



Safety Sensors Safety Systems Safety Services

CATALOG
2007



Opto-electronic protective devices and systems
for safety at work in automation

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 opto-electronic protective devices and hard guards	➤	Machine Safety 
Application advice and start-up support Safety inspections	➤	Machine Safety Services 
PC software for the methodical safety engineering of machinery and plant systems	➤	Safety Engineering Software 
"Flexible in use" opto-electronic protective devices for stationary and mobile machines (e.g. driverless transport systems)	➤	Safety Laser Scanners 
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Opto-electronic protective devices for access guarding on production cells, with or without muting function for unobstructed material transport	➤	Multiple Light Beam Safety Devices 
Single Light Beam Safety Devices in various construction designs for optimum integration into the machine concept	➤	Single Light Beam Safety Devices 
A complete range of opto-electronic protective devices with integrated 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 
Safety Switches and Safety Locking Devices for guarding protective doors, flaps, or covers	➤	Safety Switches and Safety Locking Devices 
Safety control devices for the cost-effective integration of individual safety sensors	➤	Safety Relays 
Safety Interfaces with parameterable special functions, such as muting or cycle control for integrating several safety sensors into more complex system concepts	➤	Safety Interfaces 
Suitable and harmonized accessories for the Leuze lumiflex safety sensors	➤	Accessories 
The product's catalog page via an alphabetical list of names	➤	Product Finder 



For over 40 years now the name **Leuze** has been recognized the world over as a provider of innovative and proven-in-practice solutions in the optosensor system area for plant automation. The field of application of our sensor systems ranges from the automotive industry and conveyor belt and storage system technology through to printing machines and analysis technology.

The Leuze offering ranges in this respect from simple, binary switching opto-electronic sensors, to identification and data transfer systems, on through to complex image processing systems and safety sensors for people protection in industrial applications. We continuously further develop our systems on the basis of our extensive and in-depth application know-how. At the same time we are also the right partner for both standard applications and for customized high-end solutions, and we can always be reached in little to no time via our expansive sales and service network.



For more than 30 years now **Leuze lumiflex** as a subsidiary of **Leuze electronic** is producing innovative safety systems for accident prevention in the industrial workplace, and consequently ranks among the world's leading technology providers.

Our goal is to produce safety sensors and control devices that enable an economical integration into various machine and plant system concepts, and which also provide effective people protection in accordance with international safety standards, without obstructing workflows.

This catalog illustrates our complete range of Light Beam Safety Devices, Switches, Light Curtains, Laser Scanners, -Control Devices, Safety Engineering Software and our services offering for everything to do with machine safety.



Machine Safety

Machine Safety Services

Safety Engineering Software

Safety Laser Scanners

Safety Light Curtains

Multiple Light Beam Safety Devices

Single Light Beam Safety Devices

AS-interface Safety at Work

PROFIsafe Sensors

Safety Switches and Safety Locking Devices



SALES - GERMANY



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		MALAYSIA	



Machine Safety

Machine Safety Services

Safety Engineering Software

Safety Laser Scanners

Safety Light Curtains

Multiple Light Beam Safety Devices

Single Light Beam Safety Devices

AS-interface Safety at Work

PROFIsafe Sensors

Safety Switches and Safety Locking Devices



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Machine Safety
Services

Safety
Engineering
Software

Safety Laser
Scanners

Safety Light
Curtains

Multiple
Light Beam
Safety Devices

Single
Light Beam
Safety Devices

AS-interface
Safety at Work

PROFIsafe
Sensors

Safety Switches
and Safety Lock-
ing Devices





MACHINE SAFETY

1. Introduction

Increasingly more powerful and more complex machinery and systems – machine operators and maintenance personnel are surrounded these days by complicated, multilayer technologies. For people in general it is increasingly more difficult to detect potential dangers and also increasingly "more" impossible to remove the danger in time before an accident or injury occurs. Machine safety is therefore 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 employer 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 control devices 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 some 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. Only products that satisfy these basic requirements may be distributed. 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. Fulfilment 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 directives in the area of EU machine safety and their implementation under German Law

 EU Directives	 German Law
Machinery Directive 98/37/EC	9th GPSG (Device and Product Safety Law)
Low Voltage Directive 73/23/EEC	1st GPSG (Device and Product Safety Law)
ATEX Directive 94/9/EC	11th GPSG (Device and Product Safety Law)
General Product Safety Directive 2001/95/EC	Device and Product Safety Law (GPSG)
EMC Directive 89/336/EEC	EMC Law

Machine Safety, p. 8

Machine Safety in the EU, p. 8

Machine Safety in the USA, p. 27

Protective Devices, p. 32

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.
Directive 89/655/EEC amended by 2001/45/EC	– The information of employers' liability insurance associations is provided by special topic-specific publications of the respective associations.

2.1.1 EU Machinery Directive 98/37/EC

Machinery Directive 98/37/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.

Content overview

Chapter I:	Area of application, distribution, free merchandise traffic
Chapter II:	Certification procedure
Chapter III:	CE conformity assessment
Chapter IV:	Final provisions
Annex I:	Basic Requirements of Machine Safety

Annex II:	Section A: EC Declaration of Conformity for Machinery
	Section B: EC Manufacturer Declaration for Devices and Part-Machines
	Section C: EC Declaration of Conformity for Safety Components
Annex III:	CE conformity assessment
Annex IV:	Types of machines (with high hazard potential) and safety components for which a special certification procedure applies
Annex V:	EC Conformity Declaration procedure by the manufacturer (self-certification)
Annex VI:	EC Type Examination procedure by a recognized test center
Annex VII:	Criteria and requirements at recognized test centers

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 hazard analysis and risk assessment so that all required measures for risk reduction are already considered in the machine's construction phase.

Note

The Leuze lumiflex PC software, **Safexpert** for machinery safety engineering contains a list of hazard in accordance with ISO 14121/EN 1050 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 hazard 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 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

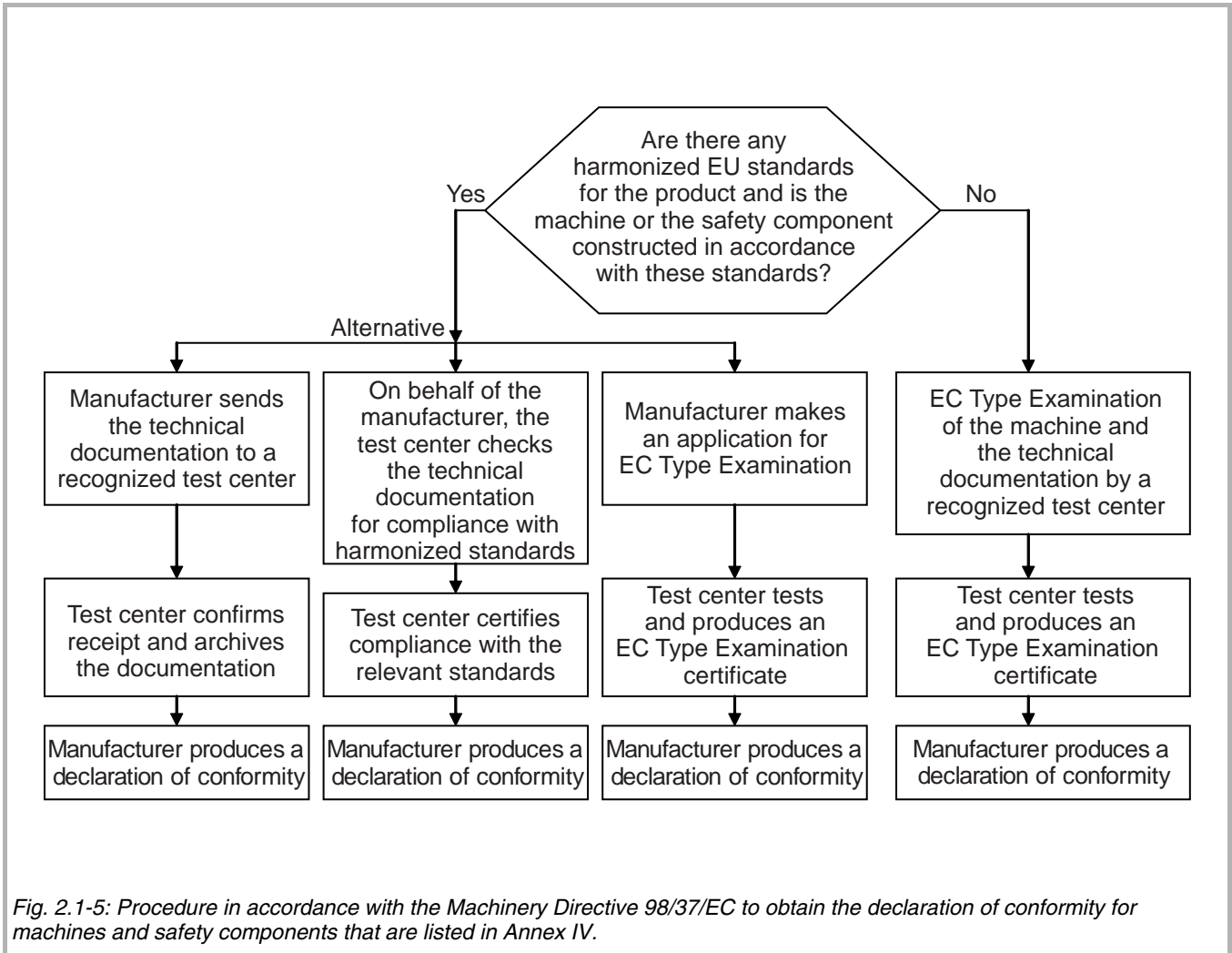


Fig. 2.1-5: Procedure in accordance with the Machinery Directive 98/37/EC to obtain the declaration of conformity for machines and safety components that are listed in Annex IV.

MACHINE SAFETY IN THE EU

2. Machine Safety in the EU

The new Machinery Directive 2006/42/EC

The currently valid EC Machinery Directive 98/37/EC will be replaced from 29 December 2009 by the new Machinery Directive 2006/42/EC. Directive 98/37/EC will apply until then. The incorporation into national law must be complete by 29 June 2008 (in Germany by the amendment to the machine ordinance – 9. GPSGV).

Extensive changes are especially prevalent with the conformity assessment procedure of Annex IV Machines. In the event that there are no harmonized EU standards or the product was not constructed under compliance of these standards, an EC Type Examination by a recognized test center is currently required. The new directive now opens up the option of self-certification for the manufacturer without the participation of a test center, if they have a quality assurance procedure in accordance with Annex X. Of course the option of having machines certified voluntarily by a recognized test center is always optional.

Further changes are:

- The **basic safety and health requirements** (Annex I) will in future require a risk assessment by the manufacturer.
- In the old Machinery Directive there are different procedures for proving the safety of machinery, exchangeable equipment, **safety components**, chains/ropes/belts for lifting purposes, cardan shafts and load-carrying equipment. In the future the same machine regulations will also apply for these products. They will have to be distributed in the future **with CE conformity assessment**, declaration of conformity and the required user information.
- The requirements for "part-machines" (also referred to as "incomplete machines") have been re-formulated in the new version of the Machinery Directive. Until now a manufacturer declaration was sufficient, but in the future the manufacturer will also have to supply a declaration of incorporation, 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).
- The delimitation of the Low Voltage Directive is no longer regulated as risk-related, but rather product-related.
- Construction site lifts are subject to the Machinery Directive.
- Instead of a "hazard analysis" a risk assessment and "risk evaluation" are required.
- 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 15 years.

The new 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 **machine operator (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 German 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 95/63/EC, 98/655/EEC 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 lumiflex provides competent advice and support services in this respect in its **Machine Safety Services** service package (see, Machine Safety Services chapter, 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 lumiflex provides safety inspections before the initial operation and regular safety inspections thereafter in its **Machine Safety Services** service package (see, Machine Safety Services chapter, 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.

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

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

*) EFTA States

As of: 1 January 2007

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

Single Light Beam Safety Devices

AS-interface Safety at Work

PROFIsafe Sensors

Safety Switches and Safety Locking Devices





MACHINE SAFETY

2. Machine Safety in the EU

2.2.3 Hierarchy of European standards for machine safety

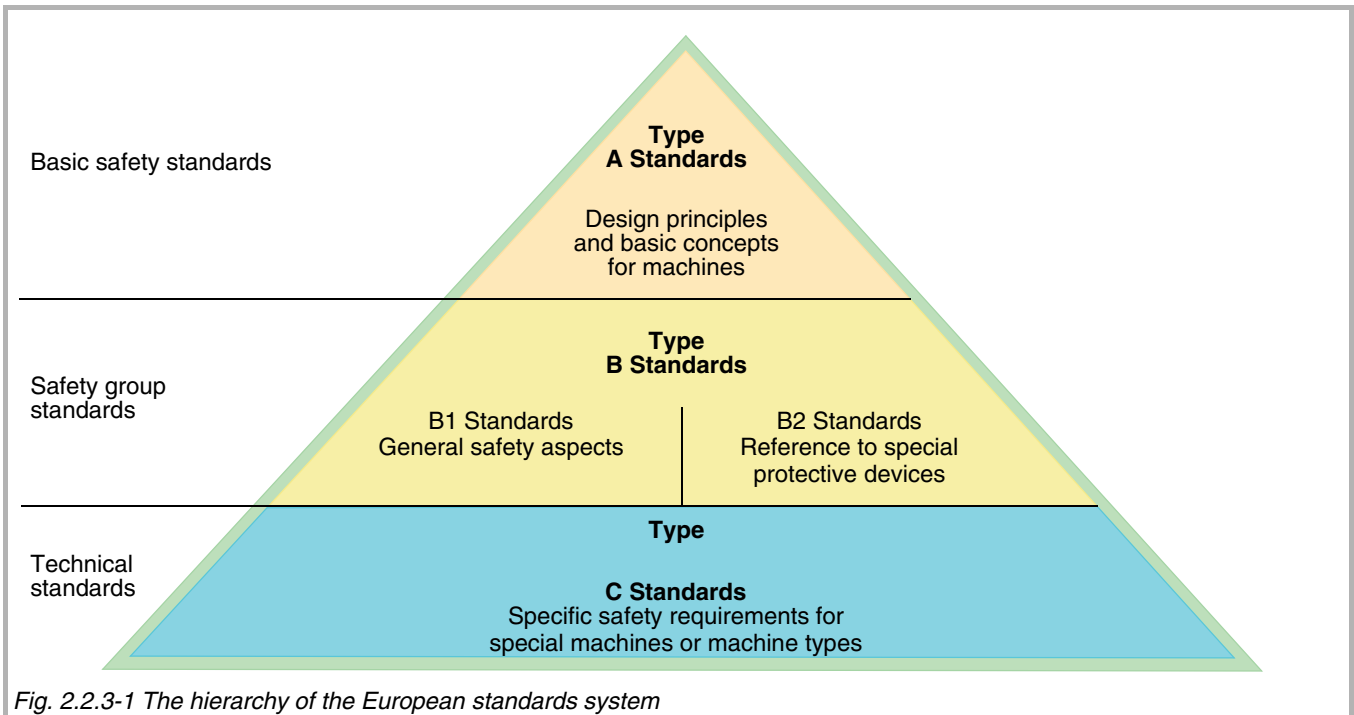
European safety standards can be divided into basic safety standards (type A standards), safety group standards (type B1 standards and type B2 standards) and machine-specific technical standards (type C standards).

The design principles and the basic concepts of type A standards, such as EN ISO 12100-1, EN ISO 12100-2 and ISO 14121-1/EN 1050, 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 emergency 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 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.



MACHINE SAFETY IN THE EU

2. Machine Safety in the EU

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

Type of Standard	European (EN) and International (ISO/IEC) Standards		
	Reference Number	Title of Standard	
A	EN ISO 12100-1	Safety of machinery – Basic concepts, general principles for design – Part 1: Basic terminology, methodology	Machine Safety Services
	EN ISO 12100-2	Safety of machinery – Basic concepts, general principles for design – Part 2: Technical principles	
	EN 1050 ISO 14121-1	Safety of machinery – Principles for risk assessment	
B	EN 294 prEN ISO 13852	Safety of machinery – Safety distances to prevent danger zones being reached by the upper limbs	Safety Laser Scanners
	EN 349 prEN ISO 13854	Safety of machinery – Minimum gaps to avoid crushing of parts of the human body	
	EN 811 prEN ISO 13857	Safety of machinery – Safety distances to prevent danger zones being reached by the lower limbs	Safety Light Curtains
	EN 954-1 EN ISO 13849-1	Safety of machinery – Safety-related parts of control systems – Part 1: Basic principles	
	EN ISO 13849-2	– Part 2: Validation	
	EN 999 ISO 13855	Safety of machinery – The positioning of protective equipment in respect of approach speeds of parts of the human body	Multiple Light Beam Safety Devices
	EN 1037 ISO 14118	Safety of machinery – Prevention of unexpected start-up	
	EN 60204-1 IEC 60204-1	Safety of machinery – Electrical equipment of machines – Part 1: General requirements	Single Light Beam Safety Devices
	EN 62061 IEC 62061	Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems	
	EN/TS 62046 IEC/TS 62046	Safety of machinery – Application of protective equipment to detect the presence of persons	AS-interface Safety at Work
	EN 418 prEN ISO 13850	Safety of machinery – Emergency stop equipment, functional aspects – Principles for design	
	EN 574 ISO 13851	Safety of machinery – Two-hand control devices. Functional aspects – Principles for design	PROFIsafe Sensors
	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 pressure sensitive mats and pressure sensitive floors	Safety Switches and Safety Locking Devices
EN 1760-2 ISO 13856-2	– Part 2: General principles for the design and testing of pressure sensitive bumpers, plates, wires and similar devices		





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 edges and pressure sensitive bars
	EN 61496-1 IEC 61496-1	Safety of machinery – Electro-sensitive protective equipment. – Part 1: General requirements and tests
	prEN 61496-2 IEC 61496-2	– Part 2: Particular requirements for active opto-electronic protective devices (AOPD)
	EN 61496-3 IEC 61496-3	– Part 3: Particular requirements for active opto-electronic 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 415-4	Safety of Packaging Machines – Part 4: Palletizers and Depalletizers
	EN 422	Rubber and plastics machines – Safety – Blow moulding 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 moulding and coremaking machinery and plant and associated equipment
	EN 775 ISO 10218	Manipulating Industrial Robots – Safety
	EN 848-1	Safety of woodworking machines – One side moulding machines with rotating tool – Part 1: Single spindle vertical moulding 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	Safety of machinery – Safety requirements for the design and construction of printing and paper converting machines – Part 1: Common requirements
	prEN 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 and tenoning machines with sliding table	
EN 1525	Safety of industrial vehicles – Automated guided vehicles (AGV) and their systems	

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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	
	Reference	Standard name
C	EN 1526	Safety of industrial vehicles – Additional requirements for automated functions on AGV
	EN 1672-1	Food processing machinery – Basic concepts – Part 1: safety requirements
	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 oder www.zvei.org, for example. Standards in their original version can be obtained from Beuth Verlag GmbH, www.beuth.de, for example.

i Note

Finding instead of searching! The Leuze lumiflex software, Safexpert for the safety engineering of machinery and plant systems enables applicable points from 9 important EU machinery safety standards to be found in full text in a matter of seconds with a high-performance search and filter function (see chapter, Safexpert, page 60).

Machine Safety Services

Safety Engineering Software

Safety Laser Scanners

Safety Light Curtains

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AS-interface Safety at Work

PROFIsafe Sensors

Safety Switches and Safety Locking Devices





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. ISO 14121/EN 1050 "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.

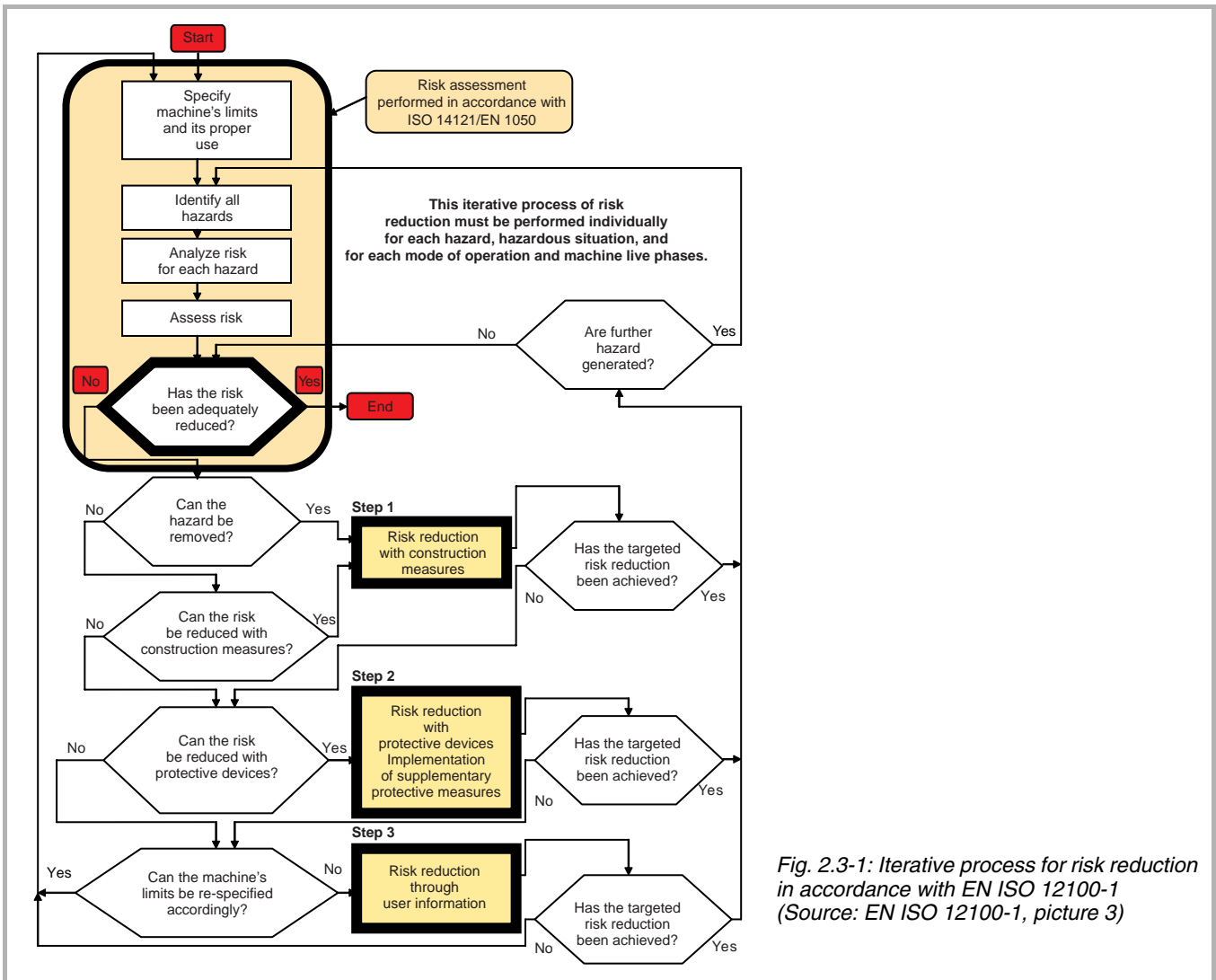


Fig. 2.3-1: Iterative process for risk reduction in accordance with EN ISO 12100-1 (Source: EN ISO 12100-1, picture 3)

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.

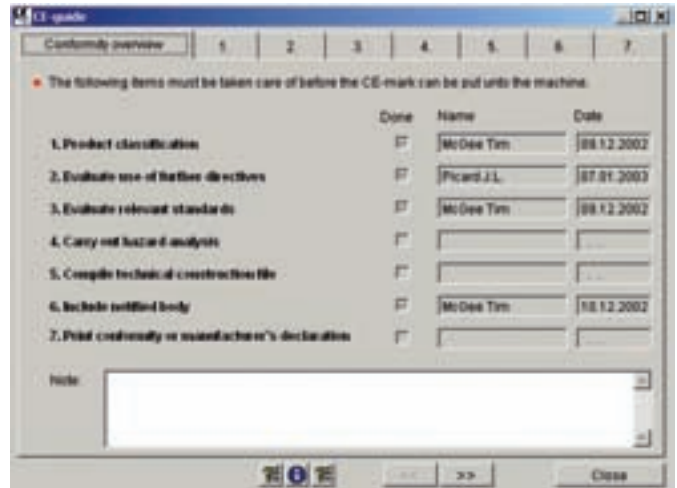
The first four steps describe the risk analysis and risk assessment. ISO 14121 / EN 1050 contains detailed requirements for this. It is important that the risk analysis and risk assessment be carried out methodically and that it is comprehensibly documented.

In addition to these protective measures selected by the machine designer/constructor, further protective measures may also be required by the machine operator or machine user 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 lumiflex PC software **Safexpert** for the safety engineering of machines contains a list of hazards in accordance with ISO 14121 / EN 1050 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 hazard points of operation and life phases of the machine and ensures a 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 Services

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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 standalone 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)	Average probability of a failure to danger [1/h] *	SIL Level IEC/EN 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

*) Comment: The PFH values represent a necessary prerequisite for determining the performance level. Furthermore CCF, category and DC must also be used to fully determine the PL.

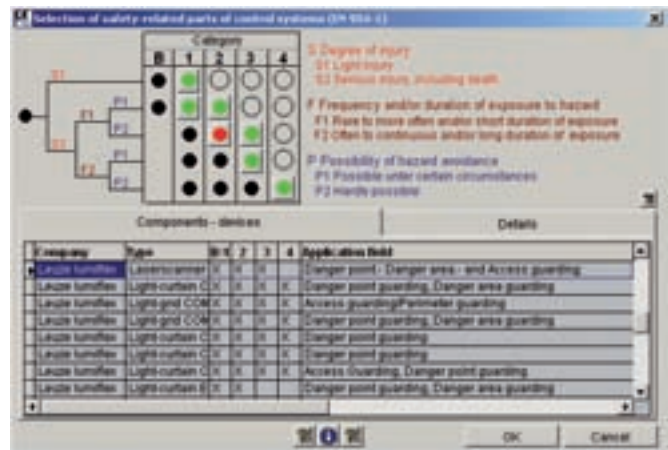
Fig. 2.4-1: Performance Level and SIL Level (Source: ZVEI Flyer "Safety of Machinery")

2.4.1 EN 954-1 "Safety of machinery – Safety-related parts of control systems"

The European standard EN 954-1 "Safety of machinery– Safety-related parts of control systems" is established as the international state of technology in the area of machine safety. It applies for all safety-related parts of control systems, regardless of the power type used, e.g. electric, hydraulic, pneumatic or mechanical. EN 954-1 defines categories for classifying different safety-related capacities (categories B, 1, 2, 3, 4). The following table shows the categories with requirements for the safety function and required system behavior when a fault occurs.

Note

Safexpert, the PC software from Leuze lumiflex for the systematic safety engineering of machinery and plant systems supports the designer when determining the required control category in accordance with EN 954-1 on the basis of a hazard analysis in accordance with EN ISO 12100-1. For further information and ordering info see chapter, Safexpert, page 60.



MACHINE SAFETY IN THE EU

2. Machine Safety in the EU

Categories of the safety-related parts of control systems in accordance with EN 954-1

Cat.	Summary of requirements	System behavior ¹⁾	Principle for achieving safety
B	The safety-related parts of control systems and/or their protective devices and their components shall 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.	The occurrence of a fault can cause the loss of the safety function.	Predominantly characterized by the selection of components.
1	The requirements of B shall be satisfied. Approved components and approved safety principles shall be applied.	The occurrence of a fault can cause the loss of the safety function, but the probability that one will occur is lower than in B.	Predominantly characterized by the selection of components.
2	The requirements of B and the use of approved safety principles shall be ensured. The safety function shall be checked at appropriate intervals by the machine control system.	The occurrence of a fault can cause the loss of the safety function between the test intervals. The loss of the safety function is detected by the test.	Predominantly characterized by the structure.
3	The requirements of B and the use of approved safety principles shall be ensured. Safety-related parts shall 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.	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.	Predominantly characterized by the structure.
4	The requirements of B and the use of proven safety principles shall be ensured. Safety-related parts shall be designed so that: – A single fault in each of these parts does not cause the loss of the safety function. – The single fault is detected with or before the next request to the safety function, or if this is not possible, an accumulation of faults may not cause the loss of the safety function.	If faults occur the safety function is always maintained. The faults are detected in time to prevent a loss of the safety function.	Predominantly characterized by the structure.

¹⁾ The risk assessment shows whether or not the complete or partial loss of the safety function(s) that the faults cause is manageable.

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MACHINE SAFETY

2. Machine Safety in the EU

Validity of EN 954-1

As already mentioned, EN 954-1 is considered today as the internationally applicable standard in the area of safety-related control systems. One deficiency of this standard is that it does not contain any special requirements for programmable electronic control systems or statements on failure probabilities (probabilistic approach). This leads to the formulation of EN ISO 13849-1. EN 954-1 will remain valid during the transition time until 31 Oct. 2009 together with EN ISO 13849-1, and will then be replaced by this. Both standards EN 954-1 and EN ISO 13849-1 are listed in the Official EU Journal. In the next 3 years machines can continue to be purely formally evaluated for safety on the basis of EN 954 and certified in accordance with the Machinery Directive.

2.4.2 EN ISO 13849-1 "Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design"

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. The same risk parameters used in EN 954-1 are used for assessing the risk.

Risk parameters:

S Severity of potential injury

S1 Light (usually reversible injury)

S2 Serious (usually irreversible injury including death)

F Frequency and/or duration of the exposure to 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 Scarcely possible

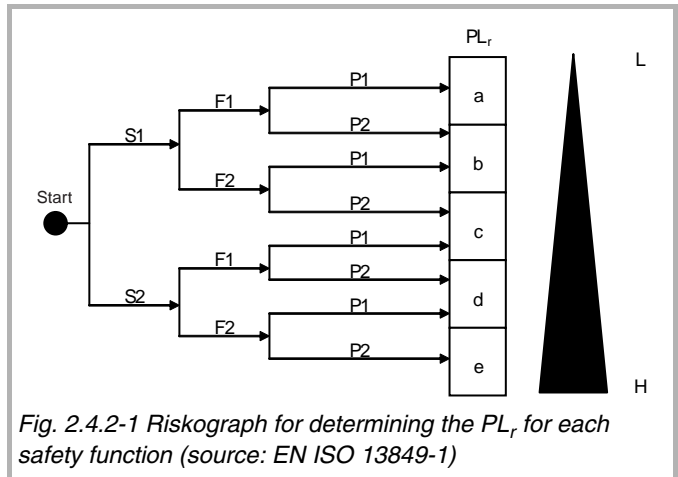


Fig. 2.4.2-1 Riskograph for determining the PL_r for each safety function (source: EN ISO 13849-1)

Legend

Start	Point at which the evaluation of the contribution to the risk minimization begins
L	Low contribution to risk minimization
H	High contribution to risk minimization
PL _r	Required performance level

MACHINE SAFETY IN THE EU

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	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.

Simplified procedure for assessing the PL in accordance with EN ISO 13849-1

EN ISO 13849-1 contains a simplified procedure for assessing the PL of a safety-related control system. A prerequisite for applying the simplified procedure is that the control design is based on one of the architectures provided in section 6 of the standard. Furthermore the following typical assumptions are also made for these architectures:

Service life of 20 years

Constant failure rates within the service life

For category 2: Request rate $\leq 1/100$ of the test rate

For category 2: MTTF_{d, TE} greater than half of the MTTF_{d, L}

The following parameters are required for determining the PL according to this procedure:

Category (in accordance with the architecture)

MTTF_d (mean time to dangerous failure)

DC_{avg} (average diagnostic coverage)

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.

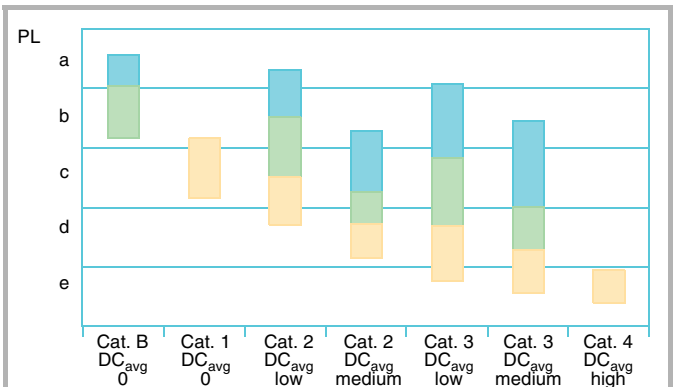


Fig. 2.4.2-3 Relation between the categories, DC_{avg}, MTTF_d of each channel and the resulting PL (source: EN ISO 13849-1)

Legend

- PL Performance level
- MTTF_d of each channel = low
- MTTF_d of each channel = medium
- MTTF_d of each channel = high

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. EN ISO 13849-2 "Safety of machinery – Safety-related parts of control systems – Part2: Validation" was published at the end of 2003. This part contains information on fault consideration, maintenance, technical documentation and notes on usage.





MACHINE SAFETY

2. Machine Safety in the EU

2.4.3 IEC/EN 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, IEC/EN 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 (SIL) in accordance with IEC/EN 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 $< 10^{-5}$

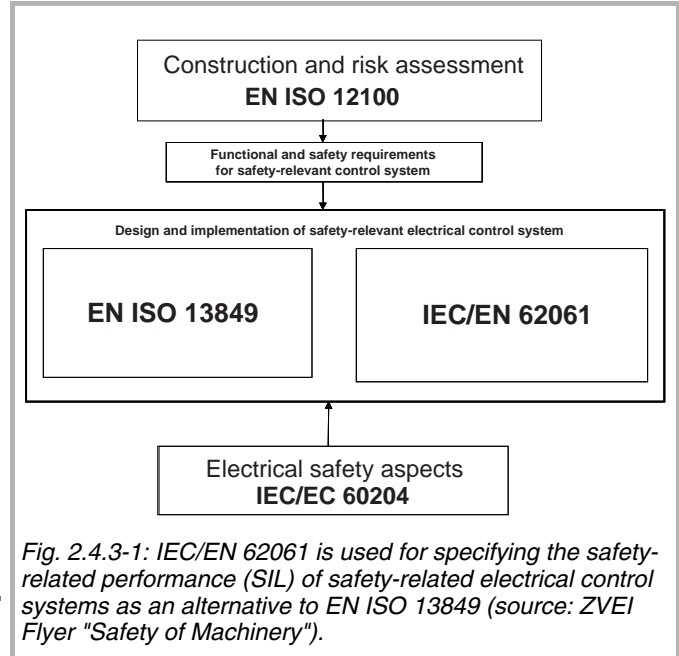


Fig. 2.4.3-1: IEC/EN 62061 is used for specifying the safety-related performance (SIL) of safety-related electrical control systems as an alternative to EN ISO 13849 (source: ZVEI Flyer "Safety of Machinery").

SIL risk assessment and definition

The informative Annex A of IEC/EN 62061 includes an example of a procedure for qualitative risk assessment and definition of the SIL. 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 ISO 14121/EN 1050 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 the occurrence of a hazardous incident
- **P** Possibility of preventing 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 IN THE EU

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, etc.	4	≤ 1hr	5	Very high	5	Impossible	5
Irreversible: Broken limb, loss of a finger	3	> 1hr to ≤ 1 day	5	Probable	4	Seldom	3
Reversible: Treatment by a medic is required	2	> 1 day to ≤ 2 weeks	4	Possible	3	Probable	1
Reversible: First aid required	1	> 2 weeks to ≤ 1 year	3	Seldom	2		
		> 1 year	2	Negligible	1		

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

The addition of these figures results in the **class of probability of harm, K**. With the two parameters S and K, we then go on to a matrix to define the SIL. 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: IEC/EN 62061, Annex A)

Draft and integration of an SRECS in accordance with IEC/EN 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/EN 61508 and consisting of hardware with embedded software or application software. In accordance with the system design the achieved safety integrity level (SIL) is determined and verifies whether or not the SIL has been achieved.





MACHINE SAFETY

2. Machine Safety in the EU

Determining the safety integrity level (SIL) 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.

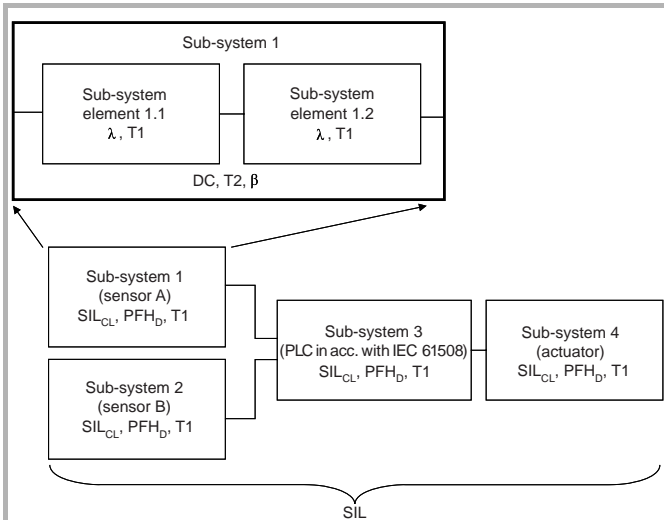


Fig. 2.4.3-2: SRECS architecture consisting of sub-systems and sub-system elements (source: ZVEI Flyer "Safety of Machinery")

The sub-systems are described safety-related by the parameters, SILCL, PFH_D and T_1 .

IEC 62061 parameters	Meaning
SILCL	SIL claim limit (maximum SIL value) of a sub-system
PFH_D	Probability of failure to danger per hour
T_1	Lifetime of a the sub-system or proof test interval if this value is less than the lifetime. Comment: 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:

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 unit is determined by adding the individual PFH_D values of the sub-systems.

Validation

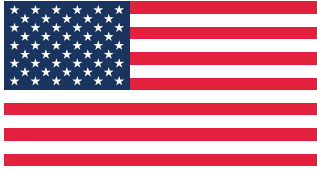
Chapter 8 contains requirements for validating the safety-related electrical control system. With the validation it is ensured by inspection and testing that the design of each safety function meets the corresponding requirements of the specification.

Validity of IEC/EN 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 98/37/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 workplace 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 O. 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 O.

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 – Coile-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

Standard	Title and content
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 Opto-Electronic Protective Devices (AOPDs).

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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. ISO 14121/EN 1050 "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.

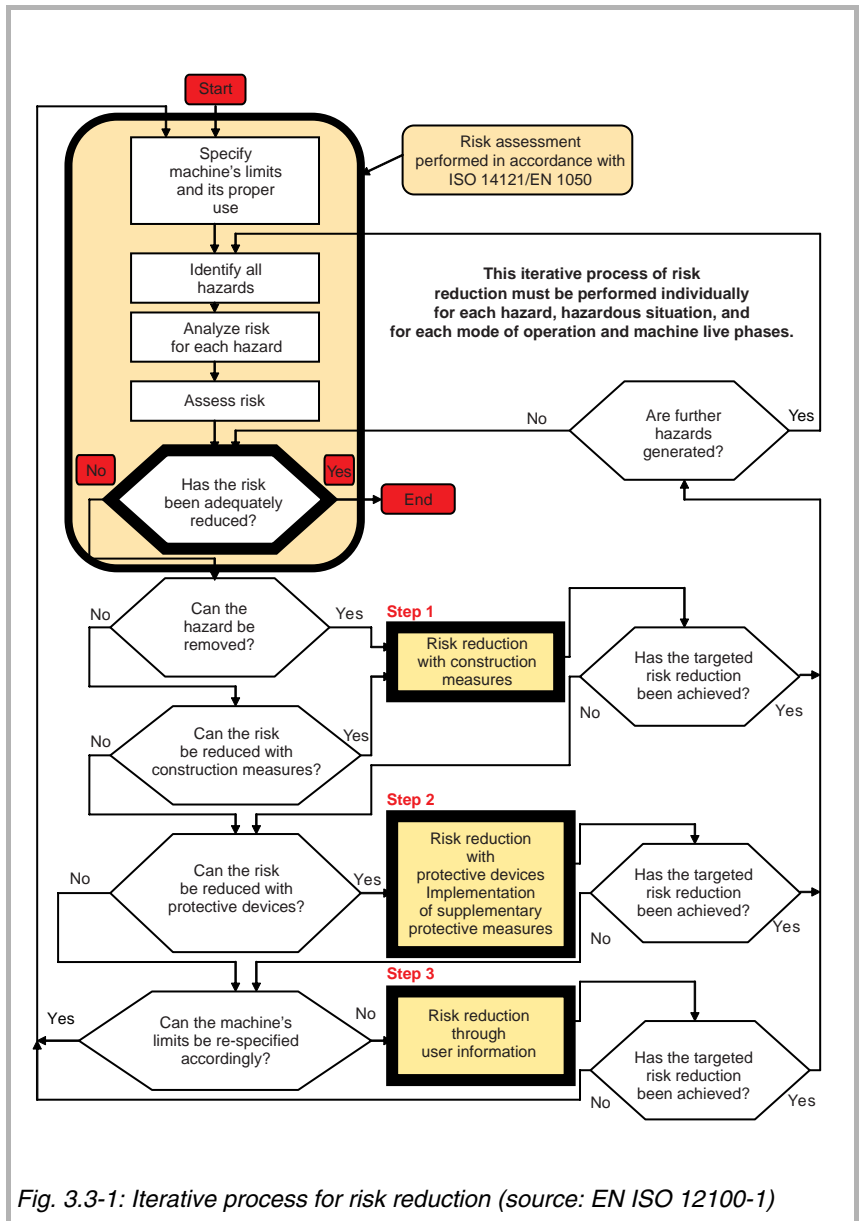


Fig. 3.3-1: Iterative process for risk reduction (source: EN ISO 12100-1)





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. ISO 14121 (EN 1050) 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 machine operator or machine user 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.

i Note

The Leuze lumiflex PC software Safexpert for the safety engineering of machines contains a list of hazards in accordance with ISO 14121 / EN 1050 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 hazards points of operation and life phases of the machine and ensures a 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. Comment: The term "common" means that these causes can have a simultaneous and same 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 954-1 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 fault is detected whenever this is reasonably possibly.

The behavior when a fault of a safety-related control unit of 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.

Machine Safety Services

Safety Engineering Software

Safety Laser Scanners

Safety Light Curtains

Multiple Light Beam Safety Devices

Single Light Beam Safety Devices

AS-interface Safety at Work

PROFIsafe Sensors

Safety Switches and Safety Locking Devices





MACHINE SAFETY

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 must 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 area is not required by the operator during normal operation. If the operation requires a more frequent access, an active opto-electronic protective device (e.g. Safety Light Curtain) or a moveable guard (e.g. doors with Safety Switches) should be used.


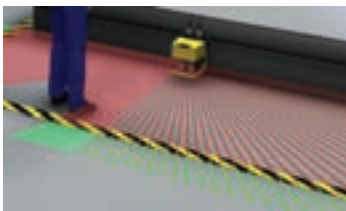
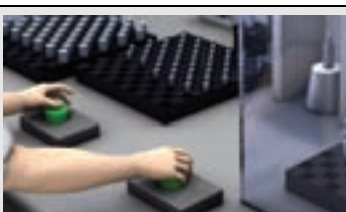

Selecting protective devices: Application advantages – application limits

	Type of protective device	Application advantages	Application limits
	Fixed hard guard (fence, cover).	Long lifetime, protection against injury caused by projected (thrown out) parts, objects.	Cannot be used if frequent access to the danger area is required. More difficult access with maintenance work. Can be removed without being noticed. Safety distance required (EN 294).
	Moveable guard without guard interlocking (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 area is required. Safety distance required, ISO 13855/EN 999.
	Moveable guard with guard interlocking (door or flap with safety guard interlocking).	The protective door can only be opened with an electric unlocking signal. Prevention of unexpected production interruptions.	Limited use possible when frequent access to the danger area is required.

PROTECTIVE DEVICES

4. Protective Devices

Selecting protective devices: Application advantages – application limits

	Type of protective device	Application advantages	Application limits
	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, ISO 13855/EN 999. 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 area.	Limited use in environments with heavy dirt build-up. Safety distance required, ISO 13855/EN 999. 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, ISO 13855/EN 999.
	Emergency 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.

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MACHINE SAFETY

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 electrosensitive 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 area (see EN 294).
- 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 opto-electronic 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 active opto-electronic protective devices and pressure-sensitive 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 opto-electronic protective devices

In the following it is assumed that a hazard analysis and risk assessment, e.g. in accordance with EN ISO 12100-1 has been performed (see chapter 2.3, page 18 and 3.3. page 29) and an opto-electronic protective device has been selected as a measure for minimizing risk.

General safety notes:

- Opto-electronic 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.
- Opto-electronic 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, around or walking 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 area guarding, people may not enter or be present in the danger area undetected. Additional protective devices may need to be provided, e.g. rear area 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 38).
- Reflective surfaces near opto-electronic 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.

PROTECTIVE DEVICES

4. Protective Devices



Step 1: Perform hazard analysis and risk assessment, e.g. in accordance with EN ISO 12100-1
(see chapter 2.3, page 18 and 3.3 page 29).


Step 2: Select type of opto-electronic 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 areas: process-conditional, maintenance-conditional.
- Financial criteria.

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

	Protective function	Application	Leuze lumiflex products
	Machine stop with hand or finger detection	With small operator distance to the danger area, 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 area	With accessible danger areas and bigger distance to the danger area	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 function	Application	Leuze lumiflex products
	Machine stop with detection of person accessing the danger area and prevention of the restart with constant presence detection.	Safeguarding danger area 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 opto-electronic protective device

The opto-electronic 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 analysis and risk assessment in accordance with EN ISO 12100-1 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 3.4 Control Reliability, page 30). 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.

Opto-electronic protective devices have different safety-related capacities, depending on the detection principle and the internal technical setup. IEC/EN 61496 and UL 61496 "Safety of machinery – Active opto-electronic protective devices" define 3 different types of active opto-electronic protective devices (AOPD), which differ in their effectiveness and frequency of error detection, i.e. their safety-related performance. The following table shows the requirements of the standard and establishes an assignment to the control categories of EN 954-1. 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 30. The corresponding AOPD type must then be selected.





MACHINE SAFETY

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	Corresponds with category (EN 954-1)
Type 2	<p>A type 2 AOPD shall have means for a periodic test. A loss of the protective function between the test intervals 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>	2
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 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>	3
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 result in the AOPD outputs being switched off.</p>	4

Table 4.2.1-1: Types and functional safety (control reliability) of active opto-electronic protective devices in accordance with IEC/EN 61496 and UL 61496.

PROTECTIVE DEVICES

4. Protective Devices

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

IEC/EN 62061

The SILCL in accordance with IEC 61508 is provided in the technical data for the products of the ASM1, ASM1E, COMPACTplus, RS4 and SOLID-2 series.

EN ISO 13849-1

For the products of the ASM1, ASM1E, COMPACT, COMPACTplus, RS4, SOLID-2 and SOLID-4 series the parameters, category, $MTTF_d$ and DC_{avg} for the simplified procedure for determining the performance level (PL) are available on request.

Help with selecting Leuze lumiflex 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 opto-electronic protective devices, the following selection aid can be used to select the appropriate Leuze lumiflex safety sensor for the risk minimization. The qualitative method presented in EN ISO 13849-1 is used for the risk assessment. A risk analysis, e.g. in accordance with EN ISO 12100 and ISO 14121/EN 1050 must basically be performed beforehand and the notes of chapter 4.2.1 must be observed.

IEC TS 62046 recommends across the board under 5.3.2.2:

- 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

i 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 the injury

S1 Light (usually reversible injury)

S2 Serious (usually irreversible injury including death)

F Frequency and/or duration of the exposure to hazard

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

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

P Possibility of preventing the hazard or limiting the harm

P1 Possible under certain conditions

P2 Scarcely possible

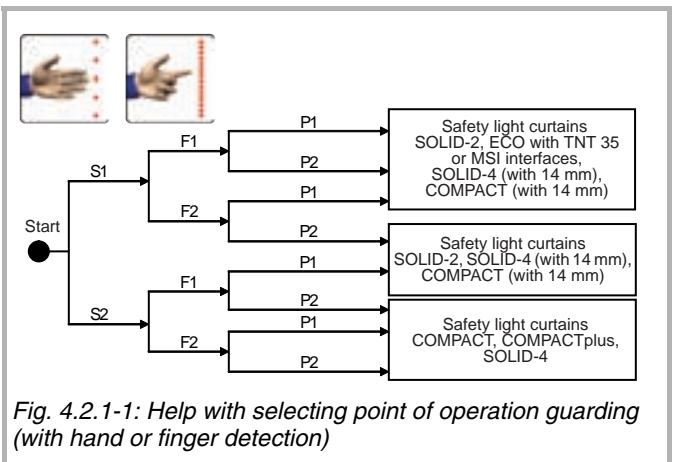


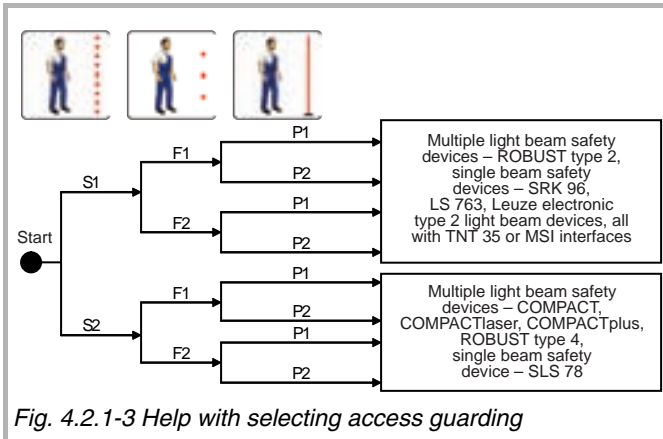
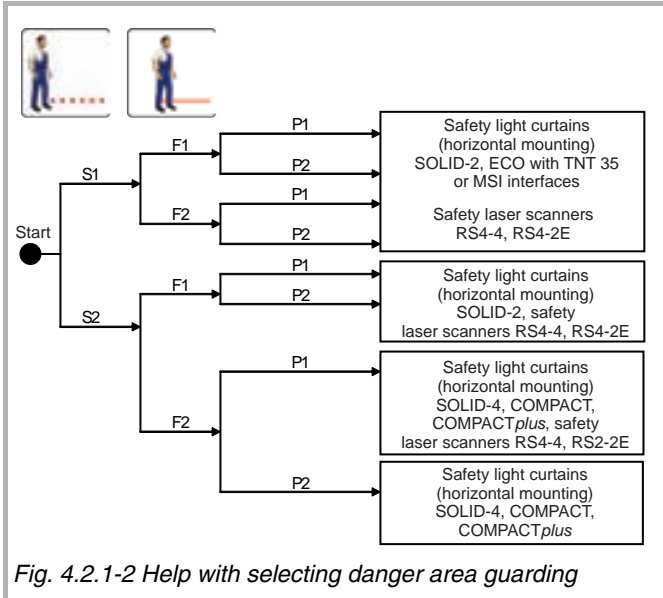
Fig. 4.2.1-1: Help with selecting point of operation guarding (with hand or finger detection)





MACHINE SAFETY

4. Protective Devices



Step 4: Calculating safety distance

Opto-electronic 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, ANSI B11.19-2003). 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 ISO 13855/EN 999 "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 ISO 13855/EN 999 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

PROTECTIVE DEVICES

4. Protective Devices

Calculation formula for the minimum safety distance for AOPD with right-angle approach (point of operation guarding):

The following calculation formulas apply for applications of opto-electronic 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 capacity 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 opto-electronic protective devices are also used to control the machine (Safety Light Curtains with single or double cycle function), their 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 $40 < d \leq 70$ mm:

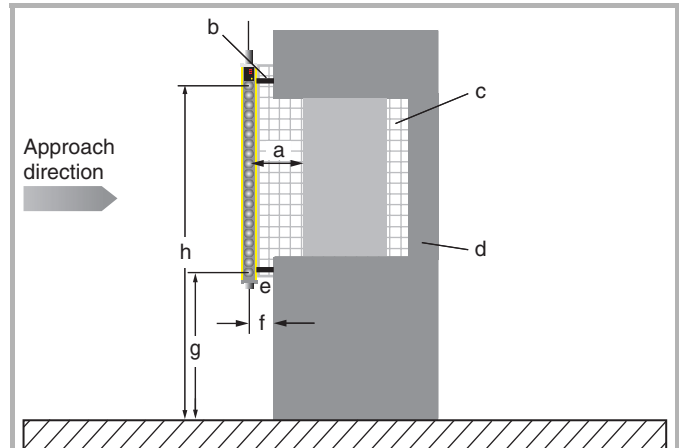
These kinds of protective devices may only be used if the risk assessment determines that the insertion of the hands does not have to be detected. The additional 850 mm to be added on corresponds with the arm length:

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

Attention:

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

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



- a = Safety distance **S** and **D_S**
- b = Measures to prevent penetration from above
- c = Measures to prevent penetration from the sides
- d = Measures to prevent penetration from the rear
- e = Measures to prevent penetration from below
- f = 75 mm maximum distance to avoid walking behind
- g = Height of the lowest beam above the reference plane
- h = Height of the highest beam above the reference plane

Fig. 4.2.1-4: Approach of the body part from a right-angle to the protective field level

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MACHINE SAFETY

4. Protective Devices

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

The following calculation formula applies for applications of opto-electronic 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.

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. The additional 850 mm to be added on corresponds with the arm length:

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

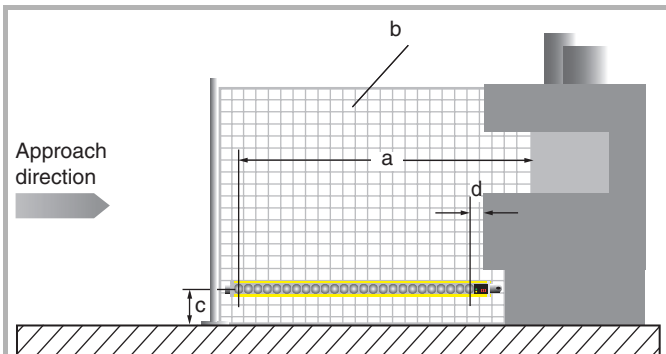
Attention:

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 automatic starting has to be provided in every case. The control device (reset button) must be positioned so that the entire danger area can be seen and it cannot be operated from the danger area.

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:

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



- a = Safety distance **S** and **D_S**
- b = Measures to prevent access from the sides
- c = Height above the floor
- d = 50 mm – Maximum distance to avoid walking 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.

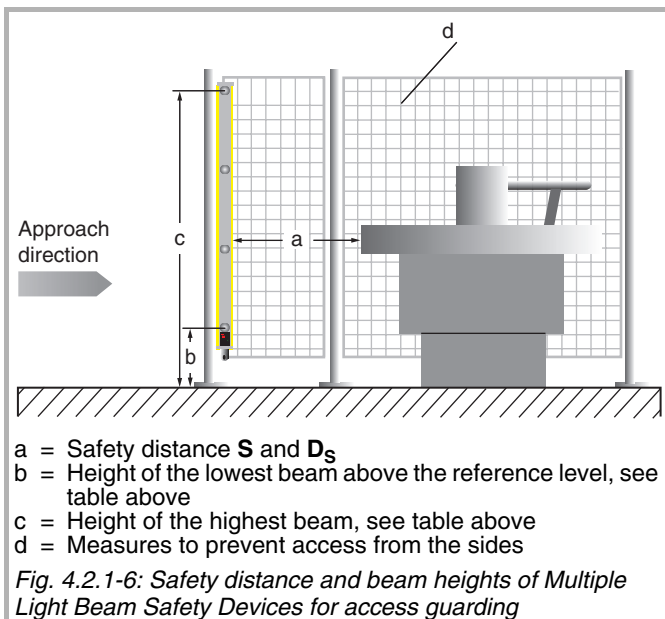
Fig. 4.2.1-5: Body part approach parallel or up to max 30° to the protective field level

PROTECTIVE DEVICES

4. Protective Devices

Number of beams and beam heights of Multiple Light Beam Safety Devices for access guarding in accordance with ISO 13855 (EN 999)

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



US specifications for safety distance calculation



The U.S. Code of Federal Regulations, Volume 29, Part 1910, Subpart O 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 O-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 opto-electronic protective devices with approach direction of body parts in an angle of 30° to 90° to the protective field level (see page 39, fig. 4.2.1-4):

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

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

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





MACHINE SAFETY

4. Protective Devices

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} (inches) = $3.4 \times (\text{resolution} - 0.276)$, 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 right-angle approach (guarding danger areas):

The following calculation formula applies for applications of opto-electronic 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 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 40, 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 height 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 [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.

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 control device (reset button) must be positioned so that the entire danger area can be seen and it cannot be operated from the danger area.

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

PROTECTIVE DEVICES

4. Protective Devices

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

Hard guards prevent access to danger areas 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 movable 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 294).

4.3.1 Fixed hard guards

Fixed hard guards can always be used when the access to the danger area 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 opto-electronic 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:

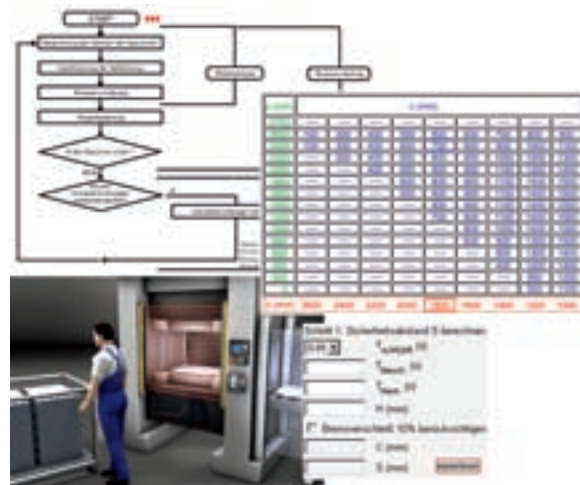
- either permanently (e.g. welded)
- or with fixing elements (nuts, bolts) that require the use of a tool. If possible, it should not be possible to keep them in the protective position after the fixing elements have been loosened.
- or position-monitored with the control-connected Safety Switches so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

Height and safety distances of fixed hard guards

EN 294 "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 lumiflex 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 294 in the application information chapter.





MACHINE SAFETY

4. Protective Devices

4.3.2 Movable hard guards

If the access to the danger area is required during the normal operation or for maintenance work, active opto-electronic protective devices, such as Safety Light Curtains or moveable hard guards such as protective doors or flaps, must be used. This kinds of movable 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 locking" and "Interlocking devices with guard locking". These Safety Switches must be set up so that they cannot be easily manipulated.



Moveable hard guards with Safety Switches (without guard locking)

Safety Switches (without guard locking) 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 999, for example.

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

S Minimum distance in millimeters measured from the danger area to the Safety Switch

K Approach speed of the body or body parts in millimeters per second

T Run-on of the entire system in seconds

C Additional distance in millimeters, which is based on the penetration into the danger area before the protective device activates

Leuze lumiflex Safety Switches (without guard locking), see pages 358 to 373.



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 locking 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. electro-magnet) 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 lumiflex Safety Locking Devices, see pages 358 to 373.

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Safety at Work

PROFIsafe
Sensors

Safety Switches
and Safety Lock-
ing Devices

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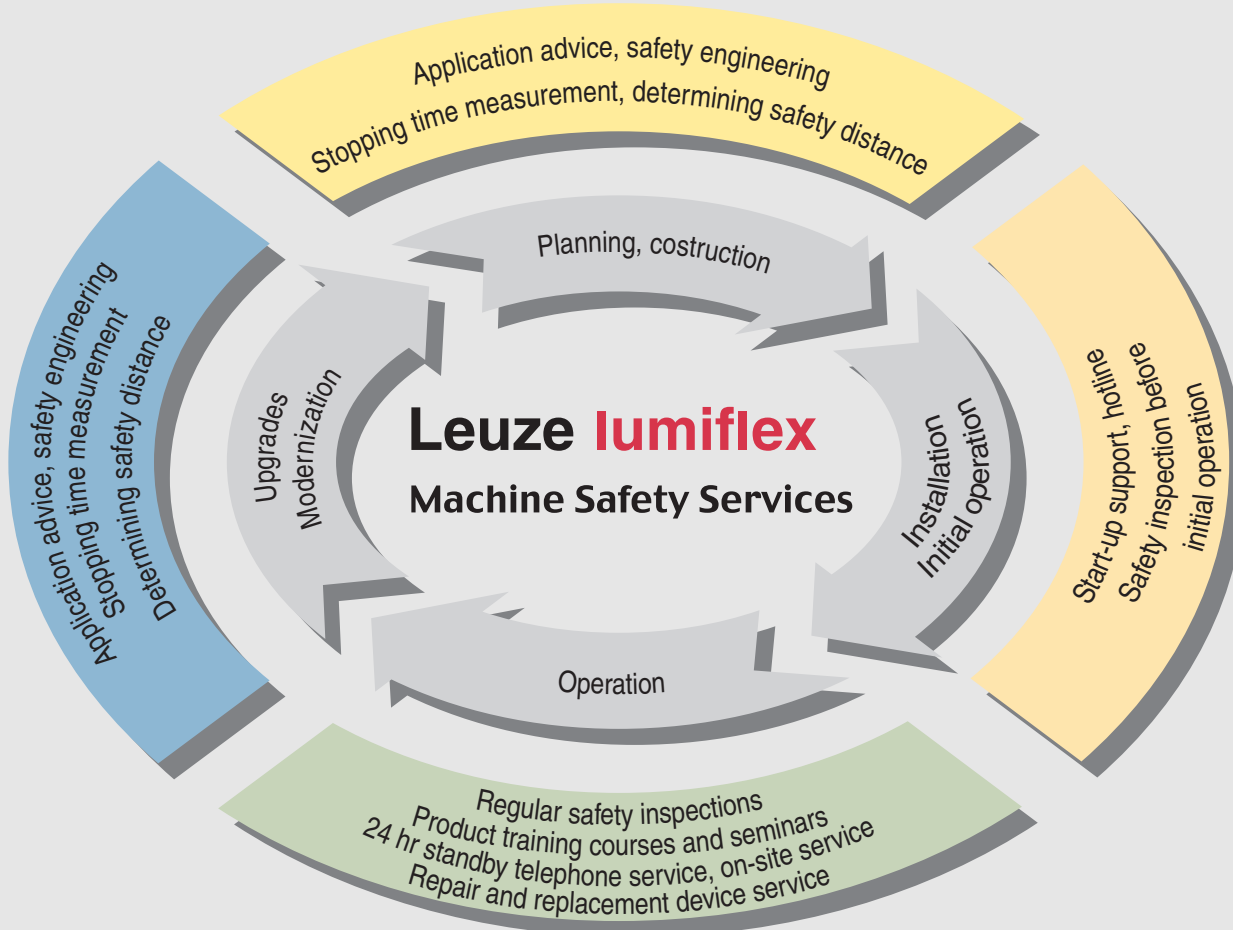
Services selection table

Selection table

Our services – Your benefits, at a glance

Whether it's planning, engineering or safety at work management in the company, the use of industrial safety technology requires a high degree of responsibility awareness and well-established expertise.

With the "Machine Safety Services" service package Leuze lumiflex provides product-related services and support for everything concerning 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.



Our service package for the entire lifetime of your machine

	Type of service	Explanation	Features			Page
			Also possible on-site	Free of charge telephone service	Also for competitor products	
	Application advice, safety -engineering	Leuze lumiflex 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
	Service on-site, repairs and swap-out 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 lumiflex 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

Single Light Beam Safety Devices

AS-interface Safety at Work

PROFIsafe Sensors

Safety Switches and Safety Locking Devices



MACHINE SAFETY SERVICES



Application advice, safety engineering



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

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 economicality 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.

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 active-opto electronic protective devices. 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 lumiflex products.



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

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INITIAL OPERATION



Initial operation support, hotline



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



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

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

Tel:
+49 (0) 8141 5350-121/-111

E-mail: service.lumiflex@leuze.de

24 h standby service

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

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MACHINE SAFETY SERVICES



Safety inspection before the machine's first operation *



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. Within the scope of our "Regular safety inspections" service module, we also carry out these inspections periodically under the terms of a maintenance contract at attractive conditions.

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

Benefits

- **Production-synchronized safety inspections with an intelligent database with InspectionControl ensure the quickest system availability and consequently secure your productivity; this also applies for products of other manufacturers at no additional cost**
- **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**
- **Dynamic, machine-specific test log contains all relevant information in a clear and transparent form – tailored to your machinery and systems**
- **Expert personnel with long-standing years of experience who work exclusively on safety issues and have access to 74 standards**

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INSPECTIONS

Safety inspection before the machine's first operation *

Typical services

- Performance in accordance with Ordinance on Industrial Safety and Health §10, BGV A2 and the relevant EN-standards (EN 692, etc.)
- Inspection of the technical and standards-compliant installation of the protective device (reaching under, reaching over, etc.)
- Testing the circuit diagrams for safe switching-related integration of the protective device into the machine control system
- Inspection of all functions of the protective device and the safe interaction with the machine control system
- Documentation of all test results in an electronic, standards-compliant inspection log (PDF format, two-page per active opto-electronic protective device)
- Log creation in database format (.mdb/.xls) possible on request
- Qualified special tests of other protective devices possible on request

Safety inspection before initial operation

Art. no.	Description
991004	Safety inspection
991003	Traveling expenses flat-rate for customers with maintenance contract (travel time and car travel costs within Germany)
991011	Traveling expenses flat-rate for customers without maintenance contract (travel time and car travel costs within Germany, one-way)

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MACHINE SAFETY SERVICES



Regular safety inspections *



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

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.

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

Benefits

- **Production-synchronized safety inspections with an intelligent database with InspectionControl ensures the lowest possible fault times and consequently secures your productivity**
- **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**
- **Dynamic, machine-specific test log contains all relevant information in a clear and transparent form – tailored to your machinery and systems**
- **Expert personnel with long-standing years of experience who work exclusively on safety issues and have access to 74 standards**

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INSPECTIONS

Regular safety inspections *

Typical services

- Safety inspections in accordance with Ordinance on Industrial Safety and Health §10, BGV A2 and the relevant EN standards (EN 692, etc.) as well as safety inspections for machines in inventory keeping in accordance with regulations for distribution; this also applies for products of other manufacturers at no additional cost
- Inspection of the technical and standards-compliant installation of the protective device (reaching under, reaching over, etc.)
- Testing the circuit diagrams for safe switching-related integration of the protective device into the machine control system
- Inspection of all functions of the protective device and the safe interaction with the machine control system
- Documentation of all test results in an electronic, standards-compliant inspection log (PDF format, two-page per active opto-electronic protective device)
- Log creation in database format (.mdb/.xls) possible on request
- Qualified special tests of other protective devices possible on request

Regular safety inspections

Art. no.	Description
991004	Safety inspection
991003	Traveling expenses flat-rate for customers with maintenance contract (travel time and car travel costs within Germany); also one-time with deployment for several days
991011	Traveling expenses flat-rate for customers without maintenance contract (travel time and car travel costs within Germany, one-way); also one-time with deployment for several days

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MACHINE SAFETY SERVICES

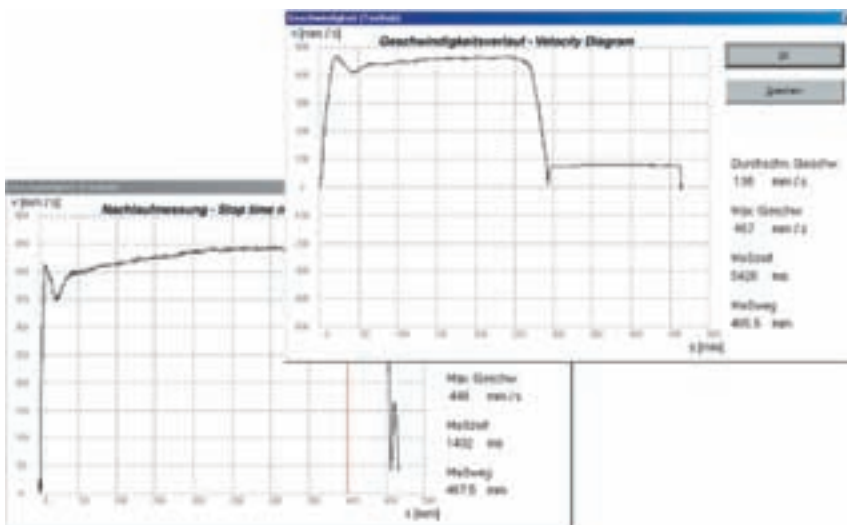


Stopping time measurements and determining safety distances *



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 lumiflex 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

Typical services

- 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.	Description
991007	Stopping time measurement
991008	Stopping time measurement extended (e.g. multiple movements, rotary indexing table)
991009	Flat-rate for waiting times per system (e.g. absence of support by operating personnel)

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MACHINE SAFETY SERVICES



On-site service, repairs and device swap-out service



We provide devices on loan to secure our customer's productivity

In the event of a functional fault, speedy help is the order of the day. Leuze lumiflex'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 and consequently ensure the necessary on-site safety. This offer applies for our standard range and for our older devices.



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

Customized on-site support

Where required our technician's will help 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 lumiflex 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

On-site service, repairs and device swap-out service

Benefits

- Fast help around the world with the Leuze lumiflex 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.	Description
991001	Working hours
991006	Travel time
991000	Car expenses
991010	Car expenses abroad (alternative: flight costs according to expenditure)
991012	Accommodation flat-rate

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ing Devices

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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 basic principles of 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. We're looking forward to getting to know you!

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

Benefits

- **Efficient and specialist use of Leuze lumiflex 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 specialist and enables you to perform the maintenance and testing of the relevant Leuze lumiflex protective device within your own area of responsibility**

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TRAINING COURSES, SEMINARS

Training courses and seminars

Art. no.	Course no.	Description
991030	501	Principles of machine safety and the latest from the world of standards (1 1/2 days) *
991031	502	COMPACT <i>plus</i> Safety Light Curtains and Multiple Light Beam Safety Devices (2 days) *
991032	503	ROTOSCAN RS4 Safety Laser Scanners (2 days) *
991033	504	ECO, SOLID-2 Safety Light Curtains, ROBUST Type 2 Multiple Light Beam Safety Devices, MSI Modular Safety Interfaces (2 days) *
991035	505	AS-i Safety, Safe Bus System (1 1/2 days) *
991037	506	Safety Light Curtains and Type 4 Multiple Light Beam Safety Devices of the SOLID-4, COMPACT and ROBUST Series, MSI Modular Safety Interfaces (2 days) *
991038	507	Safexpert - Software for Safety Engineering of Machines and Systems, User Training (2 days)*

*) incl. training papers, drinks and lunch during the training. The costs for travel and accommodation are paid by the participant.

Machine Safety
Services

Safety
Engineering
Software

Safety Laser
Scanners

Safety Light
Curtains

Multiple
Light Beam
Safety Devices

Single
Light Beam
Safety Devices

AS-interface
Safety at Work

PROFIsafe
Sensors

Safety Switches
and Safety Lock-
ing Devices

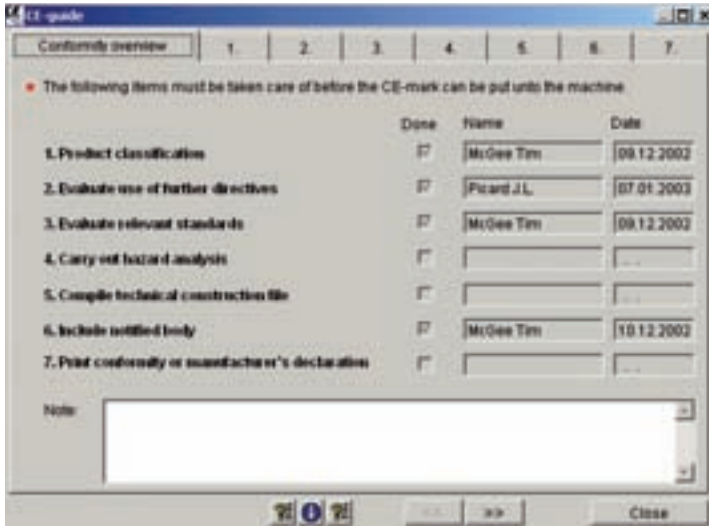
www.leuze.com/safety-services/



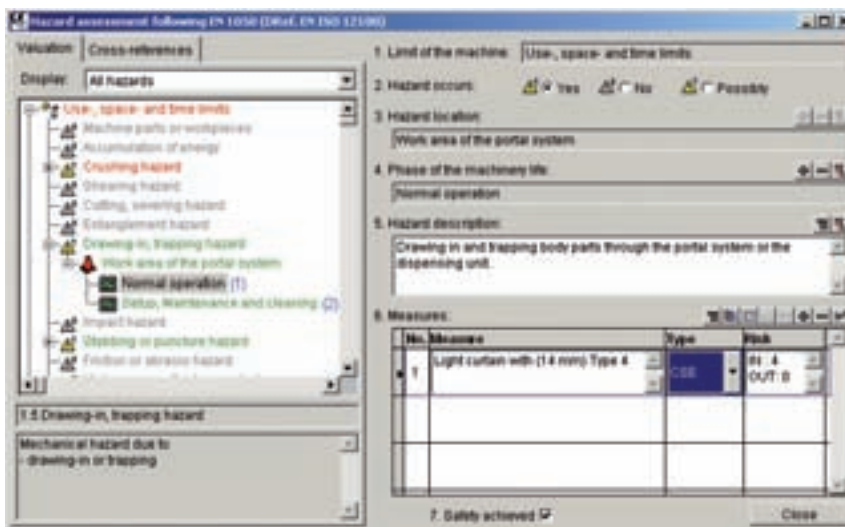


SAFETY ENGINEERING SOFTWARE

Safexpert



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



Hazard analysis precisely in accordance with standards – quick, easy and structured

Software-supported safety engineering helps project members to perform their tasks quicker, easier and better structured.

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 conformity assessment. It supports the design engineer with hazard analysis, 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.

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. Solutions from earlier projects can be easily recycled to save time and money.

Safexpert is available in the three different program packages, Basic, Compact and Professional, each with a different scope of service.

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

Important technical data, overview

Software packages for selection	3 (Basic, Compact, Professional)
Standards packages, only Professional	2 (Standard, Standard Plus)
Operating system	Microsoft Windows® 9x, ME, NT, 2000 PRO, XP
System requirements	80 MB free hard disk capacity (servers, autonomous PC-installation), 40 MB (client), graphic resolution, at least 800 pixels x 600 pixels
Installation	Setup program, activator disk
Networks	Networkability
Languages	German, English
Documentation	User manual, reference handbook
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 hazard analysis with colored identifications
- Status information provides infos on open work packages at the press of a button



Properties



Further information Page

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| ● Ordering information | 63 |
| ● Safexpert supplementary modules | 64 |
| ● Ordering info: Supplementary modules and standards packages | 65 |
| ● Safexpert standards packages | 65 |
| ● Safexpert maintenance contracts | 67 |
| ● Discount for multi-station licenses (network) | 63 |





SAFETY ENGINEERING SOFTWARE

Functions

	Safexpert software packages		
	Basic	Compact	Professional
CE project management and project documentation	●	●	●
Machine classification and standards selection wizard	●	●	●
CE guidelines	●	●	●
Hazard analysis in accordance with EN 12100, list of hazards in accordance with EN 1050	●	●	●
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	●	●	●
Operating instructions wizard*	●	●	●
Conformity and manufacturer declaration with customized adjustment options	●	●	●
Selection function of safety-related sections of regulations in accordance with EN 954-1	●	●	●
History logs for quality assurance	●	●	●
Standards and directives wizard and document management		●	●
Icons library (approx. 200 icons and symbols for machine safety)		●	●
Example of CE-compliant operating instructions		●	●
Standards package: Standard (9 important CE standards in full text)			●

*) Supplementary module, must be ordered separately

Ordering information

Safexpert

Included in scope of delivery: CD-ROM with installation information, activator disk

Functions: Per software package, Basic, Compact, Professional

Safexpert Software for machine and plant systems safety engineering

Art. no.	Article	Description	Languages
Safexpert software packages with single-station license (EP)			
600150	SE-Basic-EP-de	Safexpert Basic, EP	German
600151	SE-Basic-EP-en	Safexpert Basic, EP	English
600154	SE-Compact-EP-de	Safexpert Compact, EP	German
600155	SE-Compact-EP-en	Safexpert Compact, EP	English
600158	SE-Professional-EP-de	Safexpert Professional, EP	German
600159	SE-Professional-EP-en	Safexpert Professional, EP	English
Safexpert software packages with multi-station license (MP)			
600152	SE-Basic-MP-de	Safexpert Basic, MP	German
600153	SE-Basic-MP-en	Safexpert Basic, MP	English
600156	SE-Compact-MP-de	Safexpert Compact, MP	German
600157	SE-Compact-MP-en	Safexpert Compact, MP	English
600160	SE-Professional-MP-de	Safexpert Professional, MP	German
600161	SE-Professional-MP-en	Safexpert Professional, MP	English

Discount for multi-station licenses (network)

Discount	Description	Number of workstations
25%	Network license	2 to 4
30%	Network license	5 to 7
35%	Network license	8 to 10
40%	Network license	11 to 14
45%	Network license	15 to 20
on request	Network license	> 20

Purchase of a license authorizes installation on one computer.

