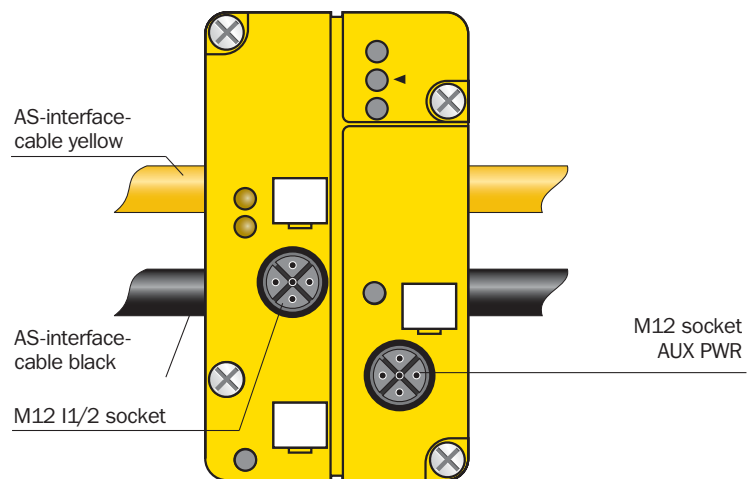
Operating temperature	-25 °C ... +70 °C
Storage temperature	-40 °C ... +85 °C
Air humidity (non condensing)	15 % ... 95 %
Rigidity	10 g, 10 Hz ... 300 Hz according to IEC 60068-2-6
Shock resistance	25 g, 6 ms according to IEC 60068-2-29

¹⁾ Within the limits of V_S

Dimensional drawings

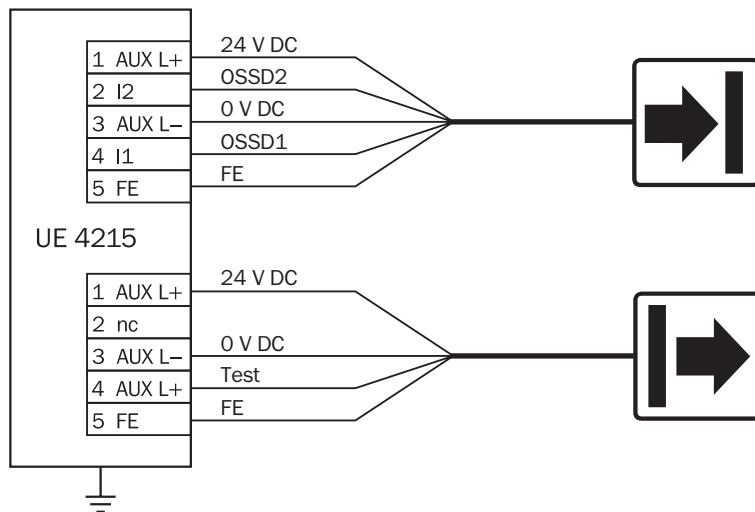


Device overview and connections

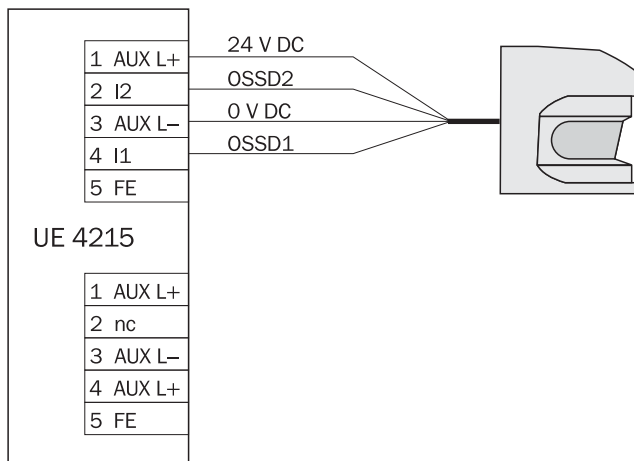


Connection diagrams

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



Connection of a safety laser scanner



Accessories

Connection type

Name	Description	Model	Cable length	Part number
Plug M12 x 5	<ul style="list-style-type: none"> Without connecting cable Screwed For wire cross-section max. 0.75 mm² 	Straight	—	6 022 083
		Angled	—	6 022 082
	<ul style="list-style-type: none"> 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
	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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

