

Catalog 2012



**Safety Sensors
Safety Systems
Safety Services**

HOW TO FIND YOUR PRODUCT!

I am looking for ...		I will find it in chapter ...
An introduction to and overview of the topics: Machine safety, the principles of risk minimization, functional safety of control systems	➤	Machine Safety 
Information for selecting and using optoelectronic protective devices and hard guards	➤	Machine Safety 
Application advice and start-up support, safety inspections or other services, such as stopping time measurements or on-site service	➤	Machine Safety Services 
PC software for the methodical safety engineering of machinery and plant systems	➤	Safety Engineering Software 
"Flexible in use" optoelectronic protective devices for stationary and mobile machines (e.g. driverless transport systems)	➤	Safety Laser Scanners 
Optoelectronic protective devices for hand and finger protection with or without tool blanking, and danger zone guarding and access guarding on machinery	➤	Safety Light Curtains 
Optoelectronic protective devices for access guarding on production cells, with or without muting function for unobstructed material transport	➤	Multiple Light Beam Safety Devices 
Preassembled safety sensor sets that can be quickly and easily put into operation	➤	Light Beam Safety Device Sets 
Single Light Beam Safety Devices in various construction designs for optimum integration into the machine concept	➤	Single Light Beam Safety Devices 
Protective devices with integrated AS-Interface, AS-i Safety Monitors and AS-i coupling modules	➤	AS-Interface Safety at Work 
Safety Laser Scanners and Safety Light Curtains with integrated PROFIBUS DP interface	➤	PROFIsafe Sensors 
Magnetically Coded Safety Sensors with evaluation unit as safety system for guards	➤	Magnetically Coded Sensors 
Safety Switches and Safety Locking Devices for guarding protective doors, flaps, or covers, for example	➤	Safety Switches and Safety Locking Devices 
E-Stop Rope Switch and E-Stop button as Safety Command Device for machinery	➤	Safety Com- mand Devices 
Safety monitoring devices and Safety Relays (compact and configurable for special functions)	➤	Safety Relays 
Programmable Safety Controllers (Safety Controller base modules, extension modules, fieldbus modules)	➤	Programmable Safety Controllers 
Suitable and harmonized accessories for Leuze electronic safety sensors	➤	Accessories 
The product's catalog page via an alphabetical list of names	➤	Product Finder 



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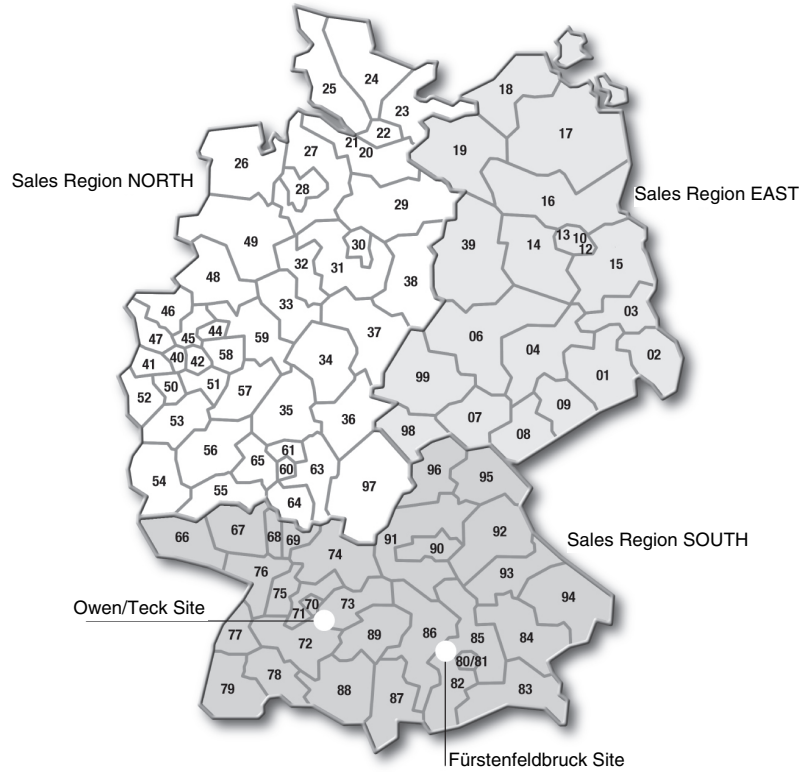
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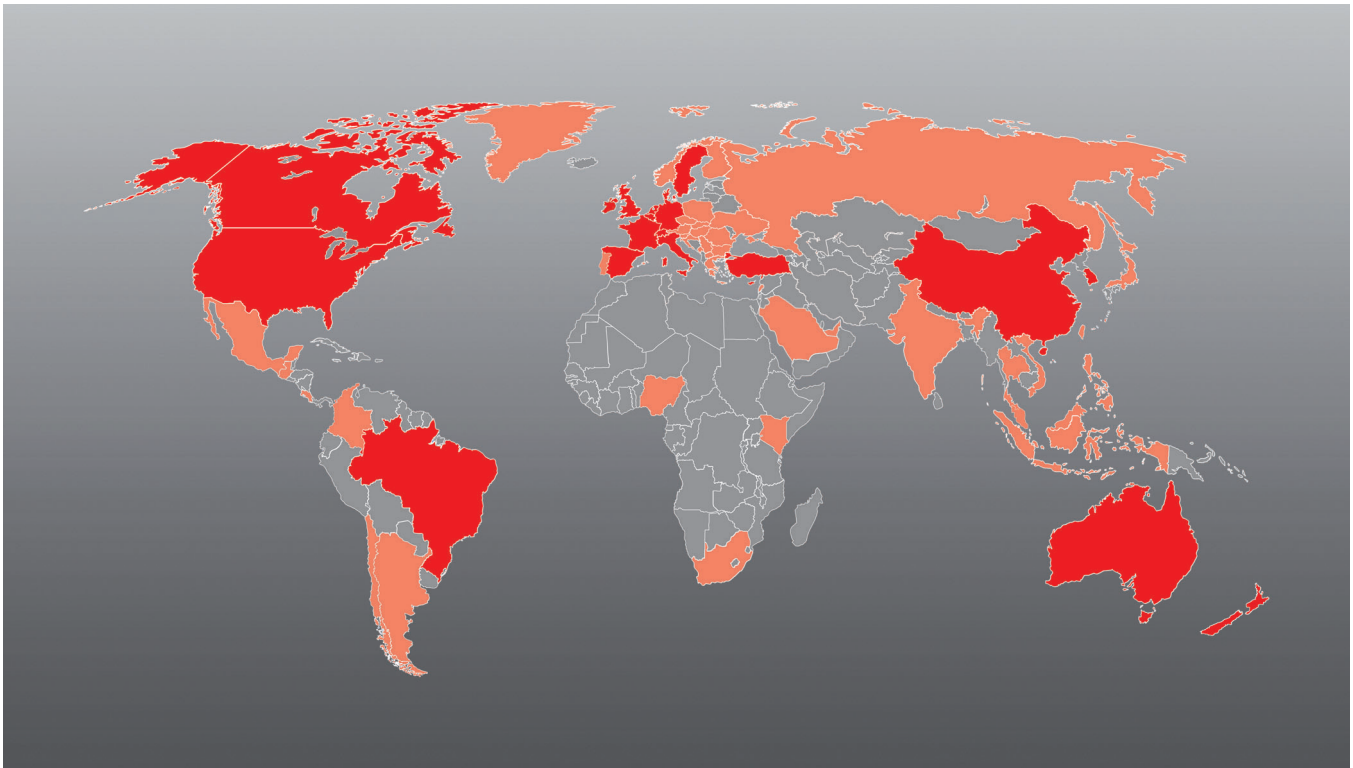
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Machine Safety
Machine Safety Services
Safety Engineering Software
Safety Laser Scanners
Safety Light Curtains
Multiple Light Beam Safety Devices
Light Beam Safety Device Sets
Single Light Beam Safety Devices
AS-Interface Safety at Work
PROFIsafe Sensors

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MACHINE SAFETY

1. Introduction

Machine safety is becoming more and more important, and becoming an integral element of machine construction. In addition to the moral obligation to protect and maintain the health of their workers, the topic of machine safety is also a question of financial sense for the operating company and machine operator. Each and every workplace accident results in costs – and the costs of costs. The examination and explanation of responsibility occupies many departments in the company, right up to executive level.

Our objective is to produce safety sensors and evaluation units that enable a cost-effective integration into various machine and system concepts, and that also provide effective people protection in accordance with international safety standards, without hampering production workflows in the process.

Throughout the various regions and countries of the world there are different concepts of machine safety and protection in the workplace. Along with differences with the requirements and evaluation of safety concepts, there are also differences with regard to responsibilities and legal consequences. The laws and bodies of rules and regulations of the country in which the machine is operated always apply, even if the machine was constructed in another country.

The following information is intended as a guiding overview of the topic of machine safety and does not detract from the in-depth study and compliance with the respectively applicable regional and machine-specific regulations and specifications, as well as the devices' operating instructions. It shall therefore not be possible to derive any form of legal claim from the following information.

2. Machine Safety in the EU




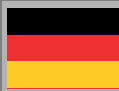
The European Union (EU) now has 27 member states with 500 million residents. The member states of the EU have set up bodies that apply across the Union, to which they have transferred parts of their single state sovereignty. The EU Commission and the EU Council compile directives with basic requirements that then must be adopted by the member states into their national law. The European standards organizations, CEN, CENELEC and ETSI are commissioned to draw up EU standards that technically solidify the applicable directives and legal provisions.

2.1 European Directives

EU product directives as the basis for free merchandise traffic

20 product directives have so far been drawn up to dismantle obstacles to trade in the single European market. The relevant products may only be distributed if they satisfy these basic requirements. If a product complies with the relevant harmonized EU standards, it is assumed that the basic requirements are met. A manufacturer can also use other technical solutions if the same level of safety is proven. Fulfillment of the basic requirements is determined in a formal conformity assessment procedure. This is performed, depending on the potential risk of the products, as much as possible within the manufacturer's own area of responsibility.

Important EU directives in the area of machine safety and their implementation under German Law

 EU Directives	 German Law
Machinery Directive 2006/42/EC	9. GPSG (Device and Product Safety Law)
Low Voltage Directive 2006/95/EC	1. GPSG (Device and Product Safety Law)
ATEX Directive 94/9/EC	11. GPSG (Device and Product Safety Law)
General Product Safety Directive 2001/95/EC	Device and Product Safety Law (GPSG)
EMC Directive 2004/108/EC	EMC Law

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MACHINE SAFETY IN THE EU

2. Machine Safety in the EU

EU safety at work directives

Safety at Work Framework Directive 89/391/EEC contains minimum requirements and general basic principles for the prevention of work-related hazards, for safety and health protection, for minimizing and eliminating risk and accident factors, and for the appropriate instruction of employees. These are minimum requirements. Each EU Member State may increase the protection level in its national implementation or, for example, set higher test requirements.

Important directives in the area of EU work safety and their implementation under German Law

 EU Directives	 German Law
Safety at Work Framework Directive 89/391/EEC	Safety at Work Law Ordinance On Industrial Safety and Health
Use of Work Equipment Directive 89/655/EEC amended by 95/63/EC	Regulations of employers' liability insurance associations (BG): – Regulations of employers' liability insurance associations continue to be legally binding. – These regulations solidify state health and safety regulations and apply as compliant with the latest state of technology. – The information of employers' liability insurance associations is provided by special topic-specific publications of the respective associations.
Directive 89/655/EEC amended by 2001/45/EC	

2.1.1 EU machinery directive 2006/42/EC

Machinery Directive 2006/42/EC regulates a uniform level of safety for machines in order to enable free merchandise traffic and distribution within the European Economic Area. It applies to manufacturers and distributors of machinery and devices. The Machinery Directive can be found in its original text at www.eur-lex.europa.eu.

Structure and content of the machinery directive:

Recitals	No. 1- 28
Part available	Article 1 - 28
Annex I:	Essential health and safety requirements for the design and construction of machines
Annex II:	Content Declaration of Conformity
Annex III:	CE conformity assessment
Annex IV:	Listing of machinery regarded as particularly hazardous or components relevant to safety

Annex V:	Non-exhaustive list of "safety components"
Annex VI:	Assembly instructions for partly completed machinery
Annex VII:	Technical documents for machinery
Annex VIII:	Assessment of conformity with internal checks on the manufacture of machinery
Annex IX:	EC Type Examination
Annex X:	Full quality assurance
Annex XI:	Minimum criteria for the notification of test centers
Annex XII:	Correlation table old/new directive

What do machine manufacturers and distributors have to comply with?

1. The basic safety requirements of Appendix I must be met.

This means that early in the design phase the designer must perform a parallel risk assessment so that all required measures for risk reduction are already considered in the machine's construction phase.

Note

The Leuze electronic **Safexpert** PC software for machinery safety engineering contains a list of hazards and supports the process of risk assessment and risk reduction in accordance with EN ISO 12100. The software enables an isolated consideration of all hazardous points of operation and life phases of the machine and ensures transparent and comprehensible documentation. For more information and details see chapter Safety Engineering Software, Safexpert, page 60.

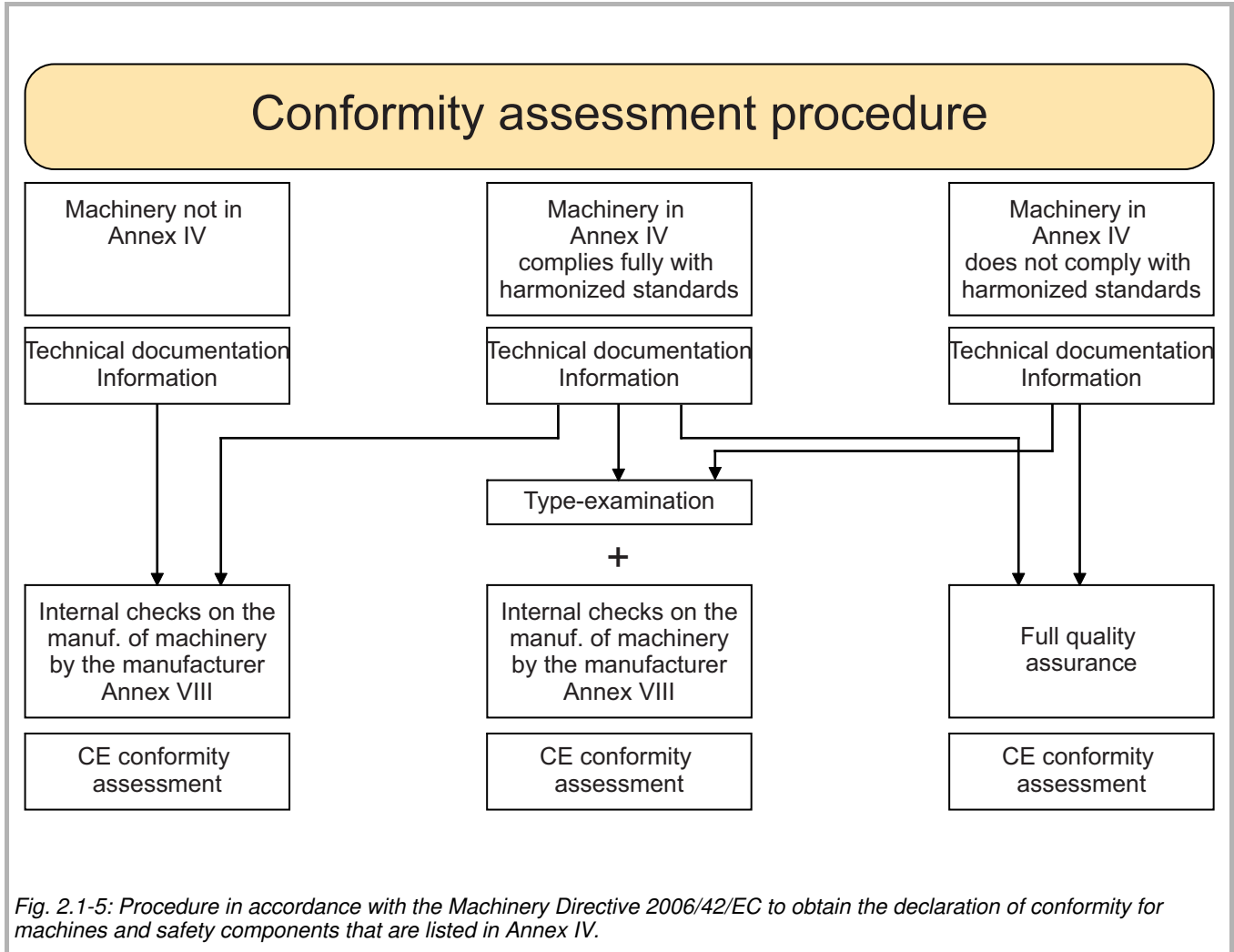
2. A declaration of conformity must be obtained for every machine.

For machines and safety components that are not listed in Annex IV, the actual manufacturer has responsibility for providing the CE conformity assessment; they obtain a declaration of conformity and consequently certify compliance with the Machinery Directive. They must document all records, such as measurement and test results, and be able to produce them when requested by national authorities.

Another certification procedure is required for machines and safety components that are listed in Annex IV (figure 2.1-5, page 10).

MACHINE SAFETY

2. Machine Safety in the EU



MACHINE SAFETY IN THE EU

2. Machine Safety in the EU

A few important statements acc. to the machinery directive include:

- The same machine regulations apply for exchangeable equipment, **safety components**, chains/ropes/belts for lifting purposes, cardan shafts and load-carrying equipment. They have to be distributed with **CE conformity assessment**, declaration of conformity and the required user information.
- For "partly completed machinery" the manufacturer has to supply special technical documents (Annex VII Part B), installation instructions (Annex VI) and a declaration of incorporation (Annex II, Part 1, Section B), which must specify which requirements of the directive apply to the part-machine and have been complied with. Installation instructions must be provided with the machine's documentation.
- Lifting devices with a speed of up to 0.15 m/s of the load carrier are subject to the Machinery Directive; with a speed of more than 0.15 m/s they are subject to the Lift Directive (if they are not covered by its rules of exception).
- Construction site lifts are subject to the Machinery Directive.
- Clearer delimitation of the Machinery Directive for the Low Voltage Directive.
- Internal production controls for series machines (Annex VIII).
- The validity of EC Type Examination certifications must be checked by the test center every 5 years. Manufacturers and test centers are obligated to retain the relevant technical documents for 10 years.

The Machinery Directive 2006/42/EC can be found in its original German text at <http://eur-lex.europa.eu>.

2.1.2 Use of work equipment directive 89/655/EEC

Use of Work Equipment Directive 89/655/EEC supplemented by Directive 95/63 EC contains the minimum specifications for safety and health protection with the use of work equipment. It applies to the **operating company (employer)** and in Section II includes the following 8 articles:

- **Article 3 General Obligations** regulates the obligations of the employer and logically requires that the employer ensures that the safety and protection of health are guaranteed with the operation of the work equipment provided.
- **Article 4 Regulations for work equipment**
- **Article 4a Checking the work equipment**
The employer ensures that the work equipment has undergone an initial test in line with the individual national legal regulations before the initial operation and after every new installation. The Member States define the modalities for these checks. In Germany this is the Ordinance On Industrial Safety and Health (see below).
- **Article 5 Specifically hazardous work equipment**
- **Article 5a Ergonomics and health protection in the workplace**
- **Article 6 Informing workers**
- **Article 7 Training of workers**
- **Article 8 Consultation and involvement of the worker**

Use of Work Equipment Directive 89/655/EEC can be found in its original text at <http://eur-lex.europa.eu>.

MACHINE SAFETY

2. Machine Safety in the EU

Ordinance on Industrial Safety and Health

With the Ordinance on Industrial Safety and Health, Directives 89/655/EEC, 95/63/EC and other directives from the work safety area are implemented in German Law. Extracts of just two paragraphs of section 2 will be presented in the following:

§3 Hazard evaluation

- (3) "Type, scope and periods of required tests must in particular be determined for the work equipment. Furthermore the employer must determine and define the necessary requirements that the people that are commissioned by the employer with the testing work equipment must satisfy."

Note

Leuze electronic provides competent advice and support services in this respect in its **Machine Safety Services** service package (see chapter Machine Safety Services, page 46).

§10 Work equipment test

- (1) "The employer must ensure that the work equipment, the safety of which depends on the installation conditions, is tested after installation and before initial operation, as well as after every installation at a new construction site or at a new location. The purpose of the test is to verify the proper installation and safe functioning of this work equipment. The test may only be performed by qualified personnel."
- (3) "The employer must ensure that the safe operation of work equipment is tested by qualified personnel after maintenance work that could impair the safety of the work equipment."

Note

Leuze electronic provides safety inspections before the initial operation and regular safety inspections thereafter in its **Machine Safety Services** service package (see chapter Machine Safety Services, page 46).



2.2 The European safety standards system

2.2.1 Correlation between directives and harmonized European standards

Harmonized European standards specify the basic requirements of the EU directives for safety and health protection as they are named, for example, in Annex I of the Machinery Directive. In accordance with the Machinery Directive, Article 5 (2), it applies here that when the protective level of an applicable harmonized standard is reached the corresponding requirement from the directive also applies as satisfied (i.e. conformity with the corresponding directive).

In contrast to directives and their national implementation under the national law of the Member State, standards are not legally binding. If the level of protection described in standards of this kind is reached by other measures, then such solutions are also possible. The difference between satisfying an applicable harmonized standard and a deviating solution, however, does have consequences. The manufacturer must prove compliance with the directive with additional documentation. Differences can also result with the conformity procedure when harmonized standards are only partly met or no applicable harmonized standards are available, see the versions in chapter 2.1.1, page 9.

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MACHINE SAFETY IN THE EU

2. Machine Safety in the EU

2.2.2 Formulation process of a harmonized standard

Technical committees and working groups below them, which for the most part recruit from national standards committees and to some degree from the employees of manufacturers in the machinery manufacturing and sensor technology sector, occupy themselves in the CEN and CENELEC standards organizations with the formulation of standards in the area of machine safety. At the end of this work phase there is an approval process in which the members of the CEN, including Switzerland, decide in accordance with a quota system for or against the adoption of a standard as a harmonized European safety standard.

A total of 29 states participate in this process. With the publication of a harmonized European safety standard in the Official EU Journal, the aptly-name "presumption of conformity" applies, i.e. it is assumed with the achievement of the protective objectives of this standard that conformity with the corresponding directive for this safety aspect is ensured.

Member State	Votes	Member State	Votes
France	29	Switzerland*	10
Germany	29	Bulgaria	10
The UK	29	Slovakia	7
Italy	29	Denmark	7
Spain	27	Finland	7
Poland	27	Norway*	7
Romania	14	Ireland	7
Holland	13	Lithuania	7
Greece	12	Latvia	4
Czech Republic	12	Slovenia	4
Belgium	12	Estonia	4
Hungary	12	Cyprus	4
Portugal	12	Luxembourg	4
Sweden	10	Malta	3
Austria	10	Iceland*	3

An EU standard is harmonized with a simple majority and at least 71% of the weighted votes

*) EFTA States

Table 2.2.2-1: Vote weighting with the approval of a harmonized EU standard

 Machine Safety
Services

 Safety
Engineering
Software

 Safety Laser
Scanners

 Safety Light
Curtains

 Multiple Light
Beam Safety
Devices

 Light Beam
Safety Device
Sets

 Single Light
Beam Safety
Devices

 AS-Interface
Safety at Work

 PROFIsafe
Sensors

MACHINE SAFETY

2. Machine Safety in the EU

2.2.3 Hierarchy of European standards for machine safety

European safety standards can be divided into basic safety standards (type A standards), safety group standards (type B1 standards and type B2 standards) and machine-specific technical standards (type C standards).

The design principles and the basic concepts of type A standards, such as EN ISO 12100, for example, are binding for all machines. Instructions for determining risks that are connected with the machine can be found here. Avenues of approach and their order for preventing risks are provided with the objective of integrating safety, even before the machine manufacturing begins. The steps that cover risk assessment and the prevention of such risks are examined in more detail in chapter 2.3, from page 18.

Type B1 standards describe general safety aspects and provide solutions for this, e.g. for the design of hard guards, or the approach speed that is required for calculating the safety distance for Safety Light Curtains or Multiple Light Beam Safety Devices. This topic is also examined in detail in chapter 4.

Normative requirements of special protective devices, such as E-Stop buttons, safety door switches, safety mats and strips or Safety Light Curtains are grouped together in the type B2 standards. Notes on the design and testing of safety components that both the manufacturer of such products and the machine designer must take into account with the use in their machine can be found here.

Type C standards describe significant hazards, specific risks and measures for reducing these risks at special machines or machine types. If a C standard exists for the machine type in question, it takes priority over a B or A type standard. If there are additional hazards that are not addressed in the standard, or if there is no special C standard for the machine being planned, risk reduction in accordance with A and B standards must be made.

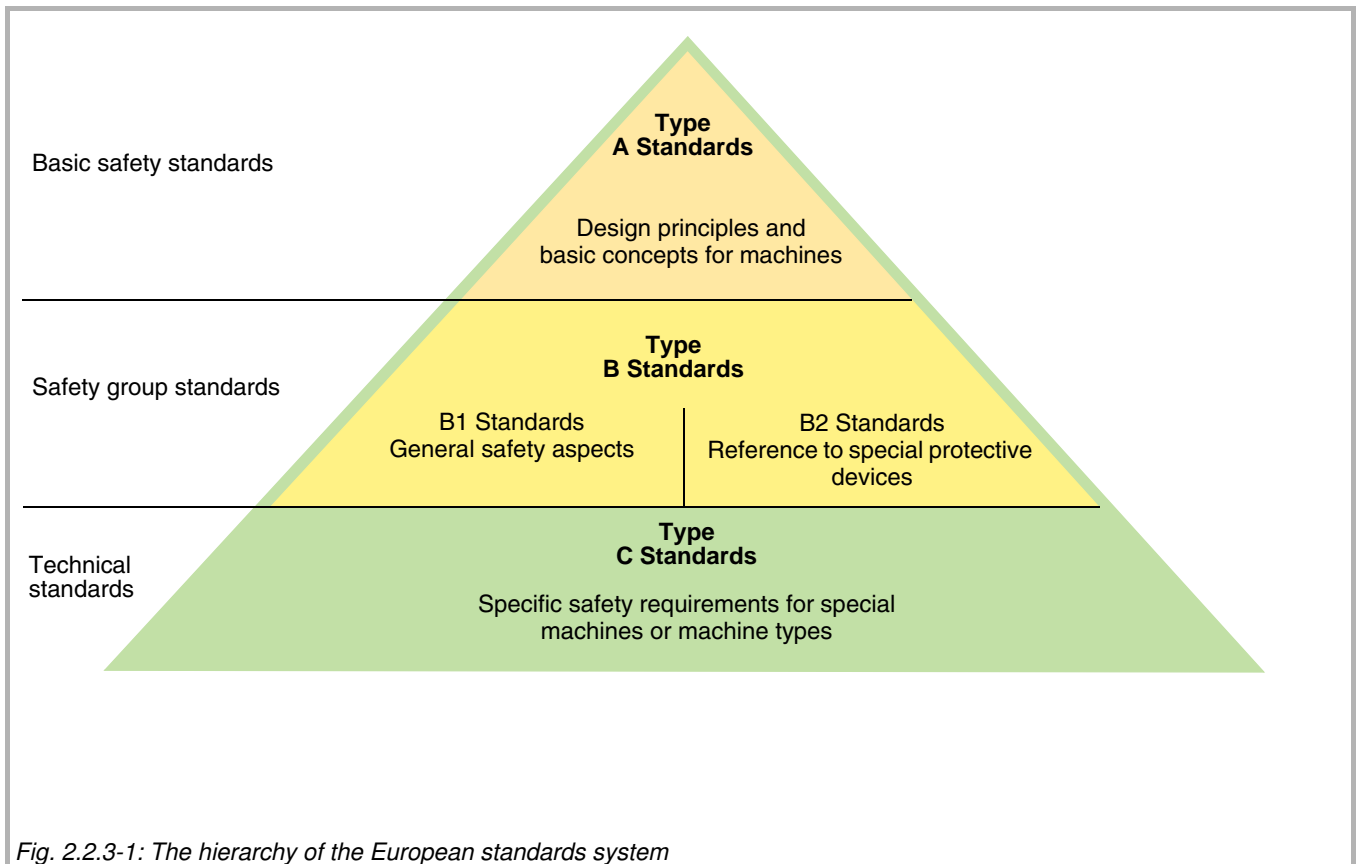


Fig. 2.2.3-1: The hierarchy of the European standards system

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MACHINE SAFETY IN THE EU

2. Machine Safety in the EU

Examples of EN and ISO/IEC standards in the machine safety area

Standard type	European (EU) and international (ISO/IEC) standards	Standard name
A	EN ISO 12100-1	Safety of machinery – Basic concepts, general principles for design – Part 1: Basic terminology, methodology (replaced by EN ISO 12100)
	EN ISO 12100-2	Safety of machinery – Basic concepts, general principles for design – Part 2: Technical principles (replaced by EN ISO 12100)
	EN ISO 14121	Safety of machinery – principles of risk assessment (replaced by EN ISO 12100)
B	EN ISO 13857	Safety of machinery – Safety distances to prevent dangerous areas being reached by the upper and lower limbs
	EN 349 ISO 13854	Safety of machinery – Minimum gaps to avoid crushing of parts of the human body
	EN ISO 13849-1	Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design
	EN ISO 13849-2	– Part 2: Validation
	EN 999 EN ISO 13855	Safety of machinery – The positioning of protective equipment in respect to approach speeds of parts of the human body
	EN 1037 ISO 14118	Safety of machinery – Prevention of unexpected start-up
	EN IEC 60204-1	Safety of machinery – Electrical equipment of machines – Part 1: General requirements
	EN IEC 62061	Functional safety of safety-related electrical, electronic and programmable electronic control systems
	prEN/TS 62046 IEC/TS 62046	Safety of machinery – Application of protective equipment to detect the presence of persons
	EN ISO 13850	Safety of machinery – E-STOP – Design principles
	EN 574 ISO 13851	Safety of machinery – Two-hand control devices - Functional aspects – Principles for design
	EN 953 ISO 14120	Safety of machinery – Guards – General requirements for the design and construction of fixed and movable guards
	EN 1088 ISO 14119	Safety of machinery – Interlocking devices associated with guards – Principles for design and selection
	EN 1760-1 ISO 13856-1	Safety of machinery – Pressure sensitive protective devices – Part 1: General principles for the design and testing of safety mats and pressure sensitive floors
EN 1760-2 ISO 13856-2	– Part 2: General principles for the design and testing of pressure sensitive edges and pressure sensitive bars	

Machine Safety Services

Safety Engineering Software

Safety Laser Scanners

Safety Light Curtains

Multiple Light Beam Safety Devices

Light Beam Safety Device Sets

Single Light Beam Safety Devices

AS-Interface Safety at Work

PROFIsafe Sensors

MACHINE SAFETY

2. Machine Safety in the EU

Examples of EN and ISO/IEC standards in the machine safety area

Standard type	European (EU) and international (ISO/IEC) standards	
	Reference	Standard name
B	EN 1760-3 ISO/DIS 13856-3	– Part 3: General principles for the design and testing of pressure sensitive bumpers, plates, wires and similar devices
	EN IEC 61496-1	Safety of machinery – Electro-sensitive protective equipment – Part 1: General requirements and tests
	prEN IEC 61496-2	– Part 2: Particular requirements for active optoelectronic protective devices
	EN IEC TS 61496-3	– Part 3: Particular requirements for active optoelectronic protective devices responsive to diffuse reflection (AOPDDR)
C	EN 81-1	Safety rules for the construction and installation of lifts – Part 1: Electric lifts
	EN 289	Plastics and rubber machines – Presses – Safety requirements
	EN 415-6	Safety of Packaging Machines Palletizers and Depalletizers
	EN 422	Rubber and plastics machines – Safety – Blow molding machines intended for the production of hollow articles. Requirements for the design and construction
	EN 528	Rail dependent storage and retrieval equipment – Safety
	EN 692	Mechanical presses – Safety – however form-fitting clutches do not satisfy the safety requirements of the directive 98/37/EC
	EN 693	Machine tools – Safety – Hydraulic presses
	EN 710	Safety requirements for foundry molding and coremaking machinery and plant and associated equipment
	EN ISO 10218-1	Industrial robots – Safety requirements - Part 1: Robots
	EN 848-1	Safety of woodworking machines – One side molding machines with rotating tool – Part 1: Single spindle vertical molding machines
	EN 869	Safety requirements for high pressure metal diecasting units
	EN 940	Safety of woodworking machines – Combined woodworking machines
	EN 972	Tannery machines – Reciprocating roller machines – Safety requirements
	EN 1010-1 ISO 1010	Safety of machinery – Safety requirements for the design and construction of printing and paper converting machines – Part 1: Common requirements
	EN 1010-2	– Part 2: Printing and varnishing machines including pre-press machinery
	EN 1114-1	Rubber and plastics machines – Extruders and extrusion lines – Safety requirements for extruders
	EN 1218-1	Safety of woodworking machines – Tenoning machines – Part 1: Single tenoning machines and slotting machines with sliding table
EN 1525	Safety of industrial vehicles – Automated guided vehicles (AGV) and their systems	

MACHINE SAFETY IN THE EU

2. Machine Safety in the EU

Examples of EN and ISO/IEC standards in the machine safety area

Standard type	European (EU) and international (ISO/IEC) standards	
	Reference	Standard name
C	EN 1526	Safety of industrial vehicles – Additional requirements for automated functions on AGV
	EN ISO 11111-1	Textile machinery – Safety requirements – Part 1: Common requirements
	EN ISO 11553-1	Safety of machinery – Laser processing machines – Part 1: General safety requirements
	EN 12387	Footwear, leather and imitation leather goods manufacturing machines – – Modular shoe repair equipment – Safety requirements
	EN 12622	Safety of machine tools – Hydraulic press brakes
	EN 12629-1	Machines for the manufacture of constructional products from concrete and calcium-silicate – Safety – Part 1: Common requirements

This is not a complete list. You will find more information on machinery standards at www.vdma.org or www.zvei.org, for example. Standards in their original version can be obtained from Beuth Verlag GmbH, www.beuth.de, for example.

Note

Finding instead of searching! With a powerful search and filter function, Leuze electronic's Safexpert software for the safety engineering of machinery and plant systems allows one to locate relevant standards within seconds. Full-text searches are performed in nine important EU-machinery safety standards and, with the appropriate standards package, in more than 60 standards (see chapter Safexpert, page 60).

MACHINE SAFETY

2. Machine Safety in the EU

2.3 Safety of machinery, risk analysis and risk assessment

The declared objective is to construct and operate machinery in such a way that injuries and harm will not occur with proper use of the machinery. Accident statistics show that a hazard at a machine will cause harm or injury sooner or later if no protective measures are taken. Protective measures are a combination of the measures performed by the designer and the user. Measures that can already be implemented in the construction phase take priority over the measures performed by the user and are generally more effective than these.

The international standard, EN ISO 12100-1 "Safety of machinery – Basic concepts, general principles for design", provides detailed help with the identification of hazards, describes the risks that designers must take into consideration, contains principles for design and a method for safe construction and risk minimization. EN ISO 14121 "Safety of machinery – Principles of risk assessment" describes an iterative method for risk analysis, risk assessment and risk minimization to achieve the required machine safety. Existing machine-specific standards, such as type C EN standards, for example, must be considered with priority.

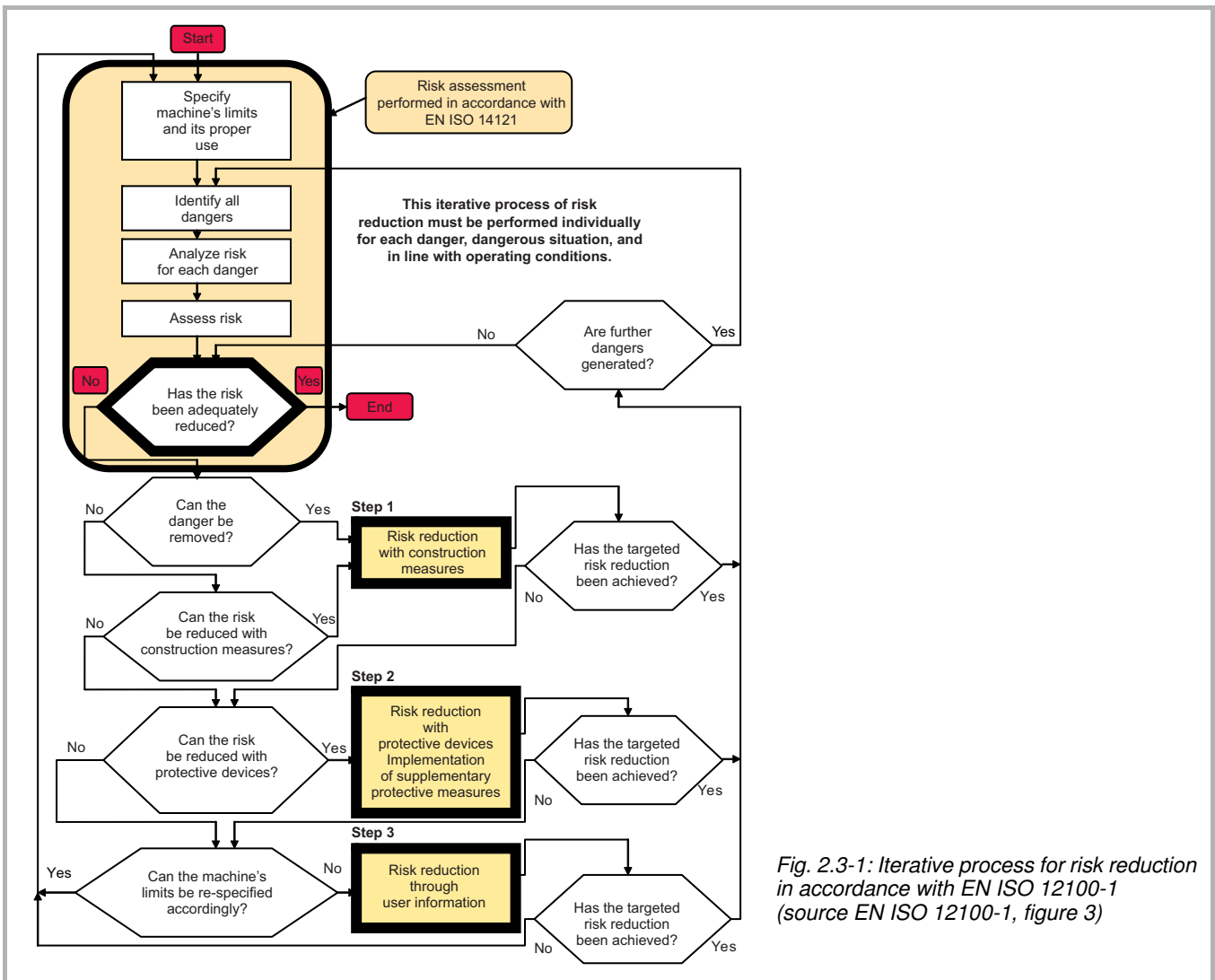


Fig. 2.3-1: Iterative process for risk reduction in accordance with EN ISO 12100-1 (source EN ISO 12100-1, figure 3)

MACHINE SAFETY IN THE EU

2. Machine Safety in the EU

EN ISO 12100-1 recommends that the machine designer use the following step-by-step procedure for risk reduction:

1. Specification of the limits and proper use of the machine
2. Identification of possible hazards and hazardous situations
3. Estimation of the risk of each identified hazard and each hazardous situation and parallel consideration of the foreseeable malpractice or faulty operation by operating personnel
4. Evaluation of each individual risk and decision on whether a risk reduction is required or not
5. Attempts to remove or reduce the risk with constructive measures. If this does not work then:
6. Reduction of the risk with the use of protective devices (separating protective devices, such as hard guards or covers, or electro-sensitive protective equipment, such as Safety Light Curtains, for example)
7. Informing and warning machine operators about the remaining risks of the machine by using warning notes and plates on the machine and in the operating instructions

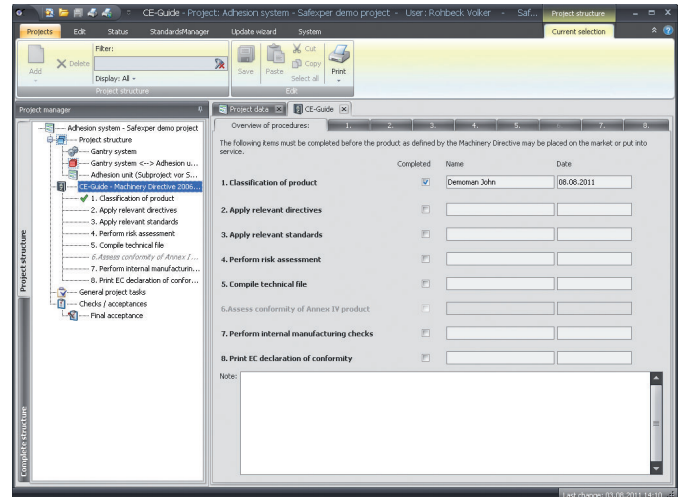
The first four steps describe the risk analysis and risk assessment. EN ISO 14121 contains detailed requirements for this. It is important that the risk analysis and risk assessment be carried out methodically and that it be comprehensibly documented.

In addition to these protective measures selected by the machine designer/constructor, further protective measures may also be required by the operating company or machine operator to reduce the remaining risk. This may be, for example:

- Organizational measures (e.g. safe work processes, regular inspections, etc.)
- Personal protective devices
- Training and instruction for operating personnel

Note

The Leuze electronic Safexpert PC software for machinery safety engineering contains a list of hazards in accordance with EN ISO 14121 and supports the process of risk assessment and risk reduction in accordance with EN ISO 12100-1. The software enables an isolated consideration of all hazardous points of operation and life phases of the machine and ensures transparent and comprehensible documentation. For further information and ordering info see chapter Safexpert, page 60.



Step-by-step, Safexpert supports the user with their tasks right through to provision of the declaration of conformity and manufacturer's declaration.

MACHINE SAFETY

2. Machine Safety in the EU

2.4 Safety-related parts of control systems

Parts of machine control systems performing safety tasks are described by those who set standards as "safety-related parts of control systems". These parts can consist of either hardware or software and stand-alone or integrated components of the machine control system. Safety-related control components incorporate the entire effective chain of a safety function provided by sensor, control unit and actuator. Each can be complexly set up in different ways, and, for example, consist of a Safety Switch and a Safety Relay, or they can also be implemented as a safety related PLC of an entire system.

The general objective is to design these control components so that the safety of the control function and the behavior of the control unit in case of a fault corresponds with the level of risk reduction determined in the risk assessment. Specific control-related measures for fault prevention in systems used in low-risk applications may not be sufficient for applications with a higher risk. For these applications, for example, additional measures for fault tolerance or fault detection would then be required.

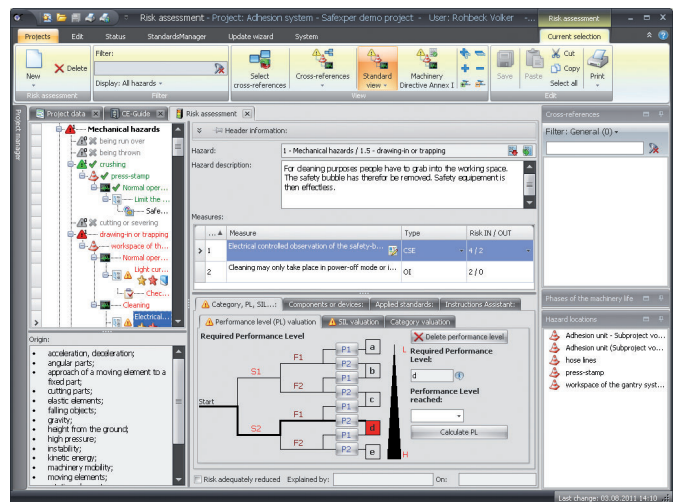
The higher the risk reduction to be provided by the safety-related control component, the higher the required safety level or the safety-related performance level of the control component. The standards described in the following use different classification systems and definitions for these safety levels.

Performance level (EN ISO 13849-1)	PFH _d Average probability of a failure to danger [1/h]	SILCL Level EN IEC 62061
a	$10^{-5} \leq PFH_d < 10^{-4}$	--
b	$3 \cdot 10^{-6} \leq PFH_d < 10^{-5}$	SIL 1
c	$10^{-6} \leq PFH_d < 3 \cdot 10^{-6}$	SIL 1
d	$10^{-7} \leq PFH_d < 10^{-6}$	SIL 2
e	$10^{-8} \leq PFH_d < 10^{-7}$	SIL 3

Fig. 2.4-1: Performance Level and SIL Level (source: ZVEI Flyer "Safety of machinery")

Note

Safexpert, the PC software from Leuze electronic for the systematic safety engineering of machinery and plant systems supports the designer when determining the required control category in accordance with EN ISO 13849-1 on the basis of a risk assessment in accordance with EN ISO 12100-1. For further information and ordering info see chapter Safexpert, page 60.



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MACHINE SAFETY IN THE EU

2. Machine Safety in the EU

2.4.1 EN ISO 13849-1 "Safety of machinery – Safety-related parts of control systems – Part 1: Basic principles"

In October 2006 EN ISO 13849-1 was officially adopted as the successor standard to EN 954-1. Like EN 954-1, it incorporates the safety-related parts of control systems (SRP/CS) in its area of application and all types of machines, regardless of the technology and energy form used (electric, hydraulic, pneumatic, mechanical, etc.). It focuses on the established categories of EN 954-1 and contains special requirements for SRP/CS with programmable electronic systems. With EN ISO 13849-1, in addition to the qualitative approach of EN 954-1, a quantitative consideration of the safety functions is also included. Performance levels (PL) are defined in EN ISO 13849-1 to classify different safety-related capacities into their respective categories. The five PLs (a, b, c, d, e) represent different average probability values of a failure to danger per hour.

Performance levels (PL) in accordance with EN ISO 13849-1

Performance level (PL)	Average probability of a failure to danger per hour (1/h)
a	$\geq 10^{-5}$ to $< 10^{-4}$
b	$\geq 3 \times 10^{-6}$ to $< 10^{-5}$
c	$\geq 10^{-6}$ to 3×10^{-6}
d	$\geq 10^{-7}$ to $< 10^{-6}$
e	$\geq 10^{-8}$ to $< 10^{-7}$

Determining the required performance level PL_r

A risk assessment must be performed and documented in order to define the required PL_r for each safety function of the safety-related control system. The informative Annex A of the standard presents a qualitative procedure for assessing the risk and for determining the PL_r.

Risk parameters:

S Seriousness of injury

S1 Minor (usually reversible) injury

S2 Serious (usually irreversible injury including death)

F Frequency and/or duration of the exposure to the hazard

F1 Seldom to not very frequent and/or exposure to hazard is brief

F2 Frequent to continuous and/or exposure to hazard is long

P Possibility of preventing the hazard or limiting the harm

P1 Possible under certain conditions

P2 Not really possible

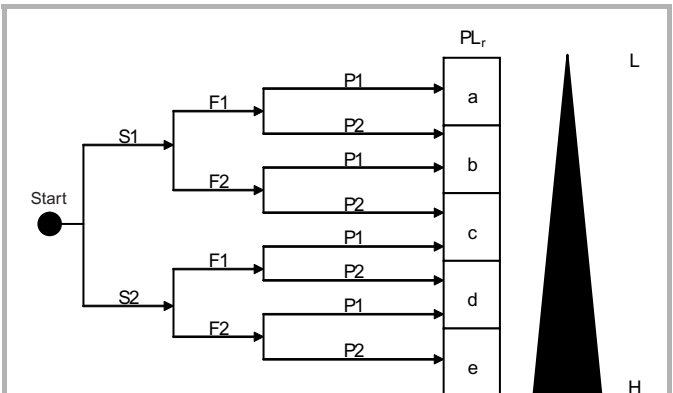


Fig. 2.4.2-1: Risk graph for determining the PL_r for each safety function (source: EN ISO 13849-1)

Legend

- Start Point at which the evaluation of the required contribution of the safety device to the risk minimization begins
- L Low contribution to risk minimization
- H High contribution to risk minimization
- PL_r Required performance level

MACHINE SAFETY

2. Machine Safety in the EU

Determination of the performance level reached

The following safety-related parameters are required for determining the performance level of components/devices:

EN ISO 13849-1 parameters	Meaning
Cat.	Category (B, 1, 2, 3, 4), structural setup as the basis for determining a specific PL
PL	Performance level (a, b, c, d, e)
MTTF _d	Mean time to dangerous failure
B _{10d}	Number of cycles with which 10 % of a random selection of the considered abrasion-prone pneumatic or electro-mechanical components have a failure to danger.
DC	Diagnostic coverage
CCF	Common cause failure
T _M	Service life, intended usage time (mission time)

Further parameters to be considered are the influence that operational factors such as request rate and/or the test rate of the safety function can have on the resulting PL.

Note

The SISTEMA PC software of the Institut für Arbeitsschutz (IFA) is used for the calculation and evaluation of the functional safety of control systems in accordance with EN ISO 13849-1. It is an ideal complement to Safexpert and can be downloaded as freeware from www.leuze.com/sistema. For more information see chapter SISTEMA, page 66.

Figure 2.4.2-3 shows a simplified method for determining the achieved PL. It illustrates a graphical method for roughly estimating the PL using the stated safety-related characteristic parameters of the components (EN ISO 13849-1).

The combination of category and DC_{avg} determines which column is to be selected. The respective shaded area is then determined in the column in accordance with the MTTF_d of each channel. The resulting PL can now be read on the vertical axis.

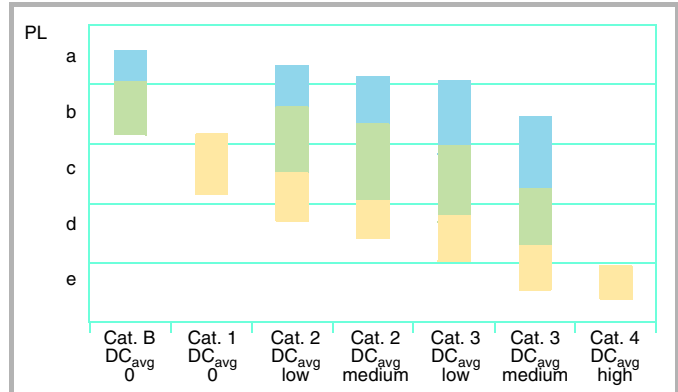


Fig. 2.4.2-3: Relation between the categories, DC_{avg}, MTTF_d of each channel and the resulting PL (source: EN ISO 13849-1)

Legend

MTTF_d in years

- MTTF_d / each channel = low 3 < MTTF_d < 10
- MTTF_d / each channel = medium 10 < MTTF_d < 30
- MTTF_d / each channel = high 30 < MTTF_d < 100

Diagnostic coverage DC

- no DC < 60 %
- low 60 % ≤ DC < 90 %
- medium 90 % ≤ DC < 99 %
- high 99 % ≤ DC ≤ 100 %

Assessing of the CCF effect

This qualitative process should be applied to the entire system. Each component of the safety-related part of the control should be considered.

The following table lists a portion of the processes for quantification for measures against CCF.

Draft/Application/Experience
Protection against overvoltage, overpressure, overcurrent etc.
Use of approved components
Evaluation/Analysis
Have the results of a failure mode and effect analysis been taken into account in order to avoid failures resulting from a common cause during development?
Competence/Training
Have designers/technicians been trained in recognizing the causes and effects of failures resulting from a common cause?

MACHINE SAFETY IN THE EU

2. Machine Safety in the EU

Validation

The design of a safety-relevant control function must be validated. The validation must show that the design of each safety function satisfies the corresponding requirements (source: EN ISO 13849-2).

2.4.3 EN IEC 62061 "Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems"

This standard contains requirements and recommendations for drafting, integrating and validating safety-related electrical, electronic and programmable control systems (SRECS) for machinery, which cannot be carried by hand during the work. In contrast to EN ISO 13849-1, it does not define any requirements for the performance of non-electrical (e.g. hydraulic, pneumatic, electro-mechanical) safety-related control elements for machines. Within the full scope of EN ISO 12100-1 it is used as an alternative to EN ISO 13849-1 for specifying the safety-related performance of safety-related electrical control systems that are required for risk reduction. As a sector-specific standard that falls within the scope of IEC 61508 for the application area of machines, EN IEC 62061 incorporates the entire SRECS lifecycle, from the concept phase until taking out of operation. The safety-related capacity is described by the "Safety Integrity Level (SIL)".

Safety Integrity Level (SILCL) in accordance with EN IEC 62061

Safety Integrity Level	Probability of a failure to danger per hour (PFH _d)
3	$\geq 10^{-8}$ to $< 10^{-7}$
2	$\geq 10^{-7}$ to $< 10^{-6}$
1	$\geq 10^{-6}$ to $< 10^{-5}$

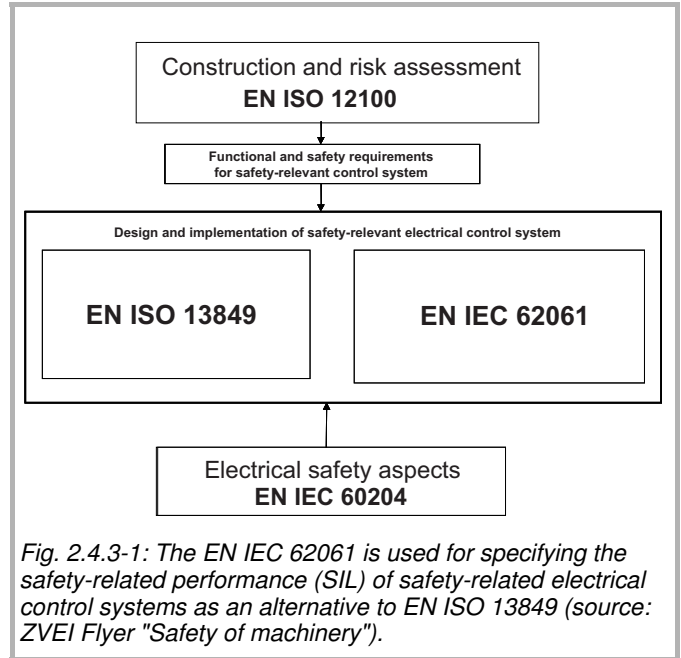


Fig. 2.4.3-1: The EN IEC 62061 is used for specifying the safety-related performance (SIL) of safety-related electrical control systems as an alternative to EN ISO 13849 (source: ZVEI Flyer "Safety of machinery").

SIL risk assessment and definition

The informative Annex A of EN IEC 62061 includes an example of a procedure for qualitative risk assessment and definition of the SILCL. This procedure must be implemented for each special hazard, for which an appropriate risk minimization is to be achieved with the help of an SRECS. It is based on the method presented in EN ISO 14121 and is used for evaluating the risk parameters.

- **S** Seriousness of the possible harm or injury
- **F** Frequency and duration of exposure
- **W** Probability of a hazardous event occurring
- **P** Possibility of avoiding or limiting the harm

For every special hazard, the individual risk parameters are considered and evaluated with a corresponding value according to their features (e.g. seriousness, frequency, probability).

MACHINE SAFETY

2. Machine Safety in the EU

Seriousness	S	Frequency of exposure	F	Probability of occurrence	W	Possibility of prevention	P
Irreversible: death, loss of an eye or arm	4	≤ 1h	5	very high	5	impossible	5
Irreversible: broken limbs, loss of a finger	3	> 1h to ≤ 1 day	5	probable	4	rare	3
Reversible: treatment by a physician required	2	> 1 day to ≤ 2 weeks	4	possible	3	probable	1
Reversible: first aid required	1	> 2 weeks to ≤ 1 year	3	rare	2		
		> 1 year	2	negligible	1		

Table 4.3-1: Classification of risk parameters in accordance with EN IEC 62061

The **class of the probability of harm K** is calculated by adding the numbers for the frequency of the exposure F, the probability of occurrence W and the possibility of avoidance P ($K = F + W + P$). The two parameters S and K are then used in a matrix to define the SILCL. The intersection point of line S with the applicable column K shows whether and which need for treatment exists.

Seriousness (S)	Class of probability of harm (K)				
	3 to 4	5 to 7	8 to 10	11 to 13	14 to 15
4	SIL 2	SIL 2	SIL 2	SIL 3	SIL 3
3		(AM)	SIL 1	SIL 2	SIL 3
2			(AM)	SIL 1	SIL 2
1				(AM)	SIL 1




Legend	
	SIL reference value for the safety-related control function
	Recommendation of application of other measures (AM)
	No need for treatment

Table 4.3-2: Matrix for defining the SIL (source: EN IEC 62061, Annex A)

Draft and integration of an SRECS in accordance with EN IEC 62061

The necessity of safety functions as measures for risk minimization emerges on the basis of the risk analysis and risk assessment in accordance with EN ISO 12100-1. Safety functions that are implemented with SRECSs are divided into sub-safety functions to design the system architecture. These virtual sub-safety functions are then assigned real sub-system elements.

These are either finished developed devices, such as sensors, control units, actuators or complex new components to be designed in accordance with the existing specifications in accordance with IEC 61508 and consisting of hardware with embedded software or application software. In accordance with the system design the achieved safety integrity level (SILCL) is determined and verifies whether or not the SIL has been achieved.

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MACHINE SAFETY IN THE EU

2. Machine Safety in the EU

Determining the safety integrity level (SILCL) of an SRECS

The achieved SIL is always lower or the same as the lowest value of the SILCLs of one of the sub-systems.

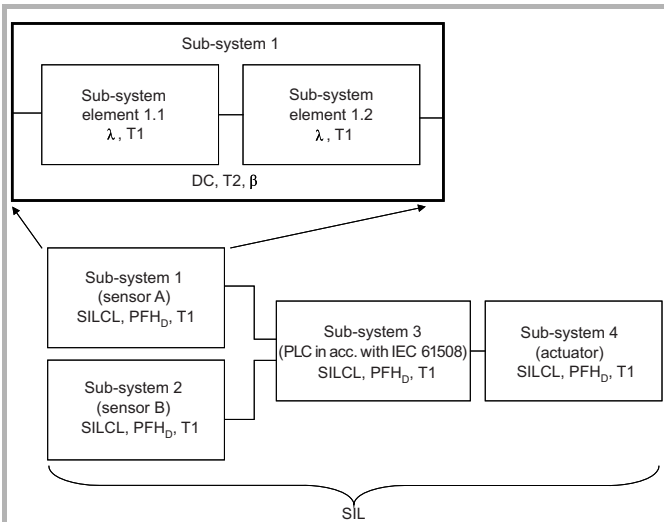


Fig. 2.4.3-2: SRECS architecture consisting of sub-systems and sub-system elements (source: ZVEI Flyer "Safety of machinery")

The sub-systems are described safety-related by the parameters, SILCL, PFH_d and T₁.

EN IEC 62061 parameters	Meaning
SILCL	SIL claim limit (maximum SIL value) of a sub-system
PFH _d	Probability of dangerous failure per hour
T ₁	Lifetime of the sub-system or proof test interval if this value is less than the lifetime. Note: The proof test is used to uncover errors in SRECSs and their sub-systems.

Sub-systems can consist of various switched sub-system elements (devices) with the following parameters:

EN IEC 62061 parameters	Meaning
λ	Failure rate; with electro-mechanical devices the failure rate is provided by the manufacturer as B ₁₀ value with reference to a number of switching cycles. The time-related failure rate and the lifetime must be determined on the basis of the switching frequency for the respective application.
SFF	Safe Failure Fraction
T ₂	Diagnostic test interval
β	Susceptibility to failures as a result of common cause
DC	Diagnostic coverage

A chapter of the standard describes a simplified method for estimating the probability of hazardous hardware failures of sub-systems. 4 different sub-system architectures (A, B, C, D) form the basis here. The corresponding calculation formulas for the probability of a failure to danger of the sub-system (PFH_d) are provided for each of these architectures. The PFH_d value of the safety-related control system is determined by adding the individual PFH_d values of the sub-systems.

Validation

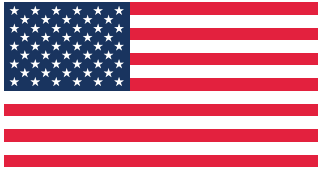
Chapter 8 contains requirements for validating the safety-related electrical control system. With the validation it is ensured by inspection and testing that the design of each safety function meets the corresponding requirements of the specification.

Validity of EN IEC 62061

IEC 62061 was adopted at the end of 2004 and accepted without change as a European standard. EN 62061 has been listed in the Official EU Journal since 31.12.2005 as a standard with presumption of conformity with Machinery Directive 2006/42/EC.

MACHINE SAFETY IN THE USA

3. Machine Safety in the USA



In 1970, Congress enacted a law entitled the "Occupational Safety and Health Act (OSHA)". Its objective was to reduce the existing dangers to safety and health at the work-

place and continuously improve the occupational health and safety regulations already in place. The Occupational Safety and Health Administration (OSHA) was set up as the responsible supervisory authority.

The following text provides an overview of the essential US American body of rules and regulations and standards in the machine safety area and in no way does it replace the required intensive study of the respective documents. It neither raises objection to completeness nor allows any legal claim to be derived from it. The respective currently applicable regional specifications or machine-specific standards must be observed.

3.1 OSHA Regulations

All general and machine-specific safety standards for machines are included in the U.S. Code of Federal Regulations, Title 29, Part 1910, Subpart 0. The following list shows a few examples. Supplementary information can be found at www.osha.gov.

Extract from the U.S. Code of Federal Regulations, Title 29, Part 1910, Subpart 0

Document number	Title and content
OSHA 1910.211	Definition
OSHA 1910.212	General requirements for all machines
OSHA 1910.213	Woodworking machinery requirements
OSHA 1910.214	Cooperage machinery requirements
OSHA 1910.215	Abrasive wheel machinery requirements
OSHA 1910.216	Mills and calendars in the rubber and plastics industries
OSHA 1910.217	Mechanical power presses
	1910.217(b)(7) Revolution Clutch Controls 1910.217(b)(14) Brake System Monitoring 1910.217(c) Safeguarding the Point of Operation 1910.217(c)(3) Point of Operation Devices 1910.217(c)(3)(iii) Presence Sensing Devices 1910.217(c)(3)(5) Additional Requirements for Safeguarding 1910.217(e) Inspection, Maintenance and Modification of Presses 1910.217(5)(c) Operation of Power Presses
OSHA 1910.218	Forging machines
OSHA 1910.219	Mechanical power-transmission apparatus

There is no uniform federal legislature in the USA that regulates the responsibility of the manufacturer or supplier. Each federal US state, however, is required by OSHA, 1970, Section 18 to develop its own occupational health and safety program. For each of these programs OSHA provides additional information on the websites, www.osha.gov or www.osha-slc.gov.

3.2 US Standards ANSI, NFPA, UL (National Consensus Standards)

In addition to the OSHA standards, the OSHA authority is authorized to monitor and enforce compliance with National Consensus Standards. These are standards, occupational health and safety regulations or modifications of such, which

- have been adopted and published by a nationally recognized standards-setting organization (e.g. ANSI, UL),
- are recognized by the Secretary of Labor as standards,
- deal as international standards (IEC, ISO) with topics or specialist areas that are not covered by a US standard.

U.S. National Consensus Standards are therefore standards that apply as supplementary to the OSHA standards. The following are some of the bodies that provide such standards:

- American National Standards Institute (ANSI)
www.ansi.org
- European Committee for Standardization (CEN)
www.cen.eu
- European Committee for Electrotechnical Standardization (CENELEC)
www.cenelec.org
- International Electrotechnical Commission (IEC)
www.iec.ch
- International Standardization Organization (ISO)
www.iso.ch
- National Fire Protection Agency (NFPA)
www.nfpa.org

MACHINE SAFETY

3. Machine Safety in the USA

Selection of important U.S. National Consensus Standards in the machine safety area (this list is not complete).

Standard	Title and content
ANSI B11.1	Mechanical Power Presses – Safety Requirements for Construction, Care, Use
ANSI B11.2	Hydraulic Power Presses – Safety Requirements for Construction, Care, 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, Use
ANSI B11.5	Machine Tools – Iron Workers – Safety Requirements for Construction, Care, 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, Mining 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, Use
ANSI B11.11	Gear-Cutting Machines – Safety Requirements for Construction, Care, Use
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 Construction, Care and Use
ANSI B11.18	Machine Tools – Machines and Machinery Systems for Processing Strip, Sheet or Plate from Coiled Configuration - Safety Requirements for Construction, Care and Use
ANSI B11.19	Performed 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.TR1	Ergonomic Guidelines for Design, Installation and Use of Machine Tools
ANSI B11.TR2	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 Standards 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
NFPA 70E	Electrical Safety Requirements for Employee Workplaces
NFPA 79	Electrical Standard for Industrial Machinery
UL 508	Industrial Control Equipment
UL 61496-1	Electro-Sensitive Protective Equipment, Part 1: General Requirements for Design, Construction and Testing of Electrosensitive Protective Devices (ESPDs).
UL 61496-2	Electro-Sensitive Protective Equipment, Part 2: Particular Requirements for Equipment Using Active Optoelectronic Protective Devices (AOPDs).

Machine Safety Services

Safety Engineering Software

Safety Laser Scanners

Safety Light Curtains

Multiple Light Beam Safety Devices

Light Beam Safety Device Sets

Single Light Beam Safety Devices

AS-Interface Safety at Work

PROFIsafe Sensors

MACHINE SAFETY IN THE USA

3. Machine Safety in the USA

3.3 Strategy for Risk Reduction

The U.S. Code of Federal Regulations, Title 29, Part 1910, Subpart O requires that with the construction of machinery risks must be analyzed and, where required, protective devices must be provided to protect the operator.

Technical Report ANSI B11.TR3:2000 includes proposals for assessing, analyzing and reducing risks on tool-making machines.

OSHA/ANSI provides the following hierarchical procedure for risk reduction:

1. Identification and analysis of the risk (see ANSI B11.TR3:2000)
2. Removal of the risk with constructive measures
3. Reduction of the risk with technical protective devices
4. Warning signals and warning information
5. Personal protective equipment for the operating personnel
6. Operator training

The international standard, EN ISO 12100-1 "Safety of machinery – Basic concepts, general principles for design" is similarly structured. It provides detailed assistance with the identification of hazards, describes the risks to be considered by the designer, contains design principles and a method for safe construction and risk minimization. EN ISO 14121 "Safety of machinery – Principles of risk assessment" describes an iterative method for risk analysis, risk assessment and risk minimization to achieve the required machine safety. Existing machine-specific standards, such as type C EN standards, for example, must be considered with priority.

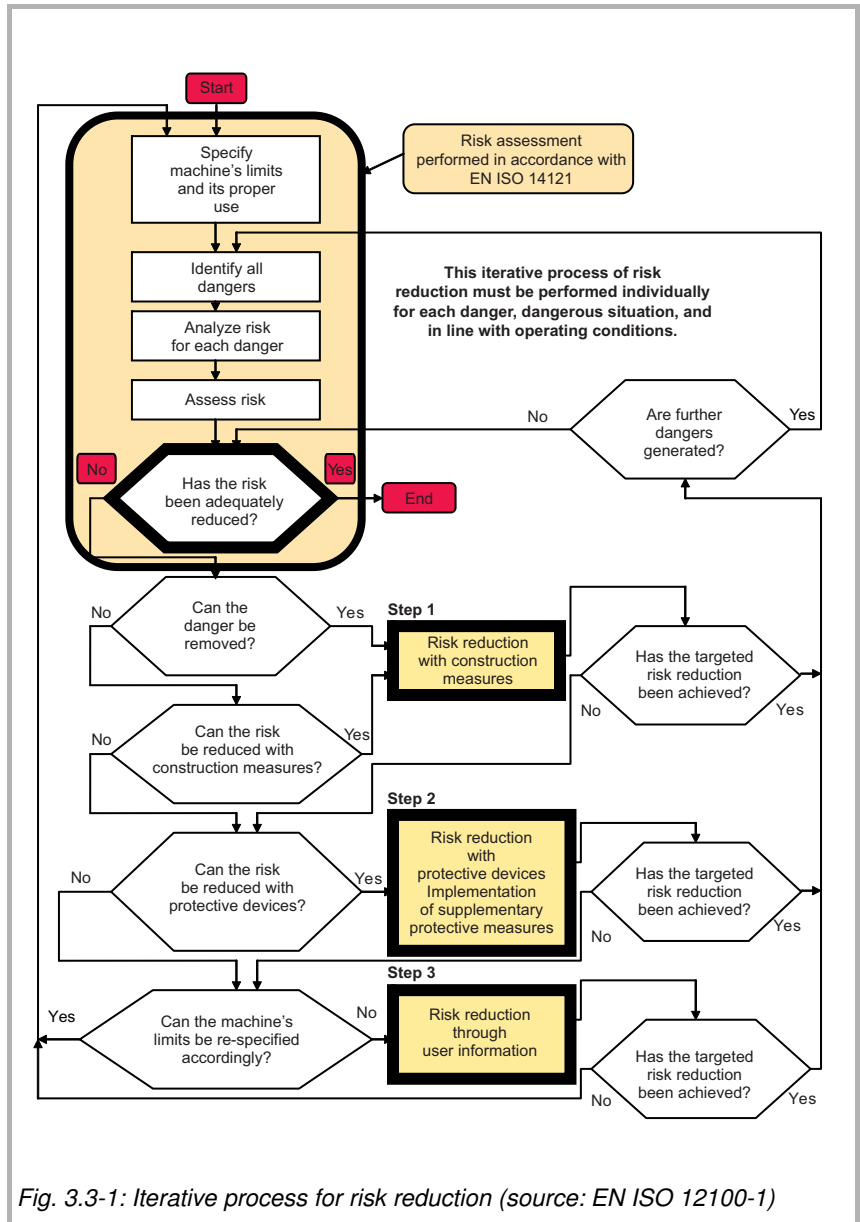


Fig. 3.3-1: Iterative process for risk reduction (source: EN ISO 12100-1)

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MACHINE SAFETY

3. Machine Safety in the USA

EN ISO 12100-1 recommends that the machine designer use the following step-by-step procedure for risk reduction:

1. Specification of the limits and proper use of the machine
2. Identification of possible hazards and hazardous situations
3. Estimation of the risk of each identified hazard and each hazardous situation and parallel consideration of the foreseeable malpractice or faulty operation by operating personnel
4. Evaluation of each individual risk and decision on whether a risk reduction is required or not
5. Attempts to remove or reduce the risk with constructive measures. If this does not work then:
6. Reduction of the risk with the use of protective devices (separating protective devices, such as hard guards or covers, or electro-sensitive protective equipment, such as Safety Light Curtains, for example)
7. Informing and warning machine operators about the remaining risks of the machine by using warning notes and plates on the machine and in the operating instructions

The first four steps describe the risk analysis and risk assessment. EN ISO 14121 contains detailed requirements for this. It is important that the risk analysis and risk assessment be carried out methodically and that it be comprehensibly documented.

In addition to these protective measures selected by the machine designer/constructor, further protective measures may also be required by the operating company or machine operator to reduce the remaining risk. This may be, for example:

- Organizational measures (e.g. safe work processes, regular inspections, etc.)
- Personal protective devices
- Training and instruction for operating personnel

Note

The Leuze electronic Safexpert PC software for machinery safety engineering contains a list of hazards in accordance with EN ISO 14121 and supports the process of risk assessment and risk reduction in accordance with EN ISO 12100-1. The software enables an isolated consideration of all hazardous points of operation and life phases of the machine and ensures transparent and comprehensible documentation. For further information and ordering info see chapter Safexpert, page 60.

3.4 Control Reliability

OSHA 1910.211

Logically contains the following requirements: A control system must be constructed in such a way that

- a fault that occurs inside the system does not prevent the normal stop process from being activated,
- another machine cycle cannot be executed before the fault has been removed and
- the fault can be revealed by a simple test, or displayed by the control system.

ANSI B11.19-2003

Subpart 3.14 logically defines "Control Reliability" as follows:

Control reliability is the capability of the machine control system, the safeguarding, other control components and related interfacing to achieve a safe state in the event of a fault within their safety related functions.

Subpart E.6.1 specifies and limits:

Control Reliability can't prevent the reinitiation of a machine cycle in case of a:

- severe mechanical failure or
- a simultaneous failure of more components.

The standard provides the following information on the structural setup:

Control reliability is not guaranteed by simple redundancy. Monitoring must be made to ensure that the redundancy remains effective.

ANSI B11.20

The following is also logically stated with regard to the control system structure in ANSI B11.20, Subpart 6.13:

"Protection against the consequences of failure of control components should not depend solely upon simple redundancy". A failure of one component of two or more parallel or serially switched control components can remain unnoticed with simple or unmonitored redundancy. The appearance of a safe operation is maintained. If another element now also fails in another redundant circuit, this can result in a dangerous state. A monitoring of redundant control system structures and the uncovering of and safe reaction to such single errors is therefore mandatory.

MACHINE SAFETY IN THE USA

3. Machine Safety in the USA

ANSI/RIA R15.06-1999

This ANSI standard contains further functional requirements for control reliability and also includes statements on errors that have common causes, such as overvoltage. Note: The term "common" means that these causes can have the same, simultaneous effect on the redundantly set up control channels.

- The monitoring must activate a stop signal when a fault is detected.
- A warning must be issued if the hazard continues to exist after the movement has been brought to a stop.
- After the fault has been detected a safe state must be maintained until the fault has been removed.
- Failures with common causes (e.g. overvoltage) must be considered when the probability of occurrence of such failures is high.
- A single fault should be detected at the time at which it occurs. If this is not practical the fault should be detected the next time the safety function is requested.

Comparison of the ANSI, IEC/EN requirements for safety-related controls

There is no precise concurrence on the definition of functional safety or control reliability in the US and IEC/EN world of standards. The requirements of Category 3 of EN ISO 13849-1 come relatively close to the OSHA/ANSI requirements:

- The safety-related parts of control systems and/or their protective devices and their components must be designed, constructed, selected and combined in accordance with the applicable standards in such a way that they can withstand the expected influences and effects.
- Proven-in-practice safety principles must be applied in design and construction. Safety-related parts must be designed so that:
 - A single fault in each of these parts does not cause the loss of the safety function.
 - The single faults are detected whenever this is reasonably possibly.

The behavior when a fault of a safety-related control unit in accordance with category 3 occurs is specified as follows:

- If a single fault occurs, the safety function is always maintained.
- Some but not all faults are detected.*
- An accumulation of undetected faults can lead to loss of the safety function.*

*) The risk assessment shows whether or not the complete or partial loss of the safety function(s) that the faults cause is manageable

Note

The SISTEMA PC software of the German Berufsgenossenschaftlichen Institut für Arbeitsschutz (BGIA) is used for the automatic calculation and evaluation of the functional safety of control systems in accordance with EN ISO 13849-1. It is an ideal complement to Safexpert and can be downloaded as freeware from www.leuze.com/sistema. For more information see chapter SISTEMA, page 66.

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PROTECTIVE DEVICES

4. Protective devices

4.1 Selecting protective devices

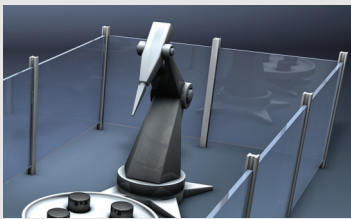


Standard EN ISO 12100-2 notes on selecting protective devices

If the hazards cannot be prevented or sufficiently limited by constructive measures, protective devices must be planned and provided. The selection of a suitable protective device should be made either in accordance with an existing machine-specific provision, e.g. a European C standard, or on the basis of a risk assessment of the respective machine.

The protective device should generally enable a simple and ergonomic operation of the machine and not obstruct its proper use. If this is not the case this can lead to the protective devices being bypassed in order to achieve an easier operation of the machine.

A fixed hard guard (e.g. a fence) should be used, where the access to the danger zone is not required by the operator during normal operation. If the operation requires a more frequent access, an electro-sensitive protective equipment (e.g. Safety Light Curtain) or a moveable guard (e.g. doors with Safety Switches) should be used.

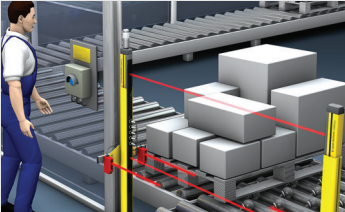
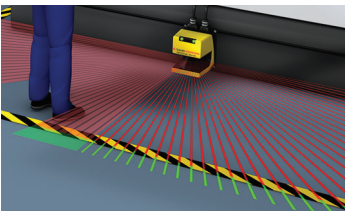
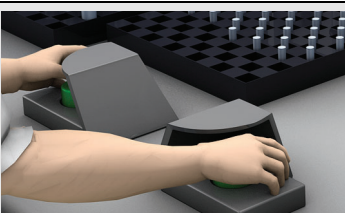
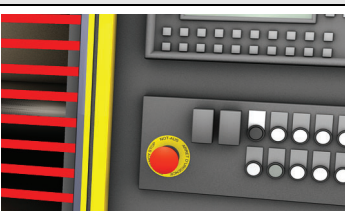
Selecting protective devices: Application advantages – application limits

	Type of protective device	Application advantages	Application limits
	Fixed hard guard (e.g. fence, cover).	Long lifetime, protection against injury caused by projected (thrown out) parts, objects.	Cannot be used if frequent access to the danger zone is required. More difficult access with maintenance work. Can be removed without being noticed. Safety distance required (EN ISO 13857).
	Moveable guard without guard interlocking (e.g. doors with flaps) with Safety Switches (without guard interlocking).	Access to machine is possible. Doors cannot be removed without being noticed.	Protective door can be opened during the operation. Cannot be used if the machine's stopping time is greater than the person's access time. Hampers operation when frequent access to the danger zone is required. Safety distance required (EN ISO 13857).
	Moveable guard with guard interlocking (e.g. door or flap with safety guard interlocking).	The protective door can only be opened with an electric unlocking signal. Prevention of unexpected production interruptions. No safety distance required.	Limited use if frequent access to the danger zone is required.

MACHINE SAFETY

4. Protective devices

Selecting protective devices: Application advantages – application limits

	Type of protective device	Application advantages	Application limits
	Light Beam Safety Devices, Multiple Light Beam Safety Devices, Safety Light Curtains	Access and ergonomic operation of the machine possible. Unobstructed material transport through the protective field is possible with combination with a muting function.	Safety distance required, EN ISO 13855. No protection against injury caused by projected (thrown out) parts, objects.
	Safety Laser Scanners	Access and ergonomic operation of the machine possible. Flexible adjustment of the protective field according to the respective danger zone.	Limited use in environments with heavy dirt build-up. Safety distance required, EN ISO 13855. No protection against injury caused by projected (thrown out) parts, objects.
	Two-hand controls	Location-dependent protective device with control function. Both of the operator's hands are required for machine activation and therefore protected against injuries.	Only protects the person operating the two-hand control device. Other people nearby are not protected. Safety distance required, EN ISO 13855.
	E-Stops	Press button(s) for stopping the machine to prevent immediate or threatening hazardous situations.	Additional cautionary measures for emergencies. Not a replacement for other protective measures. The press buttons must be placed within range of the points of operation.

PROTECTIVE DEVICES

4. Protective devices

General requirements for construction of protective devices

EN ISO 12100-2 "Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles" contains the following general constructive requirements:

Guards and electro-sensitive protective devices

- Must take mechanical and other hazards into account.
- Must be built hard-wearing and robust.
- Must not cause any additional hazards.
- Must not be easily bypassed or made ineffective.
- Must be a sufficient distance away from the danger zone (see EN ISO 13857).
- Must not obstruct the machine operation and the work process more than necessary in order to reduce every incentive to go around it.
- Must permit interventions to use or change tools or for maintenance work as much as possible without removing the protective devices. The access here must remain restricted to the area required for the work.

4.2 Guarding with optoelectronic protective devices

IEC TS 62046 "Safety of machinery – Application of protective equipment to detect the presence of persons" contains basic information for selecting, applying, connecting and putting electro-sensitive protective equipment and safety mats into operation. It addresses the authors of machine-specific C-standards, designers, test centers and anyone that is involved with the professional installation of such protective devices.

The following information refers to the recommendations of IEC TS 62046 as the international state of technology. In principle to be observed **with priority**: the operating instructions of the protective devices, regional regulations or machine-specific standards



European C-standards, for example:

EN 692 Machine tools – Mechanical presses – Safety

EN 693 Machine tools – Hydraulic presses – Safety



And in the USA for example:

OSHA 1910.217 Mechanical Power Presses

ANSI B11.1 Mechanical Power Presses – Safety Requirements for Construction, Care, Use

ANSI B11.2 Mechanical Power Presses – Safety Requirements for Construction, Care, Use

ANSI B11.19 Performed Criteria for the Design, Construction, Care and Operation of Safeguarding when referenced by other B11 Machine Tool Safety Standards

4.2.1 Selecting and applying optoelectronic protective devices

In the following it is assumed that a risk assessment, e.g. in accordance with EN ISO 12100-1, has been performed (see chapter 2.3, page 18 and 3.3. page 28) and an optoelectronic protective device has been selected as a measure for minimizing risk.

General safety notes:

- Optoelectronic protective devices do not protect against injuries caused by projected (thrown out) objects or emissions from the machine.
- The machine must allow the dangerous movement to be stopped at any point of the workflow cycle.
- Optoelectronic protective devices must be mounted in such a way that reaching into/access to the point of operation is only possible through the protective field. Reaching over, under or stepping behind must be prevented by additional protective devices (e.g. hard guards, chapter 4.3, page 43).
- With point of operation guarding (finger and hand protection) and danger zone guarding, people may not enter or be present in the danger zone undetected. Additional protective devices may need to be provided, e.g. stepping behind protection with a host/guest light curtain, for example.
- The safety distance from the protective device to the point of operation must be big enough that the dangerous movement will have stopped before a part of the person's body can reach the point of operation (see chapter 4.2.1 step 4, page 37).
- Reflective surfaces near optoelectronic protective devices can cause objects not to be detected because of the protective device's beams being reflected. An appropriate minimum distance according to the operating instructions must be observed to prevent this.

MACHINE SAFETY

4. Protective devices

Step 1: Perform risk assessment e.g. in accordance with EN ISO 12100-1



(see chapter 2.3, page 18 and 3.3 page 28)

Step 2: Select type of optoelectronic protective device and protective function

Depends on:

- Specifications of regional or machine-specific regulations
- Geometric dimensions of the area to be protected
- The protective function to be performed (e.g. machine stop with hand or finger detection)
- Ergonomic factors (ease of operation, manual cyclical insertion of parts, yes/no)
- Accessibility of danger zones: process-conditional, maintenance-conditional
- Financial criteria







The suitable optoelectronic protective device must be selected on the basis of the above information (see table).

	Protective function	Application	Leuze electronic products
	Machine stop with detection of person accessing the danger zone and prevention of the restart with constant presence detection.	Safeguarding danger zone at (accessible) feeding-in areas of machines or guarding driveways on driverless transport systems	Safety Laser Scanners Safety Light Curtains (installed at an angle or horizontal) Light curtains in host/guest configuration
			

Step 3: Selecting the required safety type of optoelectronic protective device

The optoelectronic protective device is a component of the safety-related part of the machine control system and a component in the effective chain of a partial safety function consisting of sensor, control unit and actuator. From the risk assessment (graph) in accordance with EN ISO 13849-1 or EN IEC 62061, the designer determines the safety-related performance required for the risk minimization for this partial safety function (see chapter 2.4 Safety-related parts of control systems, page 20 and , page 29). Regardless of the control system applied, the achieved level of safety-related performance (category, PL, SIL) of the entire safety function is always less than or equal to the lowest value (category, PL, SILCL) of one of its partial systems. Put simply, the chain is therefore as strong as its weakest link.

Optoelectronic protective devices have different safety-related capacities, depending on the detection principle and the internal technical setup. EN IEC 61496 and UL 61496 "Safety of machinery – Electro-sensitive protective equipment" define 3 different types of active optoelectronic protective devices (AOPD), which differ in their effectiveness and frequency of error detection, i.e. their safety-related performance. The following table 4.2.1-1 shows the requirements of this standard. For applications in the USA it must be determined which OSHA / ANSI control reliability requirement is relevant for the respective application case (observe machine-specific and regional specifications!) – see chapter 3 and 3.4, page 29). The corresponding AOPD type must then be selected.

	Protective function	Application	Leuze electronic products
  	Machine stop with hand or finger detection	With small operator distance to the danger zone, e.g. with feeding-in work at a press	Safety Light Curtains, Safety Laser Scanners (-E model)
  	Machine stop with detection of person accessing the danger zone	With accessible danger zones and bigger distance to the danger zone	Single Light Beam and Multiple Light Beam Safety Devices, Safety Laser Scanners (-E model), Safety Switches and Safety Locking Devices (in combination with hard guards)

PROTECTIVE DEVICES

4. Protective devices

AOPD type according to IEC / EN / UL 61496	Functional safety (control reliability) of AOPDs in accordance with IEC / EN / UL 61496 and requirements for the effectiveness and frequency of the error detection
Type 2	<p>A type 2 AOPD shall have means for a periodic test. A loss of the protective function between the tests is possible if a fault occurs.</p> <p>A fault shall be detected immediately either with the next periodic test or with activation of the sensor component and must result in the switching off of at least one AOPD output.</p>
Type 3 (Only defined for Safety Laser Scanners)	<p>Despite a single fault the protective function of a type 3 AOPD is maintained. An accumulation of faults can lead to loss of the safety function.</p> <p>A single fault that causes the loss of the detection capability shall be detected immediately either with activation of the sensor function, with switching on/switching off with start/restart interlock reset (if available) or with an external test (if available) and shall result in the AOPD outputs being switched off.</p> <p>A single fault that impairs the detection capability shall be detected within the time specified in the relevant part of EN IEC 61496 (5 seconds for Safety Laser Scanners). With the non-detection of the first fault, a second fault may not result in the loss of the protective function.</p>
Type 4	<p>With the occurrence of several faults the protective function of a type 4 AOPD is also maintained.</p> <p>A single fault that results in the loss of the sensor detection capacity shall be detected within the AOPD response time and result in the outputs being switched off.</p> <p>A single fault that impairs the response time or the switching off capacity of one of the AOPD outputs shall result in the AOPD outputs being switched off either within the given AOPD response time or with addressing the sensor component, with switching on/switching off or with the resetting (reset) and shall result in the AOPD outputs being switched off.</p>

Table 4.2.1-1: Types and functional safety (control reliability) of electro-sensitive protective equipment in accordance with EN IEC 61496 and UL 61496.

MACHINE SAFETY

4. Protective devices

Parameters of Leuze electronic protective devices for determining the PL in accordance with EN ISO 13849-1 and SIL in accordance with IEC 61508 / and SILCL in accordance with EN IEC 62061.

For the products of the ASM1, ASM1E, COMPACTplus, ROTOSCAN RS4, SOLID, and MSI series, SIL in accordance with IEC 61508/SILCL in accordance with EN IEC 62061 or PL in accordance with EN ISO 13849-1 is specified in the technical data.

Note

The SISTEMA PC software of the German Berufsgenossenschaftlichen Institut für Arbeitsschutz (BGIA) is used for the automatic calculation and evaluation of the functional safety of control systems in accordance with EN ISO 13849-1. It is an ideal complement to Safexpert and can be downloaded as freeware from www.leuze.com/sistema. It includes a components library with the safety-related parameters of selected Leuze electronic products. For more information see chapter SISTEMA, page 66.

Help with selecting Leuze electronic protective devices

In the event that no regional or machine-specific specifications, such as European C-standards or OSHA /ANSI standards specify specific types of optoelectronic protective devices, the following selection aid can be used to select the appropriate Leuze electronic safety sensor for the risk minimization. The qualitative method presented in EN ISO 13849-1 is used for determining the required safety level. A risk assessment, e.g. in accordance with EN ISO 12100 and EN ISO 14121 must basically be performed beforehand and the notes of chapter 4.2.1 must be observed.

IEC TS 62046 recommends across the board:

- With low risk: Type 2 AOPD and higher
- With medium risk: Type 3 AOPD (Safety Laser Scanners) or type 4 Safety Light Curtains
- With high risk: Type 4 AOPD

Safety note

The selection of the appropriate type of protective devices for sufficient risk reduction is always the responsibility of the machine constructor or system integrator. No legal claims can be derived from the following selection aid. Regional laws or machine-specific specifications, reasons for product liability or the amount of the material damage can result in the selection of another type of protective device with higher safety-related capacity, contrary to the presented recommendation. If the possibility of serious, irreversible injuries exists, we recommend using an AOPD of at least type 3.

Risk parameters:

S Seriousness of injury

- S1 Minor (usually reversible) injury
- S2 Serious (usually irreversible injury including death)

F Frequency and/or duration of the exposure to the hazard

- F1 Seldom to not very frequent and/or exposure to hazard is brief
- F2 Frequent to continuous and/or exposure to hazard is long

P Possibility of preventing the hazard or limiting the harm

- P1 Possible under certain conditions
- P2 Not really possible

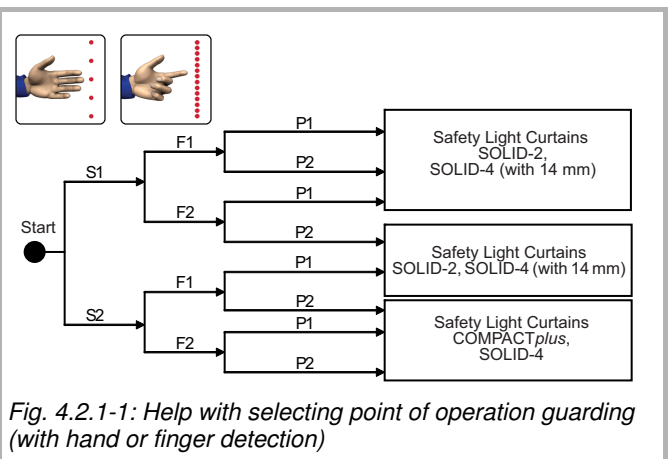


Fig. 4.2.1-1: Help with selecting point of operation guarding (with hand or finger detection)

PROTECTIVE DEVICES

4. Protective devices

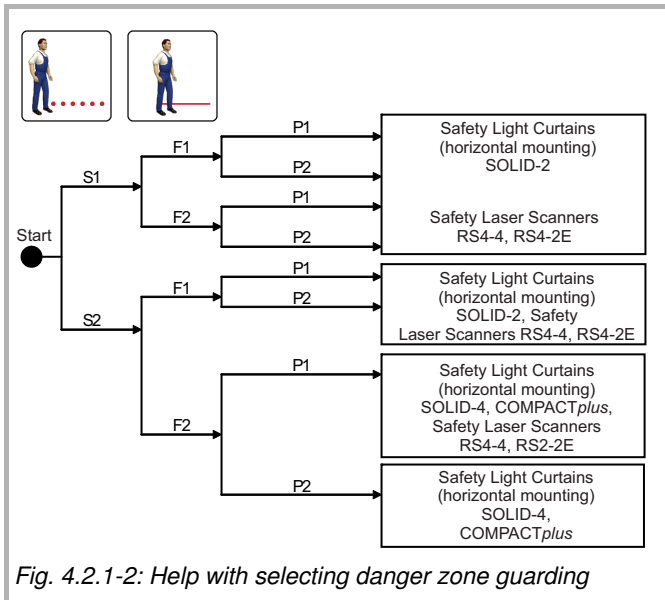


Fig. 4.2.1-2: Help with selecting danger zone guarding

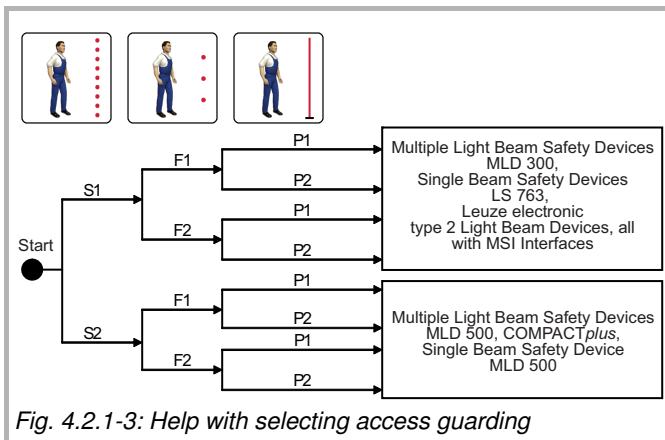


Fig. 4.2.1-3: Help with selecting access guarding

Step 4: Calculating safety distance

Optoelectronic protective devices can only perform their protective function if they are installed with a sufficient safety distance from the nearest danger point of operation. The safety distance from the protective device to the point of operation must be big enough that the dangerous movement will have stopped before a part of the person's body can reach the point of operation (see also, ANS IB11.19-2003). After calculating the safety distance it should be checked and ensured that this minimum distance allows an ergonomic operation of the machine for the operator. If this is not the case either an entire stop time of the machine or an AOPD with higher resolution must be selected.

The following overview refers to the calculation formulas of EN ISO 13855 "Safety of machinery – Positioning of protective equipment with respect to the approach speeds of parts of the human body" and the recommendations of IEC TS 62046. If the machine is the subject of a certain specification, such as machine-specific European C-standards and OSHA / ANSI standards, then reference must be made to this. This overview does not, of course, detract from the observation of the installation notes of the operating instructions.

Safety distance calculation in accordance with EN ISO 13855 and IEC TS 62046

The minimum distance of a "stop-activating" protective device from the nearest danger point of operation on the machine must be calculated with the following formula:

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

- S** The minimum safety distance in millimeters from the next point of operation to the detection point (protective field) of the protective device. An "S" of 100 mm must be observed regardless of the calculated value.
- K** Approach speed in millimeters per second, derived from data of the approach speeds of the body and body parts.
Speed (lower limbs): K = 1600 mm/s
Speed (upper limbs): K = 2000 mm/s
- T** Stopping time of the entire system (protective device response time + interface response time + machine stopping time) in seconds (IEC TS 62046 requires at least an additional 10 % on top of the determined stopping time to allow for possible deteriorations).
- C** An additional distance in millimeters. This additionally added distance is based on the fact that, depending on the resolution of the protective device, a body part can get a certain distance closer to points of operation before it is detected by the protective device.

MACHINE SAFETY

4. Protective devices

General procedure for AOPD with right-angle approach (point of operation guarding and access guarding)

According to EN ISO 13855, not only is the direction of movement through the protective field to be taken into account, so too is the circumventing of the protective device by possibly reaching over or under. Consequently, the value S is to be calculated for both the safety distance with respect to reaching / walking through the protective field S_{RT} (Reach Through) and with respect to reaching under / over S_{RO} (Reach Over). The larger of the two values is to be used as the safety distance S.

For danger zone guarding with parallel approach, reaching under and over is already implicitly taken into account.

Calculation formula for the minimum safety distance for AOPD with perpendicular approach with respect to reaching through (point of operation guarding):

The following calculation formulas apply for applications of optoelectronic protective devices with approach direction of body parts in an angle of 30° to 90° to the protective field level:

S for protective devices with detection value d (resolution) ≤ 40 mm:

$$S = (2000 \times T) + 8 \times (d - 14)$$

Attention:

S must always be at least 100 mm. If the calculation results in $S > 500$ mm, the calculation may be made again with $K = 1600$ mm/s. In this case S must be at least 500 mm.

If electro-sensitive protective equipment is also used to control the machine (Safety Light Curtains with single or double cycle function), its resolution must be ≤ 30 mm. A minimum distance S of 150 mm may not be exceeded regardless of the calculation. With $d = 14$ mm this minimum distance is 100 mm.

Attention:

Machine-specific regulations such as EN 692 or EN 693 may prescribe values for S that differ from the formula.

S for protective devices with 40 < d ≤ 70 mm:

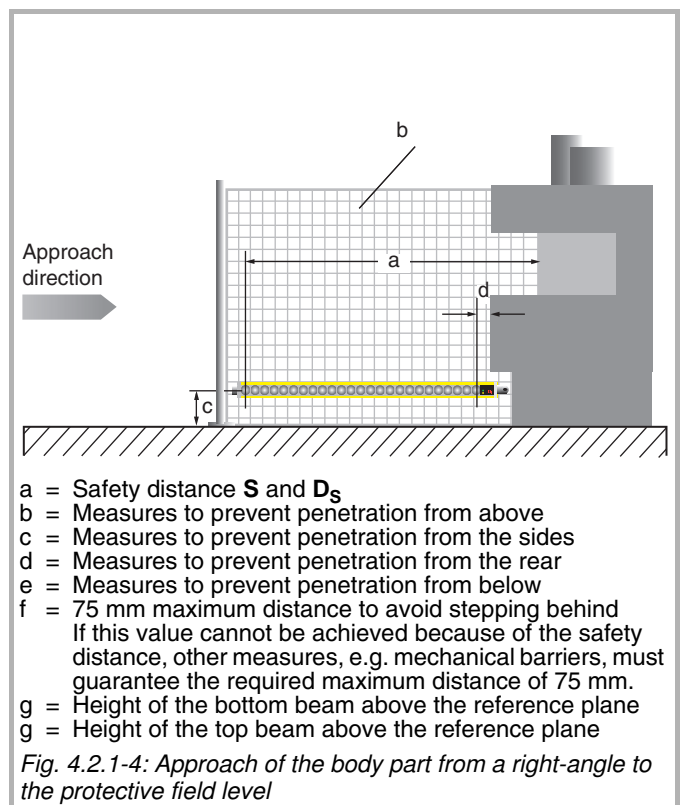
These kinds of protective devices may only be used if the risk assessment determines that the insertion of the hands does not have to be detected. The additional 850 mm to be added on corresponds with the arm length:

$$S = (1600 \times T) + 850 \text{ mm}$$

Attention:

Height of the top beam of the protective device ≥ 900 mm

Height of the bottom beam of the protective device ≤ 300 mm



PROTECTIVE DEVICES

4. Protective devices

Calculation formula for the minimum safety distance of Multiple Light Beam Safety Devices for access guarding with respect to reaching through and stepping through:

If the risk assessment determines that a detection of the penetration of the entire body is sufficient, the following calculation formula must be applied. The additional 850 mm to be added on corresponds with the arm length:

$$S = (1600 \times T) + 850 \text{ mm}$$

Attention:

This type of arrangement of the protective device allows an operator to be between the sensor and the point of operation without being detected after crossing the protective device. A start/restart interlock function that prevents the machine from starting is provided in every case. The command device (reset button) must be positioned so that the entire danger zone can be seen and it cannot be operated from the danger zone.

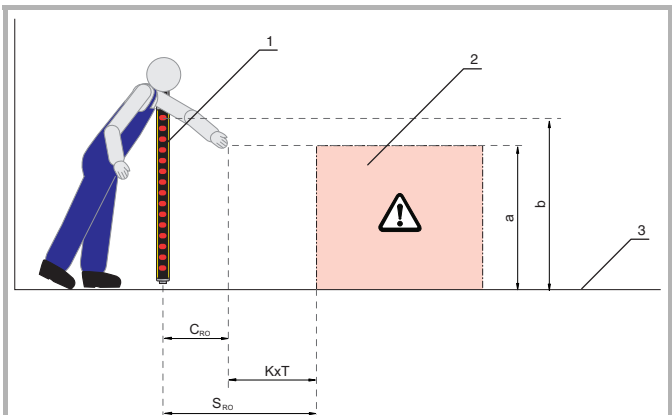
With the risk assessment and selection of the appropriate protective device, a possible getting around, e.g. crawling under the lowest beam, reaching over the highest beam, reaching through or climbing through two beams must be taken into account. If the risk assessment allows the use of a single beam protective device, the minimum distance must be calculated according to the following formula:

$$S = (1600 \times T) + 1200 \text{ mm}$$

Calculation formula for the minimum safety distance for AOPD with perpendicular approach with respect to reaching over

If it is possible to reach over or under a vertical protective field, an additional distance C_{RO} added to safety distance S_{RO} is to be taken into account according to EN ISO 13855.

$S_{RO} = K * T + C_{RO}$	
K = Approach speed for point of operation guarding with approach reaction and approach direction perpendicular to the protective field	2000 mm/s or 1600 mm/s when $S_{RO} > 500 \text{ mm}$
T = Total time of the delay, sum ($t_a + t_i + t_m$) from t_a : Response time of the protective device t_i : Response time of the safety interface device t_m : Stopping time of the machine	[s]
C_{RO} = Additional distance in which a body part can move towards the danger zone before the protective device triggers	Value from table 4.2.1-2



- 1 AOPD
- 2 point of operation
- 3 reference plane

Figure 4.2.1-5: Additional distance to be added to the safety distance for reaching over and under

MACHINE SAFETY

4. Protective devices

Height a of the point of operation [mm]	Height b of the top edge of the protective field of the electro-sensitive protective equipment											
	900	1000	1100	1200	1300	1400	1600	1800	2000	2200	2400	2600
Additional distance C_{RO} to the dangerous area [mm]												
2600	0	0	0	0	0	0	0	0	0	0	0	0
2500	400	400	350	300	300	300	300	300	250	150	100	0
2400	550	550	550	500	450	450	400	400	300	250	100	0
2200	800	750	750	700	650	650	600	550	400	250	0	0
2000	950	950	850	850	800	750	700	550	400	0	0	0
1800	1100	1100	950	950	850	800	750	550	0	0	0	0
1600	1150	1150	1100	1000	900	850	750	450	0	0	0	0
1400	1200	1200	1100	1000	900	850	650	0	0	0	0	0
1200	1200	1200	1100	1000	850	800	0	0	0	0	0	0
1000	1200	1150	1050	950	750	700	0	0	0	0	0	0
800	1150	1050	950	800	500	450	0	0	0	0	0	0
600	1050	950	750	550	0	0	0	0	0	0	0	0
400	900	700	0	0	0	0	0	0	0	0	0	0
200	600	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0

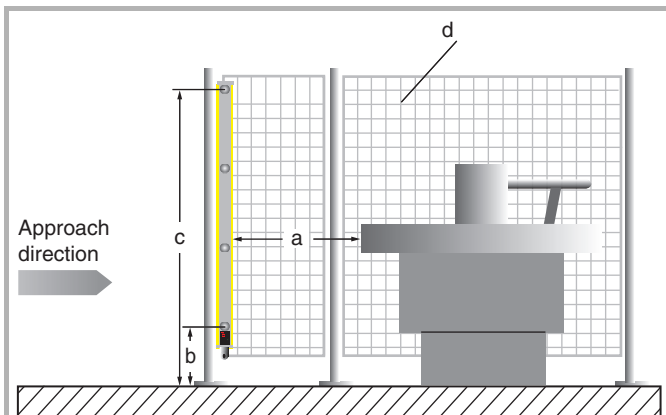
Table 4.2.1-2: Additional distance C_{RO} for reaching over the vertical protective field of an electro-sensitive protective equipment according to EN ISO 13855

PROTECTIVE DEVICES

4. Protective devices

Number of beams and beam heights of Multiple Light Beam Safety Devices for access guarding in accordance with EN ISO 13855

Number of beams of the protective device	Height of the beams above reference plane
4	300, 600, 900, 1200 mm
3	300, 700, 1100 mm
2	400, 900 mm



a = Safety distance **S** and **D_S**
 b = Height of the lowest beam above the reference level, see table above
 c = Height of the highest beam, see table above
 d = Measures to prevent access from the sides
 Fig. 4.2.1-6: Safety distance and beam heights of Multiple Light Beam Safety Devices for access guarding

Calculation formula for the minimum safety distance for AOPD with parallel approach with respect to reaching through (danger zone guarding):

The following calculation formula applies for applications of optoelectronic protective devices with approach direction of body parts parallel or in an angle up to 30° to the protective field level:

$$S = (1600 \times T) + C \text{ with}$$

$$C = (1200 - 0.4 \times H)$$

C Additional distance for lower limbs. C always greater than 850 mm (arm length)

H Height of protective field above reference plane (floor).
 Relative installation heights H of a protective device with resolution d:

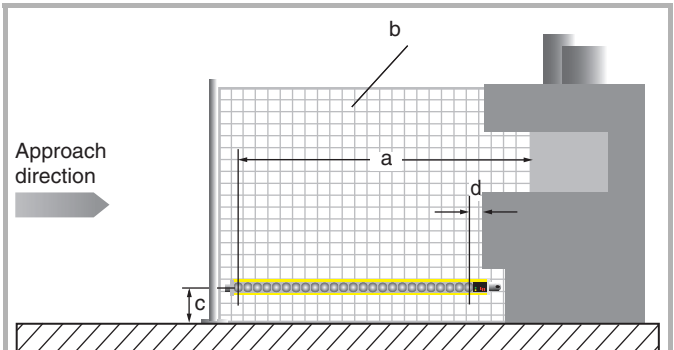
$$15 \times (d - 50) \leq H \leq 1000 \text{ mm}$$

Required resolution d of a protective device with installation height H:

$$d [\text{mm}] \leq H / 15 + 50 \text{ mm}$$

Attention:

If H is greater than 300 mm the danger exists of room to crawl under. This must be taken into account with the risk assessment.



a = Safety distance **S** and **D_S**
 b = Measures to prevent access from the sides
 c = Height H above the floor
 d = 50 mm – Maximum distance to avoid stepping behind
 If this value cannot be achieved because of the safety distance, other measures, e.g. mechanical barriers, must guarantee the required maximum distance of 50 mm.
 From 375 mm height above the floor 75 mm are permissible.

Fig. 4.2.1-7: Body part approach parallel or up to max 30° to the protective field level

MACHINE SAFETY

4. Protective devices

US specifications for safety distance calculation



The U.S. Code of Federal Regulations, Volume 29, Part 1910, Subpart 0 defines the calculation of the minimum safety distance of a protective device. OSHA 1910.217 requires that with the installation of a

Safety Light Curtain a minimum distance, which corresponds with the prescribed distance of a hard guard, is observed in every case (see OSHA 1910.217, table 0-10). If the safety distance calculation results in a greater value, this must be used.

ANSI B11.19-2003 calculation formula for the minimum safety distance for AOPD with right-angle approach (point of operation guarding):

The following calculation formula applies for applications of optoelectronic protective devices with approach direction of body parts in an angle of 30° to 90° to the protective field level (see page 38, fig. 4.2.1-4):

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

D_s The minimum safety distance in inches or millimeters between the next danger zone and detection point (protective field)

H_s Hand speed (approach speed of body parts or bodies) in inches/s or millimeters/s. ANSI B11.19-2003 provides hand speeds of 63 - 100 inch/s. 63 inches/s is frequently calculated, which equals 1600 mm/s.

Elements of the entire stop time of the machine:

T_s Stopping time of the machine measured at the last control element in s

T_c Response time of the machine control system in s (note: $T_s + T_c$ are usually measured together with a stopping time measuring device)

T_r Response time of the protective device (incl. interface module) in s

T_{bm} Additional response time for the brake wear and tear which is not detected by the tracking monitoring of the brakes. If the machine does not have a brake monitoring unit, approx. 20% of the measured tracking time ($T_s + T_c$), or a factor in accordance with the specifications of the machine manufacturer must be added as a reference value for the brake wear and tear.

D_{pf} Penetration factor in inches or millimeters. This additionally added distance is based on the fact that, depending on the resolution of the protective device, a body part can get a certain distance closer to points of operation before it is detected by the protective device.

$$D_{pf} \text{ (inches)} = 3.4 \times (\text{resolution} - 0.276), \text{ result} > 0$$

Resolution	D_{pf} (mm)	D_{pf} (inches)
14 mm	24	0.9
20 mm	44	1.7
30 mm	78	3.1

Calculation formula for the minimum safety distance for AOPD with parallel approach (danger zone guarding):

The following calculation formula applies for applications of optoelectronic protective devices with approach direction of body parts parallel or in an angle up to 30° to the protective field level: The formula is derived from the ANSI formula and is based on the principles of EN 999. With protective devices arranged in this way the safety distance from the point of operation is measured from the furthest away protective field boundary, as the detection of the body part begins here (see page 41, fig. 4.2.1-5).

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

$$D_H = 1200 \text{ mm} - (0.4 \times H)$$

D_H Additional distance for lower limbs. D_H always at least ≥ 850 mm (arm length)

H Height of protective field above reference plane (floor). Permissible installation heights H of a protective device with resolution d [mm]:
 $15 \times (d - 50) \leq H \leq 1000$ mm
 Required resolution d of a protective device with installation height H :
 $d \text{ [mm]} \leq H / 15 + 50$ mm

Attention:

If H is greater than 300 mm (12 inches) there is danger of room to crawl under. This must be taken into account with the risk assessment.

PROTECTIVE DEVICES

4. Protective devices

Calculation formula for the minimum safety distance of Multiple Light Beam Safety Devices for access guarding:

If the risk assessment determines that a detection of the penetration of the entire body is sufficient, the following calculation formula must be applied (see also, fig. 4.2.1-6, page 41). The additional 850 mm to be added on corresponds with the arm length:

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

$D_H = 850 \text{ mm}$

Attention:

This type of arrangement of the protective device allows an operator to be between the sensor and the point of operation without being detected after crossing the protective device. A start/restart interlock function that prevents the machine from starting is provided in every case. The command device (reset button) must be positioned so that the entire danger zone can be seen and it cannot be operated from the danger zone.

With the risk assessment and selection of the appropriate protective device, a possible getting around, e.g. crawling under the lowest beam, reaching over the highest beam, reaching through or climbing through two beams must be taken into account.

Number of beams of the protective device	Height of the beams above reference plane
4	300, 600, 900, 1200 mm
3	300, 700, 1100 mm
2	400, 900 mm

4.3 Guarding with hard guards (fence heights, fixing instructions, safety distances, etc.)

Hard guards prevent access to danger zones and at the same time also protect (depending on the model) against projected (thrown out) objects and (depending on the model) against dangerous emissions from the machine. EN ISO 12100-2 and EN 953 "Safety of machinery - Guards - General requirements for the design and construction of fixed and moveable guards" contain normative requirements for construction. Extracts of the most important requirements are listed in the following sections. The height of the protective fences, openings or mesh sizes of wire screens must be dimensioned and far enough away from the point of operation that they cannot be reached with any body parts (see e.g. EN ISO 13857).

4.3.1 Fixed hard guards

Fixed hard guards can always be used when the access to the danger zone is not required during the normal operation. These include protective fences, barriers, fixed covers, etc. Fixed hard guards are also frequently used in combination with optoelectronic protective devices as supplementary protective devices.

EN ISO 12100-2 requires that fixed hard guards must be firmly held in their place with constructive measures:

- either permanently (e.g. welded)
- or with fixing elements (nuts, bolts) that require the use of a tool. If possible, it should not be possible to keep them in the protective position after the fixing elements have been loosened
- or position-monitored with the control-connected Safety Switches so that the dangerous movement is blocked with the removal of the protective device (see EN 1088)

MACHINE SAFETY

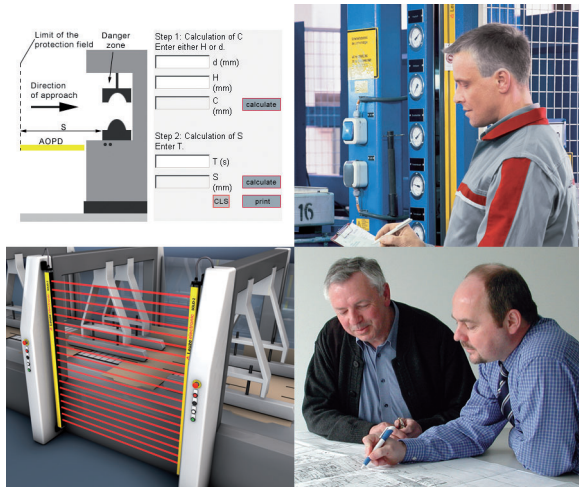
4. Protective devices

Height and safety distances of fixed hard guards

EN ISO 13857 "Safety of machinery - Safety distances to prevent danger zones being reached" contains two tables for dimensioning the height and required safety distance of fixed hard guard protective devices in accordance with the height of the point of operation. Table 1 contains dimensioning recommendations for hazards with low risk; table 2 contains measurement recommendations for applications with high risk.

Note

The Leuze electronic online advice service "Safety-Know-How" at www.safety-at-work.leuze.de contains an interactive calculation wizard for dimensioning fixed hard guards in accordance with EN ISO 13857 in the application information chapter.



4.3.2 Moveable hard guards

If the access to the danger zone is required during the normal operation or for maintenance work, electro-sensitive protective equipment, such as Safety Light Curtains or moveable hard guards such as protective doors or flaps, must be used. These kinds of moveable protective devices must be position-monitored via Safety Switches or Safety Locking Devices, and electrically connected with the control unit (for further requirements see EN ISO 12100-2).

EN 1088 essentially differentiates two types of Safety Switches (referred to as "interlocking devices" in the standard). "Interlocking devices without guard interlocking" and "Interlocking devices with guard interlocking". These Safety Switches must be set up so that they cannot be easily manipulated.



Moveable hard guards with Safety Switches (without guard interlocking)

Safety Switches (without guard interlocking) are used for position monitoring of protective doors or flaps, for example. The hard guard can be opened at any time. As soon as the hard guard is no longer closed a stop command is generated. An appropriate safety distance from the protective device to the point of operation must be observed so that the dangerous movement is stopped in good time before the point of operation can be reached.

If a C standard or other machine-specific specifications are not available, the required safety distance S can be determined with the calculation formula provided in EN ISO 13857, for example:

$$S = (K * T) + C$$

- S** Minimum distance in millimeters measured from the danger zone to the Safety Switch
 - K** 1600 mm/ms approach speed of the body or body parts in millimeters per second
 - T** Run-on of the entire system in seconds
 - C** Additional distance (taken from table 4 of ISO 13857, if it is possible to insert fingers or hand through the opening towards the hazard zone before a stop signal is generated.)
- Leuze electronic Safety Switches (without guard interlocking), see pages 338 to 376.

PROTECTIVE DEVICES

4. Protective devices



Moveable hard guards with Safety Locking Devices

Safety Locking Devices keep the hard guard in a closed position. They are always used when the dangerous machine function has not ended after the protective device has been opened, before a person can reach the point of operation (e.g. with long machine stopping times). With the guard interlocking the hard guard stays closed until the dangerous state has ended.

Machine protection is a further application area. Safety Locking Devices are frequently also used when undefined interruptions of the production process are to be prevented for process safety reasons (see also, EN IEC 60204-1, Item 9.4.1).

EN 1088 differentiates with the technical configuration of power-actuated interlocking devices between two variants:

- Spring force-actuated and electrically unlocked (e.g. electrical signal)
- Power-actuated (e.g. electromagnet) and spring-force unlocked

Safety Locking Devices with spring force-actuated interlocking also remain interlocked with a power failure on the entire machine and therefore keep a protective door blocked, including during the machine's overtravel period. Because of this property they are preferred over the power-actuated (magnetic-force actuation) Safety Locking Devices for people protection applications. Magnetic-force actuated guard interlockings are frequently used for machine guarding.

Leuze electronic Safety Locking Devices, see pages 378 to 404.

Machine Safety Services

Safety Engineering Software

Safety Laser Scanners

Safety Light Curtains

Multiple Light Beam Safety Devices

Light Beam Safety Device Sets

Single Light Beam Safety Devices

AS-Interface Safety at Work

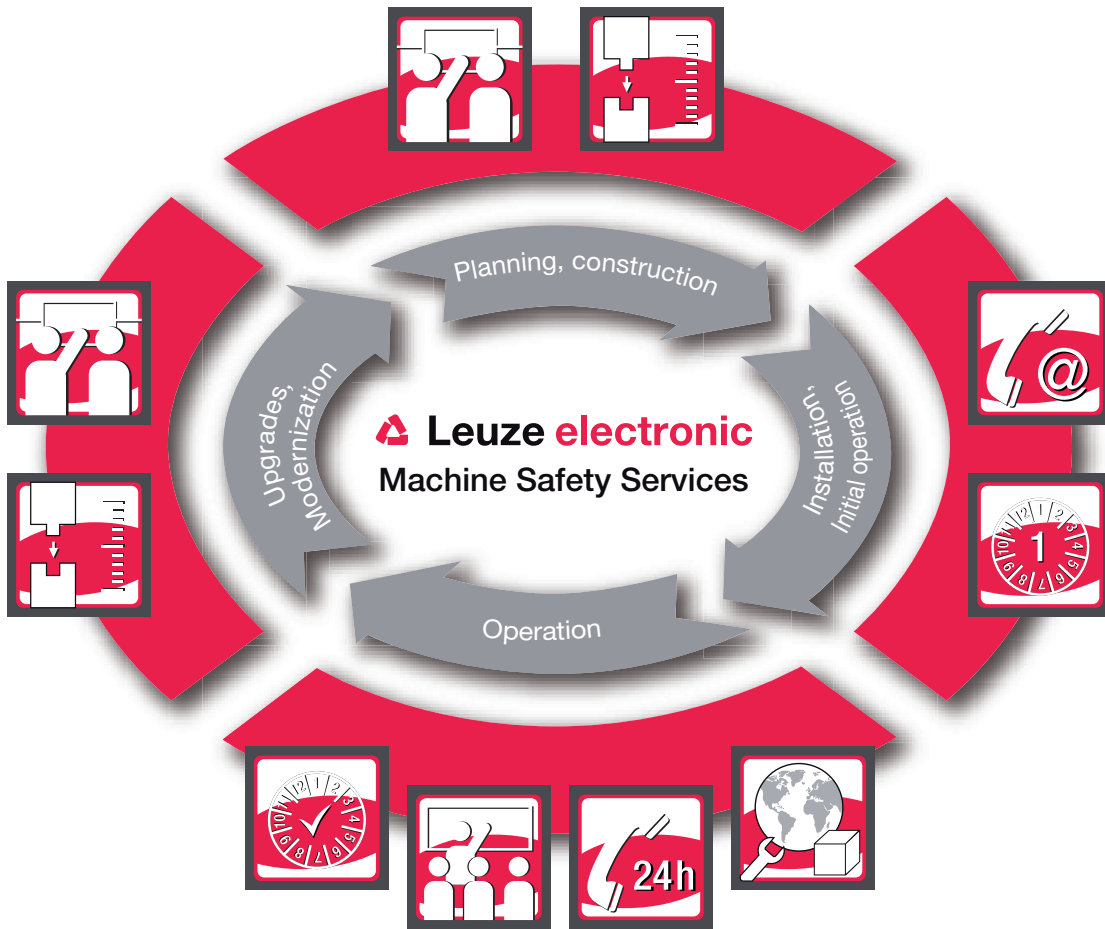
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MACHINE SAFETY SERVICES

Service selection table

Our services – Your benefits, at a glance

Whether it is Planning and Engineering or Safety at Work Management in Operations, the use of Industrial Safety Technology requires a high degree of responsibility awareness and well-established expertise.



Our service package for the entire lifetime of your machine

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Selection table

With the "Machine Safety Services" service package, we provide product-related services and support for everything related to machine and plant system safety. The individual services are coordinated with the safety-related application during the machine's lifecycle and can be applied individually or combined as requirements dictate.



Features

Also possible on-site	Free of charge telephone service	Also for competitor products
●	●	
●	●	
●		●
●		●
●		●
●		
●		

	Type of service	Explanation	Also possible on-site	Free of charge telephone service	Also for competitor products	Page
	Application advice, safety engineering	Leuze electronic consultancy and advice competence and solutions for economical safety concepts and maximum system productivity	●	●		48
	Start-up support, hotline	Quick and competent support with start-up helps you to save time and money	●	●		49
	Safety inspection before the machine's first operation*	Initial inspections help to minimize risks, ensure EU conformity and provide legal certainty	●		●	50
	Regular safety inspections*	Safety inspections help to reduce accident risk and machine downtimes, as well as complying with quality standards	●		●	52
	Stopping time measurements and determining safety distances*	Measurements performed by experts and comprehensibly documented results create a secure basis for the correct positioning of the protective devices	●		●	54
	On-site service, repairs and device replacement service	Fast help in the event of a fault caused by replacement devices of our standard range and on-site from our competent service technicians as required	●			56
	Qualified product training and seminars*	Well trained employees ensure safe and fault-free production	●			58

*) This service is currently only offered in Germany. If you are interested in this service outside Germany, please talk to your Leuze electronic sales partner

MACHINE SAFETY SERVICES



Application advice, safety engineering



Know-how from the experts – an effective cooperation for productive safety

Leuze electronic
the sensor people

Home | EU-Directives | Machine Safety in the USA | Selecting protective devices | Application advice

Safety Know How

The online Safety Know-how Wizard displays a selection of European directives and important standards relating to machine safety, and lends assistance in the selection and application of protective devices. Interactive calculation wizards support the user e.g. in establishing the norm-prescribed dimensions of protective fences or calculating the required safety clearances for protective devices that operate without physical contact.

Exclusion of liability

Neither the recommendations of this Wizard nor the list of directives and standards supplied make any claim to comprehensiveness. In the installation, operation and maintenance of these products, the relevant directives, in their currently valid version, and the instructions given in the operating manual should be observed. Failure to comply with these instructions may result in death or serious injury.

Leuze lumiflex GmbH + Co. KG will admit no liability for damages that result from the use of this Wizard or for the correctness of the information supplied on generally applicable norms and directives.

Attention!

For the correct representation and functionality of this Website please activate Javascript and install flash player.

Deutsch • Français
We reserve the right to make changes.

Last Update: 2007-09-12

print site bookmark site top of page

Safety know-how with animations, interactive calculation wizards and a selection of important directives and standards

Online adviser

Our online adviser, "Safety know-how" at www.safety-at-work.leuze.de provides a selection of European directives and important standards relating to machine safety and offers assistance with the selection and application of protective devices. Interactive calculation wizards support the person setting up, for example, with the standards-compliant dimensioning of hard guards or the calculation of required safety distances with electro-sensitive protective equipment. The adviser is also available on CD ROM.

Computer-Aided Engineering

EPLAN 5 and EPLAN P8 product macros are ready for free download for quick and easy integration into the circuit diagrams for many Leuze electronic products.

Note

The Leuze electronic Safexpert PC software for machinery safety engineering contains a list of hazards in accordance with EN ISO 14121 and supports the process of risk assessment and risk reduction in accordance with EN ISO 12100-1. The software enables an isolated consideration of all hazardous points of operation and life phases of the machine and ensures transparent and comprehensible documentation. For further information and ordering info see chapter Safexpert, page 60.

Note

The SISTEMA PC software of the German Berufsgenossenschaftlichen Institut für Arbeitsschutz (BGIA) is used for the automatic calculation and evaluation of the functional safety of control systems in accordance with EN ISO 13849-1. It is an ideal complement to Safexpert and can be downloaded as freeware from www.leuze.com/sistema. For more information see chapter SISTEMA, page 66.

Whether it be a new system or a modernization, for the designer the important thing is to integrate the safety technology into the machine in such a way that optimum productivity, ergonomics and cost effectiveness are achieved while incorporating and considering the relevant standards and specifications. Make good use of the long-standing years of application experience of our engineers in hammering out the respectively most optimum safety concept.

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START-UP



Start-up support, hotline



Our service hotline can clear up a lot of your application questions on the phone

Deadline pressure – there’s often just too little time for putting a protective device into operation. Our competent service hotline can answer a lot of questions at the early phone call stage. On our website at www.leuze.com we support our customers around the clock with a free of charge download option for operating instructions, technical descriptions, parametering/configuration software, data sheets, parameter files and FAQs for fast troubleshooting.

Contact

Service hotline:
+49 (0) 8141 5350-111
Monday to Thursday, 8.00 a.m. to 5.00 p.m. (UTC+1) and Friday, 8.00 a.m. to 4.00 p.m. (UTC+1)

E-mail: service.protect@leuze.de

24-hr standby service

For emergencies the telephone standby service of Leuze electronic is available around the clock at +49 (0) 7021/5730.



An around-the-clock standby service is a foregone conclusion for us

Machine Safety Services

Safety Engineering Software

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Light Beam Safety Device Sets

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AS-Interface Safety at Work

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MACHINE SAFETY SERVICES



Safety inspection before the machine's start-up *



We look after safety with machinery and complex plant and systems

Safety at work is the employer's responsibility and therefore the "boss's business". This principle applies the world over. In Germany the Ordinance on Industrial Safety and Health legally requires that machinery be tested before being put into operation (initial operation), after long idle periods, after changes and modifications and at regular intervals. Regardless of this, regular safety inspections guarantee compliance with safety and quality standards, serve as precautionary maintenance measures and consequently help to reduce undesirable machine downtimes to a minimum. Individual service contracts are possible at all times.

Benefits

- **EU conformity and legal certainty with proof that relevant safety and quality standards are met**
- **Proven-in-practice solution proposals for the rapid removal of safety deficiencies**
- **Comprehensible and well-documented test results in accordance with DIN ISO 9001:2000**
- **Standards-specific test protocol**
- **Accident risk and machine downtime minimization**
- **Ensuring machine productivity and availability with regular inspections**

*) This service is currently only offered in Germany. If you are interested in this service outside Germany, please talk to your Leuze electronic sales partner.

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Safety inspection before the machine's start-up *

Scope of safety inspections

- Recording the identification of machine and protective device
- Testing the technically-compliant installation of the protective device (reaching under, reaching over, etc.)
- Stopping time measurement (optional) and testing the safety distance from the protective device to the point of operation
- Testing the circuit diagrams for safe switching-related integration of the protective device into the machine control system
- Testing all functions of the protective device and the safe interaction with the machine control system
- Proven-in-practice assistance with problem analysis and presentation of solutions
- Documentation of all test results in a test log and attaching the inspection sticker
- Log in pdf format
- Safety inspections of other manufacturers' products on request

Safety inspection before start-up

Art. no.	Article	Description
S991004	CS-SIN/FR	Safety inspection, flat-rate
S991003	CS-TXP/FR	Traveling expenses flat-rate with trip planning by Leuze electronic
S991011	CS-TXN/FR	Traveling expenses flat-rate without trip planning by Leuze electronic

*) This service is currently only offered in Germany. If you are interested in this service outside Germany, please talk to your Leuze electronic sales partner.

www.leuze.com/safety-services/

MACHINE SAFETY SERVICES



Regular safety inspections *



In Germany the Ordinance on Industrial Safety and Health legally requires that machinery be tested before being put into operation (initial operation), after long idle periods, after changes and modifications and at regular intervals. Regardless of the respective legal requirements, regular safety inspections guarantee compliance with safety and quality standards, serve as precautionary maintenance measures and consequently help to reduce undesirable machine downtimes to a minimum.

Regular inspections guarantee technical safety and also increase your company's legal certainty

Benefits

- **EU conformity and legal certainty with proof that relevant safety and quality standards are met**
- **Proven-in-practice solution proposals for the rapid removal of safety deficiencies**
- **Comprehensible and well-documented test results in accordance with DIN ISO 9001:2000**
- **Standards-specific test protocol**
- **Accident risk and machine downtime minimization**
- **Ensuring machine productivity and availability with regular inspections**

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Regular safety inspections *

Scope of safety inspections

- Recording the identification of machine and protective device
- Testing the technically-compliant installation of the protective device (reaching under, reaching over, etc.)
- Stopping time measurement (optional) and testing the safety distance from the protective device to the point of operation
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Regular safety inspections

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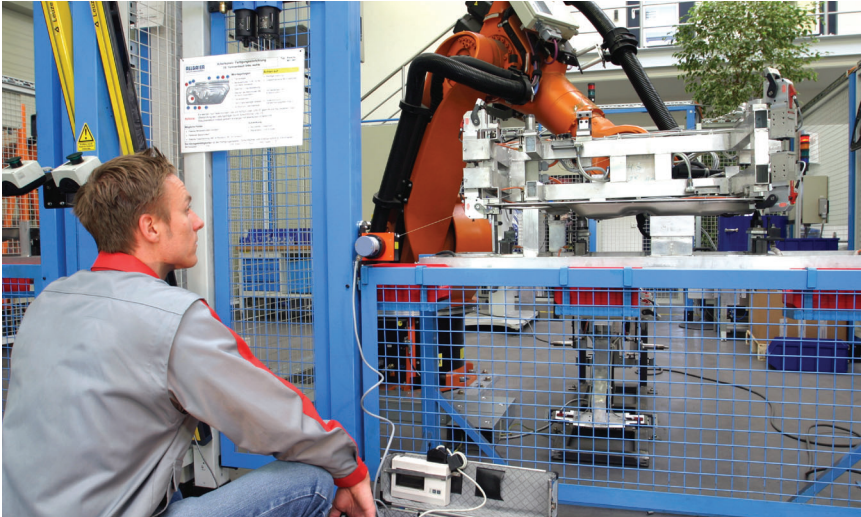
*) This service is currently only offered in Germany. If you are interested in this service outside Germany, please talk to your Leuze electronic sales partner.

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MACHINE SAFETY SERVICES

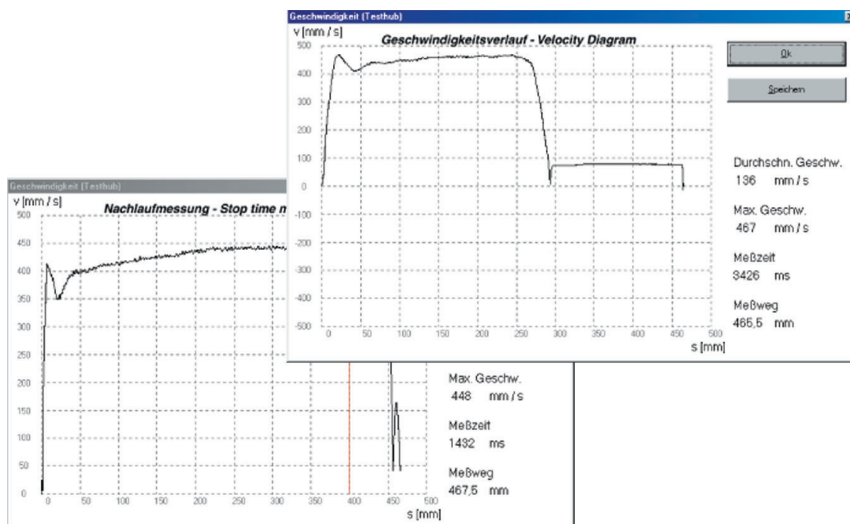


Stopping time measurements and determining safety distances *



Our stopping time measurements are an important basis for the correct positioning of protective devices

Only with a sufficiently dimensioned safety distance that corresponds with the stopping time of the machine can it be guaranteed that the dangerous movement will stop before the person reaches the point of operation. Wear and tear can, however, extend the stopping times of machines. The causes for this can, for example, be a defective brake cylinder or a faulty spark absorber. Stopping the dangerous movement in good time and therefore reliable protection by the protective device is no longer guaranteed. Stopping time measurements are therefore, in our opinion, an extremely important part of a properly carried out safety inspection.



The results of measurements and calculations can also be evaluated graphically

*) This service is currently only offered in Germany. If you are interested in this service outside Germany, please talk to your Leuze electronic sales partner.

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STOPPING TIME MEASUREMENTS

Stopping time measurements and determining safety distances *

Benefits

- Measurements performed by experts with calibrated measurement devices provide a safe and sound basis for positioning the protective device
- Comprehensible and well-documented test results in accordance with DIN ISO 9001:2000 and optional graphic analysis of the braking motion
- Early detection of wear and tear in brake components with periodical inspections

Scope of stopping time measurements

- Standards-compliant performance of 10 measurements per machine
- Graphic evaluation of the brake behavior on request
- Stop activation with "Autohand" without electrical intervention in the machine control system
- Use of appropriate measurement instruments for the respective machine type: Rotary encoder for rotation movements (e.g. rotary indexing table) and rope length transmitter for linear movements
- State-of-the-art calibrated measurement devices; documented test results in accordance with DIN ISO 9001:2000

Stopping time measurement and determining the safety distance without travel time and car expenses

Art. no.	Article	Description
S991007	CS-SMS/FR	"Standard" stopping time measurement, flat-rate
S991008	CS-SMX/FR	"Extended" stopping time measurement, flat-rate (e.g., for multiple movements, rotary indexing table)
S991009	CS-WT1/FR	Flat-rate for waiting times per system (e.g., in event of lack of support by operating personnel)

*) This service is currently only offered in Germany. If you are interested in this service outside Germany, please talk to your Leuze electronic sales partner.

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Machine Safety
Machine Safety Services
Safety Engineering Software
Safety Laser Scanners
Safety Light Curtains
Multiple Light Beam Safety Devices
Light Beam Safety Device Sets
Single Light Beam Safety Devices
AS-Interface Safety at Work
PROFIsafe Sensors

MACHINE SAFETY SERVICES



On-site service, repairs and device replacement service



Our technicians also provide rapid help, e.g. with fault searches and removals

In the event of a functional fault, speedy help is the order of the day. Leuze electronic's device swap-out service enables equipment to be swiftly replaced. As part of our 12 month guarantee we provide a free of charge replacement device after the serial number has been provided. Within Germany the delivery of a replacement device from our standard range generally takes 1 to 2 working days. Overseas the corresponding transport times are added to this. If a device failure occurs after the end of the guarantee period, we provide a device on loan free of charge for the duration of the repair period (where available), and consequently ensure the necessary on-site safety.

Customized on-site support

if necessary, our technicians will assist with the search for and removal of faults on-site. In this case please contact our service hotline at +49 (0) 8141 5350-111 or the Leuze electronic sales partner responsible for you. For emergencies the telephone standby service of Leuze electronic is available around the clock at +49 (0) 7021 5730. Repairs are competently carried out in our service center up to component level.

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**Repairs
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On-site service, repairs and device replacement service

Benefits

- Fast help around the world with the Leuze electronic device swap-out service
- Fault search and removal on-site
- Competent device repairs and maintenance
- 24 hr telephone standby service for emergencies

On-site service in Germany and Europe

Art. no.	Article	Description
S991001	CS-WTM/HR	Labor per hour in Germany and Europe
S991006	CS-TTX/HR	Travel costs per hour in Germany and Europe
S991000	CS-TTD/KM	Car expenses per km in Germany
S991010	CS-TTE/KM	Car expenses per km in Europe (alternative: Flight costs according to expenditure)
S991012	CS-THO/CT	Accommodation expenses

www.leuze.com/safety-services/

MACHINE SAFETY SERVICES



Qualified product training and seminars *



Get into top shape in safety technology with our training courses and seminars

A tailor-made training program provided by us helps the interested party in selecting the course they need. In addition to the various product training courses for specialists for the respective products, we also offer seminars on the Machinery Directive, CE conformity assessment and practice-related safety technology. We are also happy to carry out training on-site and in English, and will submit an appropriate offer on request. You will find our training program in the support area on our website at www.leuze.com. Should this not cover your training requirements, with the appropriate number of participants, we will be happy to combine the relevant training content according to your wishes.

Benefits

- **Efficient and specialist use of Leuze electronic protective devices by qualified employees**
- **High level of system availability by preventing faulty operation and application errors**
- **Small cause – big consequences. Optimum product knowledge helps to detect application problems quickly and prevent production downtimes**
- **Direct dialog between our specialists and your employees for experience exchanges, application tips and problem-solving**
- **A certificate of completion attests the training as qualified personnel and enables you to perform the maintenance and testing of the relevant Leuze electronic protective device within your own area of responsibility**

*) This service is currently only offered in Germany. If you are interested in this service outside Germany, please talk to your Leuze electronic sales partner.

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Training courses and seminars

Selected topics from our range of training courses and seminars (in German)

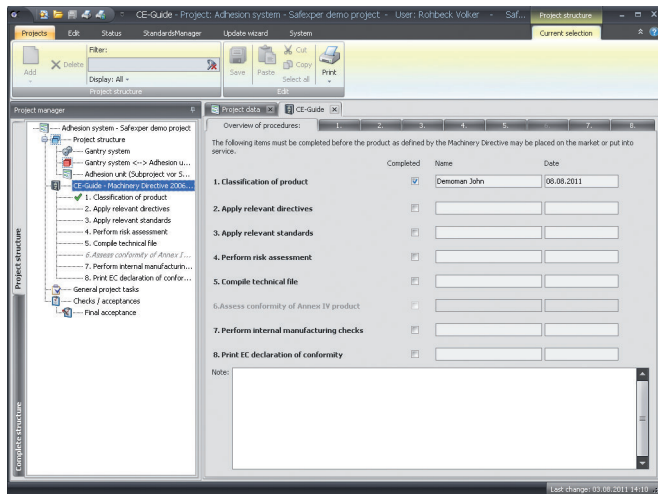
Principles of machine safety and the latest from the world of standards
COMPACT <i>plus</i> Safety Light Curtains and Multiple Light Beam Safety Devices
ROTOSCAN RS4 Safety Laser Scanners
SOLID-2 Safety Light Curtains, MLD 300 Multiple Light Beam Safety Devices, configurable MSI Safety Relays
AS-i Safety, Safe Bus System
SOLID-4 Safety Light Curtains, MLD 500 Multiple Light Beam Safety Devices, configurable MSI Safety Relays

Note

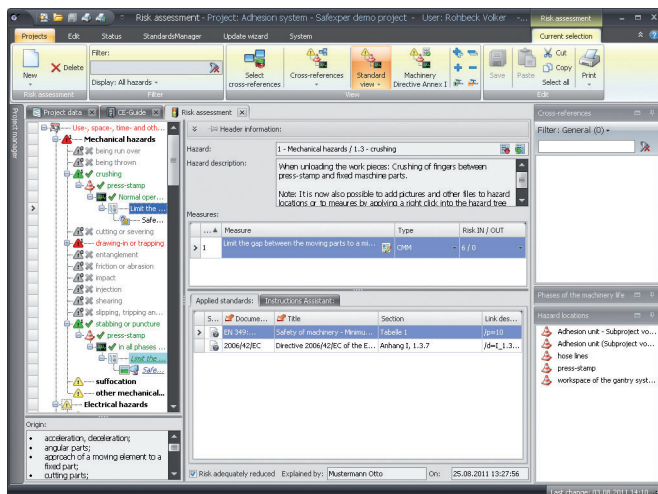
For optimally planning an individually tailored training course and seminar offering, we request that you contact us well in advance by telephone. You can reach us by telephone at +49 (0) 8141 5350-111 (service hotline).

SAFETY ENGINEERING SOFTWARE

Safexpert



Step-by-step, Safexpert supports the user with their tasks right through to provision of the declaration of conformity and manufacturer's declaration.



Hazard assessment in accordance with EN 1050 – quick, easy and structured

The Safexpert Project Manager structures and manages complex projects, enables the project team to use centrally administered data, and with job-related checklists, ensures that nothing is overseen.

Safexpert guides machine and plant manufacturers through the CE process acc. to the machinery directive (2006/42/EC). Safexpert also offers an interface to SISTEMA software for performing risk evaluations and failure probability calculations as per the requirements according to Performance Level (EN ISO 13849-1).

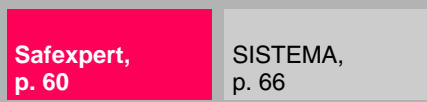
Important innovations from V 8.0:

- New, user-friendly user guidance in current Windows® design with context menus, drag & drop, etc.
- New licensing model: first license and additional licenses instead of single-user / multi-user licenses
- Sub-projects can either be linked or embedded
- New report designer
- Standards can be stored directly in the database
- All updates are performed via the Internet

Typical users

- Mechanical and electrical designers in machine and system construction
- Control system manufacturers
- Engineering offices for refitting or converting old machinery
- Safety specialists, CE commissioned experts
- Work equipment construction and servicing departments

Safexpert is a PC software for the systematic safety engineering of machinery and systems. The network-enabled PC program takes you step-by-step through CE conformity assessment, culminating in the CE sign of approval. It supports the design engineer with risk assessment, in locating relevant standards within seconds, with the creation of the technical documentation and operating instructions, and ultimately guides them through to the standards-compliant CE conformity declaration and CE manufacturer declaration of conformity.



Important technical data, overview

Software packages for selection	3 (Basic, Compact, Professional)
Standards packages	2 (Standard, Standard Plus)
Operating system	Microsoft Windows® XP, Vista, 7 (32 and 64 bit)
System requirements	500 MB free hard disk capacity, 1 GB RAM, .NET 4.0 Full Framework, Internet Explorer min. V8.0, graphics resolution of at least 1024 pixels x 768 pixels
Installation	Setup via Internet download, enabled by means of license code
Networks	Networkability
Languages	German, English, French, Spanish
Documentation	User manual
Helps	Online help, search function, filter function

Special advantages and features

- Saves time and money by re-using data from earlier projects
- Ensures more legal certainty with liability issues
- Enables direct data transfer to technical documentation
- Supports safety know-how accumulation in your company
- Brings the various construction departments in the company together with uniform safety standards
- Enables central data storage of CE-relevant data and network usage in the team
- Helps to maintain a good overview in complex, comprehensive projects
- Update service keeps you constantly at the latest standardization status
- Maximum overview with the risk assessment with colored identifications
- Status information at the press of a button
- Determination of the necessary PL and SIL values in accordance with EN ISO 13849 and EN IEC 62061
- Automatic conversion of existing projects: Calculation of the PLr and required SIL according to available data



Features



Further information

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SAFETY ENGINEERING SOFTWARE

Functions

	Safexpert software packages		
	Basic	Compact	Professional
CE project management and project documentation	●	●	●
Machine classification and standards selection wizard	●	●	●
CE guidelines	●	●	●
Risk assessment in accordance with EN ISO 12100, list of hazards in accordance with EN ISO 14121	●	●	●
Classification of the machinery on the basis of the Machinery Directive	●	●	●
Selection function for applicable standards and directives	●	●	●
Cross references and hyperlinks to important standard and directive centers	●	●	●
Conformity and manufacturer declaration with customized adjustment options	●	●	●
Selection function of safety-related sections of regulations in accordance with EN ISO 13849-1 and EN IEC 62061	●	●	●
Interface to software program SISTEMA	●	●	●
Icons library (approx. 200 icons and symbols for machine safety)		●	●
Example of CE-compliant operating instructions		●	●
NormManager		●	●
Standards and directives wizard and document management		●	●
Standards package: Standard (9 important CE standards in full text)			●

Ordering information

Safexpert

Delivery contents: link to download and license code

Functions: depending on the software package; Basic, Compact, Professional

Safexpert Software for the safety engineering of machines and systems

Art. no.	Article	Description
Safexpert basic packages		
600192	SE-BPB/F	Basic package - BASIC, first license
600193	SE-BPB/S	Basic package - BASIC, additional license
600194	SE-BPC/F	Basic package - COMPACT, first license
600195	SE-BPC/S	Basic package - COMPACT, additional license
600196	SE-BPP/FD	Basic package - PROFESSIONAL, language version of standards: German, first license
600197	SE-BPP/SD	Basic package - PROFESSIONAL, language version of standards: German, additional license
600198	SE-BPP/FE	Basic package - PROFESSIONAL, language version of standards: English, first license
600199	SE-BPP/SE	Basic package - PROFESSIONAL, language version of standards: English, additional license

Purchase of a license authorizes installation on one computer.