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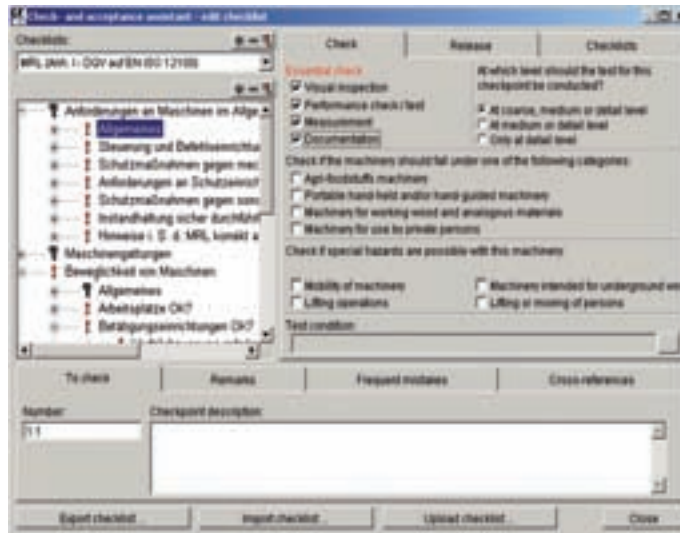




SAFETY ENGINEERING SOFTWARE

Safexpert supplementary modules

Safexpert supplementary module "Test list in accordance with EN 1050" for checking machine safety



Operating instructions wizard	Wizard for creating operating instructions in accordance with Machinery Directive 98/37 EC including data transfer from Safexpert projects
Test and acceptance wizard including test list in accordance with Machinery Directive	Wizard for accepting machines before initial operation in accordance with Machinery Directive
Test list in accordance with Ordinance On Industrial Safety and Health	Test list for checking machine safety with conversion or constructive changes by the operator in accordance with Ordinance On Industrial Safety and Health
Test list in accordance with EN 1050	Test list for checking machine safety in accordance with the requirements of EN 1050

Safexpert standards packages

Standards package: Standard (included in Professional software package)	9 important standards in full text: EN ISO 12100-1, EN ISO 12100-2, EN 294, EN 349, EN 418, EN 954-1, EN 999, EN 1050, EN 60204-1
Standards package: Standard Plus	56 supplementary European standards in full text: EN 547-1, EN 547-2, EN 547-3, EN 563, EN 563/A1, EN 563/AC2, EN 574, EN 614-1, EN 614-2, EN 626-1, EN 626-2, EN 811, 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 1837, EN 12198-1, EN 12198-2, EN 12198-3, EN 12786, EN 13478, EN 13861, EN 62061, EN ISO 7731, EN ISO 13849-2, EN ISO 14122-1, EN ISO 14122-2, EN ISO 14122-3, EN ISO 14159, EN 14738, EN 1760-3, EN ISO 14122-4

Ordering info: Supplementary modules and standards packages

Art. no.	Article	Description	Languages
Safexpert Master plus – Extension from Basic to Compact			
600250	SE-UP-Compact-EP-de	Upgrade: Basic to Compact, EP	German
600252	SE-UP-Compact-EP-en	Upgrade: Basic to Compact, EP	English
600251	SE-UP-Compact-MP-de	Upgrade: Basic to Compact, MP	German
600253	SE-UP-Compact-MP-en	Upgrade: Basic to Compact, MP	English
Safexpert supplementary modules			
600180	SE-BA-Ass-EP-de	Operating instructions wizard, EP	German
600181	SE-BA-Ass-EP-en	Operating instructions wizard, EP	English
600182	SE-BA-Ass-MP-de	Operating instructions wizard, MP	German
600183	SE-BA-Ass-MP-en	Operating instructions wizard, MP	English
600184	SE-PA-Ass-EP-de	Test and certification wizard incl. test list in accordance with MRL, EP	German
600186	SE-PA-Ass-MP-de	Test and certification wizard incl. test list in accordance with MRL, MP	German
600188	SE-PL-BV-EP-de	Test list in accordance with Ordinance on Industrial Safety and Health, EP	German
600189	SE-PL-BV-MP-de	Test list in accordance with Ordinance on Industrial Safety and Health, MP	German
600190	SE-PL-EP-de	Test list in accordance with EN 1050, EP	German
600191	SE-PL-MP-de	Test list in accordance with EN 1050, MP	German

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SAFETY ENGINEERING SOFTWARE

Safexpert standards packages

Standards package - Standard: 9 important European standards in full text (already included in Safexpert Professional)

Standards package - StandardPlus: 52 supplementary European standards in full text

Art. no.	Article	Description	Languages
Safexpert standards packages with single-station license (EP)			
600200	SE-NP-standard-EP-de	Standards package – Standard, EP:	German
600201	SE-NP-standard-EP-en	Standards package – Standard, EP:	English
600204	SE-NP-plus-EP-de	Standards package – StandardPlus without Safexpert, EP	German
600205	SE-NP-plus-EP-en	Standards package – StandardPlus without Safexpert, EP	English
600208	SE-NP-prof-EP-de	Standards package – StandardPlus with Safexpert Professional, EP*	German
600209	SE-NP-prof-EP-en	Standards package – StandardPlus with Safexpert Professional, EP*	English
Safexpert standards packages with multi-station license (MP)			
600202	SE-NP-standard-MP-de	Standards package – Standard, MP	German
600203	SE-NP-standard-MP-en	Standards package – Standard, MP	English
600206	SE-NP-plus-MP-de	Standards package – StandardPlus without Safexpert, MP	German
600207	SE-NP-plus-MP-en	Standards package – StandardPlus without Safexpert, MP	English
600210	SE-NP-prof-MP-de	Standards package – StandardPlus with Safexpert Professional, MP*	German
600211	SE-NP-prof-MP-en	Standards package – StandardPlus with Safexpert Professional, MP*	English

*) In combination with purchase of a Safexpert Professional software package

Safexpert maintenance contracts

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

Art. no.	Article	Description	Languages
Safexpert Upgrade – version update			
600254	SE-UP-5.3de/en	Version upgrade from 5.0 to 5.3	All
SDR Update (System Document Register) – only for the Safexpert software packages Compact and Professional			
600220	SE-JU-DE-EP-de	Annual Update Service SDR Germany	German
600222	SE-JU-EU-EP-de	Annual Update Service SDR Europe	German
600223	SE-JU-EU-EP-en	Annual Update Service SDR Europe	English
Safexpert Update – Update service for the individual software packages			
600230	SE-WA-Basic-EP-de	Maintenance contract: Basic	German
600231	SE-WA-Basic-EP-en	Maintenance contract: Basic	English
600232	SE-WA-Compact-EP-de	Maintenance contract: Compact	German
600233	SE-WA-Compact-EP-en	Maintenance contract: Compact	English
600234	SE-WA-Prof-EP-de	Maintenance contract: Professional	German
600235	SE-WA-Prof-EP-en	Maintenance contract: Professional	English
Standards package update – Update service for European standards			
600236	SE-WA-NP-LP-de	Standards package maintenance contract: StandardPlus/Standard	German
600237	SE-WA-NP-LP-en	Standards package maintenance contract: StandardPlus/Standard	English
Additional list price of the updated European standards			
600240	SE-WA-NP-de	Safexpert standards package maintenance contract: StandardPlus/Standard	German
600241	SE-WA-NP-en	Safexpert standards package maintenance contract: StandardPlus/Standard	English

Only in combination with a Safexpert update; additional 30% of the list price of the updated standards



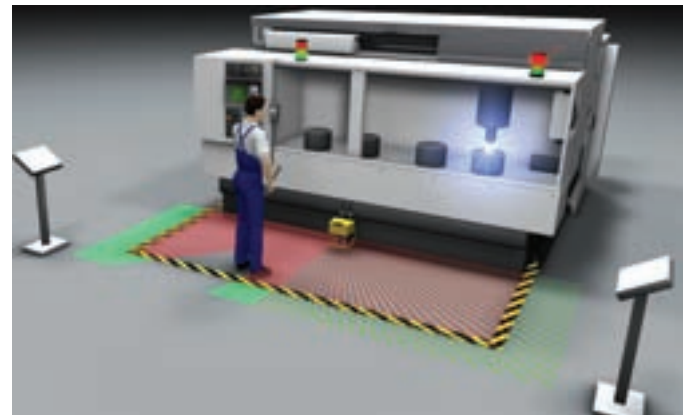


SAFETY LASER SCANNERS

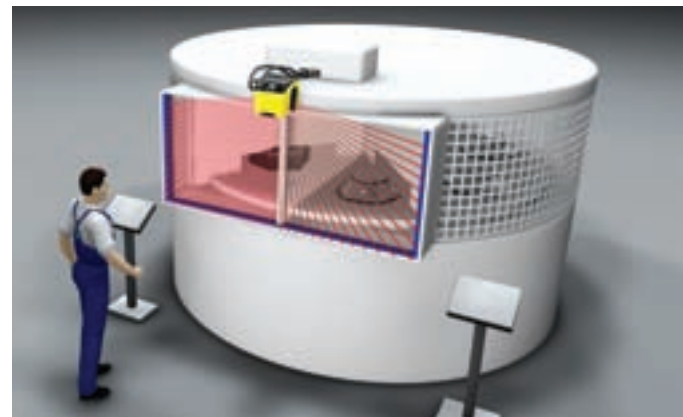
OVERVIEW

ROTOSCAN selection table

Selection table



Danger area guarding at stationary machinery - Switchover of process-dependent detection zone/warning zone combinations for smooth production process



Point of operation guarding at revolving transfer tables: Space-saving and flexible configuration for efficient cycle times.

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 its hand protection, arm protection or full person 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 detection and warning zones can be programmed via PC software and can be switched over at any time during the operation. If a person enters the detection and warning zones, 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 detection/warning zone pairs, which can assume any zone contours as well as also the ability to switch over between these pairs. Using a PC configuration software, the shape of the zone 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 area guarding at stationary machines and mobile systems, the extended version ROTOSCAN RS4-4E also has the necessary approvals for vertical access and point of operation guarding. The Laser Scanner's resolution can be varied between 30 mm and 150 mm. A reference boundary monitoring ensures additional safety.



The RS4soft configuration and diagnostics software enables easy adaption of the Laser Scanner to local conditions – both directly and via the PROFIBUS DP

Safety type, IEC/EN 61496	Detection zone range in m	Warning zone range in m	Resolution 70 mm	Resolution 150 mm	Variable resolution 30 to 150 mm	Features, type-dependent										Article	Page
						Number of switchable zone pairs	Number of signal outputs	Safeguarding danger areas	Point of operation guarding	Access guarding	RES, selectable	Integrated AS-i Safety interface	Integrated PROFIsafe interface	Measurement data output via RS232/422	Measurement data output via bus interface		
Type 3	4	15				4	2									RS4-4	72
						8	2									RS4-4E	72
						4	2									RS4-4/A1	72
	2	15				8	2									RS4-4E/A1	72
						4	2									RS4-4/P1	72
						8	2									RS4-4E/P1	72
						4	2								RS4-2E	72	

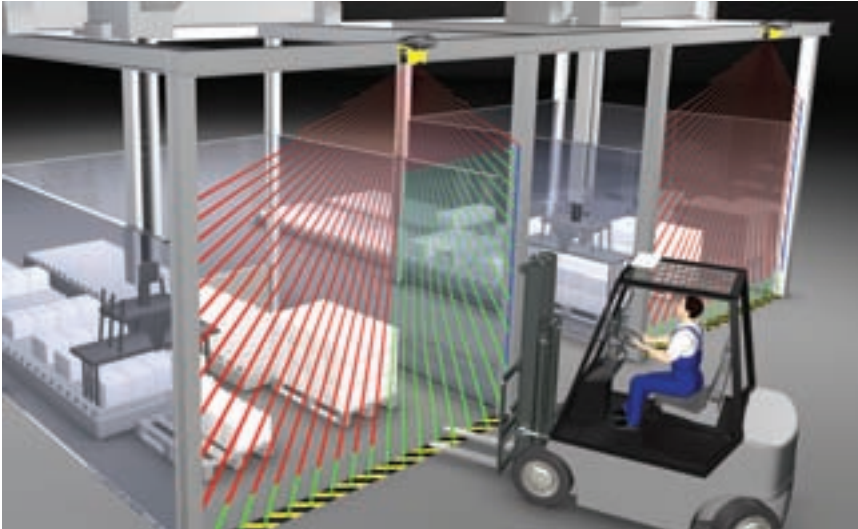


Machine Safety
Machine Safety Services
Safety Engineering Software
Safety Laser Scanners
Safety Light Curtains
Multiple Light Beam Safety Devices
Single Light Beam Safety Devices
AS-interface Safety at Work
PROFIsafe Sensors
Safety Switches and Safety Locking Devices

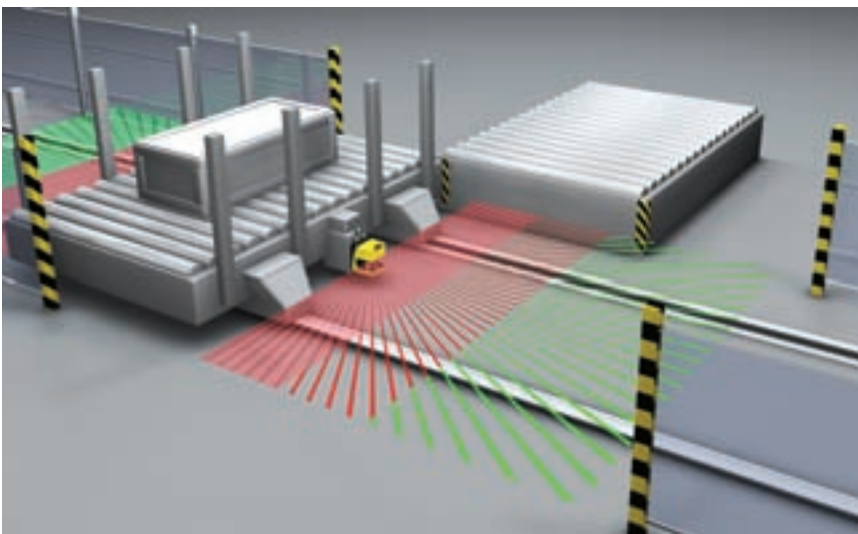


SAFETY LASER SCANNERS

ROTOSCAN RS4



Fast material flow with detection zone switchovers, for example with vertically mounted Safety Laser Scanners RS4-4E



Danger area guarding on transfer carriages: Switchovers of status and speed-dependent zone pairs for rapidly adjusting material transport

Point of operation and access guarding are classic application instances of Safety Light Curtains and Multiple Light Beam Safety Devices. If it is necessary to flexibly adjust detection zones to the danger areas, 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 area guarding of large areas in the vicinity of these machines. Switching between any kind of monitoring areas is possible, 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, detection/warning zone combination and zone switchover 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 detection zones 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 area guarding of the tools integrated in the portal.

Typical areas of application

- Obstruction-free area 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

Safety type in accordance with IEC/EN 61496	Type 3
Classification in accordance with IEC/EN 61508	SIL 2
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 Switch 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

	RS4-4	RS4-4E	RS4-2E
Start/restart function (RES), selectable	●	●	●
Resolution, selectable		●	●
Warning zone monitoring	●	●	●
Response time, selectable	●	●	●
Additional alarm output	●	●	●
Monitored detection zone switchover	●	●	●
Vertical point of operation guarding		●	
Vertical access guarding		●	●
Reference boundary monitoring		●	●
Measurement data output	●	●	●
Start test	●	●	●

Functional extensions

With safety interface	Relay output	RES	EDM	Muting	Further details
MSI-SR2/F	●	*)	●		P. 404
MSI-m	●	*)	●	●	P. 432

*) Already included in the device

Special features

- Guarding large danger areas
- Any kind of detection/warning zone contours and configurations
- Zone pair switchover during the operation
- Compact design and easy to use software
- Automatic configuration with device exchange with intelligent ConfigPlug
- Open data interface
- AS-i Safety at Work and PROFIsafe Laser Scanners

Additional RS4-4E:

- Point of operation and access guarding with variable resolution



Properties



Further information

Further information	Page
● Ordering information	72
● Electrical connection	73
● Technical data	75
● Dimensional drawings	76
● Accessories dimensional drawings	77
● Accessories ordering information	78



SAFETY LASER SCANNERS

Ordering information

ROTOSCAN RS4

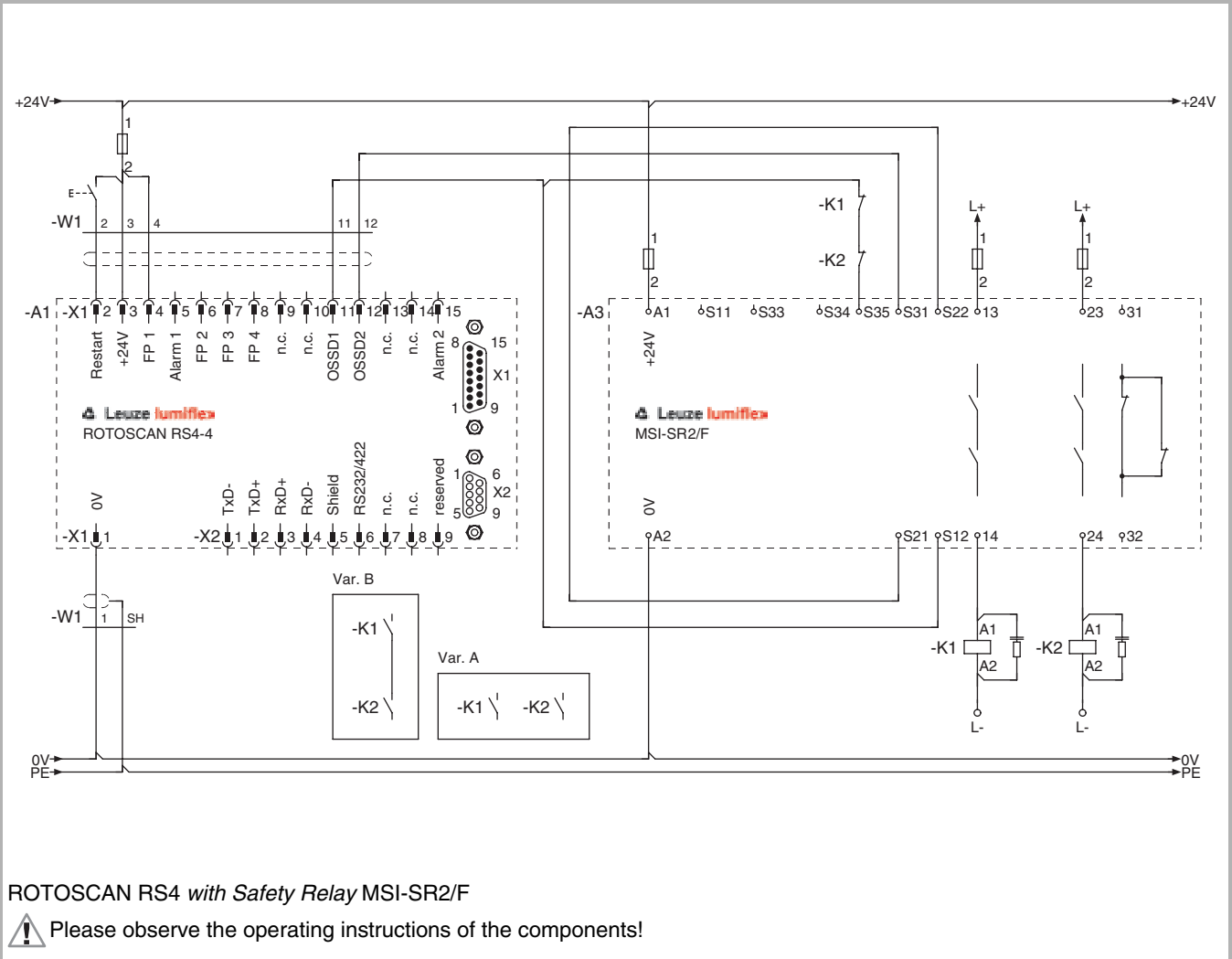
Included in scope of delivery: RS4-MG-X1-Set and RS4-MG-X1-Set, safety notes and directives, RS4soft configuration and diagnostics software.

Functions: Automatic start/restart, start/restart interlock, detection/warning zone monitoring, monitored detection zone switchover, measurement data output

Art. no.	Article	Description	
ROTOSCAN RS4			
50034195	RS4-4	ROTOSCAN RS4-4 Laser Scanner for danger area guarding	
520085	RS4-4E	ROTOSCAN RS4-4E Laser Scanner for danger area, point of operation and access guarding	
520082	RS4-2E	ROTOSCAN RS4-2E Laser Scanner for danger area and access guarding	
ROTOSCAN RS4/AS-i Safety			
580014	RS4-4/A1	ROTOSCAN RS4-4/AS-i for danger area guarding	Integrated AS-interface
520086	RS4-4E/A1	ROTOSCAN RS4-4E/AS-i for danger area, point of operation and access guarding	Integrated AS-interface
ROTOSCAN RS4/PROFIsafe			
580012	RS4-4/P1	ROTOSCAN RS4-4/PROFIBUS for danger area guarding	Integrated PROFIBUS DP interface
520087	RS4-4E/P1	ROTOSCAN RS4-4E/PROFIBUS for danger area, point of operation and access guarding	Integrated PROFIBUS DP interface

Electrical connection

ROTOSCAN RS4 connection example

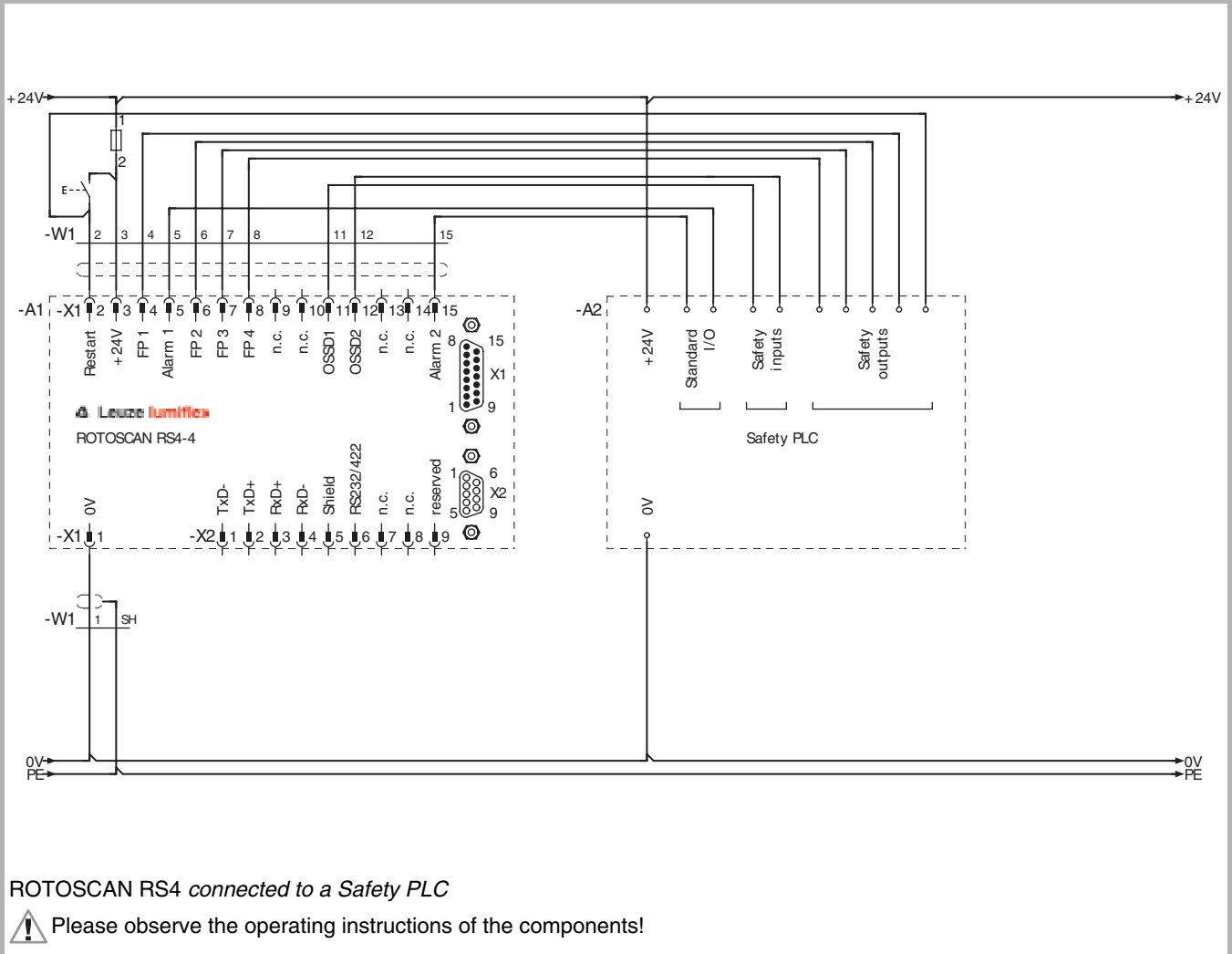




SAFETY LASER SCANNERS

Electrical connection

ROTOSCAN RS4 connection example



*) Further connection examples, see chapter PROFIBUS DP, page 350

Technical data

General system data					
Safety type in accordance with IEC/EN 61496	Type 3				
Classification in accordance with IEC/EN 61508	SIL 2				
Supply voltage	24 V DC, ±20 % Power supply in accordance with IEC 742; must be fused with 1.25 A, melting fuse				
Current consumption	Approx. 300 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				
Detection zone					
Resolution (adjustable)	30 mm	40 mm	50 mm	70 mm	150 mm
RS4-4 range				4.00 m	4.00 m
RS4-4E range	1.6 m	2.20 m	2.80 m	4.00 m	4.00 m
RS4-2E range				2.15 m	2.15 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 detection zones	4/8 (can be switched via switch outputs)				
Safety-related switch outputs (OSSD)	2 pnp transistor outputs (short-circuit monitored, cross-circuit monitored)				
Switching voltage high active	U _V -3.2 V				
Switching voltage low	Max. +2.0 V				
Switching current	Max. 250 mA				
Warning zone					
Detection range	0...15 m				
Scanning angle	Max. 190°				
Angle resolution	0.36 °				
Number of warning zones	4/8 (can be switched via switch outputs)				
Switching outputs	2 pnp transistor outputs, per 100 mA (warning zone/dirt/fault)				
Measurement zone					
Measurement range	0...50 m				
Radial resolution	5 mm				
Lateral resolution	0.36°				
Data output	Serial interface, RS232 and RS422				

You will find additional information in the RS4 connecting and operating instructions at www.leuze.com/rotoSCAN.

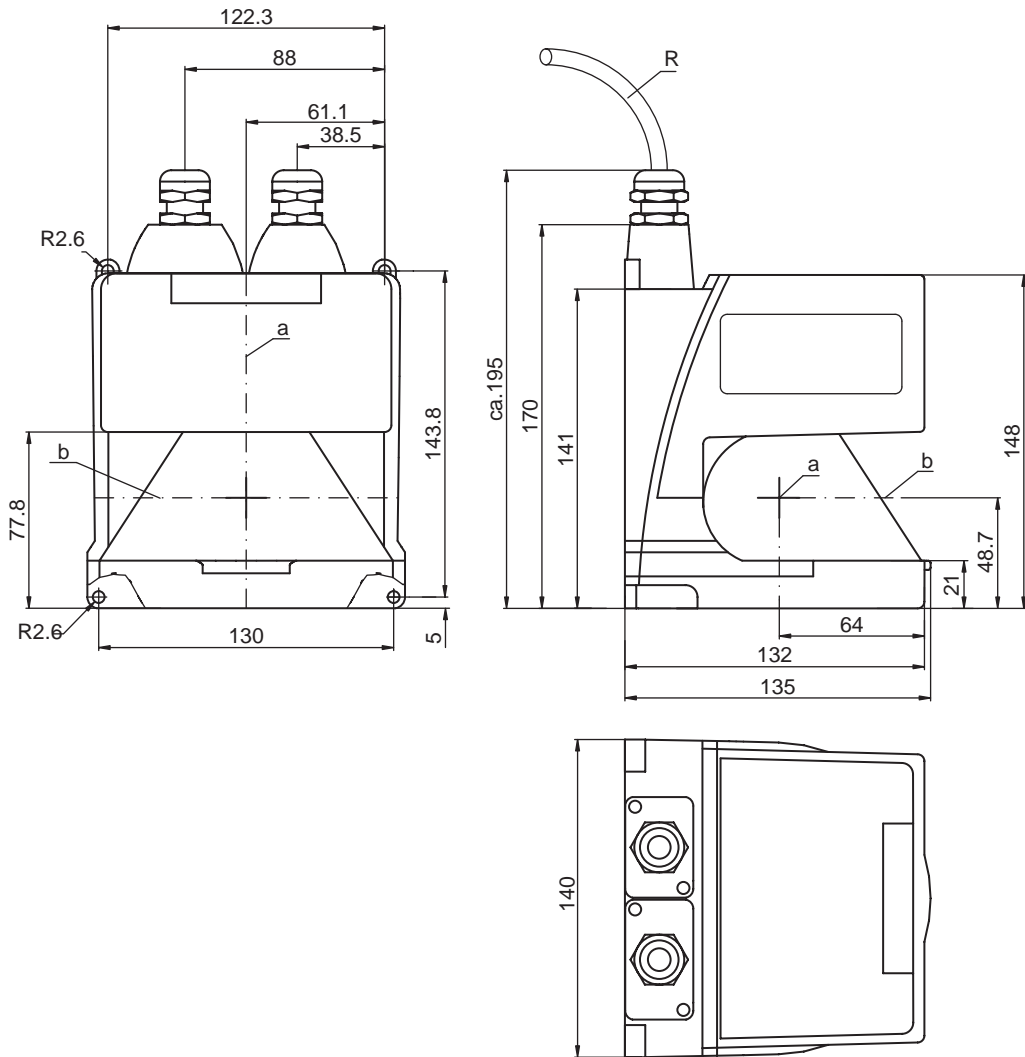




SAFETY LASER SCANNERS

Dimensional drawings

ROTOSCAN RS4 Safety Laser Scanners

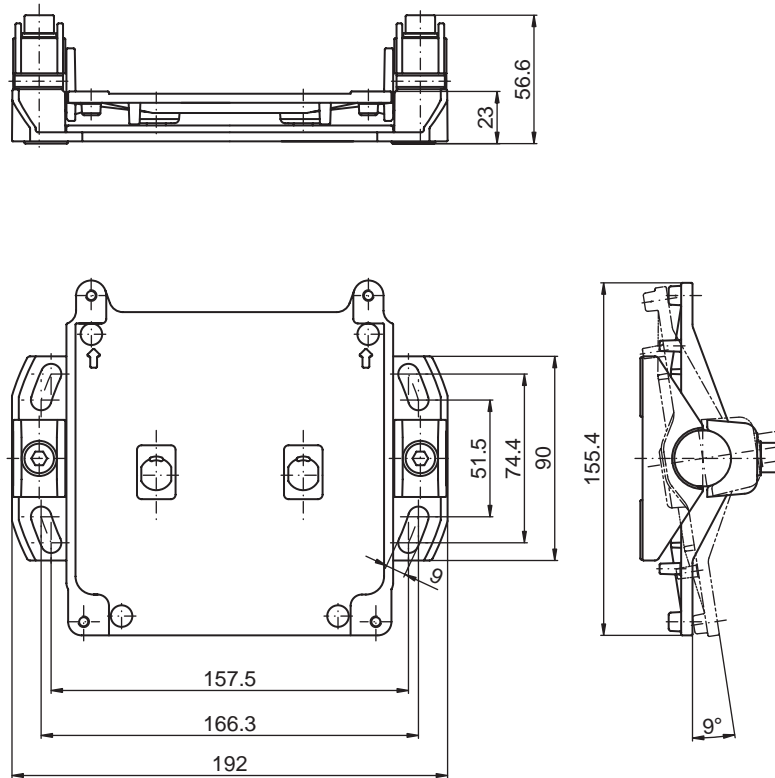


R = Smallest bending radius = 50 mm
a = Rotating mirror axis
b = Scan level

Dimensions in mm

Accessories dimensional drawings

RS4 mounting system



Dimensions in mm

www.leuze.com/rotoSCAN/





SAFETY LASER SCANNERS

Accessories ordering information

Art. no.	Article	Description	Length, design
Mounting accessories			
50033346	RS4-MS	RS4 mounting system	
50035814	RS4-Adap-P	RS4 scanner adapter plate	
Initial operation			
97005003	RS4-COB-24	RS4 configuration and test device, 24 V DC	
Connection system			
548520	CB-D15E-5000S-11GF	RS4 control cable with ConfigPlug, scanner-side preformed	5 m, straight/open end
548521	CB-D15E-10000S-11GF	RS4 control cable with ConfigPlug, scanner-side preformed	10 m, straight/open end
548522	CB-D15E-25000S-11GF	RS4 control cable with ConfigPlug, scanner-side preformed	25 m, straight/open end
548523	CB-D15E-50000S-11GF	RS4 control cable with ConfigPlug, scanner-side preformed	50 m, straight/open end
548530	CB-D15E-10000S-11WF	RS4 control cable with ConfigPlug, scanner-side preformed	10 m, angled/open end
50035863	CB-D9-3000-5GF/GM	RS4 PC cable, RS232, preformed at both sides	3 m
50035865	CB-D9-5000-5GF/GM	RS4 PC cable, RS232, preformed at both sides	5 m
50035867	CB-D9-10000-5GF/GM	RS4 PC 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, sock., 15 pins, for X1 interface, cable routing to the rear	
426265	RS4-MGS-X2-Set	RS4 plug, sock., 9 pins, for X2 interface, cable routing to the rear	
Cleaning fluid			
430400	RS4-clean-Set1	RS4 cleaning fluid for plastic, 150 ml, cleaning cloths, 25 pieces, soft, fuzz-free	
430410	RS4-clean-Set2	RS4 cleaning liquid for plastic, 1000 ml, cleaning cloths, 100 pieces, soft, fuzz-free	

Accessories ordering information

ROTOSCAN RS4/AS-i accessories ordering information

Art. no.	Article	Description	Length, design
580005	AC-M12-15M	M12 plug for detection zone 1 activation, pin 1-5 jumpered	
580004	AC-PDA1/A	AS-i adapter for bus connection and power supply for COMPACTplus Receiver/Transceiver & RS4/A1, M12, 5-pin	
548361	CB-M12-1000-5GF/GM	AS-i cable, adapter device, plug and socket, 1:1, M12, 5-pin	1 m, straight
548362	CB-M12-2000-5GF/GM	AS-i cable, adapter device, plug and socket, 1:1, M12, 5-pin	2 m, straight
520072	CB-PCO-3000	PC cable, RS232 - IR-adapter	3 m
970078	RS4-SWC	RS4 initial operation set for bus systems Includes: RS232 PC cable-IR, test operation power supply cable, RS4soft software with components for PROFIBUS integration, all instructions for RS4, RS4soft, RS4/AS-i, RS4/PROFIsafe on CD-ROM	
548363	CB-M12-2000-4GM/B	RS4 test operation power supply cable	2 m

For further information see chapter, AS-interface Safety at Work, page 322.

ROTOSCAN RS4/PROFIsafe accessories ordering information

Art. no.	Article	Description	Length, design
147500	AC-M12-PBT1	PROFIBUS M12 terminal resistor	
548100	CB-M12-25000S-4GF/GM	Cable for power supply or start/restart button, shielded	25 m, straight
520072	CB-PCO-3000	PC cable, RS232-IR adapter	3 m
970078	RS4-SWC	RS4 initial operation set for bus systems Includes: RS232 PC cable-IR, test operation power supply cable, RS4soft software with components for PROFIBUS integration, all instructions RS4, RS4soft, RS4/AS-i, RS4/PROFIsafe on CD-ROM	

For more information see chapter, PROFIsafe Sensors, page 346.



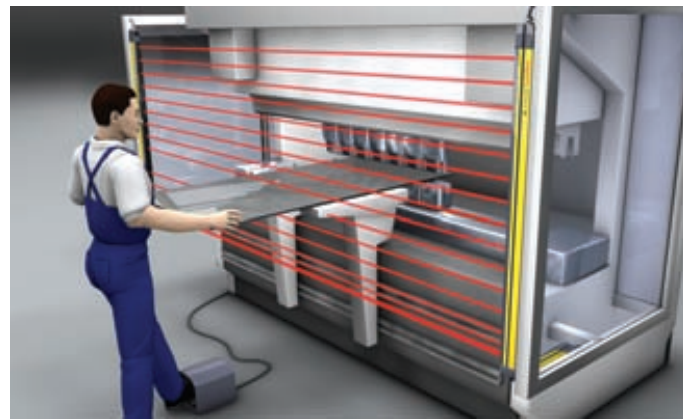


SAFETY LIGHT CURTAINS

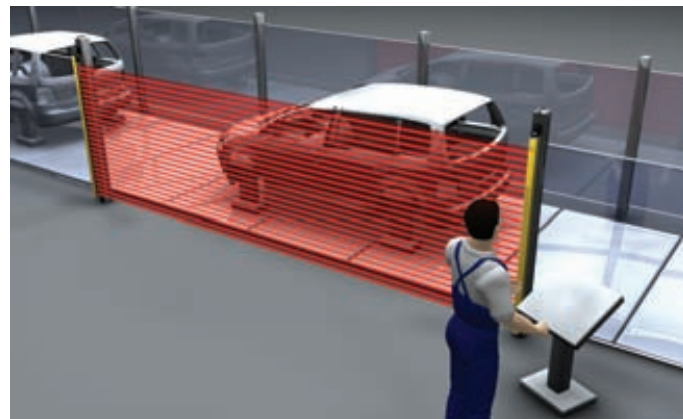
OVERVIEW

Safety Light Curtains 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 lumiflex Safety Light Curtains. And when it comes to guarding machines in automatic operation on the most compact construction designs possible, Leuze lumiflex Safety Light Curtains are the very best solution.

Leuze lumiflex Safety Light Curtains comply with the universal standards IEC/EN 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 economicality. 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 area or access guarding (from left to right: COMPACTplus, COMPACT, SOLID-4E, SOLID-2, ECO)

Safety type IEC/EN 61496	W x D in mm	Resolution (mm) Range (m)		Resolution (mm) Range (m)				Features, type-dependent										Article	Page			
		Hand/Finger	Person	Hand/Finger	Person	Person	Person	Person	Person	Transmission channel, selectable	RES, selectable	EDM, selectable	Blanking	Reduced resolution	Muting	Cycle control	Cascadability			ATEX II 2 G / 3 D	ATEX II 3 G / 3 D	Integrated AS-i Safety interface
Type 4	52 x 55								•	•	•		•	•					•	•	COMPACTplus-m	84
									•	•	•	•	•						•	•	COMPACTplus-b	100
									•	•	•	4)	4)	•	•	•			•	•	COMPACTplus-i	114
									•	•	•		2)		•	•	•		•	•	COMPACT	128
Type 2	30 x 34	14 0.3-5	20 0.7-14		30 0.5-9	40 0.9-20		90 0.9-20	•	•	•		2)							SOLID-4E	152	
	30 x 34		20 0.5-15		30 0.2-10	40 0.8-20		90 0.8-20	•	1)	1)		2)							SOLID-2	164	
	17 x 33				30 0.3-6			80 0.3-6	•	3)	3)		2)	•						ECO	178	

1) With MSI-SR2, page 404
 2) With MSI-m/R, page 432
 3) With TNT 35, page 450 or MSI-s/R, page 420
 4) Selectable with SafetyLab software, if no cycle control is set.

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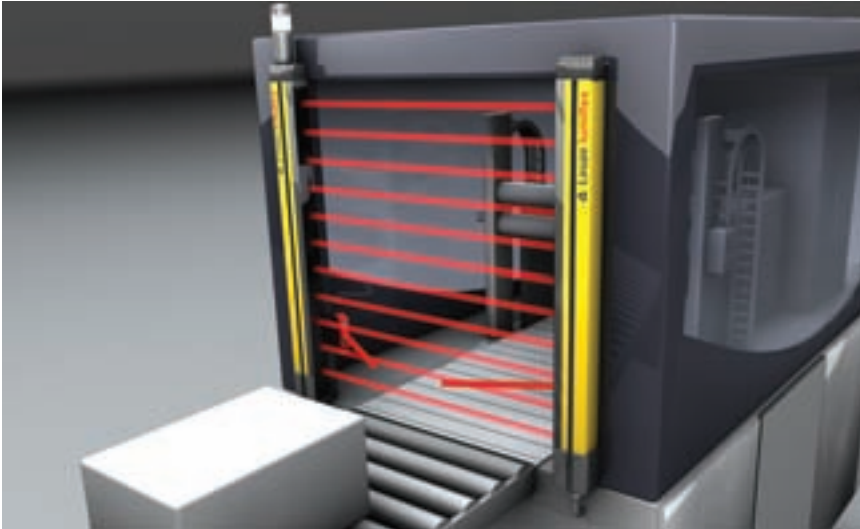
www.leuze.com/slc/





SAFETY LIGHT CURTAINS

COMPACTplus-m



Muting allows, for example, palettes or work pieces/equipment to pass by the active opto-electronic protective device, COMPACTplus-m, without any process interruption



Automatic driving out of chassises from the processing area with muting

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 type 4 Safety Light Curtains in accordance with IEC/EN 61496 are predestined for these requirements. They have 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 und 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.

Typical areas of application

Access guarding on:

- Robots
- Automatic processing centers
- Palletizers

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Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 4			
Classification in accordance with IEC/EN 61508	SIL 3			
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 (OSSD)	2 pnp transistor outputs, 2 relay outputs AS-i Safety interface, PROFIsafe inter face			
Connection system	Cable gland Hirschmann plug MIN-style plug M12 plug (safety bus systems)			

Functions

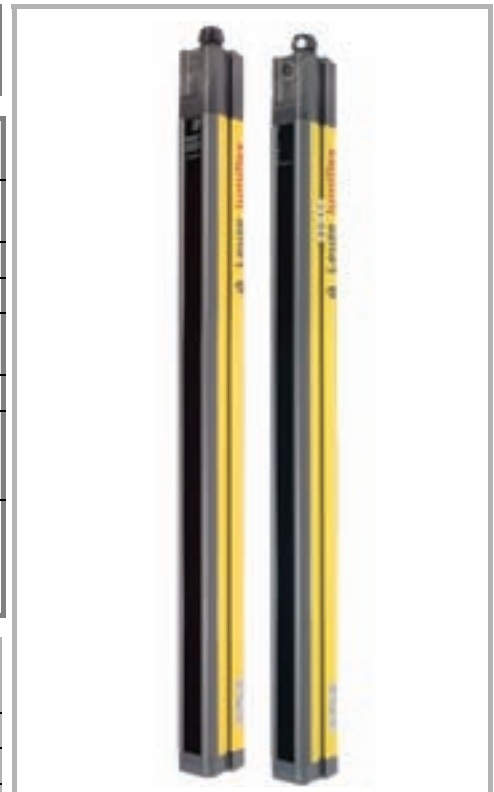
Start/restart function (RES), selectable
Dynamic contactor monitoring (EDM), selectable
2 transmission channels, selectable
4-sensor Sequential Muting
2-sensor Parallel Muting
4-sensor Parallel Muting
Muting restart override function
Output for muting indicator

Functions extension with "SafetyLab" PC software (accessories)

Infrared interface for parametering and diagnostics
More muting types
Parameterizable muting time limit
Additional control signals for muting and muting timer
Reduced resolution can be set
Partial muting can be parametered
Muting indicator function can be parametered
Beam signals for position and height measuring
Increased interference immunity with multiscan
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 connection socket for connecting local sensors and signal devices
- Local connection box and Y-cable (accessories) simplify sensor wiring



Properties



Further information

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SAFETY LIGHT CURTAINS

Ordering information

COMPACTplus-m, consisting of transmitter and receiver
 Included in scope of delivery: 4 sliding nuts, 2 bracket sets BT-S,
 1 SafetyKey, 1 connecting and operating instructions manual,
 1 self-adhesive information plate

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 scope of delivery: 4 sliding nuts, 2 bracket sets BT-S,
 1 SafetyKey, 1 connecting and operating instructions manual,
 1 self-adhesive information plate

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
90	68907000	CPT90-750/T1	Transmitter
	68907430	CPR90-750-m/T1	Receiver
180	68909000	CPT90-900/T1	Transmitter
	68909430	CPR90-900-m/T1	Receiver
270	68910000	CPT90-1050/T1	Transmitter
	68910430	CPR90-1050-m/T1	Receiver
360	68912000	CPT90-1200/T1	Transmitter
	68912430	CPR90-1200-m/T1	Receiver
450	68913000	CPT90-1350/T1	Transmitter
	68913430	CPR90-1350-m/T1	Receiver
540	68915000	CPT90-1500/T1	Transmitter
	68915430	CPR90-1500-m/T1	Receiver
630	68916000	CPT90-1650/T1	Transmitter
	68916430	CPR90-1650-m/T1	Receiver
720	68918000	CPT90-1800/T1	Transmitter
	68918430	CPR90-1800-m/T1	Receiver
810	68921000	CPT90-2100/T1	Transmitter
	68921430	CPR90-2100-m/T1	Receiver
900	68924000	CPT90-2400/T1	Transmitter
	68924430	CPR90-2400-m/T1	Receiver
990	68927000	CPT90-2700/T1	Transmitter
	68927430	CPR90-2700-m/T1	Receiver
1080	68930000	CPT90-3000/T1	Transmitter
	68930430	CPR90-3000-m/T1	Receiver

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

www.leuze.com/compactplus-m/





SAFETY LIGHT CURTAINS

COMPACT*plus*-m model varieties

Article	Description	Connection system
CPT...../T1	Transmitter	Cable gland
CPR...../T1	Receiver	Transistor output, cable gland
CPR...../R1	Receiver	Relay output, cable gland
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(T)...../R3	Receiver	Relay output, MIN-style plug, 12-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 PROFI-safe 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 time for devices with MIN-style plug: approx. 6 weeks

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...2100	150...2100 mm for 14 mm resolution
150...3000	150...3000 mm for 30 mm resolution
450...3000	450...3000 mm for 50 mm resolution
750...3000	750...3000 mm for 90 mm resolution
k	Cascading option
H	Host (from 225 mm protective field height) Guest identical with COMPACT series
f	Functions package (receiver only)
m	Muting
l	Integrated LED-lamp (only receivers with "Muting" functions package)
tt	Machine interface/Connection system
T1	Transistor output, cable gland
T2	Transistor output, Hirschmann plug (DIN 43651)
T3	Transistor output, MIN-style plug (MIN series)
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, receiver only
P1	Integrated PROFIBUS DP interface, receiver only
AP	M12 plug (transmitter only)

CP a rr -hhh k -f l /tt

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SAFETY LIGHT CURTAINS

Article numbers structure for COMPACT*plus-m*

Type 4 Safety Light Curtains

Art. no.	Description		
68	COMPACT<i>plus-m</i>		
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		
1	Transmitter host (cascadable), transmitter guest identical with COMPACT series		
4	Basic receiver device		
6	Receiver host (cascadable), receiver guest identical with COMPACT series		
8	Receiver with integrated LED-muting indicator		
dd	Function package / connection types		
Transmitter			
00	Transmitter /T1		
01	Transmitter /T2		
02	Transmitter /T3		
50	Transmitter /AP		
Receiver			
30	Muting /T1		
31	Muting /T2		
32	Muting /T3		
39	Muting /R1		
38	Muting /R2		
37	Muting /R3		
80	Muting /A1		
81	Muting /P1		

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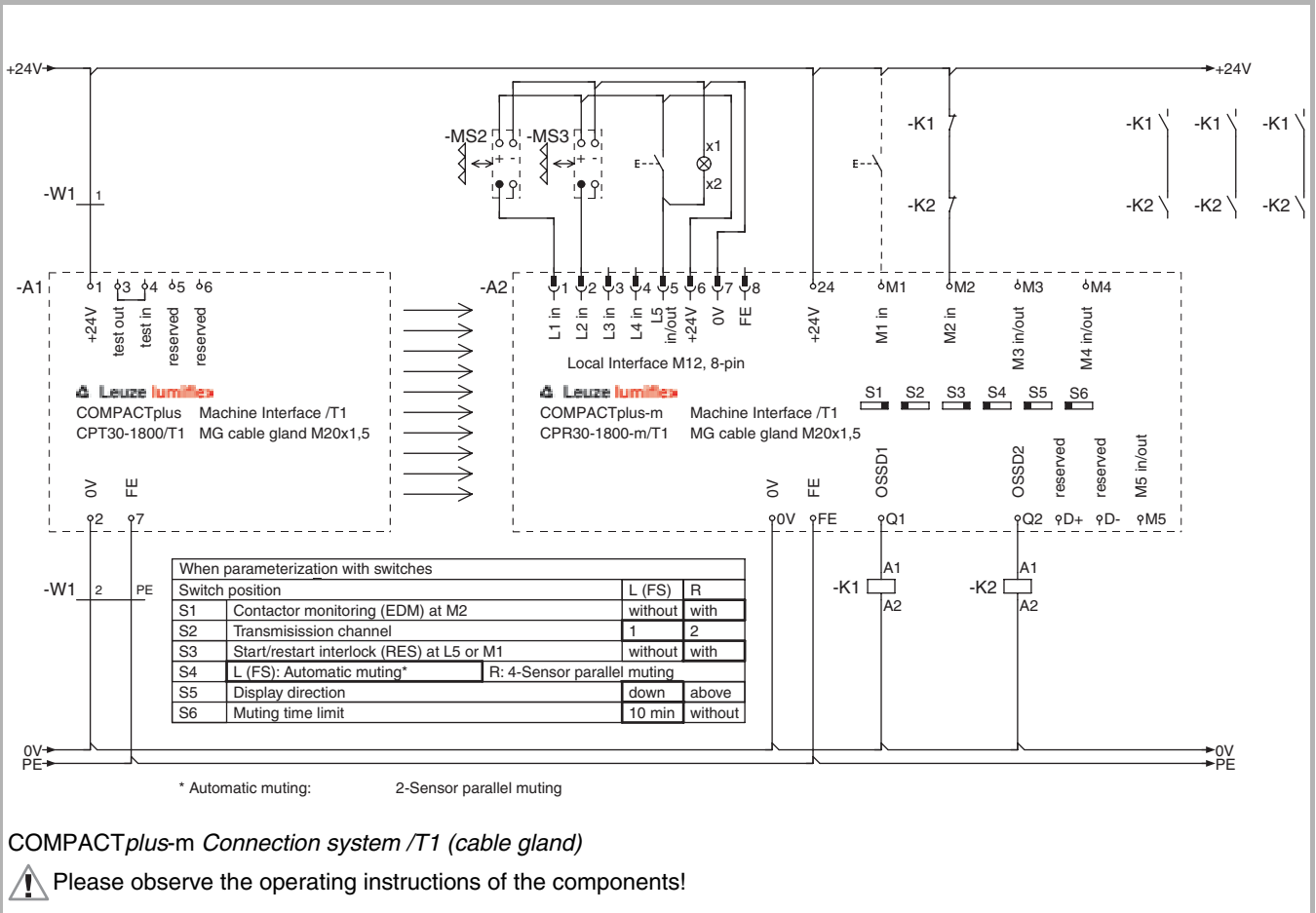
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Electrical connection

COMPACTplus-m connection example*



COMPACTplus-m Connection system /T1 (cable gland)

⚠ Please observe the operating instructions of the components!

*) For further connection examples, see chapter
 COMPACTplus-b, page 105
 COMPACTplus-i, page 118
 AS-interface Safety at Work, page 327
 PROFIBUS DP, page 354

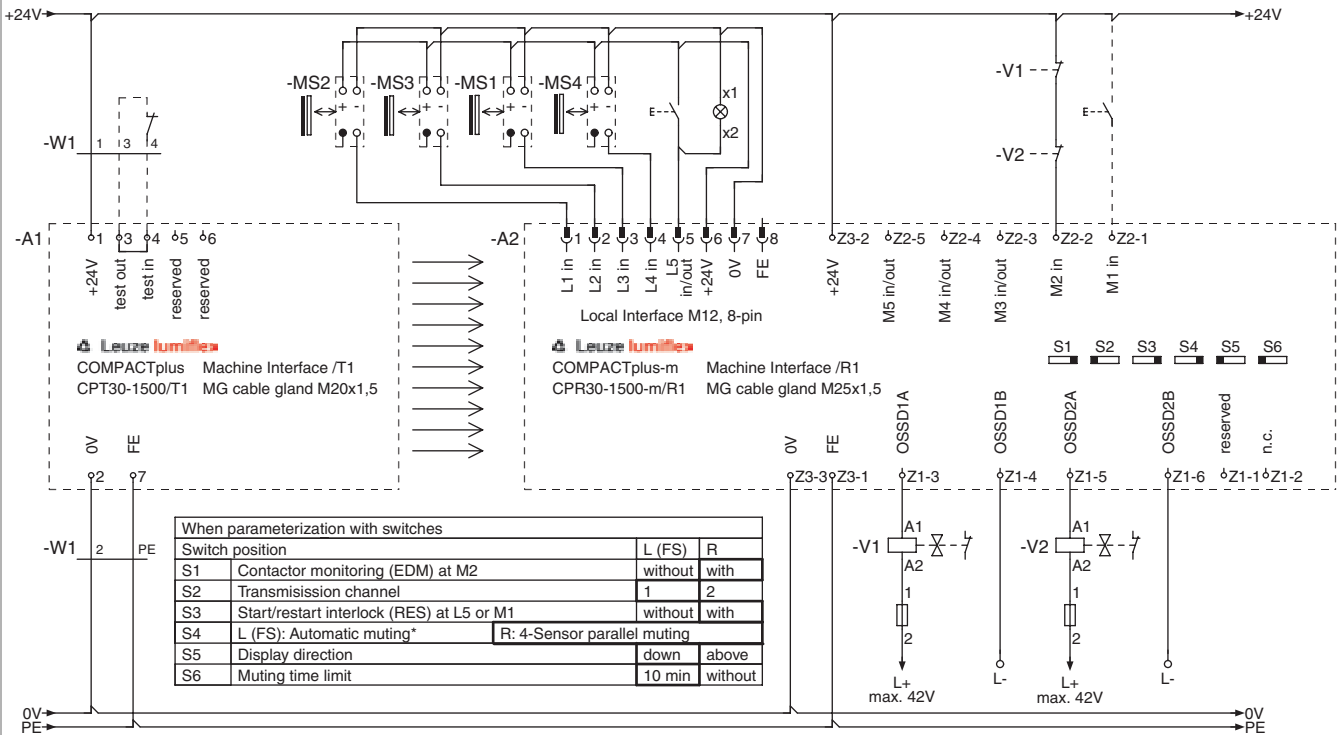




SAFETY LIGHT CURTAINS

Electrical connection

COMPACTplus-m connection example*



* 4-Sensor parallel muting: Concurrency required of MS2 and MS3, as well as of MS1 and MS4

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 105
 COMPACTplus-i, page 118
 AS-interface Safety at Work, page 327
 PROFIBUS DP, page 354

Technical data

General system data					
Safety type in accordance with IEC/EN 61496		Type 4			
Classification in accordance with IEC/EN 61508		SIL 3			
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...62 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			
Transmitter					
Transmitter diodes, class in accordance with EN 60825		1			
Wavelength		880 nm			
Current consumption		75 mA			
Connection system		Cable gland (PG13.5) Hirschmann plug (DIN 43651), 12-pin MIN-style plug (MIN Series), 3-pin M12 plug (safety bus systems), 5-pin			
Receiver					
Current consumption		160 mA without external load and muting sensors			
Safety-related switching outputs (OSSD)		2 pnp transistor outputs 2 relay outputs (make) AS-i Safety interface PROFIsafe interface			
Switching voltage high active		Min. Uv -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			

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

**) Installation length up to 3000 mm on request.

You will find additional information in the COMPACTplus-m connecting and operating instructions at www.leuze.com/compactplus-m.

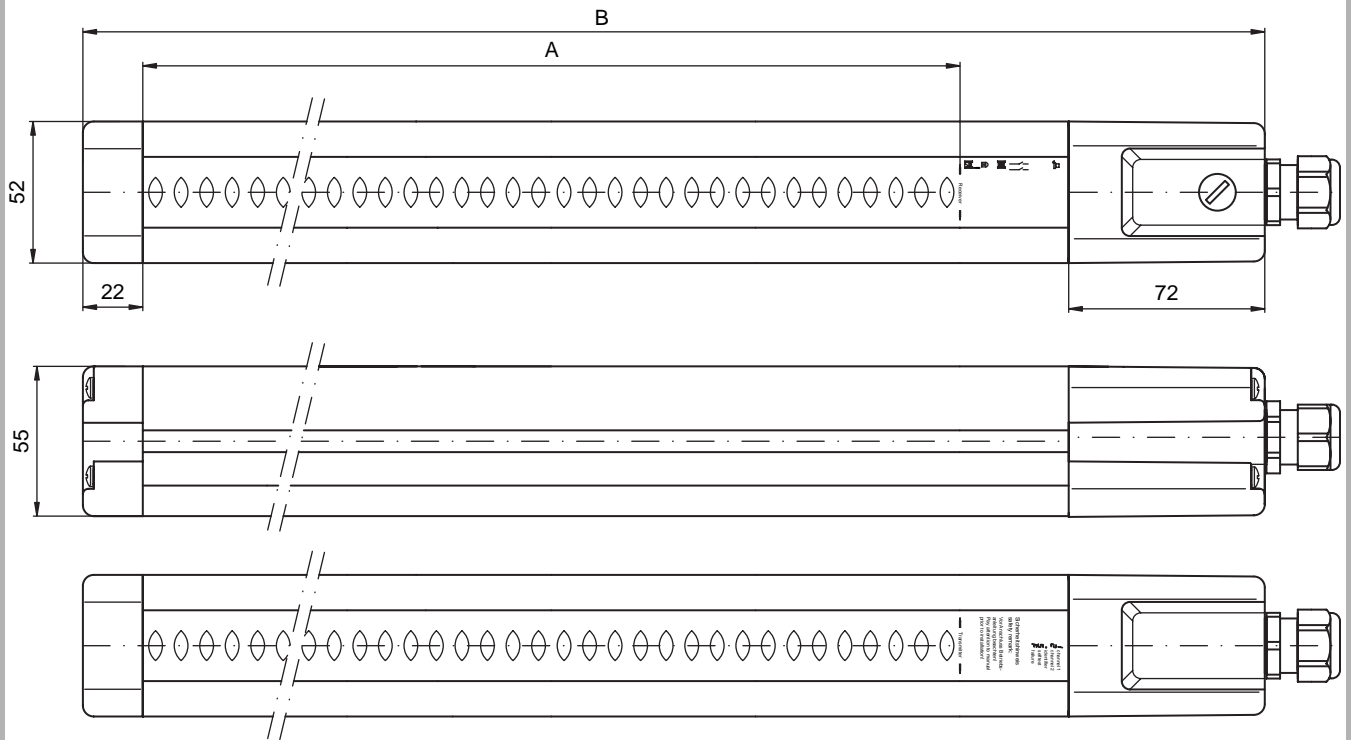




SAFETY LIGHT CURTAINS

Dimensional drawings

COMPACTplus-m Safety Light Curtain



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

Dimensions in mm

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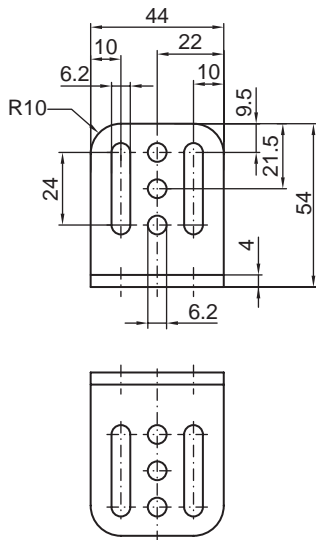
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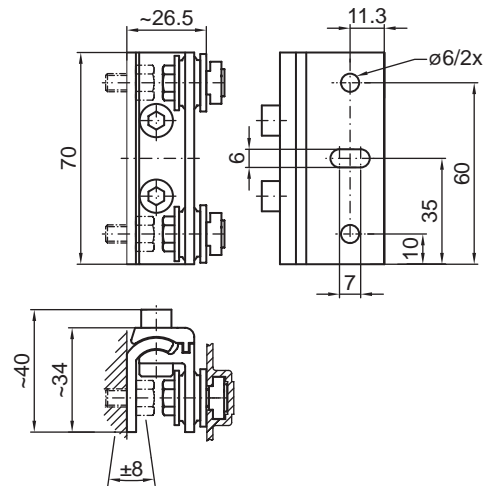
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Accessories dimensional drawings

Brackets



L-mounting bracket



Mounting bracket, swiveling with shock absorber, BT-SSD

Dimensions in mm

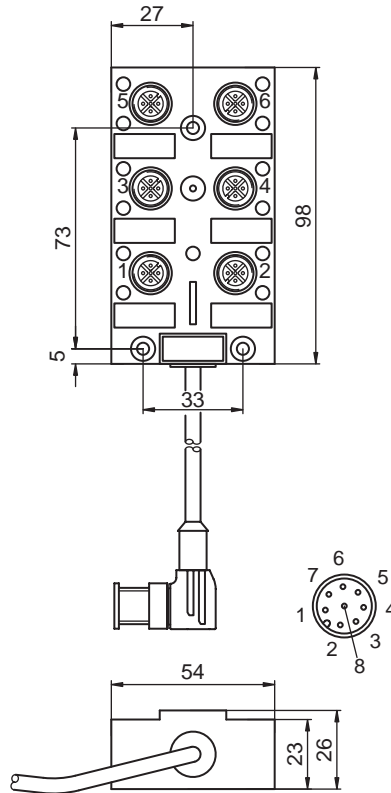




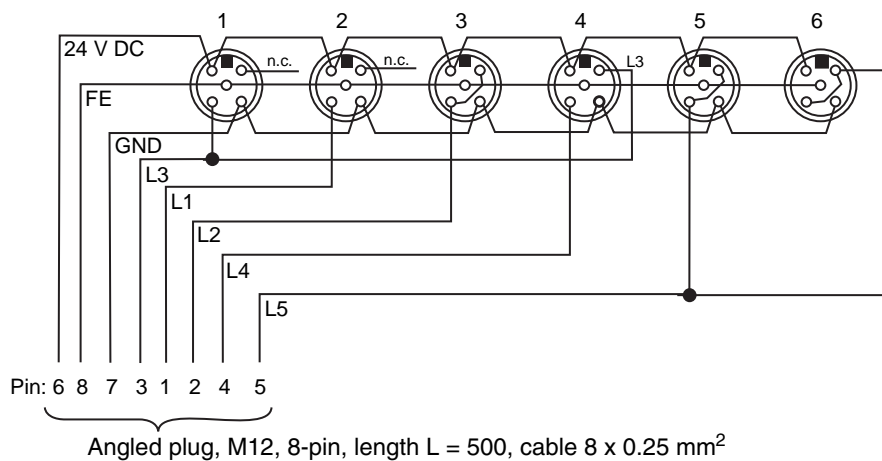
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Accessories dimensional drawings

Local connection box, AC-SCM1



Internal circuit diagram



Dimensions in mm

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Accessories ordering information

Art. no.	Article	Description	Length, design
Mounting accessories			
560300	BT-SSD	Mounting bracket, swiveling with shock absorber incl. 2 screws and 2 sliding nuts	
560120	BT-S	Mounting set consisting of 2 L-type brackets incl. 2 screws	
425720	BT-NC	Sliding nut	
Laser alignment aids			
560020	LA-78U	Laser alignment aid for lateral mounting with use for COMPACT/COMPACTplus/ROBUST/ECO/SOLID	
520004	LA-78UDC	Laser alignment aid with ROBUST/COMPACT/COMPACTplus application with UDC mounting column	
Test rods			
349945	AC-TR14/30	Test rod, 14 mm / 30 mm	
430428	AC-TRSET1	Test rod set, 14/24/33 mm	
Parametering software			
520072	CB-PCO-3000	PC cable, RS232-IR adapter	3 m
520073	SLAB-SWC	SafetyLab Diagnostics and Parameterization Software incl. PC cable, RS232 - IR-adapter	
COMPACTplus – Accessories for local and machine interfaces			
150704	CB-M12-3000-8WM	Cable for local interface with M12 x 8 plug	3 m, angled
150699	CB-M12-10000-8WM	Cable for local interface with M12 x 8 plug	10 m, angled
150677	CB-M12-10000-5WM	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 & R2, 12-pin, incl. crimp contacts	Straight
426045	AC-LDH-12WF	Hirschmann cable socket, encoded for CP/T2 & R2, 12-pin, incl. crimp contacts	Angled
426042	CB-8N-10000-12GF	Cable, machine interface /T2, /R2, Hirschmann cable socket	10 m, straight
426044	CB-8N-25000-12GF	Cable, machine interface /T2, /R2, Hirschmann cable socket	25 m, straight
426043	CB-8N-50000-12GF	Cable, machine interface /T2, /R2, Hirschmann cable socket	50 m, straight





SAFETY LIGHT CURTAINS

Accessories ordering information

Art. no.	Article	Description	Length, design
COMPACTplus – Muting accessories			
520065	AC-SCM1	Local connection box with M12-connection, for connecting to local connection socket	0.5 m
520068	AC-SCM1-BT	Local connection box with mounting plate, with M12-connection, for connecting to local connection socket	0.5 m
520066	AC-SCC2	Sensor splitter cable for PRK series ... (pin 2 active), for connecting to local connection socket	(2 x 1.5 m) & 0.3 m

Muting accessories such as muting installation systems, connection cables and lamps can be found in the sensor accessories chapter, muting accessories section.

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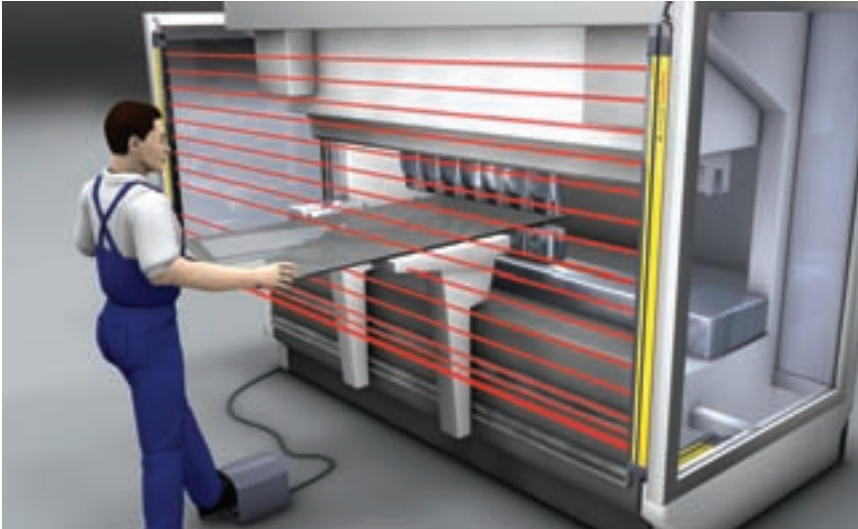
www.leuze.com/compactplus-m/



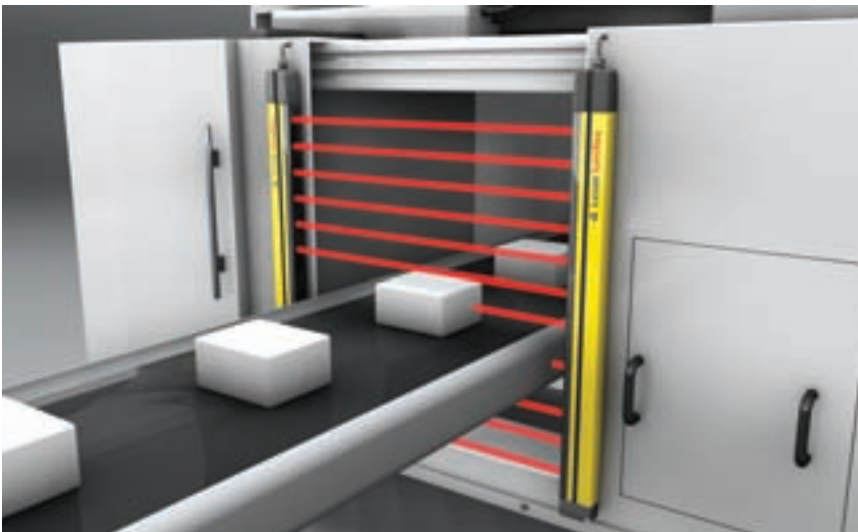


SAFETY LIGHT CURTAINS

COMPACTplus-b



Hand and finger protection with work piece blanking with blanking functions



The blanking of individual beams guarantees safety with simultaneous material flow

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 IEC/EN 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 Safety Light Curtains und 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.

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 area guarding, e.g. in robot entry areas

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COMPACTplus-b

Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 4		
Classification in accordance with IEC/EN 61508	SIL 3		
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 (OSSD)	2 pnp transistor outputs, 2 relay outputs AS-i Safety interface, PROFIsafe interface		
Connection system	Cable gland Hirschmann plug MIN-style plug M12 plug (safety bus systems)		

Functions

Start/restart function (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
Increased interference immunity with multiscan

Special features

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



Properties



Further information Page

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SAFETY LIGHT CURTAINS

Ordering information

COMPACTplus-b, consisting of transmitter and receiver
 Included in scope of delivery: 4 sliding nuts, 2 bracket sets BT-S,
 1 SafetyKey, 1 connecting and operating instructions manual,
 1 self-adhesive information plate

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

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Ordering information

COMPACTplus-b, consisting of transmitter and receiver
 Included in scope of delivery: 4 sliding nuts, 2 bracket sets BT-S,
 1 SafetyKey, 1 connecting and operating instructions manual,
 1 self-adhesive information plate

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/





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COMPACT*plus*-b model varieties

Article	Description	Connection system
CPT...../T1	Transmitter	Cable gland
CPR...../T1	Receiver	Transistor output, cable gland
CPR...../R1	Receiver	Relay output, cable gland
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...../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

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...2100	150...2100 mm for 14 mm resolution
150...3000	150...3000 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) Guest identical with COMPACT series
f	Functions package (receiver only)
b	Blanking
tt	Machine interface/Connection system
T1	Transistor output, cable gland
T2	Transistor output, Hirschmann plug (DIN 43651)
T3	Transistor output, MIN-style plug (MIN series)
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, receiver only
P1	Integrated PROFIBUS DP interface, receiver only
AP	M12 plug, transmitter only

CP a rr -hhh k -f /tt





SAFETY LIGHT CURTAINS

Article numbers structure for COMPACT*plus-b*

Type 4 Safety Light Curtains

Art. no.	Description
68	COMPACT<i>plus-b</i>
a	Resolution
1	14 mm
3	30 mm
5	50 mm
9	90 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), transmitter guest identical with COMPACT series
4	Basic receiver device
6	Receiver host (cascadable), receiver guest identical with COMPACT series
dd	Function package / connection types
	Transmitter
00	Transmitter /T1
01	Transmitter /T2
02	Transmitter /T3
50	Transmitter /AP
	Receiver
20	Blanking /T1
21	Blanking /T2
22	Blanking /T3
29	Blanking /R1
28	Blanking /R2
27	Blanking /R3
70	Blanking /A1
71	Blanking /P1

68 a bb c dd

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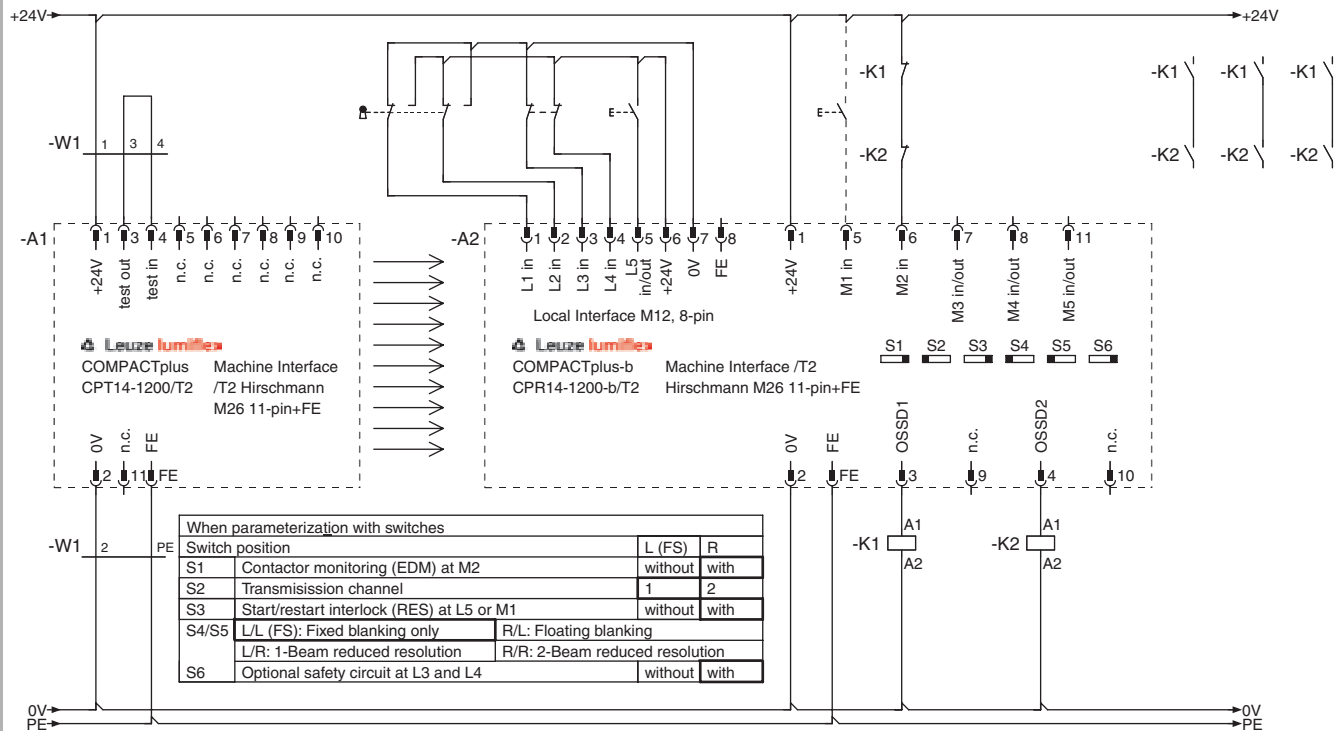
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Electrical connection

COMPACTplus-b connection example*



COMPACTplus-b Connection system /T2 (Hirschmann plug)

! Please observe the operating instructions of the components!

*) For further connection examples, see chapter
 COMPACTplus-m, page 89
 COMPACTplus-i, page 118
 AS-interface Safety at Work, page 327
 PROFIBUS DP, page 354

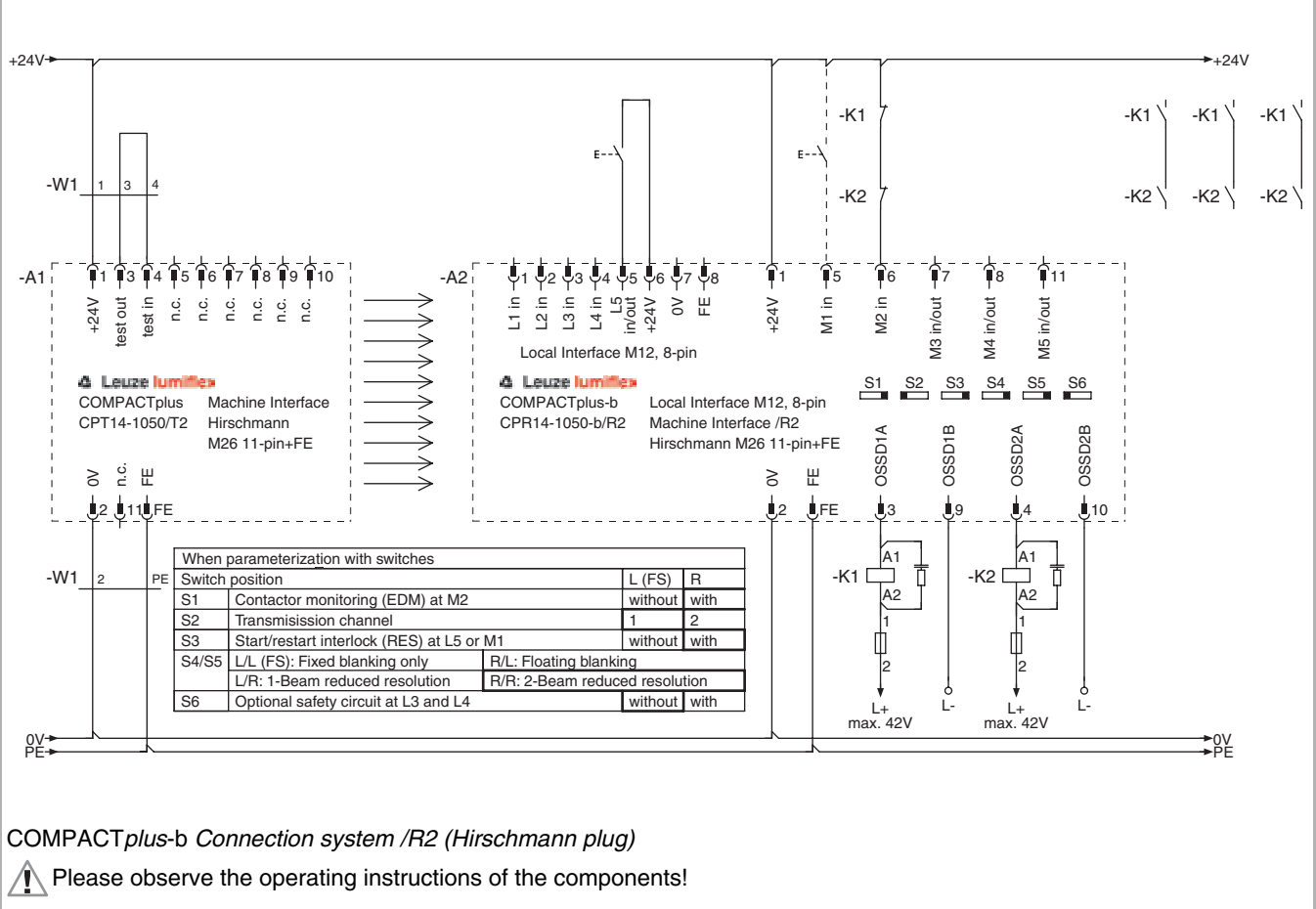




SAFETY LIGHT CURTAINS

Electrical connection

COMPACTplus-b connection example*



*) For further connection examples, see chapter
 COMPACTplus-m, page 89
 COMPACTplus-i, page 118
 AS-interface Safety at Work, page 327
 PROFIBUS DP, page 354

Technical data

General system data			
Safety type in accordance with IEC/EN 61496		Type 4	
Classification in accordance with IEC/EN 61508		SIL 3	
Resolution		14 mm	30 mm
Range		0...6 m	0...18 m
Response time	Transistor output	5...41 ms	5...22 ms
	Relay output	20...56 ms	20...37 ms
	AS-i Safety interface	10...46 ms	10...27 ms
	PROFIsafe interface	25...61 ms	25...62 ms
Protective field height		150...1800 mm	150...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	
Transmitter			
Transmitter diodes, class in accordance with EN 60825		1	
Wavelength		880 nm	
Current consumption		75 mA	
Connection system		Cable gland (PG13.5) Hirschmann plug (DIN 43651), 12-pin MIN-style plug (MIN Series), 3-pin M12 plug (safety bus systems), 5-pin	
Receiver			
Current consumption		160 mA without external load	
Safety-related switching outputs (OSSD)		2 pnp transistor outputs (short circuit-proof, cross-circuit monitored) 2 relay outputs (make) 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	

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

You will find additional information in the COMPACTplus-b connecting and operating instructions at www.leuze.com/compactplus-b.