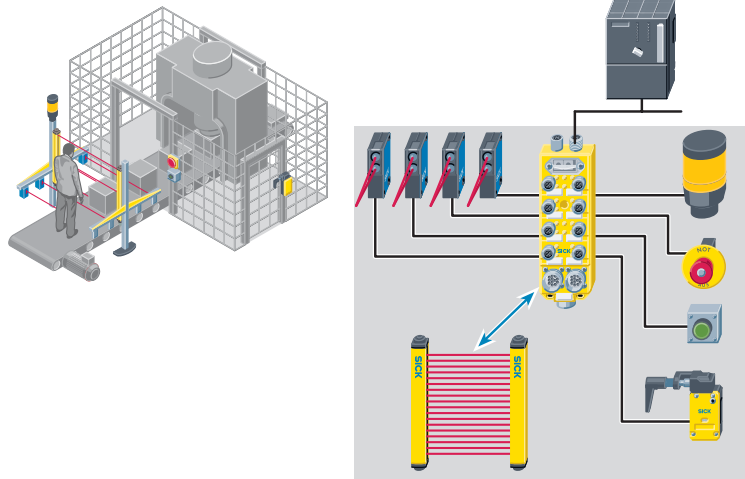
Name	Description	Part number
AS-interface module lower part	<ul style="list-style-type: none"> FKE-A-E, with addressing socket and earthing 	6 025 058
	<ul style="list-style-type: none"> FKE-A, with addressing socket 	6 022 397
	<ul style="list-style-type: none"> FKE, without addressing socket 	6 022 395

Other accessories

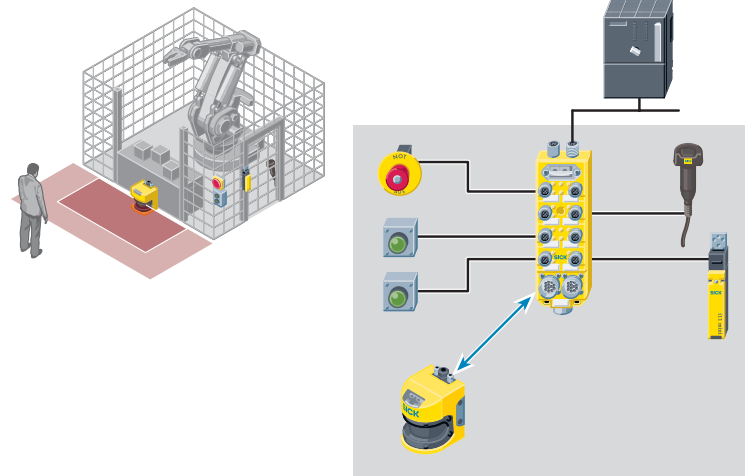
Name	Description	Part number
Claw sliding nut	<ul style="list-style-type: none"> For direct earthing of MSL, C 2000, M 2000, C 4000 required when using the AS-interface module lower parts FKE or FKE-A 	4 031 411

Application examples for safety bus modules

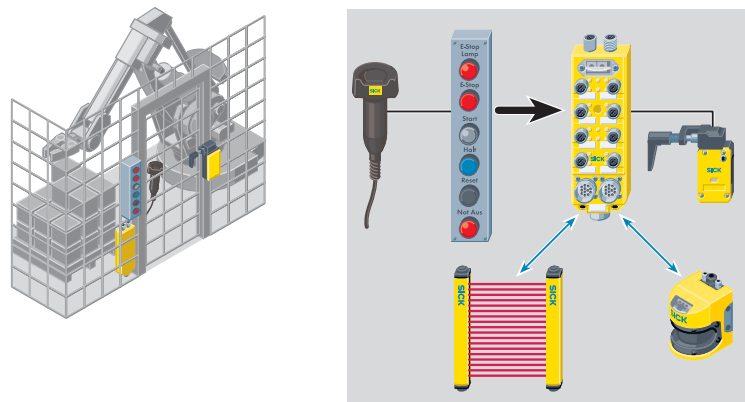
Muting



Robot cell



Access door





- 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

CE-main theme

Conformity overview | 1. | 2. | 3. | 4. | 5. | 6. | 7.

■ The following items must be taken care of before the CE-mark can be put onto the machine.

	Done	Name	Date
1. Product classification	<input checked="" type="checkbox"/>	Haarmann Heike	2000.12.11
2. Evaluate use of further directives	<input checked="" type="checkbox"/>	Haarmann Heike	2000.11.27
3. Evaluate relevant standards	<input checked="" type="checkbox"/>	Görnemann Otto	1999.04.02
4. Carry out hazard analysis	<input type="checkbox"/>		...
5. Compile technical construction file	<input checked="" type="checkbox"/>	Haarmann Heike	2000.11.27
6. Include notified body	<input checked="" type="checkbox"/>	Görnemann Otto	1999.05.14
7. Print conformity or manufacturer's declaration	<input type="checkbox"/>		...