Safexpert supplementary modules

Art. no.	Article	Description
Individual modules		
600162	SE-ASN/F	NormManager, first license
600163	SE-ASN/S	NormManager, additional license
600164	SE-ASB/F	Operating instructions wizard, first license
600165	SE-ASB/S	Operating instructions wizard, additional license
600166	SE-ASP/F	Test and acceptance wizard incl. test list in accordance with MD, first license
600167	SE-ASP/S	Test and acceptance wizard incl. test list in accordance with MD, additional license

Purchase of a license authorizes installation on one computer.

www.leuze.com/safexpert/

SAFETY ENGINEERING SOFTWARE

Safexpert standards packages

Standards package - Standard (included in Professional software package)	9 important standards in full text: EN 349, EN 954-1, EN IEC 60204, EN ISO 12100, EN ISO 12100-1, EN ISO 12100-2, EN ISO 13849-1, EN ISO 13850, EN ISO 13855, EN ISO 13857, EN ISO 14121-1
Standards package - StandardPlus	Over 50 important European standards in full text: EN 547-1, EN 547-2, EN 547-3, EN 574, EN 614-1, EN 614-2, EN 626-1, EN 626-2, EN 842, EN 894-1, EN 894-2, EN 894-3, EN 953, EN 981, EN 982, EN 983, EN 1005-1, EN 1005-2, EN 1005-3, EN 1005-4, EN 1032, EN 1037, EN 1088, EN 1093-1, EN 1093-3, EN 1093-4, EN 1093-6, EN 1093-7, EN 1093-8, EN 1093-9, EN 1093-11, EN 1127-1, EN 1746, EN 1760 -1, EN 1760-2, EN 1760-3, EN 1837, EN 12198-1, EN 12198-2, EN 12198-3, EN 12786, EN 13478, EN 13861, EN IEC 62061, EN ISO 7731, EN ISO 13732-1, EN ISO 13732-3, EN ISO 13849-2, EN ISO 14122-1, EN ISO 14122-2, EN ISO 14122-3, EN ISO 14122-4, EN ISO 14159, EN ISO 14738

Ordering information for standards packages

Art. no.	Article	Description
Standards packages		
600141	SE-NPSD	Standards package – Standard, German
600142	SE-NPPD	Standards package – StandardPlus with Safexpert Professional, German
600144	SE-NPSE	Standards package – Standard, English
600145	SE-NPPE	Standards package – StandardPlus with Safexpert Professional, English
600143	SE-NPNS	Network license for standards package – Standard for 5 simultaneous users (annual subscription)
600140	SE-NPNP	Network license for standards package – StandardPlus for 5 simultaneous users (annual subscription)

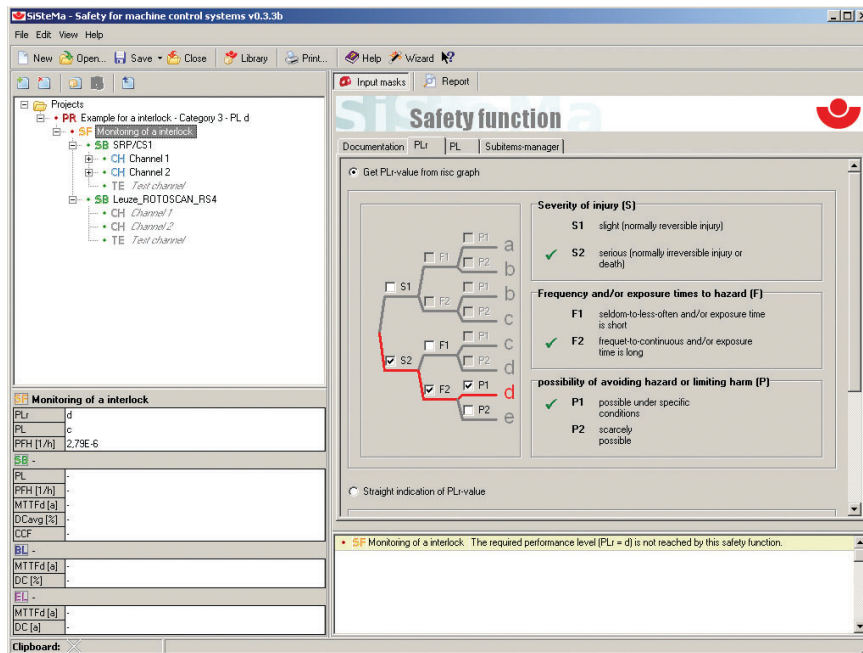
Safexpert maintenance contracts and updates

Services: The annual flat-rate is regardless of the number of updates performed. A flat-rate is levied per computer license, which applies exclusively for the software maintenance.
The cost contribution for standards is not included. Additional amounts per standard are charged for this.

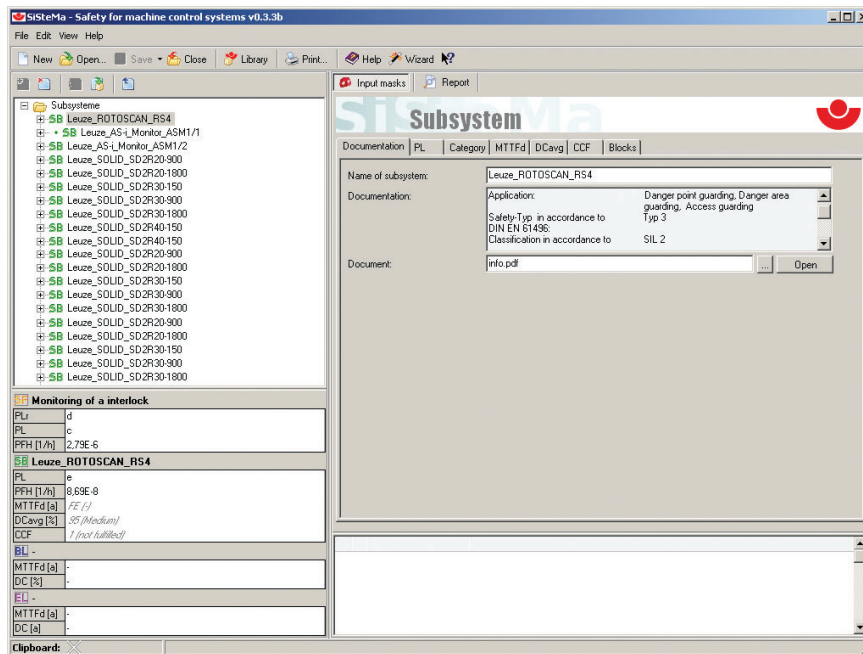
Ordering information		
Art. no.	Article	Description
Maintenance contracts		
600170	SE-MCB/F	Maintenance contract - BASIC, first license
600171	SE-MCB/S	Maintenance contract - BASIC, additional license
600172	SE-MCC/F	Maintenance contract - COMPACT, first license
600173	SE-MCC/S	Maintenance contract - COMPACT, additional license
600174	SE-MCP/F	Maintenance contract - PROFESSIONAL, first license
600175	SE-MCP/S	Maintenance contract - PROFESSIONAL, additional license
600176	SE-MCN	Maintenance contract - StandardPlus standards package, in addition to Safexpert maintenance contract
600178	SE-MCD/MD	Maintenance contract - data package, German, for CE-certification in accordance with machinery directive MD
600179	SE-MCD/ED	Maintenance contract - data package, German, for CE-certification in accordance with EMC, ATEX, PE, LV directives
600168	SE-MCD/ME	Maintenance contract - data package, English, for CE-certification in accordance with machinery directive MD
600169	SE-MCD/EE	Maintenance contract - data package, English, for CE-certification in accordance with EMC, ATEX, PE, LV directives
Updates		
600131	SE-UP7180/F	Safexpert update (BASIC or COMPACT) 7.1 -> 8.0, first license
600132	SE-UP7180/S	Safexpert update (BASIC or COMPACT) 7.1 -> 8.0, additional license
600133	SE-UP7080/F	Safexpert update (COMPACT) 7.0 -> 8.0, first license
600134	SE-UP7080/S	Safexpert update (COMPACT) 7.0 -> 8.0, additional license
600135	SE-UP6080/F	Safexpert update (COMPACT) 6.0 -> 8.0, first license
600136	SE-UP6080/S	Safexpert update (COMPACT) 6.0 -> 8.0, additional license
600137	SE-UP5580/F	Safexpert update (COMPACT) 5.5 -> 8.0, first license
600138	SE-UP5580/S	Safexpert update (COMPACT) 5.5 -> 8.0, additional license

SAFETY ENGINEERING SOFTWARE

SISTEMA



The SISTEMA version that can be downloaded at www.leuze.com/sistema includes a Leuze electronic safety component database



SISTEMA provides a hierarchical project presentation with safety functions, sub-systems, channels, blocks and elements

SISTEMA is a PC software developed by the Institut für Arbeitsschutz (IFA) for calculating and evaluating the safety of a machine's safety-related control systems (SRP/CS) in accordance with EN ISO 13849-1. On the basis of the control system architectures provided for in section 6 of the standard, the tool provides an automated calculation of the characteristic safety values and the achieved performance level (PL). The user can consequently very quickly and easily verify whether or not the achieved performance level of the control component (PL) they have implemented corresponds with the required performance level (PL_r) that the risk assessment determines necessary for this safety function. The program also transparently administers and structures complex projects. It allows creation of internal component libraries for element systems, block systems and sub-systems and their implementation in projects. An integrated wizard simplifies use of the software.

SISTEMA supports German and English. The software is provided free to the user as freeware, and can therefore be copied for free. Leuze electronic has supplemented the software with a database, which contains all of the safety-related parameters of selected Leuze electronic safety sensors and control system modules that SISTEMA requires. The SISTEMA version with integrated Leuze electronic database can be downloaded free www.leuze.com/sistema.

Typical users

- Machine manufacturers
- System integrators
- Control system manufacturers
- Engineering offices
- Test centers

Important technical data, overview

Operating system	Microsoft Windows 98, Windows ME, Windows NT, Windows 2000, Windows XP
System requirements	MS Internet Explorer 5.0 or higher, 30 MB free hard disk space, recommended screen resolution: 1024 x 768
Installation	Setup program
Languages	German, English
Helps	Software wizard assists you in creating your own projects, side bar, navigation window with tree structure

Special advantages and features

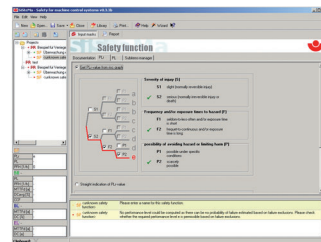
- Standards-compliant safety evaluation of control system components in accordance with EN ISO 13849-1
- Time-saving with automatic calculation of the safety-related reliability
- Use of manufacturer-specific and internal component libraries
- Software wizard for user guidance through the program
- Print function for project documentation
- Online help with detailed explanation of terms
- Leuze electronic SISTEMA version with integrated Leuze electronic component library
- Freeware, free to use

Functions

Determining the required performance level of each safety function in accordance with EN ISO 13849-1
Support of control system architectures in accordance with EN ISO 13849-1, section 6
Calculation of the achieved performance level (PL)
Leuze electronic SISTEMA version with integrated Leuze electronic component library, freeware download at www.leuze.com/sistema
DC values library
Calculation wizard for $MTTF_d$ and DC values
Creation of manufacturer-specific databases at element system, block system, subsystem and project level
Online help with detailed explanation of terms
Print function for project documentation
Software wizard for user guidance

SISTEMA

Safety of PLCs and control devices at machinery Software Wizard



Features



Further information

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SAFETY ENGINEERING SOFTWARE

Ordering information

SISTEMA

A freeware tool, developed by the Institute for Occupational Safety and Health (IFA).

Functions: SISTEMA software wizard for calculating, evaluating and verifying the safety of control components on machines in accordance with EN ISO 13849-1.

Freeware download at www.leuze.com/sistema

Please note:

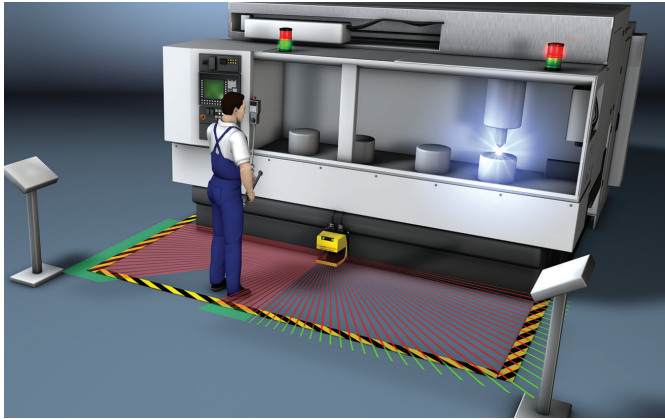
The SISTEMA program is freeware and may therefore be copied for free. Please be aware that SISTEMA makes use of other open source software, the use of which is covered by own licenses. Changes to these software components are only allowed in agreement with the respective license. A copy of the relevant licenses is provided in the application's "Licenses" sub-directory.

The software has been very attentively developed in accordance with the state-of-the-art of science and technology. It is provided to the user free of charge. The software is used at the user's risk. All forms of liability, regardless of legal basis, shall be excluded (where legally permissible). Liability shall not be accepted for quality defects and defects of title in particular, as well as the documentation and information connected with such, especially with regard to accuracy, correctness, freedom from intellectual property rights of third parties, actuality, completeness and/or usability - with the exception of intent or malice aforethought.

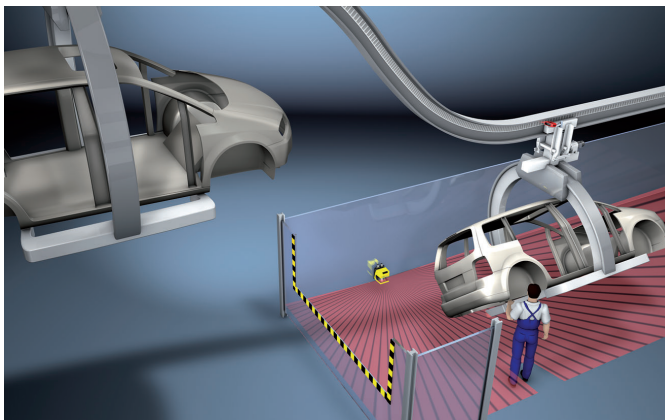
www.leuze.com/sistema/

SAFETY LASER SCANNERS

ROTOSCAN selection table



Danger zone guarding at stationary machinery: Switchover of process-dependent protective/warning field combinations for smooth production process



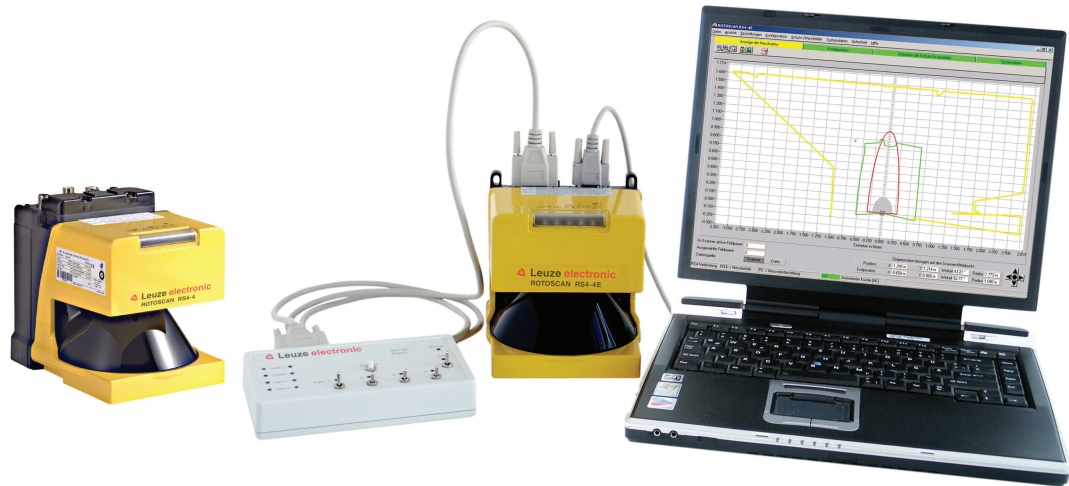
Large area danger zone guarding on overhead electric conveyor systems: Material flow-dependent field pair changeover and activation for efficient production cycles

Safety Laser Scanners offer extremely flexible and universal workplace protection, which can be individually adjusted to any requirement and can be very easily integrated into every production process. With a compact construction, the provision of the safety function in just one device and with integrated interfaces for safety bus systems, complex customer requirements quickly become easily performed tasks. Whether it is hand protection, arm protection or full personnel protection, certified in accordance with IEC 61508-SIL 2, the ROTOSCAN RS4 Safety Laser Scanner is flexible and versatile in adapting to every situation.

Similar to a radar, the Safety Laser Scanners constantly scan the complete working area two-dimensionally in an angle range of 190° and a radius of several meters. Independent protective and warning fields can be programmed via PC software and can be switched over at any time during the operation. If a person enters the protective and warning fields, they are detected and a switch-off and alarm command is generated for the machine.

The immense flexibility of the RS4 Safety Laser Scanner is a result of the independent protective/warning field pairs, which can assume any field contours as well as the ability to change over between these pairs. Using a PC configuration software, the shape of the field contours is graphically adjusted to the local conditions and required safety distances. In the same way, all other parameters can also be quickly and effectively adjusted to the requirements of the production process.

Because of its compact construction, the ROTOSCAN RS4 Safety Laser Scanner enables a flexible installation position and use in mobile applications. In addition to the classic areas of application with danger zone guarding at stationary machines, the extended version ROTOSCAN RS4-4E also has the necessary approvals for vertical access and point of operation guarding. The ROTOSCAN RS4-4M is specially designed for transfer carriages. It uses the MotionMonitoring function to ensure safe vehicle movement sequences.

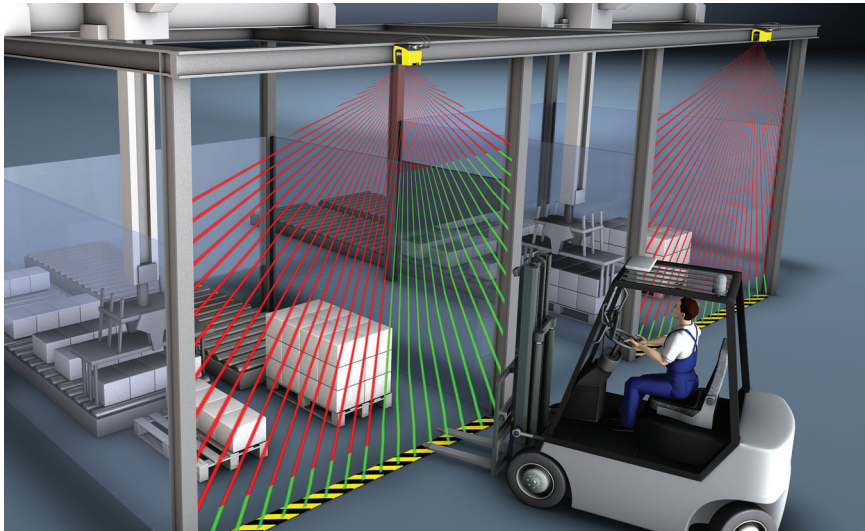


The RS4soft configuration and diagnostics software allows the Laser Scanner to be easily adjusted to local conditions – both direct and via the PROFIBUS DP

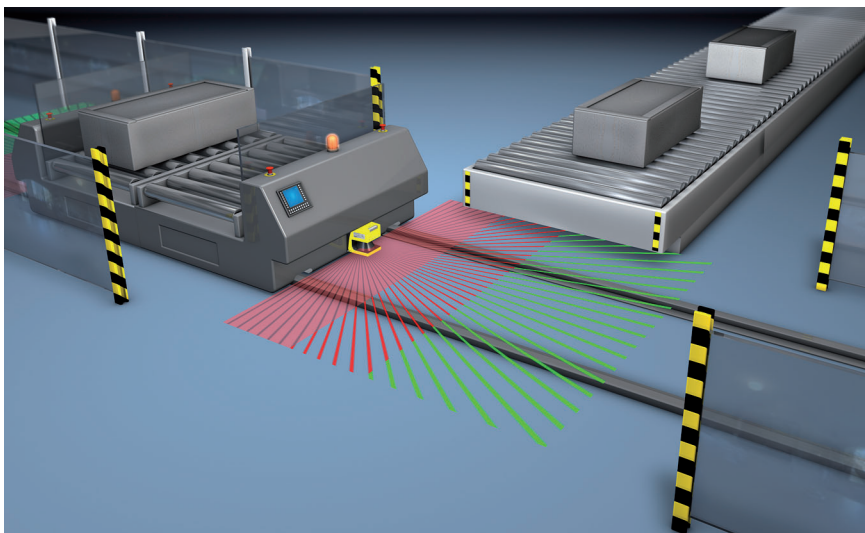
Type in accordance with EN IEC 61496		SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061		Performance Level (PL) in accordance with EN ISO 13849-1		Protective field range in m		Warning field range in m		Resolution 70 mm	Resolution 150 mm	Variable resolution from 30 to 150 mm	Features, type-dependent										Series	Page		
3	2	d	2,15	15	15	15	15	15	15	15	15	15	Number of field pairs that can change over	Number of signal outputs	Danger zone guarding	Point of operation guarding	Access guarding	RES, selectable	Integr. AS-i Safety Interface	Integr. PROFIsafe Interface	Reliable distance measurement	MotionMonitoring				
			15	●	●								4	2	●	●	●								RS4-2E	74
			15	●	●								8	2	●	●	●				●	●			RS4-2M	74
			4	15	●								4	2	●		●	●	●	●	●				RS4-4	74
			15			●							8	2	●	●	●	●	●	●	●				RS4-4E	74
			15			●							8	2	●	●	●	●	●	●	●	●			RS4-4M	74
			6,25	15		●							8	2	●	●	●	●	●	●	●				RS4-6E	74
			15			●							8	2	●	●	●	●	●	●	●	●			RS4-6M	74

SAFETY LASER SCANNERS

ROTOSCAN RS4



Fast material flow with field pair switchovers, for example with vertically mounted RS4 Safety Laser Scanners



Danger zone guarding on transfer carriages: Switchovers of status- and speed-dependent field pairs for rapidly adjusting the material transport with carriage movement monitoring using the MotionMonitoring function

Point of operation and access guarding are classic application examples of Safety Light Curtains and Multiple Light Beam Safety Devices. If it is necessary to flexibly adjust protective fields to the danger zones, or if there are space, power supply or flexibility restrictions, the Safety Laser Scanner is the better alternative. Depending on the application, the resolution can be configured so that the device safely detects a person, an arm or a person's hand.

Safety Laser Scanners are a cost-effective and flexible protective devices alternative for danger zone guarding of large areas in the vicinity of these machines. Switching between any kind of monitoring areas is possible with up to 6.25 radius, process-conditional according to the application. All configuration data, such as the definition of the zones, the resolution or the response times, is defined with the RS4soft configuration and diagnostics software.

Compactness, protective/warning field combination and field changeover are the essential features of Safety Laser Scanners for guarding corridor supply vehicles. The protection area of the traveling direction and speed of the vehicle is adjusted using staggered protective fields and their situation-conditional activation.

The Safety Laser Scanner also offers very significant advantages for portal processing systems. On one hand the vehicle can be monitored during the movement, while on the other hand, in standstill the Laser Scanner assumes a danger zone guarding of the tools integrated in the portal.

Typical areas of application

- Obstruction-free zone guarding on machine and plant systems
- Flexible guarding of corridor supply vehicles
- Variable access guarding at processing centers
- Individual point of operation guarding on machinery

ROTOSCAN RS4

Important technical data, overview

Type in accordance with EN IEC 61496	3
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	2
Performance Level (PL) in accordance with EN ISO 13849-1	d
Category in accordance with EN ISO 13849	3
Resolution (adjustable)	30 mm 40 mm 50 mm 70 mm 150 mm
Dimensions (W x H x D)	140 mm x 155 mm x 135 mm
Safety-related switching outputs (OSSDs)	2 pnp transistor outputs AS-i Safety Interface, PROFIsafe Interface
Connection system	Sub-D15, Sub-D9 for configuration M12 plug, IR interface for configuration (safety bus systems)



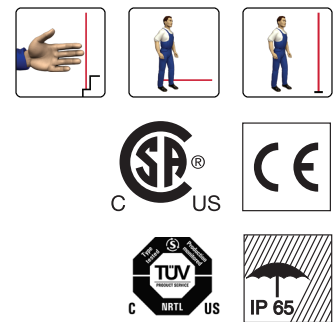
Functions	Function package		
	Basic	Extended	MotionMonitoring
Start/restart interlock (RES), selectable	●	●	●
Monitored field pair changeover	●	●	●
Warning field monitoring	●	●	●
Resolution, selectable	●	●	●
Horizontal danger zone guarding	●	●	●
Vertical point of operation guarding		●	●
Vertical access guarding		●	●
Reference boundary monitoring		●	●
Transfer carriage movement monitoring			●
Reliable distance measurement for positioning			●
Additional alarm output	●	●	●
Start test	●	●	●

Function extension					
With Safety Relay	Relay output	RES	EDM	Muting	Further details
MSI-SR4	●	*	●		p. 440
MSI-SR5	●	*	●		p. 446

*) Already included in the device

- Special features**
- Automatic configuration with device exchange with intelligent ConfigPlug
 - Guarding large danger zones
 - Any kind of protective/warning field contours and configurations
 - AS-i Safety at Work and PROFIsafe Laser Scanners

Features



Further information	Page
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● Technical data	77
● Dimensional drawings	79
● Dimensional drawings: Accessories	80
● Accessories ordering information	81

SAFETY LASER SCANNERS

Ordering information

ROTOSCAN RS4

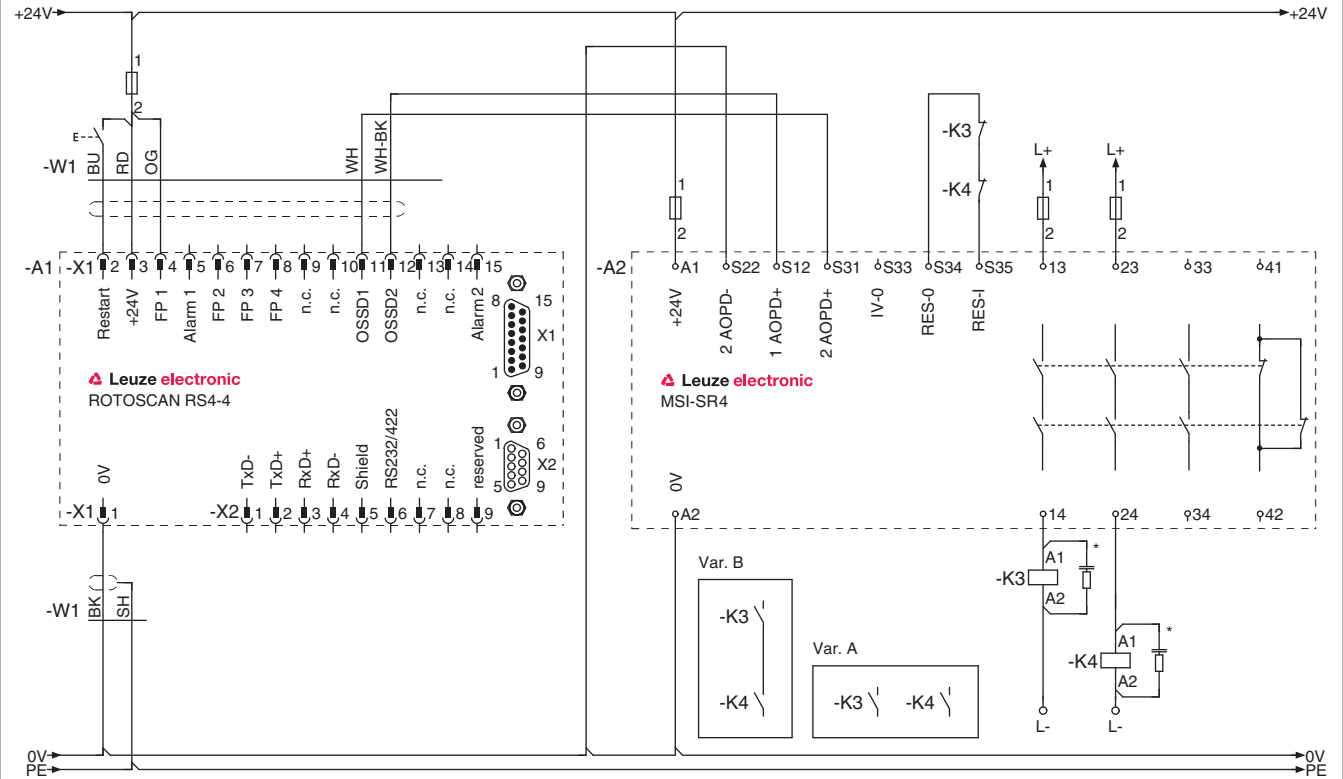
Included in delivery: RS4-MG-X1-Set and RS4-MG-X2-Set plugs, connecting and operating instructions (PDF file on CD-ROM), RS4soft configuration and diagnostics software.

Functions: Depending on function package – Basic, Extended, MotionMonitoring

Art. no.	Article	Description	
ROTOSCAN RS4			
520082	RS4-2E	ROTOSCAN RS4-2E Laser Scanner with Basic function package	
520098	RS4-2M	ROTOSCAN RS4-2M Laser Scanner with MotionMonitoring function package	
50034195	RS4-4	ROTOSCAN RS4-4 Laser Scanner with Basic function package	
520085	RS4-4E	ROTOSCAN RS4-4E Laser Scanner with Extended function package	
520099	RS4-4M	ROTOSCAN RS4-4M Laser Scanner with MotionMonitoring function package	
520044	RS4-6E	ROTOSCAN RS4-6E Laser Scanner with Extended function package	
520045	RS4-6M	ROTOSCAN RS4-6M Laser Scanner with MotionMonitoring function package	
Included in delivery: RS4soft and RS4-MG-X1-Set, RS4-MG-X2-Set plugs			
ROTOSCAN RS4/AS-i Safety			Safety-related switching outputs (OSSDs)
580014	RS4-4/A1	ROTOSCAN RS4-4/AS-i Laser Scanner with Basic function package	Integrated AS-i Safety Interface
520086	RS4-4E/A1	ROTOSCAN RS4-4E/AS-i Laser Scanner with Extended function package	Integrated AS-i Safety Interface
520042	RS4-4M/A1	ROTOSCAN RS4-4M/AS-i Laser Scanner with MotionMonitoring function package	Integrated AS-i Safety Interface
520046	RS4-6E/A1	ROTOSCAN RS4-6E/AS-i Laser Scanner with Extended function package	Integrated AS-i Safety Interface
520047	RS4-6M/A1	ROTOSCAN RS4-6M/AS-i Laser Scanner with MotionMonitoring function package	Integrated AS-i Safety Interface
ROTOSCAN RS4/PROFIsafe			
580012	RS4-4/P1	ROTOSCAN RS4-4/PROFIBUS Laser Scanner with Basic function package	Integrated PROFIBUS DP interface
520087	RS4-4E/P1	ROTOSCAN RS4-4E/PROFIBUS Laser Scanner with Extended function package	Integrated PROFIBUS DP interface
520043	RS4-4M/P1	ROTOSCAN RS4-4M/PROFIBUS Laser Scanner with MotionMonitoring function package	Integrated PROFIBUS DP interface
520048	RS4-6E/P1	ROTOSCAN RS4-6E/PROFIBUS Laser Scanner with Extended function package	Integrated PROFIBUS DP interface
520049	RS4-6M/P1	ROTOSCAN RS4-6M/PROFIBUS Laser Scanner with MotionMonitoring function package	Integrated PROFIBUS DP interface

Electrical connection

ROTOSCAN RS4 connection example



*) Spark extinction circuit, supply suitable spark extinction

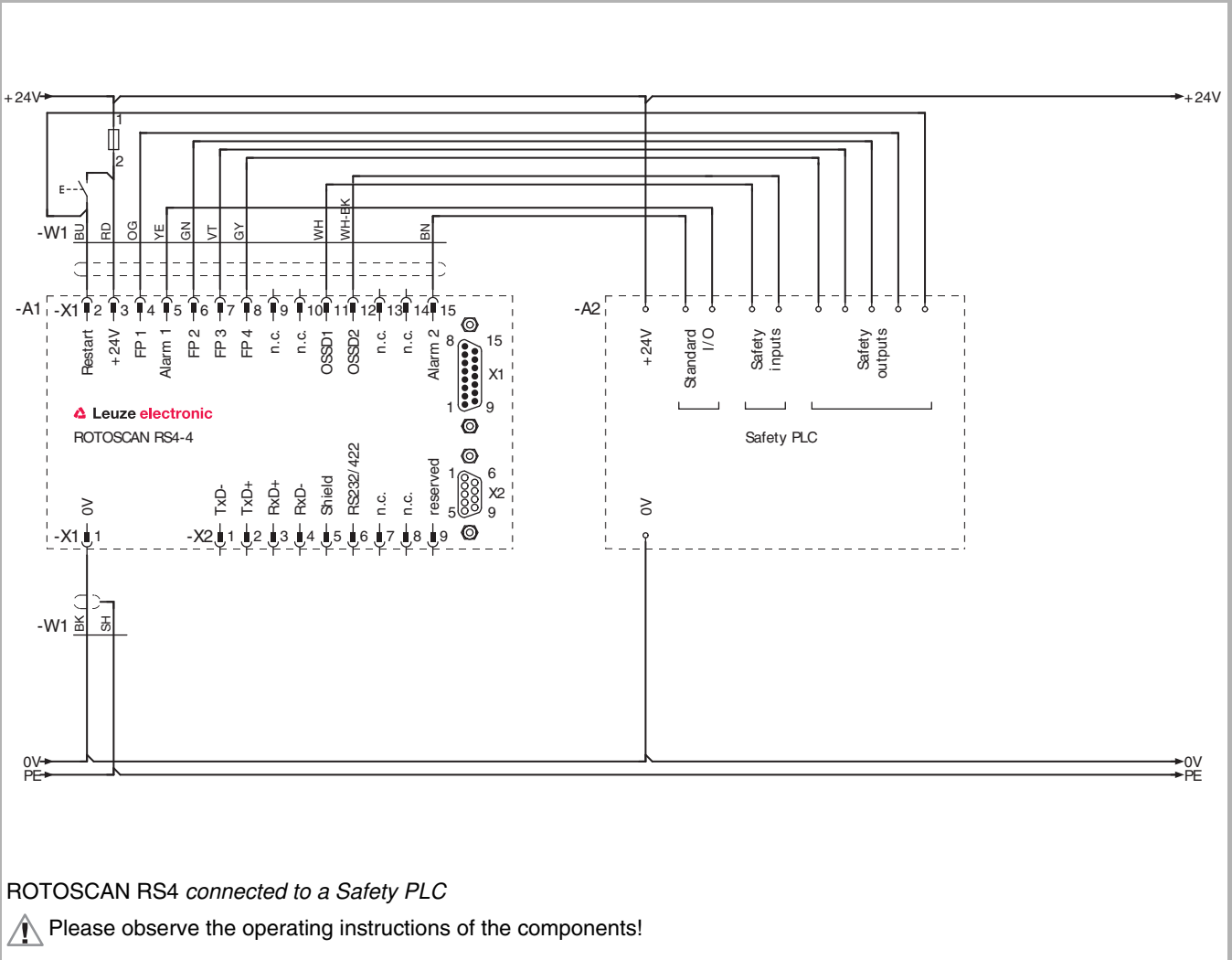
ROTOSCAN RS4 with MSI-SR4 Safety Relay

! Please observe the operating instructions of the components!

SAFETY LASER SCANNERS

Electrical connection

ROTOSCAN RS4 connection example



For further connection examples see chapter PROFIBUS DP, page 300

Technical data

General system data					
Type in accordance with EN IEC 61496	3				
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	2				
Performance Level (PL) in accordance with EN ISO 13849-1	d				
Probability of a failure to danger per hour (PFH _d)	1.50 x 10 ⁻⁷				
Service life (T _M) in accordance with EN ISO 13849-1	20 years				
Category in accordance with EN ISO 13849	3				
Supply voltage	24 V DC, -30 % to +20 % Supply in accordance with IEC 742; must be fused with 1.6 A, melting fuse				
Current consumption	Approx. 420 mA (use power supply with 2.5 A)				
Connection system	Sub-D15, Sub-D9 for configuration				
Laser protection class in accordance with EN 60825	1				
Wavelength	905 nm				
Protection rating	IP 65				
Ambient temperature, operation	0...+50°C				
Ambient temperature, storage	-20...+60°C				
Dimensions (W x H x D)	140 mm x 155 mm x 135 mm				
Weight	Approx. 2.0 kg				
Protective field					
Resolution (adjustable)	30 mm	40 mm	50 mm	70 mm	150 mm
RS4-2E/RS4-2M range				2.15 m	2.15 m
RS4-4 range				4.00 m	4.00 m
RS4-4E/RS4-4M range	1.6 m	2.20 m	2.80 m	4.00 m	4.00 m
RS4-6E/RS4-6M range	1.6 m	2.20 m	2.80 m	6.25 m	6.25 m
Scanning angle	Max. 190°				
Diffuse reflectance	Min. 1.8 %				
Response time	Min. 80 ms, can be set up to 640 ms (16-piece multiscan)				
Number of protective fields	4/8 (can be switched via switch outputs)				
Safety-related switching outputs (OSSDs)	2 pnp transistor outputs (short circuit-proof, cross-circuit monitored)				
Switching voltage high active	U _V -3.2 V				
Switching voltage low	Max. +2.0 V				
Switching current	Max. 250 mA				

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SAFETY LASER SCANNERS

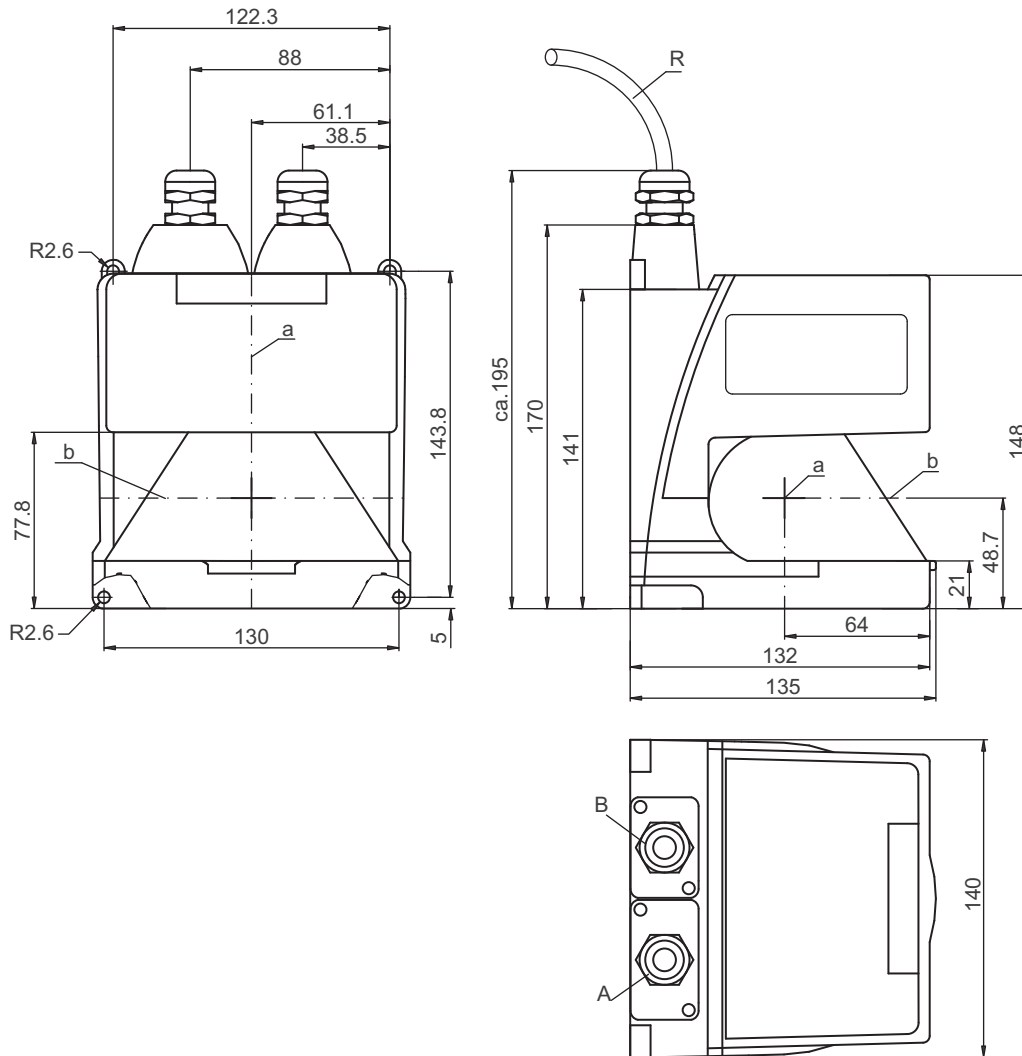
Technical data

Warning field	
Range	0...15 m
Scanning angle	Max. 190°
Angle resolution	0.36°
Number of warning fields	4/8 (can be switched via switch outputs)
Switching outputs	2 pnp transistor outputs, per 100 mA (warning field/dirt/fault)
Measurement zone	
Measurement range	0...50 m
Radial resolution	5 mm
Lateral resolution	0.36°
Data output	Serial interface, RS232 and RS422

Please note the additional information in the RS4 connecting and operating instructions at www.leuze.com/rotoscan.

Dimensional drawings

ROTOSCAN RS4 Safety Laser Scanners



R = Smallest bending radius = 50 mm
 a = Rotating mirror axis
 b = Scan level

A = Interface X1 with RS4 control cable with ConfigPlug
 B = Interface X2 with protection cap

Dimensions in mm

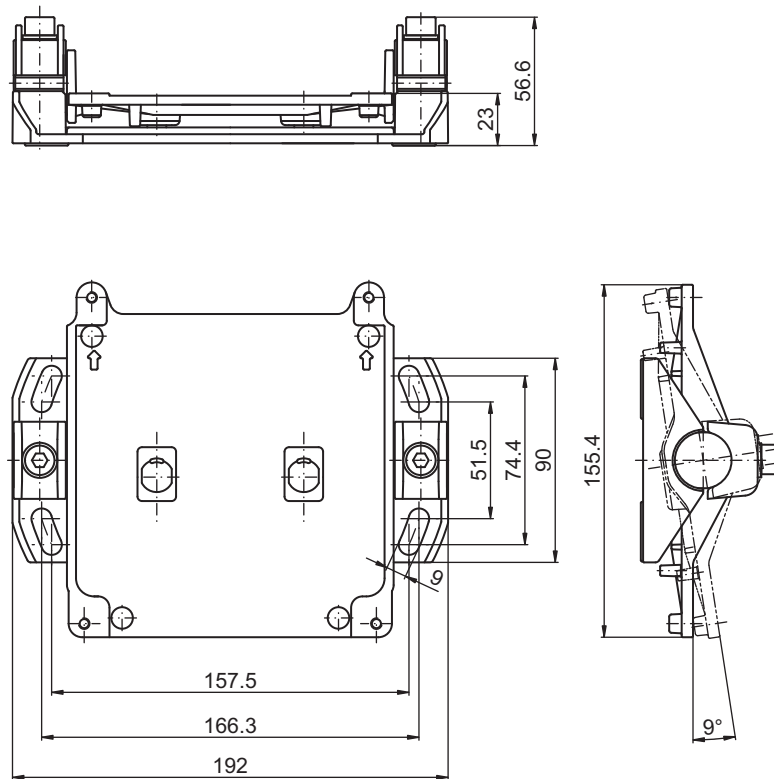
Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

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SAFETY LASER SCANNERS

Dimensional drawings: Accessories

RS4 mounting system



Dimensions in mm

Accessories ordering information

Art. no.	Article	Description	Length, design
Installation accessories			
50033346	RS4-MS	RS4 mounting system	
50035814	RS4-Adap-P	RS4 scanner adapter plate	
Start-up			
97005003	RS4-COB-24	RS4 configuration and test device, 24 V DC	
Connection system			
548520	CB-D15E-5000S-11GF	RS4 connecting cable with ConfigPlug, scanner-side preformed	5 m, straight/ open end
548521	CB-D15E-10000S-11GF	RS4 connecting cable with ConfigPlug, scanner-side preformed	10 m, straight/ open end
548522	CB-D15E-25000S-11GF	RS4 connecting cable with ConfigPlug, scanner-side preformed	25 m, straight/ open end
548523	CB-D15E-50000S-11GF	RS4 connecting cable with ConfigPlug, scanner-side preformed	50 m, straight/ open end
548530	CB-D15E-10000S-11WF	RS4 connecting cable with ConfigPlug, scanner-side preformed	10 m, angled/ open end
50035863	CB-D9-3000-5GF/GM	RS4 connecting cable, RS232, preformed at both sides	3 m
50035865	CB-D9-5000-5GF/GM	RS4 connecting cable, RS232, preformed at both sides	5 m
50035867	CB-D9-10000-5GF/GM	RS4 connecting cable, RS232, preformed at both sides	10 m
520083	AC-D15E-GF	ConfigPlug for all RS4, straight, without cable, for automatic configuration with device swap-out	
50035735	RS4-MG-X1-Set	RS4 plug, sock., 15 pins, for X1 interface	
50035768	RS4-MG-X2-Set	RS4 plug, sock., 9 pins, for X2 interface	
426266	RS4-MGS-X1-Set	RS4 plug, 15 pins, for X1 interface, cable routing to the rear	
426265	RS4-MGS-X2-Set	RS4 plug, 9 pins, for X2 interface, cable routing to the rear	
Cleaning fluid			
430400	RS4-clean-Set1	RS4 cleaning fluid for plastic, 250 ml, cleaning cloths, 25 pieces, soft, fuzz-free	
430410	RS4-clean-Set2	RS4 cleaning fluid for plastic, 1,000 ml, cleaning cloths, 100 pieces, soft, fuzz-free	

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SAFETY LASER SCANNERS

Accessories ordering information

ROTOSCAN RS4/AS-i accessories ordering information

Art. no.	Article	Description	Length, design
580005	AC-M12-15M	M12 plug for protective field 1 activation, pins 1-5 bridged	
580004	AC-PDA1/A	AS-i adapter for bus connection and power supply for COMPACT <i>plus</i> receiver/transceiver as well as ROTOSCAN RS4/A1, M12, 5-pin	
548361	CB-M12-1000-5GF/GM	Connection cable, adapter device, plug and socket, 1:1, M12, 5-pin	1 m, straight
548362	CB-M12-2000-5GF/GM	Connection cable, adapter device, plug and socket, 1:1, M12, 5-pin	2 m, straight
520072	CB-PCO-3000	Connecting cable, RS232 - IR adapter	3 m
548363	CB-M12-2000-4GMB	RS4 test operation connecting cable	2 m

For more information see chapter AS-Interface Safety at Work, page 266

ROTOSCAN RS4/PROFIBUS accessories ordering information

Art. no.	Article	Description	Length, design
147500	AC-M12-PBT1	PROFIBUS M12 terminal resistor	
548100	CB-M12-25000S-4GF/GM	Connection cable for supply or reset button, shielded	25 m, straight
520072	CB-PCO-3000	Connecting cable, RS232 - IR adapter	3 m

For more information see chapter PROFIsafe Sensors, page 296

ROTOSCAN RS4

Machine Safety

Machine Safety
Services

Safety
Engineering
Software

Safety Laser
Scanners

Safety Light
Curtains

Multiple Light
Beam Safety
Devices

Light Beam
Safety Device
Sets

Single Light
Beam Safety
Devices

AS-Interface
Safety at Work

PROFIsafe
Sensors

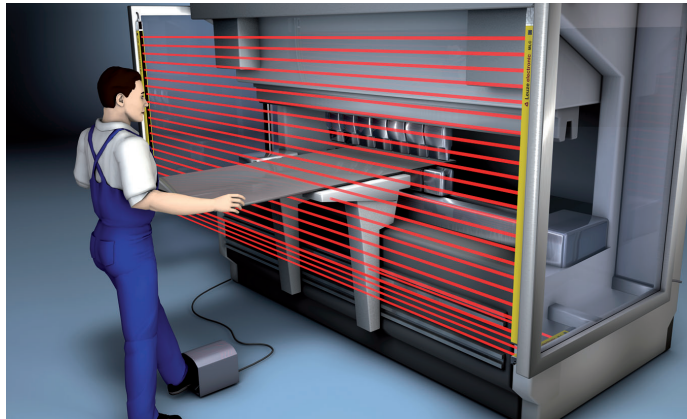
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SAFETY LIGHT CURTAINS

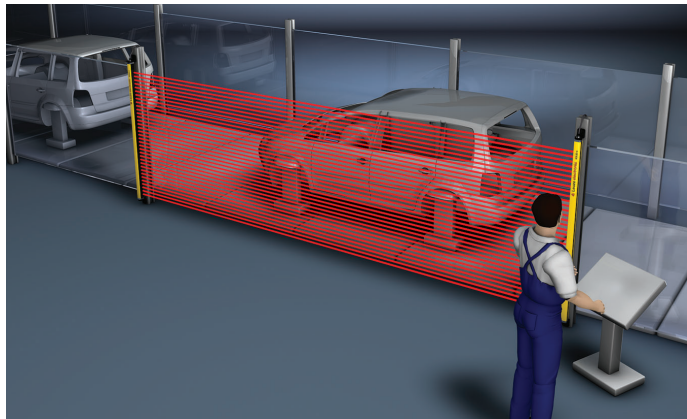
OVERVIEW

Safety Light Curtain selection table

Selection table



Safety Light Curtains with resolutions that can be reduced guarantee protection and tolerate work equipment in the protective field



Access guarding on transport conveyors provided by Safety Light Curtain with integrated start/restart interlock

People and machines work "hand-in-hand" as it were on many machines, such as presses or feed-in stations, for example. Reliable hand and finger protection is the highest priority here. This is the application area of Leuze electronic Safety Light Curtains. And when it comes to guarding machines in automatic operation on the most compact construction designs possible, Leuze electronic Safety Light Curtains are the very best solution.

The Safety Light Curtains comply with the universal standards EN IEC 61496-1 and -2 and can be used both as hand and finger protection and horizontal for person presence detection. They meet the highest requirements in this respect for integration capability, availability and cost effectiveness. On the whole this results in a high level of cost efficiency and investment security, even at the procurement stage.



Safety Light Curtains are suitable according to their model for reliable point of operation, danger zone or access guarding

Type in accordance with EN IEC 61496	Safety Integrity Level (SIL) in accordance with IEC 61508 SILCL in accordance with EN IEC 62061	Performance Level (PL) in accordance with EN ISO 13849-1	W x D in mm	Resolution (mm) Range (m)						Features, type-dependent										Series	Page
				14 0,3-6	20 0,7-14	30 0,5-9	40 0,9-20	50 0-18	90 0,9-20	Transmission channel, selectable	RES, selectable	EDM, selectable	Blanking	Reduced resolution	Muting	Cascadability	Integr. AS-i Safety Interface	Integr. PROFIsafe Interface			
4	3	e	30 x 34							•	*	*			**			SOLID-4	91		
										•	*	*			**	•		SOLID-4E	88		
2	2	d	30 x 34							•	*	*						SOLID-2	114		
										•	*	*						SOLID-2E	114		
4	3	e	52 x 55	14 0-6										•	•	•	•	COMPACTplus-m	128		
								50 0-18						•	•	•	•	COMPACTplus-b	146		

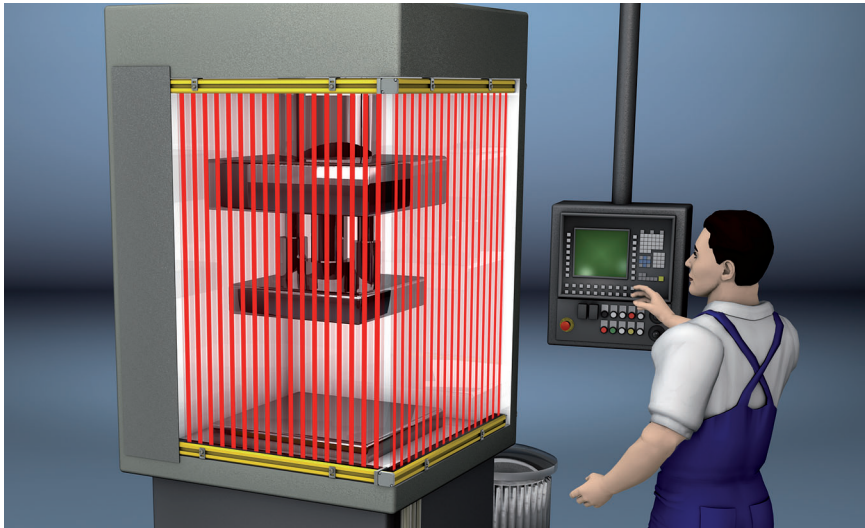
*) With MSI-SR4, p. 440
**) With MSI 100/200, p. 468/476

SOLID-4, SOLID-4E p. 86 SOLID-2, SOLID-2E p. 112 COMPACTplus p. 126

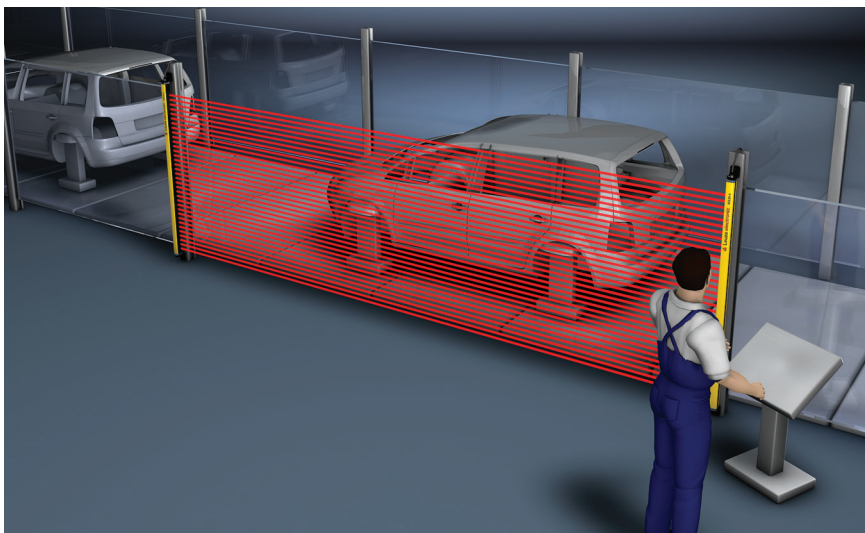
www.leuze.com/slc/

SAFETY LIGHT CURTAINS

SOLID-4, SOLID-4E



SOLID-4E with 30 mm resolution and fixed cascade for hand protection for point of operation guarding on presses



SOLID-4E with integrated start/restart interlock for access guarding on transport conveyors

Rapid market changes require flexible production line adjustments. This demands long-life safety sensor technology that is versatile in its application. Whether it be hand protection or danger zone and access guarding, the type 4 Safety Light Curtains of the SOLID-4 series provide reliable protection and ensure the highest possible system availability with their robust and interference-immune design. Protected by a warp-resistant profile housing closed on four sides and with their uncomplicated M12 connection system, they withstand even the toughest industrial conditions. The restart interlock and contactor monitoring functions, and two different transmission channels for a fault-free operation of adjacent devices close to one another, are freely selectable. The versions in resolutions of 14, 20, 30, 40, 90 mm, the slender design and the versatile fixing options guarantee short mounting times. Device versions with cable-connected or fixed cascading as well as a standard variant without restart-disable and contactor monitoring enable flexible and cost-optimized solutions.

Typical areas of application

- Automotive industry and its suppliers
- Building material and glass machinery
- Print and paper processing
- Electrical and electronics manufacturers
- Industrial robots
- Shoe and leather industry
- Tobacco industry
- Packaging machinery
- Presses
- Woodworking machines

SOLID-4, SOLID-4E

Important technical data, overview

Type in accordance with EN IEC 61496	4				
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3				
Performance Level (PL) in accordance with EN ISO 13849-1	e				
Category in accordance with EN ISO 13849	4				
Resolution	14 mm	20 mm	30 mm	40 mm	90 mm
Range (m)	0.3...6	0.7...14	0.5...9	0.9...20	0.9...20
Protective field height (type-dependent)	150...1800 mm				
Profile cross-section	30 mm x 34 mm				
Safety-related switching outputs (OSSDs)	2 pnp transistor outputs				
Connection system	M12 plug				

Functions	SOLID-4	SOLID-4E
Automatic start/restart	●	●
Start/restart interlock (RES), selectable		●
Dynamic contactor monitoring (EDM), selectable		●
2 transmission channels, selectable		●
LED display	●	●
7-segment display	●	●

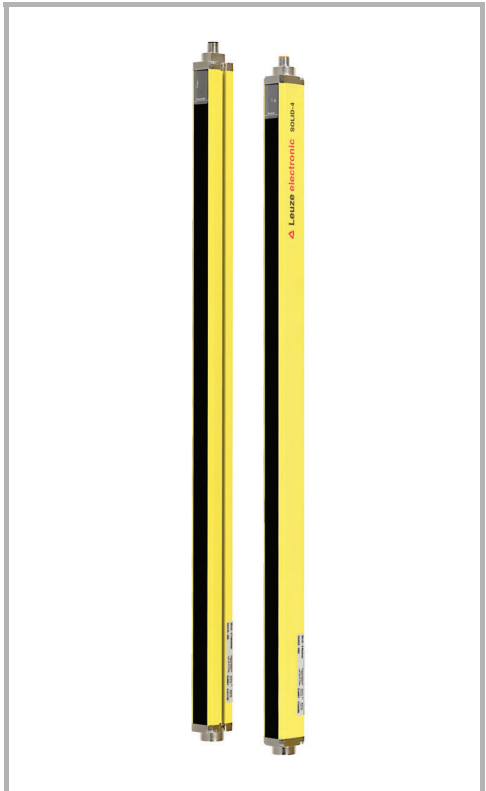
Function extension

SOLID-4						
With Safety Relay	Relay output	RES	EDM	Muting	Cycle control	Further details
MSI-SR4	●	●	●			p. 440
MSI-SR5	●	●	●			p. 446
MSI 100		●	●	●	●	p. 468
MSI 200		●	●	●	●	p. 476
SOLID-4E						
MSI-RM2	●	*	*			p. 428

*) Already included in the device

Special features

- **Type 4 self-monitoring Safety Light Curtain in accordance with EN IEC 61496**
- **Several devices can be cascaded (SOLID-4E)**
- **Slender and robust aluminum housing (30 mm x 34 mm)**
- **Fault-free operation of adjacent devices with selection of different transmission channels**
- **Easy function selection with external wiring**
- **Maintenance-free with safety transistor outputs (OSSDs)**



Features



Further information Page

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- Electrical connection 101
- Technical data 102
- Dimensional drawings 103
- Dimensional drawings: Accessories 107
- Accessories ordering information 109

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Machine Safety

Machine Safety Services

Safety Engineering Software

Safety Laser Scanners

Safety Light Curtains

Multiple Light Beam Safety Devices

Light Beam Safety Device Sets

Single Light Beam Safety Devices

AS-Interface Safety at Work

PROFIsafe Sensors

SAFETY LIGHT CURTAINS

Ordering information

SOLID-4, consisting of transmitter and receiver
 Included in delivery: 2 BT-360-SET mounting bracket sets, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Function: Automatic start/restart

Protective field height in mm	SOLID-4			SOLID-4		
	Art. no.	Article	Description	Art. no.	Article	Description
	Resolution: 14 mm			Resolution: 20 mm		
	Range: 0.3 - 6 m			Range: 0.7 - 14 m		
150	67843501	SD4T14-150	Transmitter	67841701	SD4T20-150	Transmitter
	67843201	SD4R14-150	Receiver	67840201	SD4R20-150	Receiver
225				67841702	SD4T20-225	Transmitter
				67840202	SD4R20-225	Receiver
300	67843503	SD4T14-300	Transmitter	67841703	SD4T20-300	Transmitter
	67843203	SD4R14-300	Receiver	67840203	SD4R20-300	Receiver
450	67843504	SD4T14-450	Transmitter	67841704	SD4T20-450	Transmitter
	67843204	SD4R14-450	Receiver	67840204	SD4R20-450	Receiver
600	67843506	SD4T14-600	Transmitter	67841706	SD4T20-600	Transmitter
	67843206	SD4R14-600	Receiver	67840206	SD4R20-600	Receiver
750	67843507	SD4T14-750	Transmitter	67841707	SD4T20-750	Transmitter
	67843207	SD4R14-750	Receiver	67840207	SD4R20-750	Receiver
900	67843509	SD4T14-900	Transmitter	67841709	SD4T20-900	Transmitter
	67843209	SD4R14-900	Receiver	67840209	SD4R20-900	Receiver
1050	67843510	SD4T14-1050	Transmitter	67841710	SD4T20-1050	Transmitter
	67843210	SD4R14-1050	Receiver	67840210	SD4R20-1050	Receiver
1200	67843512	SD4T14-1200	Transmitter	67841712	SD4T20-1200	Transmitter
	67843212	SD4R14-1200	Receiver	67840212	SD4R20-1200	Receiver
1350	67843513	SD4T14-1500	Transmitter	67841713	SD4T20-1350	Transmitter
	67843213	SD4R14-1350	Receiver	67840213	SD4R20-1350	Receiver
1500	67843515	SD4T14-1500	Transmitter	67841715	SD4T20-1500	Transmitter
	67843215	SD4R14-1500	Receiver	67840215	SD4R20-1500	Receiver
1650	67843516	SD4T14-1650	Transmitter	67841716	SD4T20-1650	Transmitter
	67843216	SD4R14-1650	Receiver	67840216	SD4R20-1650	Receiver
1800	67843518	SD4T14-1800	Transmitter	67841718	SD4T20-1800	Transmitter
	67843218	SD4R14-1800	Receiver	67840218	SD4R20-1800	Receiver

Test rod included in scope of delivery

Test rod included in scope of delivery

SOLID-4, SOLID-4E
p. 86

SOLID-2, SOLID-2E
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COMPACT^{plus}
p. 126

SOLID-4, SOLID-4E

Ordering information

SOLID-4, consisting of transmitter and receiver
 Included in delivery: 2 BT-360-SET mounting bracket sets, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Function: Automatic start/restart

Protective field height in mm	SOLID-4			SOLID-4		
	Art. no.	Article	Description	Art. no.	Article	Description
	Resolution: 30 mm Range: 0.5 - 9 m			Resolution: 40 mm Range: 0.9 - 20 m		
150	67841801	SD4T30-150	Transmitter	67841901	SD4T40-150	Transmitter
	67840601	SD4R30-150	Receiver	67841001	SD4R40-150	Receiver
225	67841802	SD4T30-225	Transmitter	67841902	SD4T40-225	Transmitter
	67840602	SD4R30-225	Receiver	67841002	SD4R40-225	Receiver
300	67841803	SD4T30-300	Transmitter	67841903	SD4T40-300	Transmitter
	67840603	SD4R30-300	Receiver	67841003	SD4R40-300	Receiver
450	67841804	SD4T30-450	Transmitter	67841904	SD4T40-450	Transmitter
	67840604	SD4R30-450	Receiver	67841004	SD4R40-450	Receiver
600	67841806	SD4T30-600	Transmitter	67841906	SD4T40-600	Transmitter
	67840606	SD4R30-600	Receiver	67841006	SD4R40-600	Receiver
750	67841807	SD4T30-750	Transmitter	67841907	SD4T40-750	Transmitter
	67840607	SD4R30-750	Receiver	67841007	SD4R40-750	Receiver
900	67841809	SD4T30-900	Transmitter	67841909	SD4T40-900	Transmitter
	67840609	SD4R30-900	Receiver	67841009	SD4R40-900	Receiver
1050	67841810	SD4T30-1050	Transmitter	67841910	SD4T40-1050	Transmitter
	67840610	SD4R30-1050	Receiver	67841010	SD4R40-1050	Receiver
1200	67841812	SD4T30-1200	Transmitter	67841912	SD4T40-1200	Transmitter
	67840612	SD4R30-1200	Receiver	67841012	SD4R40-1200	Receiver
1350	67841813	SD4T30-1350	Transmitter	67841913	SD4T40-1350	Transmitter
	67840613	SD4R30-1350	Receiver	67841013	SD4R40-1350	Receiver
1500	67841815	SD4T30-1500	Transmitter	67841915	SD4T40-1500	Transmitter
	67840615	SD4R30-1500	Receiver	67841015	SD4R40-1500	Receiver
1650	67841816	SD4T30-1650	Transmitter	67841916	SD4T40-1650	Transmitter
	67840616	SD4R30-1650	Receiver	67841016	SD4R40-1650	Receiver
1800	67841818	SD4T30-1800	Transmitter	67841918	SD4T40-1800	Transmitter
	67840618	SD4R30-1800	Receiver	67841018	SD4R40-1800	Receiver

Test rod included in scope of delivery

Test rod included in scope of delivery

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SAFETY LIGHT CURTAINS

Ordering information

SOLID-4, consisting of transmitter and receiver
 Included in delivery: 2 BT-360-SET mounting bracket sets, 1 set of
 connecting and operating instructions (PDF file on CD-ROM)

Function: Automatic start/restart

Protective field height in mm	SOLID-4		
	Resolution: 90 mm Range: 0.9 - 20 m		
	Art. no.	Article	Description
600	67842006	SD4T90-600	Transmitter
	67841406	SD4R90-600	Receiver
750	67842007	SD4T90-750	Transmitter
	67841407	SD4R90-750	Receiver
900	67842009	SD4T90-900	Transmitter
	67841409	SD4R90-900	Receiver
1050	67842010	SD4T90-1050	Transmitter
	67841410	SD4R90-1050	Receiver
1200	67842012	SD4T90-1200	Transmitter
	67841412	SD4R90-1200	Receiver
1350	67842013	SD4T90-1350	Transmitter
	67841413	SD4R90-1350	Receiver
1500	67842015	SD4T90-1500	Transmitter
	67841415	SD4R90-1500	Receiver
1650	67842016	SD4T90-1650	Transmitter
	67841416	SD4R90-1650	Receiver
1800	67842018	SD4T90-1800	Transmitter
	67841418	SD4R90-1800	Receiver

SOLID-4, SOLID-4E

Ordering information

SOLID-4E, consisting of transmitter and receiver
 Included in delivery: 2 BT-360-SET mounting bracket sets, 1 set of connecting and operating instructions(PDF file on CD-ROM)

Functions: Automatic start/restart, selectable start/restart interlock, dynamic contactor monitoring, selectable transmission channels

Protective field height in mm	SOLID-4E		
	Art. no.	Article	Description
	Resolution: 14 mm Range: 0.3 - 6 m		
150	67843501	SD4T14-150	Transmitter
	67843401	SD4R14-150E	Receiver
225			
300	67843503	SD4T14-300	Transmitter
	67843403	SD4R14-300E	Receiver
450	67843504	SD4T14-450	Transmitter
	67843404	SD4R14-450E	Receiver
600	67843506	SD4T14-600	Transmitter
	67843406	SD4R14-600E	Receiver
750	67843507	SD4T14-750	Transmitter
	67843407	SD4R14-750E	Receiver
900	67843509	SD4T14-900	Transmitter
	67843409	SD4R14-900E	Receiver
1050	67843510	SD4T14-1050	Transmitter
	67843410	SD4R14-1050E	Receiver
1200	67843512	SD4T14-1200	Transmitter
	67843412	SD4R14-1200E	Receiver
1350	67843513	SD4T14-1350	Transmitter
	67843413	SD4R14-1350E	Receiver
1500	67843515	SD4T14-1500	Transmitter
	67843415	SD4R14-1500E	Receiver
1650	67843516	SD4T14-1650	Transmitter
	67843416	SD4R14-1650E	Receiver
1800	67843518	SD4T14-1800	Transmitter
	67843418	SD4R14-1800E	Receiver

Test rod included in scope of delivery

Protective field height in mm	SOLID-4E		
	Art. no.	Article	Description
	Resolution: 20 mm Range: 0.7 - 14 m		
150	67841701	SD4T20-150	Transmitter
	67840401	SD4R20-150E	Receiver
225	67841702	SD4T20-225	Transmitter
	67840402	SD4R20-225E	Receiver
300	67841703	SD4T20-300	Transmitter
	67840403	SD4R20-300E	Receiver
450	67841704	SD4T20-450	Transmitter
	67840404	SD4R20-450E	Receiver
600	67841706	SD4T20-600	Transmitter
	67840406	SD4R20-600E	Receiver
750	67841707	SD4T20-750	Transmitter
	67840407	SD4R20-750E	Receiver
900	67841709	SD4T20-900	Transmitter
	67840409	SD4R20-900E	Receiver
1050	67841710	SD4T20-1050	Transmitter
	67840410	SD4R20-1050E	Receiver
1200	67841712	SD4T20-1200	Transmitter
	67840412	SD4R20-1200E	Receiver
1350	67841713	SD4T20-1350	Transmitter
	67840413	SD4R20-1350E	Receiver
1500	67841715	SD4T20-1500	Transmitter
	67840415	SD4R20-1500E	Receiver
1650	67841716	SD4T20-1650	Transmitter
	67840416	SD4R20-1650E	Receiver
1800	67841718	SD4T20-1800	Transmitter
	67840418	SD4R20-1800E	Receiver

Test rod included in scope of delivery

www.leuze.com/solid/

SAFETY LIGHT CURTAINS

Ordering information

SOLID-4E, consisting of transmitter and receiver
 Included in delivery: 2 BT-360-SET mounting bracket sets, 1 set of connecting and operating instructions(PDF file on CD-ROM)

Functions: Automatic start/restart, selectable start/restart interlock, dynamic contactor monitoring, selectable transmission channels

Protective field height in mm	SOLID-4E			SOLID-4E		
	Art. no.	Article	Description	Art. no.	Article	Description
	Resolution: 30 mm			Resolution: 40 mm		
	Range: 0.5 - 9 m			Range: 0.9 - 20 m		
150	67841801	SD4T30-150	Transmitter	67841901	SD4T40-150	Transmitter
	67840801	SD4R30-150E	Receiver	67841201	SD4R40-150E	Receiver
225	67841802	SD4T30-225	Transmitter	67841902	SD4T40-225	Transmitter
	67840802	SD4R30-225E	Receiver	67841202	SD4R40-225E	Receiver
300	67841803	SD4T30-300	Transmitter	67841903	SD4T40-300	Transmitter
	67840803	SD4R30-300E	Receiver	67841203	SD4R40-300E	Receiver
450	67841804	SD4T30-450	Transmitter	67841904	SD4T40-450	Transmitter
	67840804	SD4R30-450E	Receiver	67841204	SD4R40-450E	Receiver
600	67841806	SD4T30-600	Transmitter	67841906	SD4T40-600	Transmitter
	67840806	SD4R30-600E	Receiver	67841206	SD4R40-600E	Receiver
750	67841807	SD4T30-750	Transmitter	67841907	SD4T40-750	Transmitter
	67840807	SD4R30-750E	Receiver	67841207	SD4R40-750E	Receiver
900	67841809	SD4T30-900	Transmitter	67841909	SD4T40-900	Transmitter
	67840809	SD4R30-900E	Receiver	67841209	SD4R40-900E	Receiver
1050	67841810	SD4T30-1050	Transmitter	67841910	SD4T40-1050	Transmitter
	67840810	SD4R30-1050E	Receiver	67841210	SD4R40-1050E	Receiver
1200	67841812	SD4T30-1200	Transmitter	67841912	SD4T40-1200	Transmitter
	67840812	SD4R30-1200E	Receiver	67841212	SD4R40-1200E	Receiver
1350	67841813	SD4T30-1350	Transmitter	67841913	SD4T40-1350	Transmitter
	67840813	SD4R30-1350E	Receiver	67841213	SD4R40-1350E	Receiver
1500	67841815	SD4T30-1500	Transmitter	67841915	SD4T40-1500	Transmitter
	67840815	SD4R30-1500E	Receiver	67841215	SD4R40-1500E	Receiver
1650	67841816	SD4T30-1650	Transmitter	67841916	SD4T40-1650	Transmitter
	67840816	SD4R30-1650E	Receiver	67841216	SD4R40-1650E	Receiver
1800	67841818	SD4T30-1800	Transmitter	67841918	SD4T40-1800	Transmitter
	67840818	SD4R30-1800E	Receiver	67841218	SD4R40-1800E	Receiver

Test rod included in scope of delivery

Test rod included in scope of delivery

Ordering information

SOLID-4E, consisting of transmitter and receiver
 Included in delivery: 2 BT-360-SET mounting bracket sets, 1 set of connecting and operating instructions(PDF file on CD-ROM)

Functions: Automatic start/restart, selectable start/restart interlock, dynamic contactor monitoring, selectable transmission channels

Protective field height in mm	SOLID-4E		
	Resolution: 90 mm Range: 0.9 - 20 m		
	Art. no.	Article	Description
600	67842006	SD4T90-600	Transmitter
	67841606	SD4R90-600E	Receiver
750	67842007	SD4T90-750	Transmitter
	67841607	SD4R90-750E	Receiver
900	67842009	SD4T90-900	Transmitter
	67841609	SD4R90-900E	Receiver
1050	67842010	SD4T90-1050	Transmitter
	67841610	SD4R90-1050E	Receiver
1200	67842012	SD4T90-1200	Transmitter
	67841612	SD4R90-1200E	Receiver
1350	67842013	SD4T90-1350	Transmitter
	67841613	SD4R90-1350E	Receiver
1500	67842015	SD4T90-1500	Transmitter
	67841615	SD4R90-1500E	Receiver
1650	67842016	SD4T90-1650	Transmitter
	67841616	SD4R90-1650E	Receiver
1800	67842018	SD4T90-1800	Transmitter
	67841618	SD4R90-1800E	Receiver

Note

With cascaded devices, sliding blocks are supplied instead of BT-360 mounting brackets.

Note

Examples of fixed SOLID cascading can be found on pages 105, 106.

www.leuze.com/solid/

SAFETY LIGHT CURTAINS

Ordering information

SOLID-4E host/guest, consisting of transmitter and receiver
Included in delivery: Sliding blocks, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Function: Automatic start/restart, selectable start/restart interlock, dynamic contactor monitoring, selectable transmission channels

Protective field height in mm	SOLID-4 HOST			SOLID-4 GUEST		
	Art. no.	Article	Description	Art. no.	Article	Description
	Resolution: 14 mm Range: 0.3 - 6 m			Resolution: 14 mm Range: 0.3 - 6 m		
150				67847001	SD4T14-150G	Transmitter
				67846001	SD4R14-150G	Receiver
300	67845003	SD4T14-300H	Transmitter	67847003	SD4T14-300G	Transmitter
	67844103	SD4R14-300EH	Receiver	67846003	SD4R14-300G	Receiver
450	67844004	SD4R14-450H	Transmitter	67847004	SD4T14-450G	Transmitter
	67844104	SD4R14-450EH	Receiver	67846004	SD4R14-450G	Receiver
600	67845006	SD4T14-600H	Transmitter	67847006	SD4T14-600G	Transmitter
	67844106	SD4R14-600EH	Receiver	67846006	SD4R14-600G	Receiver
750	67845007	SD4T14-750H	Transmitter	67847007	SD4T14-750G	Transmitter
	67844107	SD4R14-750EH	Receiver	67846007	SD4R14-750G	Receiver
900	67845009	SD4T14-900H	Transmitter	67847009	SD4T14-900G	Transmitter
	67844109	SD4R14-900EH	Receiver	67846009	SD4R14-900G	Receiver
1050	67845010	SD4T14-1050H	Transmitter	67847010	SD4T14-1050G	Transmitter
	67844110	SD4R14-1050EH	Receiver	67846010	SD4R14-1050G	Receiver
1200	67845012	SD4T14-1200H	Transmitter	67847012	SD4T14-1200G	Transmitter
	67844112	SD4R14-1200EH	Receiver	67846012	SD4R14-1200G	Receiver
1350	67845013	SD4T14-1350H	Transmitter	67847013	SD4T14-1350G	Transmitter
	67844113	SD4R14-1350EH	Receiver	67846013	SD4R14-1350G	Receiver
1500	67845015	SD4T14-1500H	Transmitter	67847015	SD4T14-1500G	Transmitter
	67844115	SD4R14-1500EH	Receiver	67846015	SD4R14-1500G	Receiver
1650	67845016	SD4T14-1650H	Transmitter	67847016	SD4T14-1650G	Transmitter
	67844116	SD4R14-1650EH	Receiver	67846016	SD4R14-1650G	Receiver
1800	67845018	SD4T14-1800H	Transmitter	67847018	SD4T14-1800G	Transmitter
	67844118	SD4R14-1800EH	Receiver	67846018	SD4R14-1800G	Receiver

Note

With cascaded devices, sliding blocks are supplied instead of BT-360 mounting brackets.

Note

Examples of fixed SOLID cascading can be found on pages 105, 106.

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SOLID-2, SOLID-2E
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COMPACT^{plus}
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SOLID-4, SOLID-4E

Ordering information

SOLID-4E host/guest, consisting of transmitter and receiver
Included in delivery: Sliding blocks, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Function: Automatic start/restart, selectable start/restart interlock, dynamic contactor monitoring, selectable transmission channels

Protective field height in mm	SOLID-4 HOST			SOLID-4 GUEST		
	Art. no.	Article	Description	Art. no.	Article	Description
	Resolution: 20 mm Range: 0.7 - 14 m			Resolution: 20 mm Range: 0.7 - 14 m		
150				67847101	SD4T20-150G	Transmitter
				67846201	SD4R20-150G	Receiver
225				67847102	SD4T20-225G	Transmitter
				67846202	SD4R20-225G	Receiver
300	67845103	SD4T20-300H	Transmitter	67847103	SD4T20-300G	Transmitter
	67844303	SD4R20-300EH	Receiver	67846203	SD4R20-300G	Receiver
450	67845104	SD4T20-450H	Transmitter	67847104	SD4T20-450G	Transmitter
	67844304	SD4R20-450EH	Receiver	67846204	SD4R20-450G	Receiver
600	67845106	SD4T20-600H	Transmitter	67847106	SD4T20-600G	Transmitter
	67844306	SD4R20-600EH	Receiver	67846206	SD4R20-600G	Receiver
750	67845107	SD4T20-750H	Transmitter	67847107	SD4T20-750G	Transmitter
	67844307	SD4R20-750EH	Receiver	67846207	SD4R20-750G	Receiver
900	67845109	SD4T20-900H	Transmitter	67847109	SD4T20-900G	Transmitter
	67844309	SD4R20-900EH	Receiver	67846209	SD4R20-900G	Receiver
1050	67845110	SD4T20-1050H	Transmitter	67847110	SD4T20-1050G	Transmitter
	67844310	SD4R20-1050EH	Receiver	67846210	SD4R20-1050G	Receiver
1200	67845112	SD4T20-1200H	Transmitter	67847112	SD4T20-1200G	Transmitter
	67844312	SD4R20-1200EH	Receiver	67846212	SD4R20-1200G	Receiver
1350	67845113	SD4T20-1350H	Transmitter	67847113	SD4T20-1350G	Transmitter
	67844313	SD4R20-1350EH	Receiver	67846213	SD4R20-1350G	Receiver
1500	67845115	SD4T20-1500H	Transmitter	67847115	SD4T20-1500G	Transmitter
	67844315	SD4R20-1500EH	Receiver	67846215	SD4R20-1500G	Receiver
1650	67845116	SD4T20-1650H	Transmitter	67847116	SD4T20-1650G	Transmitter
	67844316	SD4R20-1650EH	Receiver	67846216	SD4R20-1650G	Receiver
1800	67845118	SD4T20-1800H	Transmitter	67847118	SD4T20-1800G	Transmitter
	67844318	SD4R20-1800EH	Receiver	67846218	SD4R20-1800G	Receiver

Note

With cascaded devices, sliding blocks are supplied instead of BT-360 mounting brackets.

Note

Examples of fixed SOLID cascading can be found on pages 105, 106.

www.leuze.com/solid/

SAFETY LIGHT CURTAINS

Ordering information

SOLID-4E host/guest, consisting of transmitter and receiver
Included in delivery: Sliding blocks, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Function: Automatic start/restart, selectable start/restart interlock, dynamic contactor monitoring, selectable transmission channels

Protective field height in mm	SOLID-4 HOST			SOLID-4 GUEST		
	Art. no.	Article	Description	Art. no.	Article	Description
	Resolution: 30 mm Range: 0.5 - 9 m			Resolution: 30 mm Range: 0.5 - 9 m		
150				67847201	SD4T30-150G	Transmitter
				67846401	SD4R30-150G	Receiver
225				67847202	SD4T30-225G	Transmitter
				67846402	SD4R30-225G	Receiver
300	67845203	SD4T30-300H	Transmitter	67847203	SD4T30-300G	Transmitter
	67844503	SD4R30-300EH	Receiver	67846403	SD4R30-300G	Receiver
450	67845204	SD4T30-450H	Transmitter	67847204	SD4T30-450G	Transmitter
	67844504	SD4R30-450EH	Receiver	67846404	SD4R30-450G	Receiver
600	67845206	SD4T30-600H	Transmitter	67847206	SD4T30-600G	Transmitter
	67844506	SD4R30-600EH	Receiver	67846406	SD4R30-600G	Receiver
750	67845207	SD4T30-750H	Transmitter	67847207	SD4T30-750G	Transmitter
	67844507	SD4R30-750EH	Receiver	67846407	SD4R30-750G	Receiver
900	67845209	SD4T30-900H	Transmitter	67847209	SD4T30-900G	Transmitter
	67844509	SD4R30-900EH	Receiver	67846409	SD4R30-900G	Receiver
1050	67845210	SD4T30-1050H	Transmitter	67847210	SD4T30-1050G	Transmitter
	67844510	SD4R30-1050EH	Receiver	67846410	SD4R30-1050G	Receiver
1200	67845212	SD4T30-1200H	Transmitter	67847212	SD4T30-1200G	Transmitter
	67844512	SD4R30-1200EH	Receiver	67846412	SD4R30-1200G	Receiver
1350	67845213	SD4T30-1350H	Transmitter	67847213	SD4T30-1350G	Transmitter
	67844513	SD4R30-1350EH	Receiver	67846413	SD4R30-1350G	Receiver
1500	67845215	SD4T30-1500H	Transmitter	67847215	SD4T30-1500G	Transmitter
	67844515	SD4R30-1500EH	Receiver	67846415	SD4R30-1500G	Receiver
1650	67845216	SD4T30-1650H	Transmitter	67847216	SD4T30-1650G	Transmitter
	67844516	SD4R30-1650EH	Receiver	67846416	SD4R30-1650G	Receiver
1800	67845218	SD4T30-1800H	Transmitter	67847218	SD4T30-1800G	Transmitter
	67844518	SD4R30-1800EH	Receiver	67846418	SD4R30-1800G	Receiver

Note

With cascaded devices, sliding blocks are supplied instead of BT-360 mounting brackets.

Note

Examples of fixed SOLID cascading can be found on pages 105, 106.

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SOLID-2, SOLID-2E
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SOLID-4, SOLID-4E

Ordering information

SOLID-4E host/guest, consisting of transmitter and receiver
Included in delivery: Sliding blocks, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Function: Automatic start/restart, selectable start/restart interlock, dynamic contactor monitoring, selectable transmission channels

Protective field height in mm	SOLID-4 HOST			SOLID-4 GUEST		
	Art. no.	Article	Description	Art. no.	Article	Description
	Resolution: 40 mm Range: 0.7 - 14 m			Resolution: 40 mm Range: 0.9 - 20 m		
150				67847301	SD4T40-150G	Transmitter
				67846601	SD4R40-150G	Receiver
225				67847302	SD4T40-225G	Transmitter
				67846602	SD4R40-225G	Receiver
300	67845303	SD4T40-300H	Transmitter	67847303	SD4T40-300G	Transmitter
	67844703	SD4R40-300EH	Receiver	67846603	SD4R40-300G	Receiver
450	67845304	SD4T40-450H	Transmitter	67847304	SD4T40-450G	Transmitter
	67844704	SD4R40-450EH	Receiver	67846604	SD4R40-450G	Receiver
600	67845306	SD4T40-600H	Transmitter	67847306	SD4T40-600G	Transmitter
	67844706	SD4R40-600EH	Receiver	67846606	SD4R40-600G	Receiver
750	67845307	SD4T40-750H	Transmitter	67847307	SD4T40-750G	Transmitter
	67844707	SD4R40-750EH	Receiver	67846607	SD4R40-750G	Receiver
900	67845309	SD4T40-900H	Transmitter	67847309	SD4T40-900G	Transmitter
	67844709	SD4R40-900EH	Receiver	67846609	SD4R40-900G	Receiver
1050	67845310	SD4T40-1050H	Transmitter	67847310	SD4T40-1050G	Transmitter
	67844710	SD4R40-1050EH	Receiver	67846610	SD4R40-1050G	Receiver
1200	67845312	SD4T40-1200H	Transmitter	67847312	SD4T40-1200G	Transmitter
	67844712	SD4R40-1200EH	Receiver	67846612	SD4R40-1200G	Receiver
1350	67845313	SD4T40-1350H	Transmitter	67847313	SD4T40-1350G	Transmitter
	67844713	SD4R40-1350EH	Receiver	67846613	SD4R40-1350G	Receiver
1500	67845315	SD4T40-1500H	Transmitter	67847315	SD4T40-1500G	Transmitter
	67844715	SD4R40-1500EH	Receiver	67846615	SD4R40-1500G	Receiver
1650	67845316	SD4T40-1650H	Transmitter	67847316	SD4T40-1650G	Transmitter
	67844716	SD4R40-1650EH	Receiver	67846616	SD4R40-1650G	Receiver
1800	67845318	SD4T40-1800H	Transmitter	67847318	SD4T40-1800G	Transmitter
	67844718	SD4R40-1800EH	Receiver	67846618	SD4R40-1800G	Receiver

Note

With cascaded devices, sliding blocks are supplied instead of BT-360 mounting brackets.

Note

Examples of fixed SOLID cascading can be found on pages 105, 106.

www.leuze.com/solid/

SAFETY LIGHT CURTAINS

Ordering information

SOLID-4E host/guest, consisting of transmitter and receiver
Included in delivery: Sliding blocks, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Function: Automatic start/restart, selectable start/restart interlock, dynamic contactor monitoring, selectable transmission channels

Protective field height in mm	SOLID-4 HOST			SOLID-4 GUEST		
	Art. no.	Article	Description	Art. no.	Article	Description
600	67845406	SD4T90-600H	Transmitter	67847406	SD4T90-600G	Transmitter
	67844906	SD4R90-600EH	Receiver	67846806	SD4R90-600G	Receiver
750	67845407	SD4T90-750H	Transmitter	67847407	SD4T90-750G	Transmitter
	67844907	SD4R90-750EH	Receiver	67846807	SD4R90-750G	Receiver
900	67845409	SD4T90-900H	Transmitter	67847409	SD4T90-900G	Transmitter
	67844909	SD4R90-900EH	Receiver	67846809	SD4R90-900G	Receiver
1050	67845410	SD4T90-1050H	Transmitter	67847410	SD4T90-1050G	Transmitter
	67844910	SD4R90-1050EH	Receiver	67846810	SD4R90-1050G	Receiver
1200	67845412	SD4T90-1200H	Transmitter	67847412	SD4T90-1200G	Transmitter
	67844912	SD4R90-1200EH	Receiver	67846812	SD4R90-1200G	Receiver
1350	67845413	SD4T90-1350H	Transmitter	67847413	SD4T90-1350G	Transmitter
	67844913	SD4R90-1350EH	Receiver	67846813	SD4R90-1350G	Receiver
1500	67845415	SD4T90-1500H	Transmitter	67847415	SD4T90-1500G	Transmitter
	67844915	SD4R90-1500EH	Receiver	67846815	SD4R90-1500G	Receiver
1650	67845416	SD4T90-1650H	Transmitter	67847416	SD4T90-1650G	Transmitter
	67844916	SD4R90-1650EH	Receiver	67846816	SD4R90-1650G	Receiver
1800	67845418	SD4T90-1800H	Transmitter	67847418	SD4T90-1800G	Transmitter
	67844918	SD4R90-1800EH	Receiver	67846818	SD4R90-1800G	Receiver

Note

With cascaded devices, sliding blocks are supplied instead of BT-360 mounting brackets.

Note

Examples of fixed SOLID cascading can be found on pages 105, 106.

Article list for SOLID-4

Safety Light Curtains of the SOLID-4 series

Article	Description
SD4	SOLID-4
t	Device type
T	Transmitter
R	Receiver
rr	Resolution/range
14	14 mm / range 0.3 - 6 m
20	20 mm / range 0.7 - 14 m
30	30 mm / range 0.5 - 9 m
40	40 mm / range 0.9 - 20 m
90	90 mm / range 0.9 - 20 m
hhh	Protective field height
	150...3000 mm
	Function package (receiver only)
E	With selectable start/restart interlock, contactor monitoring and transmission channels
k	Design
Without	Standard design
H	Host
G	Guest
L	L-Shape
U	U-Shape
L1	L-Shape 45°

SD4 t rr -hhh k

Note

The Host, L-Shape, U-Shape, L-Shape 45° models are available only in combination with the function package "E".

Note

Order numbers for L- and U-Shape device versions are available on request. L- and U-Shape device versions are only available with uniform resolution on all forks. With cascaded devices, sliding blocks are supplied instead of BT-360 mounting brackets.

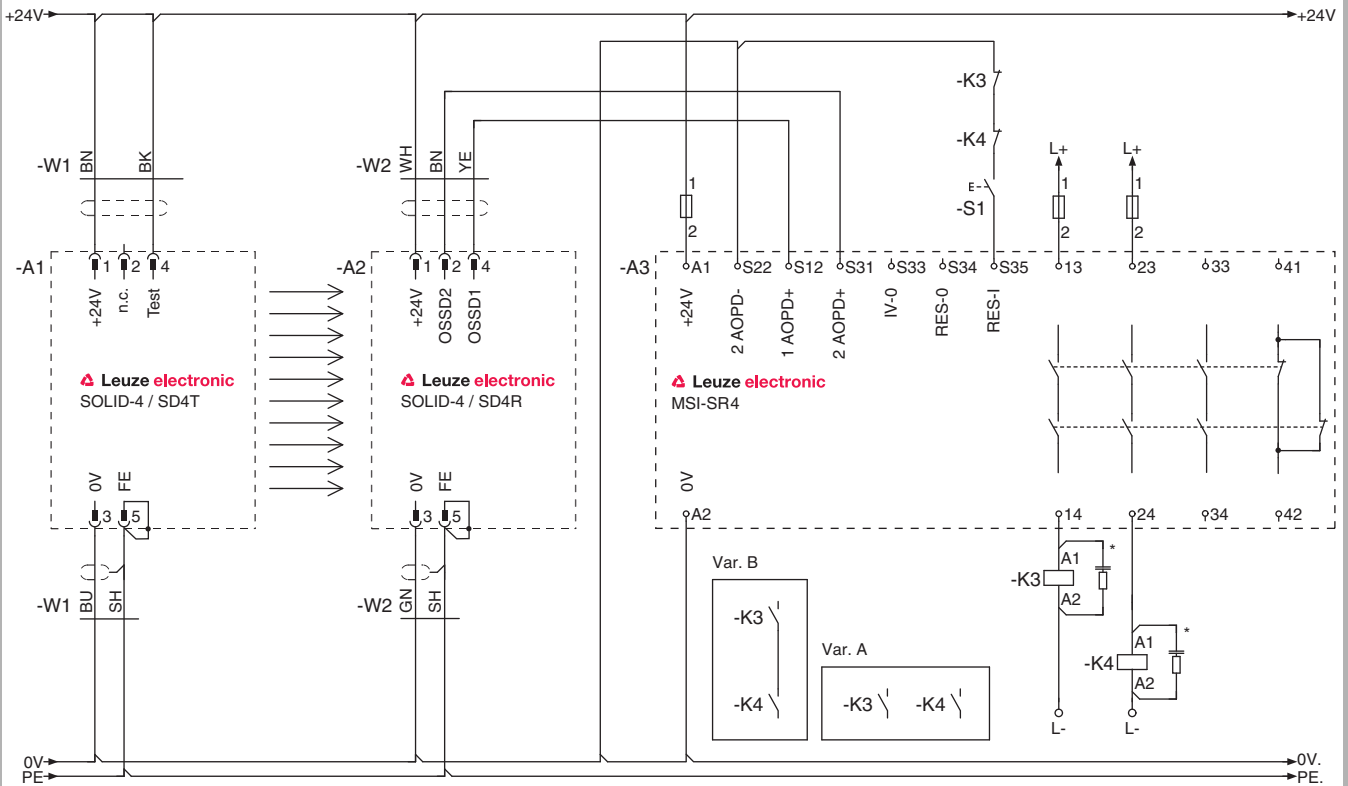
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Machine Safety
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Safety Light Curtains
Multiple Light Beam Safety Devices
Light Beam Safety Device Sets
Single Light Beam Safety Devices
AS-Interface Safety at Work
PROFIsafe Sensors

SAFETY LIGHT CURTAINS

Electrical connection

SOLID-4 connection example



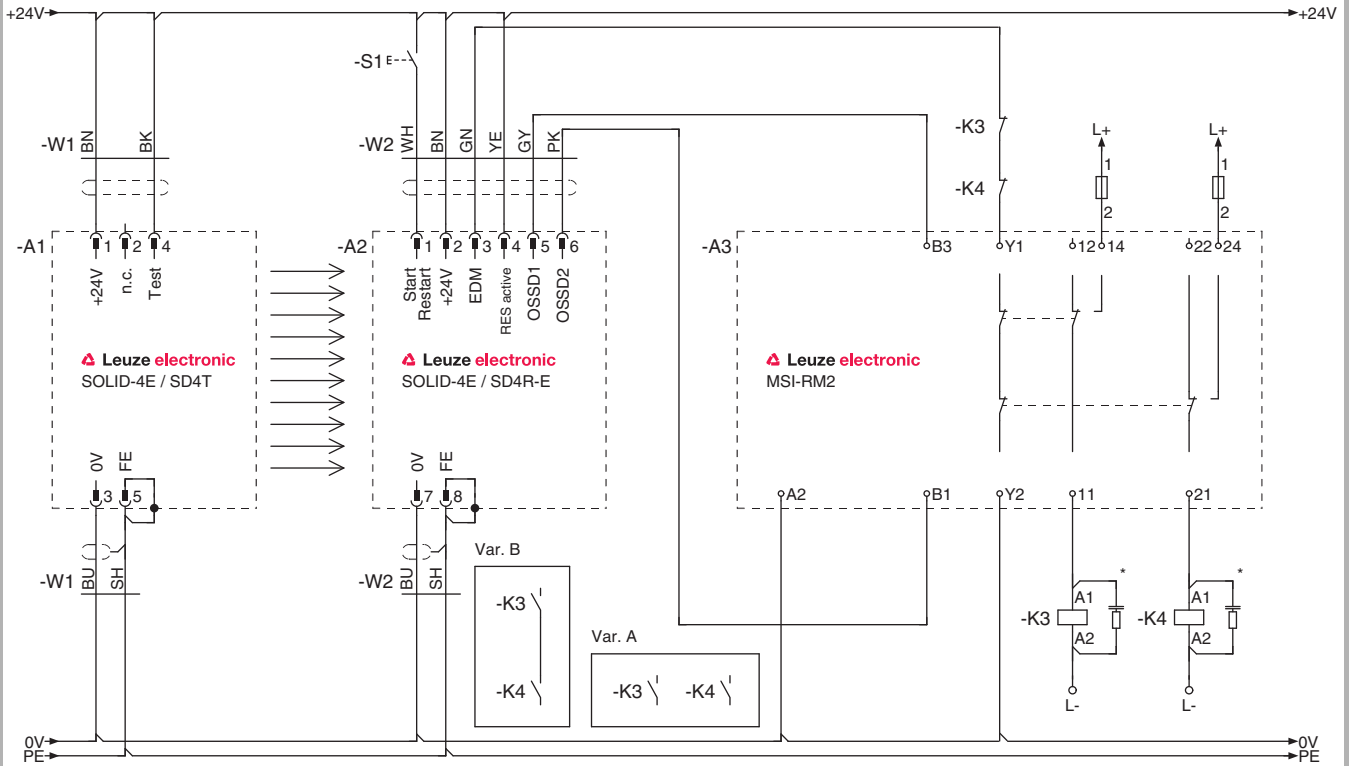
*) Spark extinction circuit, supply suitable spark extinction

SOLID-4 with MSI-SR4 Safety Relay

! Please observe the operating instructions of the components!

Electrical connection

SOLID-4E connection example



*) Spark extinction circuit, supply suitable spark extinction

SOLID-4E with MSI-RM2 Safety Relay

⚠ Please observe the operating instructions of the components!

SAFETY LIGHT CURTAINS

Technical data

General system data					
Type in accordance with EN IEC 61496	4				
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3				
Performance Level (PL) in accordance with EN ISO 13849-1	e				
Probability of a failure to danger per hour (PFH _d)	For protective heights up to 900 mm, all resolutions				6.00 x 10 ⁻⁹
	For protective heights up to 1800 mm, all resolutions				7.30 x 10 ⁻⁹
	For protective heights up to 2850 mm				8.40 x 10 ⁻⁹
Service life (T _M) in accordance with EN ISO 13849-1	20 years				
Category in accordance with EN ISO 13849	4				
Resolution	14 mm	20 mm	30 mm	40 mm	90 mm
Range	0.3...6 m	0.7...14 m	0.5...9 m	0.9...20 m	0.9...20 m
Response time (depends on protective field height)	7...38 ms	11...31 ms	6...16 ms	6...16 ms	8...11 ms
Protective field height	150...1800 mm				600...1800 mm
Synchronization	Optical via transmitter and receiver				
Supply voltage	24 V DC, ±20 %				
Connection cable length	Max. 100 m with 0.25 mm ²				
Safety class	III				
Protection rating	IP 65				
Ambient temperature, operation	0...+50 °C				
Ambient temperature, storage	-25...+70 °C				
Relative humidity	15...95 %				
Profile cross-section	30 mm x 34 mm				
Weight per device (length-dependent)	0.30...1.90 kg				
Transmitter					
Transmitter diodes, class in accordance with EN 60825	1				
Wavelength	950 nm				
Current consumption	75 mA				
Connection system	M12 plug, 5-pin				
External test input	24 V DC, max. 20 mA				
Receiver					
Current consumption	110 mA without external load				
Safety-related switching outputs (OSSDs)	2 pnp transistor outputs (short circuit-proof, cross-circuit monitored)				
Switching voltage high active	Min. U _v -2.2 V				
Switching voltage low	Max. 2.8 V				
Switching current	Typical, 250 mA				
SOLID-4 connection system	M12 plug, 5-pin				
SOLID-4E connection system	M12 plug, 8-pin				

Please note the additional information in the SOLID-4 Connecting and Operating Instructions at www.leuze.com/solid.

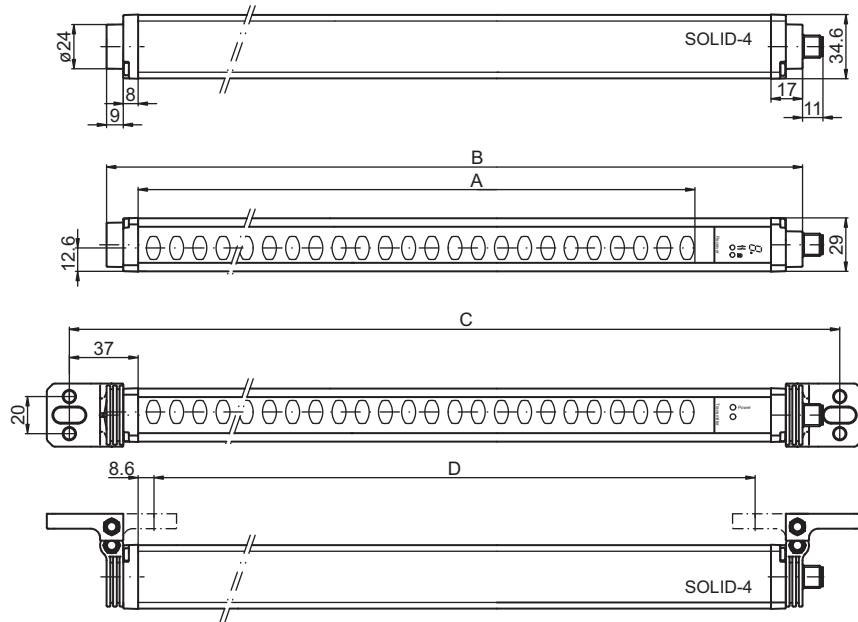
SOLID-4, SOLID-4E
p. 86

SOLID-2, SOLID-2E
p. 112

COMPACT^{plus}
p. 126

Dimensional drawings

SOLID-4/SOLID-4E Safety Light Curtain



- A = Protective field height according to ordering information
- B = A + 75.5 mm
- C = A + 115.5 mm
- D = A + 24.3 mm

Dimensions in mm

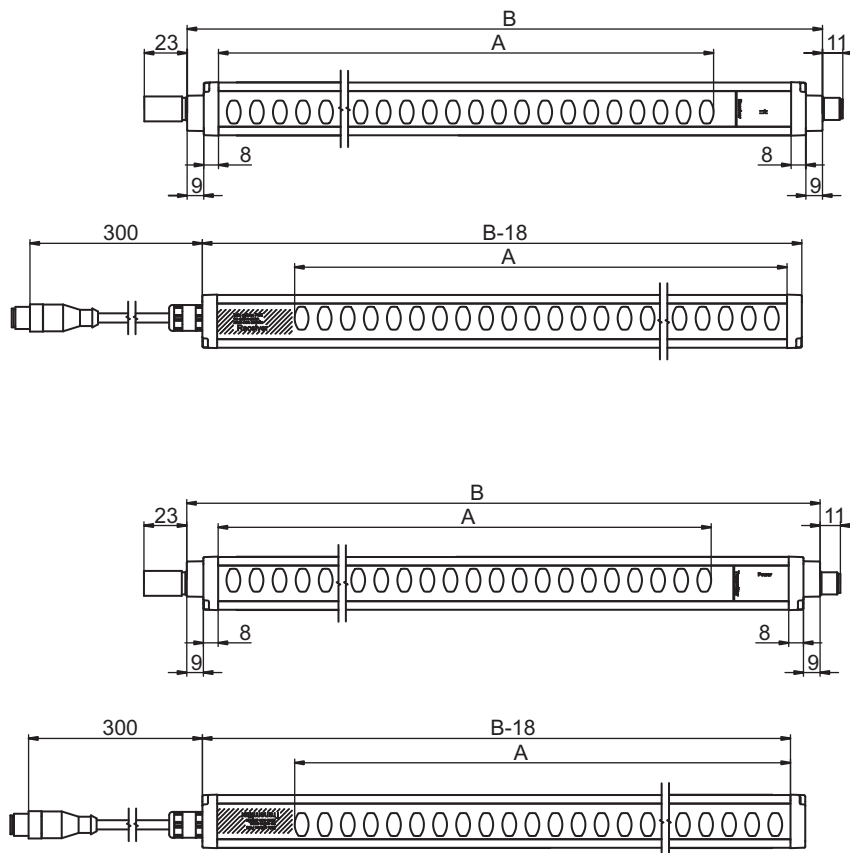
Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

www.leuze.com/solid/

SAFETY LIGHT CURTAINS

Dimensional drawings

Version as cable-connected cascading host-guest



A = Protective field height according to ordering information
 B = A + 75.5 mm

Dimensions in mm

i Note

With cascaded devices, sliding blocks are supplied instead of BT-360 mounting brackets.

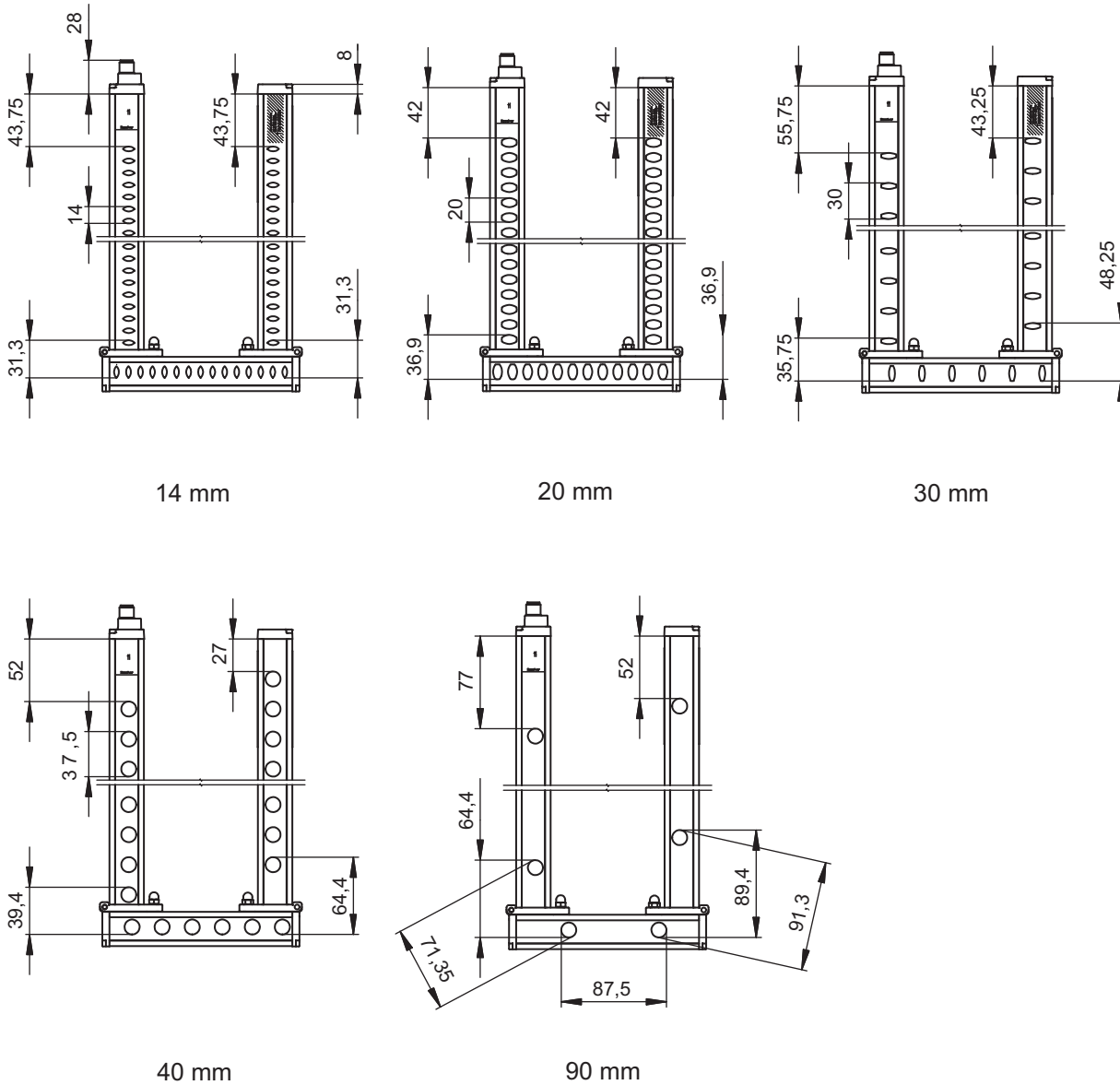
SOLID-4, SOLID-4E
 p. 86

SOLID-2, SOLID-2E
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Dimensional drawings

Version as fixed cascading L/U-Shape



Resolutions of the various L/U-Shape models

Dimensions in mm

Note

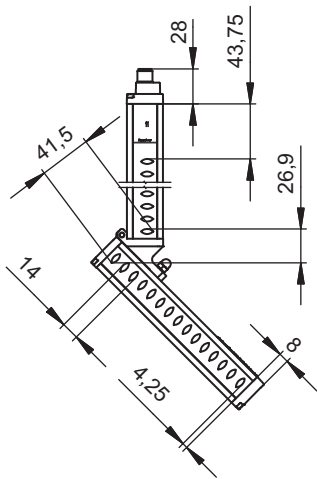
Order numbers for L- and U-Shape device versions are available on request. L- and U-Shape device versions are only available with uniform resolution on all forks. With cascaded devices, sliding blocks are supplied instead of BT-360 mounting brackets.

www.leuze.com/solid/

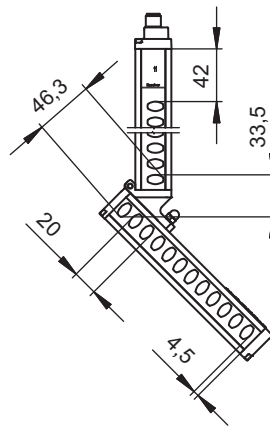
SAFETY LIGHT CURTAINS

Dimensional drawings

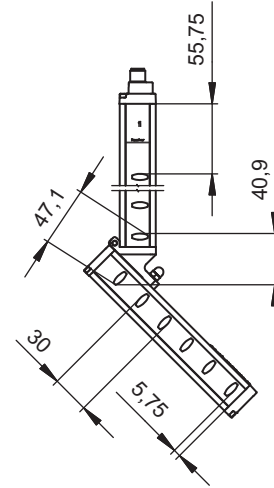
Version as fixed cascading L1-Shape



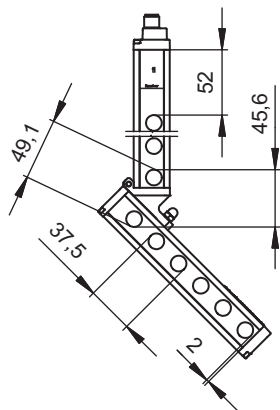
14 mm



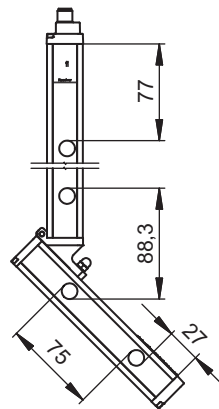
20 mm



30 mm



40 mm



90 mm

Resolutions of the various L1-Shape models

Dimensions in mm

i Note

Order numbers for L- and U-Shape device versions are available on request. L- and U-Shape device versions are only available with uniform resolution on all forks. With cascaded devices, sliding blocks are supplied instead of BT-360 mounting brackets.

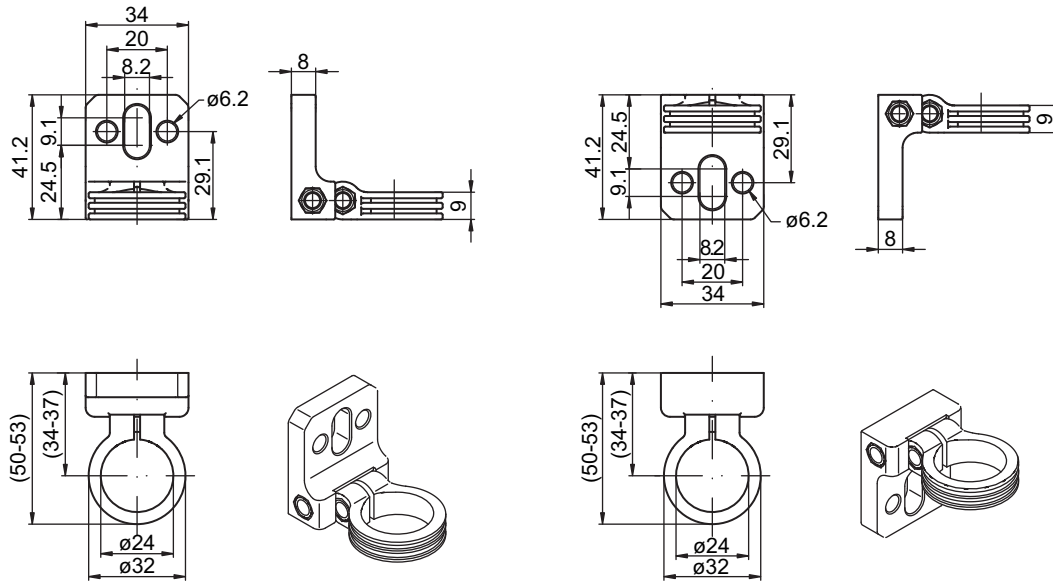
SOLID-4, SOLID-4E
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Dimensional drawings: Accessories

Mounting brackets



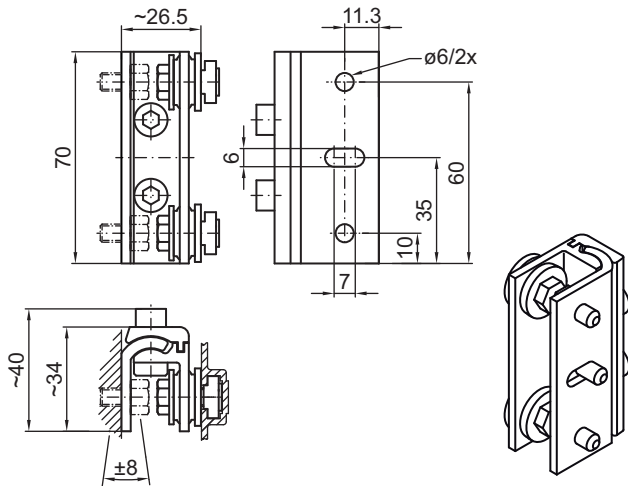
Mounting bracket, 360° rotation, BT-360

Dimensions in mm

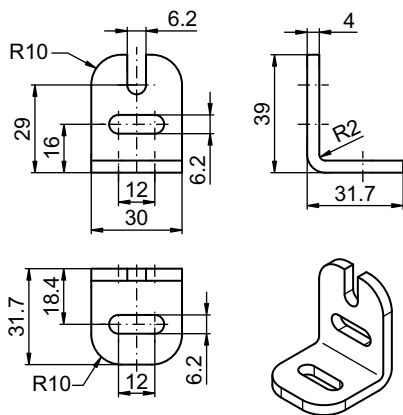
SAFETY LIGHT CURTAINS

Dimensional drawings: Accessories

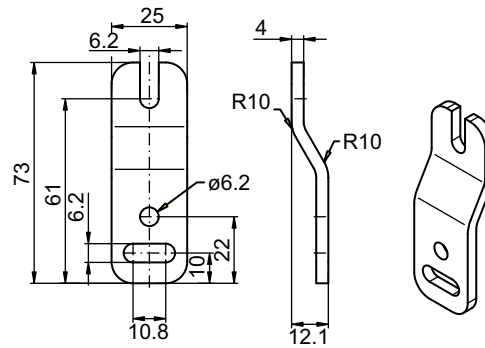
Mounting brackets



Mounting bracket, swiveling with shock absorber, BT-SSD



L-mounting bracket, BT-L



Z-mounting bracket, BT-Z

Dimensions in mm

SOLID-4, SOLID-4E
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SOLID-2, SOLID-2E
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Accessories ordering information

Art. no.	Article	Description	Length, design
Installation accessories			
429055	BT-360-SET	Mounting bracket set, consisting of 2 BT-360°	
429056	BT-2L	Mounting bracket set, consisting of 2 BT-L	
429057	BT-2Z	Mounting bracket set, consisting of 2 BT-Z	
429058	BT-2SSD	2 x 70 mm long mounting brackets, swiveling with shock absorber, incl. 4 screws and 4 sliding blocks	
429059	BT-4SSD	4 x 70 mm long mounting brackets, swiveling with shock absorber, incl. 8 screws and 8 sliding blocks	
429049	BT-2SSD-270	2 x 270 mm long mounting brackets, swiveling with shock absorber, incl 4 screws and 4 sliding blocks	
Connecting cables, 5-pin for SOLID-4 Transmitter and Receiver			
429071	CB-M12-5000S-5GF	Connecting cable shielded with M12 coupling, 5-pin	5 m, straight/open end
429072	CB-M12-5000S-5WF	Connecting cable shielded with M12 coupling, 5-pin	5 m, angled/open end
429073	CB-M12-10000S-5GF	Connecting cable shielded with M12 coupling, 5-pin	10 m, straight/open end
429074	CB-M12-10000S-5WF	Connecting cable shielded with M12 coupling, 5-pin	10 m, angled/open end
429075	CB-M12-15000S-5GF	Connecting cable shielded with M12 coupling, 5-pin	15 m, straight/open end
429076	CB-M12-15000S-5WF	Connecting cable shielded with M12 coupling, 5-pin	15 m, angled/open end
429171	CB-M12-25000S-5GF	Connecting cable shielded with M12 coupling, 5-pin	25 m, straight/open end
429172	CB-M12-25000S-5WF	Connecting cable shielded with M12 coupling, 5-pin	25 m, angled/open end

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SAFETY LIGHT CURTAINS

Accessories ordering information

Art. no.	Article	Description	Length, design
Connecting cables, 8-pin for SOLID-4E Receiver			
429081	CB-M12-5000S-8GF	Connecting cable shielded with M12 coupling, 8-pin	5 m, straight/open end
429082	CB-M12-5000S-8WF	Connecting cable shielded with M12 coupling, 8-pin	5 m, angled/open end
429083	CB-M12-10000S-8GF	Connecting cable shielded with M12 coupling, 8-pin	10 m, straight/open end
429084	CB-M12-10000S-8WF	Connecting cable shielded with M12 coupling, 8-pin	10 m, angled/open end
429085	CB-M12-15000S-8GF	Connecting cable shielded with M12 coupling, 8-pin	15 m, straight/open end
429086	CB-M12-15000S-8WF	Connecting cable shielded with M12 coupling, 8-pin	15 m, angled/open end
429181	CB-M12-25000S-8GF	Connecting cable shielded with M12 coupling, 8-pin	25 m, straight/open end
429182	CB-M12-25000S-8WF	Connecting cable shielded with M12 coupling, 8-pin	25 m, angled/open end
Laser alignment aids			
560020	LA-78U	Laser alignment aid for lateral mounting with use for COMPACT <i>plus</i> /SOLID	
Power supplies			
520061	LOGO! Power	Power supply, 120/230 V AC --> 24 V DC / 1.3 A, regulated	
Test rods			
349939	AC-TR20/40	Test rod, 20 mm / 40 mm	
349945	AC-TR14/30	Test rod, 14 mm / 30 mm	
Protective screens, see accessories, page 498			

SOLID-4, SOLID-4E

Machine Safety

Machine Safety
Services

Safety
Engineering
Software

Safety Laser
Scanners

Safety Light
Curtains

Multiple Light
Beam Safety
Devices

Light Beam
Safety Device
Sets

Single Light
Beam Safety
Devices

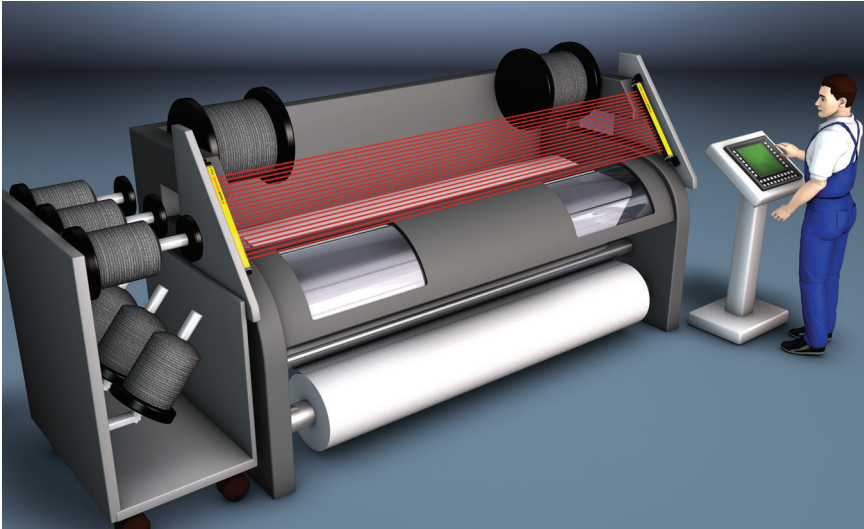
AS-Interface
Safety at Work

PROFIsafe
Sensors

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SAFETY LIGHT CURTAINS

SOLID-2, SOLID-2E

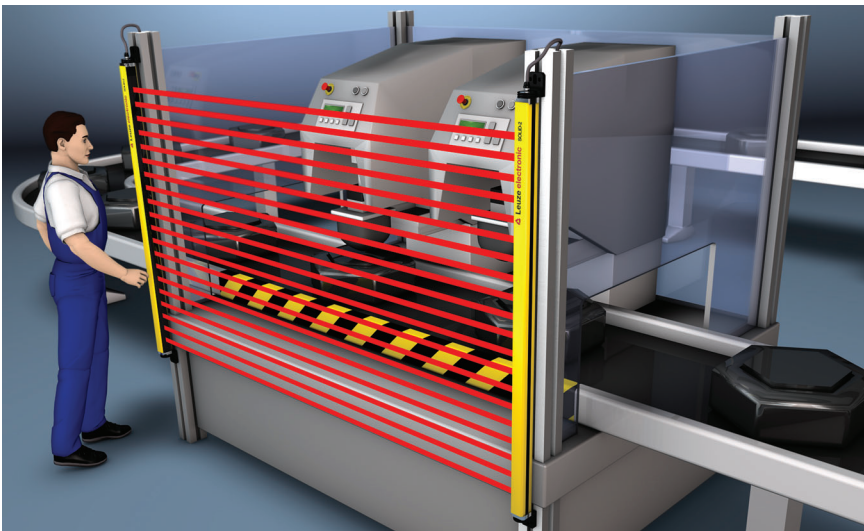


SOLID-2 with automatic restart on a textile machine

A reliable and interference-proof safety sensor system is a prerequisite for high system availability and achievement of production targets. At the same time the increasing costs pressure of global competition also requires an economical safety system. Satisfying these central requirements was the maxim with the development of the SOLID-2 type 2 Safety Light Curtains with integrated cyclical testing. These devices are characterized by their robust housing design and high interference immunity. Various resolutions and functionalities enable cost-optimized solutions with the most varied applications. SOLID-2 is predestined for hand and arm protection and for detecting the presence of people.

Typical areas of application

- Storage and conveyor systems
- Textile machinery
- Machinery in the timber and wood-processing industry
- Wafers
- Automatic loading systems
- Packaging machinery



SOLID-2E with integrated restart interlock on a pad printing machine

SOLID-2, SOLID-2E

Important technical data, overview

Type in accordance with EN IEC 61496	2			
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	2			
Performance Level (PL) in accordance with EN ISO 13849-1	d			
Category in accordance with EN ISO 13849	2			
Resolution	20 mm	30 mm	40 mm	90 mm
Range	0.5...15 m	0.2...10 m	0.8...20 m	0.8...20 m
Protective field height (type-dependent)	150...1800 mm			
Profile cross-section	30 mm x 34 mm			
Safety-related switching outputs (OSSDs)	2 pnp transistor outputs			
Connection system	M12 plug			

Functions

	SOLID-2	SOLID-2E
Integrated cyclical testing	●	●
Automatic start/restart	●	●
Start/restart interlock (RES), selectable		●
Dynamic contactor monitoring (EDM), selectable		●
2 transmission channels, selectable	●	●

Function extension

SOLID-2

With Safety Relays	Relay output	RES	EDM	Muting	Cycle control	Further details
MSI-SR4	●	●	●			p. 440
MSI-SR5	●	●	●			p. 446

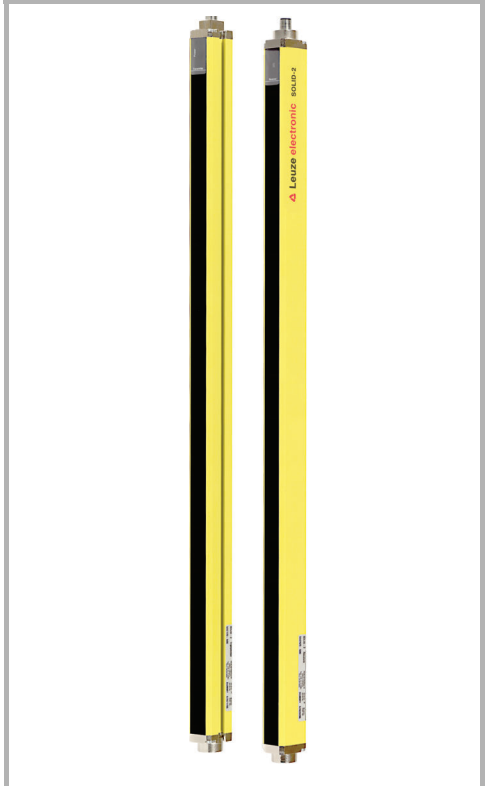
SOLID-2E

MSI-RM2	●	*	*			p. 428
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*) Already included in the device

Special features

- Type 2 self-testing Safety Light Curtain in accordance with EN IEC 61496
- SIL 2 Safety Light Curtain in accordance with IEC 61508
- Slender and robust aluminum housing (30 mm x 34 mm)
- Fault-free operation of adjacent devices with selection of different transmission channels
- Easy function selection with external wiring



Features

Further information

Further information	Page
● Ordering information	114
● Electrical connection	118
● Technical data	120
● Dimensional drawings	121
● Dimensional drawings: Accessories	122
● Accessories ordering information	124

SAFETY LIGHT CURTAINS

Ordering information

SOLID-2, consisting of transmitter and receiver
 Included in delivery: 2 BT-360-SET mounting bracket sets, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Functions: Integrated testing, automatic start/restart, selectable transmission channels

Protective field height in mm	SOLID-2			SOLID-2		
	Art. no.	Article	Description	Art. no.	Article	Description
	Resolution: 20 mm			Resolution: 30 mm		
	Range: 0.5 - 15 m			Range: 0.2 - 10 m		
150	67821701	SD2T20-150	Transmitter	67821801	SD2T30-150	Transmitter
	67820201	SD2R20-150	Receiver	67820601	SD2R30-150	Receiver
225	67821702	SD2T20-225	Transmitter	67821802	SD2T30-225	Transmitter
	67820202	SD2R20-225	Receiver	67820602	SD2R30-225	Receiver
300	67821703	SD2T20-300	Transmitter	67821803	SD2T30-300	Transmitter
	67820203	SD2R20-300	Receiver	67820603	SD2R30-300	Receiver
450	67821704	SD2T20-450	Transmitter	67821804	SD2T30-450	Transmitter
	67820204	SD2R20-450	Receiver	67820604	SD2R30-450	Receiver
600	67821706	SD2T20-600	Transmitter	67821806	SD2T30-600	Transmitter
	67820206	SD2R20-600	Receiver	67820606	SD2R30-600	Receiver
750	67821707	SD2T20-750	Transmitter	67821807	SD2T30-750	Transmitter
	67820207	SD2R20-750	Receiver	67820607	SD2R30-750	Receiver
900	67821709	SD2T20-900	Transmitter	67821809	SD2T30-900	Transmitter
	67820209	SD2R20-900	Receiver	67820609	SD2R30-900	Receiver
1050	67821710	SD2T20-1050	Transmitter	67821810	SD2T30-1050	Transmitter
	67820210	SD2R20-1050	Receiver	67820610	SD2R30-1050	Receiver
1200	67821712	SD2T20-1200	Transmitter	67821812	SD2T30-1200	Transmitter
	67820212	SD2R20-1200	Receiver	67820612	SD2R30-1200	Receiver
1350	67821713	SD2T20-1350	Transmitter	67821813	SD2T30-1350	Transmitter
	67820213	SD2R20-1350	Receiver	67820613	SD2R30-1350	Receiver
1500	67821715	SD2T20-1500	Transmitter	67821815	SD2T30-1500	Transmitter
	67820215	SD2R20-1500	Receiver	67820615	SD2R30-1500	Receiver
1650	67821716	SD2T20-1650	Transmitter	67821816	SD2T30-1650	Transmitter
	67820216	SD2R20-1650	Receiver	67820616	SD2R30-1650	Receiver
1800	67821718	SD2T20-1800	Transmitter	67821818	SD2T30-1800	Transmitter
	67820218	SD2R20-1800	Receiver	67820618	SD2R30-1800	Receiver

SOLID-2, SOLID-2E

Ordering information

SOLID-2, consisting of transmitter and receiver
 Included in delivery: 2 BT-360-SET mounting bracket sets, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Functions: Integrated testing, automatic start/restart, selectable transmission channels

Protective field height in mm	SOLID-2			SOLID-2		
	Art. no.	Article	Description	Art. no.	Article	Description
	Resolution: 40 mm Range: 0.8 - 20 m			Resolution: 90 mm Range: 0.8 - 20 m		
150	67821901	SD2T40-150	Transmitter			
	67821001	SD2R40-150	Receiver			
225	67821902	SD2T40-225	Transmitter			
	67821002	SD2R40-225	Receiver			
300	67821903	SD2T40-300	Transmitter			
	67821003	SD2R40-300	Receiver			
450	67821904	SD2T40-450	Transmitter			
	67821004	SD2R40-450	Receiver			
600	67821906	SD2T40-600	Transmitter	67822006	SD2T90-600	Transmitter
	67821006	SD2R40-600	Receiver	67821406	SD2R90-600	Receiver
750	67821907	SD2T40-750	Transmitter	67822007	SD2T90-750	Transmitter
	67821007	SD2R40-750	Receiver	67821407	SD2R90-750	Receiver
900	67821909	SD2T40-900	Transmitter	67822009	SD2T90-900	Transmitter
	67821009	SD2R40-900	Receiver	67821409	SD2R90-900	Receiver
1050	67821910	SD2T40-1050	Transmitter	67822010	SD2T90-1050	Transmitter
	67821010	SD2R40-1050	Receiver	67821410	SD2R90-1050	Receiver
1200	67821912	SD2T40-1200	Transmitter	67822012	SD2T90-1200	Transmitter
	67821012	SD2R40-1200	Receiver	67821412	SD2R90-1200	Receiver
1350	67821913	SD2T40-1350	Transmitter	67822013	SD2T90-1350	Transmitter
	67821013	SD2R40-1350	Receiver	67821413	SD2R90-1350	Receiver
1500	67821915	SD2T40-1500	Transmitter	67822015	SD2T90-1500	Transmitter
	67821015	SD2R40-1500	Receiver	67821415	SD2R90-1500	Receiver
1650	67821916	SD2T40-1650	Transmitter	67822016	SD2T90-1650	Transmitter
	67821016	SD2R40-1650	Receiver	67821416	SD2R90-1650	Receiver
1800	67821918	SD2T40-1800	Transmitter	67822018	SD2T90-1800	Transmitter
	67821018	SD2R40-1800	Receiver	67821418	SD2R90-1800	Receiver

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SAFETY LIGHT CURTAINS

Ordering information

SOLID-2E, consisting of transmitter and receiver
 Included in delivery: 2 BT-360-SET mounting bracket sets, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Functions: Integrated testing, selectable transmission channels, selectable start/restart interlock, selectable dynamic contactor monitoring

Protective field height in mm	SOLID-2E			SOLID-2E		
	Art. no.	Article	Description	Art. no.	Article	Description
	Resolution: 20 mm			Resolution: 30 mm		
	Range: 0.5 - 15 m			Range: 0.2 - 10 m		
150	67821701	SD2T20-150	Transmitter	67821801	SD2T30-150	Transmitter
	67820401	SD2R20-150E	Receiver	67820801	SD2R30-150E	Receiver
225	67821702	SD2T20-225	Transmitter	67821802	SD2T30-225	Transmitter
	67820402	SD2R20-225E	Receiver	67820802	SD2R30-225E	Receiver
300	67821703	SD2T20-300	Transmitter	67821803	SD2T30-300	Transmitter
	67820403	SD2R20-300E	Receiver	67820803	SD2R30-300E	Receiver
450	67821704	SD2T20-450	Transmitter	67821804	SD2T30-450	Transmitter
	67820404	SD2R20-450E	Receiver	67820804	SD2R30-450E	Receiver
600	67821706	SD2T20-600	Transmitter	67821806	SD2T30-600	Transmitter
	67820406	SD2R20-600E	Receiver	67820806	SD2R30-600E	Receiver
750	67821707	SD2T20-750	Transmitter	67821807	SD2T30-750	Transmitter
	67820407	SD2R20-750E	Receiver	67820807	SD2R30-750E	Receiver
900	67821709	SD2T20-900	Transmitter	67821809	SD2T30-900	Transmitter
	67820409	SD2R20-900E	Receiver	67820809	SD2R30-900E	Receiver
1050	67821710	SD2T20-1050	Transmitter	67821810	SD2T30-1050	Transmitter
	67820410	SD2R20-1050E	Receiver	67820810	SD2R30-1050E	Receiver
1200	67821712	SD2T20-1200	Transmitter	67821812	SD2T30-1200	Transmitter
	67820412	SD2R20-1200E	Receiver	67820812	SD2R30-1200E	Receiver
1350	67821713	SD2T20-1350	Transmitter	67821813	SD2T30-1350	Transmitter
	67820413	SD2R20-1350E	Receiver	67820813	SD2R30-1350E	Receiver
1500	67821715	SD2T20-1500	Transmitter	67821815	SD2T30-1500	Transmitter
	67820415	SD2R20-1500E	Receiver	67820815	SD2R30-1500E	Receiver
1650	67821716	SD2T20-1650	Transmitter	67821816	SD2T30-1650	Transmitter
	67820416	SD2R20-1650E	Receiver	67820816	SD2R30-1650E	Receiver
1800	67821718	SD2T20-1800	Transmitter	67821818	SD2T30-1800	Transmitter
	67820418	SD2R20-1800E	Receiver	67820818	SD2R30-1800E	Receiver

SOLID-2, SOLID-2E

Ordering information

SOLID-2E, consisting of transmitter and receiver
Included in delivery: 2 BT-360-SET mounting bracket sets, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Functions: Integrated testing, selectable transmission channels, selectable start/restart interlock, selectable dynamic contactor monitoring

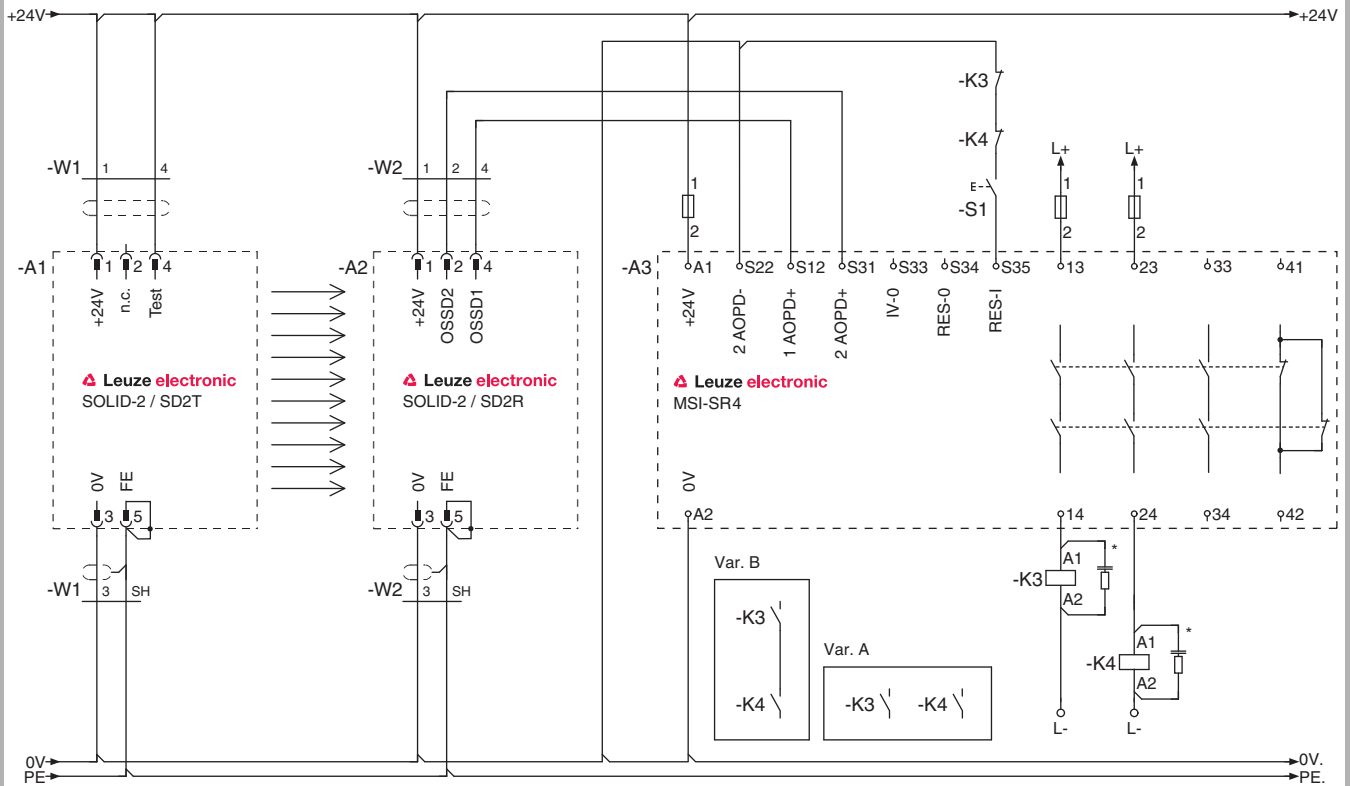
Protective field height in mm	SOLID-2E			SOLID-2E		
	Art. no.	Article	Description	Art. no.	Article	Description
	Resolution: 40 mm Range: 0.8 - 20 m			Resolution: 90 mm Range: 0.8 - 20 m		
150	67821901	SD2T40-150	Transmitter			
	67821201	SD2R40-150E	Receiver			
225	67821902	SD2T40-225	Transmitter			
	67821202	SD2R40-225E	Receiver			
300	67821903	SD2T40-300	Transmitter			
	67821203	SD2R40-300E	Receiver			
450	67821904	SD2T40-450	Transmitter			
	67821204	SD2R40-450E	Receiver			
600	67821906	SD2T40-600	Transmitter	67822006	SD2T90-600	Transmitter
	67821206	SD2R40-600E	Receiver	67821606	SD2R90-600E	Receiver
750	67821907	SD2T40-750	Transmitter	67822007	SD2T90-750	Transmitter
	67821207	SD2R40-750E	Receiver	67821607	SD2R90-750E	Receiver
900	67821909	SD2T40-900	Transmitter	67822009	SD2T90-900	Transmitter
	67821209	SD2R40-900E	Receiver	67821609	SD2R90-900E	Receiver
1050	67821910	SD2T40-1050	Transmitter	67822010	SD2T90-1050	Transmitter
	67821210	SD2R40-1050E	Receiver	67821610	SD2R90-1050E	Receiver
1200	67821912	SD2T40-1200	Transmitter	67822012	SD2T90-1200	Transmitter
	67821212	SD2R40-1200E	Receiver	67821612	SD2R90-1200E	Receiver
1350	67821913	SD2T40-1350	Transmitter	67822013	SD2T90-1350	Transmitter
	67821213	SD2R40-1350E	Receiver	67821613	SD2R90-1350E	Receiver
1500	67821915	SD2T40-1500	Transmitter	67822015	SD2T90-1500	Transmitter
	67821215	SD2R40-1500E	Receiver	67821615	SD2R90-1500E	Receiver
1650	67821916	SD2T40-1650	Transmitter	67822016	SD2T90-1650	Transmitter
	67821216	SD2R40-1650E	Receiver	67821616	SD2R90-1650E	Receiver
1800	67821918	SD2T40-1800	Transmitter	67822018	SD2T90-1800	Transmitter
	67821218	SD2R40-1800E	Receiver	67821618	SD2R90-1800E	Receiver

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SAFETY LIGHT CURTAINS

Electrical connection

SOLID-2 connection example



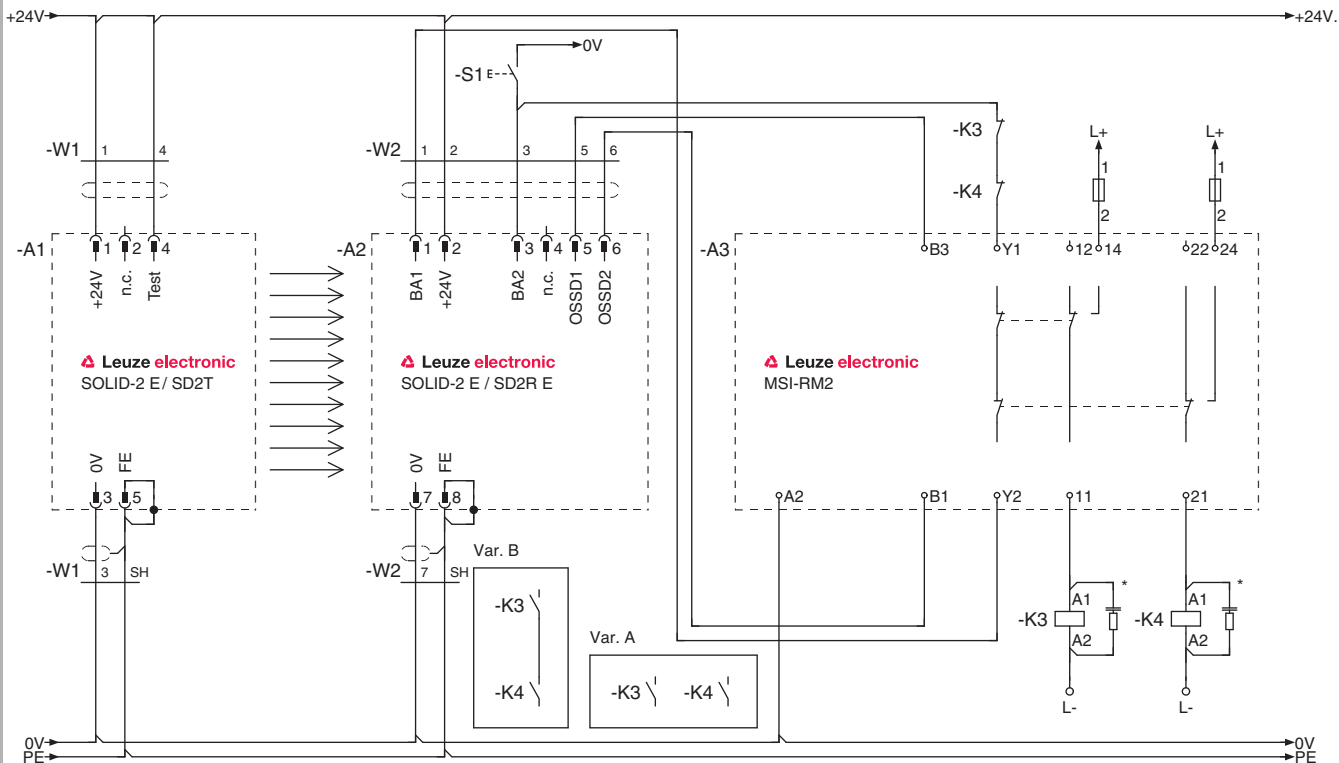
*) Spark extinction circuit, supply suitable spark extinction

SOLID-2 with MSI-SR4 Safety Relay

! Please observe the operating instructions of the components!

Electrical connection

SOLID-2E connection example



*) Spark extinction circuit, supply suitable spark extinction

SOLID-2E with MSI-RM2 Safety Relay

⚠ Please observe the operating instructions of the components!