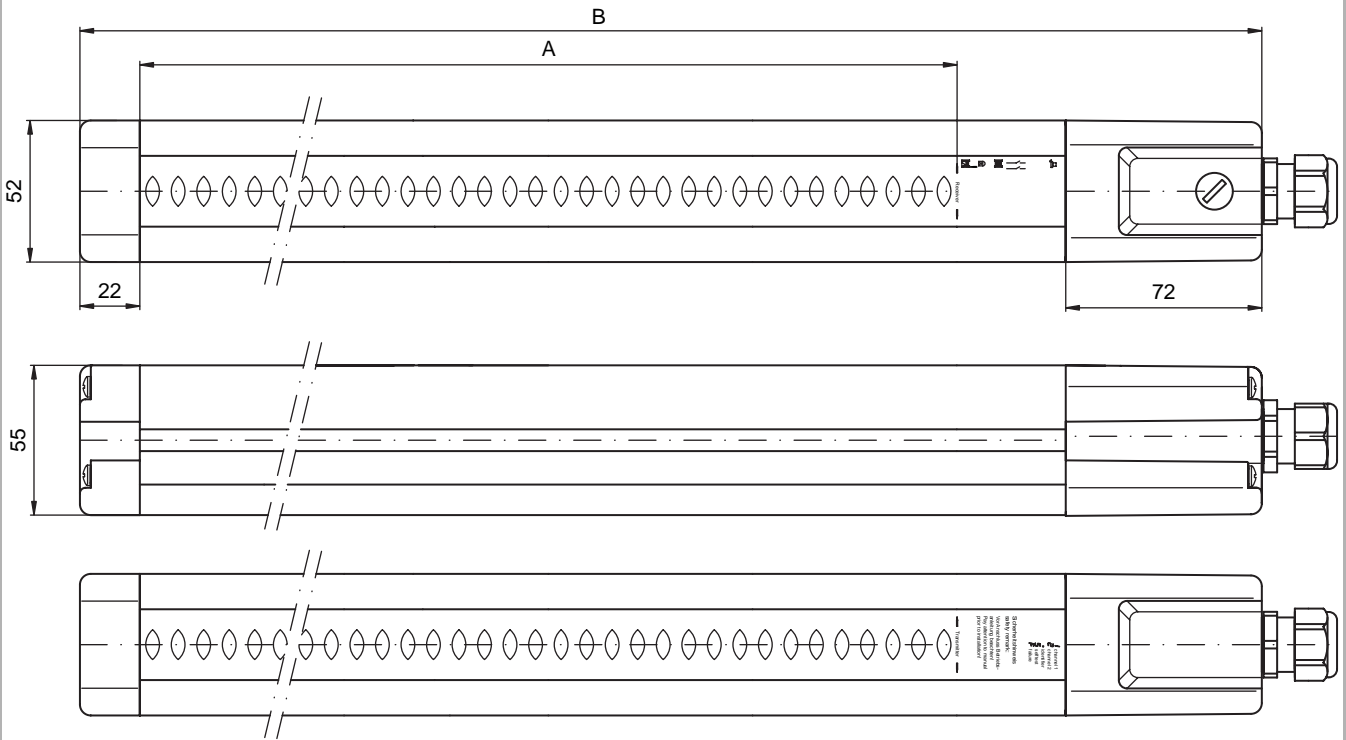




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Dimensional drawings

COMPACTplus-b Safety Light Curtain



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

Dimensions in mm

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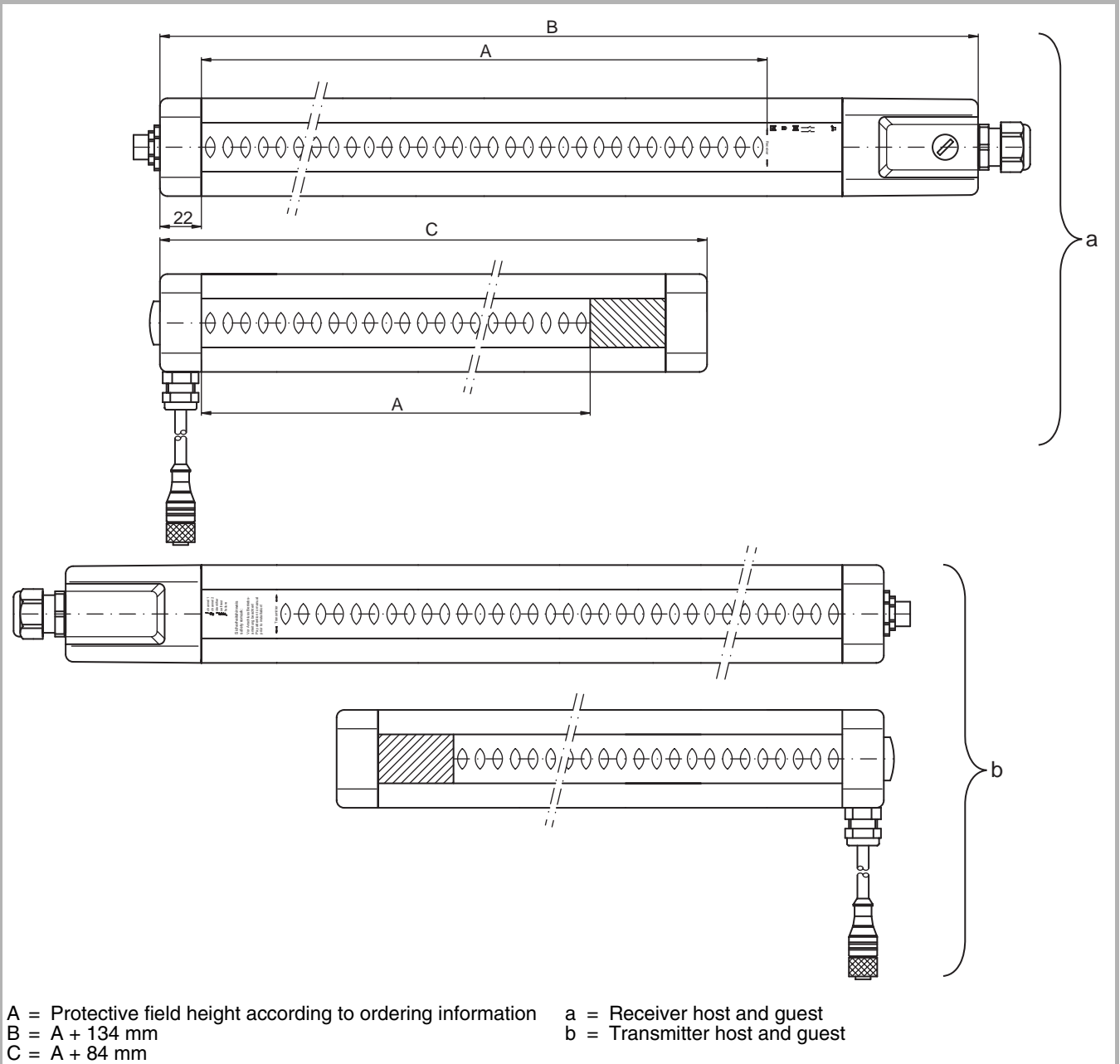
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Dimensional drawings

Host and guest dimensions



Dimensions in mm

You will find more information on the guest devices and dimensions under COMPACT from page 138.

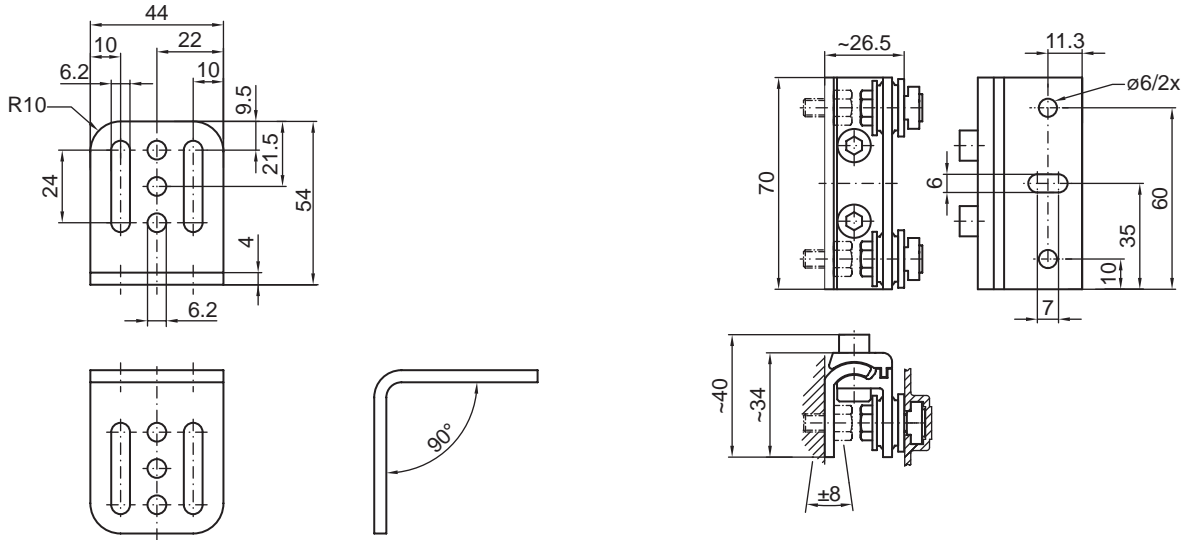




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Accessories dimensional drawings

Brackets



L-mounting bracket

Mounting bracket, swiveling with shock absorber, BT-SSD

Dimensions in mm

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Accessories ordering information

Art. no.	Article	Description	Length, design
Mounting accessories			
560300	BT-SSD	Mounting bracket, swiveling with shock absorber incl. 2 screws and 2 sliding nuts	
560120	BT-S	Mounting set consisting of 2 L-type brackets incl. 2 screws	
425720	BT-NC	Sliding nut	
Laser alignment aids, see COMPACTplus-m ordering information, page 95			
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	
Parameterization software, see COMPACTplus-m ordering information, page 95			
COMPACTplus – Accessories for local and machine interfaces			
150704	CB-M12-3000-8WM	Cable for local interface with M12 x 8 plug	3 m, angled
150699	CB-M12-10000-8WM	Cable for local interface with M12 x 8 plug	10 m, angled
150677	CB-M12-10000-5WM	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 & R2, 12-pin, incl. crimp contacts	Straight
426045	AC-LDH-12WF	Hirschmann cable socket, encoded for CP/T2 & R2, 12-pin, incl. crimp contacts	Angled
426042	CB-8N-10000-12GF	Cable, machine interface /T2, /R2, Hirschmann cable socket	10 m, straight
426044	CB-8N-25000-12GF	Cable, machine interface /T2, /R2, Hirschmann cable socket	25 m, straight
426043	CB-8N-50000-12GF	Cable, machine interface /T2, /R2, Hirschmann cable socket	50 m, straight

Delivery time for devices with MIN-style plug: approx. 6 weeks

www.leuze.com/compactplus-b/





SAFETY LIGHT CURTAINS

COMPACT*plus-i*



COMPACT*plus* for point of operation guarding at an automated line



Guarding a compression molding press with automatic unloading and machine initiation using cycle control

A cycle control can be extremely advantageous in increasing productivity, when work pieces have to be fed into or taken out of a machine by hand through a protective field, for example. The cycle control is used here for activating the machine movement after the feed-in and release of the protective field. For optimum arrangement of a production process with cycle control the COMPACT*plus-i* type Safety Light Curtains in accordance with IEC/EN 61496 provide integrated cycle control functions for different cycle operating modes. Numerous production applications can be activated with the freely selectable cycle mode (1 to 8 cycles).

COMPACT*plus* Safety Light Curtains und 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 COMPACT*plus* 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. COMPACT*plus* can be connected to both conventional safety modules and to open safety bus systems via various interfaces (transistor/relay output, Safety at Work AS-Interface, PROFIsafe). These safety sensors can therefore be flexibly integrated into existing automation environments.

Typical areas of application

- Hydraulic press in protective, single or double cycle operation
- Rotary indexing table with hand loading and unloading

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COMPACTplus-i

Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 4	
Classification in accordance with IEC/EN 61508	SIL 3	
Resolution	14 mm	30 mm
Range	0...6 m	0...18 m
Protective field height (type-dependent)	150...1800 mm	
Profile cross-section	52 mm x 55 mm	
Safety-related switching outputs (OSSD)	2 pnp transistor outputs, 2 relay outputs AS-i Safety interface, PROFIsafe interface	
Connection system	Cable gland Hirschmann plug MIN-style plug M12 plug (safety bus systems)	

Functions

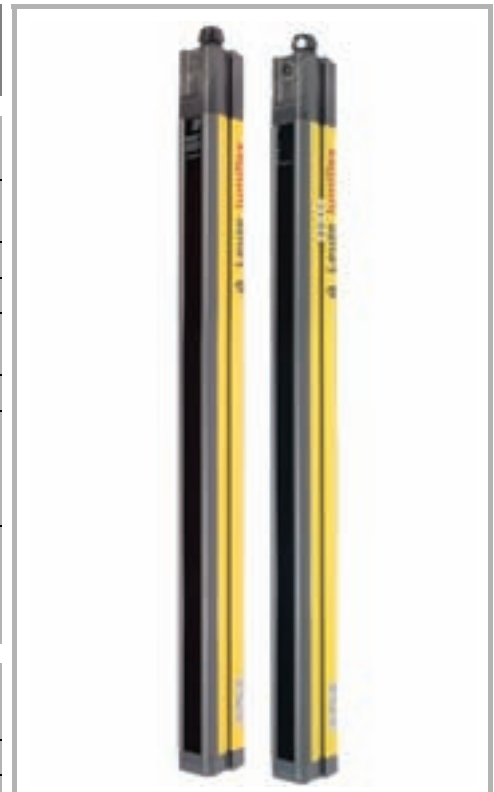
Start/restart function (RES), selectable
Dynamic contactor monitoring (EDM), selectable
2 transmission channels, selectable
Protective mode
Protective mode, 1-cycle control
Protective mode, 2-cycle control
External operating mode, selector switch
External signal, cycle release

Functions extension with "SafetyLab" PC software (accessories)

Infrared interface for parametering and diagnostics
Operating mode, 3-cycle to 8-cycle control
Bypass control for safe part of the movement
Increased interference immunity with multiscan
Additional 2-channel blanking circuit
Beam signals for position and height measuring
Fixed and floating blanking
Reduced resolution

Special features

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



Properties



Further information

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● Electrical connection	118
● Technical data	120
● Dimensional drawings	121
● Accessories dimensional drawings	123
● Accessories ordering information	124





SAFETY LIGHT CURTAINS

Ordering information

COMPACTplus-i, consisting of transmitter and receiver
 Included in scope of delivery: 4 sliding nuts, 2 bracket sets BT-S,
 1 SafetyKey, 1 connecting and operating instructions manual,
 1 self-adhesive information plate

Functions: Start/restart interlock, contactor monitoring,
 2 transmission channels, protective mode, cycle control,
 selector switch operating mode, signal cycle release

Protective field height in mm	COMPACTplus-i			COMPACTplus-i		
	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
	68101440	CPR14-150-i/T1	Receiver	68301440	CPR30-150-i/T1	Receiver
225	68102000	CPT14-225/T1	Transmitter	68302000	CPT30-225/T1	Transmitter
	68102440	CPR14-225-i/T1	Receiver	68302440	CPR30-225-i/T1	Receiver
300	68103000	CPT14-300/T1	Transmitter	68303000	CPT30-300/T1	Transmitter
	68103440	CPR14-300-i/T1	Receiver	68303440	CPR30-300-i/T1	Receiver
450	68104000	CPT14-450/T1	Transmitter	68304000	CPT30-450/T1	Transmitter
	68104440	CPR14-450-i/T1	Receiver	68304440	CPR30-450-i/T1	Receiver
600	68106000	CPT14-600/T1	Transmitter	68306000	CPT30-600/T1	Transmitter
	68106440	CPR14-600-i/T1	Receiver	68306440	CPR30-600-i/T1	Receiver
750	68107000	CPT14-750/T1	Transmitter	68307000	CPT30-750/T1	Transmitter
	68107440	CPR14-750-i/T1	Receiver	68307440	CPR30-750-i/T1	Receiver
900	68109000	CPT14-900/T1	Transmitter	68309000	CPT30-900/T1	Transmitter
	68109440	CPR14-900-i/T1	Receiver	68309440	CPR30-900-i/T1	Receiver
1050	68110000	CPT14-1050/T1	Transmitter	68310000	CPT30-1050/T1	Transmitter
	68110440	CPR14-1050-i/T1	Receiver	68310440	CPR30-1050-i/T1	Receiver
1200	68112000	CPT14-1200/T1	Transmitter	68312000	CPT30-1200/T1	Transmitter
	68112440	CPR14-1200-i/T1	Receiver	68312440	CPR30-1200-i/T1	Receiver
1350	68113000	CPT14-1350/T1	Transmitter	68313000	CPT30-1350/T1	Transmitter
	68113440	CPR14-1350-i/T1	Receiver	68313440	CPR30-1350-i/T1	Receiver
1500	68115000	CPT14-1500/T1	Transmitter	68315000	CPT30-1500/T1	Transmitter
	68115440	CPR14-1500-i/T1	Receiver	68315440	CPR30-1500-i/T1	Receiver
1650	68116000	CPT14-1650/T1	Transmitter	68316000	CPT30-1650/T1	Transmitter
	68116440	CPR14-1650-i/T1	Receiver	68316440	CPR30-1650-i/T1	Receiver
1800	68118000	CPT14-1800/T1	Transmitter	68318000	CPT30-1800/T1	Transmitter
	68118440	CPR14-1800-i/T1	Receiver	68318440	CPR30-1800-i/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

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COMPACT*plus-i* model varieties

Article	Description	Connection system
CPT...../T1	Transmitter	Cable gland
CPR...../T1	Receiver	Transistor output, cable gland
CPR...../R1	Receiver	Relay output, cable gland
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...../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, cascadable	All
CPR...../H-...	Receiver, cascadable	All

Machine Safety

Machine Safety Services

Safety Engineering Software

Safety Laser Scanners

Safety Light Curtains

Multiple Light Beam Safety Devices

Single Light Beam Safety Devices

AS-interface Safety at Work

PROFIsafe Sensors

Safety Switches and Safety Locking Devices





SAFETY LIGHT CURTAINS

Article list for COMPACT*plus-i*

Type 4 Safety Light Curtains

Article	Description
CP	COMPACT<i>plus-i</i>
a	Device type
T	Transmitter
R	Receiver
rr	Resolution/range
14	14 mm; range 0 - 6 m
30	30 mm; range 0 - 18 m
hhh	Protective field height
150...2100	150...2100 mm for 14 mm resolution
150...3000	150...3000 mm for 30 mm resolution
k	Cascading option
H	Host (from 225 mm protective field height) Guest identical with COMPACT series
f	Functions package (receiver only)
i	Cycle control
tt	Machine interface/Connection system
T1	Transistor output, cable gland
T2	Transistor output, Hirschmann plug (DIN 43651)
T3	Transistor output, MIN-style plug (MIN series)
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, receiver only
P1	Integrated PROFIBUS DP interface, receiver only
AP	M12 plug, transmitter only

CP a rr -hhh k -f /tt

Article numbers structure for COMPACTplus-i

Type 4 Safety Light Curtains

Art. no. Description

68 COMPACTplus-i

a Resolution

1 14 mm
3 30 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
1 Transmitter host (cascadable), transmitter guest identical with COMPACT series
4 Basic receiver device
6 Receiver host (cascadable), receiver guest identical with COMPACT series

dd Function package / connection types

Transmitter

00 Transmitter /T1
01 Transmitter /T2
02 Transmitter /T3
50 Transmitter /AP

Receiver

40 Initiation /T1
41 Initiation /T2
42 Initiation /T3
49 Initiation /R1
48 Initiation /R2
47 Initiation /R3
90 Initiation /A1
91 Initiation /P1

68 a bb c dd

Machine Safety

Machine Safety Services

Safety Engineering Software

Safety Laser Scanners

Safety Light Curtains

Multiple Light Beam Safety Devices

Single Light Beam Safety Devices

AS-interface Safety at Work

PROFIsafe Sensors

Safety Switches and Safety Locking Devices

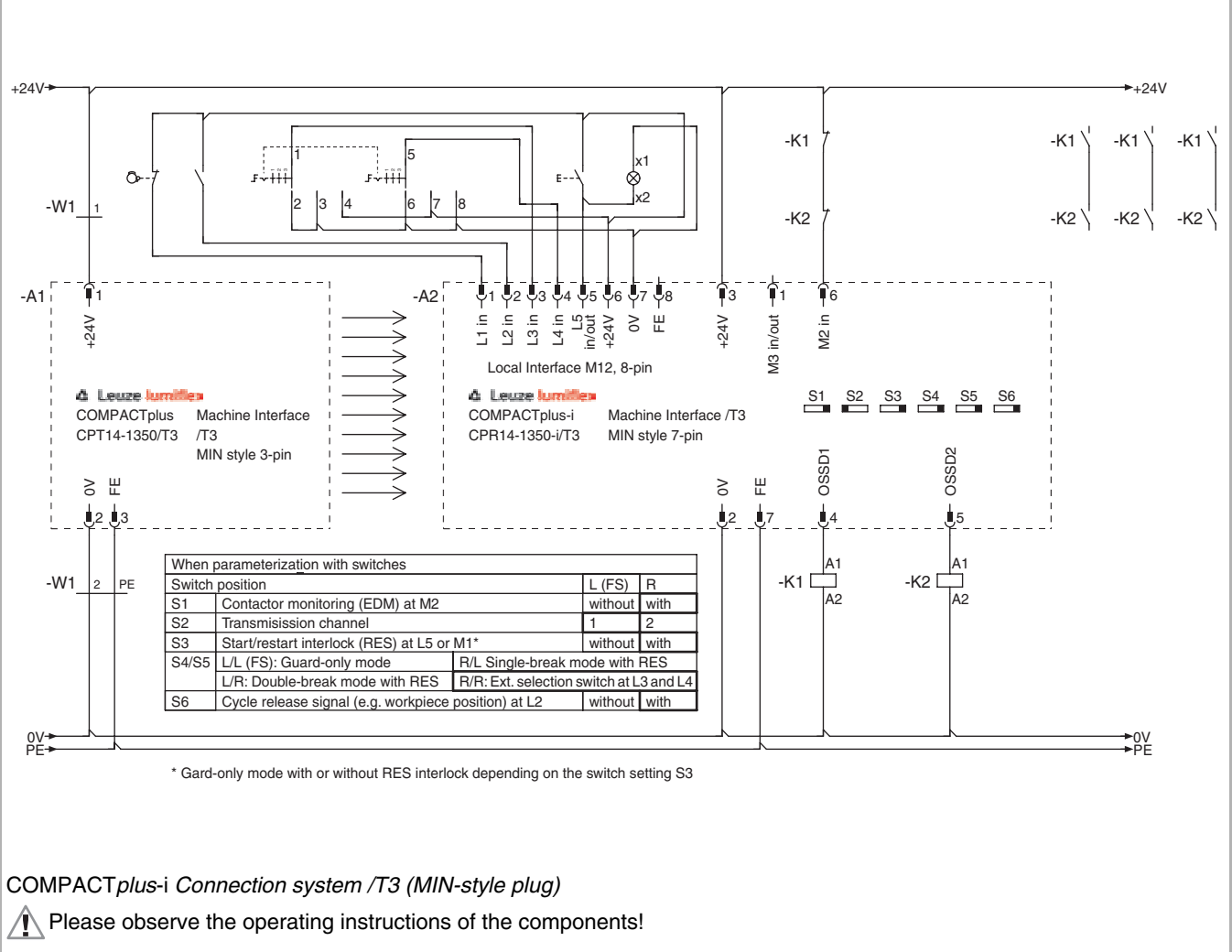




SAFETY LIGHT CURTAINS

Electrical connection

COMPACTplus-i connection example*



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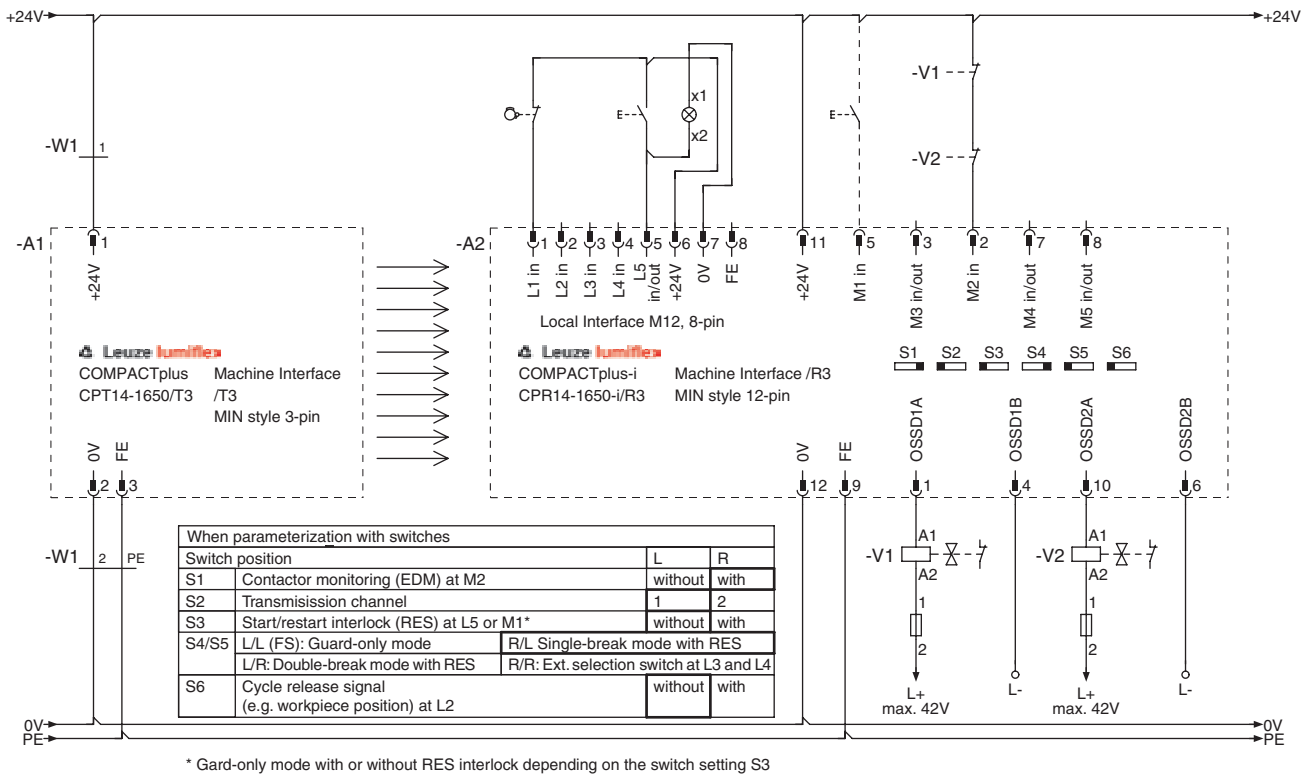
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Electrical connection

COMPACTplus-i connection example*



COMPACTplus-i Connection system /R3 (MIN-style plug)

⚠ Please observe the operating instructions of the components!

*) For further connection examples, see chapter
 COMPACTplus-m, page 89
 COMPACTplus-b, page 105
 AS-interface Safety at Work, page 327
 PROFIBUS DP, page 354





SAFETY LIGHT CURTAINS

Technical data

General system data			
Safety type in accordance with IEC/EN 61496		Type 4	
Classification in accordance with IEC/EN 61508		SIL 3	
Resolution		14 mm	30 mm
Range		0...6 m	0...18 m
Response time	Transistor output	5...41 ms	5...22 ms
	Relay output	20...56 ms	20...37 ms
	AS-i Safety interface	10...46 ms	10...27 ms
	PROFIsafe interface	25...61 ms	25...62 ms
Protective field height		150...1800 mm	150...1800 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...5.10 kg	
Transmitter			
Transmitter diodes, class in accordance with EN 60825		1	
Wavelength		880 nm	
Current consumption		75 mA	
Connection system		Cable gland (PG13.5) Hirschmann plug (DIN 43651), 12-pin MIN-style plug (MIN Series), 3-pin M12 plug (safety bus systems), 5-pin	
Receiver			
Current consumption		160 mA without external load	
Safety-related switching outputs (OSSD)		2 pnp transistor outputs (short circuit-proof, cross-circuit monitored) 2 relay outputs (make) 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	

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

You will find additional information in the COMPACT*plus*-i connecting and operating instructions at www.leuze.com/compactplus-i.

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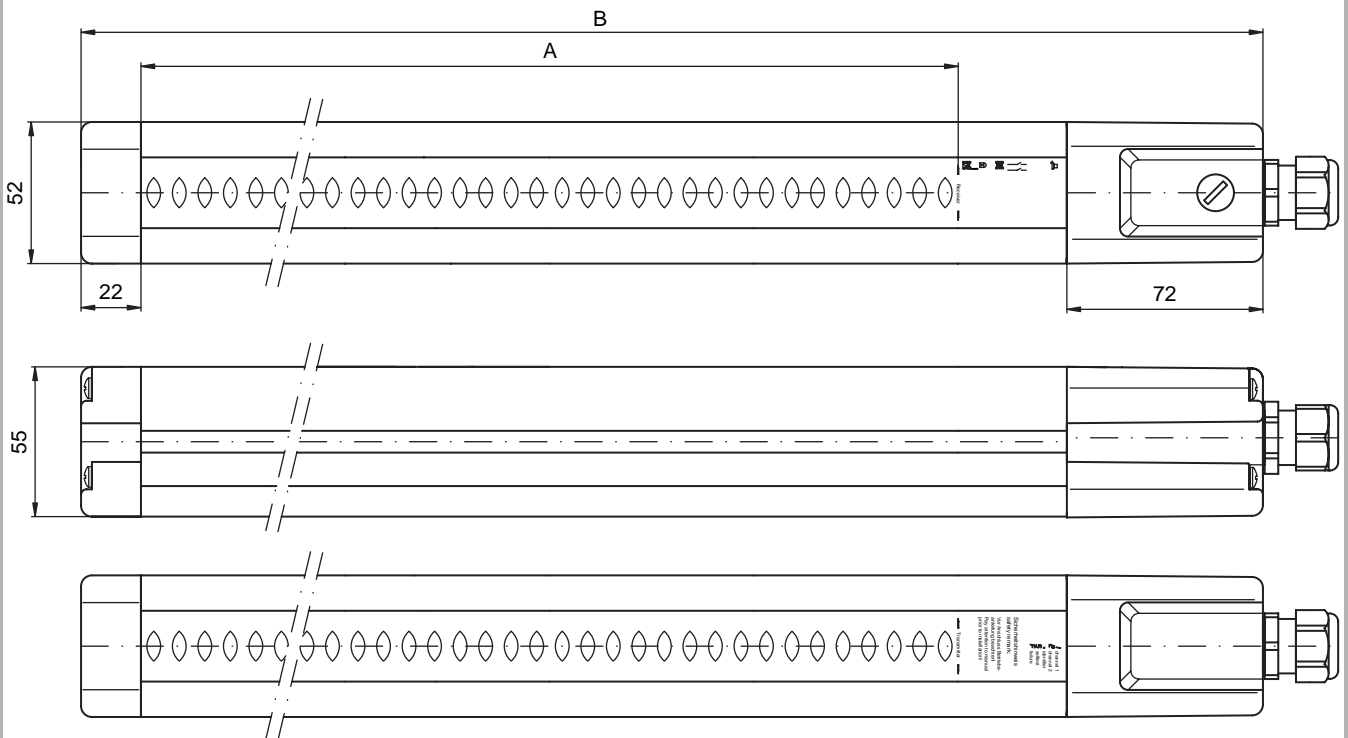
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Dimensional drawings

COMPACTplus-i Safety Light Curtain



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

Dimensions in mm

www.leuze.com/compactplus-i/

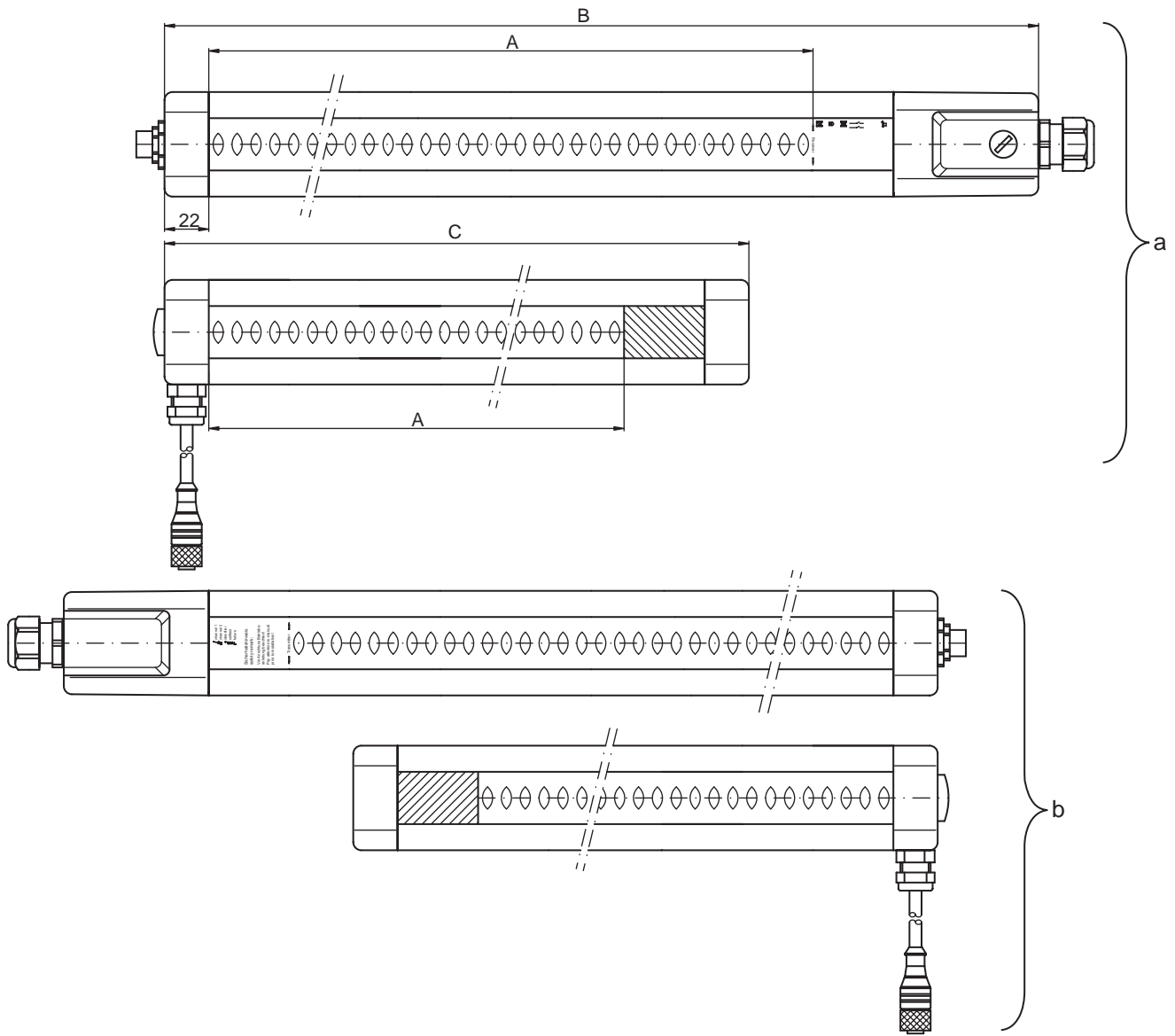




SAFETY LIGHT CURTAINS

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

You will find more information on the guest devices and dimensions under COMPACT from page 137.

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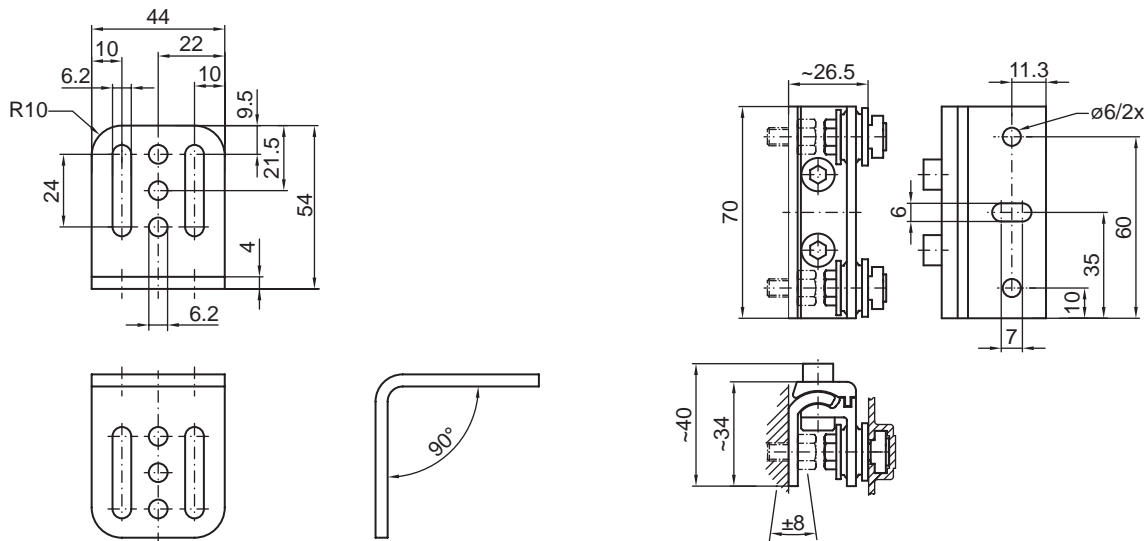
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Accessories dimensional drawings

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
Mounting accessories			
560300	BT-SSD	Mounting bracket, swiveling with shock absorber incl. 2 screws and 2 sliding nuts	
560120	BT-S	Mounting set consisting of 2 L-type brackets incl. 2 screws	
425720	BT-NC	Sliding nut	
Laser alignment aids, see COMPACTplus-m ordering information, page 95			
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	
Parameterization software, see COMPACTplus-m ordering information, page 95			
COMPACTplus – Accessories for local and machine interfaces			
150704	CB-M12-3000-8WM	Cable for local interface with M12 x 8 plug	3 m, angled
150699	CB-M12-10000-8WM	Cable for local interface with M12 x 8 plug	10 m, angled
150677	CB-M12-10000-5WM	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 & R2, 12-pin, incl. crimp contacts	Straight
426045	AC-LDH-12WF	Hirschmann cable socket, encoded for CP/T2 & R2, 12-pin, incl. crimp contacts	Angled
426042	CB-8N-10000-12GF	Cable machine interface /T2, /R2, Hirschmann cable socket	10 m, straight
426044	CB-8N-25000-12GF	Cable machine interface /T2, /R2, Hirschmann cable socket	25 m, straight
426043	CB-8N-50000-12GF	Cable machine interface /T2, /R2, Hirschmann cable socket	50 m, straight

Delivery time for devices with MIN-style plug: approx. 6 weeks

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Machine Safety

Machine Safety
Services

Safety
Engineering
Software

Safety Laser
Scanners

Safety Light
Curtains

Multiple
Light Beam
Safety Devices

Single
Light Beam
Safety Devices

AS-interface
Safety at Work

PROFIsafe
Sensors

Safety Switches
and Safety Lock-
ing Devices

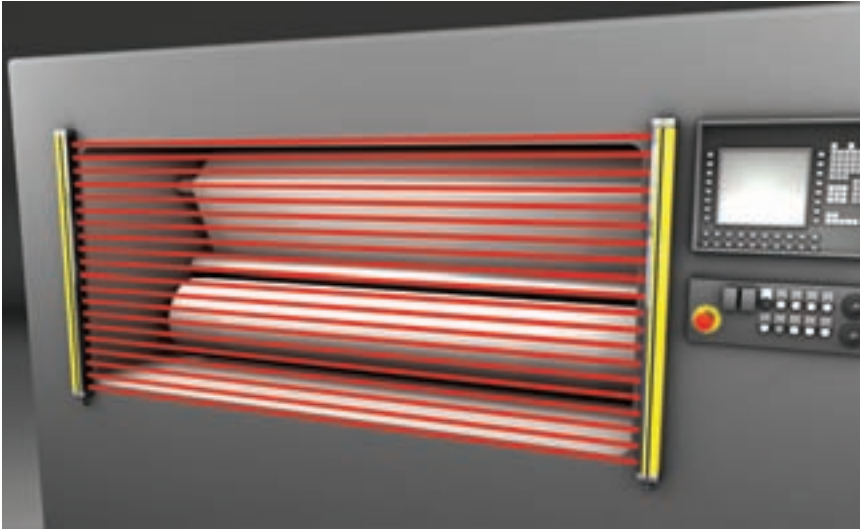
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SAFETY LIGHT CURTAINS

COMPACT



COMPACT Safety Light Curtains in use on a printing machine

With Safety Light Curtains, in addition to the reliable detection of protective field interruptions, interference immunity is particularly important for the user. COMPACT excels in meeting these requirements: The high availability is one of the great strengths of these type 4 Safety Light Curtains in accordance with IEC/EN 61496. Furthermore they also provide an excellent solution for restrictive spatial conditions or wherever a cascading option is required for sensors. The system consisting of transmitter and receiver is available in different series and in ATEX versions. The scope of function can be flexibly extended via external interface modules of the MSI series. With the numerous COMPACT series, which are all based on the same proven technical platform, many applications can be implemented with an optimum price/performance ratio.



The advantages of the COMPACT Safety Light Curtains are utilized to the maximum on presses

Typical areas of application

- Hand and finger protection, e.g. on hydraulic and mechanical presses or punching machines in the metals, leather and plastics industries, as well as filter presses
- Horizontal danger area guarding, e.g. on welding and assembly lines or robot cells

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COMPACT

Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 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 (OSSD)	2 pnp transistor outputs AS-i Safety interface			
Connection system	Cable gland Hirschmann plug MIN-style plug M12 plug M12 plug (AS-i Safety)			

Functions

Automatic start/restart
Start/restart interlock (RES), selectable *
Dynamic contactor monitoring (EDM), selectable *
2 transmission channels, selectable
7-segment display
LED-display

*) Functions available from April 2007

Functional extension

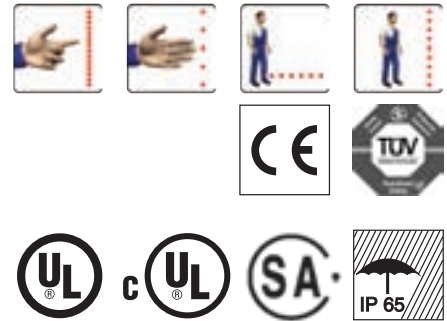
With safety interface	Relay output	Muting/Bypass	Cycle control	Further details
MSI-RM2	●			Page 396
MSI-SR2/F	●			Page 404
MSI-m	●	●		Page 432
MSI-i	●		●	Page 426
MSI-mi	●	●	●	Page 444

Special features

- **Fault-free operation of adjacent devices with selection of different transmission channels**
- **Maintenance-free with safety transistor outputs (OSSDs)**
- **MultiScan for environments with extreme stray light (e.g. welding sparks, flash lamps)**
- **Several devices can be cascaded**
- **Integrated auto-diagnostics system for simple on-site diagnostics and PC-supported diagnostics in the workshop**



Properties



Further information

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SAFETY LIGHT CURTAINS

Ordering information

COMPACT consisting of transmitter and receiver
 Included in scope of delivery: 4 sliding nuts, 2 bracket sets BT-S,
 1 connecting and operating instructions manual

Functions: Automatic start/restart, selectable transmission channels, selectable start/restart interlock ^{*)}, dynamic contactor monitoring ^{*)}, cascadability, MultiScan

^{*)} Functions available from April 2007

Protective field height in mm	COMPACT Connection system: Cable gland Resolution: 14 mm Range: 0 - 6 m				COMPACT Connection system: Cable gland Resolution: 30 mm Range: 0 - 18 m			
	Art. no.	Article	Description		Art. no.	Article	Description	
150	561101	CT14-150	Transmitter		561301	CT30-150	Transmitter	
	564101	CR14-150	Receiver		564301	CR30-150	Receiver	
225	561102	CT14-225	Transmitter		561302	CT30-225	Transmitter	
	564102	CR14-225	Receiver		564302	CR30-225	Receiver	
300	561103	CT14-300	Transmitter		561303	CT30-300	Transmitter	
	564103	CR14-300	Receiver		564303	CR30-300	Receiver	
450	561104	CT14-450	Transmitter		561304	CT30-450	Transmitter	
	564104	CR14-450	Receiver		564304	CR30-450	Receiver	
600	561106	CT14-600	Transmitter		561306	CT30-600	Transmitter	
	564106	CR14-600	Receiver		564306	CR30-600	Receiver	
750	561107	CT14-750	Transmitter		561307	CT30-750	Transmitter	
	564107	CR14-750	Receiver		564307	CR30-750	Receiver	
900	561109	CT14-900	Transmitter		561309	CT30-900	Transmitter	
	564109	CR14-900	Receiver		564309	CR30-900	Receiver	
1050	561110	CT14-1050	Transmitter		561310	CT30-1050	Transmitter	
	564110	CR14-1050	Receiver		564310	CR30-1050	Receiver	
1200	561112	CT14-1200	Transmitter		561312	CT30-1200	Transmitter	
	564112	CR14-1200	Receiver		564312	CR30-1200	Receiver	
1350	561113	CT14-1350	Transmitter		561313	CT30-1350	Transmitter	
	564113	CR14-1350	Receiver		564313	CR30-1350	Receiver	
1500	561115	CT14-1500	Transmitter		561315	CT30-1500	Transmitter	
	564115	CR14-1500	Receiver		564315	CR30-1500	Receiver	
1650	561116	CT14-1650	Transmitter		561316	CT30-1650	Transmitter	
	564116	CR14-1650	Receiver		564316	CR30-1650	Receiver	
1800	561118	CT14-1800	Transmitter		561318	CT30-1800	Transmitter	
	564118	CR14-1800	Receiver		564318	CR30-1800	Receiver	
2100	561121	CT14-2100	Transmitter		561321	CT30-2100	Transmitter	
	564121	CR14-2100	Receiver		564321	CR30-2100	Receiver	

Test rod, 14/30 mm included in delivery.

Test rod, 14/30 mm included in delivery.

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Ordering information

COMPACT consisting of transmitter and receiver
 Included in scope of delivery: 4 sliding nuts, 2 bracket sets BT-S,
 1 connecting and operating instructions manual

Functions: Automatic start/restart, selectable transmission channels, selectable start/restart interlock ^{*)}, dynamic contactor monitoring ^{*)}, cascability, MultiScan

^{*)} Functions available from April 2007

Protective field height in mm	COMPACT Connection system: Cable gland Resolution: 50 mm Range: 0 - 18 m			COMPACT Connection system: Cable gland Resolution: 90 mm Range: 0 - 18 m		
	Art. no.	Article	Description	Art. no.	Article	Description
450	561504	CT50-450	Transmitter			
	564504	CR50-450	Receiver			
600	561506	CT50-600	Transmitter			
	564506	CR50-600	Receiver			
750	561507	CT50-750	Transmitter	561907	CT90-750	Transmitter
	564507	CR50-750	Receiver	564907	CR90-750	Receiver
900	561509	CT50-900	Transmitter	561909	CT90-900	Transmitter
	564509	CR50-900	Receiver	564909	CR90-900	Receiver
1050	561510	CT50-1050	Transmitter	561910	CT90-1050	Transmitter
	564510	CR50-1050	Receiver	564910	CR90-1050	Receiver
1200	561512	CT50-1200	Transmitter	561912	CT90-1200	Transmitter
	564512	CR50-1200	Receiver	564912	CR90-1200	Receiver
1350	561513	CT50-1350	Transmitter	561913	CT90-1350	Transmitter
	564513	CR50-1350	Receiver	564913	CR90-1350	Receiver
1500	561515	CT50-1500	Transmitter	561915	CT90-1500	Transmitter
	564515	CR50-1500	Receiver	564915	CR90-1500	Receiver
1650	561516	CT50-1650	Transmitter	561916	CT90-1650	Transmitter
	564516	CR50-1650	Receiver	564916	CR90-1650	Receiver
1800	561518	CT50-1800	Transmitter	561918	CT90-1800	Transmitter
	564518	CR50-1800	Receiver	564918	CR90-1800	Receiver
2100	561521	CT50-2100	Transmitter	561921	CT90-2100	Transmitter
	564521	CR50-2100	Receiver	564921	CR90-2100	Receiver
2400	561524	CT50-2400	Transmitter	561924	CT90-2400	Transmitter
	564524	CR50-2400	Receiver	564924	CR90-2400	Receiver
2700	561527	CT50-2700	Transmitter	561927	CT90-2700	Transmitter
	564527	CR50-2700	Receiver	564927	CR90-2700	Receiver
3000	561530	CT50-3000	Transmitter	561930	CT90-3000	Transmitter
	564530	CR50-3000	Receiver	564930	CR90-3000	Receiver

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SAFETY LIGHT CURTAINS

Ordering information

COMPACT consisting of transmitter and receiver
Included in scope of delivery: 4 sliding nuts, 2 bracket sets BT-S,
1 connecting and operating instructions manual

Functions: Automatic start/restart, selectable transmission channels, selectable start/restart interlock ^{*)}, dynamic contactor monitoring ^{*)}, cascadability, MultiScan

^{*)} Functions available from April 2007

Protective field height in mm	COMPACT Connection system: M12 plug Resolution: 14 mm Range: 0 - 6 m			COMPACT Connection system: M12 plug Resolution: 30 mm Range: 0 - 18 m		
	Art. no.	Article	Description	Art. no.	Article	Description
150	557601	CT14-150/M12	Transmitter	557701	CT30-150/M12	Transmitter
	567601	CR14-150/M12	Receiver	567701	CR30-150/M12	Receiver
225	557602	CT14-225/M12	Transmitter	557702	CT30-225/M12	Transmitter
	567602	CR14-225/M12	Receiver	567702	CR30-225/M12	Receiver
300	557603	CT14-300/M12	Transmitter	557703	CT30-300/M12	Transmitter
	567603	CR14-300/M12	Receiver	567703	CR30-300/M12	Receiver
450	557604	CT14-450/M12	Transmitter	557704	CT30-450/M12	Transmitter
	567604	CR14-450/M12	Receiver	567704	CR30-450/M12	Receiver
600	557606	CT14-600/M12	Transmitter	557706	CT30-600/M12	Transmitter
	567606	CR14-600/M12	Receiver	567706	CR30-600/M12	Receiver
750	557607	CT14-750/M12	Transmitter	557707	CT30-750/M12	Transmitter
	567607	CR14-750/M12	Receiver	567707	CR30-750/M12	Receiver
900	557609	CT14-900/M12	Transmitter	557709	CT30-900/M12	Transmitter
	567609	CR14-900/M12	Receiver	567709	CR30-900/M12	Receiver
1050	557610	CT14-1050/M12	Transmitter	557710	CT30-1050/M12	Transmitter
	567610	CR14-1050/M12	Receiver	567710	CR30-1050/M12	Receiver
1200	557612	CT14-1200/M12	Transmitter	557712	CT30-1200/M12	Transmitter
	567612	CR14-1200/M12	Receiver	567712	CR30-1200/M12	Receiver
1350	557613	CT14-1350/M12	Transmitter	557713	CT30-1350/M12	Transmitter
	567613	CR14-1350/M12	Receiver	567713	CR30-1350/M12	Receiver
1500	557615	CT14-1500/M12	Transmitter	557715	CT30-1500/M12	Transmitter
	567615	CR14-1500/M12	Receiver	567715	CR30-1500/M12	Receiver
1650	557616	CT14-1650/M12	Transmitter	557716	CT30-1650/M12	Transmitter
	567616	CR14-1650/M12	Receiver	567716	CR30-1650/M12	Receiver
1800	557618	CT14-1800/M12	Transmitter	557718	CT30-1800/M12	Transmitter
	567618	CR14-1800/M12	Receiver	567718	CR30-1800/M12	Receiver

Test rod, 14/30 mm included in delivery.

Test rod, 14/30 mm included in delivery.

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Ordering information

COMPACT consisting of transmitter and receiver
Included in scope of delivery: 4 sliding nuts, 2 bracket sets BT-S,
1 connecting and operating instructions manual

Functions: Automatic start/restart, selectable transmission channels, selectable start/restart interlock ^{*)}, dynamic contactor monitoring ^{*)}, cascability, MultiScan

^{*)} Functions available from April 2007

Protective field height in mm	COMPACT Connection system: M12 plug Resolution: 50 mm Range: 0 - 18 m			COMPACT Connection system: M12 plug Resolution: 90 mm Range: 0 - 18 m		
	Art. no.	Article	Description	Art. no.	Article	Description
450	557804	CT50-450/M12	Transmitter			
	567804	CR50-450/M12	Receiver			
600	557806	CT50-600/M12	Transmitter			
	567806	CR50-600/M12	Receiver			
750	557807	CT50-750/M12	Transmitter	557907	CT90-750/M12	Transmitter
	567807	CR50-750/M12	Receiver	567907	CR90-750/M12	Receiver
900	557809	CT50-900/M12	Transmitter	557909	CT90-900/M12	Transmitter
	567809	CR50-900/M12	Receiver	567909	CR90-900/M12	Receiver
1050	557810	CT50-1050/M12	Transmitter	557910	CT90-1050/M12	Transmitter
	567810	CR50-1050/M12	Receiver	567910	CR90-1050/M12	Receiver
1200	557812	CT50-1200/M12	Transmitter	557912	CT90-1200/M12	Transmitter
	567812	CR50-1200/M12	Receiver	567912	CR90-1200/M12	Receiver
1350	557813	CT50-1350/M12	Transmitter	557913	CT90-1350/M12	Transmitter
	567813	CR50-1350/M12	Receiver	567913	CR90-1350/M12	Receiver
1500	557815	CT50-1500/M12	Transmitter	557915	CT90-1500/M12	Transmitter
	567815	CR50-1500/M12	Receiver	567915	CR90-1500/M12	Receiver
1650	557816	CT50-1650/M12	Transmitter	557916	CT90-1650/M12	Transmitter
	567816	CR50-1650/M12	Receiver	567916	CR90-1650/M12	Receiver
1800	557818	CT50-1800/M12	Transmitter	557918	CT90-1800/M12	Transmitter
	567818	CR50-1800/M12	Receiver	567918	CR90-1800/M12	Receiver
2100	557821	CT50-2100/M12	Transmitter	557921	CT90-2100/M12	Transmitter
	567821	CR50-2100/M12	Receiver	567921	CR90-2100/M12	Receiver
2400	557824	CT50-2400/M12	Transmitter	557924	CT90-2400/M12	Transmitter
	567824	CR50-2400/M12	Receiver	567924	CR90-2400/M12	Receiver
2700	557827	CT50-2700/M12	Transmitter	557927	CT90-2700/M12	Transmitter
	567827	CR50-2700/M12	Receiver	567927	CR90-2700/M12	Receiver
3000	557830	CT50-3000/M12	Transmitter	557930	CT90-3000/M12	Transmitter
	567830	CR50-3000/M12	Receiver	567930	CR90-3000/M12	Receiver

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SAFETY LIGHT CURTAINS

COMPACT – Model varieties

Art. no.	Article	Description	Connection system
55 ...	Carr-hhhh/ G	Model: Plug incl. straight cable socket	Hirschmann plug, 7-pin
57 ...	Carr-hhhh/ W	Model: Plug incl. angled cable socket	Hirschmann plug, 7-pin
56 ...	Carr-hhhh/ GW	Model: Plug without cable socket	Hirschmann plug, 7-pin
58 ...	CTrr-hhhh/ BH	Transmitter	MIN-style plug 5-pin
58 ...	CRrr-hhhh/ BH	Receiver	MIN-style plug 7-pin
58.....(+8000)	CTrr-hhhh/ BH3	Transmitter	MIN-style plug 3-pin
58.....(+5030)	CRrr-hhhh/ BH5	Receiver	MIN-style plug 5-pin
58..... (+50)	CTrr-hhhh/ A	Transmitter with AS-i Safety connection	Integrated AS-i inter face
58..... (+50)	CRrr-hhhh/ A	Receiver with AS-i Safety interface	Integrated AS-interface
5.....(+1000)	Carr-hhhh/ M/t	Model as host	
56.....(+2000)	Carr-hhhh/ S	Model as guest (also for COMPACT <i>plus</i> series)	

Delivery time for devices with MIN-style plug: approx. 6 weeks

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Article info for COMPACT

Type 4 Safety Light Curtains

Article	Description
C	COMPACT
a	Device type
T	Transmitter
R	Receiver
rr	Resolution/range
14	14 mm; range 0.3 - 6 m
30	30 mm; range 0.8 - 18 m
50	50 mm; range 0.8 - 18 m
90	90 mm; range 0.8 - 18 m
hhh	Protective field height
150...2100	150...2100 mm, for 14 mm resolution
150...3000	150...3000 mm, for 30 mm resolution
450...3000	450...3000 mm, for 50 mm resolution
750...3000	750...3000 mm, for 90 mm resolution
t	Connection system
G	Plug with straight cable socket (Hirschmann, DIN 43651)
W	Plug with angled cable socket (Hirschmann, DIN 43651)
GW	Plug without cable socket (Hirschmann, DIN 43651)
BH	MIN-style plug (transmitter, 5-pin; receiver 7-pin)
BH3	Transmitter with MIN-style (BH) plug, 3-pin (MIN Series)
BH5	Receiver with MIN-style (BH) plug, 5-pin (MIN Series)
M12	M12 plug
A	Integrated AS-interface
C a rr -hhh /t	
C a rr -hhh M/t	M For host
C a rr -hhh S	S For guest

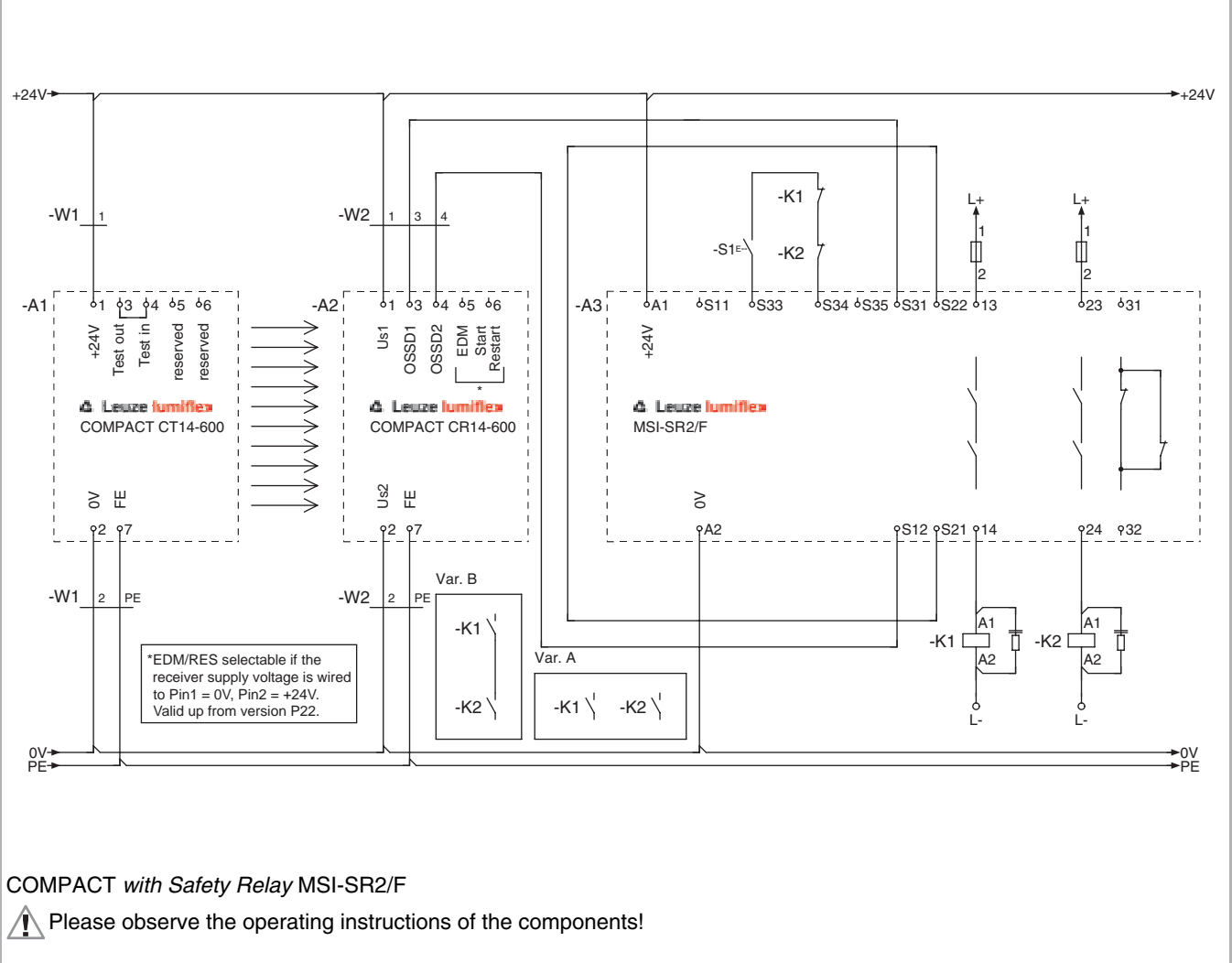




SAFETY LIGHT CURTAINS

Electrical connection

COMPACT connection example



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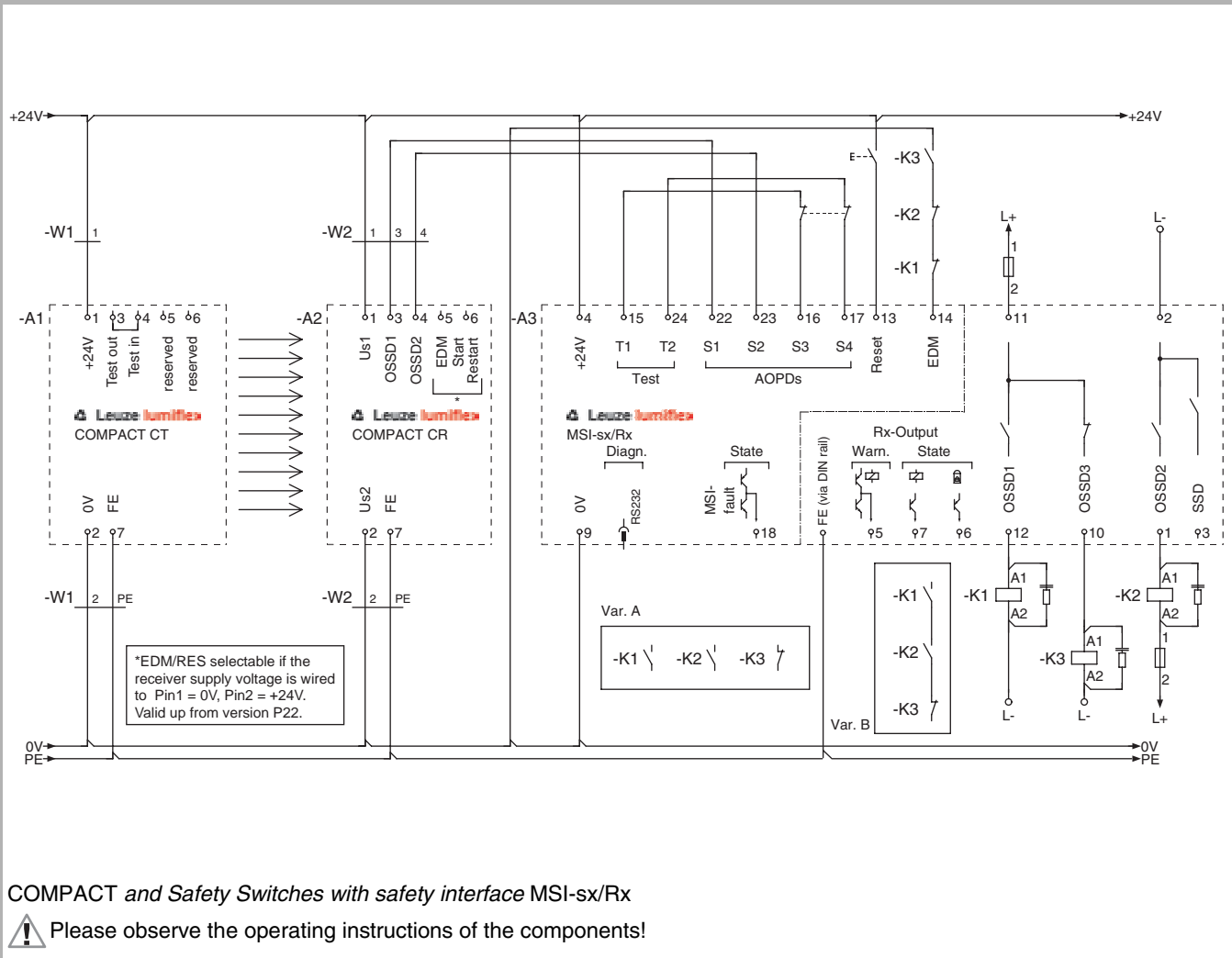
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Electrical connection

COMPACT connection example *



*) For further connection examples see chapter, AS-interface Safety at Work, page 327



Machine Safety

Machine Safety Services

Safety Engineering Software

Safety Laser Scanners

Safety Light Curtains

Multiple Light Beam Safety Devices

Single Light Beam Safety Devices

AS-interface Safety at Work

PROFIsafe Sensors

Safety Switches and Safety Locking Devices



SAFETY LIGHT CURTAINS

Technical data

General system data				
Safety type in accordance with IEC/EN 61496	Type 4			
Resolution	14 mm	30 mm	50 mm	90 mm
Range	0...6 m	0...18 m	0...18 m	0...18 m
SingleScan response time (length-dependent)	7...39 ms	7...20 ms	7...17 ms	6...13 ms
Protective field height	150...2100 mm	150...2100 mm	450...3000 mm	750...3000 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...+55 °C			
Ambient temperature, storage	-25...+70 °C			
Relative humidity	15...95 %			
Profile cross-section	52 mm x 55 mm			
Weight per device (length-dependent)	1.20...8.3 kg			
Transmitter				
Transmitter diodes, class in accordance with EN 60825	1			
Wavelength	880 nm			
Current consumption	75 mA			
Connection system	Cable gland (PG13.5), plug-in connection space Hirschmann plug (DIN 43651), 7-pin MIN-style plug (MIN Series), 5/3-pin M12 plug, 5-pin M12 plug (AS-i Safety), 3-pin			
Receiver				
Current consumption	100 mA without external load			
Safety-related switching outputs (OSSD)	2 npn transistor outputs (short circuit-proof, cross-circuit monitored) AS-i Safety interface			
Switching voltage high active	Min. U _v -2.2 V			
Switching voltage low	Max. 2.8 V			
Switching current	Typical, 250 mA			
Connection system	Cable gland (PG13.5), plug-in connection space Hirschmann plug (DIN 43651), 7-pin MIN-style plug (MIN Series), 7/5-pin M12 plug, 8-pin M12 plug (AS-i Safety), 3-pin			

You will find additional information in the COMPACT connecting and operating instructions at www.leuze.com/compact.

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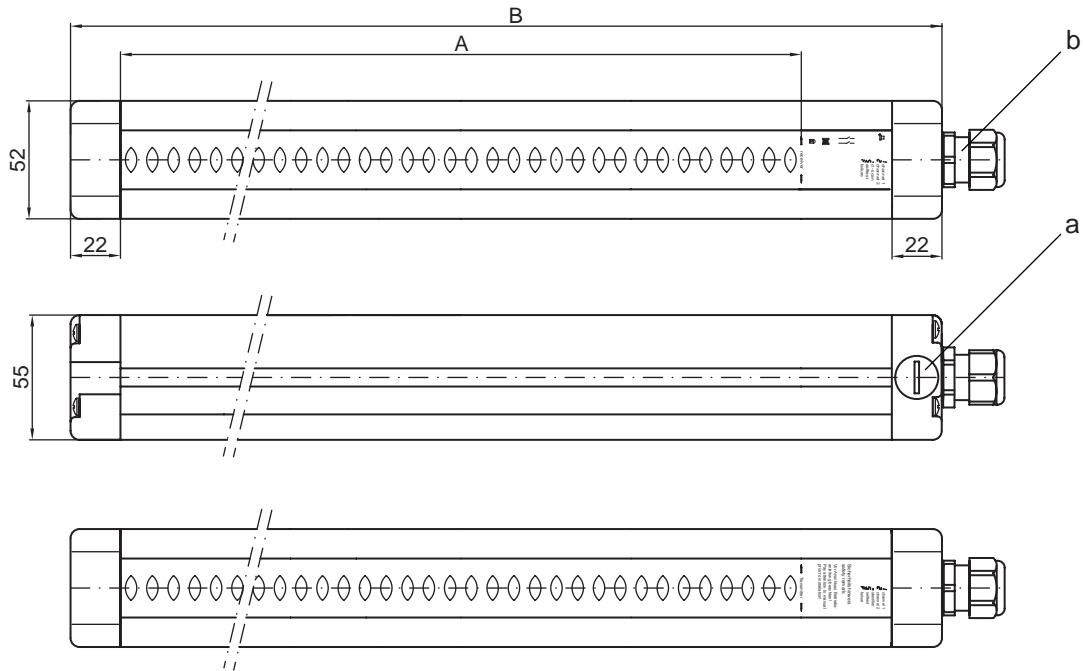
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Dimensional drawings

Standard model, C14, C30, C50, C90 series



A = Protective field height according to ordering information a = PG9, both sides
 B = A + 84 mm b = PG13.5

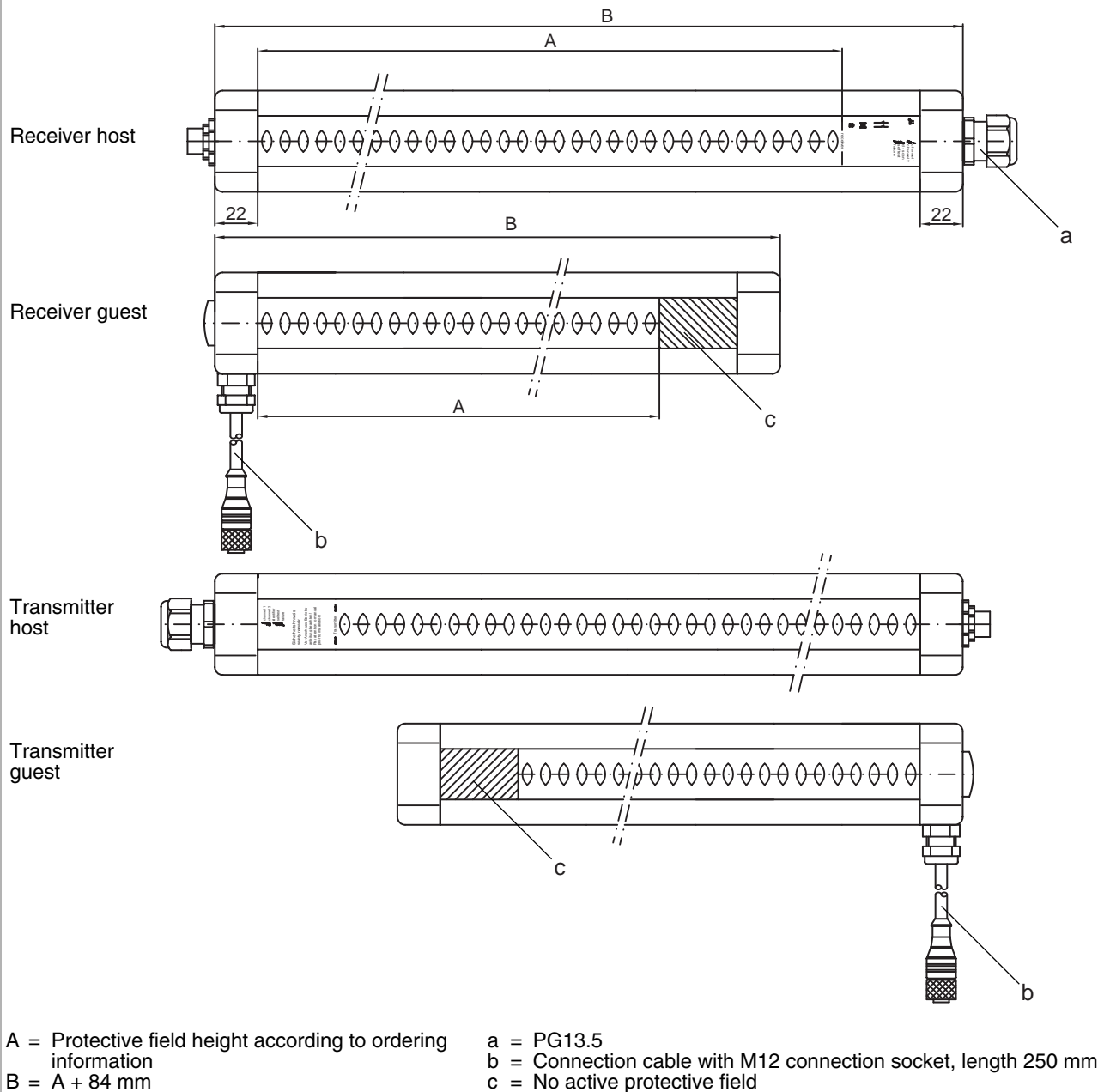




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Dimensional drawings

Model as host-guest cascade



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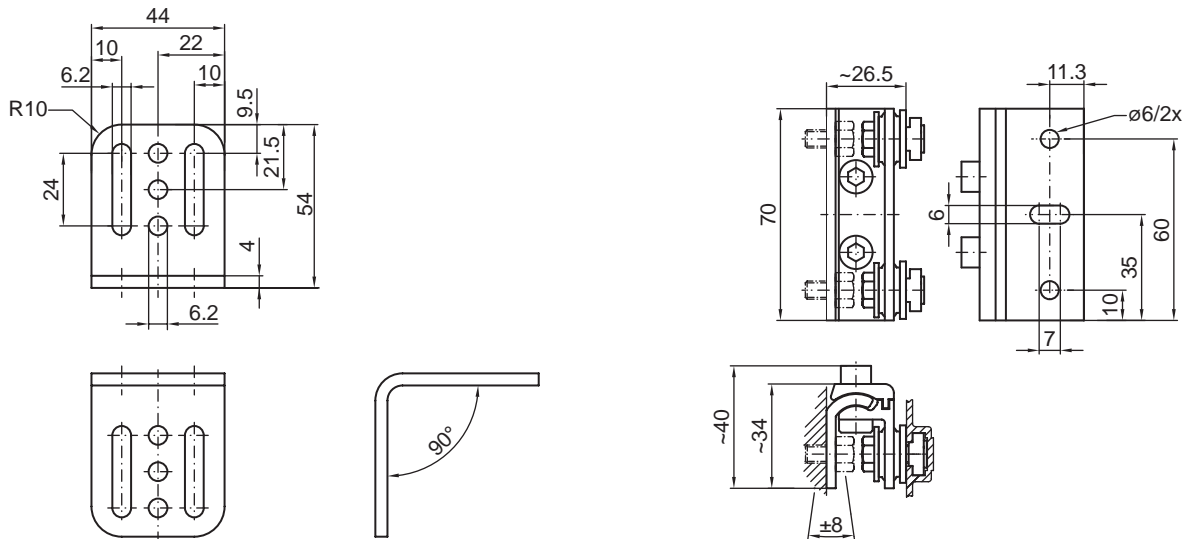
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Accessories dimensional drawings

Brackets



L-mounting bracket

Mounting bracket, swiveling with shock absorber, BT-SSD

Dimensions in mm

Accessories ordering information

Art. no.	Article	Description	Length, design
Mounting accessories			
560300	BT-SSD	Mounting bracket, swiveling with shock absorber incl. 2 screws and 2 sliding nuts	
560120	BT-S	Mounting set consisting of 2 L-type brackets incl. 2 screws	
425720	BT-NC	Sliding nut	
Laser alignment aids			
560020	LA-78U	Laser alignment aid for lateral mounting with use for COMPACT/COMPACT <i>plus</i> /ROBUST/ECO/SOLID	
520004	LA-78UDC	Laser alignment aid with ROBUST/COMPACT/COMPACT <i>plus</i> use with UDC-mounting column	
Connection system			
426040	AC-LDH-T7/GF	Hirschmann cable socket, encoded for CT, 7-pin, incl. crimp contacts	Straight
426041	AC-LDH-R7/GF	Hirschmann cable socket, encoded for CR, 7-pin, incl. crimp contacts	Straight
426050	AC-LDH-T7/WF	Hirschmann cable socket, encoded for CT, 7-pin, incl. crimp contacts	Angled
426051	AC-LDH-R7/WF	Hirschmann cable socket, encoded for CR, 7-pin, incl. crimp contacts	Angled

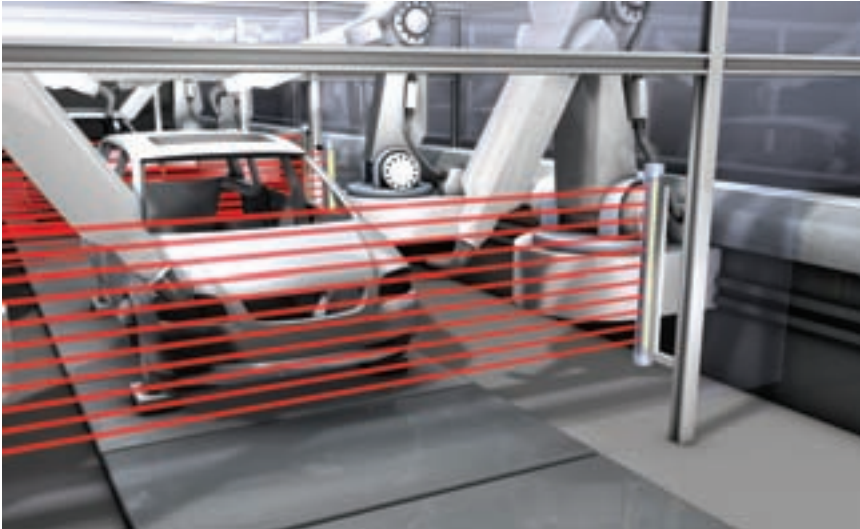
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SAFETY LIGHT CURTAINS

COMPACT EX1



Painting line with COMPACT EX1 Safety Light Curtain in the automotive industry

Typical areas of application

Can be used in zone 1 or 2 (gases) and zone 21 or 22 (flammable dusts)

- Re-filling systems for powdered substances
- Painting lines, e.g. in the automotive industry
- Chemical processes

Devices and protective systems must meet special requirements with usage in explosion-risk areas. Built into pressure-resistant glass cylinders of the Ex protection type "d" under the name COMPACT EX1, various models of the COMPACT Safety Light Curtains are available, tailor-made for these types of applications, i.e. for use up to Ex zone 1 (gases) and Ex zone 21 (flammable dusts) – with the typical benefits of the COMPACT series with regard to higher interference immunity and availability. In addition to the requirements of machine safety, COMPACT EX1 also satisfies the provisions of ATEX Directive 94/9/EC. The glass cylinder housed in the COMPACT Safety Light Curtain is firmly closed with a lid. Robust cable bushings in the lid safely enclose the cables suitable for explosion-risk areas, which are to be provided by the customer. COMPACT EX1 can be used in industrial applications, however it cannot be used in pits. The device complies as an electrical piece of apparatus of Ex device group II, Ex category 2.