Note: Responsible for the complete risk assessment is Mr. Smith, director technical department

Help | Info | ? | << | >> | Close

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	O-2
→ Ordering information	O-2
→ Services	A-0

Hazard analysis (HA)

Hazard assessment following EN 1050

Valuation: Cross-references

Display: Yes (hazard occurs)

1. Limit of the machine: use limits

2. Hazard occurs: ☒ Yes ☐ No ☐ Possibly

3. Hazard location: Operator station

4. Phase of the machinery life: Normal operation

5. Hazard description: Trapp hands between tool and material during operation / pressing

6. Measures:

No.	Measure	Type	Risk
1	Light curtain to protect the insert area, sides protected by fences	CSE	IN : 6 OUT: 3
2	Warning sign at machine	PIC	IN : 3 OUT: 2
3	Only trained personal, made aware of hazards	OI	IN : 2 OUT: 2

7. Safety achieved ☐

Close

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

Selection aid

Functions	Licences		
	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	<ul style="list-style-type: none"> English Single-place licence 	2 033 331
	<ul style="list-style-type: none"> English Multi-place licence 	2 033 333
Safexpert 5.0 Compact	<ul style="list-style-type: none"> English Single-place licence 	2 033 335
	<ul style="list-style-type: none"> English Multi-place licence 	2 033 337
Safexpert 5.0 Professional	<ul style="list-style-type: none"> English Single-place licence 	2 033 339
	<ul style="list-style-type: none"> English Multi-place licence 	2 033 341
Upgrade to newer versions	<ul style="list-style-type: none"> From Safexpert 4.0 to Safexpert 4.2 Single-place licence 	2 031 557
	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> English Single-place licence 	2 031 552
	<ul style="list-style-type: none"> English Multi-place licence 	2 031 554

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

Modules and add-ons

Designation	Description	Part number
Operating instructions assistant	<ul style="list-style-type: none"> English Single-place licence 	2 031 544
	<ul style="list-style-type: none"> English Multi-place licence 	2 031 546
Check and Acceptance assistant	<ul style="list-style-type: none"> English Single-place licence 	2 031 548
	<ul style="list-style-type: none"> English Multi-place licence 	2 031 550

Standards

Standards for expanding Compact to Professional

Designation	Description	Part number
Safexpert Standard	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Without Safexpert English 	6 022 507
Standard Plus as supplement to Safexpert Professional	<ul style="list-style-type: none"> English 	6 022 511
Standard Plus Update	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> English 	2 031 415
EN ISO 12100-2		2 031 417

C-type standards, single standards and explanations

Designation	Description	Part number
EN 692	<ul style="list-style-type: none"> Mechanical presses - Safety English 	6 024 687
EN 693	<ul style="list-style-type: none"> Hydraulic presses - Safety English 	6 024 689
EN 775	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Document register system, Europe English 	6 021 380

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 functionality 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 functionality 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.

Continued on next page

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: <ul style="list-style-type: none"> ▪ 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. <ul style="list-style-type: none"> ▪ 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. <ul style="list-style-type: none"> ▪ 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.

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.

Term	Explanation
ESD	<p>Electrostatic Discharge</p> <p>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.</p> <p>→ www.darc.de/gesetze/pdf/emvg.pdf</p>
ESPE	<p>Electro-Sensitive Protective Equipment</p> <p>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.</p> <p>ESPE comprise the following elements: a sensor function, a control/monitoring function, switching outputs (OSSD).</p> <p>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.</p>
External device monitoring	→ EDM
F	
Fieldbus	<p>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.</p>
FPLC	Fail-safe Programmable Logic Controller
FSD	<p>Final Switching Device</p> <p>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.</p>
G	
Guards	<p>A fundamental differentiation is made between “fixed” and “movable” guards.</p> <ul style="list-style-type: none"> 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	<p>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.</p>
I	
Interbus	<p>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.</p> <p>→ www.interbusclub.com</p>
Interface	<p>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.</p>

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	<p>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.</p> <p>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.</p> <p>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.</p>
Manipulation	<p>Manipulation is the conscious deactivation or bypassing of protective devices and their components.</p> <p>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.</p>
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).

Term	Explanation
Mechanical installation conditions for proximity sensors	<p>A proximity sensor can be installed flush if any attenuating material can be placed around the active face without affecting the key device features.</p> <p>A proximity sensor cannot be installed flush if a specific clear zone is required around its active face.</p> <p>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).</p>
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	<p>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.</p> <p>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.</p>
Mounting of safety switches	<p>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.</p> <p>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:</p> <ul style="list-style-type: none"> ▪ 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	<p>Machine Primary Control Element</p> <p>Text from IEC 61496-1: Element in the main circuit: The element that interrupts the main circuit to stop the machine.</p>
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	<p>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.</p> <p>The muting conditions that are defined in the standard EN 415-4 state that:</p> <ul style="list-style-type: none"> ▪ 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.