SAFETY LIGHT CURTAINS

Technical data

General system data				
Type in accordance with EN IEC 61496	2			
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	2			
Performance Level (PL) in accordance with EN ISO 13849-1	d			
Probability of a failure to danger per hour (PFH _d)	For protective heights up to 900 mm, all resolutions	8.18 x 10 ⁻⁸		
	For protective heights up to 1800 mm, all resolutions	8.92 x 10 ⁻⁸		
	For protective heights up to 2850 mm	On request		
Service life (T _M) in accordance with EN ISO 13849-1	20 years			
Category in accordance with EN ISO 13849	2			
Resolution	20 mm	30 mm	40 mm	90 mm
Range	0.5...15 m	0.2...10 m	0.8...20 m	0.8...20 m
Response time (depends on protective field height)	9...60 ms	7...31 ms	7...31 ms	8...12 ms
Protective field height	150...1800 mm			600...1800 mm
Synchronization	Optical via transmitter and receiver			
Supply voltage	24 V DC, ±20 %			
Test repetition time with internal testing	100 ms			
Connection cable length	Max. 100 m with 0.25 mm ²			
Safety class	III			
Protection rating	IP 65			
Ambient temperature, operation	0...+50 °C			
Ambient temperature, storage	-25...+70 °C			
Relative humidity	15...95 %			
Profile cross-section	30 mm x 34 mm			
Weight per device (length-dependent)	0.30... 1.90 kg			
Transmitter				
Transmitter diodes, class in accordance with EN 60825	1			
Wavelength	950 nm			
Current consumption	45 mA			
Connection system	M12 plug, 5-pin			
External test input	24 V DC, max. 20 mA			
Receiver				
Current consumption	140 mA without external load			
Safety-related switching outputs (OSSDs)	2 pnp transistor outputs (short circuit-proof, cross-circuit monitored)			
Switching voltage high active	Min. U _v - 1.9 V			
Switching voltage low	Max. 1 V			
Switching current	Max. 250 mA			
SOLID-2 connection system	M12 plug, 5-pin			
SOLID-2E connection system	M12 plug, 8-pin			
SOLID-2E signal inputs on BA1 and BA2	24 V DC, max. 10 mA			

Please note the additional information in the SOLID-2 Connecting and Operating Instructions at www.leuze.com/solid.

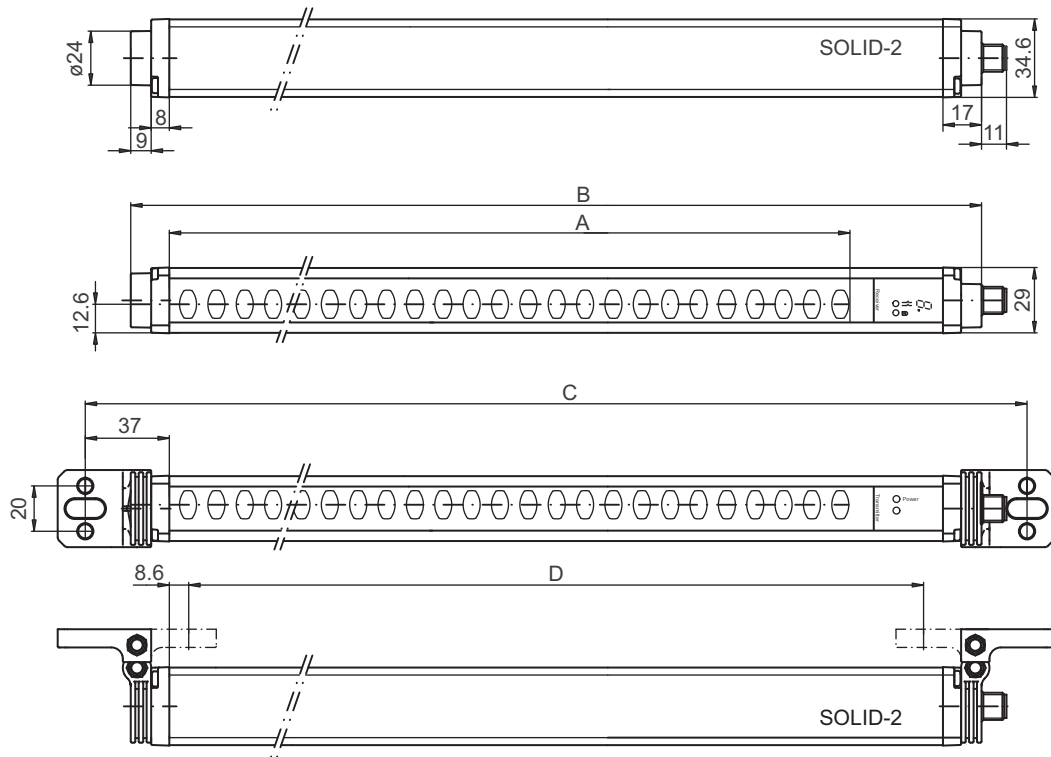
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Dimensional drawings

SOLID-2/SOLID-2E Safety Light Curtain



- A = Protective field height according to ordering information
- B = A + 75.5 mm
- C = A + 115.5 mm
- D = A + 24.3 mm

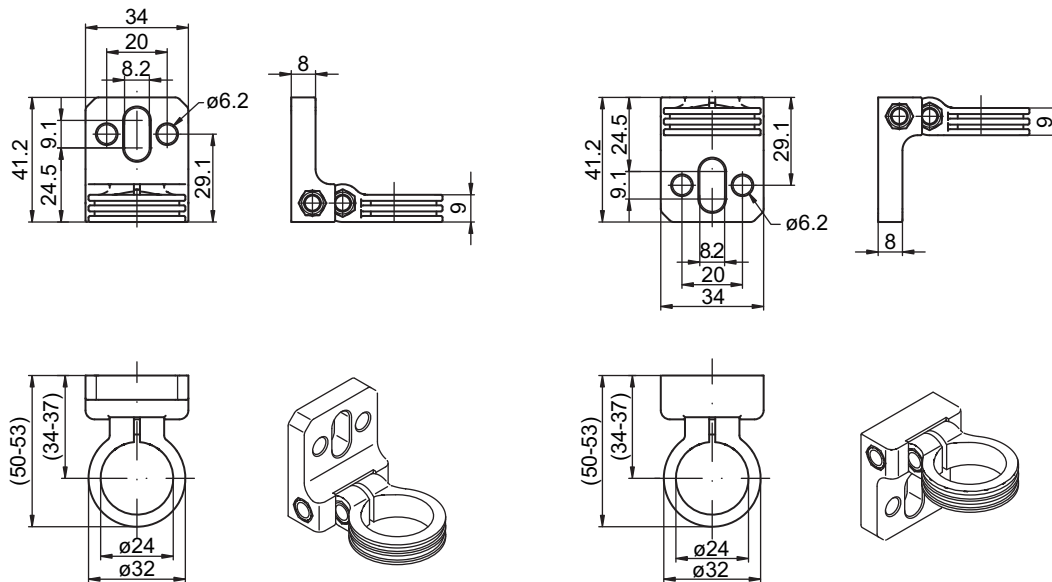
Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

www.leuze.com/solid/

SAFETY LIGHT CURTAINS

Dimensional drawings: Accessories

Mounting brackets

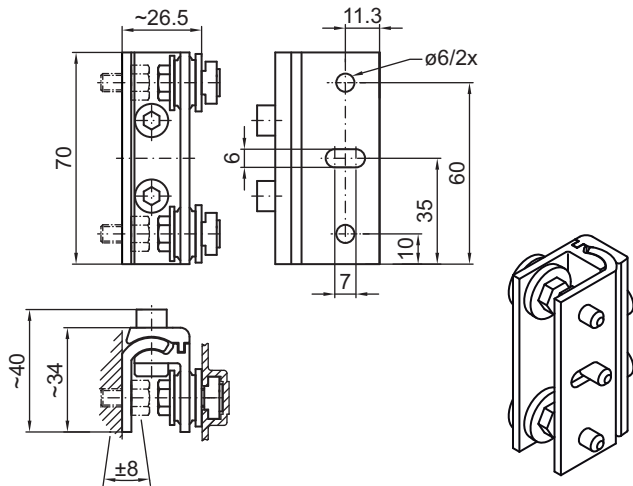


Mounting bracket, 360° rotation, BT-360

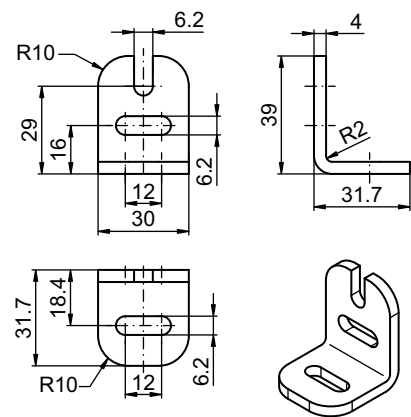
Dimensions in mm

Dimensional drawings: Accessories

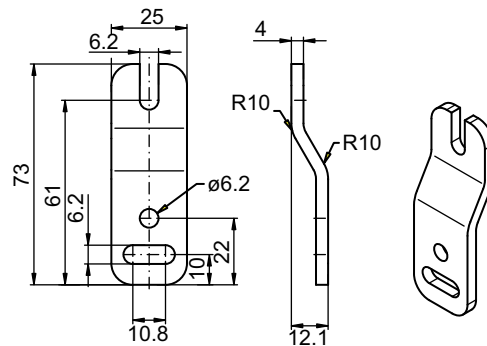
Mounting brackets



Mounting bracket, swiveling with shock absorber, BT-SSD



L-mounting bracket, BT-L



Z-mounting bracket, BT-Z

Dimensions in mm

SAFETY LIGHT CURTAINS

Accessories ordering information

Art. no.	Article	Description	Length, design
Installation accessories			
429055	BT-360-SET	Mounting bracket set, consisting of 2 BT-360°	
429056	BT-2L	Mounting bracket set, consisting of 2 BT-L	
429057	BT-2Z	Mounting bracket set, consisting of 2 BT-Z	
429058	BT-2SSD	2 x 70 mm long mounting brackets, swiveling with shock absorber, incl. 4 screws and 4 sliding blocks	
429059	BT-4SSD	4 x 70 mm long mounting brackets, swiveling with shock absorber, incl. 8 screws and 8 sliding blocks	
429049	BT-2SSD-270	2 x 270 mm long mounting brackets, swiveling with shock absorber, incl 4 screws and 4 sliding blocks	
Connecting cables, 5-pin for SOLID-2 Transmitter and SOLID-2 Receiver			
429071	CB-M12-5000S-5GF	Connecting cable shielded with M12 coupling, 5-pin	5 m, straight/open end
429072	CB-M12-5000S-5WF	Connecting cable shielded with M12 coupling, 5-pin	5 m, angled/open end
429073	CB-M12-10000S-5GF	Connecting cable shielded with M12 coupling, 5-pin	10 m, straight/open end
429074	CB-M12-10000S-5WF	Connecting cable shielded with M12 coupling, 5-pin	10 m, angled/open end
429075	CB-M12-15000S-5GF	Connecting cable shielded with M12 coupling, 5-pin	15 m, straight/open end
429076	CB-M12-15000S-5WF	Connecting cable shielded with M12 coupling, 5-pin	15 m, angled/open end
429171	CB-M12-25000S-5GF	Connecting cable shielded with M12 coupling, 5-pin	25 m, straight/open end
429172	CB-M12-25000S-5WF	Connecting cable shielded with M12 coupling, 5-pin	25 m, angled/open end

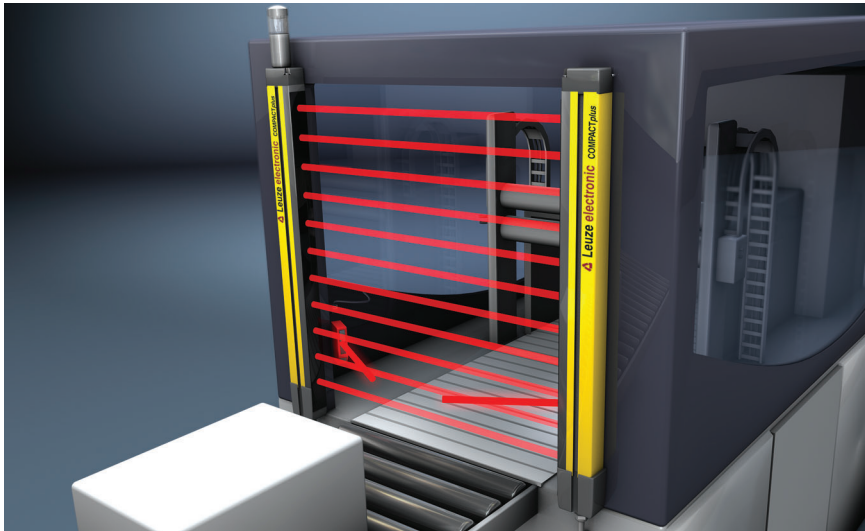
Accessories ordering information

Art. no.	Article	Description	Length, design
Connecting cables, 8-pin for SOLID-2E Receiver			
429081	CB-M12-5000S-8GF	Connecting cable shielded with M12 coupling, 8-pin	5 m, straight/open end
429082	CB-M12-5000S-8WF	Connecting cable shielded with M12 coupling, 8-pin	5 m, angled/open end
429083	CB-M12-10000S-8GF	Connecting cable shielded with M12 coupling, 8-pin	10 m, straight/open end
429084	CB-M12-10000S-8WF	Connecting cable shielded with M12 coupling, 8-pin	10 m, angled/open end
429085	CB-M12-15000S-8GF	Connecting cable shielded with M12 coupling, 8-pin	15 m, straight/open end
429086	CB-M12-15000S-8WF	Connecting cable shielded with M12 coupling, 8-pin	15 m, angled/open end
429181	CB-M12-25000S-8GF	Connecting cable shielded with M12 coupling, 8-pin	25 m, straight/open end
429182	CB-M12-25000S-8WF	Connecting cable shielded with M12 coupling, 8-pin	25 m, angled/open end
Laser alignment aids			
560020	LA-78U	Laser alignment aid for lateral mounting with use for COMPACT <i>plus</i> /SOLID	
Power supplies			
520061	LOGO! Power	Power supply, 120/230 V AC --> 24 V DC / 1.3 A, regulated	
Test rods			
349939	AC-TR20/40	Test rod, 20 mm / 40 mm	
349945	AC-TR14/30	Test rod, 14 mm / 30 mm	
Protective screens, see accessories, page 498			

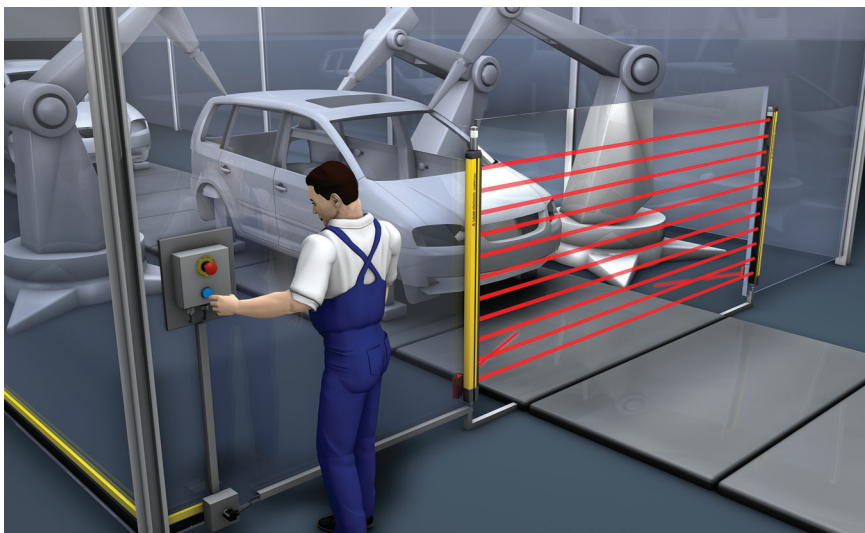
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SAFETY LIGHT CURTAINS

COMPACTplus-m



Muting allows, for example, palettes or work pieces/equipment to pass by the electro-sensitive protective equipment, COMPACTplus-m, without any process interruption



Automatic driving out of chassises from the processing area with muting

Typical areas of application

Access guarding:

- Robots
- Automatic processing centers
- Palletizers

The proper, specification-compliant, time-restricted bridging of a protective device (muting) is required in numerous instances for a continuous, and therefore efficient production process, when conveyor vehicles, work pieces or palettes have to pass a protective field without interrupting the process, for example.

The COMPACTplus-m Safety Light Curtains type 4 are predestined for this requirement in accordance with EN IEC 61496. They feature integrated muting functions and, controlled by muting sensors, they can therefore be switched inactive. After the relevant objects have passed by the safety function is automatically activated again.

COMPACTplus Safety Light Curtains and Multiple Light Beam Safety Devices can be equipped with various functions to optimally perform specific tasks with regard to higher functionality, more flexible integration and easier operability.

The COMPACTplus series have a start/restart interlock, contactor monitoring and additional functions that can be easily activated with switches. External additional modules are therefore no longer required. Specific settings are made with the diagnostics and parametering software, SafetyLab. COMPACTplus can be connected to both conventional safety modules and to open safety bus systems via various interfaces (transistor/relay output, AS-Interface Safety at Work, PROFIsafe). These safety sensors can therefore be flexibly integrated into existing automation environments.

COMPACTplus-m

Important technical data, overview

Type in accordance with EN IEC 61496	4			
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3			
Performance Level (PL) in accordance with EN ISO 13849-1	e			
Category in accordance with EN ISO 13849	4			
Resolution	14 mm	30 mm	50 mm	90 mm
Range	0...6 m	0...18 m	0...18 m	0...18 m
Protective field height (type-dependent)	150...3000 mm			
Profile cross-section	52 mm x 55 mm			
Safety-related switching outputs	2 pnp transistor outputs 2 relay outputs AS-i Safety Interface PROFIsafe Interface			
Connection system	Cable gland Hirschmann plug MIN-style plug M12 plug			

Functions

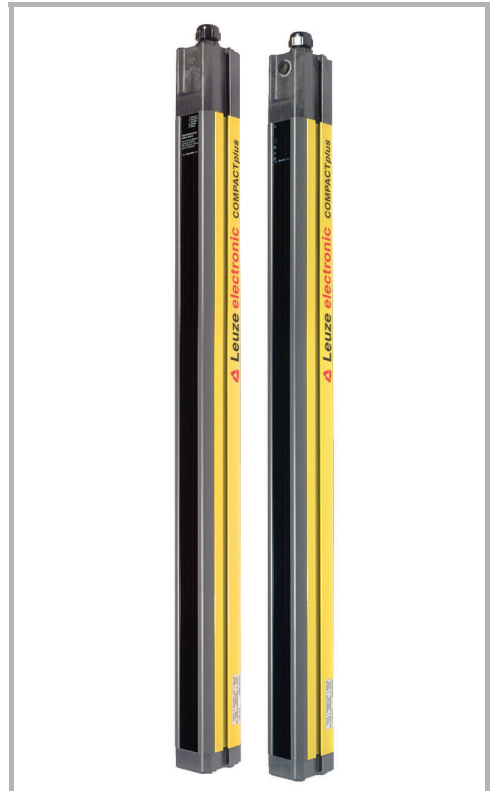
Start/restart interlock (RES), selectable
Dynamic contactor monitoring (EDM), selectable
2 transmission channels, selectable
2 or 4-sensor parallel muting
Muting restart override function
Output for muting indicator

Functions extension with "SafetyLab" PC software (accessories)

Infrared interface for parametering and diagnostics
More muting types, configurable muting time limit
Additional control signals for muting and muting timer
Reduced resolution can be set
Partial muting can be configured
Muting indicator function can be configured
Beam signals for position and height measuring
Additional 2-channel safety circuit, e.g. for door switches

Special features

- **Plug-in module with saved device parameters for fast device swap-out**
- **M12 local interface for connecting local sensors and signal devices**
- **Local connection box and Y-cable (accessories) simplify sensor wiring**



Features



Further information

Further information	Page
● Ordering information	128
● Electrical connection	133
● Technical data	135
● Dimensional drawings	137
● Dimensional drawings: Accessories	138
● Accessories ordering information	140

www.leuze.com/compactplus-m/

SAFETY LIGHT CURTAINS

Ordering information

COMPACTplus-m, consisting of transmitter and receiver
 Included in delivery: 4 sliding blocks, 2 BT-S mounting bracket sets, 1 SafetyKey, 1 set of connecting and operating instructions (PDF file on CD-ROM), 1 self-adhesive notice sign

Functions: Start/restart interlock, contactor monitoring, 2 transmission channels, 4-sensor sequential muting, 2-sensor parallel muting, 4-sensor parallel muting, muting restart override function, output for muting indicator

Protective field height in mm	COMPACTplus-m		
	Art. no.	Article	Description
150	68101000	CPT14-150/T1	Transmitter
	68101430	CPR14-150-m/T1	Receiver
225	68102000	CPT14-225/T1	Transmitter
	68102430	CPR14-225-m/T1	Receiver
300	68103000	CPT14-300/T1	Transmitter
	68103430	CPR14-300-m/T1	Receiver
450	68104000	CPT14-450/T1	Transmitter
	68104430	CPR14-450-m/T1	Receiver
600	68106000	CPT14-600/T1	Transmitter
	68106430	CPR14-600-m/T1	Receiver
750	68107000	CPT14-750/T1	Transmitter
	68107430	CPR14-750-m/T1	Receiver
900	68109000	CPT14-900/T1	Transmitter
	68109430	CPR14-900-m/T1	Receiver
1050	68110000	CPT14-1050/T1	Transmitter
	68110430	CPR14-1050-m/T1	Receiver
1200	68112000	CPT14-1200/T1	Transmitter
	68112430	CPR14-1200-m/T1	Receiver
1350	68113000	CPT14-1350/T1	Transmitter
	68113430	CPR14-1350-m/T1	Receiver
1500	68115000	CPT14-1500/T1	Transmitter
	68115430	CPR14-1500-m/T1	Receiver
1650	68116000	CPT14-1650/T1	Transmitter
	68116430	CPR14-1650-m/T1	Receiver
1800	68118000	CPT14-1800/T1	Transmitter
	68118430	CPR14-1800-m/T1	Receiver

Standard model /T1 with metric cable gland (M20).

Test rod included in scope of delivery

Protective field height in mm	COMPACTplus-m		
	Art. no.	Article	Description
150	68301000	CPT30-150/T1	Transmitter
	68301430	CPR30-150-m/T1	Receiver
225	68302000	CPT30-225/T1	Transmitter
	68302430	CPR30-225-m/T1	Receiver
300	68303000	CPT30-300/T1	Transmitter
	68303430	CPR30-300-m/T1	Receiver
450	68304000	CPT30-450/T1	Transmitter
	68304430	CPR30-450-m/T1	Receiver
600	68306000	CPT30-600/T1	Transmitter
	68306430	CPR30-600-m/T1	Receiver
750	68307000	CPT30-750/T1	Transmitter
	68307430	CPR30-750-m/T1	Receiver
900	68309000	CPT30-900/T1	Transmitter
	68309430	CPR30-900-m/T1	Receiver
1050	68310000	CPT30-1050/T1	Transmitter
	68310430	CPR30-1050-m/T1	Receiver
1200	68312000	CPT30-1200/T1	Transmitter
	68312430	CPR30-1200-m/T1	Receiver
1350	68313000	CPT30-1350/T1	Transmitter
	68313430	CPR30-1350-m/T1	Receiver
1500	68315000	CPT30-1500/T1	Transmitter
	68315430	CPR30-1500-m/T1	Receiver
1650	68316000	CPT30-1650/T1	Transmitter
	68316430	CPR30-1650-m/T1	Receiver
1800	68318000	CPT30-1800/T1	Transmitter
	68318430	CPR30-1800-m/T1	Receiver

Standard model /T1 with metric cable gland (M20).

Test rod included in scope of delivery

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Ordering information

COMPACTplus-m, consisting of transmitter and receiver
 Included in delivery: 4 sliding blocks, 2 BT-S mounting bracket sets, 1 SafetyKey, 1 set of connecting and operating instructions (PDF file on CD-ROM), 1 self-adhesive notice sign

Functions: Start/restart interlock, contactor monitoring, 2 transmission channels, 4-sensor sequential muting, 2--sensor parallel muting, 4-sensor parallel muting, muting restart override function, output for muting indicator

Protective field height in mm	COMPACTplus-m		
	Art. no.	Article	Description
450	68504000	CPT50-450/T1	Transmitter
	68504430	CPR50-450-m/T1	Receiver
600	68506000	CPT50-600/T1t	Transmitter
	68506430	CPR50-600-m/T1	Receiver
750	68507000	CPT50-750/T1	Transmitter
	68507430	CPR50-750-m/T1	Receiver
900	68509000	CPT50-900/T1	Transmitter
	68509430	CPR50-900-m/T1	Receiver
1050	68510000	CPT50-1050/T1	Transmitter
	68510430	CPR50-1050-m/T1	Receiver
1200	68512000	CPT50-1200/T1	Transmitter
	68512430	CPR50-1200-m/T1	Receiver
1350	68513000	CPT50-1350/T1	Transmitter
	68513430	CPR50-1350-m/T1	Receiver
1500	68515000	CPT50-1500/T1	Transmitter
	68515430	CPR50-1500-m/T1	Receiver
1650	68516000	CPT50-1650/T1	Transmitter
	68516430	CPR50-1650-m/T1	Receiver
1800	68518000	CPT50-1800/T1	Transmitter
	68518430	CPR50-1800-m/T1	Receiver
2100	68521000	CPT50-2100/T1	Transmitter
	68521430	CPR50-2100-m/T1	Receiver
2400	68524000	CPT50-2400/T1	Transmitter
	68524430	CPR50-2400-m/T1	Receiver
2700	68527000	CPT50-2700/T1	Transmitter
	68527430	CPR50-2700-m/T1	Receiver
3000	68530000	CPT50-3000/T1	Transmitter
	68530430	CPR50-3000-m/T1	Receiver

Standard model /T1 with metric cable gland (M20).

Protective field height in mm	COMPACTplus-m		
	Art. no.	Article	Description
450	68907000	CPT90-450/T1	Transmitter
	68907430	CPR90-450-m/T1	Receiver
600	68909000	CPT90-600/T1	Transmitter
	68909430	CPR90-600-m/T1	Receiver
750	68910000	CPT90-750/T1	Transmitter
	68910430	CPR90-750-m/T1	Receiver
900	68912000	CPT90-900/T1	Transmitter
	68912430	CPR90-900-m/T1	Receiver
1050	68913000	CPT90-1050/T1	Transmitter
	68913430	CPR90-1050-m/T1	Receiver
1200	68915000	CPT90-1200/T1	Transmitter
	68915430	CPR90-1200-m/T1	Receiver
1350	68916000	CPT90-1350/T1	Transmitter
	68916430	CPR90-1350-m/T1	Receiver
1500	68918000	CPT90-1500/T1	Transmitter
	68918430	CPR90-1500-m/T1	Receiver
1650	68921000	CPT90-1650/T1	Transmitter
	68921430	CPR90-1650-m/T1	Receiver
1800	68924000	CPT90-1800/T1	Transmitter
	68924430	CPR90-1800-m/T1	Receiver
2100	68927000	CPT90-2100/T1	Transmitter
	68927430	CPR90-2100-m/T1	Receiver
2400	68930000	CPT90-2400/T1	Transmitter
	68930430	CPR90-2400-m/T1	Receiver

Standard model /T1 with metric cable gland (M20).

www.leuze.com/compactplus-m/

SAFETY LIGHT CURTAINS

COMPACTplus-m – model varieties

Article	Description	Safety-related switching outputs (OSSD), connection system
CPT...../T1	Transmitter	Cable gland (M20)
CPR(T)...../T1	Receiver	Transistor output, cable gland (M20)
CPR(T)...../R1	Receiver	Relay output, cable gland (M25)
CPT...../T2	Transmitter	Hirschmann plug, 12-pin
CPR(T)...../T2	Receiver	Transistor output, Hirschmann plug, 12-pin
CPR(T)...../R2	Receiver	Relay output, Hirschmann plug, 12-pin
CPT...../T3	Transmitter	MIN-style plug, 3-pin
CPR(T)...../T3	Receiver	Transistor output, MIN-style plug, 7-pin
CPR(T)...../R3	Receiver	Relay output, MIN-style plug, 12-pin
CPT...../T4	Transmitter	M12 plug, 5-pin
CPR(T)...../T4	Receiver	Transistor output, M12 plug, 8-pin
CPT...../AP	Transmitter	Integrated AS-Interface, M12 plug, 5 pin
CPR...../A1	Receiver with AS-i Safety Interface	Integrated AS-Interface, M12 plug, 5 pin
CPR...../P1	Receiver with PROFIsafe interface	Integrated PROFIBUS DP interface, M12 plug, 5 pin
CPR.....ml/cc	Integrated LED muting indicator from 300 mm protective field height	For muting receiver

Delivery of devices with MIN-style plug only in the USA

Article list for COMPACTplus-m

Type 4 Safety Light Curtains

Article	Description
CP	COMPACTplus-m
a	Device type
T	Transmitter
R	Receiver
rr	Resolution/range
14	14 mm / range 0 - 6 m
30	30 mm / range 0 - 18 m
50	50 mm / range 0 - 18 m
90	90 mm / range 0 - 18 m
hhh	Protective field height
150...1800	150...1800 mm for 14 mm resolution
150...1800	150...1800 mm for 30 mm resolution
450...3000	450...3000 mm for 50 mm resolution
750...3000	750...3000 mm for 90 mm resolution
f	Function package (receiver only)
m	Muting
l	Integrated LED muting indicator (receiver only)
tt	Safety-related switching outputs (OSSD), connection system
T1	Transistor output, cable gland
T2	Transistor output, Hirschmann plug (DIN 43651)
T3	Transistor output, MIN-style plug (MIN series)
T4	Transistor output, M12 plug
R1	Relay output, cable gland, receiver only
R2	Relay output, Hirschmann plug (DIN 43651), receiver only
R3	Relay output, MIN-style plug (MIN series), receiver only
A1	Integrated AS-Interface, M12 plug, receiver only
P1	Integrated PROFIBUS DP interface, M12 plug, receiver only
AP	M12 plug, transmitter only

CP a rr -hhh -f l /tt

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SAFETY LIGHT CURTAINS

Article list for COMPACTplus-m

Type 4 Safety Light Curtains

Art. no.	Description		
68	COMPACTplus-m		
a	Resolution		
1	14 mm		
3	30 mm		
5	50 mm		
9	90 mm		
bb	Protective field height		
01	150 mm	13	1350 mm
02	225 mm	15	1500 mm
03	300 mm	16	1650 mm
04	450 mm	18	1800 mm
06	600 mm	21	2100 mm
07	750 mm	24	2400 mm
09	900 mm	27	2700 mm
10	1050 mm	30	3000 mm
12	1200 mm		
c	Device type		
0	Basic transmitter device		
4	Basic receiver device		
8	Receiver with integrated LED muting indicator		
dd	Function package/safety-related switching outputs (OSSDs)		
Transmitter			
00	Transmitter /T1		
01	Transmitter /T2		
02	Transmitter /T3		
03	Transmitter /T4		
50	Transmitter /AP		
Receiver			
30	Muting /T1		
31	Muting /T2		
32	Muting /T3		
33	Muting /T4		
39	Muting /R1		
38	Muting /R2		
37	Muting /R3		
80	Muting /A1		
81	Muting /P1		

68 a bb c dd

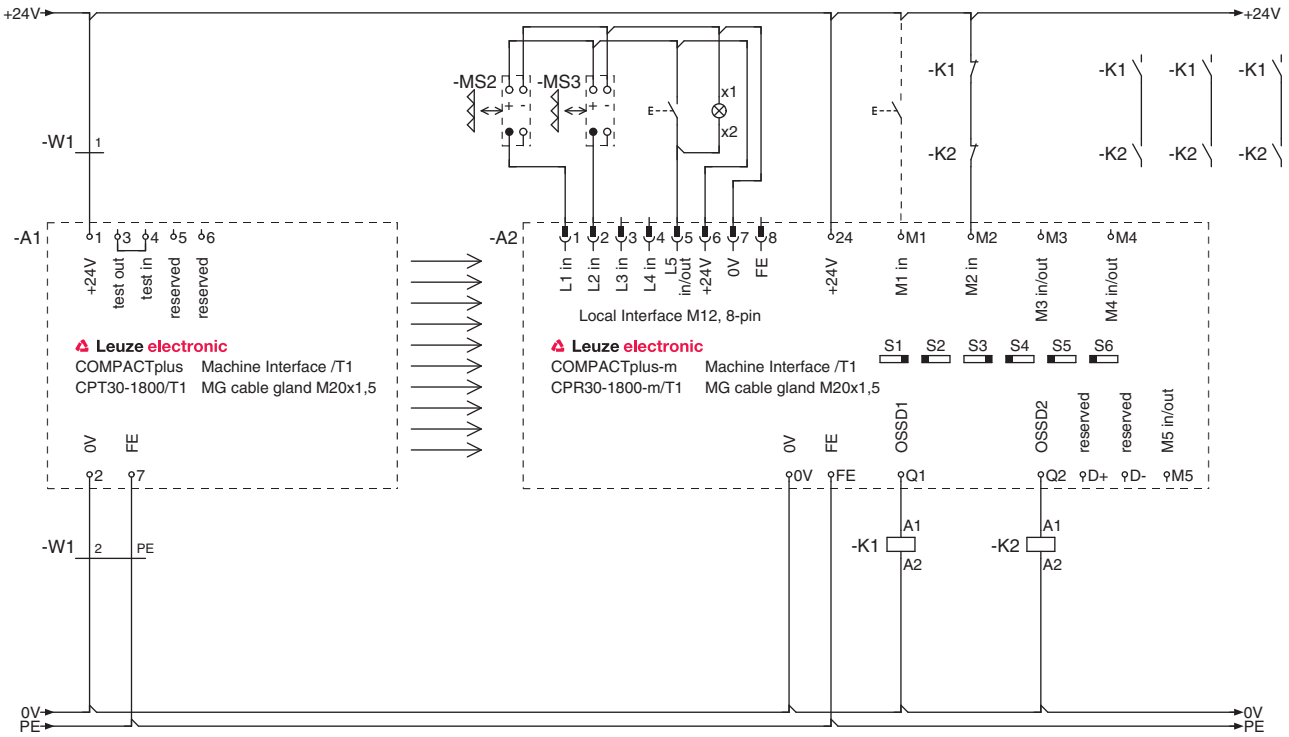
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Electrical connection

COMPACTplus-m connection example



Functions selection with DIP switches (grey: DIP switch settings)		Position	
		L (FS)	R
S1	Contactor monitoring (EDM) on M2	Without	With
S2	Transmission channel (UK)	1	2
S3	Start/restart interlock (RES) on L5 or M1	Without	With
S4	L (FS): Automatic muting**	R: 4-sensor parallel muting	
S5	Display direction	Down	Up
S6	Muting time limit	10 min	Without

***) Automatic muting: 2-sensor parallel muting

COMPACTplus-m connection system /T1 (cable gland)

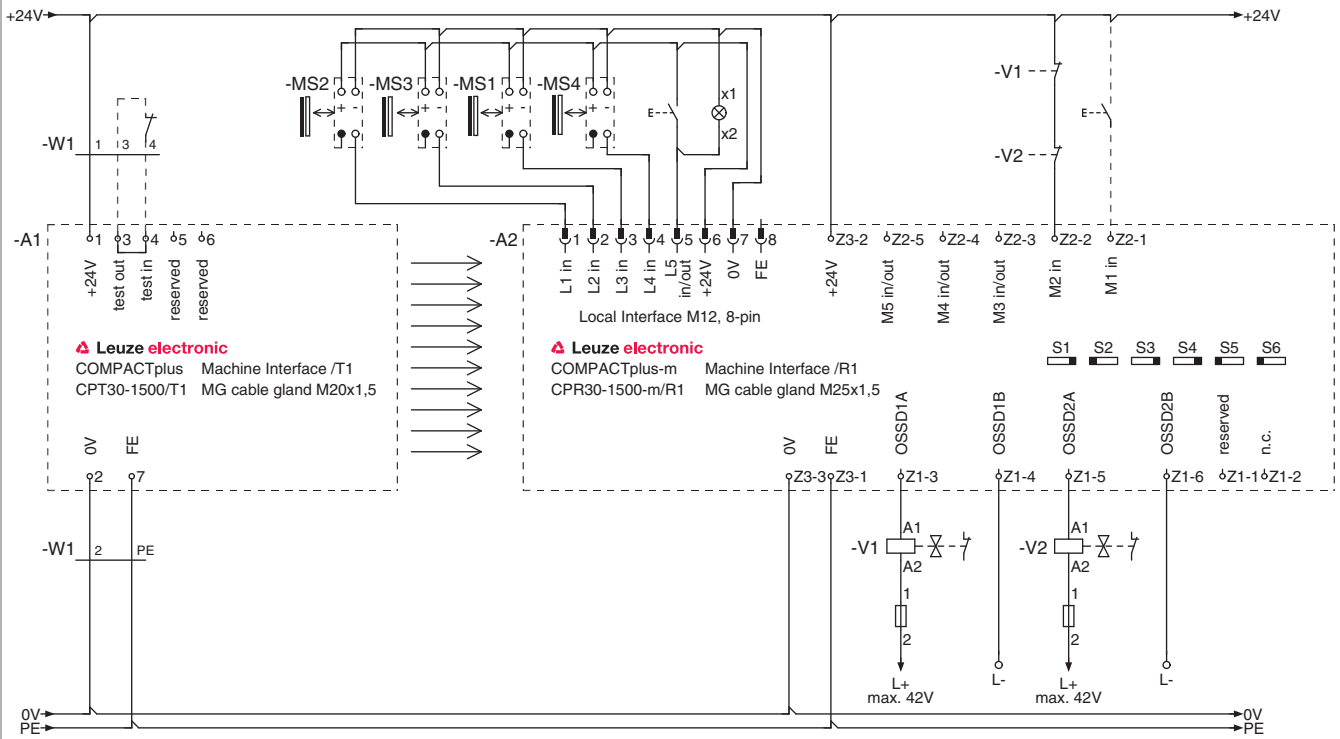
⚠ Please observe the operating instructions of the components!

For further connection examples see chapter
 COMPACTplus-b, page 155
 AS-Interface Safety at Work, page 272
 PROFIBUS DP, page 304

SAFETY LIGHT CURTAINS

Electrical connection

COMPACTplus-m connection example



Functions selection with DIP switches (grey: DIP switch settings)		Position	
		L (FS)	R
S1	Contactor monitoring (EDM) on M2	Without	With
S2	Transmission channel (UK)	1	2
S3	Start/restart interlock (RES) on L5 or M1	Without	With
S4	L (FS): Automatic muting	R: 4-sensor parallel muting**	
S5	Display direction	Down	Up
S6	Muting time limit	10 min	Without

***) 4-sensor parallel muting: Simultaneity of MS2 and MS3, and of MS1 and MS4 required.

COMPACTplus-m connection system /R1 (cable gland), switching voltages up to 42 V AC/DC

! Please observe the operating instructions of the components!

*) For further connection examples see chapter
 COMPACTplus-b, page 155
 AS-Interface Safety at Work, page 272
 PROFIBUS DP, page 304

Technical data

General system data					
Type in accordance with EN IEC 61496		4			
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061		3			
Performance Level (PL) in accordance with EN ISO 13849-1		e			
Probability of a failure to danger per hour (PFH _d)	For protective heights up to 900 mm, all resolutions	2.26 x 10 ⁻⁸			
	For protective heights up to 1800 mm, all resolutions	2.67 x 10 ⁻⁸			
	For protective heights up to 3000 mm	On request			
Service life (T _M) in accordance with EN ISO 13849-1		20 years			
Number of cycles until 10% of the components have a failure to danger.(B _{10d})*	With DC1 (ohmic load)	On request			
	With AC1 (ohmic load)	On request			
	With DC13 (inductive load)	630,000 (5 A, 24 V)			
	With AC15 (inductive load)	1,480,000 (3 A, 230 V)			
	Low load (20% nominal load)	On request			
Category in accordance with EN ISO 13849		4			
Resolution		14 mm	30 mm	50 mm	90 mm
Range		0...6 m	0...18 m	0...18 m	0...18 m
Response time	Transistor output	5...41 ms	5...22 ms	7...18 ms	6...10 ms
	Relay output	20...56 ms	20...37 ms	22...33 ms	21...25 ms
	AS-i Safety Interface	10...46 ms	10...27 ms	12...23 ms	11...15 ms
	PROFIsafe interface	25...61 ms	25...42 ms	27...38 ms	26...30 ms
Protective field height		150...1800 mm	150...1800** mm	450...3000 mm	750...3000 mm
Supply voltage		24 V DC, ±20 %			
Connection cable length		Max. 100 m with 1.0 mm ²			
Safety class		III and I (depending on model)			
Protection rating		IP 65***			
Ambient temperature, operation		0...+50°C			
Ambient temperature, storage		-25...+70°C			
Relative humidity		15...95 %			
Profile cross-section		52 mm x 55 mm			
Weight per device (length-dependent)		0.70...8.30 kg			

*) For devices with relay output

**) Installation length up to 3000 mm on request

***) Without additional measures the devices are not suited for outdoor use

SAFETY LIGHT CURTAINS

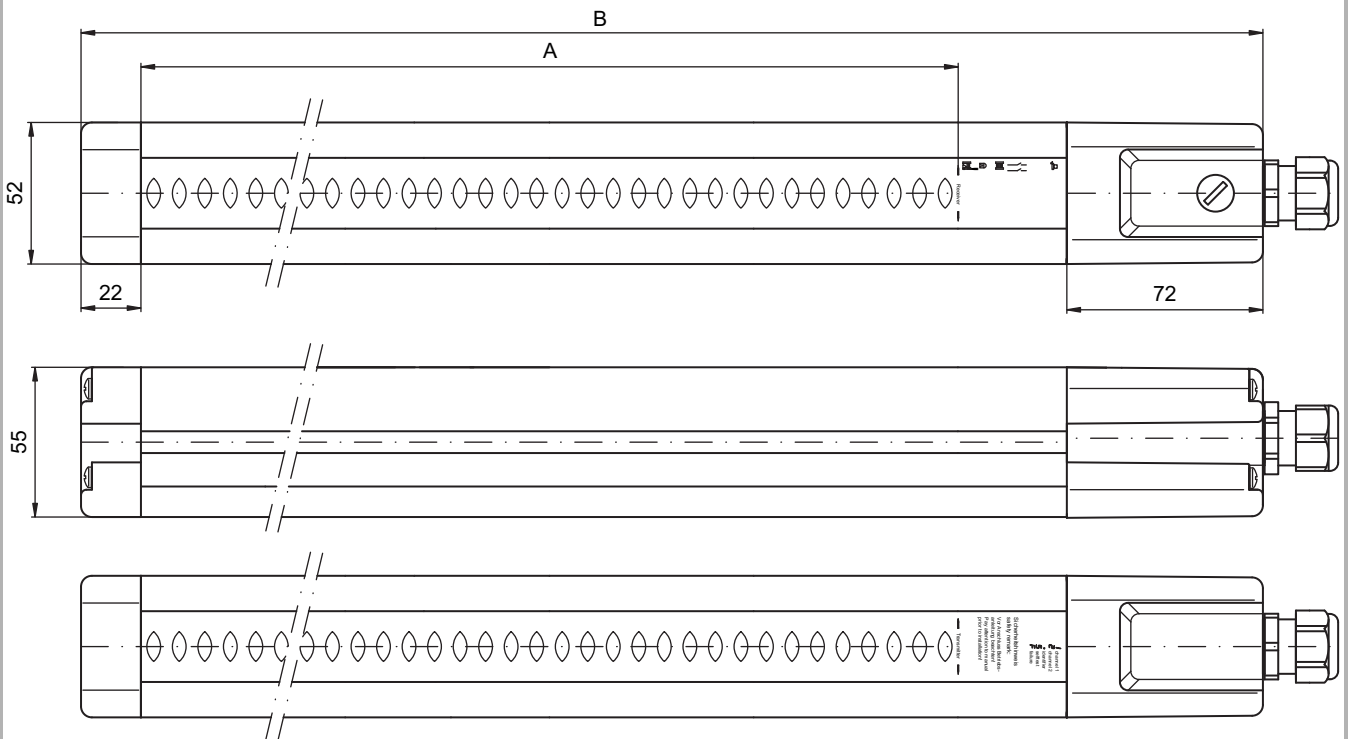
Technical data

Transmitter	
Transmitter diodes, class in accordance with EN 60825	1
Wavelength	880 nm
Current consumption	75 mA
Connection system	Cable gland (M20) Hirschmann plug (DIN 43651), 12-pin MIN-style plug (MIN series), 3-pin M12 plug, 5-pin
Receiver	
Current consumption	160 mA without external load and muting accessories
Safety-related switching outputs	2 pnp transistor outputs 2 relay outputs (N/O) AS-i Safety Interface PROFIsafe interface
Switching voltage high active	Min. U _v -1.0 V
Switching voltage low	Max. +2.5 V
Switching current	Typical, 500 mA
Connection system	Cable gland (T1: M20, R1: M25) Hirschmann plug (DIN 43651), T2: 12-pin, R2: 12-pin MIN-style plug (MIN series), T3: 7-pin, R3: 12-pin M12 plug (safety bus systems), 5-pin, T4: 8-pin

Please note the additional information in the COMPACT*plus*-m connecting and operating instructions at www.leuze.com/compactplus-m.

Dimensional drawings

COMPACTplus-m Safety Light Curtain



A = Protective field height according to ordering information
 B = A + 134 mm

Dimensions in mm

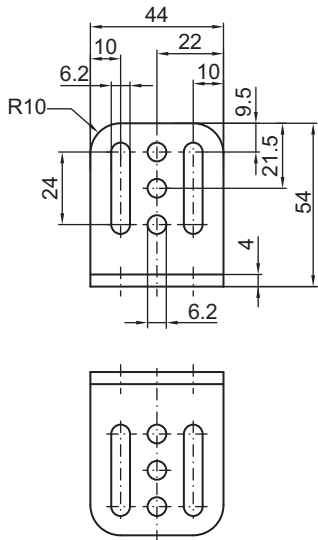
Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

www.leuze.com/compactplus-m/

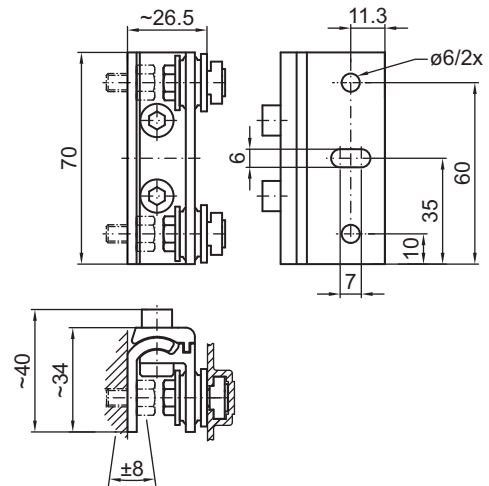
SAFETY LIGHT CURTAINS

Dimensional drawings: Accessories

Mounting brackets



L-mounting bracket

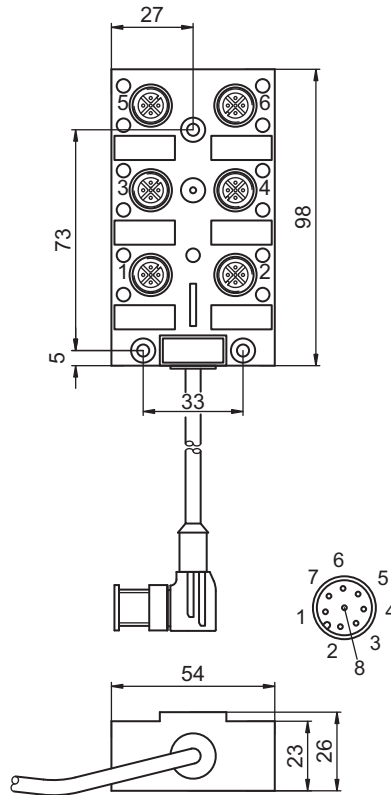


Mounting bracket, swiveling with shock absorber, BT-SSD

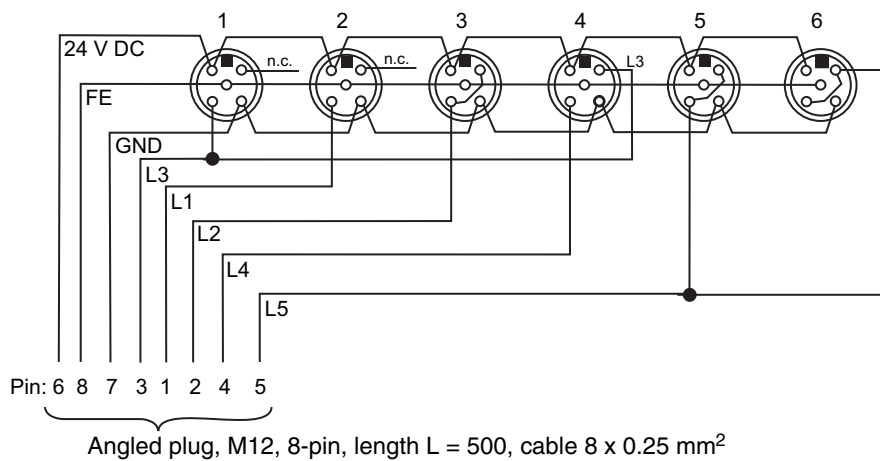
Dimensions in mm

Dimensional drawings: Accessories

Local connection box, AC-SCM1



Internal circuit diagram



Dimensions in mm

www.leuze.com/compactplus-m/

SAFETY LIGHT CURTAINS

Accessories ordering information

Art. no.	Article	Description	Length, design
Installation accessories			
429058	BT-2SSD	2 x 70 mm long mounting brackets, swiveling with shock absorber, incl. 4 screws and 4 sliding blocks	
429059	BT-4SSD	4 x 70 mm long mounting brackets, swiveling with shock absorber, incl. 8 screws and 8 sliding blocks	
429049	BT-2SSD-270	2 x 270 mm long mounting brackets, swiveling with shock absorber, incl. 4 screws and 4 sliding blocks	
560120	BT-2S	Mounting bracket set consisting of 2 L-type brackets incl. 2 screws	
425740	BT-10NC60	10 sliding blocks with 2 bore holes, one with thread M6	
425741	BT-10NC64	10 sliding blocks with 2 bore holes, with M4 and M6 thread	
425742	BT-10NC65	10 sliding blocks with 2 bore holes, with M5 and M6 thread	
Laser alignment aids			
560020	LA-78U	Laser alignment aid for lateral mounting with use for <i>COMPACTplus/SOLID</i>	
520004	LA-78UDC	Laser alignment aid for use with <i>COMPACTplus</i> with UDC device mounting column	
Test rods			
349945	AC-TR14/30	Test rod, 14 mm / 30 mm	
430428	AC-TRSET1	Test rod set 14/24/33 mm	
Parameterizing software			
520072	CB-PCO-3000	Connecting cable, RS232 - IR adapter	3 m
520073	SLAB-SWC	SafetyLab parameterization and diagnostic software incl. PC cable, RS232 - IR-adapter	

Accessories ordering information

Art. no.	Article	Description	Length, design
COMPACTplus – Accessories for local and machine interfaces			
150704	CB-M12-3000-8WM	Connecting cable for local interface with M12 x 8 plug	3 m, angled
150699	CB-M12-10000-8WM	Connecting cable for local interface with M12 x 8 plug	10 m, angled
150677	CB-M12-10000-5WM	Connecting cable for T1 Transmitter M12 x 5 plug, connection on receiver with sensor connection field	10 m, angled
426046	AC-LDH-12GF	Hirschmann cable socket, encoded for CP/T2 or CP/R2, 12-pin, incl. crimp contacts	Straight
426045	AC-LDH-12WF	Hirschmann cable socket, encoded for CP/T2 or CP/R2, 12-pin, incl. crimp contacts	Angled
426042	CB-LDH-10000-12GF	Connecting cable, machine interface /T2, /R2, Hirschmann cable socket	10 m, straight
426044	CB-LDH-25000-12GF	Connecting cable, machine interface /T2, /R2, Hirschmann cable socket	25 m, straight
426043	CB-LDH-50000-12GF	Connecting cable, machine interface /T2, /R2, Hirschmann cable socket	50 m, straight
Connection cables, 5-pin for COMPACTplus/T4 transmitter			
429071	CB-M12-5000S-5GF	Connecting cable shielded with M12 coupling, 5-pin	5 m, straight/ open end
429072	CB-M12-5000S-5WF	Connecting cable shielded with M12 coupling, 5-pin	5 m, angled/ open end
429073	CB-M12-10000S-5GF	Connecting cable shielded with M12 coupling, 5-pin	10 m, straight/ open end
429074	CB-M12-10000S-5WF	Connecting cable shielded with M12 coupling, 5-pin	10 m, angled/ open end
429075	CB-M12-15000S-5GF	Connecting cable shielded with M12 coupling, 5-pin	15 m, straight/ open end
429076	CB-M12-15000S-5WF	Connecting cable shielded with M12 coupling, 5-pin	15 m, angled/ open end
429171	CB-M12-25000S-5GF	Connecting cable shielded with M12 coupling, 5-pin	25 m, straight/ open end
429172	CB-M12-25000S-5WF	Connecting cable shielded with M12 coupling, 5-pin	25 m, angled/ open end

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SAFETY LIGHT CURTAINS

Accessories ordering information

Art. no.	Article	Description	Length, design
Connection cables, 8-pin for COMPACTplus/T4 receiver			
429081	CB-M12-5000S-8GF	Connecting cable shielded with M12 coupling, 8-pin	5 m, straight/ open end
429082	CB-M12-5000S-8WF	Connecting cable shielded with M12 coupling, 8-pin	5 m, angled/ open end
429083	CB-M12-10000S-8GF	Connecting cable shielded with M12 coupling, 8-pin	10 m, straight/ open end
429084	CB-M12-10000S-8WF	Connecting cable shielded with M12 coupling, 8-pin	10 m, angled/ open end
429085	CB-M12-15000S-8GF	Connecting cable shielded with M12 coupling, 8-pin	15 m, straight/ open end
429086	CB-M12-15000S-8WF	Connecting cable shielded with M12 coupling, 8-pin	15 m, angled/ open end
429181	CB-M12-25000S-8GF	Connecting cable shielded with M12 coupling, 8-pin	25 m, straight/ open end
429182	CB-M12-25000S-8WF	Connecting cable shielded with M12 coupling, 8-pin	25 m, angled/ open end

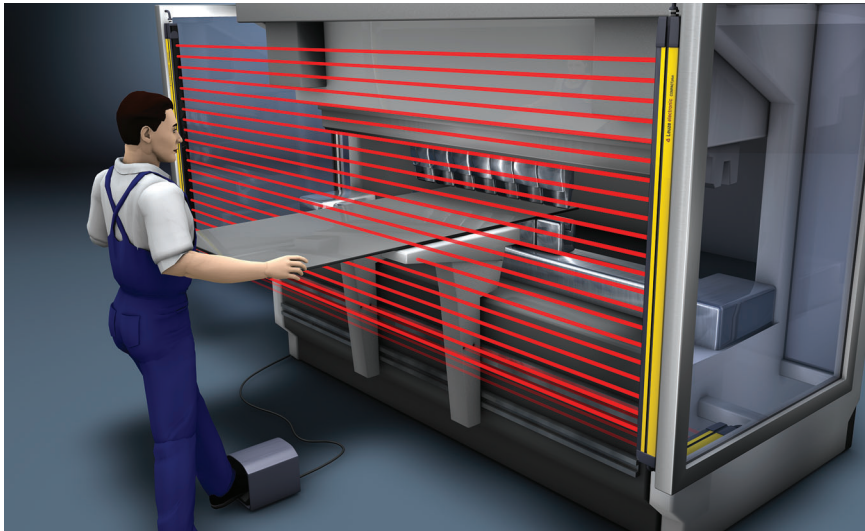
Accessories ordering information

Art. no.	Article	Description	Length, design
COMPACTplus – muting accessories			
520065	AC-SCM1	Local connection box with M12 plug, for connecting to local interface	0.5 m
520068	AC-SCM1-BT	Local connection box with mounting plate and with M12 plug, for connecting to local interface	0.5 m
520066	CB-M12-SCC2	Distribution cable for the PRK.../44 series (pin 2 active), for connecting to local interface, M12/8-pin - 2 x 4-pin	(2 x 1.5 m) + 0.3 m
150755	CB-M12-SC22	Distribution cable, 1 x plug and 2 x socket, M12, 4-pin, pin 2 active	2 x 1.5 m
150758	CB-M12-SC24	Distribution cable, 1 x plug and 2 x socket, M12, 4-pin, pin 2 active	2 m + 5 m
150766	CB-M12-SC44	Connection cable, 1x plug and 2 x socket, M12, 4-pin, pin 4 active with diode decoupling	2 x 1.0 m
150756	CB-M12-CC12	Connection cable M12/8-pin - 4-pin, pin 1 and 2 active	0.3 m
150757	CB-M12-CC15	Connection cable M12/8-pin - 4-pin, pin 1 and 5 active	1.5 m
150769	CB-M12-CC30	Connection cable M12/8-pin - 4-pin, pin 1 and 5 active	3.0 m
426363	AC-ABF-SL1	Display and control unit for muting applications with clamping components for mounting on hard guards	
426290	AC-ABF10	Control unit with optional illuminated reset button for mounting on the hard guard	
Muting accessories such as Muting Mounting Systems, connecting cables and lamps can be found in the sensor accessories chapter, muting accessories section.			
Protective screens, see accessories, page 498			

www.leuze.com/compactplus-m/

SAFETY LIGHT CURTAINS

COMPACTplus-b



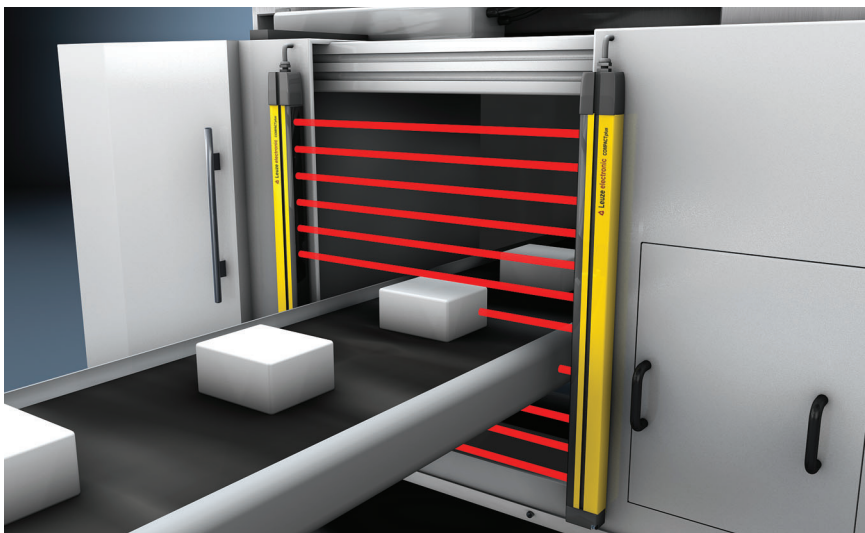
Safety Light Curtains with resolutions that can be reduced guarantee protection and tolerate work equipment in the protective field

With special task requirements in material conveyance, the blanking of individual beams may be required in order to ensure an efficient, continuous process while simultaneously guaranteeing safety. The COMPACTplus-b type 4 Safety Light Curtains in accordance with EN IEC 61496 have been designed with these requirements in mind. They provide blanking functions for blanking any amount of beams and beam areas of varying sizes. Work pieces, for example, consequently pass through the protective field without interruption. By setting a reduced resolution, thin plates or tubes can also move through the protective field.

COMPACTplus-b sensors can be cascaded with devices of the COMPACT series (for ordering information, see page 150). Here COMPACTplus acts as Host and COMPACT as Guest. The functions are given by COMPACTplus Host.

COMPACTplus Safety Light Curtains and Multiple Light Beam Safety Devices can be equipped with various functions to optimally perform specific tasks with regard to higher functionality, more flexible integration and easier operability.

The COMPACTplus series have a start/restart interlock, contactor monitoring and additional functions that can be easily activated with switches. External additional modules are therefore no longer required. Specific settings are made with the diagnostics and parametering software, SafetyLab. COMPACTplus can be connected to both conventional safety modules and to open safety bus systems via various interfaces (transistor/relay output, AS-Interface Safety at Work, PROFIsafe). These safety sensors can therefore be flexibly integrated into existing automation environments.



The blanking of individual beams guarantees safety with simultaneous material flow

Typical areas of application

- Point of operation guarding with hand and finger protection, e.g. on hydraulic and mechanical presses or punching machines in the metals, leather and plastics industries
- Horizontal danger zone guarding, e.g. in robot entry areas

SOLID-4, SOLID-4E
p. 86

SOLID-2, SOLID-2E
p. 112

COMPACTplus
p. 126

COMPACTplus-b

Important technical data, overview

Type in accordance with EN IEC 61496	4		
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3		
Performance Level (PL) in accordance with EN ISO 13849-1	e		
Category in accordance with EN ISO 13849	4		
Resolution	14 mm	30 mm	50 mm
Range	0...6 m	0...18 m	0...18 m
Protective field height (type-dependent)	150...3000 mm		
Profile cross-section	52 mm x 55 mm		
Safety-related switching outputs	2 prnp transistor outputs 2 relay outputs AS-i Safety Interface, PROFIsafe interface		
Connection system	Cable gland Hirschmann plug MIN-style plug M12 plug		

Functions

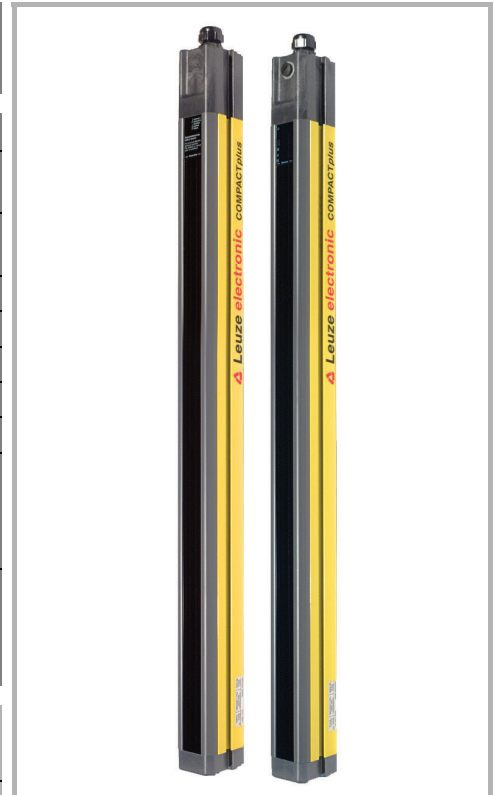
Start/restart interlock (RES), selectable
Dynamic contactor monitoring (EDM), selectable
2 transmission channels, selectable
Fixed blanking can be taught in
Floating blanking can be taught in
Single-beam or 2-beam reduced resolution
Additional 2-channel blanking circuit

Functions extension with "SafetyLab" PC software (accessories)

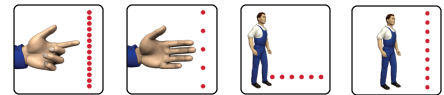
Infrared interface for parametering and diagnostics
Teaching-in override function for floating blanking
Graphics-supported protective field editor
Reduced resolutions in protective field sub-areas
3-beam reduced resolution
Beam signals for position and height measuring

Special features

- **Plug-in module with saved device parameters for fast device swap-out**
- **M12 local interface for connecting local sensors and signal devices**



Features



Further information

Further information	Page
● Ordering information	146
● Electrical connection	155
● Technical data	157
● Dimensional drawings	159
● Dimensional drawings: Accessories	161
● Accessories ordering information	162

SAFETY LIGHT CURTAINS

Ordering information

COMPACTplus-b, consisting of transmitter and receiver
 Included in delivery: 4 sliding blocks, 2 BT-S mounting bracket sets, 1 SafetyKey, 1 set of connecting and operating instructions (PDF file on CD-ROM), 1 self-adhesive notice sign

Functions: Start/restart interlock, contactor monitoring, 2 transmission channels, fixed blanking, floating blanking, reduced resolution

Protective field height in mm	COMPACTplus-b			COMPACTplus-b		
	Art. no.	Article	Description	Art. no.	Article	Description
	Resolution: 14 mm			Resolution: 30 mm		
	Range: 0 - 6 m			Range: 0 - 18 m		
150	68101000	CPT14-150/T1	Transmitter	68301000	CPT30-150/T1	Transmitter
	68101420	CPR14-150-b/T1	Receiver	68301420	CPR30-150-b/T1	Receiver
225	68102000	CPT14-225/T1	Transmitter	68302000	CPT30-225/T1	Transmitter
	68102420	CPR14-225-b/T1	Receiver	68302420	CPR30-225-b/T1	Receiver
300	68103000	CPT14-300/T1	Transmitter	68303000	CPT30-300/T1	Transmitter
	68103420	CPR14-300-b/T1	Receiver	68303420	CPR30-300-b/T1	Receiver
450	68104000	CPT14-450/T1	Transmitter	68304000	CPT30-450/T1	Transmitter
	68104420	CPR14-450-b/T1	Receiver	68304420	CPR30-450-b/T1	Receiver
600	68106000	CPT14-600/T1	Transmitter	68306000	CPT30-600/T1	Transmitter
	68106420	CPR14-600-b/T1	Receiver	68306420	CPR30-600-b/T1	Receiver
750	68107000	CPT14-750/T1	Transmitter	68307000	CPT30-750/T1	Transmitter
	68107420	CPR14-750-b/T1	Receiver	68307420	CPR30-750-b/T1	Receiver
900	68109000	CPT14-900/T1	Transmitter	68309000	CPT30-900/T1	Transmitter
	68109420	CPR14-900-b/T1	Receiver	68309420	CPR30-900-b/T1	Receiver
1050	68110000	CPT14-1050/T1	Transmitter	68310000	CPT30-1050/T1	Transmitter
	68110420	CPR14-1050-b/T1	Receiver	68310420	CPR30-1050-b/T1	Receiver
1200	68112000	CPT14-1200/T1	Transmitter	68312000	CPT30-1200/T1	Transmitter
	68112420	CPR14-1200-b/T1	Receiver	68312420	CPR30-1200-b/T1	Receiver
1350	68113000	CPT14-1350/T1	Transmitter	68313000	CPT30-1350/T1	Transmitter
	68113420	CPR14-1350-b/T1	Receiver	68313420	CPR30-1350-b/T1	Receiver
1500	68115000	CPT14-1500/T1	Transmitter	68315000	CPT30-1500/T1	Transmitter
	68115420	CPR14-1500-b/T1	Receiver	68315420	CPR30-1500-b/T1	Receiver
1650	68116000	CPT14-1650/T1	Transmitter	68316000	CPT30-1650/T1	Transmitter
	68116420	CPR14-1650-b/T1	Receiver	68316420	CPR30-1650-b/T1	Receiver
1800	68118000	CPT14-1800/T1	Transmitter	68318000	CPT30-1800/T1	Transmitter
	68118420	CPR14-1800-b/T1	Receiver	68318420	CPR30-1800-b/T1	Receiver

Standard model /T1 with metric cable gland (M20).

Test rod included in scope of delivery

Standard model /T1 with metric cable gland (M20).

Test rod included in scope of delivery

Ordering information

COMPACTplus-b, consisting of transmitter and receiver
 Included in delivery: 4 sliding blocks, 2 BT-S mounting bracket sets, 1 SafetyKey, 1 set of connecting and operating instructions (PDF file on CD-ROM), 1 self-adhesive notice sign

Functions: Start/restart interlock, contactor monitoring, 2 transmission channels, fixed blanking, floating blanking, reduced resolution

Protective field height in mm	COMPACTplus-b		
	Resolution: 50 mm Range: 0 - 18 m		
	Art. no.	Article	Description
450	68504000	CPT50-450/T1	Transmitter
	68504420	CPR50-450-b/T1	Receiver
600	68506000	CPT50-600/T1	Transmitter
	68506420	CPR50-600-b/T1	Receiver
750	68507000	CPT50-750/T1	Transmitter
	68507420	CPR50-750-b/T1	Receiver
900	68509000	CPT50-900/T1	Transmitter
	68509420	CPR50-900-b/T1	Receiver
1050	68510000	CPT50-1050/T1	Transmitter
	68510420	CPR50-1050-b/T1	Receiver
1200	68512000	CPT50-1200/T1	Transmitter
	68512420	CPR50-1200-b/T1	Receiver
1350	68513000	CPT50-1350/T1	Transmitter
	68513420	CPR50-1350-b/T1	Receiver
1500	68515000	CPT50-1500/T1	Transmitter
	68515420	CPR50-1500-b/T1	Receiver
1650	68516000	CPT50-1650/T1	Transmitter
	68516420	CPR50-1650-b/T1	Receiver
1800	68518000	CPT50-1800/T1	Transmitter
	68518420	CPR50-1800-b/T1	Receiver
2100	68521000	CPT50-2100/T1	Transmitter
	68521420	CPR50-2100-b/T1	Receiver
2400	68524000	CPT50-2400/T1	Transmitter
	68524420	CPR50-2400-b/T1	Receiver
2700	68527000	CPT50-2700/T1	Transmitter
	68527420	CPR50-2700-b/T1	Receiver
3000	68530000	CPT50-3000/T1	Transmitter
	68530420	CPR50-3000-b/T1	Receiver

Standard model /T1 with metric cable gland (M20).

www.leuze.com/compactplus-b/

SAFETY LIGHT CURTAINS

Ordering information

COMPACTplus-b Host, consisting of transmitter and receiver
 Included in delivery: 4 sliding blocks, 2 BT-S mounting bracket sets, 1 SafetyKey, 1 set of connecting and operating instructions (PDF file on CD-ROM), 1 self-adhesive notice sign

Functions: Start/restart interlock, contactor monitoring, 2 transmission channels, fixed blanking, floating blanking, reduced resolution

Protective field height in mm	COMPACTplus-b Host			COMPACTplus-b Host		
	Art. no.	Article	Description	Art. no.	Article	Description
	Resolution: 14 mm			Resolution: 30 mm		
	Range: 0 - 6 m			Range: 0 - 18 m		
225	68102100	CPT14-225H/T1	Transmitter			
	68102620	CPR14-225H-b/T1	Receiver			
300	68103100	CPT14-300H/T1	Transmitter	68303100	CPT30-300H/T1	Transmitter
	68103620	CPR14-300H-b/T1	Receiver	68303620	CPR30-300H-b/T1	Receiver
450	68104100	CPT14-450H/T1	Transmitter	68304100	CPT30-450H/T1	Transmitter
	68104620	CPR14-450H-b/T1	Receiver	68304620	CPR30-450H-b/T1	Receiver
600	68106100	CPT14-600H/T1	Transmitter	68306100	CPT30-600H/T1	Transmitter
	68106620	CPR14-600H-b/T1	Receiver	68306620	CPR30-600H-b/T1	Receiver
750	68107100	CPT14-750H/T1	Transmitter	68307100	CPT30-750H/T1	Transmitter
	68107620	CPR14-750H-b/T1	Receiver	68307620	CPR30-750H-b/T1	Receiver
900	68109100	CPT14-900H/T1	Transmitter	68309100	CPT30-900H/T1	Transmitter
	68109620	CPR14-900H-b/T1	Receiver	68309620	CPR30-900H-b/T1	Receiver
1050	68110100	CPT14-1050H/T1	Transmitter	68310100	CPT30-1050H/T1	Transmitter
	68110620	CPR14-1050H-b/T1	Receiver	68310620	CPR30-1050H-b/T1	Receiver
1200	68112100	CPT14-1200H/T1	Transmitter	68312100	CPT30-1200H/T1	Transmitter
	68112620	CPR14-1200H-b/T1	Receiver	68312620	CPR30-1200H-b/T1	Receiver
1350	68113100	CPT14-1350H/T1	Transmitter	68313100	CPT30-1350H/T1	Transmitter
	68113620	CPR14-1350H-b/T1	Receiver	68313620	CPR30-1350H-b/T1	Receiver
1500	68115100	CPT14-1500H/T1	Transmitter	68315100	CPT30-1500H/T1	Transmitter
	68115620	CPR14-1500H-b/T1	Receiver	68315620	CPR30-1500H-b/T1	Receiver
1650	68116100	CPT14-1650H/T1	Transmitter	68316100	CPT30-1650H/T1	Transmitter
	68116620	CPR14-1650H-b/T1	Receiver	68316620	CPR30-1650H-b/T1	Receiver
1800	68118100	CPT14-1800H/T1	Transmitter	68318100	CPT30-1800H/T1	Transmitter
	68118620	CPR14-1800H-b/T1	Receiver	68318620	CPR30-1800H-b/T1	Receiver

Ordering information

COMPACTplus-b Host, consisting of transmitter and receiver
 Included in delivery: 4 sliding blocks, 2 BT-S mounting bracket sets, 1 SafetyKey, 1 set of connecting and operating instructions (PDF file on CD-ROM), 1 self-adhesive notice sign

Functions: Start/restart interlock, contactor monitoring, 2 transmission channels, fixed blanking, floating blanking, reduced resolution

Protective field height in mm	COMPACTplus-b Host		
	Art. no.	Article	Description
	Resolution: 50 mm		
	Range: 0 - 18 m		
450	68504100	CPT50-450H/T1	Transmitter
	68504620	CPR50-450H-b/T1	Receiver
600	68506100	CPT50-600H/T1	Transmitter
	68506620	CPR50-600H-b/T1	Receiver
750	68507100	CPT50-750H/T1	Transmitter
	68507620	CPR50-750H-b/T1	Receiver
900	68509100	CPT50-900H/T1	Transmitter
	68509620	CPR50-900H-b/T1	Receiver
1050	68510100	CPT50-1050H/T1	Transmitter
	68510620	CPR50-1050H-b/T1	Receiver
1200	68512100	CPT50-1200H/T1	Transmitter
	68512620	CPR50-1200H-b/T1	Receiver
1350	68513100	CPT50-1350H/T1	Transmitter
	68513620	CPR50-1350H-b/T1	Receiver
1500	68515100	CPT50-1500H/T1	Transmitter
	68515620	CPR50-1500H-b/T1	Receiver
1650	68516100	CPT50-1650H/T1	Transmitter
	68516620	CPR50-1650H-b/T1	Receiver
1800	68518100	CPT50-1800H/T1	Transmitter
	68518620	CPR50-1800H-b/T1	Receiver
2100	68521100	CPT50-2100H/T1	Transmitter
	68521620	CPR50-2100H-b/T1	Receiver
2400	68524100	CPT50-2400H/T1	Transmitter
	68524620	CPR50-2400H-b/T1	Receiver
2700	68527100	CPT50-2700H/T1	Transmitter
	68527620	CPR50-2700H-b/T1	Receiver
3000	68530100	CPT50-3000H/T1	Transmitter
	68530620	CPR50-3000H-b/T1	Receiver

www.leuze.com/compactplus-b/

SAFETY LIGHT CURTAINS

Ordering information

COMPACTplus Guest, consisting of transmitter and receiver
Included in delivery: 4 sliding blocks, 2 BT-S mounting bracket sets

Functions: For cascading with COMPACTplus-b host, functions specified by host

Protective field height in mm	COMPACTplus Guest Connection system: M12 plug Resolution: 14 mm Range: 0 - 6 m			COMPACTplus Guest Connection system: M12 plug Resolution: 30 mm Range: 0 - 18 m		
	Art. no.	Article	Description	Art. no.	Article	Description
150	563101	CT14-150S	Transmitter	563301	CT30-150S	Transmitter
	566101	CR14-150S	Receiver	566301	CR30-150S	Receiver
225	563102	CT14-225S	Transmitter	563302	CT30-225S	Transmitter
	566102	CR14-225S	Receiver	566302	CR30-225S	Receiver
300	563103	CT14-300S	Transmitter	563303	CT30-300S	Transmitter
	566103	CR14-300S	Receiver	566303	CR30-300S	Receiver
450	563104	CT14-450S	Transmitter	563304	CT30-450S	Transmitter
	566104	CR14-450S	Receiver	566304	CR30-450S	Receiver
600	563106	CT14-600S	Transmitter	563306	CT30-600S	Transmitter
	566106	CR14-600S	Receiver	566306	CR30-600S	Receiver
750	563107	CT14-750S	Transmitter	563307	CT30-750S	Transmitter
	566107	CR14-750S	Receiver	566307	CR30-750S	Receiver
900	563109	CT14-900S	Transmitter	563309	CT30-900S	Transmitter
	566109	CR14-900S	Receiver	566309	CR30-900S	Receiver
1050	563110	CT14-1050S	Transmitter	563310	CT30-1050S	Transmitter
	566110	CR14-1050S	Receiver	566310	CR30-1050S	Receiver
1200	563112	CT14-1200S	Transmitter	563312	CT30-1200S	Transmitter
	566112	CR14-1200S	Receiver	566312	CR30-1200S	Receiver
1350	563113	CT14-1350S	Transmitter	563313	CT30-1350S	Transmitter
	566113	CR14-1350S	Receiver	566313	CR30-1350S	Receiver
1500	563115	CT14-1500S	Transmitter	563315	CT30-1500S	Transmitter
	566115	CR14-1500S	Receiver	566315	CR30-1500S	Receiver
1650	563116	CT14-1650S	Transmitter	563316	CT30-1650S	Transmitter
	566116	CR14-1650S	Receiver	566316	CR30-1650S	Receiver
1800	563118	CT14-1800S	Transmitter	563318	CT30-1800S	Transmitter
	566118	CR14-1800S	Receiver	566318	CR30-1800S	Receiver
2100	563121	CT14-2100S	Transmitter	563321	CT30-2100S	Transmitter
	566121	CR14-2100S	Receiver	566321	CR30-2100S	Receiver

Ordering information

COMPACTplus Guest, consisting of transmitter and receiver
Included in delivery: 4 sliding blocks, 2 BT-S mounting bracket sets

Functions: For cascading with COMPACTplus-b host, functions specified by host

Protective field height in mm	COMPACTplus Guest Connection system: M12 plug Resolution: 50 mm Range: 0 - 18 m			COMPACTplus Guest Connection system: M12 plug Resolution: 90 mm Range: 0 - 18 m		
	Art. no.	Article	Description	Art. no.	Article	Description
450	563504	CT50-450S	Transmitter			
	566504	CR50-450S	Receiver			
600	563506	CT50-600S	Transmitter			
	566506	CR50-600S	Receiver			
750	563507	CT50-750S	Transmitter	563907	CT90-750S	Transmitter
	566507	CR50-750S	Receiver	566907	CR90-750S	Receiver
900	563509	CT50-900S	Transmitter	563909	CT90-900S	Transmitter
	566509	CR50-900S	Receiver	566909	CR90-900S	Receiver
1050	563510	CT50-1050S	Transmitter	563910	CT90-1050S	Transmitter
	566510	CR50-1050S	Receiver	566910	CR90-1050S	Receiver
1200	563512	CT50-1200S	Transmitter	563912	CT90-1200S	Transmitter
	566512	CR50-1200S	Receiver	566912	CR90-1200S	Receiver
1350	563513	CT50-1350S	Transmitter	563913	CT90-1350S	Transmitter
	566513	CR50-1350S	Receiver	566913	CR90-1350S	Receiver
1500	563515	CT50-1500S	Transmitter	563915	CT90-1500S	Transmitter
	566515	CR50-1500S	Receiver	566915	CR90-1500S	Receiver
1650	563516	CT50-1650S	Transmitter	563916	CT90-1650S	Transmitter
	566516	CR50-1650S	Receiver	566916	CR90-1650S	Receiver
1800	563518	CT50-1800S	Transmitter	563918	CT90-1800S	Transmitter
	566518	CR50-1800S	Receiver	566918	CR90-1800S	Receiver
2100	563521	CT50-2100S	Transmitter	563921	CT90-2100S	Transmitter
	566521	CR50-2100S	Receiver	566921	CR90-2100S	Receiver
2400	563524	CT50-2400S	Transmitter	563924	CT90-2400S	Transmitter
	566524	CR50-2400S	Receiver	566924	CR90-2400S	Receiver
2700	563527	CT50-2700S	Transmitter	563927	CT90-2700S	Transmitter
	566527	CR50-2700S	Receiver	566927	CR90-2700S	Receiver
3000	563530	CT50-3000S	Transmitter	563930	CT90-3000S	Transmitter
	566530	CR50-3000S	Receiver	566930	CR90-3000S	Receiver

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SAFETY LIGHT CURTAINS

COMPACTplus-b – model varieties

Article	Description	Safety-related switching outputs (OSSD), connection system
CPT...../T1	Transmitter	Cable gland (M20)
CPR...../T1	Receiver	Transistor output, cable gland (M20)
CPR...../R1	Receiver	Relay output, cable gland (M25)
CPT...../T2	Transmitter	Hirschmann plug, 12-pin
CPR...../T2	Receiver	Transistor output, Hirschmann plug, 12-pin
CPR...../R2	Receiver	Relay output, Hirschmann plug, 12-pin
CPT...../T3	Transmitter	MIN-style plug, 3-pin
CPR...../T3	Receiver	Transistor output, MIN-style plug, 7-pin
CPR...../R3	Receiver	Relay output, MIN-style plug, 12-pin
CPT...../T4	Transmitter	M12 plug, 5-pin
CPR...../T4	Receiver	Transistor output, M12 plug, 8-pin
CPT...../AP	Transmitter	Integrated AS-Interface, M12 plug, 5-pin
CPR...../A1	Receiver with AS-i Safety Interface	Integrated AS-Interface, M12 plug, 5-pin
CPR...../P1	Receiver with PROFIsafe interface	Integrated PROFIBUS DP interface, M12 plug, 5 pin
CPT...../H/...	Transmitter, cascable	All
CPR...../H-...	Receiver, cascable	All

Delivery of devices with MIN-style plug only in the USA

Article list for COMPACTplus-b

Type 4 Safety Light Curtains

Article	Description
CP	COMPACTplus-b
a	Device type
T	Transmitter
R	Receiver
rr	Resolution/range
14	14 mm / range 0 - 6 m
30	30 mm / range 0 - 18 m
50	50 mm / range 0 - 18 m
hhh	Protective field height
150...1800	150...1800 mm for 14 mm resolution
150...1800	150...1800 mm for 30 mm resolution
450...3000	450...3000 mm for 50 mm resolution
k	Cascading option
H	Host (from 225 mm protective field height)
f	Function package (receiver only)
b	Blanking
tt	Safety-related switching outputs (OSSD), connection system
T1	Transistor output, cable gland
T2	Transistor output, Hirschmann plug (DIN 43651)
T3	Transistor output, MIN-style plug (MIN series)
T4	Transistor output, M12 plug
R1	Relay output, cable gland, receiver only
R2	Relay output, Hirschmann plug (DIN 43651), receiver only
R3	Relay output, MIN-style plug (MIN series), receiver only
A1	Integrated AS-Interface, M12 plug, receiver only
P1	Integrated PROFIBUS DP interface, M12 plug, receiver only
AP	M12 plug, transmitter only

CP a rr -hhh k -f /tt

www.leuze.com/compactplus-b/

Machine Safety
Machine Safety Services
Safety Engineering Software
Safety Laser Scanners
Safety Light Curtains
Multiple Light Beam Safety Devices
Light Beam Safety Device Sets
Single Light Beam Safety Devices
AS-Interface Safety at Work
PROFIsafe Sensors

SAFETY LIGHT CURTAINS

Article list for COMPACTplus-b

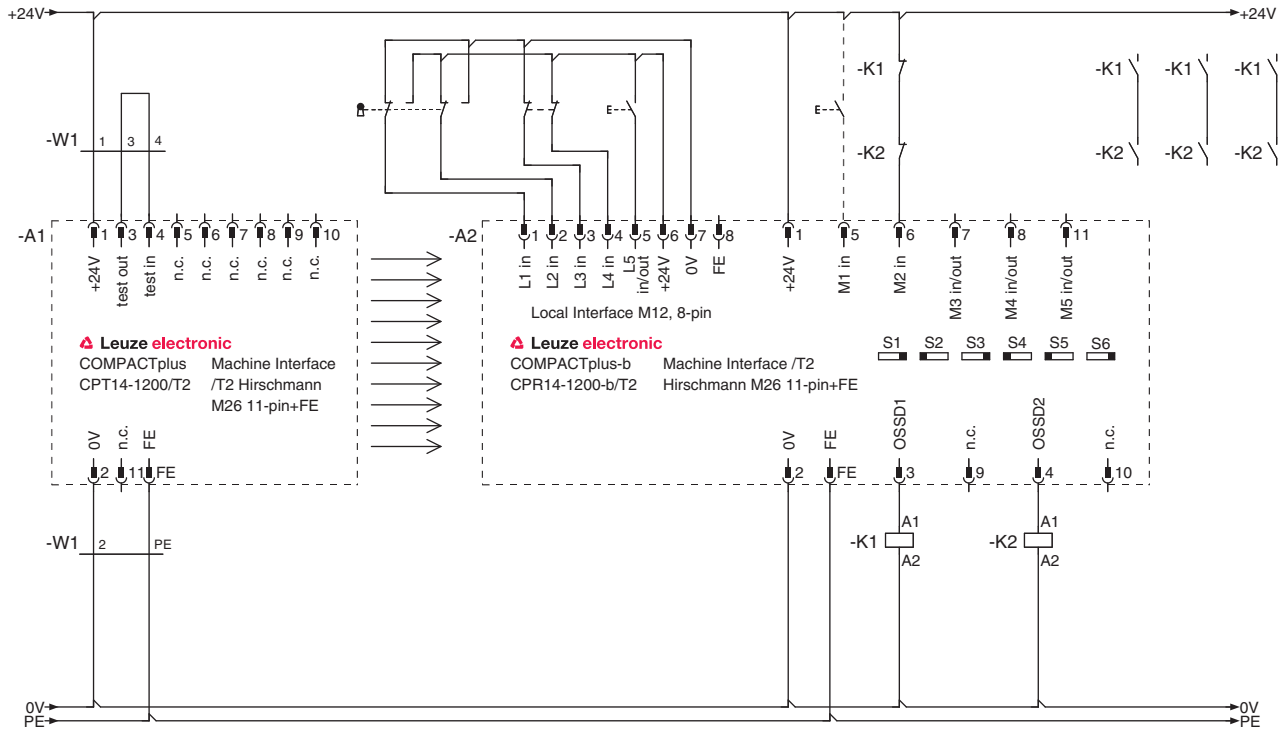
Type 4 Safety Light Curtains

Art. no.	Description
68	COMPACTplus-b
a	Resolution
1	14 mm
3	30 mm
5	50 mm
bb	Protective field height
01	150 mm
02	225 mm
03	300 mm
04	450 mm
06	600 mm
07	750 mm
09	900 mm
10	1050 mm
12	1200 mm
13	1350 mm
15	1500 mm
16	1650 mm
18	1800 mm
21	2100 mm
24	2400 mm
27	2700 mm
30	3000 mm
c	Device type
0	Basic transmitter device
1	Transmitter Host (cascadable)
4	Basic receiver device
6	Receiver Host (cascadable)
dd	Function package/safety-related switching outputs (OSSDs)
Transmitter	
00	Transmitter /T1
01	Transmitter /T2
02	Transmitter /T3
03	Transmitter /T4
50	Transmitter /AP
Receiver	
20	Blanking /T1
21	Blanking /T2
22	Blanking /T3
23	Blanking /T4
29	Blanking /R1
28	Blanking /R2
27	Blanking /R3
70	Blanking /A1
71	Blanking /P1

68 a bb c dd

Electrical connection

COMPACTplus-b connection example



Functions selection with DIP switches (grey: DIP switch settings)		Position	
		L (FS)	R
S1	Contactor monitoring (EDM) on M2	Without	With
S2	Transmission channel (UK)	1	2
S3	Start/restart interlock (RES) on L5 or M1	Without	With
S4/S5	L/L (FS): Fixed blanking only	R/L: Floating blanking	
	L/R: 1-beam reduced resolution	R/R: 2-beam reduced resolution	
S6	Optional safety circuit on L3 and L4	Without	With

COMPACTplus-b connection system /T2 (Hirschmann plug)

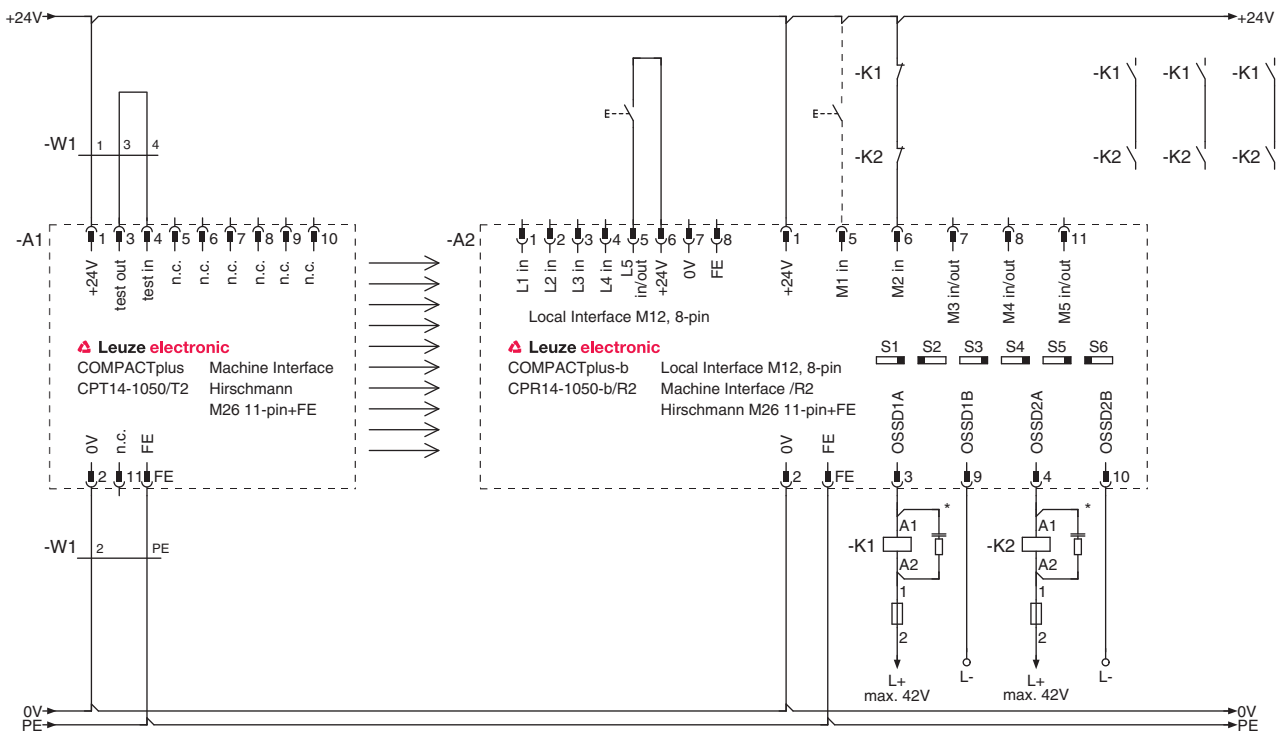
⚠ Please observe the operating instructions of the components!

*) For further connection examples see chapter
 COMPACTplus-m, page 133
 AS-Interface Safety at Work, page 272
 PROFIBUS DP, page 304

SAFETY LIGHT CURTAINS

Electrical connection

COMPACTplus-b connection example



Functions selection with DIP switches (grey: DIP switch settings)	Position	
	L (FS)	R
S1 Contactor monitoring (EDM) on M2	Without	With
S2 Transmission channel (UK)	1	2
S3 Start/restart interlock (RES) on L5 or M1	Without	With
S4/S5 L/L (FS): Fixed blanking only	R/L: Floating blanking	
	L/R: 1-beam reduced resolution	R/R: 2-beam reduced resolution
S6 Optional safety circuit on L3 and L4	Without	With

*) Spark extinction circuit, supply suitable spark extinction

COMPACTplus-b connection system /R2 (Hirschmann plug)

! Please observe the operating instructions of the components!

*) For further connection examples see chapter
 COMPACTplus-m, page 133
 AS-Interface Safety at Work, page 272
 PROFIBUS DP, page 304

Technical data

General system data				
Type in accordance with EN IEC 61496	4			
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3			
Performance Level (PL) in accordance with EN ISO 13849-1	e			
Probability of a failure to danger per hour (PFH _d)	For protective heights up to 900 mm, all resolutions	2.26 x 10 ⁻⁸		
	For protective heights up to 1800 mm, all resolutions	2.67 x 10 ⁻⁸		
	For protective heights up to 3000 mm	On request		
Service life (T _M) in accordance with EN ISO 13849-1	20 years			
Number of cycles until 10% of the components have a failure to danger.(B _{10d})*	With DC1 (ohmic load)	On request		
	With AC1 (ohmic load)	On request		
	With DC13 (inductive load)	630,000 (5 A, 24 V)		
	With AC15 (inductive load)	1,480,000 (3 A, 230 V)		
	Low load (20% nominal load)	On request		
Category in accordance with EN ISO 13849	4			
Resolution	14 mm	30 mm	50 mm	
Range	0...6 m	0...18 m	0...18 m	
Response time	Transistor output	5...41 ms	5...22 ms	7...18 ms
	Relay output	20...56 ms	20...37 ms	22...33 ms
	AS-i Safety Interface	10...46 ms	10...27 ms	12...23 ms
	PROFIsafe interface	25...61 ms	25...42 ms	27...38 ms
Protective field height	150...1800 mm	150...1800** mm	450...3000 mm	
Supply voltage	24 V DC, ±20 %			
Connection cable length	Max. 100 m with 1.0 mm ²			
Safety class	III and I (depending on model)			
Protection rating	IP 65***			
Ambient temperature, operation	0...+50°C			
Ambient temperature, storage	-25...+70°C			
Relative humidity	15...95 %			
Profile cross-section	52 mm x 55 mm			
Weight per device (length-dependent)	0.70...8.30 kg			

*) For devices with relay output

**) Installation length up to 3000 mm on request

***) Without additional measures the devices are not suited for outdoor use

SAFETY LIGHT CURTAINS

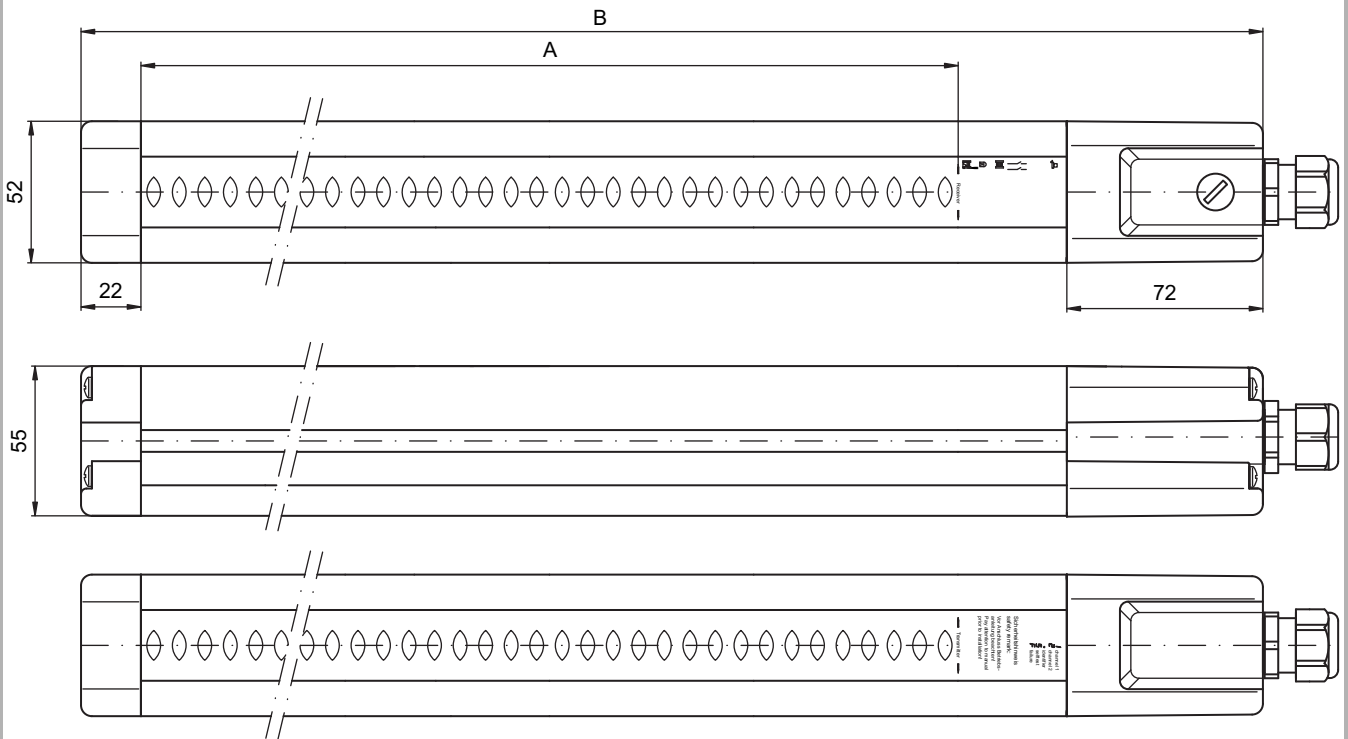
Technical data

Transmitter	
Transmitter diodes, class in accordance with EN 60825	1
Wavelength	880 nm
Current consumption	75 mA
Connection system	Cable gland (M20) Hirschmann plug (DIN 43651), 12-pin MIN-style plug (MIN series), 3-pin M12 plug, 5-pin
Receiver	
Current consumption	160 mA without external load
Safety-related switching outputs	2 pnp transistor outputs (short circuit-proof, cross-circuit monitored) 2 relay outputs (N/O) AS-i Safety Interface PROFIsafe interface
Switching voltage high active	Min. U _v -1.0 V
Switching voltage low	Max. +2.5 V
Switching current	Typical, 500 mA
Connection system	Cable gland (T1: M20, R1: M25) Hirschmann plug (DIN 43651), T2: 12-pin, R2: 12-pin MIN-style plug (MIN series), T3: 7-pin, R3: 12-pin M12 plug (safety bus systems), 5-pin, T4: 8-pin

Please note the additional information in the COMPACT*plus*-b Connecting and Operating Instructions at www.leuze.com/compactplus-b.

Dimensional drawings

COMPACTplus-b Safety Light Curtain



A = Protective field height according to ordering information
 B = A + 134 mm

Dimensions in mm

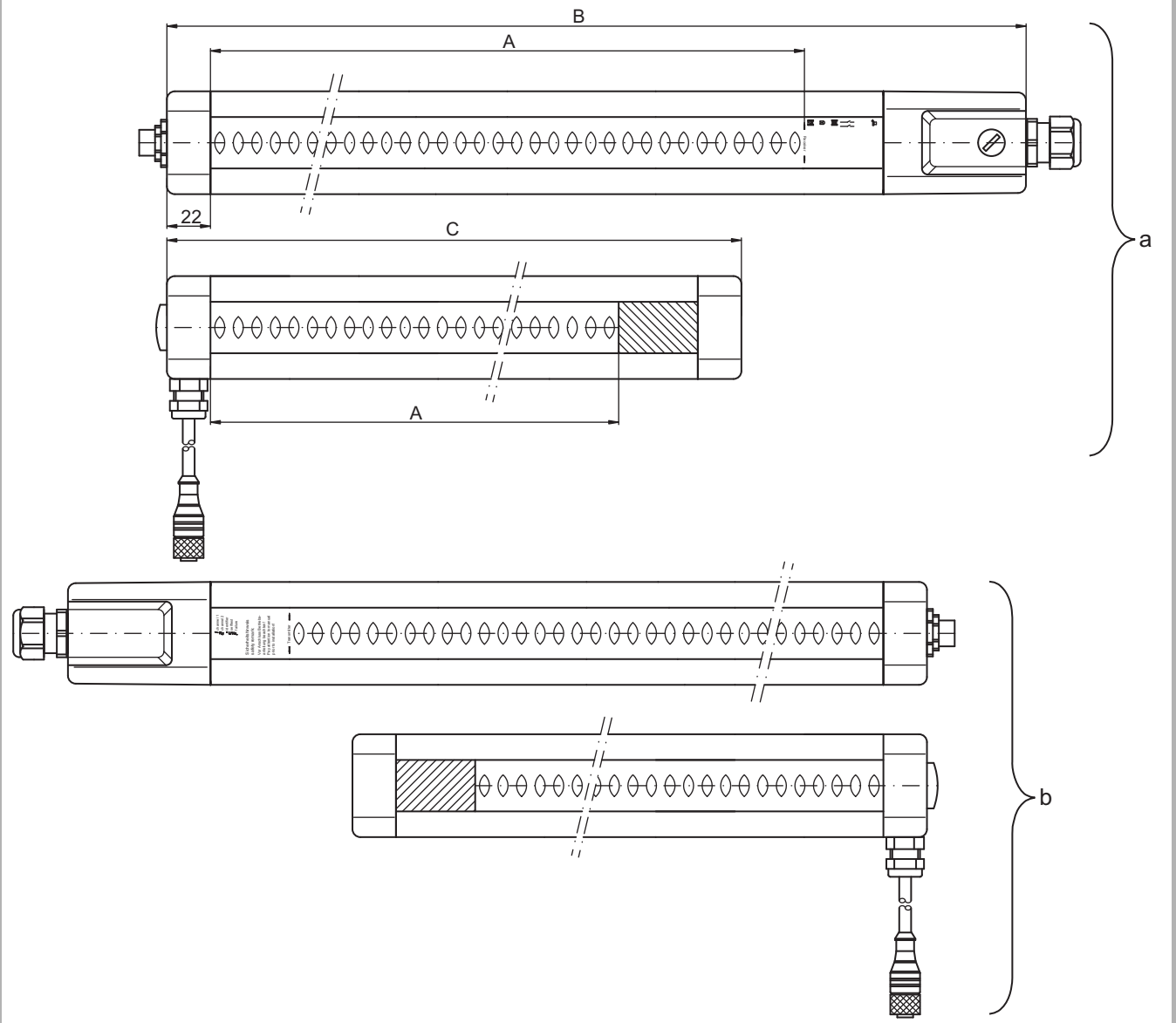
Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

www.leuze.com/compactplus-b/

SAFETY LIGHT CURTAINS

Dimensional drawings

Host and guest dimensions



A = Protective field height according to ordering information
 B = A + 134 mm
 C = A + 84 mm

a = Receiver host and guest
 b = Transmitter host and guest

Dimensions in mm

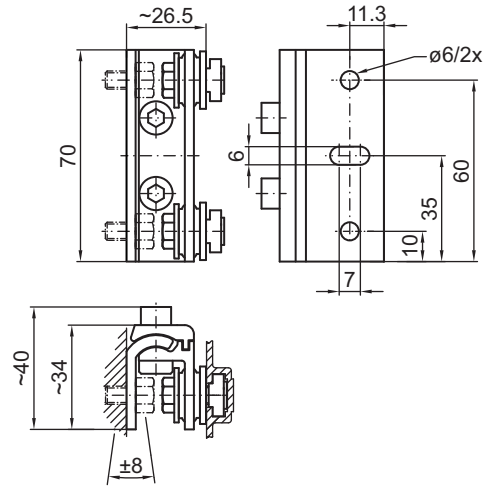
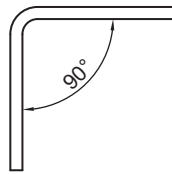
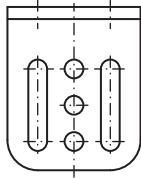
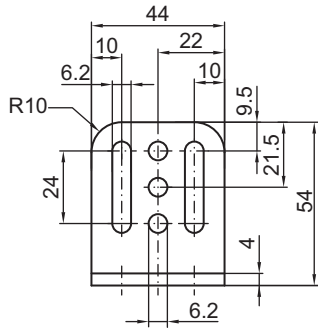
SOLID-4, SOLID-4E
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SOLID-2, SOLID-2E
 p. 112

COMPACTplus
 p. 126

Dimensional drawings: Accessories

Mounting brackets



L-mounting bracket

Mounting bracket, swiveling with shock absorber, BT-SSD

Dimensions in mm

SAFETY LIGHT CURTAINS

Accessories ordering information

Art. no.	Article	Description	Length, design
Installation accessories			
429058	BT-2SSD	2 x 70 mm long mounting brackets, swiveling with shock absorber, incl. 4 screws and 4 sliding blocks	
429059	BT-4SSD	4 x 70 mm long mounting brackets, swiveling with shock absorber, incl. 8 screws and 8 sliding blocks	
429049	BT-2SSD-270	2 x 270 mm long mounting brackets, swiveling with shock absorber, incl. 4 screws and 4 sliding blocks	
560120	BT-2S	Mounting bracket set consisting of 2 L-type brackets incl. 2 screws	
425740	BT-10NC60	10 sliding blocks with 2 bore holes, one with thread M6	
425741	BT-10NC64	10 sliding blocks with 2 bore holes, with M4 and M6 thread	
425742	BT-10NC65	10 sliding blocks with 2 bore holes, with M5 and M6 thread	
Laser alignment aids, see COMPACTplus-m ordering information, page 140			
SafetyKey			
520070	AC-SK1	SafetyKey for teaching in	
Test rods			
430430	AC-TRSET2	Test rod set 14/19/24/29/33 mm	
430432	AC-TRSET3	Test rod set 14/30/38 mm	
Configuration software, see COMPACTplus-m ordering information, page 140			
COMPACTplus – Accessories for local and machine interfaces			
150704	CB-M12-3000-8WM	Connecting cable for local interface with M12 x 8 plug	3 m, angled
150699	CB-M12-10000-8WM	Connecting cable for local interface with M12 x 8 plug	10 m, angled
150677	CB-M12-10000-5WM	Connecting cable for T1 Transmitter M12 x 5 plug, connection on receiver with sensor connection field	10 m, angled
426046	AC-LDH-12GF	Hirschmann cable socket, encoded for CP/T2 or CP/R2, 12-pin, incl. crimp contacts	Straight
426045	AC-LDH-12WF	Hirschmann cable socket, encoded for CP/T2 or CP/R2, 12-pin, incl. crimp contacts	Angled
426042	CB-LDH-10000-12GF	Connecting cable, machine interface /T2, /R2, Hirschmann cable socket	10 m, straight
426044	CB-LDH-25000-12GF	Connecting cable, machine interface /T2, /R2, Hirschmann cable socket	25 m, straight
426043	CB-LDH-50000-12GF	Connecting cable, machine interface /T2, /R2, Hirschmann cable socket	50 m, straight
Protective screens, see accessories, page 498			

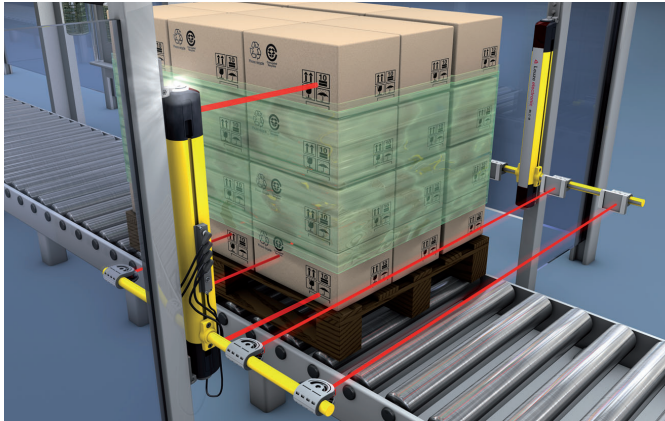
Accessories ordering information

Art. no.	Article	Description	Length, design
Connection cables, 5-pin for COMPACTplus/T4 transmitter			
429071	CB-M12-5000S-5GF	Connecting cable shielded with M12 coupling, 5-pin	5 m, straight/ open end
429072	CB-M12-5000S-5WF	Connecting cable shielded with M12 coupling, 5-pin	5 m, angled/ open end
429073	CB-M12-10000S-5GF	Connecting cable shielded with M12 coupling, 5-pin	10 m, straight/ open end
429074	CB-M12-10000S-5WF	Connecting cable shielded with M12 coupling, 5-pin	10 m, angled/ open end
429075	CB-M12-15000S-5GF	Connecting cable shielded with M12 coupling, 5-pin	15 m, straight/ open end
429076	CB-M12-15000S-5WF	Connecting cable shielded with M12 coupling, 5-pin	15 m, angled/ open end
429171	CB-M12-25000S-5GF	Connecting cable shielded with M12 coupling, 5-pin	25 m, straight/ open end
429172	CB-M12-25000S-5WF	Connecting cable shielded with M12 coupling, 5-pin	25 m, angled/ open end
Connection cables, 8-pin for COMPACTplus/T4 receiver			
429081	CB-M12-5000S-8GF	Connecting cable shielded with M12 coupling, 8-pin	5 m, straight/ open end
429082	CB-M12-5000S-8WF	Connecting cable shielded with M12 coupling, 8-pin	5 m, angled/ open end
429083	CB-M12-10000S-8GF	Connecting cable shielded with M12 coupling, 8-pin	10 m, straight/ open end
429084	CB-M12-10000S-8WF	Connecting cable shielded with M12 coupling, 8-pin	10 m, angled/ open end
429085	CB-M12-15000S-8GF	Connecting cable shielded with M12 coupling, 8-pin	15 m, straight/ open end
429086	CB-M12-15000S-8WF	Connecting cable shielded with M12 coupling, 8-pin	15 m, angled/ open end
429181	CB-M12-25000S-8GF	Connecting cable shielded with M12 coupling, 8-pin	25 m, straight/ open end
429182	CB-M12-25000S-8WF	Connecting cable shielded with M12 coupling, 8-pin	25 m, angled/ open end

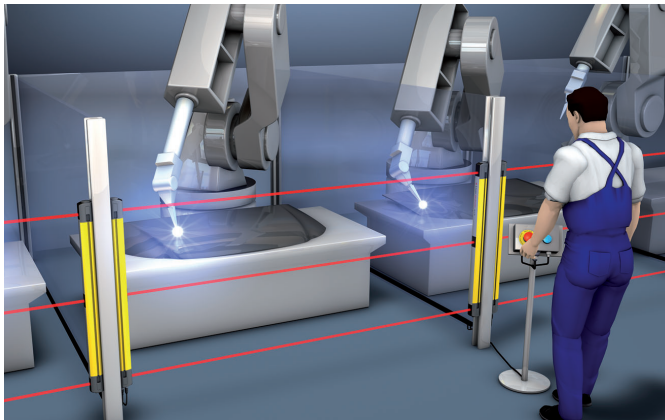
www.leuze.com/compactplus-b/

MULTIPLE LIGHT BEAM SAFETY DEVICES

Multiple Light Beam Safety Device selection table



MLD 500 Multiple Light Beam Safety Device with integrated muting indicator in an application with sequential muting



With their integrated laser alignment aid, the series MLD 300 and MLD 500 enable the efficient and economic setup of type 2 and type 4 access guardings with and without muting

In many production systems there is often the requirement of guarding the access to automatic production cells without obstructing the conveyor system and material feed in the process. The user is provided with a harmonized range of Multiple Light Beam Safety Devices for this requirement.

The individual features and performance data of the individual Light Beam Devices allow the most varied applications to be optimally implemented, and often without additional measures. The high ranges of the sensors also allow very spacious systems to be guarded. Integrated additional functions, such as integrated alignment lasers, support the speedy start-up.

ROTOSCAN RS4-4E Safety Laser Scanners can also be used with numerous advantages for complete guarding of access areas with bigger heights or contours that are not square.

MLD 500
p. 166

MLD 300
p. 196

Selection table

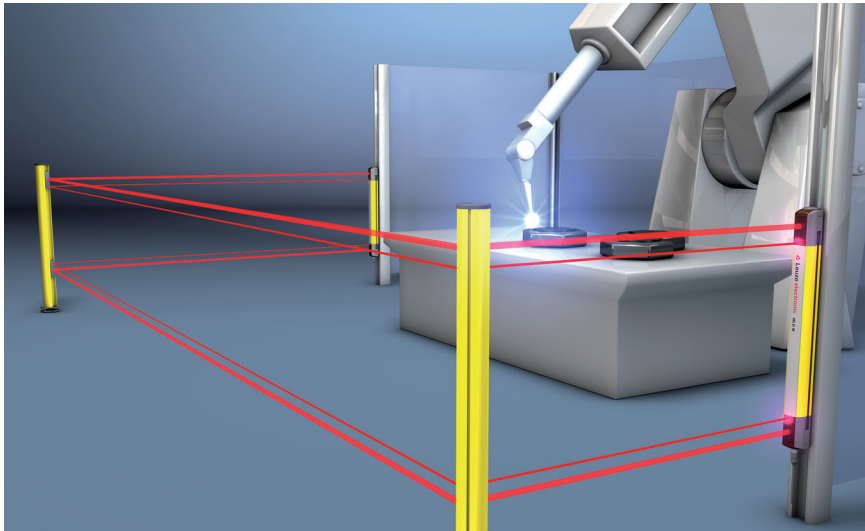


Numerous types of Multiple Light Beam Safety Devices are available for providing individual guarding solutions, including the COMPACTplus-m, MLD 500 and MLD 300 devices

Type in accordance with EN IEC 61496	SIL in accordance with IEC 61508 or SILCL in accordance with EN IEC 62061	Performance Level (PL) in accordance with EN ISO 13849-1	W x D in mm	Beam distance (mm) Number of beams	Range in m	Features, type-dependent										Series	Page	
						Transmitter/receiver	Transceiver system	Transmission channel selection	RES / EDM, selectable	Muting functions, selectable	Integr. muting indicator	Integr. laser alignment aid	pnp transistor output	Safety Relay outputs	Integr. AS-i Safety Interface			Integr. PROFIsafe Interface
4	3	e	52 x 65	500/2 400/3 300/4	0,5 - 50 / 20 - 70	●			●	●	●	●	●	●	●	●	MLD 500	168
				500/2 400/3	0,5 - 8		●		●	●	●	●	●	●	●	●	MLD 500 transceiver	168
2	2	d	52 x 65	500/2 400/3 300/4	0,5 - 50 / 20 - 70	●			●	●	●	●	●	●	●	●	MLD 300	198
				500/2 400/3	0,5 - 8		●		●	●	●	●	●	●	●	●	MLD 300 transceiver	198

MULTIPLE LIGHT BEAM SAFETY DEVICES

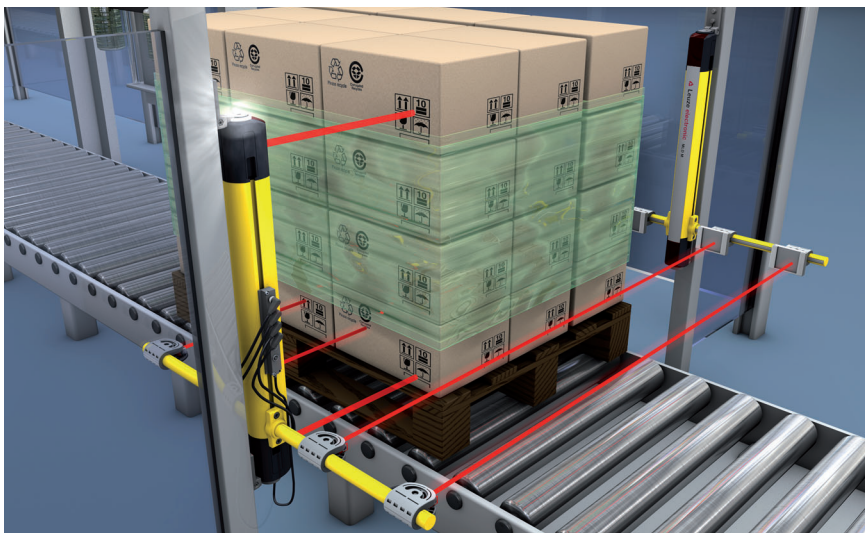
MLD 500



Easy setting up of an access guarding with integrated laser alignment aid

It is advantageous from a cost effectiveness and optimum usability standpoint to use safety sensors that are characterized by functions that match the specific requirements of the given application as closely as possible. The Multiple Light Beam Safety Device MLD 500 (type 4, PLe) has been specially designed for this.

As for the MLD 300 series (type 2, PL d), the MLD 500 sensors are characterized by their individual function classes. A start/restart interlock and contactor monitoring can thereby be selected and, if necessary, various muting modes realized. The series can be used both as standard access guarding as well as for applications where sequential, parallel or partial muting is required. Additional muting devices are not required, thus simplifying construction and lowering costs during setup of the muting application.



MLD 500 Multiple Light Beam Safety Device with integrated muting indicator in an application with sequential muting

The series is predestined for wide-area perimeter guarding, which is realized with Deflecting Mirrors, enabling operation at ranges of up to 70 m. In addition to transmitter/receiver versions, 2- and 3-beam (patented) transceiver versions are also available. No PC is necessary for configuration, as the functions are set via the pin assignments at the connection. Operating temperatures as low as -30°C are possible. Options such as the integrated laser alignment aid, an integrated muting indicator and the patented swivel mount for easy fastening and alignment round out the MLD product range.

Typical areas of application

- Access guardings with and without muting on robot cells, processing centers, production lines
- Packaging machinery, palletizers, wrapping machinery, plastic and rubber machinery, concrete and stoneware machinery, ...
- Rear zone guarding on pressure forming presses

Important technical data, overview

Type in accordance with EN IEC 61496	4		
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3		
Performance Level (PL) in accordance with EN ISO 13849-1	e		
Category in accordance with EN ISO 13849	4		
Number of beams*	2	3	4
Beam distance	500 mm	400 mm	300 mm
Range (transmitter-receiver systems, type-dependent)	MLDxyy-R /-T: 0.5...50 m MLDxyy-xR /-xT: 20...70 m		
Range (transceiver systems)	0.5 - 8 m		
Profile cross-section	52 mm x 65 mm		
Safety-related switching outputs	2 pnp transistor outputs, AS-i Safety Interface		
Connection system	M12 plug		

*) Information on MLD Single Light Beam Safety Devices can be found on page 230.

Functions


	MLD 510	MLD 520	MLD 530	MLD 535
Automatic start/restart	●	●		
Start/restart interlock (RES)		●	●	●
Contacting monitoring (EDM), selectable		●	●	●
2-sensor muting (parallel, sequential)			●	●
4-sensor muting (sequential)				●
Configurable operating modes		●	●	●
Laser alignment aid (optional for transmitter-receiver systems)	●	●		




Special features

- Version available as 3-beam transceiver
- Integrated muting function, no additional muting module is necessary
- The configuration is simply performed by means of wiring, i. e. no software, PC or DIP switch are necessary
- The use at ambient temperatures as low as -30°C is possible
- Options: integrated laser alignment aid, integrated muting indicator, 7-segment display, AS-i Safety interface.



Features



Further information

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MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

MLD 510, consisting of transmitter and receiver
 Included in delivery: 4 sliding blocks, 1 set of connecting and
 operating instructions (PDF file on CD-ROM)

Functions: Automatic restart, 2 OSSDs

Beam distance/ number of beams	MLD 510			
	Range: 0.5 - 50 m			
	Art. no.	Article	Description	Option
500 mm / 2	66501100	MLD500-T2	Transmitter	
	66533100	MLD510-R2	Receiver	
	66502100	MLD500-T2L	Transmitter	With integrated laser alignment aid
	66536100	MLD510-R2L	Receiver	With reflex element for laser alignment aid
400 mm / 3	66501200	MLD500-T3	Transmitter	
	66533200	MLD510-R3	Receiver	
	66502200	MLD500-T3L	Transmitter	With integrated laser alignment aid
	66536200	MLD510-R3L	Receiver	With reflex element for laser alignment aid
300 mm / 4	66501300	MLD500-T4	Transmitter	
	66533300	MLD510-R4	Receiver	
	66502300	MLD500-T4L	Transmitter	With integrated laser alignment aid
	66536300	MLD510-R4L	Receiver	With reflex element for laser alignment aid

Ordering information

MLD 510, consisting of transmitter and receiver or transceiver and Deflecting Mirror
 Included in delivery: 4 sliding blocks, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Functions: Automatic restart, 2 OSSDs

Beam distance/ number of beams	MLD 510			
	Range: 20 - 70 m			
	Art. no.	Article	Description	Option
500 mm / 2	66501500	MLD500-XT2	Transmitter	
	66533500	MLD510-XR2	Receiver	
	66502500	MLD500-XT2L	Transmitter	With integrated laser alignment aid
	66536500	MLD510-XR2L	Receiver	With reflex element for laser alignment aid
400 mm / 3	66501600	MLD500-XT3	Transmitter	
	66533600	MLD510-XR3	Receiver	
	66502600	MLD500-XT3L	Transmitter	With integrated laser alignment aid
	66536600	MLD510-XR3L	Receiver	With reflex element for laser alignment aid
300 mm / 4	66501700	MLD500-XT4	Transmitter	
	66533700	MLD510-XR4	Receiver	
	66502700	MLD500-XT4L	Transmitter	With integrated laser alignment aid
	66536700	MLD510-XR4L	Receiver	With reflex element for laser alignment aid

Beam distance/ number of beams	MLD 510 transceiver systems			
	Range: 0.5 - 8 m			
	Art. no.	Article	Description	Option
500 mm / 2	66500100	MLD-M002	Deflecting Mirror	
	66537100	MLD510-RT2	Transceiver	
400 mm / 3	66500201	MLD-XM03	Deflecting Mirror	
	66537200	MLD510-RT3	Transceiver	

Beam distance/ number of beams	MLD 510 transceiver systems			
	Range: 0.5 - 6 m			
	Art. no.	Article	Description	Option
400 mm / 3	66500200	MLD-M003	Deflecting Mirror	
	66537200	MLD510-RT3	Transceiver	

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MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

MLD 520, consisting of transmitter and receiver
Included in delivery: 4 sliding blocks, 1 set of connecting and
operating instructions (PDF file on CD-ROM)

Functions: 2 OSSDs, start/restart interlock selectable,
contactor monitoring selectable

MLD 520				
Range: 0.5 - 50 m				
Beam distance/ number of beams	Art. no.	Article	Description	Option
500 mm / 2	66501100	MLD500-T2	Transmitter	
	66553100	MLD520-R2	Receiver	
	66502100	MLD500-T2L	Transmitter	With integrated laser alignment aid
	66556100	MLD520-R2L	Receiver	With reflex element for laser alignment aid
400 mm / 3	66501200	MLD500-T3	Transmitter	
	66553200	MLD520-R3	Receiver	
	66502200	MLD500-T3L	Transmitter	With integrated laser alignment aid
	66556200	MLD520-R3L	Receiver	With reflex element for laser alignment aid
300 mm / 4	66501300	MLD500-T4	Transmitter	
	66553300	MLD520-R4	Receiver	
	66502300	MLD500-T4L	Transmitter	With integrated laser alignment aid
	66556300	MLD520-R4L	Receiver	With reflex element for laser alignment aid

Ordering information

MLD 520, consisting of transmitter and receiver or transceiver and Deflecting Mirror
 Included in delivery: 4 sliding blocks, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Functions: 2 OSSDs, start/restart interlock selectable, contactor monitoring selectable

Beam distance/ number of beams	MLD 520			
	Range: 20 - 70 m			
	Art. no.	Article	Description	Option
500 mm / 2	66501500	MLD500-XT2	Transmitter	
	66553500	MLD520-XR2	Receiver	
	66502500	MLD500-XT2L	Transmitter	With integrated laser alignment aid
	66556500	MLD520-XR2L	Receiver	With reflex element for laser alignment aid
400 mm / 3	66501600	MLD500-XT3	Transmitter	
	66553600	MLD520-XR3	Receiver	
	66502600	MLD500-XT3L	Transmitter	With integrated laser alignment aid
	66556600	MLD520-XR3L	Receiver	With reflex element for laser alignment aid
300 mm / 4	66501700	MLD500-XT4	Transmitter	
	66553700	MLD520-XR4	Receiver	
	66502700	MLD500-XT4L	Transmitter	With integrated laser alignment aid
	66556700	MLD520-XR4L	Receiver	With reflex element for laser alignment aid

Beam distance/ number of beams	MLD 520 transceiver systems			
	Range: 0.5 - 8 m			
	Art. no.	Article	Description	Option
500 mm / 2	66500100	MLD-M002	Deflecting Mirror	
	66557100	MLD520-RT2	Transceiver	
400 mm / 3	66500201	MLD-XM03	Deflecting Mirror	
	66557200	MLD520-RT3	Transceiver	

Beam distance/ number of beams	MLD 520 transceiver systems			
	Range: 0.5 - 6 m			
	Art. no.	Article	Description	Option
400 mm / 3	66500200	MLD-M003	Deflecting Mirror	
	66557200	MLD520-RT3	Transceiver	

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MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

MLD 530, consisting of transmitter and receiver
Included in delivery: 4 sliding blocks, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Functions: 2 OSSDs, start/restart interlock selectable, contactor monitoring selectable, 2-sensor parallel muting, 2-sensor sequential muting, muting-timeout extension, alternative connection for second muting signal, muting enable function, partial muting

Beam distance/ number of beams	MLD 530			
	Range: 0.5 - 50 m			
	Art. no.	Article	Description	Option
500 mm / 2	66501100	MLD500-T2	Transmitter	
	66563100	MLD530-R2	Receiver	
	66564100	MLD530-R2M	Receiver	With integrated muting indicator
	66502100	MLD500-T2L	Transmitter	With integrated laser alignment aid
	66566100	MLD530-R2L	Receiver	With reflex element for laser alignment aid
400 mm / 3	66501200	MLD500-T3	Transmitter	
	66563200	MLD530-R3	Receiver	
	66564200	MLD530-R3M	Receiver	With integrated muting indicator
	66502200	MLD500-T3L	Transmitter	With integrated laser alignment aid
	66566200	MLD530-R3L	Receiver	With reflex element for laser alignment aid
300 mm / 4	66501300	MLD500-T4	Transmitter	
	66563300	MLD530-R4	Receiver	
	66564300	MLD530-R4M	Receiver	With integrated muting indicator
	66502300	MLD500-T4L	Transmitter	With integrated laser alignment aid
	66566300	MLD530-R4L	Receiver	With reflex element for laser alignment aid
	66565300	MLD530-R4LM	Receiver	With reflex element for laser alignment aid and integrated muting indicator

Ordering information

MLD 530, consisting of transmitter and receiver or transceiver and Deflecting Mirror
 Included in delivery: 4 sliding blocks, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Functions: 2 OSSDs, start/restart interlock selectable, contactor monitoring selectable, 2-sensor parallel muting, 2-sensor sequential muting, muting-timeout extension, alternative connection for second muting signal, muting enable function, partial muting

Beam distance/ number of beams	MLD 530			
	Range: 20 - 70 m			
	Art. no.	Article	Description	Option
500 mm / 2	66501500	MLD500-XT2	Transmitter	
	66563500	MLD530-XR2	Receiver	
	66502500	MLD500-XT2L	Transmitter	With integrated laser alignment aid
	66566500	MLD530-XR2L	Receiver	With reflex element for laser alignment aid
400 mm / 3	66501600	MLD500-XT3	Transmitter	
	66563600	MLD530-XR3	Receiver	
	66502600	MLD500-XT3L	Transmitter	With integrated laser alignment aid
	66566600	MLD530-XR3L	Receiver	With reflex element for laser alignment aid
300 mm / 4	66501700	MLD500-XT4	Transmitter	
	66563700	MLD530-XR4	Receiver	
	66502700	MLD500-XT4L	Transmitter	With integrated laser alignment aid
	66566700	MLD530-XR4L	Receiver	With reflex element for laser alignment aid

Beam distance/ number of beams	MLD 530 transceiver systems			
	Range: 0.5 - 8 m			
	Art. no.	Article	Description	Option
500 mm / 2	66500100	MLD-M002	Deflecting Mirror	
	66567100	MLD530-RT2	Transceiver	
	66568100	MLD530-RT2M	Transceiver	With integrated muting indicator
400 mm / 3	66500201	MLD-XM03	Deflecting Mirror	
	66567200	MLD530-RT3	Transceiver	
	66568200	MLD530-RT3M	Transceiver	With integrated muting indicator

Beam distance/ number of beams	MLD 530 transceiver systems			
	Range: 0.5 - 6 m			
	Art. no.	Article	Description	Option
400 mm / 3	66500200	MLD-M003	Deflecting Mirror	
	66567200	MLD530-RT3	Transceiver	
	66568200	MLD530-RT3M	Transceiver	With integrated muting indicator

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MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

MLD 535, consisting of transmitter and receiver or transceiver and Deflecting Mirror
 Included in delivery: 4 sliding blocks, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Functions: 2 OSSDs, start/restart interlock selectable, contactor monitoring selectable, 2-sensor parallel muting, 2-sensor sequential muting, 4-sensor sequential muting, muting-timeout extension, alternative connection for second muting signal, muting enable function, partial muting

Beam distance/ number of beams	MLD 535			
	Range: 0.5 - 50 m			
	Art. no.	Article	Description	Option
500 mm / 2	66501100	MLD500-T2	Transmitter	
	66573100	MLD535-R2	Receiver	
	66574100	MLD535-R2M	Receiver	With integrated muting indicator
	66502100	MLD500-T2L	Transmitter	With integrated laser alignment aid
	66576100	MLD535-R2L	Receiver	With reflex element for laser alignment aid
	66575100	MLD535-R2LM	Receiver	With reflex element for laser alignment aid and integrated muting indicator
400 mm / 3	66501200	MLD500-T3	Transmitter	
	66573200	MLD535-R3	Receiver	
	66574200	MLD535-R3M	Receiver	With integrated muting indicator
	66502200	MLD500-T3L	Transmitter	With integrated laser alignment aid
	66576200	MLD535-R3L	Receiver	With reflex element for laser alignment aid
	66575200	MLD535-R3LM	Receiver	With reflex element for laser alignment aid and integrated muting indicator
300 mm / 4	66501300	MLD500-T4	Transmitter	
	66573300	MLD535-R4	Receiver	
	66574300	MLD535-R4M	Receiver	With integrated muting indicator
	66502300	MLD500-T4L	Transmitter	With integrated laser alignment aid
	66576300	MLD535-R4L	Receiver	With reflex element for laser alignment aid
	66575300	MLD535-R4LM	Receiver	With reflex element for laser alignment aid and integrated muting indicator

Ordering information

MLD 535, consisting of transmitter and receiver or transceiver and Deflecting Mirror
 Included in delivery: 4 sliding blocks, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Functions: 2 OSSDs, start/restart interlock selectable, contactor monitoring selectable, 2-sensor parallel muting, 2-sensor sequential muting, 4-sensor sequential muting, muting-timeout extension, alternative connection for second muting signal, muting enable function, partial muting

MLD 535				
Range: 20 - 70 m				
Beam distance/ number of beams	Art. no.	Article	Description	Option
500 mm / 2	66501500	MLD500-XT2	Transmitter	
	66573500	MLD535-XR2	Receiver	
	66502500	MLD500-XT2L	Transmitter	With integrated laser alignment aid
	66576500	MLD535-XR2L	Receiver	With reflex element for laser alignment aid
400 mm / 3	66501600	MLD500-XT3	Transmitter	
	66573600	MLD535-XR3	Receiver	
	66502600	MLD500-XT3L	Transmitter	With reflex element for laser alignment aid
	66576600	MLD535-XR3L	Receiver	With integrated laser alignment aid
300 mm / 4	66501700	MLD500-XT4	Transmitter	
	66573700	MLD535-XR4	Receiver	
	66502700	MLD500-XT4L	Transmitter	With integrated laser alignment aid
	66576700	MLD535-XR4L	Receiver	With reflex element for laser alignment aid

MLD 535 transceiver systems				
Range: 0.5 - 8 m				
Beam distance/ number of beams	Art. no.	Article	Description	Option
500 mm / 2	66500100	MLD-M002	Deflecting Mirror	
	66577100	MLD535-RT2	Transceiver	
	66578100	MLD535-RT2M	Transceiver	With integrated muting indicator
400 mm / 3	66500201	MLD-XM03	Deflecting Mirror	
	66577200	MLD535-RT3	Transceiver	
	66578200	MLD535-RT3M	Transceiver	With integrated muting indicator

MLD 535 transceiver systems				
Range: 0.5 - 6 m				
Beam distance/ number of beams	Art. no.	Article	Description	Option
400 mm / 3	66500200	MLD-M003	Deflecting Mirror	
	66577200	MLD535-RT3	Transceiver	
	66578200	MLD535-RT3M	Transceiver	With integrated muting indicator

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MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

MLD 510/AS-i, consisting of transmitter and receiver or transmitter and Deflecting Mirror
 Included in delivery: 4 sliding blocks, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Functions (in combination with ASM Safety Monitor): Start/restart interlock selectable, contactor monitoring selectable, 2-sensor parallel muting, 2-sensor sequential muting, 4-sensor sequential muting, muting-timeout extension

Beam distance/ number of beams	MLD 510/AS-i			
	Range: 0.5 - 50 m			
	Art. no.	Article	Description	Option
500 mm / 2	66501101	MLD500-T2/A	Transmitter	
	66533101	MLD510-R2/A	Receiver	
	66534101	MLD510-R2M/A	Receiver	With integrated muting indicator
	66533102	MLD510-R2E/A	Receiver	With connection socket for external muting indicator
	66502101	MLD500-T2L/A	Transmitter	With integrated laser alignment aid
	66536101	MLD510-R2L/A	Receiver	With reflex element for laser alignment aid
	66535101	MLD510-R2LM/A	Receiver	With reflex element for laser alignment aid and integrated muting indicator
	66536102	MLD510-R2LE/A	Receiver	With reflex element for laser alignment aid and connection socket for external muting indicator
400 mm / 3	66501201	MLD500-T3/A	Transmitter	
	66533201	MLD510-R3/A	Receiver	
	66534201	MLD510-R3M/A	Receiver	With integrated muting indicator
	66533202	MLD510-R3E/A	Receiver	With connection socket for external muting indicator
	66502201	MLD500-T3L/A	Transmitter	With integrated laser alignment aid
	66536201	MLD510-R3L/A	Receiver	With reflex element for laser alignment aid
	66535201	MLD510-R3LM/A	Receiver	With reflex element for laser alignment aid and integrated muting indicator
	66536202	MLD510-R3LE/A	Receiver	With reflex element for laser alignment aid and connection socket for external muting indicator
300 mm / 4	66501301	MLD500-T4/A	Transmitter	
	66533301	MLD510-R4/A	Receiver	
	66534301	MLD510-R4M/A	Receiver	With integrated muting indicator
	66533302	MLD510-R4E/A	Receiver	With connection socket for external muting indicator
	66502301	MLD500-T4L/A	Transmitter	With integrated laser alignment aid
	66536301	MLD510-R4L/A	Receiver	With reflex element for laser alignment aid
	66535301	MLD510-R4LM/A	Receiver	With reflex element for laser alignment aid and integrated muting indicator
	66536302	MLD510-R4LE/A	Receiver	With reflex element for laser alignment aid and connection socket for external muting indicator

Ordering information

MLD 510/AS-i, consisting of transmitter and receiver or transceiver and Deflecting Mirror
 Included in delivery: 4 sliding blocks, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Functions (in combination with ASM Safety Monitor): Start/restart interlock selectable, contactor monitoring selectable, 2-sensor parallel muting, 2-sensor sequential muting, 4-sensor sequential muting, muting-timeout extension

Beam distance/ number of beams	MLD 510/AS-i			
	Range: 20 - 70 m			
	Art. no.	Article	Description	Option
500 mm / 2	66501501	MLD500-XT2/A	Transmitter	
	66533501	MLD510-XR2/A	Receiver	
	66502501	MLD500-XT2L/A	Transmitter	With integrated laser alignment aid
	66536501	MLD510-XR2L/A	Receiver	With reflex element for laser alignment aid
	66533502	MLD510-XR2E/A	Receiver	With connection socket for external muting indicator
	66536502	MLD510-XR2LE/A	Receiver	With reflex element for laser alignment aid and connection socket for external muting indicator
400 mm / 3	66501601	MLD500-XT3/A	Transmitter	
	66533601	MLD510-XR3/A	Receiver	
	66502601	MLD500-XT3L/A	Transmitter	With integrated laser alignment aid
	66536601	MLD510-XR3L/A	Receiver	With reflex element for laser alignment aid
	66533602	MLD510-XR3E/A	Receiver	With connection socket for external muting indicator
	66536602	MLD510-XR3LE/A	Receiver	With reflex element for laser alignment aid and connection socket for external muting indicator
300 mm / 4	66501701	MLD500-XT4/A	Transmitter	
	66533701	MLD510-XR4/A	Receiver	
	66502701	MLD500-XT4L/A	Transmitter	With integrated laser alignment aid
	66536701	MLD510-XR4L/A	Receiver	With reflex element for laser alignment aid
	66533702	MLD510-XR4E/A	Receiver	With connection socket for external muting indicator
	66536702	MLD510-XR4LE/A	Receiver	With reflex element for laser alignment aid and connection socket for external muting indicator

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MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

MLD 510/AS-i, consisting of transmitter and receiver or transceiver and Deflecting Mirror
 Included in delivery: 4 sliding blocks, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Functions (in combination with ASM Safety Monitor): Start/restart interlock selectable, contactor monitoring selectable, 2-sensor parallel muting, 2-sensor sequential muting, 4-sensor sequential muting, muting-timeout extension

Beam distance/ number of beams	MLD 510/AS-i transceiver systems			
	Range: 0.5 - 8 m			
	Art. no.	Article	Description	Option
500 mm / 2	66500100	MLD-M002	Deflecting Mirror	
	66537101	MLD510-RT2/A	Transceiver	
	66538101	MLD510-RT2M/A	Transceiver	With integrated muting indicator
	66537102	MLD510-RT2E/A	Transceiver	With connection socket for external muting indicator
400 mm / 3	66500201	MLD-XM03	Deflecting Mirror	
	66537201	MLD510-RT3/A	Transceiver	
	66538201	MLD510-RT3M/A	Transceiver	With integrated muting indicator
	66537202	MLD510-RT3E/A	Transceiver	With connection socket for external muting indicator

Beam distance/ number of beams	MLD 510/AS-i transceiver systems			
	Range: 0.5 - 6 m			
	Art. no.	Article	Description	Option
400 mm / 3	66500200	MLD-M003	Deflecting Mirror	
	66537201	MLD510-RT3/A	Transceiver	
	66538201	MLD510-RT3M/A	Transceiver	With integrated muting indicator
	66537202	MLD510-RT3E/A	Transceiver	With connection socket for external muting indicator

Article list for MLD 500, MLD 300

Article	Description
MLD	Multiple Light Beam Safety Device
X	Series
3	MLD 300
5	MLD 500
yy	Function variant
00	Transmitter
10	Automatic restart
12	External testing
20	Start/restart interlock selectable, contactor monitoring selectable
30	Muting
35	4-sensor sequential muting
z	Device type
T	Transmitter
R	Receiver
RT	Transceiver
xT	Transmitter for high range
xR	Receiver for high range
a	Number of beams
2	2-beam
3	3-beam
4	4-beam
b	Option
L	Integrated laser alignment aid
M	Integrated muting indicator
E	Connection socket for external muting indicator (only AS-i variants)
t	Safety-related switching outputs (OSSD), connection system
-	Transistor output, M12 plug
A	Integrated AS-Interface, M12 connector, (safety bus systems)

MLD X yy z a b /t

Machine Safety

Machine Safety Services

Safety Engineering Software

Safety Laser Scanners

Safety Light Curtains

Multiple Light Beam Safety Devices

Light Beam Safety Device Sets

Single Light Beam Safety Devices

AS-Interface Safety at Work

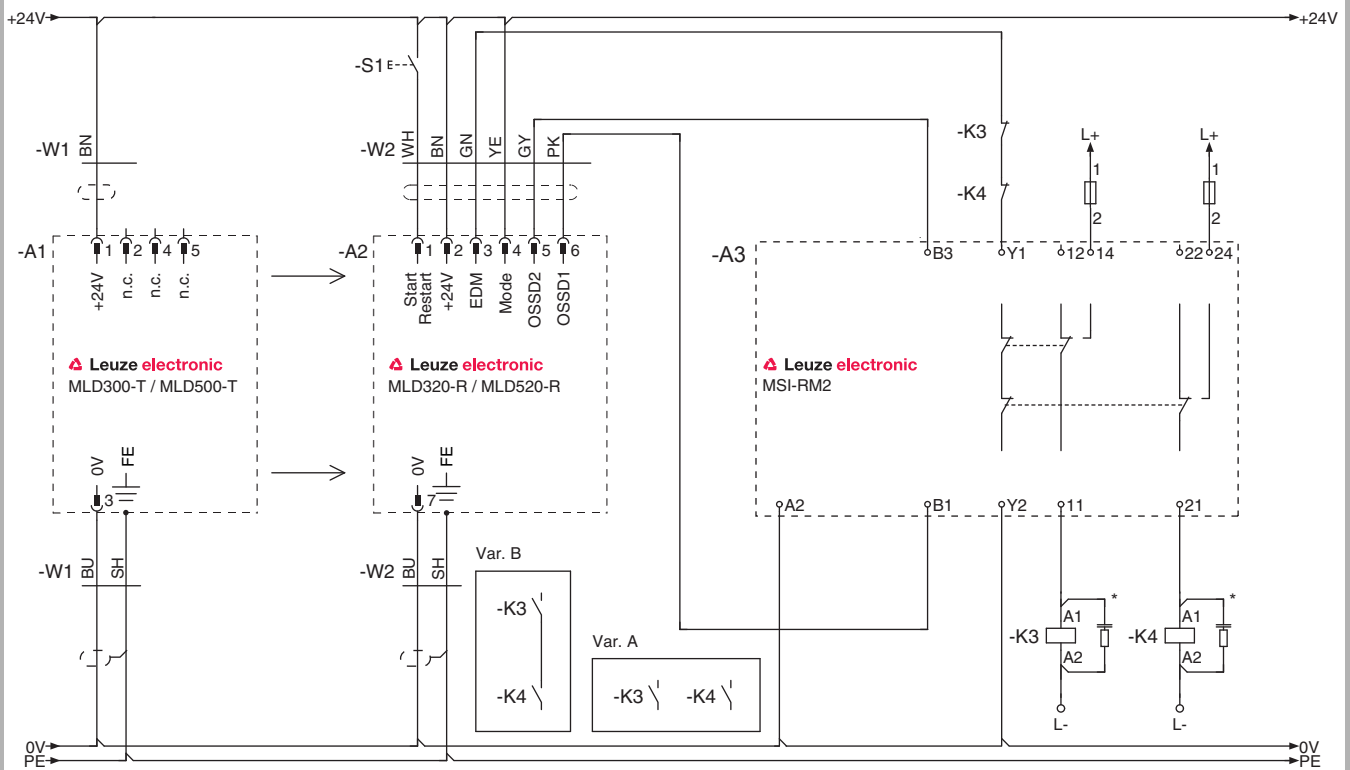
PROFIsafe Sensors

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MULTIPLE LIGHT BEAM SAFETY DEVICES

Electrical connection

MLD 500 connection example



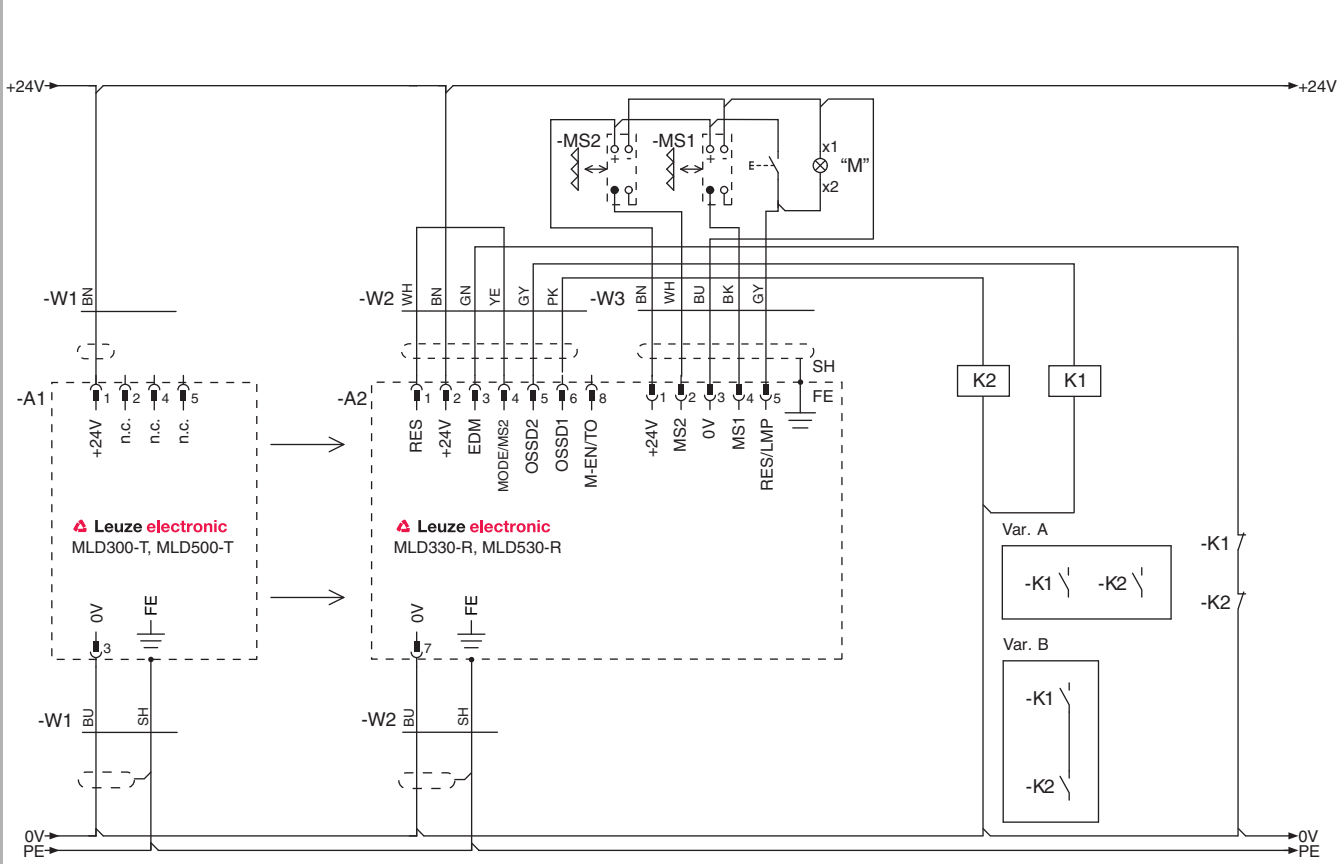
*) Spark extinction circuit, supply suitable spark extinction

MLD 500 Multiple Light Beam Safety Device (transmitter-receiver system) with MSI-RM2 Safety Relay (transceiver connected in an analogous manner)

! Please observe the operating instructions of the components!