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COMPACT EX1

Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 4	
Resolution	14 mm	30 mm
Range	0.3...6 m	0.8...18 m
SingleScan response time	17...33 ms	9...17 ms
Protective field height	750, 1050, 1500 mm	750, 1050, 1500 mm
Protective housing diameter	Approx. 150 mm	
Safety-related switching outputs (OSSD)	2 pnp transistor outputs	
Connection system	Cable gland	
Ex device group	II	
Ex device category	2	
Temperature class, gases	T6	
Permissible ignition temperature	T > 85 °C	
Ignition protection type	"d" pressure-encapsulated	
Transmitter		
Wavelength	880 nm	

You will find additional information in the COMPACT connecting and operating instructions and supplementary COMPACT EX1 instructions at www.leuze.com/compact-ex1.

Functions

See chapter COMPACT, page 127, however without internal EDM / RES

Functional extensions

See chapter COMPACT, page 127, however without internal EDM / RES

Special features

- **Type 4, suitable for safety category 4**
- **Complies with ATEX Directive 94/9/EC**
- **Fault-free operation of adjacent devices with selection of different transmission channels**
- **Maintenance-free with safety transistor outputs (OSSDs)**
- **Ignition protection type "d" pressure-encapsulated**
- **Temperature class, T6**

COMPACT EX1 specification plate with info as electrical equipment:

- (Ex)II 2 G - EEx II d B T6 (gases)
- (Ex)II 2 D 85 °C (flammable dusts)

For explanations, see www.leuze.com/atex.



Properties



Further information

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www.leuze.com/compact-ex1/





SAFETY LIGHT CURTAINS

Ordering information

COMPACT EX1, consisting of transmitter and receiver included in delivery: 2 mounting sets for the protective columns, 1 COMPACT connecting and operating instructions manual, a supplementary COMPACT EX1 connecting and operating instructions manual

Functions: Automatic start/restart, selectable transmission channels, MultiScan

Protective field height in mm	COMPACT EX1			COMPACT EX1		
	Art. no.	Article	Description	Art. no.	Article	Description
750	Resolution: 14 mm					
	Range: 0.3 - 6 m					
750	569140	CT14-750-EX1	Transmitter	569144	CT30-750-EX1	Transmitter
	569141	CR14-750-EX1	Receiver	569145	CR30-750-EX1	Receiver
1050	569142	CT14-1050-EX1	Transmitter	569146	CT30-1050-EX1	Transmitter
	569143	CR14-1050-EX1	Receiver	569147	CR30-1050-EX1	Receiver
1500	569070	CT14-1500-EX1	Transmitter	569072	CT30-1500-EX1	Transmitter
	569071	CR14-1500-EX1	Receiver	569073	CR30-1500-EX1	Receiver

Delivery time for EX1 devices, approx. 6 weeks

Test rod, 14/30 mm included in delivery

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COMPACT EX1

Electrical connection

COMPACT EX1 connection example

See chapter, COMPACT, page 134

 With explosion-risk applications the MSI Safety Relay or MSI safety interfaces must be installed outside the explosion-risk zone. The connection cables to be provided by the customer must comply with the local explosion applicable provisions and must have an external diameter of 5 mm to 15 mm. They must be laid in such a way that possible damages are prevented. The user standards EN 60679-14 (for gases) or EN 50281-1-2 (for dusts) must be observed.

Technical data

See chapter, COMPACT, page 136

www.leuze.com/compact-ex1/

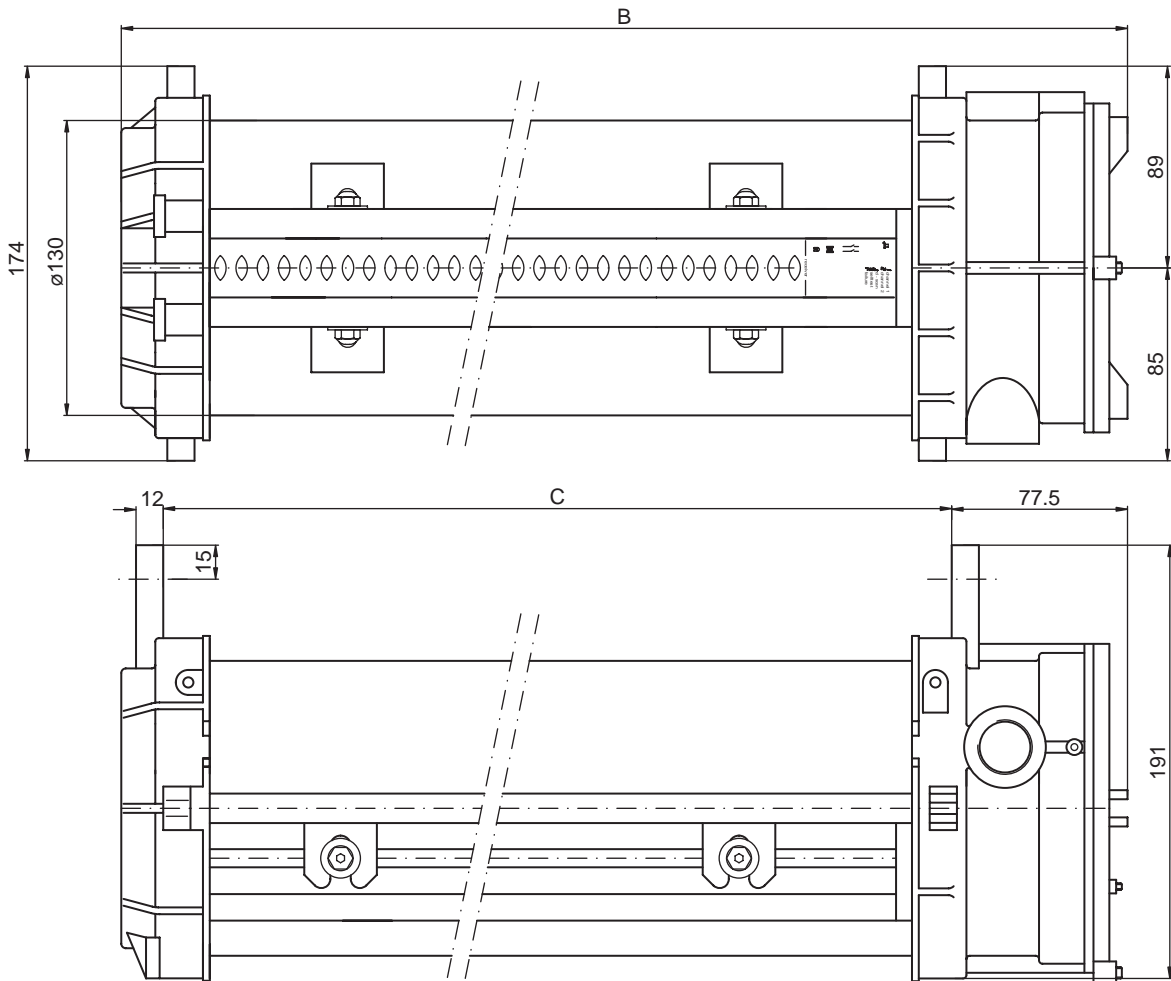




SAFETY LIGHT CURTAINS

Dimensional drawings

COMPACT EX1 Safety Light Curtain



Dimensions table for Ex1 housing

Protective field height	B	C
750	1365	1260
1050 and 1500	1655	1560

Dimensions in mm

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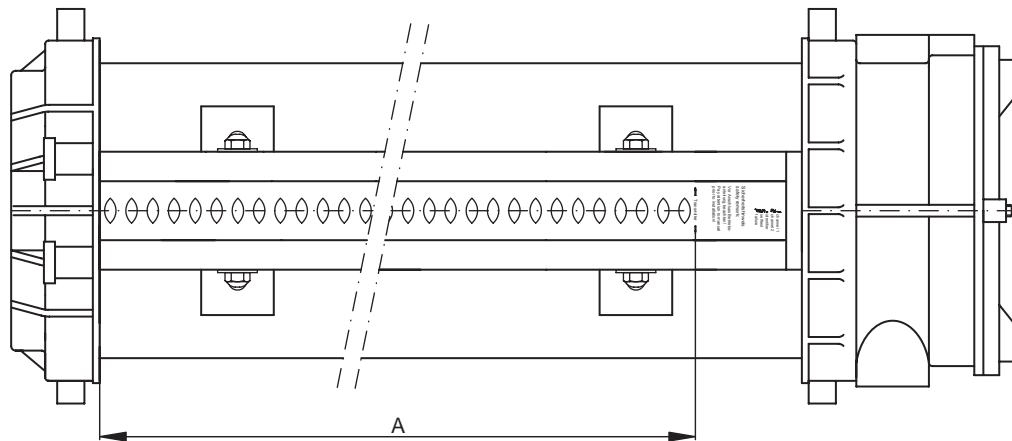
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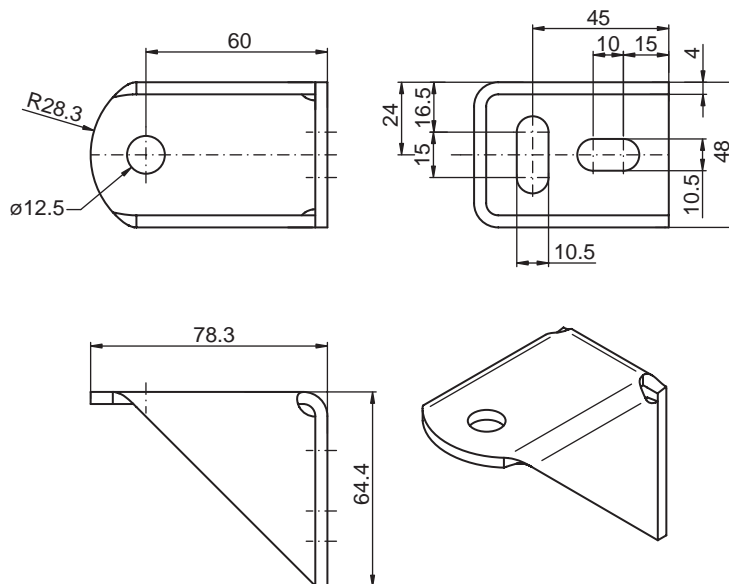
Dimensional drawings

COMPACT EX1 Safety Light Curtain



A = Protective field height according to ordering information

Accessories dimensional drawings



Mounting bracket for protective column

Dimensions in mm

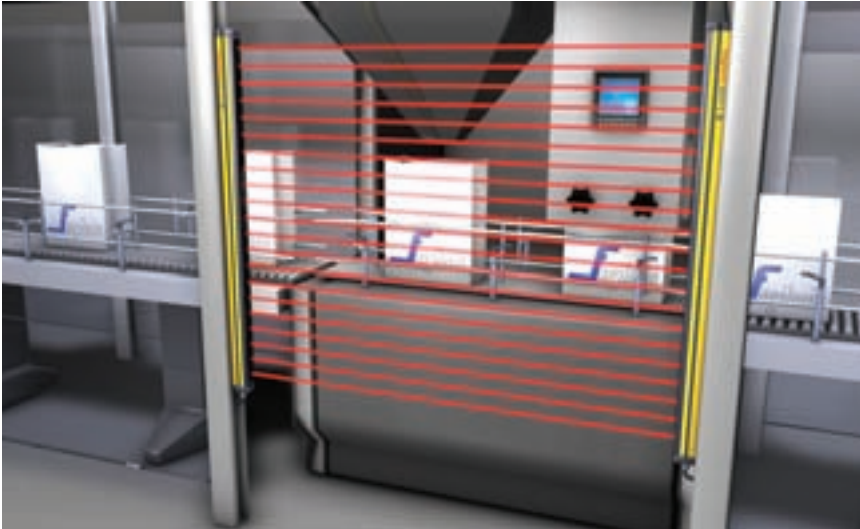
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SAFETY LIGHT CURTAINS

COMPACT EX2



COMPACT EX2 Safety Light Curtain on a re-filling system

Typical areas of application

Can be used in zone 2 (gases) and zone 22 (flammable, non-conductive dusts)

- Re-filling systems for powdered substances
- Painting lines, e.g. in the automotive industry
- Chemical processes

Devices and protective systems must meet special requirements with usage in explosion-risk areas. COMPACT EX2 with the "non-sparking" ignition protection type and special precautions on the transmitter and receiver housing is available in different models for these types of applications, i.e. for use in Ex zone 2 (gases) and in Ex zone 22 (flammable, non-conductive dusts) – with the typical advantages of the COMPACT series with regard to interference immunity and availability. In addition to the requirements of machine safety, COMPACT EX2 also satisfies the provisions of ATEX Directive 94/9/EC. Reinforced connecting front screens ensure that the housing remains sealed with mechanical influences, e.g. an impact or blow of some kind. Metal bushings enclose the cables suitable for explosion-risk areas, which are to be provided by the customer. COMPACT EX2 can be used in industrial applications, however it cannot be used in pits. The device complies as an electrical apparatus of Ex device group II, Ex category 3.

COMPACT EX2

Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 4	
Resolution	14 mm	30 mm
Range	0.3...6 m	0.8...18 m
SingleScan response time	17...33 ms	9...17 ms
Protective field height	750, 1050, 1500 mm	750, 1050, 1500 mm
Profile cross-section	52 mm x 55 mm	
Safety-related switching outputs (OSSD)	2 pnp transistor outputs	
Connection system	Cable gland	
Ex device group	II	
Ex device category	3	
Temperature class, gases	T4	
Permissible ignition temperature	T > 135 °C	
Ignition protection type	"nA" non-sparking	
Transmitter		
Wavelength	880 nm	

You will find additional information in the COMPACT connecting and operating instructions and supplementary COMPACT EX2 instructions at www.leuze.com/compact-ex2.

Functions

See chapter COMPACT, page 127, however without internal EDM / RES

Functional extensions

See chapter COMPACT, page 127, however without internal EDM / RES

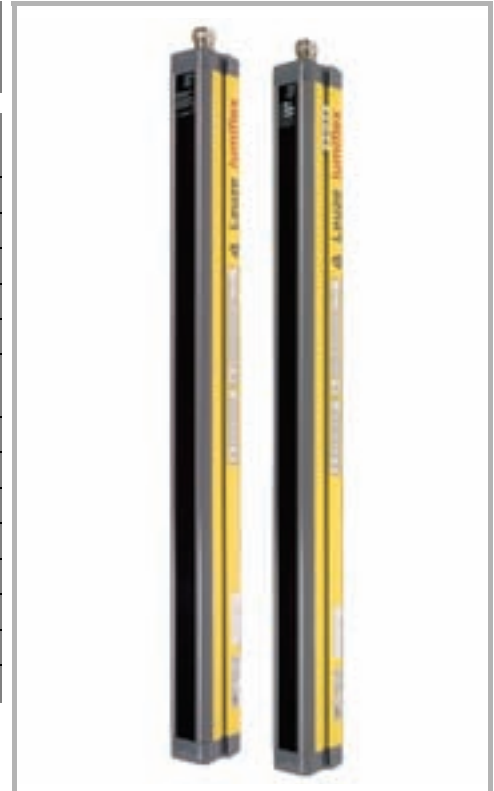
Special features

- **Type 4, suitable for safety category 4**
- **Complies with ATEX Directive 94/9/EC**
- **Fault-free operation of adjacent devices with selection of different transmission channels**
- **Maintenance-free with safety transistor outputs (OSSDs)**
- **Ignition protection type, "nA" non-sparking**
- **Temperature class, T4**

COMPACT EX2 specification plate with info as electrical equipment:

- Ex II 3 G - EEx II nA T4 (gases)
- Ex II 3 D 135 °C (flammable, non-conductive dusts)

For explanations, see www.leuze.com/atex.



Properties



Further information

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SAFETY LIGHT CURTAINS

Ordering information

COMPACT EX2, consisting of transmitter and receiver included in delivery: 4 sliding nuts, 2 bracket set BT-S, 1 COMPACT connecting and operating instructions manual and 1 supplementary COMPACT EX2 connecting and operating instructions manual

Functions: Automatic start/restart, selectable transmission channels, MultiScan

Protective field height in mm	COMPACT EX2			COMPACT EX2		
	Art. no.	Article	Description	Art. no.	Article	Description
750	Resolution: 14 mm					
	Range: 0.3 - 6 m					
750	569130	CT14-750-EX2	Transmitter	569134	CT30-750-EX2	Transmitter
	569131	CR14-750-EX2	Receiver	569135	CR30-750-EX2	Receiver
1050	569132	CT14-1050-EX2	Transmitter	569136	CT30-1050-EX2	Transmitter
	569133	CR14-1050-EX2	Receiver	569137	CR30-1050-EX2	Receiver
1500	569074	CT14-1500-EX2	Transmitter	569076	CT30-1500-EX2	Transmitter
	569075	CR14-1500-EX2	Receiver	569077	CR30-1500-EX2	Receiver

Delivery time for EX2 devices, approx. 3 weeks

Test rod, 14/30 mm included in delivery

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COMPACT EX2

Electrical connection

COMPACT EX2 connection example

See chapter, COMPACT, page 135

! With explosion-risk applications the MSI Safety Relay or MSI safety interfaces must be installed outside the explosion-risk zone. The connection cables to be provided by the customer must comply with the local explosion applicable provisions and must have an external diameter of 8 mm to 11 mm. They must be laid in such a way that possible damages are prevented. The user standards EN 60679-14 (for gases) or EN 50281-1-2 (for dusts) must be observed.

Technical data

See chapter, COMPACT, page 136

Dimensional drawings

See chapter, COMPACT, page 137

! Host-guest combinations are not possible with the COMPACT EX2 model.

Accessories dimensional drawings

See chapter, COMPACT, page 139

! A laser alignment aid may only be used if explosion-risk conditions are not prevalent.

Accessories ordering information

See chapter, COMPACT, page 139

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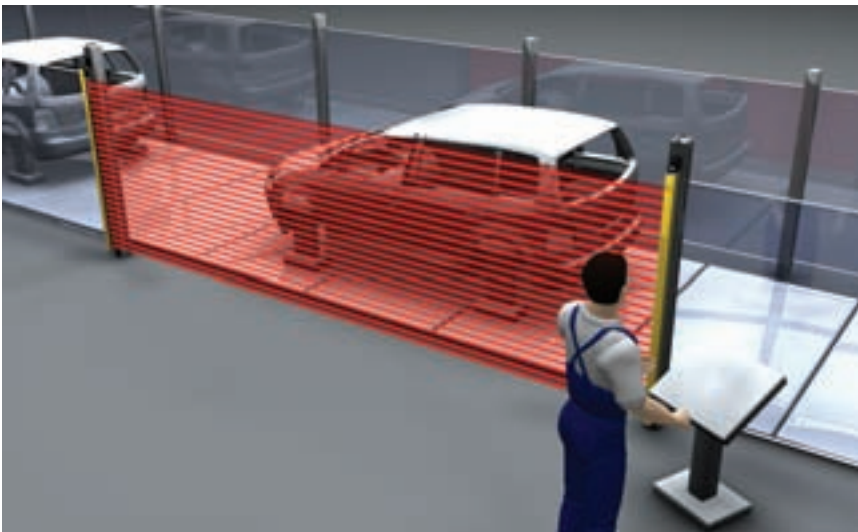


SAFETY LIGHT CURTAINS

SOLID-4E



SOLID-4E with 20 mm resolution 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 area and access guarding, the type 4 Safety Light Curtains of the SOLID-4E 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. Versions in resolutions of 14, 20, 30, 40, 90 mm, which guarantee short mounting times due to their slender designs and versatile fixing options, ensure flexible, 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

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Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 4				
Resolution	14 mm *	20 mm	30 mm	40 mm	90 mm
Range	0.3...5 m	0.5...14 m	0.5...9 m	0.9...20 m	0.9...20 m
Protective field height (type-dependent)	150...1800 mm				
Profile cross-section	30 mm x 34 mm				
Safety Switching outputs (OSSDs)	2 pnp transistor outputs				
Connection system	M12 plug				

* Expected availability from April 2007

Functions

Automatic start/restart

Start/restart function (RES), selectable

Dynamic contactor monitoring (EDM), selectable

2 transmission channels, selectable

LED-display

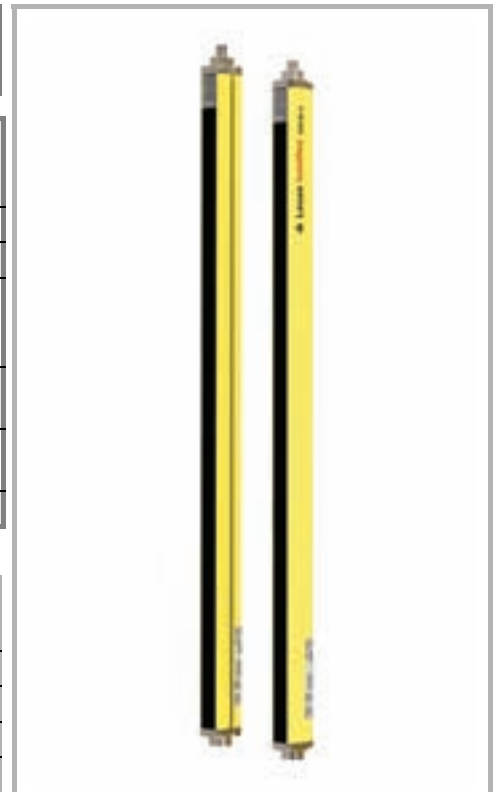
7-segment display

Functional extensions

With safety interface	Relay output	Muting	Cycle control	Further details
MSI-RM2	●			P. 396
MSI-m	●	●		P. 432
MSI-i	●		●	P. 426
MSI-mi	●	●	●	P. 444

Special features

- Type 4 self-monitoring Safety Light Curtain in accordance with IEC/EN 61496
- 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)



Properties



Further information

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SAFETY LIGHT CURTAINS

Ordering information

SOLID-4E, consisting of transmitter and receiver included in delivery: 2 bracket sets BT-360-SET, 1 connecting and operating instructions manual

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: 14 mm Range: 0.3 - 5 m			Resolution: 20 mm Range: 0.7 - 14 m		
150	67843501 67843401	SD4T14-150 SD4R14-150E	Transmitter Receiver	67841701 67840401	SD4T20-150 SD4R20-150E	Transmitter Receiver
225				67841702 67840402	SD4T20-225 SD4R20-225E	Transmitter Receiver
300	67843503 67843403	SD4T14-300 SD4R14-300E	Transmitter Receiver	67841703 67840403	SD4T20-300 SD4R20-300E	Transmitter Receiver
450	67843504 67843404	SD4T14-450 SD4R14-450E	Transmitter Receiver	67841704 67840404	SD4T20-450 SD4R20-450E	Transmitter Receiver
600	67843506 67843406	SD4T14-600 SD4R14-600E	Transmitter Receiver	67841706 67840406	SD4T20-600 SD4R20-600E	Transmitter Receiver
750	67843507 67843407	SD4T14-750 SD4R14-750E	Transmitter Receiver	67841707 67840407	SD4T20-750 SD4R20-750E	Transmitter Receiver
900	67843509 67843409	SD4T14-900 SD4R14-900E	Transmitter Receiver	67841709 67840409	SD4T20-900 SD4R20-900E	Transmitter Receiver
1050	67843510 67843410	SD4T14-1050 SD4R14-1050E	Transmitter Receiver	67841710 67840410	SD4T20-1050 SD4R20-1050E	Transmitter Receiver
1200	67843512 67843412	SD4T14-1200 SD4R14-1200E	Transmitter Receiver	67841712 67840412	SD4T20-1200 SD4R20-1200E	Transmitter Receiver
1350	67843513 67843413	SD4T14-1500 SD4R14-1350E	Transmitter Receiver	67841713 67840413	SD4T20-1350 SD4R20-1350E	Transmitter Receiver
1500	67843515 67843415	SD4T14-1500 SD4R14-1500E	Transmitter Receiver	67841715 67840415	SD4T20-1500 SD4R20-1500E	Transmitter Receiver
1650	67843516 67843416	SD4T14-1650 SD4R14-1650E	Transmitter Receiver	67841716 67840416	SD4T20-1650 SD4R20-1650E	Transmitter Receiver
1800	67843518 67843418	SD4T14-1800 SD4R14-1800E	Transmitter Receiver	67841718 67840418	SD4T20-1800 SD4R20-1800E	Transmitter Receiver

Test rod included in scope of delivery

Test rod included in scope of delivery

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Ordering information

SOLID-4E, consisting of transmitter and receiver included in delivery: 2 bracket sets BT-360-SET, 1 connecting and operating instructions manual

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

www.leuze.com/solid-4/





SAFETY LIGHT CURTAINS

Ordering information

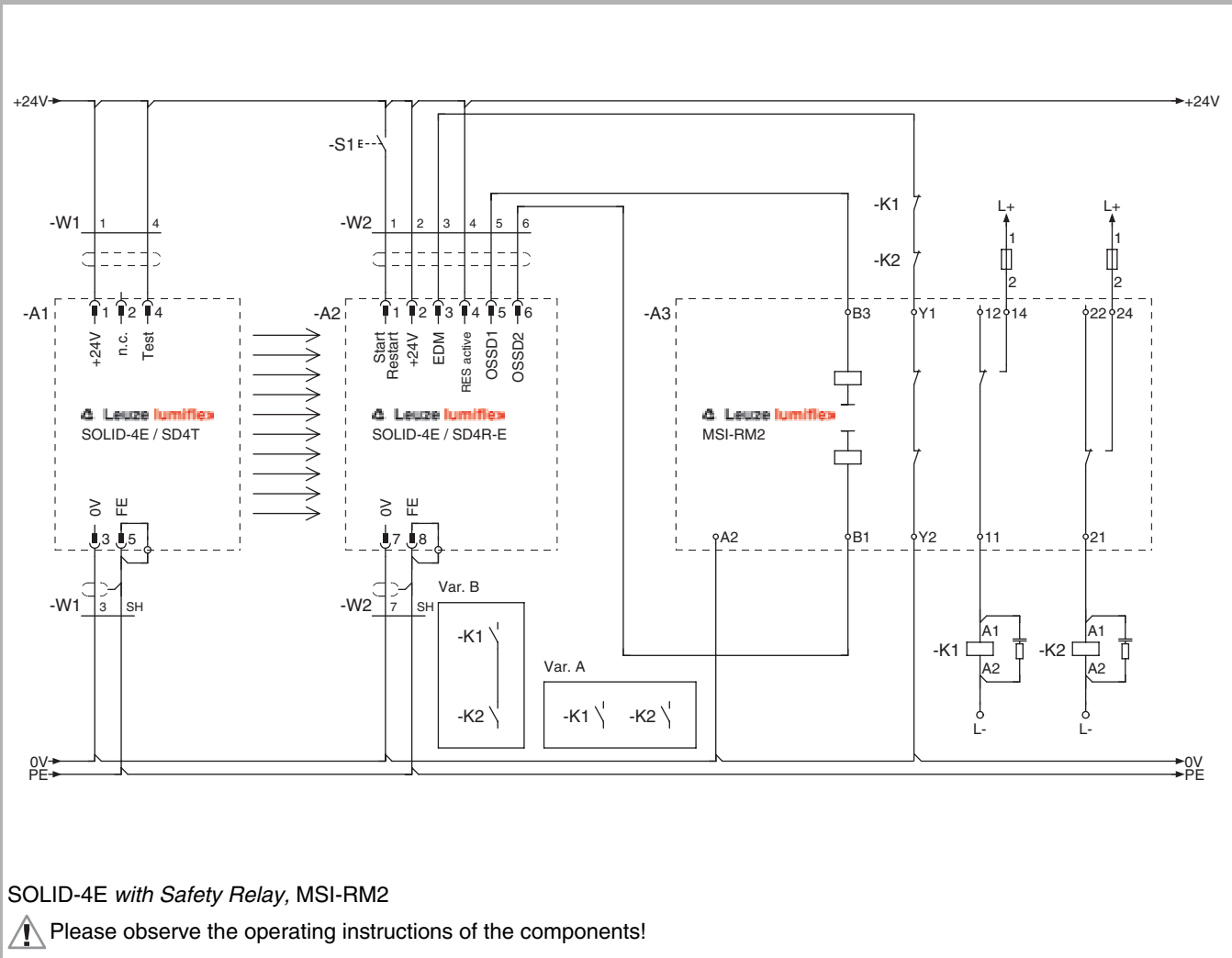
SOLID-4E, consisting of transmitter and receiver included in delivery: 2 bracket sets BT-360-SET, 1 connecting and operating instructions manual

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
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

Electrical connection

SOLID-4E connection example



SOLID-4E with Safety Relay, MSI-RM2

⚠ Please observe the operating instructions of the components!





SAFETY LIGHT CURTAINS

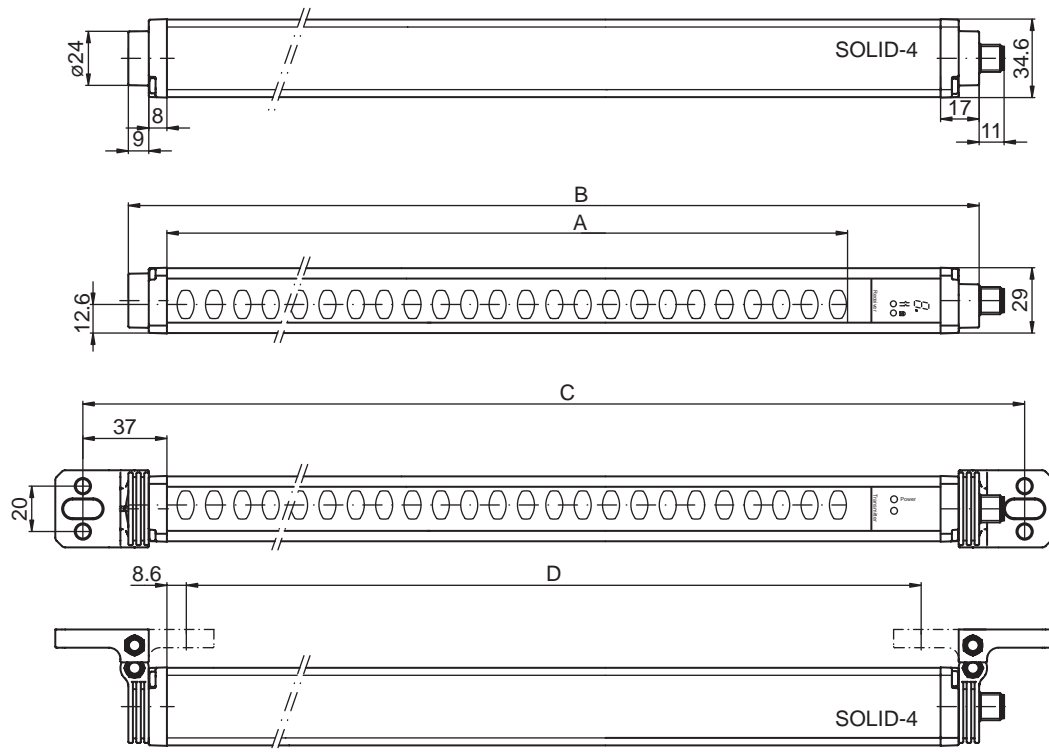
Technical data

General system data					
Safety type in accordance with IEC/EN 61496	Type 4				
Resolution	14 mm	20 mm	30 mm	40 mm	90 mm
Range	0.3...5 m	0.7...14 m	0.5...9 m	0.9...20 m	0.9...20 m
Response time (depends on protective field height)	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, $\pm 20\%$				
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 (OSSD)	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				
Cable length	Max. 100 m with 0.25 mm ²				
Connection system	M12 plug, 8-pin				

You will find additional information in the SOLID-4E connecting and operating instructions at www.leuze.com/solid-4.

Dimensional drawings

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

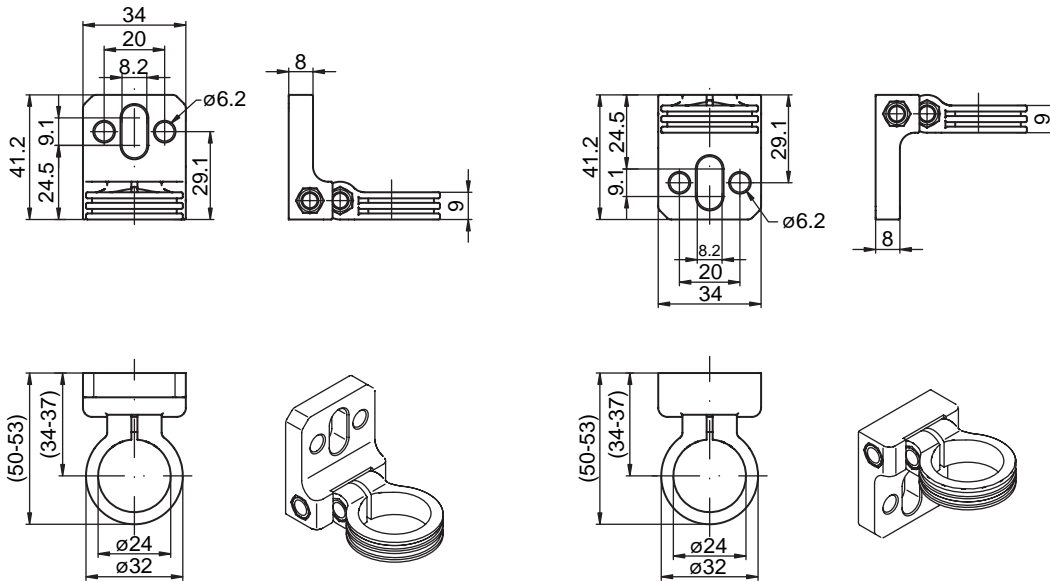




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Accessories dimensional drawings

Brackets



Bracket, 360° rotation, BT-360

Dimensions in mm

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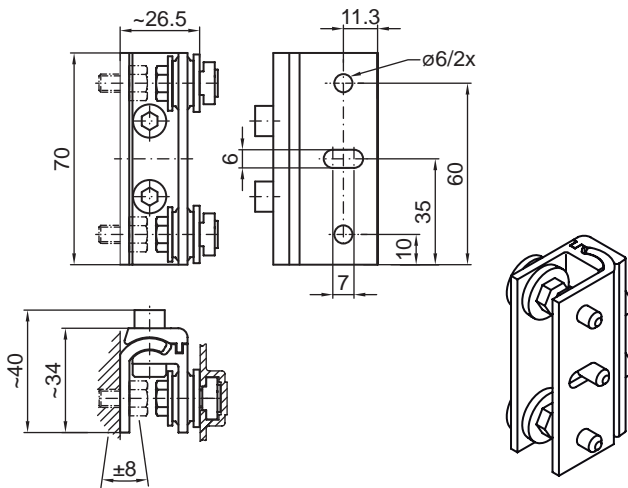
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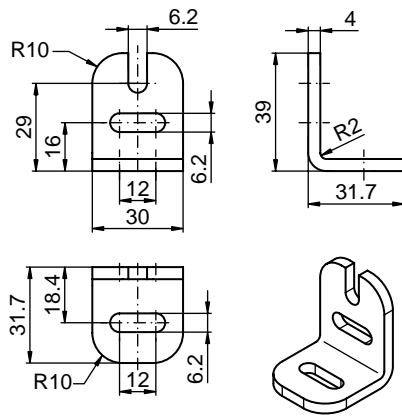
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Accessories dimensional drawings

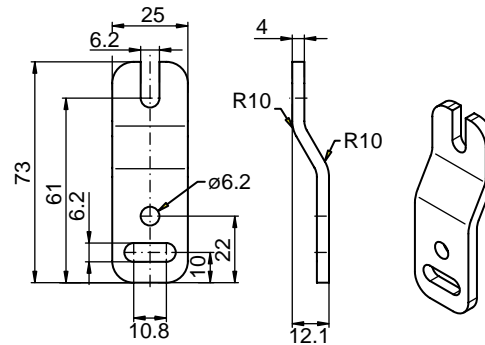
Brackets



Mounting bracket, swiveling with shock absorber, BT-SSD



L-mounting bracket, BT-L



Z-mounting bracket, BT-Z

Dimensions in mm

www.leuze.com/solid-4/





SAFETY LIGHT CURTAINS

Accessories ordering information

Art. no.	Article	Description	Length, design
Mounting accessories			
429050	BT-360	Bracket, 360° rotation	
429051	BT-L	L-mounting bracket	
429052	BT-Z	Z-mounting bracket	
429055	BT-360-SET	Mounting bracket set, consisting of 2 BT-360°	
429056	BT-L-mounting set	Mounting bracket set, consisting of 2 BT-L	
429057	BT-Z-mounting set	Mounting bracket set, consisting of 2 BT-Z	
560300	BT-SSD	Mounting bracket, swiveling with shock absorber incl. 2 screws and 2 sliding nuts	
Connection cable, 5-pin for SOLID-4 Transmitter			
429071	CB-M12-5000S-5GF	Connection cable shielded with M12 coupling, 5-pin	5 m, straight/open end
429072	CB-M12-5000S-5WF	Connection cable shielded with M12 coupling, 5-pin	5 m, angled/open end
429073	CB-M12-10000S-5GF	Connection cable shielded with M12 coupling, 5-pin	10 m, straight/open end
429074	CB-M12-10000S-5WF	Connection cable shielded with M12 coupling, 5-pin	10 m, angled/open end
429075	CB-M12-15000S-5GF	Connection cable shielded with M12 coupling, 5-pin	15 m, straight/open end
429076	CB-M12-15000S-5WF	Connection cable shielded with M12 coupling, 5-pin	15 m, angled/open end

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Accessories ordering information

Art. no.	Article	Description	Length, design
Connection cable, 8-pin for SOLID-4E Receiver			
429081	CB-M12-5000S-8GF	Connection cable shielded with M12 coupling, 8-pin	5 m, straight/open end
429082	CB-M12-5000S-8WF	Connection cable shielded with M12 coupling, 8-pin	5 m, angled/open end
429083	CB-M12-10000S-8GF	Connection cable shielded with M12 coupling, 8-pin	10 m, straight/open end
429084	CB-M12-10000S-8WF	Connection cable shielded with M12 coupling, 8-pin	10 m, angled/open end
429085	CB-M12-15000S-8GF	Connection cable shielded with M12 coupling, 8-pin	15 m, straight/open end
429086	CB-M12-15000S-8WF	Connection cable shielded with M12 coupling, 8-pin	15 m, angled/open end
Laser alignment aids			
560020	LA-78U	Laser alignment aid for lateral mounting with use for COMPACT/COMPACT <i>plus</i> /ROBUST/ECO/SOLID	
Power supplies			
520060	SITOP power	Power supply, 120/230 V AC --> 24 V DC / 5 A, regulated	
520061	LOGO! Power	Power supply, 120/230 V AC --> 24 V DC / 1.3 A, regulated	
Test rods			
349558	AC-TR20	Test rod, 20 mm	
349945	AC-TR14/30	Test rod, 14 mm / 30 mm	
349557	AC-TR40	Test rod, 40 mm	

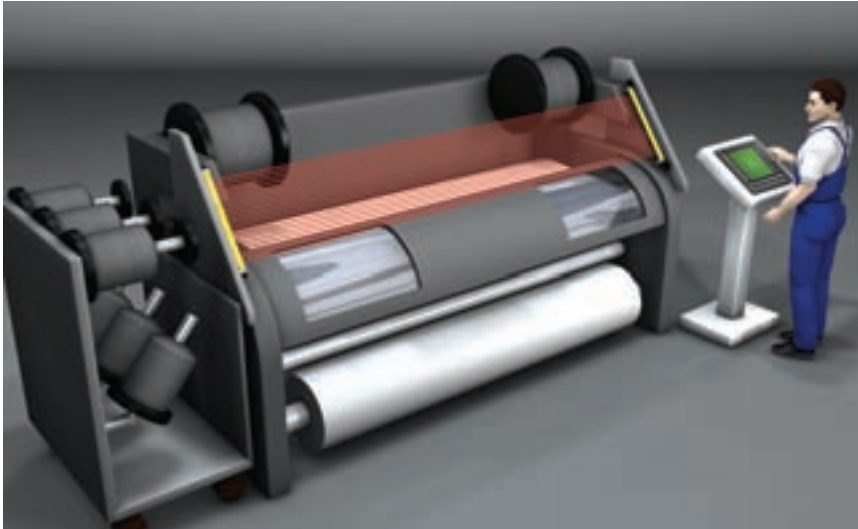
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SAFETY LIGHT CURTAINS

SOLID-2/SOLID-2E

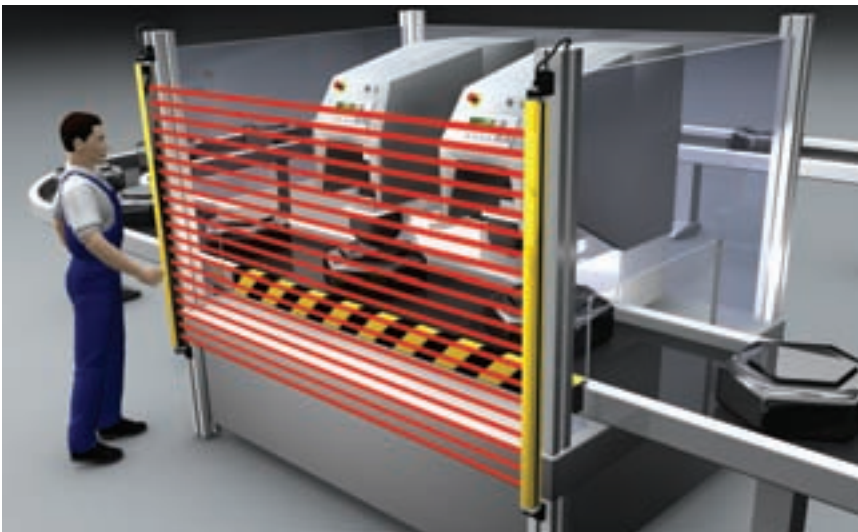


SOLID-2 with automatic restart on a textile machine

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

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SOLID-2/SOLID-2E

Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 2			
Classification in accordance with IEC/EN 61508	SIL 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 (OSSD)	2 pnp transistor outputs			
Connection system	M12 plug			

Functions

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

Functional extensions

SOLID-2

With safety interface	Relay output	RES	EDM	Muting	Cycle control	Further details
MSI-SR2/F	●	●	●			P. 404
MSI-m *)	●	●	●	●		P. 432
MSI-i *)	●	●	●		●	P. 426
MSI-mi *)	●	●	●	●	●	P. 444

SOLID-2E

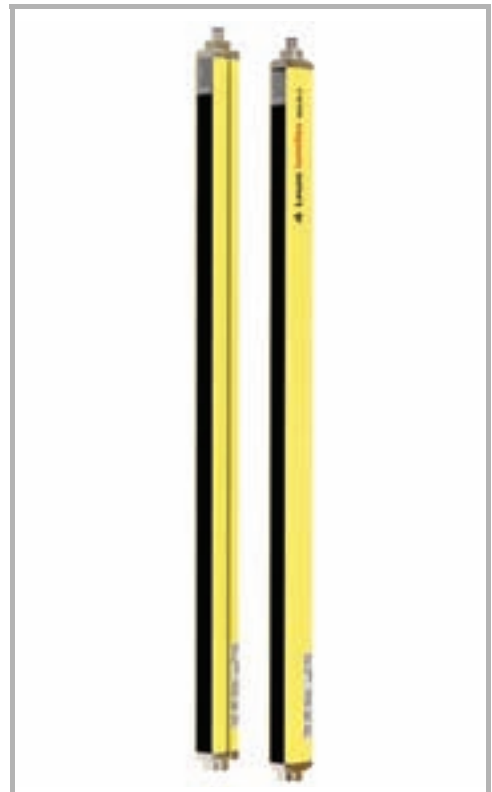
MSI-RM2	●	**)	**)			P. 396
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*) Can also be connected to SOLID-2E

***) Already included in the device

Special features

- Self-testing type 2 Safety Light Curtain in accordance with IEC/EN 61496
- SIL 2 Safety Light Curtain in accordance with IEC/EN 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



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SAFETY LIGHT CURTAINS

Ordering information

SOLID-2, consisting of transmitter and receiver
Included in delivery: 2 bracket sets BT-360-SET, 1 connecting and operating instructions manual

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

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Ordering information

SOLID-2, consisting of transmitter and receiver
Included in delivery: 2 bracket sets BT-360-SET, 1 connecting and operating instructions manual

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			Resolution: 90 mm		
	Range: 0.8 - 20 m			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

www.leuze.com/solid-2/





SAFETY LIGHT CURTAINS

Ordering information

SOLID-2E, consisting of transmitter and receiver
Included in delivery: 2 bracket sets BT-360-SET, 1 connecting and operating instructions manual

Functions: Integrated testing, selectable transmission channels, selectable start/restart interlock, 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 - 10m		
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

Ordering information

SOLID-2E, consisting of transmitter and receiver
Included in delivery: 2 bracket sets BT-360-SET, 1 connecting and operating instructions manual

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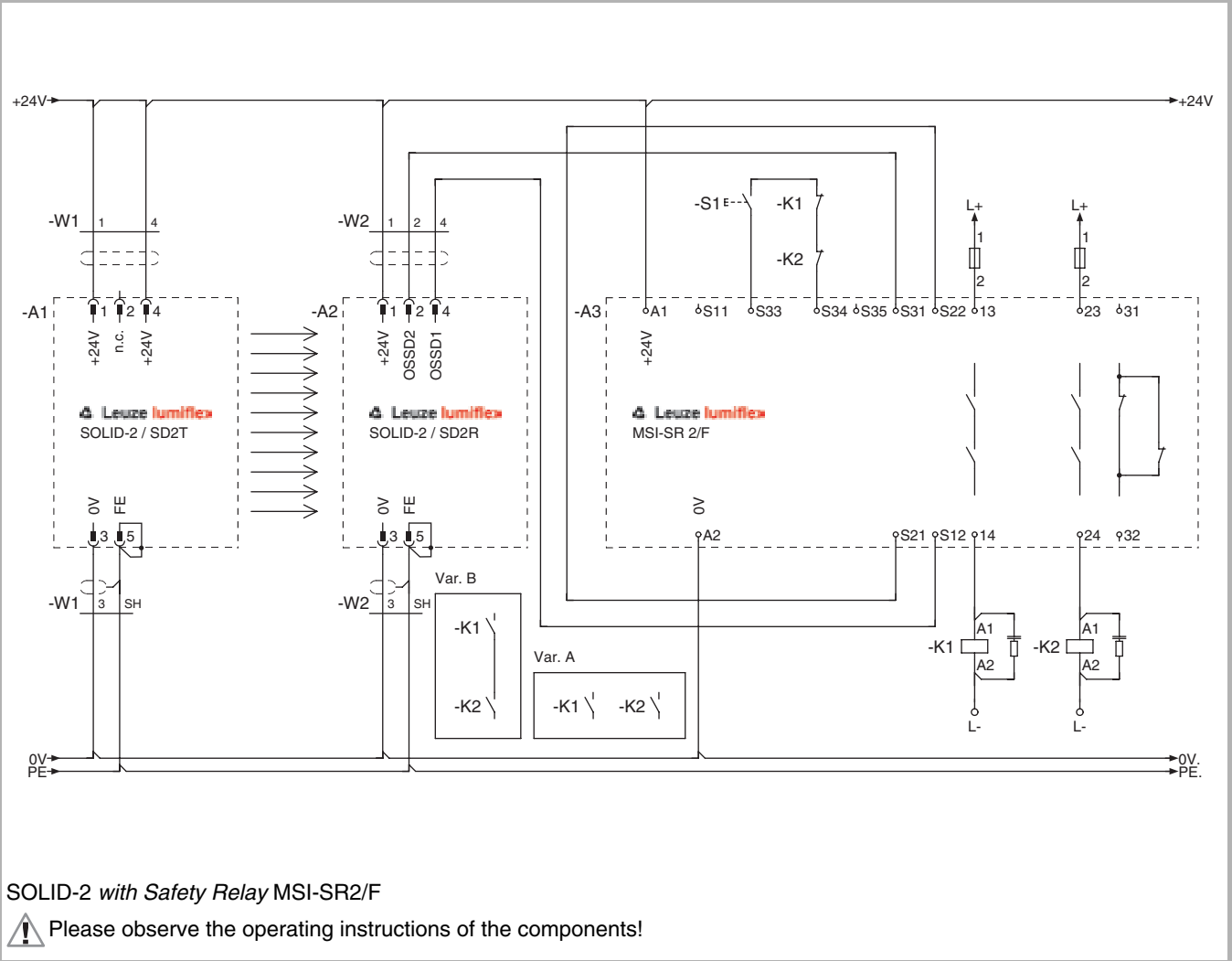




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Electrical connection

SOLID-2 connection example

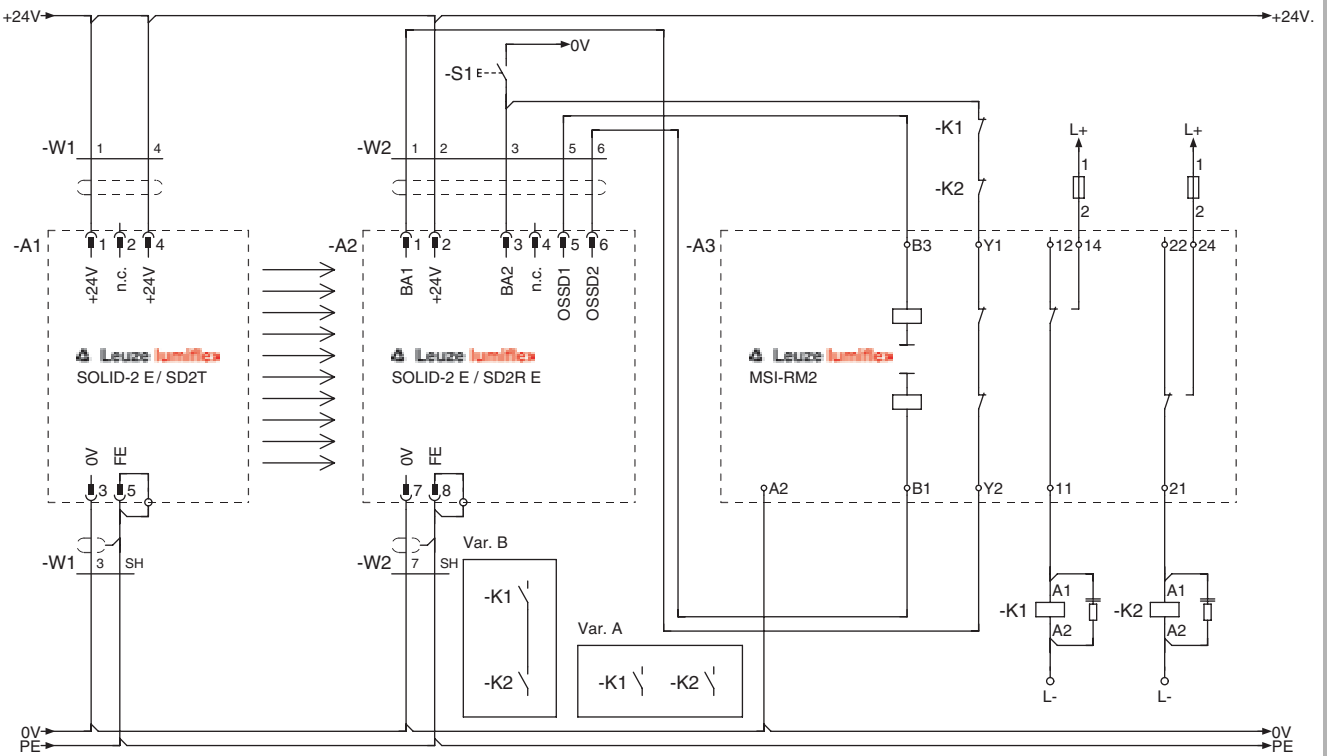


SOLID-2 with Safety Relay MSI-SR2/F

⚠ Please observe the operating instructions of the components!

Electrical connection

SOLID-2E connection example



SOLID-2E with Safety Relay, MSI-RM2

⚠ Please observe the operating instructions of the components!





SAFETY LIGHT CURTAINS

Technical data

General system data				
Safety type in accordance with IEC/EN 61496	Type 2			
Classification in accordance with IEC/EN 61508	SIL 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	75 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 (OSSD)	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			
Cable length	Max. 100 m with 0.25 mm ²			
SOLID-2 Connection system	M12 plug, 5-pin			
SOLID-2E Connection system	M12, 8-pin			
SOLID-2E signal inputs on BA1 and BA2	24 V DC, max. 10 mA			

You will find additional information in the SOLID 2 connecting and operating instructions at www.leuze.com/solid-2.

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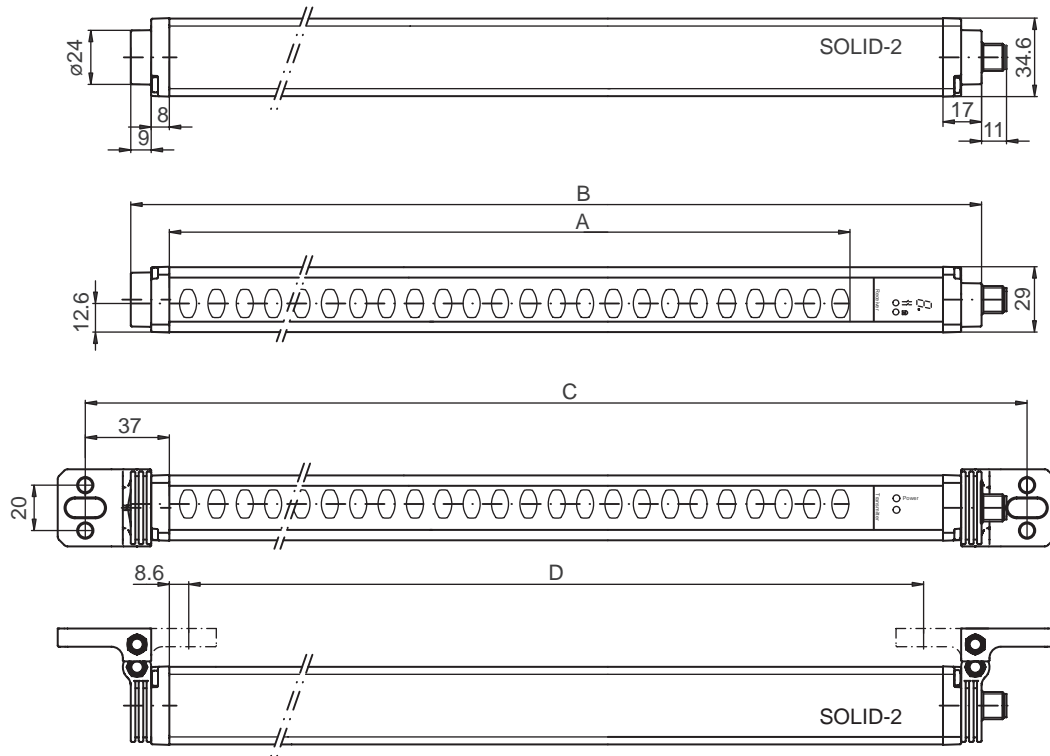
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Dimensional drawings

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

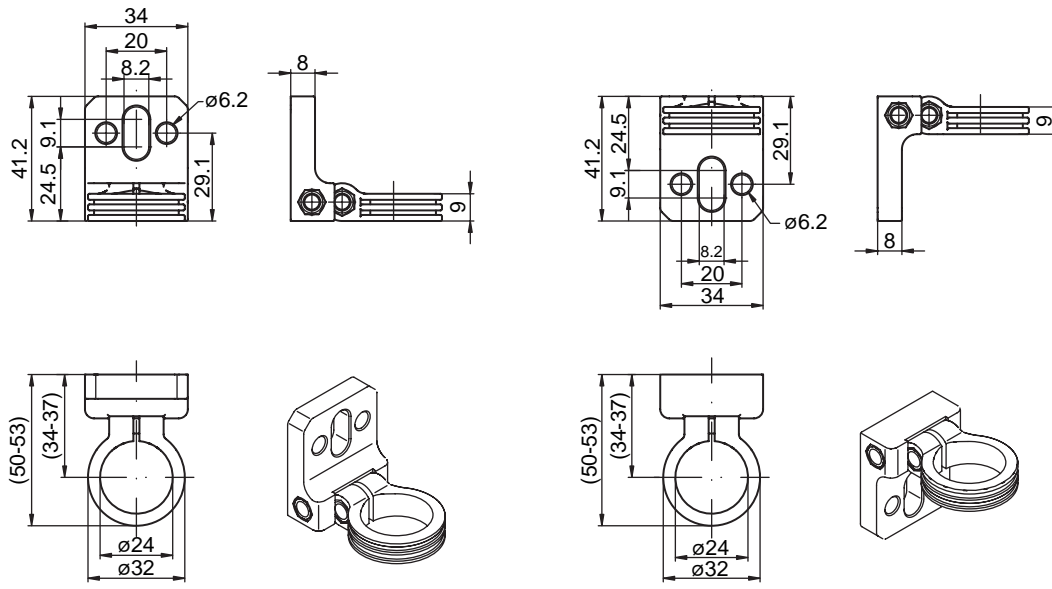




SAFETY LIGHT CURTAINS

Accessories dimensional drawings

Brackets



Bracket, 360° rotation, BT-360

Dimensions in mm

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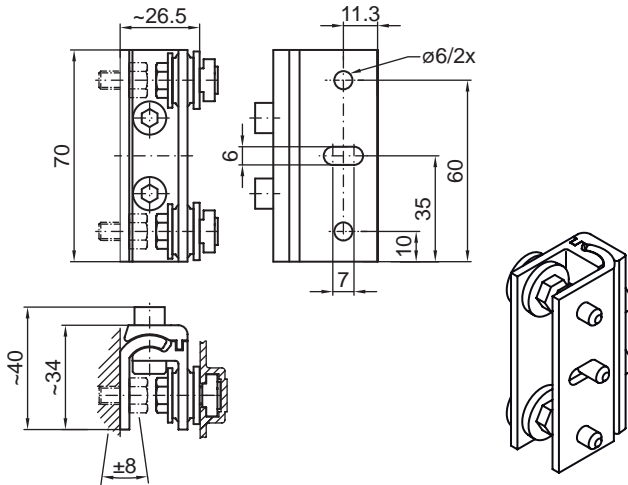
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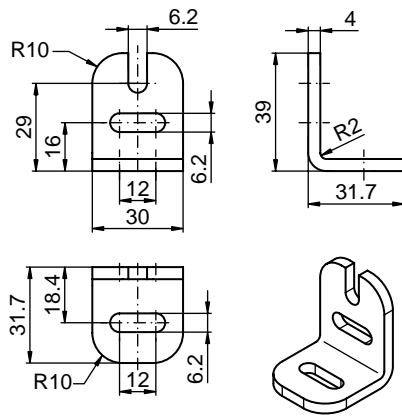
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Accessories dimensional drawings

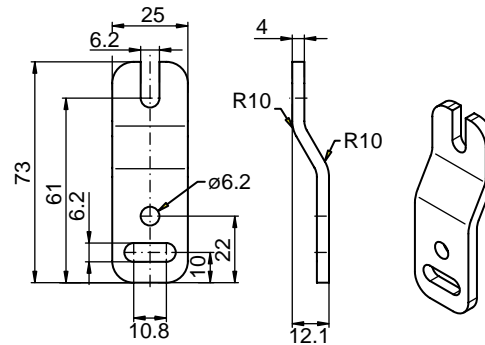
Brackets



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
Mounting accessories			
429050	BT-360	Bracket, 360° rotation	
429051	BT-L	L-mounting bracket	
429052	BT-Z	Z-mounting bracket	
429055	BT-360-SET	Mounting bracket set, consisting of 2 BT-360°	
429056	BT-L-mounting set	Mounting bracket set, consisting of 2 BT-L	
429057	BT-Z-mounting set	Mounting bracket set, consisting of 2 BT-Z	
560300	BT-SSD	Mounting bracket, swiveling with shock absorber incl. 2 screws and 2 sliding nuts	
Connection cable, 5-pin for SOLID-2 Transmitter and SOLID-2 Receiver			
429071	CB-M12-5000S-5GF	Connection cable shielded with M12 coupling, 5-pin	5 m, straight/open end
429072	CB-M12-5000S-5WF	Connection cable shielded with M12 coupling, 5-pin	5 m, angled/open end
429073	CB-M12-10000S-5GF	Connection cable shielded with M12 coupling, 5-pin	10 m, straight/open end
429074	CB-M12-10000S-5WF	Connection cable shielded with M12 coupling, 5-pin	10 m, angled/open end
429075	CB-M12-15000S-5GF	Connection cable shielded with M12 coupling, 5-pin	15 m, straight/open end
429076	CB-M12-15000S-5WF	Connection cable shielded with M12 coupling, 5-pin	15 m, angled/open end

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Accessories ordering information

Art. no.	Article	Description	Length, design
Connection cable, 8-pin for SOLID-2E Receiver			
429081	CB-M12-5000S-8GF	Connection cable shielded with M12 coupling, 8-pin	5 m, straight/open end
429082	CB-M12-5000S-8WF	Connection cable shielded with M12 coupling, 8-pin	5 m, angled/open end
429083	CB-M12-10000S-8GF	Connection cable shielded with M12 coupling, 8-pin	10 m, straight/open end
429084	CB-M12-10000S-8WF	Connection cable shielded with M12 coupling, 8-pin	10 m, angled/open end
429085	CB-M12-15000S-8GF	Connection cable shielded with M12 coupling, 8-pin	15 m, straight/open end
429086	CB-M12-15000S-8WF	Connection cable shielded with M12 coupling, 8-pin	15 m, angled/open end
Laser alignment aids			
560020	LA-78U	Laser alignment aid for lateral mounting with use for COMPACT/COMPACT <i>plus</i> /ROBUST/ECO/SOLID	
Power supplies			
520060	SITOP power	Power supply, 120/230 V AC --> 24 V DC / 5 A, regulated	
520061	LOGO! Power	Power supply, 120/230 V AC --> 24 V DC / 1.3 A, regulated	
Test rods			
349558	AC-TR20	Test rod, 20 mm	
349945	AC-TR14/30	Test rod, 14 mm / 30 mm	
349557	AC-TR40	Test rod, 40 mm	

www.leuze.com/solid-2/





SAFETY LIGHT CURTAINS

ECO



ECO is recommended as the ideal solution for protecting users on carton packaging systems



ECO enables extremely cost-effective solutions, especially with spatial restrictions

Machines with low injury risk and little space require cost-effective and small protective devices. The ECO Safety Light Curtains satisfy both of these core requirements. With these type 2 light curtains in accordance with IEC/EN 61496, the TNT 35 module, for example, is used as a Test Monitoring Unit.

ECO Safety Light Curtains are available in various protective heights, and on the basis of their housing cross-section of only 17 mm x 33 mm and via variable mounting options, they can be flexibly installed in compact systems. Rear area guarding can be implemented by cascading the ECO systems. The selection of different transmission channels guarantees the fault-free operation of devices that are close next to one another. An MSI interface module, e.g. MSI-m for muting can be applied for a function extension that meets requirements. The special ECO 30/80 model is specifically designed for guarding goods lifts.

Typical areas of application

For the textiles, timber, packaging, storage and conveyor system areas there are machine-specific C-standards, which allow for guarding with type 2 Safety Light Curtains and Multiple Light Beam Safety Devices.

- Weaving machines, warping frames and warping machines (textiles)
- Paternoster storage systems
- Automatic loading systems for PCBs
- Corpus presses in the timber industry
- Packaging machinery
- Tannery machines, e.g. vacuum dryers
- Shoe manufacturing machinery
- Rotary indexing machines
- Goods lifts (ECO 30/80)

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Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 2 with a safety interface or a Test Monitoring Unit		
Resolution	30 mm	55 mm	80 mm
Range	0.3...6 m	0.3...6 m	0.3...6 m
Protective field height (type-dependent)	150...1800 mm		
Profile cross-section	17 mm x 33 mm		
Safety-related switching output (OSSD)	pnp transistor output		
Connection system	M12 plug		

Functions

Automatic start/restart

External test input

2 transmission channels, selectable

LED-display

Functional extensions

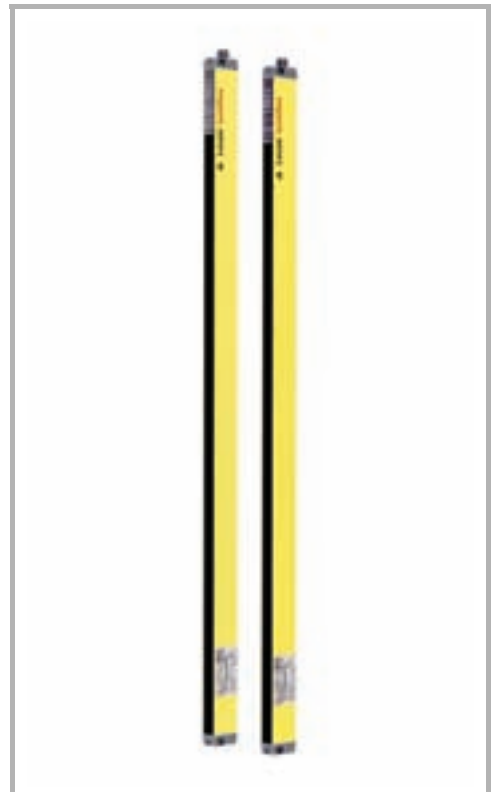
With safety interface	Relay output	RES	EDM	Muting	Cycle control	Further details
TNT 35	●	●	●			P. 450
MSI-s	●	●	●			P. 420
MSI-m	●	●	●	●		P. 432
MSI-i	●	●	●		●	P. 426
MSI-mi	●	●	●	●	●	P. 444

Special features

- Extremely small and stable housing (cross-section, 17 mm x 33 mm)
- Fault-free operation of adjacent devices with selection of different transmission channels
- Dirt and error signal output to PLC
- Easy connection with M12 plug
- Flexible function extensions, e.g. cyclical testing, restart interlock, muting
- Shortened initial operation and effective service with PC-supported visualization and diagnostics
- Cascading possible

ECO 30/80 additional

- Tailor-made for requirements with use on goods lifts



Machine Safety Services

Safety Engineering Software

Safety Laser Scanners

Safety Light Curtains

Properties



Multiple Light Beam Safety Devices

Single Light Beam Safety Devices

Further information

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AS-interface Safety at Work

PROFIsafe Sensors





SAFETY LIGHT CURTAINS

Ordering information

ECO, consisting of transmitter and receiver
Included in delivery: 1 connecting and operating instructions manual

Functions: External test input, automatic start/restart, selectable transmission channels, cascading*

Protective field height in mm	ECO			ECO		
	Art. no.	Article	Description	Art. no.	Article	Description
	Resolution: 30 mm Range: 0.3 - 6 m			Resolution: 55 mm Range: 0.3 - 6 m		
150	621301	ET30-150	Transmitter			
	624301	ER30-150	Receiver			
225	621302	ET30-225	Transmitter			
	624302	ER30-225	Receiver			
300	621303	ET30-300	Transmitter	621503	ET55-300	Transmitter
	624303	ER30-300	Receiver	624503	ER55-300	Receiver
450	621304	ET30-450	Transmitter	621504	ET55-450	Transmitter
	624304	ER30-450	Receiver	624504	ER55-450	Receiver
600	621306	ET30-600	Transmitter	621506	ET55-600	Transmitter
	624306	ER30-600	Receiver	624506	ER55-600	Receiver
750	621307	ET30-750	Transmitter	621507	ET55-750	Transmitter
	624307	ER30-750	Receiver	624507	ER55-750	Receiver
900	621309	ET30-900	Transmitter	621509	ET55-900	Transmitter
	624309	ER30-900	Receiver	624509	ER55-900	Receiver
1050	621310	ET30-1050	Transmitter	621510	ET55-1050	Transmitter
	624310	ER30-1050	Receiver	624510	ER55-1050	Receiver
1200	621312	ET30-1200	Transmitter	621512	ET55-1200	Transmitter
	624312	ER30-1200	Receiver	624512	ER55-1200	Receiver
1350	621313	ET30-1350	Transmitter	621513	ET55-1350	Transmitter
	624313	ER30-1350	Receiver	624513	ER55-1350	Receiver
1500	621315	ET30-1500	Transmitter	621515	ET55-1500	Transmitter
	624315	ER30-1500	Receiver	624515	ER55-1500	Receiver
1650	621316	ET30-1650	Transmitter	621516	ET55-1650	Transmitter
	624316	ER30-1650	Receiver	624516	ER55-1650	Receiver
1800	621318	ET30-1800	Transmitter	621518	ET55-1800	Transmitter
	624318	ER30-1800	Receiver	624518	ER55-1800	Receiver

Transmitter and receiver with M12 connection, 8-pin.

Transmitter and receiver with M12 connection, 8-pin.

* On request
The article code for cascading versions is Eabb-ddddM for host and Eabb-ddddS for guest.

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Ordering information

ECO, consisting of transmitter and receiver
Included in delivery: 1 connecting and operating instructions manual

Functions: External test input, automatic start/restart, selectable transmission channels, cascadability*

Protective field height in mm	ECO			ECO 30/80 additional For guarding goods lifts		
	Art. no.	Article	Description	Art. no.	Article	Description
	Resolution: 80 mm Range: 0.3 - 6 m			Resolution: 30 mm / 80 mm Range: 0.3 - 6 m		
450	621804	ET80-450	Transmitter			
	624804	ER80-450	Receiver			
600	621806	ET80-600	Transmitter			
	624806	ER80-600	Receiver			
900	621809	ET80-900	Transmitter			
	624809	ER80-900	Receiver			
1200	621812	ET80-1200	Transmitter			
	624812	ER80-1200	Receiver			
1500	621815	ET80-1500	Transmitter	629715	ET30/80-1500	Transmitter
	624815	ER80-1500	Receiver	629815	ER30/80-1500	Receiver
1800	621818	ET80-1800	Transmitter			
	624818	ER80-1800	Receiver			
1875				629718	ET30/80-1875	Transmitter
				629818	ER30/80-1875	Receiver
2400				629724	ET30/80-2400	Transmitter
				629824	ER30/80-2400	Receiver

Transmitter and receiver with M12 connection, 8-pin.

Transmitter and receiver with M12 connection, 8-pin.

* On request
The article code for cascadable versions is Eabb-ddddM for host and Eabb-ddddS for guest.

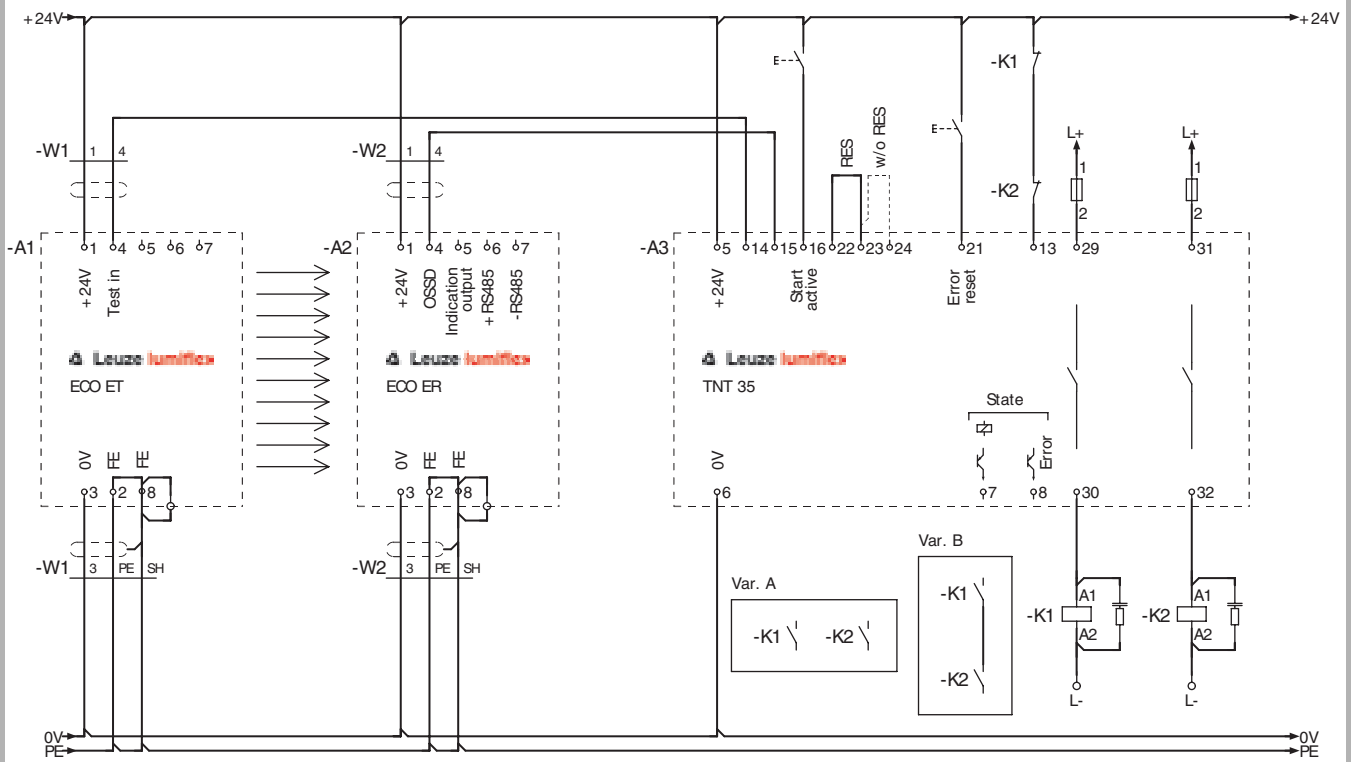




SAFETY LIGHT CURTAINS

Electrical connection

ECO connection example



ECO with Test Monitoring Unit TNT 35

Please observe the operating instructions of the components!