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.

Term	Explanation
PELV	<p>Protective Extra Low Voltage</p> <p>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.</p>
Positively driven opening on safety switches	<p>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.</p> <p>→ Further stipulations are defined in the standards IEC 947-5-1, EN 60947, VDE 0660 part 200.</p>
Power-up delay	Time that the safety module requires to become ready for operation after application of the supply voltage.
PROFIBUS PROFIBUS DP	<p>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.</p> <p>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.</p> <p>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.</p>
PROFIsafe	Profile for safety-related data transmission via the PROFIBUS network
Protective field	<p>The area in which the test object specified by the manufacturer is detected by the item of electro-sensitive protective equipment (ESPE).</p> <ul style="list-style-type: none"> ▪ 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.

Term	Explanation
PSDI control	<p>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:</p> <ul style="list-style-type: none"> ▪ In the single break PSDI 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	<p>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.</p>
R	
Radiation source	<p>Source for beam generation using semiconductor LEDs or conventional gas discharge lamps.</p>
Reactivation delay	<p>Delay until a sensor's protective function is effective (response time of all relays).</p>
Reduced resolution	<p>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.</p>
Reflector distance, min.	<p>Minimal permissible distance between photoelectric reflex switch and reflector</p>
RES	<p>Reset inhibit → Restart interlock</p>
Reset time	<p>Time between operating the reset (in the "safe" state) and the "enabled" state. The time starts:</p> <ul style="list-style-type: none"> ▪ 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	<p>Time by which the response of the safety contacts is delayed. The times can be adjusted on switching devices with response delay.</p>
Response time	<p>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).</p>
Response time ESPE	<p>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)</p>
Restart interlock	<p>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.</p> <ul style="list-style-type: none"> ▪ 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.

Term	Explanation
Risk assessment	<p>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.</p> <p>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.</p> <p>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.</p> <p>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:</p> <ul style="list-style-type: none"> ▪ The possible severity of injury ▪ The frequency and/or duration of exposure to the hazard ▪ The possibility of preventing the hazard <p>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.</p> <p>The categories are also not intended to be used in any given order or hierarchical arrangement in relation to safety requirements.</p> <p>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).</p>
Risk estimation	<p>It is necessary to estimate the risk to determine the measures required to achieve the protection objectives and the resulting solutions.</p> <p>The necessary safety solutions are defined taking into account the risk parameters and the severity of the hazard.</p>
S	
Safe outputs	→ OSSD
Safety operating devices	<p>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.</p> <p>Authorised personnel enter hazardous areas with the safety operating device to carry out programming, setup, observation, repair, test or service work.</p>
Safety switches	<p>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.</p> <p>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.</p>
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®	<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.</p> <p>→ www.safetybus.de</p>

Term	Explanation
SCC	<p>Standard Council of Canada</p> <p>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.</p> <p>→ www.scc.ca</p>
SDL	<p>Safety Data Link</p> <p>SICK safety interface (connection for OSSDs and EFI)</p>
Selection of several protective fields	An AOPDDR can have several switchable protective fields.
Self-monitoring	<p>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.</p> <p>(e.g. the start of a working cycle on the machine).</p>
SELV	<p>Safety Extra Low Voltage</p> <p>Protection by safety extra-low voltage (see DIN VDE 0100-410/01.97).</p> <p>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.</p>
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	<p>Safety Integrity Level</p> <p>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).</p> <ul style="list-style-type: none"> ▪ 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	<p>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.</p> <p>The reset device is to be operated under the following conditions:</p> <ul style="list-style-type: none"> ▪ 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) <p>→ Further information e.g. EN 692</p> <p>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.</p> <p>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).</p> <p>In general the following errors must be excluded when mounting protective devices: Reaching over, reaching under, reaching around, standing behind.</p>
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.

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	<p>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:</p> <ul style="list-style-type: none"> ▪ 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	<ul style="list-style-type: none"> ▪ 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	<p>The switching of the input circuits within a defined time is monitored (only on automatic reset).</p> <p>Enabling takes place only if input circuit 2 closes at most 0.5 s <i>after</i> input circuit 1. If input circuit 2 closes <i>before</i> input circuit 1, the control is not active.</p>
T	
Time function	<p>The time function can be useful for improving provision of the acquired signal to other connected devices:</p> <ul style="list-style-type: none"> ▪ 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	<p>Technischer Überwachungsverein</p> <p>→ www.tuevs.de</p>
Type	<p>The machine or system manufacturer must perform a risk analysis as per the Machinery Directive.</p> <p>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.</p>
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.

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.