Electrical connection

MLD 500 connection example



2-sensor parallel muting with MLD 530 Multiple Light Beam Safety Device (transmitter-receiver system), muting timeout 10 min (transceiver connected in an analogous manner)

⚠ Please observe the operating instructions of the components!

MULTIPLE LIGHT BEAM SAFETY DEVICES

Technical data

General system data			
Type in accordance with EN IEC 61496	4		
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3		
Performance Level (PL) in accordance with EN ISO 13849-1	e		
Category in accordance with EN ISO 13849	4		
Number of beams	2	3	4
Beam distance	500 mm	400 mm	300 mm
Average probability of a failure to danger per hour (PFH _d)	6.6 x 10 ⁻⁹		
Mean time to dangerous failure (MTTF _d)	146 years		
Service life (T _M) in accordance with EN ISO 13849-1	20 years		
Range (transmitter-receiver systems, type-dependent)	MLDxyy-R /-T: 0.5...50 m MLDxyy-xR /-xT: 20...70 m		
Range (transceiver systems)	0.5 - 8 m		
Response time	25 ms for MLD 510, MLD 520. 50 ms for MLD 530		
Supply voltage	+24 V, ±20%		
Connection cable length	100 m		
Safety class	III		
Protection rating	IP 67		
Ambient temperature, operation	-30...+55°C		
Ambient temperature, storage	-40... +75°C		
Relative humidity	0...95 %		
Profile cross-section	52 mm x 65 mm		
Weight	Type-dependent		
Transmitter			
Transmitter diodes, class in accordance with EN 60825	1		
Wavelength	850 nm		
Current consumption	50 mA		
Connection system	M12 plug, 5-pin		
Receiver			
Current consumption	150 mA without external load, muting sensors and muting indicator		
Safety-related switching outputs	2 pnp transistor outputs, AS-i Safety Interface		
Switching voltage high active	Min. 18.2 V		
Switching voltage low	Max. 2.5 V		
Switching current	Typical, 300 mA		
Connection system	M12 plug, 5-pin, 8-pin		

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Technical data

Transceiver	
Current consumption	150 mA without external load, muting sensors and muting indicator
Safety-related switching outputs (OSSDs)	2 pnp transistor outputs
Switching voltage high active	Min. 18.2 V
Switching voltage low	Max. 2.5 V
Switching current	Typical, 300 mA
Connection system	M12 plug, 5-pin

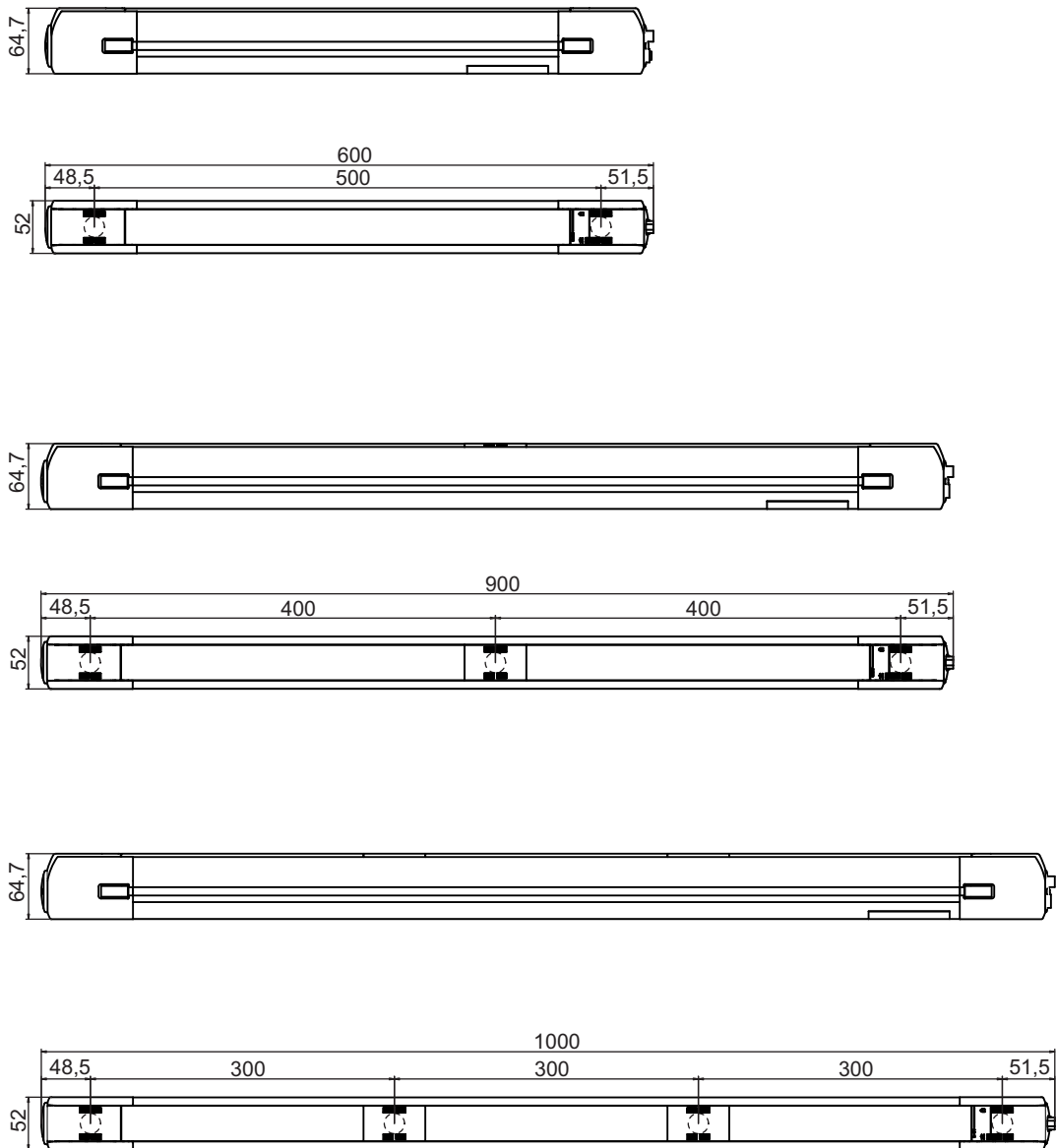
Additional information can be found in the MLD Connecting and Operating Instructions at www.leuze.com/mld.

www.leuze.com/mld/

MULTIPLE LIGHT BEAM SAFETY DEVICES

Dimensional drawings

MLD 500 Multiple Light Beam Safety Device, transmitter, receiver



Dimensions in mm

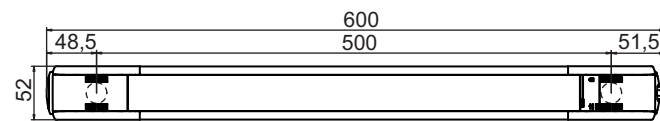
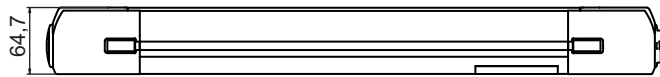
Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

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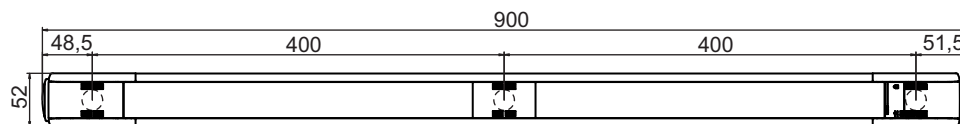
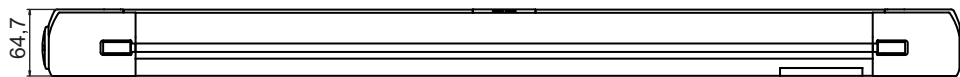
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Dimensional drawings

MLD 500 transceiver



2-beam transceiver



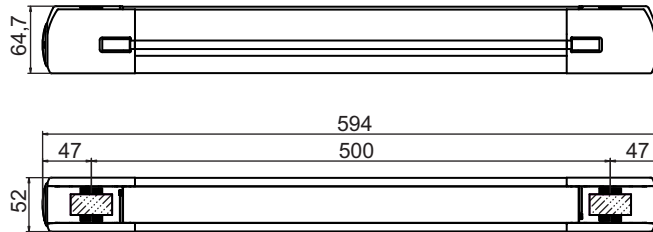
3-beam transceiver

Dimensions in mm

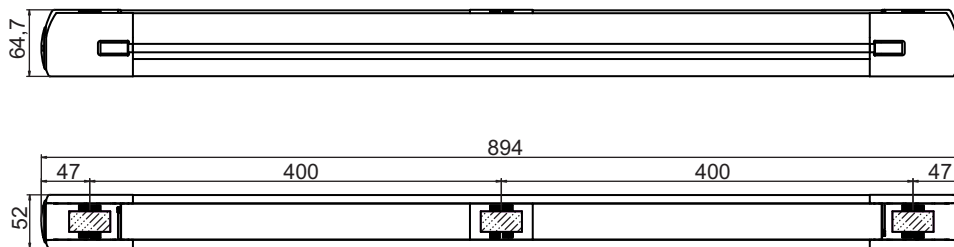
MULTIPLE LIGHT BEAM SAFETY DEVICES

Dimensional drawings

MLD-M Deflecting Mirrors



2-beam Deflecting Mirror MLD-M002

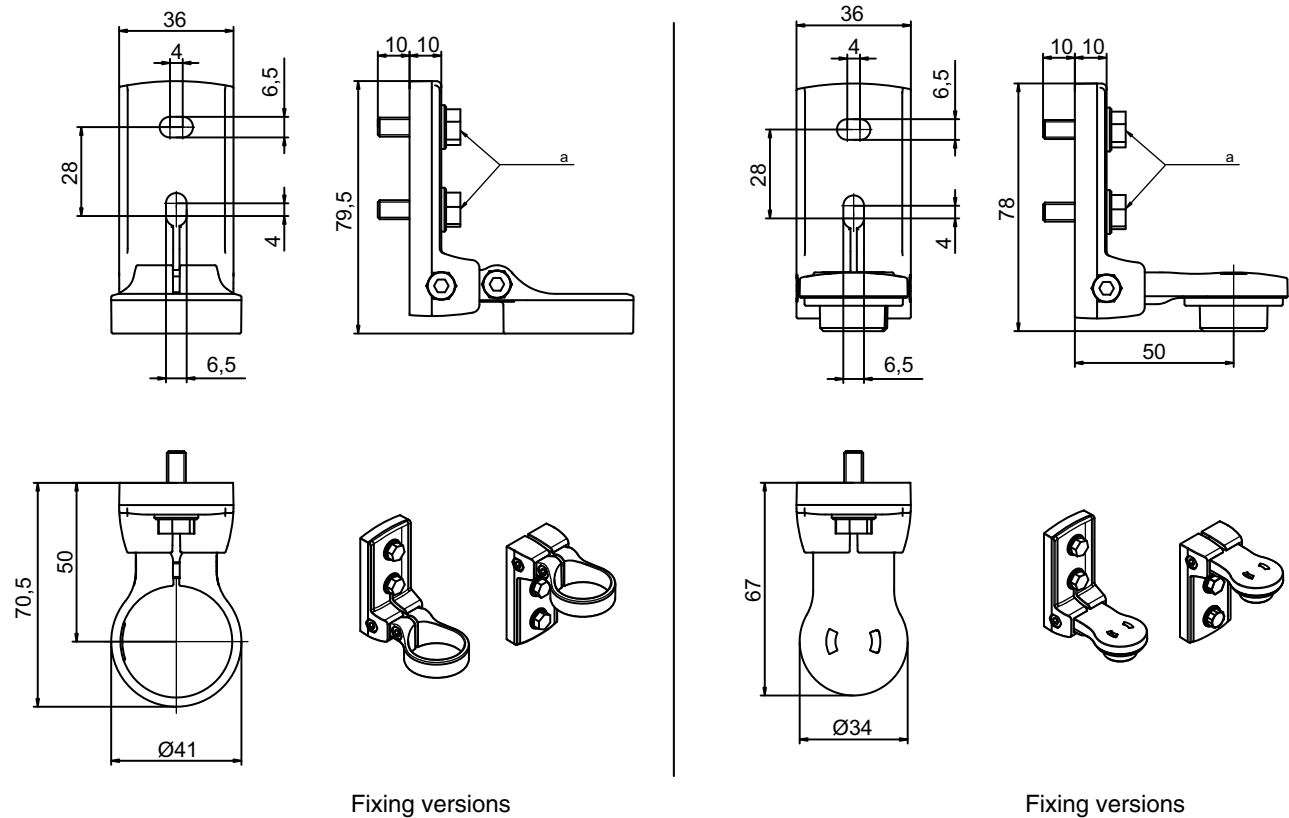


3-beam Deflecting Mirror MLD-M003

Dimensions in mm

Dimensional drawings: Accessories

Mounting brackets



a = screw M6

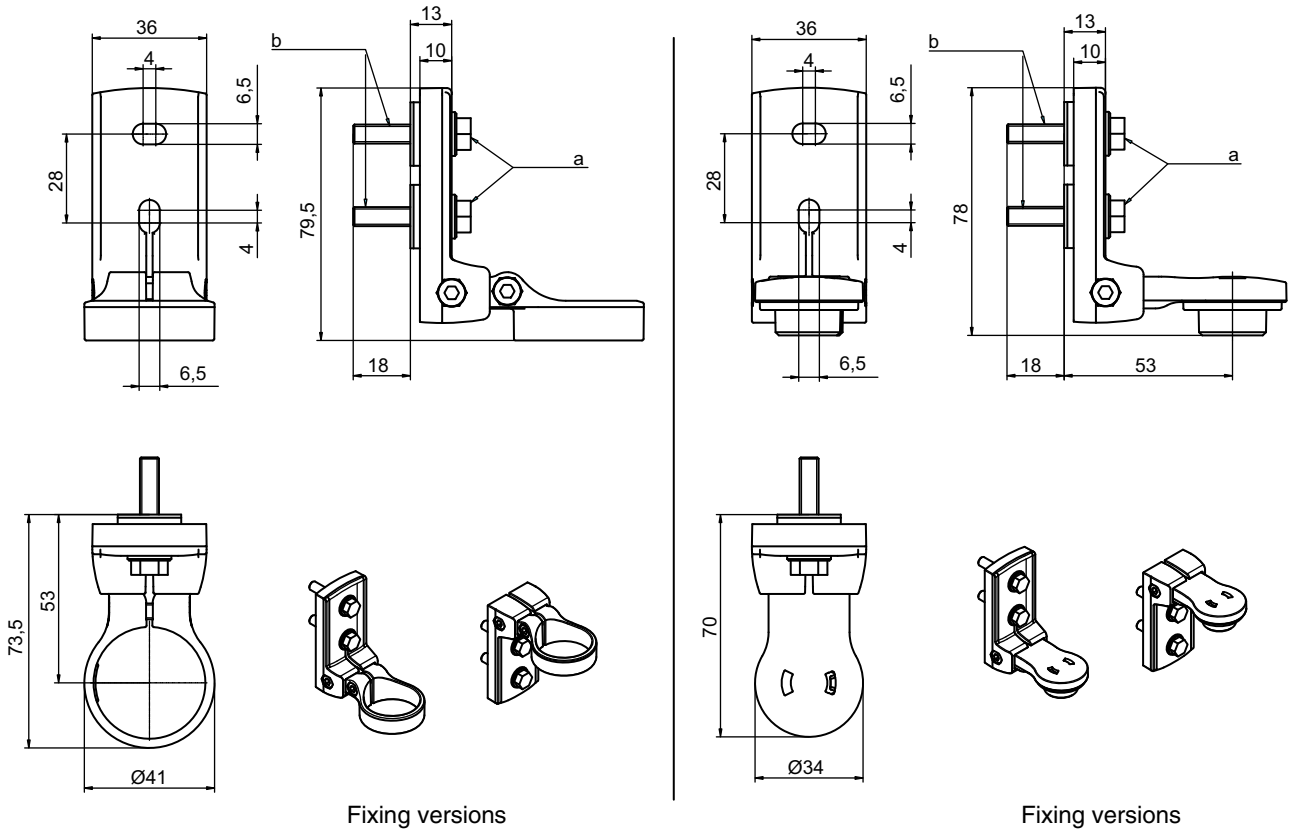
BT-SET-240BC mounting bracket set, consisting of BT-240B swivel mounts (right) and BT-240C (left), screws.
 For all MLD 300/500 (but not for MLD-M00X; here, the BT-SET-240CC is to be selected)

Dimensions in mm

MULTIPLE LIGHT BEAM SAFETY DEVICES

Dimensional drawings: Accessories

Mounting brackets



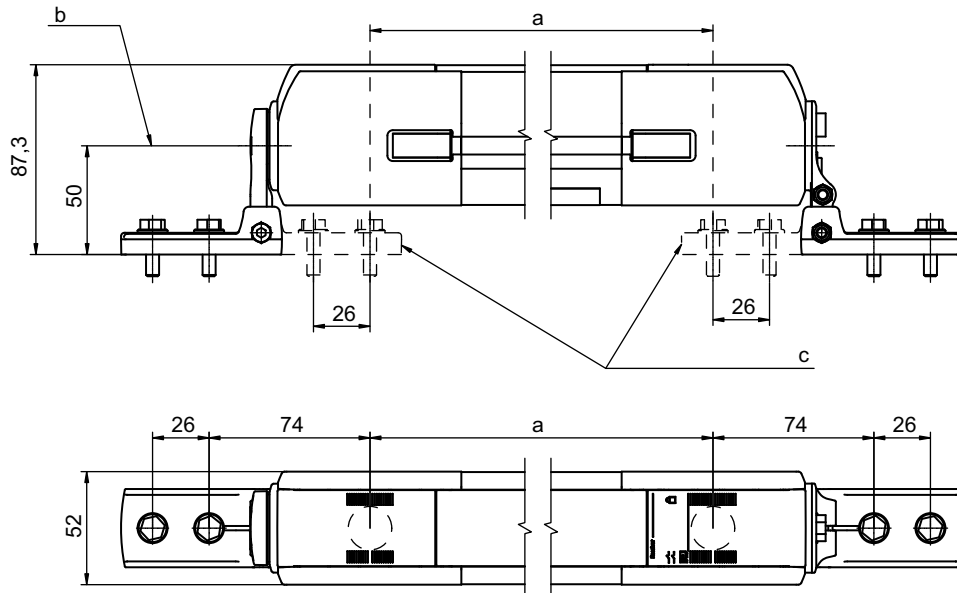
a = screw M6
 b = shock absorber, thread M6

BT-SET-240BC mounting bracket set, consisting of BT-240B swivel mounts (right) and BT-240C (left), screws, shock absorber. For all MLD 300/500 (but not for MLD-M00X; here, the BT-SET-240CCS is to be selected)

Dimensions in mm

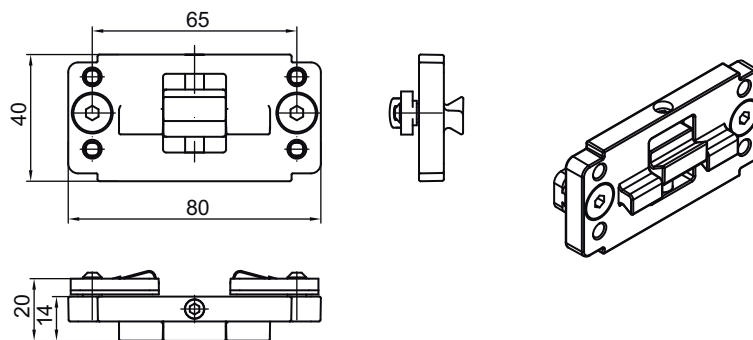
Dimensional drawings: Accessories

Mounting brackets



- a = beam distance
- b = swivel axis
- c = alternative fixing version

BT-240B and BT-240C swivel mount mounting dimensions



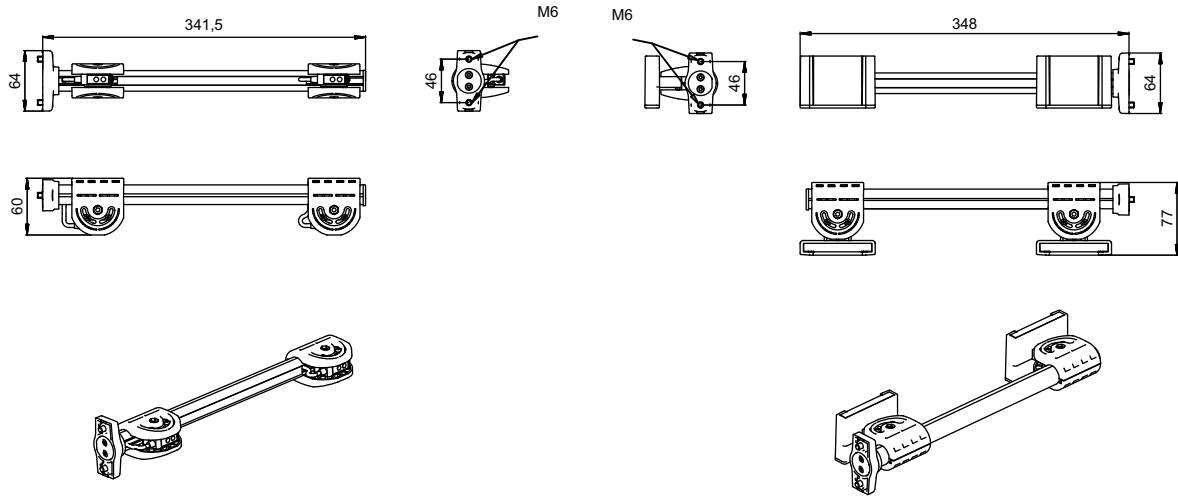
BT-P40 clamp bracket

Dimensions in mm

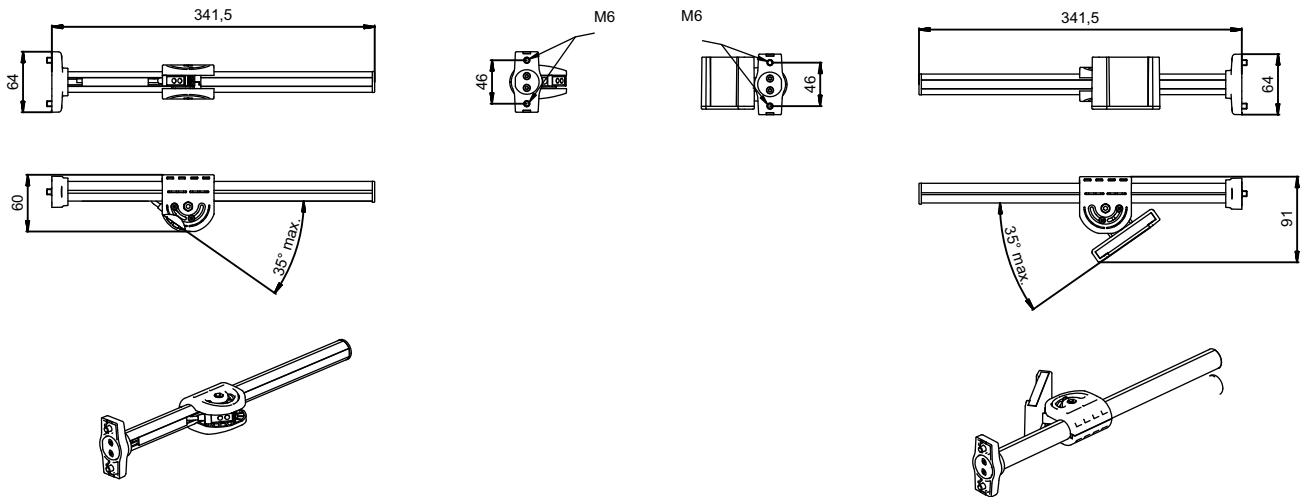
MULTIPLE LIGHT BEAM SAFETY DEVICES

Dimensional drawings: Accessories

Muting Sensor Sets



Muting Sensor Set for 4-sensor sequential muting



Muting Sensor Set for 2-sensor parallel muting

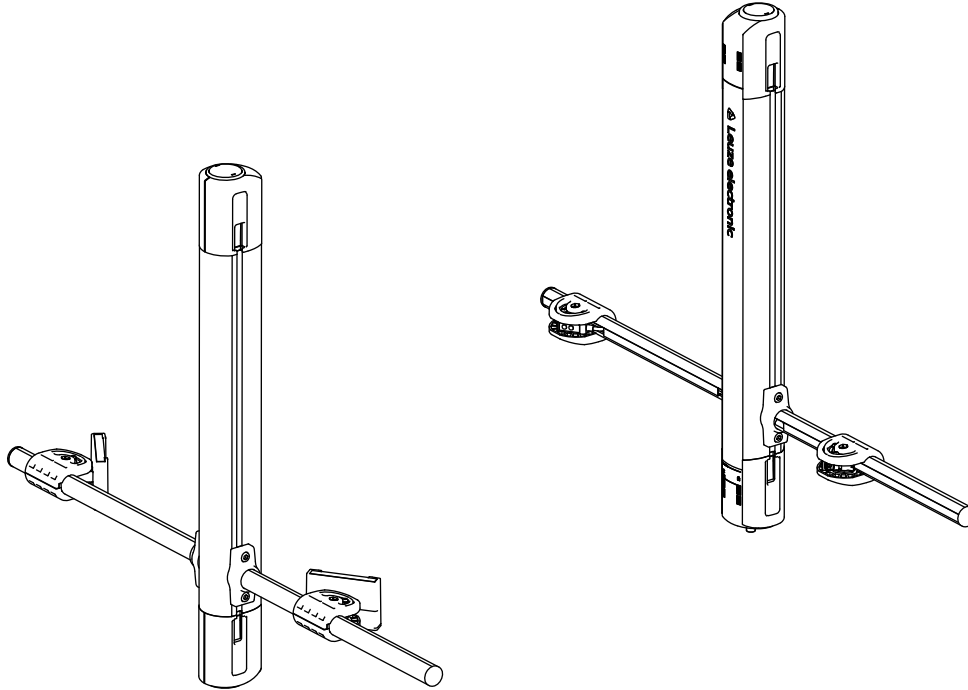
Dimensions in mm

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Assembly drawings

Muting Sensor Set



Set-AC-MT-2S mounted on MLD 500 Multiple Light Beam Safety Device

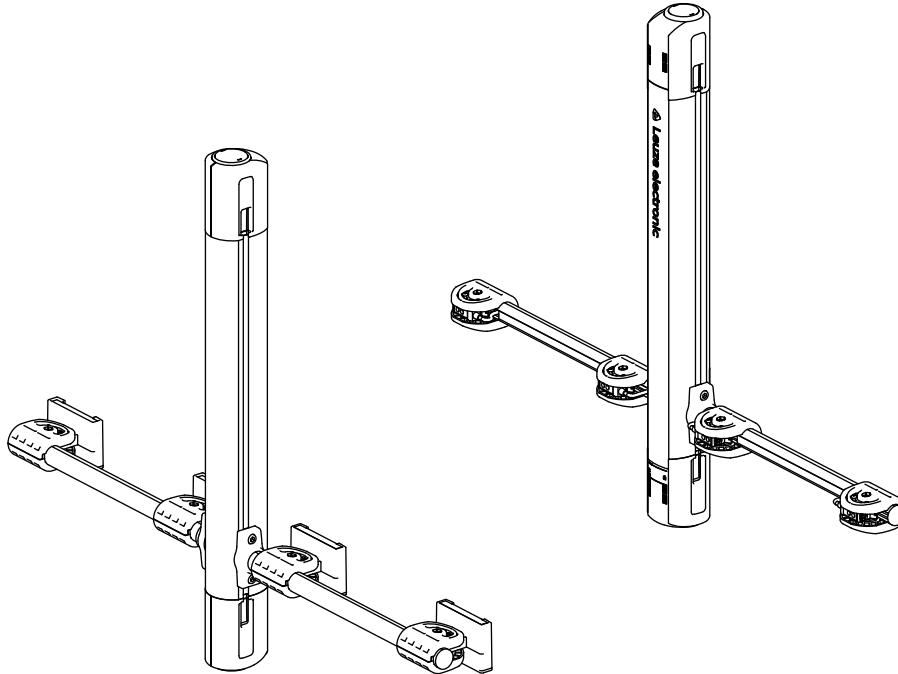
MLD with SET-AC AC-SCM5 (-BT) connection box make up a complete system.

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MULTIPLE LIGHT BEAM SAFETY DEVICES

Assembly drawings

Muting Sensor Set

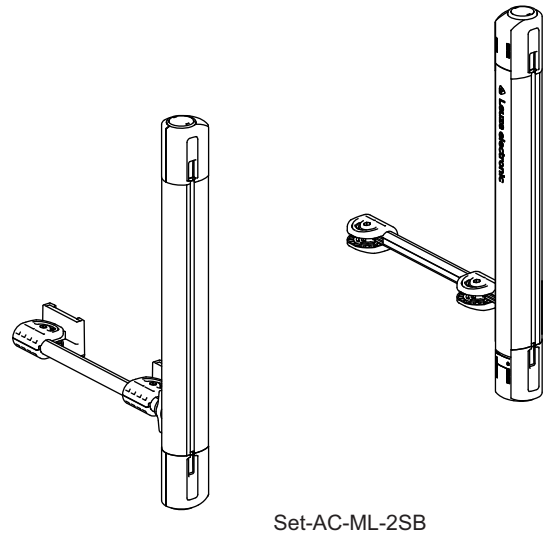
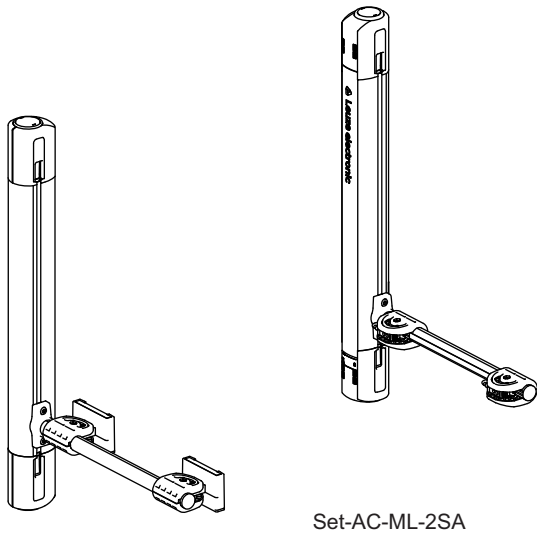


Set-AC-MT-4S mounted on MLD 500 Multiple Light Beam Safety Device

MLD with SET-AC and AC-SCM6 (-BT) connection box comprises a complete system.

Assembly drawings

Muting Sensor Set



Set-AC-ML mounted on MLD 500 Multiple Light Beam Safety Device; depending on the alignment of the Muting Sensor Set, either Set-AC-ML-2SA or Set-AC-ML-2SB is used

MLD with SET-AC AC-SCM5 (-BT) connection box make up a complete system.

MULTIPLE LIGHT BEAM SAFETY DEVICES

Accessories ordering information

Art. no.	Article	Description	Length, design
Connection cables for MLD 310, MLD 312, MLD 510 (machine interface)			
678055	CB-M12-5000E-5GF	Connecting cable shielded with M12 coupling, 5-pin	5 m, straight/open end
678056	CB-M12-10000E-5GF	Connecting cable shielded with M12 coupling, 5-pin	10 m, straight/open end
678057	CB-M12-15000E-5GF	Connecting cable shielded with M12 coupling, 5-pin	15 m, straight/open end
678058	CB-M12-25000E-5GF	Connecting cable shielded with M12 coupling, 5-pin	25 m, straight/open end
678059	CB-M12-50000E-5GF	Connecting cable shielded with M12 coupling, 5-pin	50 m, straight/open end
Connection cables for MLD 320, MLD 330, MLD 335, MLD 520, MLD 530, MLD 535 (machine interface)			
678060	CB-M12-5000E-8GF	Connecting cable shielded with M12 coupling, 8-pin	5 m, straight/open end
678061	CB-M12-10000E-8GF	Connecting cable shielded with M12 coupling, 8-pin	10 m, straight/open end
678062	CB-M12-15000E-8GF	Connecting cable shielded with M12 coupling, 8-pin	15 m, straight/open end
678063	CB-M12-25000E-8GF	Connecting cable shielded with M12 coupling, 8-pin	25 m, straight/open end
678064	CB-M12-50000E-8GF	Connecting cable shielded with M12 coupling, 8-pin	50 m, straight/open end
Connection cables for MLD 330, MLD 530 (local interface)			
678050	CB-M12-5000E-5GM	Connecting cable shielded with M12 plug, 5-pin	5 m, straight/open end
678051	CB-M12-10000E-5GM	Connecting cable shielded with M12 plug, 5-pin	10 m, straight/open end
678052	CB-M12-15000E-5GM	Connecting cable shielded with M12 plug, 5-pin	15 m, straight/open end
678053	CB-M12-25000E-5GM	Connecting cable shielded with M12 plug, 5-pin	25 m, straight/open end
Connection cables for MLD 335, MLD 535 (local interface)			
50110180	KB M12/8-5000-SA	Connection cables for MLD 335, MLD 535 (local interface), 8-pin, length 5 m	
50110181	KB M12/8-10000-SA	Connection cables for MLD 335, MLD 535 (local interface), 8-pin, length 10 m	
50110186	KB M12/8-15000-SA	Connection cables for MLD 335, MLD 535 (local interface), 8-pin, length 15 m	
50110188	KB M12/8-25000-SA	Connection cables for MLD 335, MLD 535 (local interface), 8-pin, length 25 m	

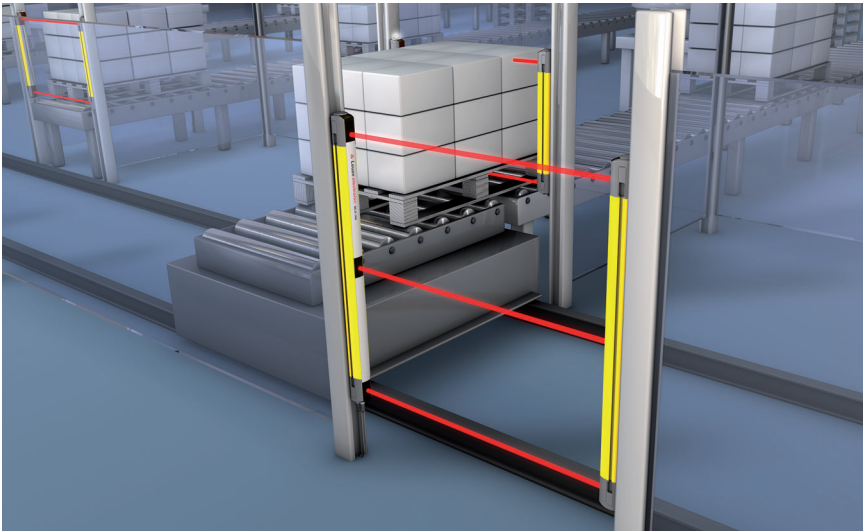
Accessories ordering information

Art. no.	Article	Description	Length, design
Mounting brackets and mounting bracket sets			
424416	BT-P40	Clamp bracket	
560340	BT-SET-240BC	Consisting of BT-240B, BT-240C swivel mounts, screws	
560341	BT-SET-240CC	Consisting of 2 x BT-240C swivel mounts, screws (for MLD-M002 or MLD-M003 Deflecting Mirror)	
560342	BT-SET-240BCS	Consisting of BT-240B, BT-240C swivel mounts, screws, shock absorber	
560343	BT-SET-240CCS	Consisting of 2 x BT-240C swivel mounts, screws, shock absorber (for MLD-M002 or MLD-M003 Deflecting Mirror)	
560344	BT-SET-240C	Consisting of BT-240C swivel mount, screws	
560345	BT-SET-240CS	Consisting of BT-240C swivel mount, screws, shock absorber	
560346	BT-SET-240BS	Consisting of BT-240C swivel mount, screws, shock absorber	
560347	BT-SET-240B	Consisting of BT-240 B standard swivel mount (swivel mount 240° rotation), screws	
Accessories for muting			
520062	AC-SCM5	Local connection box with M12-connection for connecting to 5-pin local interface (4 connections for 2 muting sensors, muting indicator, reset button)	
520063	AC-SCM5-BT	Local connection box with M12-connection for connecting to 5-pin local interface (4 connections for 2 muting sensors, muting indicator, reset button), with mounting plate	
520058	AC-SCM6	Local connection box with M12-connection for connecting to 8-pin local interface (6 connections for 4 muting sensors, muting indicator, reset button)	
520059	AC-SCM6-BT	Local connection box with M12-connection for connecting to 8-pin local interface (6 connections for 4 muting sensors, muting indicator, reset button), with mounting plate	
426490	Set-AC-ML-2SA	Muting Sensor Set for 2-sensor sequential muting, incl. 2 Reflection Light Beam Devices, (range 3.6 m) with cable connection, 2 reflectors, pre-mounted	
426491	Set-AC-ML-2SB	Muting Sensor Set for 2-sensor sequential muting, incl. 2 Reflection Light Beam Devices, (range 3.6 m) with cable connection, 2 reflectors, pre-mounted	
426492	Set-AC-MT-4S	Muting Sensor Set for 4-sensor sequential muting, incl. 4 Reflection Light Beam Devices, (range 3.6 m) with cable connection, 4 reflectors, pre-mounted	
426494	Set-AC-MT-2S	Muting Sensor Set for 2-sensor parallel muting, incl. 2 Reflection Light Beam Devices, (range 3.6 m) with cable connection, 2 reflectors, pre-mounted	
Accessories for laser alignment aid			
520071	AC-MK1	MagnetKey for activation of the laser alignment aid	

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MULTIPLE LIGHT BEAM SAFETY DEVICES

MLD 300

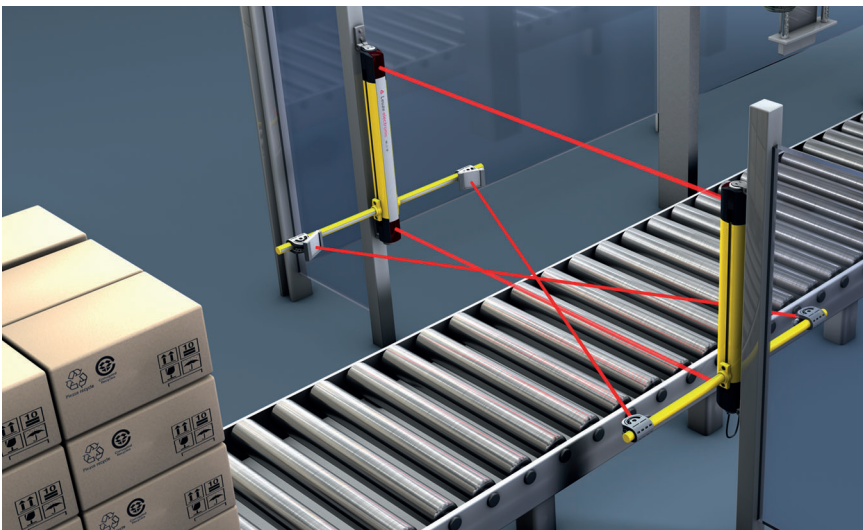


Access guarding with 3-beam transceiver of the MLD 300 series for conveyor and storage systems

It is advantageous from a cost effectiveness and optimum usability standpoint to use safety sensors that are characterized by functions that match the specific requirements of the given application as closely as possible. The Multiple Light Beam Safety Device MLD 300 (type 2, PLd) has been specially designed for this.

As for the MLD 500 series (type 4, PL e), the MLD 300 sensors are characterized by their individual function classes. A start/restart interlock and contactor monitoring can thereby be selected and, if necessary, various muting modes realized. The series can be used both as standard access guarding as well as for applications where sequential, parallel or partial muting is required. Additional muting devices are not required, thus simplifying construction and lowering costs during setup of the muting application.

The series is predestined for wide-area perimeter guarding, which is realized with Deflecting Mirrors, enabling operation at ranges of up to 70 m. In addition to transmitter/receiver versions, 2- and 3-beam (patented) transceiver versions are also available. No PC is necessary for configuration, as the functions are set via the pin assignments at the connection. Operating temperatures as low as -30°C are possible. Options such as the integrated laser alignment aid, an integrated muting indicator and the patented swivel mount for easy fastening and alignment round out the MLD product range.



MLD 300 Multiple Light Beam Safety Device with integrated parallel muting at one conveyor line

Typical areas of application

- Print and paper machinery; Packaging machinery in accordance with EN 415
- Conveyor systems in accordance with prEN 620; continuous conveyors for piece goods in accordance with EN 619
- Woodworking machinery in accordance with EN 691, textile machinery, e.g. in accordance with ISO 11111
- Protective devices for storage and narrow passages in accordance with DIN 15185, Part 2
- Further areas of application: machinery and plant systems acc. to C-standards, in which category 2 safety devices are required

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Important technical data, overview

Type in accordance with EN IEC 61496	2		
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	2		
Performance Level (PL) in accordance with EN ISO 13849-1	d		
Category in accordance with EN ISO 13849	3		
Number of beams	2	3	4
Beam distance	500 mm	400 mm	300 mm
Range (transmitter-receiver systems, type-dependent)	MLDxyy-R /-T: 0.5...50 m MLDxyy-xR /-xT: 20...70 m		
Range (transceiver systems)	0.5 - 8 m		
Profile cross-section	52 mm x 65 mm		
Safety-related switching outputs (OSSDs)	2 pnp transistor outputs		
Connection system	M12 plug		

Functions

	MLD 310, MLD 312*	MLD 320	MLD 330	MLD 335
Automatic start/restart	●	●		
Start/restart interlock (RES)		●	●	●
Contacting monitoring (EDM), selectable		●	●	●
2-sensor muting (parallel, sequential)			●	●
4-sensor muting (sequential)				●
Configurable operating modes		●	●	●
Laser alignment aid (optional for transmitter-receiver systems)	●	●		


*) MLD 312 with external test

Special features




- Version available as 3-beam transceiver
- Integrated muting function, no additional muting module is necessary
- The configuration is simply performed by means of wiring, i. e. no software, PC or DIP switch are necessary
- The use at ambient temperatures as low as -30 °C is possible
- Options: integrated laser alignment aid, integrated muting indicator, 7-segment display



Features



Multiple Light Beam Safety Devices

Light Beam Safety Device Sets

Further information	Page
● Ordering information	198
● Electrical connection	180
● Technical data	209
● Dimensional drawings	184
● Dimensional drawings: Accessories	187
● Accessories ordering information	194

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MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

MLD 310, consisting of transmitter and receiver
 Included in delivery: 4 sliding blocks, 1 set of connecting and
 operating instructions (PDF file on CD-ROM)

Functions: Automatic restart, 2 OSSDs

MLD 310 transmitter-receiver systems				
Range: 0.5 - 50 m				
Beam distance/ number of beams	Art. no.	Article	Description	Option
500 mm / 2	66001100	MLD300-T2	Transmitter	
	66033100	MLD310-R2	Receiver	
	66002100	MLD300-T2L	Transmitter	With integrated laser alignment aid
	66036100	MLD310-R2L	Receiver	With reflex element for laser alignment aid
400 mm / 3	66001200	MLD300-T3	Transmitter	
	66033200	MLD310-R3	Receiver	
	66002200	MLD300-T3L	Transmitter	With integrated laser alignment aid
	66036200	MLD310-R3L	Receiver	With reflex element for laser alignment aid
300 mm / 4	66001300	MLD300-T4	Transmitter	
	66033300	MLD310-R4	Receiver	
	66002300	MLD300-T4L	Transmitter	With integrated laser alignment aid
	66036300	MLD310-R4L	Receiver	With reflex element for laser alignment aid

Ordering information

MLD 310, consisting of transmitter and receiver or transceiver and Deflecting Mirror
 Included in delivery: 4 sliding blocks, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Functions: Automatic restart, 2 OSSDs

Beam distance/ number of beams	MLD 310			
	Range: 20 - 70 m			
	Art. no.	Article	Description	Option
500 mm / 2	66001500	MLD300-XT2	Transmitter	
	66033500	MLD310-XR2	Receiver	
	66002500	MLD300-XT2L	Transmitter	With integrated laser alignment aid
	66036500	MLD310-XR2L	Receiver	With reflex element for laser alignment aid
400 mm / 3	66001600	MLD300-XT3	Transmitter	
	66033600	MLD310-XR3	Receiver	
	66002600	MLD300-XT3L	Transmitter	With integrated laser alignment aid
	66036600	MLD310-XR3L	Receiver	With reflex element for laser alignment aid
300 mm / 4	66001700	MLD300-XT4	Transmitter	
	66033700	MLD310-XR4	Receiver	
	66002700	MLD300-XT4L	Transmitter	With integrated laser alignment aid
	66036700	MLD310-XR4L	Receiver	With reflex element for laser alignment aid

Beam distance/ number of beams	MLD 310 transceiver systems			
	Range: 0.5 - 8 m			
	Art. no.	Article	Description	Option
500 mm / 2	66500100	MLD-M002	Deflecting Mirror	
	66037100	MLD310-RT2	Transceiver	
400 mm / 3	66500201	MLD-XM03	Deflecting Mirror	
	66037200	MLD310-RT3	Transceiver	

Beam distance/ number of beams	MLD 310 transceiver systems			
	Range: 0.5 - 6 m			
	Art. no.	Article	Description	Option
400 mm / 3	66500200	MLD-M003	Deflecting Mirror	
	66037200	MLD310-RT3	Transceiver	

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MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

MLD 312, consisting of transmitter and receiver or transceiver and Deflecting Mirror
 Included in delivery: 4 sliding blocks, 1 set of connecting and operating instructions (PDF files on CD-ROM)

Functions: Automatic restart, 1 OSSD, 1 test input

Beam distance/ number of beams	MLD 312			
	Range: 0.5 - 50 m			
	Art. no.	Article	Description	Option
500 mm / 2	66001100	MLD300-T2	Transmitter	
	66043100	MLD312-R2	Receiver	
	66002100	MLD300-T2L	Transmitter	With integrated laser alignment aid
	66046100	MLD312-R2L	Receiver	With reflex element for laser alignment aid
400 mm / 3	66001200	MLD300-T3	Transmitter	
	66043200	MLD312-R3	Receiver	
	66002200	MLD300-T3L	Transmitter	With integrated laser alignment aid
	66046200	MLD312-R3L	Receiver	With reflex element for laser alignment aid
300 mm / 4	66001300	MLD300-T4	Transmitter	
	66043300	MLD312-R4	Receiver	
	66002300	MLD300-T4L	Transmitter	With integrated laser alignment aid
	66046300	MLD312-R4L	Receiver	With reflex element for laser alignment aid

Ordering information

MLD 312, consisting of transmitter and receiver or transceiver and Deflecting Mirror
 Included in delivery: 4 sliding blocks, 1 set of connecting and operating instructions (PDF files on CD-ROM)

Functions: Automatic restart, 1 OSSD, 1 test input

Beam distance/ number of beams	MLD 312			
	Range: 20 - 70 m			
	Art. no.	Article	Description	Option
500 mm / 2	66001500	MLD300-XT2	Transmitter	
	66043500	MLD312-XR2	Receiver	
	66002500	MLD300-XT2L	Transmitter	With integrated laser alignment aid
	66046500	MLD312-XR2L	Receiver	With reflex element for laser alignment aid
400 mm / 3	66001600	MLD300-XT3	Transmitter	
	66043600	MLD312-XR3	Receiver	
	66002600	MLD300-XT3L	Transmitter	With integrated laser alignment aid
	66046600	MLD312-XR3L	Receiver	With reflex element for laser alignment aid
300 mm / 4	66001700	MLD300-XT4	Transmitter	
	66043700	MLD312-XR4	Receiver	
	66002700	MLD300-XT4L	Transmitter	With integrated laser alignment aid
	66046700	MLD312-XR4L	Receiver	With reflex element for laser alignment aid

Beam distance/ number of beams	MLD 312 transceiver systems			
	Range: 0.5 - 8 m			
	Art. no.	Article	Description	Option
500 mm / 2	66500100	MLD-M002	Deflecting Mirror	
	66047100	MLD312-RT2	Transceiver	
400 mm / 3	66500201	MLD-XM03	Deflecting Mirror	
	66047200	MLD312-RT3	Transceiver	

Beam distance/ number of beams	MLD 312 transceiver systems			
	Range: 0.5 - 6 m			
	Art. no.	Article	Description	Option
400 mm / 3	66500200	MLD-M003	Deflecting Mirror	
	66047200	MLD312-RT3	Transceiver	

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MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

MLD 320, consisting of transmitter and receiver
 Included in delivery: 4 sliding blocks, 1 connecting and operating
 instructions (PDF file on CD-ROM)

Functions: 2 OSSDs, start/restart interlock selectable,
 contactor monitoring selectable

Beam distance/ number of beams	MLD 320			
	Range: 0.5 - 50 m			
	Art. no.	Article	Description	Option
500 mm / 2	66001100	MLD300-T2	Transmitter	
	66053100	MLD320-R2	Receiver	
	66002100	MLD300-T2L	Transmitter	With integrated laser alignment aid
	66056100	MLD320-R2L	Receiver	With reflex element for laser alignment aid
400 mm / 3	66001200	MLD300-T3	Transmitter	
	66053200	MLD320-R3	Receiver	
	66002200	MLD300-T3L	Transmitter	With integrated laser alignment aid
	66056200	MLD320-R3L	Receiver	With reflex element for laser alignment aid
300 mm / 4	66001300	MLD300-T4	Transmitter	
	66053300	MLD320-R4	Receiver	
	66002300	MLD300-T4L	Transmitter	With integrated laser alignment aid
	66056300	MLD320-R4L	Receiver	With reflex element for laser alignment aid

Ordering information

MLD 320, consisting of transmitter and receiver or transceiver and Deflecting Mirror
 Included in delivery: 4 sliding blocks, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Functions: 2 OSSDs, start/restart interlock selectable, contactor monitoring selectable

Beam distance/ number of beams	MLD 320			
	Range: 20 - 70 m			
	Art. no.	Article	Description	Option
500 mm / 2	66001500	MLD300-XT2	Transmitter	
	66053500	MLD320-XR2	Receiver	
	66002500	MLD300-XT2L	Transmitter	With integrated laser alignment aid
	66056500	MLD320-XR2L	Receiver	With reflex element for laser alignment aid
400 mm / 3	66001600	MLD300-XT3	Transmitter	
	66053600	MLD320-XR3	Receiver	
	66002600	MLD300-XT3L	Transmitter	With integrated laser alignment aid
	66056600	MLD320-XR3L	Receiver	With reflex element for laser alignment aid
300 mm / 4	66001700	MLD300-XT4	Transmitter	
	66053700	MLD320-XR4	Receiver	
	66002700	MLD300-XT4L	Transmitter	With integrated laser alignment aid
	66056700	MLD320-XR4L	Receiver	With reflex element for laser alignment aid

Beam distance/ number of beams	MLD 320 transceiver systems			
	Range: 0.5 - 8 m			
	Art. no.	Article	Description	Option
500 mm / 2	66500100	MLD-M002	Deflecting Mirror	
	66057100	MLD320-RT2	Transceiver	
400 mm / 3	66500201	MLD-XM03	Deflecting Mirror	
	66057200	MLD320-RT3	Transceiver	

Beam distance/ number of beams	MLD 320 transceiver systems			
	Range: 0.5 - 6 m			
	Art. no.	Article	Description	Option
400 mm / 3	66500200	MLD-M003	Deflecting Mirror	
	66057200	MLD320-RT3	Transceiver	

www.leuze.com/mld/

MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

MLD 330, consisting of transmitter and receiver
Included in delivery: 4 sliding blocks, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Functions: 2 OSSDs, start/restart interlock selectable, contactor monitoring selectable, 2-sensor parallel muting, 2-sensor sequential muting, muting-timeout extension, alternative connection for second muting signal, muting enable function, partial muting

Beam distance/ number of beams	MLD 330			
	Range: 0.5 - 50 m			
	Art. no.	Article	Description	Option
500 mm / 2	66001100	MLD300-T2	Transmitter	
	66063100	MLD330-R2	Receiver	
	66064100	MLD330-R2M	Receiver	With integrated muting indicator
	66002100	MLD300-T2L	Transmitter	With integrated laser alignment aid
	66066100	MLD330-R2L	Receiver	With reflex element for laser alignment aid
400 mm / 3	66001200	MLD300-T3	Transmitter	
	66063200	MLD330-R3	Receiver	
	66064200	MLD330-R3M	Receiver	With integrated muting indicator
	66002200	MLD300-T3L	Transmitter	With integrated laser alignment aid
	66066200	MLD330-R3L	Receiver	With reflex element for laser alignment aid
300 mm / 4	66001300	MLD300-T4	Transmitter	
	66063300	MLD330-R4	Receiver	
	66064300	MLD330-R4M	Receiver	With integrated muting indicator
	66002300	MLD300-T4L	Transmitter	With integrated laser alignment aid
	66066300	MLD330-R4L	Receiver	With reflex element for laser alignment aid
	66065300	MLD330-R4LM	Receiver	With reflex element for laser alignment aid and integrated muting indicator

Ordering information

MLD 330, consisting of transmitter and receiver or transceiver and Deflecting Mirror
 Included in delivery: 4 sliding blocks, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Functions: 2 OSSDs, start/restart interlock selectable, contactor monitoring selectable, 2-sensor parallel muting, 2-sensor sequential muting, muting-timeout extension, alternative connection for second muting signal, muting enable function, partial muting

Beam distance/ number of beams	MLD 330			
	Range: 20 - 70 m			
	Art. no.	Article	Description	Option
500 mm / 2	66001500	MLD300-XT2	Transmitter	
	66063500	MLD330-XR2	Receiver	
	66002500	MLD300-XT2L	Transmitter	With integrated laser alignment aid
	66066500	MLD330-XR2L	Receiver	With reflex element for laser alignment aid
400 mm / 3	66001600	MLD300-XT3	Transmitter	
	66063600	MLD330-XR3	Receiver	
	66002600	MLD300-XT3L	Transmitter	With integrated laser alignment aid
	66066600	MLD330-XR3L	Receiver	With reflex element for laser alignment aid
300 mm / 4	66001700	MLD300-XT4	Transmitter	
	66063700	MLD330-XR4	Receiver	
	66002700	MLD300-XT4L	Transmitter	With integrated laser alignment aid
	66066700	MLD330-XR4L	Receiver	With reflex element for laser alignment aid

Beam distance/ number of beams	MLD 330 transceiver systems			
	Range: 0.5 - 8 m			
	Art. no.	Article	Description	Option
500 mm / 2	66500100	MLD-M002	Deflecting Mirror	
	66067100	MLD330-RT2	Transceiver	
	66068100	MLD330-RT2M	Transceiver	With integrated muting indicator
400 mm / 3	66500201	MLD-XM03	Deflecting Mirror	
	66067200	MLD330-RT3	Transceiver	
	66068200	MLD330-RT3M	Transceiver	With integrated muting indicator

Beam distance/ number of beams	MLD 330 transceiver systems			
	Range: 0.5 - 6 m			
	Art. no.	Article	Description	Option
400 mm / 3	66500200	MLD-M003	Deflecting Mirror	
	66067200	MLD330-RT3	Transceiver	
	66068200	MLD330-RT3M	Transceiver	With integrated muting indicator

www.leuze.com/mld/

MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

MLD 335, consisting of transmitter and receiver or transceiver and Deflecting Mirror
 Included in delivery: 4 sliding blocks, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Functions: 2 OSSDs, start/restart interlock selectable, contactor monitoring selectable, 2-sensor parallel muting, 2-sensor sequential muting, 4-sensor sequential muting, muting-timeout extension, alternative connection for second muting signal, muting enable function, partial muting

Beam distance/ number of beams	MLD 335			
	Range: 0.5 - 50 m			
	Art. no.	Article	Description	Option
500 mm / 2	66001100	MLD300-T2	Transmitter	
	66073100	MLD335-R2	Receiver	
	66074100	MLD335-R2M	Receiver	With integrated muting indicator
	66002100	MLD300-T2L	Transmitter	With integrated laser alignment aid
	66076100	MLD335-R2L	Receiver	With reflex element for laser alignment aid
	66075100	MLD335-R2LM	Receiver	With reflex element for laser alignment aid and integrated muting indicator
400 mm / 3	66001200	MLD300-T3	Transmitter	
	66073200	MLD335-R3	Receiver	
	66074200	MLD335-R3M	Receiver	With integrated muting indicator
	66002200	MLD300-T3L	Transmitter	With integrated laser alignment aid
	66076200	MLD335-R3L	Receiver	With reflex element for laser alignment aid
	66075200	MLD335-R3LM	Receiver	With reflex element for laser alignment aid and integrated muting indicator
300 mm / 4	66001300	MLD300-T4	Transmitter	
	66073300	MLD335-R4	Receiver	
	66074300	MLD335-R4M	Receiver	With integrated muting indicator
	66002300	MLD300-T4L	Transmitter	With integrated laser alignment aid
	66076300	MLD335-R4L	Receiver	With reflex element for laser alignment aid
	66075300	MLD335-R4LM	Receiver	With reflex element for laser alignment aid and integrated muting indicator

Ordering information

MLD 335, consisting of transmitter and receiver or transceiver and Deflecting Mirror
 Included in delivery: 4 sliding blocks, 1 set of connecting and operating instructions (PDF file on CD-ROM)

Functions: 2 OSSDs, start/restart interlock selectable, contactor monitoring selectable, 2-sensor parallel muting, 2-sensor sequential muting, 4-sensor sequential muting, muting-timeout extension, alternative connection for second muting signal, muting enable function, partial muting

MLD 335				
Range: 20 - 70 m				
Beam distance/ number of beams	Art. no.	Article	Description	Option
500 mm / 2	66001500	MLD300-XT2	Transmitter	
	66073500	MLD335-XR2	Receiver	
	66002500	MLD300-XT2L	Transmitter	With integrated laser alignment aid
	66076500	MLD335-XR2L	Receiver	With reflex element for laser alignment aid
400 mm / 3	66001600	MLD300-XT3	Transmitter	
	66073600	MLD335-XR3	Receiver	
	66002600	MLD300-XT3L	Transmitter	With reflex element for laser alignment aid
	66076600	MLD335-XR3L	Receiver	With integrated laser alignment aid
300 mm / 4	66001700	MLD300-XT4	Transmitter	
	66073700	MLD335-XR4	Receiver	
	66002700	MLD300-XT4L	Transmitter	With integrated laser alignment aid
	66076700	MLD335-XR4L	Receiver	With reflex element for laser alignment aid

MLD 335 transceiver systems				
Range: 0.5 - 8 m				
Beam distance/ number of beams	Art. no.	Article	Description	Option
500 mm / 2	66500100	MLD-M002	Deflecting Mirror	
	66077100	MLD335-RT2	Transceiver	
	66078100	MLD335-RT2M	Transceiver	With integrated muting indicator
400 mm / 3	66500201	MLD-XM03	Deflecting Mirror	
	66077200	MLD335-RT3	Transceiver	
	66078200	MLD335-RT3M	Transceiver	With integrated muting indicator

MLD 335 transceiver systems				
Range: 0.5 - 6 m				
Beam distance/ number of beams	Art. no.	Article	Description	Option
400 mm / 3	66500200	MLD-M003	Deflecting Mirror	
	66077200	MLD335-RT3	Transceiver	
	66078200	MLD335-RT3M	Transceiver	With integrated muting indicator

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MULTIPLE LIGHT BEAM SAFETY DEVICES

Article list for MLD 500, MLD 300

Article	Description
MLD	Multiple Light Beam Safety Device
X	Series
3	MLD 300
5	MLD 500
yy	Function variant
00	Transmitter
10	Automatic restart
12	External testing
20	Start/restart interlock selectable, contactor monitoring selectable
30	Muting
35	4-sensor sequential muting
z	Device type
T	Transmitter
R	Receiver
RT	Transceiver
xT	Transmitter for high range
xR	Receiver for high range
a	Number of beams
2	2-beam
3	3-beam
4	4-beam
b	Option
L	Integrated laser alignment aid
M	Integrated muting indicator

Electrical connection

Connection examples see page 180, and 181

MLD 500
p. 166

MLD 300
p. 196

Technical data

General system data			
Type in accordance with EN IEC 61496	2		
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	2		
Performance Level (PL) in accordance with EN ISO 13849-1	d		
Category in accordance with EN ISO 13849	3		
Number of beams	2	3	4
Beam distance	500 mm	400 mm	300 mm
Average probability of a failure to danger per hour (PFH _d)	1.2 x 10 ⁻⁸		
Mean time to dangerous failure (MTTF _d)	146 years		
Service life (T _M) in accordance with EN ISO 13849-1	20 years		
Range (transmitter-receiver systems, type-dependent)	MLDxyy-R /-T: 0.5...50 m MLDxyy-xR /-xT: 20...70 m		
Range (transceiver systems)	0.5 - 8 m		
Response time	25 ms for MLD 310, MLD 312, MLD 320. 50 ms for MLD 330		
Supply voltage	+24 V, ±20%		
Connection cable length	100 m		
Safety class	III		
Protection rating	IP 67		
Ambient temperature, operation	-30...+55°C		
Ambient temperature, storage	-40... +75°C		
Relative humidity	0...95 %		
Profile cross-section	52 mm x 65 mm		
Weight	Type-dependent		
Transmitter			
Transmitter diodes, class in accordance with EN 60825	1		
Wavelength	850 nm		
Current consumption	50 mA		
Connection system	M12 plug, 5-pin		
Receiver			
Current consumption	150 mA without external load, muting sensors and muting indicator		
Safety-related switching outputs (OSSDs)	2 pnp transistor outputs		
Switching voltage high active	Min. 18.2 V		
Switching voltage low	Max. 2.5 V		
Switching current	Typical, 300 mA		
Connection system	M12 plug, 5-pin, 8-pin		

MULTIPLE LIGHT BEAM SAFETY DEVICES

Technical data

Transceiver

Current consumption	150 mA without external load, muting sensors and muting indicator
Safety-related switching outputs (OSSDs)	2 pnp transistor outputs
Switching voltage high active	Min. 18.2 V
Switching voltage low	Max. 2.5 V
Switching current	Typical, 300 mA
Connection system	M12 plug, 5-pin

Additional information can be found in the MLD Connecting and Operating Instructions at www.leuze.com/mld.

Dimensional drawings

Dimensional drawings, see page 184.

Dimensional drawings: Accessories

Dimensional drawings of accessories, see page 187.

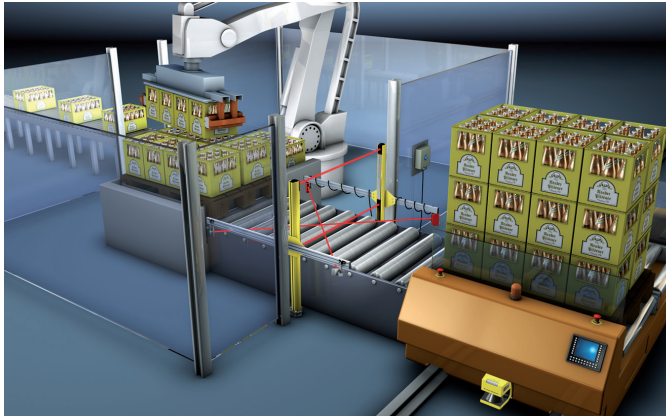
Accessories ordering information

Accessories ordering information, see page 194.

www.leuze.com/mld/

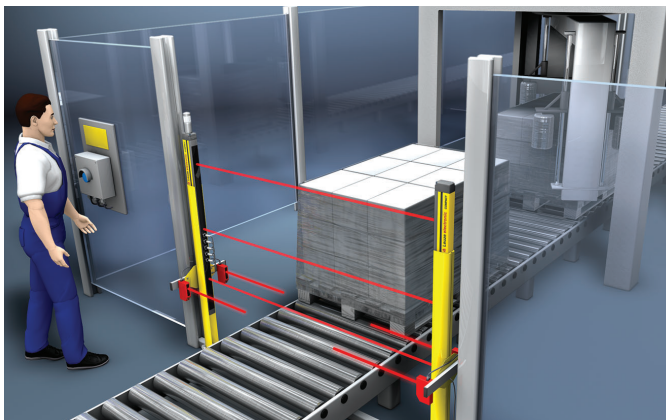
LIGHT BEAM SAFETY DEVICE SETS

Light Beam Safety Device Set selection table



Conveyor systems are one of many application options for complete systems with muting and override functions – shown here is an implementation with MLDSET

Access guarding with optical protective devices with muting function frequently consists of numerous components that must be electrically and mechanically harmonized with one another, to guarantee both safety and availability. While the selection of the right components by the design engineer in the planning phase can be difficult, with the start-up on the setup site the time required for this and the necessary knowledge of the setup site personnel for correct parametering have proven to be critical. With the CPSET Light Beam Safety Device Sets, Leuze electronic provides well-thought-through solutions that incorporate these requirements. They include select and ready prepared components for the respective application cases. Muting applications can therefore be implemented quicker, easier, and frequently more cost-effectively.



Muting with Light Beam Safety Device Set in a wrapping machine application

CPSET
p. 216

MLDSET
p. 222

Preassembled Light Beam Safety Device Sets that can be quickly and easily put into operation

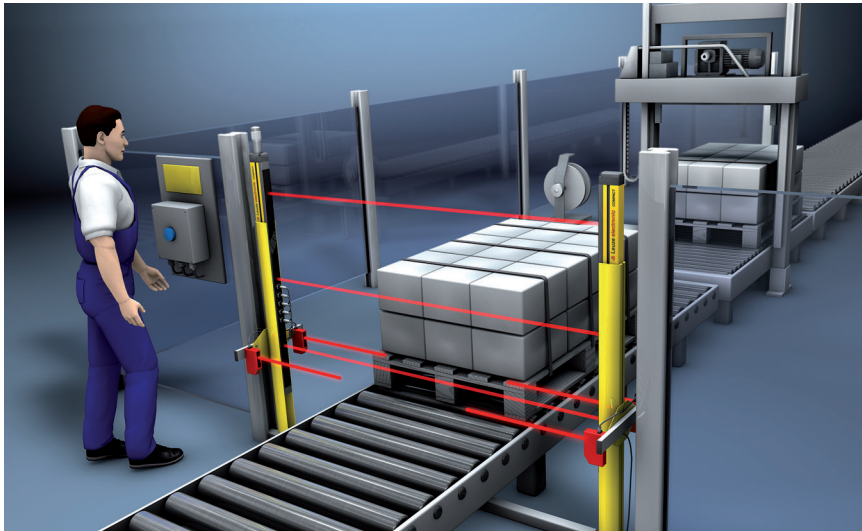


Type in accordance with EN IEC 61496	SIL in accordance with IEC 61508 or SILCL in accordance with EN IEC 62061	Beam distance (mm), number of beams	Range in m	Features		Series*	Page
				Transceiver with passive mirror	Number of muting sensors		
4	3	500 / 2	0 - 6,5	●	4	CPSET-M11	216
				●	2	CPSET-M12	217
			●	2	CPSET-M23	218	
			●	4	CPSET-M24	219	
		0,5 - 8	●	2	MLDSET-M01	224	
			●	2	MLDSET-M02	226	

In the table and on the following pages, you will find a selection of our Light Beam Safety Device Sets. Additional information on our range of sets is available on request!

LIGHT BEAM SAFETY DEVICE SETS

CPSET

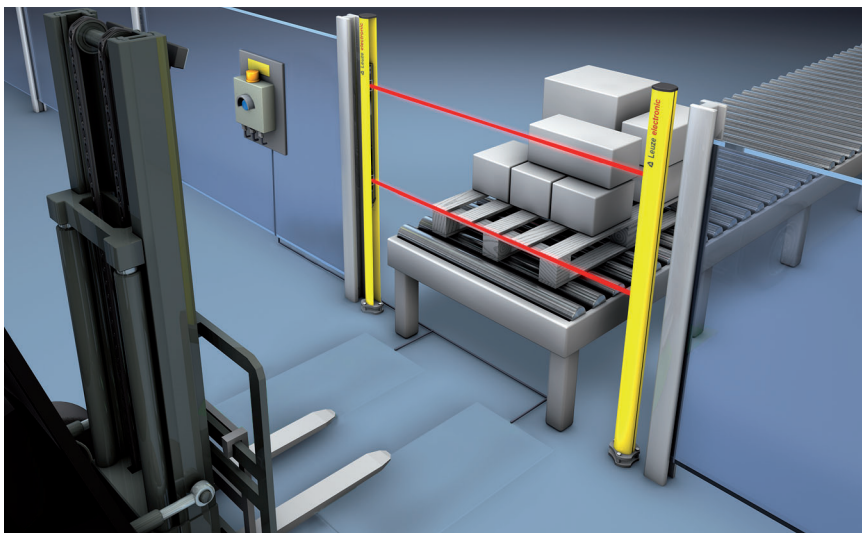


CPSET with muting on a strapping system; left in picture: control unit with reset button

The CPSET complete muting systems provide Light Beam Safety Device Sets for various muting modes with all the necessary components. The components are already preassembled, and are mechanically and electrically harmonized with one another. The factory-set parametering is already adjusted to the respective application instance and reduces input at the setup site to a minimum. Depending on the model, in addition to the pre-parametered optical protective device, the CPSET complete systems also include suitable muting sensors, including mounting brackets, Device Columns with already installed devices, suitable cables, and with some sets, the necessary display and control units, which can be easily mounted on the hard guard.

Typical areas of application

- Access guarding with muting
- Conveyor/storage systems
- Robot cells, automatic processing centers, palletizers



CPSET with muting function based on induction loops on a pallet transfer station; left in picture: display and control unit with integrated evaluation unit for induction loops

On the following pages, you will find a selection of our Light Beam Safety Device Sets. Additional information on our range of sets is available on request!

Important technical data, overview

Type in accordance with EN IEC 61496	4		
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3		
Performance Level (PL) in accordance with EN ISO 13849-1	e		
Category in accordance with EN ISO 13849	4		
Probability of a failure to danger per hour (PFH _d)	M11, M12	4.37 x 10 ⁻⁸	
	M23, M24	5.75 x 10 ⁻⁸	
Service life (T _M) in accordance with EN ISO 13849-1	20 years		
Number of beams	2	3	4
Beam distance	500 mm	400 mm	300 mm
Range (type-dependent)	Cxx0/y:	0...18 m	
	Cxx1/y:	6...70 m	
Muting transceiver range (type-dependent)	0...6.5 m		

In the table and on the following pages, you will find a selection of our Light Beam Safety Device Sets. Additional information on our range of sets is available on request!

Functions

Access guarding with muting function

Muting with optical sensors or induction loops

Special features

- **Plug & Play complete solutions with plug-in connections**
- **Efficient setup – quick start-up**
- **Various sets: Multiple Light Beam Safety Device or muting transceivers premounted in Device Columns**
- **Preinstalled muting components and display and control unit with reset button for unlocking start/restart interlock**



Features



Further information

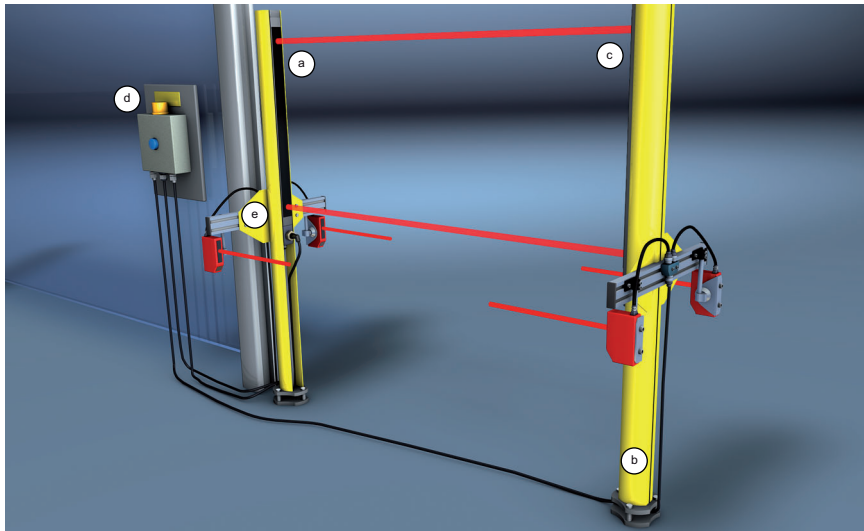
Page

- CPSET-M11 216
- CPSET-M12 217
- CPSET-M23 218
- CPSET-M24 219
- Accessories ordering information 220

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LIGHT BEAM SAFETY DEVICE SETS

CPSET-M11



With the CPSET-M11 Safety Sensor Set reflection light scanners serve as muting sensors. The implemented 4-sensor parallel muting enables a space-saving arrangement at system separation points on conveyor lines. The muting sensors can be very easily directed at the transport material with the start-up and their scan range can be set accordingly. The display and control unit included with delivery is prepared for mounting on the hard guard. The safety sensor is already pre-parametered at the factory according to the application. Further adjustments are possible with the SafetyLab PC software. The connection cable to the cabinet must be ordered separately.

Active-passive solution: CPSET complete system with 4-sensor double parallel muting for guarding separation points in linked systems

	Article	Description	Further information
a	CPRT500/2-m03/R2	Muting transceiver	---
b	UDC-1900-S1	Device Columns	Page 488
c	CPM500/2V-SO	Deflecting Mirror	---
d	AC-CPB-OPT	Display and control unit with reset button and muting indicator mounted on mounting plate	Page 512
e	MSSU-H46	Muting Sensor Set	Page 500

Ordering information

CPSET-M11

Included in delivery: See article list above; also: 4 BT46.1 mounting devices, 2 M12 Y distributors, 2 cables, 15 m length for HRT muting sensor, installation and cabling accessories, 1 set of connecting and operating instructions (PDF file on CD-ROM)

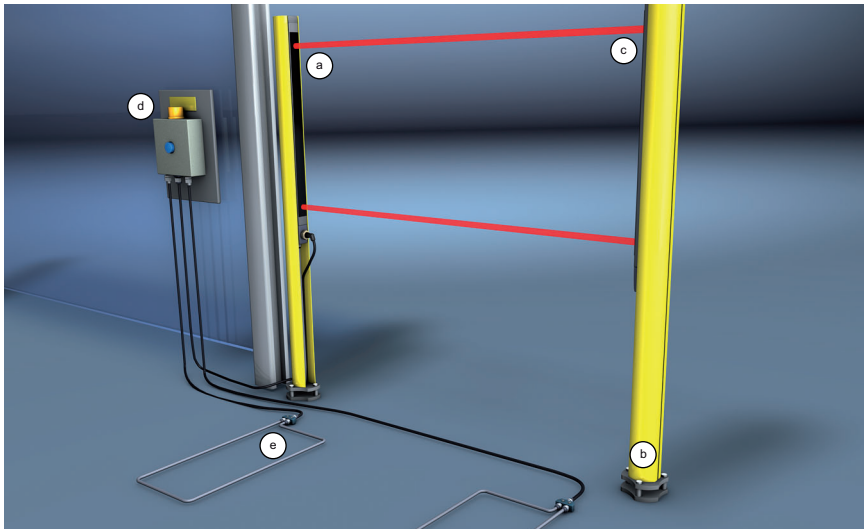
Functions: 4-sensor parallel muting, integrated muting indicator, muting time limit, muting restart override function, start/restart interlock, MultiScan

Art. no.	Article	Description	Special feature
909992	CPSET-M11	Complete system for applications with 4-sensor double parallel muting	Without machine interface cable to the cabinet

Accessories ordering information

Ordering information, see page 220.

CPSET-M12



The CPSET-M12 Safety Sensor Set with 2-sensor parallel muting via induction loops enables safe activation of the muting function, e.g. by forklifts. The induction loops are laid in the floor so that people cannot trigger the muting function with simple metallic objects. The display and control unit with evaluation unit for the induction loops included with delivery is prepared for mounting on the hard guard. The safety sensor is already pre-parametered at the factory according to the application. Further adjustments are possible with the SafetyLab PC software. The connection cable to the cabinet must be ordered separately.

Active-passive solution: CPSET complete system with inductive muting for guarding palette transfer stations

	Article	Description	Further information
a	CPRT500/2-m03/R2	Muting transceiver	---
b	UDC-1900-S1	Device Columns	Page 488
c	CPM500/2V-SO	Deflecting Mirror	---
d	AC-CPB-IND	Display and control unit with integrated evaluation unit for induction loops with reset button and muting indicator mounted on mounting plate	Page 512
e	AC-2LP1	2 induction loops with 6 m loop length and 15 m supply line	---

Ordering information

CPSET-M12

Included in delivery: See article list above; also: 2 HARAX M12 connector, installation and cabling accessories, 1 set of connecting and operating instructions(PDF file on CD-ROM)

Functions: Muting with 2 induction loops, integrated muting indicator, muting time limit, muting restart override function, start/restart interlock, MultiScan

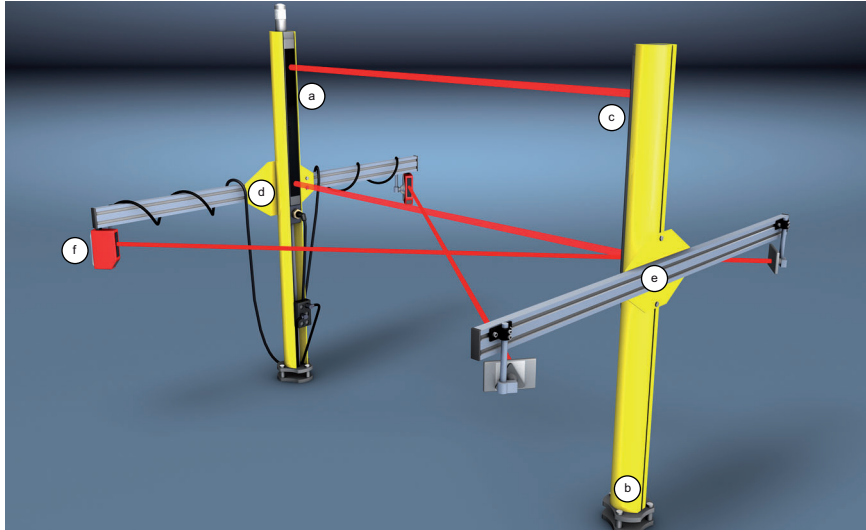
Art. no.	Article	Description	Special feature
909991	CPSET-M12	Complete system for applications with 2-sensor parallel muting	Without machine interface cable to the cabinet

Accessories ordering information

Ordering information, see page 220.

LIGHT BEAM SAFETY DEVICE SETS

CPSET-M23



The CPSET-M23 Safety Sensor Set is used with 2-beam access guarding with muting. 2 Reflection Light Beam Devices with crossed beams are used as muting sensors. All cables, except the cable to the cabinet, are included in the delivery. The muting sensors and reflectors are already mounted at the factory on the MMS Muting Mounting System's fixing component. The safety devices are also already pre-mounted in the Device Columns and pre-parametered according to the application. Further adjustments are possible with the SafetyLab PC software.

Active-passive solution: CPSET complete system 2-beam for applications with 2-sensor parallel muting

	Article	Description	Further information
a	CPRT500/2-mI0/R2	Muting transceiver with integrated LED muting indicator	---
b	UDC-1300-S1	Device Columns	Page 488
c	CPM500/2V-SO	Deflecting Mirror	---
d	MMS-A-1000	Muting Mounting System	Page 500
e	MMS-P-1000	Muting Mounting System	Page 500
f	PRK 46B	Accessories set with Reflection Light Beam Devices	---

Ordering information

CPSET-M23

Included in delivery: See article list above; also: 1 set of connecting and operating instructions (PDF file on CD-ROM), installation and cabling accessories

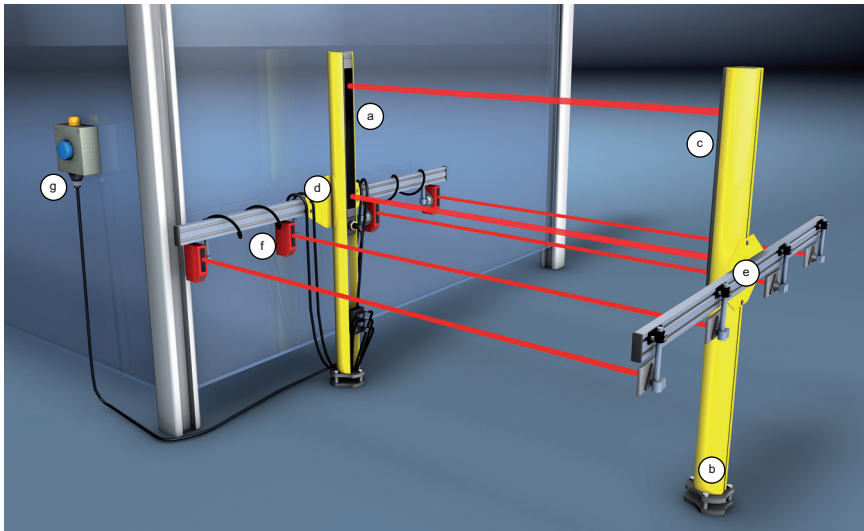
Functions: 2-sensor parallel muting, integrated muting indicator, muting time limit, muting restart override function, start/restart interlock, MultiScan

Art. no.	Article	Description	Special feature
909978	CPSET-M23	Complete system for applications with 2-sensor parallel muting	Without machine interface cable to the cabinet

Accessories ordering information

Ordering information, see page 220.

CPSET-M24



The CPSET-M24 Safety Sensor Set is used with 2-beam access guarding with muting. 4 Reflection Light Beam Devices with parallel beams are used as muting sensors. All cables, except the cable to the cabinet, are included in the delivery. The muting sensors and reflectors are already mounted at the factory on the MMS Muting Mounting System's fixing component. The safety devices are also already pre-mounted in the Device Columns and pre-parametered according to the application. Further adjustments can be made via switch in the device or via the SafetyLab PC software.

Active-passive solution: CPSET complete system 2-beam for applications with 4-sensor sequential muting

	Article	Description	Further information
a	CPRT500/2-m06/R2	Muting transceiver	---
b	UDC-1900-S1	Device Columns	Page 488
c	CPM500/2V-SO	Deflecting Mirror	---
d	MMS-A-1000-S	Muting Mounting System	Page 500
e	MMS-P-1000-S	Muting Mounting System	Page 500
f	PRK 46B	Accessories set with Reflection Light Beam Devices	---
g	AC-ABF-SL1	Display and control unit for muting applications	Page 512

Ordering information

CPSET-M24

Included in delivery: See article list above; also: 1 set of connecting and operating instructions (PDF file on CD-ROM), installation and cabling accessories

Functions: 4-sensor sequential muting, muting time limit, muting restart override function, start/restart interlock, MultiScan

Art. no.	Article	Description	Special feature
909968	CPSET-M24	Complete system for applications with 4-sensor sequential muting	Without machine interface cable to the cabinet

Accessories ordering information

Ordering information, see page 220.

LIGHT BEAM SAFETY DEVICE SETS

Accessories ordering information

CPSET-M11, -M12, -M23, -M24 accessories

Art. no.	Article	Description
520073	SLAB-SWC	SafetyLab diagnostics and parametering software incl. PC cable
426042	CB-LDH-10000-12GF	Cable, 10 m, 12 wires, 1 end open, with Hirschmann cable socket, 12-pin for machine interface/T2 and /R2
426044	CB-LDH-25000-12GF	Cable, 25 m, 12 wires, 1 end open, with Hirschmann cable socket, 12-pin for machine interface/T2 and /R2
426043	CB-LDH-50000-12GF	Cable, 50 m, 12 wires, 1 end open, with Hirschmann cable socket, 12-pin for machine interface/T2 and /R2

CPSET

Machine Safety

Machine Safety
Services

Safety
Engineering
Software

Safety Laser
Scanners

Safety Light
Curtains

Multiple Light
Beam Safety
Devices

Light Beam
Safety Device
Sets

Single Light
Beam Safety
Devices

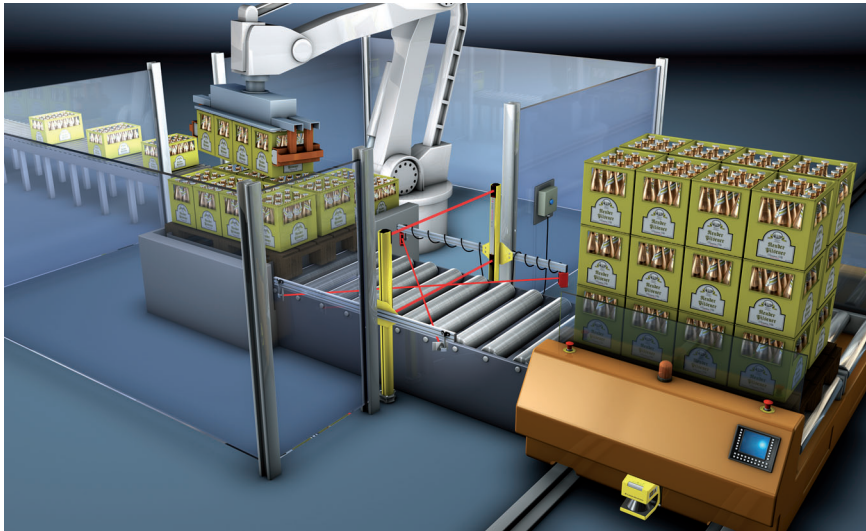
AS-Interface
Safety at Work

PROFIsafe
Sensors

www.leuze.com/cpset/

LIGHT BEAM SAFETY DEVICE SETS

MLDSET



MLDSET with muting on a roller conveyor

MLDSET is a complete muting system for the access guarding of areas through which operational material must be transported. In addition to the optical protective device with integrated LED muting indicator, the MLDSET includes two device columns into which the devices are pre-mounted such that they can easily be adjusted in height.

The muting Light Beam Devices are pre-mounted on the 1 m long adjustable Muting Mounting System MMS. An MSI-RM2 Safety Relay as well as wiring accessories for the sensors are enclosed. The connecting cable to the cabinet can be ordered separately in various lengths.

Important technical data, overview

Type in accordance with EN IEC 61496	4
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3
Performance Level (PL) in accordance with EN ISO 13849-1	e
Category in accordance with EN ISO 13849	4
Average probability of a failure to danger per hour (PFH _d)	6.6 x 10 ⁻⁹
Service life (T _M) in accordance with EN ISO 13849-1	20 years
Number of beams	2 (MLDSET-M01) 3 (MLDSET-M02)
Beam distance	500 mm (MLDSET-M01) 400 mm (MLDSET-M02)
Range	0.5...8 m

Functions

Access guarding with bridging function

Muting with optical sensors or induction loops

Special features

- Plug & Play complete solutions with plug-in connections
- Efficient setup – quick start-up
- Complete muting set, including device columns and accessories
- Complete muting accessories included



Features

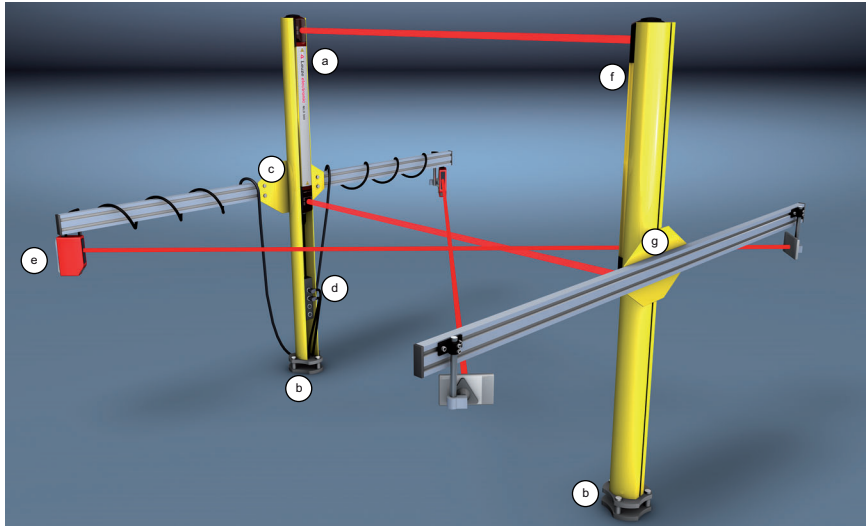


Further information **Page**

- | | |
|------------------------------------|-----|
| ● MLDSET-M01 | 224 |
| ● MLDSET-M02 | 226 |
| ● Accessories ordering information | 225 |

LIGHT BEAM SAFETY DEVICE SETS

MLDSET-M01



The MLDSET-M01 Safety Sensor Set is used with 2-beam access guarding with muting. 2 Reflection Light Beam Devices with crossed beams are used as muting sensors. The muting sensors and reflectors are already mounted at the factory on the fixing component of the MMS Muting Mounting System; the safety devices are pre-mounted in the Device Columns and pre-parametered accordingly.

MLDSET complete system, 2-beam for applications with 2-sensor parallel muting

	Article	Description	Further information
a	MLD530-RT2M	Muting transceiver	Page 173
b	UDC-1300-S1	Device Columns	Page 488
c	MMS-A-1000	Muting Mounting System	Page 500
d	AC-SCM5-BT	Muting sensor connection box	---
e	PRK 46B	Accessories set with Reflection Light Beam Devices	---
f	MLD-M002	Deflecting Mirror in device column UDC-1300-S1	---
g	MMS-P-1000	Muting Mounting System, reflectors premounted	Page 500
-	MSI-RM2	Safety Relay	Page 428

Ordering information

MLDSET-M01

Included in delivery: See article list above; also: 1 set of connecting and operating instructions (PDF file on CD-ROM)

Functions: 2-sensor parallel muting, integrated muting indicator, muting time limit, muting restart override function, start/restart interlock, MultiScan

Art. no.	Article	Description	Special feature
66900010	MLDSET-M01	Complete muting set	For connection to the cabinet, ready-made cables of lengths 5 m, 10 m, 15 m and 25 m are available. These are not included as part of the delivery contents, however.

Accessories ordering information

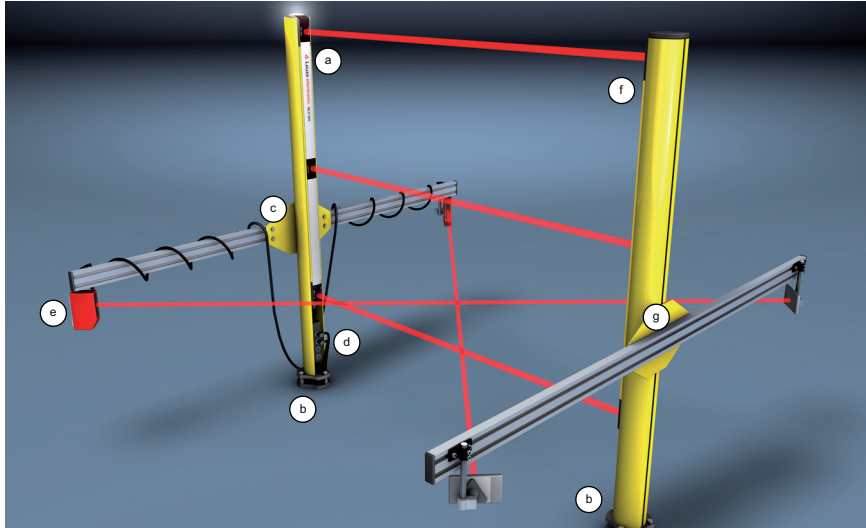
Accessories MLDSET-M01

Art. no.	Article	Description
678060	CB-M12-5000E-8GF	Connection cable, 8-pin, length 5 m
678061	CB-M12-10000E-8GF	Connection cable, 8-pin, length 10 m
678062	CB-M12-15000E-8GF	Connection cable, 8-pin, length 15 m
678063	CB-M12-25000E-8GF	Connection cable, 8-pin, length 25 m
426290	AC-ABF10	Display and control unit
150682	CB-M12-5000-3GF/GM	Connection cable, 3-pin, length 5 m

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LIGHT BEAM SAFETY DEVICE SETS

MLDSET-M02



MLDSET

The MLDSET-M02 Safety Sensor Set is used with 3-beam access guarding with muting. 2 Reflection Light Beam Devices with crossed beams are used as muting sensors. The muting sensors and reflectors are already mounted at the factory on the fixing component of the MMS Muting Mounting System; the safety devices are pre-mounted in the Device Columns and pre-parametered accordingly.

	Article	Description	Further information
a	MLD530-RT3M	Muting transceiver	Page 173
b	UDC-1300-S1	Device Columns	Page 488
c	MMS-A-1000	Muting Mounting System	Page 500
d	AC-SCM5-BT	Muting sensor connection box	---
e	PRK 46B	Accessories set with Reflection Light Beam Devices	---
f	MLD-M003	Deflecting Mirror in device column UDC-1300-S1	---
g	MMS-P-1000	Muting Mounting System, reflectors premounted	Page 500
-	MSI-RM2	Safety Relay	Page 428

Ordering information

MLDSET-M02

Included in delivery: See article list above; also: 1 set of connecting and operating instructions (PDF file on CD-ROM)

Functions: 2-sensor parallel muting, integrated muting indicator, muting time limit, muting restart override function, start/restart interlock, MultiScan

Art. no.	Article	Description	Special feature
66900011	MLDSET-M02	Complete muting set	For connection to the cabinet, ready-made cables of lengths 5 m, 10 m, 15 m and 25 m are available. These are not included as part of the delivery contents, however.

Accessories ordering information

Accessories ordering information see page 225

MLDSET

Machine Safety

Machine Safety
Services

Safety
Engineering
Software

Safety Laser
Scanners

Safety Light
Curtains

Multiple Light
Beam Safety
Devices

Light Beam
Safety Device
Sets

Single Light
Beam Safety
Devices

AS-Interface
Safety at Work

PROFIsafe
Sensors

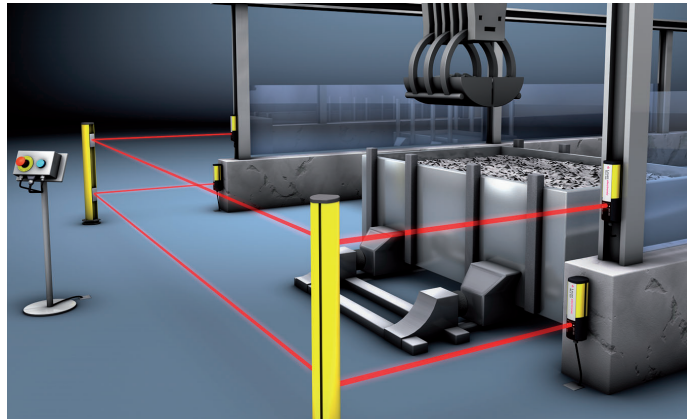
www.leuze.com/mldset/

SINGLE LIGHT BEAM SAFETY DEVICES

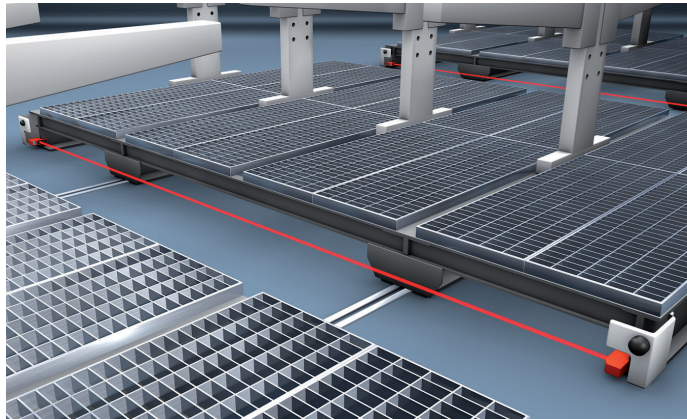
OVERVIEW

Single Light Beam Safety Device selection table

Selection table



Access guarding of danger zones in conveyor/storage systems with the SLS 78/R series



Foot area guarding on mobile racking and shelving

Whether the application involves printing machines or packaging machines, whether it's in a conveyor/storage system or in other industries with safety-related automation, our Single Light Beam Safety Devices perform the most diverse detection, identification and protection tasks like lightning. The individual sensor series with their various housing construction forms and functionalities enable the designer to provide optimum integration into the existing machine concept.



Due to their dimensions, Single Light Beam Safety Devices are able to make full use of their advantages in certain installation situations

Features, type-dependent

Type in accordance with EN IEC 61496	Range in m	Automatic start/restart	Start/restart interlock (RES)	Contactor monitoring (EDM), selectable	2-sensor muting, (parallel, sequential)	Integrated laser alignment aid (optional) *	Minimum object diameter in mm	Ambient light suppression	Variants for multi-axis operation	Light source: infrared light	Light source: red light	Light-on	Antivalent	pnp transistor output	Safety Relay Outputs (2 N/O)	Round pin plug	Cable gland	Connection cable	Min. temp. - 25 °C, integrated optics heating	Plastic housing	Metal housing	Stainless steel housing	Series	Page
4	0,5 - 100	●				●				●		●		●		M12					●		MLD 510	232
	0,5 - 100	●	●	●		●				●		●		●		M12					●		MLD 520	233
	0,5 - 100	●	●	●	●	●				●		●		●		M12					●		MLD 530	234
2	0,5 - 20						14	●			●		●	**		M12		●		●			SLSR 25B	246
	0 - 40						22	●			●		●	**		M12		●		●			SLSR 46B	252
	0 - 50						28			●	●	●		●		M12	●		●		●		SLS 96 M/P	258
	0 - 50						28		●	●	●	●		●		M12	●			●			SLS 96 K/P	258
	0 - 10						13				●		●	●		M12		●		●			SLS 318	264

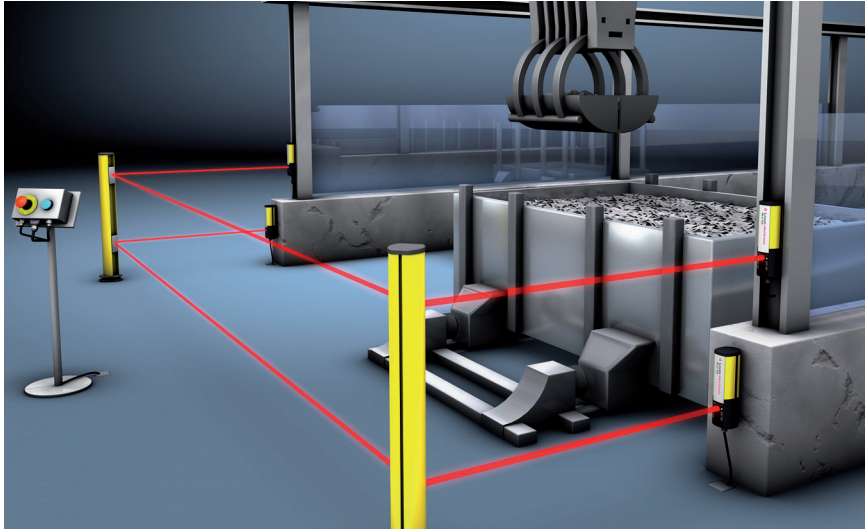
*) up to 70 m
**) push-pull

- MLD 500
p. 230
- SLSR 25B
p. 244
- SLSR 46B
p. 250
- SLS 96
p. 256
- SLS 318
p. 262

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SINGLE LIGHT BEAM SAFETY DEVICES

MLD 500



Easy setting up of an access guarding with integrated laser alignment aid

Typical areas of application

- Packaging machinery, palletizers, wrapping machinery, plastic and rubber machinery, concrete and stoneware machinery, ...
- Rear zone guarding on pressure forming presses

If there are no plane attachment areas on the machine that are suitable for the mounting of Multiple Light Beam Safety Devices or when variable beam distances are required, it is not possible to use Multiple Light Beam Devices in the standard profile. In these cases, the single light beam device versions of the MLD series may be used. Even in the case of edges in the attachment geometries, these devices do not give rise to unmonitored undercuts.

Like the multiple light beam MLD versions, the MLD Single Light Beam Safety Devices feature individual function classes. A start/restart interlock and contactor monitoring can thereby be selected and, if necessary, various muting modes realized.

The series is predestined for wide-area perimeter guarding implemented with Deflecting Mirrors. Ranges of up to 100 m and operating temperatures down to -30°C are possible.

Even for the MLD Single Light Beam Safety Devices, the optional integrated laser alignment aid can contribute significantly to a much simplified alignment in case of long ranges.

MLD 500
p. 230

SLSR 25B
p. 244

SLSR 46B
p. 250

SLS 96
p. 256

SLS 318
p. 262

Important technical data, overview

Type in accordance with EN IEC 61496	4
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3
Performance Level (PL) in accordance with EN ISO 13849-1	e
Category in accordance with EN ISO 13849	4
Number of beams	1
Range (type-dependent)	MLD5yy-R /-T: 0.5...70 m MLD5yy-xR /-xT: 20...100 m
Profile cross-section	52 mm x 65 mm
Safety-related switching outputs	2 pnp transistor outputs, AS-i Safety Interface
Connection system	M12 plug

Functions

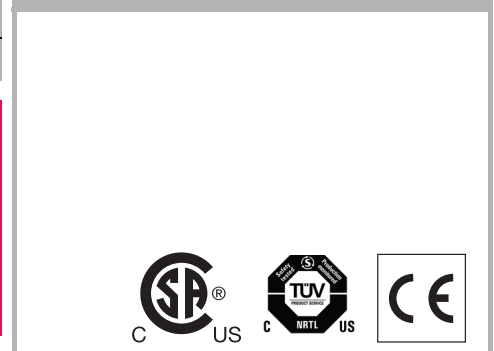
	MLD 510	MLD 520	MLD 530
Automatic start/restart	●	●	
Start/restart interlock (RES)		●	●
Contacting monitoring (EDM), selectable		●	●
2-sensor muting (parallel, sequential)			●
Configurable operating modes		●	●
Laser alignment aid (optional)	●	●	

Special features

- The configuration is simply performed by means of wiring, i. e. no software, PC or DIP switch are necessary
- The use at ambient temperatures as low as -30 °C is possible
- Options: integrated laser alignment aid, integrated muting indicator, 7-segment display
- Integrated muting function, no additional muting module is necessary



Features



Further information

Page

- Ordering information 232
- Electrical connection 180
- Technical data 237
- Dimensional drawings 238
- Dimensional drawings: Accessories 240
- Accessories ordering information 242

SINGLE LIGHT BEAM SAFETY DEVICES

Ordering information

MLD 510, consisting of transmitter and receiver
 Included in delivery: 4 sliding blocks, 1 set of connecting and
 operating instructions

Functions: Automatic restart, 2 OSSDs

MLD 510 transmitter-receiver systems

Range: 0.5 - 70 m

Art. no.	Article	Description	Option
66501000	MLD500-T1	Transmitter	
66533000	MLD510-R1	Receiver	
66502000	MLD500-T1L	Transmitter	With integrated laser alignment aid
66536000	MLD510-R1L	Receiver	With reflex element for laser alignment aid

MLD 510 transmitter-receiver systems

Range: 20 - 100 m

Art. no.	Article	Description	Option
66501400	MLD500-XT1	Transmitter	
66533400	MLD510-XR1	Receiver	

Ordering information

MLD 520, consisting of transmitter and receiver
Included in delivery: 4 sliding blocks, 1 set of connecting and operating instructions

Functions: 2 OSSDs, start/restart interlock selectable, contactor monitoring selectable

MLD 520 transmitter-receiver systems

Range: 0.5 - 70 m

Art. no.	Article	Description	Option
66501000	MLD500-T1	Transmitter	
66553000	MLD520-R1	Receiver	
66502000	MLD500-T1L	Transmitter	With integrated laser alignment aid
66556000	MLD520-R1L	Receiver	With reflex element for laser alignment aid

MLD 520 transmitter-receiver systems

Range: 20 - 100 m

Art. no.	Article	Description	Option
66501400	MLD500-XT1	Transmitter	
66553400	MLD520-XR1	Receiver	

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SINGLE LIGHT BEAM SAFETY DEVICES

Ordering information

MLD 530, consisting of transmitter and receiver
Included in delivery: 4 sliding blocks, 1 set of connecting and operating instructions

Functions: 2 OSSDs, start/restart interlock selectable, contactor monitoring selectable, 2-sensor parallel muting, 2-sensor sequential muting, muting-timeout extension, alternative connection for second muting signal, muting enable function

MLD 530 transmitter-receiver systems

Range: 0.5 - 70 m

Art. no.	Article	Description	Option
66501000	MLD500-T1	Transmitter	
66563000	MLD530-R1	Receiver	
66502000	MLD500-T1L	Transmitter	With integrated laser alignment aid
66566000	MLD530-R1L	Receiver	With reflex element for laser alignment aid

MLD 530 transmitter-receiver systems

Range: 20 - 100 m

Art. no.	Article	Description	Option
66501400	MLD500-XT1	Transmitter	
66563400	MLD530-XR1	Receiver	

Ordering information

MLD 510/AS-i, consisting of transmitter and receiver
Included in delivery: 4 sliding blocks, 1 set of connecting and operating instructions

Functions (in combination with ASM Safety Monitor): Start/restart interlock selectable, contactor monitoring selectable, 2-sensor parallel muting, 2-sensor sequential muting, muting-timeout extension

MLD 510/AS-i			
Range: 0.5 - 70 m			
Art. no.	Article	Description	Option
66501001	MLD500-T1/A	Transmitter	
66533001	MLD510-R1/A	Receiver	
66502001	MLD500-T1L/A	Transmitter	With integrated laser alignment aid
66536001	MLD510-R1L/A	Receiver	With reflex element for laser alignment aid
66533002	MLD510-R1E/A	Receiver	With connection socket for external muting indicator
66536002	MLD510-R1LE/A	Receiver	With reflex element for laser alignment aid and connection socket for external muting indicator

MLD 510/AS-i			
Range: 20 - 100 m			
Art. no.	Article	Description	Option
66501401	MLD500-XT1/A	Transmitter	
66533401	MLD510-XR1/A	Receiver	
66533402	MLD510-XR1E/A	Receiver	With connection socket for external muting indicator

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SINGLE LIGHT BEAM SAFETY DEVICES

Article list for MLD 500

Article	Description
MLD 500	Single Light Beam Safety Device
yy	Function variant
00	Transmitter
10	Automatic restart
20	Start/restart interlock selectable, contactor monitoring selectable
30	Muting
z	Device type
T	Transmitter
R	Receiver
xT	Transmitter for high range
xR	Receiver for high range
b	Option
L	Integrated laser alignment aid
M	Integrated muting indicator
E	Connection socket for external muting indicator (only AS-i variants)
t	Safety-related switching outputs (OSSD), connection system
-	Transistor output, M12 plug
A	Integrated AS-Interface, M12 connector, (safety bus systems)

MLD **yy** **z** **b** **/t**

Electrical connection

Connection example, see page 180.

Technical data

General system data	
Type in accordance with EN IEC 61496	4
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3
Performance Level (PL) in accordance with EN ISO 13849-1	e
Category in accordance with EN ISO 13849	4
Number of beams	1
Average probability of a failure to danger per hour (PFH _d)	6.6 x 10 ⁻⁹
Mean time to dangerous failure (MTTF _d)	146 years
Service life (T _M) in accordance with EN ISO 13849-1	20 years
Range (type-dependent)	MLD5yy-R /-T: 0.5...70 m MLD5yy-xR /-xT: 20...100 m
Response time	25 ms, 50 ms for MLD 530, MLD 330
Supply voltage	+24 V, ±20%
Connection cable length	100 m
Safety class	III
Protection rating	IP 67
Ambient temperature, operation	-30...+55°C
Ambient temperature, storage	-40... +75°C
Relative humidity	0...95 %
Profile cross-section	52 mm x 65 mm
Weight	1.4 kg
Transmitter	
Transmitter diodes, class in accordance with EN 60825	1
Wavelength	850 nm
Current consumption	50 mA
Connection system	M12 plug, 5-pin
Receiver	
Current consumption	150 mA without external load, muting sensors and muting indicator
Safety-related switching outputs	2 pnp transistor outputs, AS-i Safety Interface
Switching voltage high active	Min. 18.2 V
Switching voltage low	Max. 2.5 V
Switching current	Typical, 300 mA
Connection system	M12 plug, 5-pin, 8-pin

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Machine Safety

Machine Safety Services

Safety Engineering Software

Safety Laser Scanners

Safety Light Curtains

Multiple Light Beam Safety Devices

Light Beam Safety Device Sets

Single Light Beam Safety Devices

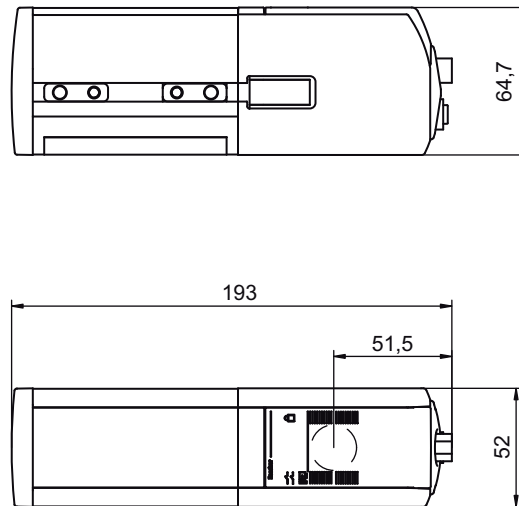
AS-Interface Safety at Work

PROFIsafe Sensors

SINGLE LIGHT BEAM SAFETY DEVICES

Dimensional drawings

MLD 500 Single Light Beam Safety Device, transmitter, receiver



Dimensions in mm

MLD 500
p. 230

SLSR 25B
p. 244

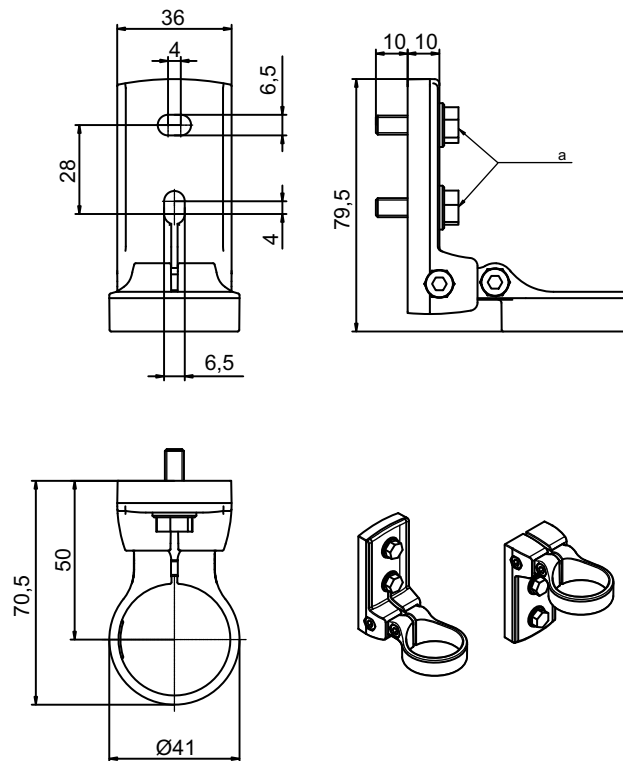
SLSR 46B
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p. 262

Dimensional drawings: Accessories

Mounting brackets



a = screw M6

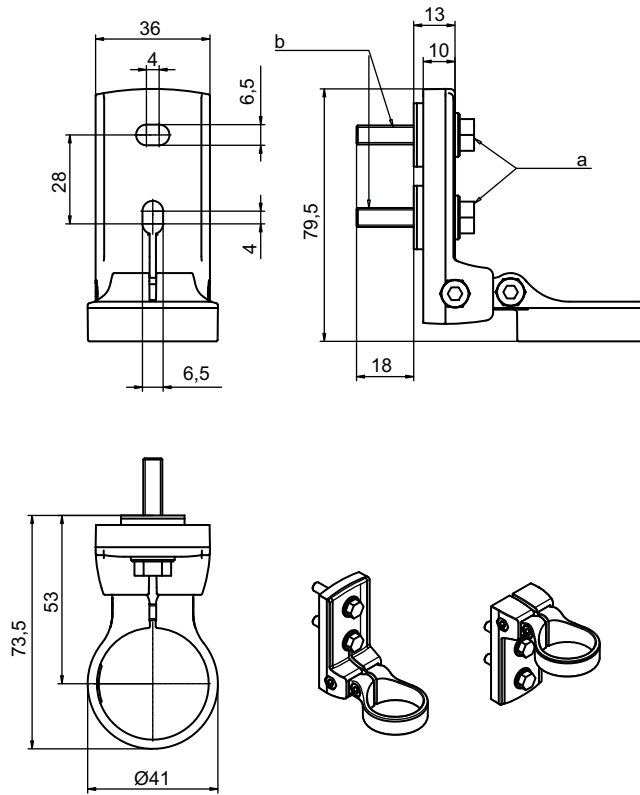
BT-SET-240CS mounting bracket set, consisting of BT-240C swivel mount, screws, shock absorber

Dimensions in mm

SINGLE LIGHT BEAM SAFETY DEVICES

Dimensional drawings: Accessories

Mounting brackets



a = screw M6
 b = shock absorber, thread M6

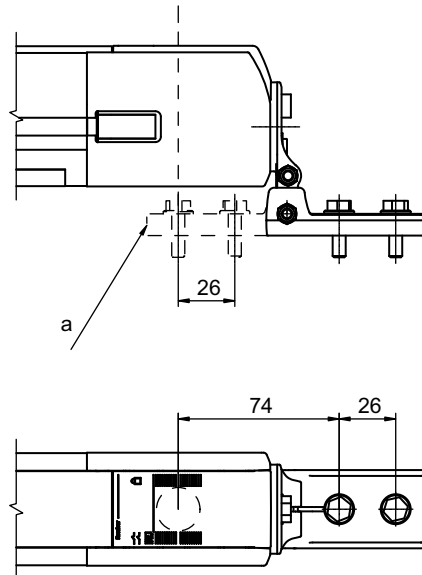
BT-SET-240CS mounting bracket set, consisting of BT-240C swivel mount, screws, shock absorber

Dimensions in mm

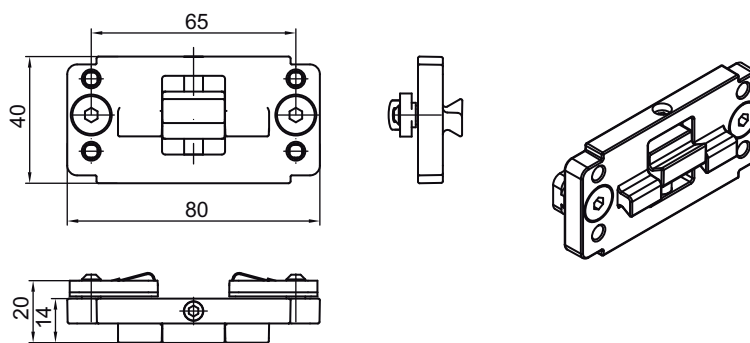
MLD 500 p. 230	SLSR 25B p. 244	SLSR 46B p. 250	SLS 96 p. 256	SLS 318 p. 262
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Dimensional drawings: Accessories

Mounting brackets



a = alternative fixing version
 BT-240C swivel mount mounting dimensions



BT-P40 clamp bracket

Dimensions in mm

SINGLE LIGHT BEAM SAFETY DEVICES

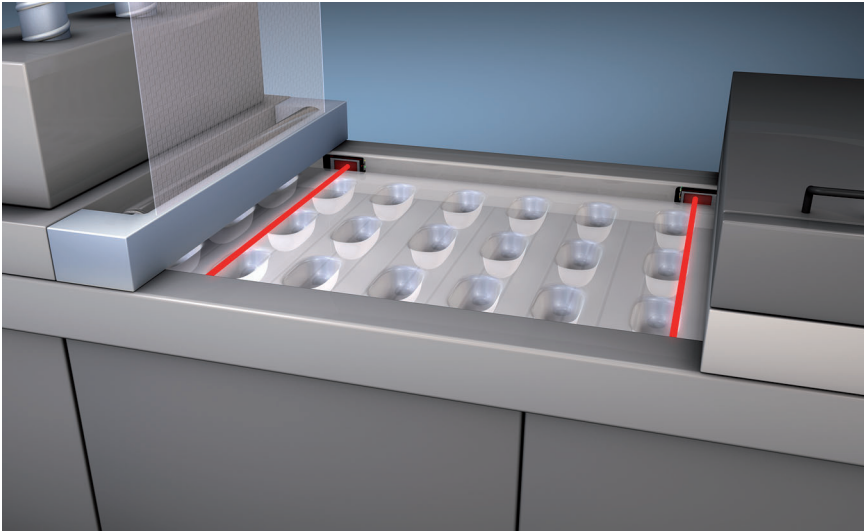
Accessories ordering information

Art. no.	Article	Description	Length, design
Connection cables for MLD 510 (machine interface)			
678055	CB-M12-5000E-5GF	Connecting cable shielded with M12 coupling, 5-pin	5 m, straight/open end
678056	CB-M12-10000E-5GF	Connecting cable shielded with M12 coupling, 5-pin	10 m, straight/open end
678057	CB-M12-15000E-5GF	Connecting cable shielded with M12 coupling, 5-pin	15 m, straight/open end
678058	CB-M12-25000E-5GF	Connecting cable shielded with M12 coupling, 5-pin	25 m, straight/open end
Connection cables for MLD 520, MLD 530 (machine interface)			
678060	CB-M12-5000E-8GF	Connecting cable shielded with M12 coupling, 8-pin	5 m, straight/open end
678061	CB-M12-10000E-8GF	Connecting cable shielded with M12 coupling, 8-pin	10 m, straight/open end
678062	CB-M12-15000E-8GF	Connecting cable shielded with M12 coupling, 8-pin	15 m, straight/open end
678063	CB-M12-25000E-8GF	Connecting cable shielded with M12 coupling, 8-pin	25 m, straight/open end
Connection cables for MLD 530 (local interface)			
678050	CB-M12-5000E-5GM	Connecting cable shielded with M12 plug, 5-pin	5 m, straight/open end
678051	CB-M12-10000E-5GM	Connecting cable shielded with M12 plug, 5-pin	10 m, straight/open end
678052	CB-M12-15000E-5GM	Connecting cable shielded with M12 plug, 5-pin	15 m, straight/open end
678053	CB-M12-25000E-5GM	Connecting cable shielded with M12 plug, 5-pin	25 m, straight/open end
Mounting brackets and mounting bracket sets			
424416	BT-P40	Clamp bracket	
560344	BT-SET-240C	Consisting of BT-240C swivel mount, screws	
560345	BT-SET-240CS	Consisting of BT-240C swivel mount, screws, shock absorber	
Muting Accessories			
520062	AC-SCM5	Local connection box with M12-connection for connecting to local interface (4 connections for 2 muting sensors, muting indicator, reset button)	
520063	AC-SCM5-BT	Local connection box with mounting plate (with 2 M4x22 cheese head screws and 2 sliding blocks)	
Accessories for laser alignment aid			
520071	AC-MK1	MagnetKey for activation of the laser alignment aid	

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SINGLE LIGHT BEAM SAFETY DEVICES

SLSR 25B



SLSR 25B Single Light Beam Safety Devices are used when connecting, welding and separating, on plastic wrap packaging machines, for example

SLSR 25B Light Beam Safety Device provides the same advantages as the SLSR 46B. Just like the SLSR 46B, it is also a costs-optimized alternative for ranges up to 20 and 40 meters (with the SLSR 46B).

It is particularly special because of its small dimensions for this performance class.

The visible red light makes aligning so much easier. The SAT-5 alignment aid also provides an innovative alignment tool, especially for big ranges. The SAT-5 uses the sensor beam for aligning. Together with a safety monitoring device, such as the MSI-T or a configurable MSI Safety Relay, the SLSR 25B forms a type 2 electro-sensitive protective equipment.

Typical areas of application

- Point of operation guarding on palletizer systems, wood processing and packaging machinery

Important technical data, overview

Type in accordance with EN IEC 61496	2 (in combination with a safety interface device or a safety monitoring device)
Category in accordance with EN ISO 13849	2
Operating range	0.5...20 m
Operating voltage, U _B	10... 30 V DC (incl. residual ripple)
Dimensions (WxHxD)	15.0 x 51.3 x 28.8 mm
Housing	Plastic
Switching output	2 push-pull switching outputs Pin 2: pnp dark-on, npn light-on Pin 4: pnp light-on, npn dark-on
Connection system	Cable, 2 m, M8 round pin plug, M12 round pin plug

Functions

LED display

Activation input for test and series connection

Active ambient light suppression (A²LS)

Function extension

SLSR 25B

With safety interface device	Relay output	RES	EDM	Muting	Further details
MSI-T	●	●	●		p. 454
MSI 100, MSI 200		●	●	●	p. 467

Special features

- Single Light Beam Safety Devices with visible red light and high functional reserve
- Solid plastic housing with IP 67 protection rating for industrial use
- Wide voltage range from 10 to 30 V with pnp transistor output for PLC applications
- All standard connection variants



Features



Further information

Further information	Page
● Ordering information	246
● Electrical connection	252
● Technical data	246
● Dimensional drawings	248
● Accessories ordering information	249

SINGLE LIGHT BEAM SAFETY DEVICES

Ordering information

SLSR 25B, consisting of transmitter and receiver

Functions: Activation input for testing and series connection

Art. no.	Article	Description	Connection system
50108489	SLSSR 25B.8-S12	Transmitter, plastic, red light	M12 round pin plug, 4-pin
50108492	SLSER 25B/66-S12	Receiver, plastic, red light	M12 round pin plug, 4-pin
50108490	SLSSR 25B.8-S8	Transmitter, plastic, red light	M8 round pin plug, 4-pin
50108493	SLSER 25B/66-S8	Receiver, plastic, red light	M8 round pin plug, 4-pin
50108491	SLSSR 25B.8	Transmitter, plastic, red light	Cable, 2 m
50108494	SLSER 25B/66	Receiver, plastic, red light	Cable, 2 m
50110151	SLSSR 25B.8.200-S12	Transmitter, plastic, red light	Cable, M12 round pin plug
50110152	SLSER 25B/66.200-S12	Receiver, plastic, red light	Cable, M12 round pin plug

Electrical connection

See SLSR 46B connection example, page 252

Technical data

General system data

Type in accordance with EN IEC 61496	2 (in combination with a configurable MSI Safety Relay or a safety monitoring device)
Service life (T_M) in accordance with EN ISO 13849-1	20 years
Category in accordance with EN ISO 13849	2
Mean time to dangerous failure ($MTTF_d$) in accordance with EN ISO 13849-1	425 years
Operating range	0.5...20 m
Response time	5 ms
Test reaction time	9 ms
Operating voltage, U_B	10... 30 V DC (incl. residual ripple)
Safety class	II
Protection rating	IP 67, IP 69K
Ambient temperature, operation	-30...+55 °C
Ambient temperature, storage	-30... +60 °C
Dimensions (WxHxD)	15.0 x 51.3 x 28.8 mm
Housing	Plastic
Weight (transmitter with receiver)	30 g (plug variant), 60 g (cable variant)

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SLSR 25B
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SLSR 46B
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Technical data

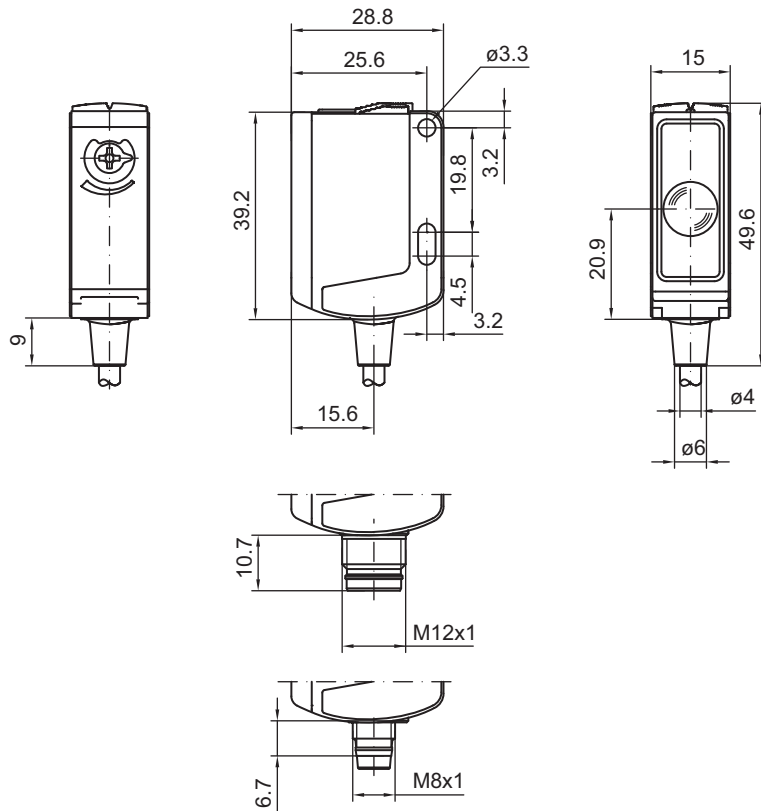
Transmitter	
Current consumption	30 mA
Transmitter diodes, class in accordance with EN 60825	1
Light source	Red light
Wavelength	624 nm
Activation input for test and series connection	Active ≥ 8 V Inactive ≤ 2 V
Connection system	Cable, 2 m, M8 round pin plug, M12 round pin plug
Receiver	
Current consumption	30 mA without external load
Switching output	2 push-pull switching outputs Pin 2: pnp dark-on, npn light-on Pin 4: pnp light-on, npn dark-on
Switching voltage high active	Min. $U_v - 2$ V
Switching voltage low	Max. 2 V
Output current	Max. 100 mA
Connection system	Cable, 2 m, M8 round pin plug, M12 round pin plug

Please note the additional information at www.leuze.com/sls/.

SINGLE LIGHT BEAM SAFETY DEVICES

Dimensional drawings

SLSR 25B Single Light Beam Safety Device



Dimensions in mm

MLD 500
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SLSR 46B
p. 250

SLS 96
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SLS 318
p. 262

Accessories ordering information

Art. no.	Article	Description	Length, design
Connection cables			
50104545	K-D M12W-4P-5m-PVC	Connecting cable, 5 m, M12, 4-pin	Angled, PVC
50104544	K-D M12A-4P-5m-PVC	Connecting cable, 5 m, M12, 4-pin	Axial, PVC
Alignment aids, see page 255			
Deflecting Mirror, see page 496			

www.leuze.com/sls/

SINGLE LIGHT BEAM SAFETY DEVICES

SLSR 46B



Guarding at a wood processing machine with an SLSR 46B Single Light Beam Safety Device

Many industrial applications require the use of safety sensors with high functional and performance reserves, to remain flexible with system-related conversions, for example. The SLS 46B Single Light Beam Safety Device offers sufficient functional reserves for numerous application variations, and with the particularly strong red light payload signal it can enable ranges of up to 40 m. The visible red light makes aligning so much easier. The SAT-5 alignment aid also provides an innovative alignment tool, especially for big ranges. The SAT-5 uses the sensor beam for aligning. With the solid plastic housing with IP 67 protection rating, it is highly recommended for a wide range of industrial applications as a flexible and economical solution. Together with a safety monitoring device, such as the MSI-T or a configurable MSI Safety Relay, the SLSR 46B forms a type 2 electro-sensitive protective equipment.

Typical areas of application

- Point of operation guarding on palletizer systems, wood processing and packaging machinery

Important technical data, overview

Type in accordance with EN IEC 61496	2 (in combination with a safety interface device or a safety monitoring device)
Category in accordance with EN ISO 13849	2
Operating range	0.5...40 m
Operating voltage, U _B	10... 30 V DC (incl. residual ripple)
Dimensions (WxHxD)	18.5 mm x 77 mm x 43 mm
Housing	Plastic
Switching output	2 push-pull switching outputs Pin 2: pnp dark-on, npn light-on Pin 4: pnp light-on, npn dark-on
Connection system	Cable, 2 m M12 round pin plug

Functions

LED display
Activation input for test and series connection
Active ambient light suppression (A ² LS)

Function extension

With safety interface device	Relay output	RES	EDM	Muting	Further details
MSI-T	●	●	●		p. 454
MSI 100, MSI 200		●	●	●	p. 467

Special features

- Single Light Beam Safety Devices with visible red light and high functional reserve
- Solid plastic housing with IP 67 protection rating for industrial use
- Wide voltage range from 10 to 30 V with pnp transistor output for PLC applications
- Clearly visible alignment display on the front screen



Features



Further information

	Page
● Ordering information	252
● Electrical connection	252
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● Dimensional drawings	254
● Accessories ordering information	255

SINGLE LIGHT BEAM SAFETY DEVICES

Ordering information

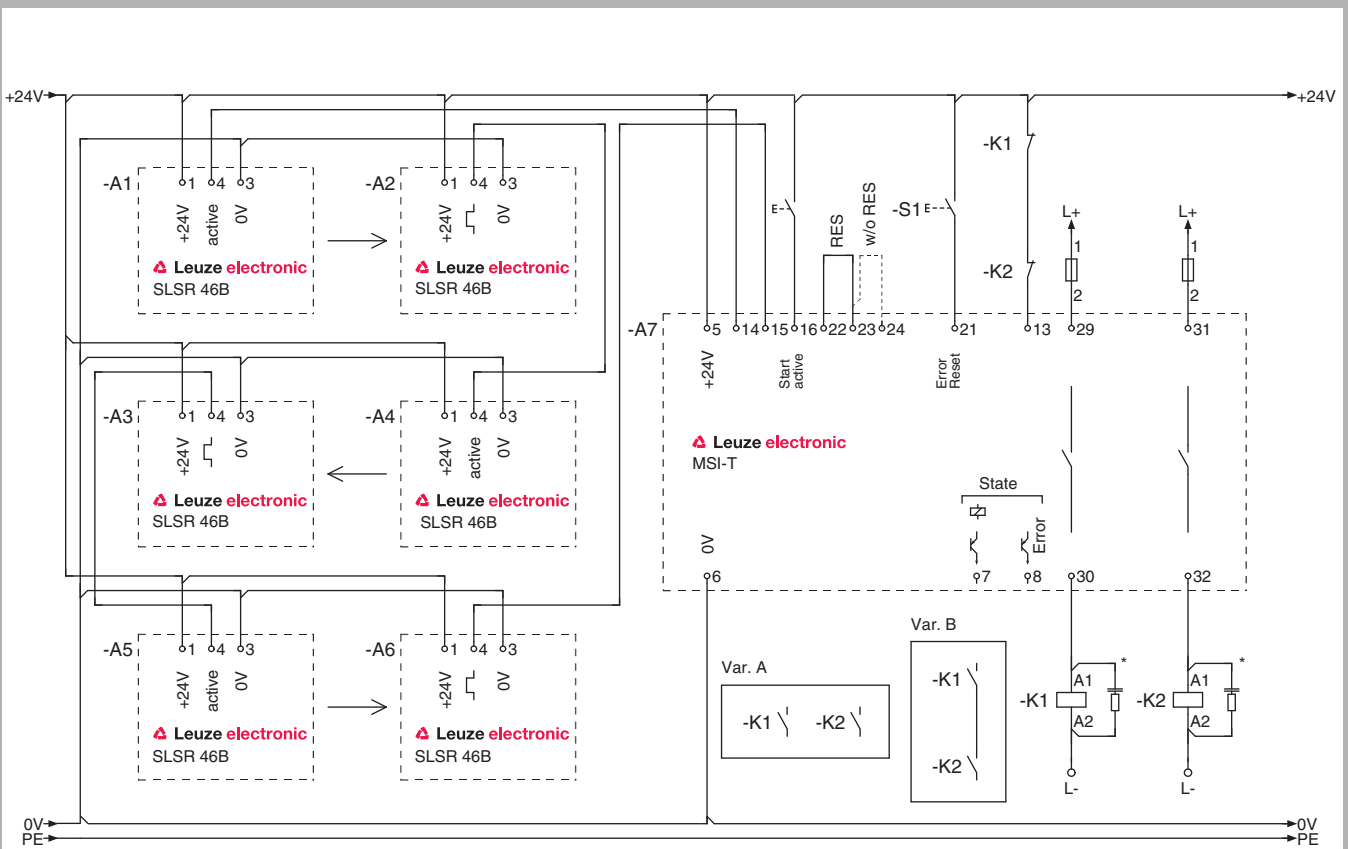
SLSR 46B, consisting of transmitter and receiver

Functions: Activation input for testing and series connection

Art. no.	Article	Description	Connection system
50108538	SLSSR 46B.8-S12	Transmitter with activation input	M12 round pin plug, 4-pin
50108540	SLSER 46B/66-S12	Receiver	M12 round pin plug, 4-pin
50108539	SLSSR 46B.8	Transmitter	Cable, 2 m
50108541	SLSER 46B/66	Receiver	Cable, 2 m

You will find further information and ordering info in the Leuze electronic Opto-Electronic Sensors Catalog.

SLS 46B electrical connection



*) Spark extinction circuit, supply suitable spark extinction

Series connection SLSR 46B with MSI-T safety monitoring device

! Please observe the operating instructions of the components!

MLD 500 p. 230	SLSR 25B p. 244	SLSR 46B p. 250	SLS 96 p. 256	SLS 318 p. 262
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Technical data

General system data	
Type in accordance with EN IEC 61496	2 (in combination with a configurable MSI Safety Relay or a safety monitoring device)
Service life (T_M) in accordance with EN ISO 13849-1	20 years
Category in accordance with EN ISO 13849	2
Mean time to dangerous failure ($MTTF_d$) in accordance with EN ISO 13849-1	407 years
Operating range	0.5...40 m
Response time	4,5 ms
Test reaction time	9 ms
Operating voltage, U_B	10... 30 V DC (incl. residual ripple)
Safety class	II
Protection rating	IP 67, IP 69K
Ambient temperature, operation	-30...+55°C
Ambient temperature, storage	-30... +60°C
Dimensions (WxHxD)	18.5 mm x 77 mm x 43 mm
Housing	Plastic
Weight (transmitter with receiver)	100 g (plug variant), 260 g (cable variant)
Transmitter	
Current consumption	30 mA
Transmitter diodes, class in accordance with EN 60825	1
Light source	Red light
Wavelength	624 nm
Activation input for test and series connection	Active ≥ 8 V Inactive ≤ 2 V
Connection system	Cable, 2 m M12 round pin plug
Receiver	
Current consumption	30 mA without external load
Switching output	2 push-pull switching outputs Pin 2: pnp dark-on, npn light-on Pin 4: pnp light-on, npn dark-on
Switching voltage high active	Min. $U_v - 2$ V
Switching voltage low	Max. 2 V
Output current	Max. 100 mA
Connection system	Cable, 2 m M12 round pin plug, 4-pin

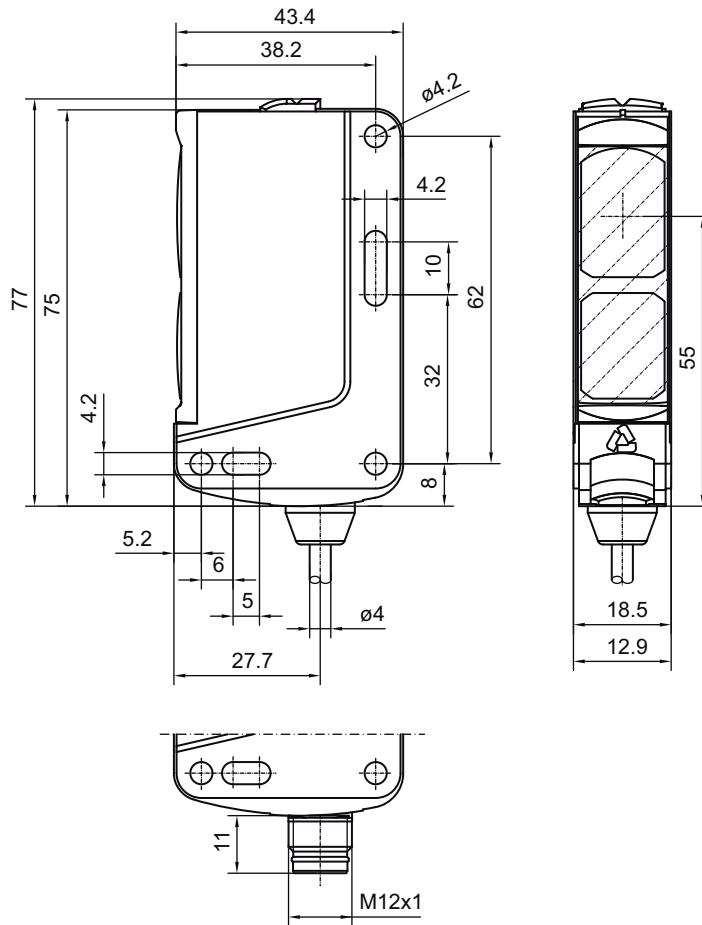
Please note the additional information at www.leuze.com/sls/.

www.leuze.com/sls/

SINGLE LIGHT BEAM SAFETY DEVICES

Dimensional drawings

SLSR 46B Single Light Beam Safety Device



Dimensions in mm

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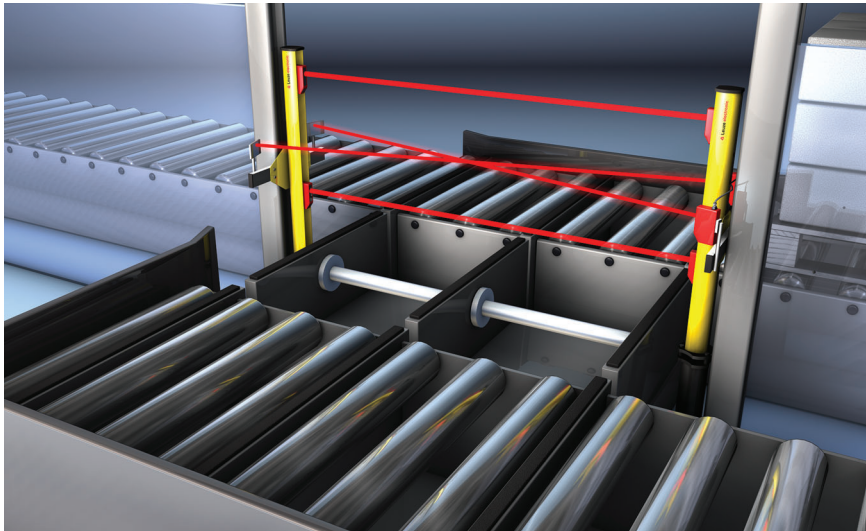
Accessories ordering information

Art. no.	Article	Description	Length, design
Connection cables			
50104545	K-D M12W-4P-5m-PVC	Connecting cable, 5 m, M12, 4-pin	Angled, PVC
50104544	K-D M12A-4P-5m-PVC	Connecting cable, 5 m, M12, 4-pin	Axial, PVC
Alignment aid			
50040739	ARH 46	Alignment aid for SLSR 46B series sensors	
50109545	SAT-5	Spot Alignment Tool (alignment aid when using the transmitter beam for the SLSR 46B and SLSR 25B series)	
Deflecting Mirror, see page 496			

www.leuze.com/sls/

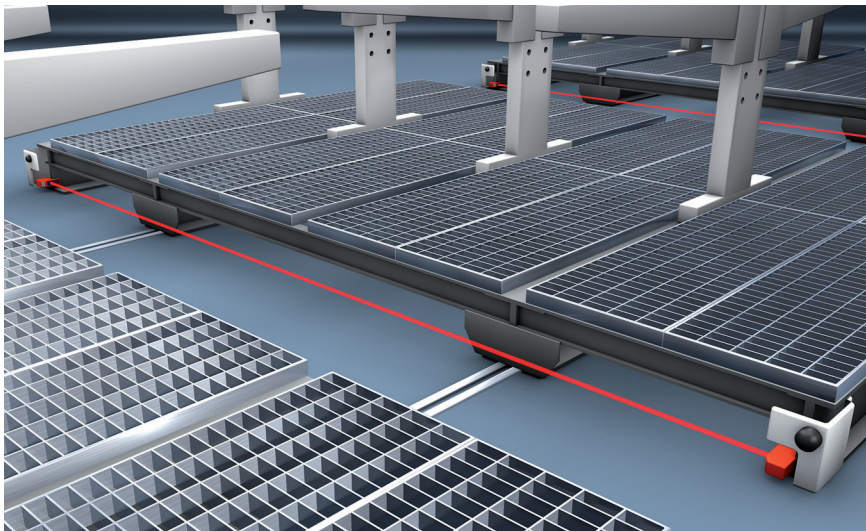
SINGLE LIGHT BEAM SAFETY DEVICES

SLS 96



Palletizer guarding with SLS 96 Single Light Beam Safety Devices

Single Light Beam Safety Devices that provide the most universal coverage possible for the most important requirements at point of operation and access guarding must combine the most diverse device features. The SLS 96 series was conceived to provide the design engineer with optimum integration and application in wide-ranging industrial use. The designer now has the choice between a robust metal housing with glass cover and a solid plastic housing, both with IP 67 protection rating. Furthermore they can also choose whether the connection is to be via M12 plug or via a terminal chamber. Red light and infrared light variants enable fault-free parallel operation of adjacent Light Beam Devices. The extensive range of accessories for this Light Beam Device rounds off the exceptional features of this series. Together with a safety monitoring device, such as the MSI-T or a configurable MSI Safety Relay, the SLS 96 forms a type 2 electro-sensitive protective equipment.