Technical data

General system data			
Safety type in accordance with IEC/EN 61496	Type 2 with a safety interface or a Test Monitoring Unit		
Resolution	30 mm	55 mm	80 mm
Range	0.3...6 m	0.3...6 m	0.3...6 m
Response time (depends on protective field height)	8...29 ms	8...19 ms	8...15 ms
Protective field height	150...1800 mm *	150...1800 mm *	450...1800 mm *
Synchronization	Optical via transmitter and receiver		
Supply voltage	24 V DC, $\pm 20\%$		
Connection cable length	Max. 50 m with 0.25 mm ²		
Safety class	I		
Protection rating	IP 65		
Ambient temperature, operation	0...+55 °C		
Ambient temperature, storage	-25...+75 °C		
Relative humidity	15...95 %		
Profile cross-section	17 mm x 33 mm		
Weight per device (length-dependent)	0.16...1.08 kg		
Transmitter			
Transmitter diodes, class in accordance with EN 60825	1		
Wavelength	880 nm		
Current consumption	75 mA		
Connection system	M12 plug, 8-pin		
External test input	24 V DC, max. 20 mA = no test 0 V or high impedance = Test via external test device, test period min. 20 ms		
Receiver			
Current consumption	75 mA without external load		
Safety-related switching output (OSSD)	1 pnp transistor output (short circuit-proof)		
Switching voltage high active	Min. U _v -1.9 V		
Switching voltage low	Max. 1.0 V		
Switching current	Typical, 100 mA		
Connection system	M12 plug, 8-pin		

*) Installation length up to 3000 mm on request

You will find additional information in the ECO connecting and operating instructions at www.leuze.com/eco/.

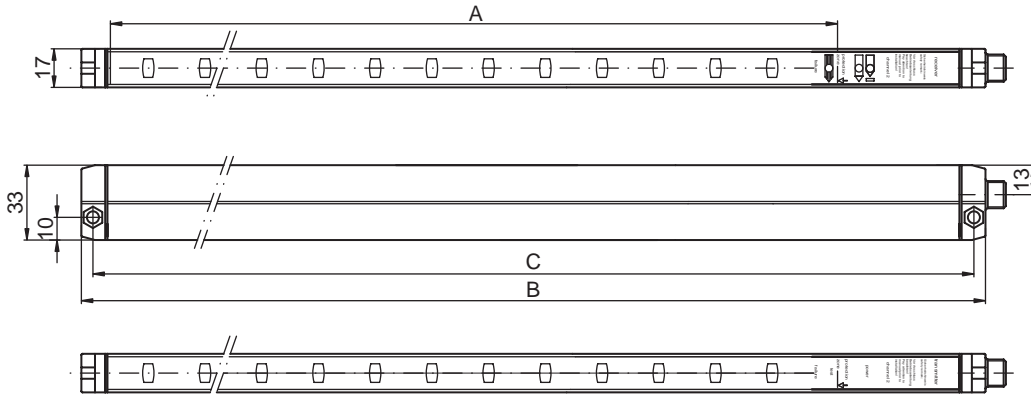




SAFETY LIGHT CURTAINS

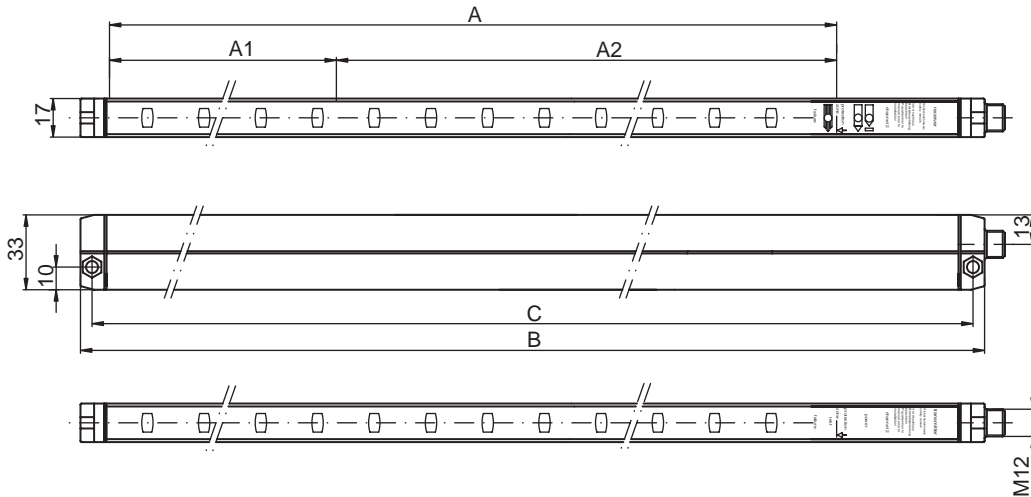
Dimensional drawings

ECO series: E30, E55, E80



A = Device type + 20.5 mm
 B = A + 78 mm
 C = A + 68 mm

ECO series: E30/80



A = Device type + 20.5 mm
 A1= Resolution 30 mm
 A2= Resolution 80 mm
 B = A + 78 mm
 C = A + 68 mm

Dimensions in mm

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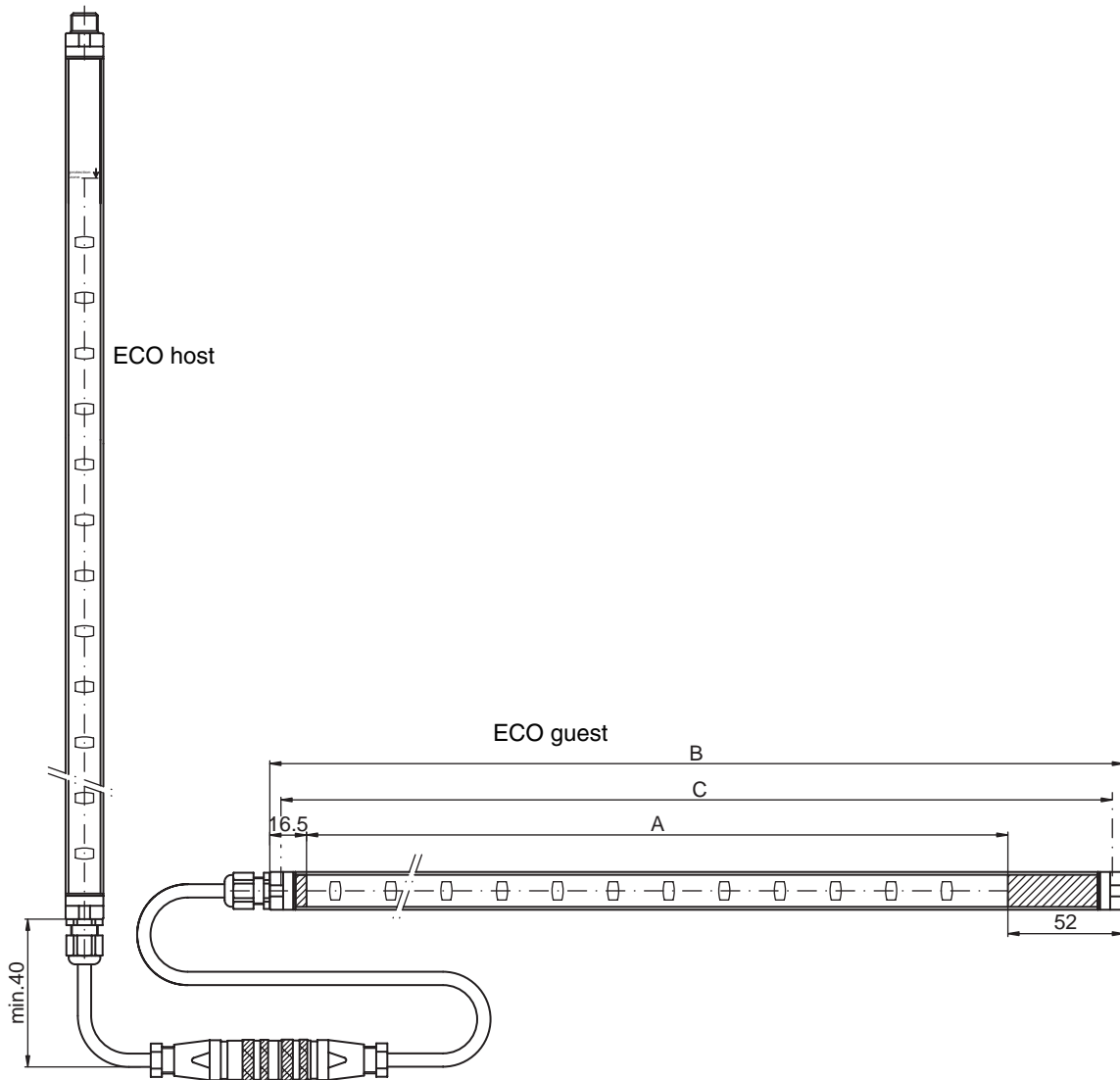
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Dimensional drawings

ECO in cascadable model



A = Device type + 30 mm
 B = A + 68.5 mm
 C = A + 58.5 mm

Cable length, host/guest including socket, 250 mm

Dimensions in mm

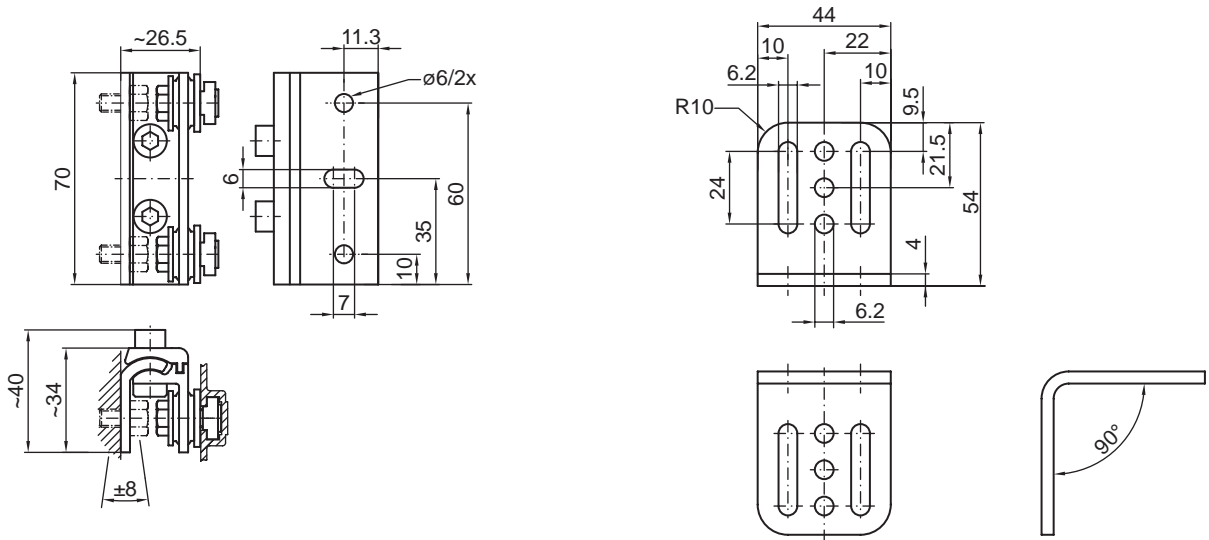




SAFETY LIGHT CURTAINS

Accessories dimensional drawings

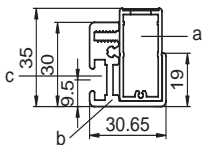
Brackets



Mounting bracket, swiveling with shock absorber, BT-SSD

L-mounting bracket

Mounting via the ECO protective and mounting profile



- a = ECO Safety Light Curtain
- b = ECO protective and mounting profile
- c = Slot for freely positionable M6 sliding nuts

Dimensions in mm

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Accessories ordering information

Art. no.	Article	Description	Length, design
Mounting accessories			
560300	BT-SSD	Mounting bracket, swiveling with shock absorber incl. 2 screws and 2 sliding nuts	
560120	BT-S	Mounting set consisting of L-type bracket incl. 2 screws	
Protective and mounting profiles for ECO Transmitter or receiver			
426701	E-MP-150	Protective and mounting profile for ECO-150	250 mm
426702	E-MP-225	Protective and mounting profile for ECO-225	325 mm
426703	E-MP-300	Protective and mounting profile for ECO-300	400 mm
426704	E-MP-450	Protective and mounting profile for ECO-450	550 mm
426706	E-MP-600	Protective and mounting profile for ECO-600	700 mm
426707	E-MP-750	Protective and mounting profile for ECO-750	850 mm
426709	E-MP-900	Protective and mounting profile for ECO-900	1000 mm
426710	E-MP-1050	Protective and mounting profile for ECO-1050	1150 mm
426712	E-MP-1200	Protective and mounting profile for ECO-1200	1200 mm
426713	E-MP-1350	Protective and mounting profile for ECO-1350	1450 mm
426715	E-MP-1500	Protective and mounting profile for ECO-1500	1600 mm
426716	E-MP-1650	Protective and mounting profile for ECO-1650	1750 mm
426718	E-MP-1800	Protective and mounting profile for ECO-1800	1900 mm
Connection cable			
548405	CB-M12-5000S8-8GF	Connection cable with M12 socket	5 m, straight/open end
548305	CB-M12-5000S8-8WF	Connection cable with M12 socket	5 m, angled/open end
548410	CB-M12-10000S8-8GF	Connection cable with M12 socket	10 m, straight/open end
548415	CB-M12-15000S8-8GF	Connection cable with M12 socket	15 m, straight/open end
548315	CB-M12-15000S8-8WF	Connection cable with M12 socket	15 m, angled/open end
Laser alignment aids			
560020	LA-78U	Laser alignment aid for lateral mounting with use for COMPACT/COMPACT <i>plus</i> /ROBUST/ECO/SOLID	



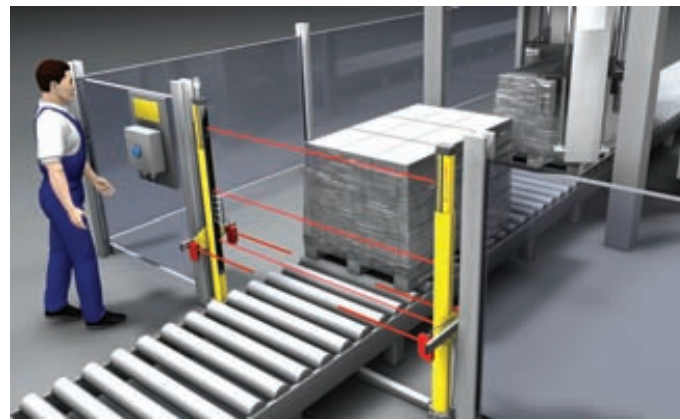


MULTIPLE LIGHT BEAM SAFETY DEVICES

OVERVIEW

Multiple Light Beam Safety Devices selection table

Selection table

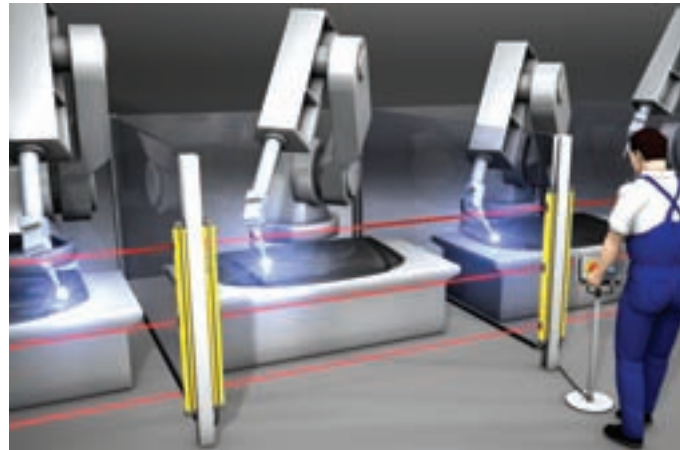


Muting function on a strapping system based on the COMPACTplus-m Multiple Light Beam Safety Device

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 initial operation.

ROBUST 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.



Guarding welding robot cells with ROBUST Multiple Light Beam Safety Devices



Numerous types of Multiple Light Beam Safety Devices are available for providing individual guarding solutions, including the COMPACT, COMPACTlaser and ROBUST devices (from left to right)

Safety type IEC/EN 61496	W x D in mm	Beam distance (mm) Number of beams	Range in m	Features, type-dependent														Article	Page
				Transmitter/Receiver	Transceiver with passive mirror (PM)	Transceiver with active mirror (AM)	Transmission channel selection	RES / EDM, selectable	RES / EDM, external	Muting functions, external	Muting functions, selectable	Integrated muting indicator	Integrated laser alignment aid	pnp transistor output	Safety Relay outputs	ATEX II 3 G / 3 D	Integrated AS-i Safety interface		
Type 4	52 x 55	500/2 400/3 300/4	0 - 18	•			•	•			•	•	•	•	•	•	•	COMPACTplus-m	191
		500/2 600/2	0 - 6.5		•		•	•			•	•	•	•	•	•	•	COMPACTplus-m Transceiver	205
		500/2 400/3 300/4	0 - 18; 6 - 70	•			•	•		2)			•		•		•	COMPACT	224
	52 x 57	500/2 400/3	0.8 - 18	•			•		1) 2)				•		•			COMPACT EX2	238
		500/2 400/3	6 - 70	•			•	•		2)			•	•			•	COMPACTlaser	240
		500/2 400/3 300/4	0.5 - 8; 0.5 - 50 0.5 - 50 0.5 - 8	•	•	•			1) 2) 1) 2) 1) 2)			•			•	•	•	ROBUST 42 ROBUST 43 ROBUST 44	254
Type 2	52 x 57	500/2 400/3 300/4	0.5 - 8; 0.5 - 50 0.5 - 50 0.5 - 8	•	•	•		3) 2) 3) 2) 3) 2)			•		•				ROBUST 22 ROBUST 23 ROBUST 24	270	

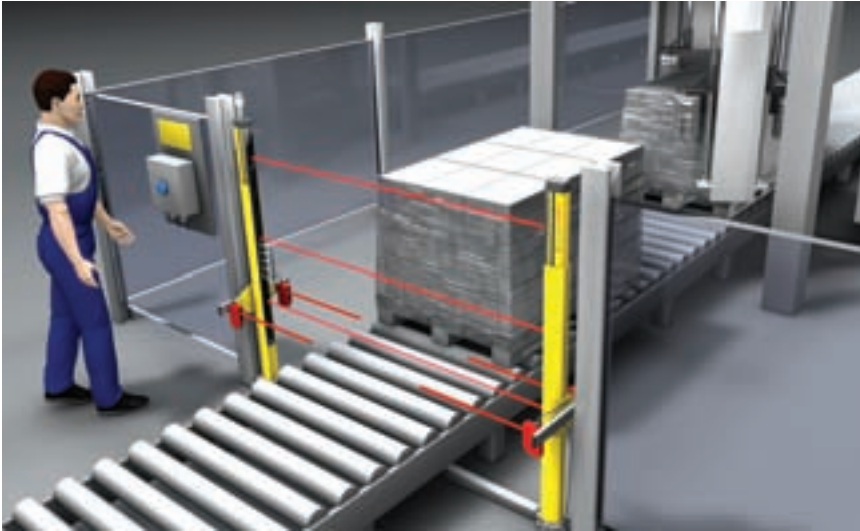
1) With MSI-SR2, page 404
2) With MSI-m/R, page 432
3) With TNT 35, page 450
or MSI-s/R, page 420





MULTIPLE LIGHT BEAM SAFETY DEVICES

COMPACTplus-m



COMPACTplus-m in transceiver model with muting function in a wrapping machine application



Cross-conveyor system: One of many application options for COMPACTplus Transceiver systems with muting and override function

Typical areas of application

- Access guarding with muting
- Robot cells, automatic processing centers, palletizers

Multiple Light Beam Safety Devices with muting function ensure constant person 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. Various selectable output modules enable optimum integration into every control system concept.

COMPACTplus Safety Light Curtains und Multiple Light Beam Safety Devices are equipped with various function packages 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. COMPACTplus can be connected to both conventional safety modules and to open safety bus systems via various interfaces (transistor/relay output, Safety at Work AS-Interface, PROFIsafe).

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Important technical data, overview

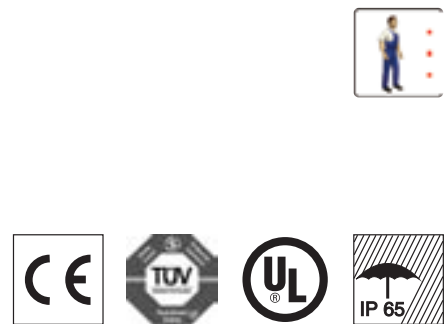
Safety type in accordance with IEC/EN 61496	Type 4		
Classification in accordance with IEC/EN 61508	SIL 3		
Number of beams	2	3	4
Beam distance	500 mm	400 mm	300 mm
Range (type-dependent)	Cxx0/y: 0...18 m Cxx1/y: 6...70 m		
Range, muting-transceiver (type-dependent)	0...6.5 m		
Profile cross-section	52 mm x 55 mm		
Safety-related switching outputs (OSSD)	2 pnp transistor outputs, 2 relay outputs AS-i Safety interface, PROFIsafe interface		
Connection system	Cable gland Hirschmann plug MIN-Style plug M12 plug (safety bus systems)		

Functions

Start/restart function (RES), selectable
Dynamic contactor monitoring (EDM), selectable
2 transmission channels, selectable
4-sensor Sequential Muting
2-sensor Parallel Muting
4-sensor Parallel Muting
Muting restart override function
Output for muting indicator
7-segment display



Properties



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MULTIPLE LIGHT BEAM SAFETY DEVICES

Function extension with "SafetyLab" PC software (accessories)

Infrared interface for parametering and diagnostics
Further muting operating modes
Parameterizable muting time limit
Additional control signals for muting and muting timer
Muting indicator function can be parametered
Increased interference immunity with multiscan
Additional 2-channel safety circuit, e.g. for door switches

Special features

- Muting sensors, start/restart button, lamp can be connected directly on the device via integrated or external sensor connection module
- Further muting operating modes can be selected via switch, no PC required
- Integrated monitored override function in accordance with the latest safety requirements for safe override after switch-offs
- Integrated evaluation unit; no external control devices required
- Connection option of emergency STOP control device or Safety Switch on additional switch-off circuit
- MultiScan function with multiple scanning of the beams and 2 transmission channels for maximum availability
- Plug-in parameter module with saved device configuration for quick and easy device swap-out

Additional COMPACT*plus* muting transceiver, CPRT-m

- Electrical wiring only on one side of the conveyor lines by using the transceiver principle (transmitter and receiver in one device)

Ordering information

COMPACTplus-m, consisting of transmitter and receiver
Included in delivery: 4 sliding nuts, 2 bracket sets BT-S,
1 connecting and operating instructions manual, 1 self-adhesive
information plate

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	Connection system
500 mm / 2	With cable gland			
	68840000	CPT500/2/T1	Transmitter	Cable gland
	68840430	CPR500/2-m/T1	Receiver	Transistor output, cable gland
	68740430	CPR500/2-mx/T1	Receiver with integrated sensor connection field	Transistor output, cable gland
	68840830	CPR500/2-ml/T1	Receiver with integrated LED-Muting indicator	Transistor output, cable gland
	68740830	CPR500/2-mxl/T1	Receiver with integrated sensor connection field and LED-Muting indicator	Transistor output, cable gland
	68840439	CPR500/2-m/R1	Receiver	Relay output, cable gland
	68740439	CPR500/2-mx/R1	Receiver with integrated sensor connection field	Relay output, cable gland
	68840839	CPR500/2-ml/R1	Receiver with integrated LED-Muting indicator	Relay output, cable gland
500 mm / 2	With Hirschmann plug			
	68840001	CPT500/2/T2	Transmitter	Hirschmann plug, 12-pin
	68840431	CPR500/2-m/T2	Receiver	Transistor output, Hirschmann plug, 12-pin
	68740431	CPR500/2-mx/T2	Receiver with integrated sensor connection field	Transistor output, Hirschmann plug, 12-pin
	68840831	CPR500/2-ml/T2	Receiver with integrated LED-Muting indicator	Transistor output, Hirschmann plug, 12-pin
	68740831	CPR500/2-mxl/T2	Receiver with integrated sensor connection field and LED-Muting indicator	Transistor output, Hirschmann plug, 12-pin
	68840438	CPR500/2-m/R2	Receiver	Relay output, Hirschmann plug, 12-pin
	68740438	CPR500/2-mx/R2	Receiver with integrated sensor connection field	Relay output, Hirschmann plug, 12-pin
	68840838	CPR500/2-ml/R2	Receiver with integrated LED-Muting indicator	Relay output, Hirschmann plug, 12-pin
68740838	CPR500/2-mxl/R2	Receiver with integrated sensor connection field and LED-Muting indicator	Relay output, Hirschmann plug, 12-pin	





MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

COMPACTplus-m, consisting of transmitter and receiver
 Included in delivery: 4 sliding nuts, 2 bracket sets BT-S,
 1 connecting and operating instructions manual, 1 self-adhesive
 information plate

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	Connection system
500 mm / 2	With MIN-style plug (delivery time: approx. 6 weeks)			
	68840002	CPT500/2/T3	Transmitter	MIN-style plug, 3pin
	68840432	CPR500/2-m/T3	Receiver	Transistor output, MIN-style plug, 7-pin
	68740432	CPR500/2-mx/T3	Receiver with integrated sensor connection field	Transistor output, MIN-style plug, 7-pin
	68840832	CPR500/2-ml/T3	Receiver with integrated LED-muting indicator	Transistor output, MIN-style plug, 7-pin
	68740832	CPR500/2-mxl/T3	Receiver with integrated sensor connection field and LED-Muting indicator	Transistor output, MIN-style plug, 7-pin
	68840437	CPR500/2-m/R3	Receiver	Relay output, MIN-style plug, 12-pin
	68740437	CPR500/2-mx/R3	Receiver with integrated sensor connection field	Relay output, MIN-style plug, 12-pin
	68840837	CPR500/2-ml/R3	Receiver with integrated LED-Muting indicator	Relay output, MIN-style plug, 12-pin
	68740837	CPR500/2-mxl/R3	Receiver with integrated sensor connection field and LED-Muting indicator	Relay output, MIN-style plug, 12-pin

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Ordering information

COMPACTplus-m, consisting of transmitter and receiver
Included in delivery: 4 sliding nuts, 2 bracket sets BT-S,
1 connecting and operating instructions manual, 1 self-adhesive
information plate

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	Connection system
500 mm / 2	With integrated AS-interface Safety at Work or PROFIsafe interface			
	68840050	CPT500/2/AP	Transmitter	Integrated AS-interface and 24V power supply
	68840480	CPR500/2-m/A1	Receiver	Integrated AS-interface
	68740480	CPR500/2-mx/A1	Receiver with integrated sensor connection field	Integrated AS-interface
	68840880	CPR500/2-ml/A1	Receiver with integrated LED-Muting indicator	Integrated AS-interface
	68740880	CPR500/2-mxl/A1	Receiver with integrated sensor connection field and LED-Muting indicator	Integrated AS-interface
	68840481	CPR500/2-m/P1	Receiver	Integrated PROFIBUS DP interface
	68740481	CPR500/2-mx/P1	Receiver with integrated sensor connection field	Integrated PROFIBUS DP interface
	68840881	CPR500/2-ml/P1	Receiver with integrated LED-Muting indicator	Integrated PROFIBUS DP interface
68740881	CPR500/2-mxl/P1	Receiver with integrated sensor connection field and LED-Muting indicator	Integrated PROFIBUS DP interface	





MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

COMPACTplus-m, consisting of transmitter and receiver
Included in delivery: 4 sliding nuts, 2 bracket sets BT-S,
1 connecting and operating instructions manual, 1 self-adhesive
information plate

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: 6 - 70 m			
	Art. no.	Article	Description	Connection system
500 mm / 2	With cable gland			
	68845000	CPT501/2/T1	Transmitter	Cable gland
	68845430	CPR501/2-m/T1	Receiver	Transistor output, cable gland
	68845439	CPR501/2-m/R1	Receiver	Relay output, cable gland
500 mm / 2	With Hirschmann plug			
	68845001	CPT501/2/T2	Transmitter	Hirschmann plug, 12-pin
	68845431	CPR501/2-m/T2	Receiver	Transistor output, Hirschmann plug, 12-pin
	68845438	CPR501/2-m/R2	Receiver	Relay output, Hirschmann plug, 12-pin
500 mm / 2	With MIN-style plug (delivery time: approx. 6 weeks)			
	68845002	CPT501/2/T3	Transmitter	MIN-style plug, 3pin
	68845432	CPR501/2-m/T3	Receiver	Transistor output, MIN-style plug, 7-pin
	68845437	CPR501/2-m/R3	Receiver	Relay output, MIN-style plug, 12-pin
500 mm / 2	With integrated AS-interface Safety at Work or PROFIsafe interface			
	68845050	CPT501/2/AP	Transmitter	Integrated AS-interface
	68845480	CPR501/2-m/A1	Receiver	Integrated AS-interface
	68845481	CPR501/2-m/P1	Receiver	Integrated PROFIBUS DP interface

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Ordering information

COMPACTplus-m, consisting of transmitter and receiver
Included in delivery: 4 sliding nuts, 2 bracket sets BT-S,
1 connecting and operating instructions manual, 1 self-adhesive
information plate

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	Connection system
400 mm / 3	With cable gland			
	68823000	CPT400/3/T1	Transmitter	Cable gland
	68823430	CPR400/3-m/T1	Receiver	Transistor output, cable gland
	68723430	CPR400/3-mx/T1	Receiver with integrated sensor connection field	Transistor output, cable gland
	68823830	CPR400/3-ml/T1	Receiver with integrated LED-Muting indicator	Transistor output, cable gland
	68723830	CPR400/3-mxl/T1	Receiver with integrated sensor connection field and LED-Muting indicator	Transistor output, cable gland
	68823439	CPR400/3-m/R1	Receiver	Relay output, cable gland
	68723439	CPR400/3-mx/R1	Receiver with integrated sensor connection field	Relay output, cable gland
	68823839	CPR400/3-ml/R1	Receiver with integrated sensor connection field and LED-Muting indicator	Relay output, cable gland
68723839	CPR400/3-mxl/R1	Receiver with integrated sensor connection field and LED-Muting indicator	Relay output, cable gland	





MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

COMPACTplus-m, consisting of transmitter and receiver
Included in delivery: 4 sliding nuts, 2 bracket sets BT-S,
1 connecting and operating instructions manual, 1 self-adhesive
information plate

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	Connection system
400 mm / 3	With Hirschmann plug			
	68823001	CPT400/3/T2	Transmitter	Transistor output, Hirschmann plug, 12-pin
	68823431	CPR400/3-m/T2	Receiver	Transistor output, Hirschmann plug, 12-pin
	68723431	CPR400/3-mx/T2	Receiver with integrated sensor connection field	Transistor output, Hirschmann plug, 12-pin
	68823831	CPR400/3-ml/T2	Receiver with integrated LED-Muting indicator	Transistor output, Hirschmann plug, 12-pin
	68723831	CPR400/3-mxl/T2	Receiver with integrated sensor connection field and LED-Muting indicator	Transistor output, Hirschmann plug, 12-pin
	68823438	CPR400/3-m/R2	Receiver	Relay output, Hirschmann plug, 12-pin
	68723438	CPR400/3-mx/R2	Receiver with integrated sensor connection field	Relay output, Hirschmann plug, 12-pin
	68823838	CPR400/3-ml/R2	Receiver with integrated LED-Muting indicator	Relay output, Hirschmann plug, 12-pin
68723838	CPR400/3-mxl/R2	Receiver with integrated sensor connection field and LED-Muting indicator	Relay output, Hirschmann plug, 12-pin	

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Ordering information

COMPACTplus-m, consisting of transmitter and receiver
Included in delivery: 4 sliding nuts, 2 bracket sets BT-S,
1 connecting and operating instructions manual, 1 self-adhesive
information plate

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	Connection system
400 mm / 3	With MIN-style plug (delivery time: approx. 6 weeks)			
	68823002	CPT400/3/T3	Transmitter	MIN-style plug, 3pin
	68823432	CPR400/3-m/T3	Receiver	Transistor output, MIN-style plug, 7-pin
	68723432	CPR400/3-mx/T3	Receiver with integrated sensor connection field	Transistor output, MIN-style plug, 7-pin
	68823832	CPR400/3-ml/T3	Receiver with integrated LED-Muting indicator	Transistor output, MIN-style plug, 7-pin
	68723832	CPR400/3-mxl/T3	Receiver with integrated sensor connection field and LED-Muting indicator	Transistor output, MIN-style plug, 7-pin
	68823437	CPR400/3-m/R3	Receiver	Relay output, MIN-style plug, 12-pin
	68723437	CPR400/3-mx/R3	Receiver with integrated sensor connection field	Relay output, MIN-style plug, 12-pin
	68823837	CPR400/3-ml/R3	Receiver with integrated sensor connection field and LED-Muting indicator	Relay output, MIN-style plug, 12-pin
	68723837	CPR400/3-mxl/R3	Receiver with integrated sensor connection field and LED-Muting indicator	Relay output, MIN-style plug, 12-pin





MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

COMPACTplus-m, consisting of transmitter and receiver
 Included in delivery: 4 sliding nuts, 2 bracket sets BT-S,
 1 connecting and operating instructions manual, 1 self-adhesive
 information plate

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	Connection system
400 mm / 3	With integrated AS-interface Safety at Work or PROFIsafe interface			
	68823050	CPT400/3/AP	Transmitter	Integrated AS-interface and 24V-power supply
	68823480	CPR400/3-m/A1	Receiver	Integrated AS-interface
	68723480	CPR400/3-mx/A1	Receiver with integrated sensor connection field	Integrated AS-interface
	68823880	CPR400/3-ml/A1	Receiver with integrated sensor connection field and LED-Muting indicator	Integrated AS-interface
	68723880	CPR400/3-mxl/A1	Receiver with integrated LED-Muting indicator	Integrated AS-interface
	68823481	CPR400/3-m/P1	Receiver	Integrated PROFIBUS DP interface
	68723481	CPR400/3-mx/P1	Receiver with integrated sensor connection field	Integrated PROFIBUS DP interface
	68823881	CPR400/3-ml/P1	Receiver with integrated sensor connection field and LED-Muting indicator	Integrated PROFIBUS DP interface
	68723881	CPR400/3-mxl/P1	Receiver with integrated sensor connection field and LED-Muting indicator	Integrated PROFIBUS DP interface

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Ordering information

COMPACTplus-m, consisting of transmitter and receiver
Included in delivery: 4 sliding nuts, 2 bracket sets BT-S,
1 connecting and operating instructions manual, 1 self-adhesive
information plate

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: 6 - 70 m			
	Art. no.	Article	Description	Connection system
400 mm / 3	With cable gland			
	68831000	CPT401/3/T1	Transmitter	Cable gland
	68831430	CPR401/3-m/T1	Receiver	Transistor output, cable gland
	68831439	CPR401/3-m/R1	Receiver	Relay output, cable gland
400 mm / 3	With Hirschmann plug			
	68831001	CPT401/3/T2	Transmitter	Hirschmann plug, 12-pin
	68831431	CPR401/3-m/T2	Receiver	Hirschmann plug, 12-pin
	68831438	CPR401/3-m/R2	Receiver	Relay output, Hirschmann plug, 12-pin
400 mm / 3	With MIN-style plug (delivery time: approx. 6 weeks)			
	68831002	CPT401/3/T3	Transmitter	MIN-style plug, 3pin
	68831432	CPR401/3-m/T3	Receiver	Transistor output, MIN-style plug, 7-pin
	68831437	CPR401/3-m/R3	Receiver	Relay output, MIN-style plug, 12-pin
400 mm / 3	With integrated AS-interface Safety at Work or PROFIsafe interface			
	68831050	CPT401/3/AP	Transmitter	Integrated AS-interface and 24V-power supply
	68831480	CPR401/3-m/A1	Receiver	Integrated AS-interface
	68831481	CPR401/3-m/P1	Receiver	Integrated PROFIBUS DP interface





MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

COMPACTplus-m, consisting of transmitter and receiver
Included in delivery: 4 sliding nuts, 2 bracket sets BT-S,
1 connecting and operating instructions manual, 1 self-adhesive
information plate

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	Connection system
300 mm / 4	With cable gland			
	68804000	CPT300/4/T1	Transmitter	Cable gland
	68804430	CPR300/4-m/T1	Receiver	Transistor output, cable gland
	68704430	CPR300/4-mx/T1	Receiver with integrated sensor connection field	Transistor output, cable gland
	68804830	CPR300/4-ml/T1	Receiver with integrated LED-Muting indicator	Transistor output, cable gland
	68704830	CPR300/4-mxl/T1	Receiver with integrated sensor connection field and LED-Muting indicator	Transistor output, cable gland
	68804439	CPR300/4-m/R1	Receiver	Relay output, cable gland
	68704439	CPR300/4-mx/R1	Receiver with integrated sensor connection field	Relay output, cable gland
	68804839	CPR300/4-ml/R1	Receiver with integrated sensor connection field and LED-Muting indicator	Relay output, cable gland
	68704839	CPR300/4-mxl/R1	Receiver with integrated sensor connection field and LED-Muting indicator	Relay output, cable gland

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Ordering information

COMPACTplus-m, consisting of transmitter and receiver
Included in delivery: 4 sliding nuts, 2 bracket sets BT-S,
1 connecting and operating instructions manual, 1 self-adhesive
information plate

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	Connection system
300 mm / 4	With Hirschmann plug			
	68804001	CPT300/4/T2	Transmitter	Hirschmann plug, 12-pin
	68804431	CPR300/4-m/T2	Receiver	Transistor output, Hirschmann plug, 12-pin
	68704431	CPR300/4-mx/T2	Receiver with integrated sensor connection field	Transistor output, Hirschmann plug, 12-pin
	68804831	CPR300/4-ml/T2	Receiver with integrated LED-Muting indicator	Transistor output, Hirschmann plug, 12-pin
	68704831	CPR300/4-mxl/T2	Receiver with integrated sensor connection field and LED-Muting indicator	Transistor output, Hirschmann plug, 12-pin
	68804438	CPR300/4-m/R2	Receiver	Relay output, Hirschmann plug, 12-pin
	68704438	CPR300/4-mx/R2	Receiver with integrated sensor connection field	Relay output, Hirschmann plug, 12-pin
	68804838	CPR300/4-ml/R2	Receiver with integrated sensor connection field and LED-Muting indicator	Relay output, Hirschmann plug, 12-pin
68704838	CPR300/4-mxl/R2	Receiver with integrated sensor connection field and LED-Muting indicator	Relay output, Hirschmann plug, 12-pin	





MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

COMPACTplus-m, consisting of transmitter and receiver
Included in delivery: 4 sliding nuts, 2 bracket sets BT-S,
1 connecting and operating instructions manual, 1 self-adhesive
information plate

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	Connection system
300 mm / 4	With MIN-style plug (delivery time: approx. 6 weeks)			
	68804002	CPT300/4/T3	Transmitter	MIN-style plug, 3pin
	68804432	CPR300/4-m/T3	Receiver	Transistor output, MIN-style plug, 7-pin
	68704432	CPR300/4-mx/T3	Receiver with integrated sensor connection field	Transistor output, MIN-style plug, 7-pin
	68804832	CPR300/4-ml/T3	Receiver with integrated LED-Muting indicator	Transistor output, MIN-style plug, 7-pin
	68704832	CPR300/4-mxl/T3	Receiver with integrated sensor connection field and LED-Muting indicator	Transistor output, MIN-style plug, 7-pin
	68804437	CPR300/4-m/R3	Receiver	Relay output, MIN-style plug, 12-pin
	68704437	CPR300/4-mx/R3	Receiver with integrated sensor connection field	Relay output, MIN-style plug, 12-pin
	68804837	CPR300/4-ml/R3	Receiver with integrated sensor connection field and LED-Muting indicator	Relay output, MIN-style plug, 12-pin
	68704837	CPR300/4-mxl/R3	Receiver with integrated sensor connection field and LED-Muting indicator	Relay output, MIN-style plug, 12-pin

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Ordering information

COMPACTplus-m, consisting of transmitter and receiver
Included in delivery: 4 sliding nuts, 2 bracket sets BT-S,
1 connecting and operating instructions manual, 1 self-adhesive
information plate

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	Connection system
300 mm / 4	With integrated AS-interface Safety at Work or PROFIsafe interface			
	68804050	CPT300/4/AP	Transmitter	Integrated AS-interface and 24V-power supply
	68804480	CPR300/4-m/A1	Receiver	Integrated AS-interface
	68704480	CPR300/4-mx/A1	Receiver with integrated sensor connection field	Integrated AS-interface
	68804880	CPR300/4-ml/A1	Receiver with integrated LED-Muting indicator	Integrated AS-interface
	68704880	CPR300/4-mxl/A1	Receiver with integrated sensor connection field and LED-Muting indicator	Integrated AS-interface
	68804481	CPR300/4-m/P1	Receiver	Integrated PROFIBUS DP interface
	68704481	CPR300/4-mx/P1	Receiver with integrated sensor connection field	Integrated PROFIBUS DP interface
	68804881	CPR300/4-ml/P1	Receiver with integrated sensor connection field and LED-Muting indicator	Integrated PROFIBUS DP interface
	68704881	CPR300/4-mxl/P1	Receiver with integrated sensor connection field and LED-Muting indicator	Integrated PROFIBUS DP interface





MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

COMPACTplus-m, consisting of transmitter and receiver
Included in delivery: 4 sliding nuts, 2 bracket sets BT-S,
1 connecting and operating instructions manual, 1 self-adhesive
information plate

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: 6 - 70 m			
	Art. no.	Article	Description	Connection system
300 mm / 4	With cable gland			
	68814000	CPT301/4/T1	Transmitter	Cable gland
	68814430	CPR301/4-m/T1	Receiver	Transistor output, cable gland
	68814439	CPR301/4-m/R1	Receiver	Relay output, cable gland
300 mm / 4	With Hirschmann plug			
	68814001	CPT301/4/T2	Transmitter	Hirschmann plug, 12-pin
	68814431	CPR301/4-m/T2	Receiver	Transistor output, Hirschmann plug, 12-pin
	68814438	CPR301/4-m/R2	Receiver	Relay output, Hirschmann plug, 12-pin
300 mm / 4	With MIN-style plug (delivery time: approx. 6 weeks)			
	68814002	CPT301/4/T3	Transmitter	MIN-style plug, 3pin
	68814432	CPR301/4-m/T3	Receiver	Transistor output, MIN-style plug, 7-pin
	68814437	CPR301/4-m/R3	Receiver	Relay output, MIN-style plug, 12-pin
300 mm / 4	With integrated AS-interface Safety at Work or PROFIsafe interface			
	68814050	CPT301/4/AP	Transmitter	Integrated AS-interface and 24V-power supply
	68814480	CPR301/4-m/A1	Receiver	Integrated AS-interface
	68814481	CPR301/4-m/P1	Receiver	Integrated PROFIBUS DP interface

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Ordering information

COMPACTplus muting transceiver (note: the passive Deflecting Mirrors, CPM500/2V, are required for operating a COMPACTplus muting transceiver)

Included in delivery: 2 sliding nuts, 1 bracket set BTS, 1 connecting and operating instructions manual, 1 self-adhesive information plate

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	Connection system
	909606	CPM500/2V	Deflecting Mirrors for muting transceivers	
	909607	CPM500/2V-SO	Deflecting Mirrors for column mounting without mounting bracket	
500 mm / 2	With cable gland			
	68800430	CPRT500/2-m/T1	Muting transceiver	Transistor output, cable gland
	68801430	CPRT500/2-mx/T1	Muting transceiver with integrated sensor connection field	Transistor output, cable gland
	68800830	CPRT500/2-ml/T1	Muting transceiver with integrated LED-Muting indicator	Transistor output, cable gland
	68801830	CPRT500/2-mxl/T1	Muting transceiver with integrated sensor connection field and LED-Muting indicator	Transistor output, cable gland
	68800439	CPRT500/2-m/R1	Muting transceiver	Relay output, cable gland
	68801439	CPRT500/2-mx/R1	Muting transceiver with integrated sensor connection field	Relay output, cable gland
	68800839	CPRT500/2-ml/R1	Muting transceiver with integrated LED-Muting indicator	Relay output, cable gland
68801839	CPRT500/2-mxl/R1	Muting transceiver with integrated sensor connection field and LED-Muting indicator	Relay output, cable gland	





MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

COMPACTplus muting transceiver (note: the passive Deflecting Mirrors, CPM500/2V, are required for operating a **COMPACTplus** muting transceiver)

Included in delivery: 2 sliding nuts, 1 bracket set BTS, 1 connecting and operating instructions manual, 1 self-adhesive information plate

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	Connection system
500 mm / 2	With Hirschmann plug			
	68800431	CPRT500/2-m/T2	Muting transceiver	Transistor output, Hirschmann plug, 12-pin
	68801431	CPRT500/2-mx/T2	Muting transceiver with integrated sensor connection field	Transistor output, Hirschmann plug, 12-pin
	68800831	CPRT500/2-ml/T2	Muting transceiver with integrated LED-Muting indicator	Transistor output, Hirschmann plug, 12-pin
	68801831	CPRT500/2-mxl/T2	Muting transceiver with integrated sensor connection field and LED-Muting indicator	Transistor output, Hirschmann plug, 12-pin
	68800438	CPRT500/2-m/R2	Muting transceiver	Relay output, Hirschmann plug, 12-pin
	68801438	CPRT500/2-mx/R2	Muting transceiver with integrated sensor connection field	Relay output, Hirschmann plug, 12-pin
	68800838	CPRT500/2-ml/R2	Muting transceiver with integrated LED-Muting indicator	Relay output, Hirschmann plug, 12-pin
68801838	CPRT500/2-mxl/R2	Muting transceiver with integrated sensor connection field and LED-Muting indicator	Relay output, Hirschmann plug, 12-pin	

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Ordering information

COMPACTplus muting transceiver (note: the passive Deflecting Mirrors, CPM500/2V, are required for operating a COMPACTplus muting transceiver)

Included in delivery: 2 sliding nuts, 1 bracket set BTS, 1 connecting and operating instructions manual, 1 self-adhesive information plate

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	Connection system
500 mm / 2	With MIN-style plug (delivery time: approx. 6 weeks)			
	68800432	CPRT500/2-m/T3	Muting transceiver	MIN-style plug, 3pin
	68801432	CPRT500/2-mx/T3	Muting transceiver with integrated sensor connection field	Transistor output, MIN-style plug, 7-pin
	68800832	CPRT500/2-ml/T3	Muting transceiver with integrated LED-Muting indicator	Transistor output, MIN-style plug, 7-pin
	68801832	CPRT500/2-mxl/T3	Muting transceiver with integrated sensor connection field and LED-Muting indicator	Transistor output, MIN-style plug, 7-pin
	68800437	CPRT500/2-m/R3	Muting transceiver	Relay output, MIN-style plug, 12-pin
	68801437	CPRT500/2-mx/R3	Muting transceiver with integrated sensor connection field	Relay output, MIN-style plug, 12-pin
	68800837	CPRT500/2-ml/R3	Muting transceiver with integrated LED-Muting indicator	Relay output, MIN-style plug, 12-pin
500 mm / 2	With integrated AS-interface Safety at Work or PROFIsafe interface			
	68800480	CPRT500/2-m/A1	Muting transceiver	Integrated AS-interface
	68801480	CPRT500/2-mx/A1	Muting transceiver with integrated sensor connection field	Integrated AS-interface
	68800880	CPRT500/2-ml/A1	Muting transceiver with integrated LED-Muting indicator	Integrated AS-interface
	68801880	CPRT500/2-mxl/A1	Muting transceiver with integrated sensor connection field and LED-Muting indicator	Integrated AS-interface
	68800481	CPRT500/2-m/P1	Muting transceiver	Integrated PROFIBUS DP interface
	68801481	CPRT500/2-mx/P1	Muting transceiver with integrated sensor connection field	Integrated PROFIBUS DP interface
	68800881	CPRT500/2-ml/P1	Muting transceiver with integrated LED-Muting indicator	Integrated PROFIBUS DP interface
	68801881	CPRT500/2-mxl/P1	Muting transceiver with integrated sensor connection field and LED-Muting indicator	Integrated PROFIBUS DP interface





MULTIPLE LIGHT BEAM SAFETY DEVICES

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 nuts, 1 bracket set BTS, 1 connecting and operating instructions manual, 1 self-adhesive information plate

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	Connection system
	909605	CPM600/2V	Deflecting Mirrors for muting transceivers	
600 mm / 2	With cable gland			
	68798430	CPRT600/2-m/T1	Muting transceiver	Transistor output, cable gland
	68799430	CPRT600/2-mx/T1	Muting transceiver with integrated sensor connection field	Transistor output, cable gland
	68798830	CPRT600/2-ml/T1	Muting transceiver with integrated LED-Muting indicator	Transistor output, cable gland
	68799830	CPRT600/2-mxl/T1	Muting transceiver with integrated sensor connection field and LED-Muting indicator	Transistor output, cable gland
	68798439	CPRT600/2-m/R1	Muting transceiver	Relay output, cable gland
	68799439	CPRT600/2-mx/R1	Muting transceiver with integrated sensor connection field	Relay output, cable gland
	68798839	CPRT600/2-ml/R1	Muting transceiver with integrated LED-Muting indicator	Relay output, cable gland
	68799839	CPRT600/2-mxl/R1	Muting transceiver with integrated sensor connection field and LED-Muting indicator	Relay output, cable gland

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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 nuts, 1 bracket set BTS, 1 connecting and operating instructions manual, 1 self-adhesive information plate

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	Connection system
600 mm / 2	With MIN-style plug (delivery time: approx. 6 weeks)			
	68798432	CPRT600/2-m/T3	Muting transceiver	Transistor output, MIN-style plug, 7-pin
	68799432	CPRT600/2-mx/T3	Muting transceiver with integrated sensor connection field	Transistor output, MIN-style plug, 7-pin
	68798832	CPRT600/2-ml/T3	Muting transceiver with integrated LED-Muting indicator	Transistor output, MIN-style plug, 7-pin
	68799832	CPRT600/2-mxl/T3	Muting transceiver with integrated sensor connection field and LED-Muting indicator	Transistor output, MIN-style plug, 7-pin
	68798437	CPRT600/2-m/R3	Muting transceiver	Relay output, MIN-style plug, 12-pin
	68799437	CPRT600/2-mx/R3	Muting transceiver with integrated sensor connection field	Relay output, MIN-style plug, 12-pin
	68798837	CPRT600/2-ml/R3	Muting transceiver with integrated LED-Muting indicator	Relay output, MIN-style plug, 12-pin
600 mm / 2	With integrated Safety at Work AS-interface			
	68798480	CPRT600/2-m.../A1	Muting transceiver	Integrated AS-interface
	68799480	CPRT600/2-mx/A1	Muting transceiver with integrated sensor connection field	Integrated AS-interface
	68798880	CPRT600/2-ml/A1	Muting transceiver with integrated LED-Muting indicator	Integrated AS-interface
	68799880	CPRT600/2-mxl/A1	Muting transceiver with integrated sensor connection field and LED-Muting indicator	Integrated AS-interface





MULTIPLE LIGHT BEAM SAFETY DEVICES

Article info for COMPACT*plus*

Type 4 Multiple Light Beam Safety Devices

Article	Description
CP	COMPACT<i>plus</i>
a	Device type
T	Transmitter
R	Receiver
RT	Transceiver
rrr	Beam distance/range
300	300 mm; range 0 - 18 m
400	400 mm; range 0 - 18 m
500	500 mm; range 0 - 18 m
301	300 mm; range 6 - 70 m
401	400 mm; range 6 - 70 m
501	500 mm; range 6 - 70 m
n	Number of beams
2	2-beam
3	3-beam
4	4-beam
f	Function package (receiver/transceiver only)
m	Muting
x	Integrated sensor connection field (receiver/transceiver only)
l	Integrated LED-lamp (receiver/transceiver only)
tt	Machine interface/Connection system
T1	Transistor output, cable gland
T2	Transistor output, Hirschmann plug (DIN 43651)
T3	Transistor output, MIN-style plug (MIN series)
R1	Relay output, cable gland, receiver/transceiver only
R2	Relay output, Hirschmann plug (DIN 43651), receiver/transceiver only
R3	Relay output, MIN-style plug (MIN series), receiver/transceiver only
A1	Integrated AS-interface, receiver/transceiver only
P1	Integrated PROFIBUS DP interface, receiver/transceiver only
AP	M12 plug (transmitter only)

CP a rrr /n -f x l /tt

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Article numbers structure for COMPACTplus

Type 4 Multiple Light Beam Safety Devices

Art no. Description

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abb

Transmitter and receiver

804	4-beam	300 mm	18 m range
704	4-beam	300 mm	18 m range, integrated sensor connection field
814	4-beam	300 mm	70 m range
823	3-beam	400 mm	18 m range
723	3-beam	400 mm	18 m range, integrated sensor connection field
831	3-beam	400 mm	70 m range
840	2-beam	500 mm	18 m range
740	2-beam	500 mm	18 m range, integrated sensor connection field
845	2-beam	500 mm	70 m range

Transceiver

800	2-beam	500 mm	-
801	2-beam	500 mm	Integrated sensor connection field
798	2-beam	600 mm	-
799	2-beam	600 mm	Integrated sensor connection field

c Device type

0	Basic transmitter device
4	Basic receiver/transceiver device
8	Receiver/transceiver with integrated LED-Muting indicator

dd Function package/connection types

Transmitter

00	Transmitter /T1
01	Transmitter /T2
02	Transmitter /T3
50	Transmitter /AP

Receiver

30	Muting /T1
31	Muting /T2
32	Muting /T3
39	Muting /R1
38	Muting /R2
37	Muting /R3
80	Muting /A1
81	Muting /P1

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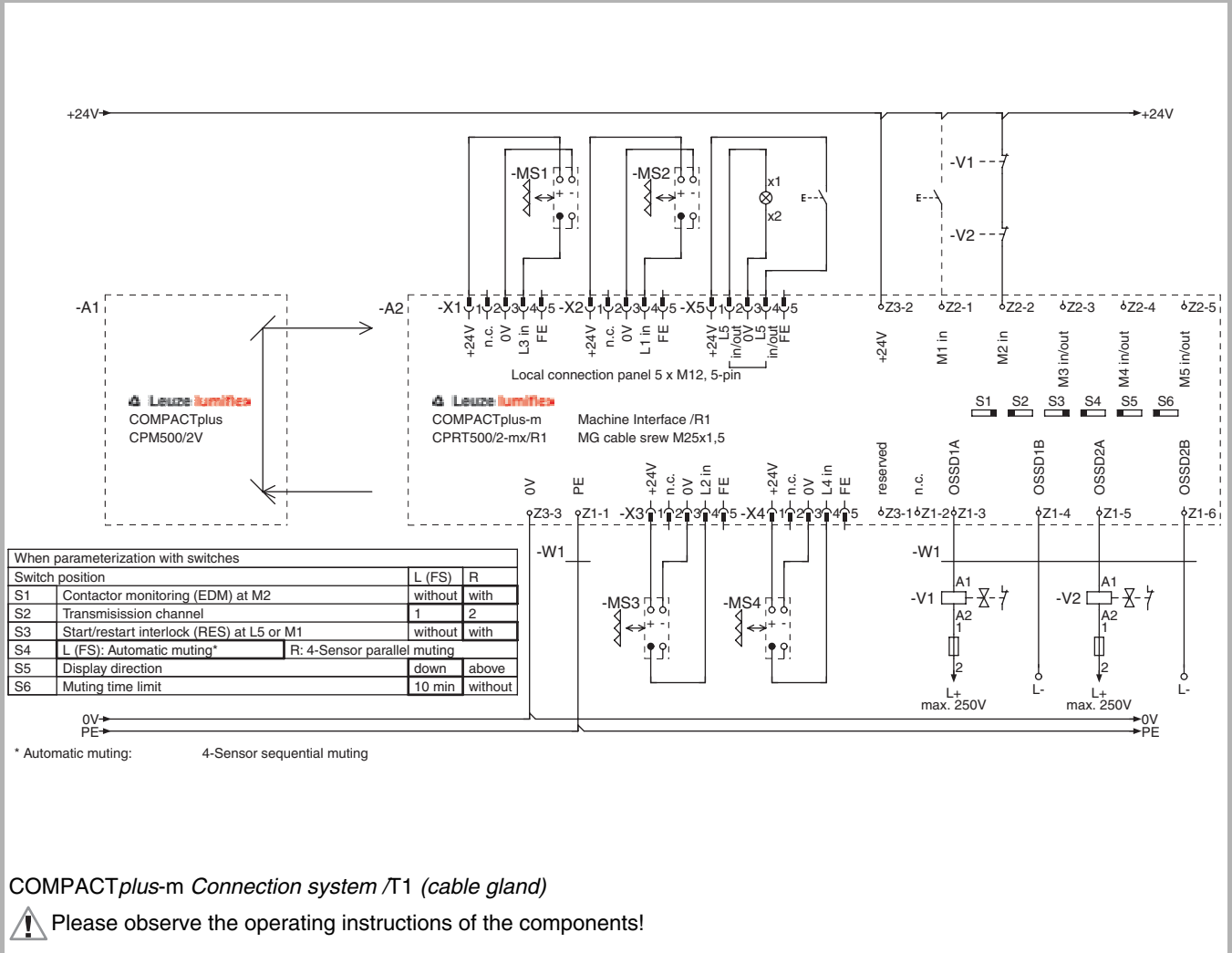




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Electrical connection

COMPACTplus-m connection example



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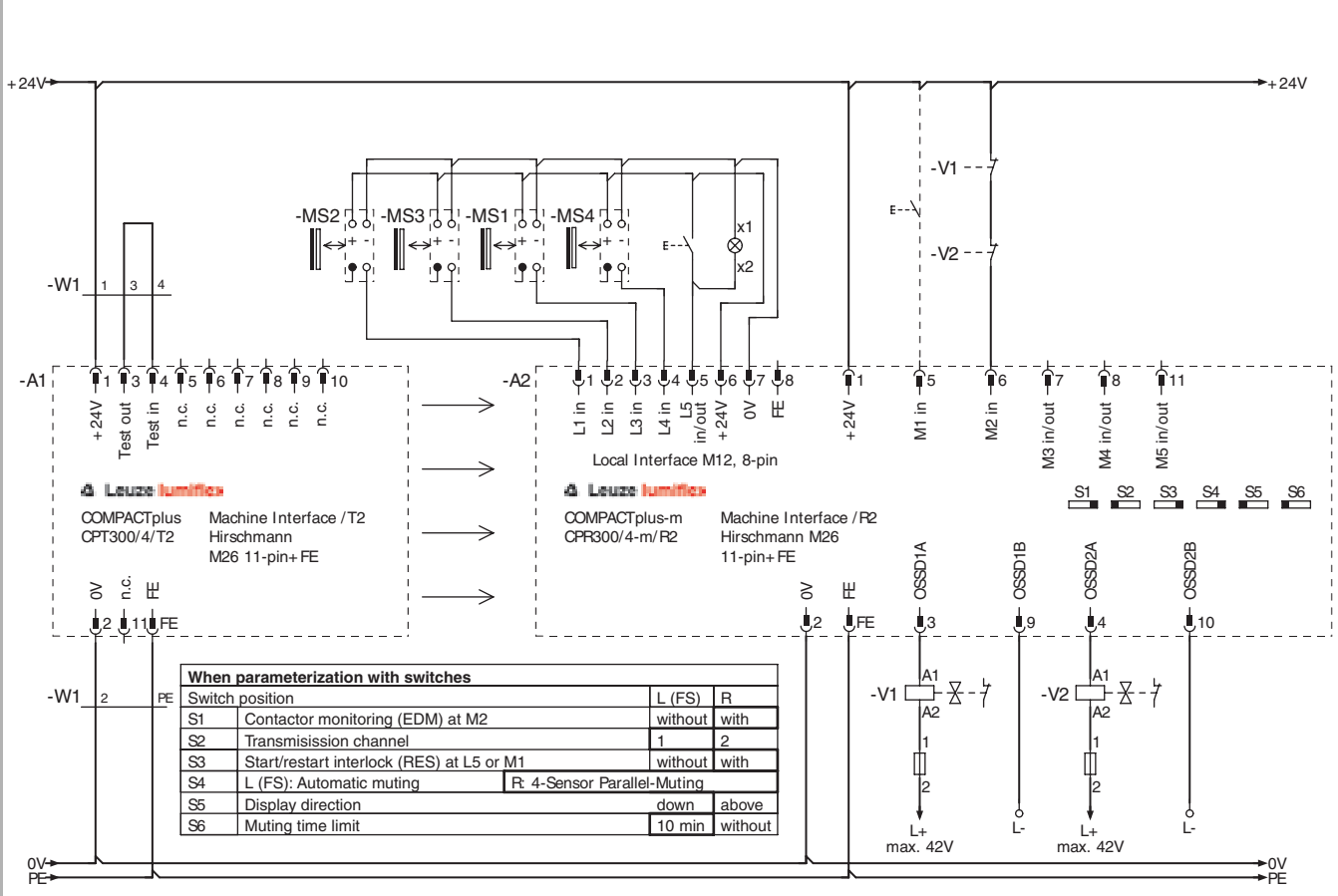
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Electrical connection

COMPACTplus-m connection example



COMPACTplus-m Connection system R2 (Hirschmann plug)

⚠ Please observe the operating instructions of the components!





MULTIPLE LIGHT BEAM SAFETY DEVICES

Technical data

General system data					
Safety type in accordance with IEC/EN 61496		Type 4			
Classification in accordance with IEC/EN 61508		SIL 3			
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)		Cxx0/y: 0...18 m Cxx1/y: 6...70 m			
Muting transceiver range (type-dependent)		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, $\pm 20\%$			
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			
Transmitter					
Transmitter diodes, class in accordance with EN 60825		1			
Wavelength		880 nm			
Current consumption		75 mA			
Connection system		Cable gland (PG13.5) Hirschmann plug (DIN 43651), 12-pin MIN-style plug (MIN Series), 3-pin M12 plug (safety bus systems), 5-pin			
External test input		24 V DC, max. 20 mA			

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Technical data

Receiver	
Current consumption	160 mA without external load, muting sensors and Muting indicator
Safety-related switching outputs (OSSD)	2 pnp transistor outputs (short circuit-proof, cross-circuit monitored) 2 relay outputs (make) 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
Transceiver (2 beam)	
Current consumption	160 mA without external load, muting sensors and Muting indicator
Safety-related switching outputs (OSSD)	2 pnp transistor outputs (short circuit-proof, cross-circuit monitored) 2 relay outputs (make) 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

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

You will find additional information in the COMPACTplus-m connecting and operating instructions at www.leuze.com/compactplus-m and www.leuze.com/compactplus-cprt-m.

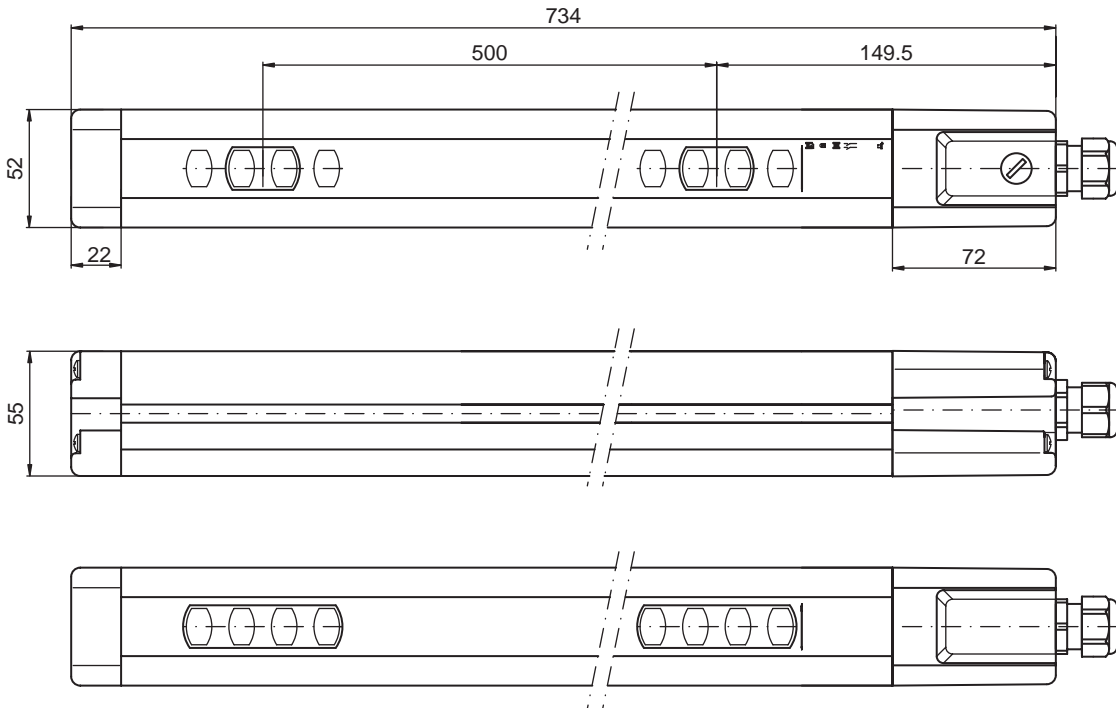




MULTIPLE LIGHT BEAM SAFETY DEVICES

Dimensional drawings

COMPACTplus-m Multiple Light Beam Safety Device



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

Dimensions in mm

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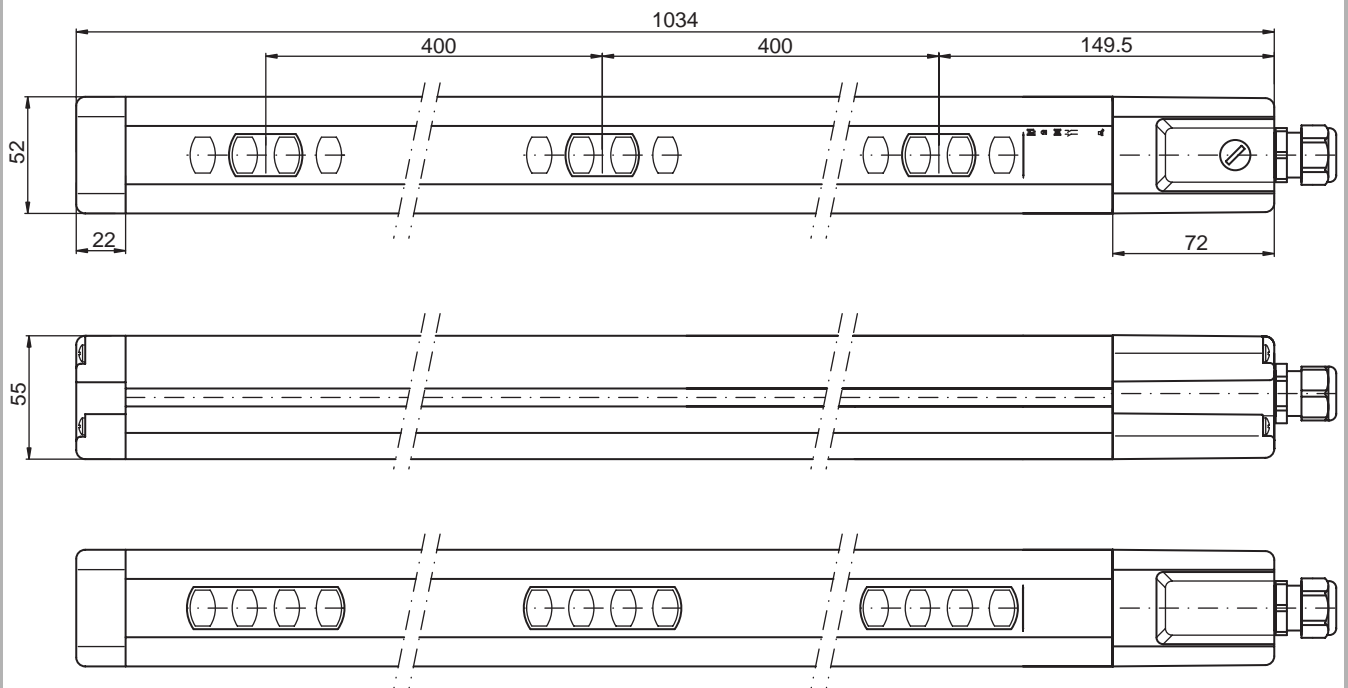
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Dimensional drawings

COMPACTplus-m Multiple Light Beam Safety Device



Dimensions in mm

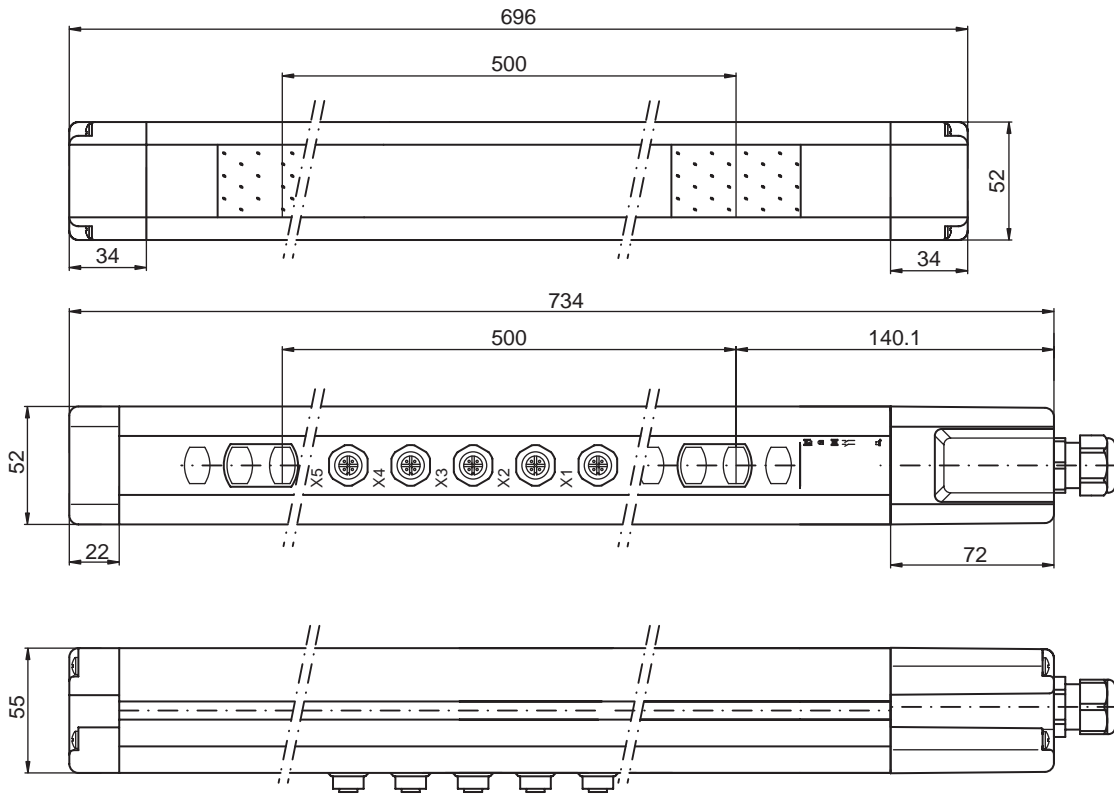




MULTIPLE LIGHT BEAM SAFETY DEVICES

Dimensional drawings

Muting transceiver, CPRT-mx



Dimensions in mm

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Accessories dimensional drawings

Brackets

See Safety Light Curtains COMPACT*plus*-m, Accessories dimensional drawings, page 93

Accessories ordering information

- Safety Light Curtains COMPACT*plus*-m, Accessories ordering information, page 95
- AS-interface Safety at Work, page 322
- UDC, DC Device Columns, page 456
- UMC, MC Deflecting Mirror Columns/individual mirrors, page 460
- MMS Muting Mounting Systems, page 466
- Muting indicator, page 470
- Muting sensors, page 472
- Connection cable, page 474
- Laser alignment aids, page 478

www.leuze.com/compactplus-m/



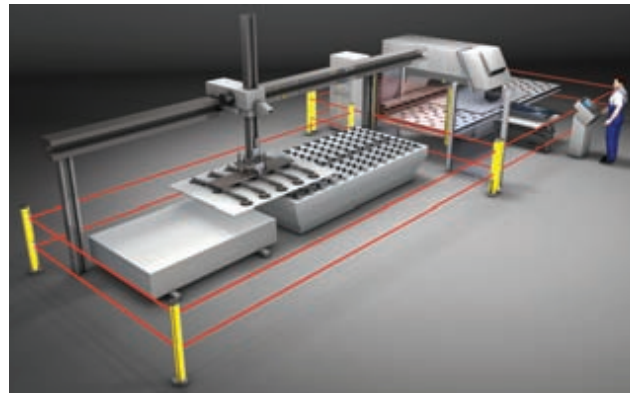


MULTIPLE LIGHT BEAM SAFETY DEVICES

OVERVIEW

COMPACT selection table

Selection table



The integrated laser alignment aid of the COMPACT laser simplifies the alignment of the Deflecting Mirrors with multiple-side guarding

COMPACT Multiple Light Beam Safety Devices are active optoelectronic protective devices (AOPD) type 4 in accordance with IEC/EN 61496. COMPACT is a proven-in-practice reliable series with references on the market. The wide-ranging COMPACT portfolio includes 2, 3 and 4-beam models. Explosion-risk variants and systems with integrated laser alignment aids are also available. The direct connection to AS-interface networks can be performed with an integrated AS Safety at Work interface.

COMPACT laser with integrated laser alignment aid – ideal for multiple-side guarding



Safety type in accordance with IEC/EN 61496	Beam distance in mm/ number of beams	Range in m	Features, type-dependent											CT Transmitter	CR Receiver	Page
			2 pnp transistor outputs	Cable gland	Hirschmann plug incl. straight cable socket	Hirschmann plug incl. straight cable socket	M12 plug	RES / EDM, selectable	Muting functions, external	ATEX II 3 G / 3 D	Integrated laser alignment aid	Integrated AS-i Safety interface				
Type 4	500/2	0 – 18	●	●			●	●	2)			●	CT500/2	CR500/2	224	
			●				●	●	2)		●	CT500/2/A	CR500/2/A	224		
			●		●			●	2)			CT500/2/M12	CR500/2/M12	224		
			●			●		●	2)			CT500/2/G	CR500/2/G	224		
		●				●		2)			CT500/2/W	CR500/2/W	224			
		0.8 – 18	●	●				1)	3)	●		CT500/2 EX2	CR500/2 EX2	238		
			●	●								CT501/2	CR501/2	225		
			●				●				●	CT501/2/A	CR501/2/A	225		
			●				●					CT501/2/M12	CR501/2/M12	225		
		6 – 70	●			●						CT501/2/G	CR501/2/G	225		
			●				●					CT501/2/W	CR501/2/W	225		
			●	●							●	CT501L/2	CR501L/2	242		
	●					●				●	CT501L/2/A	CR501L/2/A	243			
	●				●	●				●	CT501L/2/GW	CR501L/2/GW	242			
	●						●		2)		CT400/3	CR400/3	226			
	●					●			2)		CT400/3/A	CR400/3/A	226			
	●					●			2)		CT400/3/M12	CR400/3/M12	226			
	400/3	0 – 18	●							2)			CT400/3/G	CR400/3/G	226	
			●			●				2)			CT400/3/W	CR400/3/W	226	
			●	●					1)	3)	●		CT400/3 EX2	CR400/3 EX2	238	
			●	●								CT401/3	CR401/3	227		
		6 – 70	●				●					●	CT401/3/A	CR401/3/A	227	
			●				●					●	CT401/3/M12	CR401/3/M12	227	
			●			●						CT401/3/G	CR401/3/G	227		
●			●								CT401/3/W	CR401/3/W	227			
●									●	CT401L/3	CR401L/3	244				
●				●					●	CT401L/3/A	CR401L/3/A	245				
●				●	●				●	CT401L/3/GW	CR401L/3/GW	244				

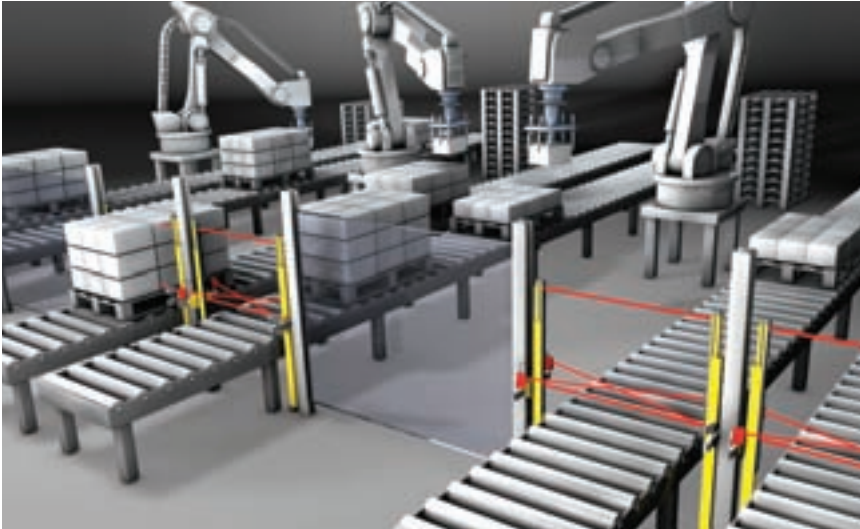
1) With MSI-SR2, outside EX-zone, page 404
 2) With MSI-m/R, page 432
 3) With MSI-m/R, outside EX-zone, page 432



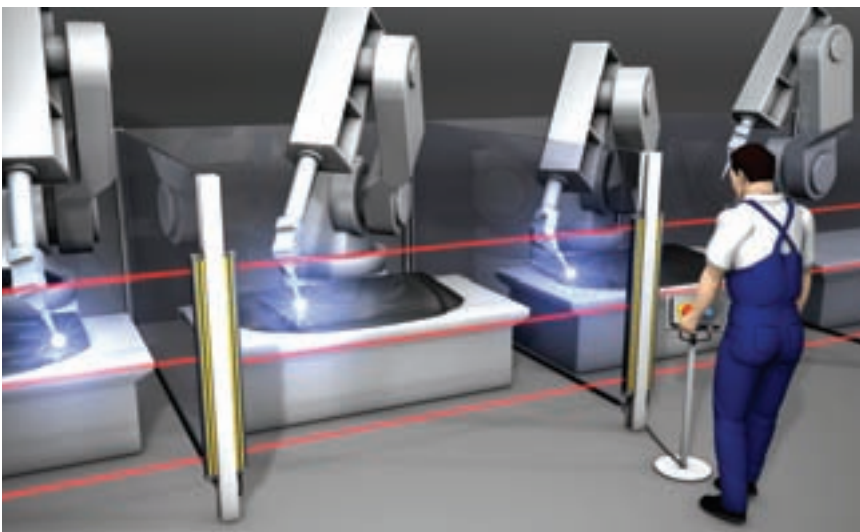


MULTIPLE LIGHT BEAM SAFETY DEVICES

COMPACT



External muting function: COMPACT Multiple Light Beam Safety Device application on a palletizer line



COMPACT Multiple Light Beam Safety Device application for access guarding on welding robot cells

In addition to the reliable detection of people with access and perimeter guarding, the interference immunity of safety light devices for the user also applies as one of the most important properties of these kinds of sensors, which is why COMPACT is a good solution here. The high availability is one of the major strong points of these type 4 Multiple Light Beam Safety Devices in accordance with IEC/EN 61496. The system consisting of transmitter and receiver is available in different series and in ATEX versions. The scope of function can be flexibly extended via external interface modules of the MSI series. The numerous COMPACT series, which are all based on the same proven technical platform, allow many applications to be implemented with an optimum price/performance ratio.

Typical areas of application

- Access guarding, e.g. for robots, automatic processing centers, palletizer systems
- Perimeter guarding, e.g. on laser and punching machines

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COMPACT

Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 4		
Number of beams	2	3	4
Beam distance	500 mm	400 mm	300 mm
Range	Cxx0/y: 0...18 m Cxx1/y: 6...70 m		
Profile cross-section	52 mm x 55 mm		
Safety-related switching outputs (OSSD)	2 pnp transistor outputs AS-i Safety interface		
Connection system	Cable gland Hirschmann plug MIN-style plug M12 plug M12 plug (AS-i Safety)		

Functions

Automatic start/restart
Start/restart interlock (RES), selectable *
Dynamic contactor monitoring (EDM), selectable *
2 transmission channels, selectable
LED-display
7-segment display

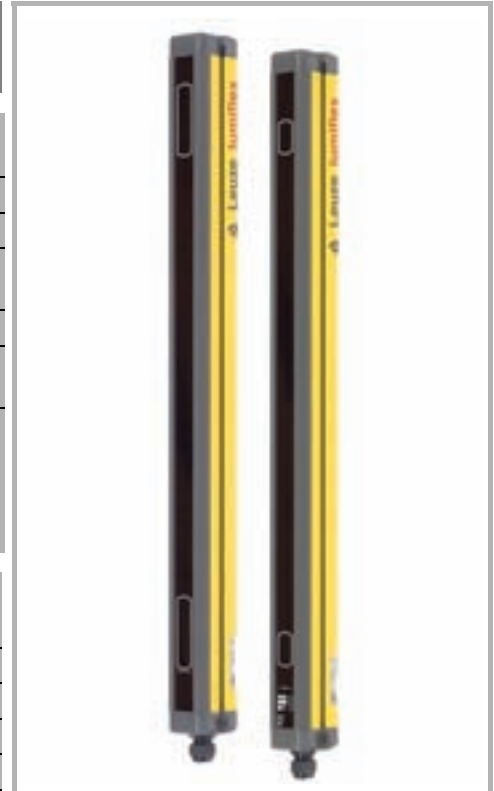
*) Functions available from April 2007

Functional extension

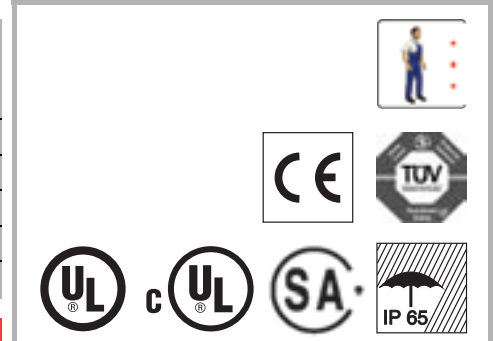
With safety interface	Relay output	Muting	Double muting	Further details
MSI-RM2	●			P. 396
MSI-SR2/F	●			P. 404
MSI-sx	●			P. 420
MSI-m	●	●		P. 432
MSI-mx	●	●	●	P. 432

Special features

- **Fault-free operation of adjacent devices with selection of different transmission channels**
- **MultiScan for environments with extreme stray light (e.g. welding sparks, flash lamps)**
- **Integrated auto-diagnostics system for simple on-site diagnostics and PC-supported diagnostics in the workshop**
- **Maintenance-free with safety transistor outputs (OSSDs)**



Properties



Further information

	Page
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● Accessories ordering information	235
● COMPACT EX2	236
● COMPACT/laser	240





MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

COMPACT consisting of transmitter and receiver
Included in delivery: 4 sliding nuts, 2 bracket sets BT-S,
1 connecting and operating instructions manual

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

Beam distance/ number of beams	COMPACT			
	Range: 0 - 18 m			
	Art. no.	Article	Description	Connection system
	With cable gland			
500 mm / 2	567502	CT500/2	Transmitter	Cable gland
	568502	CR500/2	Receiver	Cable gland
	With Hirschmann plug			
500 mm / 2	557502	CT500/2/G	Transmitter	Hirschmann plug, 7-pin, straight
	558502	CR500/2/G	Receiver	Hirschmann plug, 7-pin, straight
	577502	CT500/2/W	Transmitter	Hirschmann plug, 7-pin, angled
	578502	CR500/2/W	Receiver	Hirschmann plug, 7-pin, angled
	With MIN-style plug (delivery time: approx. 6 weeks)			
500 mm / 2	587359	CT500/2/BH	Transmitter	MIN-style plug 5-pin
	588359	CR500/2/BH	Receiver	MIN-style plug 7-pin
	589507	CT500/2/BH3	Transmitter	MIN-style plug 3-pin
	589607	CR500/2/BH5	Receiver	MIN-style plug 5-pin
	With M12 plug			
500 mm / 2	567425	CT500/2/M12	Transmitter	M12 plug, 5-pin
	568425	CR500/2/M12	Receiver	M12 plug, 8-pin
	With integrated AS Safety at Work interface			
500 mm / 2	587502	CT500/2/A	Transmitter	Integrated AS-interface
	588502	CR500/2/A	Receiver	Integrated AS-interface

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Ordering information

COMPACT consisting of transmitter and receiver
 Included in delivery: 4 sliding nuts, 2 bracket sets BT-S,
 1 connecting and operating instructions manual

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

Beam distance/ number of beams	COMPACT			
	Range: 6 - 70 m			
	Art. no.	Article	Description	Connection system
	With cable gland			
500 mm / 2	567512	CT501/2	Transmitter	Cable gland
	568512	CR501/2	Receiver	Cable gland
	With Hirschmann plug			
500 mm / 2	557512	CT501/2/G	Transmitter	Hirschmann plug, 7-pin, straight
	558512	CR501/2/G	Receiver	Hirschmann plug, 7-pin, straight
	577512	CT501/2/W	Transmitter	Hirschmann plug, 7-pin, angled
	578512	CR501/2/W	Receiver	Hirschmann plug, 7-pin, angled
	With MIN-style plug (delivery time approx. 6 weeks)			
500 mm / 2	587360	CT501/2/BH	Transmitter	MIN-style plug 5-pin
	588360	CR501/2/BH	Receiver	MIN-style plug 7-pin
	589508	CT501/2/BH3	Transmitter	MIN-style plug 3-pin
	589608	CR501/2/BH5	Receiver	MIN-style plug 5-pin
	With M12 plug			
500 mm / 2	567426	CT501/2/M12	Transmitter	M12 plug, 5-pin
	568426	CR501/2/M12	Receiver	M12 plug, 8-pin
	With integrated AS Safety at Work interface			
500 mm / 2	587512	CT501/2/A	Transmitter	Integrated AS-interface
	588512	CR501/2/A	Receiver	Integrated AS-interface

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MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

COMPACT consisting of transmitter and receiver
 Included in delivery: 4 sliding nuts, 2 bracket sets BT-S,
 1 connecting and operating instructions manual

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

Beam distance/ number of beams	COMPACT			
	Range: 0 - 18 m			
	Art. no.	Article	Description	Connection system
	With cable gland			
400 mm / 3	567403	CT400/3	Transmitter	Cable gland
	568403	CR400/3	Receiver	Cable gland
	With Hirschmann plug			
400 mm / 3	557403	CT400/3/G	Transmitter	Hirschmann plug, 7-pin, straight
	558403	CR400/3/G	Receiver	Hirschmann plug, 7-pin, straight
	577403	CT400/3/W	Transmitter	Hirschmann plug, 7-pin, angled
	578403	CR400/3/W	Receiver	Hirschmann plug, 7-pin, angled
	With MIN-style plug (delivery time approx. 6 weeks)			
400 mm / 3	587353	CT400/3/BH	Transmitter	MIN-style plug 5-pin
	588353	CR400/3/BH	Receiver	MIN-style plug 7-pin
	589505	CT400/3/BH3	Transmitter	MIN-style plug 3-pin
	589605	CR400/3/BH5	Receiver	MIN-style plug 5-pin
	With M12 plug			
400 mm / 3	567423	CT400/3/M12	Transmitter	M12 plug, 5-pin
	568423	CR400/3/M12	Receiver	M12 plug, 8-pin
	With integrated AS Safety at Work interface			
400 mm / 3	587403	CT400/3/A	Transmitter	Integrated AS-interface
	588403	CR400/3/A	Receiver	Integrated AS-interface

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Ordering information

COMPACT consisting of transmitter and receiver
 Included in delivery: 4 sliding nuts, 2 bracket sets BT-S,
 1 connecting and operating instructions manual

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

Beam distance/ number of beams	COMPACT			
	Range: 6 - 70 m			
	Art. no.	Article	Description	Connection system
	With cable gland			
400 mm / 3	567413	CT401/3	Transmitter	Cable gland
	568413	CR401/3	Receiver	Cable gland
	With Hirschmann plug			
400 mm / 3	557413	CT401/3/G	Transmitter	Hirschmann plug, 7-pin, straight
	558413	CR401/3/G	Receiver	Hirschmann plug, 7-pin, straight
	577413	CT401/3/W	Transmitter	Hirschmann plug, 7-pin, angled
	578413	CR401/3/W	Receiver	Hirschmann plug, 7-pin, angled
	With MIN-style plug (delivery time: approx. 6 weeks)			
400 mm / 3	587354	CT401/3/BH	Transmitter	MIN-style plug 5-pin
	588354	CR401/3/BH	Receiver	MIN-style plug 7-pin
	589506	CT401/3/BH3	Transmitter	MIN-style plug 3-pin
	589606	CR401/3/BH5	Receiver	MIN-style plug 5-pin
	With M12 plug			
400 mm / 3	567424	CT401/3/M12	Transmitter	M12 plug, 5-pin
	568424	CR401/3/M12	Receiver	M12 plug, 8-pin
	With integrated AS Safety at Work interface			
400 mm / 3	587413	CT401/3/A	Transmitter	Integrated AS-interface
	588413	CR401/3/A	Receiver	Integrated AS-interface

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MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

COMPACT consisting of transmitter and receiver
Included in delivery: 4 sliding nuts, 2 bracket sets BT-S,
1 connecting and operating instructions manual

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

Beam distance/ number of beams	COMPACT			
	Range: 0 - 18 m			
	Art. no.	Article	Description	Connection system
	With cable gland			
300 mm / 4	567304	CT300/4	Transmitter	Cable gland
	568304	CR300/4	Receiver	Cable gland
	With Hirschmann plug			
300 mm / 4	557304	CT300/4/G	Transmitter	Hirschmann plug, 7-pin, straight
	558304	CR300/4/G	Receiver	Hirschmann plug, 7-pin, straight
	577304	CT300/4/W	Transmitter	Hirschmann plug, 7-pin, angled
	578304	CR300/4/W	Receiver	Hirschmann plug, 7-pin, angled
	With MIN-style plug (delivery time: approx. 6 weeks)			
300 mm / 4	587357	CT300/4/BH	Transmitter	MIN-style plug 5-pin
	588357	CR300/4/BH	Receiver	MIN-style plug 7-pin
	589501	CT300/4/BH3	Transmitter	MIN-style plug 3-pin
	589601	CR300/4/BH5	Receiver	MIN-style plug 5-pin
	With M12 plug			
300 mm / 4	567421	CT300/4/M12	Transmitter	M12 plug, 5-pin
	568421	CR300/4/M12	Receiver	M12 plug, 8-pin
	With integrated AS Safety at Work interface			
300 mm / 4	587304	CT300/4/A	Transmitter	Integrated AS-interface
	588304	CR300/4/A	Receiver	Integrated AS-interface

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Ordering information

COMPACT consisting of transmitter and receiver
 Included in delivery: 4 sliding nuts, 2 bracket sets BT-S,
 1 connecting and operating instructions manual

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

Beam distance/ number of beams	COMPACT			
	Range: 6 - 70 m			
	Art. no.	Article	Description	Connection system
	With cable gland			
300 mm / 4	567314	CT301/4	Transmitter	Cable gland
	568314	CR301/4	Receiver	Cable gland
	With Hirschmann plug			
300 mm / 4	557314	CT301/4/G	Transmitter	Hirschmann plug, 7-pin, straight
	558314	CR301/4/G	Receiver	Hirschmann plug, 7-pin, straight
	577314	CT301/4/W	Transmitter	Hirschmann plug, 7-pin, angled
	578314	CR301/4/W	Receiver	Hirschmann plug, 7-pin, angled
	With MIN-style plug (delivery time: approx. 6 weeks)			
300 mm / 4	587358	CT301/4/BH	Transmitter	MIN-style plug 5-pin
	588358	CR301/4/BH	Receiver	MIN-style plug 7-pin
	589502	CT301/4/BH3	Transmitter	MIN-style plug 3-pin
	589602	CR301/4/BH5	Receiver	MIN-style plug 5-pin
	With M12 plug			
300 mm / 4	567422	CT301/4/M12	Transmitter	M12 plug, 5-pin
	568422	CR301/4/M12	Receiver	M12 plug, 8-pin
	With integrated AS Safety at Work interface			
300 mm / 4	587314	CT301/4/A	Transmitter	Integrated AS-interface
	588314	CR301/4/A	Receiver	Integrated AS-interface





MULTIPLE LIGHT BEAM SAFETY DEVICES

Article info for COMPACT

Type 4 Multiple Light Beam Safety Devices

Article	Description
C.....	COMPACT
C.....L....	COMPACT^{laser}
a	Device type
T	Transmitter
R	Receiver
rrr	Beam distance/range
300	300 mm; range 0 - 18 m
400	400 mm; range 0 - 18 m
500	500 mm; range 0 - 18 m
301	300 mm; range 6 - 70 m
401	400 mm; range 6 - 70 m
501	500 mm; range 6 - 70 m
n	Number of beams
2	2-beam
3	3-beam
4	4-beam (not for COMPACT ^{laser})
t	Connection system
G	Plug with straight cable socket (Hirschmann, DIN 43651)
W	Plug with angled cable socket (Hirschmann, DIN 43651)
GW	Plug without cable socket (Hirschmann, DIN 43651)
BH	MIN-style plug (transmitter, 5-pin; receiver 7-pin)
BH3	Transmitter with MIN-style (BH) plug, 3-pin (MIN Series)
BH5	Receiver with MIN-style (BH) plug, 5-pin (MIN Series)
M12	M12 plug
A	Integrated AS-interface

C a rrr /n /t
C a rrr L /n /t

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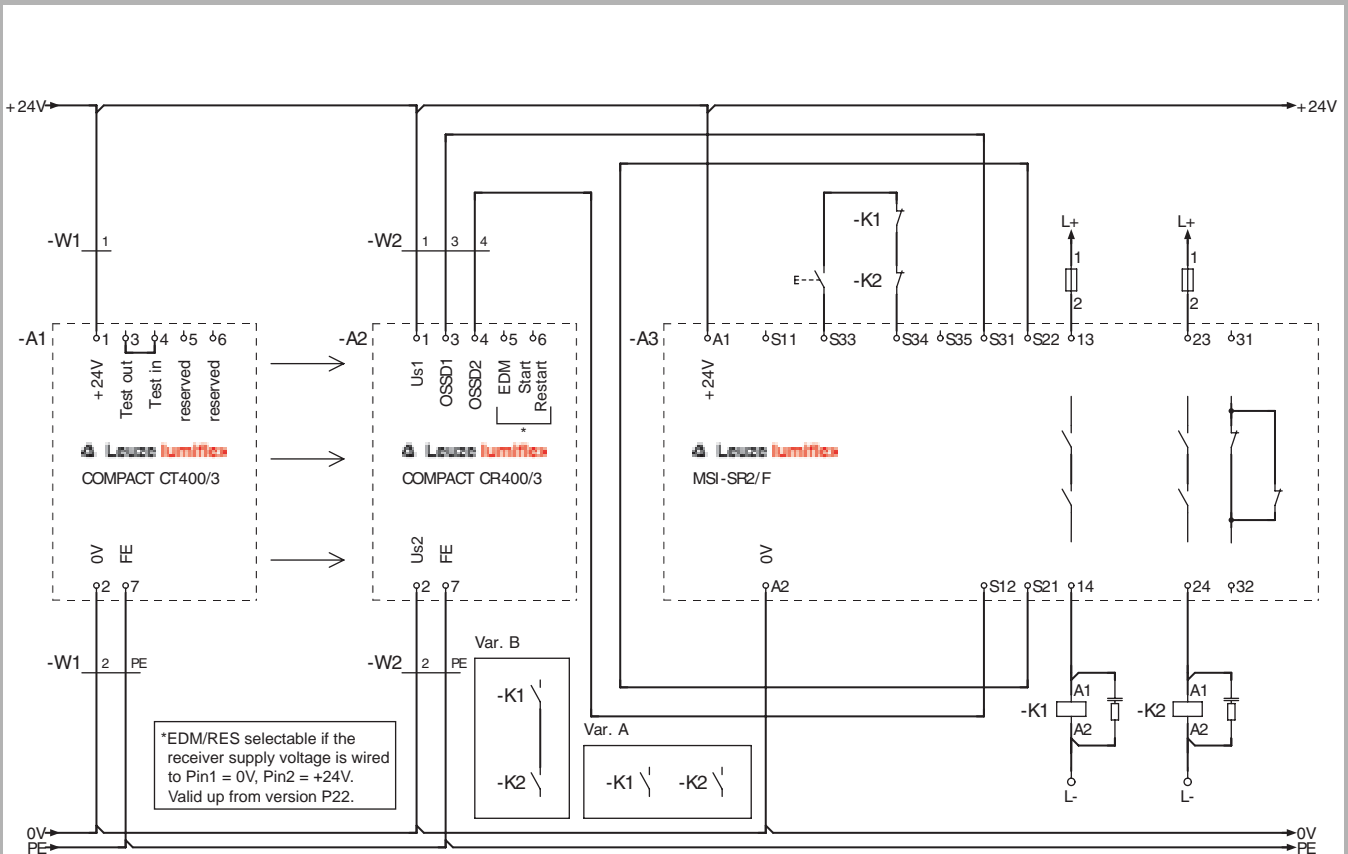
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Electrical connection

COMPACT connection example



COMPACT with Safety Relay MSI-SR2/F

! Please observe the operating instructions of the components!

*) For further connection examples, see chapter
 COMPACT EX2, page 149
 COMPACT/laser, page 246
 AS-interface Safety at Work, page 327





MULTIPLE LIGHT BEAM SAFETY DEVICES

Technical data

General system data			
Safety type in accordance with IEC/EN 61496	Type 4		
Number of beams	2	3	4
Beam distance	500 mm	400 mm	300 mm
Range	Cxx0/y: 0...18 m Cxx1/y: 6.0...70 m		
Response time	5 ms		
Response time (MultiScan)	8 ms		
Beam height above reference plane in accordance with EN 999	400, 900 mm	300, 700, 1100 mm	300, 600, 900, 1200 mm
Supply voltage	24 V DC, $\pm 20\%$		
Connection cable length	Max. 100 m with 0.25 mm ²		
Safety class	III		
Protection rating	IP 65		
Ambient temperature, operation	0...+55 °C		
Ambient temperature, storage	-25...+70 °C		
Relative humidity	15...95 %		
Profile cross-section	52 mm x 55 mm		
Weight per device (length-dependent)	1.30...2.30 kg		
Transmitter			
Current consumption	75 mA		
Connection system	Cable gland (PG13.5), plug-in connection space Hirschmann plug (DIN 43651), 7-pin MIN-style plug (MIN series), 5/3-pin M12 plug, 5-pin M12 plug (AS-i Safety), 3-pin		
Transmitter diodes, class in accordance with EN 60825	1		
Wavelength	880 nm		
Receiver			
Current consumption	100 mA without external load		
Safety-related switching outputs (OSSD)	2 pnp transistor outputs (short circuit-proof, cross-circuit monitored) AS-i Safety interface		
Switching voltage high active	Min. U _v -2 V		
Switching voltage low	Max. 2.8 V		
Switching current	Typical, 250 mA		
Connection system	Cable gland (PG13.5), plug-in connection space Hirschmann plug (DIN 43651), 7-pin MIN-style plug (MIN series), 7/5-pin M12 plug, 8-pin M12 plug (AS-i Safety), 3-pin		

You will find additional information in the COMPACT connecting and operating instructions at www.leuze.com/compact.

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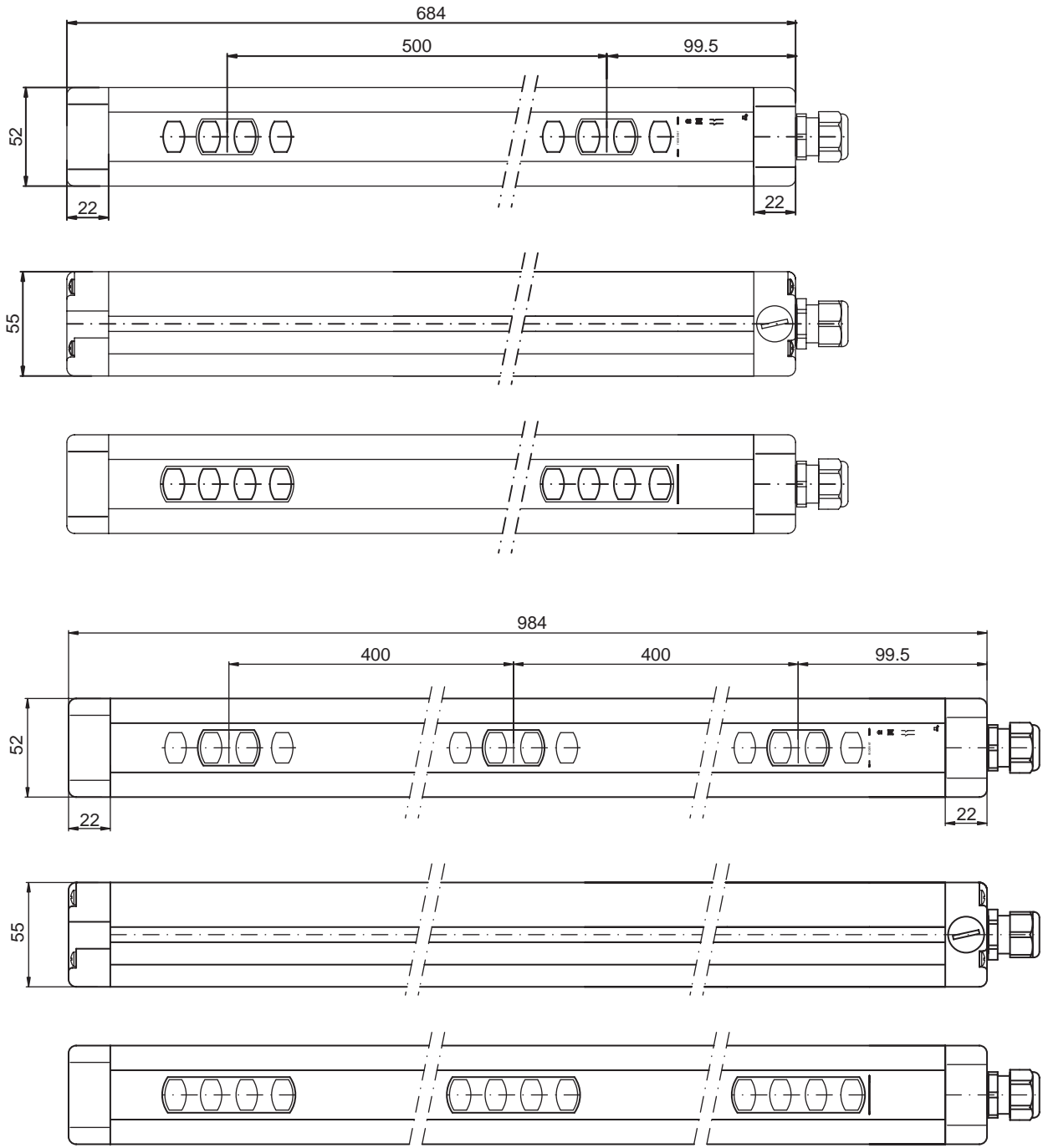
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Dimensional drawings

COMPACT Multiple Light Beam Safety Device



Dimensions in mm

www.leuze.com/compact/

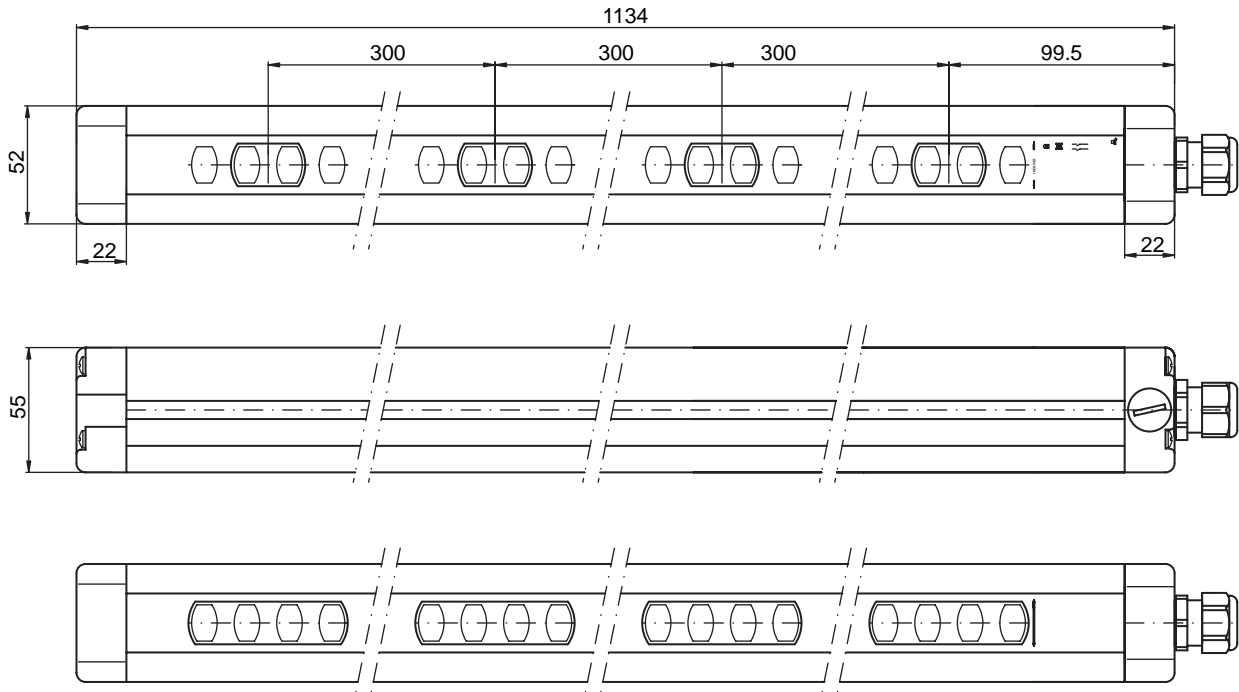




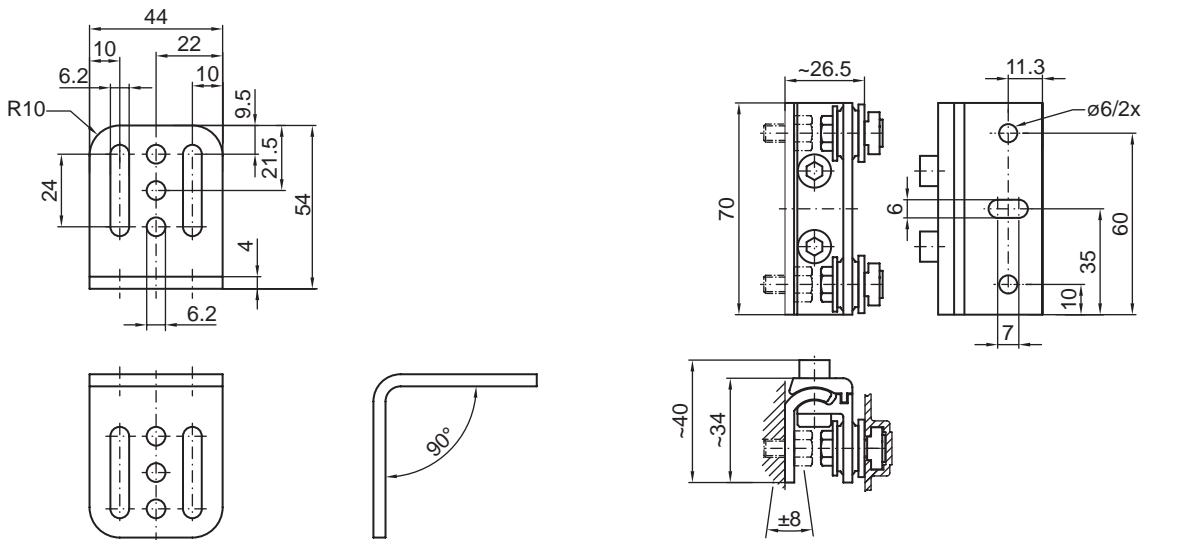
MULTIPLE LIGHT BEAM SAFETY DEVICES

Dimensional drawings

COMPACT Multiple Light Beam Safety Device



Accessories dimensional drawings



L-mounting bracket

Mounting bracket, swiveling with shock absorber

Dimensions in mm

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Accessories ordering information

Art. no.	Article	Description	
Mounting accessories			
560300	BT-SSD	Mounting bracket, swiveling with shock absorber incl. 2 screws and 2 sliding nuts	
560301	BT-SSD-270	Mounting bracket, swiveling with shock absorber, 270 mm, incl. sliding nuts	
560120	BT-S	Mounting set consisting of 2 L-type brackets incl. 2 screws	
425720	BT-NC	Sliding nut	
Deflecting Mirror Columns			Mirror distance/ total height in mm
549702	UMC-1002	Deflecting Mirror Column, 2 alignable individual mirrors	400 / 1360
549703	UMC-1303	Deflecting Mirror Column, 3 alignable individual mirrors	300 / 1360
549704	UMC-1304	Deflecting Mirror Column, 4 alignable individual mirrors	500 / 1660
549756	UMC-1602	Deflecting Mirror Column, 2 alignable individual mirrors	500 / 1660
MagnetKey			
520071	AC-MK1	MagnetKey for laser activation (included in delivery)	
Connection system			Length, design
426040	AC-LDH-T7/GF	Hirschmann cable socket, 7-pin, encoded for CT, incl. crimp contacts	Straight
426041	AC-LDH-R7/GF	Hirschmann cable socket, 7-pin, encoded for CR, incl. crimp contacts	Straight
426050	AC-LDH-T7/WF	Hirschmann cable socket, 7-pin, encoded for CT, incl. crimp contacts	Angled
426051	AC-LDH-R7/WF	Hirschmann cable socket, 7-pin, encoded for CR, incl. crimp contacts	Angled
Laser alignment aids			
560020	LA-78U	Laser alignment aid for lateral mounting with use for COMPACT/COMPACT <i>plus</i> /ROBUST/ECO/SOLID	
520004	LA-78UDC	Laser alignment aid with ROBUST/COMPACT/COMPACT <i>plus</i> application with UDC-mounting column	

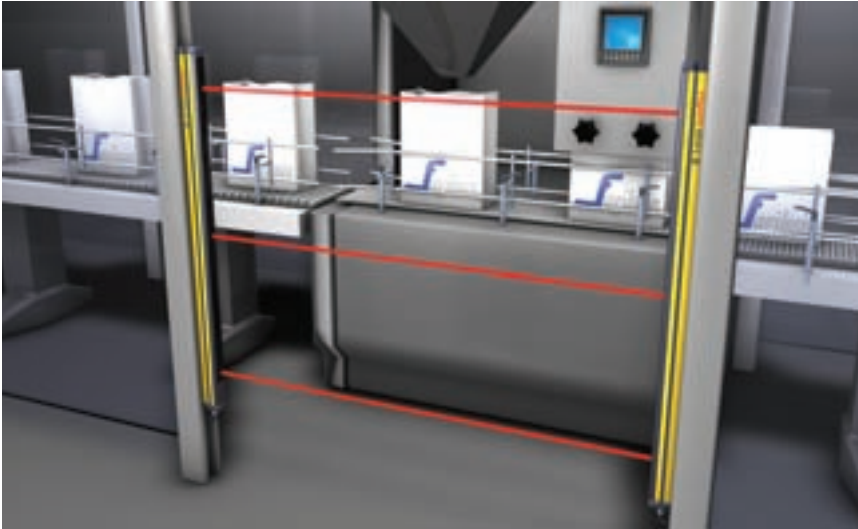
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MULTIPLE LIGHT BEAM SAFETY DEVICES

COMPACT EX2



COMPACT EX2 *Multiple Light Beam Safety Device on a re-filling system*

Typical areas of application

Can be used in zone 2 (gases) and zone 22 (flammable, non-conductive dusts)

- Re-filling systems for powdered substances
- Painting lines, e.g. in the automotive industry
- Chemical processes

Devices and protective systems must meet special requirements with use in explosion-risk areas. COMPACT EX2 with the "non-sparking" ignition protection type and special precautions on the transmitter and receiver housing is available in different models for these types of applications, i.e. for use in Ex zone 2 (gases) and in Ex zone 22 (flammable, non-conductive dusts) – with the typical advantages of the COMPACT series with regard to interference immunity and availability. In addition to the requirements of machine safety, COMPACT EX2 also satisfies the provisions of ATEX Directive 94/9/EC. Reinforced connecting front screens ensure that the housing remains sealed with mechanical influences, e.g. an impact or blow of some kind. Metal bushings enclose the cables suitable for explosion-risk areas, which are to be provided by the customer. COMPACT EX2 can be used in industrial applications, however it cannot be used in pits. The device complies as an electrical apparatus of Ex device group II, Ex category 3.

COMPACT EX2

Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 4	
Number of beams	2	3
Beam distance	500 mm	400 mm
Range	0.8...18 m	
SingleScan response time	5 ms	
Profile cross-section	52 mm x 55 mm	
Safety-related switching outputs (OSSD)	2 pnp transistor outputs	
Connection system	Cable gland	
Ex device group	II	
Ex device category	3	
Temperature class	T4	
Permissible ignition temperature	T > 135 °C	
Ignition protection type	"nA" non-sparking	
Transmitter		
Wavelength	880 nm	

You will find additional information in the COMPACT connecting and operating instructions and supplementary COMPACT EX2 instructions at www.leuze.com/compact-ex2.

Functions

See chapter COMPACT, page 223, however without internal EDM / RES

Functional extensions

See chapter COMPACT, page 223, however without internal EDM / RES

Special features

- **Type 4, suitable for safety category 4**
- **Complies with ATEX Directive 94/9/EC**
- **Fault-free operation of adjacent devices with selection of different transmission channels**
- **Maintenance-free with safety transistor outputs (OSSDs)**
- **Ignition protection type, "nA" non-sparking**

COMPACT EX2 specification plate with info as electrical equipment:

- Ex II 3 G - EEx II nA T4 (gases)
- Ex II 3 D 135 °C (flammable, non-conductive dusts)

For explanations, see www.leuze.com/atex.



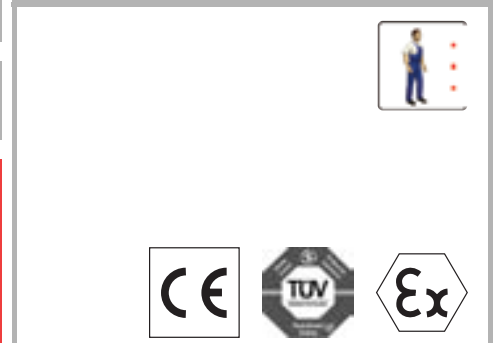
Machine Safety Services

Safety Engineering Software

Safety Laser Scanners

Safety Light Curtains

Properties



Multiple Light Beam Safety Devices

Single Light Beam Safety Devices

Further information Page

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AS-interface Safety at Work

PROFIsafe Sensors



Safety Switches and Safety Locking Devices



MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

COMPACT EX2, consisting of transmitter and receiver
Included in delivery: 4 sliding nuts, 2 bracket sets BT-S,
1 COMPACT connecting and operating instructions manual and
1 supplementary COMPACT EX2 connecting and operating in-
structions manual

Functions: Automatic start/restart, selectable transmis-
sion channels, MultiScan

Beam distance/ number of beams	COMPACT EX2			
	Range: 0.8 - 18 m			
	Art. no.	Article	Description	Connection system
	Cable gland			
500 mm / 2	569170	CT500/2-EX2	Transmitter	Cable gland
	569171	CR500/2-EX2	Receiver	Cable gland
400 mm / 3	569172	CT400/3-EX2	Transmitter	Cable gland
	569173	CR400/3-EX2	Receiver	Cable gland

Electrical connection

COMPACT EX2 connection example

See chapter, COMPACT, page 231

! With explosion-risk applications the MSI Safety Relay or MSI safety interfaces must be installed outside the explosion-risk zone. The connection cables to be provided by the customer must comply with the local explosion-risk applicable provisions and must have an external diameter of 8 mm to 11 mm. They must be laid in such a way that possible damages are prevented.
The user standards EN 60679-14 (for gases) or EN 50281-1-2 (for dusts) must be observed.

Dimensional drawings

See chapter, COMPACT, page 233

Accessories dimensional drawings

See chapter, COMPACT, page 234

! A laser alignment aid may only be used if explosion-risk conditions are not prevalent.

Accessories ordering information

See chapter, COMPACT, page 235

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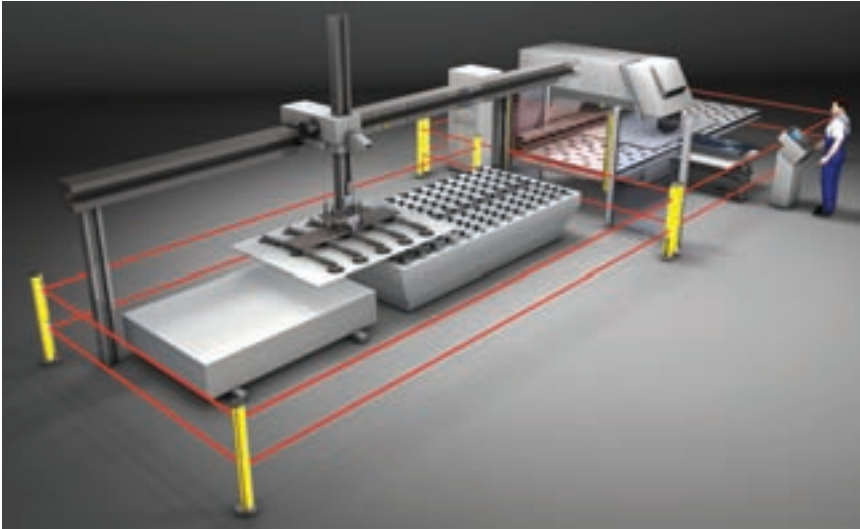


www.leuze.com/compact-ex2/



MULTIPLE LIGHT BEAM SAFETY DEVICES

COMPACTlaser



The integrated laser alignment aid of the COMPACTlaser simplifies the alignment of the Deflecting Mirrors with multiple-side guarding

Typical areas of application

- Access guarding, e.g. on robots, automatic processing centers, palletizer systems
- Perimeter guarding, e.g. on laser and punching machines

Where ever multiple-side guarding of machines is required, without restricting the machine's accessibility, safety light beam devices together with Deflecting Mirror Columns are an effective, safe and economical solution. Type 4 Multiple Light Beam Safety Devices of the COMPACT series have also been fitted with integrated red light alignment lasers per beam in order to meet customer requirements after the shortest possible start-up time, and to also provide maximum alignment quality at the same time. The high availability is one of the major strong points of the COMPACT type 4 Multiple Light Beam Safety Device in accordance with IEC/EN 61496. A well-thought through accessories range, consisting of Deflecting Mirror Columns with integrate spirit levels for leveling and clear and concise alignment instructions round off the COMPACT complete solution. The scope of function can be flexibly extended via external interface modules of the MSI series. With the numerous COMPACT series, which are all based on the same proven technical platform, many applications can be implemented with an optimum price/performance ratio.

COMPACTlaser

Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 4	
Number of beams	2	3
Beam distance	500 mm	400 mm
Range	6...70 m	
Profile cross-section	52 mm x 55 mm	
Safety-related switching outputs (OSSD)	2 pnp transistor outputs AS-i Safety interface	
Connection system	Cable gland (PG13.5) Hirschmann plug M12 plug M12 plug (AS-i Safety)	
Transmitter		
Laser protection class in accordance with EN 60825	2	
Laser wavelength	650 nm	
Power	< 1 mW	

You will find more information in the COMPACT connecting and operating instructions at www.leuze.com/compactlaser.

Functions

See chapter, COMPACT, page 223

Functional extensions

See chapter, COMPACT, page 223

Special features

- **Very fast start-up (initial operation) with red light alignment laser per beam and attachable alignment templates. Can also be performed by the machine operator, e.g. with structural changes.**
- **Easy pre-alignment of the Deflecting Mirror Columns with integrated spirit levels, combined with high alignment quality for maximum light beam device payload signal, and therefore maximum system availability**
- **Automatic resetting of the Deflecting Mirror Columns after mechanical impacts/blows with special spring elements**
- **Transistor output or AS-i Safety interface available**
- **70 m range**



Properties



Further information

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● Ordering information	242
● Electrical connection	246
● Technical data	232
● Dimensional drawings	247
● Accessories dimensional drawings	249
● Accessories ordering information, see chapter, COMPACT	235
● COMPACT	222





MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

COMPACTlaser, consisting of transmitter and receiver
Included in delivery: 4 sliding nuts, 1 connecting and operating
instructions manual With mounting in UDC mounting columns:
With drill hole template and high-grade -floor anchors

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

Beam distance/ number of beams	COMPACTlaser			
	Range: 6 - 70 m			
	Art. no.	Article	Description	Connection system
500 mm / 2	With cable gland			
	568600	CT501L/2	Transmitter with integrated laser alignment aid	Cable gland
	568601	CR501L/2	Receiver	Cable gland
	568700	CT501L/2-UDC	Transmitter with integrated laser alignment aid, mounted in UDC mounting column	Cable gland
	568701	CR501L/2-UDC	Receiver, mounted in UDC mounting column	Cable gland
500 mm / 2	With Hirschmann plug			
	568604	CT501L/2/GW	Transmitter with integrated laser alignment aid	Hirschmann plug, 7-pin
	568605	CR501L/2/GW	Receiver	Hirschmann plug, 7-pin
	568704	CT501L/2/GW-UDC	Transmitter with integrated laser alignment aid, mounted in UDC mounting column	Hirschmann plug, 7-pin
	568705	CR501L/2/GW-UDC	Receiver, mounted in UDC mounting column	Hirschmann plug, 7-pin
500 mm / 2	With MIN-style plug (delivery time: approx. 6 weeks)			
	568612	CT501L/2/BH	Transmitter with integrated laser alignment aid	MIN-style plug 5-pin
	568613	CR501L/2/BH	Receiver	MIN-style plug 7-pin
	568712	CT501L/2/BH-UDC	Transmitter with integrated laser alignment aid, mounted in UDC mounting column	MIN-style plug 5-pin
	568713	CR501L/2/BH-UDC	Receiver, mounted in UDC mounting column	MIN-style plug 7-pin
	568622	CT501L/2/BH3	Transmitter with integrated laser alignment aid	MIN-style plug 3-pin
	568623	CR501L/2/BH5	Receiver	MIN-style plug 5-pin
	568722	CT501L/2/BH3-UDC	Transmitter with integrated laser alignment aid, mounted in UDC mounting column	MIN-style plug 3-pin
	568723	CR501L/2/BH5-UDC	Receiver, mounted in UDC mounting column	MIN-style plug 5-pin
500 mm / 2	With M12 plug			
	567429	CT501L/2/M12	Transmitter	M12 plug, 5-pin
	568429	CR501L/2/M12	Receiver	M12 plug, 8-pin

COMPACTlaser device without mounting column required for each swiveling mounting bracket, BT-SSD-270!

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Ordering information

COMPACTlaser, consisting of transmitter and receiver
 Included in delivery: 4 sliding nuts, 1 connecting and operating
 instructions manual With mounting in UDC mounting columns:
 With drill hole template and high-grade -floor anchors

Functions: Automatic start/restart, selectable
 transmission channels, MultiScan

Beam distance/ number of beams	COMPACTlaser			
	Range: 6 - 70 m			
	Art. no.	Article	Description	Connection system
500 mm / 2	With integrated AS Safety at Work interface			
	589512	CT501L/2/A	Transmitter with integrated laser alignment aid	Integrated AS-interface
	589612	CR501L/2/A	Receiver	Integrated AS-interface
	568708	CT501L/2/A-UDC	Transmitter with integrated laser alignment aid, mounted in UDC mounting column	Integrated AS-interface
	568709	CR501L/2/A-UDC	Receiver, mounted in UDC mounting column	Integrated AS-interface

COMPACTlaser device without mounting column required for each swiveling mounting bracket, BT-SSD-270!





MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

COMPACTlaser, consisting of transmitter and receiver
 Included in delivery: 4 sliding nuts, 1 connecting and operating instructions manual With mounting in UDC mounting columns:
 With drill hole template and high-grade -floor anchors

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

Beam distance/ number of beams	COMPACTlaser			
	Range: 6 - 70 m			
	Art. no.	Article	Description	Connection system
400 mm / 3	With cable gland			
	568602	CT401L/3	Transmitter with integrated laser alignment aid	Cable gland
	568603	CR401L/3	Receiver	Cable gland
	568702	CT401L/3-UDC	Transmitter with integrated laser alignment aid, mounted in UDC mounting column	Cable gland
	568703	CR401L/3-UDC	Receiver, mounted in UDC mounting column	Cable gland
400 mm / 3	With Hirschmann plug			
	568606	CT401L/3/GW	Transmitter with integrated laser alignment aid	Hirschmann plug, 7-pin
	568607	CR401L/3/GW	Receiver	Hirschmann plug, 7-pin
	568706	CT401L/3/GW-UDC	Transmitter with integrated laser alignment aid, mounted in UDC mounting column	Hirschmann plug, 7-pin
	568707	CR401L/3/GW-UDC	Receiver, mounted in UDC mounting column	Hirschmann plug, 7-pin
400 mm / 3	With MIN-style plug (delivery time: approx. 6 weeks)			
	568614	CT401L/3/BH	Transmitter with integrated laser alignment aid	MIN-style plug 5-pin
	568615	CR401L/3/BH	Receiver	MIN-style plug 7-pin
	568714	CT401L/3/BH-UDC	Transmitter with integrated laser alignment aid, mounted in UDC mounting column	MIN-style plug 5-pin
	568715	CR401L/3/BH-UDC	Receiver, mounted in UDC mounting column	MIN-style plug 7-pin
	568624	CT401L/3/BH3	Transmitter with integrated laser alignment aid	MIN-style plug 3-pin
	568625	CR401L/3/BH5	Receiver	MIN-style plug 5-pin
	568724	CT401L/3/BH3-UDC	Transmitter with integrated laser alignment aid, mounted in UDC mounting column	MIN-style plug 3-pin
	568725	CR401L/3/BH5-UDC	Receiver, mounted in UDC mounting column	MIN-style plug 5-pin

COMPACTlaser device without mounting column required for each swiveling mounting bracket, BT-SSD-270!

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Ordering information

COMPACTlaser, consisting of transmitter and receiver
 Included in delivery: 4 sliding nuts, 1 connecting and operating
 instructions manual With mounting in UDC mounting columns:
 With drill hole template and high-grade -floor anchors

Functions: Automatic start/restart, selectable
 transmission channels, MultiScan

Beam distance/ number of beams	COMPACTlaser			
	Range: 6 - 70 m			
	Art. no.	Article	Description	Connection system
400 mm / 3	With integrated AS-interface			
	568610	CT401L/3/A	Transmitter with integrated laser alignment aid	Integrated AS-interface
	568611	CR401L/3/A	Receiver	Integrated AS-interface
	568710	CT401L/3/A-UDC	Transmitter with integrated laser alignment aid, mounted in UDC mounting column	Integrated AS-interface
	568711	CR401L/3/A-UDC	Receiver, mounted in UDC mounting column	Integrated AS-interface

COMPACTlaser device without mounting column required for each swiveling mounting bracket, BT-SSD-270!

Article info for COMPACT

See type 4 COMPACT Multiple Light Beam Safety Device article info, page 210

www.leuze.com/compactlaser/

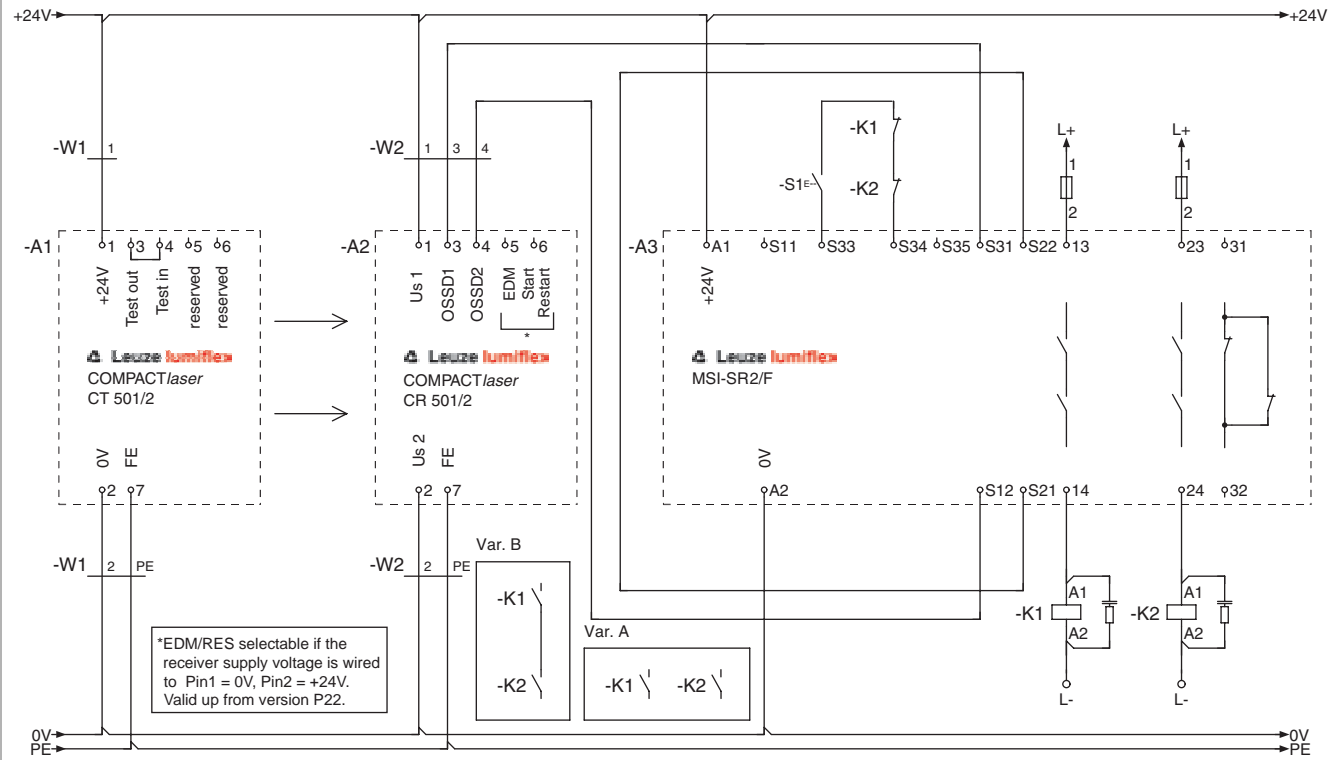




MULTIPLE LIGHT BEAM SAFETY DEVICES

Electrical connection

COMPACTlaser connection example

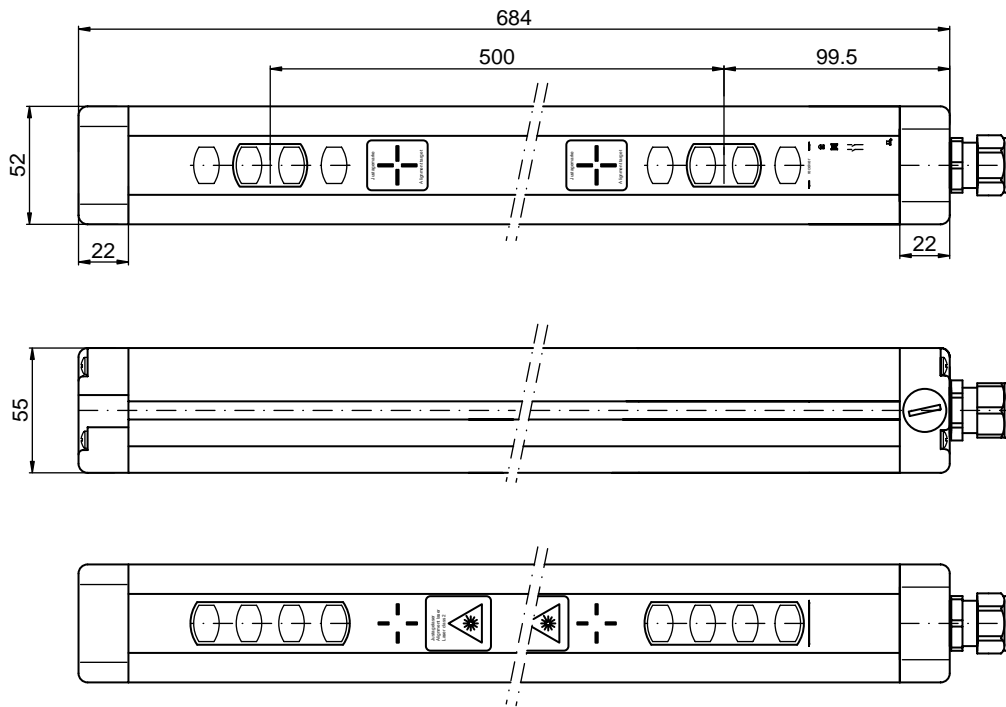


COMPACTlaser with Safety Relay MSI-SR2/F

Please observe the operating instructions of the components!

Dimensional drawings

CR501L/2 Receiver and CT501L/2 Transmitter

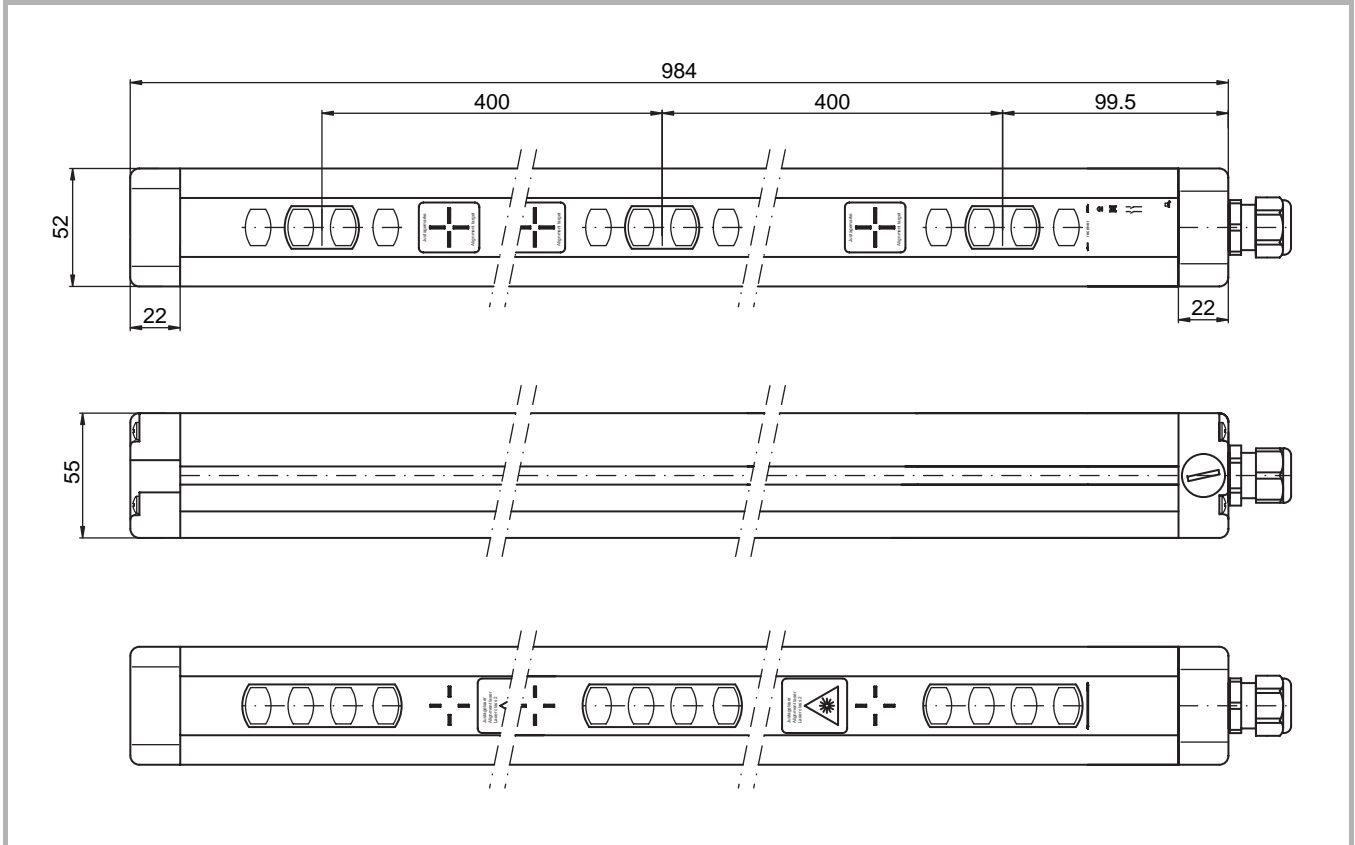




MULTIPLE LIGHT BEAM SAFETY DEVICES

Dimensional drawings

CR401L/3 Receiver and CT401L/3 Transmitter



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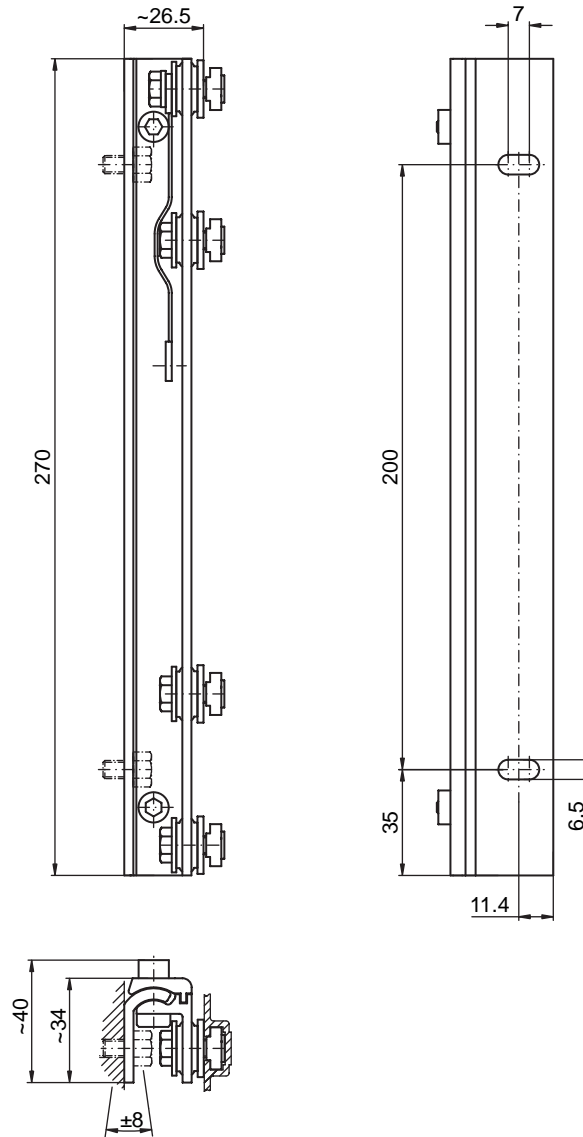
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Accessories dimensional drawings

Mounting bracket, swiveling with shock absorber, BT-SSD-270



Dimensions in mm

Accessories ordering information

See chapter, COMPACT, page 235



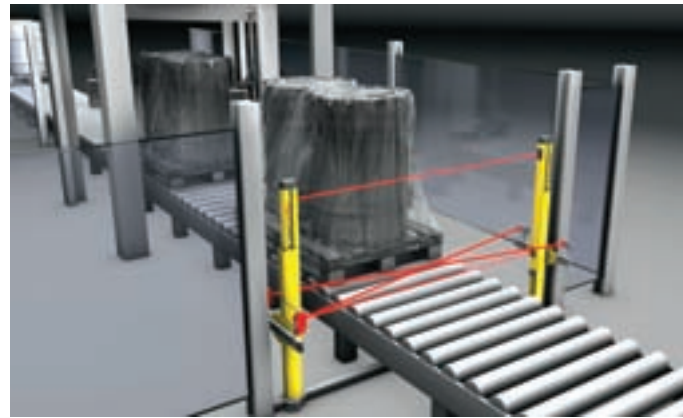


MULTIPLE LIGHT BEAM SAFETY DEVICES

OVERVIEW

ROBUST 42, 43, 44 selection table

Selection table



High functional reliability: ROBUST systems provide reliable protection, with pallet wrappers, for example

ROBUST Multiple Light Beam Safety Devices are available in two different series – in accordance with IEC/EN 61496 as type 4 devices (ROBUST 42, 43, 44), and as type 2 devices (ROBUST 22, 23, 24 in combination with a Test Monitoring Unit).

The ROBUST series also guarantees safe and reliable operation with extreme environmental conditions and in a temperature range from -25 to +55 C. The sensors are characterized by a stable, warp-resistant extruded aluminium profile, protection rating up to IP 67 and an integrated optics heating. ROBUST devices can be flexibly extended with MSI safety interface modules, e.g. for muting applications. This applies for both the transmitter/receiver model and for the transceiver construction, with which the transmitter and receiver are both housed in the same housing.

Safety category, IEC/EN61496	Beam distance in mm/ number of beams	Range in m	Features, type-dependent										Article	Page	
			RRT Transceiver (active/passive)	RT Transmitter / RR Receiver	RES / EDM, external	Muting functions, external	Parallel Muting connection box	Serial/Parallel Muting connection box	Safety Relay outputs	Cable gland	Hirschmann plug	M12 plug			Integrated muting indicator
Type 4	500/2	0.5 - 2.5	●		1) 2)				●	●				RRT42	PM2-500
			●		1) 2)				●	●		●		RRT42.3	PM2-500
			●		2) 2)	●			●	●				RRT42-MCB-2.1	PM2-500
			●		2) 2)	●			●	●		●		RRT42.3-MCB-2.1	PM2-500
			●		2) 2)		●		●	●		●		RRT42.3-MCB-4.1	PM2-500
			●		1) 2)				●			●		RRT42.6	PM2-500
		1.5 - 8	●					●		●				RRT42.G	PM2-500
			●		3)						●	●		RRT42/A	PM2-500
			●		1) 2)				●	●				RRT42	PM2-500V
			●		1) 2)				●	●		●		RRT42.3	PM2-500V
			●		2) 2)	●			●	●				RRT42-MCB-2.1	PM2-500V
			●		2) 2)	●			●	●		●		RRT42.3-MCB-2.1	PM2-500V
	0.5 - 50	●		2) 2)			●	●		●			RRT42.3-MCB-4.1	PM2-500V	
		●		1) 2)					●		●		RRT42.6	PM2-500V	
		●						●		●			RRT42.G	PM2-500V	
		●		3)						●	●		RRT42/A	PM2-500V	
		●		1)				●	●				RRT42	AMI42	
		●		1)				●		●			RRT42.6	AMI42.1	
	400/3	0.5 - 2.5	●	1) 2)			●	●					RT43	RR43	
			●	1) 2)			●	●		●			RT43.6	RR43.6	
		1.5 - 8	●	1) 2)			●	●					RRT44	PM4-300	
	300/4	0.5 - 2.5	●	3)						●	●		RRT44/A	PM4-300	
			●	1) 2)			●	●					RRT44	PM4-300V	
		1.5 - 8	●	3)						●	●		RRT44/A	PM4-300V	

1) RES and EDM with MSI-SR2/F, page 404 or MSI-s/R, page 420
 2) RES, EDM and muting with MSI-m/R or MSI-mx/Rx, page 432
 3) RES and EDM with AS-i safety monitor, page 324

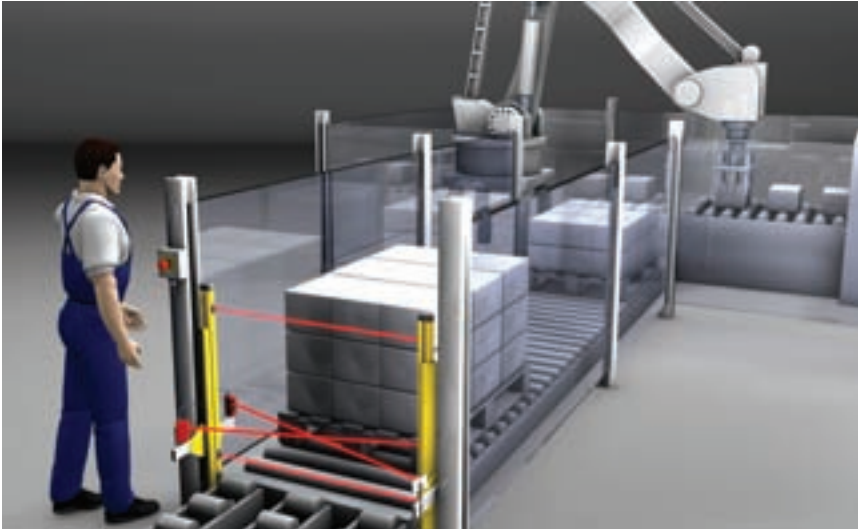


Machine Safety
 Machine Safety Services
 Safety Engineering Software
 Safety Laser Scanners
 Safety Light Curtains
 Multiple Light Beam Safety Devices
 Single Light Beam Safety Devices
 AS-interface Safety at Work
 PROFIsafe Sensors
 Safety Switches and Safety Locking Devices



MULTIPLE LIGHT BEAM SAFETY DEVICES

ROBUST 42, 43, 44



Flexible integration: ROBUST Multiple Light Beam Safety Device application with a palletizer robot

In difficult industrial conditions, functional reliability and dependability are especially important with opto-electronic protective devices. In addition to their flexible applicability, the ROBUST safety light beam devices have been designed for precisely these requirements (IP 67 protection rating). The 42, 43 and 44 series enable the implementation of a type 4 protective device in accordance with IEC/EN 61496 – 2-beam (RRT42), 3-beam (RT/RR43) and 4-beam (RRT44). The 2-beam and 4-beam safety light devices, ROBUST RRT42 and RRT44 form a functional unit in combination with a Deflecting Mirror, whereby both transmitter and receiver system are housed in one shared housing (transceiver). With the 3-beam ROBUST, the RT43 Transmitter and RR43 Receiver form a functional unit with separate transmitter and receiver housing. The ROBUST MCB models enable direct connection of muting sensors and muting indicator.

Typical areas of application

- Area guarding on machines and systems and access guarding on robots, e.g. welding robots
- Production lines, transfer lines
- Rear area guarding on pressure forming presses
- Packaging machinery, palletizers, wrapping machinery, plastic and rubber machinery, concrete and stoneware machinery, etc.

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Important technical data, overview

Safety type in accordance with IEC/EN 61496		Type 4		
Number of beams		2	3	4
Beam distance		500 mm	400 mm	300 mm
Range in comb. with	PM2-500:	0.5 m - 2.5 m	50 m	PM4-300: 0.5 m - 2.5 m PM4-300V: 1.5 m - 8.0 m
	PM2-500V: AMI42:	1.5 m - 8.0 m 50 m		
Protection rating		IP 67 (IP 65 for models with integrated lamps)		
Temperature range, operation		-25...+55 °C		
Temperature range, storage		-30...+70 °C		
Profile cross-section		52 mm x 57 mm		
Safety Switching outputs (OSSDs)		2 relay outputs, AS-i Safety interface		
Connection system (type-dependent)		Cable gland Hirschmann plug M12 plug (AS-i Safety interface)		

Functions

Automatic start/restart
Integrated optics heating

Functional extensions

With safety interface	Relay output	RES	EDM	Muting	Double muting	Further details
MSI-SR2/F	●	●	●			P. 404
MSI-m	●	●	●	●		P. 432
MSI-mx	●	●	●	●	●	P. 432

Special features

- Integrated optics heating for use with extreme environmental conditions
- Protection rating: IP 67
- Glass optics with spacing bolts for mounting laser alignment aid
- Switching outputs with positive-guided Safety Relay contacts
- Muting in combination with safety interfaces, MSI-m, MSI-mx
- MCB 2.1 and MCB 4.1 with integrated muting sensor connection
- Models with integrated muting indicator
- Models with integrated AS-interface



Machine Safety Services

Safety Engineering Software

Safety Laser Scanners

Safety Light Curtains

Properties



Multiple Light Beam Safety Devices

Single Light Beam Safety Devices

Further information

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● Accessories ordering information	267

AS-interface Safety at Work

PROFIsafe Sensors

Safety Switches and Safety Locking Devices



MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

ROBUST 42, 43, 44, consisting of transmitter and receiver, and 1 RRT42 or RRT44 Transceiver.

Note: Either the passive Deflecting Mirrors PM2 or PM4, or with large ranges, the active Deflecting Mirrors, AMI42, are required for operating ROBUST Transceivers

Included in delivery: With RR/RT 4 sliding nuts, 2 bracket sets BT-S, and with RRT 2 sliding nuts and 1 bracket set BT-S, 1 connecting and operating instructions manual

Functions: Automatic start/restart, optics heating, LED-display, optional muting sensor connection

Beam distance/ number of beams	ROBUST			
	Range: Type-dependent			
	Art. no.	Article	Description	Connection system
500 mm / 2	ROBUST 42			
	50029527	RRT42	Transceiver	Cable gland
	909681	RRT42.3	Transceiver with integrated lamp	Cable gland
	909692	RRT42.6	Transceiver	M12 plug
	909685	RRT42/G	Transceiver	Hirschmann plug
	909679	RRT42.3-MCB-2.1	Transceiver with integrated muting connection box (MCB) for Parallel Muting, connection for start/restart button and Muting indicator	Cable gland
	909678	RRT42.3-MCB-4.1	Transceiver with integrated muting connection box (MCB) for Sequential Muting, connection for start/restart button and muting indicator	Cable gland
	909696	RRT42-MCB-2.1	Transceiver for Parallel Muting, connection for start/restart button	Cable gland
	50029088	PM2-500	Passive Deflecting Mirror, range 0.5 - 2.5 m	
	909661	PM2-500V	Passive Deflecting Mirror, range 1.5 - 8 m	
	50029087	AMI42	Active Deflecting Mirror, range 0.5 - 50 m	Cable gland
	909695	AMI42.1	Active Deflecting Mirror, range 0.5 - 50 m	M12 plug
400 mm / 3	ROBUST 43			
	50029085	RT43	Transmitter	Cable gland
	50029086	RR43	Receiver	Cable gland
	909697	RT43.6	Transmitter, range 50 m	M12 plug
909698	RR43.6	Receiver, range 50 m	M12 plug	
300 mm / 4	ROBUST 44			
	50029569	RRT44	Transceiver	Cable gland
	50029570	PM4-300	Passive Deflecting Mirror, range 0.5 - 2.5 m	
909663	PM4-300V	Passive Deflecting Mirror, range 1.5 - 8 m		

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ROBUST 22-24
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Ordering information

ROBUST 42, 43, 44, consisting of transmitter and receiver, and 1 RRT42 or RRT44 Transceiver

Note: Either the passive Deflecting Mirrors PM2 or PM4, or with large ranges, the active Deflecting Mirrors, AMI42, are required for operating ROBUST Transceiver

Included in delivery: With RR/RT 4 sliding nuts, 2 bracket sets BT-S, and with RRT 2 sliding nuts and 1 bracket set BT-S, 1 connecting and operating instructions manual

Functions: Automatic start/restart, optics heating, LED-display, optional muting sensor connection

Beam distance/ number of beams	ROBUST/AS-i			
	Range: Type-dependent			
	Art. no.	Article	Description	Connection system
500 mm / 2	ROBUST 42/A			
	580010	RRT42/A	Transceiver	M12 plug, integrated AS-interface
	50029088	PM2-500	Passive Deflecting Mirror, range 0.5 - 2.5 m	
	909661	PM2-500V	Passive Deflecting Mirror, range 1.5 - 8 m	
300 mm / 4	ROBUST 44/A			
	580011	RRT44/A	Transceiver	M12 plug, integrated AS-interface
	50029570	PM4-300	Passive Deflecting Mirror, range 0.5 - 2.5 m	
	909663	PM4-300V	Passive Deflecting Mirror, range 1.5 - 8 m	

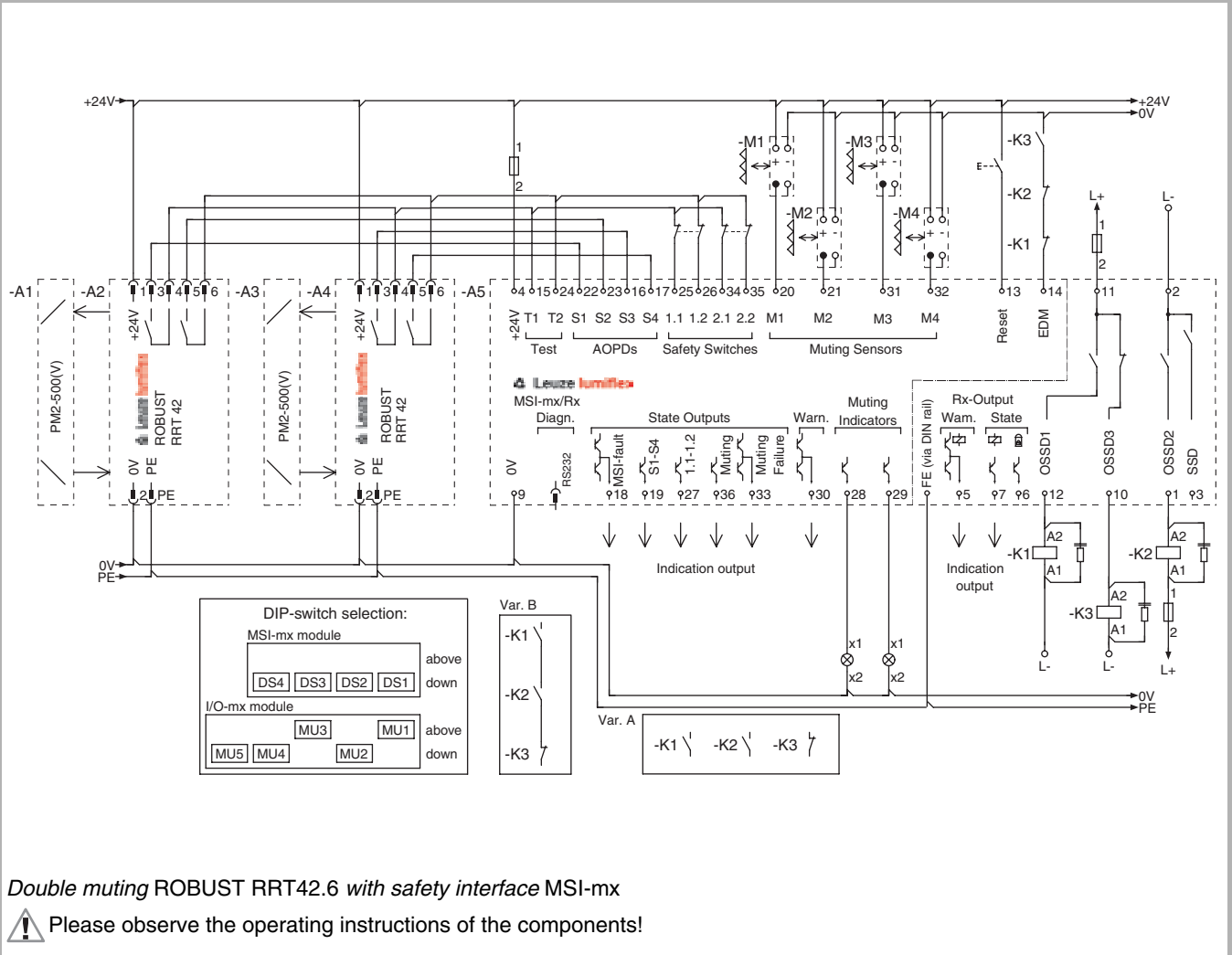




MULTIPLE LIGHT BEAM SAFETY DEVICES

Electrical connection

ROBUST 42, 43, 44 connection example



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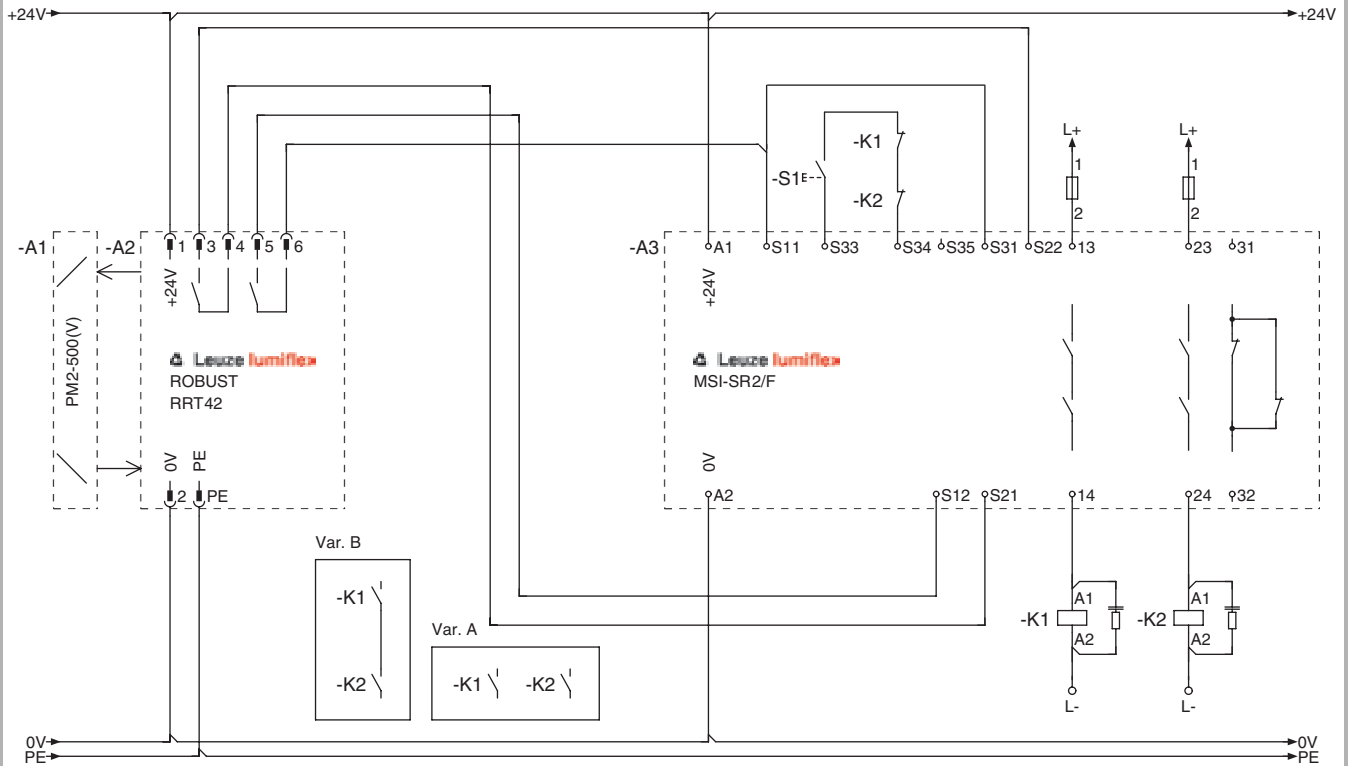
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Electrical connection

ROBUST 42, 43, 44 connection example



ROBUST RRT42 connected to a Safety Relay SR2/F

! Please observe the operating instructions of the components!