Foot area guarding on mobile racking and shelving

Typical areas of application

- Point of operation and access guarding in conveyor/storage systems, drinks industry and on packaging machinery

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p. 230

SLSR 25B
p. 244

SLSR 46B
p. 250

SLS 96
p. 256

SLS 318
p. 262

Important technical data, overview

Type in accordance with EN IEC 61496	2
Category in accordance with EN ISO 13849	2
Operating range	0...50 m (infrared light) 0...30 m (red light)
Operating voltage, U _B	10... 30 V DC (incl. residual ripple)
Dimensions (WxHxD)	30 mm x 90 mm x 70 mm
Housing	Metal Plastic
Switching output	pnp transistor output
Connection system	Cable gland M12 round pin plug

Functions

LED display

Activation input for test and series connection

Function extension

With safety interface device	Relay output	RES	EDM	Muting	Further details
MSI-T	●	●	●		p. 454
MSI 100, MSI 200		●	●	●	p. 467

Special features

- High functional reserve in the visible red light and infrared light range
- Wide voltage range from 10 to 30 V with pnp transistor output for PLC applications
- 2 displays on transmitter and receiver for status display with start-up and running operation
- Optics heating for use with low temperatures (SLS 96 M/P-1071)
- Variants for multiple operation (SLS 96 K/P-1207)



Features



Further information

Further information	Page
● Ordering information	258
● Electrical connection	252
● Technical data	259
● Dimensional drawings	260
● Accessories ordering information	261

SINGLE LIGHT BEAM SAFETY DEVICES

Ordering information

SLS 96, consisting of transmitter and receiver

Functions: Activation input for testing and series connection

Art. no.	Article	Description	Connection system
50025215	SLSS 96M-1080-T2-45	Transmitter, metal, infrared light	M12 round pin plug, 4-pin
50025193	SLSE 96M/P-1070-T2-41	Receiver, metal, infrared light	M12 round pin plug, 4-pin
50080478	SLSS 96M-1090-T2-45	Transmitter, metal, infrared light, low temperature model	M12 round pin plug, 4-pin
50080479	SLSE 96M/P-1071-T2-41	Receiver, metal, infrared light, low temperature model	M12 round pin plug, 4-pin
50025213	SLSS 96M-1080-T2-24	Transmitter, metal, infrared light	Terminals
50025192	SLSE 96M/P-1070-T2-21	Receiver, metal, infrared light	Terminals
50029454	SLSS 96M-1090-T2-24	Transmitter, metal, infrared light, low temperature model	Terminals
50029455	SLSE 96M/P-1071-T2-21	Receiver, metal, infrared light, low temperature model	Terminals
50031249	SLSS 96M-1210-T2-45	Transmitter, metal, red light	M12 round pin plug, 4-pin
50031250	SLSE 96M/P-1200-T2-41	Receiver, metal, red light	M12 round pin plug, 4-pin
50025209	SLSS 96M-1210-T2-24	Transmitter, metal, red light	Terminals
50031562	SLSE 96M/P-1200-T2-21	Receiver, metal, red light	Terminals
50031559	SLSS 96K-1080-T2-45	Transmitter, plastic, infrared light	M12 round pin plug, 4-pin
50031561	SLSE 96K/P-1070-T2-41	Receiver, plastic, infrared light	M12 round pin plug, 4-pin
50028011	SLSS 96K-1210-T2-45	Transmitter, plastic, red light	M12 round pin plug, 4-pin
50028012	SLSE 96K/P-1200-T2-41	Receiver, plastic, red light	M12 round pin plug, 4-pin
50081292	SLSS 96K-1080-T2-24	Transmitter, plastic, infrared light	Terminals
50081293	SLSE 96K/P-1070-T2-21	Receiver, plastic, infrared light	Terminals
50028011	SLSS 96K-1210-T2-45	Transmitter, plastic, red light	M12 round pin plug, 4-pin
50041109	SLSE 96K/P-1207-T2-41	Receiver, plastic, red light with filter for multiple operation	M12 round pin plug, 4-pin
50028009	SLSS 96K-1210-T2-24	Transmitter, plastic, red light	Terminals
50028010	SLSE 96K/P-1200-T2-21	Receiver, plastic, red light	Terminals
50028009	SLSS 96K-1210-T2-24	Transmitter, plastic, red light	Terminals
50035078	SLSE 96K/P-1207-T2-21	Receiver, plastic, red light with filter for multiple operation	Terminals

You will find further information and ordering info in the Leuze electronic Opto-Electronic Sensors Catalog.

Electrical connection

See SLSR 46B connection example, page 252

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p. 230

SLSR 25B
p. 244

SLSR 46B
p. 250

SLS 96
p. 256

SLS 318
p. 262

Technical data

General system data	
Type in accordance with EN IEC 61496	2
Service life (T_M) in accordance with EN ISO 13849-1	20 years
Category in accordance with EN ISO 13849	2
Mean time to dangerous failure ($MTTF_d$) in accordance with EN ISO 13849-1	445 years
Operating range	0...50 m (infrared light) 0...30 m (red light)
Response time	1 ms
Test reaction time	2 ms
Operating voltage, U_B	10... 30 V DC (incl. residual ripple)
Safety class	II
Protection rating	IP 67
Ambient temperature, operation	-20...+60 °C
Ambient temperature, storage	-40...+70 °C
Dimensions (WxHxD)	30 mm x 90 mm x 70 mm
Housing	Metal Plastic
Weight (transmitter and receiver)	380 g (metal housing), 260 g (plastic housing)
Transmitter	
Current consumption	50 mA
Transmitter diodes, class in accordance with EN 60825	1
Light source	Infrared light Red light
Wavelength	880 nm (infrared light) 660 nm (red light)
Activation input for test and series connection	24 V DC Active ≥ 8 V Inactive ≤ 2 V
Connection system	Cable gland M12 round pin plug, 4-pin
Receiver	
Current consumption	50 mA without external load
Switching output	pnp transistor output
Switching voltage high active	Min. $U_v - 2$ V
Switching voltage low	Max. 2 V
Output current	Max. 100 mA
Connection system	Cable gland M12 round pin plug, 4-pin

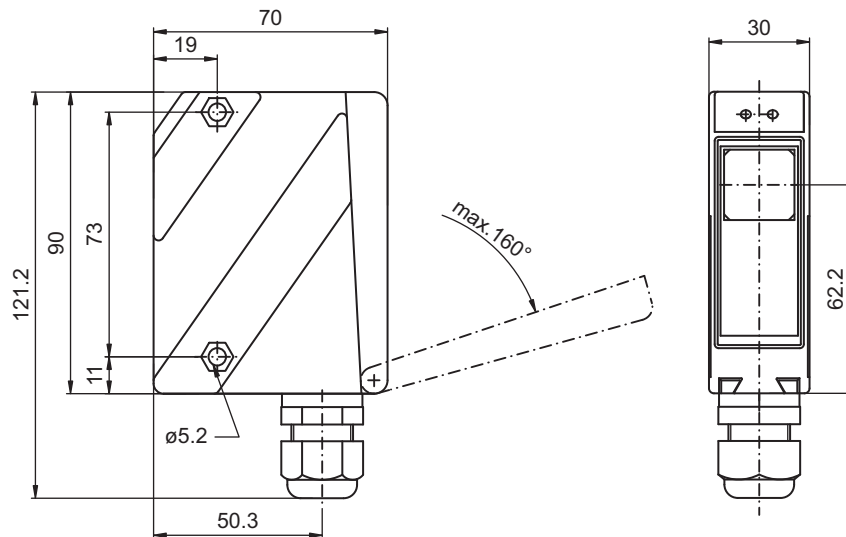
Please note the additional information at www.leuze.com/sls/.

www.leuze.com/sls/

SINGLE LIGHT BEAM SAFETY DEVICES

Dimensional drawings

SLS 96 Single Light Beam Safety Device



Dimensions in mm

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SLSR 46B
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p. 256

SLS 318
p. 262

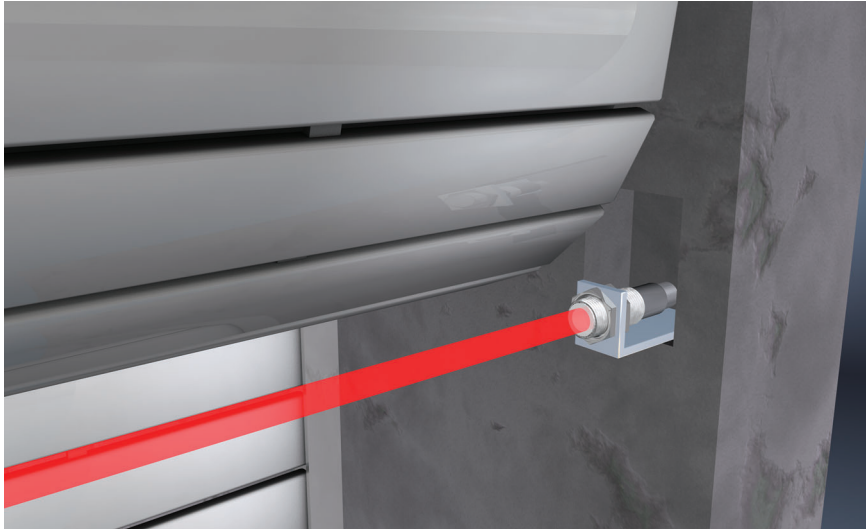
Accessories ordering information

Art. no.	Article	Description	Length, design
Connection cables			
50104545	K-D M12W-4P-5m-PVC	Connecting cable, 5 m, M12, 4-pin	Angled, PVC
50104544	K-D M12A-4P-5m-PVC	Connecting cable, 5 m, M12, 4-pin	Axial, PVC
Alignment aid			
50080502	ARH 96	Alignment aid for series 96 sensors	
Deflecting Mirror			
50000670	US 1	Deflecting Mirror	
50017434	US 2	Deflection mirror on mounting plate, can be turned by 90°	

www.leuze.com/sls/

SINGLE LIGHT BEAM SAFETY DEVICES

SLS 318



Roller shutter guarding with SLS 318 Single Light Beam Safety Device

The case often arises in which Single Light Beam Safety Devices have to be integrated into very tight installation areas. In this instance, SLS 318 Light Beam Safety Devices are the preferred choice. Because of their slender cylindrical construction they can be mounted quickly and easily, even in areas where space is restricted. They are also to be recommended here on the basis of their IP 67 protection rating for demanding industrial applications, whereby the device model can be selected as either plastic or stainless steel. The SLS 318 Light Beam Safety Devices enable switching frequencies of 1000 Hz and together with a safety monitoring device, such as the MSI-T or a configurable MSI Safety Relay, they form type 2 electro-sensitive protective equipment.

Typical areas of application

- In difficult industrial conditions
- Wood processing and paper industry
- Print and packaging machinery

MLD 500
p. 230

SLSR 25B
p. 244

SLSR 46B
p. 250

SLS 96
p. 256

SLS 318
p. 262

Important technical data, overview

Type in accordance with EN IEC 61496	2
Category in accordance with EN ISO 13849	2
Operating range	0...10 m
Operating voltage, U _B	10... 30 V DC
Dimensions	Cylindrical construction, M18x1
Housing	Plastic Metal housing on request
Switching output	pnp transistor output
Connection system	Cable, 2 m M12 round pin plug

Functions

LED display

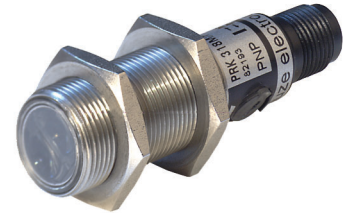
Activation input for test and series connection

Function extension

With safety interface device	Relay output	RES	EDM	Muting	Further details
MSI-T	●	●	●		p. 454
MSI 100, MSI 200		●	●	●	p. 467

Special features

- Housing (plastic or stainless steel) in short cylindrical design, M18x1 in accordance with IP 67 protection rating
- 2 antivalent switching outputs for light/dark switching and as control function
- Visible red light in straight optics
- Switching frequency, 1000 Hz
- LED display in transmitter and receiver
- Adjustable responsivity



Features



Further information

Page

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● Electrical connection	252
● Technical data	264
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● Accessories ordering information	265

SINGLE LIGHT BEAM SAFETY DEVICES

Ordering information

SLS 318, consisting of transmitter and receiver

Functions: Activation input for testing and series connection

Art. no.	Article	Description	Connection system
50083116	SLSS 318K-S12	Transmitter, plastic, red light	M12 round pin plug, 4-pin
50083117	SLSE 318K/P-S12	Receiver, plastic, red light	M12 round pin plug, 4-pin
50083132	SLSS 318K	Transmitter, plastic, red light	Cable, 2 m
50083133	SLSE 318K/P	Receiver, plastic, red light	Cable, 2 m

You will find further information and ordering info in the Leuze electronic Opto-Electronic Sensors Catalog.

Electrical connection

See SLSR 46B connection example, page 252

Technical data

General system data

Type in accordance with EN IEC 61496	2
Service life (T_M) in accordance with EN ISO 13849-1	20 years
Category in accordance with EN ISO 13849	2
Mean time to dangerous failure ($MTTF_d$) in accordance with EN ISO 13849-1	414 years
Operating range	0...10 m
Response time	0.5ms
Test reaction time	1 ms
Operating voltage, U_B	10... 30 V DC
Safety class	II
Protection rating	IP 67
Temperature range, operation/storage	-25...+65°C / -40...+70°C
Dimensions	Cylindrical construction, M18x1
Housing	Metal, plastic
Weight (transmitter and receiver)	15 g (plug variant, plastic housing), 85 g (cable variant, plastic housing), 35 g (plug variant, metal housing), 105 g (cable variant, metal housing)
Transmitter	
Current consumption	25 mA
Transmitter diodes, class in accordance with EN 60825	1
Light source	Red light
Wavelength	660 nm

MLD 500
p. 230

SLSR 25B
p. 244

SLSR 46B
p. 250

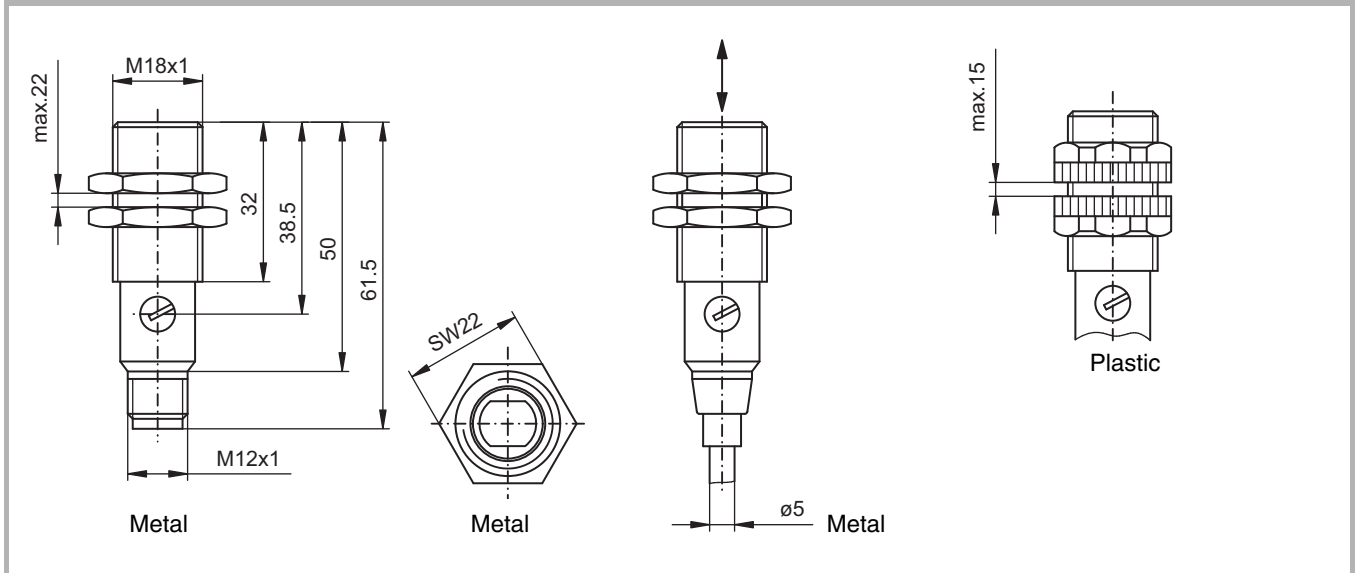
SLS 96
p. 256

SLS 318
p. 262

Technical data

Activation input for test and series connection	Active $\geq 8\text{ V}$ / inactive $\leq 1.5\text{ V}$
Connection system	Cable, 2 m M12 round pin plug, 4-pin
Receiver	
Current consumption	25 mA without external load
Switching output	pnp transistor output
Switching voltage high active	Min. $U_v - 1.6\text{ V}$
Switching voltage low	Max. 1.6 V
Output current	Max. 100 mA
Connection system	Cable, 2 m M12 round pin plug, 4-pin

SLS 318 dimensional drawings



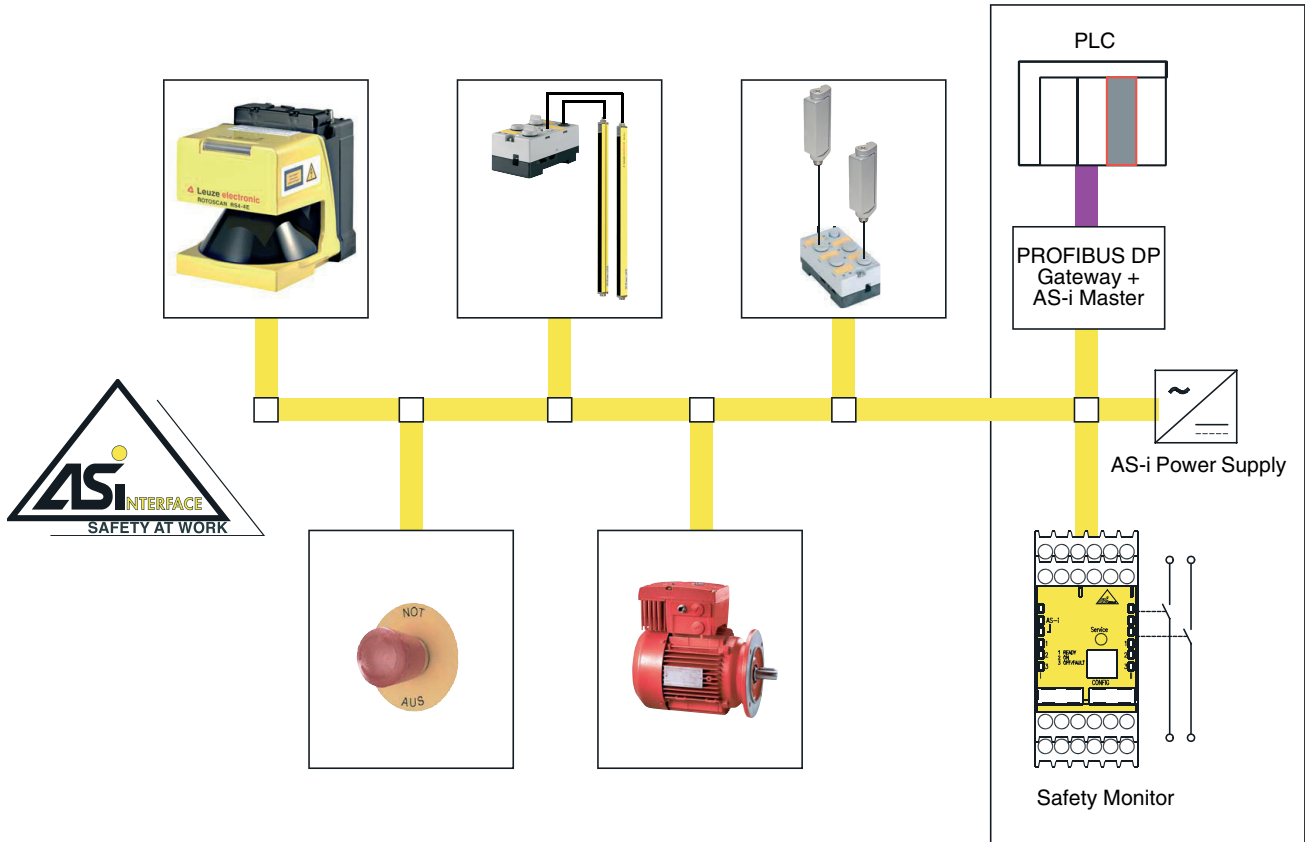
Dimensions in mm

Accessories ordering information

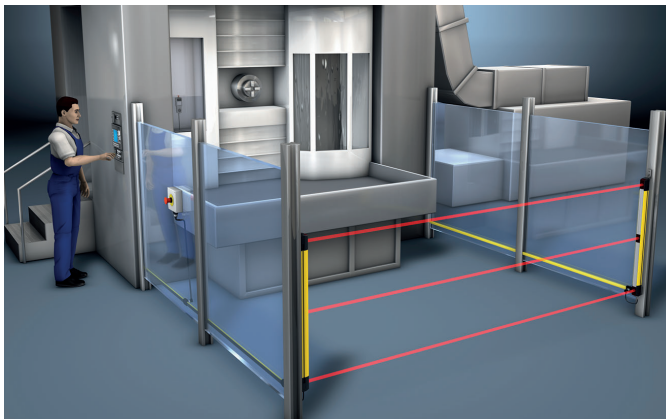
Art. no.	Article	Description	Length, design
Connection cables			
50104545	K-D M12W-4P-5m-PVC	Connecting cable, 5 m, M12, 4-pin	Angled, PVC
50104544	K-D M12A-4P-5m-PVC	Connecting cable, 5 m, M12, 4-pin	Axial, PVC

AS-Interface Safety at Work

AS-Interface Safety at Work overview



Networking with AS-Interface at the sensor/actuator level and coupling to higher level field buses



MLD 500 Multiple Light Beam Safety Devices with integrated AS-Interface at a processing center

Flexibility and fast diagnostics are becoming increasingly more important for automation technology in modern production systems, which of course also applies to safety technology. At the same time, every automation level makes its own demands on communication. While Ethernet-based systems are increasingly used at the guidance, control and field level, AS-Interface (AS-i) has established itself at the sensor/actuator level.

When compared with conventional point-to-point wiring, AS-i pushes to the fore with its low installation, wiring and connection costs. Suitable gateways create connections to higher-level field bus systems.

ASM1, ASM1E, p. 268	ASM2E, p. 276	ROTOSCAN RS4/AS-i, p. 284	COMPACT ^{plus} / AS-i, p. 286	MLD 500/AS-i, p. 288	ASKM1, p. 292	ASKM2, p. 294
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AS-Interface Safety at Work overview



Multiple Light Beam Safety Devices, Safety Light Curtains or Safety Laser Scanners can be connected directly to AS-i flat cable via integrated AS-Interfaces.
In the foreground: The AS-i Safety Monitor and the coupling module for connecting further components

														Features		
Category in accordance with EN ISO 13849	Performance Level (PL) in accordance with EN ISO 13849-1	SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	Number of safety-related switching outputs (OSSDs)	Number of safety-related switching outputs (OSSDs) together with AS-i switching signal switching	Number of safe AS-i switching signals	Number of configurable function modules	Monitoring modules with contact bounce filter	Number of programmable logic operators, OR (inputs)	Number of programmable logic operators, AND (inputs)	Programmable logic operators, FLIP-FLOP	Programmable muting logic	Programmable logic operators, switch on/off delay	Link with adjacent AS-i networks	Help signals for error unlocking and safe AS-i actuator restart	Series	Page
4	e	3	1			32		2							ASM1/1	268
			2			32		2							ASM1/2	268
			1			48	●	6	6	●	●	●			ASM1E/1	268
			2			48	●	6	6	●	●	●			ASM1E/2	268
			1	1	1	48	●	6	6	●	●	●	●	●	ASM2E/1	276
			2	1	1	48	●	6	6	●	●	●	●	●	ASM2E/2	276

AS-i is therefore a particularly economic and flexibly integrated solution, which, with the Safety at Work functionality, also meets safety-related requirements. The user consequently has the option of integrating all binary switching safety-related components into their AS-Interface network.

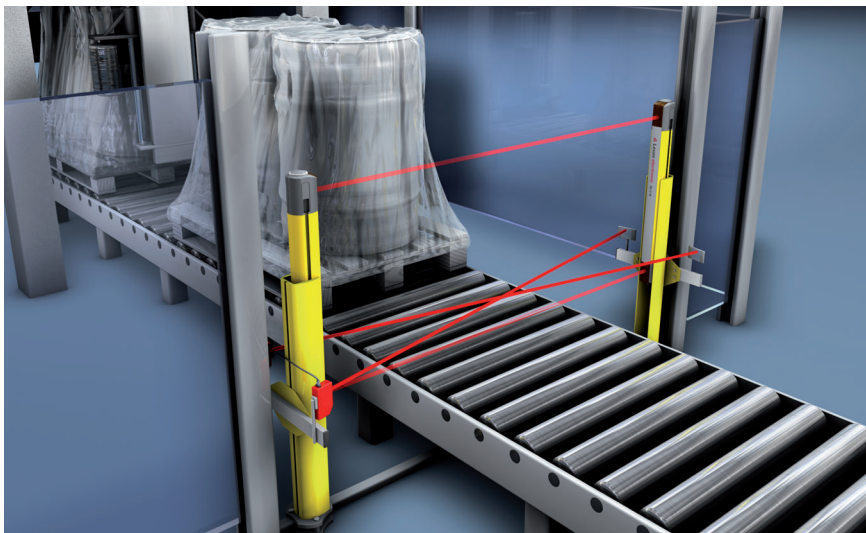
www.leuze.com/as-interface/

AS-Interface Safety at Work

Safety Monitors, ASM1, ASM1E



AS-Interface Safety at Work-based robot application with 2 release circuits



The ASM muting functionality enables palettes in a wrapping machine application, for example, to pass by the electro-sensitive protective equipment without any process interruption.

dependent or independent release circuits with configurable contactor monitoring are available.

With an extended scope of functions, the ASM1E device type provides even more convenience with the configuration and diagnostics of a safety application monitored via an AS-Interface. Besides additional logic and diagnostics functions, ASM1E also has an activation/deactivation mode for parameterized software modules. The machine manufacturer can therefore already prepare the configuration of the Safety Monitor in the preliminary stage for all safety sensors that could be used with an extension.

The ASM1E-m variants are additionally equipped with an integrated muting function package to enable a continuous material flow, e.g. for automated production cells or packaging stations, while maintaining the protective function. The muting sensors required for this are easily integrated via standard AS-Interface input slaves; a separate muting controller is no longer required.

Typical areas of application

- Automation networks based on AS-Interface Safety at Work in the lower field level
- Mixed operation of AS-i standard components and safety-related components
- Packaging systems, car manufacturing, conveyor and storage systems, machine tools, processing centers and production lines

The AS-i Safety Monitor, the ASM1, is a core component of the AS-Interface Safety at Work system. Using configuration software it monitors the safety-related bus participants that are assigned to it, e.g. command devices, Multiple Light Beam Safety Devices and Safety Switches.

The Safety Monitor has an RS 232 diagnostics interface for the PC-supported configuration and diagnostics. Logical links can be easily created with the graphic user interface of the® based software. The user can combine safety sensors and command devices with a mouse click and assign different release circuits for switching off the dangerous movement. Depending on the device type, two

ASM1, ASM1E, p. 268	ASM2E, p. 276	ROTOSCAN RS4/AS-i p. 284	COMPACT ^{plus} / AS-i, p. 286	MLD 500/AS-i, p. 288	ASKM1, p. 292	ASKM2, p. 294
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SAFETY MONITORS, ASM1, ASM1E

Important technical data, overview

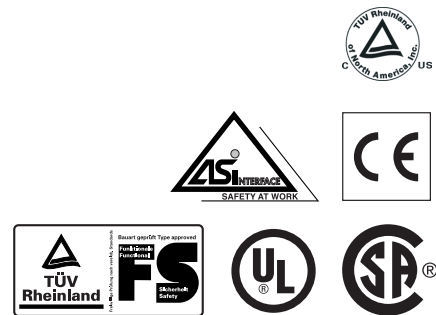
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3
Performance Level (PL) in accordance with EN ISO 13849-1	e
Category in accordance with EN ISO 13849	4
Stop category in accordance with EN IEC 60204-1	STOP 0 and 1
Supply voltage	24 V DC, ±15%
System response time	Max. 40 ms
Protection rating	IP 20
Ambient temperature, operation	-20...+60°C
Dimensions (W x H x D)	45 mm x 105 mm x 120 mm
Number of Safety Monitors per AS-Interface network	4 (with maximum 31 integrated AS-i slaves)
Safety-related switching outputs (OSSDs)	Up to 2 potential-free safety-related switching outputs (1 A DC-13, 24 V DC / 3 A AC-15, 230 V AC)

Special features

- Up to 31 safe AS-i slaves can be connected
- Freely selectable assignment (Drag & Drop) of the sensor to output-side release circuits with easy to operate asimon configuration and diagnostics software
- 48 link modules (e.g. OR, AND, FLIPFLOP) and turn on/off delays can be configured
- RS 232 interface for PC-supported system configuration, system diagnostics as well as configuration data transfer to replacement device
- Immediate switch-off STOP 0 and delayed switch-off STOP 1 of the release circuits can be parametered
- SERVICE button for teach-in with sensor swap-out
- 2-sensor parallel muting or 4-sensor sequential muting (ASM1E)
- Programmable muting logic (programmable with ASM1E-m/1 and ASM1E-m/2: muting time extension, muting timeout, muting sensor signal filter, close sequence, direction change, muting enable, muting override mode with buttons or key switches)



Features



Further information

Further information	Page
● Ordering information	271
● Electrical connection	272
● Technical data	273
● Dimensional drawings	274
● Accessories ordering information	282

AS-Interface Safety at Work

Functions, ASM1, ASM1E

	ASM1/1	ASM1/2	ASM1E/1	ASM1E/2
Number of safety-related switching outputs (OSSDs)	1	2	1	2
Number of configurable function modules	32	32	48	48
PC configuration and diagnostics interface	RS 232	RS 232	RS 232	RS 232
Monitoring modules with contact bounce filter			●	●
Service button for manual error unlocking and automatic device swap-out of the safe AS-i slaves	●	●	●	●
Status LED display for AS-Interface communication, OSSD, start/restart interlock, protective mode, errors	●	●	●	●
System signal output	●	●	●	●
Further functions (can be configured with asimon configuration and diagnostics software)				
Programmable logic operators, OR (inputs)	2	2	6	6
Programmable logic operators, AND (inputs)			6	6
Programmable logic operators, FLIP-FLOP			●	●
Programmable logic operators, switch on/off delay			●	●
Programmable logic operators, system statuses	●	●	●	●
Programmable muting logic			●	●
STOP 0 / STOP 1	●	●	●	●
Start/restart interlock (RES), selectable	●	●	●	●
Dynamic contactor monitoring (EDM), selectable	●	●	●	●
Monitoring modules with contact-simultaneity monitoring	●	●	●	●
Activation/deactivation of function modules	●	●	●	●
Support of AS-Interface A/B technology	●	●	●	●
Diagnostics data transfer via AS-Interface	●	●	●	●
Error unlocking via AS-Interface	●	●	●	●

SAFETY MONITORS, ASM1, ASM1E

Ordering information

ASM1 or ASM1E

Included in delivery: Device front screen for protection and sealing; connecting and operating instructions (short version)

Functions: Monitoring the AS-Interface Safety at Work bus participants, with selectable start/restart interlock, contactor monitoring, STOP 0/STOP 1, PC diagnostics interface

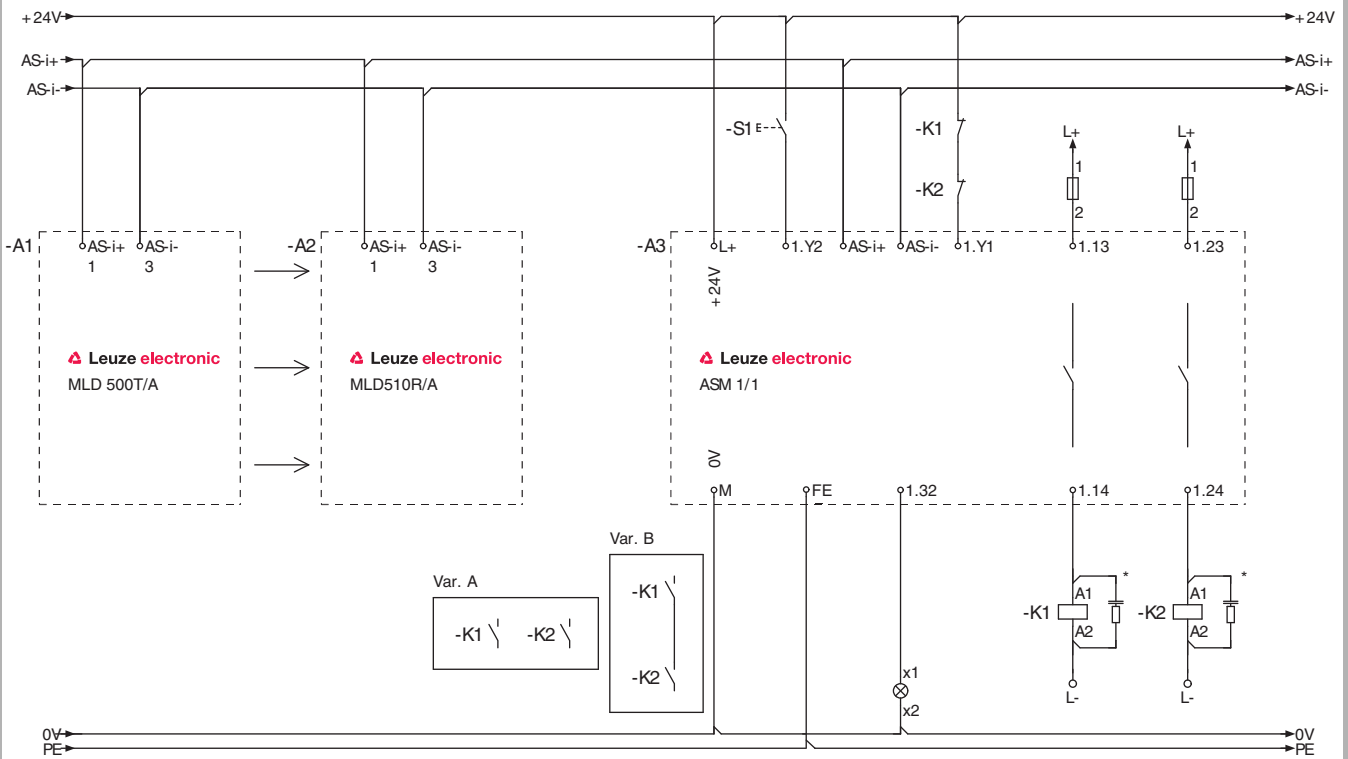
Art. no.	Article	Description	Safety-related switching outputs (OSSDs)
580020	ASM1/1	AS-i Safety Monitor	1 release circuit
580024	ASM1E/1	AS-i Safety Monitor, extended	1 release circuit
580021	ASM1/2	AS-i Safety Monitor	2 release circuits
580025	ASM1E/2	AS-i Safety Monitor, extended	2 release circuits
580055	ASM1E-m/1	AS-i Safety Monitor, extended, muting	1 release circuit
580056	ASM1E-m/2	AS-i Safety Monitor, extended, muting	2 release circuits

www.leuze.com/asi/

AS-Interface Safety at Work

Electrical connection

ASM1 connection example



*) Spark extinction circuit, supply suitable spark extinction

ASM1 Safety Monitor with COMPACTplus Safety Light Curtain with integrated AS-Interface

! Please observe the operating instructions of the components!

ASM1, ASM1E, p. 268	ASM2E, p. 276	ROTOSCAN RS4/AS-i p. 284	COMPACTplus/ AS-i, p. 286	MLD 500/AS-i, p. 288	ASKM1, p. 292	ASKM2, p. 294
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SAFETY MONITORS, ASM1, ASM1E

Technical data

General system data		
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3	
Performance Level (PL) in accordance with EN ISO 13849-1	e	
Probability of a failure to danger per hour (PFH _d)	9.10 x 10 ⁻⁹	
Service life (T _M) in accordance with EN ISO 13849-1	20 years	
Number of cycles until 10% of the components have a failure to danger (B _{10d})	With DC1 (ohmic load)	On request
	With AC1 (ohmic load)	
	With DC13 (inductive load)	10.000.000 (I ≤ 2 A, 24 V)
	With AC15 (inductive load)	100,000 (2 A, 230 V) 250,000 (1 A, 230 V) 540,000 (0.5 A, 230 V)
	Low load (20% nominal load)	On request
Category in accordance with EN ISO 13849	4	
Stop category in accordance with EN IEC 60204-1	STOP 0 and 1	
Supply voltage	24 V DC, ±15%	
System response time (exclusive sensor response time)	Max. 40 ms	
Readiness delay	Max. 10 s	
Protection rating	IP 20 (only suitable for use in electrical operating rooms/cabinets with IP 54 minimum protection rating)	
Ambient temperature, operation	-20...+60 °C	
Ambient temperature, storage	-30... +70 °C	
Dimensions (W x H x D)	45 mm x 105 mm x 120 mm	
Housing material	Polyamide PA 66	
Mounting	Snap-on fastening on DIN rails in accordance with EN 50022	
Connection system	1x 0.5 to 4.0 mm ² and 2x 0.5 to 2.5 mm ² (single-wired) 1x 0.5 to 2.5 mm ² and 2x 0.5 to 1.5 mm ² (multi-wire) 2x 20 to 14 (AWG)	
Current consumption	150 mA (ASM1/1, ASM1E/1), 200 mA (ASM1/2, ASM1E/2)	
Number of Safety Monitors per AS-Interface network	4 (with maximum 31 integrated AS-Interface slaves)	
AS-i data		
AS-i profile	Monitor 7.F	
AS-i voltage range	18.5...31.6 V	
AS-i current consumption	< 45 mA	
Configuration interface		
RS 232	9600 baud, no parity, 1 start bit, 1 stop bit, 8 data bits	

www.leuze.com/asi/

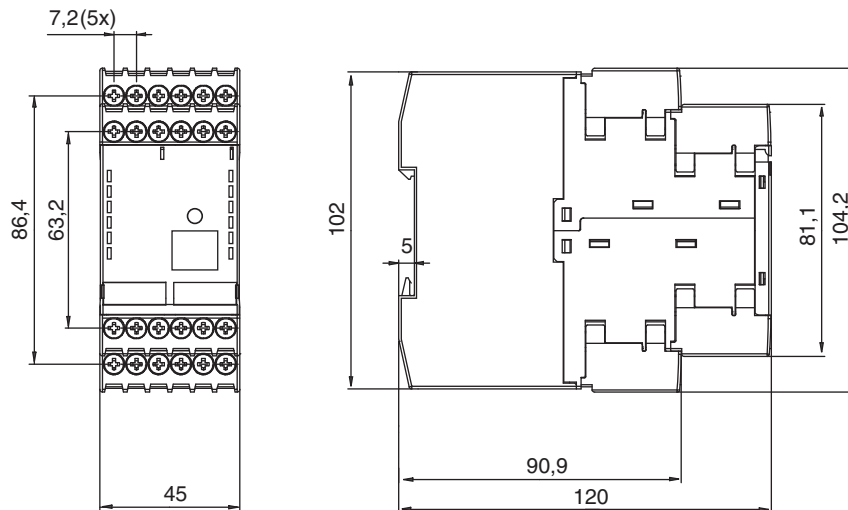
AS-Interface Safety at Work

Technical data

Inputs and outputs	
Input start	Opto-coupling input (high-active), input current approx. 10 mA with 24 V DC
Input feedback circuit	Opto-coupling input (high-active), input current approx. 10 mA with 24 V DC
Signal output ("Safety on" – OSSDs active)	pnp transistor output, 200 mA, short circuit and reverse-connect protection
Safety-related switching outputs (OSSDs)	Up to 2 potential-free safety-related switching outputs (max. contact load: 1 A with 24 V DC, 3 A with 230 V AC)
Fuse	External with max. 4 A MT
Overvoltage category	3 (for rated operating voltage, 300 V AC in accordance with VDE 0110 Part 1)

Please note the additional information in the connecting and operating instructions at www.leuze.com/asi.

AS-Interface Safety at Work ASM1, ASM1E dimensional drawings



Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

Accessories ordering information

See page 282.

ASM1, ASM1E,
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RS4/AS-i
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ASKM2,
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SAFETY MONITORS, ASM1, ASM1E

Machine Safety

Machine Safety
Services

Safety
Engineering
Software

Safety Laser
Scanners

Safety Light
Curtains

Multiple Light
Beam Safety
Devices

Light Beam
Safety Device
Sets

Single Light
Beam Safety
Devices

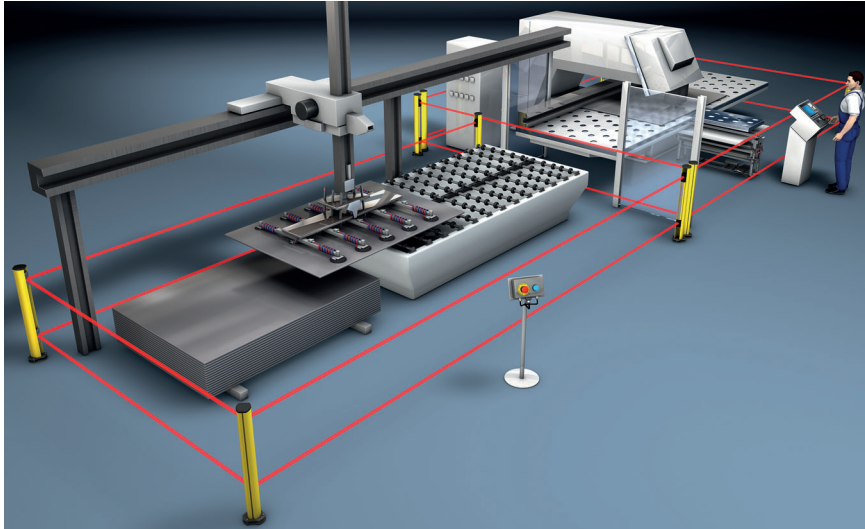
AS-Interface
Safety at Work

PROFIsafe
Sensors

www.leuze.com/asi/

AS-Interface Safety at Work

Safety Monitor, ASM2E



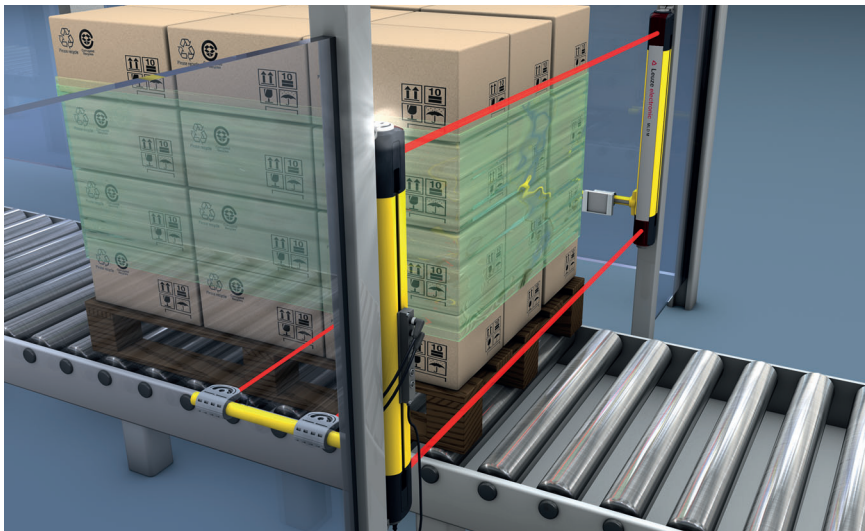
Coupling adjacent AS-i networks with the ASM2E Safety Monitor provides the option of a cross-network E-Stop connection and a global restart, especially with large and linked systems.

The ASM2E Safety Monitor has all the functionalities and features of the ASM1E Safety Monitor. Several safety-related actuators, such as drives or valve modules, can be monitored and safely switched simultaneously with just one ASM2E Safety Monitor. This means, for example, that in one conveyor line all drives in an actuator group can be blocked or released at the same time. Adjacent AS-i networks can also be safety-related linked with the ASM2E Safety Monitor, so that, for example, if an E-Stop button is pressed in an AS-i network, the adjacent network also switches off immediately. And adjacent networks can also be released in the same way.

The status information of the safety and signal outputs can also be retrieved from the respective other network for diagnostics purposes. A PC is not required to swap out the monitor or an actuator slave. For the user this means an efficient and economic use of their existing AS-i infrastructure.

Typical areas of application

- Coupling adjacent AS-i networks in linked systems
- Safe, simultaneous drive switch-off in conveyor systems
- Applications in packaging systems, car manufacturing, storage systems, machine tools, processing centers, big production systems



The muting functionality enables palettes to pass by the electro-sensitive protective equipment without any process interruption with both the ASM1E and the ASM2E Safety Monitor

ASM1, ASM1E,
p. 268

ASM2E,
p. 276

ROTOSCAN
RS4/AS-i
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COMPACT^{plus}/
AS-i,
p. 286

MLD 500/AS-i,
p. 288

ASKM1,
p. 292

ASKM2,
p. 294

SAFETY MONITOR, ASM2E

Important technical data, overview

SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3	
Performance Level (PL) in accordance with EN ISO 13849-1	e	
Category in accordance with EN ISO 13849	4	
Stop category in accordance with EN IEC 60204-1	STOP 0 and 1	
Supply voltage	24 V DC, ±15%	
System response time (without sensor/actuator response time)	Max. 40 ms	
Protection rating	IP 20	
Ambient temperature, operation	-20...+60 °C	
Dimensions (W x H x D)	45 mm x 105 mm x 120 mm	
Number of Safety Monitors per AS-Interface network	4 (with maximum 31 integrated AS-i slaves)	
Safety-related switching outputs	ASM2E/1	ASM2E/2
Safety-related switching outputs (OSSDs)	1	1
Safety-related switching outputs (OSSDs), synchronous with AS-i switching signal		1
Safe AS-i switching signal for safe actuators or coupling adjacent networks	1	1
Safety-related switching outputs (OSSD), potential-free	1 A, 24 V DC / 3 A, 230 V AC	

Special features

- Safety-related control of safe AS-i actuators with same safe AS-i address
- Higher level start and E-Stop functions with safety-related coupling of adjacent AS-i networks
- Help signals for start/restart interlock status
- AS-i actuator error restart
- Furthermore: All ASM1E Safety Monitor functions and features are provided



Features



Further information

Further information	Page
● Ordering information	278
● Electrical connection	279
● Technical data	280
● Dimensional drawings	281
● Accessories ordering information	282

AS-Interface Safety at Work

Functions

	ASM2E/1	ASM2E/2
Number of safety-related switching outputs (OSSDs)	1	2
Number of configurable function modules	48	48
PC configuration and diagnostics interface	RS 232	RS 232
Monitoring modules with contact bounce filter	●	●
Service button for manual error unlocking and automatic device swap-out of the safe AS-i slave	●	●
Status LED display for AS-Interface communication, OSSD, start/restart interlock, protective mode, errors	●	●
System signal output	●	●
Selectable functions for AS-i actuator		
AS-i actuator error unlocking	●	●
Start/restart interlock (RES)	●	●
Dynamic contactor monitoring (EDM)	●	●
Further functions (can be configured with asimon configuration and diagnostics software)		
Functions as with ASM1E, see page 270		

Ordering information

ASM2E

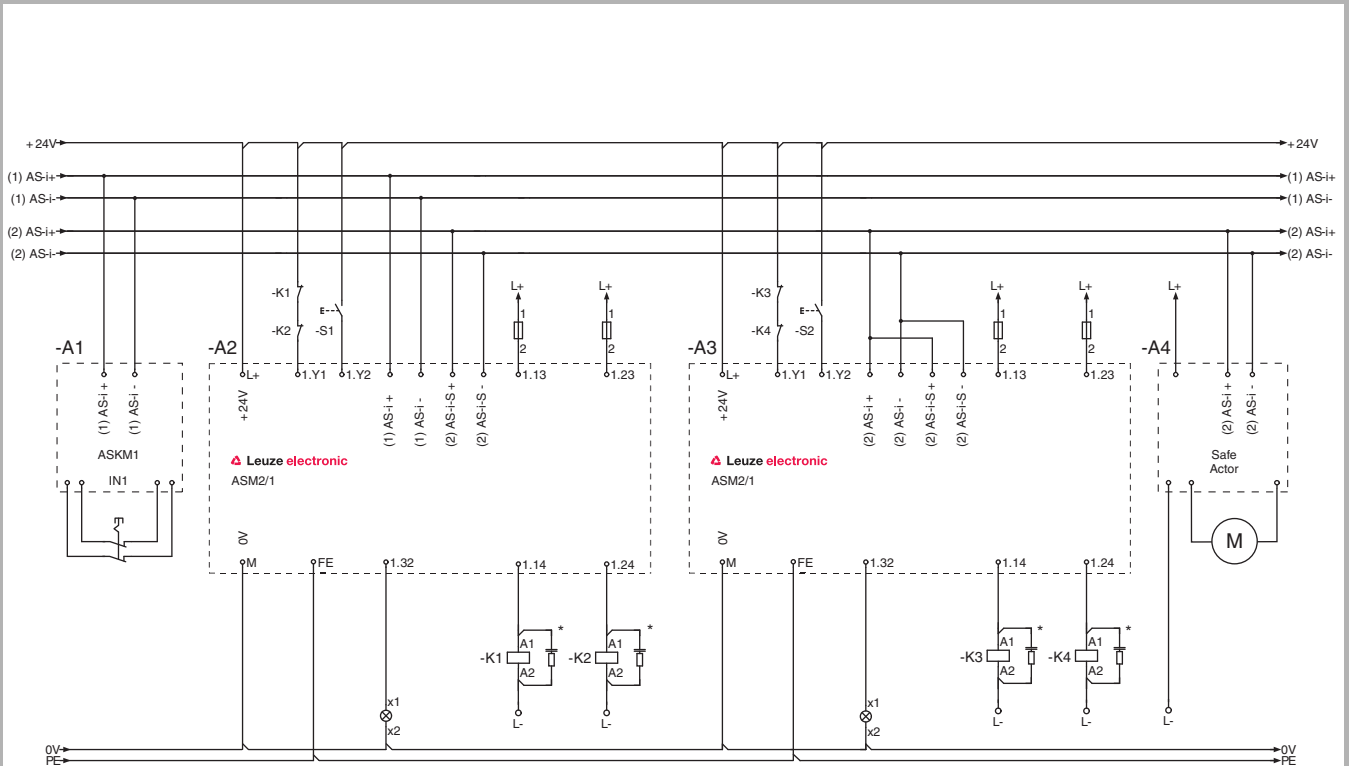
Included in delivery: Device front screen for protection and sealing; connecting and operating instructions (short version)

Functions: Monitoring the AS-i actuators, coupling AS-i networks, global E-STOP and restart, selectable start/restart interlock, contactor monitoring, STOP 0/STOP 1, PC diagnostics interface

Art. no.	Article	Description	Safety-related switching outputs (OSSDs)
580028	ASM2E/1	AS-i Safety Monitor, extended, AS-i output	1 release circuit, 1 AS-i switching signal
580029	ASM2E/2	AS-i Safety Monitor, extended, AS-i output	2 release circuits, 1 AS-i switching signal
580057	ASM2E-m/1	AS-i Safety Monitor, extended, muting	1 release circuit (relay output), 1 AS-i switching signal
580058	ASM2E-m/2	AS-i Safety Monitor, extended, muting	2 release circuits (relay output), 1 AS-i switching signal

Electrical connection

ASM2E connection example



*) Spark extinction circuit, supply suitable spark extinction

Higher level E-Stop switching of AS-i networks coupled via ASM2E

! Please observe the operating instructions of the components!

AS-Interface Safety at Work

Technical data

General system data		
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3	
Performance Level (PL) in accordance with EN ISO 13849-1	e	
Probability of a failure to danger per hour (PFH _d)	9.10 x 10 ⁻⁹	
Service life (T _M) in accordance with EN ISO 13849-1	20 years	
Number of cycles until 10% of the components have a failure to danger (B _{10d})	With DC1 (ohmic load)	On request
	With AC1 (ohmic load)	On request
	With DC13 (inductive load)	10.000.000 (I ≤ 2 A, 24 V)
	With AC15 (inductive load)	100,000 (2 A, 230 V) 250,000 (1 A, 230 V) 540,000 (0.5 A, 230 V)
	Low load (20% nominal load)	On request
Category in accordance with EN ISO 13849	4	
Stop category in accordance with EN IEC 60204-1	STOP 0 and 1	
Supply voltage	24 V DC, ±15%	
System response time (without sensor/actuator response time)	Max. 40 ms	
Readiness delay	Max. 10 s	
Protection rating	IP 20 (only suitable for use in electrical operating rooms/cabinets with IP 54 minimum protection rating)	
Ambient temperature, operation	-20...+60 °C	
Ambient temperature, storage	-30... +70 °C	
Dimensions (W x H x D)	45 mm x 105 mm x 120 mm	
Housing material	Polyamide PA 66	
Mounting	Snap-on fastening on DIN rails in accordance with EN 50022	
Connection system	1x 0.5 to 4.0 mm ² and 2x 0.5 to 2.5 mm ² (single-wired) 1x 0.5 to 2.5 mm ² and 2x 0.5 to 1.5 mm ² (multi-wire) 2x 20 to 14 (AWG)	
Current consumption	150 mA (ASM1/1, ASM1E/1), 200 mA (ASM1/2, ASM1E/2)	
Number of Safety Monitors per AS-Interface network	4 (with maximum 31 AS-Interface slaves)	
AS-i data		
AS-i profile	Monitor 7.F	
AS-i voltage range	18.5...31.6 V	
AS-i current consumption	< 45 mA	
Configuration interface		
RS 232	9600 baud, no parity, 1 start bit, 1 stop bit, 8 data bits	

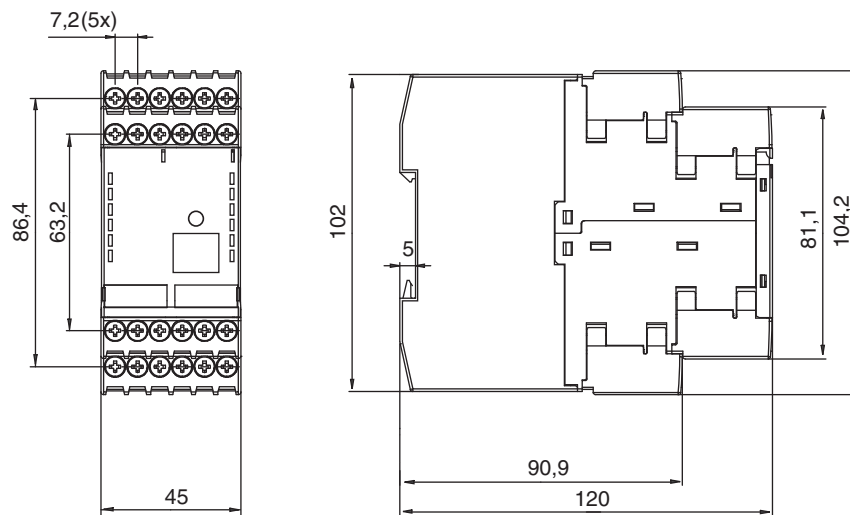
SAFETY MONITOR, ASM2E

Technical data

Inputs and outputs		
Input start	Opto-coupling input (high-active), input current approx. 10 mA with 24 V DC	
Input feedback circuit	Opto-coupling input (high-active), input current approx. 10 mA with 24 V DC	
Signal output ("Safety on" – OSSDs active)	pnp transistor output, 200 mA, short circuit and reverse-connect protection	
Safety-related switching outputs	ASM2E/1	ASM2E/2
Safety-related switching outputs (OSSDs)	1	1
Safety-related switching outputs (OSSDs), synchronous with AS-i switching signal		1
Safe AS-i switching signal for safe actuators or coupling adjacent networks	1	1
Safety-related switching outputs (OSSD), potential-free	1 A, 24 V DC / 3 A, 230 V AC	
Fuse	External with max. 4 A MT	
Overvoltage category	3 (for rated operating voltage, 300 V AC in accordance with VDE 0110 Part 1)	

Please note the additional information in the connecting and operating instructions at www.leuze.com/asi.

AS-Interface Safety at Work ASM2E dimensional drawings



Dimensions in mm
Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

AS-Interface Safety at Work

Accessories ordering information

ASM1, ASM1E, ASM2E accessories

Art. no.	Article	Description
580032	ASM-SWC	ASM start-up set for ASM1, ASM1E and ASM2E includes: Configuration and diagnostics software, connecting and operating instructions and user's guide, software (PDF file on CD-ROM), programming cable, device swap-out data cable
50104078	CB-ASM-PK1	ASM parametering cable
50104079	CB-ASM-DK1	ASM device swap-out data cable

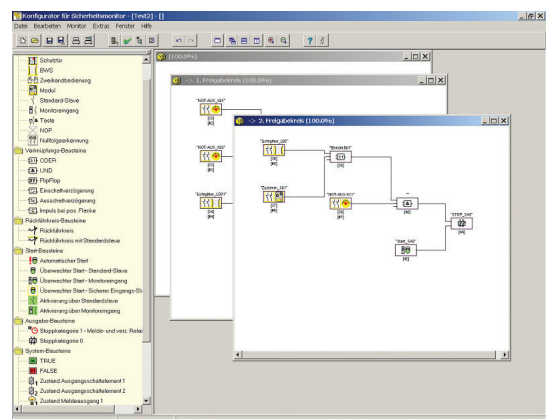
Safety Monitor start-up set, ASM-SWC

The complete ASM-SWC package with configuration and diagnostics software, PC cable set and detailed technical manual provides the user with everything that they require for the Safety Monitor start-up.



Configuration and diagnostics software

asimon is the user-friendly configuration and diagnostics software for the ASM Safety Monitors. asimon provides the user with the ability to easily configure Safety Monitors via an intuitive menu guide, and perform an efficient system diagnosis. The asimon software's multi-window system is one of its especially impressive features. Customer-specific user modules can be easily defined with asimon. Safety configurations can be visualized as circuit diagrams, and a graphic printout is possible at all times.



ASM1, ASM1E, p. 268	ASM2E, p. 276	ROTOSCAN RS4/AS-i p. 284	COMPACT ^{plus} / AS-i, p. 286	MLD 500/AS-i, p. 288	ASKM1, p. 292	ASKM2, p. 294
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ASM1, ASM1E, ASM2E SAFETY MONITOR

Accessories ordering information

AS-i accessories			
Art. no.	Article	Description	Length, design
580003	APG-02	Programming device for entering addresses with standard/A/B AS-i slaves	
50024346	AM 06	AS-i adapter for bus connection (AS-i flat cable), M12, 3-pin	
580004	AC-PDA1/A	AS-i adapter for bus connection and current supply for COMPACTplus receiver/transceiver as well as ROTOSCAN RS4, M12, 5-pin	
548361	CB-M12-1000-5GF/GM	Connection cable, adapter device, plug and socket, 1:1, M12, 5-pin	1 m, straight
548362	CB-M12-2000-5GF/GM	Connection cable, adapter device, plug and socket, 1:1, M12, 5-pin	2 m, straight
678031	CB-M12-1000S-5GF/GM	Connecting cable, plug and socket, 1:1, M12, 5-pin, shielded	1 m, straight
678033	CB-M12-2500S-5GF/GM	Connecting cable, plug and socket, 1:1, M12, 5-pin, shielded	2.5 m, straight
678035	CB-M12-5000S-5GF/GM	Connecting cable, plug and socket, 1:1, M12, 5-pin, shielded	5 m, straight
678040	CB-M12-10000S-5GF/GM	Connecting cable, plug and socket, 1:1, M12, 5-pin, shielded	10 m, straight
678045	CB-M12-15000S-5GF/GM	Connecting cable, plug and socket, 1:1, M12, 5-pin, shielded	15 m, straight
548502	CB-M12-2000S-8GF/GM	Connecting cable, plug and socket, 1:1, M12, 8-pin, shielded	2 m, straight
548505	CB-M12-5000S-8GF/GM	Connecting cable, plug and socket, 1:1, M12, 8-pin, shielded	5 m, straight
548510	CB-M12-10000S-8GF/GM	Connecting cable, plug and socket, 1:1, M12, 8-pin, shielded	10 m, straight

APG-02 programming device

The handy APG-02 device is used for entering the bus address for standard/A/B AS-i slaves.



AS-Interface Safety at Work

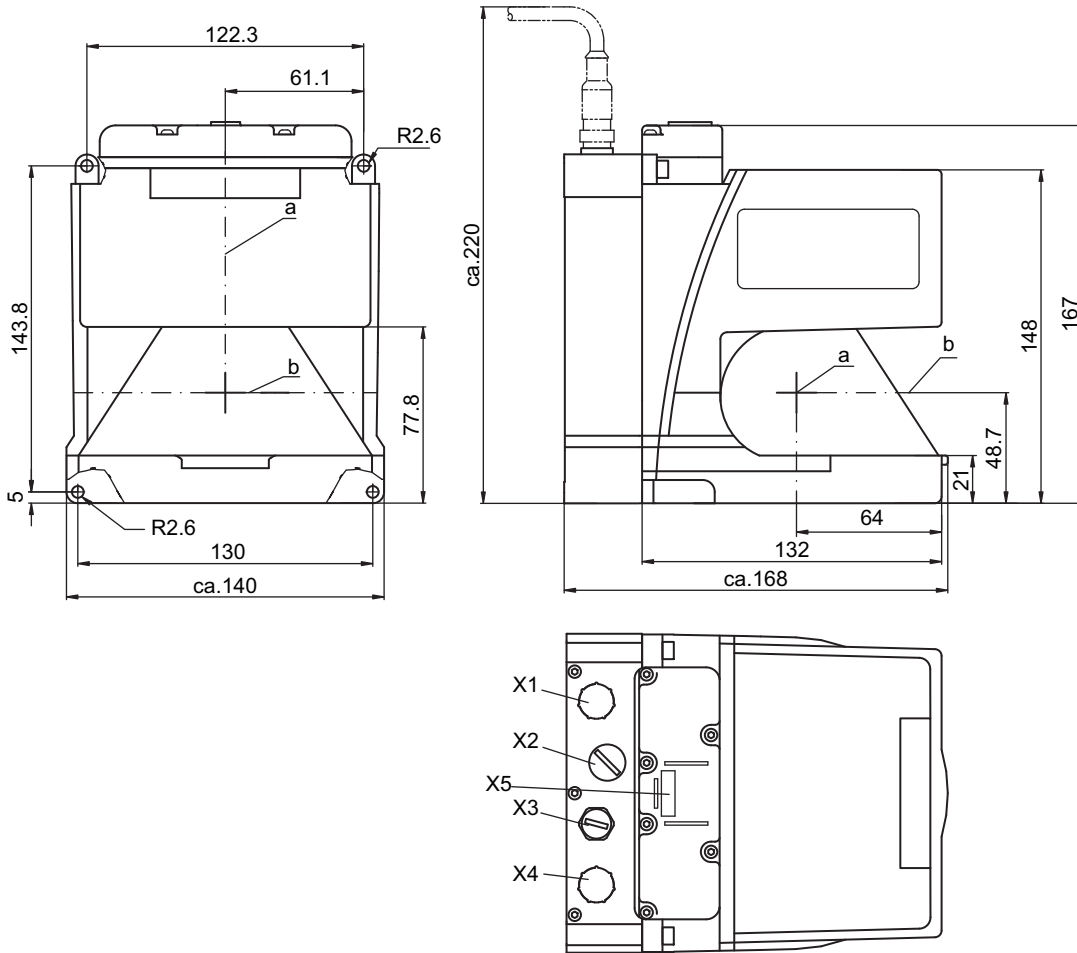
ROTOSCAN RS4/AS-i Safety Laser Scanners

Electrical connection

Connection example, see page 272.

For more information go to www.leuze.com/asi.

Dimensional drawings



- X1 = AS-i bus connection and 24-volt power supply
- X2 = AS-i address programming device
- X3 = Field pair changeover
- X4 = Reset button
- X5 = Optical PC interface

a = Rotating mirror axis
b = Scan level

Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

Ordering information

Ordering information, see page 74.

ASM1, ASM1E, p. 268	ASM2E, p. 276	ROTOSCAN RS4/AS-i p. 284	COMPACT ^{plus} / AS-i, p. 286	MLD 500/AS-i, p. 288	ASKM1, p. 292	ASKM2, p. 294
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ROTOSCAN RS4/AS-i

Important technical data, overview

Type in accordance with EN IEC 61496	3
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	2
Performance Level (PL) in accordance with EN ISO 13849-1	d
Category in accordance with EN ISO 13849	3
Resolution (adjustable)	30 mm 40 mm 50 mm 70 mm 150 mm
Dimensions (W x H x D)	140 mm x 220 mm x 168 mm
Safety-related switching outputs	AS-i Safety Interface, 4-bit AS-i data
Connection system	M12 plug, IR interface for configuration
AS-i profile	Safe slave
Slave address	1...31, programmable (factory setting = 0)
Cycle time in accordance with AS-i specifications	5 ms
Current consumption from AS-i circuit	50 mA
Sensor response time	2-piece evaluation, 85 ms (corresponds with 2 scans), up to 16 scans can be set (645 ms)
Restart delay time	Min. 160 ms (after protective field release)

Please note the additional information in the connecting and operating instructions at www.leuze.com/asi.

Function extension with ASM1/ASM1E Safety Monitor

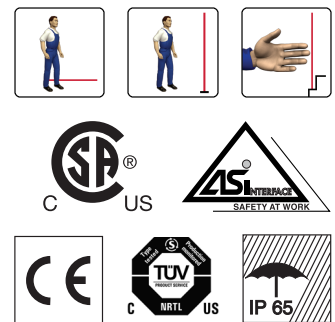
	ASM1/1	ASM1/2	ASM1E/1	ASM1E/2
Start/restart interlock (RES), selectable	●	●	●	●
Dynamic contactor monitoring (EDM), selectable	●	●	●	●
Diagnostics data transfer via AS-Interface	●	●	●	●

Special features

- **Type 3 Safety Laser Scanner in accordance with EN IEC 61496-1/-3**
- **Integrated interface for direct connection to the safe AS-Interface network via M12 device plug**
- **Bus addressing with AS-Interface addressing device directly via M12 device plug**
- **Safe data transfer of the output signal via AS-Interface**
- **Diagnostics data transfer and warning zone monitoring via AS-Interface bus**



Features



Further information

	Page
● Functions, see ROTOSCAN RS4	73
● Electrical connection, see ASM1	272
● Dimensional drawings	284
● Ordering information, see ROTOSCAN RS4	74

AS-Interface Safety at Work

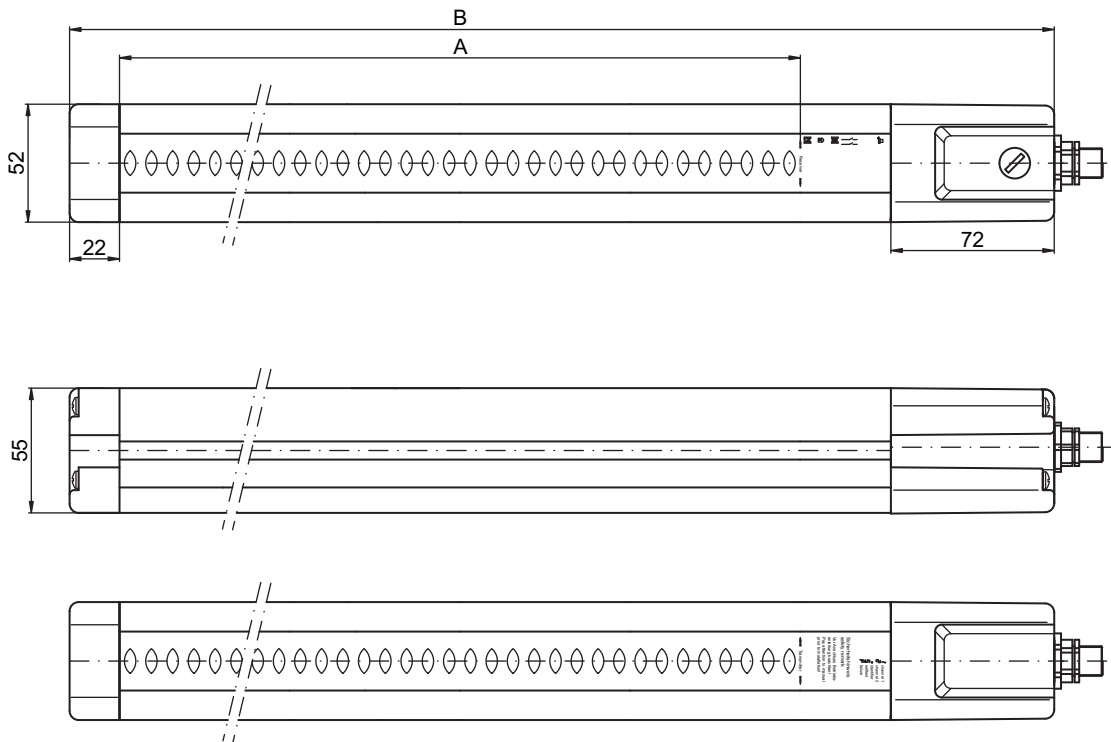
COMPACTplus/AS-i Safety Light Curtains

Electrical connection

Connection example, see page 272.

For more information go to www.leuze.com/compactplus-m and www.leuze.com/compactplus-b.

Dimensional drawings



A = Protective field height according to ordering information
 B = A + 134 mm

Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

Ordering information

Ordering information, see Safety Light Curtains COMPACTplus, page 146.

ASM1, ASM1E,
p. 268

ASM2E,
p. 276

ROTOSCAN
RS4/AS-i
p. 284

COMPACTplus
AS-i,
p. 286

MLD 500/AS-i,
p. 288

ASKM1,
p. 292

ASKM2,
p. 294

COMPACTplus/AS-i

Important technical data, overview

Type in accordance with EN IEC 61496	4			
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3			
Performance Level (PL) in accordance with EN ISO 13849-1	e			
Category in accordance with EN ISO 13849	4			
Resolution (type-dependent)	14 mm	30 mm	50 mm	90 mm
Range	0...6 m	0...18 m	0...18 m	0...18 m
Protective field height (type-dependent)	150...3000 mm			
Profile cross-section	52 mm x 55 mm			
Safety-related switching output	AS-i Safety Interface			
Connection system	M12 plug (AS-i Safety)			
AS-i profile	S-7.B.1, safe slave			
Slave address	1...31, programmable (factory setting = 0)			
Cycle time in accordance with AS-i specifications	5 ms			
Current consumption from AS-i circuit	50 mA			
Sensor response time	10 to 66 ms			
Restart delay time	20...5000 ms, can be set with SafetyLab software, presetting 100 ms (after protective field release)			

Please note the additional information in the connecting and operating instructions at www.leuze.com/asi.

For more information go to www.leuze.com/compactplus-m and www.leuze.com/compactplus-b.

Special features

- Type 4 Safety Light Curtain in accordance with EN IEC 61496-1/-2
- Integrated AS-Interface, bus connection via the AC-PDA1/A, adapter for AS-i data transfer and separate 24-volt power supply
- Safe data transfer of the OSSD signals via AS-Interface
- Device swap-out without PC via SERVICE function of the AS-i Safety Monitor
- Additional diagnostics information via AS-Interface, e.g. muting sensors status, muting or weak signal display
- Several devices can be cascaded (COMPACTplus-b)
- Direct connection of muting sensors, reset button or indicator directly on the device via sensor connection module (COMPACTplus-m)



Features



Further information

Further information	Page
● Muting function package	127
● Blanking function package	145
● Electrical connection, see ASM1	272
● Dimensional drawings	286
● Ordering information, see COMPACTplus	128, 146

www.leuze.com/asi/

AS-Interface Safety at Work

MLD 500/AS-i Single Light Beam Safety Devices

Electrical connection

Connection example, see page 272.

Dimensional drawings

Dimensional drawings, see page 238.

Ordering information

Ordering information, see page 235.

Important technical data, overview

Type in accordance with EN IEC 61496	4
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3
Performance Level (PL) in accordance with EN ISO 13849-1	e
Category in accordance with EN ISO 13849	4
Range (type-dependent)	MLD5yy-R /-T: 0.5...70 m MLD5yy-xR /-xT: 20...100 m
Profile cross-section	52 mm x 55 mm
Safety-related switching output	AS-i Safety Interface
Connection system	M12 plug (AS-i Safety)
AS-i profile	S-7.B.1, safe slave
Slave address	1...31, programmable (factory setting = 0)
Cycle time in accordance with AS-i specifications	5 ms
Current consumption from AS-i circuit	50 mA (transmitter), max. 140 mA (receiver, type-dependent)
Sensor response time	25 ms
Restart delay time	100 ms or 500 ms

For more information go to www.leuze.com/mld.

Special features

- **Type 4 Single Light Beam Safety Device in accordance with EN IEC 61496**
- **Integrated AS-Interface, bus connection via the M12-AS-i adapter**
- **Safe data transfer of the OSSD signals via AS-Interface**
- **Device swap-out without PC via SERVICE function of the AS-i Safety Monitor**



Features



Further information

Further information	Page
● Electrical connection, see ASM1	272
● Dimensional drawings, see MLD 500	238
● Ordering information, see MLD 500	235

www.leuze.com/asi/

AS-Interface Safety at Work

MLD 500/AS-i Multiple Light Beam Safety Devices

Electrical connection

Connection example, see page 272.

Dimensional drawings

Dimensional drawings, see page 184.

Ordering information

Ordering information, see page 176.

Important technical data, overview

Type in accordance with EN IEC 61496	4		
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3		
Performance Level (PL) in accordance with EN ISO 13849-1	e		
Category in accordance with EN ISO 13849	4		
Number of beams	2	3	4
Beam distance	500 mm	400 mm	300 mm
Range (type-dependent)	MLDxyy-R/-T: 0.5...50 m MLDxyy-xR/-xT: 20...70 m		
Range (transceiver systems)	0.5 - 8 m (2-beam) 0.5 - 6 m (3-beam)		
Profile cross-section	52 mm x 55 mm		
Safety-related switching output	AS-i Safety Interface		
Connection system	M12 plug (AS-i Safety)		
AS-i profile	S-7.B.1, safe slave		
Slave address	1...31, programmable (factory setting = 0)		
Cycle time in accordance with AS-i specifications	5 ms		
Current consumption from AS-i circuit	50 mA (transmitter), max. 140 mA (receiver, type-dependent)		
Sensor response time	25 ms		
Restart delay time	100 ms or 500 ms		

For more information go to www.leuze.com/mld.

Special features

- **Type 4 Multiple Light Beam Safety Device in accordance with EN IEC 61496**
- **Integrated AS-Interface, bus connection via the M12-AS-i adapter**
- **Safe data transfer of the OSSD signals via AS-Interface**
- **Device swap-out without PC via SERVICE function of the AS-i Safety Monitor**



Features



Further information

Page

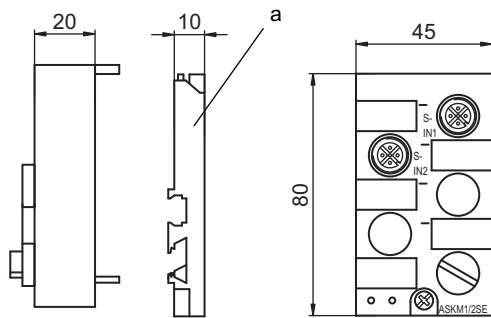
- Electrical connection, see ASM1 272
- Dimensional drawings, see MLD 500 184
- Ordering information, see MLD 500 176

AS-Interface Safety at Work

ASKM1 AS-Interface Safety at Work coupling module

The ASKM1 safe coupling module allows electro-mechanical safety sensors with contact-based outputs, such as E-Stop command devices or Safety Switches, as well as Safety Light Curtains with relay outputs to be easily connected to the AS-Interface. The ASKM1 converts the sensor signals into data words and provides these for forwarding via AS-Interface. The transfer of data and power is performed simultaneously via the unshielded AS-i flat cable.

Dimensional drawings

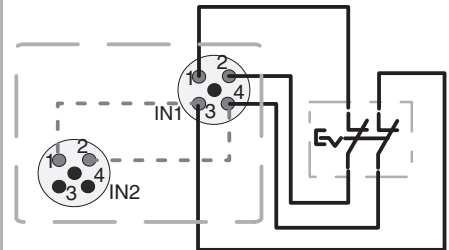


a = Mounting plate

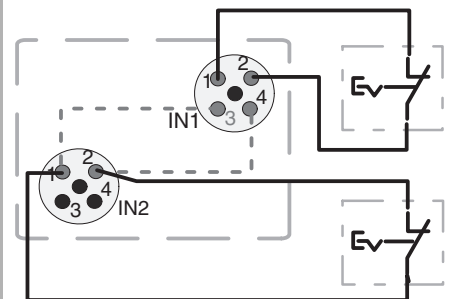
Dimensions in mm

For more information go to www.leuze.com/asi.

Electrical connection



Category 3 in accordance with EN ISO 13849: protective door with a Safety Switch (2 break contacts)



Category 4 in accordance with EN ISO 13849: protective door with two Safety Switches (1 break contact)

Ordering information

Art. no.	Article	Description
580000	ASKM1/2SE	Coupling module with 2 safe inputs
580001	ASKM1-MP	Mounting plate for ASKM1/2SE* coupling module
580002	ASKM1-PK	Parametering cable for AS-i parametering device APG-02

*) Must always also be ordered for ASKM1/2SE

ASM1, ASM1E, p. 268	ASM2E, p. 276	ROTOSCAN RS4/AS-i p. 284	COMPACT ^{plus} / AS-i, p. 286	MLD 500/AS-i, p. 288	ASKM1, p. 292	ASKM2, p. 294
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ASKM1 COUPLING MODULE

Important technical data, overview

Category in accordance with EN ISO 13849	4
Operating voltage	AS-i (19 - 31.6 V)
Current consumption (total)	≤ 45 mA
Connection system	M12, 5-pin
AS-i profile	Safe slave
Protection rating (with ASKM1-MP mounting plate)	IP 67
Ambient temperature, operation	-25... +85 °C
Ambient temperature, storage	-40... +85 °C
Dimensions (H x W x D)	80 mm x 45 mm x 34 mm

Please note the additional information in the connecting and operating instructions at www.leuze.com/asi.

Functions

	Connectable electro-mechanical safety devices*			
	Safety Switches	E-Stop command devices, 1 and 2-channel	Single Light Beam Safety Devices	Multiple Light Beam Safety Devices
ASKM1	1/2	1/2	1/2	1/2

*) Applies for safety sensors with contact-based outputs. For the number of connectable safety sensors in accordance with the attainable categories in accordance with EN ISO 13849, see the ASKM1 connection examples on page 292.

Special features

- Safe AS-Interface bus participant for connecting 1 or 2 electro-mechanical sensors
- LED displays: AS-i status, inputs
- AS-Interface addressing via integrated addressing port
- Simple network connection with AS-i penetration technology
- Mounting plate for DIN rails and screwed mounting



Features



Further information

Further information	Page
● Electrical connection to AS-Interface	272

AS-Interface Safety at Work

ASKM2 AS-Interface Safety at Work coupling module

The ASKM2 coupling module allows SOLID 2 and SOLID-4 Safety Light Curtains to be easily connected to AS-Interface networks. The ASKM2 converts the sensor signals into data words and provides these for forwarding via AS-Interface. The transfer of data and power is performed simultaneously via the unshielded AS-i flat cable.

Dimensional drawings

For dimensional drawings see ASKM 1, page 292.

Ordering information

Art. no.	Article	Description
580007	ASKM2/SEe	Coupling module, electronic, with 2 safe inputs for semiconductor OSSDs
580001	ASKM1-MP	Mounting plate for ASKM* coupling module
580008	ASKM/PS	Power supply for 2 transmitters
580002	ASKM1-PK	Parametering cable for AS-i APG-02 programming device

*) Applies for safety sensors with contact-based outputs

Electrical connection

The diagram shows the ASKM2 coupling module with four main connection points labeled 1, 2, 3, and 4. Point 1 is a 5-pin connector labeled 'SEe'. Point 2 is a 5-pin connector labeled 'SEe'. Point 3 is a 5-pin connector labeled 'SEe'. Point 4 is a circular connector labeled 'ADDR'. Below the module, there are two small circular connectors labeled 'AS-i Fault' and 'ASKM2/SEe'.

Three circular diagrams showing pin layouts for different sensors. The first diagram (SOLID-4 Receiver) has 8 pins numbered 1-8. The second diagram (SOLID-2 Receiver) has 4 pins numbered 1-4. The third diagram (SOLID Transmitter) has 4 pins numbered 1-4.

Pin	SOLID-4 Receiver (1)	SOLID-2 Receiver (2)	SOLID Transmitter (3)
1	Diagnostics	+	+
2	+	OSSD 2	n.c.
3	+	-	-
4	Diagnostics	OSSD 1	+
5	OSSD 1	FE	FE
6	OSSD 2		
7	-		
8	FE		

Pin assignments with connection of SOLID-2 and SOLID-4 Safety Light Curtains to the ASKM2 coupling module

ASM1, ASM1E, p. 268	ASM2E, p. 276	ROTOSCAN RS4/AS-i p. 284	COMPACT ^{plus} / AS-i, p. 286	MLD 500/AS-i, p. 288	ASKM1, p. 292	ASKM2, p. 294
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ASKM2 COUPLING MODULE

Important technical data, overview

SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3
Category in accordance with EN ISO 13849	4
Operating voltage	AS-i (19 - 31.6 V)
Current consumption (total)	≤ 270 mA
Current consumption (without load)	≤ 45 mA
Connection system	M12, 5-pin, 8-pin
AS-i profile	Safe slave
Protection rating (with ASKM1-MP mounting plate)	IP 67
Ambient temperature, operation	-25...+70 °C
Ambient temperature, storage	-40... +85 °C
Dimensions (H x W x D)	80 mm x 45 mm x 30 or 34 mm

Please note the additional information in the connecting and operating instructions at www.leuze.com/asi.

Connectable safety sensors

- SOLID-2 Safety Light Curtain
- SOLID-4 Safety Light Curtain

Special features

- Safe AS-Interface bus participant for connecting 1 Leuze electronic SOLID-2 or SOLID-4 Safety Light Curtain
- LED displays: AS-i status, inputs
- Error signal can be retrieved via AS-Interface
- AS-Interface addressing via integrated addressing port
- Simple bus connection with AS-i penetration technology
- Mounting plate for DIN rails and screwed mounting



Features

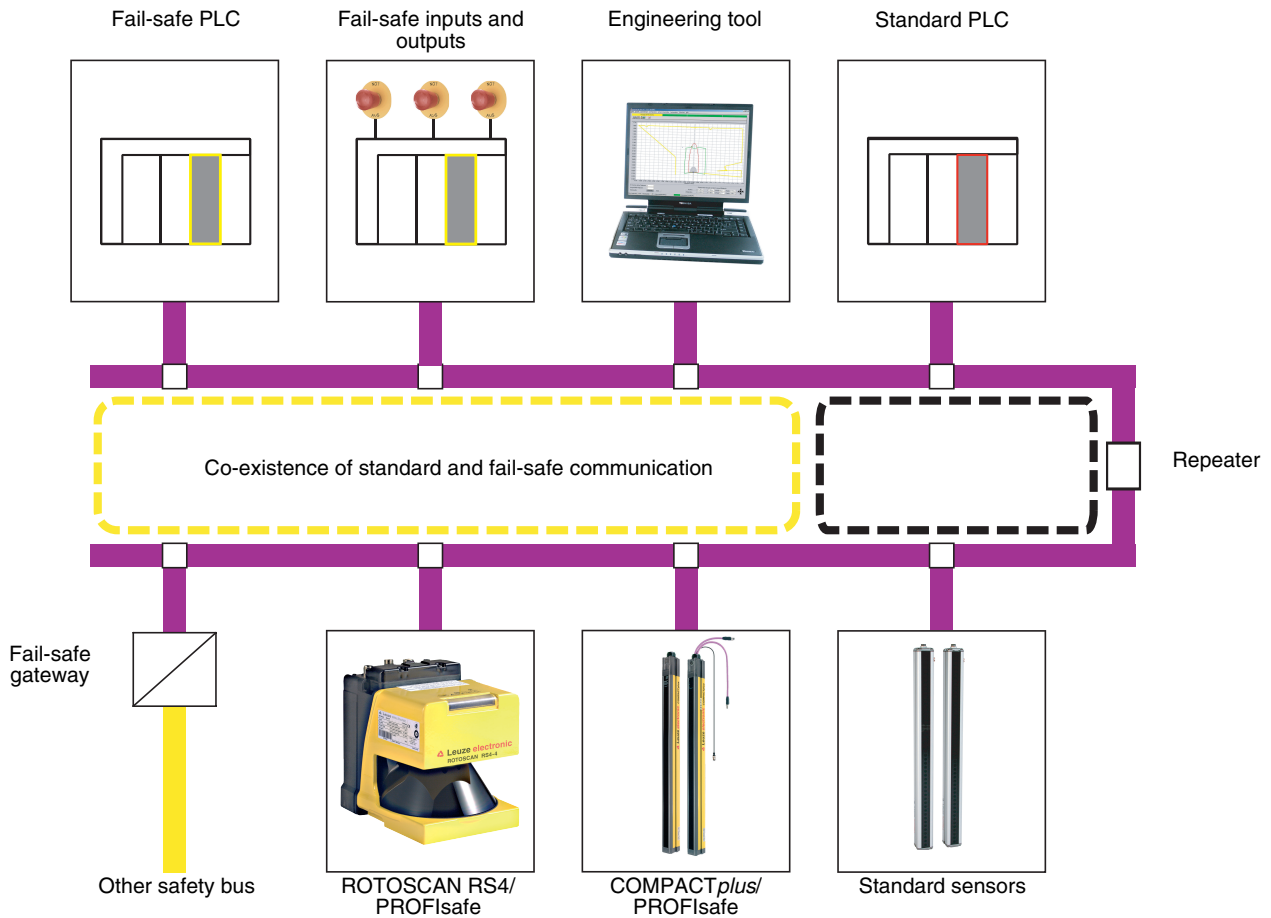


Further information

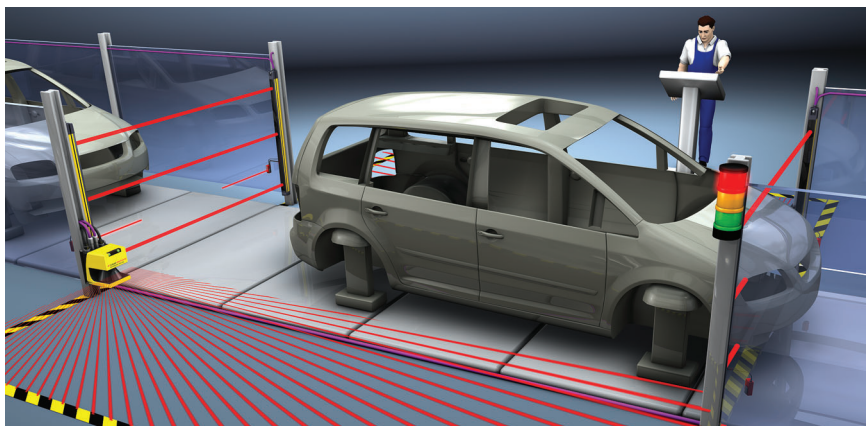
Further information	Page
● Electrical connection to AS-Interface	272

PROFIsafe Sensors

Overview of PROFIsafe Sensors



Networking standard components and safety sensors (yellow circuit) with direct coupling on PROFIBUS DP



Laser Scanners and Multiple Light Beam Safety Devices directly connected on the PROFIBUS with muting function in an automotive industry application

PROFIsafe Sensors
p. 298

ROTOSCAN RS4/
PROFIsafe
p. 298

COMPACTplus/
PROFIsafe
p. 302

Overview of PROFI-safe Sensors



Whether it be type 4 Safety Light Curtains, Multiple Light Beam Safety Devices or Safety Laser Scanners – via the integrated PROFI-safe interface the sensors can be connected directly to the PROFIBUS DP

PROFIBUS is an open field bus standard that covers all areas of application in production engineering, process automation, drive system engineering and safety-related communication. Because of its universal application for almost every area of automation, the PROFIBUS has advanced to become the market leader with several million PROFIBUS nodes installed in the industrial sector.

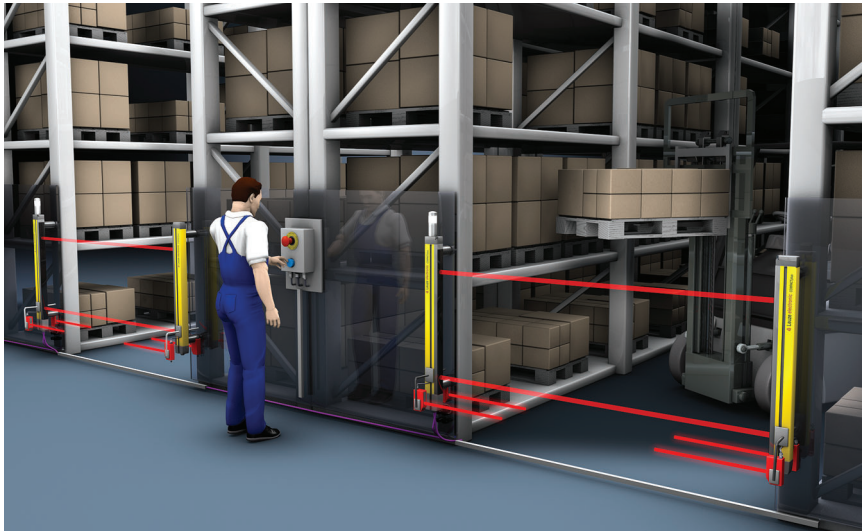
The new V2 driver generation for PROFI-safe provides a standardized profile for the PROFIBUS and PROFINET bus systems, which are firmly established in numerous industries. PROFI-safe V2 is compatible with the V1 mode, previously restricted to PROFIBUS DP alone, and enables the mixed operation of various PROFIBUS networks.

Both the type 3 ROTOSCAN RS4/PROFI-safe Safety Laser Scanner and the type 4 COMPACTplus/PROFI-safe Safety Light Curtain demonstrate their value with an integrated PROFI-safe interface and the support of the current PROFI-safe profile.

Visualization and parametering can be performed via both the local interface on the respective device and directly via PROFIBUS. As the device software supports the Tool Calling Interface (TCI) defined by the PNO, direct retrieval is possible from a TCI-enabled engineering system, such as STEP 7 from version 5.4. Access via a higher level PROFINET is therefore also possible in this way.

PROFIsafe Sensors

ROTOSCAN RS4/PROFIsafe, COMPACTplus/PROFIsafe



Safety sensors with integrated PROFIBUS DP interface in wide-ranging automation environments networked with PROFIBUS

Communication skills, transparent information paths and decentralization are important elements of forward-thinking automation concepts. Industrial communication systems like PROFIBUS DP connect decentralized periphery equipment with one another at field level, such as sensors, E/A modules or actuators, and therefore assume a key function – including with regard to safety-related components. The PROFIsafe application profile enables the shared operation of standard automation devices and safety-set devices on the PROFIBUS DP. The Leuze electronic safety sensors, RS4/PROFIsafe and COMPACTplus/PROFIsafe, are equipped with an integrated PROFIBUS DP connection unit for the direct bus connection. The proxy functions block, which is also included with delivery, ensures an automatic download and therefore an easy device swap-out if a fault occurs.

Both the type 3 ROTOSCAN RS4-4/PROFIsafe Safety Laser Scanner and the type 4 COMPACTplus/PROFIsafe Safety Light Curtain have the valuable feature of supporting the current PROFIsafe profile – plus, they are also prepared for PROFINET. The PROFIBUS DP bus connection is performed with both sensors directly and without additional bus coupling modules. With a data transfer rate of up to 12 MBd, both the safe cyclic and the acyclic data traffic are supported on PROFIBUS DP. Rapid safety-relevant real-time data, such as a switch-off command with addressing the sensor and comprehensive diagnostics data with the controlling PLC, for example, can consequently be exchanged.

ROTOSCAN RS4/PROFIsafe Safety Laser Scanner

The ROTOSCAN RS4/PROFIsafe is a piece of electro-sensitive protective equipment with integrated PROFIsafe adapter, which enables this device to be safely coupled to PROFIBUS DP. The parametering and diagnostics are enabled with the direct access via PROFIBUS/PROFINET via the TCI interface or on-site via an infrared interface. The protective field contours and all other parameters can be easily generated via Windows® software with graphic input option. The field pair (protective field/warning field) changeover is also possible during operation.

Typical areas of application

- Access and danger zone guarding
- Vertical point of operation and access guarding with variable resolution (ROTOSCAN RS4-4E)
- Feed-in stations, processing machinery, robots, driverless transport systems with PROFIBUS DP networking

Safety Light Curtains and Multiple Light Beam Safety Devices COMPACTplus/PROFIsafe

COMPACTplus/PROFIsafe, a type 4 safety sensor, is available with the blanking, muting and cycle control integrated function packages. The individual adjustment of the functions is performed either via switches in the device, directly via PROFIBUS/PROFINET via TCI interface or the optical PC interface of the receiver using the easy to use SafetyLab diagnostics and parametering software. The changeover of the complete parameter set with the safe PLC program is also possible during operation.

Typical areas of application

- Access and perimeter guarding, danger zone guarding
- Automated production cells with PROFIBUS DP networking

ROTOSCAN RS4/PROFIsafe

Important technical data, overview

Type in accordance with EN IEC 61496	3
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	2
Performance Level (PL) in accordance with EN ISO 13849-1	d
Category in accordance with EN ISO 13849	3
Resolution (adjustable)	30 mm 40 mm 50 mm 70 mm 150 mm
Dimensions (W x H x D)	140 mm x 230 mm x 168 mm
Safety-related switching output	PROFIsafe interface
Connection system	M12 plug (b-coded for PROFIBUS DP), IR interface for parametering
PROFIsafe driver version	V2
PROFIBUS DP data rate	9.6 kBd...12 MBd
Configuration/parametering	With software
Parametering interface	Infrared
Inputs and outputs	Input for reset button
Cyclic safe data	1 byte
Acyclic data	Measured values, error data, warnings

Please note the additional information in the connecting and operating instructions at www.leuze.com/profisafe.

Functions

See ROTOSCAN RS4-4/RS4-4E on page 73.

For more information go to www.leuze.com/rotoscan.

PROFIsafe function extensions

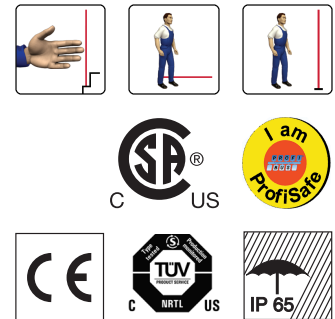
- Diagnostics data transfer via PROFIBUS DP
- Start/restart interlock (RES), selectable
- Plus all functions and modules of the safety PLC used

Special PROFIsafe features

- Easy project planning via GSD and parametering software
- Integrated PROFIBUS connection unit with PROFIsafe V2 version
- Acyclic DP-V1 services for online diagnostics and measurement value logging
- Automatic parameter download and verification when replacing a device with Proxy Function Block
- Direct access via PROFIBUS DP or infrared interface for on-site parametering and diagnostics



Features



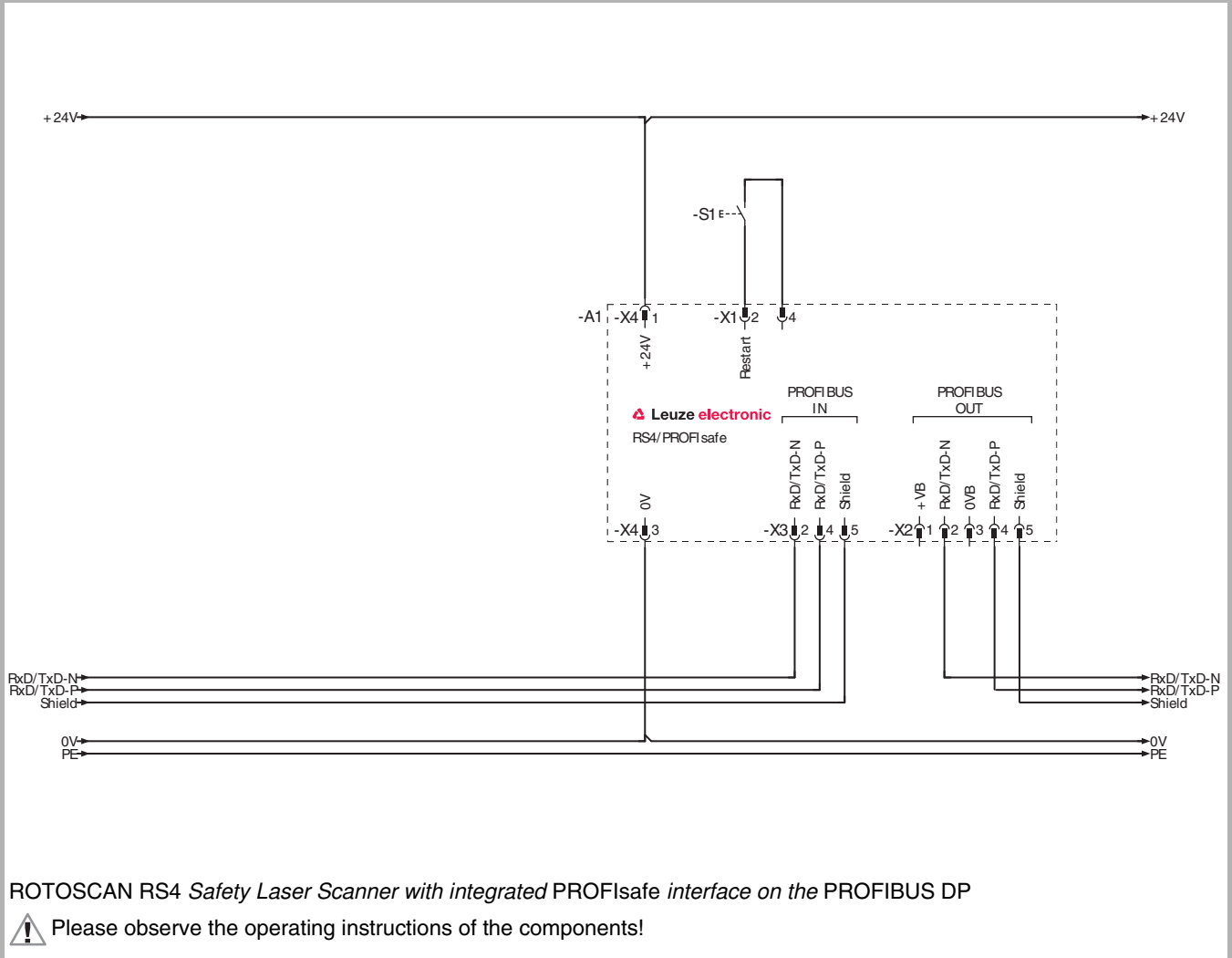
Further information

Further information	Page
● Ordering information, see ROTOSCAN RS4	74
● Electrical connection	300
● Technical data, see ROTOSCAN RS4	77
● Dimensional drawings	301
● Dimensional drawings: Accessories, see ROTOSCAN RS4	80
● Accessories ordering information, see ROTOSCAN RS4	81

PROFIsafe Sensors

Electrical connection

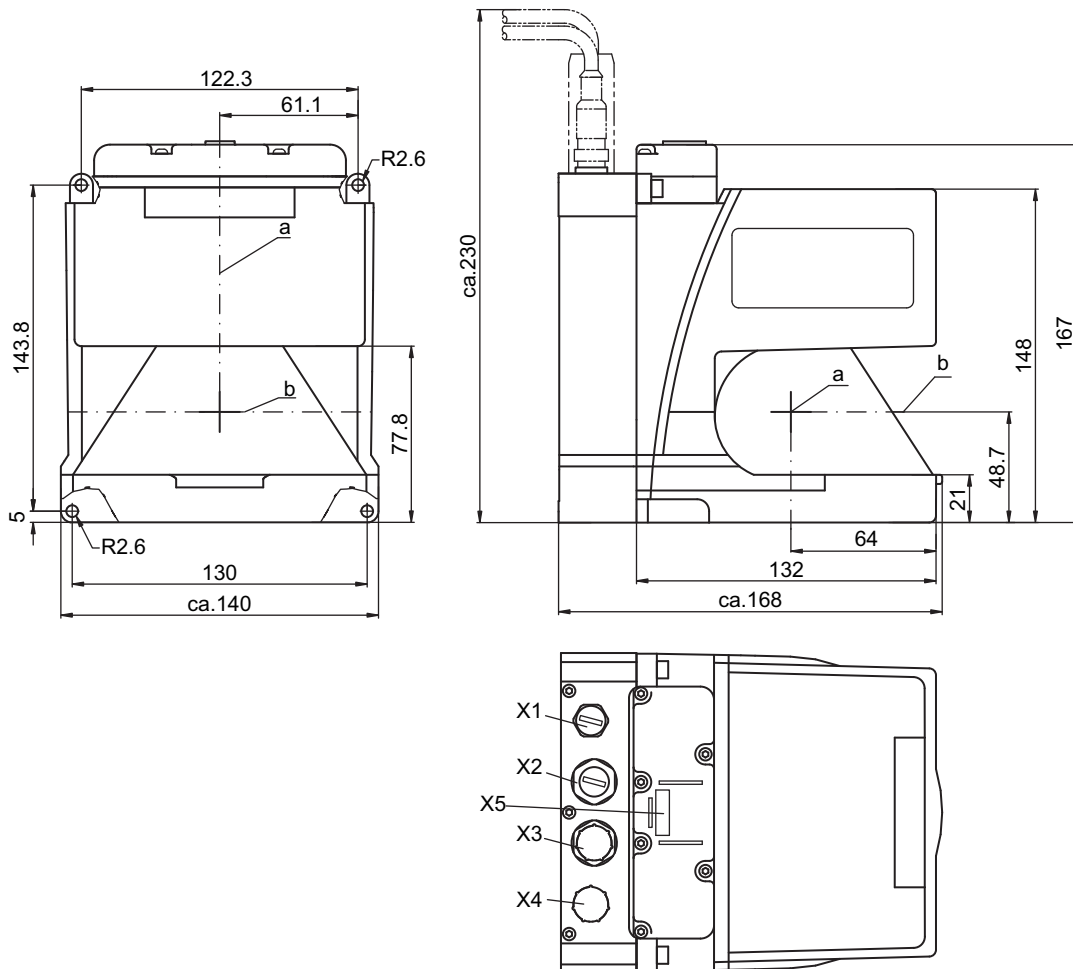
ROTOSCAN RS4/PROFIsafe connection example



ROTOSCAN RS4/PROFIsafe

Dimensional drawings

ROTOSCAN RS4/PROFIsafe - Safety Laser Scanner with integrated PROFIsafe interface



- X1 = Reset button
- X2 = PROFIBUS output
- X3 = PROFIBUS input
- X4 = 24-volt power supply
- X5 = Optical PC interface

a = Rotating mirror axis
b = Scan level

Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

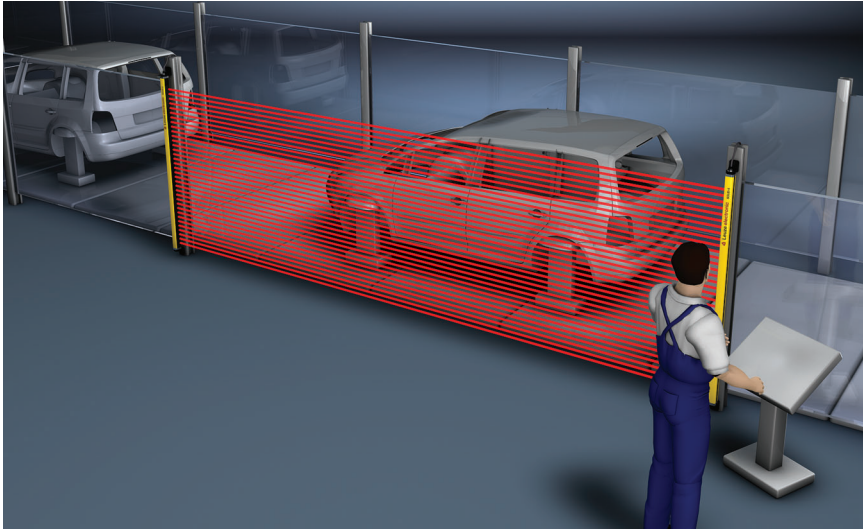
Ordering information

Ordering information, see ROTOSCAN RS4, page 74.

www.leuze.com/profisafe/

PROFIsafe Sensors

COMPACTplus/PROFIsafe Safety Light Curtains



COMPACTplus/PROFIsafe access guarding on a final assembly line

Special PROFIsafe features

- Easy project planning via GSD and parametering software
- Integrated PROFIBUS connection unit with PROFIsafe V2 version
- Fast real-time transfer of safe cyclical data
- Acyclic DP-V1 services for online diagnostics and measurement value logging
- Automatic parameter download and verification when replacing a device with Proxy Function Block
- Integrated interface for local control and status signals saves on additional bus nodes
- Configuration via switch or via SafetyLab PC software; connection via local optical interface or directly via PROFIBUS

The COMPACTplus/PROFIsafe product is the PROFIBUS DP version of the COMPACTplus series. The safe coupling on PROFIBUS via the PROFIsafe profile is performed via an integrated interface, i.e. without additional bus coupling modules.

With a data transfer rate of up to 12 MBd, fast, safety-relevant real-time data can be exchanged, e.g. a sensor switch-off command and comprehensive acyclic diagnostics data with the regulating PLC.

The individual adjustment of the functions is performed either via 6 switches in the device, directly via PROFIBUS/PROFINET via TCI interface or the optical interface of the receiver using the easy to use Safety-Lab diagnostics and parametering software. After parametering, a program part of the Safety PLC, the proxy functions block, saves the current parameters in the memory of the safe bus master. In the event of a device swap-out, only the bus address must be set on the exchange device via two rotary switches. The download of the corresponding sensor parameters for this bus participant is performed automatically via the bus.

COMPACTplus/PROFIsafe

Important technical data, overview

Type in accordance with EN IEC 61496	4			
Classification in accordance with IEC 61508	3			
Performance Level (PL) in accordance with EN ISO 13849-1	e			
Category in accordance with EN ISO 13849	4			
Resolution (type-dependent)	14 mm	30 mm	50 mm	90 mm
Range	0...6 m	0...18 m	0...18 m	0...18 m
Protective field height (type-dependent)	150...3000 mm			
Profile cross-section	52 mm x 55 mm			
Safety-related switching output	PROFIsafe interface			
Connection system	M12 plug (b-coded for PROFIBUS DP)			
PROFIsafe driver version	V2			
PROFIBUS DP data rate	9.6 kBd...12 MBd			
Configuration/parametering	With software, teach-in, switch			
Parametering interface	Infrared			
Inputs and outputs	5 inputs, 2 outputs for reset button, muting sensors, muting indicators, etc.			
Cyclic safe data	4 byte			
Acyclic data	Protective field individual beam data, error data, warnings			

Please note the additional information in the connecting and operating instructions at www.leuze.com/profisafe.

Function packages

Muting – see COMPACTplus-m from page 126.

Blanking – see COMPACTplus-b from page 144.

All function packages can be parametered application-specific via the SafetyLab PC software. You will find information on the functions that are based on SafetyLab on pages 127, 145.

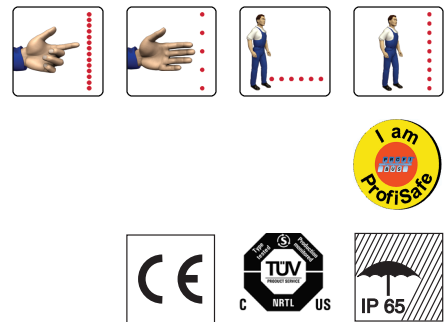
For more information go to www.leuze.com/compactplus-m and www.leuze.com/compactplus-b.

PROFIsafe function extensions

Diagnostics data transfer via PROFIBUS DP
Plus all functions and modules of the safety PLC used



Features



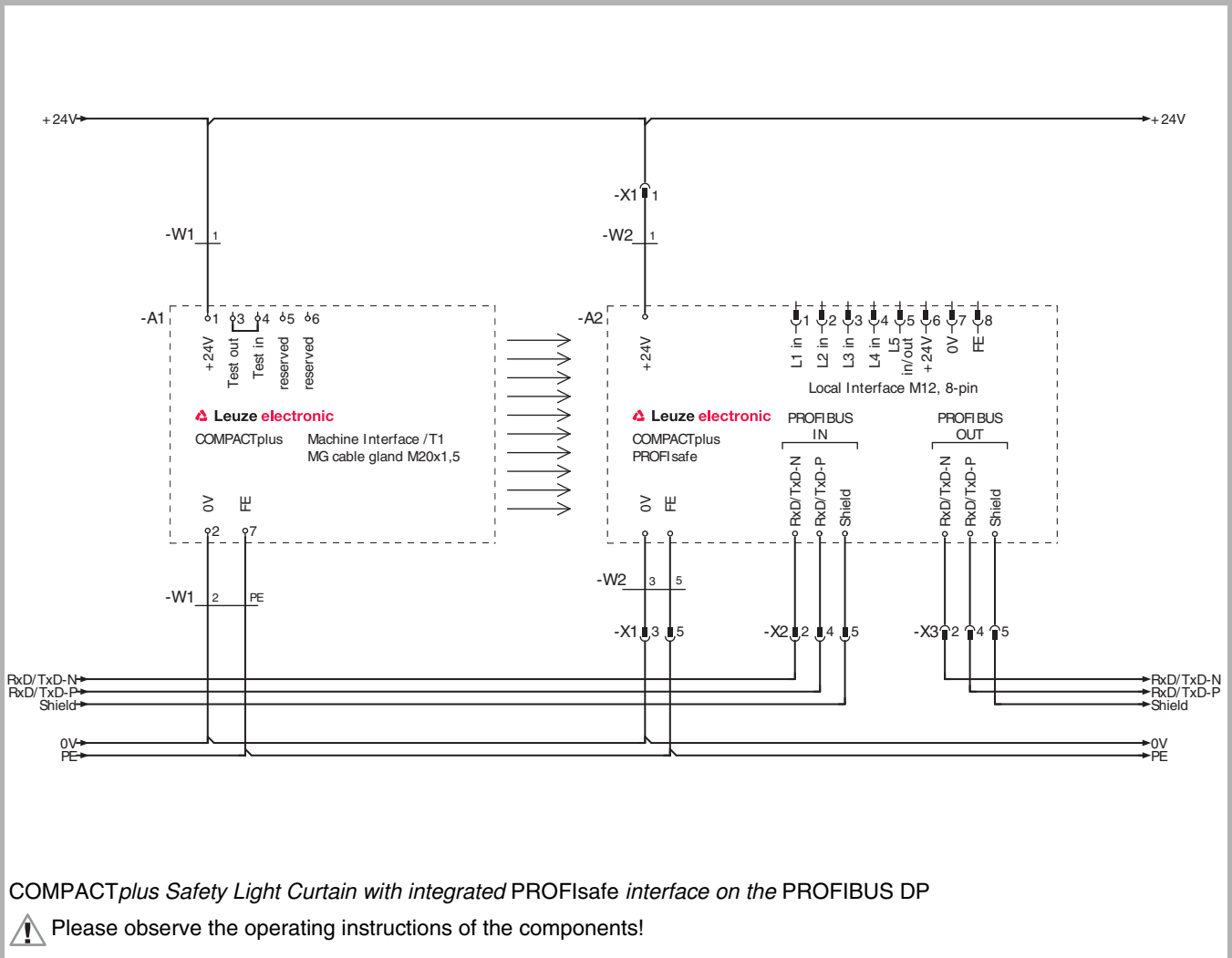
Further information

Further information	Page
● Ordering information, see COMPACTplus	128, 146
● Electrical connection	304
● Technical data, see COMPACTplus	135, 157
● Dimensional drawings	305

PROFIsafe Sensors

Electrical connection

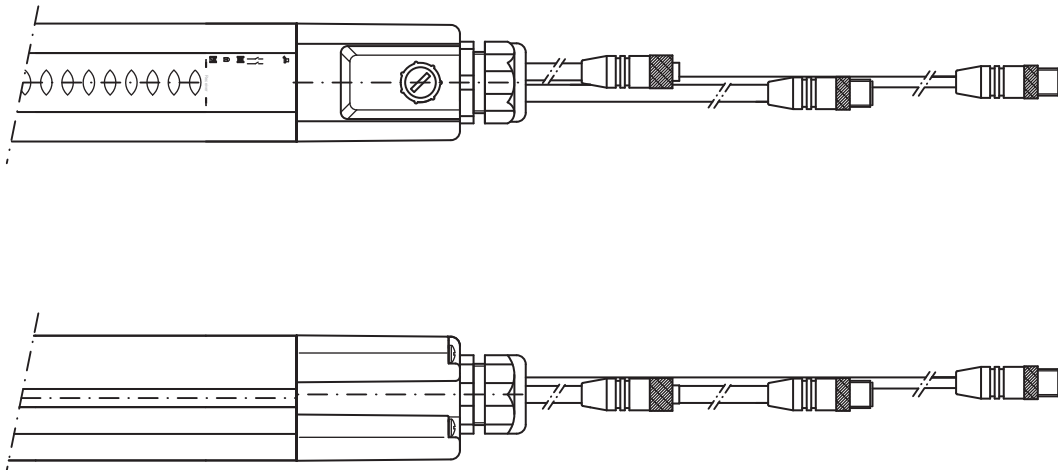
COMPACTplus/PROFIsafe connection example



COMPACT*plus*/PROFIsafe

Dimensional drawings

COMPACT*plus*/PROFIsafe – Safety Light Curtain with integrated PROFIsafe interface



Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

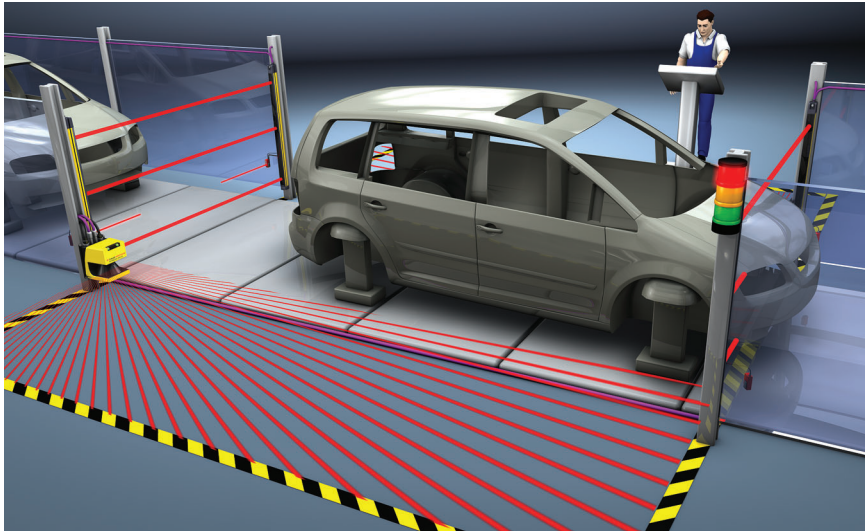
Ordering information

Ordering information, see COMPACT*plus*, page 128, 146.

www.leuze.com/profisafe/

PROFIsafe Sensors

COMPACTplus/PROFIsafe Multiple Light Beam Safety Devices



Laser Scanners and Multiple Light Beam Safety Devices directly connected on the PROFIBUS with muting function in an automotive industry application

Multiple Light Beam Safety Devices with muting function ensure constant personnel protection with unobstructed material feed in conveyor technology. Productivity and safety requirements with automated production systems can consequently be well satisfied.

The COMPACTplus-m series with integrated muting and override function provides an extremely flexible and economical solution. These Multiple Light Beam Safety Devices can also be deployed as the CPRT-m two-beam, active/passive transceiver system. To keep wiring expenditure as low as possible here, all active components, such as the transmitter, receiver and the integrated evaluation unit are housed in a shared housing (transceiver). All sensors, control and display elements required for differentiating between people and materials can be connected directly on-site on the device.

COMPACTplus Safety Light Curtains and Multiple Light Beam Safety Devices are equipped with various functions to optimally perform specific tasks with regard to higher functionality, more flexible integration and easier operability. The COMPACTplus series have a start/restart interlock, contactor monitoring and additional functions that can be easily activated with switches. External additional modules are consequently not required. Specific settings are made with the diagnostics and parametering software, SafetyLab.

Special PROFIsafe features

- Easy project planning via GSD and parametering software
- Integrated PROFIBUS connection unit with PROFIsafe V2 version
- Fast real-time transfer of safe cyclical data
- Acyclic DP-V1 services for online diagnostics and measurement value logging
- Automatic parameter download and verification when replacing a device with Proxy Function Block
- Integrated interface for local control and status signals saves on additional bus nodes
- Configuration via switch or via SafetyLab PC software; connection via local optical interface or directly via PROFIBUS

Typical areas of application

- Access guarding with muting
- Robot cells, automatic processing centers, palletizers

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

COMPACTplus/PROFIsafe

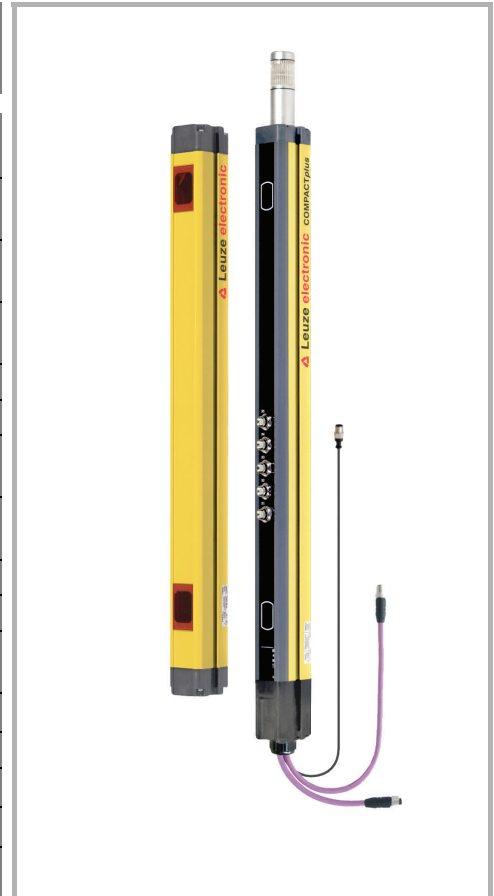
Important technical data, overview

Type in accordance with EN IEC 61496	4		
Classification in accordance with IEC 61508	3		
Performance Level (PL) in accordance with EN ISO 13849-1	e		
Category in accordance with EN ISO 13849	4		
Number of beams	2	3	4
Beam distance	500 mm	400 mm	300 mm
Range (type-dependent)	Cxx0/y:	0...18 m	
	Cxx1/y:	6...70 m	
Muting transceiver range (type-dependent)	0...6.5 m		
Profile cross-section	52 mm x 55 mm		
Safety-related switching output	PROFIsafe interface		
Connection system	M12 plug (b-coded for PROFIBUS DP)		
PROFIsafe driver version	V2		
PROFIBUS DP data rate	9.6 kBd...12 MBd		
Configuration/parametering	With software, teach-in, switch		
Parametering interface	Infrared		
Inputs and outputs	5 inputs, 2 outputs for reset button, muting sensors, muting indicators, etc.		
Cyclic safe data	4 byte		
Acyclic data	Protective field individual beam data		


Please note the additional information in the connecting and operating instructions at www.leuze.com/profisafe.


PROFIsafe function extensions


- Diagnostics data transfer via PROFIBUS DP
- Plus all functions and modules of the safety PLC used





Features











Further information	Page
● Ordering information	308
● Electrical connection	304
● Technical data	310
● Dimensional drawings	312
● Accessories ordering information	315

PROFIsafe Sensors

Ordering information

COMPACTplus-m, consisting of transmitter and receiver
 Included in delivery: 4 sliding blocks, 2 BT-S mounting bracket sets, 1 set of connecting and operating instructions (PDF file on CD-ROM), 1 self-adhesive notice sign

Functions: Start/restart interlock, contactor monitoring, 2 transmission channels, 4-sensor sequential muting, 2-sensor parallel muting, 4-sensor parallel muting, muting restart override function, output for muting indicator

Beam distance/ number of beams	COMPACTplus-m		
	Range: 0 - 18 m		
	Art. no.	Article	Description
500 mm / 2	Connection system with M12 plug (safety bus systems)		
	68840050	CPT500/2/AP	Transmitter
	68840481	CPR500/2-m/P1	Receiver
	68740481	CPR500/2-mx/P1	Receiver with integrated sensor connection field
	68840881	CPR500/2-ml/P1	Receiver with integrated LED muting indicator
400 mm / 3	68740881	CPR500/2-mxl/P1	Receiver with integrated sensor connection field and LED muting indicator
	68823050	CPT400/3/AP	Transmitter
	68823481	CPR400/3-m/P1	Receiver
	68723481	CPR400/3-mx/P1	Receiver with integrated sensor connection field
	68823881	CPR400/3-ml/P1	Receiver with integrated sensor connection field and LED muting indicator
300 mm / 4	68723881	CPR400/3-mxl/P1	Receiver with integrated sensor connection field and LED muting indicator
	68804050	CPT300/4/AP	Transmitter
	68804481	CPR300/4-m/P1	Receiver
	68704481	CPR300/4-mx/P1	Receiver with integrated sensor connection field
	68804881	CPR300/4-ml/P1	Receiver with integrated sensor connection field and LED muting indicator
	68704881	CPR300/4-mxl/P1	Receiver with integrated sensor connection field and LED muting indicator

Beam distance/ number of beams	COMPACTplus-m		
	Range: 6 - 70 m		
	Art. no.	Article	Description
500 mm / 2	Connection system with M12 plug (safety bus systems)		
	68845050	CPT501/2/AP	Transmitter
400 mm / 3	68845481	CPR501/2-m/P1	Receiver
	68831050	CPT401/3/AP	Transmitter
300 mm / 4	68831481	CPR401/3-m/P1	Receiver
	68814050	CPT301/4/AP	Transmitter
	68814481	CPR301/4-m/P1	Receiver

COMPACTplus/PROFIsafe

Ordering information

COMPACTplus muting transceiver (note: the passive Deflecting Mirrors CPM600/2V are required for operating a COMPACTplus muting transceiver)
 Included in delivery: 2 sliding blocks, 1 BT-2S mounting bracket set, 1 set of connecting and operating instructions,(PDF file on CD-ROM), 1 self-adhesive notice sign

Functions: Start/restart interlock, contactor monitoring, 2 transmission channels, 4-sensor sequential muting, 2-sensor parallel muting, 4-sensor parallel muting, muting restart override function, output for muting indicator

Beam distance/ number of beams	COMPACTplus CPRT-m		
	Range: 0 - 6.5 m		
	Art. no.	Article	Description
500 mm / 2	Connection system with M12 plug (safety bus systems)		
	68800481	CPRT500/2-m/P1	Muting transceiver
	68801481	CPRT500/2-mx/P1	Muting transceiver with integrated sensor connection field
	68800881	CPRT500/2-ml/P1	Muting transceiver with integrated LED muting indicator
	68801881	CPRT500/2-mxl/P1	Muting transceiver with integrated sensor connection field and LED muting indicator

Delivery of devices with MIN-style plug only in the USA

Beam distance/ number of beams	COMPACTplus CPRT-m		
	Range: 0 - 6.5 m		
	Art. no.	Article	Description
600 mm / 2	Connection system with M12 plug (safety bus systems)		
	68798481	CPRT600/2-m/P1	Muting transceiver
	68799481	CPRT600/2-mx/P1	Muting transceiver with integrated sensor connection field
	68798881	CPRT600/2-ml/P1	Muting transceiver with integrated LED muting indicator
	68799881	CPRT600/2-mxl/P1	Muting transceiver with integrated sensor connection field and LED muting indicator

Electrical connection

Connection example, see COMPACTplus/PROFIsafe Safety Light Curtain, page 304.

PROFIsafe Sensors

Technical data

General system data					
Type in accordance with EN IEC 61496	4				
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3				
Performance Level (PL) in accordance with EN ISO 13849-1	e				
Probability of a failure to danger per hour (PFH _d)	Up to 4 beams	1.90 x 10 ⁻⁸			
Service life (T _M) in accordance with EN ISO 13849-1	20 years				
Number of cycles until 10% of the components have a failure to danger. (B _{10d})*	With DC1 (ohmic load)	On request			
	With AC1 (ohmic load)	On request			
	With DC13 (inductive load)	630,000 (5 A, 24 V)			
	With AC15 (inductive load)	1,480,000 (3 A, 230 V)			
	Low load (20% nominal load)	On request			
Category in accordance with EN ISO 13849	4				
Number of beams	2 (muting transceiver)	2 (transmitter/receiver)	3 (transmitter/receiver)	4 (transmitter/receiver)	
Beam distance	500 mm	500 mm	400 mm	300 mm	
Range (type-dependent)	CPxx0/y: 0...18 m CPxx1/y: 6...70 m				
Muting transceiver range	0...6.5 m				
Response time	Transistor output	20 ms	19 ms	19 ms	19 ms
	Relay output	35 ms	34 ms	34 ms	34 ms
	AS-i Safety Interface	25 ms	24 ms	24 ms	24 ms
	PROFIsafe interface	40 ms	39 ms	39 ms	39 ms
Beam height above reference plane in accordance with EN 999	400, 900 mm	400, 900 mm	300, 700, 1100 mm	300, 600, 900, 1200 mm	
Supply voltage	24 V DC, ±20 %				
Connection cable length	Max. 100 m with 1 mm ²				
Safety class	III and I (depending on model)				
Protection rating	IP 65**				
Ambient temperature, operation	0...+50 °C				
Ambient temperature, storage	-25...+70 °C				
Relative humidity	15...95 %				
Profile cross-section	52 mm x 55 mm				
Weight per device (length-dependent)	1.90...3.10 kg				

*) For devices with relay output

**) Without additional measures the devices are not suited for outdoor use

COMPACT*plus*/PROFIsafe

Technical data

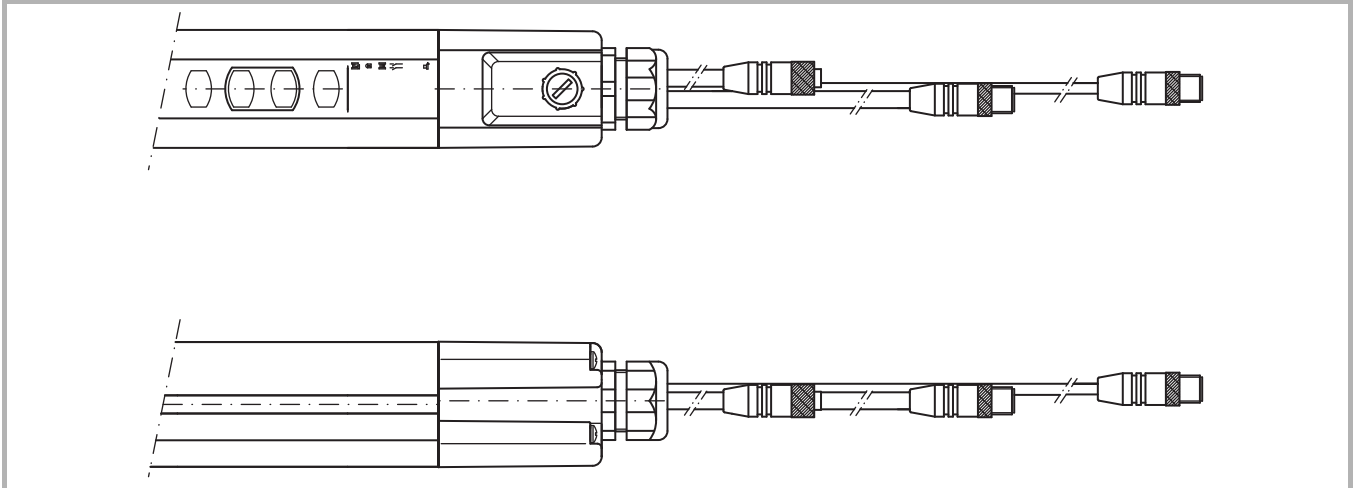
Transmitter	
Transmitter diodes, class in accordance with EN 60825	1
Wavelength	880 nm
Current consumption	75 mA
Connection system	M12 plug, 5-pin
External test input	24 V DC, max. 20 mA
Receiver	
Current consumption	160 mA without external load, muting sensors and muting indicator
Safety-related switching outputs (OSSDs)	2 pnp transistor outputs (short circuit-proof, cross-circuit monitored) 2 relay outputs (N/O) PROFIsafe interface
Switching voltage high active	Min. U _v -1.0 V
Switching voltage low	Max. +2.5 V
Switching current	Typical, 500 mA
Connection system	M12 plug (safety bus systems), 5-pin, T4: 8-pin
Transceiver (2-beam)	
Current consumption	160 mA without external load, muting sensors and muting indicator
Safety-related switching outputs (OSSDs)	2 pnp transistor outputs (short circuit-proof, cross-circuit monitored) 2 relay outputs (N/O) PROFIsafe interface
Switching voltage high active	Min. U _v -1.0 V
Switching voltage low	Max. +2.5 V
Switching current	Typical, 500 mA
Connection system	M12 plug (safety bus systems), 5-pin, T4: 8-pin

Please note the additional information in the COMPACT*plus*-m connecting and operating instructions at www.leuze.com/compactplus-m.

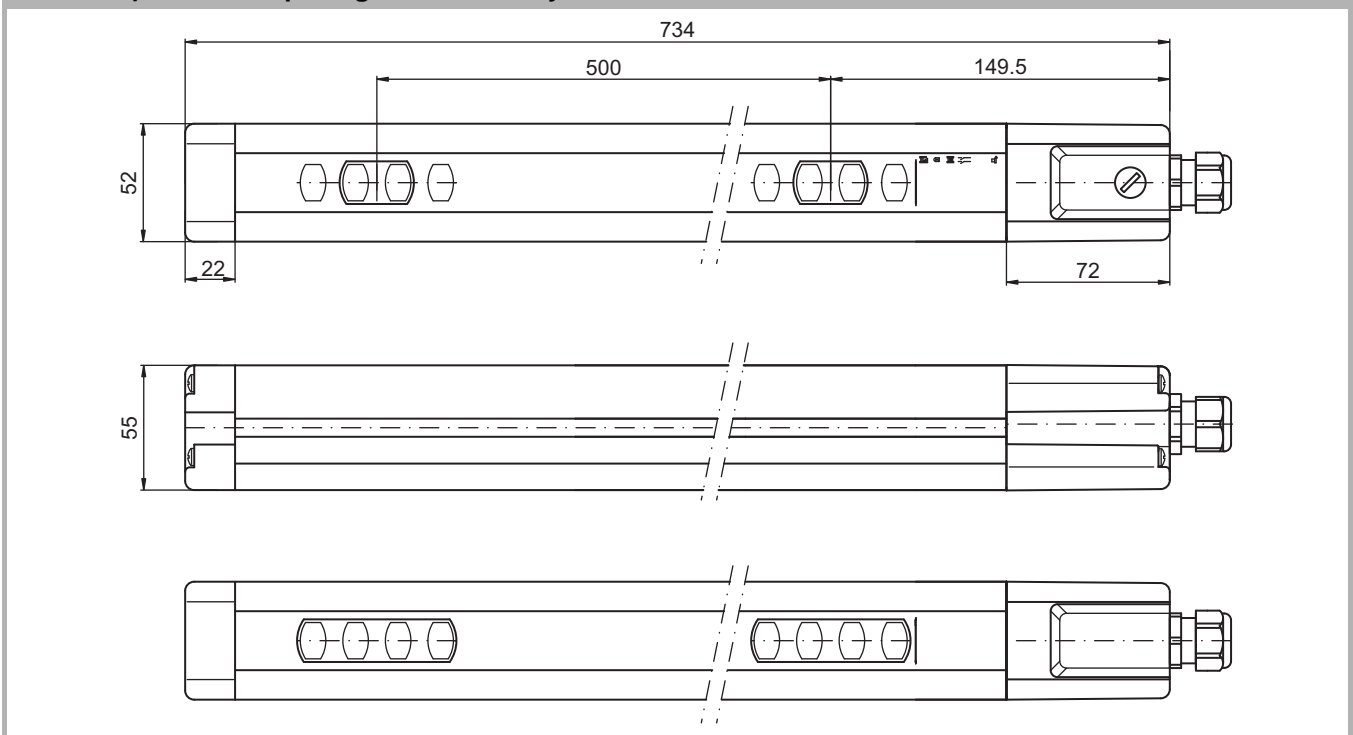
PROFIsafe Sensors

Dimensional drawings

CPRT-m muting transceiver with integrated PROFIsafe interface



COMPACTplus-m Multiple Light Beam Safety Device

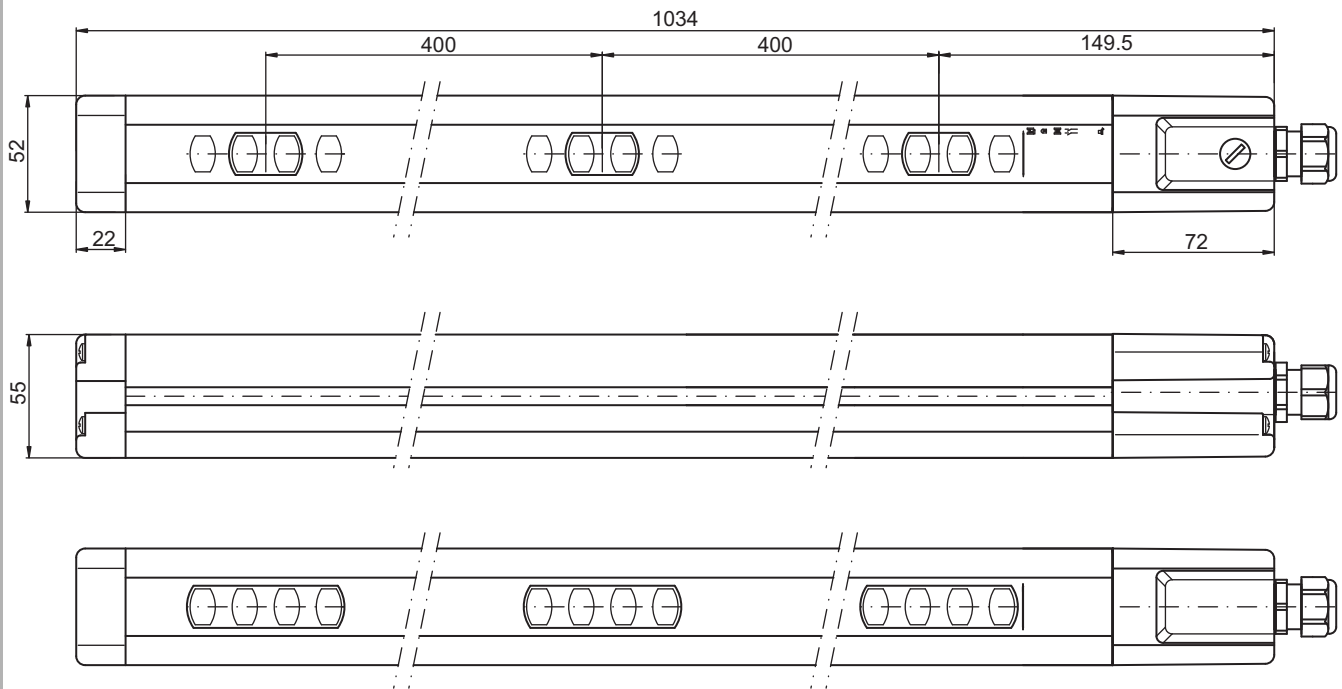


Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

Dimensional drawings

COMPACTplus-m Multiple Light Beam Safety Device

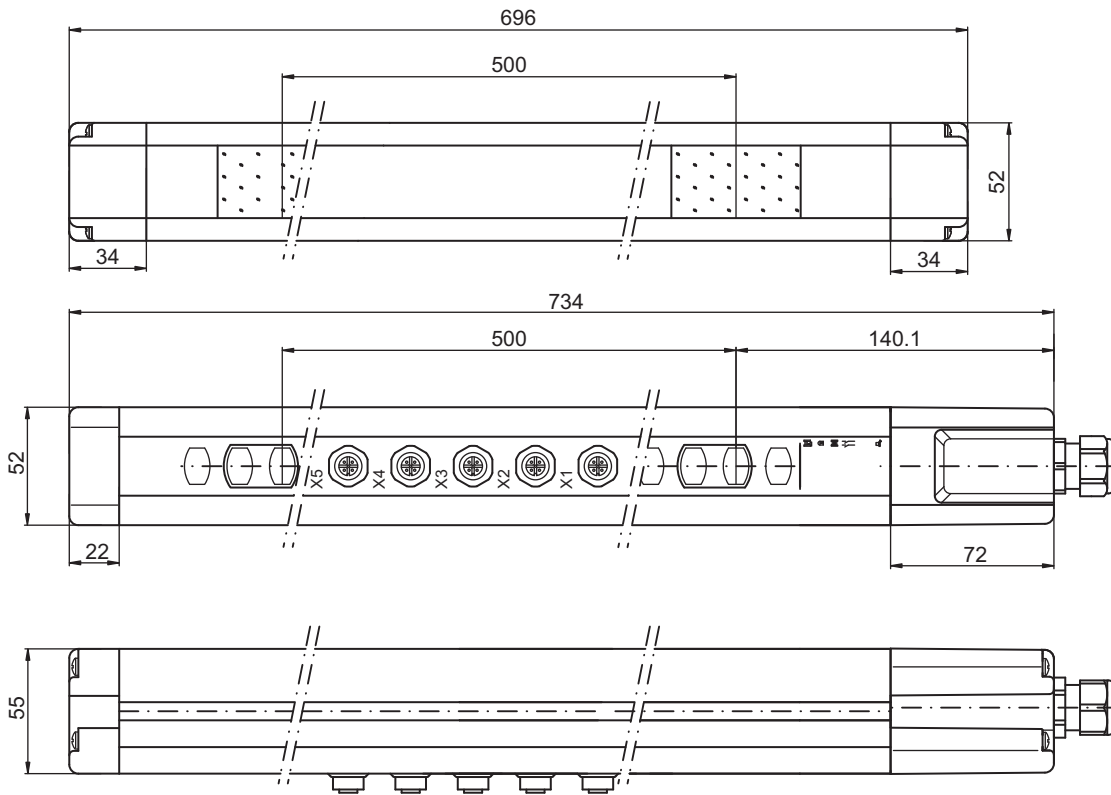


Dimensions in mm

PROFIsafe Sensors

Dimensional drawings

Muting transceiver, CPRT-mx and Deflecting Mirror CPM500/2V



Dimensions in mm

Dimensional drawings: Accessories

Mounting brackets

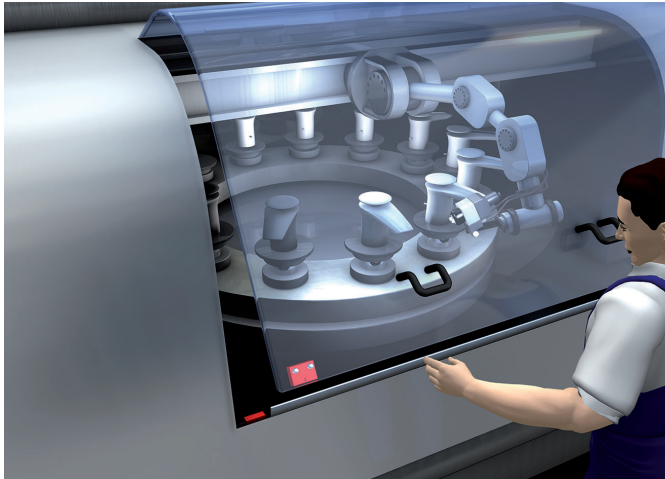
See Safety Light Curtains COMPACT*plus*-m, Dimensional drawings: Accessories, page 138

Accessories ordering information

- See Safety Light Curtains COMPACT*plus*-m, Accessories ordering information, page 140
- AS-Interface Safety at Work, page 267
- UDC, DC Device Columns, page 488
- UMC, MC Deflecting Mirror Columns/individual mirrors, page 492
- MMS Muting Mounting Systems, page 500
- Muting indicator, page 506
- Muting sensors, page 510
- Connection cables, page 514
- Laser alignment aids, page 522

MAGNETICALLY CODED SENSORS

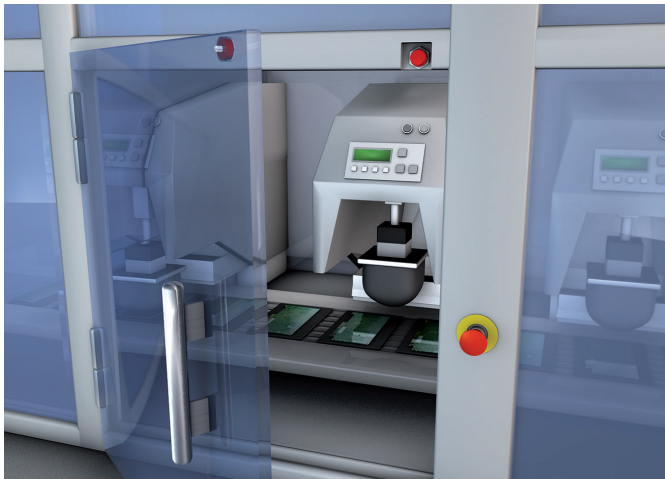
Magnetically Coded Sensor selection table



Even during a painting process with a robot in an enclosed processing cell, the function of the MC336 Magnetically Coded Sensor is not impaired.