MULTIPLE LIGHT BEAM SAFETY DEVICES

Technical data

General system data			
Safety type in accordance with IEC/EN 61496	Type 4		
Number of beams	2 (transceiver)	3 (transmitter/receiver)	4 (transceiver)
Beam distance	500 mm	400 mm	300 mm
Range	PM2-500: 0.5 m - 2.5 m PM2-500V: 1.5 m - 8.0 m AMI42: 50 m	50 m	PM4-300: 0.5 m - 2.5 m PM4-300V: 1.5 m - 8.0 m
Response time	20 ms		
Beam heights above reference level in acc. with EN 999	400, 900 mm	300, 700, 1100 mm	300, 600, 900, 1200 mm
Supply voltage	24 V DC, ±15 %		
Connection cable length	Max. 100 m with 0.25 mm ²		
Safety class	I		
Protection rating	IP 67 (IP 65 for models with integrated lamps)		
Ambient temperature, operation	-25...+55 °C		
Ambient temperature, storage	-30...+70 °C		
Relative humidity	15...95 %		
Profile cross-section	52 mm x 57 mm		
Weight per device (length-dependent)	0.90...2.10 kg		
RRT42 Transceiver (2-beam):			
Current consumption	Approx. 280 mA		
Safety-related switching outputs (OSSD, type-dependent)	2 relay outputs (make), AS-i Safety interface		
Switching voltage	Max. 250 V AC/DC with PG11, with plug connection, 42 V AC/DC		
Switching current	Max. 4 A with PG11, 2 A with M12 connection		
Connection system	Cable gland (PG11) Hirschmann plug M12 plug, 8-pin M12 plug (AS-i Safety), 4-pin		

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Technical data

RT43 Transmitter (3-beam)	
Transmitter diodes, class in accordance with EN 60825	1
Wavelength	880 nm
Current consumption	Approx. 200 mA
Connection system	Cable gland (PG11) M12 plug, 5-pin
RR43 Receiver (3-beam)	
Current consumption	Approx. 300 mA without external load
Safety-related switching outputs (OSSD)	2 relay outputs (make)
Switching voltage	Max. 250 V AC/DC with PG11, with plug connection, 42 V AC/DC
Switching current	Max. 4 A with PG11, 2 A with M12 connection
Connection system	Cable gland (PG11) M12 plug, 8-pin
RRT44 Transceiver (4 beam)	
Current consumption	Approx. 350 mA
Safety-related switching outputs (OSSD)	2 relay outputs (make)
Switching voltage	Max. 250 V AC/DC with PG11, otherwise 42 V AC/DC
Switching current	Max. 4 A with PG11, 2 A with M12 connection
Connection system	Cable gland (PG11) M12 plug (AS-i Safety), 4-pin

You will find additional information in the ROBUST 42, 43, 44 connecting and operating instructions at www.leuze.com/robust4.

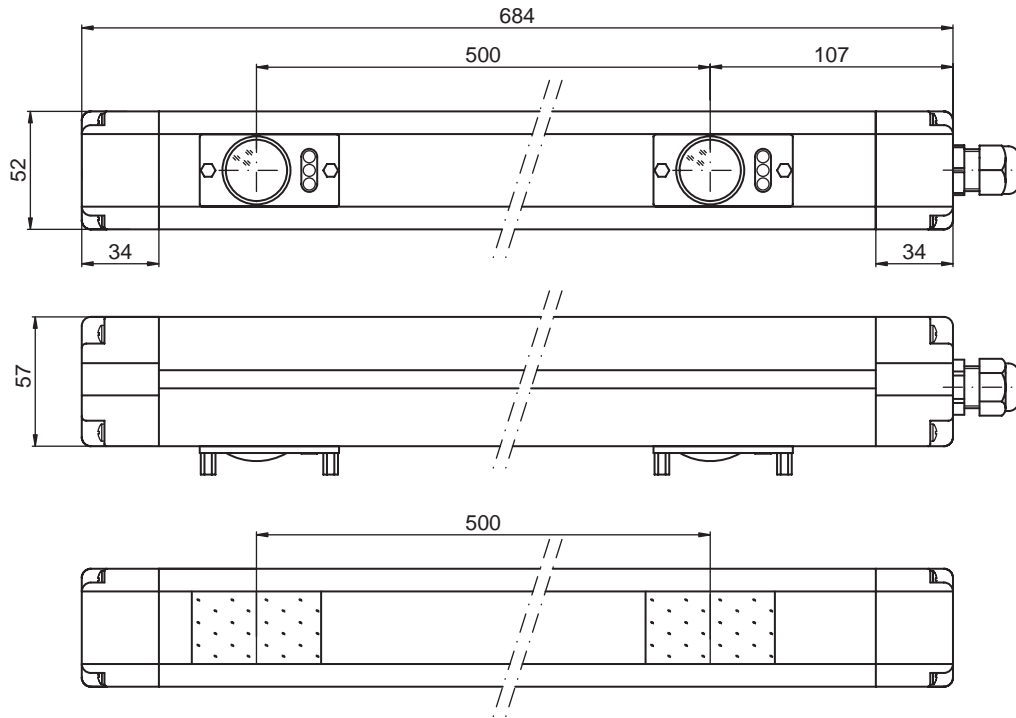




MULTIPLE LIGHT BEAM SAFETY DEVICES

Dimensional drawings

ROBUST Transceiver RRT42, PM2-500(V)



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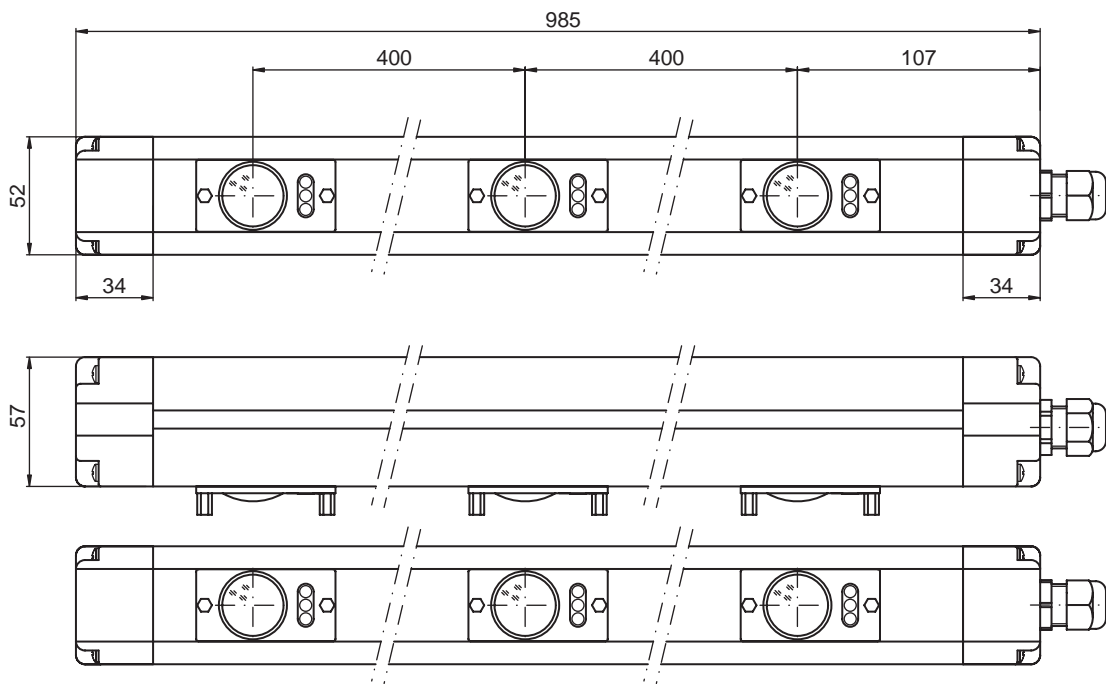
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Dimensional drawings

ROBUST Transmitter RT43 and Receiver RR43

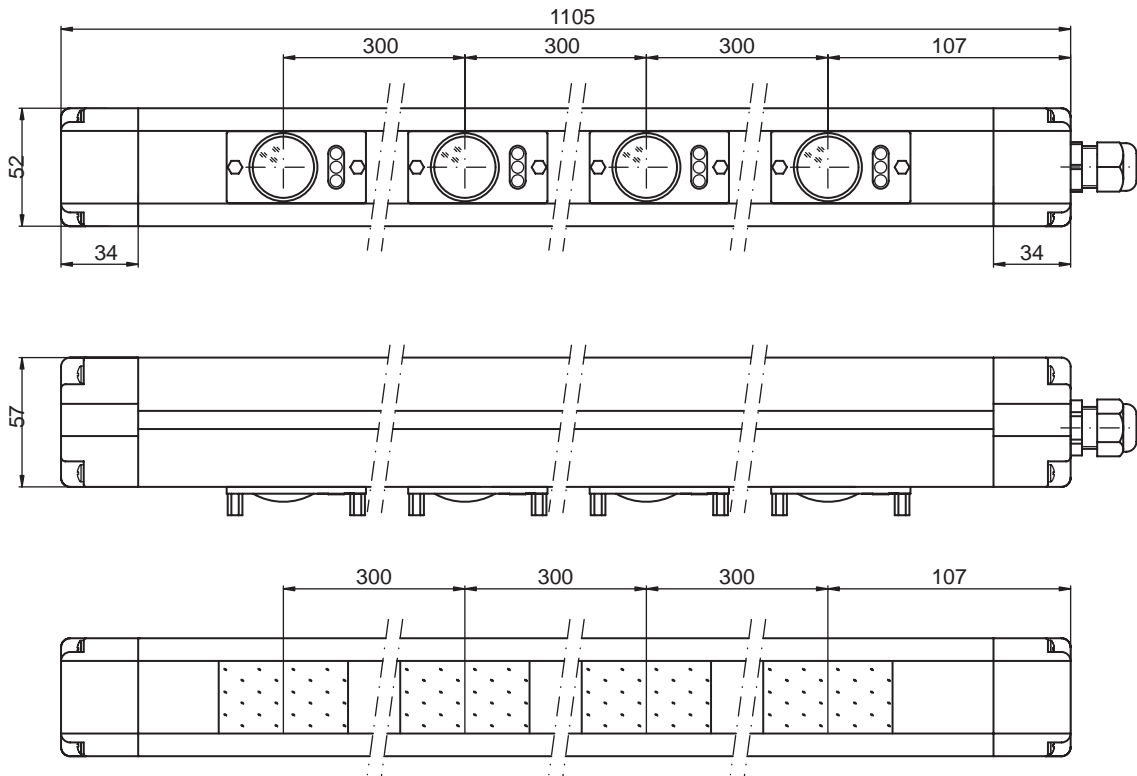




MULTIPLE LIGHT BEAM SAFETY DEVICES

Dimensional drawings

ROBUST Transceiver RRT44, PM4-300(V)



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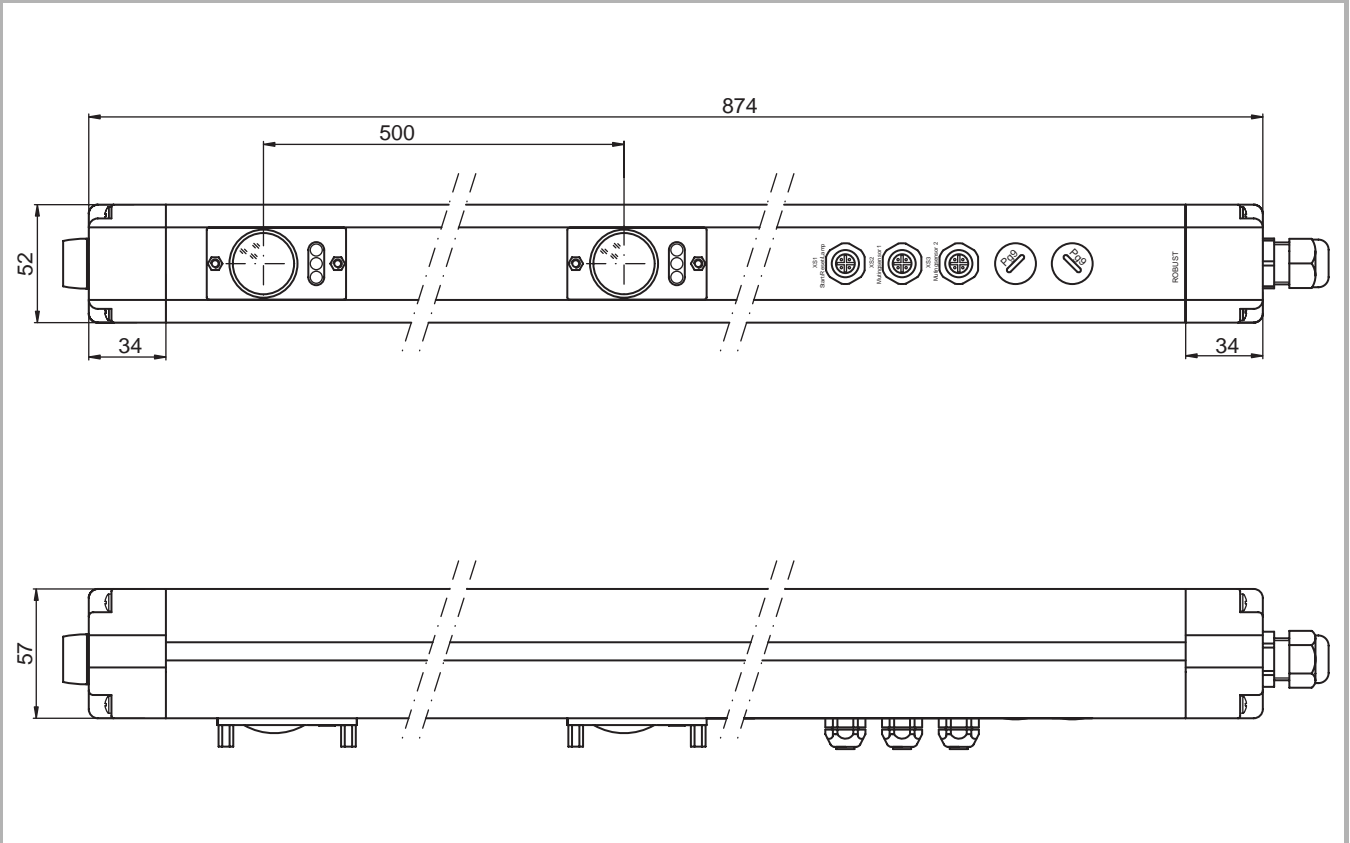
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Dimensional drawings

ROBUST Transceiver RRT42.3-MCB-2.1 with integrated muting connection box

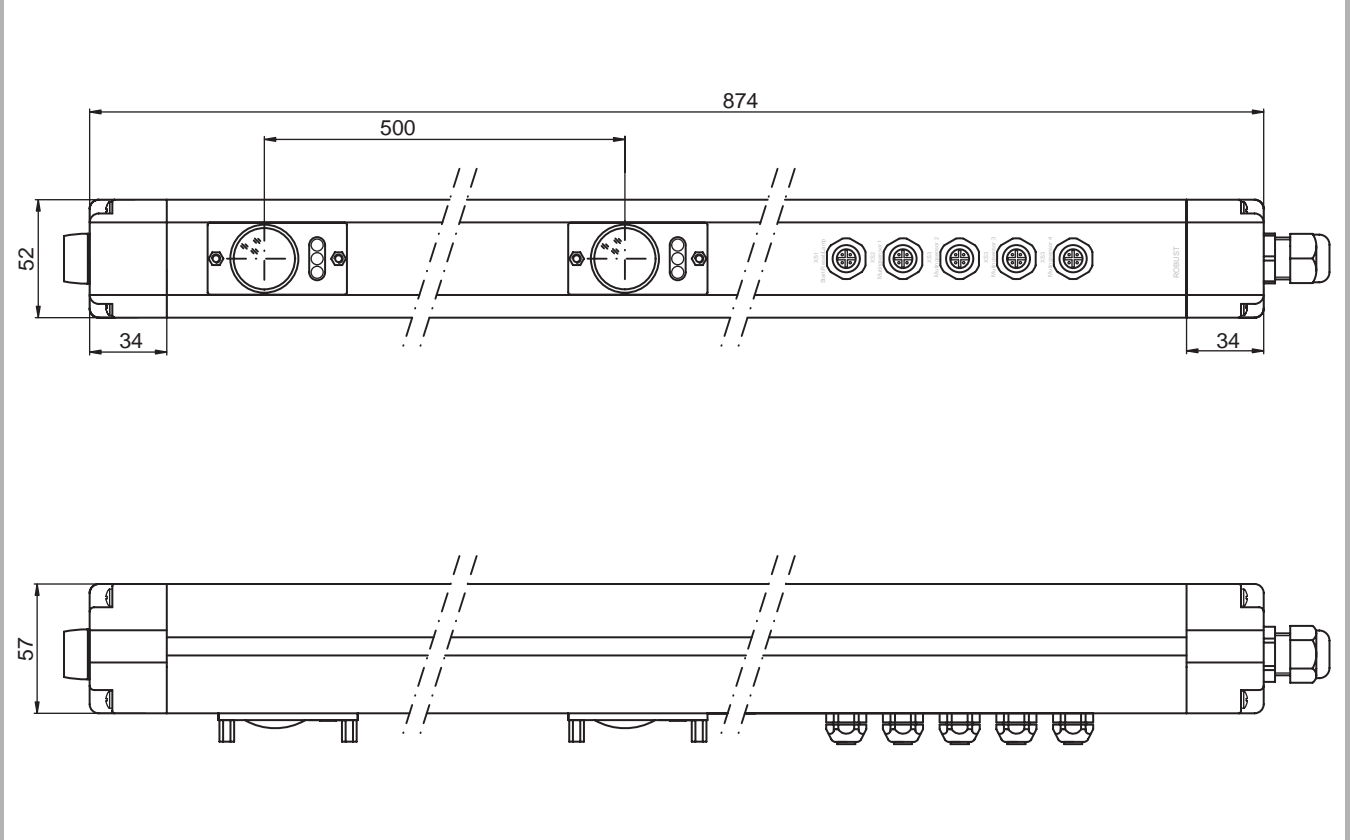




MULTIPLE LIGHT BEAM SAFETY DEVICES

Dimensional drawings

ROBUST Transceiver RRT42.3-MCB-4.1 with integrated muting connection box



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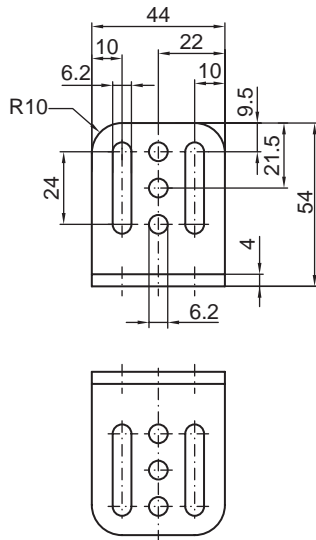
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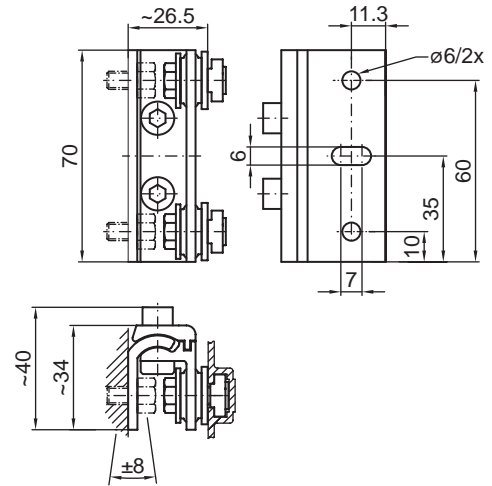
Accessories dimensional drawings

Brackets



L-mounting bracket

Dimensions in mm



Mounting bracket, swiveling with shock absorber, BT-SSD

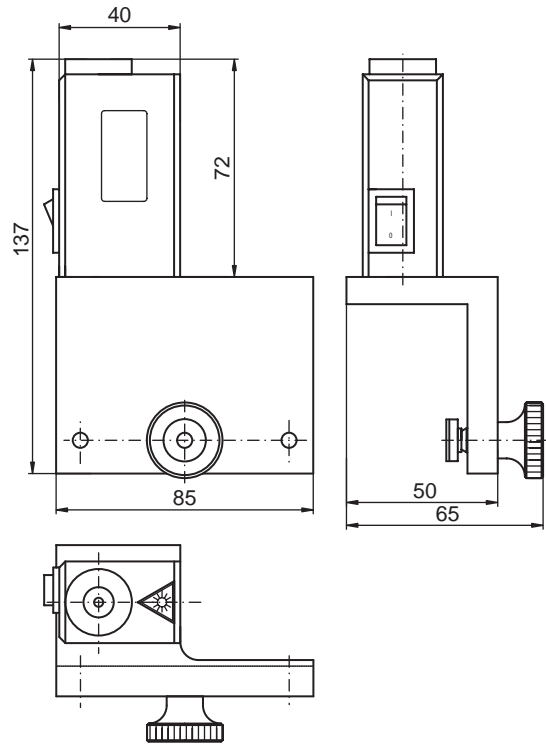




MULTIPLE LIGHT BEAM SAFETY DEVICES

Accessories dimensional drawings

Laser alignment aid, LA-78U



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Accessories ordering information

Art. no.	Article	Description	Length, design
Mounting accessories			
560120	BT-S	Mounting set consisting of 2 L-type brackets incl. 2 screws	
560300	BT-SSD	Mounting bracket, swiveling with shock absorber incl. 2 screws and 2 sliding nuts	
425720	BT-NC	Sliding nut	
Laser alignment aids			
560020	LA-78U	Laser alignment aid for lateral mounting with use for COMPACT/COMPACT <i>plus</i> /ROBUST/ECO/SOLID	
520004	LA-78UDC	Laser alignment aid with ROBUST/COMPACT/COMPACT <i>plus</i> application with UDC -mounting column	
Connection system			
50029498	AS M12-3	Plug set for AMI42(.x), M12, 3-pin	
50021778	AS 78-01	Plug set for SLS/ROBUST Transmitter and AMI42, Hirschmann plug incl. cable socket	
50021779	AS 78-02	Plug set for SLS/ROBUST Receiver + Transceiver, Hirschmann plug incl. cable socket	
Connection cable			
429087	CB-M12-5000-5GF	Connection cable, M12, 5-pin	5 m
429088	CB-M12-25000-5GF	Connection cable, M12, 5-pin	15 m
429089	CB-M12-25000-5GF	Connection cable, M12, 5-pin	25 m
548405	CB-M12-5000-8GF	Connection cable, M12, 8-pin	5 m
548415	CB-M12-15000-8GF	Connection cable, M12, 8-pin	15 m
548425	CB-M12-25000-8GF	Connection cable, M12, 8-pin	25 m

www.leuze.com/robust4/





MULTIPLE LIGHT BEAM SAFETY DEVICES

OVERVIEW

ROBUST 22, 23, 24 selection table

Selection table



ROBUST guarding with Multiple Light Beam Safety Device on palletizer line

ROBUST Multiple Light Beam Safety Devices are available in two different series – in accordance with IEC/EN 61496 as type 4 devices (ROBUST 42, 43, 44), and as type 2 devices (ROBUST 22, 23, 24 in combination with a Test Monitoring Unit).

The ROBUST series also guarantees safe and reliable operation with extreme environmental conditions and in a temperature range from -25 to +55 C. The sensors are characterized by a stable, warp-resistant extruded aluminium profile, protection rating up to IP 67 and an integrated optics heating. ROBUST devices can be flexibly extended with MSI safety interface modules, e.g. for muting applications. This applies for both the transmitter/receiver model and for the transceiver construction, with which the transmitter and receiver are both housed in the same housing.

ROBUST Multiple Light Beam Safety Devices guarantee maximum availability, even under difficult environmental conditions



Safety category IC/EN 61496	Beam distance in mm/ number of beams	Range in m	Features, type-dependent							Article		Page
			RRT Transceiver (active/passive)	RT Transmitter / RR Receiver	RES / EDM, external	Muting functions, external	pnp transistor output	Cable gland	M12 plug	Integrated muting indicator		
Type 2	500/2	0.5 - 2.5	●		1) 2)	●		●		RRT22	PM2-500	272
			●		1) 2)	●	●		RRT22.1	PM2-500		
			●		1) 2)	●	●	●	RRT22.2	PM2-500		
		1.5 - 8	●		1) 2)	●		●	RRT22	PM2-500V		
			●		1) 2)	●	●		RRT22.1	PM2-500V		
			●		1) 2)	●		●	RRT22.2	PM2-500V		
	0.5 - 50	●		1)		●	●	RRT22	AMI42.1			
		●		1)		●	●	RRT22.1	AMI42			
		●		1)		●	●	RRT22.2	AMI42.1			
	400/3			●	1) 2)	●	●	RT23	RR23			
	300/4	0.5 - 2.5	●		1) 2)	●	●	RRT24	PM4-300			
			●		1) 2)	●	●	RRT24.1	PM4-300			
1.5 - 8		●		1) 2)	●	●	RRT24	PM4-300V				
			●		1) 2)	●	RRT24.1	PM4-300V				

1) Test monitoring, RES and EDM with TNT 35, page 450 or MSI-s/R, page 420
 2) Test monitoring, RES, EDM and muting with MSI-m/R or MSI-mx/Rx, page 432





MULTIPLE LIGHT BEAM SAFETY DEVICES

ROBUST 22, 23, 24



Guarding a material feeding opening with ROBUST Multiple Light Beam Safety Devices

In difficult industrial conditions, functional reliability and dependability are especially important with opto-electronic protective devices. In addition to their flexible applicability, the ROBUST safety light beam devices have been designed for precisely these requirements (IP 67 protection rating). The 22, 23, and 24 series in combination with Test Monitoring Units such as TNT 35 enable the implementation of a type 2 protective device in accordance with IEC/EN 61490-1 – 2-beam (ROBUST 22), 3-beam (ROBUST 23) and 4-beam (ROBUST 24). The 2-beam and 4-beam safety light devices, ROBUST RRT22 and RRT24 form a functional unit in combination with Deflecting Mirrors (passive and active), whereby both transmitter and receiver system are housed in one shared profile housing (transceiver). With the 3-beam ROBUST the RR23 receiver and RR23 Transmitter form a functional unit with separate transmitter and receiver housing.

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 that must be allocated in line with risk assessment in accordance with EN 954-1 to safety category 2 or in C-standards for machinery and plant in which category 2 safety devices are required

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ROBUST 22, 23, 24

Important technical data, overview

Safety type in accordance with IEC/EN 61496		Type 2 in combination with a safety interface or a Test Monitoring Unit			
Number of beams	2	3	4		
Beam distance	500 mm	400 mm	300 mm		
Range	PM2-500: PM2-500V: AMI42:	0.5 m - 2.5 m 1.5 m - 8.0 m 50 m	50 m	PM4-300: PM4-300V:	0.5 m - 2.5 m 1.5 m - 8.0 m
Protection rating	IP 67				
Temperature range, operation	-25...+55 °C				
Temperature range, storage	-30...+70 °C				
Profile cross-section	52 mm x 57 mm				
Safety-related switching output (OSSD)	pnp transistor output				
Connection system (type-dependent)	Cable gland M12 plug				

Functions

Automatic start/restart
Integrated optics heating

Functional extensions

With safety interface	Relay output	RES	EDM	Muting	Double muting	Further details
TNT 35	●	●	●			P. 450
MSI-m	●	●	●	●		P. 432
MSI-mx	●	●	●	●	●	P. 432

Special features

- Integrated optics heating for use with extreme environmental conditions
- Protection rating: IP 67
- Glass optics with spacing bolts for mounting laser alignment aid
- pnp transistor output
- Activation input for test and series connection
- Muting in combination with safety interfaces, MSI
- Models with integrated muting indicator



Properties

Multiple Light Beam Safety Devices

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MULTIPLE LIGHT BEAM SAFETY DEVICES

Ordering information

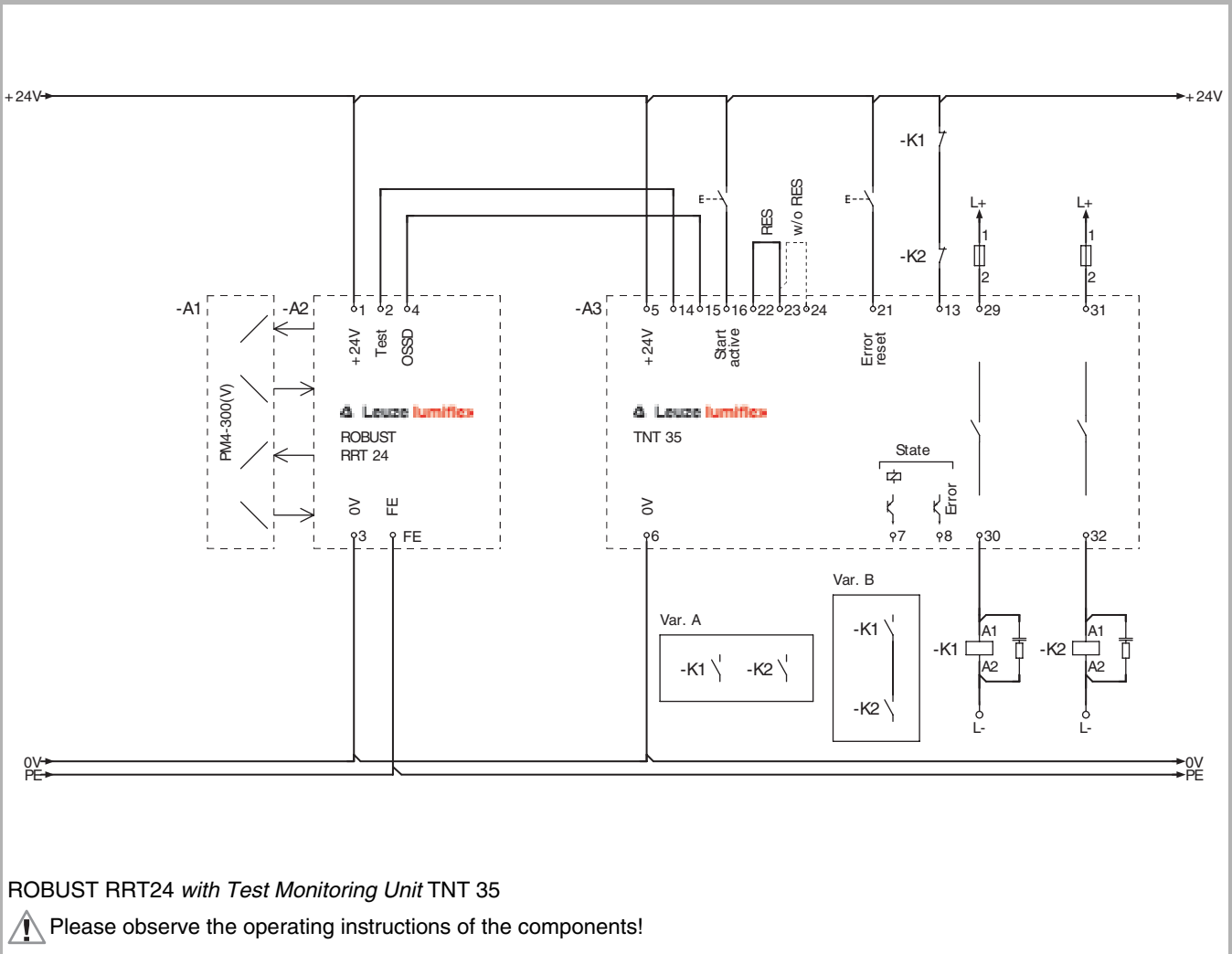
ROBUST 22, 23, 24, consisting of transmitter and receiver, and 1 RRT22 or RRT24 Transceiver (note: Either the passive Deflecting Mirrors PM2 or PM4, or with large ranges, the active Deflecting Mirrors, AMI42, are required for operating ROBUST Transceivers) Included in delivery: With RR/RT 4 sliding nuts, 2 bracket sets BT-S, and with RRT 2 sliding nuts and 1 bracket set BT-S, 1 connecting and operating instructions manual

Functions: Automatic start/restart, optics heating

Beam distance/ number of beams	ROBUST			
	Range: Type-dependent			
	Art. no.	Article	Description	Connection system
500 mm / 2	ROBUST 22			
	50029081	RRT22	Transceiver	M12 plug
	50029759	RRT22.1	Transceiver	Cable gland
	50029760	RRT22.2	Transceiver with integrated lamp	Cable gland
	50029088	PM2-500	Passive Deflecting Mirror, range 0.5 - 2.5 m	
	909661	PM2-500V	Passive Deflecting Mirror, range 1.5 - 8 m	
	50029087	AMI42	Active Deflecting Mirror, range 0.5 - 50 m	Cable gland
	909695	AMI42.1	Active Deflecting Mirror, range 0.5 - 50 m	M12 plug
400 mm / 3	ROBUST 23			
	50029496	RT23	Transmitter	M12 plug
	50029497	RR23	Receiver	M12 plug
300 mm / 4	ROBUST 24			
	50030016	RRT24	Transceiver	Cable gland
	50081465	RRT24.1 M12	Transceiver	M12 plug
	50029570	PM4-300	Passive Deflecting Mirror, range 0.5 - 2.5 m	
	909663	PM4-300V	Passive Deflecting Mirror, range 1.5 - 8 m	

Electrical connection

ROBUST 22, 23, 24 connection example



Machine Safety

Machine Safety Services

Safety Engineering Software

Safety Laser Scanners

Safety Light Curtains

Multiple Light Beam Safety Devices

Single Light Beam Safety Devices

AS-interface Safety at Work

PROFIsafe Sensors

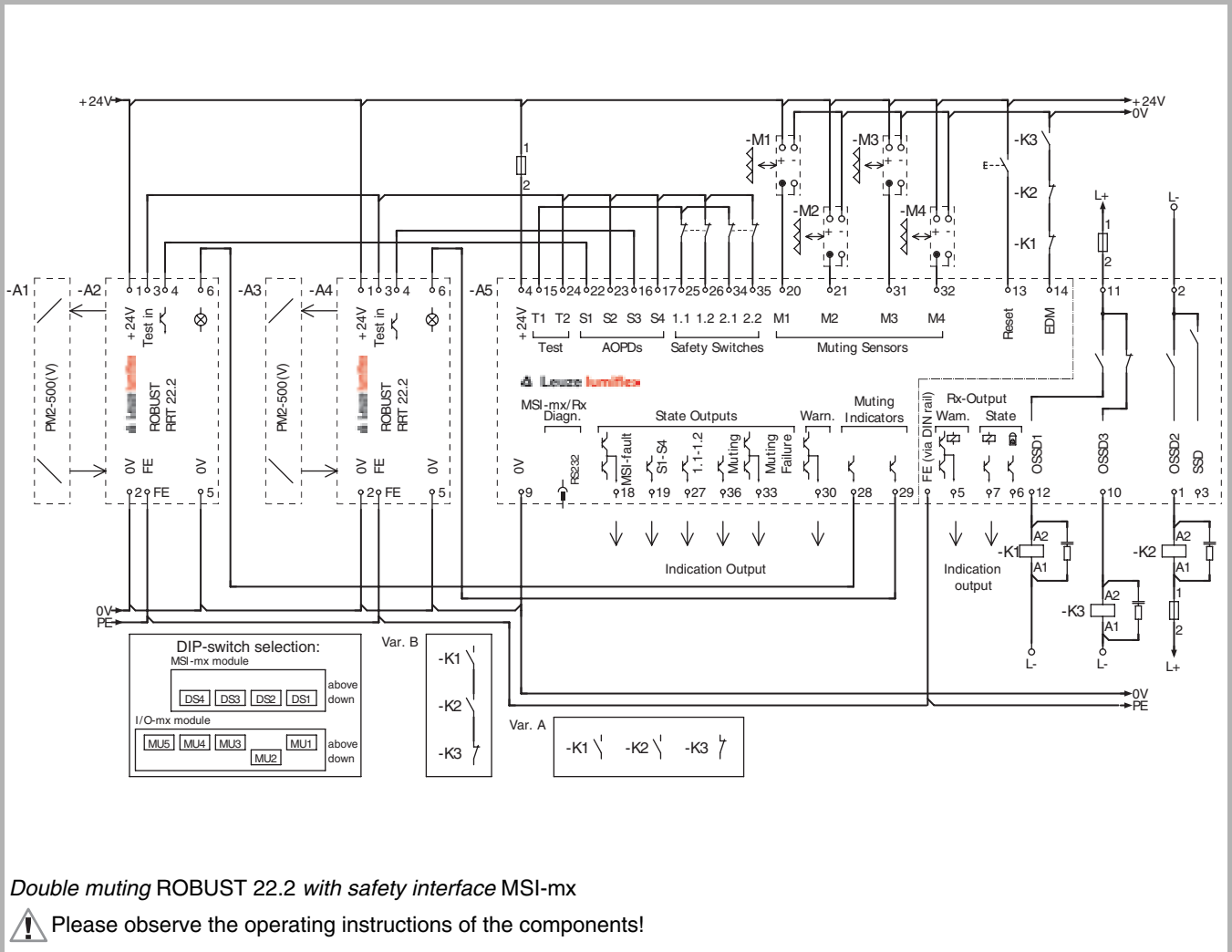
Safety Switches and Safety Locking Devices



MULTIPLE LIGHT BEAM SAFETY DEVICES

Electrical connection

ROBUST 22, 23, 24 connection example



Technical data

General system data			
Safety type in accordance with IEC/EN 61496	Type 2 in combination with a safety interface or a Test Monitoring Unit		
Number of beams	2 (transceiver)	3 (transmitter/receiver)	4 (transceiver)
Beam distance	500 mm	400 mm	300 mm
Range	PM2-500: 0.5 m - 2.5 m PM2-500V: 1.5 m - 8.0 m AMI42: 50 m	50 m	PM4-300: 0.5 m - 2.5 m PM4-300V: 1.5 m - 8.0 m
Response time	8 ms	9 ms	12 ms
Beam height above reference plane in accordance with EN 999	400, 900 mm	300, 700, 1100 mm	300, 600, 900, 1200 mm
Supply voltage	24 V DC, $\pm 15\%$		
Connection cable length	Max. 50 m with 0.25 mm ²		
Safety class	III		
Protection rating	IP 67		
Ambient temperature, operation	-25...+55 °C		
Ambient temperature, storage	-30...+70 °C		
Relative humidity	15...95 %		
Profile cross-section	52 mm x 57 mm		
Weight per device (length-dependent)	0.90...2.20 kg		
RRT22 Transceiver (2 beam)			
Transmitter diodes, class in accordance with EN 60825	1		
Wavelength	880 nm		
Current consumption	Approx. 80 mA		
Safety-related switching output (OSSD)	pnp transistor output (short circuit-proof)		
Output current	Max. 200 mA		
Connection system, RRT22	M12 plug, 5-pin		
Connection system, RRT22.1 / RRT22.2	Cable gland (PG11)		
Wire gauge, RRT22.1 / RRT22.2	Max. 2.5 mm ²		





MULTIPLE LIGHT BEAM SAFETY DEVICES

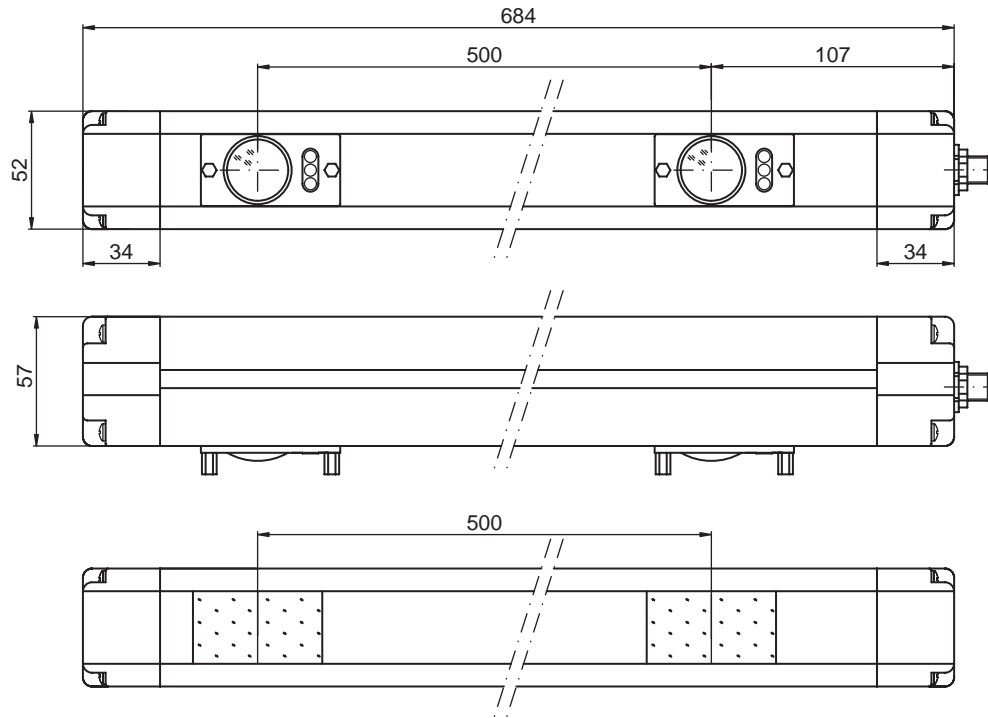
Technical data

RT23 Transmitter (3-beam)	
Transmitter diodes, class in accordance with EN 60825	1
Wavelength	880 nm
Current consumption	Approx. 150 mA
Connection system	M12 plug
External test input	24 V DC, max. 20 mA = no test 0 V or high impedance = Test via external test device, test period min. 20 ms
RR23 Receiver (3-beam)	
Current consumption	Approx. 130 mA
Safety-related switching output (OSSD)	pnp transistor output (short circuit-proof)
Output current	Max. 200 mA
Connection system	M12 plug, 5-pin
Output current	Max. 200 mA
RRT24 Transceiver (4 beam):	
Transmitter diodes, class in accordance with EN 60825	1
Wavelength	880 nm
Current consumption	Approx. 160 mA
Safety-related switching output (OSSD)	pnp transistor output (short circuit-proof)
Output current	Max. 200 mA
Connection system	M12 plug, 5-pin

You will find additional information in the ROBUST 22, 23, 24 connecting and operating instructions at www.leuze.com/robust22, www.leuze.com/robust23 and www.leuze.com/robust24.

Dimensional drawings

ROBUST Transceiver RRT22, PM2-500(V)

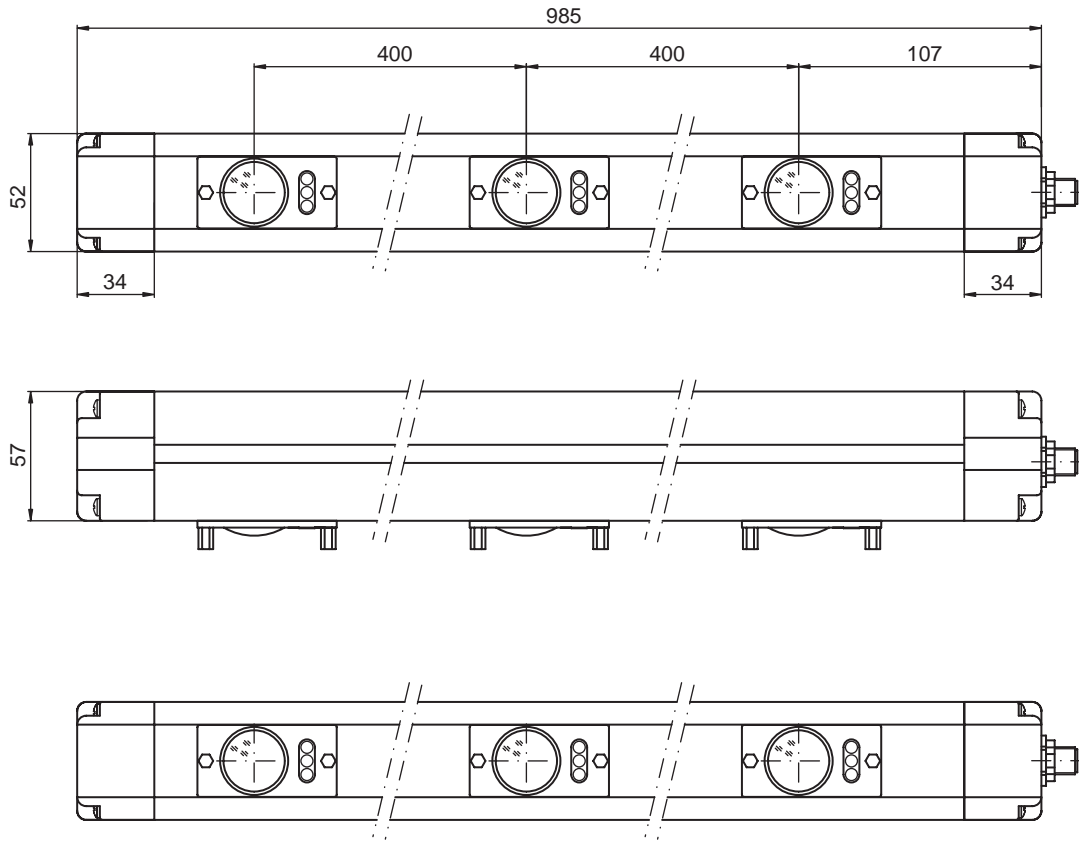




MULTIPLE LIGHT BEAM SAFETY DEVICES

Dimensional drawings

ROBUST Transmitter RT23 and Receiver RR23



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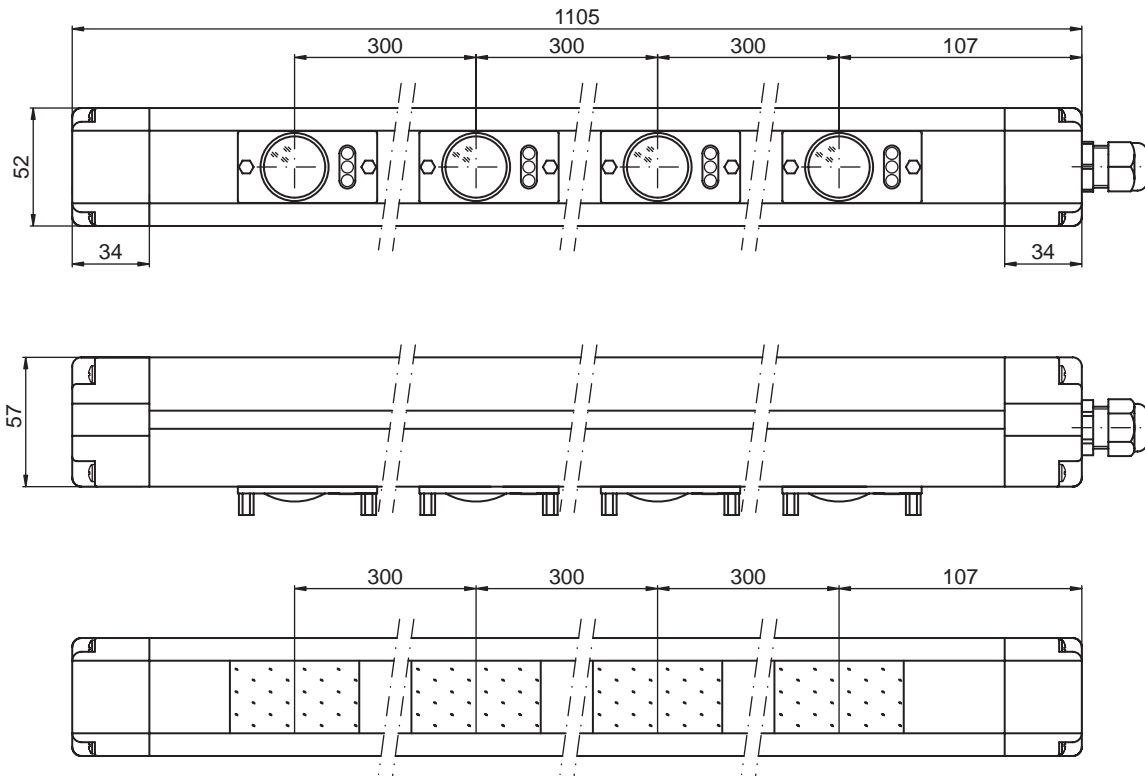
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Dimensional drawings

ROBUST Transceiver RRT24, PM4-300(V)

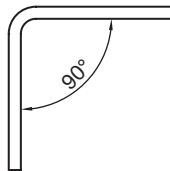
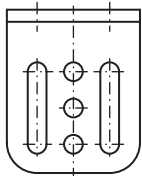
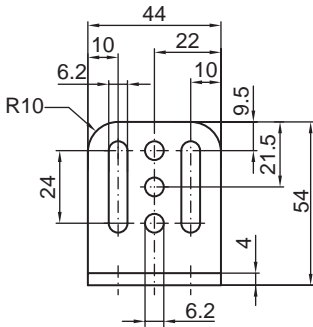




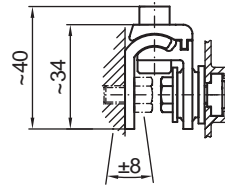
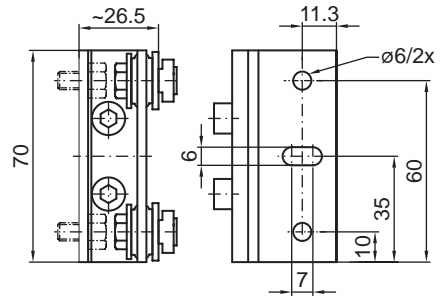
MULTIPLE LIGHT BEAM SAFETY DEVICES

Accessories dimensional drawings

Brackets

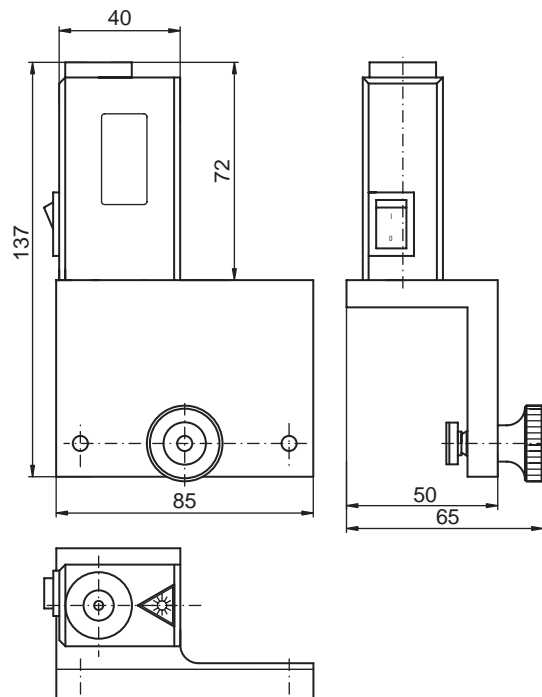


L-mounting bracket



Mounting bracket, swiveling with shock absorber, BT-SSD

Laser alignment aid, LA-78U



Dimensions in mm

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COMPACTlaser
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ROBUST 42-44
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ROBUST 22-24
p. 270

Accessories ordering information

Art. no.	Article	Description	Length, design
Mounting accessories			
560120	BT-S	Mounting set consisting of 2 L-type brackets incl. 2 screws	
560300	BT-SSD	Mounting bracket, swiveling with shock absorber incl. 2 screws and 2 sliding nuts	
425720	BT-NC	Sliding nut	
Laser alignment aids			
560020	LA-78U	Laser alignment aid for lateral mounting with use for COMPACT/COMPACT <i>plus</i> /ROBUST/ECO/SOLID	
520004	LA-78UDC	Laser alignment aid with ROBUST/COMPACT/COMPACT <i>plus</i> application with UDC-mounting column	
Connection system			
50029498	AS M12-3	Plug set for AMI42(.x), M12, 3-pin	
50021778	AS 78-01	Plug set for SLS/ROBUST Transmitter and AMI 42, Hirschmann plug incl. cable socket	
50021779	AS 78-02	Plug set for SLS/ROBUST Receiver + Transceiver, Hirschmann plug incl. cable socket	
150717	CB-M12-2000-5GM	Connection cable, M12, 5-pin	2 m, straight/open end
150718	CB-M12-5000-5 GM	Connection cable, M12, 5-pin	5 m, straight/open end
50020501	KD 095-5A	Connection cable, M12, 5-pin, performable	Straight
Connection cable			
429087	CB-M12-5000-5GF	Connection cable, M12, 5-pin	5 m
429088	CB-M12-25000-5GF	Connection cable, M12, 5-pin	15 m
429089	CB-M12-25000-5GF	Connection cable, M12, 5-pin	25 m
548405	CB-M12-5000-8GF	Connection cable, M12, 8-pin	5 m
548415	CB-M12-15000-8GF	Connection cable, M12, 8-pin	15 m
548425	CB-M12-25000-8GF	Connection cable, M12, 8-pin	25 m

www.leuze.com/msd/



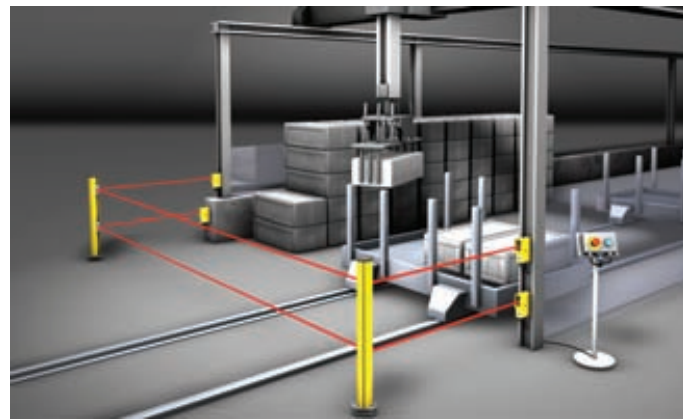


SINGLE LIGHT BEAM SAFETY DEVICES

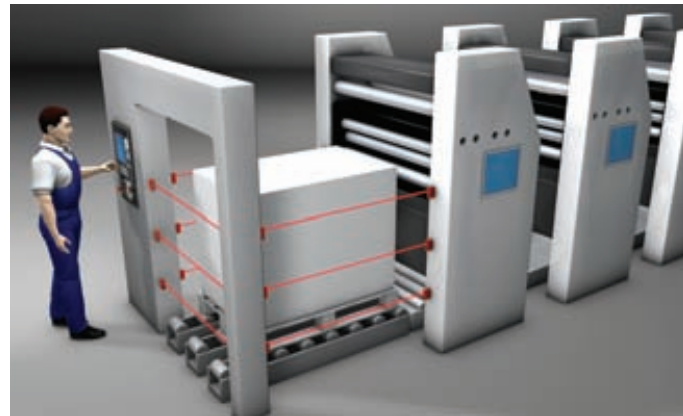
OVERVIEW

Single Light Beam Safety Device selection table

Selection table



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



Guarding a sheet-fed printing machine with an SLSR 8 single beam safety device

If there is no level setup surface on the machine, and therefore the application of Multiple Light Beam Safety Devices is ruled out, danger areas can be efficiently guarded with single beam safety devices. There are no unmonitored undercuts. 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.

On the basis of their dimensions, the advantages of Single Light Beam Safety Devices are fully exploited with certain installation situations (above from left to right: SLS 78/R, SRK 96 with reflector, SLS 96; bottom from left to right: SLS 318, SLSR 8)



Safety category in accordance with EC/EN 61496	Range in m	Minimum object diameter in mm	Transmitter/receiver principle	Reflection principle 1)	Transmitter with activation input	Ambient light suppression	Multiple light axis operation	Features, type-dependent												Article	Page	
								Light source: Infrared light	Light source: Red light	Light-on	Antivalent	pnp transistor output	2 Safety Relay outputs (2 make)	Round pin plug	Cable gland	Connection cable	Min. temp. - 25°C, integrated optics heating	Plastic housing	Metal housing			UL approval
Type 4	0 - 50		●					●												SLS 78/R	286	
	0 - 10	13	●		●	●														SLSR 8 / 66.8 - S12	316	
	0 - 30	22	●		●															SLS 46 / 44.8 - S12	306	
	0 - 30	22	●		●								●							SLS 46 / 44.8, 2000	306	
	0 - 50	28	●		●															SLS 96 M/P - 1070 - T2 - 4	310	
	0 - 50	28	●		●									●						SLS 96 M/P - 1071 - T2 - 4	310	
	0 - 50	28	●		●								●							SLS 96 M/P - 1070 - T2 - 2	310	
	0 - 50	28	●		●								●							SLS 96 M/P - 1071 - T2 - 2	310	
	0 - 30	28	●		●															SLS 96 M/P - 1200 - T2 - 4	310	
	0 - 30	28	●		●									●						SLS 96 M/P - 1200 - T2 - 2	310	
Type 2	0 - 50	28	●		●															SLS 96 K/P - 1070 - T2 - 4	310	
	0 - 30	28	●		●															SLS 96 K/P - 1070 - T2 - 2	310	
	0 - 30	28	●		●															SLS 96 K/P - 1200 - T2 - 4	310	
	0 - 30	28	●		●															SLS 96 K/P - 1200 - T2 - 2	310	
	0 - 30	28	●		●															SLS 96 K/P - 1207 - T2 - 4	310	
	0 - 30	28	●		●															SLS 96 K/P - 1200 - T2 - 2	310	
	0 - 30	28	●		●															SLS 96 K/P - 1207 - T2 - 2	310	
	0 - 10	13	●		●																SLS 318 K/P - S12	320
	0 - 10	13	●		●																SLS 318 K/P	320
	0 - 6	8	●		●																SLS 763/4.8 L8	300
0 - 6	8	●		●																SLS 763/4.8 2500	300	
0.5 - 6			●		●															SRK 96 M/P - 1210 - T2 - 47	292	
0.5 - 6			●		●															SRK 96 M/P - 1210 - T2 - 29	292	

1) Operation only permissible with reflector PTKS 50 x 50, PTKS 20 x 40 or PTKS 100 x 100
 2) Red light, laser class 2
 3) Push-pull

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- SRK 96 p. 290
- LS 763 p. 298
- SLS 46 p. 304
- SLS 96 p. 308
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www.leuze.com/ssd/

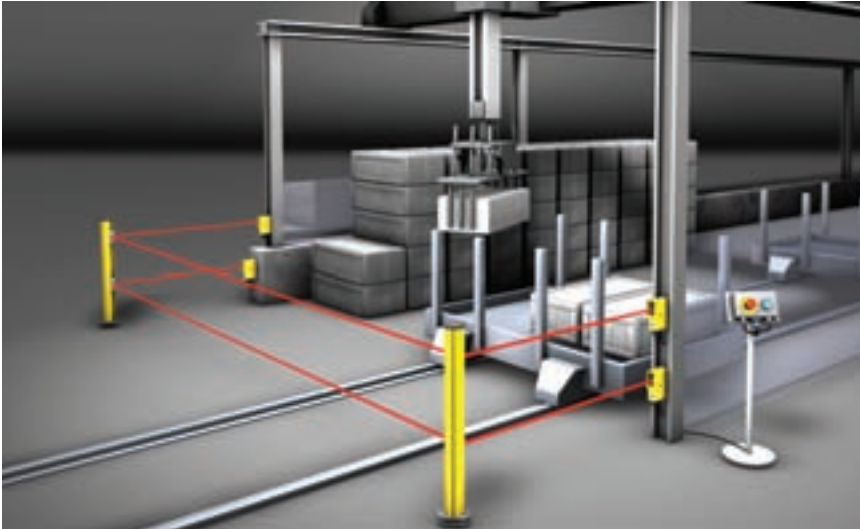


Machine Safety
Machine Safety Services
Safety Engineering Software
Safety Laser Scanners
Safety Light Curtains
Multiple Light Beam Safety Devices
Single Light Beam Safety Devices
AS-interface Safety at Work
PROFIsafe Sensors
Safety Switches and Safety Locking Devices



SINGLE LIGHT BEAM SAFETY DEVICES

SLS 78/R



A typical application of the SLS 78/R is the access guarding of danger areas in storage system technology

If a Single Light Beam Safety Device in accordance with IEC/EN 61496 is required for use in difficult industrial situations for large ranges, the SLS 78/R is the right choice. Its functionality can be extended tailor-made with the intelligent MSI safety modules. This installation-friendly safety light beam device consists of transmitter and receiver and is especially suitable for access guarding danger areas. With Deflecting Mirrors multiple-side guarding can also be cost-effectively implemented. The number of beams and their distances depend on the risk assessment and the specifications of the individual machine.

Typical areas of application

- Conveyor and storage systems
- Processing machinery in metals industry
- Setting machines in the glass and ceramics industry
- Plastics and rubber industry
- Packaging, wood processing and construction material machinery

Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 4
Operating range	0...60 m
Response time	20 ms
Operating voltage, U_B	24 V DC \pm 15 %
Operating temperature	-25 °C to +60 °C
Dimensions (WxHxD)	38 mm x 127 mm x 99 mm
Housing	Metal
Safety-related switching outputs (OSSD)	2 relay outputs
Connection system	Cable gland (PG11) Spring terminals Plug connection, DIN 43651

Functions

Operating mode, "Protective mode without restart interlock"

Ambient light suppression

Integrated optics heating

LED-display

Functional extensions

With safety interface	Relay output	RES	EDM	Muting	Further details
MSI-SR2/F	●	●	●		P. 404
MSI-s	●	●	●		P. 420
MSI-sx	●	●	●		P. 420
MSI-m	●	●	●	●	P. 432
MSI-mx	●	●	●	●	P. 432

Special features

- Range from 0 to 60 m
- Constant and pulsed light-proof
- Integrated dirt controls via LED-displays
- Integrated optics heating enables use under extreme environmental conditions
- Operating temperature -25 °C to +60 °C
- High mechanical and chemical resistance
- Rapid access with screwless spring terminals



Properties



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● Accessories ordering information	289





SINGLE LIGHT BEAM SAFETY DEVICES

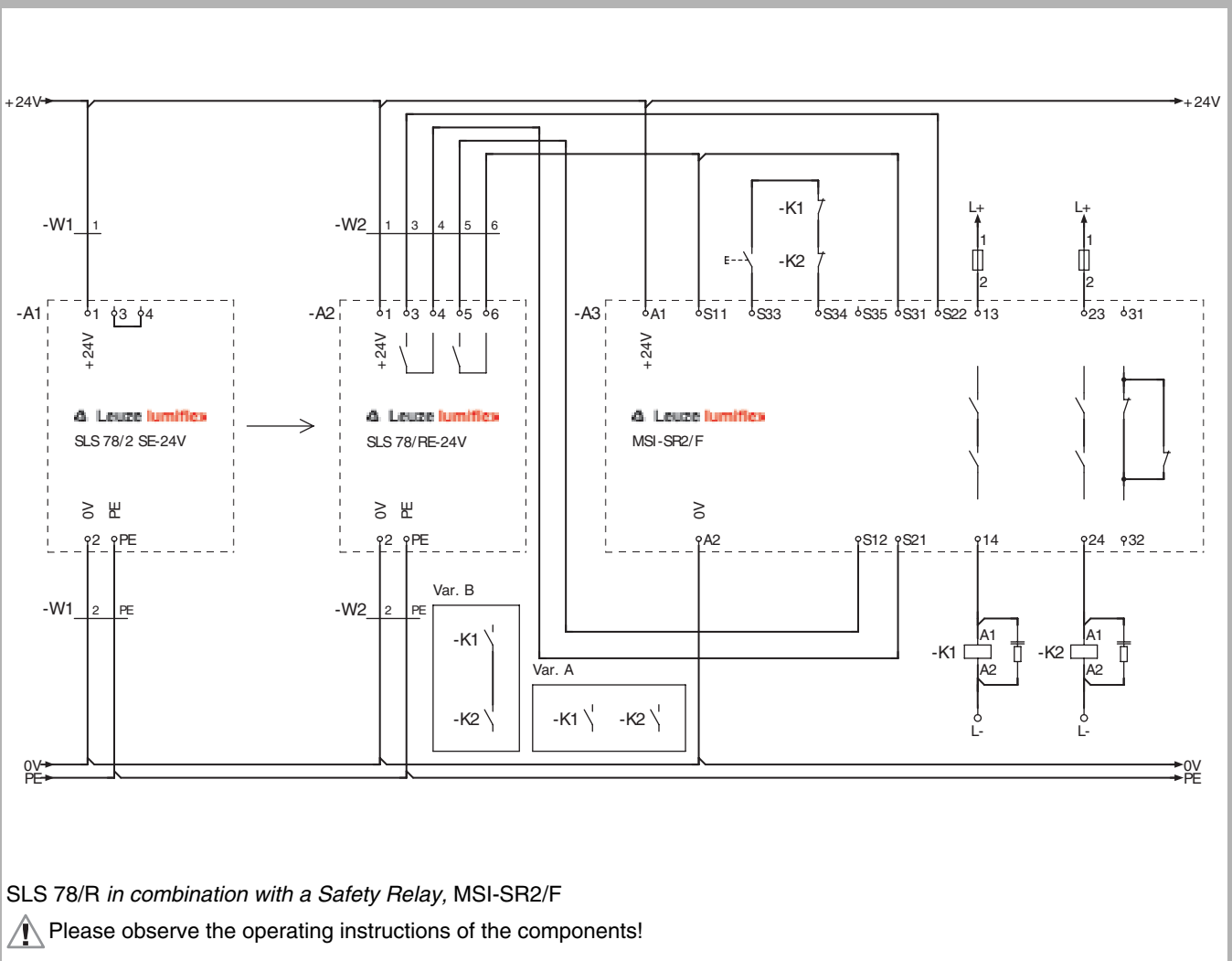
Ordering information

SLS 78/R, consisting of transmitter and receiver

Functions: Automatic start/restart

Art. no.	Article	Description	Connection system
50021208	SLS 78/2 SE-24 V	Transmitter	Cable gland
50021209	SLS 78/ RE-24V	Receiver	Cable gland

Electrical connection



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p. 318

Technical data

General system data	
Safety type in accordance with IEC/EN 61496	Type 4
Operating range	0...60 m
Response time	20 ms
Operating voltage, U _B	24 V DC ± 15 %
Connection cable length	Max. 100 m with 0.25 mm ²
Safety class	I
Protection rating	IP 65
Ambient temperature, operation	-25...+60 °C
Ambient temperature, storage	-25...+70 °C
Relative humidity	95 %
Dimensions (WxHxD)	38 mm x 127 mm x 99 mm
Housing	Aluminum diecast
Transmitter	
Transmitter diodes, class in accordance with EN 60825	1
Light source	Infrared light
Wavelength	880 nm
Current consumption	100 mA
Connection system	Cable gland (PG11) Spring terminals Plug connection, DIN 43651
Weight	580 g
Receiver	
Current consumption	250 mA
Safety-related switching outputs (OSSD)	2 relay outputs (make)
Switching current	Max. 2 A, AC-1/DC-1
Switching voltage	Max. 250 V AC
Connection system	Cable gland (PG11) Spring terminals Switching connection, DIN 43651
Weight	600 g

You will find additional information in the SLS 78/R connecting and operating instructions at www.leuze.com/sls78r.

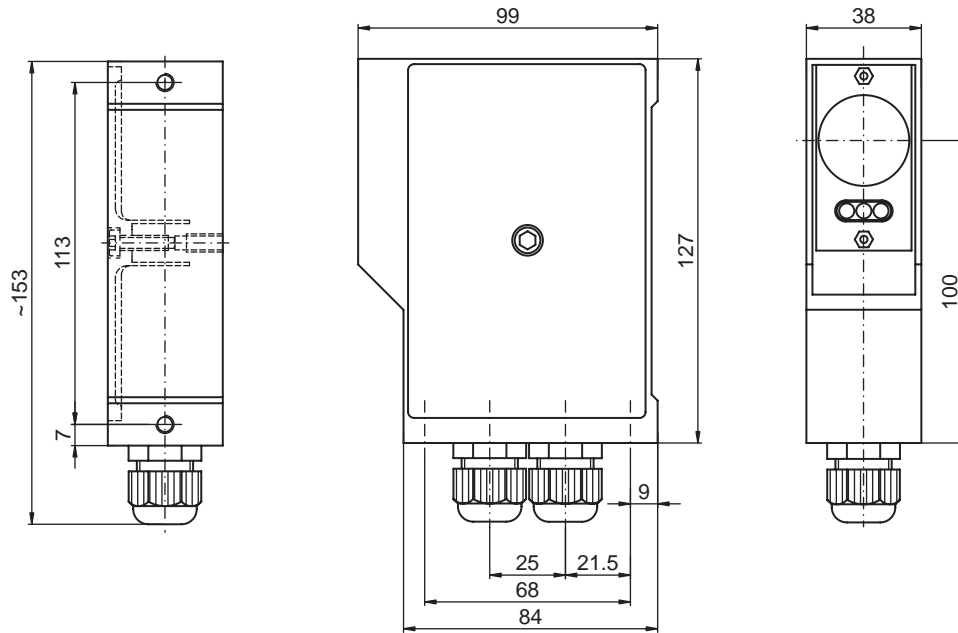




SINGLE LIGHT BEAM SAFETY DEVICES

Dimensional drawings

SLS 78/R with cable gland, PG11



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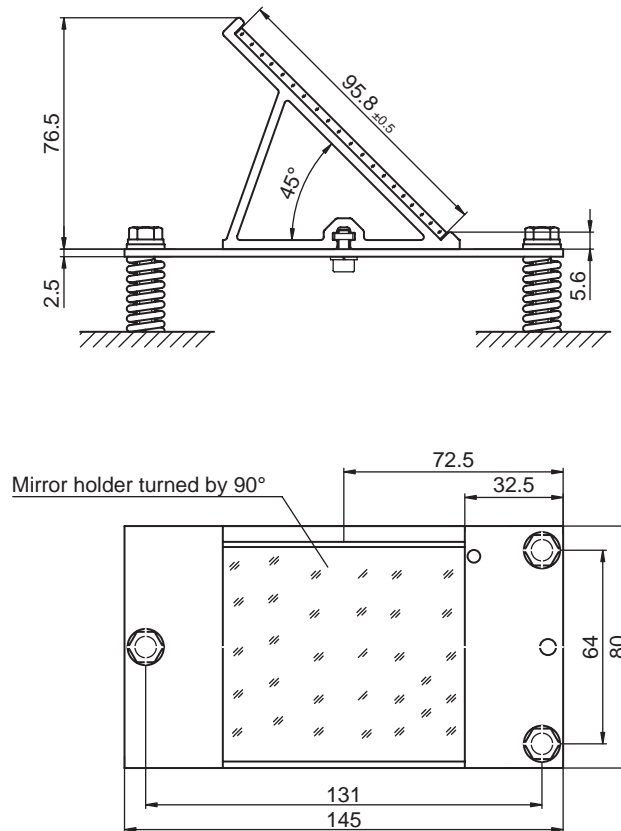
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Accessories dimensional drawings

US2 Deflecting Mirror complete with mounting panel, mirror carrier rotates



Accessories ordering information

Art. no.	Article	Description
Mounting accessories		
50003374	BT78	Mounting bracket, BT 78-100
Laser alignment aids		
549000	LA-78	Laser alignment aid for frontal mounting
Connection system		
50021778	AS 78-01	Plug set for SLS/ROBUST Transmitter and AMI42, DIN 43651, incl. cable socket
50021779	AS 78-02	Plug set for SLS/ROBUST Receiver + Transceiver, DIN 43651, incl. cable socket
See chapter, Safety Relay and interfaces		





SINGLE LIGHT BEAM SAFETY DEVICES

SRK 96



Guarding a printing machine reel changer with SRK 96 single beam safety device

Along with the reliability of the sensor technology, in many applications a simple, cost-effective installation is also very important. This where the SRK 96 single beam retro-reflective safety devices show their strength. As the electrical wiring is only implemented on the active side, they are an especially efficient solution for access guarding. The SRK 96 are especially quick in installing and easy to align. Together with a TNT Test Monitoring Unit or MSI safety interface, the system consisting of red laser light beam device and special reflector forms a type 2 protective device in accordance with IEC EN 61496-1, -2.