With Magnetically Coded Sensors and the corresponding MSI-MC310 Safety Relays, Leuze electronic provides special safety systems for extremely tough or challenging application cases. The magnetically coded safety system is intended for guards and, due to its closed design and high-strength plastic housing, is predestined for use under critical environmental conditions; or in other words, anywhere stress from dust and humidity is particularly high.

The safety system always consists of an MC3x sensor, the corresponding actuator and the MSI-MC310 Safety Relay or an MSI 100/200 Safety Controller. The sensor contains a special combination of reed contacts that are contactlessly activated by the coded magnetic field of the actuator. If, for example, a door is opened, the actuator mounted here is separated from the sensor, which is located on the stationary part of the guard, and a switching signal is triggered. As a result, risky machine movements can only be executed while the protective device is closed. The system reaches safety standards up to Performance Level PL e and category 4 in accordance with EN ISO 13849-1.



MC330 Cylindrical Magnetically Coded Sensor for safeguarding a pad printing machine.

MC330
p. 318

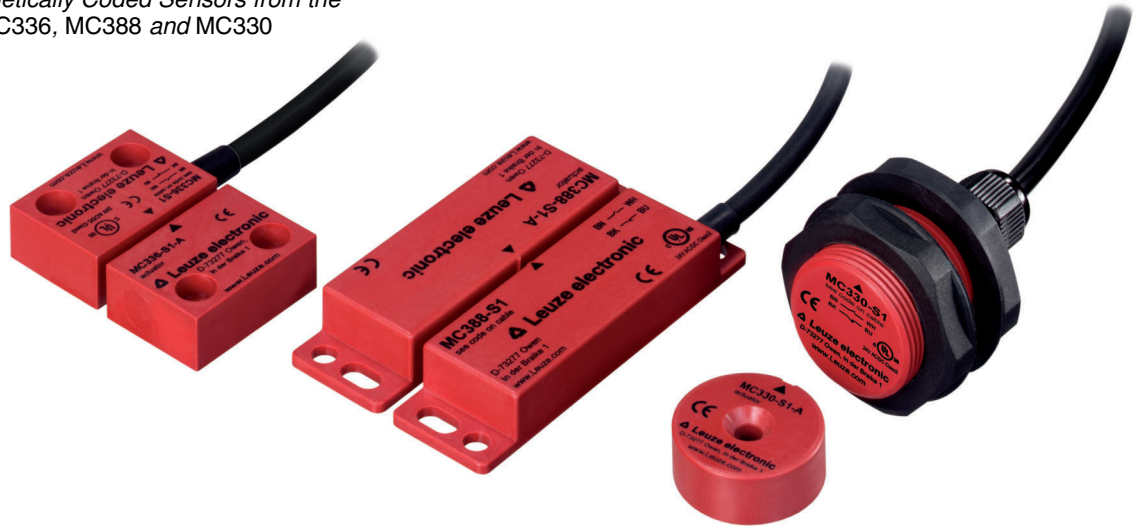
MC336
p. 326

MC388
p. 332

OVERVIEW

Selection table

Selection of Magnetically Coded Sensors from the left to the right: MC336, MC388 and MC330



Safety Switches

Safety Locking Devices

Safety Command Devices

Safety Relays

Programmable Safety Controllers

Accessories

Glossary

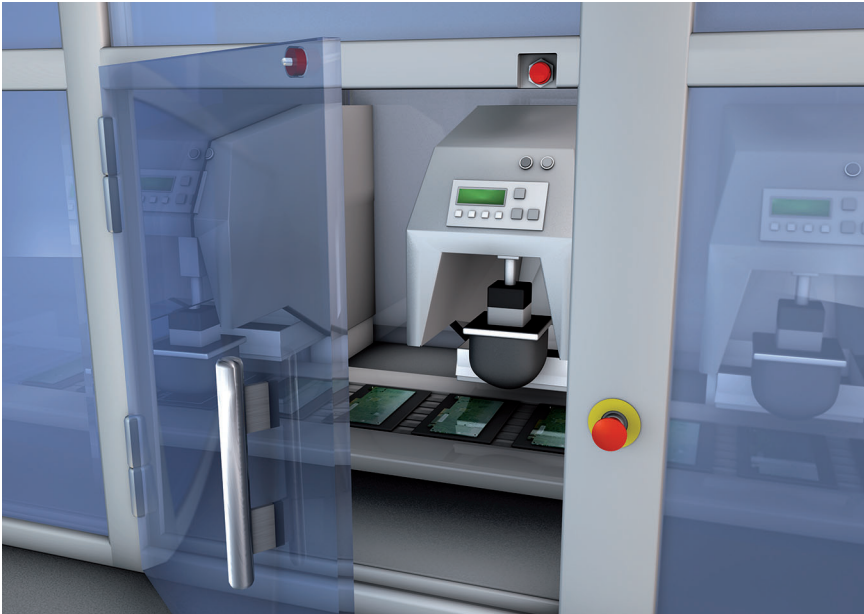
Product Finder

Design		Features, type-dependent				Series	Page
		Assured cut-in distance (Sao)	Cut-out point (OFF)	Assured cut-out distance (Sar)	Connection system		
cubic	cylindrical						
	●	< 6 mm	> 12 mm	> 14 mm	M8 plug, 4-pin	MC330	320
	●				PUR/PVC (cable (2, 5, 10 m))	MC330	320
●		< 3 mm	> 8 mm	> 11 mm	M8 plug, 4-pin	MC336	328
●					PUR/PVC (cable (2, 5, 10 m))	MC336	328
●		< 6 mm	> 13 mm	> 30 mm	M8 plug, 4-pin	MC388	334
●					PUR/PVC (cable (2, 5, 10 m))	MC388	334

www.leuze.com/proximitysensors/

MAGNETICALLY CODED SENSORS

MC330 Magnetically Coded Sensor



Cylindrical Magnetically Coded Safety Sensor MC330 for safeguarding a pad printing machine.

When a switching signal should be triggered in safety systems under demanding environmental conditions (dust, humidity and the like) in a manner virtually contactless and wear-free, the MC330 Magnetically Coded Sensor is used - optionally with large or small doors or flaps. It can be integrated in a particularly advantageous way with round bore holes, e.g. in aluminum profiles, since it can be screwed in recessed and then activated on the front.

Typical areas of application

- With critical ambient conditions
- Especially with dust, humidity and the like
- In the wood, pharmaceutical, food industry

Important technical data, overview

Category in accordance with EN ISO 13849-1	Up to 4 (depending on the number of connected sensors)
Performance Level (PL) in accordance with EN ISO 13849-1	Up to e (depending on the number of connected sensors)
Safe switching distances and off distance if markings are aligned: Sao (on), (OFF), Sar	< 6 mm, > 12 mm, > 14 mm
Switching tolerance (without ferromagnetic materials in immediate vicinity)	±1 mm
Contact type	Reed contacts (magnetically sensitive)
Contact equipment	1NO/1NC
Short circuit protection	By means of MSI-MC310 Safety Relay
Min. approach speed of actuator towards sensor	50 mm/s
Response time	3 ms
Ambient temperature, operation	-20... +70°C

Functions

Interlock device without guard interlocking in accordance with EN 1088.
 Safety system in combination with an evaluation unit such as the MSI-MC310 Safety Relay or the MSI 100 or MSI 200 Safety Controller.
 Integration in control circuits up to category 4 in accordance with EN ISO 13849.

Special features

- Not sensitive to dust, humidity and the like (dirt level 3 in accordance with EN 60947-1)
- Glass fiber reinforced plastic sensor and actuator
- Approach actuation directions lengthwise, high, deep
- Connection per M8 plug, PVC or PUR connection cable, each firmly integrated in the housing
- Integrated compact design



Features



(in combination with MSI-MC310)

Further information **Page**

● Ordering information	320
● Electrical connection	321
● Technical data	322
● Dimensional drawings	324
● Accessories ordering information	324
● MSI-MC310	458

MAGNETICALLY CODED SENSORS

Ordering information

MC330

Included in delivery: 1 MC330-S1-A actuator, 2 mounting rings, stainless steel mounting screw, application information (printed document)

Notice: the MSI-MC310 Safety Relay is required for certified evaluation! This must be ordered separately (see page 460).

Functions: Interlock device without guard interlocking in accordance with EN 1088, safety system in combination with MSI-MC310 Safety Relay (evaluation unit)

MC330 Magnetically Coded Sensor

Art. no.	Article	Description
63001100	MC330-S1C2-A	Sensor, 1NO/1NC, connection cable, 2 m, PVC
63001101	MC330-S1C5-A	Sensor, 1NO/1NC, connection cable, 5 m, PVC
63001102	MC330-S1C10-A	Sensor, 1NO/1NC, connection cable, 10 m, PVC
63001103	MC330-S1R2-A	Sensor, 1NO/1NC, connection cable, 2 m, PUR
63001104	MC330-S1R5-A	Sensor, 1NO/1NC, connection cable, 5 m, PUR
63001105	MC330-S1R10-A	Sensor, 1NO/1NC, connection cable, 10 m, PUR
63001106	MC330-S1M8-A	Sensor, 1NO/1NC, M8 plug, 4-pin

Part number code for MC330

Article	Description
MC330	Magnetically Coded Sensors
-S1	Sensor, 1NO/1NC
C2, C5, C10	PVC connection cable, length 2, 5, 10 m
R2, R5, R10	PUR connection cable, length 2, 5, 10 m
-M8	M8 plug size
-A	Standard version

MC330

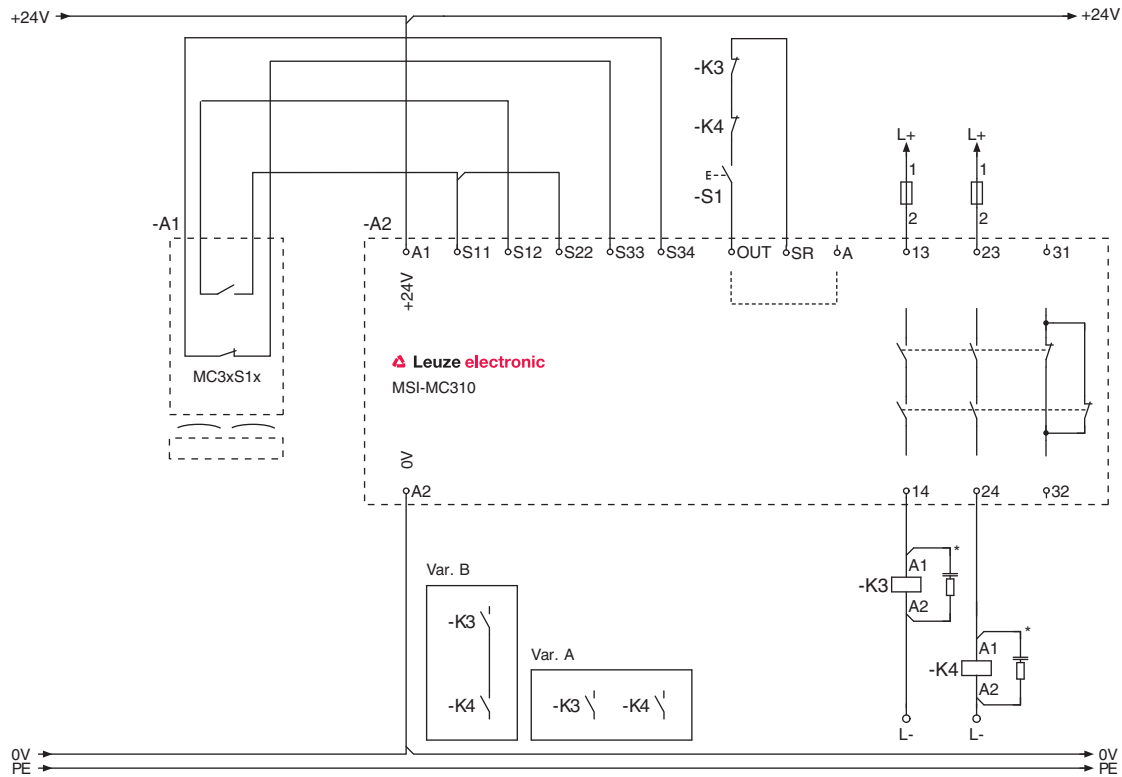
MC330
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MC336
p. 326

MC388
p. 332


Electrical connection

MC330 connection example



*) Spark extinction circuit, supply suitable spark extinction

Magnetically Coded Sensor with MSI-MC310 Safety Relay

 Please observe the operating instructions of the components!

MAGNETICALLY CODED SENSORS

Technical data

Sensor type	Interlock device without guard interlocking in accordance with EN 1088	
External actuator	Coded magnetic, compatible with respective sensor series	
Category in accordance with EN ISO 13849-1	Up to 4, depending on evaluation, 1 sensor connected	Up to 3, depending on evaluation, more than 1 sensor connected
Service life (T_M) in accordance with EN ISO 13849-1	20 years	
Number of switching cycles at which up to 10% of components have failed dangerously (B_{10d})	20.000.000	
Assured cut-in distance (S_{ao}) Cut-out point (OFF) Assured cut-out distance (S_{ar})	< 6 mm > 12 mm > 14 mm	
Switching tolerance (without ferromagnetic materials in immediate vicinity)	± 1 mm	
Contact type	Reed contacts (magnetically sensitive)	
Contact equipment	1NO/1NC	
Mechanical life time	10×10^7 switching cycles	
Max. switching voltage	27 V AC/DC	
Switched current I_e max.	0.5 A	
Short circuit protection	Via e.g. MSI-MC310, MSI 100, MSI 200	
Requirement on the voltage supply when used acc. to cULus (UL 508)	Class 2 Circuits	
Installation point	Arbitrary, provided housing markings are aligned	
Min. distance to other magnetic sensors	50 mm	
Approach actuation directions	In longitudinal axis, left and right In vertical axis, up and down In depth, to and from sensor	
Min. approach speed of actuator towards sensor	50 mm/s	
Response time	3 ms	
Connection		
Number of connection cable infeeds	1 (connection cable or M8 plug)	
Type of connection	Connection cable with wire-end sleeves or M8 plug, each screwed/molded to housing	
Cable cross-section (wire)	4 x 0.35 mm ² (connection cable)	
Environment		
Ambient temperature, operation	-20... +70°C	
Vibration, sensitivity acc. to	EN 60947-5-3	
Shock, sensitivity acc. to	EN 60947-5-3	
Dirt levels, external, in accordance with EN 60947-1	3	
EMC compliance	EN 60947-5-3 EN 61000-6-3 EN 61000-6-2	

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Technical data

Housing	
Sensor material	Plastic, glass fiber reinforced (PPS)
Actuator material	Plastic, glass fiber reinforced (PPS)
Dimensions	M30 x 36 mm
Protection rating acc. to EN 60529	IP 67

These tables do not apply in combination with additional M12 plug or connecting cable except where these components are explicitly mentioned.

Please note the additional information in the connecting and operating instructions at www.leuze.com/mc330/.

Safety Switches

Safety Locking Devices

Safety Command Devices

Safety Relays

Programmable Safety Controllers

Accessories

Glossary

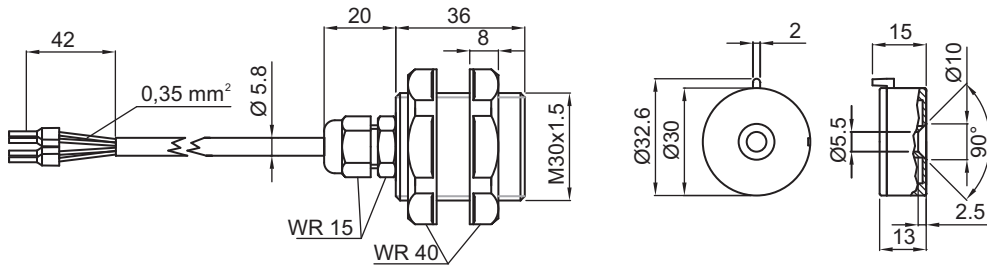
Product Finder

www.leuze.com/mc330/

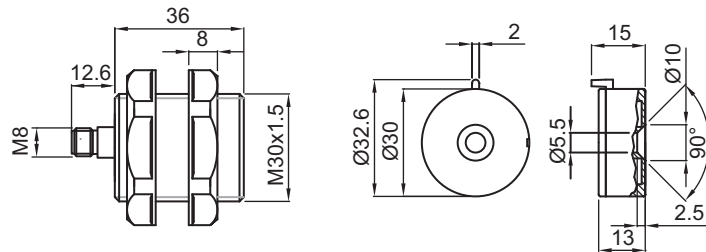
MAGNETICALLY CODED SENSORS

Dimensional drawings

MC330 Magnetically Coded Sensor



MC330 Magnetically Coded Sensor with MC330-S1-A connection cable and actuator (right)



MC330 Magnetically Coded Sensor with M8 plug and MC330-S1-A actuator (right)

Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

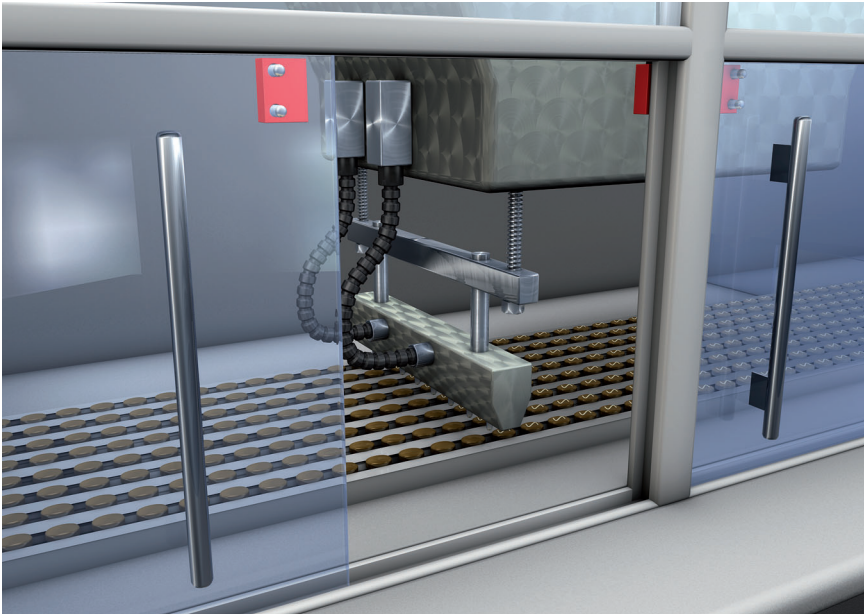
Accessories ordering information

Art. no.	Article	Description	Length, design
63001152	MC330-S1-A	Actuator	Cylindrical

www.leuze.com/mc330/

MAGNETICALLY CODED SENSOR

MC336 Magnetically Coded Sensor

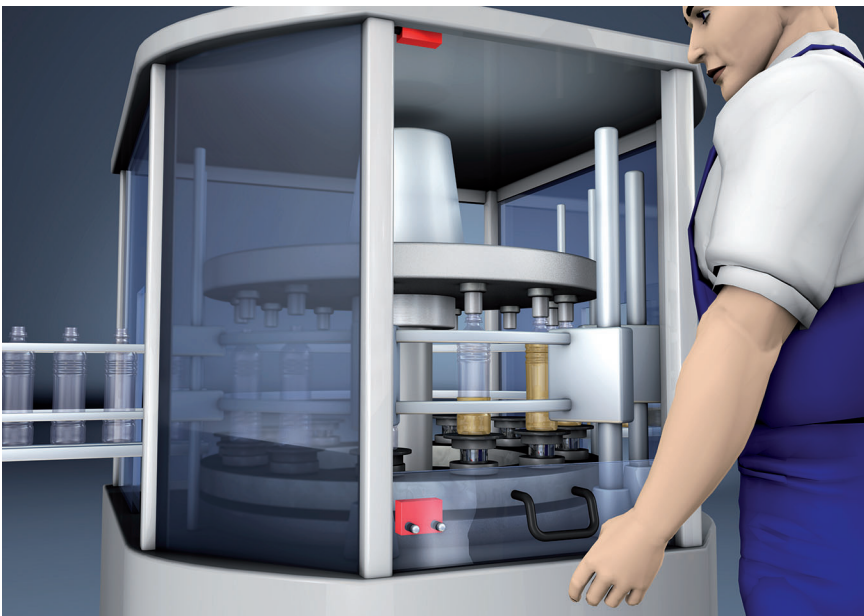


First and foremost, the MC336 Magnetically Coded Sensor is used for small guards, sliding gates or hoods to trigger switching signals in safety systems under demanding environmental conditions (dust, humidity and the like) in a manner virtually contactless and wear-free. Thanks to its small dimensions, it can be easily integrated even when space is restricted.

Typical areas of application

- With critical ambient conditions
- Especially with dust, humidity and the like
- In the wood, pharmaceutical, food industry

Use of Magnetically Coded Sensors such as the MC336 is particularly advantageous in the food industry due to their robustness.



MC336 Magnetically Coded Sensor for safeguarding the sliding gate of a filling system.

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MC336
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MC388
p. 332

Important technical data, overview

Category in accordance with EN ISO 13849-1	Up to 4 (depending on the number of connected sensors)
Performance Level (PL) in accordance with EN ISO 13849-1	Up to e (depending on the number of connected sensors)
Safe switching distances and off distance if markings are aligned: Sao (on), (OFF), Sar	< 3 mm, > 8 mm, > 11 mm
Switching tolerance (without ferromagnetic materials in immediate vicinity)	±1 mm
Contact type	Reed contacts (magnetically sensitive)
Contact equipment	1NO/1NC
Short circuit protection	By means of MSI-MC310 Safety Relay
Min. approach speed of actuator towards sensor	50 mm/s
Response time	3 ms
Ambient temperature, operation	-20... +70°C

Functions

- Interlock device without guard interlocking in accordance with EN 1088.
- Safety system in combination with an evaluation unit such as the MSI-MC310 Safety Relay or the MSI 100 or MSI 200 Safety Controller.
- Integration in control circuits up to category 4 in accordance with EN ISO 13849.

Special features

- **Not sensitive to dust, humidity and the like (dirt level 3 in accordance with EN 60947-1)**
- **Glass fiber reinforced plastic sensor and actuator**
- **Approach actuation directions lengthwise, high, deep**
- **Connection per M8 plug, PVC or PUR connection cable, each firmly integrated in the housing**
- **Integrated compact design**



Features



(in combination with MSI-MC310)

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● MSI-MC310	458

MAGNETICALLY CODED SENSOR

Ordering information

MC336

Included in delivery: 1 MC336-S1-A actuator, 4 stainless steel mounting screws, application information (printed document)

Notice: the MSI-MC310 Safety Relay is required for certified evaluation! This must be ordered separately (see page 460).

Functions: Interlock device without guard interlocking in accordance with EN 1088, safety system in combination with MSI-MC310 Safety Relay (evaluation unit)

MC336 Magnetically Coded Sensor

Art. no.	Article	Description
63001050	MC336-S1C2-A	Sensor, 1NO/1NC, connection cable, 2 m, PVC
63001051	MC336-S1C5-A	Sensor, 1NO/1NC, connection cable, 5 m, PVC
63001052	MC336-S1C10-A	Sensor, 1NO/1NC, connection cable, 10 m, PVC
63001053	MC336-S1R2-A	Sensor, 1NO/1NC, connection cable, 2 m, PUR
63001054	MC336-S1R5-A	Sensor, 1NO/1NC, connection cable, 5 m, PUR
63001055	MC336-S1R10-A	Sensor, 1NO/1NC, connection cable, 10 m, PUR
63001056	MC336-S1M8-A	Sensor, 1NO/1NC, M8 plug, 4-pin

Part number code for MC336

Article	Description
MC336	Magnetically Coded Sensors
-S1	Sensor, 1NO/1NC
C2, C5, C10	PVC connection cable, length 2, 5, 10 m
R2, R5, R10	PUR connection cable, length 2, 5, 10 m
-M8	M8 plug size
-A	Standard version

Electrical connection

See connection example MC330, page 321.

Technical data

Sensor type	Interlock device without guard interlocking in accordance with EN 1088	
External actuator	Coded magnetic, compatible with respective sensor series	
Category in accordance with EN ISO 13849-1	Up to 4, depending on evaluation, 1 sensor connected	Up to 3, depending on evaluation, more than 1 sensor connected
Service life (T_M) in accordance with EN ISO 13849-1	20 years	
Number of switching cycles at which up to 10% of components have failed dangerously (B_{10d})	20.000.000	
Assured cut-in distance (S_{ao}) Cut-out point (OFF) Assured cut-out distance (S_{ar})	< 3 mm > 8 mm > 11 mm	
Switching tolerance (without ferromagnetic materials in immediate vicinity)	±1 mm	
Contact type	Reed contacts (magnetically sensitive)	
Contact equipment	1NO/1NC	
Mechanical life time	10×10 ⁷ switching cycles	
Max. switching voltage	27 V AC/DC	
Switched current I_e max.	0.5 A	
Short circuit protection	via e.g. MSI-MC310, MSI 100, MSI 200	
Requirement on the voltage supply when used acc. to cULus (UL 508)	Class 2 Circuits	
Installation point	Arbitrary, provided housing markings are aligned	
Min. distance to other magnetic sensors	50 mm	
Approach actuation directions	In longitudinal axis, left and right In vertical axis, up and down In depth, to and from sensor	
Min. approach speed of actuator towards sensor	50 mm/s	
Response time	3 ms	
Connection		
Number of connection cable infeeds	1 (connection cable or M8 plug)	
Type of connection	Connection cable with wire-end sleeves or M8 plug, each screwed/molded to housing	
Cable cross-section (wire)	4 x 0.35 mm ² (connection cable)	
Environment		
Ambient temperature, operation	-20... +70°C	
Vibration, sensitivity acc. to	EN 60947-5-3	
Shock, sensitivity acc. to	EN 60947-5-3	
Dirt levels, external, in accordance with EN 60947-1	3	
EMC compliance	EN 60947-5-3 EN 61000-6-3 EN 61000-6-2	

MAGNETICALLY CODED SENSOR

Technical data

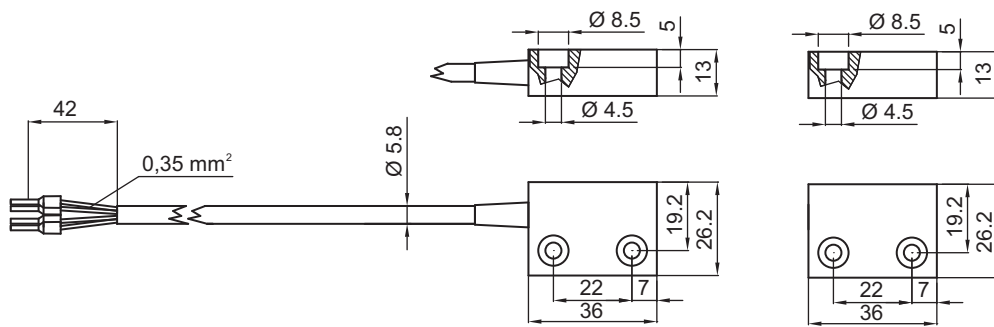
Housing	
Sensor material	Plastic, glass fiber reinforced (PPS)
Actuator material	Plastic, glass fiber reinforced (PPS)
Dimensions (L x W x H)	36 mm x 26 mm x 13 mm
Protection rating acc. to EN 60529	IP 67

These tables do not apply in combination with additional M12 plug or connecting cable except where these components are explicitly mentioned.

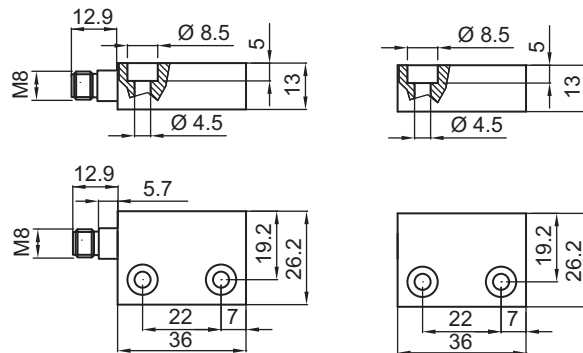
Please note the additional information in the connecting and operating instructions at www.leuze.com/mc336/.

Dimensional drawings

MC33 Magnetically Coded Sensor



MC336 Magnetically Coded Sensor with MC336-S1-A connection cable and actuator (right)



MC336 Magnetically Coded Sensor with M8 plug and MC336-S1-A actuator (right)

Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

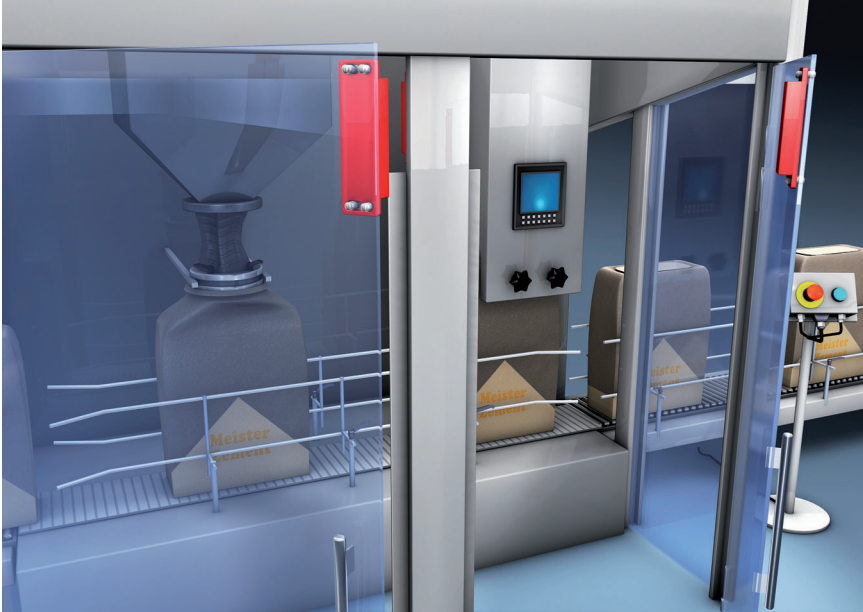
Accessories ordering information

Art. no.	Article	Description	Length, design
63001151	MC336-S1-A	Actuator	Cubic

www.leuze.com/mc336/

MAGNETICALLY CODED SENSOR

MC388 Magnetically Coded Sensor



Magnetically Coded Sensors such as the MC388 are not sensitive to stress caused by dust, for example when safeguarding accesses to filling systems.

First and foremost, the MC388 Magnetically Coded Sensor is used for large guards and sliding gates to trigger switching signals in safety systems under demanding environmental conditions (dust, humidity and the like) in a manner virtually contactless and wear-free. Thanks to the large switching distances, covered mounting is also possible.

Typical areas of application

- With critical ambient conditions
- Especially with dust, humidity and the like
- In the wood, pharmaceutical, food industry

MC388

Important technical data, overview

Category in accordance with EN ISO 13849-1	Up to 4 (depending on the number of connected sensors)
Performance Level (PL) in accordance with EN ISO 13849-1	Up to e (depending on the number of connected sensors)
Safe switching distances and off distance if markings are aligned: Sao (on), (OFF), Sar	< 6 mm, > 13 mm, > 30 mm
Switching tolerance (without ferromagnetic materials in immediate vicinity)	±1 mm
Contact type	Reed contacts (magnetically sensitive)
Contact equipment	1NO/1NC
Short circuit protection	By means of MSI-MC310 Safety Relay
Min. approach speed of actuator towards sensor	50 mm/s
Response time	3 ms
Ambient temperature, operation	-20... +70 °C

Functions

- Interlock device without guard interlocking in accordance with EN 1088.
- Safety system in combination with an evaluation unit such as the MSI-MC310 Safety Relay or the MSI 100 or MSI 200 Safety Controller.
- Integration in control circuits up to category 4 in accordance with EN ISO 13849.

Special features

- Not sensitive to dust, humidity and the like (dirt level 3 in accordance with EN 60947-1)
- Glass fiber reinforced plastic sensor and actuator
- Approach actuation directions lengthwise, high, deep
- Connection per M8 plug,PVC or PUR connection cable, each firmly integrated in the housing
- Integrated compact design



Features



(in combination with MSI-MC310)

Further information Page

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| ● Electrical connection | 321 |
| ● Technical data | 335 |
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| ● Accessories ordering information | 337 |
| ● MSI-MC310 | 458 |

MAGNETICALLY CODED SENSOR

Ordering information

MC388

Included in delivery: 1 MC388-S1-A actuator, 4 stainless steel mounting screws, application information (printed document)

Notice: the MSI-MC310 Safety Relay is required for certified evaluation! This must be ordered separately (see page 460).

Functions: Interlock device without guard interlocking in accordance with EN 1088, safety system in combination with MSI-MC310 Safety Relay (evaluation unit)

MC388 Magnetically Coded Sensor

Art. no.	Article	Description
63001000	MC388-S1C2-A	Sensor, 1NO/1NC, connection cable, 2 m, PVC
63001001	MC388-S1C5-A	Sensor, 1NO/1NC, connection cable, 5 m, PVC
63001002	MC388-S1C10-A	Sensor, 1NO/1NC, connection cable, 10 m, PVC
63001003	MC388-S1R2-A	Sensor, 1NO/1NC, connection cable, 2 m, PUR
63001004	MC388-S1R5-A	Sensor, 1NO/1NC, connection cable, 5 m, PUR
63001005	MC388-S1R10-A	Sensor, 1NO/1NC, connection cable, 10 m, PUR
63001006	MC388-S1M8-A	Sensor, 1NO/1NC, M8 plug, 4-pin

Part number code for MC388

Article	Description
MC388	Magnetically Coded Sensors
-S1	Sensor, 1NO/1NC
C2, C5, C10	PVC connection cable, length 2, 5, 10 m
R2, R5, R10	PUR connection cable, length 2, 5, 10 m
-M8	M8 plug size
-A	Standard version

MC388

Electrical connection

See connection example MC330, page 321.

Technical data

Sensor type	Interlock device without guard interlocking in accordance with EN 1088	
External actuator	Coded magnetic, compatible with respective sensor series	
Category in accordance with EN ISO 13849-1	Up to 4, depending on evaluation, 1 sensor connected	Up to 3, depending on evaluation, more than 1 sensor connected
Service life (T_M) in accordance with EN ISO 13849-1	20 years	
Number of switching cycles at which up to 10% of components have failed dangerously (B_{10d})	20.000.000	
Assured cut-in distance (S_{ao}) Cut-out point (OFF) Assured cut-out distance (S_{ar})	< 6 mm > 13 mm > 30 mm	
Switching tolerance (without ferromagnetic materials in immediate vicinity)	± 1 mm	
Contact type	Reed contacts (magnetically sensitive)	
Contact equipment	1NO/1NC	
Mechanical life time	10×10^7 switching cycles	
Max. switching voltage	27 V AC/DC	
Switched current I_e max.	0.5 A	
Short circuit protection	Via e.g. MSI-MC310, MSI 100, MSI 200	
Requirement on the voltage supply when used acc. to cULus (UL 508)	Class 2 Circuits	
Installation point	Arbitrary, provided housing markings are aligned	
Min. distance to other magnetic sensors	50 mm	
Approach actuation directions	In longitudinal axis, left and right In vertical axis, up and down In depth, to and from sensor	
Min. approach speed of actuator towards sensor	50 mm/s	
Response time	3 ms	
Connection		
Number of connection cable infeeds	1 (connection cable or M8 plug)	
Type of connection	Connection cable with wire-end sleeves or M8 plug, each screwed/molded to housing	
Cable cross-section (wire)	4 x 0.35 mm ² (connection cable)	
Environment		
Ambient temperature, operation	-20... +70 °C	
Vibration, sensitivity acc. to	EN 60947-5-3	
Shock, sensitivity acc. to	EN 60947-5-3	
Dirt levels, external, in accordance with EN 60947-1	3	
EMC compliance	EN 60947-5-3 EN 61000-6-3 EN 61000-6-2	

Safety Switches

Safety Locking Devices

Safety Command Devices

Safety Relays

Programmable Safety Controllers

Accessories

Glossary

Product Finder

MAGNETICALLY CODED SENSOR

Technical data

Housing

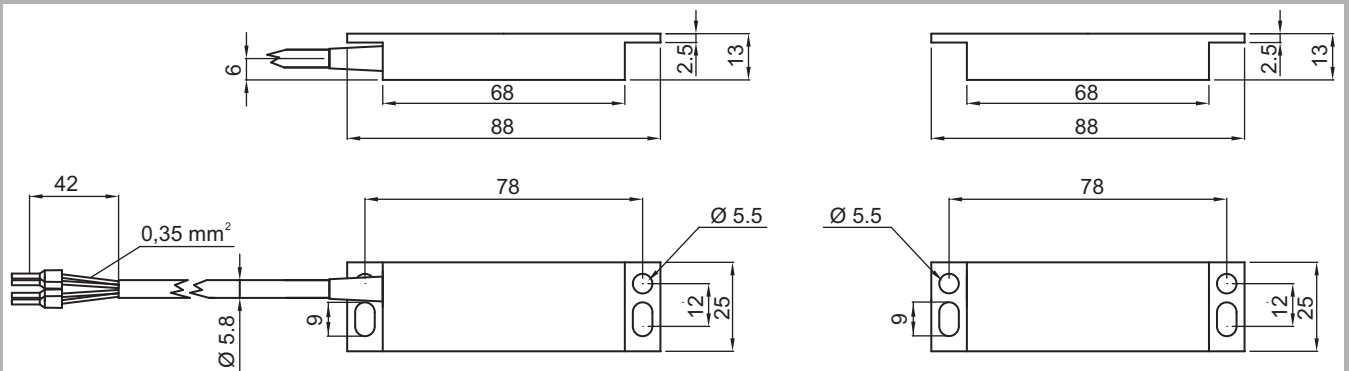
Sensor material	Plastic, glass fiber reinforced (PPS)
Actuator material	Plastic, glass fiber reinforced (PPS)
Dimensions (L x W x H)	88 mm x 25 mm x 13 mm
Protection rating acc. to EN 60529	IP 67

These tables do not apply in combination with additional M12 plug or connecting cable except where these components are explicitly mentioned.

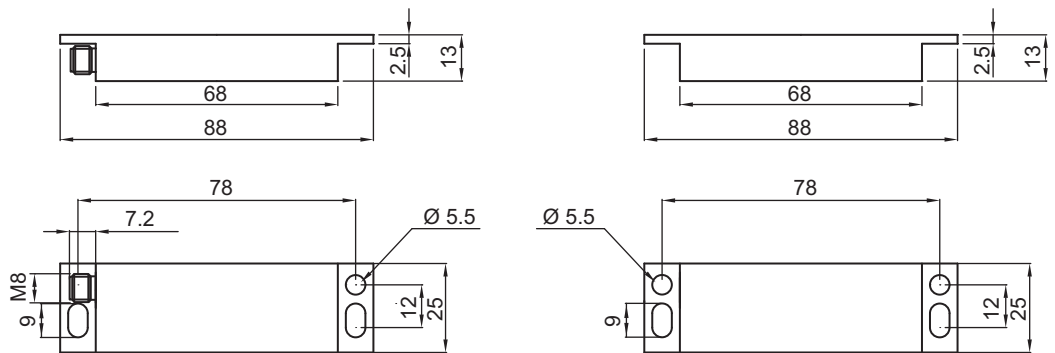
Please note the additional information in the connecting and operating instructions at www.leuze.com/mc388/.

Dimensional drawings

MC388 Magnetically Coded Sensor



MC388 Magnetically Coded Sensor with MC388-S1-A connection cable and actuator (right)



MC330 Magnetically Coded Sensor with M8 plug and MC388-S1-A actuator (right)

Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

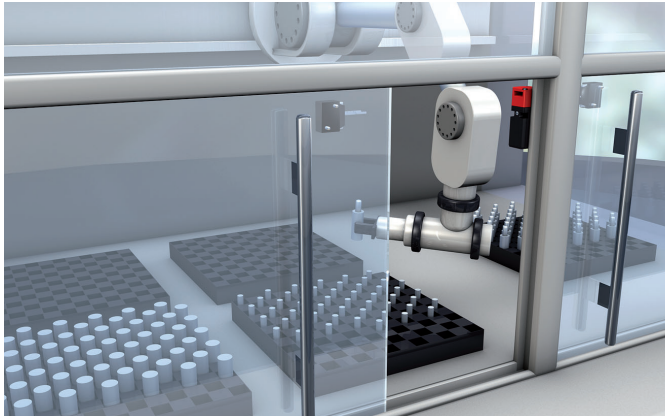
Accessories ordering information

Art. no.	Article	Description	Length, design
63001150	MC388-S1-A	Actuator	cubic

www.leuze.com/mc388/

SAFETY SWITCHES

Safety Switch selection table



Safety Switch for guarding the sliding door on a pick-and-place machine

Safety Switches are used for the position monitoring of moving protective devices, such as protective doors or flaps. Safety Switches without guard interlocking can always be used when the dangerous movement stops before the entering person can reach the point of operation. The Leuze electronic Safety Switches portfolio also includes Safety Position Switches (S300) and Safety Hinge Switches (S400) and therefore provides the perfect solution for many different applications.



Safety Position Switch on machine with a protective device and swivel joints – a typical application, e.g. in automated parts processing

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Selection of Leuze electronic Safety Switches from left to right: S20 Normal-Duty Safety Switch, S300 Safety Position Switch, S200 Heavy-Duty Safety Switch, S400 Safety Hinge Switch



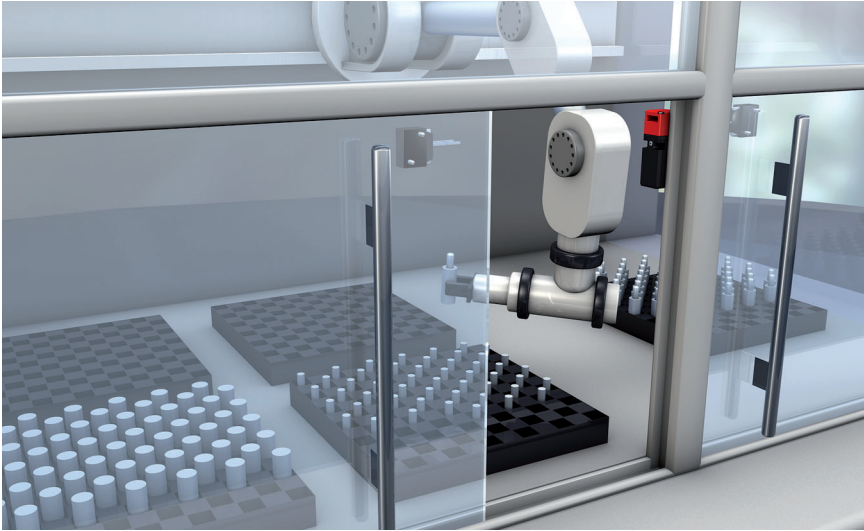
Features, type-dependent

Description	Plastic housing	Metal housing	Screw terminal	Integrated cable	M12 plug	Safety Switches contact set	N/C = N/C contact for safety circuit	N/O = N/O contact for signal circuit	Series	Page
Safety Switch with separate actuator	●		●			2NC ⊕			S20-P3...	342
	●		●			1NC ⊕ + 1NO			S20-P1...	342
	●		●			2NC ⊕ + 1NO			S20-P4... **	342
	●				●	2NC ⊕ + 1NO			S20-P4C1-M12...	342
			●	●			2NC ⊕		S200-M3...	352
			●	●			1NC ⊕ + 1NO		S200-M1...	352
			●	●			2NC ⊕ + 1NO		S200-M4...	352
Safety Position Switch		●				2NC ⊕ + 1NO		●	S200-M4C1-M12...	352
		●				1NC* ⊕ + 1NO			S300-M0...	362
		●				2NC ⊕ + 1NO			S300-M13...	362
	●				●	1NC* ⊕ + 1NO			S300-P13...	362
Safety Hinge Switches	●	●	●			2NC ⊕ + 1NO			S300-P13C1-M12-...	362
		●		●		2NC ⊕ + 1NO			S400-..., S410-...	370
		●		●	●	2NC ⊕ + 1NO			S400-...M12-..., S410-...M12-...	370
	●		●	●		2NC ⊕ + 1NO			S400-...CB02M12-..., S410-...CB02M12-...	370

* With step function against contact bounces
 **) Second hinge available separately

SAFETY SWITCHES

S20 Safety Switch



S20 Safety Switch for guarding the sliding door on a pick-and-place machine

The S20 is a Safety Switch without guard interlocking, which can always be used when the dangerous movement stops before the entering person can reach the point of operation. This is the case, for example, with machines and systems where the operator is protected from the point of operation with cages/grids or sliding doors, and a process or production interruption is essentially possible and may be required. The S20 series Safety Switches have a housing made of fiber-glass-reinforced plastic in accordance with protection rating IP 67. The models equipped with various contact sets and connection systems (screw terminals, M12 plugs) enable integration in control circuits up to category 4 in accordance with EN ISO 13849. The swivel deflecting head and numerous actuators enable universal use of this Safety Switch.

Typical areas of application

- Monitoring of rotating, swiveling or sliding protective doors in "normal duty" applications
- Lateral monitoring of sliding protective grids or sliding doors

Important technical data, overview

Switch type	Interlock device without guard interlocking in accordance with EN 1088		
Housing material	Fiberglass-reinforced, thermo-plastic plastic, self-extinguishing		
Actuation force (pull-out)	10 N or 30 N		
Contact equipment	2NC ⊖ 1NC ⊖ + 1NO 2NC ⊖ + 1NO		
Switching principle	Creep contact		
External actuator	AC-ANxx series: straight, angled, resilient, alignable		
Approach actuation directions	1 x above, 4 x side (90°)		
Approach speed	Max. 0.5 m/s		
Connection system	Number of cable entries	1, 3	1
	Type of cable entries	M20x1.5	M12 plug
Protection rating	IP 67		

Functions

Interlock device without guard interlocking in accordance with EN 1088
 Integration in control circuits up to category 4 in accordance with EN ISO 13849.

Special features

- Contact sets for integration up to category 4 in accordance with EN ISO 13849
- Easy mounting with standard construction
- Universal use with 5 actuator starting directions
- 8 different actuators for different installation conditions and applications
- Self-centering with funnel-shaped entry opening
- Protective insulation, tough non-flammable plastic



Features



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| ● Accessories ordering information | 348 |

SAFETY SWITCHES

Ordering information

S20

Included in delivery: Application information (print document)

Functions: Interlock device without guard interlocking in accordance with EN 1088

S20 Safety Switches, Normal Duty

Art. no.	Article	Description	Contact equipment
63000100	S20-P3C1-M20-FH	Safety Switches	(2NC ⊖) creep contacts
63000101	S20-P1C1-M20-FH	Safety Switches	(1NC ⊖ + 1NO) creep contacts
63000102	S20-P1C3-M20-LH	Safety Switches	(1NC ⊖ + 1NO) creep contacts
63000103	S20-P4C1-M20-FH	Safety Switches	(2NC ⊖ + 1NO) creep contacts
63000104	S20-P4C3-M20-LH	Safety Switches	(2NC ⊖ + 1NO) creep contacts
63000105	S20-P4C1-M20-FH30	Safety Switch, 30 N withdrawal force	(2NC ⊖ + 1NO) creep contacts
63000106	S20-P4C1-M12-FH	Safety Switch, M12 plug	(2NC ⊖ + 1NO) creep contacts

Actuators must be ordered separately, see page 348.

Article list for S20

Article	Description
S20	Safety Switches
-P	Plastic housing
1, 3, 4	Contact set
C1, C3	Number of cable bushings
-M20	Metric thread
-M12	M12 plug
-FH	Non-removable head
-LH	Removable head

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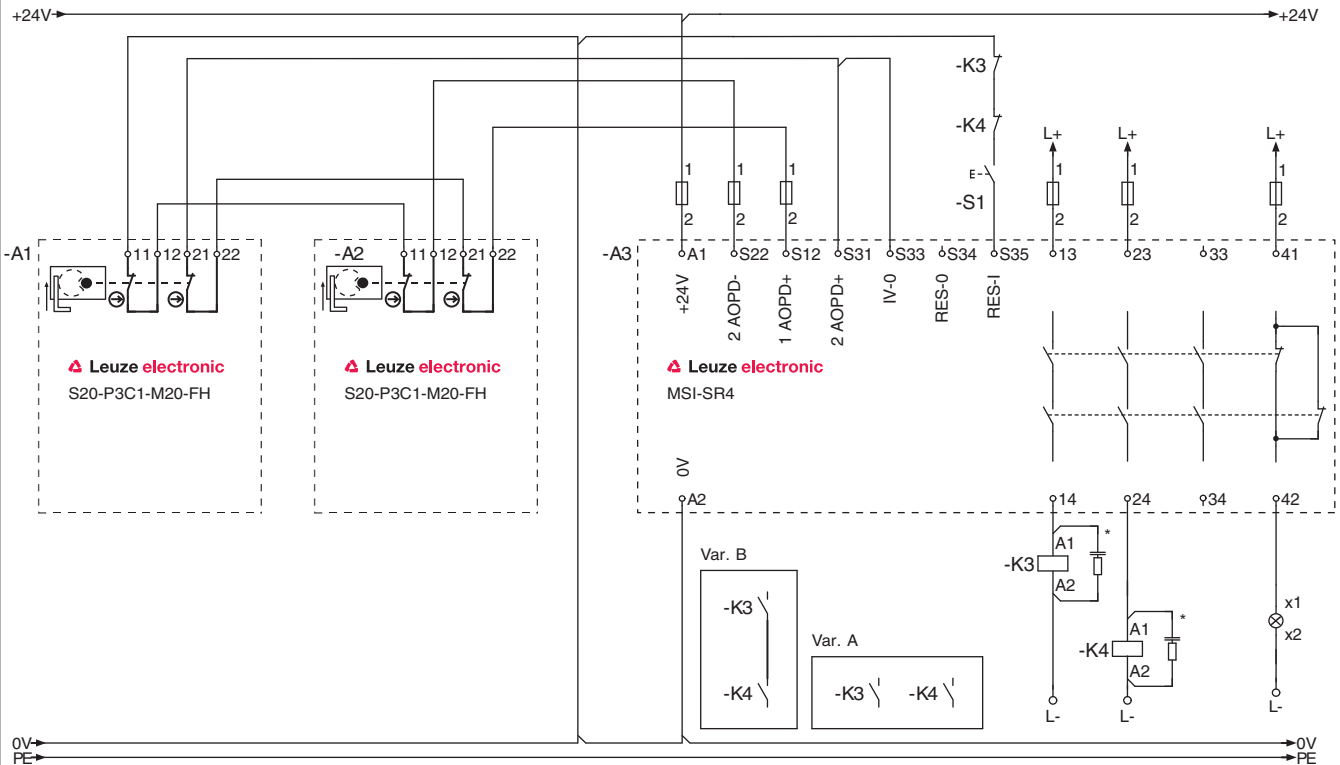
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Electrical connection

S20 connection example



*) Spark extinction circuit, supply suitable spark extinction

S20 Safety Switch with MSI-SR4 Safety Relay

⚠ Please observe the operating instructions of the components!

SAFETY SWITCHES

Technical data

General system data		
Switch type	Interlock device without guard interlocking in accordance with EN 1088	
Service life (T_M) in accordance with EN ISO 13849-1	20 years	
Number of cycles until 10% of the components have a failure to danger (B_{10d})	2.000.000	
Ambient temperature, operation	-25...+80 °C	
Dirt levels, external, in accordance with EN 60947-1	3	
Housing material	Fiberglass-reinforced, thermo-plastic plastic, self-extinguishing	
External actuator	AC-ANxx series: straight, angled, resilient, alignable	
Dimensions	See dimensional drawing	
Protection rating	IP 67	
Contact protection	Protective insulation O	
Approach actuation directions	1 x above, 4 x lateral (90°)	
Mechanical life time in accordance with IEC 60947-5-1	1 x 10 ⁶ actuation cycles	
Actuation frequency according to IEC 60947-5-1	Max. 3600 per hour	
Approach speed	Max. 0.5 m/s	
Actuation force (pull-out)	10 N / 30 N (S20-P4C1-M20-FH30)	
Actuating path with forced separation	Min. 9.0 mm Min. 7.2 mm Min. 7.8 mm	S20-P3... S20-P1... S20-P4...
Recoil tolerance	4.5 mm	
Contact equipment	2NC ⊖ 1NC ⊖ + 1NO 2NC ⊖ + 1NO	S20-P3... S20-P1... S20-P4...
Switching principle	Creep contact	
Contact opening	Force-fit	
Contact material	Silver alloy	
Usage category in accordance with EN 60947-5-1 with screw terminal connection	AC 15: U _e / I _e : 250 V / 6 A, 400 V / 4 A, 500 V / 1 A DC 13: U _e / I _e : 24 V / 6 A, 125 V / 1.1 A, 250 V / 0.4 A	
Usage category in accordance with EN 60947-5-1 with M12 plug connection	AC15: U _e / I _e : 24 V / 2 A DC13: U _e / I _e : 24 V / 2 A	
Rated insulation voltage	400 V AC, 600 V DC (screw terminal connection) 30 V AC, 36 V DC (M12-plug connection)	
Conventional thermal current	Max. 10 A (screw terminal connection) Max. 2 A (M12-plug connection)	
Short-circuit protection according to IEC 60269-1	500 V, 10 A, type aM (screw terminal connection) 500 V, 2 A, type gG (M12-plug connection)	
Connection system	M12 plug	1 (S20-...M12...)
	Number of cable entries	1 (S20-...C1...)
		3 (S20-...C3...)
	Type of cable entries	M20x1.5
Conductor cross-section (stranded) with screw terminal connection	1 x 0.5 mm ² to 2 x 2.5 mm ²	

Please note the additional information in the connecting and operating instructions at www.leuze.com/s20.

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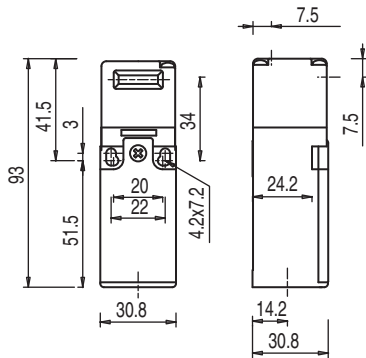
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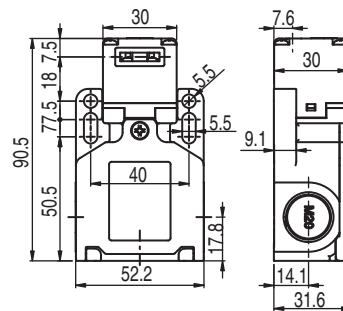
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Dimensional drawings

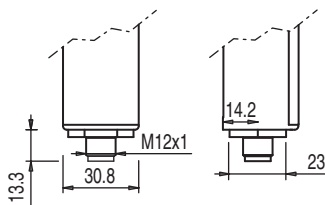
S20 Safety Switch



Safety switches S20-P3C1-M20-FH, S20-P4C1-M20-FH, S20-P1C1-M20-FH, S20-P4C1-M20-FH30



Safety Switches S20-P1C3-M20-LH, S20-P4C3-M20-LH



Safety Switch S20-P4C1-M12-FH (dimensions of M12 plug)

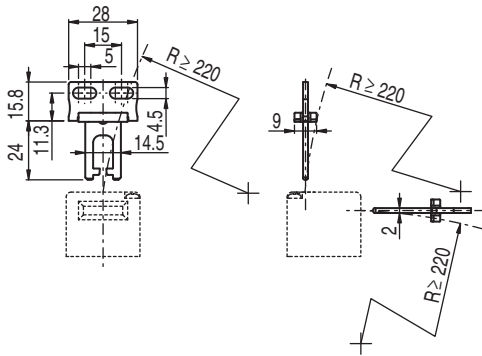
Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

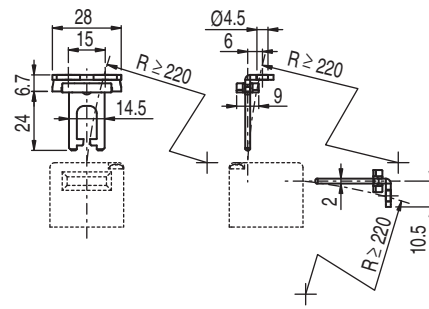
SAFETY SWITCHES

Dimensional drawings: Accessories

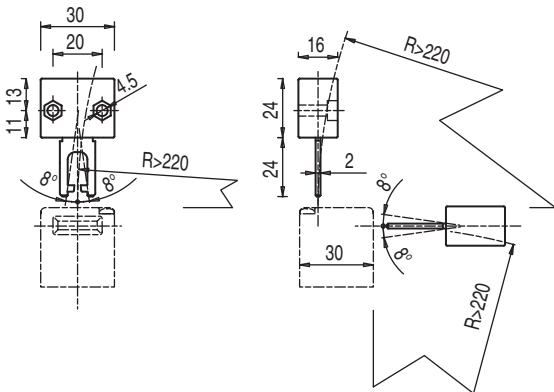
AC-AN actuator...



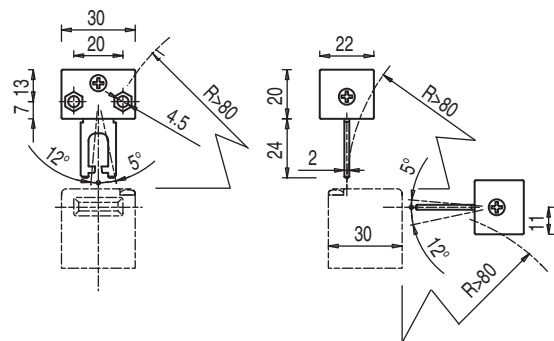
Actuator AC-AN-S



Actuator AC-AN-A



Actuator AC-AN-F4



Actuator AC-AN-F2J2

Dimensions in mm

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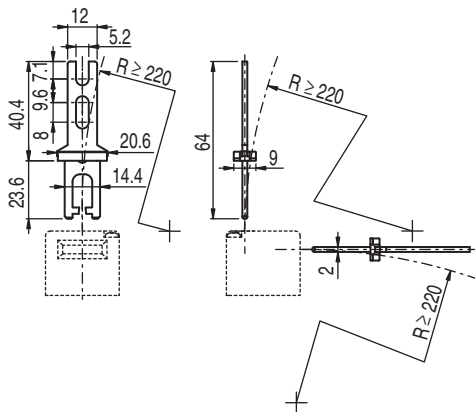
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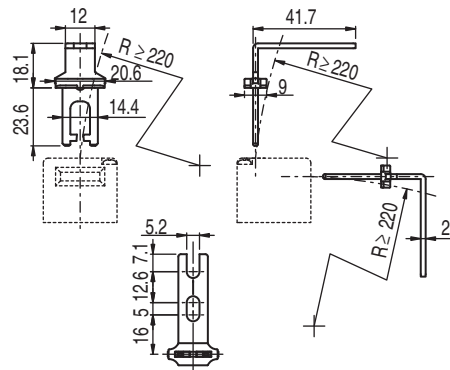
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Dimensional drawings: Accessories

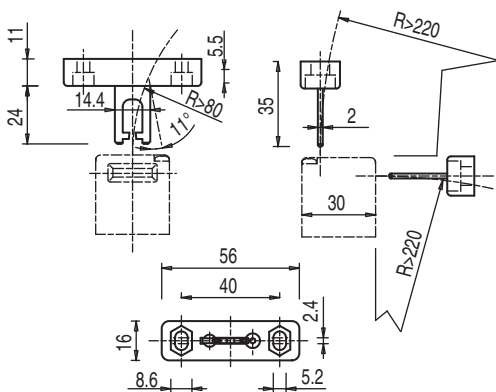
AC-AN- actuator...



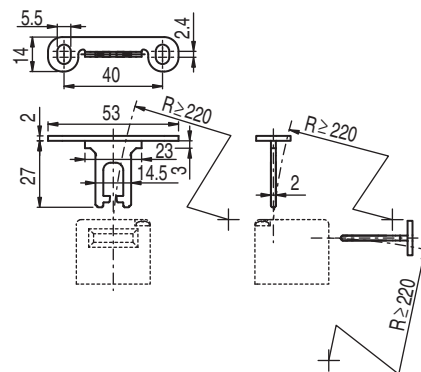
Actuator AC-AN-SL



Actuator AC-AN-AL



Actuator AC-AN-F1J2



Actuator AC-AN-ASH

Dimensions in mm

SAFETY SWITCHES

Accessories ordering information

S20 Normal Duty accessories

Art. no.	Article	Description	Design
63000700	AC-AN-S	Actuator	Straight
63000701	AC-AN-A	Actuator	Angled
63000702	AC-AN-F4	Actuator	Straight, flexible, 4 directions
63000703	AC-AN-F2J2	Actuator	Straight, flexible, 2 directions, alignable 2 directions
63000704	AC-AN-SL	Actuator	Straight, long
63000705	AC-AN-AL	Actuator	Angled, long
63000706	AC-AN-F1J2	Actuator	Straight, flexible, 1 direction, alignable 2 directions
63000707	AC-AN-ASH	Actuator	Angled, short
63000843	AC-A-M20-12NPT	Adapter	M20 x 1.5 on 1/2 NPT
63000844	AC-PLP-8	Built-in plug	M12, plastic, with internal 8-pin connection cable
Connection cables			
678055	CB-M12-5000E-5GF	Connecting cable shielded with M12 coupling, 5-pin	5 m, straight/open end
678056	CB-M12-10000E-5GF	Connecting cable shielded with M12 coupling, 5-pin	10 m, straight/open end
678057	CB-M12-15000E-5GF	Connecting cable shielded with M12 coupling, 5-pin	15 m, straight/open end
678058	CB-M12-25000E-5GF	Connecting cable shielded with M12 coupling, 5-pin	25 m, straight/open end
678060	CB-M12-5000E-8GF	Connecting cable shielded with M12 coupling, 8-pin	5 m, straight/open end
678061	CB-M12-10000E-8GF	Connecting cable shielded with M12 coupling, 8-pin	10 m, straight/open end
678062	CB-M12-15000E-8GF	Connecting cable shielded with M12 coupling, 8-pin	15 m, straight/open end
678063	CB-M12-25000E-8GF	Connecting cable shielded with M12 coupling, 8-pin	25 m, straight/open end

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Article list for S20 accessories

Article	Description
AC	Accessories
-AN	Actuator, Normal Duty
-S	Straight
-A	Angled
-F2	Flexible in 2 directions
-F4	Flexible in 4 directions
J2	Alignable in 2 directions
-SL	Straight and long
-AL	Angled and long
-ASH	Angled and short
-PLP-8	Built-in plug, 8-pin, plastic
-M12	M12 plug

AC

www.leuze.com/s20/

SAFETY SWITCHES

S200 Safety Switch



S200 Safety Switch on the door of a plastic film wrapping station

The S200 is a Safety Switch without guard interlocking, which can always be used when the dangerous movement stops before the entering person can reach the point of operation. It is used, for example, with heavy doors or shutter doors in tough environments, i.e. it is preferred with "heavy duty" applications in which a process or production interruption is possible or may be required. The S200 series Safety Switches have a housing made of metal in accordance with protection rating IP 67. The models equipped with various contact sets and connection systems (screw terminals, M12 connectors) enable integration in control circuits up to category 4 in accordance with EN ISO 13849. The standard construction in combination with six different "heavy duty" actuators enables easy mounting in the most diverse mechanical conditions.

Typical areas of application

- Monitoring heavy sliding doors and large protective doors and shutter gates
- Use in tough environments

Important technical data, overview

Switch type	Interlock device without guard interlocking in accordance with EN 1088		
Housing material	Metal		
Actuation force (pull-out)	10 N		
Contact equipment	2NC ⊕ 1NC ⊕ + 1NO 2NC ⊕ + 1NO		
Switching principle	Creep contact		
External actuator	AC-AHxx, series, straight, angled, resilient, alignable		
Approach actuation directions	1 x above, 4 x side (90°)		
Approach speed	Max. 0.5 m/s		
Connection system	Number of cable entries	1	1
	Type of cable entries	M20 x 1.5	M12 plug
Protection rating	IP 67		

Functions

Interlock device without guard interlocking in accordance with EN 1088
 Integration in control circuits up to category 4 in accordance with EN ISO 13849

Special features

- Metal housing for use in tough environments
- Easy mounting with standard construction
- Contact sets for integration up to category 4 in accordance with EN ISO 13849
- Large double-bridge contacts for long service life
- Universal use with 5 actuator starting directions
- Self-centering with funnel-shaped entry opening
- 6 different "heavy duty" AC-AHxx series actuators for the most diverse installation conditions and applications



Features



Further information

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SAFETY SWITCHES

Ordering information

S200

Included in delivery: Application information (print document)

Functions: Interlock device without guard interlocking in accordance with EN 1088

S200 Safety Switches, Heavy Duty

Art. no.	Article	Description	Contact equipment
63000200	S200-M3C1-M20	Safety Switches	(2NC ⊖) creep contacts
63000201	S200-M1C1-M20	Safety Switches	(1NC ⊖ + 1NO) creep contacts
63000202	S200-M4C1-M20	Safety Switches	(2NC ⊖ + 1NO) creep contacts
63000203	S200-M4C1-M12	Safety Switch, M12 plug	(2NC ⊖ + 1NO) creep contacts

Actuators must be ordered separately, see page 358.

Article list for S200

Article	Description
S200	Safety Switches
-M	Metal housing
1, 3, 4	Contact set
C1	Number of cable bushings
-M20	Metric thread
-M12	M12 plug

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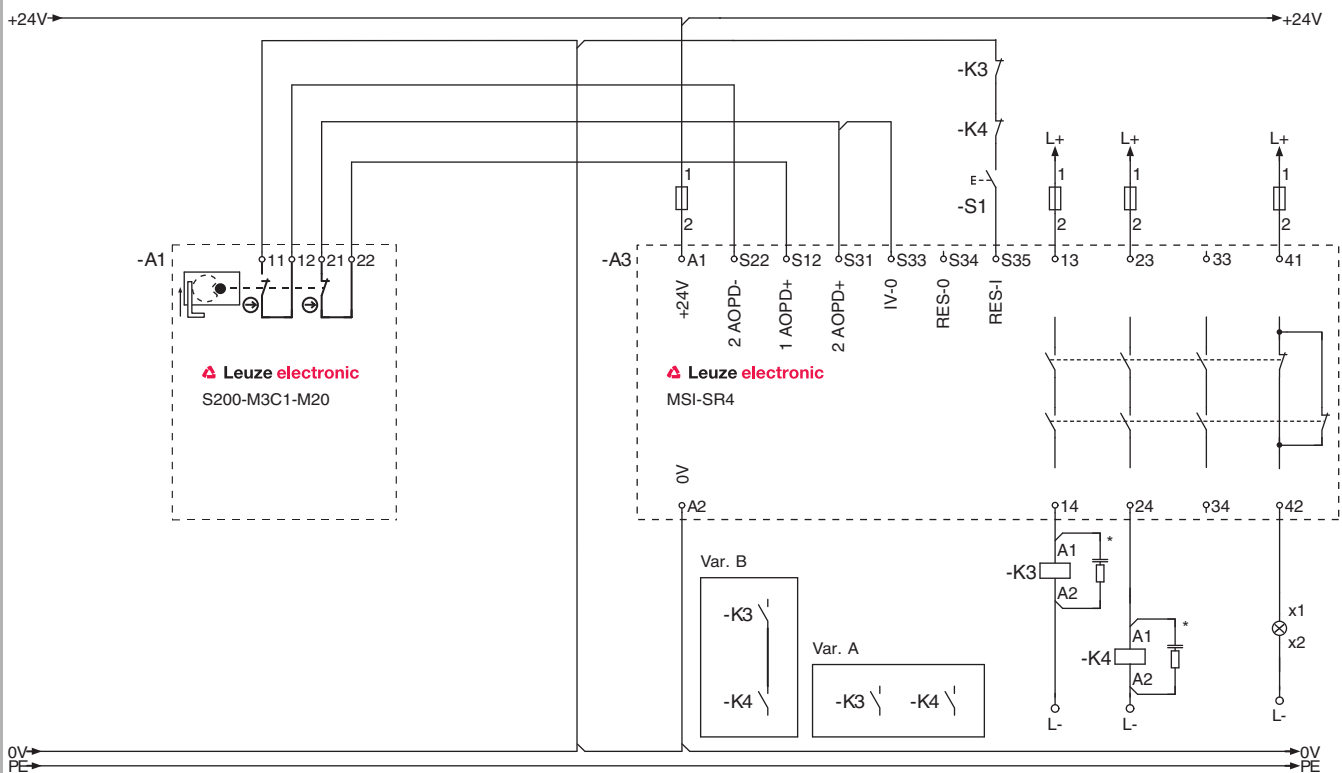
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Electrical connection

S200 connection example



*) Spark extinction circuit, supply suitable spark extinction

S200 Safety Switch with MSI-SR4 Safety Relay

⚠ Please observe the operating instructions of the components!

SAFETY SWITCHES

Technical data

General system data		
Switch type	Interlock device without guard interlocking in accordance with EN 1088	
Service life (T_M) in accordance with EN ISO 13849-1	20 years	
Number of cycles until 10% of the components have a failure to danger (B_{10d})	2.000.000	
Ambient temperature, operation	-25...+80 °C	
Dirt levels, external, in accordance with EN 60947-1	3	
Housing material	Metal	
External actuator	AC-AHxx series, straight, angled, resilient, alignable	
Dimensions	See dimensional drawing	
Protection rating	IP 67	
Contact protection	Earthing	
Approach actuation directions	1 x above, 4 x lateral (90°)	
Mechanical life time in accordance with IEC 6047-5-1	1 x 10 ⁶ actuation cycles	
Actuation frequency in accordance with IEC 6047-5-1	Max. 3600 per hour	
Approach speed	Max. 0.5 m/s	
Actuation force (pull-out)	10 N	
Actuating path with forced separation	Min. 10.2 mm Min. 8.6 mm Min. 8.8 mm	S200-M3C1-M20 S200-M1C1-M20 S200-M4C1-M20 / S200-M4C1-M12
Recoil tolerance	5 mm	
Contact equipment	2NC ⊕ 1NC ⊕ + 1NO 2NC ⊕ + 1NO	S200-M3... S200-M1... S200-M4...
Switching principle	Creep contact	
Contact opening	Force-fit	
Contact material	Silver alloy	

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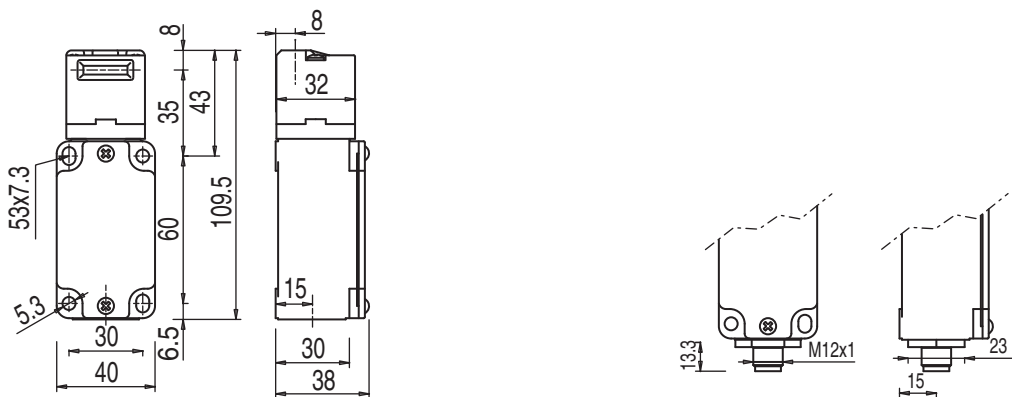
S400, S410
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Technical data

General system data		
Usage category in accordance with EN 60947-5-1 with screw terminal connection	AC 15: U _e / I _e : 250 V / 6 A, 400 V / 4 A, 500 V / 1 A DC 13: U _e / I _e : 24 V / 6 A, 125 V / 1.1 A, 250 V / 0.4 A	
Usage category in accordance with EN 60947-5-1 with M12 plug connection	AC15: U _e / I _e : 24 V / 2 A DC13: U _e / I _e : 24 V / 2 A	
Rated insulation voltage	400 V AC, 600 V DC (screw terminal connection) 30 V AC, 36 V DC (M12-plug connection)	
Conventional thermal current	Max. 10 A (screw terminal connection) Max. 2 A (M12-plug connection)	
Short-circuit protection according to IEC 60269-1	500 V, 10 A, type aM (screw terminal connection) 500 V, 2 A, type gG (M12-plug connection)	
Connection system	M12 plug	
	Number of cable entries	1 (S200-...M12...)
	Type of cable entries	M20 x 1.5
	Conductor cross-section (stranded) with screw terminal connection	1 x 0.5 mm ² to 2 x 2.5 mm ²

Please note the additional information in the connecting and operating instructions at www.leuze.com/s200.

S200 dimensional drawings



Safety Switches S200-M3C1-M20, S200-M1C1-M20, S200-M4C1-M20

Safety Switch S200-M4C1-M12 (dimensions of M12 plug)

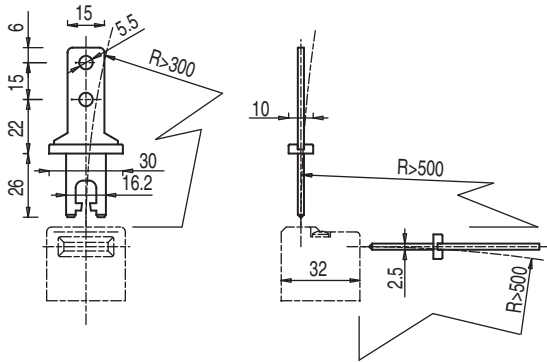
Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

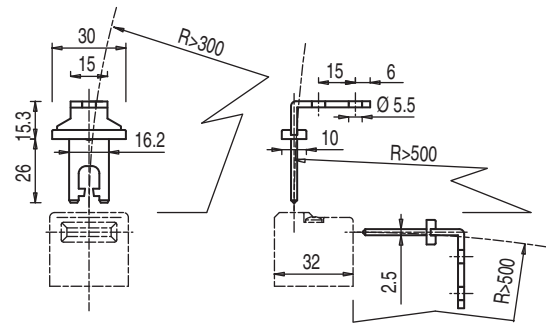
SAFETY SWITCHES

Dimensional drawings: Accessories

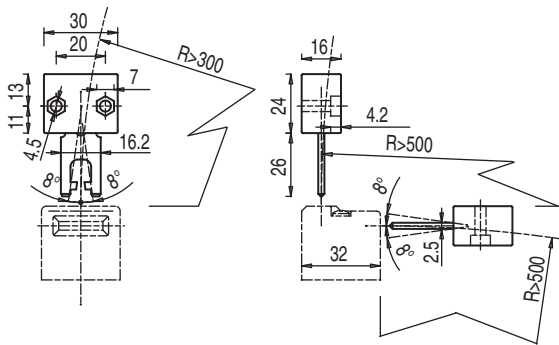
AC-AH- actuator...



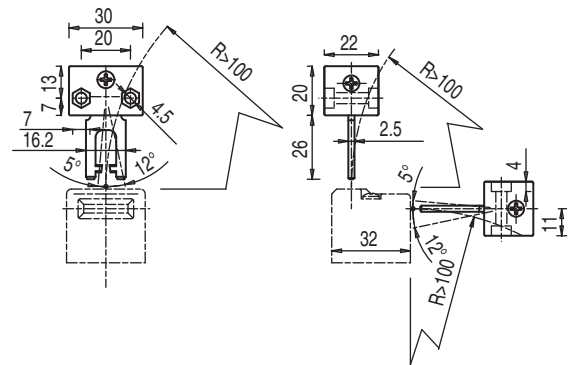
Actuator AC-AH-S



Actuator AC-AH-A



Actuator AC-AH-F4



Actuator AC-AH-F2J2

Dimensions in mm

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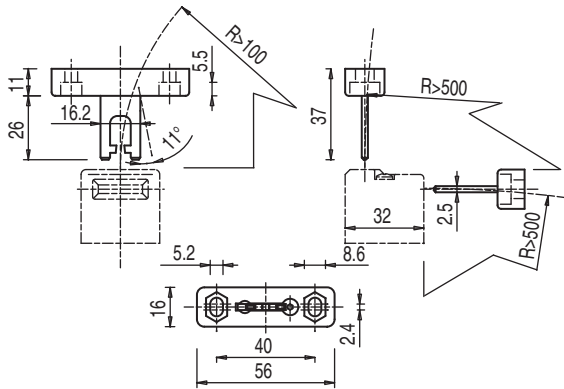
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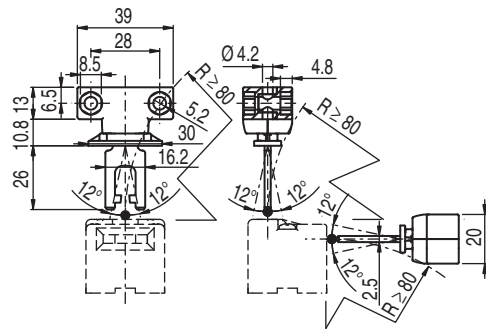
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Dimensional drawings: Accessories

AC-AH- actuator...



Actuator AC-AH-F1J2



Actuator AC-AH-F4J2-TK

Dimensions in mm

SAFETY SWITCHES

Accessories ordering information

S200 Heavy Duty accessories

Art. no.	Article	Description	Design
63000720	AC-AH-S	Actuator	Straight
63000721	AC-AH-A	Actuator	Angled
63000722	AC-AH-F4	Actuator	Straight, flexible, 4 directions
63000723	AC-AH-F2J2	Actuator	Straight, flexible, 2 directions, alignable 2 directions
63000724	AC-AH-F1J2	Actuator	Straight, flexible, 1 direction, alignable 2 directions
63000725	AC-AH-F4J2-TK	Actuator	Straight, flexible, 4 directions, alignable 2 directions, rotatable head
63000843	AC-A-M20-12NPT	Adapter	M20 x 1.5 on 1/2 NPT
63000845	AC-PLM-8	Built-in plug	M12, metal, with internal 8-pin connection cable
63000846	AC-KL-AH	KeyLock for locking the actuator introduction	

"Connection cables": see S20 Safety Switch, page 348

Article list for S200 accessories

Article	Description
AC	Accessories
-AH	Actuator, Heavy Duty
-S	Straight
-A	Angled
-F1	Flexible in 1 directions
-F2	Flexible in 2 directions
-F4	Flexible in 4 directions
J2	Alignable in 2 directions
-TK	Actuator key, turns
-PLM-8	Built-in plug, 8-pin, metal
-KL	Locking of the actuator introduction
-M12	M12 plug

AC

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www.leuze.com/s200/

SAFETY SWITCHES

S300 Safety Position Switch



Safety Position Switch on machine with a protective device and swivel joints – a typical application, e.g. in automated parts processing

This Safety Switch is also used when the dangerous movement stops before the entering person can reach the point of operation, i.e. with machines with very short stopping times. Because of its construction design, the S300 Safety Position Switch is also mounted on flaps as an alternative to hinge switches – always with the prerequisite that appropriate actuation tappets or notches can actuate the switch when friction closed. The S300 Safety Position Switches have a metal housing in accordance with protection rating IP 67. The models equipped with various contact sets enable integration in control circuits up to category 4 in accordance with EN ISO 13849. In addition, variants are available with various actuators and holders and connection options. Thus, the S300 series covers a number of mechanical and electrical applications.

Typical areas of application

- Covers and sliding doors with force-fit actuation
- Cover flaps with forced actuation
- Machine-actuated additional switch-off in combination with S200 Safety Switches, for example

Important technical data, overview

Switch type	Interlock device without guard interlocking in accordance with EN 1088		
Housing material	Metal, plastic (glass fiber reinforced, self-extinguishing)		
Contact equipment	1NC ⊕ + 1NO 2NC ⊕ + 1NO		
Switching principle	Snap-action contact, creep contact		
Actuator	Tappet actuator, various roller levers with roll, porcelain lever		
Approach actuation directions	1 x above + 4 x lateral (90°), 360° + 4 x side (90°)		
Switching direction	Left-right one side, both sides		
Approach speed	Min. 0.04 mm/s up to max. 1.0 m/s (depending on angle of approach and product type)		
	Number of cable entries	1, 3	1
Connection system	Type of cable entries	M20x1.5	M12 plug
	Protection rating	IP 67	

Functions

Interlock device without guard interlocking in accordance with EN 1088
Integration in control circuits up to category 4 in accordance with EN ISO 13849
Stop command with automatic or manual forced actuation

Special features

- Metal housing for "heavy duty" applications
- Contact sets for integration up to category 4 in accordance with EN ISO 13849
- Switching direction selectable
- Universal use with individually set actuator approach directions and angles
- Roll actuator extremely long-life/robust due to special treatment



Features



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SAFETY SWITCHES

Ordering information


S300

Included in delivery: Application information (print document)

Functions: Interlock device without guard interlocking in accordance with EN 1088

S300 Safety Position Switches, Heavy Duty

Art. no.	Article	Description	Contact equipment
63000300	S300-M0C3-M20-15	Safety Position Switch with roller plunger, metal design	(1NC ⊖ + 1NO) step contacts
63000301	S300-M13C3-M20-15	Safety Position Switch with roller plunger, metal design	(2NC ⊖ + 1NO) creep contacts
63000302	S300-M0C3-M20-31	Safety Position Switch with roller lever, metal design	(1NC ⊖ + 1NO) step contacts
63000303	S300-M13C3-M20-31	Safety Position Switch with roller lever, metal design	(2NC ⊖ + 1NO) creep contacts
63000304	S300M13C3-M20-CB	Safety Position Switch, short actuator holder, metal design	(2NC ⊖ + 1NO) creep contacts
63000305	S300M13C1-M20-SB	Safety Position Switch, long actuator holder, metal design	(2NC ⊖ + 1NO) creep contacts
63000306	S300P13C1-M20-CB	Safety Position Switch, short actuator holder, plastic design	(2NC ⊖ + 1NO) creep contacts
63000307	S300P13C1-M12-CB	Safety Position Switch, short actuator holder, plastic design, M12 plug	(2NC ⊖ + 1NO) creep contacts
63000308	S300P13C1-M20-SB	Safety Position Switch, long actuator holder, plastic design	(2NC ⊖ + 1NO) creep contacts
63000309	S300P13C1-M12-SB	Safety Position Switch, long actuator holder, plastic design, M12 plug	(2NC ⊖ + 1NO) creep contacts

 **Note**

Variants 63000304 to 63000309 can be combined with various actuators, see page 367.

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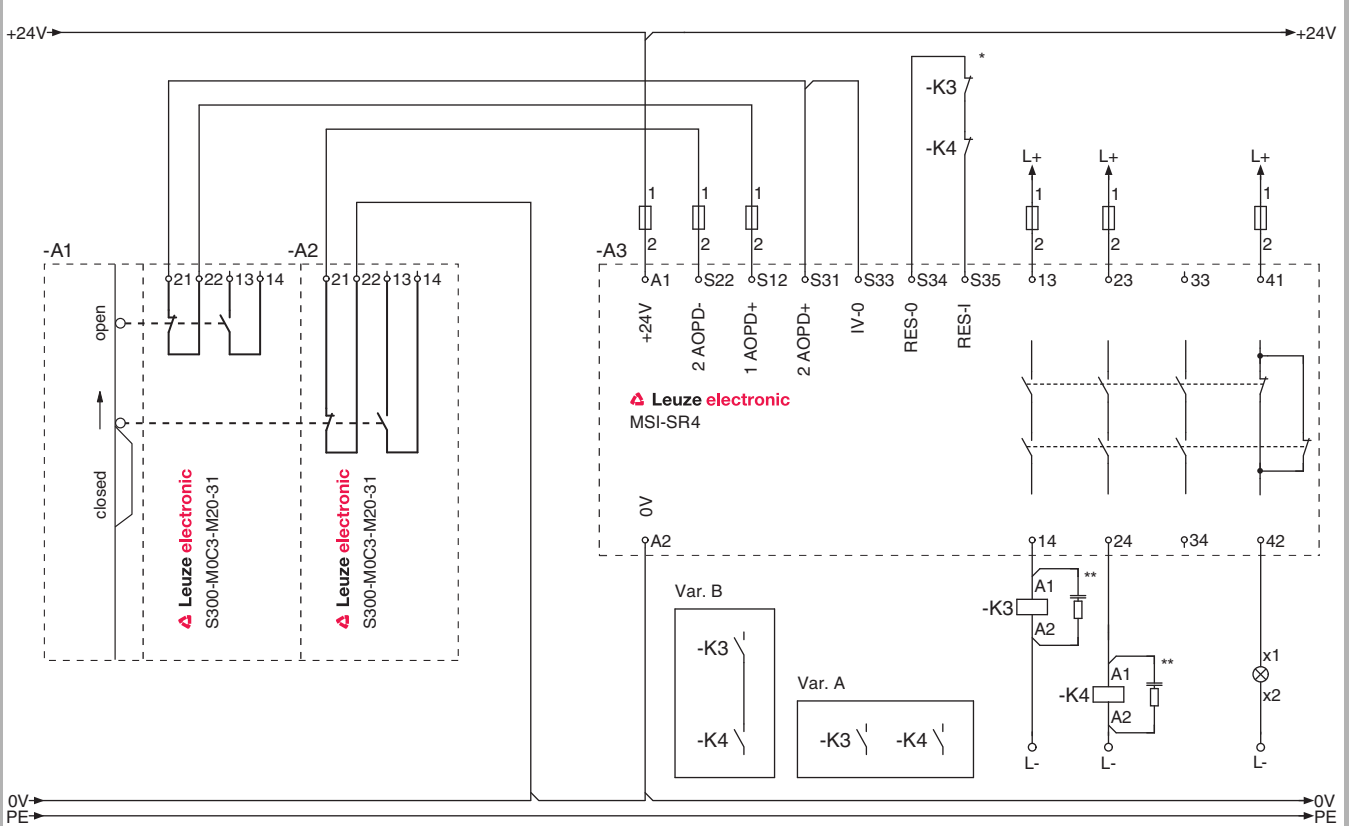
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Article list for S300

Article	Description
S300	Safety Position Switch
-M	Metal housing
0, 13	Contact set
C3	Number of cable bushings
-M20	Metric thread
-15, 31	Actuator model
CB	Cable entry
SB	M12 plug connection

S300

S300 electrical connection



*) Automatic start! It must not be possible to reach or walk behind the interlock device!
 **) Spark extinction circuit, supply suitable spark extinction

S300 Safety Position Switch with MSI-SR4 Safety Relay

⚠ Please observe the operating instructions of the components!

SAFETY SWITCHES

Technical data

General system data		
Switch type	Interlock device without guard interlocking in accordance with EN 1088	
Service life (T_M) in accordance with EN ISO 13849-1	20 years	
Number of cycles until 10% of the components have a failure to danger (B_{10d})	40.000.000	
Ambient temperature, operation	-25...+80°C	
Dirt levels, external, in accordance with EN 60947-1	3	
Housing material	S300-M...: metal S300-P...: plastic, glass fiber reinforced, self-extinguishing	
Actuator	Tappet actuator, roller lever with roll, porcelain lever	
Dimensions	See dimensional drawing	
Protection rating	IP 67	
Approach actuation directions	1 x above, 4 x side (90°)	S300 with roller plunger
	360° + 4 x side (90°)	S300 with roller lever
Switching direction	Left-right one side, both sides	
Mechanical life time in accordance with IEC 6047-5-1	20 x 10 ⁶ actuation cycles	
Actuation frequency according to IEC 6047-5-1	Max. 3600 per hour	
Contact equipment	1NC ⊕ + 1NO	S300-M0...
	2NC ⊕ + 1NO	S300-M13..., S300-P13...
Switching principle	Snap-action contact	S300-M0...
	Creep contact	S300-M13..., S300-P13...
Contact opening	Force-fit	
Contact material	Silver alloy	
Usage category in accordance with EN 60947-5-1 with screw terminal connection	AC 15: U_e / I_e : 250 V / 6 A, 400 V / 4 A, 500 V / 1 A DC 13: U_e / I_e : 24 V / 6 A, 125 V / 1.1 A, 250 V / 0.4 A	
Usage category in accordance with EN 60947-5-1 with M12 plug connection	AC15: U_e / I_e : 24 V / 2 A DC13: U_e / I_e : 24 V / 2 A	
Rated insulation voltage	500 V AC, 600 V DC (screw terminal connection) 30 V AC, 36 V DC (M12-plug connection)	
Conventional thermal current	Max. 10 A (screw terminal connection) Max. 2 A (M12-plug connection)	
Short-circuit protection according to IEC 60269-1	500 V, 10 A, type aM (screw terminal connection) 500 V, 2 A, type gG (M12-plug connection)	
Connection system	Number of cable entries	1 (S300-P...C1...) 3 (S300-M...C3...)
	Type of cable entries	M20 x 1.5

Please note the additional information in the connecting and operating instructions at www.leuze.com/s300.

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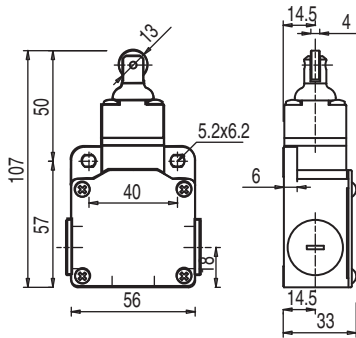
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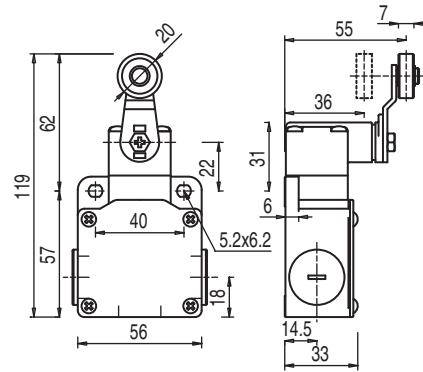
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Dimensional drawings

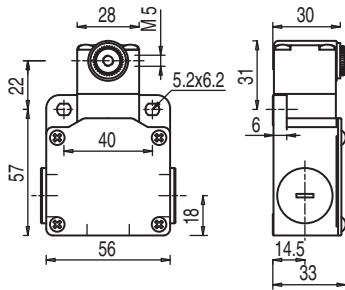
S300 Safety Position Switch



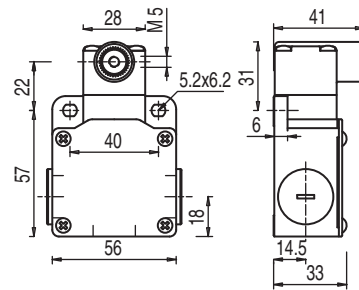
Safety Position Switches
S300-M0C3-M20-15, S300-M13C3-M20-15



Safety Position Switches
S300-M0C3-M20-31, S300-M13C3-M20-31



Safety Position Switch S300-M13C3-M20-CB



Safety Position Switch S300-M13C3-M20-SB

Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

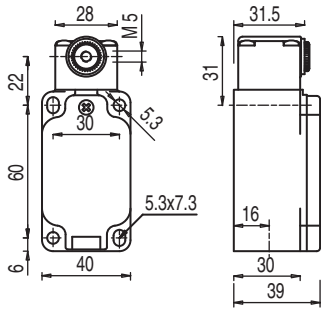
Note

The pictured models can be combined with various actuators, see page 367.

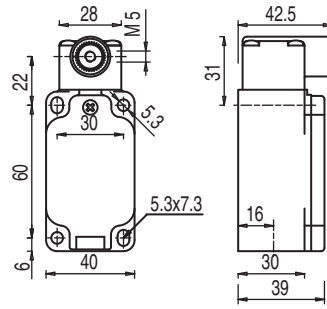
SAFETY SWITCHES

Dimensional drawings

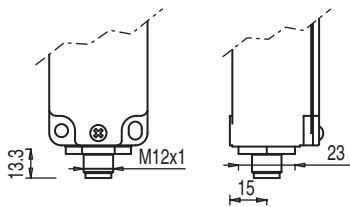
S300 Safety Position Switch



Safety Position Switch
S300-P13C1-M20-CB, S300-P13C1-M12-CB



Safety Position Switch
S300-P13C1-M20-SB, S300-P13C1-M12-SB



Safety Position Switch S300-P13C1-M12-... (dimensions of M12 plug)

Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

Note

The pictured models can be combined with various actuators, see page 367.

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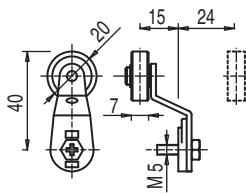
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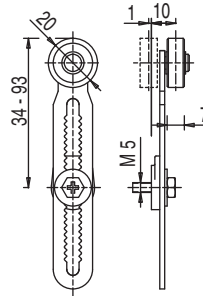
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Dimensional drawings: Accessories

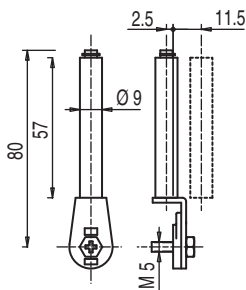
AC- actuator...



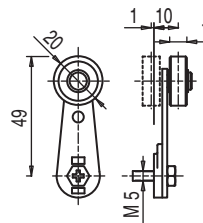
AC-AL-R actuator



AC-LL-R actuator



AC-PL actuator



AC-SL-R actuator

Dimensions in mm

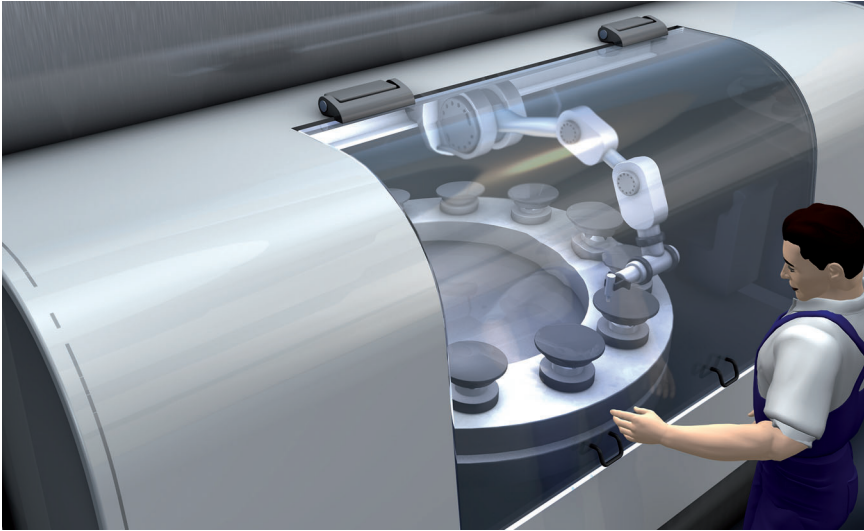
AS300 accessories ordering information

Art. no.	Article	Description	Design
63000843	AC-A-M20-12NPT	Adapter	M20 x 1.5 on 1/2 NPT
63000845	AC-PLM-8	Built-in plug	M12, metal, with internal 8-pin connection cable
63000880	AC-SL-R	Actuator	Roller lever with roll, straight
63000881	AC-AL-R	Actuator	Roller lever with roll, angled
63000882	AC-LL-R	Actuator	Roller lever with roll, long
63000883	AC-PL	Actuator	Porcelain lever, straight

"Connection cables": see S20 Safety Switch, page 348

SAFETY SWITCHES

S400, S410 Safety Hinge Switches



Safety Hinge Switch on a semi-automatic test system with protective hood

S400 series Safety Hinge Switches are used for position monitoring of hard guards that can rotate (e.g. protective hoods) with a monitoring switch (without guard interlocking) integrated into the hinge. The S400 Safety Hinge Switches unite the Safety Switch and door hinge functions in one component. This Safety Switch is used with machines with small stopping times, depending on the distance to the point of operation. As external actuators are not required with this Switch, it can also be used problem-free in environments with high dust concentration levels or with heavy particle loads. The Switch is extremely compact, but robust at the same time, and therefore predestined for numerous applications. It also boasts a simple switching angle alignment. If, for example, doors are to be moved or aligned later on, re-alignment is no problem. The covered screws of the S400 Safety Hinge Switch ensure that it is highly tamperproof. Depending on the version, the electrical connection is made via a cable or an M12 plug - available with cable entry from above, below or wall side (mounting side). This flexibility enables the monitoring of a wide range of doors, hoods, flaps, etc.

Typical areas of application

- Monitoring of rotating or swiveling protective doors
- Hand protection with flap and hood position monitoring

Important technical data, overview

Switch type	Interlock device without guard interlocking in accordance with EN 1088
Housing material	Metal
Loads/stresses	1500 Nm (axial), 1000 Nm (radial), 25 Nm (torsional)
Contact equipment	2NC ⊖ + 1NO
Switching principle	Creep contact, snap-action contact
Internal actuator	Safety Switch in hinge, encapsulated
Actuation angle	max. 180°
Connection system	Cable, M12 plug
Cable entry	Bottom, top, at wall side
Protection rating	IP 67, IP 69K

Functions

Interlock device without guard interlocking in accordance with EN 1088
Integration in control circuits up to category 4 in accordance with EN ISO 13849
Mechanical hinge with integrated Safety Switch

Special features

- Contact sets for integration up to category 4 in accordance with EN ISO 13849
- Maximum opening angle of the protective device, 180°
- Repeatable setting (switching angle alignment) with moved or misaligned doors
- Protection rating: IP 67
- Compact, rounded-off construction design in robust metal version
- Encapsulated, internal actuator guarantees proper functioning, even under difficult conditions
- Extremely tamperproof with covered screws (unobtrusive sturdy design with rear-side mounting)



Features



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SAFETY SWITCHES

Ordering information

S400, S410

Included in delivery: Application information (print document)

Functions: Interlock device without guard interlocking in accordance with EN 1088, mechanical hinge with integrated Safety Switch, integrated encapsulated actuator, switching angle can be aligned again and again

S400, S410 Safety Hinge Switches

Art. no.	Article	Description
63000400	S400-M4CB2-B	Safety Hinge Switch, 2 m cable, cable entry on bottom
63000401	S400-M4M12-B	Safety Hinge Switch, M12 plug, 8-pin, cable entry on bottom
63000402	S400-M4CB2-T	Safety Hinge Switch, 2 m cable, cable entry on top
63000403	S400-M4M12-T	Safety Hinge Switch, M12 plug, 8-pin, cable entry on top
63000406	S400-M4-CB02M12-W	Safety Hinge Switch, 0.2 m cable, M12 plug (8-pin), cable entry at wall side
63000407	S400-M1-CB02M12-W	Safety Hinge Switch, 0.2 m cable, M12 plug (8-pin), cable entry at wall side
63000411	S400-M4-CB2PUR-W	Safety Hinge Switch, 2 m PUR cable, cable entry at wall side
63000404	S410-M1CB2-B	Safety Hinge Switch, 2 m cable, cable entry on bottom
63000405	S410-M1M12-B	Safety Hinge Switch, M12 plug, 8-pin, cable entry on bottom
63000408	S410-M1-CB2-T	Safety Hinge Switch, 2 m cable, cable entry on top
63000409	S410-M1M12-T	Safety Hinge Switch, M12 plug (8-pin), cable entry on top
63000410	S410-M4-CB02M12-W	Safety Hinge Switch, 0.2 m cable, M12 plug (8-pin), cable entry at wall side
63000412	S410-M4-CB2PUR-W	Safety Hinge Switch, 2 m PUR cable, cable entry at wall side

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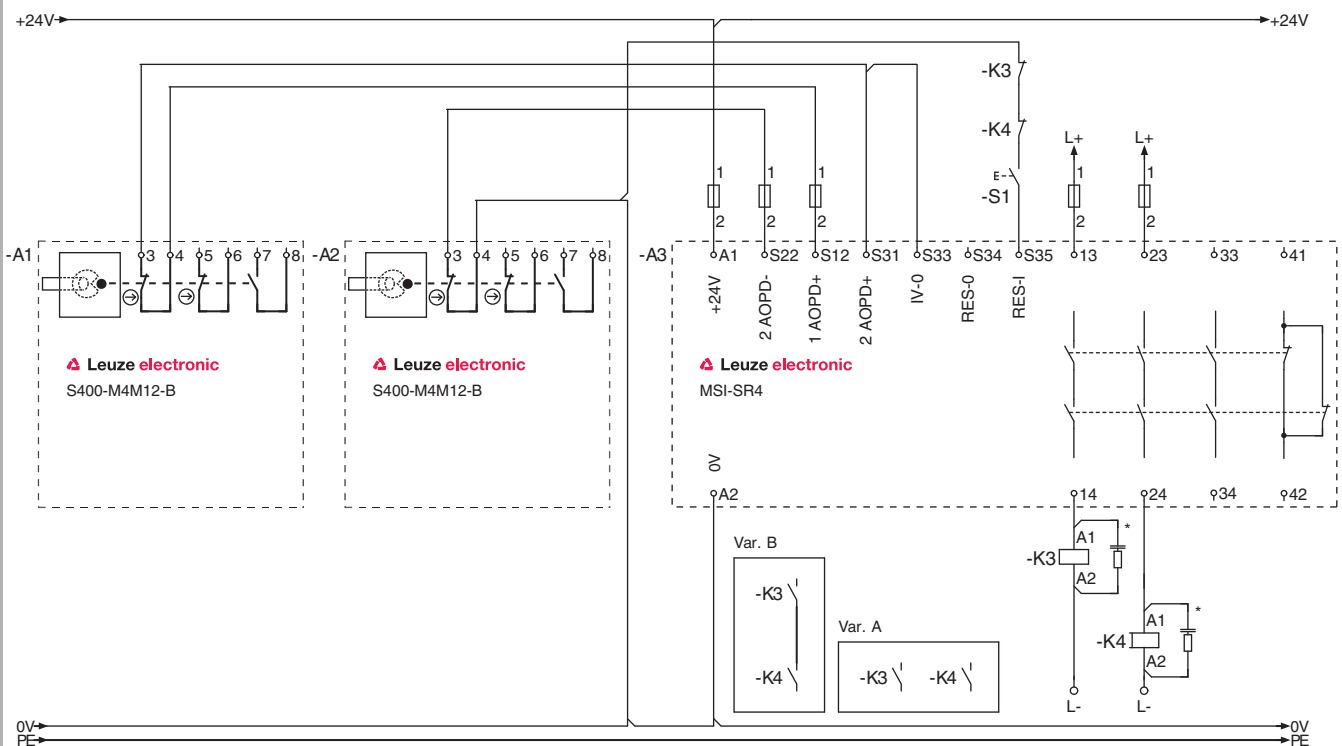
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Article list for S400, S410

Article	Description
S400,S410	Safety Hinge Switches
-M	Metal housing
1	Contact set, 2NC ⊖ + 1NO, snap-action contact
4	Contact set, 2NC ⊖ + 1NO, creep contact
CB2	Cable, 2 m long
M12	M12 plug
-PUR	PUR cable
-B	Cable entry from below with left installation
-T	Cable entry from above with left installation
-W	Cable entry at wall side

S400
S410

S400 electrical connection



*) Spark extinction circuit, supply suitable spark extinction

S400 Safety Hinge Switch with MSI-SR4 Safety Relay

Please observe the operating instructions of the components!

SAFETY SWITCHES

Technical data

Switch type	Interlock device without guard interlocking in accordance with EN 1088	
Service life (T_M) in accordance with EN ISO 13849-1	20 years	
Number of cycles until 10% of the components have a failure to danger (B_{10d})	5.000.000	
Ambient temperature, operation	-25...+80 °C	
Dirt levels, external, in accordance with EN 60947-1	3	
Housing material	Metal	
Internal actuator	Safety Switch in hinge, encapsulated	
Dimensions	See dimensional drawing	
Protection rating	IP 67, IP 69K	
Actuation angle	max. 180°	
Mechanical life time in accordance with IEC 6047-5-1	1 x 10 ⁶ actuation cycles	
Actuation frequency according to IEC 6047-5-1	Max. 1200 per hour	
Actuating path with forced separation	Min. +4° (from switching point)	
Loads/stresses	S400: max. 1500 Nm (axial), max. 1000 Nm (radial), max. 25 Nm (torsional) S410: max. 750 Nm (axial), max. 500 Nm (radial), max. 12 Nm (torsional)	
Contact equipment	2NC \oplus + 1NO	
Switching principle	Creep contact	S400-M4..., S410-M4...
	Snap-action contact	S400-M1..., S410-M1...
Contact opening	Force-fit	
Contact material	Silver alloy, solid	
Usage category in accordance with EN 60947-5-1	AC 15 / DC 13: Ue 24 V, Ie 2 A	
Rated insulation voltage	30 V AC, 36 V DC	
Conventional thermal current	Max. 2 A	
Short-circuit protection according to IEC 60269-1	500 V, 2 A, type gG	
Connection system	Number of cable bushings	1
	Cable routing side	from below with left installation: (S400-...-B, S410-...-B) from above with left installation: (S400-...-T, S410-...-T) wall-side installation: (S400-...-W, S410-...-W)
	Type of connection	Cable: (S400-M4CB2-..., S410-M1CB2-...) PUR cable: (S400-M4-CB2PUR-W, S410-M4-CB2PUR-W) 0.2 m cable with M12 plug: (S400-M4-CB02M12-W, S400-M1-CB02M12-W, S410-M4-CB02M12-W) M12 plug: (S400-M4M12-B, S400-M4M12-T, S410-M1M12-B, S410-M1M12-T)
	Conductor cross-section (stranded) with screw terminal connection	7 x 0.5 mm ² (S400-...CB2..., S410-...CB2...)

Please note the additional information in the connecting and operating instructions at www.leuze.com/s400.

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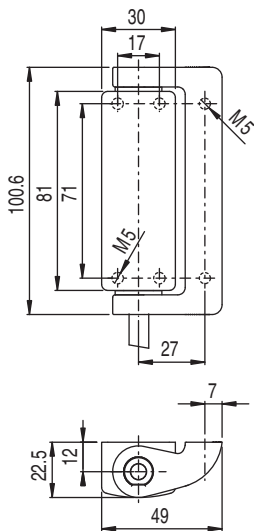
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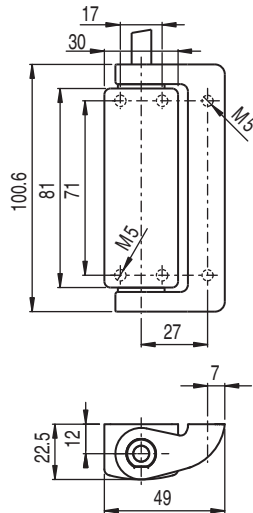
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Dimensional drawings

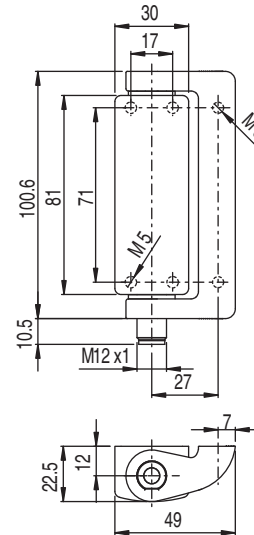
S400 Safety Hinge Switches



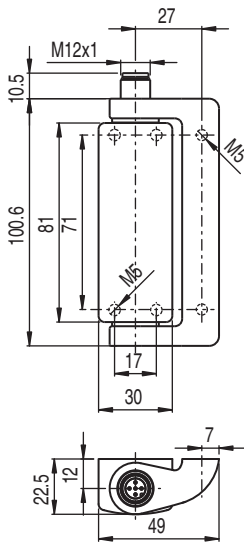
Drilling dimensions Safety Hinge Switch S400-M4CB2-B



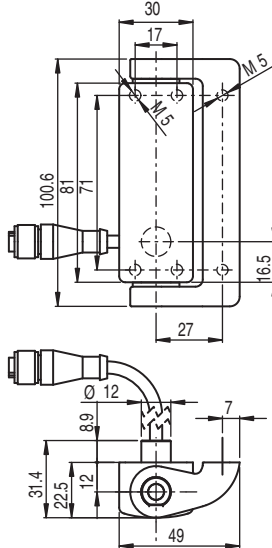
Drilling dimensions Safety Hinge Switch S400-M4CB2-T



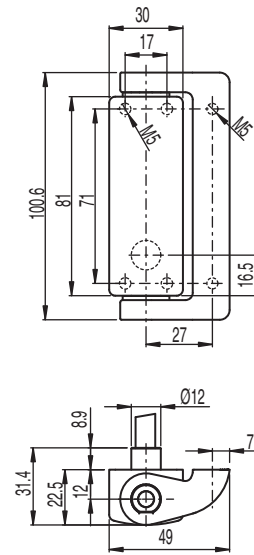
Drilling dimensions Safety Hinge Switch S400-M4M12-B



Drilling dimensions Safety Hinge Switch S400-M4M12-T



Drilling dimensions Safety Hinge Switch S400-M...-CB02M12-W



Drilling dimensions Safety Hinge Switch S400-M4-CB2PUR-W

Dimensions in mm

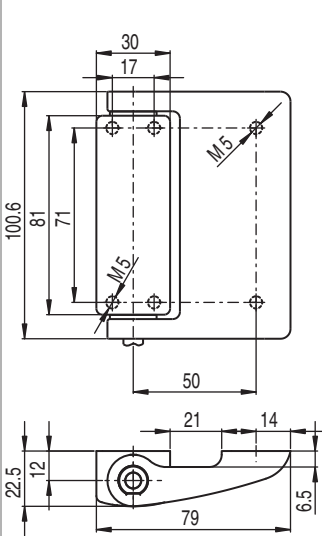
Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

www.leuze.com/s400/

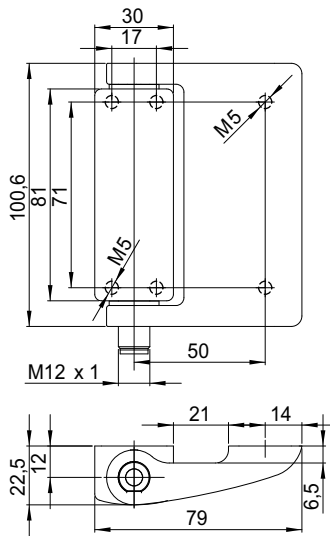
SAFETY SWITCHES

Dimensional drawings

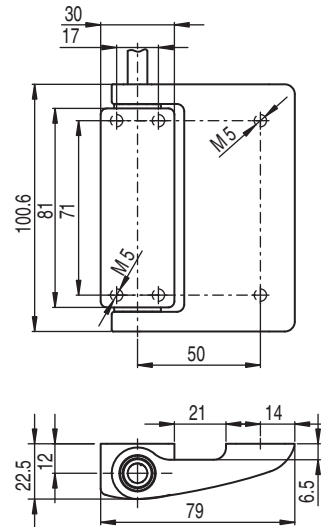
S410 Safety Hinge Switches



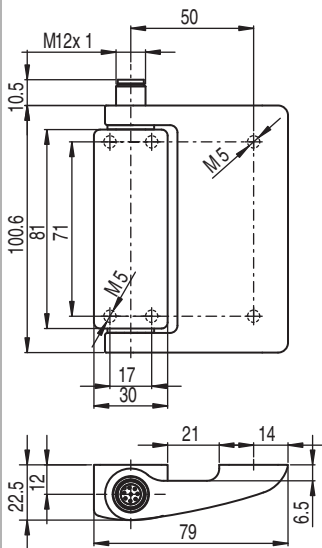
Drilling dimensions Safety Hinge Switch S410-M1CB2-B



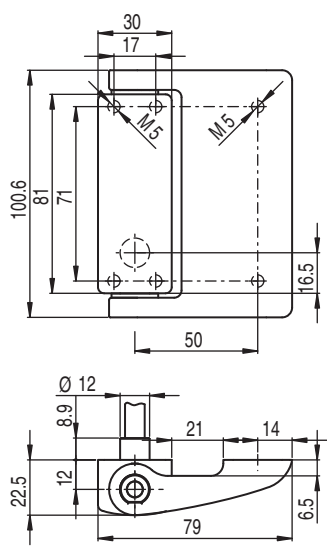
Drilling dimensions Safety Hinge Switch S410-M1M12-B



Drilling dimensions Safety Hinge Switch S410-M1CB2-T



Drilling dimensions Safety Hinge Switch S410-M1M12-T



Drilling dimensions Safety Hinge Switch S410-M4-CB2PUR-W (also: S410-M4-CB02M12-W)

Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

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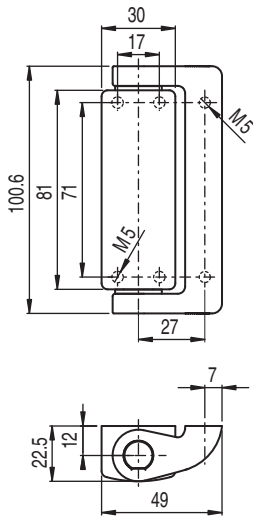
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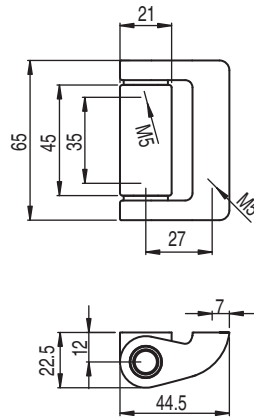
**S400, S410
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Dimensional drawings: Accessories

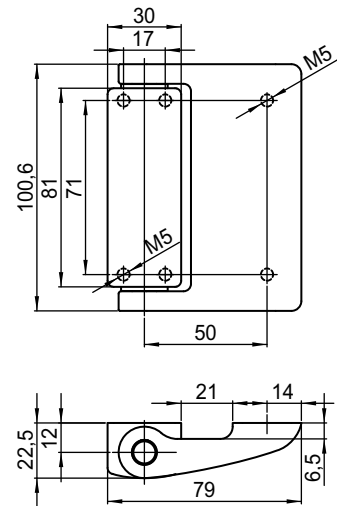
AC-H- additional hinges...



Additional hinge AC-H-S400



Additional hinge, small, AC-H-S400-S



Additional hinge AC-H-S410

Dimensions in mm

SAFETY SWITCHES

Accessories ordering information

S400, S410 accessories

Art. no.	Article	Description
63000770	AC-H-S400	Additional hinge for S400 Safety Hinge Switch
63000775	AC-H-S400-S	Additional hinge, small for the S400 Safety Hinge Switch
63000771	AC-MP3-S400	Mounting plates, flat, long version, for Safety Hinge Switch S400
63000772	AC-MP1-S400	Mounting plates, angled, long version, for Safety Hinge Switch S400
63000773	AC-H-S410	Additional hinge for S410 Safety Hinge Switch
63000774	AC-SEPL-S4xx	Safety plug for Safety Hinge Switch S4xx

"Connection cables": see S20 Safety Switch, page 348

Article list for S400, S410 accessories

Article	Description
AC	Accessories

- | | |
|-------|-------------------------|
| -H | Additional hinge |
| -MP1 | Mounting plate flat |
| -MP3 | Mounting plate angled |
| -SEPL | Replacement safety plug |

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www.leuze.com/s400/

SAFETY LOCKING DEVICES

Safety Locking Devices selection table



Safety Locking Device as access guarding

Safety Locking Devices keep the protective door locked and therefore prevent inadmissible access by people. The access to the danger zone is only released by an electric signal when either the dangerous movement has stopped (personnel protection) or an uninterrupted work process has been finished (machine protection). All Leuze electronic Safety Switches and Locking Devices are configured with their robust design for use in tough industrial applications and prove their value under the most demanding operational conditions.



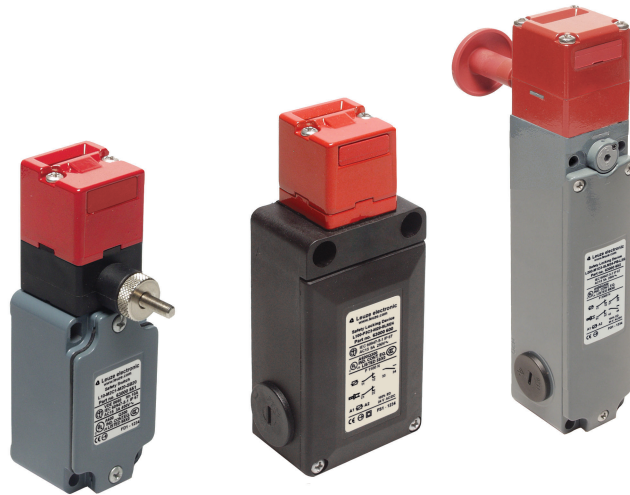
Safety Locking Device on a metal processing center with stopping times

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The Leuze electronic Safety Locking Devices completely cover the entire spectrum from normal to very high requirements (from left to right): L10, L100, L200



Features, type-dependent

Plastic housing	Metal housing	Manual operation (knurled nut)	Manual operation (key)	Spring force-actuated guard interlocking *	Auxiliary unlocking, manual	Magnet-actuated guard interlocking **	Contact set magnet	N/C = N/C contact for safety circuit	N/O = N/O contact for signal circuit	Contact set actuator/mechanical	N/C = N/C contact for safety circuit	N/O = N/O contact for signal circuit
●		●								2NC ⊕		
	●	●								2NC ⊕		
●			●							2NC ⊕ + 1NO		
	●		●							2NC ⊕ + 1NO		
●				●	●		1NC ⊕ + 1NO			1NC ⊕		
●						●	1NC ⊕ + 1NO			1NC ⊕		
●				●	●		2NC ⊕			1NC ⊕		
	●			●	●		2NC ⊕			1NC ⊕ + 1NO		
	●					●	2NC ⊕			1NC ⊕ + 1NO		

*) Closed current principle, equipment and personnel protection

***) Closed current principle, equipment and personnel protection

****) Variants with 10 s delay available

Series	Page
L10-P2...	382
L10-M2...	382
L10-P3... ***	382
L10-M3...	382
L100-P3C3-M20-SLM24	390
L100-P3C3-M20-MLM24	390
L100-P4C3-M20-SLM24	390
L200-M1C3-SLM24-...	398
L200-M1C3-MLM24-L2G	398

SAFETY LOCKING DEVICES

L10



Economical solution: L10 Safety Locking Device on a door to the store area without control signal for the guard interlocking (manual locking and unlocking)

The small and economical L10 Safety Locking Device uses its locking function to prevent protective doors from opening. Its compact structure also makes the L10 series suitable for use on thin doors or with tight installation situations. The locking/unlocking delay occurs manually via either a knurled nut or a key. The patented guard interlocking is used in particular in systems where the activation of a locking magnet is no longer required. The available variants allow a range of mechanical and time requirements to be met. The series enables extremely economical solutions and significantly reduces wiring and cabling costs. Typical applications of this guard interlocking with manual locking and unlocking are remote door and gate guarding and applications on doors that only have to be actuated relatively seldom. The L10 series is used for guarding machinery and systems with stopping times. The contact set enables safety-related integration up to category 4 in accordance with EN ISO 13849.

Typical areas of application

- Remote doors or gates (without control signals for guard interlocking)
- Tough ambient conditions, rarely occurring access situations
- Access guarding on machines with run-on dangerous movements

Important technical data, overview

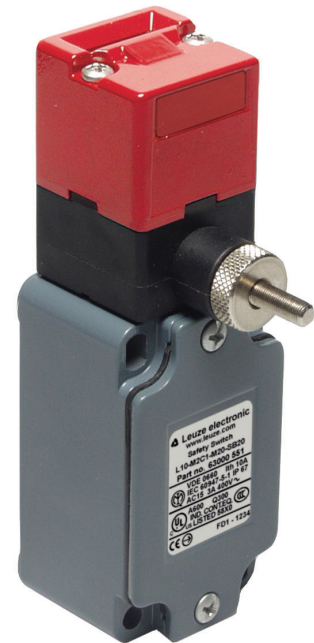
Switch type	Interlock device with guard interlocking in accordance with EN 1088	
Housing material	Metal or fiberglass-reinforced, thermo-plastic plastic, self-extinguishing	
Interlocking force	Max. 1000 N	
Contact equipment	2NC ⊖ 2NC ⊖ + 1NO	
Switching principle	Creep contact	
External actuator	AC-AHxx, series, straight, angled, resilient, alignable	
Locking actuation	Manual	
Delayed actuator release	Type-dependent, approx. 10 s or 20 s, manual by means of knurled nut or key	
Locking type	Mechanical	
Approach actuation directions	1 x above, 4 x side (90°)	
Connection system	Number of cable entries	1
	Type of cable entries	M20 x 1.5
Protection rating	IP 67	

Functions

- Interlock device with guard interlocking in accordance with EN 1088
- Integration in control circuits up to category 4 in accordance with EN ISO 13849
- Mechanical guard interlocking with manual locking and unlocking

Special features

- Contact sets for integration up to category 4 in accordance with EN ISO 13849
- Universal use with 5 actuator starting directions
- 6 different "heavy duty" AC-AHxx series actuators for the most diverse installation conditions
- Self-centering with funnel-shaped entry opening
- Reduced wiring through manual locking and releasing
- Economical locking device with small design



Features



Further information **Page**

● Ordering information	382
● Electrical connection	391
● Technical data	384
● Dimensional drawings	385
● Dimensional drawings: Accessories	385
● Accessories ordering information	386

SAFETY LOCKING DEVICES

Ordering information

L10

Included in delivery: 2 keys (L10-...-KO), application information (print document)

Functions: Interlock device with guard interlocking in accordance with EN 1088

L10 Safety Locking Devices

Art. no.	Article	Description	Contact equipment
63000550	L10-P2C1-M20-SB20	Safety Locking Device, plastic, manual locking/unlocking, approx. 20 s delay	(2NC ⊖) creep contacts
63000551	L10-M2C1-M20-SB20	Safety Locking Device, metal, manual locking/unlocking, approx. 20 s delay	(2NC ⊖) creep contacts
63000552	L10-P3C1-M20-SB20	Safety Locking Device, plastic, manual locking/unlocking, approx. 20 s delay	(2NC ⊖ + 1NO) creep contacts
63000553	L10-M3C1-M20-SB20	Safety Locking Device, metal, manual locking/unlocking, approx. 20 s delay	(2NC ⊖ + 1NO) creep contacts
63000554	L10-P3C1-M20-LB10	Safety Locking Device, plastic, manual locking/unlocking, approx. 10 s delay	(2NC ⊖ + 1NO) creep contacts
63000555	L10-P3C1-M20-LB20	Safety Locking Device, plastic, manual locking/unlocking, approx. 20 s delay	(2NC ⊖ + 1NO) creep contacts
63000558	L10-P3C1-M20-KO	Safety Locking Device, plastic, manual locking/unlocking via key operation	(2NC ⊖ + 1NO) creep contacts
63000559	L10-M3C1-M20-KO	Safety Locking Device, metal, manual locking/unlocking via key operation	(2NC ⊖ + 1NO) creep contacts

Actuators must be ordered separately, see page 386.

Article list for L10

Article	Description
L10	Safety Locking Device
-P	Plastic housing
-M	Metal housing
2	Contact set, 2NC ⊖, creep contact
3	Contact set, 2NC ⊖ + 1NO, creep contact
C1	Number of cable bushings
-M20	Metric thread
-SB20	Manual time delay, approx. 20 seconds, short actuation distance
-LB10	Manual time delay, approx. 10 seconds, short actuation distance
-LB20	Manual time delay, approx. 20 seconds, short actuation distance
-KO	Actuation by key

L10

Electrical connection

See L100 connection example, page 391.

www.leuze.com/l10/

SAFETY LOCKING DEVICES

Technical data

General system data		
Switch type	Interlock device with guard interlocking in accordance with EN 1088	
Service life (T_M) in accordance with EN ISO 13849-1	20 years	
Number of cycles until 10% of the components have a failure to danger (B_{10d})	2.000.000	
Locking type	Mechanical	
Locking actuation	Manual by means of knurled nut or key	
Ambient temperature, operation	-25...+80 °C	
Dirt levels, external, in accordance with EN 60947-1	3	
Housing material	Fiberglass-reinforced, thermo-plastic plastic, self-extinguishing	L10-P...
	Metal	L10-M...
External actuator	AC-AHxx, series, straight, angled, resilient, alignable	
Dimensions	See dimensional drawings	
Protection rating	IP 67	
Contact protection	Protective insulation O (L10-P...) Grounding (L10-M...)	
Approach actuation directions	1 x above, 4 x side (90°)	
Mechanical life time in accordance with IEC 6047-5-1	0.5 x 10 ⁶ actuation cycles	
Actuation frequency in accordance with IEC 6047-5-1	Max. 360 per hour	
Approach speed	Max. 0.5 m/s	
Actuation force (pull-out)	10 N (L10-...-SB20, L10-...-LB10, L10-...-LB20) 30 N (L10-...-KO)	
Recoil tolerance	4.5 mm	
Interlocking force	Max. 1000 N	
Contact equipment	2NC ⊕	L10-P2..., L10-M2...
	2NC ⊕ + 1NO	L10-P3..., L10-M3...
Switching principle	Creep contact	
Contact opening	Force-fit	
Contact material	Silver alloy	
Usage category in accordance with EN 60947-5-1	AC 15: U_e / I_e : 250 V / 6 A, 400 V / 4 A, 500 V / 1 A DC 13: U_e / I_e : 24 V / 6 A, 125 V / 1.1 A, 250 V / 0.4 A	
Rated insulation voltage	500 V AC, 600 V DC	
Conventional thermal current	Max. 10 A	
Short-circuit protection according to IEC 60269-1	500 V, 10 A, type aM	
Connection system	Number of cable entries	1
	Type of cable entries	M20 x 1.5
	Cable cross-section (wire)	1 x 0.5 mm ² to 2 x 2.5 mm ²
Delayed actuator release	Approx. 20 s or 10 s (L10-P3C1-M20-LB10)	

Please note the additional information in the connecting and operating instructions at www.leuze.com/l10.

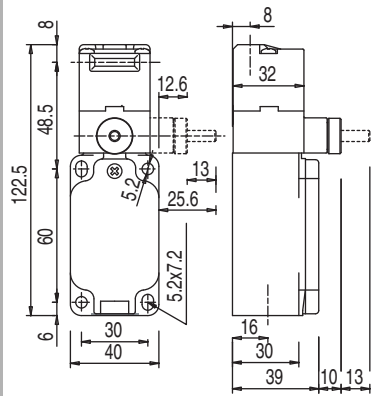
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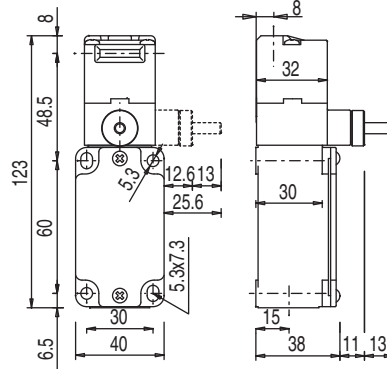
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Dimensional drawings

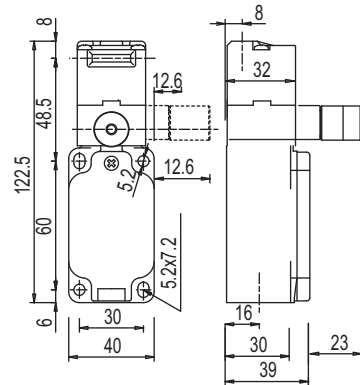
Safety Locking Device L10



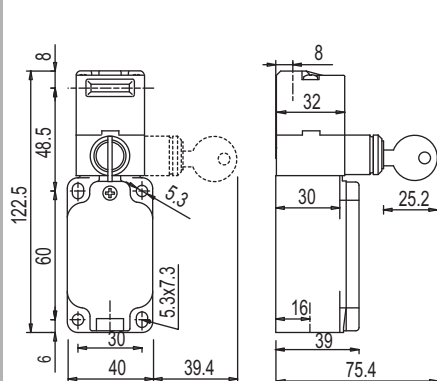
Safety Locking Device
L10-P2C1-M20-SB20,
L10-P3C1-M20-SB20



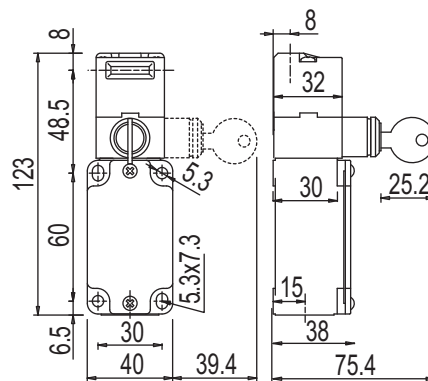
Safety Locking Device
L10-M2C1-M20-SB20,
L10-M3C1-M20-SB20



Safety Locking Device
L10-P3C1-M20-LB10,
L10-P3C1-M20-LB20



Safety Locking Device
L10-P3C1-M20-KO



Safety Locking Device
L10-M3C1-M20-KO

Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

Dimensional drawings: Accessories

See accessories, S200 all actuators, page 356.

SAFETY LOCKING DEVICES

Accessories ordering information

L10 accessories

Art. no.	Article	Description	Design
63000720	AC-AH-S	Actuator	Straight
63000721	AC-AH-A	Actuator	Angled
63000722	AC-AH-F4	Actuator	Straight, flexible, 4 directions
63000723	AC-AH-F2J2	Actuator	Straight, flexible, 2 directions, alignable 2 directions
63000724	AC-AH-F1J2	Actuator	Straight, flexible, 1 direction, alignable 2 directions
63000725	AC-AH-F4J2-TK	Actuator	Straight, flexible, 4 directions, alignable 2 directions, rotatable head
63000843	AC-A-M20-12NPT	Signal-color adapter	M20 x 1.5 on 1/2 NPT
63000844	AC-PLP-8	Built-in plug	M12, plastic, with internal 8-pin connection cable
63000845	AC-PLM-8	Built-in plug	M12, metal, with internal 8-pin connection cable
63000846	AC-KL-AH	KeyLock for locking the actuator introduction	

Article list for L10 accessories

Article	Description
AC	Accessories
-AHL	Actuator, Heavy Duty
-S	Straight
-A	Angled
-RM	Rubber-mounted
-F4	Flexible in 4 directions
J2	Alignable in 2 directions
-TK	Actuator key, turns
-PLP-8	Built-in plug, 8-pin, plastic
-PLM-8	Built-in plug, 8-pin, metal
-KL	Locking of the actuator introduction

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SAFETY LOCKING DEVICES

L100



Safety Locking Device on a metal processing center with stopping times

The versatile in use L100 Safety Locking Device uses its locking function to prevent protective doors of machines and systems from opening. It is used for both personnel safety and for machine protection depending on requirements, with appropriate guard interlocking types (spring-force or magnet-actuated locking). It is used for guarding machines and systems with stopping times. Due to the adjustable switch-on power reduction, it is also optimally suitable for systems with very high access options and guard interlocking applications. The contact set enables safety-related integration up to category 4 in accordance with EN ISO 13849.

Typical areas of application

- Access guarding on machines with run-on dangerous movements
- Guard interlocking of protective doors in production processes where the prevention of undefined interruptions is required
- Systems with numerous access options

Important technical data, overview

Switch type	Interlock device with guard interlocking in accordance with EN 1088	
Housing material	Fiberglass-reinforced, thermo-plastic plastic, self-extinguishing	
Interlocking force	Max. 1100 N	
Contact equipment	Magnet:	1NC ⊖ + 1NO 2NC ⊖
	Actuator:	1NC ⊖
Switching principle	Creep contact	
External actuator	AC-AHxx, series, straight, angled, resilient, alignable	
Locking type	Mechanically, electro-magnetically	
Locking actuation	Spring, magnet	
Approach actuation directions	1 x above, 4 x side (90°)	
Connection system	Number of cable entries	3
	Type of cable entries	M20 x 1.5
Protection rating	IP 66	

Functions

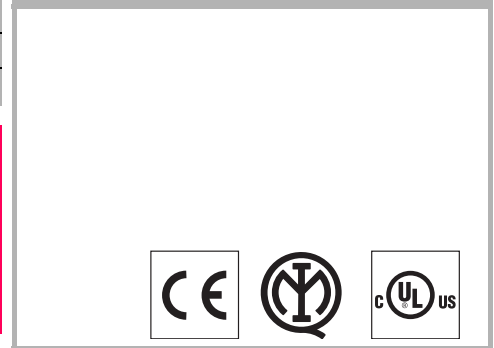
Interlock device with guard interlocking in accordance with EN 1088
Integration in control circuits up to category 4 in accordance with EN ISO 13849
Mechanical guard interlocking (spring-force)
Electro-magnetic guard interlocking (magnet-force)
Switch-on power reduction, adjustable
Auxiliary unlocking (-SLM24)

Special features

- Universal use with 5 actuator starting directions
- 6 different "heavy duty" actuators for the most diverse installation conditions
- Self-centering with funnel-shaped entry opening
- Switch-on power reduction, adjustable



Features



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SAFETY LOCKING DEVICES

Ordering information

L100

Included in delivery: Application information (print document)

Functions: Interlock device with guard interlocking in accordance with EN 1088, auxiliary release (-SLM24, switch-on power reduction, adjustable)

L100 Safety Locking Devices

Art. no.	Article	Description	Contact equipment
63000600	L100-P3C3-M20-SLM24	Safety Locking Device, plastic, mechanically locked, magnet 24 V	M:(1NC ⊖ + 1NO) A:(1NC ⊖)
63000601	L100-P3C3-M20-MLM24	Safety Locking Device, plastic, electro-magnetically locked, magnet 24 V	M:(1NC ⊖ + 1NO) A:(1NC ⊖)
63000602	L100-P4C3-M20-SLM24	Safety Locking Device, plastic, mechanically locked, magnet 24 V	M:(2NC ⊖) A:(1NC ⊖)

Actuators must be ordered separately, see page 395.

Article list for L100

Article	Description
L100	Safety Locking Device
-P	Plastic housing
3, 4	Contact set
C3	Number of cable bushings
-M20	Metric thread
-SLM24	Mechanically locked, magnet voltage, 24 V
-MLM24	Electrically locked, magnet voltage, 24 V

L 100

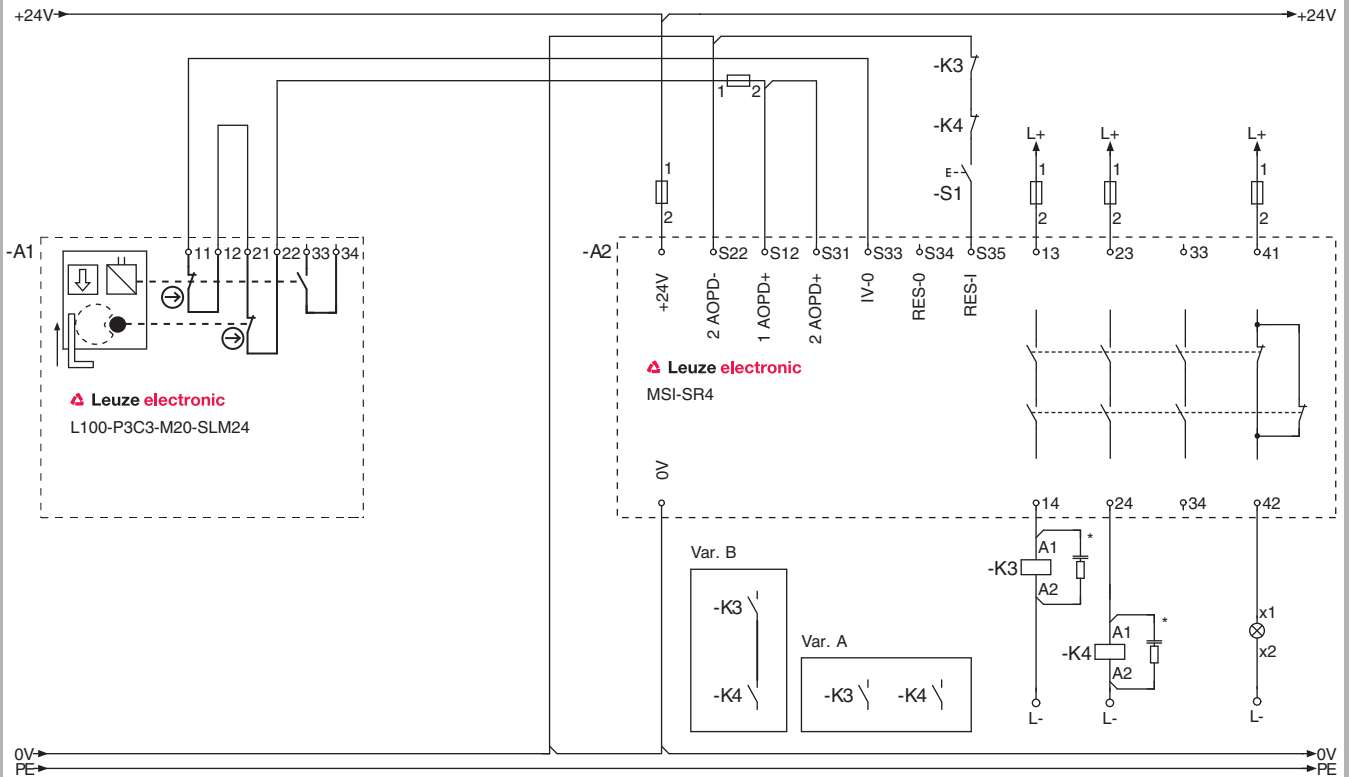
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Electrical connection

L100 connection example



*) Spark extinction circuit, supply suitable spark extinction

L100 Safety Locking Device with MSI-SR4 Safety Relay

Please observe the operating instructions of the components!

SAFETY LOCKING DEVICES

Technical data

General system data			
Switch type	Interlock device with guard interlocking in accordance with EN 1088		
Service life (T_M) in accordance with EN ISO 13849-1	20 years		
Number of cycles until 10% of the components have a failure to danger (B_{10d})	5.000.000		
Locking type	Mechanical (L100-P...SLM24) Electromagnetic (L100-P...MLM24)		
Locking actuation	Spring (L100-P...SLM24) Magnet (L100-P...MLM24)		
Ambient temperature, operation	-25...+60°C		
Dirt levels, external, in accordance with EN 60947-1	3		
Housing material	Fiberglass-reinforced, thermo-plastic plastic, self-extinguishing		
External actuator	AC-AHxx, series, straight, angled, resilient, alignable		
Dimensions	See dimensional drawing		
Protection rating	IP 66		
Contact protection	Protective insulation O		
Approach actuation directions	1 x above, 4 x side (90°)		
Mechanical life time in accordance with IEC 6047-5-1	0.8 x 10 ⁶ actuation cycles		
Actuation frequency according to IEC 6047-5-1	Max. 600 per hour		
Approach speed	Max. 0.5 m/s		
Actuation force (pull-out)	30 N		
Recoil tolerance	4.5 mm		
Interlocking force	Max. 1100 N		
Contact equipment	Magnet:	1NC ⊕ + 1NO	L100-P3...
		2NC ⊕	L100-P4...
	Actuator:	1NC ⊕	L100-P3... L100-P4...
Switching principle	Creep contact		
Contact opening	Force-fit		
Contact material	Silver alloy		
Magnet operating voltage and tolerance	24 V DC (-10 % to +25 %)		
Duty cycle	100 %		
Power consumption	Average, 20 VA		
Switch-on power limit, adjustable	4-way		
Usage category in accordance with EN 60947-5-1	AC 15: Ue / Ie: 250 V / 6 A, 400 V / 4 A, 500 V / 1 A DC 13: Ue / Ie: 24 V / 6 A, 125 V / 1.1 A, 250 V / 0.4 A		

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Technical data

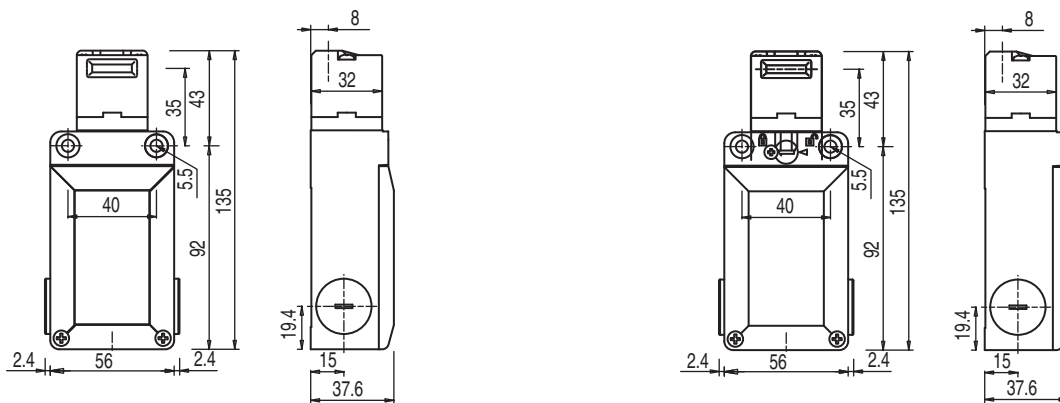
Rated insulation voltage	400 V AC	
Conventional thermal current	Max. 10 A	
Short-circuit protection according to IEC 60269-1	Magnet	24 V, 1.0 A, type aM
	Safety circuit	500 V, 10 A, type aM
Connection system	Number of cable entries	3
	Type of cable entries	M20 x 1.5
	Cable cross-section (wire)	1 x 0.34 mm ² to 2 x 1.5 mm ²

Please note the additional information in the connecting and operating instructions at www.leuze.com/l100/.

SAFETY LOCKING DEVICES

Dimensional drawings

L100 Safety Locking Device



*Safety Locking Device L100-P3C3-M20-SLM24,
L100-P4C3-M20-SLM24*

Safety Locking Device L100-P3C3-M20-MLM24

Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

Dimensional drawings: Accessories

See accessories, S200 all actuators, page 356.

Accessories ordering information
L100 accessories

Art. no.	Article	Description	Design
63000720	AC-AH-S	Actuator	Straight
63000721	AC-AH-A	Actuator	Angled
63000722	AC-AH-F4	Actuator	Straight, flexible, 4 directions
63000723	AC-AH-F2J2	Actuator	Straight, flexible, 2 directions, alignable 2 directions
63000724	AC-AH-F1J2	Actuator	Straight, flexible, 1 direction, alignable 2 directions
63000725	AC-AH-F4J2-TK	Actuator	Straight, flexible, 4 directions, alignable 2 directions, rotatable head
63000843	AC-A-M20-12NPT	Adapter	M20 x 1.5 on 1/2 NPT
63000844	AC-PLP-8	Built-in plug	M12, plastic, with internal 8-pin connection cable
63000846	AC-KL-AH	KeyLock for locking the actuator introduction	

Article list for L100 accessories

Article	Description
AC	Accessories
-AHL	Actuator, Heavy Duty
-S	Straight
-A	Angled
-RM	Rubber-mounted
-F1	Flexible in 1 directions
-F2	Flexible in 2 directions
-F4	Flexible in 4 directions
J2	Alignable in 2 directions
-TK	Actuator key, turns
-PLP-8	Built-in plug, 8-pin, plastic
-KL	Locking of the actuator introduction

AC

SAFETY LOCKING DEVICES

L200



Heavy-Duty L200 Safety Locking Device on a very large gate in a logistics operation with forklift traffic

The L200 Safety Locking Device designed for highly demanding applications is predestined for guarding large protective doors and sliding gates, in logistics operations, for example, or with very big machinery, and under harsh conditions. It is insensitive here to high recoil forces, such as when massive, heavy doors and gates slam. The guard interlocking is especially impressive due to its slender but very robust structure. It is used according to requirements with appropriate locking types (spring-force or magnet-actuated locking). The contact set enables safety-related integration up to category 4 in accordance with EN ISO 13849. If an escape route is planned, then when using the PB variant, the locking device can be quickly unlocked by pressing the ergonomically optimized unlocking button installed in the danger zone. The available extensions for the emergency release button make it easy to adapt to local conditions on site.

Typical areas of application

- Use with harsh ambient conditions and high mechanical demand
- Access guarding on big machinery and systems with dangerous movements that run-on
- Guard interlocking of heavy protective doors or sliding gates where the prevention of undefined interruptions is required

Important technical data, overview

Switch type	Interlock device with guard interlocking in accordance with EN 1088	
Housing material	Metal	
Interlocking force	Max. 2500 N	
Contact equipment	Magnet:	M: 2NC ⊖
	Actuator:	A: 1NC ⊖ + 1NO
Switching principle	Creep contact	
External actuator	AC-AHLxx series, straight, angled, resilient, alignable	
Locking type	Mechanically, electro-magnetically	
Locking actuation	Spring, magnet	
Approach actuation directions	1 x above, 4 x side (90°)	
Connection system	Number of cable entries	3
	Type of cable entries	M20 x 1.5
Protection rating	IP 67	

Functions

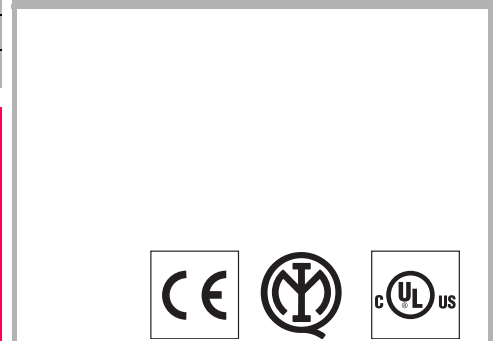
Interlock device with guard interlocking in accordance with EN 1088
Integration in control circuits up to category 4 in accordance with EN ISO 13849
Mechanical guard interlocking (spring-force)
Electro-magnetic guard interlocking (magnet-force)
Emergency unlock (-PB)
Illuminated displays for magnet activation
Auxiliary unlocking (-SLM24, -PB)

Special features

- "Heavy duty" use, including under tough, harsh ambient conditions and external mechanical stresses
- Universal use with 5 actuator starting directions
- 4 different "heavy duty" actuators for the most diverse installation applications
- Self-centering with funnel-shaped entry opening
- Ergonomically optimized emergency unlocking button (Panic Button version), position selectable
- Compact, slender, extremely robust



Features



Further information

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● Ordering information	398
● Electrical connection	399
● Technical data	400
● Dimensional drawings	401
● Dimensional drawings: Accessories	402
● Accessories ordering information	404

SAFETY LOCKING DEVICES

Ordering information

L200

Included in delivery: Application information (print document)

Functions: Interlock device with guard interlocking in accordance with EN 1088, emergency unlocking button (-PB), illuminated displays, auxiliary release (-SLM24, -PB)

L200 Safety Locking Devices

Art. no.	Article	Description	Contact equipment
63000650	L200-M1C3-SLM24-L2G	Safety Locking Device, metal, mechanically locked, magnet 24 V, 2 green LEDs	M:(2NC ⊕) A:(1NC ⊕ + 1NO)
63000651	L200-M1C3-MLM24-L2G	Safety Locking Device, metal, electro-magnetically locked, magnet 24 V, 2 green LEDs	M:(2NC ⊕) A:(1NC ⊕ + 1NO)
63000652	L200-M1C3-SLM24-PB-L2G	Safety Locking Device, metal, mechanically locked, magnet 24 V, emergency unlocking button, 2 green LEDs	M:(2NC ⊕) A:(1NC ⊕ + 1NO)

Actuators must be ordered separately, see page 404.

Article list for L200

Article	Description
L200	Safety Locking Device
-M	Metal housing
1	Contact set
C3	Number of cable bushings
-SLM24	Mechanically locked, magnet voltage, 24 V
-MLM24	Electrically locked, magnet voltage, 24 V
-L2G	2 green signal LEDs
-PB	Emergency unlock button

L 200

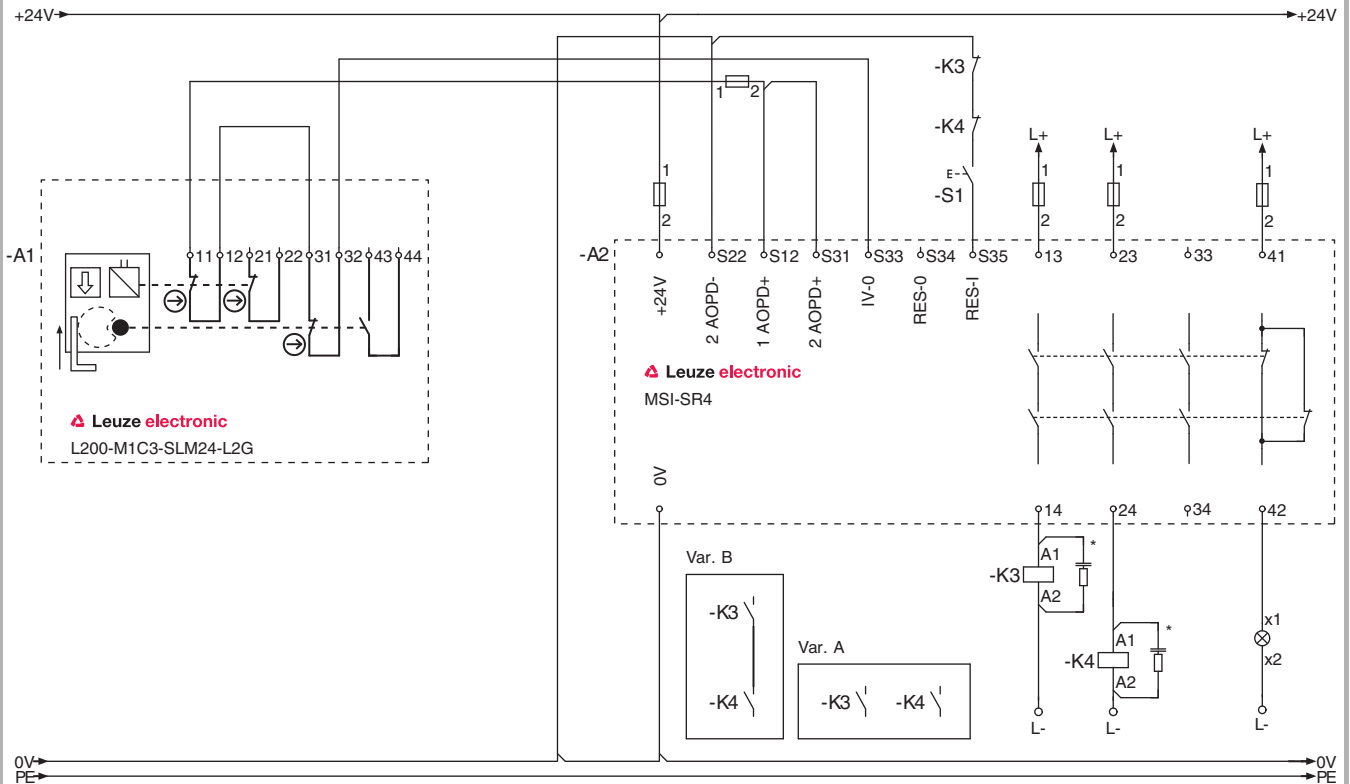
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Electrical connection

L200 connection example



*) Spark extinction circuit, supply suitable spark extinction

L200 Safety Locking Device with MSI-SR4 Safety Relay

⚠ Please observe the operating instructions of the components!

SAFETY LOCKING DEVICES

Technical data

General system data		
Switch type	Interlock device with guard interlocking in accordance with EN 1088	
Service life (T_M) in accordance with EN ISO 13849-1	20 years	
Number of cycles until 10% of the components have a failure to danger (B_{10d})	5.000.000	
Locking type	Mechanically (L200-M1C3-SLM24-L2G, L200-M1C3-SLM24-PB-L2G) Electro-magnetically (L200-M1C3-MLM24-L2G)	
Locking actuation	Spring (L200-M1C3-SLM24-L2G, L200-M1C3-SLM24-PB-L2G) Magnet (L200-M1C3-MLM24-L2G)	
Ambient temperature, operation	-25...+60 °C	
Dirt levels, external, in accordance with EN 60947-1	3	
Housing material	Metal	
External actuator	AC-AHLxx series, straight, angled, resilient, alignable	
Dimensions	See dimensional drawing	
Protection rating	IP 67	
Contact protection	Earthing	
Approach actuation directions	1 x above, 4 x side (90°)	
Mechanical life time in accordance with IEC 6047-5-1	1 x 10 ⁶ actuation cycles	
Actuation frequency according to IEC 6047-5-1	Max. 600 per hour	
Approach speed	Max. 0.5 m/s	
Actuation force (pull-out)	30 N	
Recoil tolerance	4.5 mm	
Interlocking force	Max. 2500 N	
Contact equipment	Magnet:	2NC ⊖
	Actuator:	1NC ⊖ + 1NO
Switching principle	Creep contact	
Contact opening	Force-fit	
Contact material	Silver alloy	
Magnet operating voltage and tolerance	24 V DC (-10 % to +25 %)	
Duty cycle	100 %	
Power consumption	Average, 9 VA	
Usage category in accordance with EN 60947-5-1	AC 15: U _e 250 V, I _e 5 A DC 13: U _e / I _e : 24 V / 6 A, 125 V / 1.1 A, 250 V / 0.4 A	
Rated insulation voltage	250 V AC, 300 V DC	
Conventional thermal current	Max. 10 A	
Short-circuit protection according to IEC 60269-1	Magnet	0.5 A, 24 V, type gG
	Safety circuit	500 V, 10 A, type gG
Connection system	Number of cable entries	3
	Type of cable entries	M20 x 1.5
	Cable cross-section (wire)	1 x 0.34 mm ² to 2 x 1.5 mm ²

Please note the additional information in the connecting and operating instructions at www.leuze.com/l200.

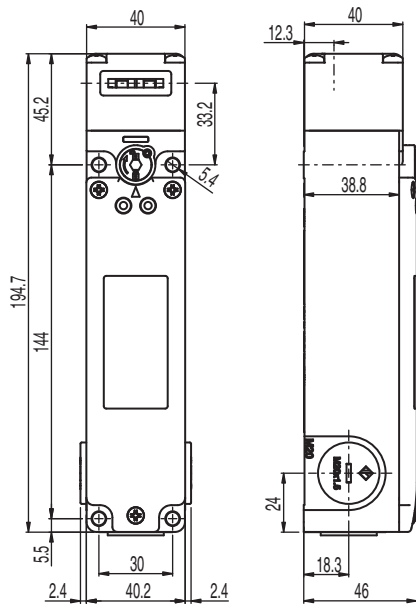
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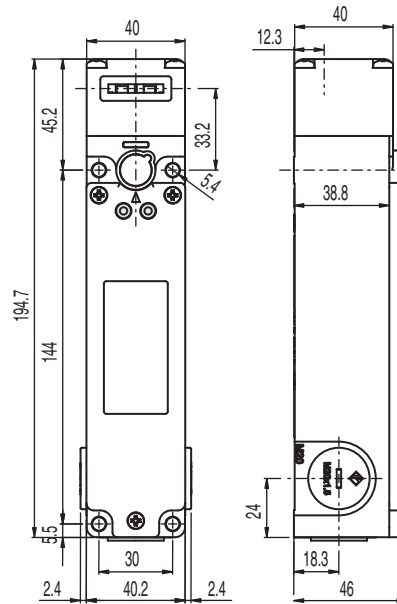
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Dimensional drawings

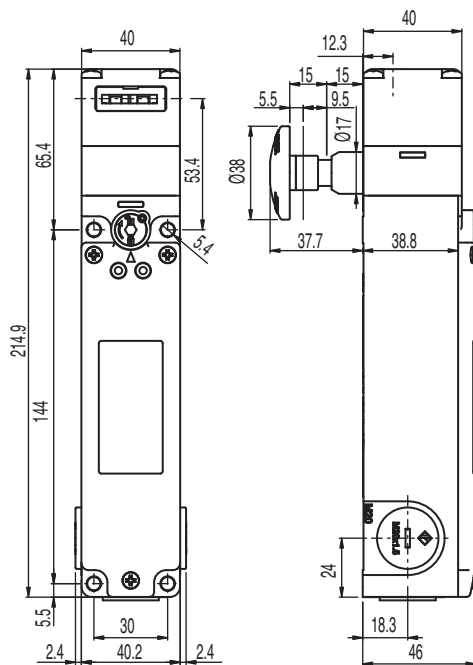
L200 Safety Locking Device



Safety Locking Device L200-M1C3-SLM24-L2G



Safety Locking Device L200-M1C3-MLM24-L2G



Safety Locking Device L200-M1C3-SLM24-PB-L2G

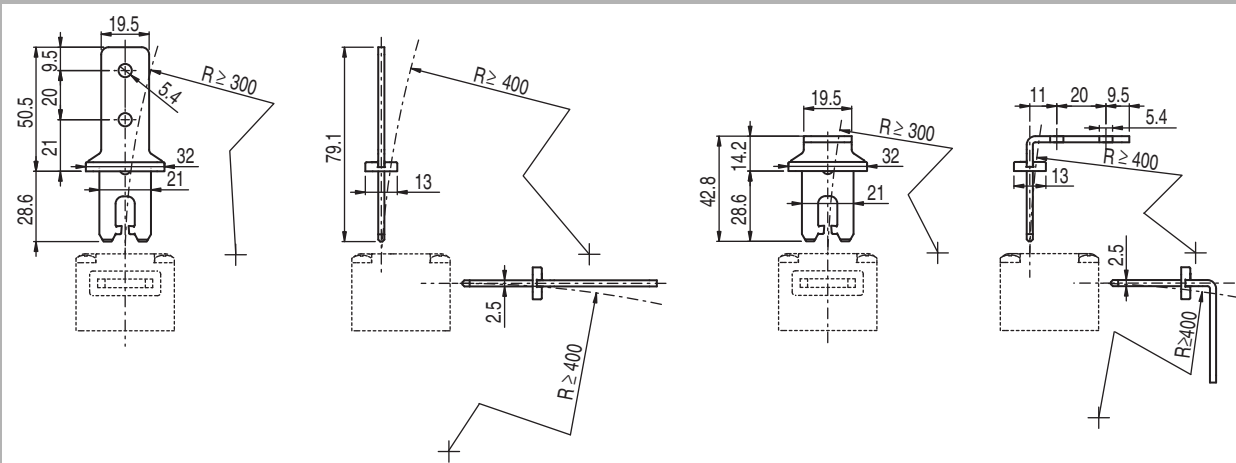
Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

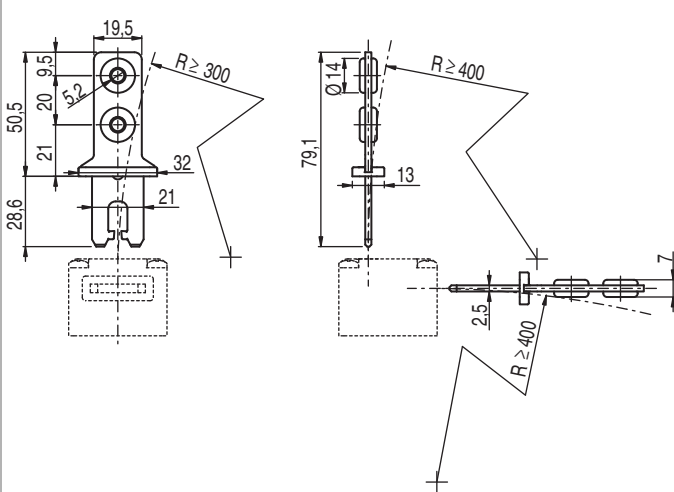
SAFETY LOCKING DEVICES

Dimensional drawings: Accessories

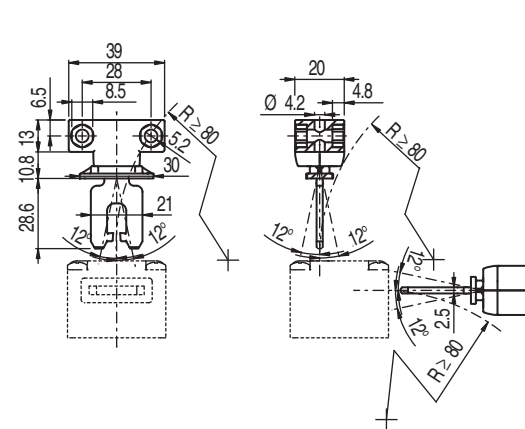
AC-AHL- actuator...



Actuator AC-AHL-S



Actuator AC-AHL-A



Actuator AC-AHL-RM

Actuator AC-AHL-F4J2-TK

Dimensions in mm

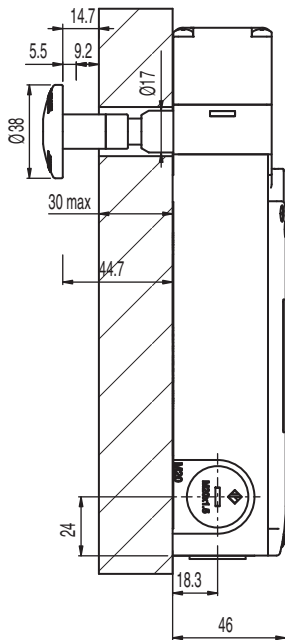
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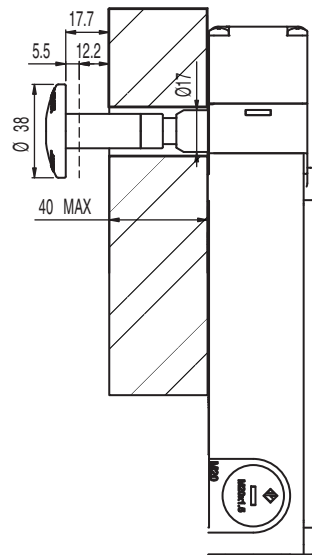
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Dimensional drawings: Accessories

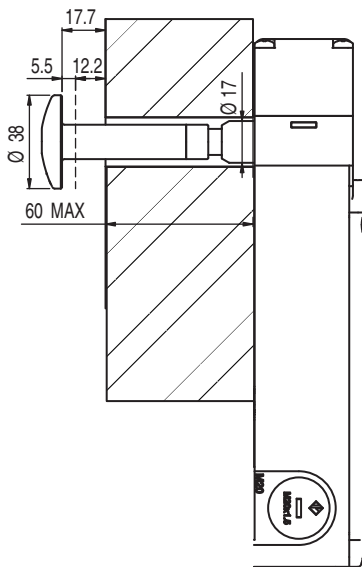
AC-PB actuator...



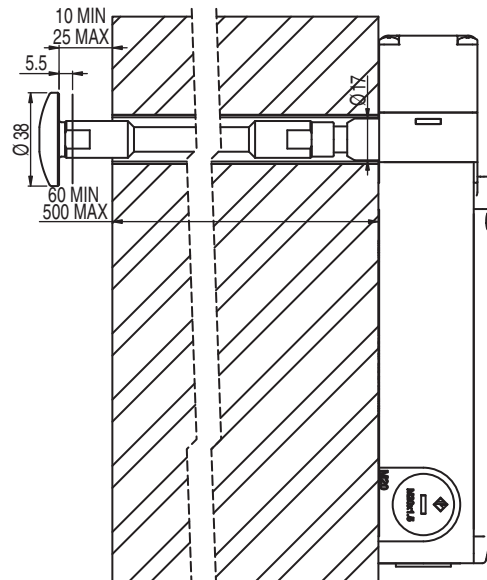
AC-PB30-L200 actuator



AC-PB40-L200 actuator



AC-PB60-L200 actuator



AC-PB500-L200 actuator

Dimensions in mm

SAFETY LOCKING DEVICES

Accessories ordering information

L200 Heavy Duty accessories

Art. no.	Article	Description	Design
63000740	AC-AHL-S	Actuator	Straight
63000741	AC-AHL-A	Actuator	Angled
63000742	AC-AHL-RM	Actuator	Straight, rubber-mounted fixing
63000743	AC-AHL-F4J2-TK	Actuator	Straight, flexible, 4 directions, alignable 2 directions, rotatable head
63000843	AC-A-M20-12NPT	Adapter	M20 x 1.5 on 1/2 NPT
63000845	AC-PLM-8	Built-in plug	M12, metal, with internal 8-pin connection cable
63000847	AC-KL-AHL	KeyLock for locking the actuator introduction	
63000749	AC-Exit-PB	"Push To Exit" signal-color stick-on label	
63000750	AC-PB15-L200	Extension for the emergency release button	15 mm long, with screws
63000751	AC-PB30-L200	Extension for the emergency release button	30 mm long, with screws
63000752	AC-PB40-L200	Extension for the emergency release button	40 mm long, with screws
63000753	AC-PB60-L200	Extension for the emergency release button	60 mm long, with screws
63000754	AC-PB500-L200	Extension for the emergency release button	60 mm to 500 mm long, with screws and 2 mounting brackets

Article list for L200 accessories

Article	Description
AC	Accessories
-AHL	Actuator, Heavy Duty
-S	Straight
-A	Angled
-RM	Rubber-mounted
-F4	Flexible in 4 directions
J2	Alignable in 2 directions
-TK	Actuator key, turns
-PLM-8	Built-in plug, 8-pin, metal
-KL	Locking of the actuator introduction

AC

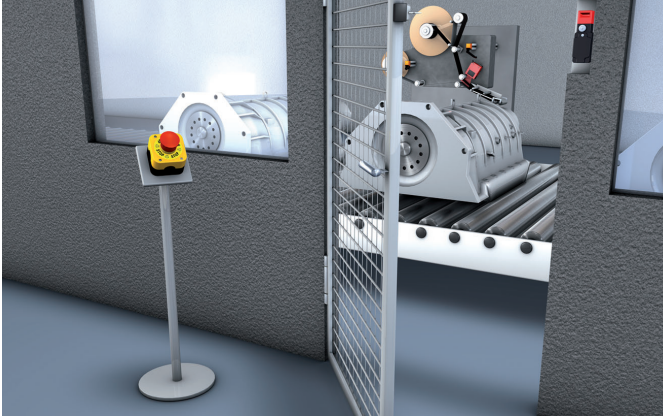
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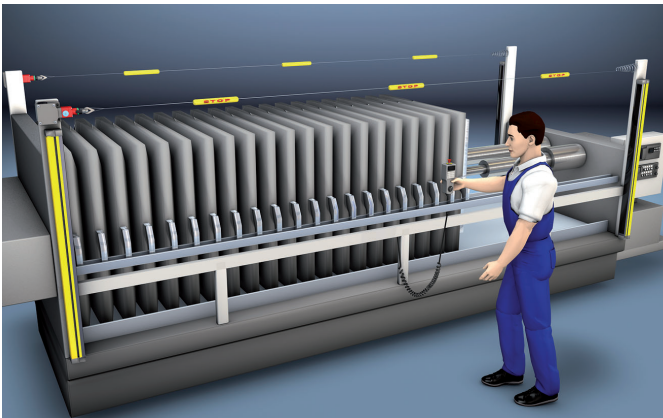
SAFETY COMMAND DEVICES

Command Device selection table



The ESB200 E-Stop button is a Safety Command Device for outputting the stop command in the event of dangerous machine movements

For stopping in emergencies EN ISO 12100-1 stipulates protective devices and supplementary measures, such as E-Stop buttons or emergency rope switches, for example. The E-Stop function may not be used here as a substitute for protective devices or other safety functions. The ESB200 (E-Stop button) and ERS200 (E-Stop Rope Switch) series are used exclusively for outputting the E-Stop signal. All variants within this series were developed and optimized with respect to safety and ergonomics acc. to EN IEC 60204-1, EN 60547-5-1/5 and EN ISO 13850.



The ERS200 E-Stop Rope Switch is used as a Safety Command Device in expansive hazard locations, e.g., at a filter press

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ERS200
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A wide variety of Safety Command Devices, consisting of E-Stop buttons and E-Stop Rope Switches, offers solutions for nearly all applications requiring the output of a stop command



Type of command device	Type of actuation		Design				Unlocking			Connection system		Series	Page
	E-Stop button	Rope	With housing (for mounting)	Without housing (for installation)	Straight (in longitudinal axis)	Angled	E-Stop button (turn)	Key (turn)	Indicator button (pull)	Screw terminal	M12 plug		
E-Stop button	●		●				●			●		ESB200-4TR...-C	410
	●		●					●		●		ESB200-4KR...-C	410
	●		●				●				●	ESB200-4TR...-M12p	410
	●		●					●			●	ESB200-4KR...-M12p	410
	●			●			●			●		ESB210-4TR	410
	●			●				●		●		ESB210-4KR	410
E-Stop Rope Switch		●	●		●				●	●		ERS200-...-M20-HLR	416
		●	●		●				●		●	ERS200-...-M12-HLR	416
		●	●			●			●	●		ERS200-...-M20-HAR	416
		●	●			●			●	●		ERS200-...-M20-HAL	416

SAFETY COMMAND DEVICES

ESB200 E-Stop button

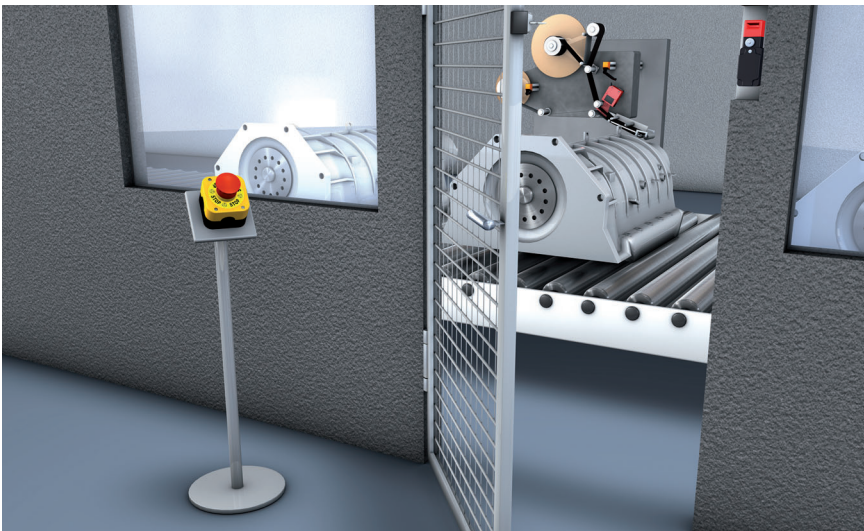


Installation variant of the ESB200 Safety Command Device (without housing), e.g., in control panels on handling or tool machines for stopping dangerous machine movements

E-Stop buttons of the ESB200 series are used at points of operation at which stop command output at a local or specific location is useful, e.g., if the points of operation are not very expansive or broad and the operator can easily access the buttons at any time. The variety of the series enables both mounting, e.g., on profiles, as well as the installation in control panels, etc. For time-saving connection, the mounting variants are also available with M12 plug. Depending on requirements, the button can be enabled by turning the red E-Stop button or by turning a key. When used with the 2NC contact set, all ESB200 or ESB210 variants can be integrated in control circuits up to category 4 in accordance with EN ISO 13849. Moreover, the 1NO contact set allows identification and signaling tasks to be performed.

Typical areas of application

- Mounting in the vicinity of the operator on machines and plants where there is good accessibility
- In control panels (installation variants without housing)



Mounted Safety Command Device with housing on a control console for outputting the stop command

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ERS200
p. 414

Important technical data, overview

Switch type	E-Stop command device in accordance with EN 60947-5-5 and EN ISO 13850
Housing material	Fiberglass-reinforced plastic, self-extinguishing
Contact equipment	2NC ⊕ + 1NO
Switching principle	Creep contact
Internal actuator	Self-locking Safety Switch
Connection system	M20 x 1.5 (3-way), M16 x 1.5 (2-way), M12 plug
Protection rating	IP 67, IP 69K

Functions

E-Stop command device in accordance with EN 60947-5-5 and EN ISO 13850
Integration in control circuits up to category 4 in accordance with EN ISO 13849
Position-dependent E-Stop command output
Reset function (via rotary knob or key)
Suitable for mounting or installation

Special features

- Contact sets for integration up to category 4 in accordance with EN ISO 13849
- 2 safety circuits, 1 signal circuit
- Either screw terminals or M12 connection
- Ergonomically optimized
- Protection rating IP 67 and IP 69K



Features



Further information **Page**

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|-------------------------|-----|
| ● Ordering information | 410 |
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SAFETY COMMAND DEVICES

Ordering information

ESB200

Included in delivery: connecting and operating instructions as well as (depending on variant) mounting screws, 1 "STOP" ring, 2 keys

Functions: E-Stop command device in accordance with EN 60947-5-5 and EN ISO 13850, E-Stop button for position-dependent E-Stop command output, with reset function (via rotary knob or key), suitable for mounting or installation

ESB200 E-Stop button

Art. no.	Article	Description	
63000000	ESB200-4TR-C	With housing for mounting	For separate mounting with internal screw fitting, rotary release, creep contacts (2NC \ominus + 1NO) with screw terminals
63000002	ESB200-4KR-C	With housing for mounting	For separate mounting with internal screw fitting, unlocking with key (2 keys included in delivery contents), creep contacts (2NC \ominus + 1NO) with screw terminals
63000004	ESB200-4TR-M12p	With housing for mounting	For separate mounting with external screw fitting, rotary release, connection via M12 plug, creep contacts (2NC \ominus + 1NO)
63000006	ESB200-4KR-M12p	With housing for mounting	For separate mounting with external screw fitting, unlocking with key (2 keys included in delivery contents), connection via M12 plug, creep contacts (2NC \ominus + 1NO)
63000008	ESB210-4TR	Without housing for installation	For panel mounting with central screw fitting, rotary release, creep contacts (2NC \ominus + 1NO) with screw terminals
63000010	ESB210-4KR	Without housing for installation	For panel mounting with central screw fitting, unlocking with key (2 keys), creep contacts (2NC \ominus + 1NO) with screw terminals

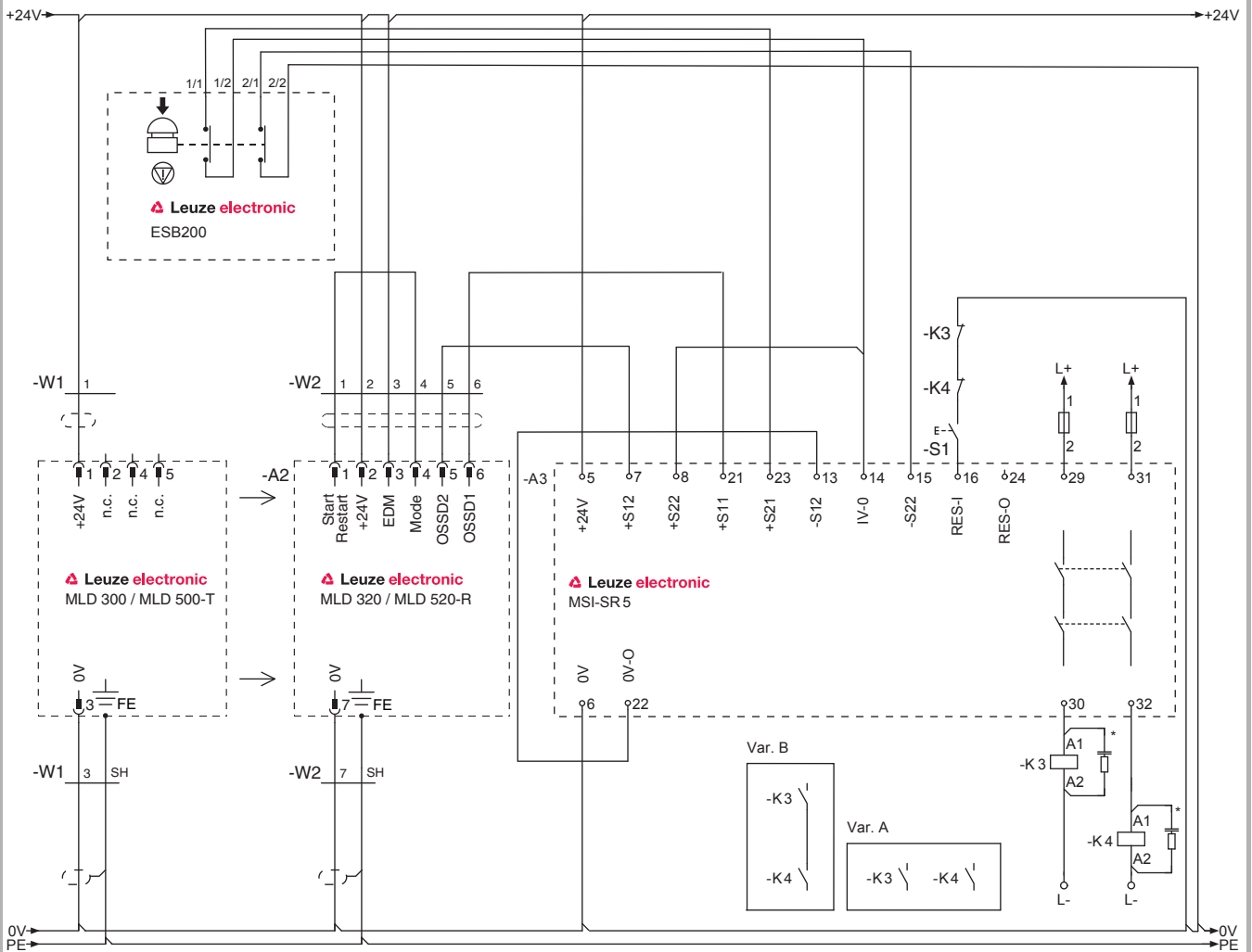
Part number code for ESB200

Article	Description
ESB	
200	With housing for mounting
210	Without housing for installation
-4	2NC \ominus + 1NO contact set
TR	Enable by turning the button
KR	Enable by turning the key
-C	Mounting screws located inside
M12p	M12 plug

ESB 200

Electrical connection

ESB200 connection example



ESB200 Safety Command Device with MLD Multiple Light Beam Safety Device and MSI-SR5 Safety Relay

⚠ Please observe the operating instructions of the components!

SAFETY COMMAND DEVICES

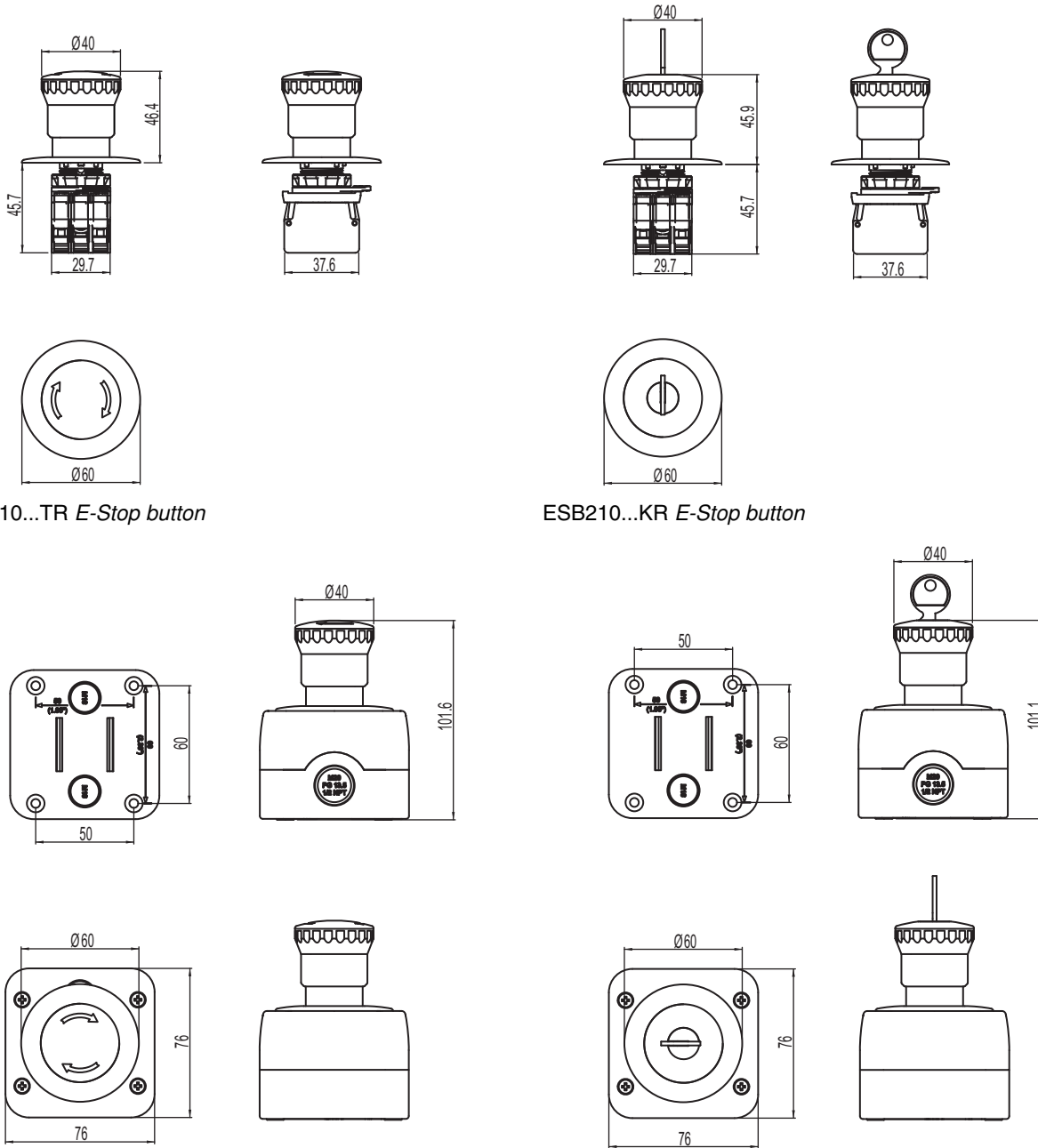
Technical data

General system data		
Switch type	E-Stop command device in accordance with EN 60947-5-5 and EN ISO 13850	
Service life (T_M) in accordance with EN ISO 13849-1	20 years	
Number of cycles until 10% of the components have a failure to danger (B_{10d})	600.000	
Installation point	Arbitrary	
Ambient temperature, operation	-25...+80°C	
Dirt levels, external, in accordance with EN 60947-1	3	
Housing material	Fiberglass-reinforced plastic, self-extinguishing	
Internal actuator	Self-locking Safety Switch	
Dimensions	See dimensional drawing	
Protection rating	IP 67, IP 69K	
Mechanical life time in accordance with IEC 60947-5-1	300.000	
Actuation frequency according to IEC 60947-5-1	Max. 3600 per hour	
Contact equipment	2NC \oplus + 1NO	
Switching principle	Creep contact	
Contact opening	Force-fit	
Contact material	Silver alloy	
Usage category in accordance with EN 60947-5-1	AC 15: U_e / I_e : 24 V / 6 A, 120 V / 6 A, 250 V / 6 A, 400 V / 3 A DC 13: U_e / I_e : 24 V / 2.5 A, 125 V / 0.6 A, 250 V / 0.3 A	
Rated insulation voltage	600 V AC, 600 V DC	
Conventional thermal current	10 A	
Short-circuit protection according to IEC 60269-1	500 V, 10 A, type gG/gL	
Connection system	Number of cable entries	To 5
	Type of cable entries	M12 plug, M20 x 1.5, M16 x 1.5
	Cable cross-section (wire)	1 x 0.5 mm ² to 2 x 2.5 mm ²

Please note the additional information in the connecting and operating instructions at www.leuze.com/esb200.

Dimensional drawings

ESB200 E-Stop button



ESB210...TR E-Stop button

ESB210...KR E-Stop button

ESB200...TR E-Stop button

ESB200...KR E-Stop button

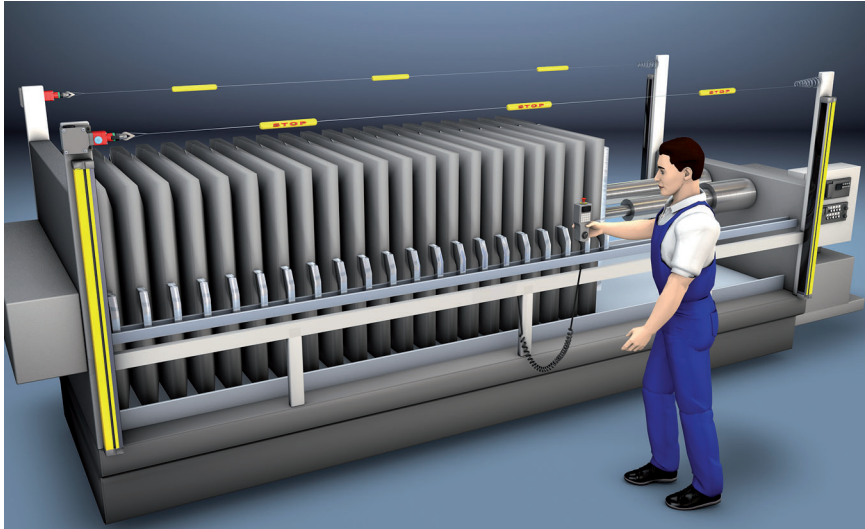
Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

www.leuze.com/esb200/

SAFETY COMMAND DEVICES

ERS200 E-Stop Rope Switch



ERS200 E-STOP Rope Switch as Safety Command Device on a filter press

The ERS200 E-Stop Rope Switch series is used with preference with expansive points of operation. Its simple operation ensures fast stop command output along the point of operation. The switch's alignment indicator ensures that it is easy to set. The ERS 200 variants enable integration in control circuits up to category 4 in accordance with EN ISO 13849.

Typical areas of application

- Machinery and systems with expansive points of operation
- Large machines and systems, in which command input by pulling a rope is beneficial

Important technical data, overview

Switch type	E-Stop command device in accordance with EN 60947-5-5 and EN ISO 13850
Housing material	Metal
Contact equipment	1NC ⊖ + 1NO 2NC ⊖ + 1NO 2NC ⊖
Switching principle	Creep contact
Internal actuator	Self-locking Safety Switch with 2 switching directions
Actuation force (pull-out)	83 N, 235 N
Actuation force (slacken)	63 N, 147 N
Actuation force (pull-out with forced separation)	90 N, 250 N
Connection system	M20 x 1.5 (3-way)
Protection rating	IP 67

Functions

E-Stop command device in accordance with EN 60947-5-5 and EN ISO 13850
Integration in control circuits up to category 4 in accordance with EN ISO 13849
Position-independent E-Stop command input
Reset function (reset button with indicator)
Rope head with alignment indicator

Special features

- Contact sets for integration up to category 4 in accordance with EN ISO 13849
- Pulling the rope or rope fracture safely stops the machine
- Simple setup through switching point indicator
- Easy integration with 3 cable approach directions
- Clicks in on both sides with friction-locking contacts
- Compact metal housing
- Protection rating: IP 67



Features



Further information **Page**

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● Technical data	419
● Dimensional drawings	421
● Dimensional drawings: Accessories	423
● Accessories ordering information	424

SAFETY COMMAND DEVICES

Ordering information

ERS200

Included in delivery: Application information (print document)

Functions: command device in accordance with EN 60947-5-5 and EN ISO 13850, Rope Switch with reset function and alignment indicator

ERS200 E-Stop Rope Switch, Heavy Duty

Art. no.	Article	Description	Contact equipment
63000500	ERS200-M0C3-M20-HLR	E-Stop Rope Switch with reset function and alignment indicator, actuation direction in longitudinal axis, 3 cable entries	(1NC ⊕ + 1NO) creep contacts
63000501	ERS200-M1C3-M20-HLR	E-Stop Rope Switch with reset function and alignment indicator, actuation direction in longitudinal axis, 3 cable entries	(2NC ⊕) creep contacts
63000502	ERS200-M4C3-M20-HLR	E-Stop Rope Switch with reset function and alignment indicator, actuation direction in longitudinal axis, 3 cable entries	(2NC ⊕ + 1NO) creep contacts
63000503	ERS200-M4C1-M20-HLR	E-Stop Rope Switch with reset function and alignment indicator, actuation direction in longitudinal axis, 1 cable entry	(2NC ⊕ + 1NO) creep contacts
63000504	ERS200-M4C1-M12-HLR	E-Stop Rope Switch with reset function and alignment indicator, actuation direction in longitudinal axis, M12 plug, 1 cable entry	(2NC ⊕ + 1NO) creep contacts
63000520	ERS200-M4C3-M20-HAR	E-Stop Rope Switch with reset function and alignment indicator, actuation direction to the right, 3 cable entries	(2NC ⊕ + 1NO) creep contacts
63000522	ERS200-M0C3-M20-HAR	E-Stop Rope Switch with reset function and alignment indicator, actuation direction to the right, 3 cable entries	(1NC ⊕ + 1NO) creep contacts
63000523	ERS200-M1C1-M20-HAR	E-Stop Rope Switch with reset function and alignment indicator, actuation direction to the right, 1 cable entry	(2NC) creep contacts
63000521	ERS200-M4C3-M20-HAL	E-Stop Rope Switch with reset function and alignment indicator, actuation direction to the left, 3 cable entries	(2NC ⊕ + 1NO) creep contacts
63000524	ERS200-M0C3-M20-HAL	E-Stop Rope Switch with reset function and alignment indicator, actuation direction to the left, 3 cable entries	(1NC + 1NO) creep contacts, 3 cable entries, to the left
63000525	ERS200-M1C1-M20-HAL	E-Stop Rope Switch with reset function and alignment indicator, actuation direction to the left, 1 cable entry	(2NC) creep contacts

Steel rope, rope clamps and other accessories must be ordered separately, see page 424.

Article list for ERS200

Article	Description
ERS200	
-M	Metal housing
0, 1, 4	Contact set
C3	Number of cable bushings
-M20	Metric thread
-HLR	Rope pull direction in longitudinal axis
-HAR	Rope pull direction, right angled
-HAL	Rope pull direction, left angled

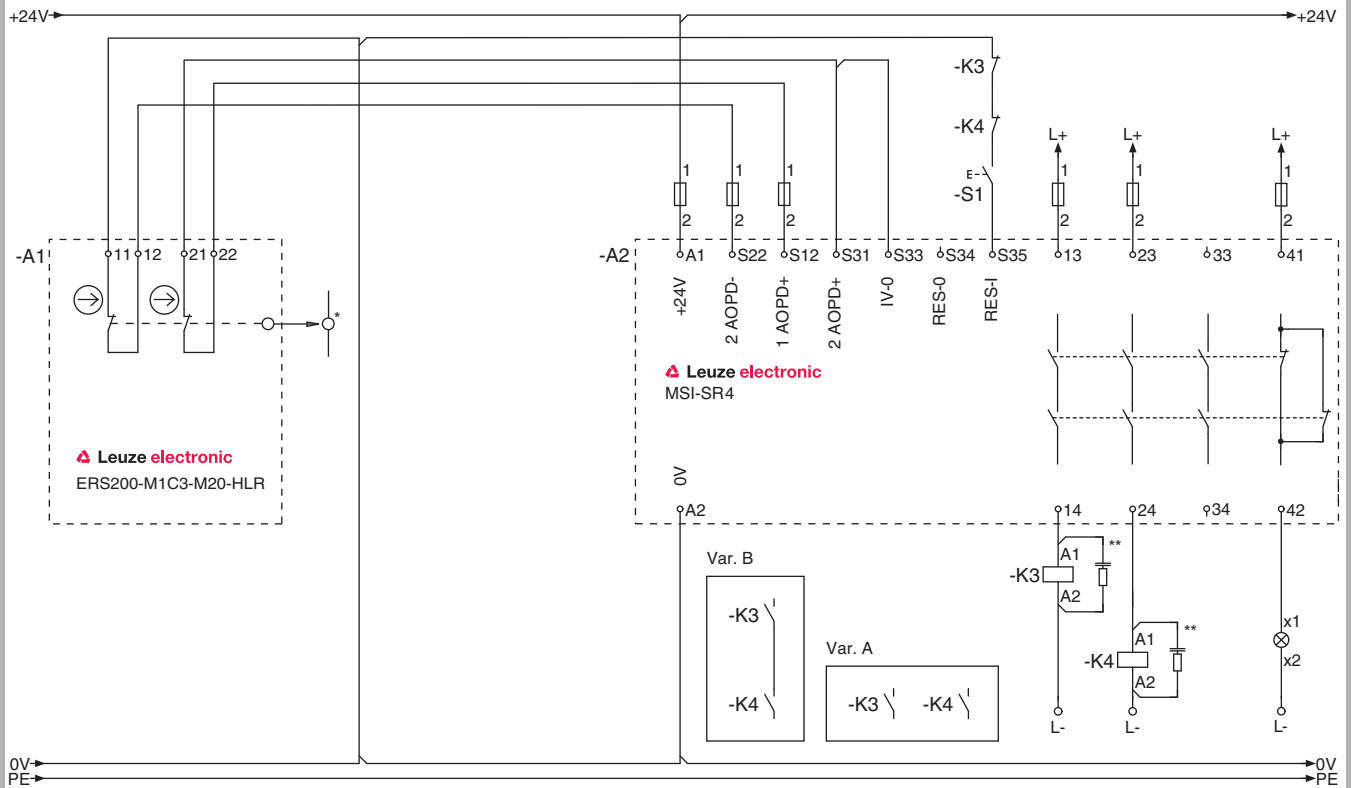
ERS200

www.leuze.com/ers200/

SAFETY COMMAND DEVICES

Electrical connection

ERS200 connection example



*) Rope
 **) Spark extinction circuit, supply suitable spark extinction

ERS200 E-Stop Rope Switch with MSI-SR4 Safety Relay

! Please observe the operating instructions of the components!

Technical data

General system data		
Switch type	E-Stop command device in accordance with EN 60947-5-5 and EN ISO 13850	
Service life (T_M) in accordance with EN ISO 13849-1	20 years	
Number of cycles until 10% of the components have a failure to danger (B_{10d})	2.000.000	
Installation point	On rope pull axis	ERS200-M...-HLR
	On rope pull axis, to the right	ERS200-M4...-HAR
	On rope pull axis, to the left	ERS200-M4...-HAL
Ambient temperature, operation	-25...+80 °C	
Dirt levels, external, in accordance with EN 60947-1	3	
Housing material	Metal	
Internal actuator	Self-locking Safety Switch with 2 switching directions	
Dimensions	See dimensional drawing	
Protection rating	IP 67	
Actuation directions	In longitudinal axis of the rope head	
Mechanical life time in accordance with IEC 60947-5-1	1 x 10 ⁶ actuation cycles	
Actuation frequency according to IEC 60947-5-1	Max. 600 per hour	
Actuation force (pull-out)	83 N	ERS200-M...-HLR
	235 N	ERS200-M4...-HAR ERS200-M4...-HAL
Actuation force (slacken)	63 N	ERS200-M...-HLR
	147 N	ERS200-M4...-HAR ERS200-M4...-HAL
Actuation force (pull-out with forced separation)	90 N	ERS200-M...-HLR
	250 N	ERS200-M4...-HAR ERS200-M4...-HAL
Actuating path with forced separation	Min. 8 mm	ERS200-M...-HLR
	Min. 14 mm	ERS200-M4...-HAR ERS200-M4...-HAL
Contact equipment	1NC ⊕ + 1NO	ERS200-M0...
	2NC ⊕ + 1NO	ERS200-M4...
	2NC ⊕	ERS200-M1...
Switching principle	Creep contact	
Contact opening	Force-fit	
Contact material	Silver alloy	

SAFETY COMMAND DEVICES

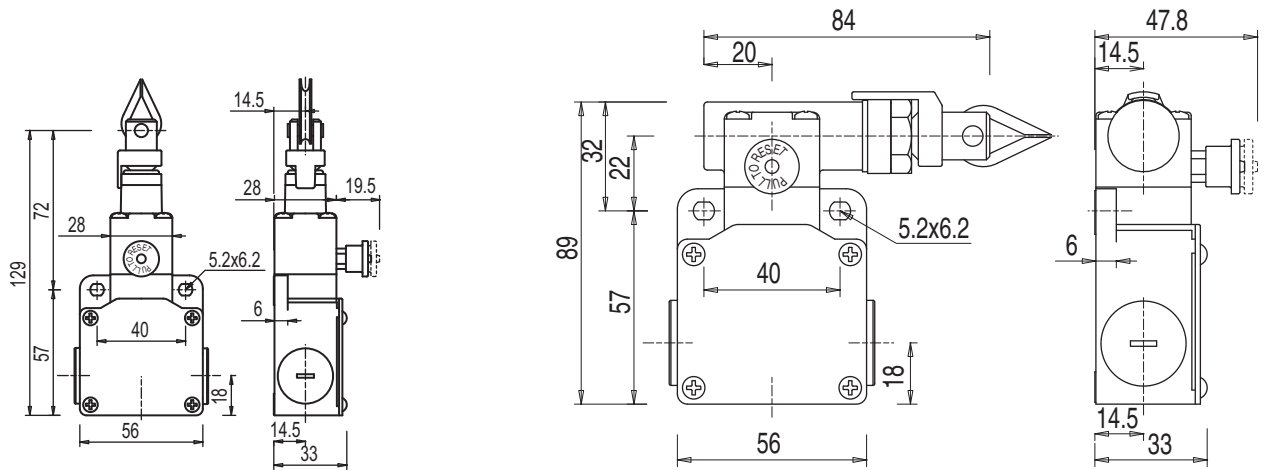
Technical data

General system data		
Usage category in accordance with EN 60947-5-1	AC 15: U _e / I _e : 250 V / 6 A, 400 V / 4 A, 500 V / 1 A DC 13: U _e / I _e : 24 V / 6 A, 125 V / 1.1 A, 250 V / 0.4 A	
Rated insulation voltage	500 V AC, 600 V DC	
Conventional thermal current	Max. 10 A	
Short-circuit protection according to IEC 60269-1	500 V, 10 A, type aM	
Connection system	Number of cable entries	3, 1
	Type of cable entries	M12 plug, M20 x 1.5
	Cable cross-section (wire)	1 x 0.5 mm ² to 2 x 2.5 mm ²
Actuator: Rope length at 20°C temperature difference	Max. 24 m	ERS200-M...-HLR
	Max. 70 m	ERS200-M...-HAR ERS200-M...-HAL

Please note the additional information in the connecting and operating instructions at www.leuze.com/ers200.

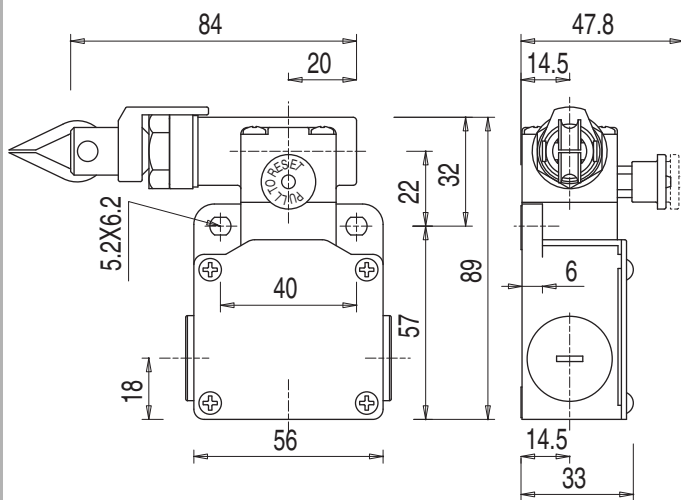
Dimensional drawings

ERS200 E-Stop Rope Switch



E-Stop Rope Switch ERS200-M...C3-...-HLR

ERS200-M...C3-...-HAR



ERS200-M...C3-...-HAL

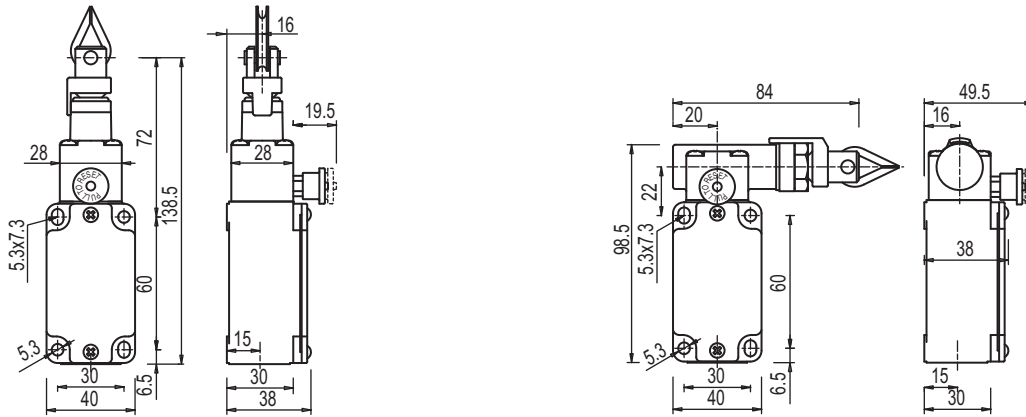
Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

SAFETY COMMAND DEVICES

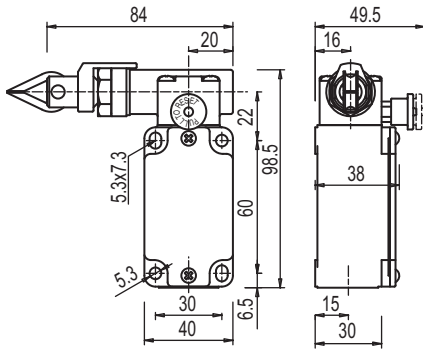
Dimensional drawings

ERS200 E-Stop Rope Switch



ERS200-M...C1-...-HLR

ERS200-M...C1-...-HAR



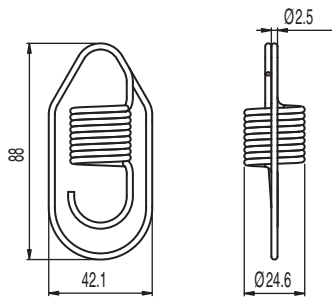
ERS200-M...C1-...-HAL

Dimensions in mm

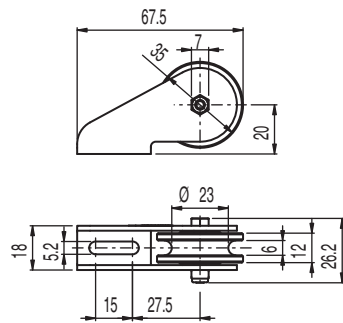
Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

Dimensional drawings: Accessories

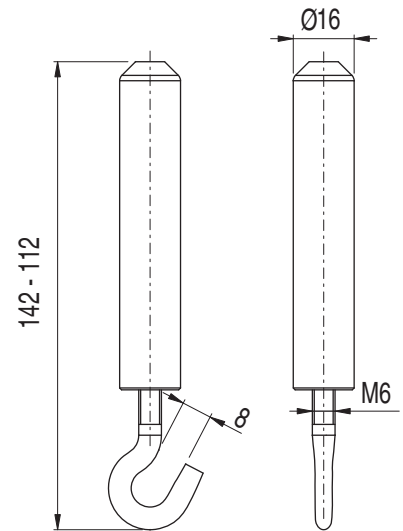
Safety spiral spring



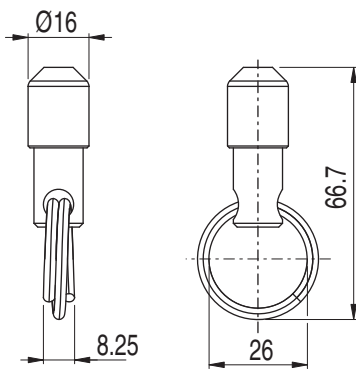
Safety spiral spring AC-SL-ERS



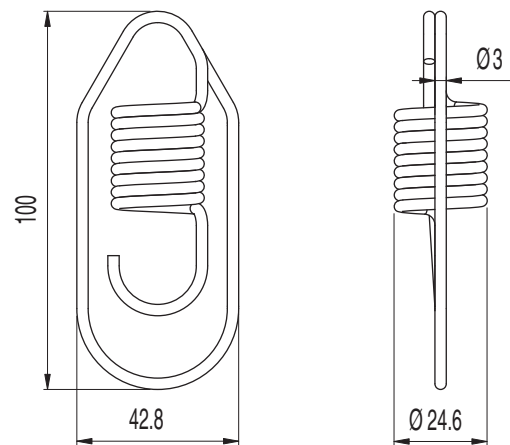
Corner pulley AC-AP-ERS



Stud bolts, adjustable AC-SBO-ERS



End ring with fixing AC-ENCLF-ERS



Safety spiral spring AC-SA-ERS

Dimensions in mm

SAFETY COMMAND DEVICES

Accessories ordering information

Accessories for ERS200

Art. no.	Article	Description	Length, design
63000790	AC-KT10-ERS	Accessories set	Consisting of rope clamps and 10 m steel rope
63000791	AC-KT20-ERS	Accessories set	Consisting of rope clamps and 20 m steel rope
63000792	AC-SL-ERS	Safety spiral spring	For ERS200-M0C3-M20-HLR ERS200-M1C3-M20-HLR ERS200-M4C3-M20-HLR
63000793	AC-AP-ERS	Corner pulley	
63000794	AC-STOP-ERS	Rope label, <STOP>	For rope diameter 5 mm max.
63000795	AC-STRO-35-ERS	Steel rope	35 m long
63000796	AC-STRO-100-ERS	Steel rope	100 m long
63000797	AC-SBO-ERS	Stud bolts	Adjustable
63000798	AC-ENCLF-ERS	End ring	With fixing
63000799	AC-SA-ERS	Safety spiral spring	For ERS200-M4C3-M20-HAR, ERS200-M4C3-M20-HAL
63000800	AC-P-ERS	Deflection roller	

Article list for ERS200 accessories

Article	Description
AC	Accessories
-KT10, 20	Kit with rope, 10, 20 m long
-SL	Safety spiral spring for -HLR
-SA	Safety spiral spring for -HAL, -HAR
-AP	Corner pulley for rope pull
-P	Deflection roller
STRO	Steel rope
SBO	Stud bolts
ENCLF	End ring with fixing

AC

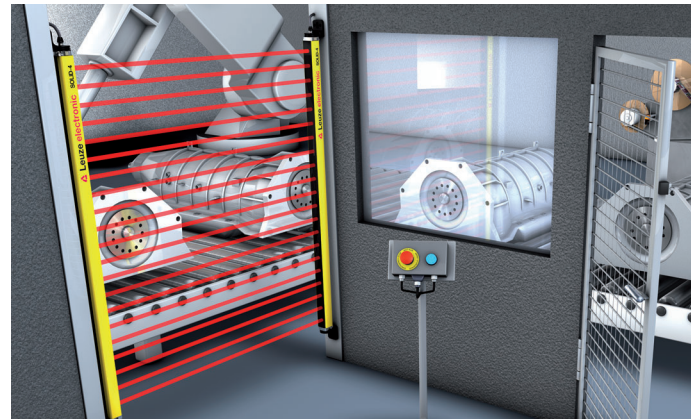
www.leuze.com/ers200/

SAFETY RELAYS

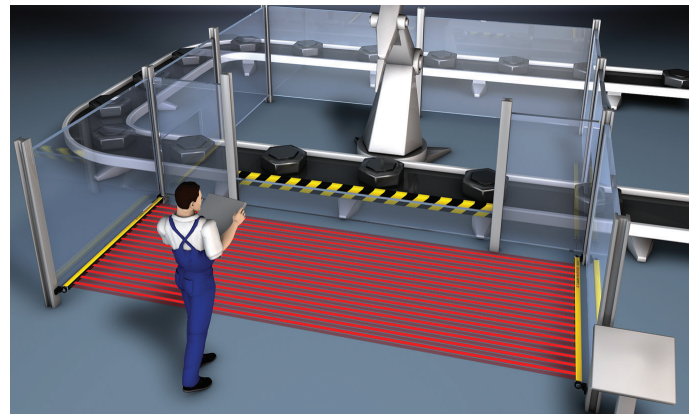
OVERVIEW

Safety Relay selection table

Selection table



Safeguarding an assembly station and a service door with the MSI-SR5 Safety Relay



Safety Light Curtain with an MSI-SR4 Safety Relay as danger zone guarding with start/restart interlock on a robot cell

With Safety Relays of the MSI series, depending on the application, opto-electronic safety sensors or Safety Switches can be connected to the safety circuit of the machine control system. The interfaces must be right here. In addition to high reliability and service life, small construction dimensions are often also required. The MSI Safety Relays take these requirements into account with their mechanical and electrical design in an ideal way, and also enable an economical integration into many kinds of safety-related faulty connection situations.

Space-saving and reliable: the MSI Safety Relay family: MSI-SR5, MSI-2H, MSI-SR4, MSI-RM2



Features						
OSSDs, relay, 3 N/O, 1 N/C	OSSDs, relay, 2 N/O, 1 N/C	OSSDs, relay, 2 make contacts	RES, dynamic	RES, via AOPD	EDM, static in the reset circuit	EDM, via AOPD

*) Depending on the category of the upstream protective device

Safety type/category in accordance with EN ISO 13849	Performance Level (PL) in accordance with EN ISO 13849-1	Connectable safety components	OSSDs, relay, 3 N/O, 1 N/C	OSSDs, relay, 2 N/O, 1 N/C	OSSDs, relay, 2 make contacts	RES, dynamic	RES, via AOPD	EDM, static in the reset circuit	EDM, via AOPD	Series	Page
Depending on the safety type of the upstream AOPD	Depending on the safety type of the upstream AOPD	Type 4 or type 2 AOPD with 2 safety transistor outputs, RES and internal dynamic EDM			●		●	●		MSI-RM2	430
Safety type: Type III C in accordance with EN 574*	e	Two-hand switching device	●							MSI-2H	436
Up to category 4 in accordance with EN ISO 13849	e	Safety Light Curtains, Single and Multiple Light Beam Safety Devices, type 3 Safety Laser Scanners, Safety Switches, E-Stop command devices	●			●		●		MSI-SR4	442
Up to category 4 in accordance with EN ISO 13849	e	Safety Light Curtains, Single and Multiple Light Beam Safety Devices, type 3 Safety Laser Scanners, Safety Switches, E-Stop command devices			●	●		●		MSI-SR5	448
2	Up to d	AOPDs			●	●		●		MSI-T	454
Up to category 4 in accordance with EN ISO 13849	Up to e	Magnetically Coded Sensors		●		●		●		MSI-MC310	460

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- MSI-MC310
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www.leuze.com/msi-relays/

SAFETY RELAYS

MSI-RM2



Guarding a paternoster shelf with SOLID-2E Safety Light Curtain and MSI-RM2 relay module

Optoelectronic protective devices today frequently have electronic switching outputs and integrated additional functions such as contactor monitoring (EDM) and start/restart interlock. However the requirement for the protective device to transmit the switching signals, not electronically, but rather contact-based to the machine control system often exists. With the new MSI-RM2 relay module the user is provided with a compact and at the same time cost-effective solution for connecting safety sensors. The relay module, only 17.5 mm wide, has two potential-free make contact circuits with a response time of only 10 ms and LED displays for the switching status. As its switching behavior is monitored by the EDM function of the safety sensor, an additional electronic monitoring system in the relay module is not required. The MSI-RM2 conforms to standard EN IEC 60204-1.

Typical areas of application

- Connection of electro-sensitive protective equipment with electronic outputs, integrated contactor monitoring (EDM) and start/restart interlock (RES) on machine control systems.

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MSI-RM2

Important technical data, overview

Category in accordance with EN ISO 13849	Up to 4 (depending on the category of the upstream protective device)
Supply voltage	24 V DC, ±20 % (via AOPD)
Safety-related switching outputs (OSSDs)	2 relay outputs (changeover)
Signal output	Relay output (NC)
Response time	10 ms
Ambient temperature, operation	0...+50°C
Ambient temperature, storage	-25...+70°C
Dimensions (W x H x D)	17.5 mm x 99 mm x 113.6 mm

Functions

Signal conversion of electronic outputs of electro-sensitive protective equipment on potential-free relay contacts

Monitoring external contactors in the signal circuit with the upstream protective device

Special features

- Suitable up to category 4 (depending on the category of the upstream protective device)
- 2 release circuits, 1 break contact as signal circuit for device monitoring (EDM)
- LED displays, K1 and K2
- Supply voltage through upstream protective device
- Housing width, 17.5 mm



Features



Further information

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SAFETY RELAYS

Ordering information

MSI-RM2

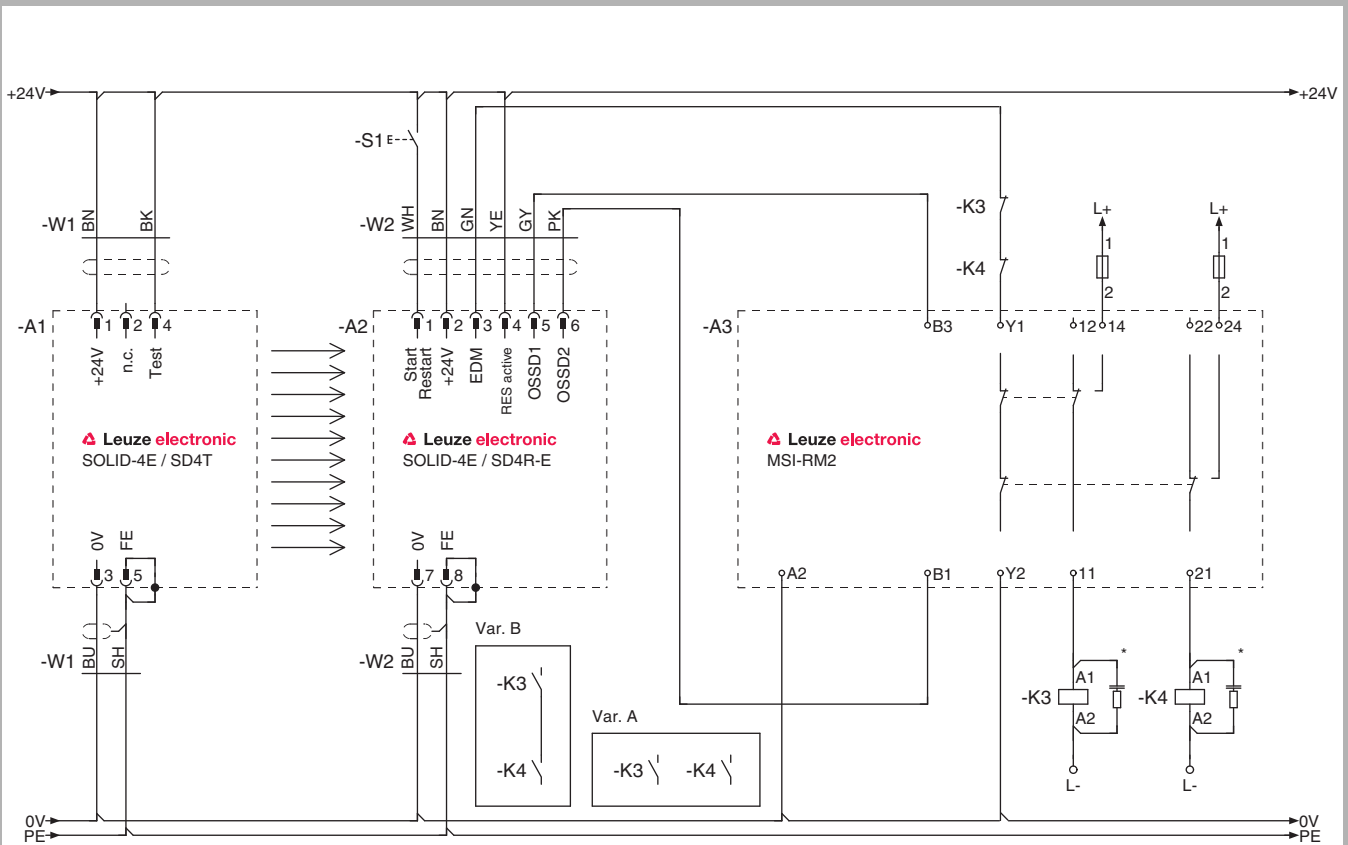
Included in delivery: 1 set of connecting and operating instructions (PDF file on CD-ROM)

Functions: Relay module for optoelectronic protective devices in accordance with EN IEC 60204-1, EN 50205 EN IEC 60255, IEC 60664-1

MSI-RM2 Safety Relay

Art. no.	Article	Description
549918	MSI-RM2	Relay module, two-channel, for AOPDs with 2 OSSDs and EDM

Electrical connection, MSI-RM2 connection example



*) Spark extinction circuit, supply suitable spark extinction

MSI-RM2 with SOLID-4E Safety Light Curtain

! Please observe the operating instructions of the components!

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Technical data

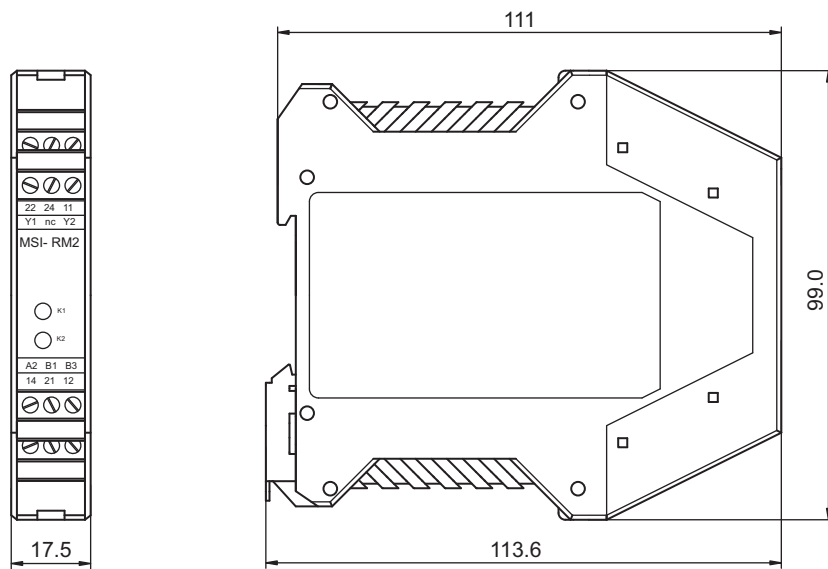
General system data		
Category in accordance with EN ISO 13849	Up to 4 (depending on the category of the upstream protective device)	
Service life (T_M) in accordance with EN ISO 13849-1	20 years	
Number of cycles until 10% of the components have a failure to danger (B_{10d})	With DC1 (ohmic load)	10,000,000 (2 A, 24 V)
	With AC1 (ohmic load)	100,000 (2 A, 230 V) 600,000 (1 A, 230 V) 1,300,000 (0.5 A, 230 V)
	With DC13 (inductive load)	10,000,000 (2 A, 24 V)
	With AC15 (inductive load)	100,000 (2 A, 230 V) 600,000 (1 A, 230 V) 1,300,000 (0.5 A, 230 V)
	Low load (20% nominal load)	1.860.000
Supply voltage	24 V DC $\pm 20\%$ (via OSSDs of the connected AOPD)	
Power consumption	1.5 W (supply via AOPD)	
Safety-related switching outputs (OSSDs)	2 relay outputs (changeover)	
Signal output	Relay output (NC)	
Continuous current per current path	Max. 3 A	
Response time	10 ms	
Restart delay time	20 ms	
Current consumption (inputs B1 and B3)	32 mA each	
Admissible input line resistance	50 Ω	
Ambient temperature, operation	0...+50°C	
Ambient temperature, storage	-25...+70°C	
Safety class	II	
Protection rating	IP 20	
Connection system	Screw terminals	
Dimensions (W x H x D)	17.5 mm x 99 mm x 113.6 mm	
Mounting	On 35 mm DIN rail	

Please note the additional information in the connecting and operating instructions and at www.leuze.com/relays/.

SAFETY RELAYS

Dimensional drawings

MSI-RM2 Safety Relay



Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

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SAFETY RELAYS

MSI-2H



Guarding a feeding-in area with two-hand control station and two-hand control relay MSI-2H

With manually fed presses, after placing in the work piece the operator must press two hand-activated buttons outside the danger zone with both hands at almost the exact same time to start the next machine production step. This guarantees that both hands are outside the danger zone and the existing safety requirements are satisfied. The MSI-2H Safety Relay is the link between these activation elements and the machine control system; it acts as two-hand relay in accordance with EN 574 type III C. The device checks the simultaneous activation of the buttons and ensures a controlled process start. The module is used everywhere that feeding-in is not automatic, but rather has to be performed manually by people. These kinds of situations frequently arise in electronics production and in plate metal processing. The use of protective door monitors in accordance with EN IEC 60204-1 STOP 0 is also possible.

Typical areas of application

- Two-hand control units (e.g. on presses, pick-and-place machines) in accordance with EN 574, type III C
- Two-channel protective door monitoring

Important technical data, overview

Performance Level (PL) in accordance with EN ISO 13849-1	e
Category in accordance with EN ISO 13849	Up to 4 (depending on the category of the upstream protective device)
Stop category in accordance with EN IEC 60204-1	STOP 0
Supply voltage	24 V AC/DC -15 % to +10 %
Safety-related switching outputs (OSSDs)	2 relay outputs (N/O)
Signal output	Relay output (N/C)
Response time	20 ms
Ambient temperature, operation	-25... +55 °C
Dimensions (W x H x D)	22.5 mm x 99 mm x 113.6 mm

Functions

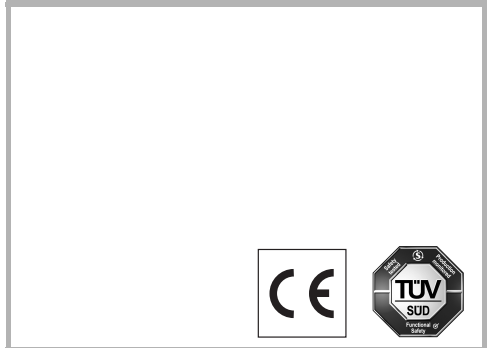
Two-hand relay in accordance with EN 574 Type III C
Automatic start/restart
Static contactor monitoring (EDM)
Simultaneity monitoring of the two-hand buttons
Cross circuit monitoring

Special features

- **Controlled start by checking the feedback circuit and button contacts**
- **Two-channel control with cross circuit monitoring**
- **Simultaneity monitoring, 0.5 s**
- **2 release circuits, 1 NC contact as signal circuit**
- **Potential-free safety-related switching outputs**
- **LED displays: K1, K2, supply voltage**
- **Housing width, 22.5 mm**



Features



Further information **Page**

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SAFETY RELAYS

Ordering information

MSI-2H

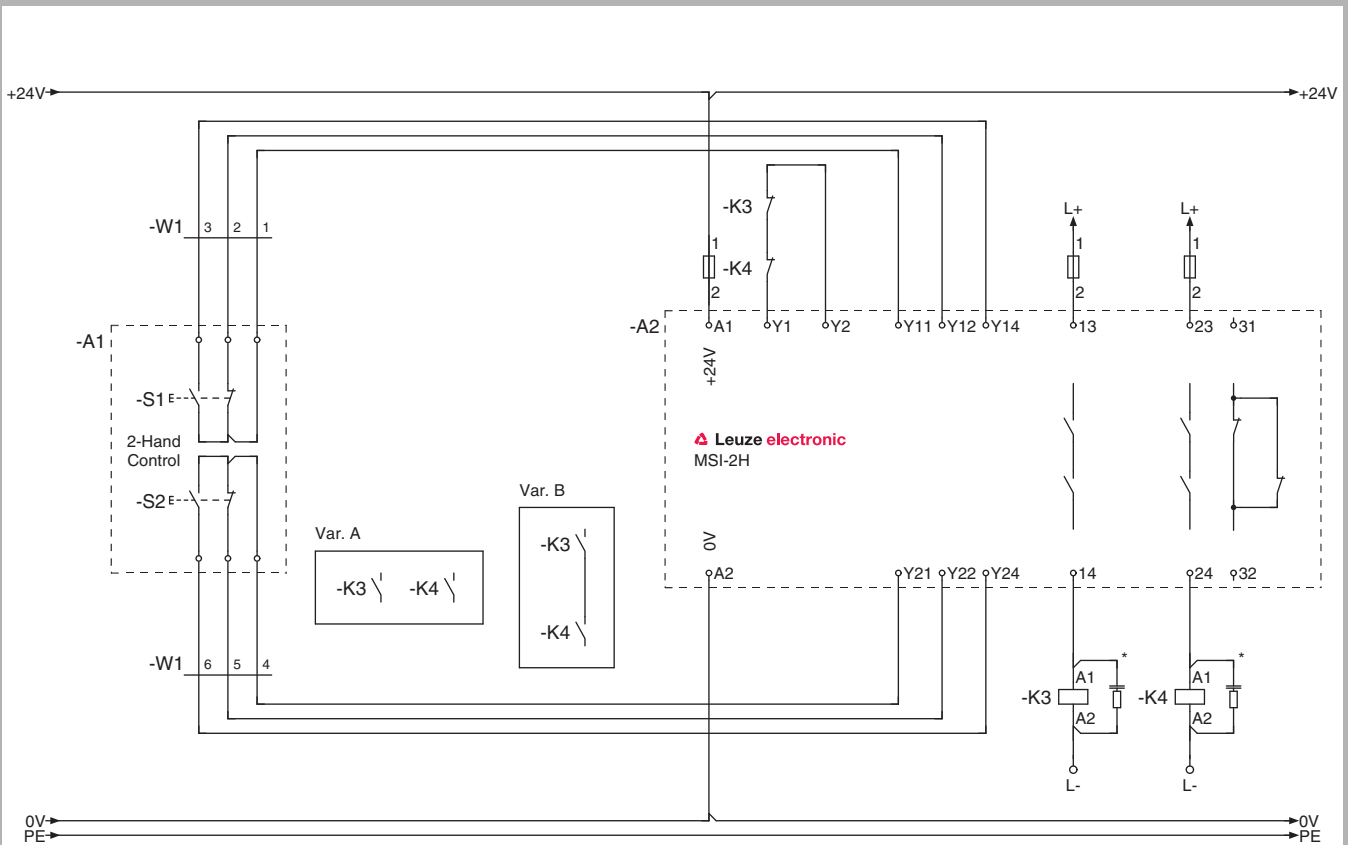
Included in delivery: Connecting and operating instructions (PDF file on CD-ROM)

Functions: Two-hand control relay in accordance with EN 574 type III C and protective door monitors in accordance with EN IEC 60204-1 stop category STOP 0

MSI-2H Safety Relay, category 4

Art. no.	Article	Description
549912	MSI-2H	E-Stop relay, category 4, for connecting two-hand control devices

Electrical connection



*) Spark extinction circuit, supply suitable spark extinction

MSI-2H as two-hand control unit in accordance with EN 574 type III C

! Please observe the operating instructions of the components!

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MSI-SR4
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MSI-SR5
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Technical data

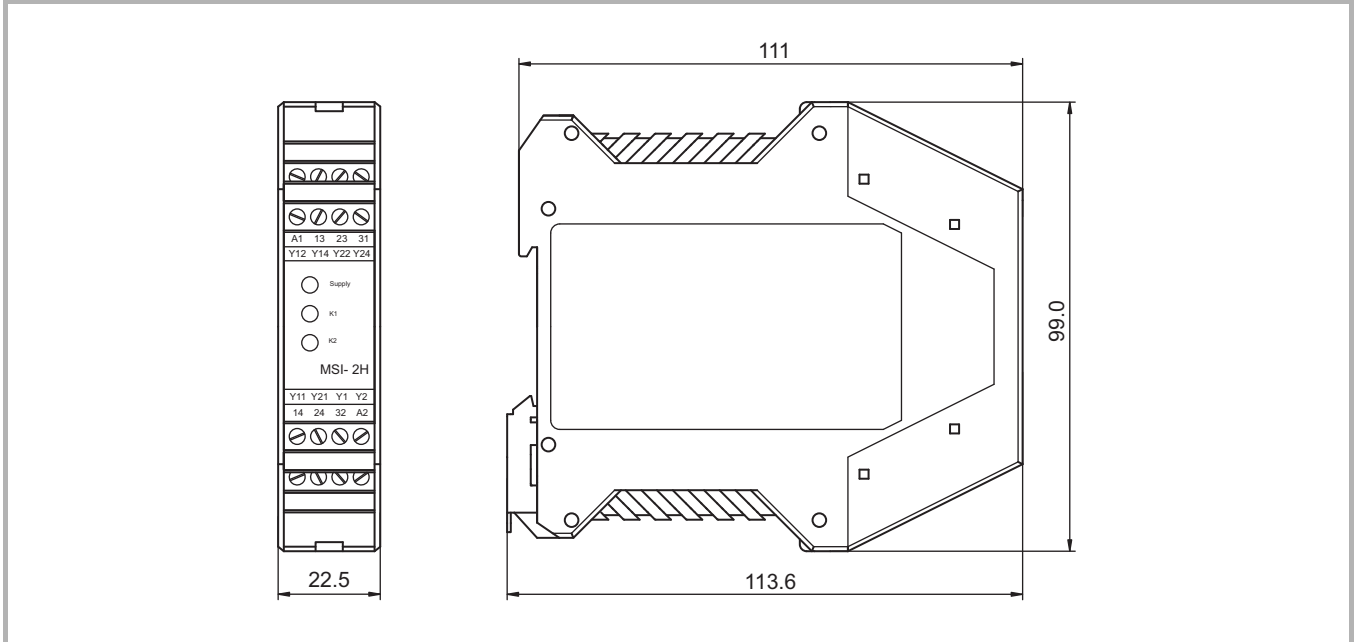
General system data		
Performance Level (PL) in accordance with EN ISO 13849-1	e	
Category in accordance with EN ISO 13849	Up to 4 (depending on the category of the upstream protective device)	
Service life (T_M) in accordance with EN ISO 13849-1	20 years	
Probability of a failure to danger per hour (PFH_d)	3.80×10^{-8}	
Number of cycles until 10% of the components have a failure to danger (B_{10d})	With DC1 (ohmic load)	400.000
	With AC1 (ohmic load)	
	With DC13 (inductive load)	
	With AC15 (inductive load)	
	Low load (20% nominal load)	20.000.000
Mean time to dangerous failure ($MTTF_d$) in accordance with EN ISO 13849-1	70 years	
Stop category in accordance with EN IEC 60204-1	STOP 0	
Supply voltage	24 V AC/DC -15 % to +10 %	
Power consumption	2.1 W (AC) / 1.9 W (DC)	
Safety-related switching outputs (OSSDs)	2 relay outputs (N/O)	
Signal output	Relay output (N/C)	
Continuous current per current path	Max. 3 A	
Response time	20 ms	
Restart delay time	50 ms	
Time window for simultaneity monitoring	Max. 0.5 s	
Admissible input line resistance	<70 Ω	
Ambient temperature, operation	-25... +55°C	
Protection rating	IP 20	
Connection system	Screw terminals	
Dimensions (W x H x D)	22.5 mm x 99 mm x 113.6 mm	
Mounting	On 35 mm DIN rail	

Please note the additional information in the connecting and operating instructions and at www.leuze.com/relays.

SAFETY RELAYS

Dimensional drawings

MSI-2H Safety Relay



Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

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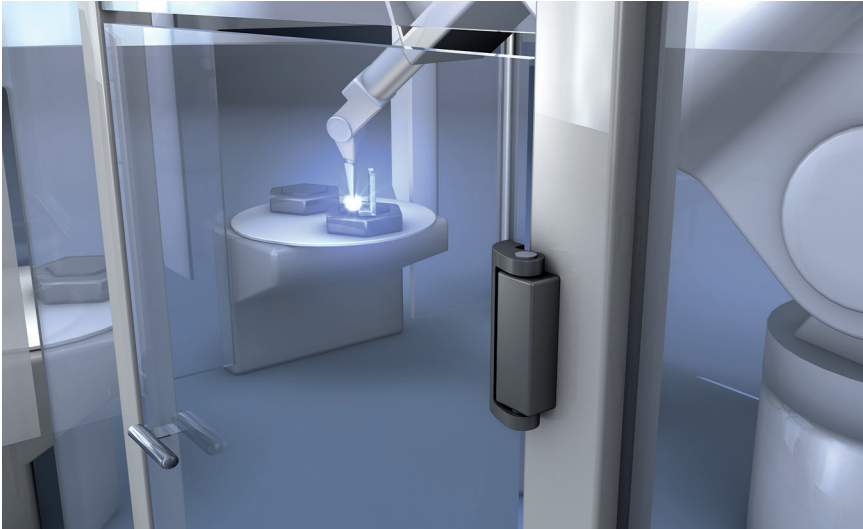
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SAFETY RELAYS

MSI-SR4



Guarding a robot area with S400 Safety Switch and MSI-SR4 Safety Relay

If Safety Switches or optoelectronic protective devices are used for guarding danger zones, as the standard link the MSI-SR4 Safety Relay establishes the connection to the machine control system. The relay acts as an E-Stop relay or protective door monitor in accordance with EN IEC 60204-1, STOP-0. The MSI-SR4 equipment includes the evaluation of input signals using relay or transistor outputs as well as three safety-related switching outputs and a signal output. A wide range of applications can therefore be covered. The short response time of only 10 ms is especially advantageous. A very compact construction of the machines is therefore possible with hand and finger protection in particular. The MSI-SR4 is easy to connect because of the unambiguous assignment of the functions – this guarantees time-saving installation.

Typical areas of application

- Two-channel E-Stop circuit
- MSI-SR4 is the preferred option as two-channel protective door monitoring
- MSI-SR4 is the preferred option as sequential circuit for Safety Light Devices, type 4, with relay or transistor outputs

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MSI-SR4

Magnetically Coded Sensors

Safety Switches

Safety Locking Devices

Safety Command Devices

Safety Relays

Programmable Safety Controllers

Accessories

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Important technical data, overview

SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3
Performance Level (PL) in accordance with EN ISO 13849-1	e
Category in accordance with EN ISO 13849	4 (depending on the category of the upstream protective device)
Stop category in accordance with EN IEC 60204-1	STOP 0
Supply voltage	24 V AC/DC ±20%
Safety-related switching outputs (OSSDs)	3 relay outputs (N/O)
Signal output	1 relay output (N/C)
Response time	10 ms
Restart delay time (automatic start)	300 ms
Ambient temperature, operation	0...+55°C
Ambient temperature, storage	-25...+70°C
Dimensions (W x H x D)	22.5 mm x 99 mm x 113.6 mm

Functions

Automatic start/restart
Start/restart interlock (RES), optionally with/without
Static contactor monitoring (EDM)
Cross circuit monitoring

Special features

- Housing width, 22.5 mm
- Very short response time
- Monitored reset button
- 3 release circuits, 1 N/C contact as signal circuit
- Potential-free safety-related switching outputs
- LED displays: K1, K2, supply voltage, RES



Features



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SAFETY RELAYS

Ordering information

MSI-SR4

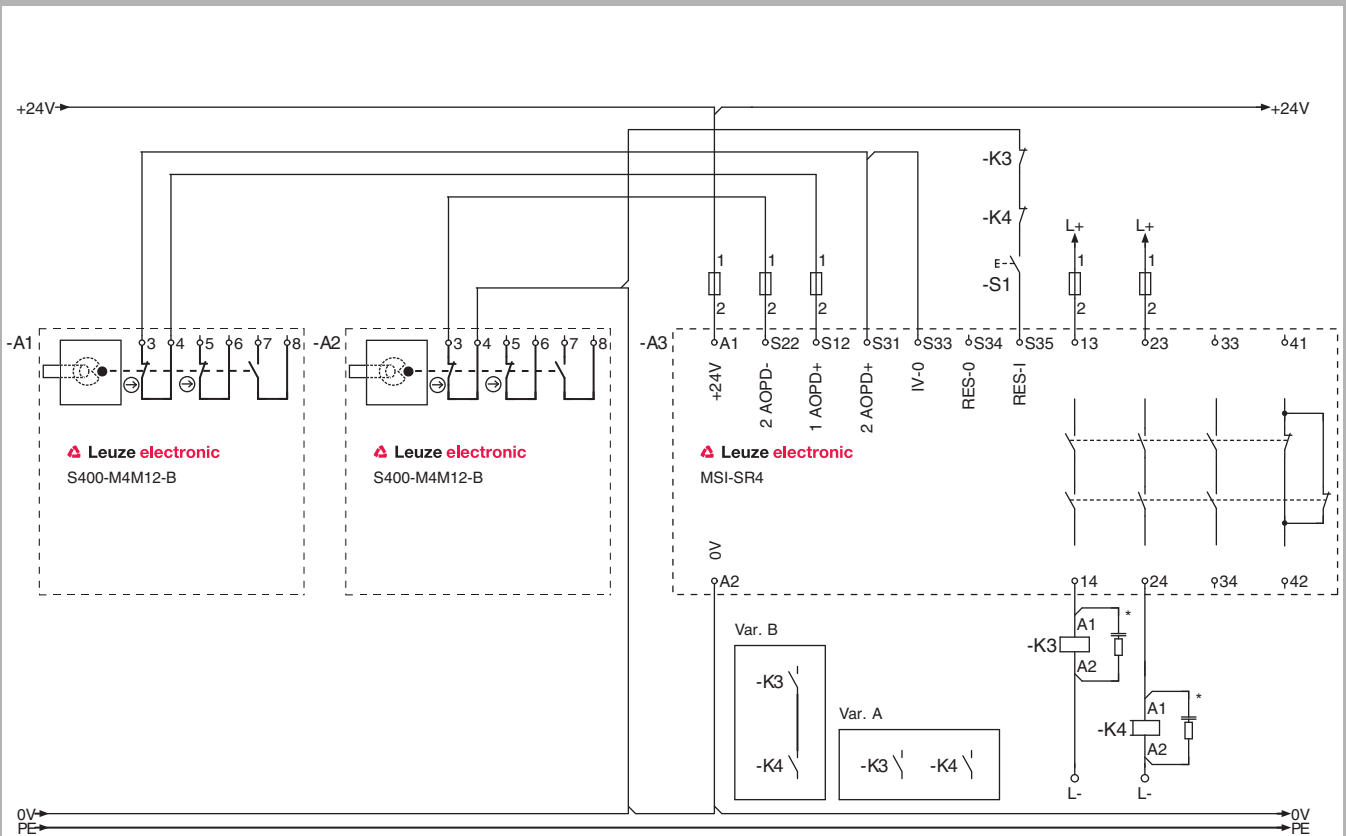
Included in delivery: 1 set of connecting and operating instructions (PDF file on CD-ROM)

Functions: E-Stop relay and protective door monitor in accordance with EN IEC 60204-1 stop category STOP 0, EN 13849-1 category 4, PL e

MSI-SR4 Safety Relay, category 4

Art. no.	Article	Description
549986	MSI-SR4	E-Stop relay

Electrical connection, MSI-SR4 connection example



*) Spark extinction circuit, supply suitable spark extinction

MSI-SR4 as link between S400 Safety Hinge Switches and machine control system

! Please observe the operating instructions of the components!

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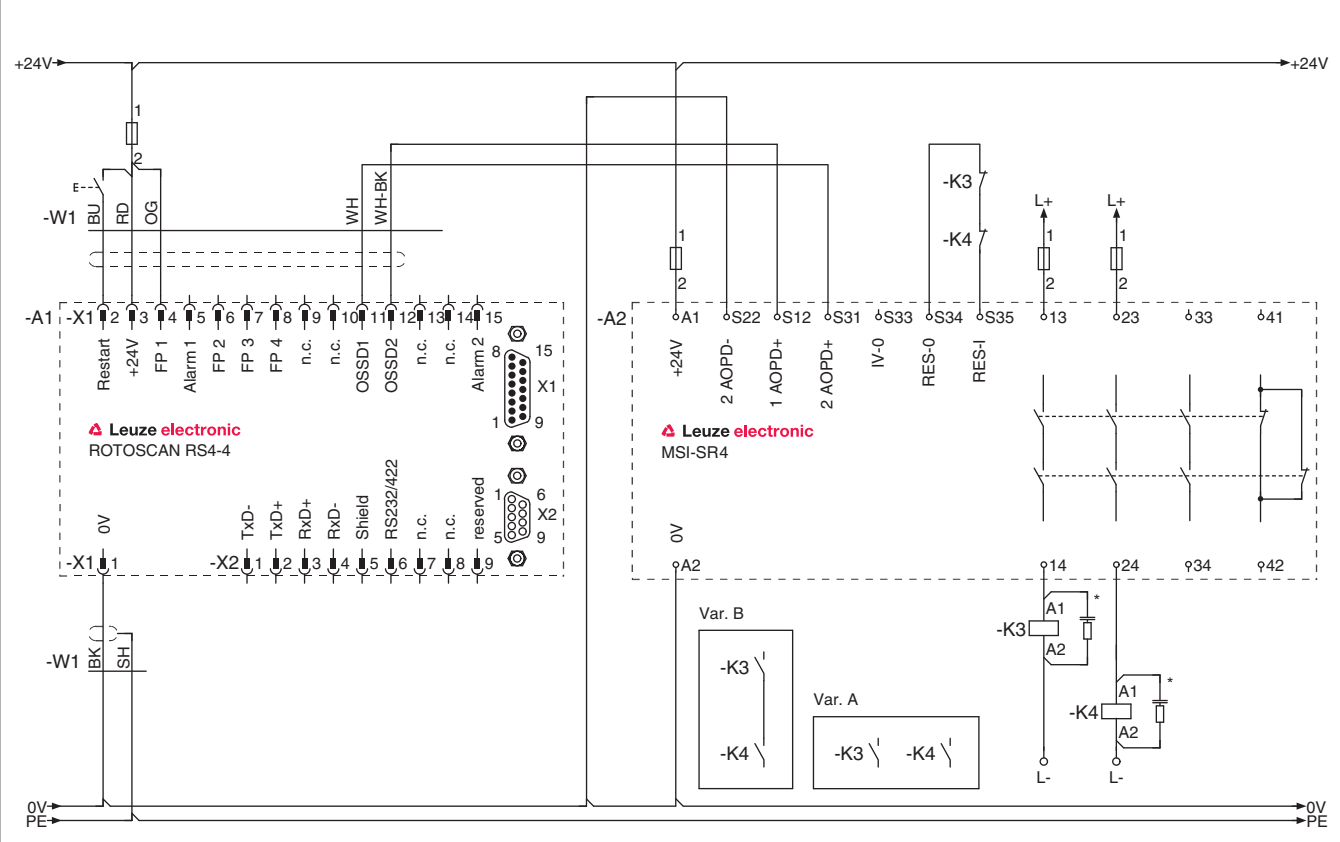
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Electrical connection

MSI-SR4 connection example



*) Spark extinction circuit, supply suitable spark extinction

MSI-SR4 as link between ROTOSCAN RS4 Laser Scanners and the machine control system

! Please observe the operating instructions of the components!

SAFETY RELAYS

Technical data

General system data		
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3	
Performance Level (PL) in accordance with EN ISO 13849-1	e	
Service life (T_M) in accordance with EN ISO 13849-1	20 years	
Probability of a failure to danger per hour (PFH_d) in accordance with the average number of annual n_{op} activations (for the calculation formula, see EN ISO 13849-1:2008, chapter C.4.2 and C.4.3)	$n_{op} = 4,800$	1.4×10^{-9}
	$n_{op} = 28,800$	4.5×10^{-9}
	$n_{op} = 86,400$	1.5×10^{-8}
Number of cycles until 10% of the components have a failure to danger (B_{10d})	With DC1 (ohmic load)	1,000,000 (3 A, 24 V)
	With AC1 (ohmic load)	1,400,000 (5 A, 230 V)
	With DC13 (inductive load)	1,000,000 (3 A, 24 V)
	With AC15 (inductive load)	1,400,000 (5 A, 230 V)
	Low load (20% nominal load)	On request
Category in accordance with EN ISO 13849	4 (depending on the category of the upstream protective device)	
Mean time to dangerous failure ($MTTF_d$) in accordance with EN ISO 13849-1	73 years	
Stop category in accordance with EN IEC 60204-1	STOP 0	
Supply voltage	24 V AC/DC $\pm 20\%$	
Power consumption	3 W	
Safety-related switching outputs (OSSDs)	3 relay outputs (N/O)	
Signal output	1 relay output (normal closed contact)	
Continuous current per current path	Max. 3 A	
Response time	10 ms	
Restart delay time (manual start)	30 ms	
Restart delay time (automatic start)	300 ms	
Input current	Max. 100 mA	
Admissible input line resistance	<70 Ω	
Ambient temperature, operation	0...+55 °C	
Ambient temperature, storage	-25...+70 °C	
Protection rating	IP 20	
Connection system	Screw terminals	
Dimensions (W x H x D)	22.5 mm x 99 mm x 113.6 mm	
Mounting	On 35 mm DIN rail	

Please note the additional information in the connecting and operating instructions and at www.leuze.com/relays.

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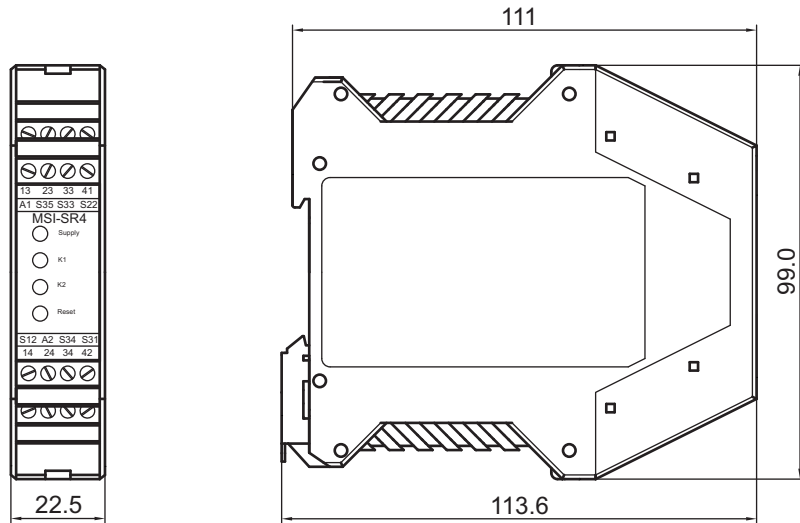
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Dimensional drawings

MSI-SR4 Safety Relay



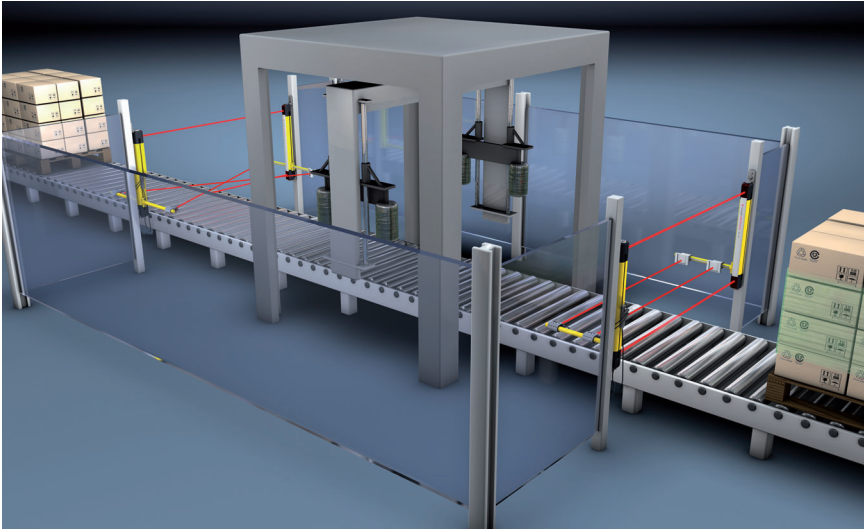
Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

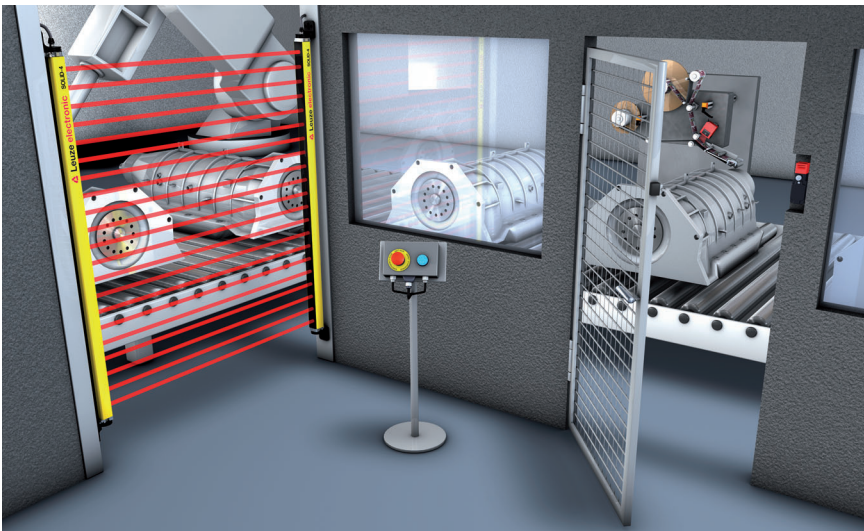
www.leuze.com/relays/

SAFETY RELAYS

MSI-SR5



Safeguarding the entry and exit on a muting system



Safeguarding an assembly station and a service door

Only rarely are safety sensors used individually. Usually, several sensors that act together on a single switch-off circuit are used, e.g. access guarding with a Multiple Light Beam Safety Device and a protective door to the danger zone. Or if a Multiple Light Beam Safety Device is used at both the entry and the exit of a robot cell for safeguarding. In the case of point of operation guarding with a Safety Light Curtain and a Multiple Light Beam Safety Device for rear zone guarding of a press, the sensors must likewise be connected to a common switch-off circuit. The MSI-SR5 Safety Relay can perform these tasks economically. Here, two devices can be connected at the entries, either with two transistor OSSDs or by designing as a two-channel contact circuit. Furthermore, the start/restart interlock and contactor monitoring functions are available. The compact construction and function selection by means of wiring make possible simple, space-saving and economical applications.

Typical areas of application

- Connection of two pieces of electro-sensitive protective equipment with integrated muting function in the entry and exit of muting systems.
- Combined connection of one piece of electro-sensitive protective equipment and one safety-oriented switch, e.g. access safeguarding and service door.
- Combined connection of two safety-oriented switches on moveable guards.
- Combined connection of two or more E-Stop command devices.

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MSI-SR5



Important technical data, overview

SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3
Performance Level (PL) in accordance with EN ISO 13849-1	e
Category in accordance with EN ISO 13849	4 (depending on the category of the upstream protective device)
Stop category in accordance with EN IEC 60204-1	STOP 0
Supply voltage	24 V AC/DC ±20%
Safety-related switching outputs (OSSDs)	2 relay outputs (N/O)
Response time	10 ms
Restart delay time (automatic start)	350 ms
Ambient temperature, operation	0...+55 °C
Ambient temperature, storage	-25...+70 °C
Dimensions (W x H x D)	22.5 mm x 99 mm x 113.6 mm

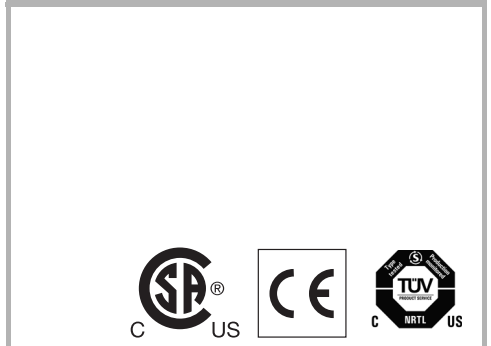
Functions

Monitoring of two sensors
Start/restart interlock (RES), optionally with/without
Static contactor monitoring (EDM)
Cross circuit monitoring

Special features

- Very short response time
- Monitored reset button
- Evaluation of two (possibly different) sensors
- LED displays: K1, K2, supply voltage, RES
- Housing width, 22.5 mm
- Potential-free safety-related switching outputs

Features



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SAFETY RELAYS

Ordering information

MSI-SR5

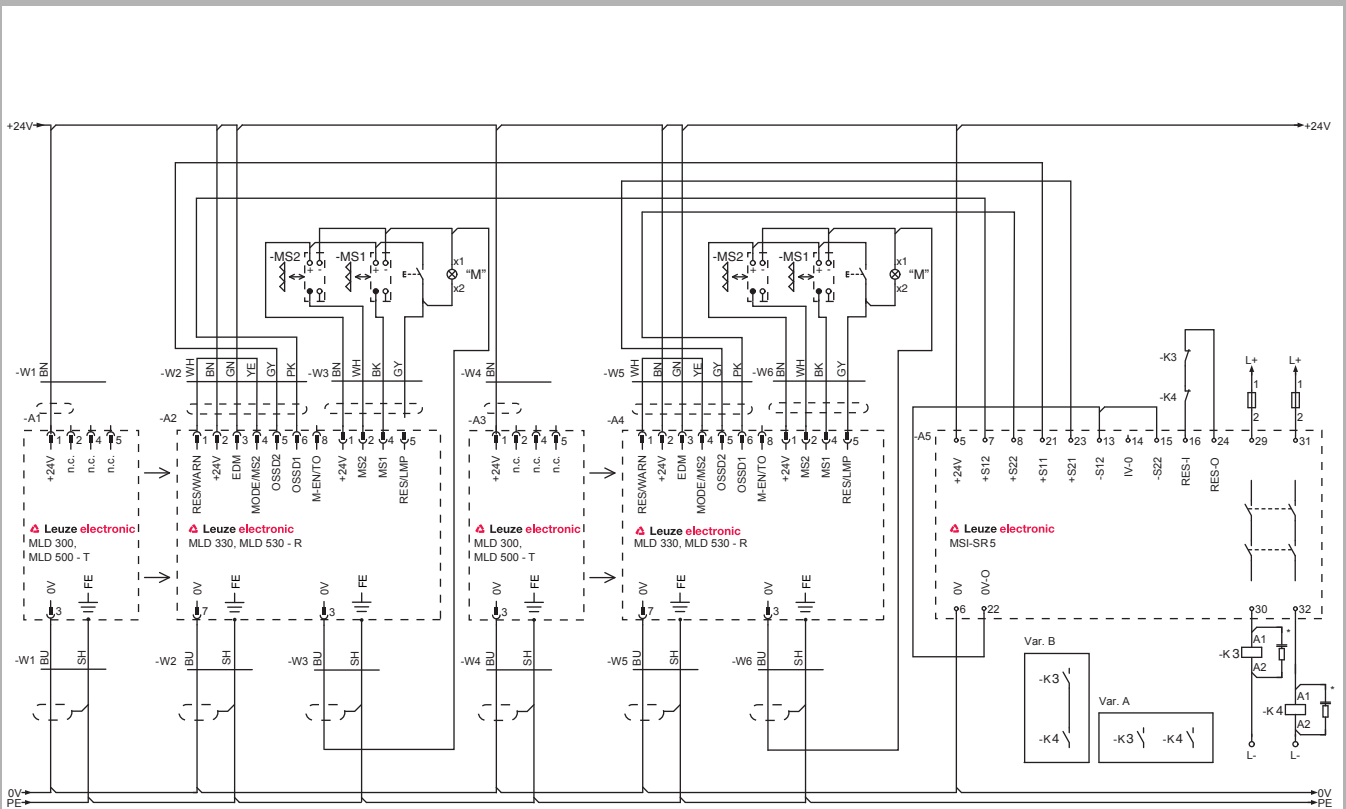
Included in delivery: 1 set of connecting and operating instructions (PDF file on CD-ROM)

Functions: E-Stop relay and protective door monitor in accordance with EN IEC 60204-1 stop category STOP 0, EN 13849-1 category 4, PL e

MSI-SR5 Safety Relays

Art. no.	Article	Description
549991	MSI-SR5	E-Stop relay with separate monitoring of two sensors

Electrical connection, MSI-SR5 connection example



*) Spark extinction circuit, supply suitable spark extinction

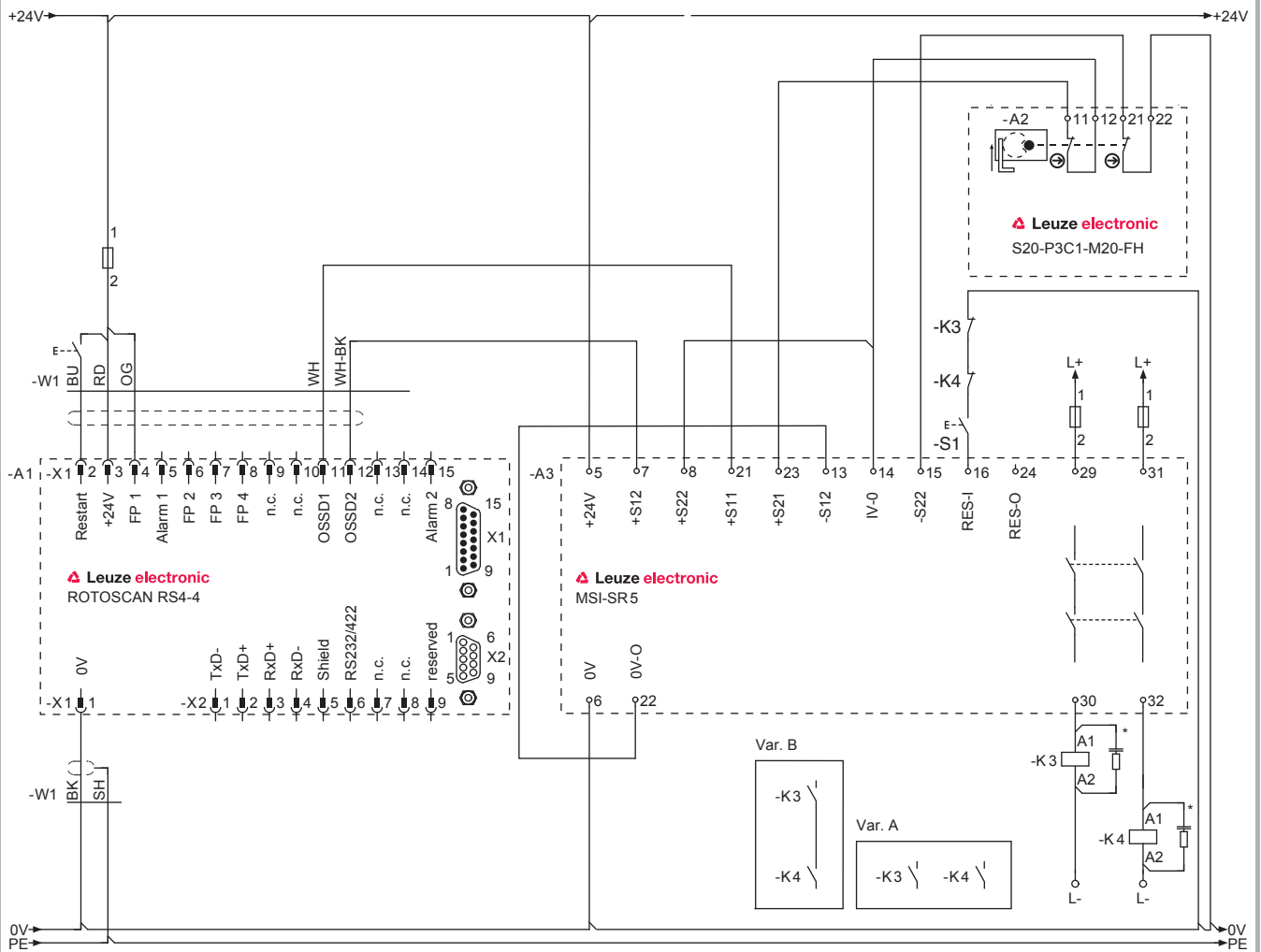
MSI-SR5 with two MLD 330 or MLD 530 Multiple Light Beam Safety Devices

! Please observe the operating instructions of the components!

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Electrical connection

MSI-SR5 connection example



*) Spark extinction circuit, supply suitable spark extinction

MSI-SR5 with ROTOSCAN RS4 Safety Laser Scanner and S20 Safety Switch

⚠ Please observe the operating instructions of the components!

SAFETY RELAYS

Technical data

General system data		
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3	
Performance Level (PL) in accordance with EN ISO 13849-1	e	
Service life (T_M) in accordance with EN ISO 13849-1	20 years	
Probability of a failure to danger per hour (PFH_d) in accordance with the average number of annual n_{op} activations (for the calculation formula, see EN ISO 13849-1:2008, chapter C.4.2 and C.4.3)	$n_{op} = 4.800$	1×10^{-8}
	$n_{op} = 28.800$	2×10^{-8}
	$n_{op} = 86.400$	5×10^{-8}
Number of cycles until 10% of the components have a failure to danger (B_{10d})	With DC1 (ohmic load)	400.000
	With AC1 (ohmic load)	
	With DC13 (inductive load)	
	With AC15 (inductive load)	
	Low load (20% nominal load)	2.500.000
Category in accordance with EN ISO 13849	4 (depending on the category of the upstream protective device)	
Mean time to dangerous failure ($MTTF_d$) in accordance with EN ISO 13849-1	73 years	
Stop category in accordance with EN IEC 60204-1	STOP 0	
Supply voltage in accordance with IEC 60742	24 V AC/DC $\pm 20\%$	
Power consumption	4,8 W	
Safety-related switching outputs (OSSDs)	2 relay outputs (N/O)	
Continuous current per current path	Max. 3 A	
Response time	10 ms	
Restart delay time (manual start)	50 ms	
Restart delay time (automatic start)	350 ms	
Current consumption (without external load)	Max. 150 mA	
Admissible input line resistance	$<30 \Omega$	
Ambient temperature, operation	0...+55°C	
Ambient temperature, storage	-25...+70°C	
Protection rating	IP 20	
Connection system	Screw terminals	
Dimensions (W x H x D)	22.5 mm x 99 mm x 113.6 mm	
Mounting	On 35 mm DIN rail	

Please note the additional information in the connecting and operating instructions and at www.leuze.com/relays.

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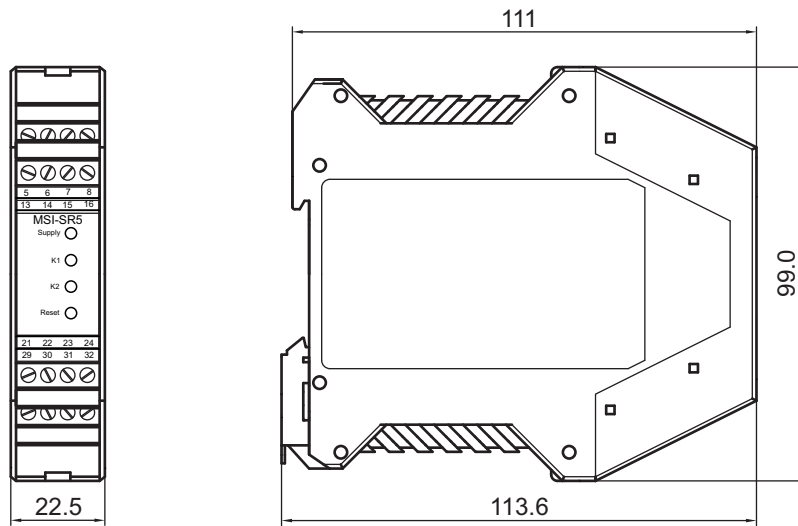
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Dimensional drawings

MSI-SR5 Safety Relay



Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

www.leuze.com/relays/

SAFETY RELAYS

MSI-T



Guarding a wood processing center with SLSR 46B Single Light Beam Safety Devices and MSI-T safety monitoring device

MSI-T is a safety monitoring device for the periodic testing of "testable" optoelectronic protective devices. The two components, both the safety sensor as well as the MSI-T relay, together form an AOPD acc. to EN IEC 61496-1, -2. Up to 6 type 2 sensors can be connected to the MSI-T via a series connection. In addition to testable Leuze electronic type 2 Single Light Beam Safety Devices, type 2 Multiple Light Beam Safety Devices of the MLD 300 series can also be connected to the relay. The machine's functional sequence remains unimpaired by the periodic internal function tests.

Typical areas of application

- Print and paper processing machinery in accordance with EN 1010
- Power-operated windows, doors and gates in accordance with ZH 1/494
- Storage installations in accordance with ZH 1/482 and DIN 15185/2
- Textile machinery in accordance with VGB 76 or DIN ISO 11111
- Packaging machinery in accordance with VBG 76 or prEN 415-2, 3 and 4
- Meat processing machinery in accordance with VBG 79
- Machinery used in the chemicals, rubber and plastics industries in accordance with VBG 22
- Wood processing machinery in accordance with ZH 3.1 to 3.19 and ZH 1/56a

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Important technical data, overview

Type in accordance with EN IEC 61496	2
Performance Level (PL) in accordance with EN ISO 13849-1: 2008	Up to d
Category in accordance with EN ISO 13849-1	2
Supply voltage	24 V DC ±20 %
Response time	<20 ms
Start-up delay	Approx. 2 s
Ambient temperature, operation	-20...+60 °C
Dimensions (W x H x D)	22.5 mm x 99 mm x 113.6 mm

Functions

Safety monitoring device for periodic testing of up to 6 type 2 sensors
Multiple monitoring of type 2 sensors with series connection
Start/restart interlock (RES), optionally with/without
Static contactor monitoring (EDM), with/without optional
"Safety on" signal output
"Error" signal output

Special features

- Constant cyclical testing every 2 s without process interruption of the machine function during the test
- 2 Safety Relay outputs with internal monitoring
- Filter time 130 ms (MSI-TR2)
- STOP1 function (MSI-TS)
- LED indicators for all important functions and operating states.
- Low space-requirement in the cabinet with compact construction



Features



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SAFETY RELAYS

Ordering information

MSI-T

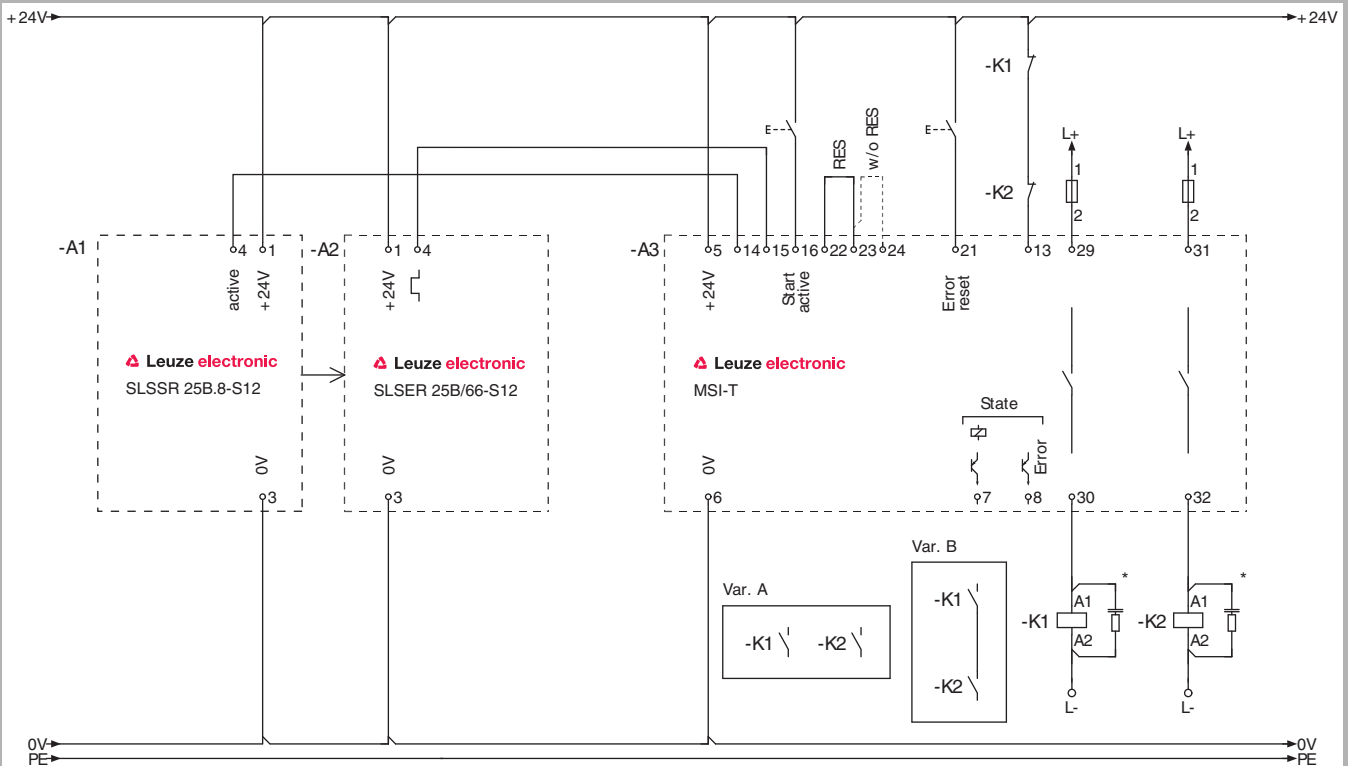
Included in delivery: 1 set of connecting and operating instructions, (PDF file on CD-ROM)

Functions: Periodic function test, start/restart interlock selectable, contactor monitoring (EDM) selectable, "Error" signal output, "Safety ON" signal output (MSI-TR1 and MSI-TR2 only), "STOP1" signal output (MSI-TS only)

MSI-T Safety Relays

Art. no.	Article	Description
549988	MSI-TR1	Safety Relay for periodic testing of type 2 sensors
549990	MSI-TR2	Safety Relay for periodic testing of type 2 sensors with filter time 130 ms
549989	MSI-TS	Safety Relay for periodic testing of type 2 sensors with STOP1 function

Electrical connection



*) Spark extinction circuit, supply suitable spark extinction

MSI-T Safety Relay with type 2 SLSR 25B Single Light Beam Safety Device

! Please observe the operating instructions of the components!

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Technical data

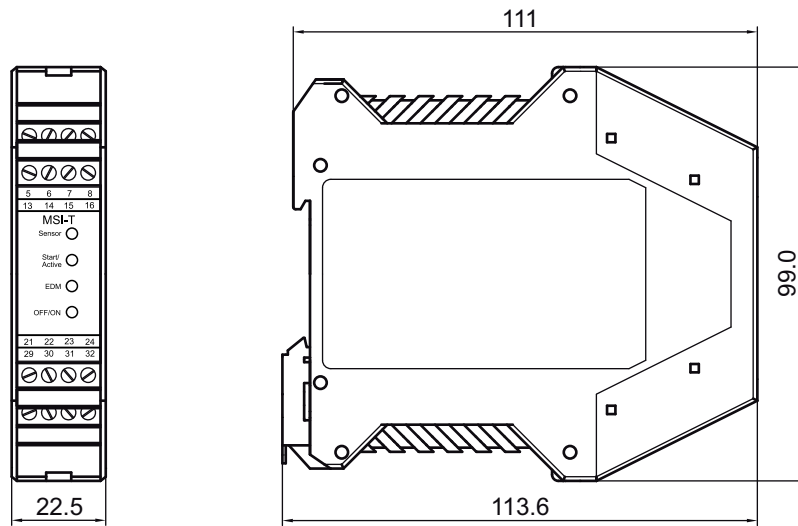
General system data	
Type in accordance with EN IEC 61496	2
Performance Level (PL) in accordance with EN ISO 13849-1: 2008	Up to d
Service life (T_M) in accordance with EN ISO 13849-1	20 years
Probability of a failure to danger per hour (PFH_d)	8.8×10^{-8}
Category in accordance with EN ISO 13849-1	2
Mean time to dangerous failure ($MTTF_d$)	75 years
Supply voltage	+24 V DC $\pm 20\%$
Current consumption	Approx. 200 mA
Response time	<20 ms
Start-up delay	Approx. 2 s
Safety class	II
Protection rating	IP 20 (only suitable for use in operating rooms/cabinets with IP 54 minimum protection rating)
Ambient temperature, operation	-20...+60°C
Ambient temperature, storage	-30...+70°C
Relative humidity (non-condensing)	0...95 %
Dimensions (W x H x D)	22.5 mm x 99 mm x 113.6 mm
Weight	Approx. 200 g
Transmitter activation	PNP (high active)
Receiver input	Input current approx. 5 mA
Start input	Input current approx. 5 mA
Reset input	Input current approx. 5 mA
Contact monitoring (EDM)	Input current approx. 5 mA
"Safety ON" signal output	PNP transistor output, 100 mA, short-circuit and polarity reversal protection
"Error" signal output	PNP transistor output, 100 mA, short-circuit and polarity reversal protection
Safety output	Potential-free make contacts, max. switching voltage 250 V AC, max. current load 2 A
Fuse	External with max. 4 A MT
Overvoltage category	2 for rating voltage 300 V AC in accordance with VDE 0110 part 1

Please note the additional information in the connecting and operating instructions and at www.leuze.com/relays.

SAFETY RELAYS

Dimensional drawings

MSI-T Safety Relay



Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

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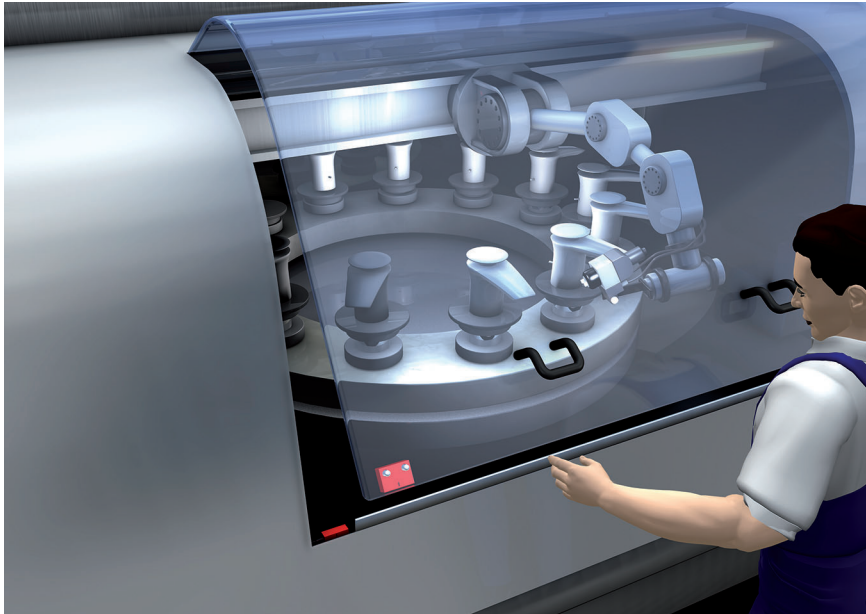
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www.leuze.com/relays/

SAFETY RELAYS

MSI-MC310

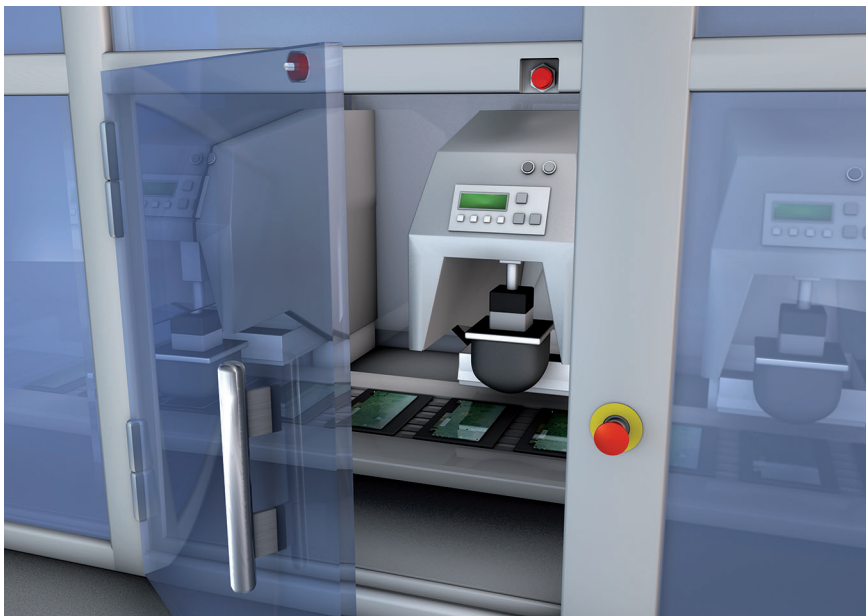


Together with the MSI-MC310 Safety Relay, which is located in the control area of the machine, the MC336 Magnetically Coded Sensor safeguards a painting robot.

The MSI-MC310 Safety Relay serves as evaluation unit for the application of Magnetically Coded Sensors. In combination with the MSI-MC310 Safety Relay, the MC3x Magnetically Coded Sensors are suitable for the integration in control circuits up to category 4 and Performance Level PL e in accordance with EN ISO 13849-1. These kinds of magnetically coded safety systems are used, for example, in the food, pharmaceutical and wood industry to monitor moveable guards such as protective doors, sliding grips or flaps. Opening the protective devices triggers an E-Stop command. For guards that are accessible from behind, a reset button can be connected to the MSI-MC310 Safety Relay for manual starting.

Typical areas of application

- Application in combination with MC3x Magnetically Coded Sensors
- Construction of a safety system up to category 4 in accordance with EN ISO 13849



Cylindrical Magnetically Coded Sensor MC330 for safeguarding a pad printing machine. The associated MSI-MC310 Safety Relay is located in the cabinet.

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MSI-MC310

Magnetically Coded Sensors

Safety Switches

Safety Locking Devices

Safety Command Devices

Safety Relays

Programmable Safety Controllers

Accessories

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Important technical data, overview

Performance Level (PL) in accordance with EN ISO 13849-1	Up to e (depending on the number of connected sensors)
Category in accordance with EN ISO 13849-1	Up to 4 (depending on the number of connected sensors)
Stop category in accordance with EN IEC 60204-1, EN 13850	STOP 0
Supply voltage	24 V AC/DC, ±10%, SELV
Output contacts, OSSDs OSSD protective circuit	2 normal open contacts (N/O), 1 normal closed contact (N/C) Provide suitable spark extinction (via relays, contactors)
Regression delay, response time	20 ms
Ambient temperature, operation	0...+55 °C
Relative humidity (non-condensing)	4% ...100%
Ambient temperature, storage	-25...+70 °C
Relative humidity (non-condensing)	5 % ...95 %
Dimensions (W x H x D)	22.5 mm x 99 mm x 113.6 mm

Functions

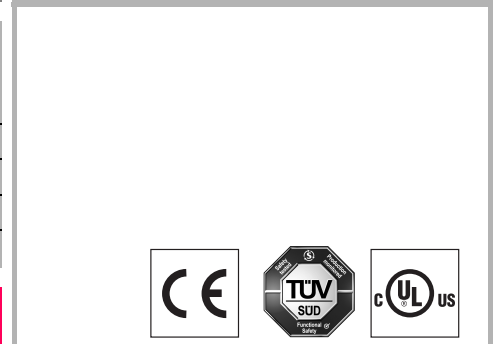
Evaluation unit for the construction of a safety system in combination with MC3x Magnetically Coded Sensors
Up to 30 sensors can be connected in serial combination
Stop function
Start/restart interlock /RES
Contactor monitoring (EDM) in start circuit

Special features

- **Compact housing**
- **All Magnetically Coded Sensors (1NC/1NO) from Leuze electronic are connectable**
- **Automatic and start/restart operation**



Features



Further information

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SAFETY RELAYS

Ordering information

MSI-MC310

Included in delivery: 1 set of connecting and operating instructions (PDF-file on CD-ROM)

Notice: for certified evaluation of MC3x Magnetically Coded Sensors, the MSI-MC310 Safety Relay is required!

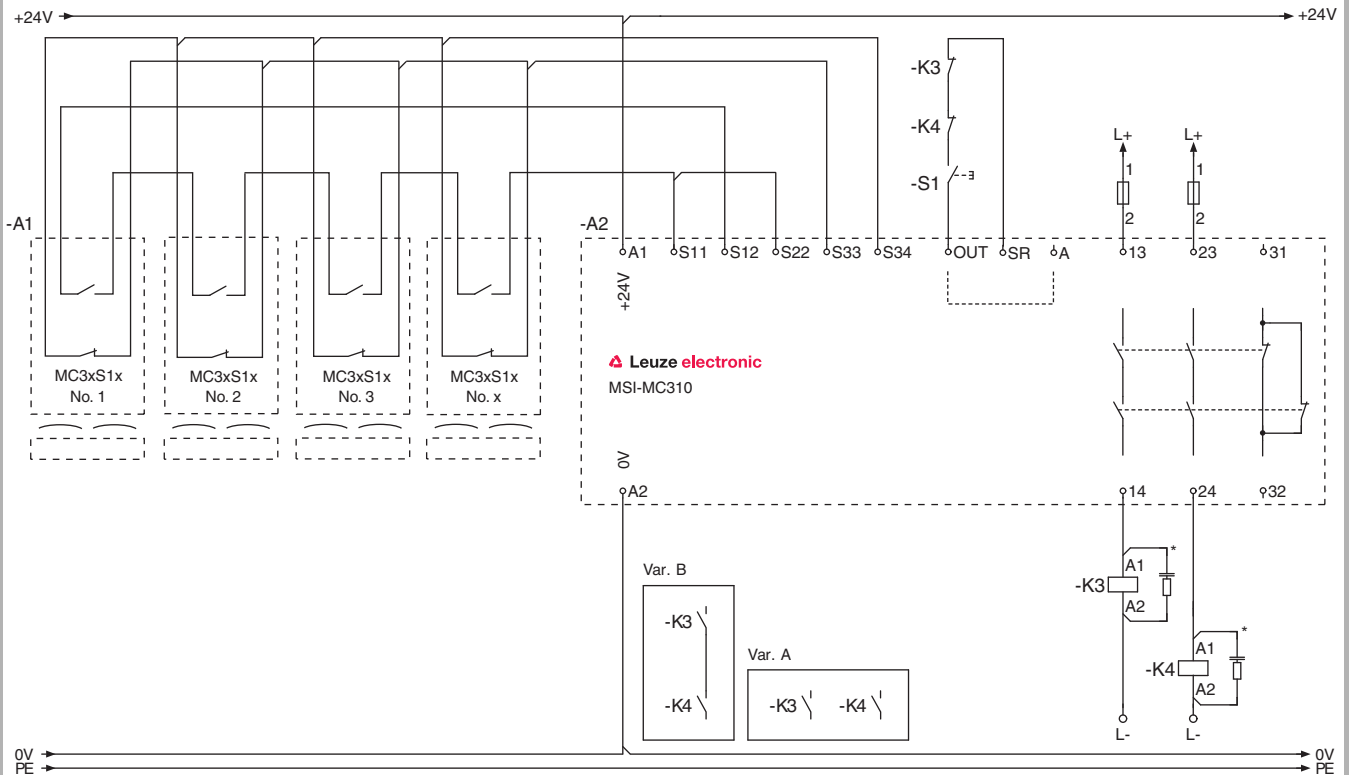
Functions: Evaluation unit for the construction of a safety system in combination with MC3x Magnetically Coded Sensors (max. 30 sensors connectable in series), automatic and start/restart operation

MSI-MC310 Safety Relay

Art. no.	Article	Description
549941	MSI-MC310	Safety Relay

Electrical connection

MSI-MC310 connection example



*) Spark extinction circuit, supply suitable spark extinction

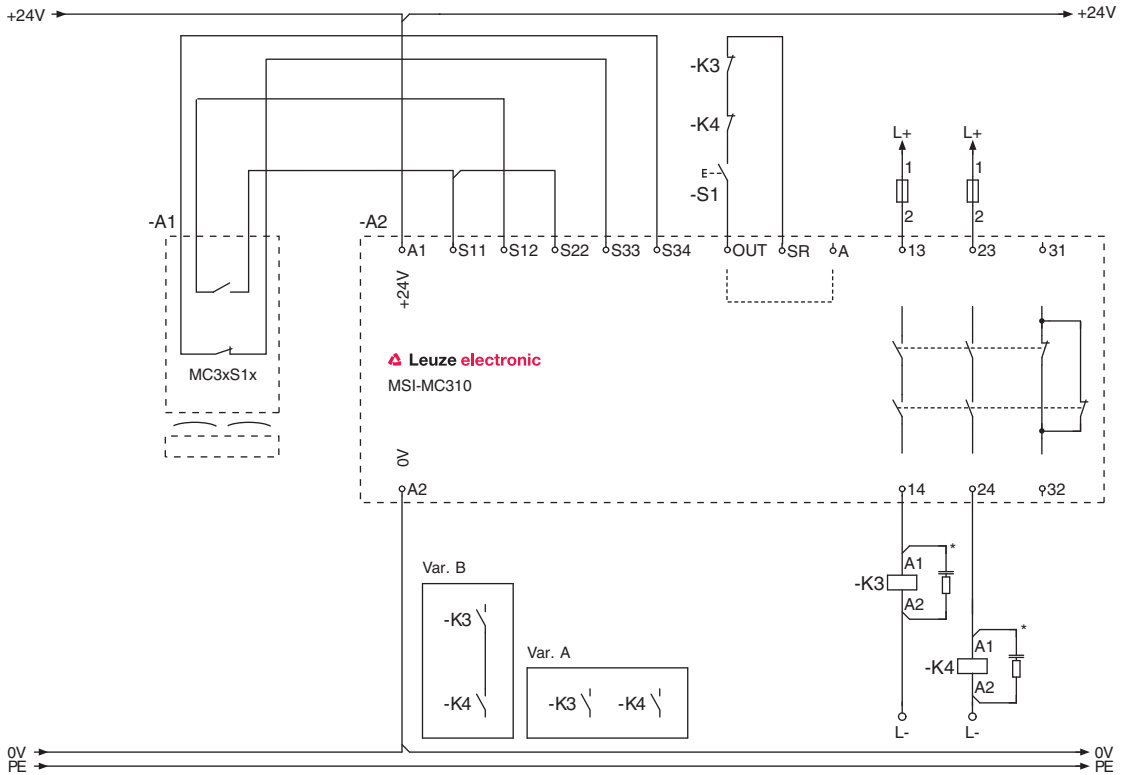
Magnetically Coded Sensors with MSI-MC310 Safety Relay, category 3, Performance Level PL e

⚠ Please observe the operating instructions of the components!

SAFETY RELAYS


Electrical connection

MSI-MC310 connection example



*) Spark extinction circuit, supply suitable spark extinction

Magnetically Coded Sensor with MSI-MC310 Safety Relay, category 4, Performance Level PL e

 Please observe the operating instructions of the components!

Technical data

General system data			
Performance Level (PL) in accordance with EN ISO 13849-1	e	e	d
Category in accordance with EN ISO 13849-1	Up to 4, depending on evaluation, 1 sensor connected	Up to 4, depending on evaluation, more than 1 sensor connected	
Service life (T_M) in accordance with EN ISO 13849-1	20 years		
Average probability of a dangerous failure per hour (PFH_d) with a mean annual number of switching cycles performed by the relay (n_{op})	2.47×10^{-8}	4.29×10^{-8}	1.03×10^{-7}
AC-15 I = 0.9 A	29500	29500	65000
DC-13 I = 0.1 A	97000	97000	261000
I = 1 A	75000	75000	128000
I = 1.5 A	18000	18000	31500
Number of switching cycles at which up to 10% of components have failed dangerously (B_{10d})	2.000.000		
Mean time to dangerous failure ($MTTF_d$ in years)	100	100	56
Stop category in accordance with EN IEC 60204-1, EN 13850	STOP 0		
Control input SR for start/restart interlock (reset)	Potential-free N/O contact (RES-button or key switch)		
Connectable sensors	MC388, MC336, MC330 Magnetically Coded Sensor		
Contact type of the sensors	1NC / 1NO		
Max. number of sensors	30, serial		
Cable length, sensors	30 m		
Pickup delay manual start	600 ms		
Pickup delay automatic start	400 ms		
Max. activation time window between two sensor channels	500 ms		
Regression delay, response time	20 ms		
Supply voltage	24 V AC/DC, $\pm 10\%$, SELV		
Max. input current at 24V DC/AC	10 mA to 110 mA / 30 mA to 150 mA		
Max. switched current, AC-1	3 A		
Min. switched current	10 mA		
Max. switching power	720 W		
Rated insulation voltage	250 V AC		
Mechanical life time	1×10^7 switching cycles		
Requirement on the voltage supply when used acc. to cULus (UL 508)	Class 2 Circuits		
Overvoltage category	II		
Output contacts, OSSDs OSSD protective circuit	2 normal open contacts (N/O), 1 normal closed contact (N/C) Provide suitable spark extinction (via relays, contactors)		
OSSD switching capacity in accordance with EN 60947-5-1	AC-15 (U_e / I_e): 240 V / 0.9 DC-13 (U_e / I_e): 24 V / 1.5 A		
Internal safeguarding of U_b	750 mA per PTC Multifuse		
External contact fuse protection in accordance with EN 60269-1	4A gG		

SAFETY RELAYS

Technical data

Connection	
Protection rating acc. to EN 60529	Housing IP 40, terminals IP 20 for installation in cabinet or housing with protection rating of at least IP 54 required Finger-safe acc. to DIN VDE 0106 part 100, maximum stripped length of the connection cables 8 mm
Connection cross-section (GS-ET-20: 2009)	1 x 0.2 to 2.5 mm ² , fine-wired or 1 x 0.25 to 2.5 mm ² , fine-wired with wire-end sleeves 2 x 0.5 to 1.5 mm ² , fine-wired with Twin wire-end sleeves 1 x 0.2 to 2.5 mm ² , single-wired or 2 x 0.25 to 1.0 mm ² , fine-wired with wire-end sleeves 2 x 0.2 to 1.5 mm ² , fine-wired 2 x 0.2 to 1.0 mm ² , single-wired
Environment	
Ambient temperature, operation Relative humidity (non-condensing)	0...+55°C 4% ...100%
Ambient temperature, storage Relative humidity (non-condensing)	-25...+70°C 5% ...95%
Vibration resistance	EN 60947-5-3
Dirt levels, external, in accordance with EN 60947-1	2
EMC compliance	EN 60947-5-3 EN 61000-6-3 EN 61000-6-2 EN 55011
Housing	
Material	Plastic (PA)
Dimensions (W x H x D)	22.5 mm x 99 mm x 113.6 mm
Installation point	Arbitrary, on 35 mm DIN top-hat supporting rail in accordance with DIN EN 50022

These tables do not apply in combination with additional M12 plug or connecting cable except where these components are explicitly mentioned.

Please note the additional information in the connecting and operating instructions and at www.leuze.com/relays.

MSI-RM2
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MSI-2H
p. 434

MSI-SR4
p. 440

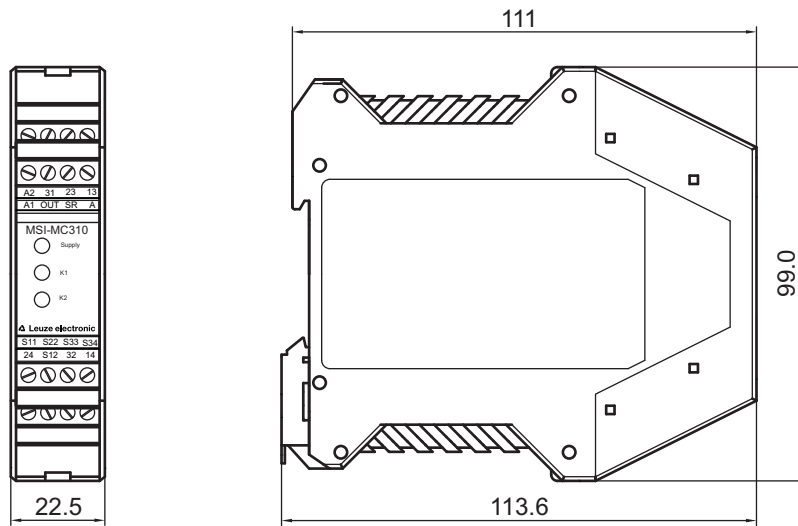
MSI-SR5
p. 446

MSI-T
p. 452

MSI-MC310
p. 458

Dimensional drawings

MSI-MC310 Safety Relay



Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

www.leuze.com/relays/

PROGRAMMABLE SAFETY CONTROLLERS

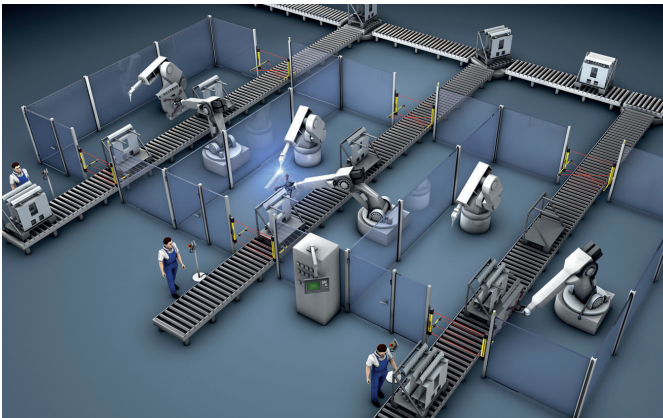
Programmable Safety Controller selection table



Control of individual safety components with programmable Safety Controllers.

For small- to medium-size machines, compact safety controls are used increasingly for monitoring the safety circuit. A simple and quickly realized safety system independent of standard controls is preferred by the user. With their simple handling during start-up, flexible configuration options and broad, on-board functionality, the MSI 100 and MSI 200 programmable Safety Controllers offer an optimum system solution for small- to medium-size machines.

Based on the MSI*safesoft* programming software, the MSI 100 and MSI 200 Safety Controllers facilitate the efficient integration, communication and coordination of a machine's safety elements through the use of function modules and logic blocks. Depending on machine type, the advantage of the modularity of these safety controls becomes apparent in the simple expandability of the safety system through I/O modules and through the connection of communication modules for integration in the fieldbus level.



*When creating safety circuits with the MSI 100 and MSI 200 Safety Controllers, the MSI*safesoft* software facilitates menu-driven and trouble-free configuration.*

MSI 100
p. 468

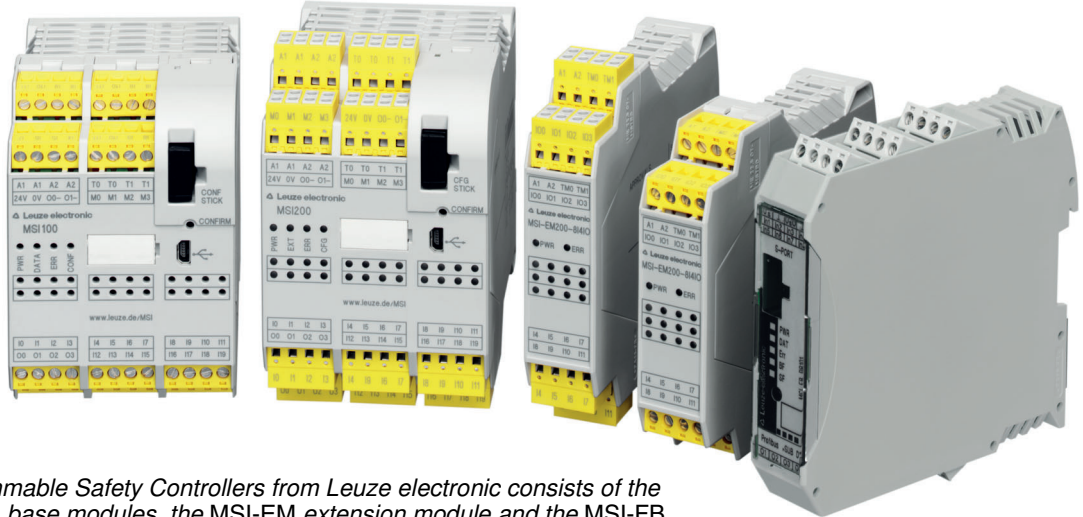
MSI 200
p. 476

MSI-EM
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MSI-FB
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OVERVIEW

Selection table



The family of programmable Safety Controllers from Leuze electronic consists of the MSI 100 and MSI 200 base modules, the MSI-EM extension module and the MSI-FB fieldbus module.

Category in accordance with EN ISO 13849			Performance Level (PL) in accordance with EN ISO 13849-1			Dimensions (W x H x D)		Inputs/outputs (OSSDs)		Features, type-dependent		Series	Page
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	Base module	Additional module	W	H	D	Inputs/outputs (OSSDs)	Bus interface	Screw terminal	Spring-cage terminal				
4	3	e	67.5 mm	114.5 mm	99 mm	20/4	With MSI-FB	●	●	MSI 100	468		
			67.5 mm	114.5 mm	112 mm	20/4	With MSI-FB	●	●	MSI 200	476		
			22 mm	114.5 mm	99 mm	8/4*		●	●	MSI-EM	484		
			22 mm	114.5 mm	99 mm		PROFIBUS	●		MSI-FB**	486		

*) configurable channels for input/output selectable
 **) connectable to all MSI 100 and MSI 200 base modules

www.leuze.com/msi-controller/

PROGRAMMABLE SAFETY CONTROLLERS

MSI 100 Safety Controller



Programmable Safety Controllers, such as the stand-alone MSI 100 base module, control safety within automated production processes.

In automated systems, sensors and actuators must interact with one another functionally and safely. The necessary coordination is performed by the MSI 100 programmable Safety Controller. The controller monitors all safety functions, e.g. of E-Stop buttons, two-hand controls, protective doors, AOPDs and similar, in machines and systems in extremely compact form. With an overall width of just 67.5 mm, the device makes 20 safe inputs and 4 safe outputs available to the user. Additional clock- and ground-switching outputs increase the safety of the monitoring circuits. Message outputs are available for diagnostics. The programming for defining the device function can be quickly and easily performed with the *MSIsafesoft* software. The software's certified function blocks, which can be integrated using drag & drop functionality, facilitate menu-driven and trouble-free configuration of every safety circuit application.



As stand-alone base module, the MSI 100 Safety Controller monitors safety components at 20 safe inputs, e.g. L100 Safety Locking Devices in a blister machine.

Typical areas of application

- Robot cells
- Automatic processing centers
- Packaging machinery
- Tool manufacturing

MSI 100
p. 468

MSI 200
p. 476

MSI-EM
p. 484

MSI-FB
p. 486

Important technical data, overview

SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3
Performance Level (PL) in accordance with EN ISO 13849-1	e
Category in accordance with EN ISO 13849	4
Supply voltage	24 V DC
Reaction time	<30 ms
Ambient temperature, operation	-20... +55°C
Protection rating	IP 20
Dimensions (W x H x D)	67.5 mm x 114.5 mm x 99 mm
Connection system	Plug in screw terminals, spring-cage terminals
Number of safe inputs	20 (up to SIL 3 / EN IEC 62061)
Safety-related switching outputs (OSSDs)	4 (cat. 4 / EN 13849-1 / EN 954)
Interfaces	USB, TBUS DIN rail for bus coupler

Functions

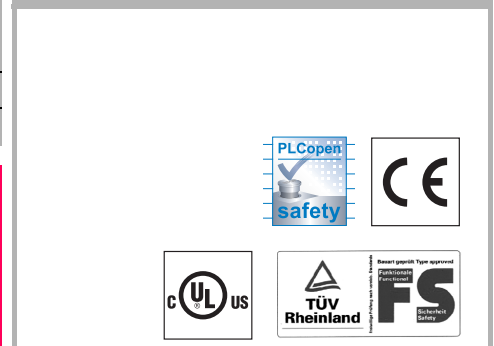
Freely configurable safety base module
Monitoring of all safe functions in machines and systems
Transfers diagnostic data via MSI-FB fieldbus module (option)

Special features

- 20 safe inputs, 4 safe switching outputs (OSSDs)
- 4 message outputs, 2 clock switching outputs, 2 ground-switching outputs
- Free configuration with *MSIsafesoft* software
- Extensive device library with certified function blocks
- Data stick with configuration storage
- Designs with screw terminals as well as with spring-cage terminals
- Start-up set for quickly getting up to speed



Features



Further information

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PROGRAMMABLE SAFETY CONTROLLERS

Ordering information

MSI 100

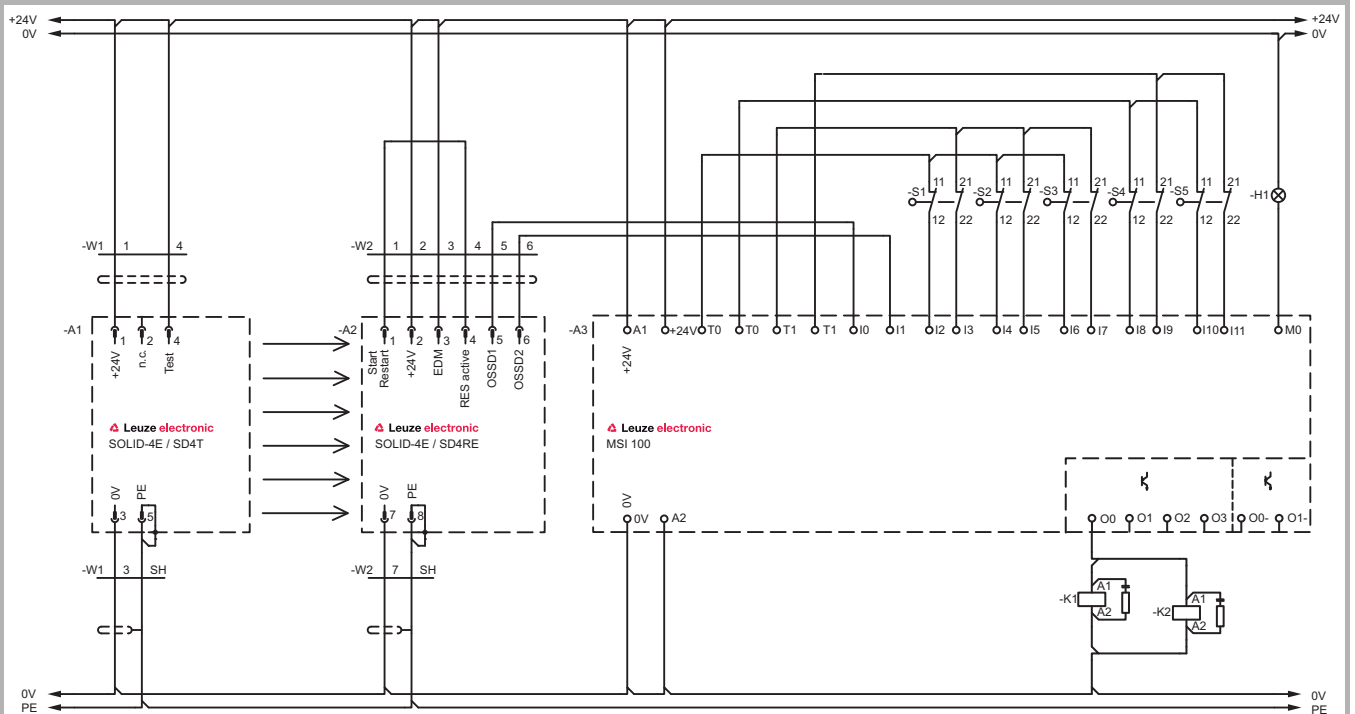
Included in delivery: connecting and operating instructions, 1 terminal set, 1 data memory module, 1 TBUS Safety connection plug. Start-up set can be ordered separately.

Functions: Freely configurable safety base module, monitoring of all safety-oriented functions in machines and systems

MSI 100

Art. no.	Article	Description	Safe inputs / safety-related switching outputs (OSSDs)
547802	MSI101	Programmable MSI Safety Controller, screw terminal	20 safe inputs, 4 transistor outputs
547812	MSI102	Programmable MSI Safety Controller, spring-cage terminal	20 safe inputs, 4 transistor outputs

Electrical connection, MSI 100 connection example



MSI 100 with SOLID-4E Safety Light Curtain and several S200 Safety Switches

! Please observe the operating instructions of the components!

MSI 100 p. 468	MSI 200 p. 476	MSI-EM p. 484	MSI-FB p. 486
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Technical data

General system data		
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3	
Performance Level (PL) in accordance with EN ISO 13849-1	e	
Service life (T_M) in accordance with EN ISO 13849-1	20 years	
Probability of a failure to danger per hour (PFH_d)	1.37×10^{-8}	
Category in accordance with EN ISO 13849	4	
Mean time to dangerous failure ($MTTF_d$) in accordance with EN ISO 13849-1	8324 years	
Supply voltage	24 V DC	
Current consumption	Approx. 200 mA without external load	
Maximum reaction time	<30 ms	
Restart recovery time	<5 ms	
Readiness delay	4 s	
Protection rating	Housing	IP 20
	Connection terminals	IP 20
Ambient temperature, operation	-20... +55°C	
Ambient temperature, storage	-20... +70°C	
Dimensions (W x H x D)	67.5 mm x 114.5 mm x 99 mm	
Conductor cross-section	Screw connection	0.2...2.5 mm ²
	Spring-cage connection	0.2...1.5 mm ²
Housing material	Unreinforced polyamide PA	
Mounting	On 35 mm DIN rail	
Connection system	Plug-in screw terminals	
Interfaces	USB, TBUS DIN rail for bus coupler	
Input data logic		
Nominal input voltage U_N	24 V DC, -15 % to +10 %	
Typ. current consumption at U_N	200 mA	
Inputs		
Number of safe inputs	20 (up to SIL 3 / EN IEC 62061)	
Nominal voltage U_N	24 V DC (to ground A2)	
Typ. current consumption at U_N	4 mA	

PROGRAMMABLE SAFETY CONTROLLERS

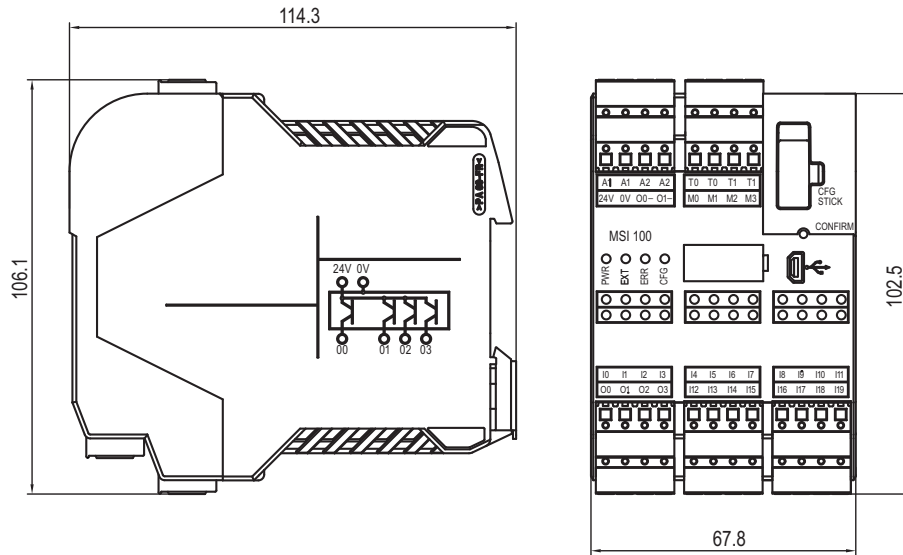
Technical data

Outputs	
Safety-related switching outputs (OSSDs)	4 (cat. 4 / EN 13849-1 / EN 954)
Ground-switching outputs	2
Nominal voltage	24 V DC, -15 % to +10 %
Limiting continuous current for devices at A1 and A2 terminals (wired-through current paths A1/A1 and A2/A2)	6 A
Limiting continuous current via TBUS (when supplying external modules via TBUS)	4 A
Clock outputs	2, limiting continuous current 100 mA at 24 V DC
Signal outputs	4, limiting continuous current 100 mA at 24 V DC

Please note the additional information in the connecting and operating instructions and at www.leuze.com/controller/.

Dimensional drawings

MSI 100 programmable Safety Controller



Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

www.leuze.com/controller/

PROGRAMMABLE SAFETY CONTROLLERS

Accessories ordering information

Art. no.	Article	Description
547820	AC-MSI-CFG1	10x plug-in data memory modules
547821	AC-MSI-TCS	10x MSI TBUS safety connection plugs
547822	AC-MSI-USB	MSI USB cable MSI-PC, 2 m
547823	AC-MSI-TC	10x MSI TBUS standard connection plugs (for fieldbus gateways)
547825	MSI-SWC1	MSI start-up set (includes: CD with MSIsafesoft, USB cable, Quick Start Guide)
MSI-FB		
547806	MSI-FB-PB101	PROFIBUS module, screw terminal

Start-up set for MSI 100, MSI 200

The start-up set offers everything for fast realization of the application. It includes:

- MSIsafesoft configuration software
- USB cable for connecting the Safety Controller to a PC (not included in delivery)
- Quick Start Guide for a quick introduction to the topic: First Steps.



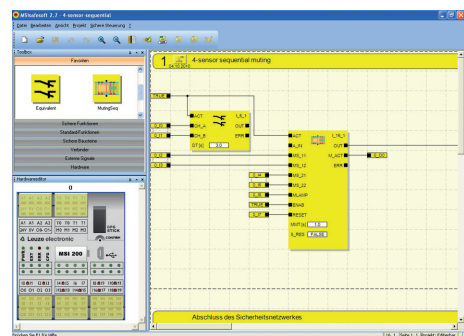
MSIsafesoft configuration software for simple device configuration

The MSIsafesoft configuration software helps the user avoid systematic errors. The software supports the user with certified function modules, automatic logic testing, practical wiring inspection and extensive simulation.

With the software, users easily configure the functions of MSI modules through drag & drop functionality.

1. Select and configure safety functions.
2. Connect inputs and outputs of the module to the safety functions.
3. Test the safety functions and save—finished.

The integrated simulation mode and automatic logic testing provide safety even during creation. Configured with the click of a mouse, the device simultaneously reduces wiring and minimizes sources of error. Thanks to the simple configuration, new protective devices can be integrated quickly and safely at any time.

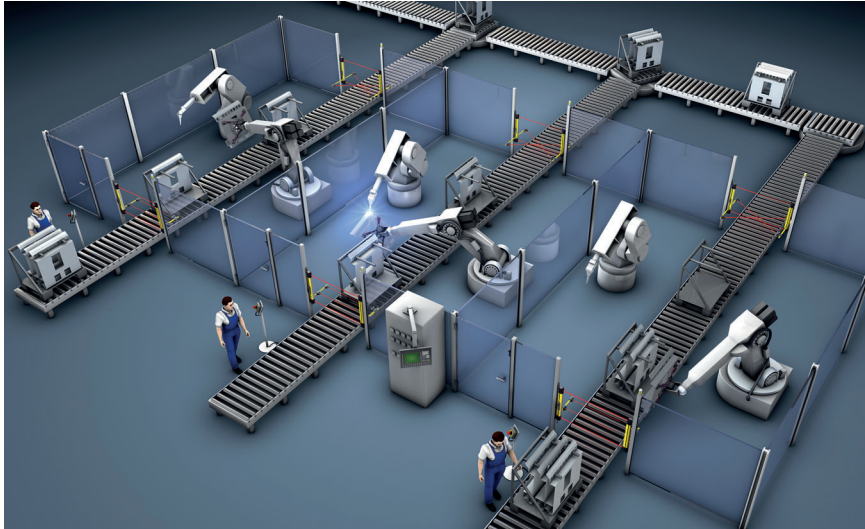


MSI 100 p. 468	MSI 200 p. 476	MSI-EM p. 484	MSI-FB p. 486
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www.leuze.com/controller/

PROGRAMMABLE SAFETY CONTROLLERS

MSI 200 Safety Controller, expandable

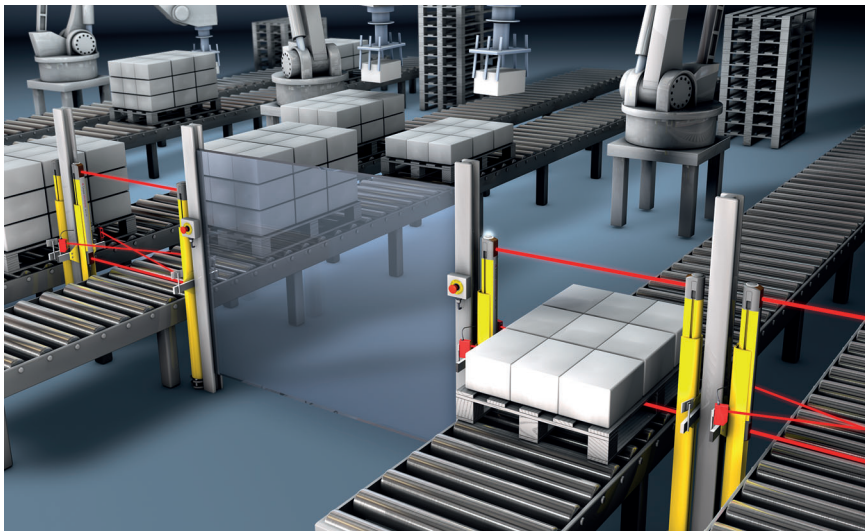


In automated systems, sensors and actuators must interact with one another functionally and safely. The necessary coordination is performed by the MSI 200 programmable Safety Controller. Unlike the MSI 100 controller, the MSI 200 facilitates the coupling of extension modules (safe I/O modules are available as accessories).

Typical areas of application

- Robot cells
- Automatic processing centers
- Packaging machinery
- Tool manufacturing

Programmable Safety Controllers, such as the modularly expandable MSI 200 base module, control a range of safety components within complex, automatic production processes thanks to the numerous safe inputs.



In systems with many safety sensors, the modularly expandable MSI 200 Safety Controller has advantages, since the number of safe inputs can be significantly increased with additional MSI-EM extension modules.

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MSI 200
p. 476

MSI-EM
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MSI-FB
p. 486

Important technical data, overview

SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3
Performance Level (PL) in accordance with EN ISO 13849-1	e
Category in accordance with EN ISO 13849	4
Supply voltage	24 V DC
Reaction time	<30 ms
Ambient temperature, operation	-20... +55°C
Protection rating	IP 20
Dimensions (W x H x D)	67.5 mm x 114.5 mm x 112 mm
Connection system	Plug in screw terminals, spring-cage terminals
Number of safe inputs	20 (up to SIL 3 / EN IEC 62061)
Safety-related switching outputs (OSSDs)	4 (cat. 4 / EN 13849-1 / EN 954)
Interfaces	USB, TBUS DIN rails for extension modules and bus couplers

Functions

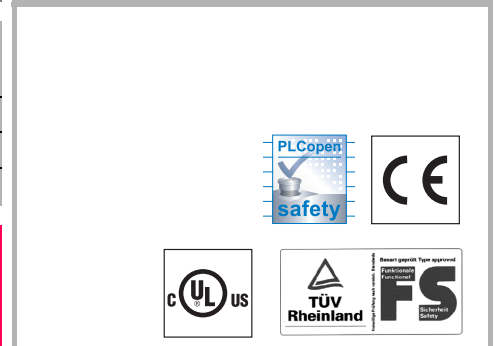
Freely configurable safety base module
Monitoring of all safe functions in machines and systems
Safety-oriented expandability with additional input/output modules
Transfers diagnostic data via MSI-FB fieldbus module (option)

Special features

- 20 safe inputs, 4 safe switching outputs (OSSDs)
- Extension modules with additional input/output modules available for MSI 200
- 4 message outputs, 2 clock switching outputs, 2 ground-switching outputs
- Free configuration with *MSIsafesoft* software
- Extensive device library with certified function blocks
- Data stick with configuration storage
- Designs with screw terminals as well as with spring-cage terminals
- Start-up set for quickly getting up to speed



Features



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PROGRAMMABLE SAFETY CONTROLLERS

Ordering information

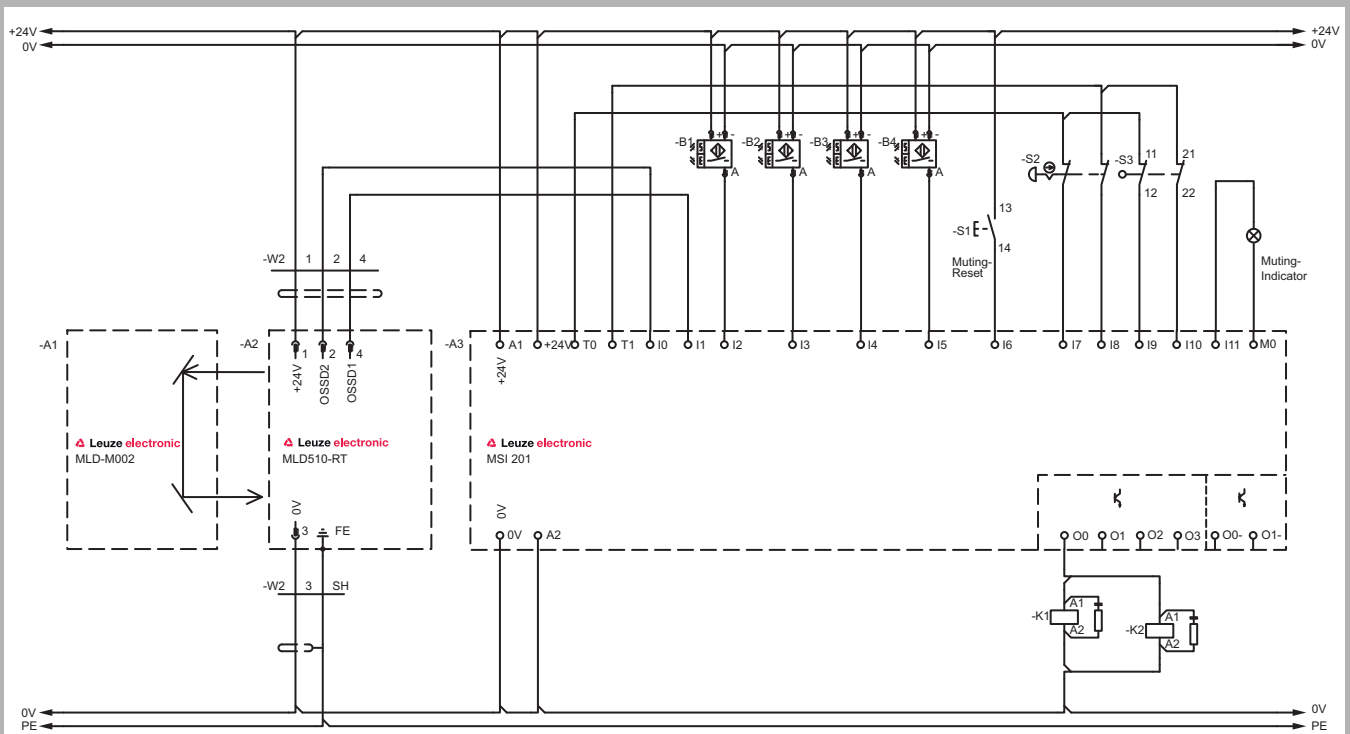
MSI 200

Included in delivery: connecting and operating instructions, 1 terminal set, 1 data memory module, 2 TBUS Safety connection plugs. Start-up set can be ordered separately.

Functions: Freely configurable safety base module, monitoring of all safety-oriented functions in machines and systems, safety-oriented expandability with additional input/output modules

Art. no.	Article	Description	Safe inputs / safety-related switching outputs (OSSDs)
MSI 200			
547803	MSI201	Programmable MSI Safety Controller, expandable, screw terminal	20 safe inputs, 4 transistor outputs
547813	MSI202	Programmable MSI Safety Controller, expandable, spring-cage terminal	20 safe inputs, 4 transistor outputs

Electrical connection, MSI 200 connection example



MSI 200 with E-Stop button and MLD Multiple Light Beam Safety Device for 4-sensor sequential muting

! Please observe the operating instructions of the components!

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MSI-EM
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Technical data

General system data		
SIL in accordance with IEC 61508 and SILCL in accordance with EN IEC 62061	3	
Performance Level (PL) in accordance with EN ISO 13849-1	e	
Service life (T_M) in accordance with EN ISO 13849-1	20 years	
Probability of a failure to danger per hour (PFH_d)	1.37×10^{-8}	
Category in accordance with EN ISO 13849	4	
Mean time to dangerous failure ($MTTF_d$) in accordance with EN ISO 13849-1	8324 years	
Supply voltage	24 V DC	
Current consumption	Approx. 200 mA without external load	
Maximum reaction time	<30 ms	
Restart recovery time	<5 ms	
Readiness delay	4 s	
Protection rating	Housing	IP 20
	Connection terminals	IP 20
Ambient temperature, operation	-20... +55°C	
Ambient temperature, storage	-20... +70°C	
Dimensions (W x H x D)	67.5 mm x 114.5 mm x 112 mm	
Conductor cross-section	Screw connection	0.2...2.5 mm ²
	Spring-cage connection	0.2...1.5 mm ²
Housing material	Unreinforced polyamide PA	
Mounting	On 35 mm DIN rail	
Number of possible safe extension modules	10	
Connection system	Pluggable spring-cage terminals	
Interfaces	USB, TBUS DIN rails for extension modules and bus couplers	
Input data logic		
Nominal input voltage U_N	24 V DC, -15 % to +10 %	
Typ. current consumption at U_N	200 mA	
Inputs		
Number of safe inputs	20 (up to SIL 3 / EN IEC 62061)	
Nominal voltage U_N	24 V DC (to ground A2)	
Typ. current consumption at U_N	4 mA	

www.leuze.com/controller/

PROGRAMMABLE SAFETY CONTROLLERS

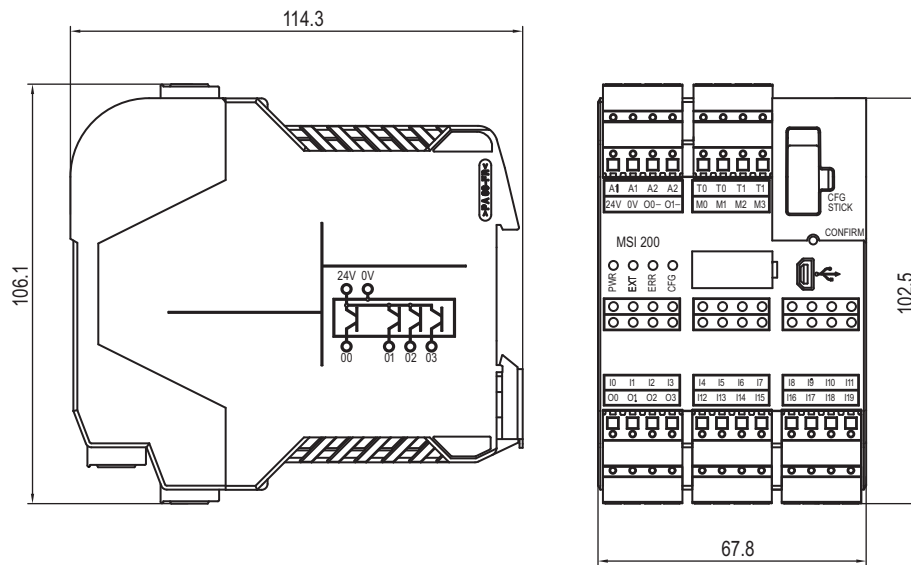
Technical data

Outputs	
Safety-related switching outputs (OSSDs)	4 (cat. 4 / EN 13849-1 / EN 954)
Ground-switching outputs	2
Nominal voltage	24 V DC, -15 % to +10 %
Limiting continuous current for devices at A1 and A2 terminals (wired-through current paths A1/A1 and A2/A2)	6 A
Limiting continuous current via TBUS (when supplying external modules via TBUS)	4 A
Clock outputs	2, limiting continuous current 100 mA at 24 V DC
Signal outputs	4, limiting continuous current 100 mA at 24 V DC

Please note the additional information in the connecting and operating instructions and at www.leuze.com/controller/.

Dimensional drawings

MSI 200 programmable Safety Controller



Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

www.leuze.com/controller/

PROGRAMMABLE SAFETY CONTROLLERS

Accessories ordering information

Art. no.	Article	Description
547820	AC-MSI-CFG1	10x plug-in data memory module
547821	AC-MSI-TCS	10x MSI TBUS safety connection plug
547822	AC-MSI-USB	MSI USB cable MSI-PC, 2 m
547823	AC-MSI-TC	10x MSI TBUS standard connection plug (for fieldbus gateways)
547825	MSI-SWC1	MSI start-up set (includes: CD with MSI <i>safesoft</i> , USB cable, Quick Start Guide)
MSI-EM		
547804	MSI-EM201-8I4IO	Digital extension module, screw terminal
547814	MSI-EM202-8I4IO	Digital extension module, spring-cage terminal
MSI-FB		
547806	MSI-FB-PB101	PROFIBUS module, screw terminal

Start-up set

See start-up set for MSI 100, MSI 200, page 474

Configuration software

See MSI*safesoft* configuration software for simple device configuration, page 474

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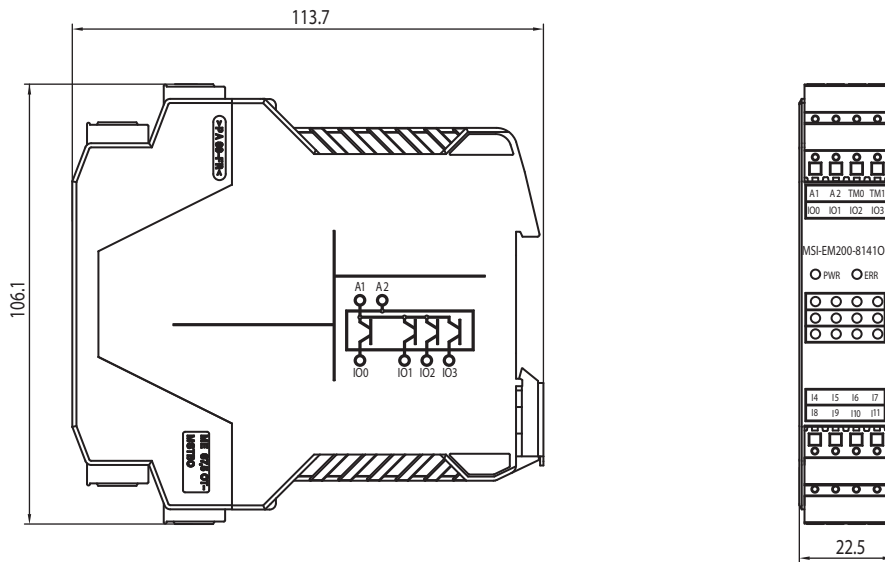
MSI-FB
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www.leuze.com/controller/

PROGRAMMABLE SAFETY CONTROLLERS

MSI-EM extension modules (I/O extension)

Dimensional drawings



Dimensions in mm

Ordering information

MSI-EM

Included in delivery: 1 TBUS safety connection plug.

Functions: Extension module for the MSI 200 programmable Safety Controller, extension with 8 safe inputs and 4 safe, freely configurable channels-either safe inputs or outputs (OSSDs)

Art. no.	Article	Description
547804	MSI-EM201-8I4IO	Digital extension module, screw terminal
547814	MSI-EM202-8I4IO	Digital extension module, spring-cage terminal

Important technical data, overview

Category in accordance with EN ISO 13849	4
Dimensions (W x H x D)	22.5 mm x 114.5 mm x 99 mm
Connection system	Plug in screw terminals, spring-cage terminals
Number of safe inputs	12, 4 of which are configurable as input or output
Safety-related switching outputs (OSSDs)	4 if using the configurable inputs/outputs as outputs
Interfaces	TBUS DIN rails for extension modules and bus coupler

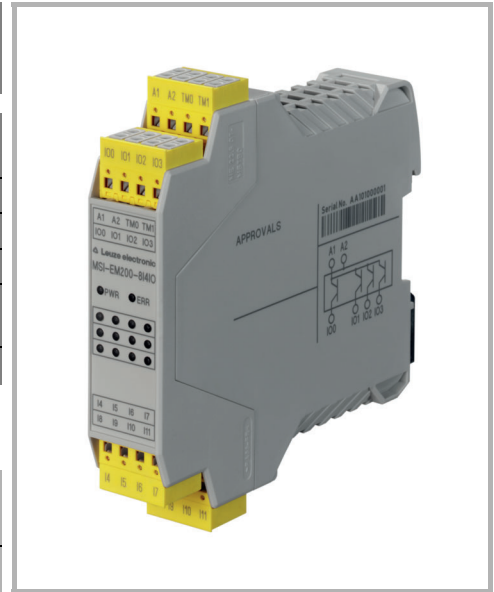
Please note the additional information in the connecting and operating instructions at www.leuze.com/controller/.

Functions

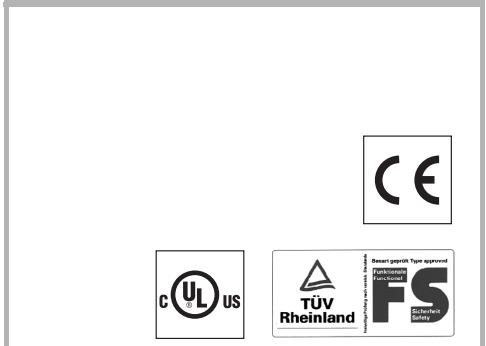
Extension module for the MSI 200 programmable Safety Controller
 Extension with 8 safe inputs and 4 safe, freely configurable channels-either as safe inputs or outputs (OSSDs)

Special features

- Simple connection via DIN rail connector
- Designs with screw terminals as well as with spring-cage terminals
- Compact housing width 22 mm
- 4 freely configurable safety outputs (OSSDs)



Features



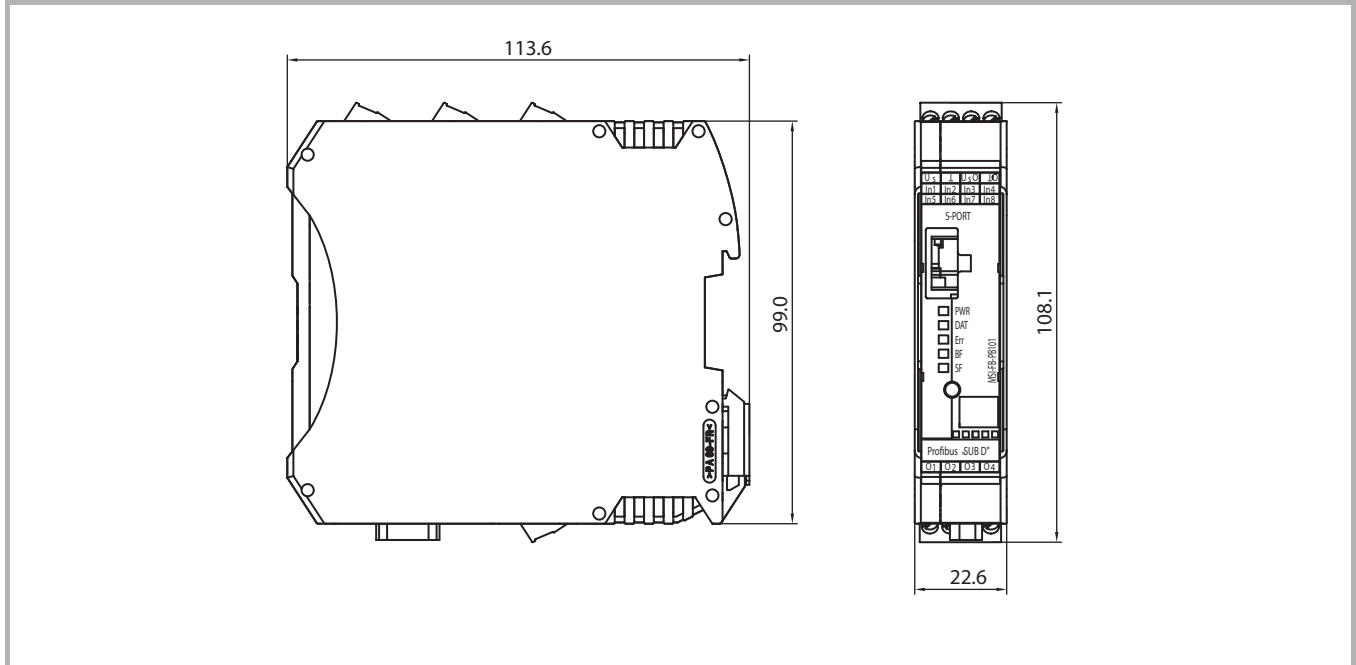
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| ● Dimensional drawings | 484 |

PROGRAMMABLE SAFETY CONTROLLERS

MSI-FB-PB fieldbus modules (Profibus)

Dimensional drawings



Dimensions in mm

Ordering information

MSI-FB

Included in delivery: 1 TBUS safety connection plug.

Functions: Fieldbus module for the MSI 100 and MSI 200 programmable Safety Controllers for connecting to PROFIBUS

Art. no.	Article	Description
547806	MSI-FB-PB101	PROFIBUS module, screw terminal

MSI-FB-PB

Important technical data, overview

Supply voltage	24 V DC
Protection rating	IP 20
Dimensions (W x H x D)	22.5 mm x 114.5 mm x 99 mm
Connection system	Plug-in screw terminals
Number of inputs	4
Number of switching outputs	4
Interface 1	IFS interface, TBUS
Interface 2	PROFIBUS-DP, D-SUB-9

Please note the additional information in the connecting and operating instructions at www.leuze.com/controller/.

Functions

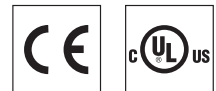
Fieldbus module for connecting the MSI 100 and MSI 200 programmable Safety Controllers to PROFIBUS

Special features

- Certified in accordance with DPV1 specification (EN 50170)
- Simple connection via DIN rail connector
- Compact housing width 22 mm



Features



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www.leuze.com/controller/

ACCESSORIES

UDC, DC Device Columns

Free-standing optoelectronic protective devices are subject to special requirements with regard to mounting, stability and alignment quality. The UDC/DC device mounting columns enable the free-standing mounting of Leuze electronic Multiple Light Beam Safety Devices and Safety Light Curtains on the floor. Firmly anchored in the floor, they reliably protect the sensors against damage with their robust construction. A

precise vertical and axial alignment of the devices is an easy option. Spring elements in the base of the Device Columns (UDC model) ensure an automatic resetting after mechanical impacts (blows, knocks).

Areas of application and ordering information

Accessories		Suitable for sensors with complete installation			
Device Columns		Safety Light Curtain (protective field height in mm)		Multiple Light Beam Safety Device	
Art. no.	Article	COMPACTplus	SOLID-4, 2	MLD 500, MLD 300	COMPACTplus-m
UDC with automatic reset function incl. accessories set					
549827	UDC-1000-S1	Up to 750 mm	Up to 900 mm	2-beam	2-beam
549828	UDC-1300-S1	Up to 1050 mm	Up to 1200 mm	All	All
549814	UDC-1600-S1	Up to 1350 mm	Up to 1500 mm	All	All
549829	UDC-1900-S1	Up to 1650 mm	Up to 1800 mm	All	All
DC-S1 - with fixed mounting plate					
549610	DC-1000-S1	Up to 750 mm	Up to 900 mm	2-beam	2-beam
549613	DC-1300-S1	Up to 1050 mm	Up to 1200 mm	All	All
549616	DC-1600-S1	Up to 1350 mm	Up to 1500 mm	All	All
549619	DC-1900-S1	Up to 1650 mm	Up to 1800 mm	All	All
Accessories for Device Columns					
430092	MS-DC/MC	DC/MC column accessories set			
346172	CP-UDC/DC	Cover, open at the top for UDC/DC			
424416	BT-P40	Clamp bracket incl. screws and sliding blocks			
424417	BT-2P40	2 clamp brackets incl. screws and sliding blocks			
426181	PSC-1000*	Protective screen DC/UDC		1000 mm long	
426182	PSC-1300*	Protective screen DC/UDC		1300 mm long	
426183	PSC-1600*	Protective screen DC/UDC		1600 mm long	
426184	PSC-1900*	Protective screen DC/UDC		1900 mm long	

*) Please note that the range of the Safety Light Curtain is reduced by approx. 10 % per screen with the use of protective screens. These articles are not suitable for COMPACTplus Safety Light Curtains with local connection box AC-SCM1

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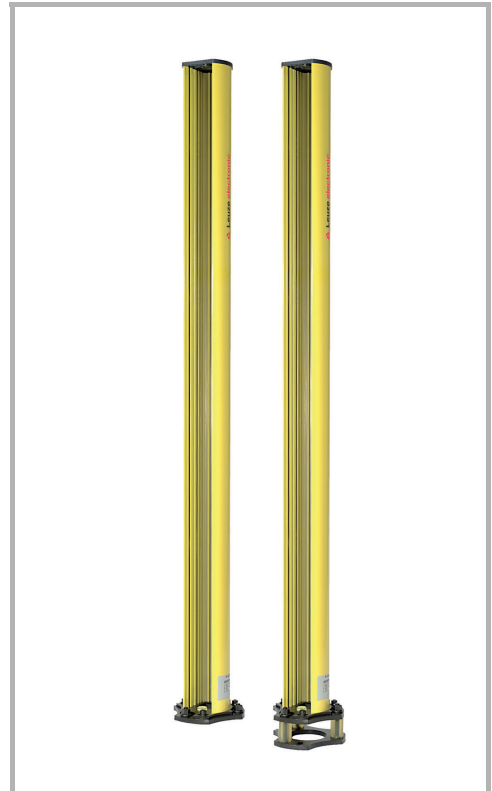
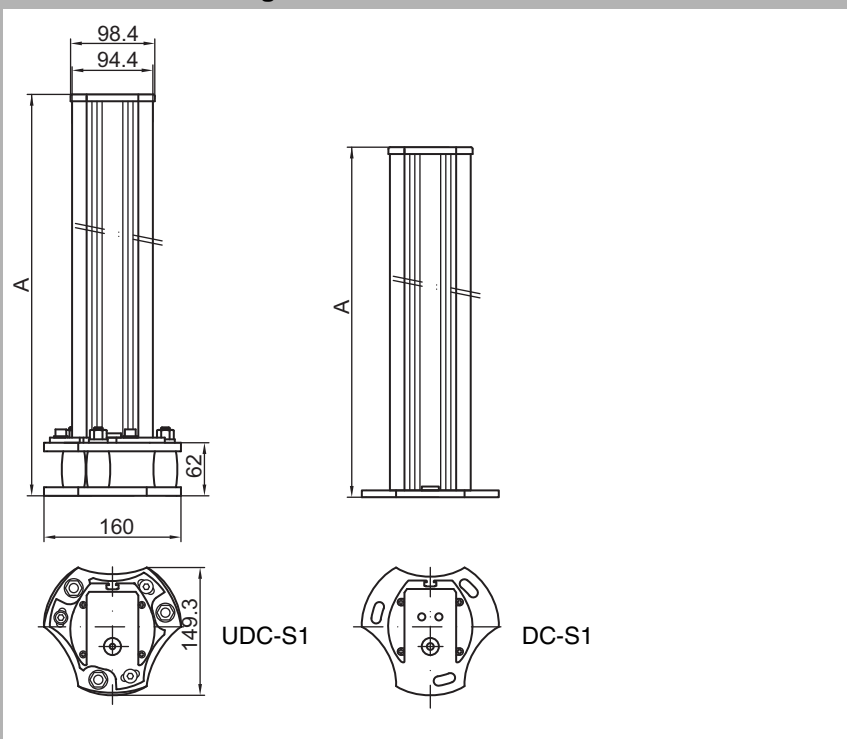
UDC, DC DEVICE COLUMNS

Features

	UDC-S1	DC-S1
Easy vertical alignment	●	●
Easy axial alignment	●	●
Easy height adjustment of the built-in device with a supplied mounting plate	●	●
Automatic resetting after mechanical impacts with special spring elements	●	
Additional protective screens PSC-1x00 available	●	●
Complete mounting set for floor fixing included with delivery	●	

Please note the additional information at www.leuze.com/sensor-accessories

Dimensional drawings



Further information

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Dimensions table for UDC-S1

Article (UDC-S1)	Dim. A
UDC-1000-S1	1060
UDC-1300-S1	1360
UDC-1600-S1	1660
UDC-1900-S1	1960

Dimensions table for DC-S1

Article	Dim. A
DC-1000-S1	1000
DC-1300-S1	1300
DC-1600-S1	1600
DC-1900-S1	1900

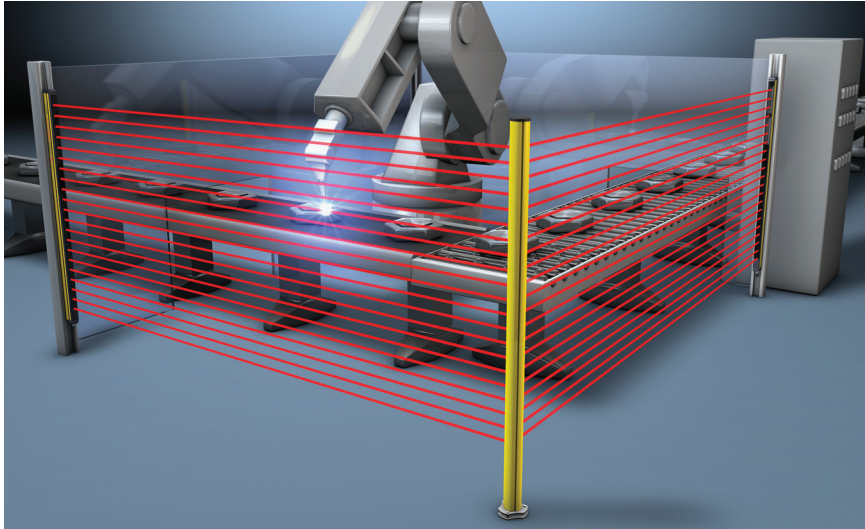
Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

www.leuze.com/sensor-accessories/

ACCESSORIES

UMC, MC Deflecting Mirror Columns/continuous mirror



Multiple side access guarding with Safety Light Curtain and beam deflection with mirror columns

The UMC/MC-1000, -1300, -1600 and -1900 mirror columns have a continuous mirror for beam deflection. In combination with Safety Light Curtains, cost-effective multiple side danger zone guardings can be implemented. The mirror columns enable precise vertical and axial mirror alignment. Spring elements in the base of the Deflecting Mirror Columns (UMC model) ensure an automatic resetting after mechanical impacts (blows, knocks).

Areas of application and ordering information

Accessories		Suitable for sensors	
Deflecting Mirror Column		Safety Light Curtain (protective field height in mm)	
Art. no.	Article	COMPACTplus	SOLID-4, SOLID-2
UMC - with automatic reset function incl. accessories set			
549710	UMC-1000	Up to 900 mm	Up to 900 mm
549713	UMC-1300	Up to 1200 mm	Up to 1200 mm
549716	UMC-1600	Up to 1500 mm	Up to 1500 mm
549719	UMC-1900	Up to 1800 mm	Up to 1800 mm
MC with fixed mounting plate			
549305	MC-902		
549310	MC-1000	Up to 900 mm	Up to 900 mm
549313	MC-1300	Up to 1200 mm	Up to 1200 mm
549316	MC-1600	Up to 1500 mm	Up to 1500 mm
549319	MC-1900	Up to 1800 mm	Up to 1800 mm
Accessories for MC Deflecting Mirror Columns			
430092	MS-DC/MC	DC/MC column accessories set	

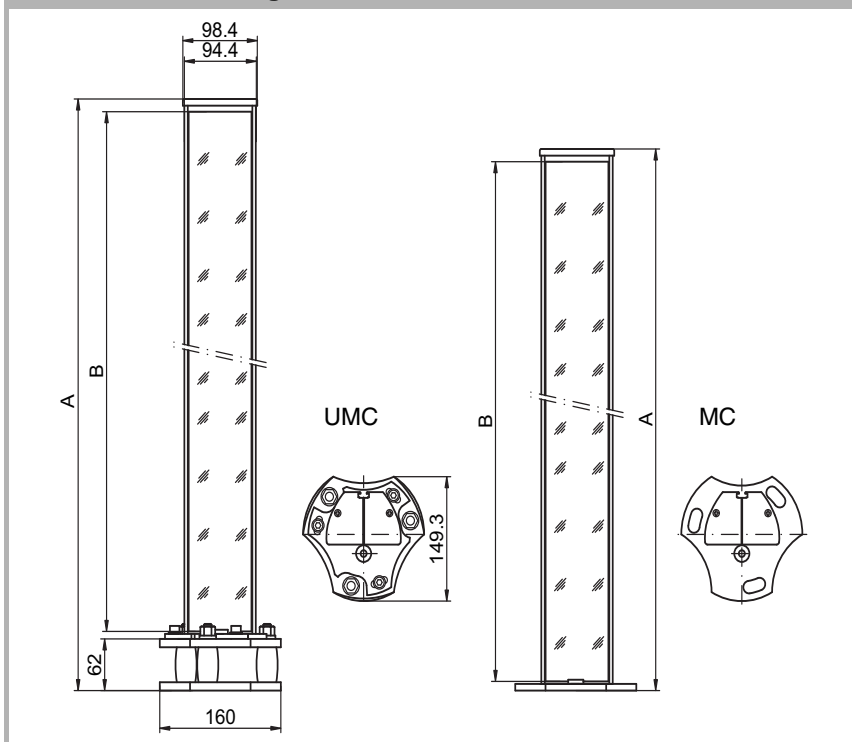
UMC, MC WITH CONTINUOUS MIRROR

Features

	UMC	MC
Continuous mirror surface for beam deflecting of Safety Light Curtains	●	●
Robust profile construction in high quality design	●	●
Easy installation, quick vertical and axial alignment in just a few steps	●	●
Automatic resetting after mechanical impacts with special spring elements	●	
Complete mounting set for floor fixing included with delivery	●	

Please note the additional information at www.leuze.com/sensor-accessories.

Dimensional drawings

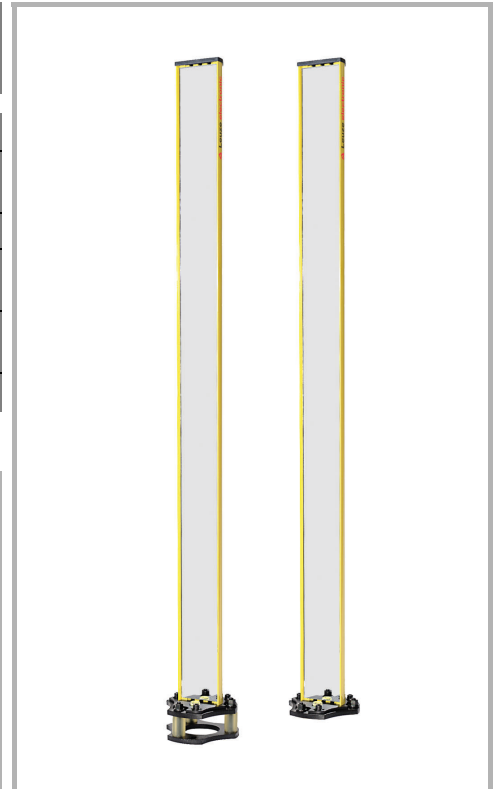


Article	Dim. A	Dim. B
UMC-1000	1060	974
UMC-1300	1360	1274
UMC-1600	1660	1574
UMC-1900	1960	1874

Article	Dim. A	Dim. B
MC-1000	1000	974
MC-1300	1300	1274
MC-1600	1600	1574
MC-1900	1900	1874

Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.



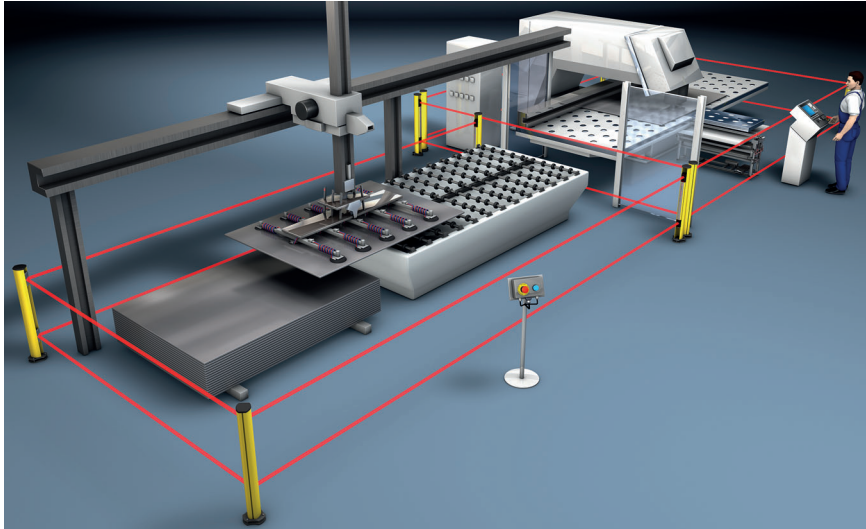
Further information

- Areas of application and ordering information 490
- UDC, DC 488
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ACCESSORIES

UMC, MC Deflecting Mirror Columns/individual mirrors



The use of UMC/MC Deflecting Mirror Columns enables cost-effective Light Beam Device solutions for multiple side danger zone guarding. The UMC/MC-1002, -1303 and -1304 beam deflecting units are equipped with 2, 3 and 4 mirrors that each deflect the individual light beams of Multiple Light Beam Safety Devices. They enable precise vertical and axial alignment of the individual mirrors in the 3 axes. Spring elements in the base of the mirror columns (UMC model) ensure an automatic resetting after mechanical impacts (blows, knocks).

Multiple side access guarding with Multiple Light Beam Safety Devices and beam deflection with Deflecting Mirror Columns

Areas of application and ordering information

Accessories			Suitable for sensors	
Deflecting Mirror Column			Multiple Light Beam Safety Device	
Art. no.	Article	Description	MLD 500, MLD 300	COMPACT ^{plus} -m
UMC with automatic reset function				
549702	UMC-1002	2 individual mirrors at a distance of 500 mm	2-beam	2-beam
549703	UMC-1303	3 individual mirrors at a distance of 400 mm	3-beam	3-beam
549704	UMC-1304	4 individual mirrors at a distance of 300 mm	4-beam	4-beam
MC with fixed mounting plate				
549302	MC-1002	2 individual mirrors at a distance of 500 mm	2-beam	2-beam
549303	MC-1303	3 individual mirrors at a distance of 400 mm	3-beam	3-beam
549304	MC-1304	4 individual mirrors at a distance of 300 mm	4-beam	4-beam
Accessories for MC Deflecting Mirror Columns				
430092	MS-DC/MC	DC/MC column accessories set		
425508	UMC/130 mirror	Replacement mirror for UMC/MC		

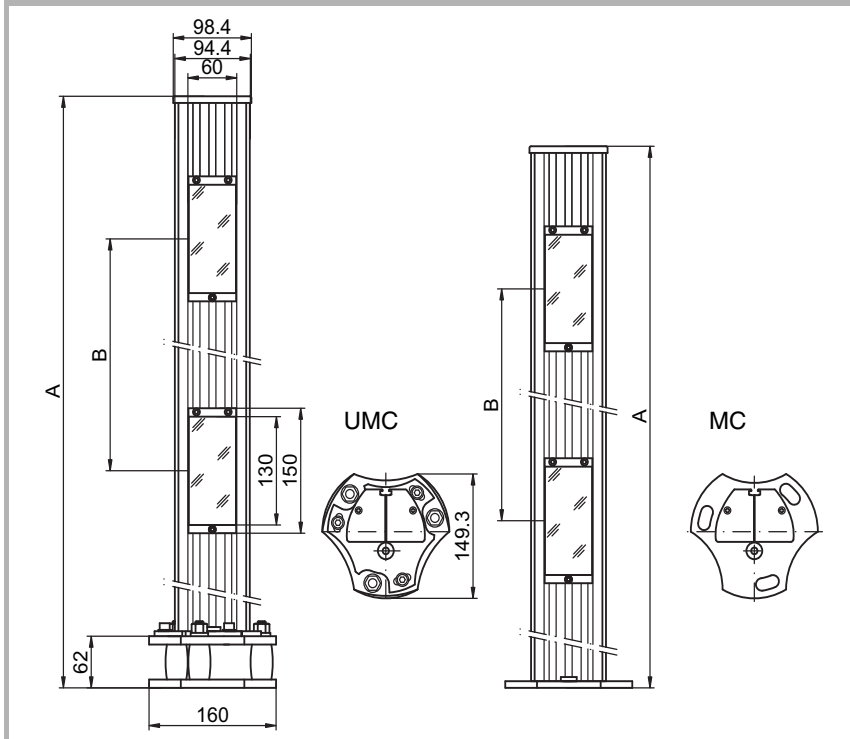
UMC, MC WITH INDIVIDUAL MIRRORS

Features

	UMC	MC
Easy installation, quick vertical and axial alignment in just a few steps	●	●
Individual mirrors can be exchanged and separately aligned	●	●
Beam distance in accordance with EN 999 preset	●	●
Automatic resetting after mechanical impacts with special spring elements	●	
Complete mounting set for floor fixing included with delivery	●	

Please note the additional information at www.leuze.com/sensor-accessories.

Dimensional drawings

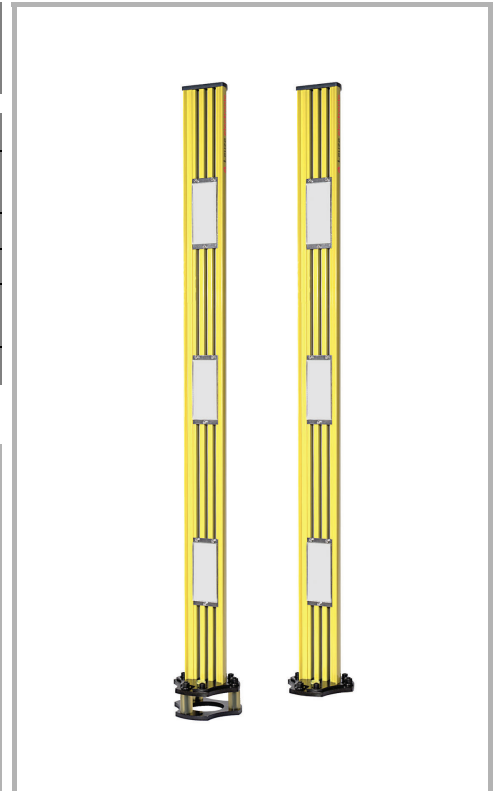


Article	Dim. A	Dim. B
UMC-1002	1060	500
UMC-1303	1360	400
UMC-1304	1360	300

Article	Dim. A	Dim. B
MC-1002	1000	500
MC-1303	1300	400
MC-1304	1300	300

Dimensions in mm

Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.



Further information

- Areas of application and ordering information 492
- UDC, DC 488
- Laser alignment aids 522

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ACCESSORIES

UM60 Deflecting Mirrors



The combination of Safety Light Curtains and UM60 Deflecting Mirrors enables cost-effective, multiple side danger zone guarding, e.g. at manual feed-in areas on machinery. The UM60 Deflecting Mirrors feature a very slender mirror carrier. A very precise and easy mounting is possible with sliding blocks or swivel mounting brackets (accessories).

Multiple side point of operation guarding on a press with Safety Light Curtains and beam deflection with Deflecting Mirrors

Areas of application and ordering information

Accessories		Suitable for sensors	
Deflecting Mirror		Safety Light Curtain (protective field height in mm)	
Art. no.	Article	COMPACTplus	SOLID-4, SOLID-2
529601	UM60-150	Up to 150 mm	Up to 150 mm
529602	UM60-225	Up to 225 mm	Up to 225 mm
529603	UM60-300	Up to 300 mm	Up to 300 mm
529604	UM60-450	Up to 450 mm	Up to 450 mm
529606	UM60-600	Up to 600 mm	Up to 600 mm
529607	UM60-750	Up to 750 mm	Up to 750 mm
529609	UM60-900	Up to 900 mm	Up to 900 mm
529610	UM60-1050	Up to 1050 mm	Up to 1050 mm
529612	UM60-1200	Up to 1200 mm	Up to 1200 mm
529613	UM60-1350	Up to 1350 mm	Up to 1350 mm
529615	UM60-1500	Up to 1500 mm	Up to 1500 mm
529616	UM60-1650	Up to 1650 mm	Up to 1650 mm
529618	UM60-1800	Up to 1800 mm	Up to 1800 mm

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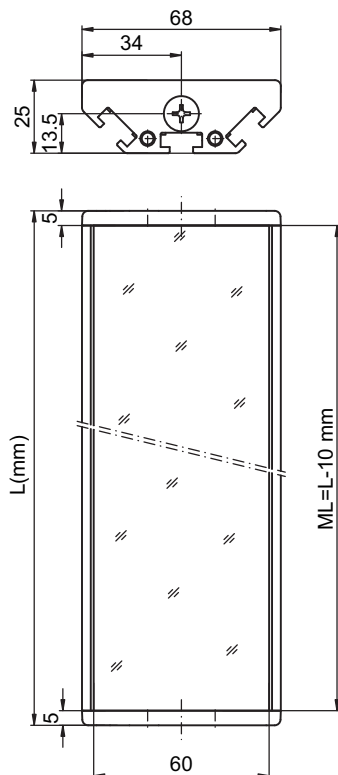
UM60 DEFLECTING MIRRORS

Areas of application and ordering information

Features

- Continuous mirror surface for beam deflecting of Safety Light Curtains
- Robust aluminum profile housing
- Slender and flat construction, 60 mm wide
- Easy mounting, fast alignment with mounting angles (in the preferred angles, 0°, 45° and 90°, as well as swiveling)

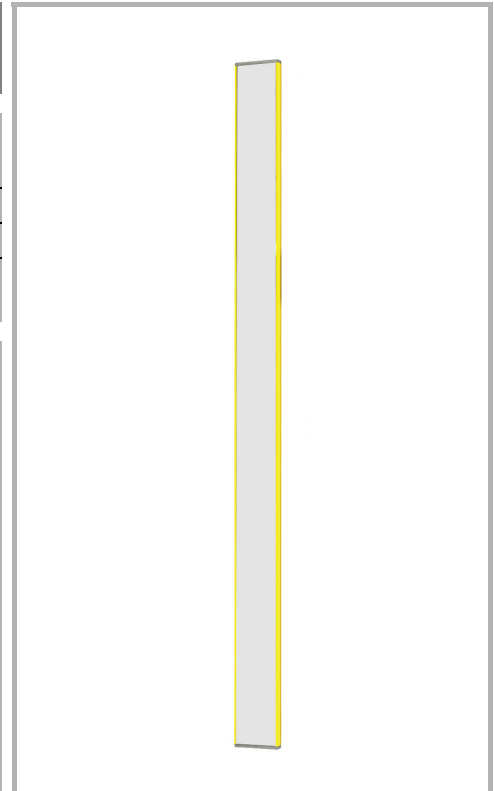
Dimensional drawings



Our 3D CAD models can be found at: www.leuze.com/3d-cad-models.

UM60 – Accessories

Art. no.	Article	Description
560300	BT-2SSD-270	Mounting bracket, swiveling with shock absorber (from a length of 1200 mm, min. 2 x 560300)
560120	BT-2S	Mounting bracket set consisting of 2 L-type brackets incl. 2 screws
430105	BT-2UM60	Mounting bracket set consisting of 2 UM60 brackets incl. screws



Dimensions table

Article	Mirror length, ML	Total length, L
UM60-150	210	220
UM60-225	285	295
UM60-300	360	370
UM60-450	510	520
UM60-600	660	670
UM60-750	810	820
UM60-900	960	970
UM60-1050	1110	1120
UM60-1200	1260	1270
UM60-1350	1410	1420
UM60-1500	1560	1570
UM60-1650	1710	1720
UM60-1800	1860	1870

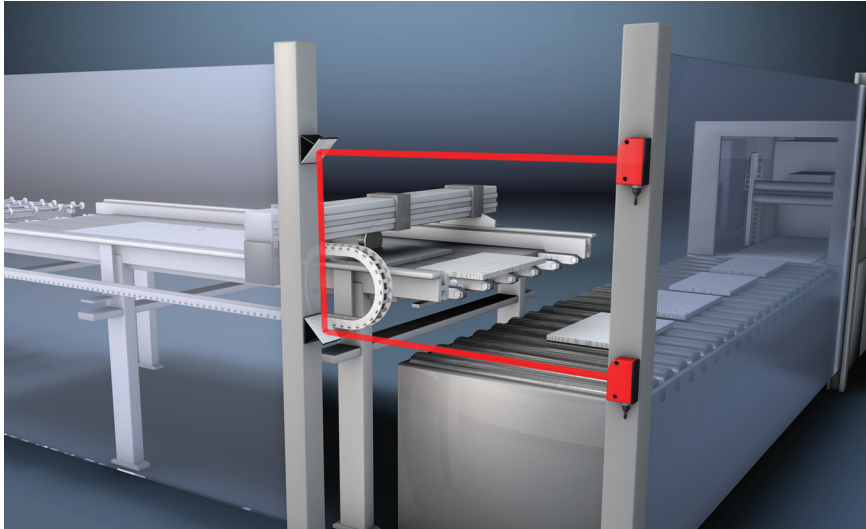
Dimensions in mm

Further information

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● Dimensional drawings: Accessories, see BT-L and BT-SSD	● 161

ACCESSORIES

US Deflecting Mirrors



L-shape and 2-beam guardings can be implemented with the US 2 Deflecting Mirror series in combination with Single Light Beam Safety Devices with a 90° beam deflection. This enables a reduction in the number of Light Beam Devices and therefore the wiring expenditure. The stepless 3-axis alignment of the mirror carrier enables a fast and precise alignment of the mirror in the 3 axes.

Access guarding with Single Light Beam Safety Devices and US Deflecting Mirrors

Ordering information

Art. no.	Article	Description
50000670	US 1	Deflecting Mirror for tube mounting
50017434	US 2	Deflecting Mirror, rotates for profile mounting
50019628	US 2.1	Deflecting Mirror, for profile mounting
50023174	US 2.2	Deflecting Mirror, with straps for profile mounting

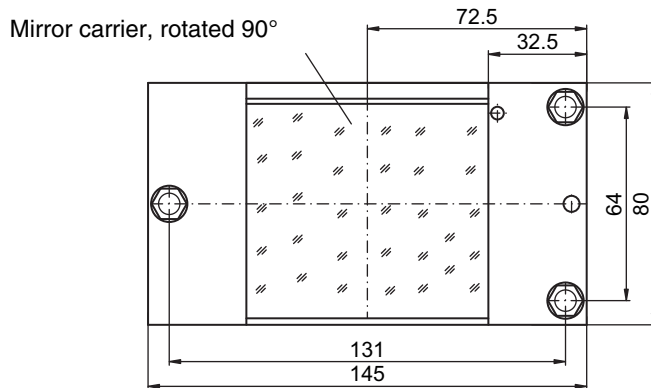
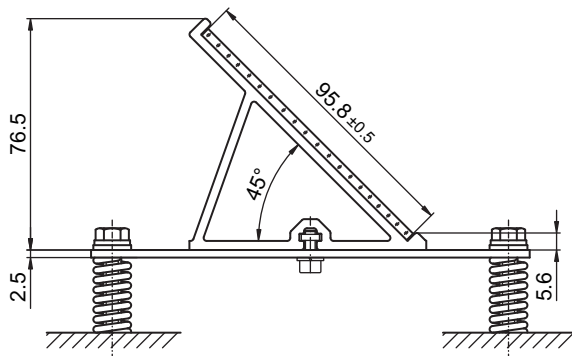
US DEFLECTING MIRRORS

Features

	US 2	US 2.1	US 2.2
Precise alignment in all 3 axes	●		
Glass mirror in extruded aluminum profile	●	●	●
Mirror carrier on mounting plate, 90° rotation	●		

Please note the additional information at www.leuze.com/sensor-accessories.

Dimensional drawings



US 2 Deflecting Mirror

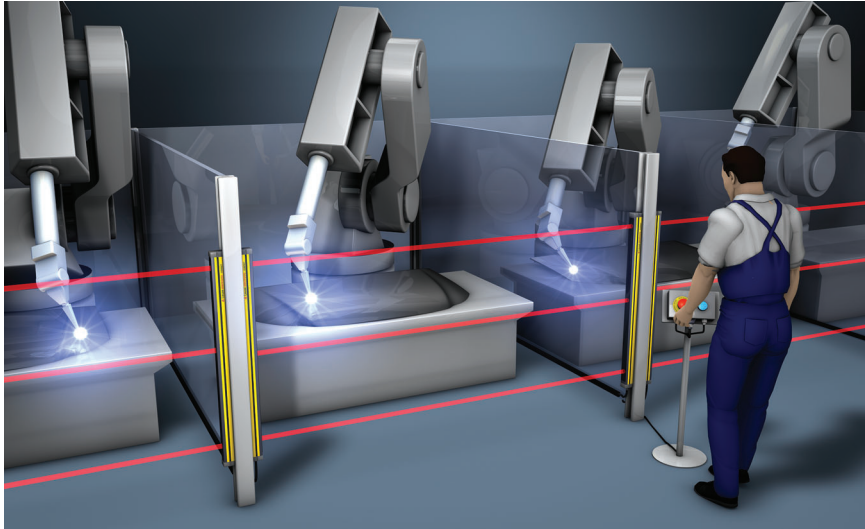
Dimensions in mm



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ACCESSORIES

Protective screens



Protective screens reliably protect safety sensors from welding sparks, near welding lines, for example

Protective screens mounted on Safety Light Curtains and Multiple Light Beam Safety Devices prevent the device's front screen from being damaged. These optional protective screens provide investment security, as the screens provide simple, flexible, cost-effective and efficient protection for sensors throughout their lifespan. The protective screens can be easily exchanged as required.

Areas of application and ordering information

Accessories			Suitable for sensors		
Protective screens			Multiple Light Beam Safety Device	Safety Light Curtain	Suitable support
Art. no.	Article	Length	COMPACTplus-m*	COMPACTplus	
346503	PS-C-CP-300	340 mm		300 mm	429044 AC-PS-MB-C-CP-1 Set consisting of two supports
346504	PS-C-CP-450	490 mm		450 mm	
346506	PS-C-CP-600	640 mm	2-beam	600 mm	
346507	PS-C-CP-750	790 mm		750 mm	
346509	PS-C-CP-900	940 mm	3-beam	900 mm	
346510	PS-C-CP-1050	1090 mm	4-beam	1050 mm	
346512	PS-C-CP-1200	1240 mm		1200 mm	429045 AC-PS-MB-C-CP-2 Set consisting of three supports
346513	PS-C-CP-1350	1390 mm		1350 mm	
346515	PS-C-CP-1500	1540 mm		1500 mm	
346516	PS-C-CP-1650	1690 mm		1650 mm	
346518	PS-C-CP-1800	1840 mm		1800 mm	

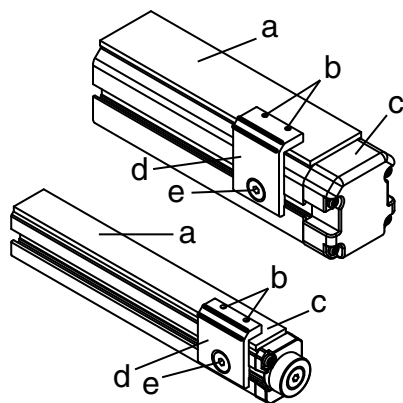
*) Not used for models with integrated sensor connection field

Areas of application and ordering information

Accessories			Suitable for sensors		Suitable support
Protective screens			Safety Light Curtain		
Art. no.	Article	Length	SOLID-2/SOLID-2E	SOLID-4E	
346803	PS-SD-300	341.5 mm	300 mm	300 mm	429042 AC-PS-MB-SD-1 Set consisting of two supports
346804	PS-SD-450	491.5 mm	450 mm	450 mm	
346806	PS-SD-600	641.5 mm	600 mm	600 mm	
346807	PS-SD-750	791.5 mm	750 mm	750 mm	
346809	PS-SD-900	941.5 mm	900 mm	900 mm	
346810	PS-SD-1050	1091.5 mm	1050 mm	1050 mm	429043 AC-PS-MB-SD-2 Set consisting of three supports
346812	PS-SD-1200	1241.5 mm	1200 mm	1200 mm	
346813	PS-SD-1350	1391.5 mm	1350 mm	1350 mm	
346815	PS-SD-1500	1541.5 mm	1500 mm	1500 mm	
346816	PS-SD-1650	1691.5 mm	1650 mm	1650 mm	
346818	PS-SD-1800	1841.5 mm	1800 mm	1800 mm	

i Please note that the range of the Safety Light Curtain is reduced by approx. 10 % per screen with the use of protective screens. If, for example, transmitters and receivers are protected by one protective screen each with a SOLID-4E with 40 mm resolution and a standard range of 20 m, the resulting maximum range for the entire system is 16 m.

Assembly drawing



- a = Protective screen
- b = Grub screw, M4x8
- c = Transmitter or receiver
- d = Disk clamp
- e = Countersunk screw M6x10 and sliding block

Features

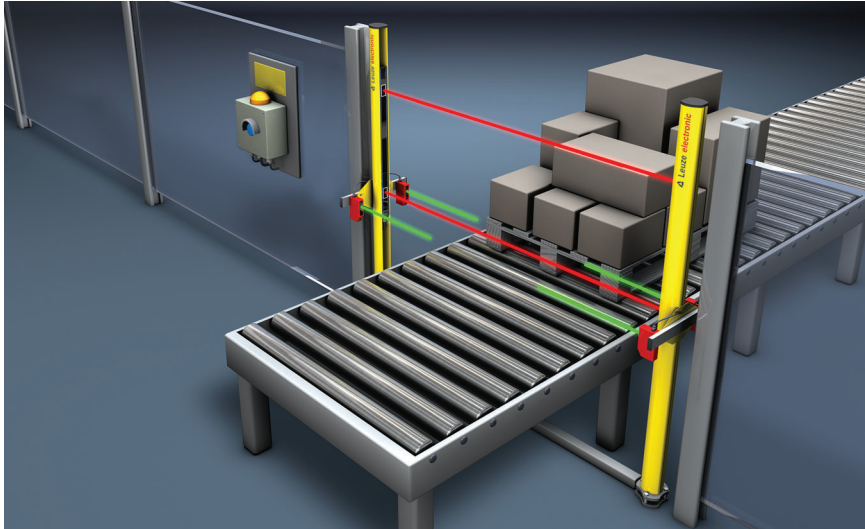
- **Protective window material: PMMA, clear**
- **Effective protection, easy to install, robust**
- **Cost-effective standard accessories**
- **Damaged screens are easy to swap out**
- **Protective screen lengths ranging from 300 mm to 1800 mm**
- **Strong and sturdy installation with two or three supports**

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ACCESSORIES

MMS Muting Mounting Systems



Installation and start-up times can be significantly reduced with the right accessories. The MMS Muting Mounting Systems are ex-works fully preassembled mounting brackets for Light Barriers and reflectors in 2- and 4-sensor muting applications. In combination with the DC or UDC device columns and the Multiple Light Beam Safety Devices of the MLD 300, MLD 500 and COMPACTplus Series, complete muting solutions can be implemented which are optimally matched to one another.

Muting Mounting System for mounting muting sensors and reflectors on free standing device mounting columns, DC/UDC

Ordering information

Art. no.	Article	Description	Mounting
548800	MMS-A-1000	Muting Mounting System, active side, full length 1,000 mm with 2 rods, 12 mm for Light Beam Device mounting systems	Mounting on Device Column
548801	MMS-P-1000	Muting Mounting System, passive side, full length 1,000 mm with 2 reflectors, TKS 50x50	Mounting on Device Column
548805	MMS-A-1000-S	Muting Mounting System for sequential muting, active side, full length 1,000 mm with 4 rods, 12 mm for Light Beam Device mounting systems	Mounting on Device Column
548806	MMS-P-1000-S	Muting Mounting System for sequential muting, passive side, full length 1,000 mm with 4 reflectors, TKS 30x50	Mounting on Device Column
548804	MMS-A-350	Muting Mounting System, active side, full length 350 mm with 2 rods, 12 mm for Light Beam Device mounting systems	Mounting on Device Column
548803	MMS-P-350	Muting Mounting System, passive side, full length 350 mm with 2 reflectors, TKS 50x50	Mounting on Device Column
430305	MMS-A-2N55	Muting Mounting System for slot mounting directly on the device without DC/UDC column for 2 sensors, with angled rods, 60x130x12 mm for Light Beam Device mounting systems	Slot mounting (on side slot)
430306	MMS-AP-N60	Muting Mounting System for slot mounting directly on the device without DC/UDC Column for 1 Reflection Light Beam Device (incl. reflector), with angled rods, 60x130x12 mm for Light Beam Device mounting systems	Slot mounting (on side slot)
426371	MSSU-H46	Muting Sensor Set incl. mounting bracket and reflection light scanner, additional information on page 511	Mounting on Device Column

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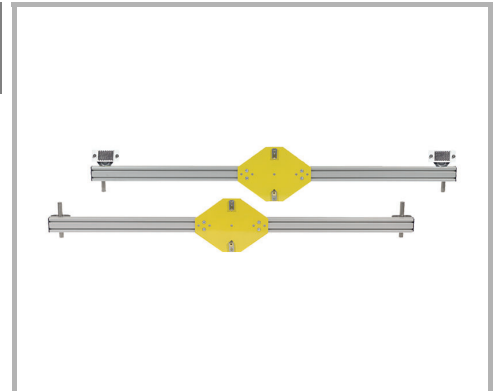
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MMS MUTING MOUNTING SYSTEMS

Features

	MMS-A- xxx	MMS-P- xxx	MMS-A- 2N55	MMS- AP-N60	MSSU- H46
Mounting system for muting sensors suitable for DC/UDC device columns	●	●	●	●	●
Movable trapezoid plate for mounting the MMS on the DC/UDC Device Columns	●	●			●
Largely free horizontal positioning of the sensors and reflectors	●	●			●
Largely free vertical positioning of the sensors and reflectors			●	●	
Mounting of muting sensors with 12 mm V2A rods	●	●	●	●	●
Reflectors in delivery		●		●	
Muting sensors preassembled on rods in delivery					●

Please note the additional information at www.leuze.com/sensor-accessories.



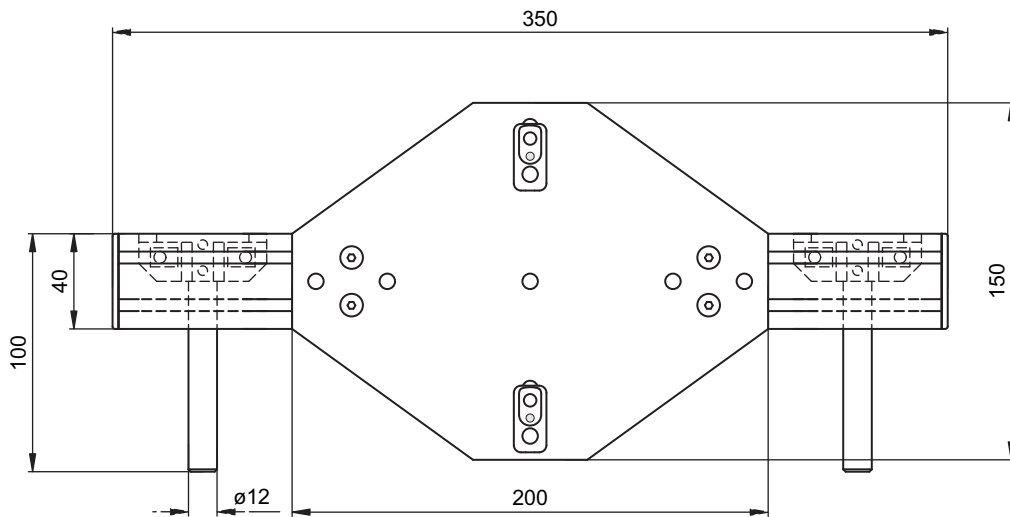
Further information Page

- Dimensional drawings 502
- DC/UDC 488

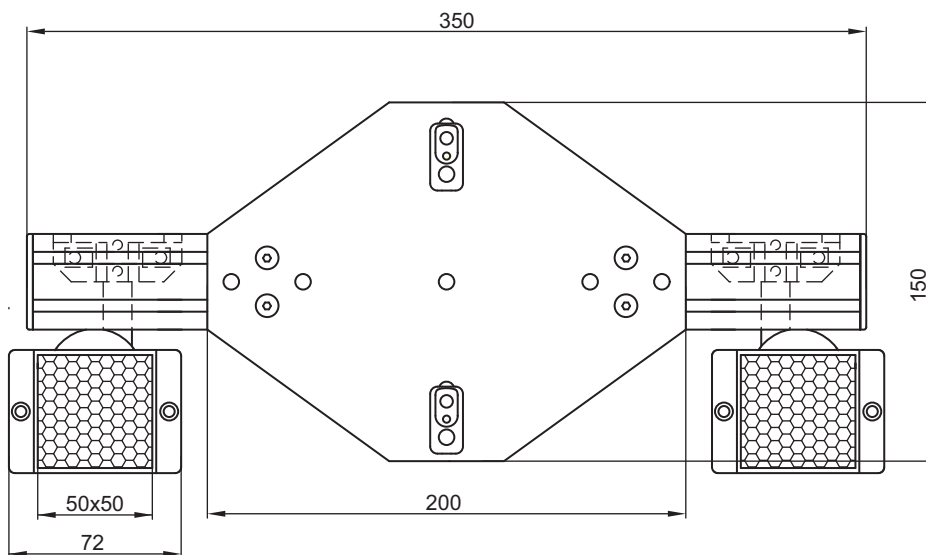
ACCESSORIES

Dimensional drawings

Muting Mounting System MMS-A-350, active side 350 mm



Muting Mounting System MMS-P-350, passive side 350 mm



Dimensions in mm

Muting Mounting System, alternatively available in 1000 mm

UDC, DC
p. 488

UMC, MC
p. 490

UM60
p. 494

US
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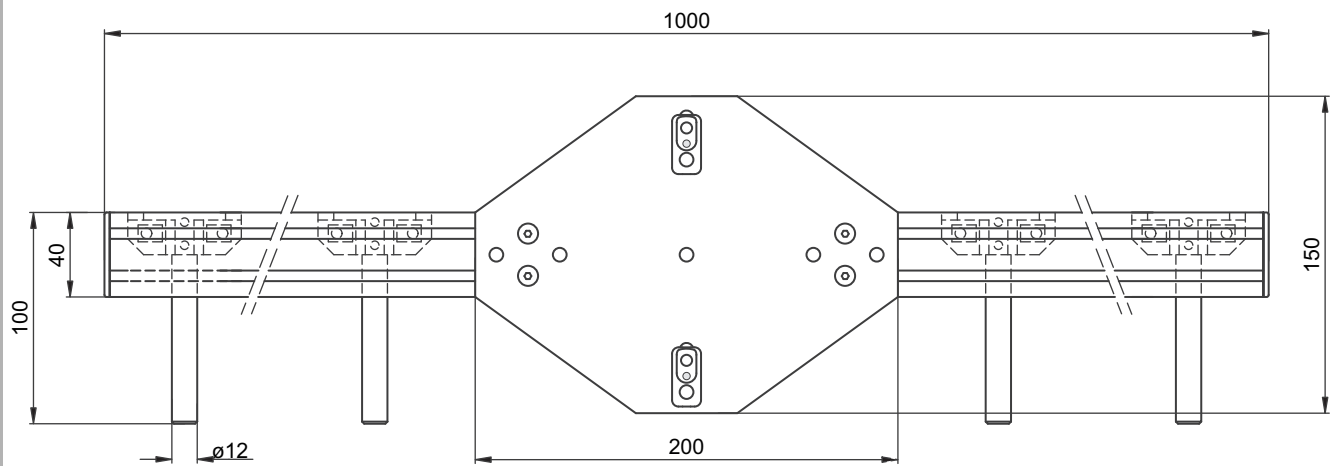
Protective
screens
p. 498

MMS
p. 500

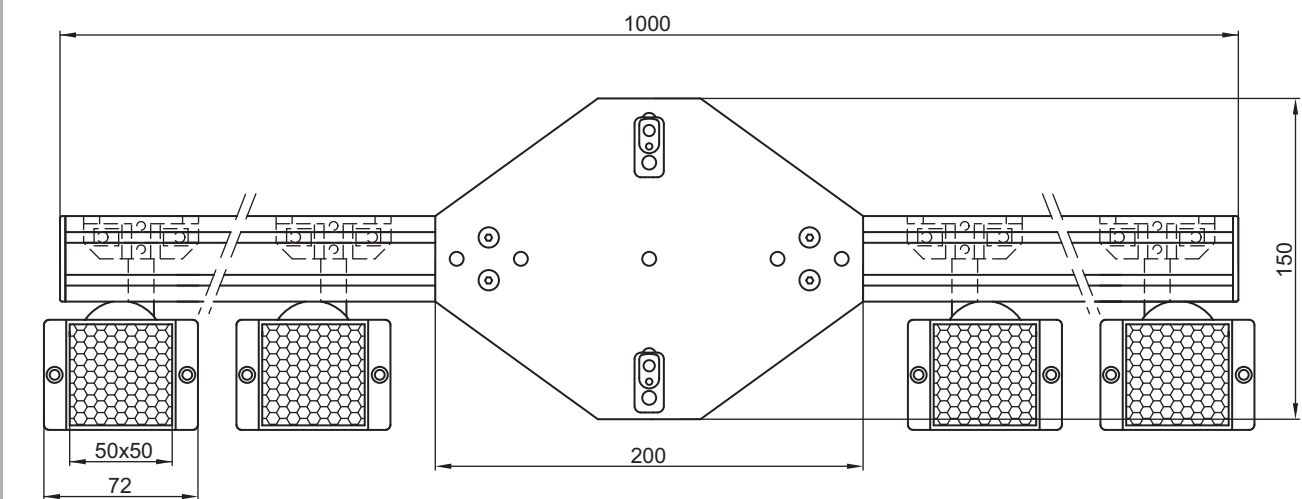
MMS MUTING MOUNTING SYSTEMS

Dimensional drawings

Muting Mounting System MMS-A-1000-S, active side 1000 mm



Muting Mounting System MMS-P-1000-S, passive side 1000 mm



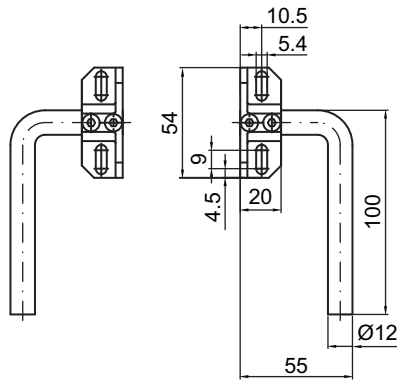
Dimensions in mm

www.leuze.com/sensor-accessories/

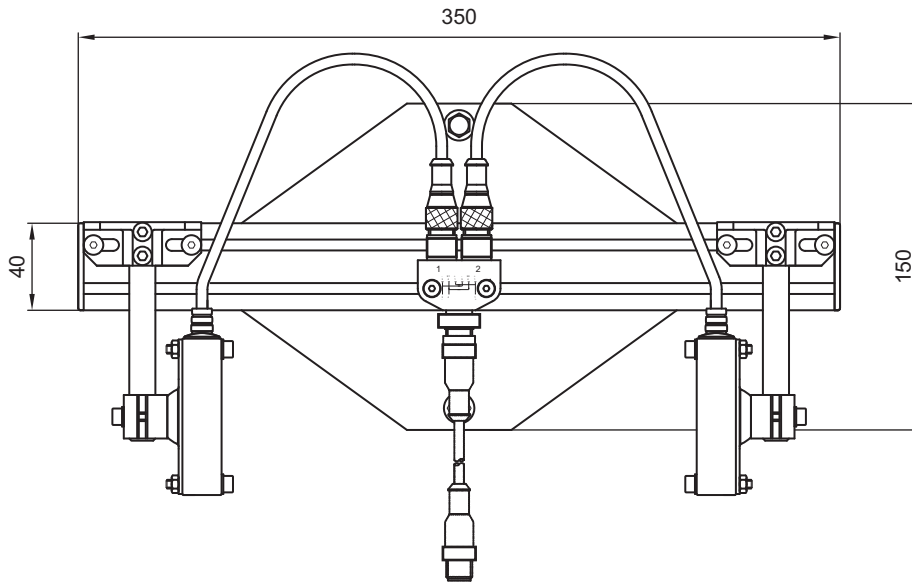
ACCESSORIES

Dimensional drawings

MMS-A-2N55 Muting Mounting System



MSSU-H46 Muting Mounting System



Dimensions in mm

UDC, DC
p. 488

UMC, MC
p. 490

UM60
p. 494

US
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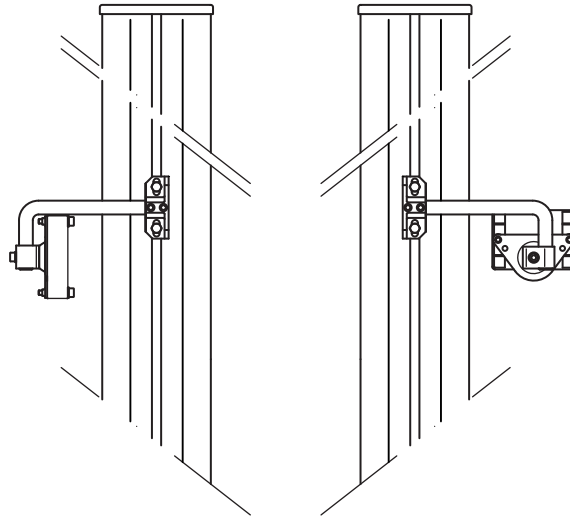
Protective
screens
p. 498

MMS
p. 500

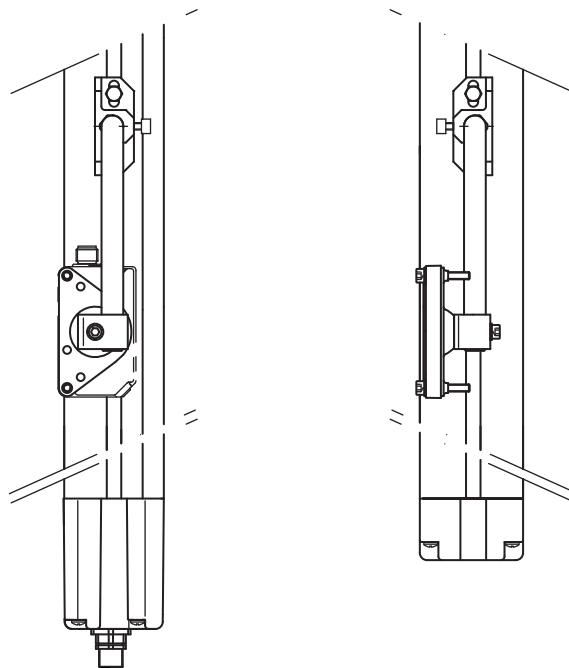
MMS MUTING MOUNTING SYSTEMS

Assembly drawings

Muting Mounting System MMS-AP-N60 mounted on Device Column DC/UDC










Muting Mounting System MMS-AP-N60 mounted on side slot of a safety sensor



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ACCESSORIES

Muting indicators

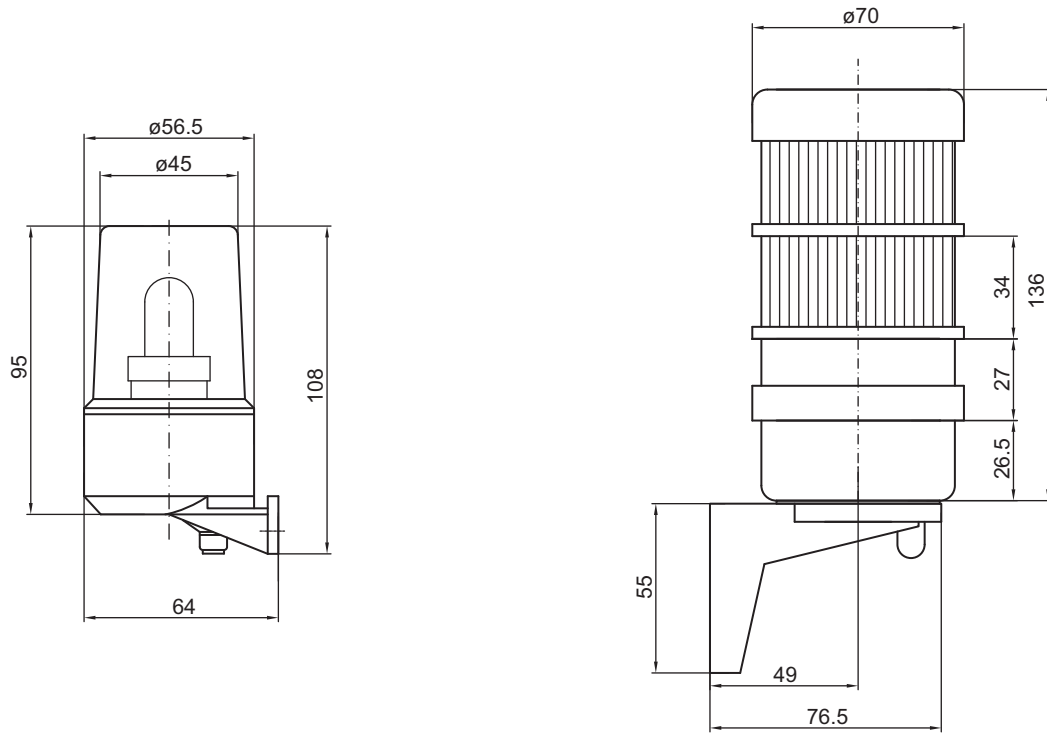
Ordering information				Features						
	Article	Art. no.	Description				Impact-resistant polyamide housing	Fast mounting with bayonet system	Protection rating	LED signal elements with long life time (up to 100,000 hrs)
	MS851	548000	Muting indicator, clear, with bulb, E14 4W / 24 V, with mounting	●	●		●		IP 54	
	MS70/2	660600	Muting indicator with 2 continuous light elements, clear, bulb BA15d / 24 V, with mounting bracket	●	●		●	●	IP 65	
	MS70/LED	660610	Monitored LED muting indicator, yellow, 24 V, without mounting element	●	●		●	●	IP 65	●
	MS70/LED-M12-2000-4GM	660611	Monitored LED muting indicator, yellow, 24 V, with mounting bracket and mounted connection cable, M12, 4 pin, straight, 2 m	●	●		●	●	IP 65	●

Please note the additional information at www.leuze.com/sensor-accessories.

MUTING INDICATORS

Dimensional drawings

Muting indicators



MS851

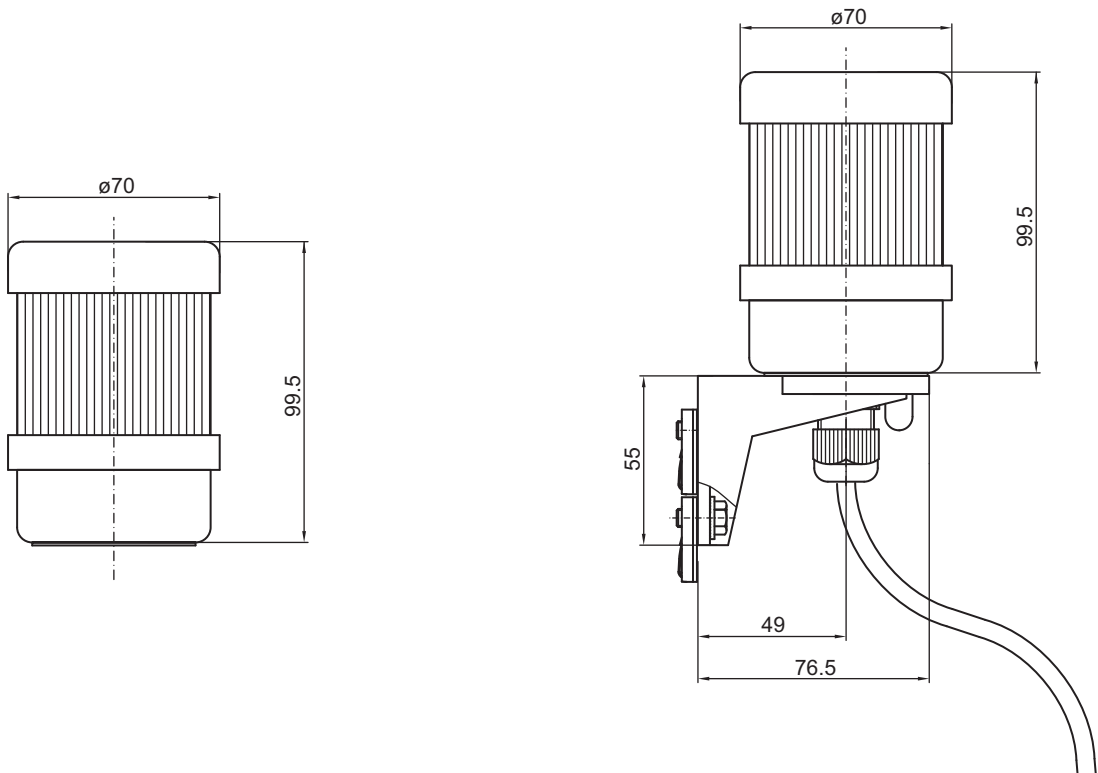
MS70/2

Dimensions in mm

ACCESSORIES

Dimensional drawings

Muting indicators



MS70/LED

MS70/LED-M12-2000-4GM

Dimensions in mm

MUTING INDICATORS

Magnetically
Coded Sensors

Safety Switches

Safety Locking
Devices

Safety Command
Devices

Safety Relays

Programmable
Safety Controllers

Accessories

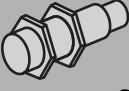




Glossary

Product Finder

www.leuze.com/sensor-accessories/






ACCESSORIES

Muting sensors, Muting Sensor Sets – Features and ordering information

Series	Dimensions in mm	Housing material		Operating principle	Typ. op. range limit	Light source			Response time
		Plastic	Metal			Infrared light	Red light	Laser	
 3	11 x 32 x 17	●		One-way Light Beam Device	0 ... 8.5m		●		0.5 ms
				Reflection Light Beam Device	0.02 ... 6m		●	●	0.5 ms
				Reflection light scanner	5 ... 500mm		●		0.5 ms
				Refl. light scanner with backgr. blanking	7 ... 180mm		●		0.5 ms
 25	15 x 39 x 29	●		One-way Light Beam Device	0 ... 12m		●		1 ms
				Reflection Light Beam Device	0.05 ... 15m		●	●	1 ms
				Reflection light scanner	5 ... 800mm		●		1 ms
				Refl. light scanner with backgr. blanking	5 ... 800mm	●	●		1 ms
 18	15 x 50 x 33		●	Reflection Light Beam Device	0 ... 5m		●		0.33ms
 8	15 x 48 x 38	●		One-way Light Beam Device	0 ... 100m		●	●	0.18 ms
				Reflection Light Beam Device	0 ... 20m		●	●	0.18 ms
				Reflection light scanner	5 ... 800mm		●		0.33 ms
				Refl. light scanner with backgr. blanking	5 ... 400mm		●	●	0.25 ms
 95	17 x 66 x 35	●		One-way Light Beam Device	0 ... 20m	●	●		0.5 ms
				Reflection Light Beam Device	0 ... 9m		●		0.5 ms
				Reflection light scanner	10 ... 900mm	●	●		0.5 ms
				Refl. light scanner with backgr. blanking	20 ... 500mm	●	●		0.5 ms

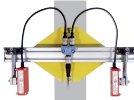
MUTING SENSORS, MUTING SENSOR SETS

Muting sensors, Muting Sensor Sets – Features and ordering information

Series	Dimensions in mm	Housing material		Operating principle	Typ. op. range limit	Light source			Response time
		Plastic	Metal			Infrared light	Red light	Laser	
 46	18 x 72 x 43	●		One-way Light Beam Device	0 ... 50m	●			2.5ms
				Reflection Light Beam Device	0.05 ... 18m		●		1 ms
				Refl. light scanner with backgr. blanking	10 ... 1000mm	●	●		2.5ms
 96	30 x 90 x 70	●	●	One-way Light Beam Device	0 ... 150m	●	●		1 ms
				Reflection Light Beam Device	0 ... 28m	●	●		0.5ms
				Reflection light scanner	20 ... 1200mm	●	●		0.5ms
				Refl. light scanner with backgr. blanking	10 ... 5500mm	●	●	●	1.67ms
 412	M12 x 55		●	One-way Light Beam Device	0 ... 8 m		●		1 ms
				Reflection Light Beam Device	0.05 ... 1.6m		●		0.7ms
				Reflection light scanner	0 ... 400mm		●		0.7ms
 318	M18 x 50	●	●	One-way Light Beam Device	0 ... 120m	●		●	0.1 ms
				Reflection Light Beam Device	0.02 ... 15m	●	●	●	0.1 ms
				Reflection light scanner	0 ... 700mm	●		●	0.1 ms
				Refl. light scanner with backgr. blanking	5 ... 110mm	●			0.5ms
 618	M18 x 60		●	One-way Light Beam Device	0 ... 12m	●			1 ms
				Reflection Light Beam	0 ... 7m		●		1 ms
				Reflection light scanner	0 ... 300mm	●			1 ms

You will find further information and ordering info in the Leuze electronic Opto-Electronic Sensors Catalog.

Muting Sensor Sets, preassembled – Features and ordering information

	Art. no.	Article	Description
	426371	MSSU-H46	Includes MMS-A-350 Muting Mounting System with 2 HRT 46 diffuse reflection light scanners, Y distributors for electrical parallel switching of both light scanners

ACCESSORIES

Display and control units







Display and control units supplement the Leuze electronic muting accessories. They consist of a plastic box with reset button for start/restart interlock and for override after a muting error (muting restart/override). The devices include an additional LED indicator, depending on the type. All display and control units are prepared for direct mounting on hard guards. They are used with access guarding with or without muting. They are especially impressive here due to their easy integra-

tion into the protective device. As a fixed component of some CPSET safety sensor sets, they make a significant contribution to being able to quickly achieve and efficiently operate muting solutions. All devices are intended for connection to the COMPACTplus safety sensors. In addition, the AC-ABF-SL1, AC-ABF10 and AC-ABF50 display and control units are also suitable for connection to devices in the MLD and MSI series.

Typical areas of application

- Muting applications in conveyor and storage systems

Ordering information

Figure	Art. no.	Article	Description	Features
	426387	AC-CPB-IND	Display and control unit for muting applications with 2 induction loops as muting sensors	<ul style="list-style-type: none"> – Connection to COMPACTplus via local interface – Evaluator for inductions loops integrated – Inductions loops must be ordered separately – LED muting indicator
	426388	AC-CPB-OPT	Display and control unit for muting applications with 2 optical muting sensors	<ul style="list-style-type: none"> – Connection to COMPACTplus via local interface – LED muting indicator
	426389	AC-CPB-RES	Control unit for access guarding without muting	<ul style="list-style-type: none"> – Connection to COMPACTplus via local interface
	426363	AC-ABF-SL1	Display and control unit for muting applications	<ul style="list-style-type: none"> – LED muting indicator – Connection to: <ul style="list-style-type: none"> – COMPACTplus with AC-SCM1 – MLD 330, MLD 530 – MSI-m
	426290	AC-ABF10	Control unit	<ul style="list-style-type: none"> – With reset button – Connection via connection box on COMPACTplus, MLD and MSI
	426292	AC-ABF50	Control unit	<ul style="list-style-type: none"> – Connection to MLD 330, MLD 530 with integrated indicators, length of connection cables 3 x 5 m

Muting indicators
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Muting sensors,
Muting Sensor Sets
p. 510

**Display and control
units
p. 512**

Connection cables
p. 514

Laser alignment aids
p. 522

DISPLAY AND CONTROL UNITS

Important technical data, overview

VDE Safety Class	III
Housing	Plastic
Clamping plate	Aluminum
Supply voltage	24 V DC
Switching current via button	1...1000 mA
Ambient temperature, operation	-25...+60°C
Ambient temperature, storage	-30... +70°C

Functions

- Display and control function for muting applications
- Commit and override via button

Special features

- Easy mounting on hard guards with clamping plate



Features



Further information

- COMPACTplus-m
- Ordering information

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ACCESSORIES

Connecting cables – Areas of application and ordering information

Here you will find connecting cables specifically for our sensors for quick and easy start-up



Art. no.	Article	Description	Suitable for		
Device connecting cables		Socket	Cable	Plug	
Connection cables for AS-i Safety sensors					
548361	CB-M12-1000-5GF/GM	M12, straight, 5-pin	1 m	M12, straight, 5-pin	AS-i Safety sensors
548362	CB-M12-2000-5GF/GM	M12, straight, 5-pin	2 m	M12, straight, 5-pin	AS-i Safety sensors
678031	CB-M12-1000S-5GF/GM	M12, straight, 5-pin	1 m	M12, straight, 5-pin	AS-i Safety sensors
678033	CB-M12-2500S-5GF/GM	M12, straight, 5-pin	2.5 m	M12, straight, 5-pin	AS-i Safety sensors
678035	CB-M12-5000S-5GF/GM	M12, straight, 5-pin	5 m	M12, straight, 5-pin	AS-i Safety sensors
678040	CB-M12-10000S-5GF/GM	M12, straight, 5-pin	10 m	M12, straight, 5-pin	AS-i Safety sensors
678045	CB-M12-15000S-5GF/GM	M12, straight, 5-pin	15 m	M12, straight, 5-pin	AS-i Safety sensors
548502	CB-M12-2000S-8GF/GM	M12, straight, 8-pin	2 m	M12, straight, 8-pin	AS-i Safety sensors
548505	CB-M12-5000S-8GF/GM	M12, straight, 8-pin	5 m	M12, straight, 8-pin	AS-i Safety sensors
548510	CB-M12-10000S-8GF/GM	M12, straight, 8-pin	10 m	M12, straight, 8-pin	AS-i Safety sensors

CONNECTION CABLES

Connecting cables – Areas of application and ordering information

Art. no.	Article	Description	Suitable for		
Device connecting cables		Socket	Cable	Plug	
Connection cables for SOLID, COMPACTplus					
426042	CB-LDH-10000-12GF	Hirschmann, straight, 12-pin	10 m, PVC	Open, 12-wire	COMPACTplus/T2, /R2
426044	CB-LDH-25000-12GF	Hirschmann, straight, 12-pin	25 m, PVC	Open, 12-wire	COMPACTplus/T2, /R2
426043	CB-LDH-50000-12GF	Hirschmann, straight, 12-pin	50 m, PVC	Open, 12-wire	COMPACTplus/T2, /R2
429071	CB-M12-5000S-5GF	M12, straight, 5-pin	5 m, PUR, UL, shielded	Open, 5-wire	SOLID, COMPACTplus/T4
429072	CB-M12-5000S-5WF	M12, angled, 5-pin	5 m, PUR, UL, shielded	Open, 5-wire	SOLID, COMPACTplus/T4
429081	CB-M12-5000S-8GF	M12, straight, 8-pin	5 m, PUR, UL, shielded	Open, 8-wire	SOLID, COMPACTplus/T4
429082	CB-M12-5000S-8WF	M12, angled, 8-pin	5 m, PUR, UL, shielded	Open, 8-wire	SOLID, COMPACTplus/T4
429073	CB-M12-10000S-5GF	M12, straight, 5-pin	10 m, PUR, UL, shielded	Open, 5-wire	SOLID, COMPACTplus/T4
429074	CB-M12-10000S-5WF	M12, angled, 5-pin	10 m, PUR, UL, shielded	Open, 5-wire	SOLID, COMPACTplus/T4
429083	CB-M12-10000S-8GF	M12, straight, 8-pin	10 m, PUR, UL, shielded	Open, 8-wire	SOLID, COMPACTplus/T4
429084	CB-M12-10000S-8WF	M12, angled, 8-pin	10 m, PUR, UL, shielded	Open, 8-wire	SOLID, COMPACTplus/T4
429075	CB-M12-15000S-5GF	M12, straight, 5-pin	15 m, PUR, UL, shielded	Open, 5-wire	SOLID, COMPACTplus/T4
429076	CB-M12-15000S-5WF	M12, angled, 5-pin	15 m, PUR, UL, shielded	Open, 5-wire	SOLID, COMPACTplus/T4
429085	CB-M12-15000S-8GF	M12, straight, 8-pin	15 m, PUR, UL, shielded	Open, 8-wire	SOLID, COMPACTplus/T4
429086	CB-M12-15000S-8WF	M12, angled, 8-pin	15 m, PUR, UL, shielded	Open, 8-wire	SOLID, COMPACTplus/T4

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ACCESSORIES

Connecting cables – Areas of application and ordering information

Art. no.	Article	Description			Suitable for
		Socket	Cable	Plug	
Device connecting cables					
Connection cables for SOLID, COMPACTplus					
429171	CB-M12-25000S-5GF	M12, straight, 5-pin	25 m, PUR, UL, shielded	Open, 5-wire	SOLID, COMPACTplus/T4
429172	CB-M12-25000S-5WF	M12, angled, 5-pin	25 m, PUR, UL, shielded	Open, 5-wire	SOLID, COMPACTplus/T4
429181	CB-M12-25000S-8GF	M12, straight, 8-pin	25 m, PUR, UL, shielded	Open, 8-wire	SOLID, COMPACTplus/T4
429182	CB-M12-25000S-8WF	M12, angled, 8-pin	25 m, PUR, UL, shielded	Open, 8-wire	SOLID, COMPACTplus/T4
Connection cables for RS4					
548520	CB-D15E-5000S-11GF	SUB-D, 15-pin	5 m, PUR, UL, shielded	Open, 11-wire	RS4
548521	CB-D15E-10000S-11GF	SUB-D, 15-pin	10 m, PUR, UL, shielded	Open, 11-wire	RS4
548522	CB-D15E-25000S-11GF	SUB-D, 15-pin	20 m, PUR, UL, shielded	Open, 11-wire	RS4
548523	CB-D15E-50000S-11GF	SUB-D, 15-pin	35 m, PUR, UL, shielded	Open, 11-wire	RS4
548530	CB-D15E-10000S-11WF	SUB-D, 15-pin	50 m, PUR, UL, shielded	Open, 11-wire	RS4
548100	CB-M12-25000S-4GF/GM	M12, straight, 4-pin	25 m, shielded	M12, straight, 4-pin	RS4/P1
548363	CB-M12-2000-4GMB	M12, straight, 4-pin	2 m, PUR, UL	Open, 4-wire, jumper between 1-4, 2-3	RS4/A1, RS4/P1

Connecting cables – Areas of application and ordering information

Art. no.	Article	Description			Suitable for
		Socket	Cable	Plug	
Device connecting cables					
Connection cables for MLD 300, MLD 500					
678050	CB-M12-5000E-5GM	M12 plug, 5-pin	5 m, straight	Open end	MLD 300, MLD 500
678051	CB-M12-10000E-5GM	M12 plug, 5-pin	10 m, straight	Open end	MLD 300, MLD 500
678052	CB-M12-15000E-5GM	M12 plug, 5-pin	15 m, straight	Open end	MLD 300, MLD 500
678053	CB-M12-25000E-5GM	M12 plug, 5-pin	25 m, straight	Open end	MLD 300, MLD 500
678055	CB-M12-5000E-5GF	M12 coupling, 5-pin	5 m, straight	Open end	MLD 300, MLD 500
678056	CB-M12-10000E-5GF	M12 coupling, 5-pin	10 m, straight	Open end	MLD 300, MLD 500
678057	CB-M12-15000E-5GF	M12 coupling, 5-pin	15 m, straight	Open end	MLD 300, MLD 500
678058	CB-M12-25000E-5GF	M12 coupling, 5-pin	25 m, straight	Open end	MLD 300, MLD 500
678059	CB-M12-50000E-5GF	M12 coupling, 5-pin	50 m, straight	Open end	MLD 300, MLD 500
678060	CB-M12-5000E-8GF	M12 coupling, 8-pin	5 m, straight	Open end	MLD 300, MLD 500
678061	CB-M12-10000E-8GF	M12 coupling, 8-pin	10 m, straight	Open end	MLD 300, MLD 500
678062	CB-M12-15000E-8GF	M12 coupling, 8-pin	15 m, straight	Open end	MLD 300, MLD 500
678063	CB-M12-25000E-8GF	M12 coupling, 8-pin	25 m, straight	Open end	MLD 300, MLD 500
678064	CB-M12-50000E-8GF	M12 coupling, 8-pin	50 m, straight	Open end	MLD 300, MLD 500
Connection cables for MLD 335, MLD 535 (local interface)					
50110180	KB M12/8-5000-SA				
50110181	KB M12/8-10000-SA				
50110186	KB M12/8-15000-SA				
50110188	KB M12/8-25000-SA				

ACCESSORIES

Connecting cables – Areas of application and ordering information

Art. no.	Article	Description			Suitable for
Device connecting cables		Socket	Cable	Plug	
Connection cables for S20, S200, S300 S400, L10, L100, L200					
678055	CB-M12-5000E-5GF	M12 coupling, 5-pin	5 m, straight	Open end	S20, S200, S300 S400, L10, L100, L200
678056	CB-M12-10000E-5GF	M12 coupling, 5-pin	10 m, straight	Open end	S20, S200, S300 S400, L10, L100, L200
678057	CB-M12-15000E-5GF	M12 coupling, 5-pin	15 m, straight	Open end	S20, S200, S300 S400, L10, L100, L200
678058	CB-M12-25000E-5GF	M12 coupling, 5-pin	25 m, straight	Open end	S20, S200, S300 S400, L10, L100, L200
678060	CB-M12-5000E-8GF	M12 coupling, 8-pin	5 m, straight	Open end	S20, S200, S300 S400, L10, L100, L200
678061	CB-M12-10000E-8GF	M12 coupling, 8-pin	10 m, straight	Open end	S20, S200, S300 S400, L10, L100, L200
678062	CB-M12-15000E-8GF	M12 coupling, 8-pin	15 m, straight	Open end	S20, S200, S300 S400, L10, L100, L200
678063	CB-M12-25000E-8GF	M12 coupling, 8-pin	25 m, straight	Open end	S20, S200, S300 S400, L10, L100, L200
Muting Accessories					
520058	AC-SCM6	Local connection box with M12-connection for connecting to local interface (6 connections for 4 muting sensors, muting indicator, reset button)			
520059	AC-SCM6-BT	Local connection box with M12-connection for connecting to local interface (6 connections for 4 muting sensors, muting indicator, reset button), with mounting plate			

Connecting cables – Areas of application and ordering information

Art. no.	Article	Description			Suitable for
Connecting cable /T1 Transmitter to sensor socket M12/5					
150677	CB-M12-10000-5WM	Open, 5-wire	10 m, PUR, UL	M12, angled, 5-pin	COMPACT <i>plus</i>
50104545	K-D M12W-4P-5m-PVC	M12, angled, 4-pin	5 m, PVC	M12, angled, 4-pin	Single Light Beam Safety Devices
50104544	K-D M12A-4P-5m-PVC	M12, straight, 4-pin	5 m, PVC	M12, straight, 4-pin	Single Light Beam Safety Devices
Local connecting cables		Socket	Cable	Plug	
520066	CB-M12-SCC2	2 x M12, straight, 3-pin	2 x 1.5 m + 0.3 m	M12, angled, 8-pin	COMPACT <i>plus</i>
150755	CB-M12-SC22	2 x M12, 4-pin	2 x 1.5 m	M12, 4-pin	COMPACT <i>plus</i> , MLD 300, MLD 500
150756	CB-M12-CC12	M12, 4-pin	0.3 m	M12, 8-pin	COMPACT <i>plus</i>
150757	CB-M12-CC15	M12, 4-pin	1.5 m	M12, 8-pin	COMPACT <i>plus</i>
150769	CB-M12-CC30	M12, 4-pin	3 m	M12, 8-pin	COMPACT <i>plus</i>
150758	CB-M12-SC24	2 x M12, 4-pin	2 m or 5 m	M12, 4-pin	COMPACT <i>plus</i> , MLD 300, MLD 500
150766	CB-M12-SC44	2x M12, 4-pin	2 x 1.0 m	M12, 4-pin	COMPACT <i>plus</i> , MLD 300, MLD 500
150704	CB-M12-3000-8WM	Open, 8-wire	3 m, PUR, UL	M12, angled, 8-pin	COMPACT <i>plus</i>
150699	CB-M12-10000-8WM	Open, 8-wire	10 m, PUR, UL	M12, angled, 8-pin	COMPACT <i>plus</i>
Connection muting sensors, indicators, display and control unit					
150680	CB-M12-1500-3GF/GM	M12, straight, 3-pin	1.5 m, PUR	M12, straight, 3-pin	COMPACT <i>plus</i> , MLD 300, MLD 500
150681	CB-M12-1500-3GF/WM	M12, straight, 3-pin	1.5 m, PUR	M12, angled, 3-pin	COMPACT <i>plus</i> , MLD 300, MLD 500
150682	CB-M12-5000-3GF/GM	M12, straight, 3-pin	5 m, PUR	M12, straight, 3-pin	COMPACT <i>plus</i> , MLD 300, MLD 500
150683	CB-M12-5000-3GF/WM	M12, straight, 3-pin	5 m, PUR	M12, angled, 3-pin	COMPACT <i>plus</i> , MLD 300, MLD 500

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ACCESSORIES

Connecting cables – Areas of application and ordering information

Art. no.	Article	Description	Suitable for		
Connection muting sensors, indicators, display and control unit					
150684	CB-M12-15000-3GF/GM	M12, straight, 3-pin	15 m, PUR, UL	M12, straight, 3-pin	COMPACT <i>plus</i> , MLD 300, MLD 500
150685	CB-M12-15000-3GF/WM	M12, straight, 3-pin	15 m, PUR	M12, angled, 3-pin	COMPACT <i>plus</i> , MLD 300, MLD 500
548050	CB-M12-1500X-3GF/WM	M12, straight, 3-pin	1.5 m, PUR, UL, crossed socket, pin2 -> plug-pin4	M12, angled, 3-pin	COMPACT <i>plus</i> , MLD 300, MLD 500
548051	CB-M12-1500X-3GF/GM	M12, straight, 3-pin	1.5 m, PUR, UL, crossed socket, pin2 -> plug-pin4	M12, straight, 3-pin	COMPACT <i>plus</i> , MLD 300, MLD 500
548052	CB-M12-1500X-3WF/WM	M12, angled, 3-pin	1.5 m, PUR, UL, crossed socket, pin2 -> plug-pin4	M12, angled, 3-pin	COMPACT <i>plus</i> , MLD 300, MLD 500
150717	CB-M12-2000-5GM	Open, 5-wire	2 m, PUR, UL	M12, straight, 5-pin	COMPACT <i>plus</i>
150718	CB-M12-5000-5GM	Open, 5-wire	5 m	M12, straight, 5-pin	COMPACT <i>plus</i>
548510	CB-M12-10000S-8GF/GM	M12, straight, 8-pin	10 m	M12, straight, 8-pin	COMPACT <i>plus</i>
Signal distributor		Socket	Cable	Plug	
520069	CB-M12-ACT4/1	2 x M12, straight, 4-pin	-	M12, straight, 4-pin	All with M12 connection system
548040	CB-M12-ACY3/1	2 x M12, straight, 3-pin	-	M12, straight, 3-pin	All with M12 connection system

CONNECTION CABLES

Connecting cables – Areas of application and ordering information

Art. no.	Article	Description	Suitable for		
PC cable					
50104078	CB-ASM-PK1	SUB-D, 9-pin	2.5 m, PVC	RJ45, 8-pin	AS-i
520072	CB-PCO-3000	SUB-D, 9-pin	3 m	Infrared adapter	COMPACT <i>plus</i> , RS4/A1, RS4/P1
50035863	CB-D9-3000-5GF/GM	SUB-D, 9-pin	3 m, shielded	SUB-D, 9-pin	RS4
50035865	CB-D9-5000-5GF/GM	SUB-D, 9-pin	5 m, shielded	SUB-D, 9-pin	RS4
50035867	CB-D9-10000-5GF/GM	SUB-D, 9-pin	10 m, shielded	SUB-D, 9-pin	RS4
Copier cable for AS-i monitor program					
50104079	CB-ASM-DK1	RJ45 plug, 8-pin	0.3 m	RJ45, 8-pin	ASM1, ASM1E

Magnetically Coded Sensors

Safety Switches

Safety Locking Devices

Safety Command Devices

Safety Relays

Programmable Safety Controllers

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ACCESSORIES

Laser alignment aids

Opto-electronic safety sensors mostly work with infrared, therefore invisible light. The alignment of these sensors and the Deflecting Mirrors is generally relatively time-consuming, especially with multiple side guarding with Deflecting Mirrors. By contrast, the LA 78 series laser alignment aids make

alignment easy and convenient. They are mounted directly on the sensor housing and visibly mark the target point of the sensor beams with a red light laser. Complex arrangements can consequently be set up by just one person, while also saving time in the process.

Areas of application, ordering information and dimensional drawings

- Battery-operated red light lasers for quick and easy alignment of Leuze electronic opto sensors and Deflecting Mirrors.

Special features

	LA-78	LA-78U	LA-78UDC	LA-78M	LA-78M-UDC
Red light laser, laser class 2	●	●	●	●	●
Robust aluminum housing	●	●	●	●	●
Battery-operated	●	●	●	●	●
For special use in the DC or UDC floor columns			●		●

Accessories		Suitable for sensors					
Laser alignment aid		Safety Light Curtain		Multiple Light Beam Safety Device		Single Light Beam Safety Device	Laser Scanner
Art. no.	Article	COMPACTplus	SOLID-2 SOLID-4	COMPACTplus-m	MLD	SLS 78/R	RS4
549000	LA-78				*)	●	●
560020	LA-78U	●	●	●	*)		
520004	LA-78UDC	●	●	●	*)		
520023	LA-78M				●		
520024	LA-78M-UDC				●		

*) when using with BT-LA-78M mounting brackets (part no. 520021) or BT-LA-78M-UDC (part no. 520022)

Please note the additional information at www.leuze.com/sensor-accessories.

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Muting Sensor Sets
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Display and control
units
p. 512

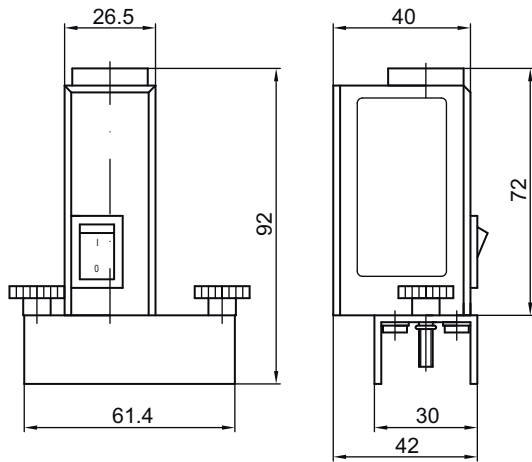
Connection cables
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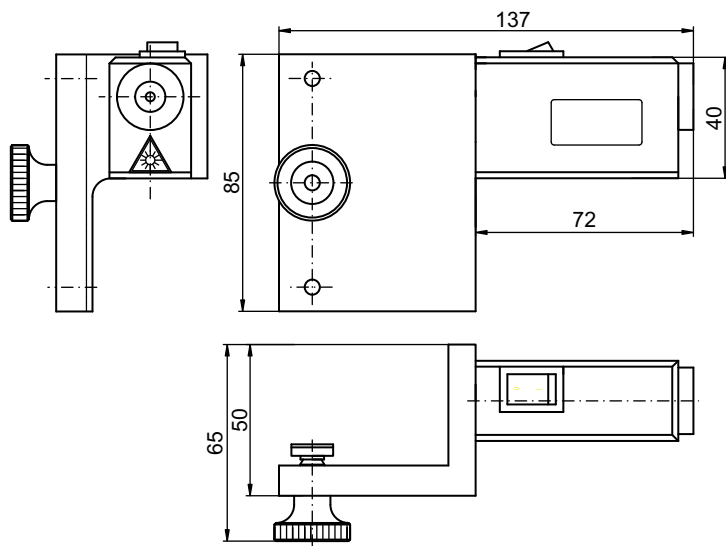
LASER ALIGNMENT AIDS

Dimensional drawings

LA-78, LA-78U dimensional drawings



LA-78



LA-78U

Dimensions in mm



Features

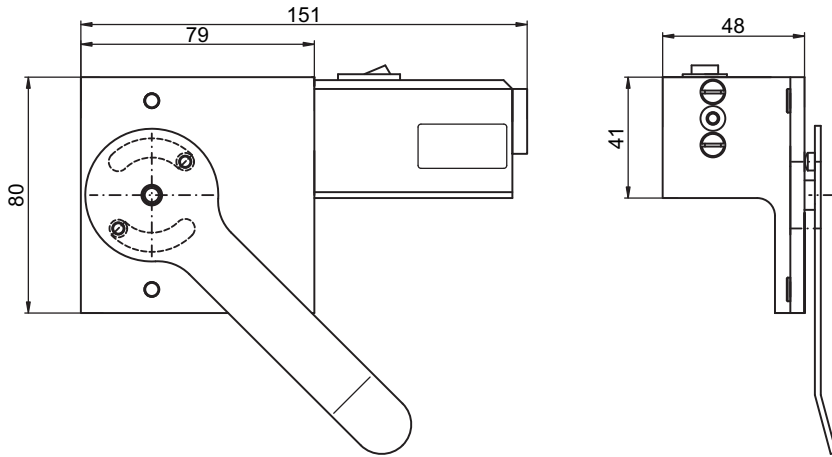


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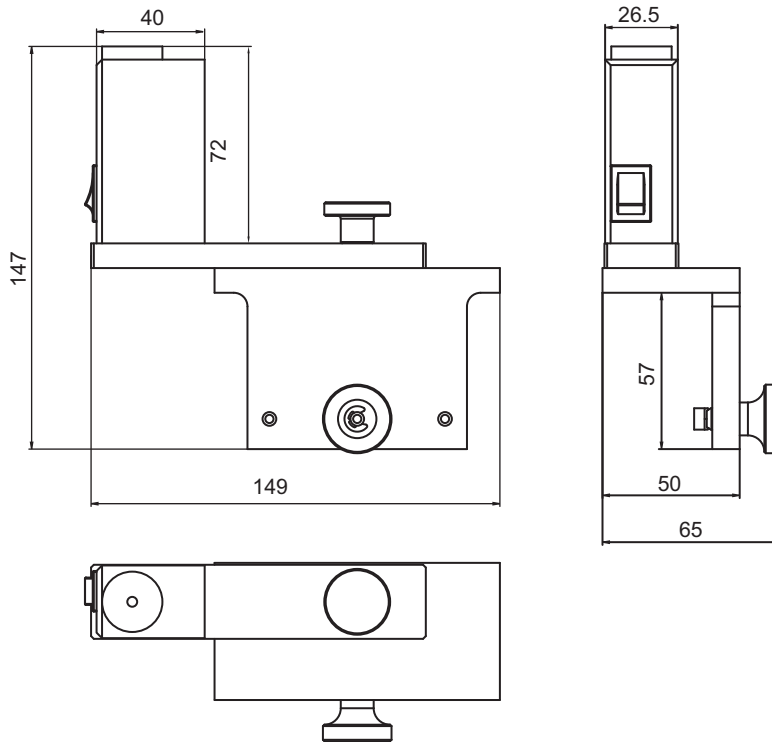
ACCESSORIES

Dimensional drawings

LA-78UDC, LA-78M dimensional drawings



LA-78UDC



LA-78M

Dimensions in mm

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Muting sensors,
Muting Sensor Sets
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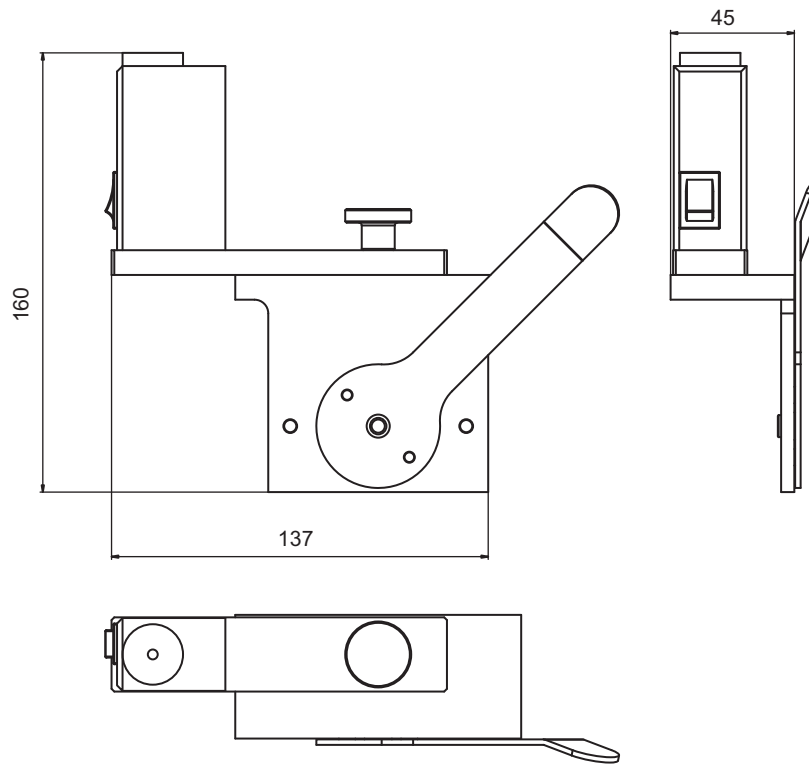
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Dimensional drawings

LA-78M-UDC dimensional drawing



LA-78M-UDC

Dimensions in mm

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Safety Switches

Safety Locking Devices

Safety Command Devices

Safety Relays

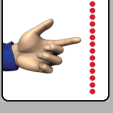
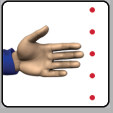

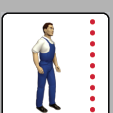



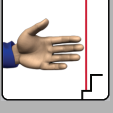
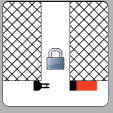
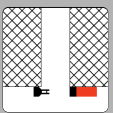
Programmable Safety Controllers

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Features		
<p>Point of operation guarding: Light Curtain with finger resolution</p>		<p>Applies for resolution $d = 14$ mm, is selected when working is required close to the point of operation and/or where space is restricted.</p>
<p>Point of operation guarding: Light Curtain with hand resolution</p>		<p>Applies for resolutions d between 14 mm and 40 mm Additional "C" required with calculation of the safety distance.</p>
<p>Danger zone guarding: Light Curtain</p>		<p>Required resolution according to height above the floor, from 50 mm (on the floor) up to 116 mm (with 1 m height); additional "C" required with calculation of the safety distance.</p>
<p>Access guarding: Light Curtain</p>		<p>Is selected where space is restricted. Additional "C" required with calculation of the safety distance when the resolution is greater than 14 mm. Start/restart interlock obligatory.</p>
<p>Access guarding: Multiple Light Beam Safety Device</p>		<p>Access guarding or perimeter guarding at danger zones. Additional "C" = 850 mm, start/restart interlock obligatory.</p>
<p>Danger zone guarding: Laser scanner</p>		<p>Is selected in the preliminary stage for stationary machines or industrial conveyor trucks/transfer carriages. Protective and warning fields can be changed over.</p>
<p>Passage guarding: Laser Scanner</p>		<p>Is selected for changeable protective fields or when optical components cannot be mounted on a door frame. Floor, door frame as reference plane. additional "C" required with calculation of the safety distance.</p>
<p>Point of operation guarding: Laser scanner</p>		<p>Changeable overlapping protective fields with hand resolution can be implemented in the Laser Scanner's close range. Reference frames around the access window and additional "C" required with calculation of the safety distance.</p>
<p>Safety Locking Device</p>		<p>Safety Locking Devices keep moveable guards in a closed position. Use with long machine stopping times.</p>
<p>Safety Switches (without guard interlocking)</p>		<p>Position monitoring of protective doors. Opening the hard guard generates a stop command. Calculation of the safety distance required.</p>

Abbreviations and technical terms

AOPD	Active optoelectronic protective device
AOPDDR	Active optoelectronic protective device responsive to diffuse reflection
AS-Interface Safety at Work	Extension of an AS-Interface sensor/actuator network with safety-related sensors and actuators.
Blanking	A function with which one or more areas of the protective field of an AOPD is/are made ineffective so that work pieces in the AOPD's protective field do not cause the protective device to switch off. Blanking can be stationary or floating.
BWS	B erührungslos w irkende S chutz e inrichtung (English: ESPE)
Contactor monitoring (EDM)	The contactor monitoring monitors the N/C contacts of downstream positive-guided contactors and relays.
EDM	E xternal D evice M onitoring
ESPE	E lectro S ensitive P rotective E quipment (German: BWS)
Muting	Temporary safety-related automatic suspension of the AOPD's protective function during the material transport through the AOPD (see also IEC TS 62046).
Muting override	Manual activation of the muting function by activating a command device for moving material out of the muting area (at least one muting sensor must be activated for this, see also IEC TS 62046).
OSSD1 OSSD2	Safety-related switching output O utput S ignal S witching D evice
PROFIsafe	Profile for safety-related data transfer via PROFIBUS DP.
Range	Distance between transmitter and receiver, and with reflex systems between sensor and reflector (with Light Curtains also called protective field width).
Protective field	The area in which the defined test object is detected by the AOPD.
Protective field height	Height of the active protective field with Light Curtains.
RES	Start/restart interlock, prevents the automatic restarting of the machine after addressing a safety sensor, after switching on the supply voltage or changing the machine's operating or actuation mode.
Response time	Time between penetration/entry into the active protective field and the actual switching off of the OSSDs.

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