Typical areas of application

- Printing machinery
- Packaging machinery
- Wood processing industry

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Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 2 in combination with a test -monitoring unit
Operating range	0.5...6 m
Operating voltage, U_B	10...30 V DC (incl. residual ripple)
Dimensions (WxHxD)	30 mm x 90 mm x 70 mm
Housing	Metal
Switching output	pnp transistor output
Connection system	Cable gland M12 round pin plug

Functions

LED-display

Activation input for test and series connection

Functional extensions

With safety interface	Relay output	RES	EDM	Muting	Further details
TNT 35	●	●	●		P. 450
MSI-s	●	●	●		P. 420
MSI-sx	●	●	●		P. 420
MSI-m	●	●	●	●	P. 432

Special features

- 6 m range
- Easy alignment with visible red light
- Innovative retro-reflective safety device principle, i.e. electrical connection is only required on one side
- No manipulation by standard reflectors or reflective foil/film



Properties



Further information

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SINGLE LIGHT BEAM SAFETY DEVICES

Ordering information

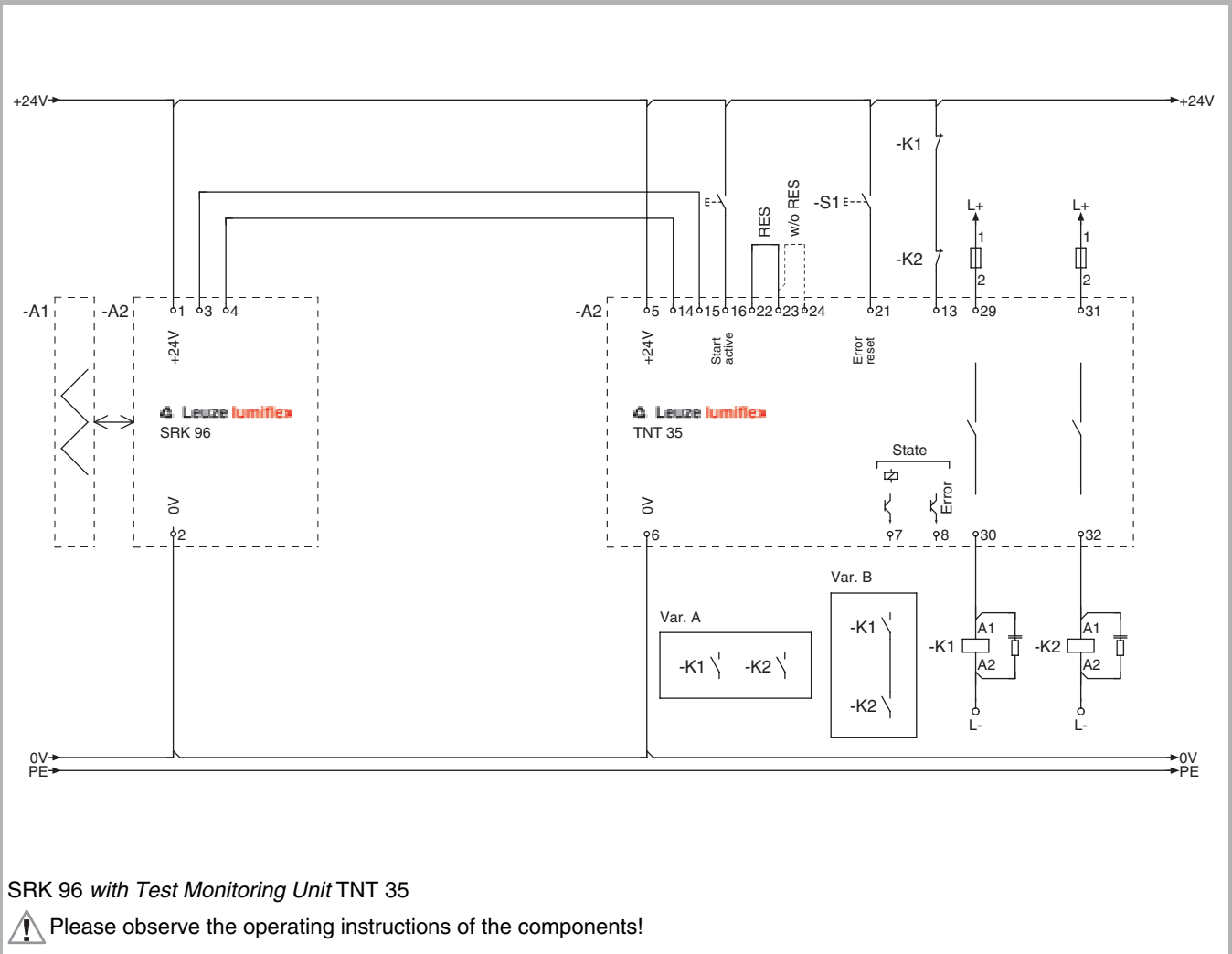
SRK 96 (A PTKS type special reflector is required to operate SRK single beam safety devices. This is already included in the SRK 96 set)
Included in delivery: 1 connecting and operating instructions manual

Functions: Activation input for testing and series switching

Art. no.	Article	Description	Connection system
50032021	SET SRK 96M/P-29 +PTKS50x50	Set consisting of reflection light device and safety reflector, PTKS 50x50	Cable gland
50032022	SET SRK 96M/P-47 +PTKS50x50	Set consisting of reflection light device and safety reflector, PTKS 50x50	M12 plug, 4-pin
50060918	SRK 96M/P-1210-T2-29	Reflection light device	Cable gland
50060919	SRK 96M/P-1210-T2-47	Reflection light device	M12 plug, 4-pin
50032173	PTKS 20x40	Safety reflector 20 mm x 40 mm	
50060946	PTKS 50x50	Safety reflector 50 mm x 50 mm	
50036095	PTKS 100x100	Safety reflector 100 mm x 100 mm	

Electrical connection

SRK 96 connection example



Machine Safety

Machine Safety Services

Safety Engineering Software

Safety Laser Scanners

Safety Light Curtains

Multiple Light Beam Safety Devices

Single Light Beam Safety Devices

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PROFIsafe Sensors

Safety Switches and Safety Locking Devices



SINGLE LIGHT BEAM SAFETY DEVICES

Technical data

General system data	
Safety type in accordance with IEC/EN 61496	Type 2 in combination with a Test Monitoring Unit
Operating range	0.5...6 m
Response time	6 ms
Operating voltage, U _B	10...30 V DC (incl. residual ripple)
Safety class	II
Protection rating	IP 67
Ambient temperature, operation	-10...+50 °C
Ambient temperature, storage	-30...+60 °C
Relative humidity in accordance with IEC 68, Parts 1 and 2	Humidity class, G
Dimensions (WxHxD)	30 mm x 90 mm x 70 mm
Housing	Metal
Weight	380 g
Transmitter diodes, class in accordance with EN 60825	1
Light source	Red light laser diode
Wavelength	670 nm
Activation input for test and series connection	24 V DC Active ≥8 V Inactive ≥ V
Current consumption	40 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)

You will find additional information in the SRK 96 connecting and operating instructions at www.leuze.com/srk96.

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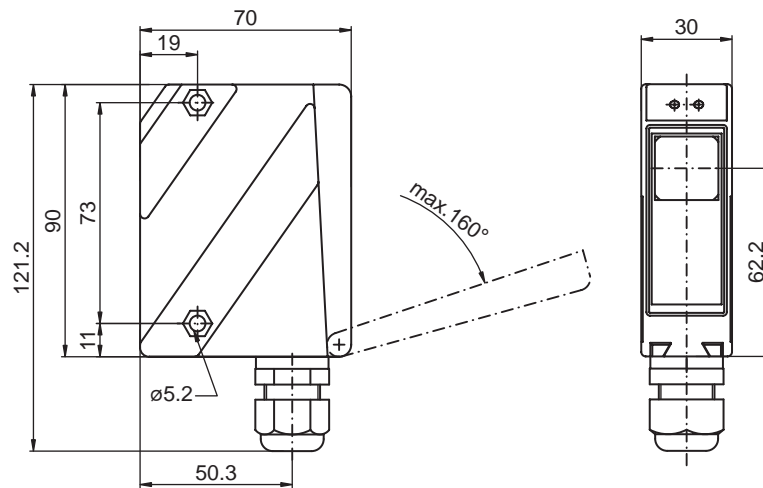
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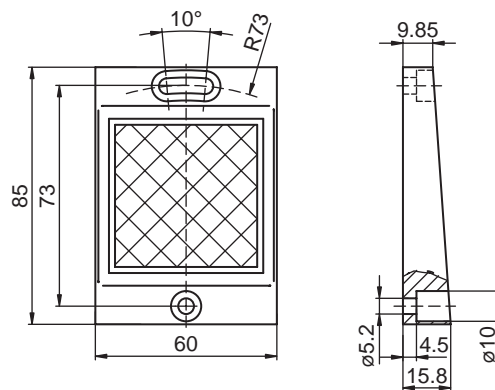
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Dimensional drawings

SRK 96 Single Light Beam Safety Device



Safety reflector 50 mm x 50 mm, PTKS 50x50





SINGLE LIGHT BEAM SAFETY DEVICES

Accessories ordering information

Art. no.	Article	Description	Length, design
Connection system			
50032841	KB-Y-SRK96-600-4	SRK96 connection cable for device series switching	600 mm
Connection cable			
50080839	BK7 KB-450-5000-4	Connection cable, 5 m, M12, 4-pin	
50080842	BK7 KB-450-5000-4A	Connection cable, 5 m, M12, 4-pin, axial	
50020500	BK7 KB-095-5000-5	Connection cable, M12, 5-pin, 5 m, angled	

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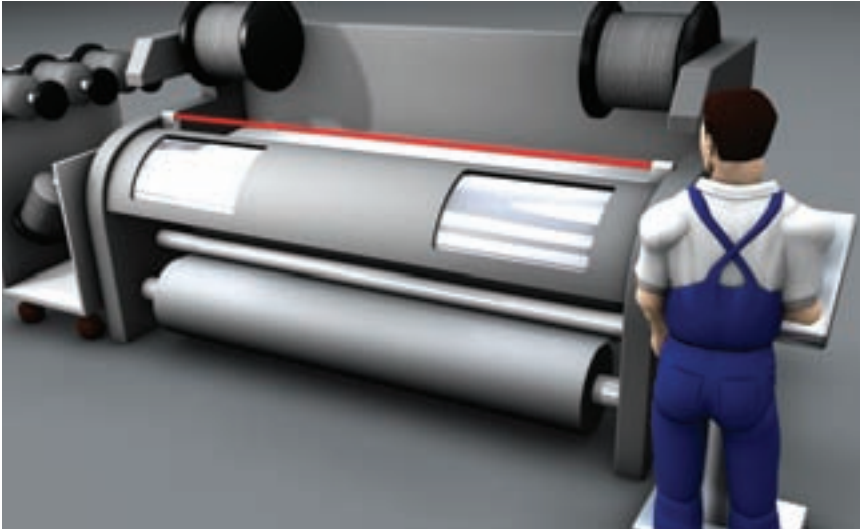
www.leuze.com/srk96/





SINGLE LIGHT BEAM SAFETY DEVICES

LS 763



Guarding a weaving machine with an LS 763 Single Light Beam Safety Device

Heavy vibrations in machinery operation, as with weaving machines, for example, make heavy demands on Safety Light Barriers. On the basis of its compact construction and robustness of the impact-resistant metal housing, the LS 763 can reliably guarantee a high degree of availability, even with strong vibrations. Together with a Test Monitoring Unit, such as the TNT 35 or an MSI safety interface, for example, the LS 763 Single Light Beam Safety Device with test input forms a type 2 active opto-electronic protective device.

Typical areas of application

- Point of operation guarding in industrial environments with especially strong machine vibrations
- Weaving machines, packaging machinery, etc.

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Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 2 in combination with a Test Monitoring Unit
Operating range	0...6 m
Operating voltage, U_B	24 V DC \pm 15%
Dimensions (WxHxD)	27 mm x 14.6 mm x 52 mm
Housing	Metal
Switching output	pnp transistor output
Connection system	Cable, 2.5 m M8 round pin plug

Functions

LED-display

Activation input for test and series connection

Functional extensions

With safety interface	Relay output	RES	EDM	Muting	Further details
TNT 35	●	●	●		P. 450
MSI-s	●	●	●		P. 420
MSI-sx	●	●	●		P. 420
MSI-m	●	●	●	●	P. 432

Special features

- Compact construction with impact-resistant metal housing and glass optics
- Infrared single beam safety device with high functional reserve
- LED- display for function monitoring in transmitter and receiver
- Flexible PUR connection cable for industrial use or connection via M8 round pin plug connection



Properties



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SINGLE LIGHT BEAM SAFETY DEVICES

Ordering information

LS 763, consisting of transmitter and receiver

Functions: Activation input for test and series switching

Art. no.	Article	Description	Connection system
50027465	LS 763/2.8 trans, 2500	Transmitter	Cable end, 2.5 m
50027466	LS 763/4 R, 2500	Receiver	Cable end, 2.5 m
50081024	LS 763/2.8 SE-L8	Transmitter	M8 plug, 4-pin
50081025	LS 763/4 E-L8	Receiver	M8 plug, 4-pin

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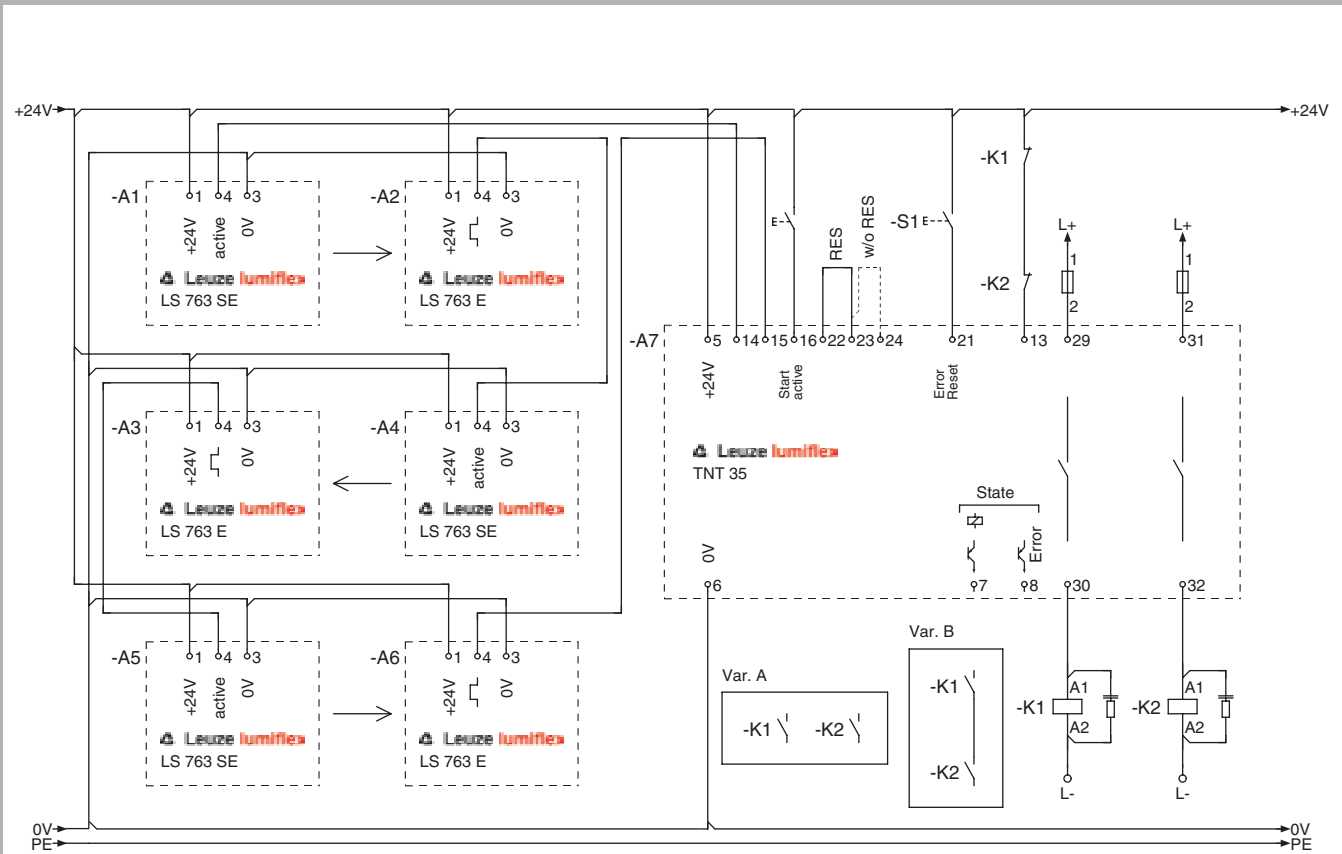
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Electrical connection

LS 763 connection example



LS 763 series connection with Test Monitoring Unit TNT 35

! Please observe the operating instructions of the components!





SINGLE LIGHT BEAM SAFETY DEVICES

Technical data

General system data	
Safety type in accordance with IEC/EN 61496	Type 2 in combination with a Test Monitoring Unit
Operating range	0...6 m
Response time	5 ms
Operating voltage, U_B	24 V DC \pm 15%
Safety class	II
Protection rating	IP 67
Ambient temperature, operation	-20...+60 °C
Ambient temperature, storage	-30...+70 °C
Dimensions (WxHxD)	27 mm x 14.6 mm x 52 mm
Housing	Metal
Weight	130 g
Transmitter	
Current consumption	20 mA
Transmitter diodes, class in accordance with EN 60825	1
Light source	Infrared light
Wavelength	880 nm
Activation input for test and series connection	24 V DC Active \geq 8 V Inactive \leq 2 V
Connection system	Cable, 2.5 m M8 round pin plug (4-pin)
Receiver	
Current consumption	15 mA without external load
Connection system	Cable, 2.5 m M8 round pin plug (4-pin)
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, 2.5 m M8 round pin plug (4-pin)

You will find additional information at www.leuze.com/ls763.

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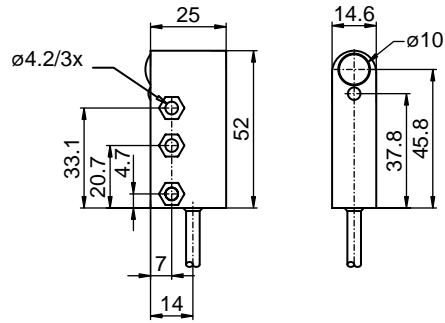
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Dimensional drawings

LS 763 Single Light Beam Safety Device





SINGLE LIGHT BEAM SAFETY DEVICES

SLS 46



Guarding at a wood processing machine with an SLS 46 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 46 Single Light Beam Safety Device offers sufficient functional reserves for numerous application variations and with the particularly strong infrared payload signal it can enable ranges of up to 30 m. 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 Test Monitoring Unit such as TNT 35 or an MSI safety interface, for example, the SLS 46 forms a type 2 active opto-electronic protective device.

Typical areas of application

- Point of operation guarding on palletizer systems, wood processing and packaging machinery

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p. 318

Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 2 in combination with a Test Monitoring Unit
Operating range	0...30 m
Operating voltage, U_B	10...30 V DC (incl. residual ripple)
Dimensions (WxHxD)	18.4 mm x 72 mm x 43 mm
Housing	Plastic
Switching output	pnp transistor output
Connection system	Cable, 2 m M12 round pin plug

Functions

LED-display

Activation input for test and series connection

Functional extensions

With safety interface	Relay output	RES	EDM	Muting	Further details
TNT 35	●	●	●		P. 450
MSI-s	●	●	●		P. 420
MSI-sx	●	●	●		P. 420
MSI-m	●	●	●	●	P. 432

Special features

- Infrared single beam safety device with 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



Properties



Further information

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SINGLE LIGHT BEAM SAFETY DEVICES

Ordering information

SLS 46, consisting of transmitter and receiver

Functions: Activation input for test and series connection

Art. no.	Article	Description	Connection system
50060935	SLSS 46.8-S12	Transmitter housing: Plastic. Light source: Infrared light	M12 round pin plug, 4-pin
50060936	SLSE 46/44-S12	Receiver housing: Plastic. Light source: Infrared light	M12 round pin plug, 4-pin
50060939	SLSS 46.8, 2000	Transmitter housing: Plastic. Light source: Infrared light	Cable, 2 m
50060940	SLSE 46/44, 2000	Receiver housing: Plastic. Light source: Infrared light	Cable, 2 m

You will find further information and ordering info in the Leuze electronic Opto-Electronic Sensors Catalog

Electrical connection

See LS763 connection example, page 301

Technical data

General system data

Safety type in accordance with IEC/EN 61496	Type 2 in combination with a Test Monitoring Unit
Operating range	0...30 m
Response time	2.5 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)	18.4 mm x 72 mm x 43 mm
Housing	Plastic
Weight	100 g
Transmitter	
Current consumption	30 mA
Transmitter diodes, class in accordance with EN 60825	1
Light source	Infrared light
Wavelength	880 nm
Activation input for test and series connection	Active ≥ 8 V Inactive ≥ 2 V
Connection system	Cable 2 M12 round pin plug

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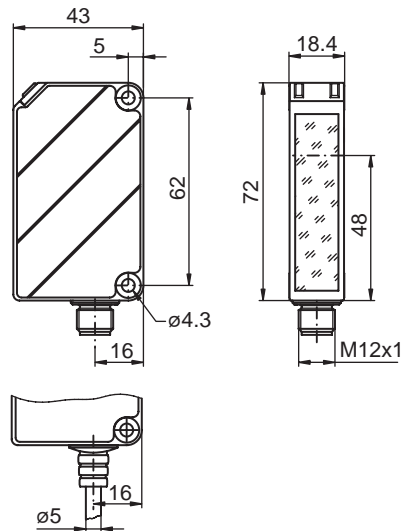
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Technical data

Receiver	
Current consumption	30 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, 2 m M12 round pin plug

You will find additional information at www.leuze.com/sls46.

Dimensional drawings



SLS 46 Single Light Beam Safety Device

Accessories ordering information

Art. no.	Article	Description	Length, design
Connection cable			
50080839	BK7 KB-450-5000-4	Connection cable, M12, 4-pin	5000 mm, angled
50080842	BK7 KB-450-5000-4A	Connection cable, M12, 4-pin	5000 mm, axial
Alignment aid			
50040739	ARH 46	Alignment aid for series 46 sensors	
Deflecting Mirror, see page 464			

www.leuze.com/sls46/





SINGLE LIGHT BEAM SAFETY DEVICES

SLS 96



Palletizer guarding with SLS 96 Single Light Beam Safety Devices

Typical areas of application

- Point of operation and access guarding in conveyor/storage systems, drinks industry and on packaging machinery

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 test monitoring such as TNT 35 or an MSI safety interface, for example, the SLS 96 forms a type 2 active optoelectronic protective device.

Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 2 in combination with a Test Monitoring Unit
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

Functional extensions

With safety interface	Relay output	RES	EDM	Muting	Further details
TNT 35	●	●	●		P. 450
MSI-s	●	●	●		P. 420
MSI-sx	●	●	●		P. 420
MSI-m	●	●	●	●	P. 432

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)



Properties



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SINGLE LIGHT BEAM SAFETY DEVICES

Ordering information

SLS 96, consisting of transmitter and receiver

Functions: Activation input for test 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 housing: 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

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Technical data

General system data	
Safety type in accordance with IEC/EN 61496	Type 2 in combination with a Test Monitoring Unit
Operating range	0...50 m (infrared light) 0...30 m (red light)
Response time	1 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	380 g (metal) 150 g (plastic)
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 ≅ 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)

You will find additional information at www.leuze.com/sls96.

www.leuze.com/sls96/

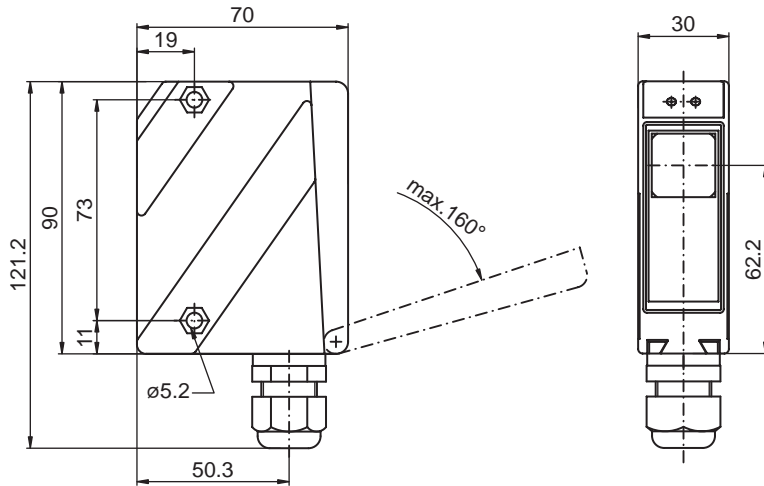




SINGLE LIGHT BEAM SAFETY DEVICES

Dimensional drawings

SLS 96 Single Light Beam Safety Device



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Accessories ordering information

Art. no.	Article	Description	Length, design
Connection cable			
50080839	BK7 KB-450-5000-4	Connection cable, M12, 4-pin	5000 mm, angled
50080842	BK7 KB-450-5000-4A	Connection cable, M12, 4-pin	5000 mm, axial
Alignment aid			
50080502	ARH 96	Alignment aid for series 96 sensors	
Deflecting Mirror			
50000670	US 1	Deflecting Mirror	
50017434	US 2	Deflecting Mirror mounting plate, 90° rotation	

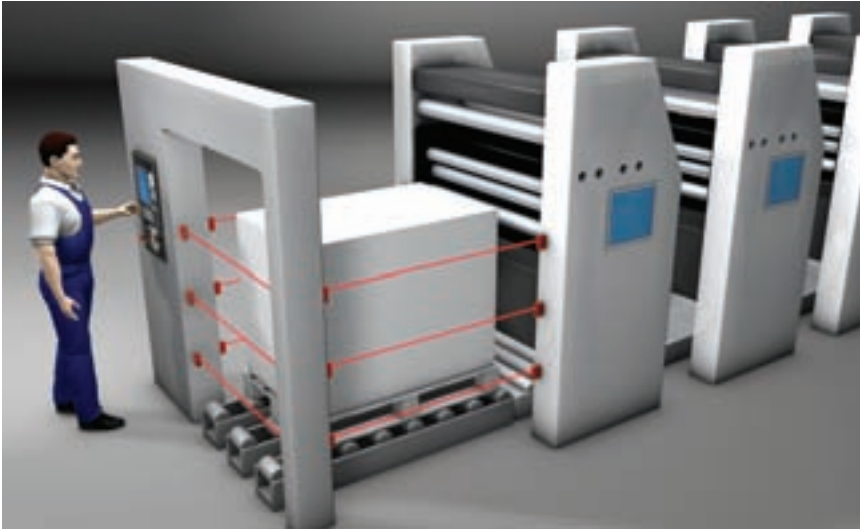
www.leuze.com/sls96/





SINGLE LIGHT BEAM SAFETY DEVICES

SLSR 8



Guarding a sheet-fed printing machine with an SLSR 8 Single Light Beam Safety Device

Versatile Single Light Beam Safety Devices are used in the printing and packaging area. It is an advantage here to use a Light Beam Safety Device that combines numerous functions in itself. Because of its functional diversity, the SLSR 8 light beam device is a true multi-talent. It has an active ambient light suppression and push-pull switching outputs, and many more features. It is protected by a robust metal housing that provides IP 67 protection rating and can be used in tough industrial conditions in a temperature range from – 40 to +60 °C. Together with a Test Monitoring Unit such as TNT 35 or an MSI safety interface, for example, the SLSR 8 forms a type 2 active opto-electronic protective device.

Typical areas of application

- Access guarding on printing and packaging machinery

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Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 2 in combination with a test -monitoring unit
Operating range	0...10 m
Operating voltage, U _B	10...30 V DC (incl. residual ripple)
Dimensions (WxHxD)	15 mm x 65.5 mm x 38 mm
Housing	Metal
Switching outputs	2 push-pull switching outputs Pin 2: pnp dark-on, npn light-on Pin 4: pnp light-on, npn dark-on
Connection system	M12 round pin plug

Functions

LED-display

Activation input for test and series connection

Active ambient light suppression (A²LS)

Functional extensions

With safety interface	Relay output	RES	EDM	Muting	Further details
TNT 35	●	●	●		P. 450
MSI-s	●	●	●		P. 420
MSI-sx	●	●	●		P. 420
MSI-m	●	●	●	●	P. 432

Special features

- Push-pull switching outputs for light/dark switching and as control function
- Selectable connection direction via swivel M12 plug



Properties



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SINGLE LIGHT BEAM SAFETY DEVICES

Ordering information

SLSR 8, consisting of transmitter and receiver

Functions: Activation input for test and series connection, active ambient light suppression (A²LS)

Art. no.	Article	Description	Connection system
50038791	SLSSR 8.8-S12	Transmitter, metal, red light	M12 round pin plug, 5-pin
50038792	SLSER 8/66-S12	Receiver, metal, red light	M12 round pin plug, 5-pin

You will find further information and ordering info in the Leuze electronic Opto-Electronic Sensors Catalog

Electrical connection

See LS763 connection example, page 301

Technical data

General system data

Safety type in accordance with IEC/EN 61496	Type 2 in combination with a Test Monitoring Unit
Operating range	0...10 m
Response 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
Housing	Metal
Weight	70 g

Transmitter

Current consumption	35 mA
Transmitter diodes, class in accordance with EN 60825	1
Light source	Red light
Wavelength	660 nm
Activation input for test and series connection	24 V DC Active ≥8 V Inactive ≲ V
Connection system	M12 round pin plug (5-pin)

Receiver

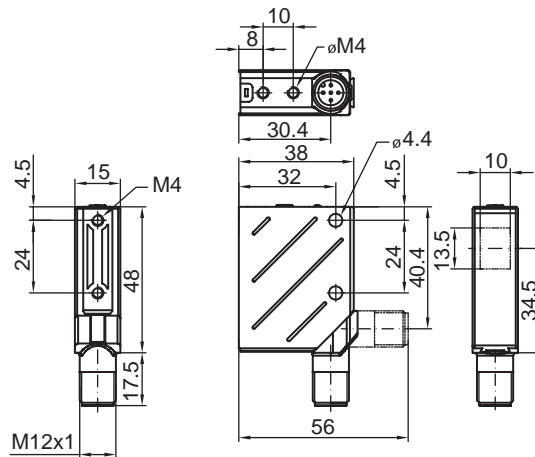
Current consumption	35 mA without external load
Switching outputs	2 push-pull switching outputs Pin 2: pnp dark-on, npn light-on Pin 4: pnp light-on, npn dark-on
Switching voltage high active	Min. U _v – 2 V
Switching voltage low	Max. 2 V
Output current	Max. 100 mA
Connection system	M12 round pin plug (5-pin)

You will find additional information at www.leuze.com/slsr8.

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Dimensional drawings

SLSR 8 Single Light Beam Safety Device



Accessories ordering information

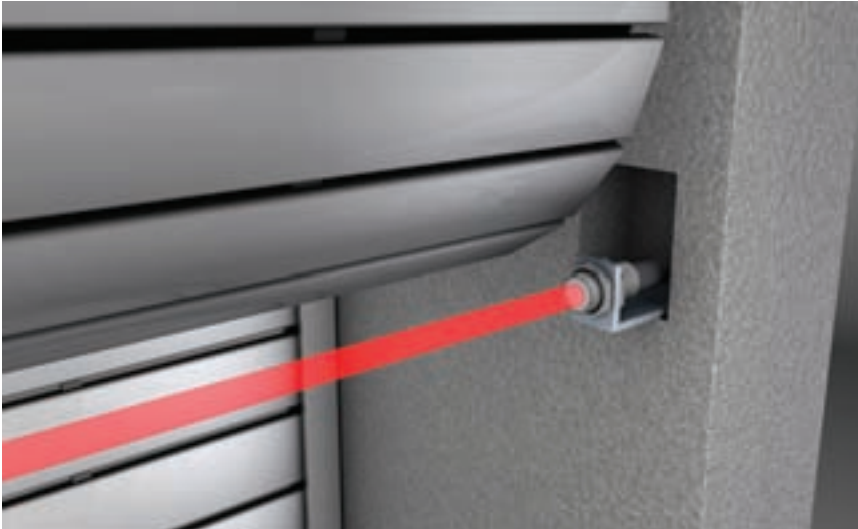
Art. no.	Article	Description	Length, design
Connection cable			
50080839	BK7 KB-450-5000-4	Connection cable, M12, 4-pin	5000 mm, angled
50080842	BK7 KB-450-5000-4A	Connection cable, M12, 4-pin	5000 mm, axial
Deflecting Mirror			
50000670	US 1	Deflecting Mirror	
50017434	US 2	Deflecting Mirror mounting plate, 90° rotation	





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 safety light beam 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 312 safety light beam devices enables switching frequencies of 1000 Hz and together with a Test Monitoring Unit such as the TNT 35 or an MSI safety interface, for example, they form type 2 active optoelectronic protective devices.

Typical areas of application

- In difficult industrial conditions
- Wood processing and paper industry
- Print and packaging machinery

Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 2 in combination with a test -monitoring unit
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

Functional extensions

With safety interface	Relay output	RES	EDM	Muting	Further details
TNT 35	●	●	●		P. 450
MSI-s	●	●	●		P. 420
MSI-sx	●	●	●		P. 420
MSI-m	●	●	●	●	P. 432

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



Properties



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SINGLE LIGHT BEAM SAFETY DEVICES

Ordering information

SLS 318, consisting of transmitter and receiver

Functions: Activation input for test and series connection

Art. no.	Article	Description	Connection system
50083116	SLSS 46.8-S12	Transmitter housing: Plastic. Light source: Red light	M12 round pin plug, 4-pin
50083117	SLSS 46.8-S12	Receiver housing: Plastic. Light source: Red light	M12 round pin plug, 4-pin
50083132	SLSS 318K	Transmitter housing: Plastic. Light source: Red light	Cable, 2m
50083133	SLSE 318K/P	Receiver, plastic housing, light source: Red light	Cable, 2m

You will find further information and ordering info in the Leuze electronic Opto-Electronic Sensors Catalog

Electrical connection

See LS763 connection example, page 301

Technical data

General system data

Safety type in accordance with IEC/EN 61496	Type 2 in combination with a Test Monitoring Unit
Operating range	0...10 m
Response time	0.5 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	90 g (cable), 20 g (M12)

Transmitter

Current consumption	25 mA
Transmitter diodes, class in accordance with EN 60825	1
Light source	Red light
Wavelength	660 nm
Activation input for testing and series connection	Active ≥ 8 V / inactive ≤ 1.5 V
Connection system	Cable, 2 m M12 round pin plug (4-pin)

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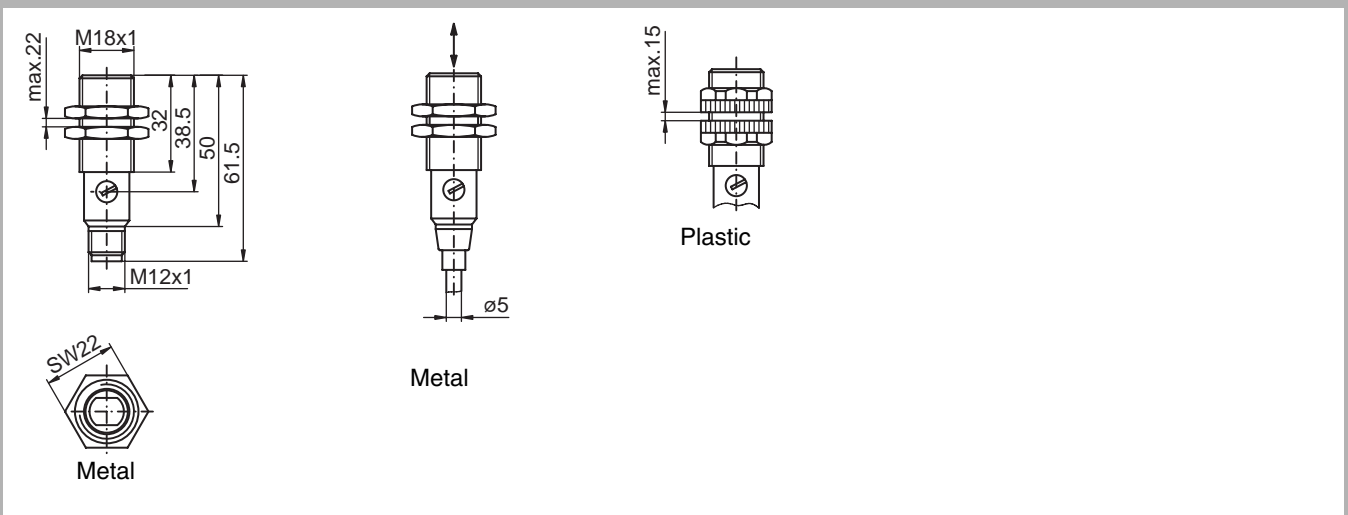
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Technical data

Receiver	
Current consumption	25 mA without external load
Switching output	pnp transistor output
Switching voltage high active	Min. $U_v - 1.6$ V
Switching voltage low	Max. 1.6 V
Output current	Max. 100 mA
Connection system	Cable, 2 m M12 round pin plug (4-pin)

Dimensional drawings



Accessories ordering information

Art. no.	Article	Description	Length, design
Connection cable			
50080839	BK7KB-450-5000-4	Connection cable, M12, 4-pin	5000 mm, angled
50080842	BK7KB-450-5000-4A	Connection cable, M12, 4-pin	5000 mm, axial



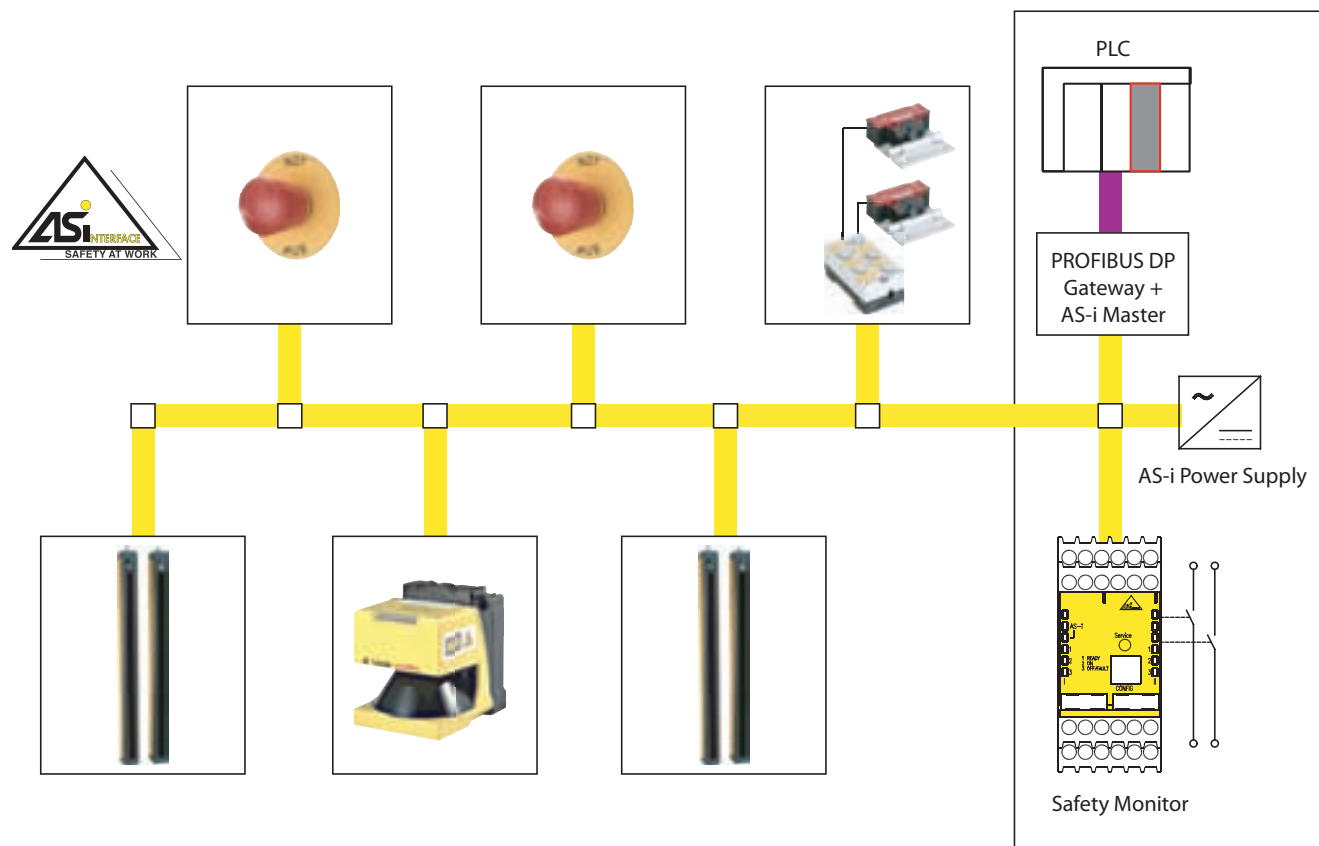


AS-interface Safety at Work

OVERVIEW

AS-interface Safety at Work overview

AS-interface Safety at Work overview



Networking with AS-interface at the sensor/actuator level and coupling to higher level field buses



Multiple Light Beam Safety Devices with integrated AS-interface at a processing center



Multiple Light Beam Safety Devices, Safety Light Curtains or Safety Laser Scanners (from left to right) can be connected directly to AS-i flat cable via integrated AS-interfaces. Foreground: The AS-i safety monitor and the coupling module for connecting further components

Flexibility and fast diagnostics are becoming increasingly more important for automation technology in modern production systems, which of course also applies for 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.

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.

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- ROTOSCAN RS4/AS-i Safety, p. 332
- COMPACTplus/AS-i, p. 334
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- ASKM1, p. 344

www.leuze.com/asi/



Machine Safety

Machine Safety Services

Safety Engineering Software

Safety Laser Scanners

Safety Light Curtains

Multiple Light Beam Safety Devices

Single Light Beam Safety Devices

AS-interface Safety at Work

PROFIsafe Sensors

Safety Switches and Safety Locking Devices

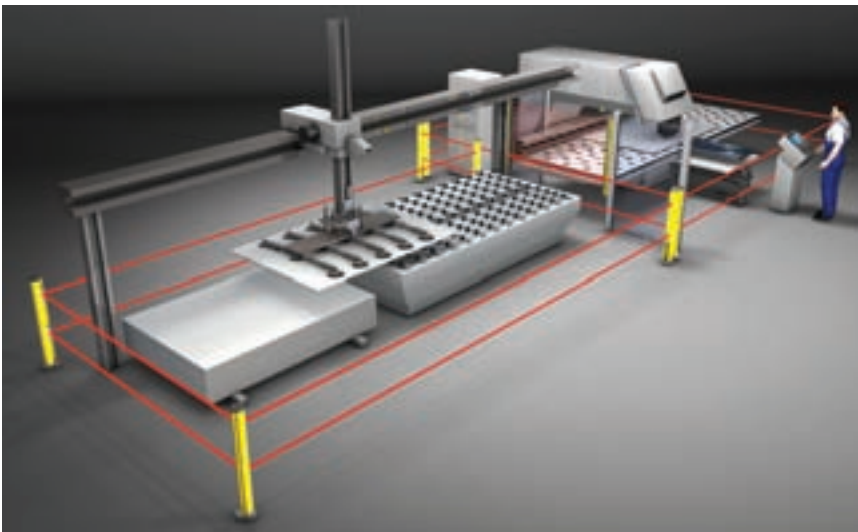


AS-interface Safety at Work

ASM1, ASM1E Safety Monitors



AS-interface Safety at Work-based robot application with 2 release circuits



With larger systems AS-interface Safety at Work reduces the costs for safety technology and simplifies the integration of further components

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. control 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 Windows® based software. The user can combine safety sensors and control devices with a mouse click and assign different release circuits for switching off the dangerous movement. Depending on the device type, two 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.

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

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ASM1, ASM1E SAFETY MONITORS

Important technical data, overview

Safety type in accordance with IEC/EN 61508	SIL 3
Safety category in accordance with EN 954-1	4
Safety type in accordance with IEC/EN 61496-1	Type 4 (in combination with active opto-electronic protective devices)
STOP category in accordance with IEC/EN 60204-1	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 make contacts (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 for the monitoring modules
- RS 232 interface for PC-supported system configuration and 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 automatic system integration (teach-in) of AS-i sensors with a sensor exchange and system reset



Properties



Further information

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AS-interface Safety at Work

Functions

	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	RS232	RS232	RS232
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, 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	●	●	●	●
STOP 0 / STOP 1	●	●	●	●
Start/restart function (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	●	●	●	●

Ordering information

ASM1 and 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	Connection system
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

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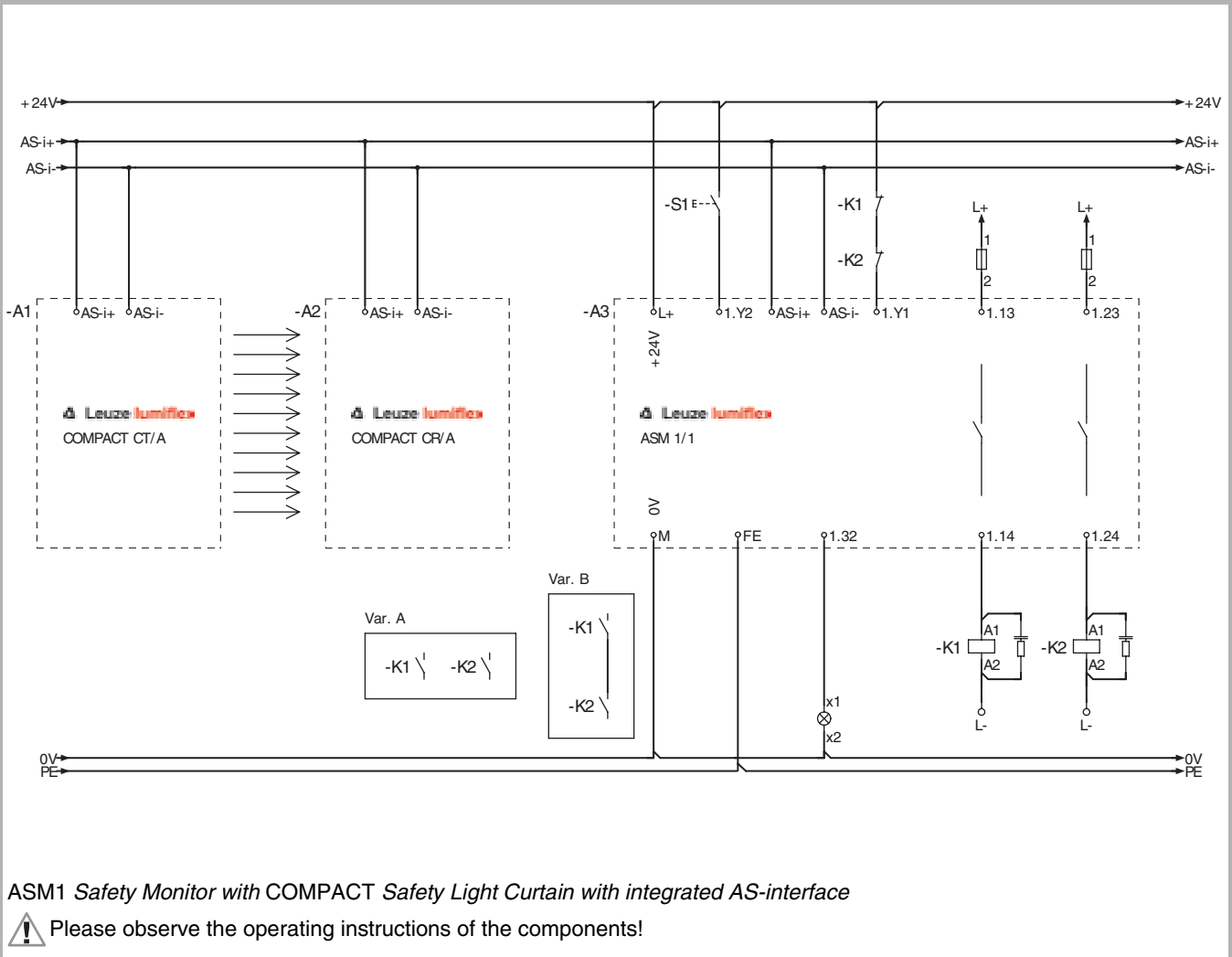
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ASM1, ASM1E SAFETY MONITORS

Electrical connection

ASM1 connection example





AS-interface Safety at Work

Technical data

General system data	
Safety type in accordance with IEC/EN 61508	SIL 3
Safety category in accordance with EN 954-1	4
Safety type in accordance with IEC/EN 61496-1	Type 4
STOP category in accordance with IEC/EN 60204-1	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/control 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
Installation	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
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 make contacts (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 acc. with VDE 0110 Part 1)

You will find additional information in the connecting and operating instructions at www.leuze.com/asm.

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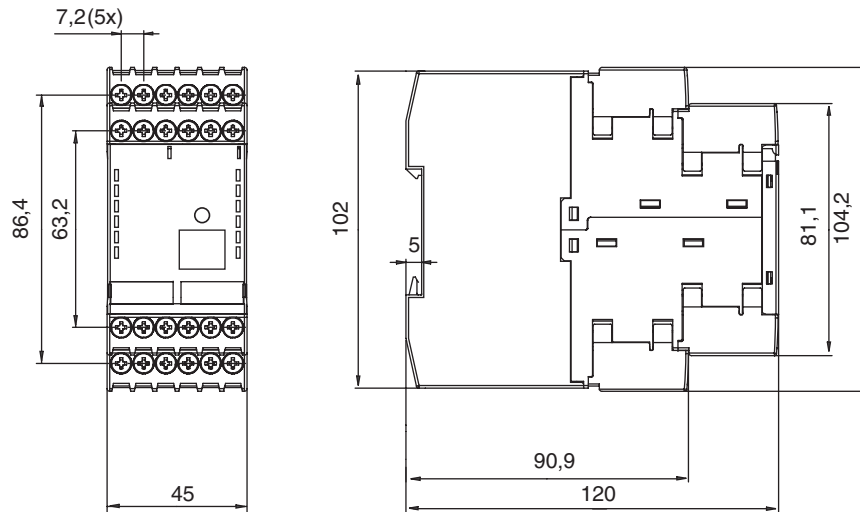
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ASM1, ASM1E SAFETY MONITORS

Dimensional drawings

AS-interface Safety at Work ASM1, ASM1E



www.leuze.com/asm/



Machine Safety

Machine Safety Services

Safety Engineering Software

Safety Laser Scanners

Safety Light Curtains

Multiple Light Beam Safety Devices

Single Light Beam Safety Devices

AS-interface Safety at Work

PROFIsafe Sensors

Safety Switches and Safety Locking Devices



AS-interface Safety at Work

Accessories ordering information

ASM1, ASM1E – Accessories

Art. no.	Article	Description
580032	ASM1-SWC	ASM initial operation set for ASM1 and ASM1E Includes: asimon configuration and diagnostics software, connecting and operating instructions and user manual, software (electronic on CD-ROM), programming cable, device swap-out data cable
50104078	ASM1-PK	ASM1 parametering cable
50104079	ASM1-DK	ASM1 device swap-out data cable

Safety monitor initial operation set, ASM1-SWC

The complete ASM1-SWC package with configuration and diagnostics software, PC cable set and detailed technical manual provides the user with everything that they require for the initial operation of the safety monitor.



ASM1, ASM1E SAFETY MONITORS

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	
50024750	AKB 01	AS-i flat cable, yellow	Per meter
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 power supply for COMPACTplus Receiver/Transceiver & ROTOSCAN RS4, M12, 5-pin	
50024748	KB-095-1000-3AW	AS-i cable, adapter device, M12, 3-pin	1 m, straight/angled
50024749	KB-095-2000-3AW	AS-i cable, adapter device, M12, 3-pin	2 m, straight/angled
548361	CB-M12-1000-5GF/GM	AS-i cable, adapter device, plug and socket, 1:1, M12, 5pin	1 m, straight
548362	CB-M12-2000-5GF/GM	AS-i cable, adapter device, plug and socket, 1:1, M12, 5pin	2 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.



www.leuze.com/asm/





AS-interface Safety at Work

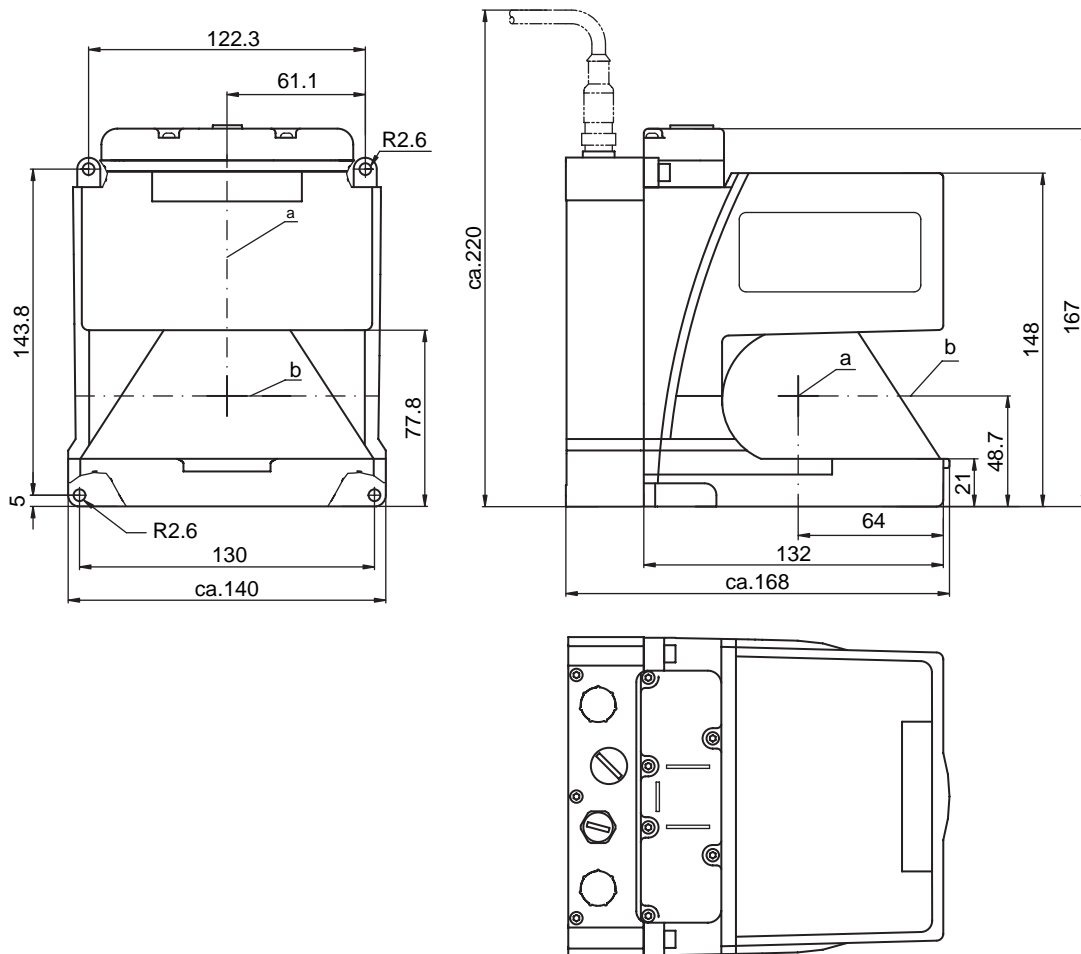
ROTOSCAN RS4/AS-i Safety Laser Scanners

Electrical connection

Connection example, see page 327

For more information go to www.leuze.com/rs4-asi

Dimensional drawings



Ordering information

Ordering information, see page 72

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ROTOSCAN RS4/AS-i SAFETY LASER SCANNERS

Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 3				
Classification in accordance with IEC/EN 61508	SIL 2				
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)	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 detection field release)				

You will find 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 function (RES), selectable	●	●	●	●
Dynamic contactor monitoring (EDM), selectable	●	●	●	●
Diagnostics data transfer via AS-interface	●	●	●	●

Special features

- **Type 3 Safety Laser Scanner in accordance with IEC/EN 61496-1/-3**
- **Integrated interface for direct connection to the safe AS-interface network**
- **Easy AS-interface connection 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 field monitoring via AS-interface bus**
- **Any kind of protective/warning field contours and configurations**
- **Field pair switchover possible during the operation**



Properties



Further information

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● Functions, see ROTOSCAN RS4	71
● Electrical connection, see ASM1	327
● Dimensional drawings	332
● Ordering information, see ROTOSCAN RS4	72





AS-interface Safety at Work

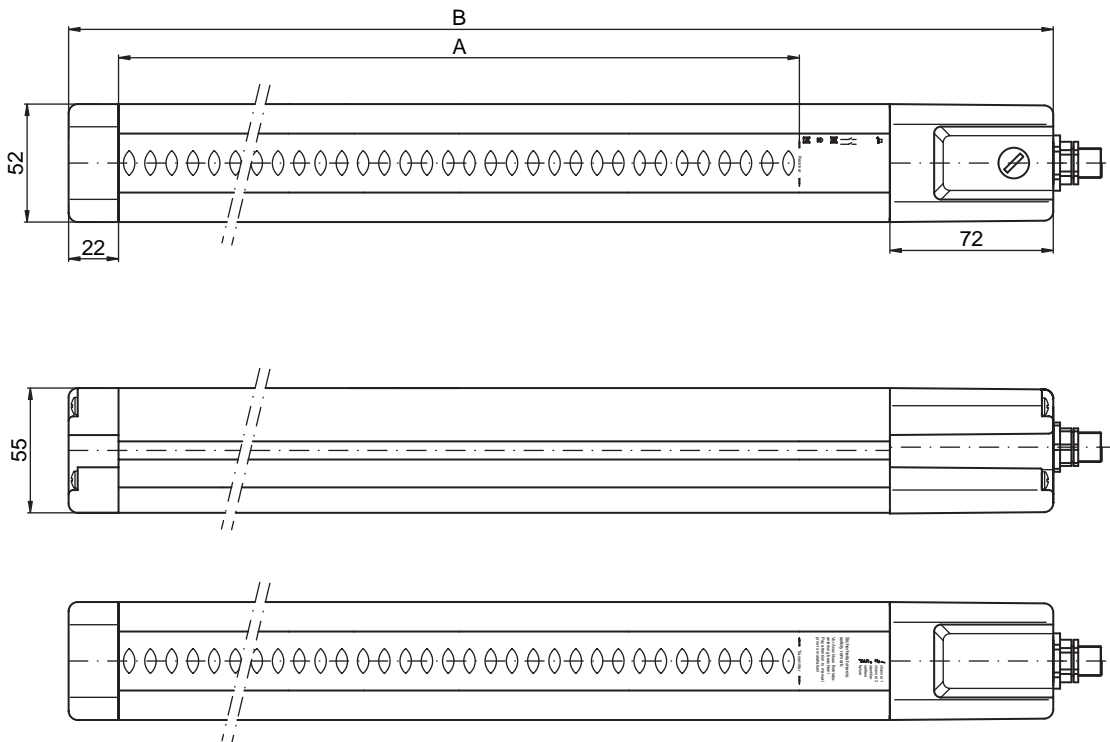
COMPACTplus/AS-i Safety Light Curtains

Electrical connection

Connection example, see page 327

For more information go to www.leuze.com/compactplus-m, www.leuze.com/compactplus-b and www.leuze.com/compactplus-i.

Dimensional drawings



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

Ordering information

Ordering information, see Safety Light Curtains COMPACTplus, page 100

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COMPACTplus/AS-i SAFETY LIGHT CURTAINS

Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 4			
Classification in accordance with IEC/EN 61508	SIL 3			
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 (OSSD)	AS-i Safety interface			
Connection system	M12 plug (AS-i Safety)			
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	40 mA			
Sensor response time	10 to 66 ms			
Restart delay time	20...500 ms, can be set with SafetyLab software, presetting 100 ms (after protective field release)			

You will find additional information in the connecting and operating instructions at www.leuze.com/compactplus-asi.

For more information go to www.leuze.com/compactplus-m, www.leuze.com/compactplus-b and www.leuze.com/compactplus-i.

Special features

- Type 4 Safety Light Curtain in accordance with IEC/EN 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, COMPACTplus-i)
- Direct connection of muting sensors, start/restart button or lamp directly on the device via sensor connection module (COMPACTplus-m)



Properties



Further information	Page
● Muting function package	83
● Blanking function package	99
● Cycle control function package	113
● Electrical connection, see ASM1	327
● Dimensional drawings	334
● Ordering information, see COMPACTplus	100

www.leuze.com/compactplus-asi/





AS-interface Safety at Work

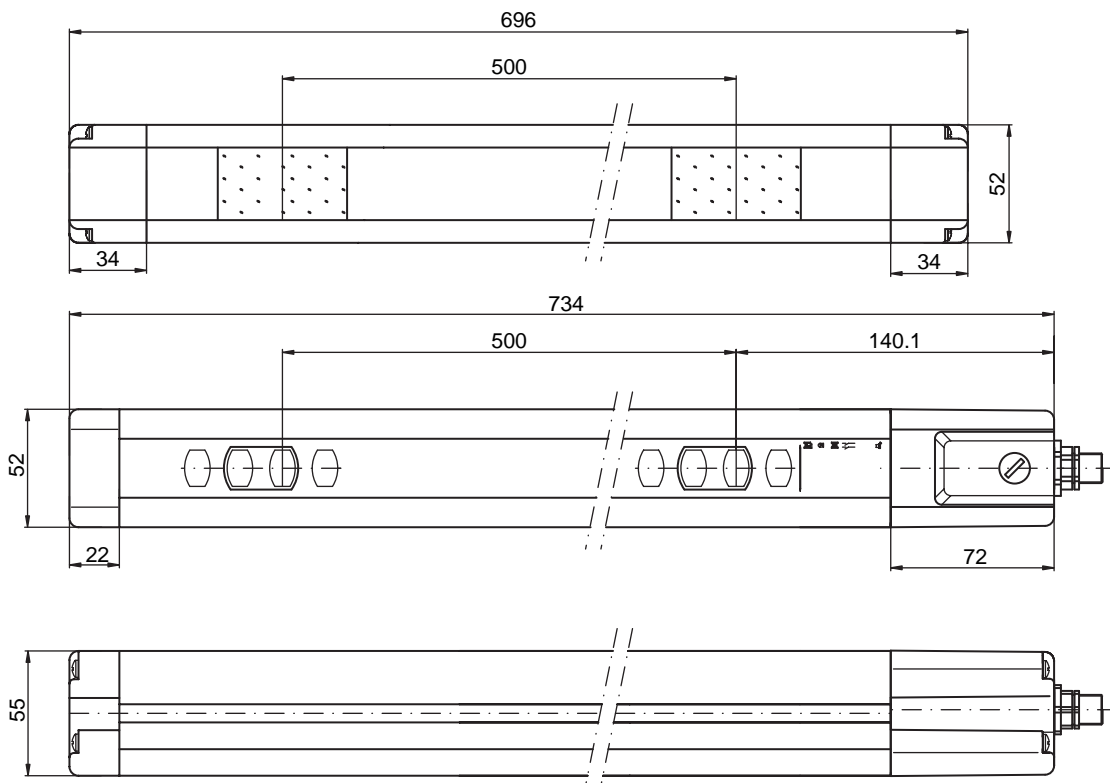
COMPACT_{plus}/AS-i Multiple Light Beam Safety Devices

Electrical connection

Connection example, see page 327

For more information go to www.leuze.com/cprt-m-asi.

Dimensional drawings



Dimensions: CPRT-m muting transceiver with integrated AS-I Safety at Work interface

Ordering information

Ordering information, see chapter Multiple Light Beam Safety Devices COMPACT_{plus}-m, page 191

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COMPACTplus/AS-i

Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 4		
Classification in accordance with IEC/EN 61508	SIL 3		
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 (OSSD)	AS-i Safety interface		
Connection system	M12 plug (AS-i Safety)		
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	40 mA		
Sensor response time	24 ms, 25 ms (muting transceiver)		
Restart delay time	20...500 ms, can be set with SafetyLab software, presetting 100 ms (after protective field release)		

You will find additional information in the connecting and operating instructions at www.leuze.com/cprt-m-asi.

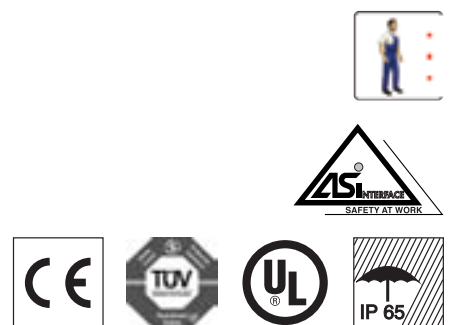
For more information go to www.leuze.com/compactplus-cprt-m.

Special features

- **Type 4 Multiple Light Beam Safety Device in accordance with IEC/EN 61496-1/-2**
- **Integrated AS-interface, bus connection via the M12-AS-i 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**
- **Direct connection of muting sensors, start/restart button or lamp directly on the device via sensor connection module**
- **Muting restart function possible via AS-interface by calling up AS-i-IC parameters**
- **Additional diagnostics information via AS-interface, e.g. muting sensors status, muting or weak signal display**



Properties



Further information

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● Function packages: Multiple Light Beam Safety Devices with muting	189
● Electrical connection, see ASM1	327
● Dimensional drawings	336
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AS-interface Safety at Work

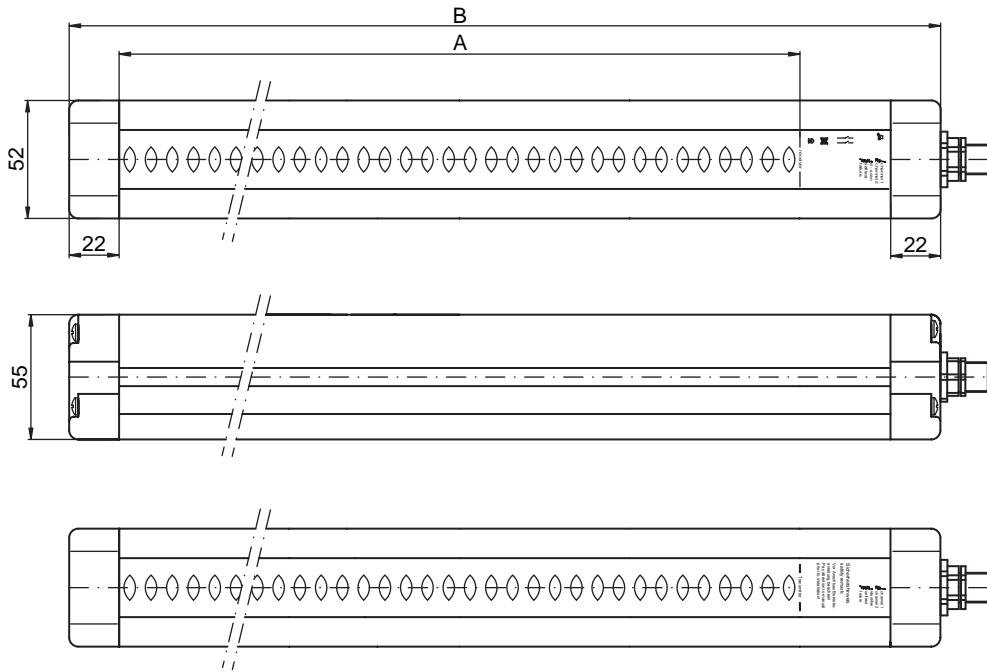
COMPACT/AS-i Safety Light Curtains

Electrical connection

Connection example, see page 327

For more information go to www.leuze.com/compact-asi.

Dimensional drawings



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

Ordering information

Ordering information, see Safety Light Curtains COMPACT, page 128

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COMPACT/AS-i SAFETY LIGHT CURTAINS

Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 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 output (OSSD)	AS-i Safety interface			
Connection system	M12 plug (AS-i Safety)			
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	Transmitter: Max. 130 mA. Receiver: Max. 140 mA.			
Sensor response time (length-dependent)	12...54 ms			
Restart time (adjustable)	100/500 ms (after protective field release)			

You will find additional information in the connecting and operating instructions www.leuze.com/compact-asi.

Function extension with ASM1/ASM1E safety monitor

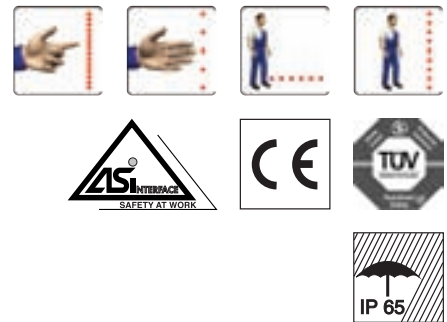
	ASM1/1	ASM1/2	ASM1E/1	ASM1E/2
Start/restart function (RES), selectable	●	●	●	●
Dynamic contactor monitoring (EDM), selectable	●	●	●	●
Diagnostics data transfer via AS-interface	●	●	●	●

Special features

- **Type 4 Safety Light Curtain in accordance with IEC/EN 61496-1/-2**
- **Integrated interface for direct connection to the safe AS-interface network**
- **Easy AS-interface connection 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**
- **Additional diagnostics information via AS-interface: Centralized alarm (e.g. weak signal display)**
- **Several devices can be cascaded**



Properties



Further information

Further information	Page
● Functions	127
● Electrical connection, see ASM1	327
● Dimensional drawings	338
● Ordering information, see COMPACT	128





AS-interface Safety at Work

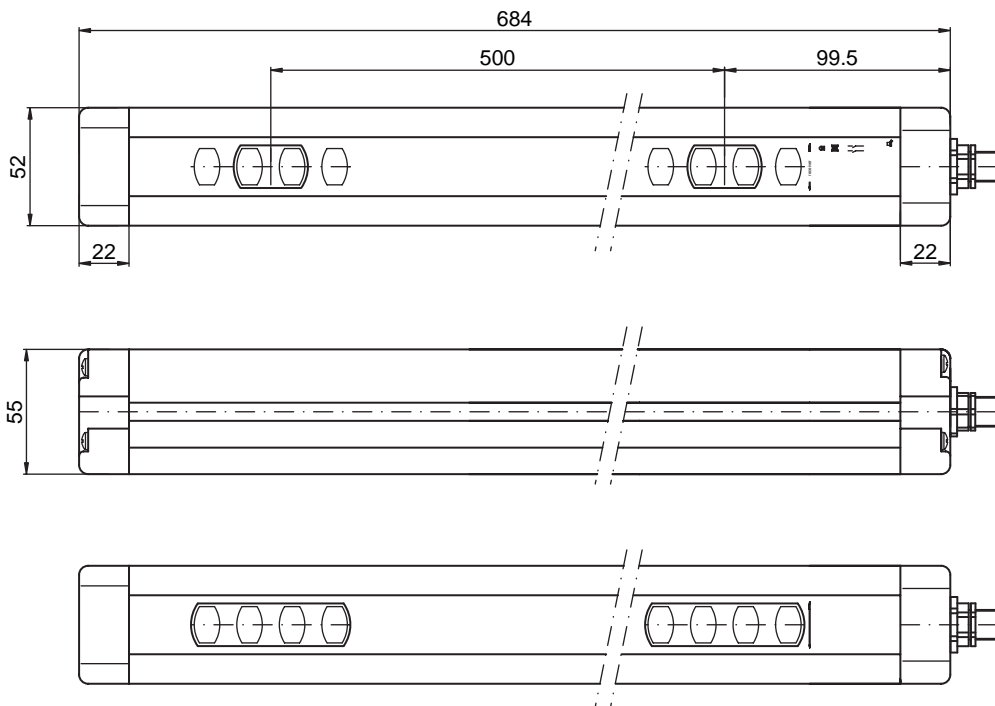
COMPACT/AS-i Multiple Light Beam Safety Devices

Electrical connection

Connection example, see page 327

For more information go to www.leuze.com/compact-asi.

Dimensional drawings



Ordering information

Ordering information, see Multiple Light Beam Safety Devices COMPACT, page 224

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COMPACT/AS-i

Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 4		
Number of beams	2	3	4
Beam distance	500 mm	400 mm	300 mm
Range	Cxx0/y:	0...18 m	
	Cxx1/y:	6...70 m	
Profile cross-section	52 mm x 55 mm		
Safety-related switching output (OSSD)	AS-i Safety interface		
Connection system	M12 plug (AS-i Safety)		
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	Transmitter: Max. 130 mA. Receiver: Max. 140 mA.		
Sensor response time (type-dependent)	10 ms (SingleScan), 13 ms (MultiScan)		
Restart time (adjustable)	100/500 ms (after protective field release)		

You will find additional information in the connecting and operating instructions www.leuze.com/compact-asi.

Function extension with ASM1/ASM1E safety monitor

	ASM1/1	ASM1/2	ASM1E/1	ASM1E/2
Start/restart function (RES), selectable	●	●	●	●
Dynamic contactor monitoring (EDM), selectable	●	●	●	●
Diagnostics data transfer via AS interface	●	●	●	●

Special features

- **Type 4 Multiple Light Beam Safety Device in accordance with IEC/EN 61496-1/-2**
- **Integrated interface for direct connection to the safe AS-interface network**
- **Easy AS-interface connection 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**
- **Additional diagnostics information via AS-interface: Centralized alarm (e.g. weak signal display)**
- **Several devices can be cascaded**



Properties



Multiple Light Beam Safety Devices

Single Light Beam Safety Devices

Further information

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● Integrated laser alignment aid, see COMPACT/laser	241
● Electrical connection, see ASM1	327
● Dimensional drawings	340
● Ordering information, see COMPACT	224
● Ordering information, see COMPACT/laser	242

AS-interface Safety at Work

PROFIsafe Sensors



Safety Switches and Safety Locking Devices



AS-interface Safety at Work

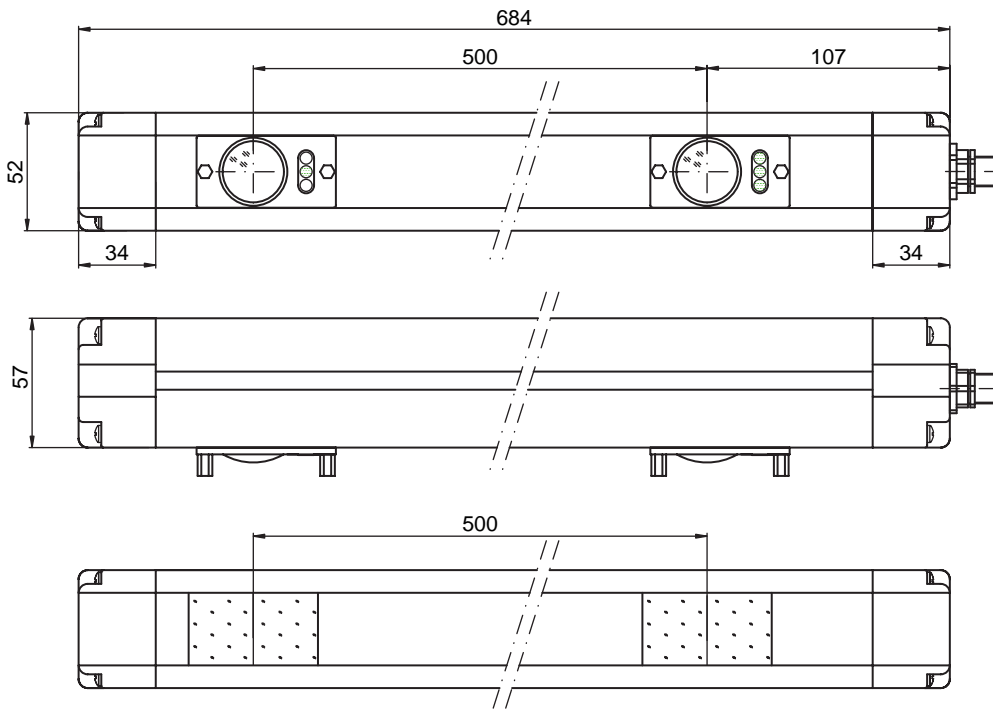
ROBUST/AS-i Multiple Light Beam Safety Devices

Electrical connection

Connection example, see page 327

For more information go to www.leuze.com/robust-asi.

Dimensional drawings



Ordering information

See ROBUST 42, 44 ordering information on page 254

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ROBUST/AS-i

Important technical data, overview

Safety type in accordance with IEC/EN 61496		Type 4	
Number of beams (type-dependent)		2	4
Beam distance		500 mm	300 mm
Range	PM2-500:	0.5 m - 2.5 m	PM4-300: 0.5 m - 2.5 m
	PM2-500V:	1.5 m - 8.0 m	PM4-300V: 1.5 m - 8.0 m
Protection rating		IP 67 (IP 65 for models with integrated lamps)	
Ambient temperature, operation		-25...+55 °C	
Ambient temperature, storage		-30...+70 °C	
Profile cross-section		52 mm x 57 mm	
Safety-related switching output (OSSD)		AS-i Safety interface	
Connection system		M12 plug (AS-i Safety)	
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		160 mA (ROBUST42), 300 mA (ROBUST 44)	
Sensor response time		12 ms	
Restart delay time		Typically 50 ms (after protective field release)	

You will find additional information in the connecting and operating instructions at www.leuze.com/robust-asi.

Function extension with ASM1/ASM1E safety monitor

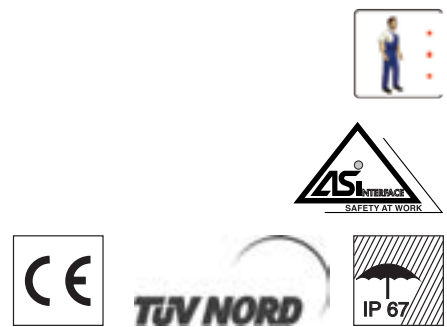
	ASM1/1	ASM1/2	ASM1E/1	ASM1E/2
RES, selectable	●	●	●	●
EDM, selectable	●	●	●	●
Diagnostics data transfer via AS-interface	●	●	●	●

Special features

- **Type 4 Multiple Light Beam Safety Device in accordance with IEC/EN 61496-1/-2**
- **Integrated interface for direct connection to the safe AS-interface network**
- **Easy AS-interface connection 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**
- **Integrated optics heating for use with extreme environmental conditions**
- **Protection rating: IP 67**



Properties



Further information

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● Functions, see ROBUST 42, 44	253
● Electrical connection, see ASM1	327
● Dimensional drawings	342
● Ordering information, see ROBUST 42, 44	254



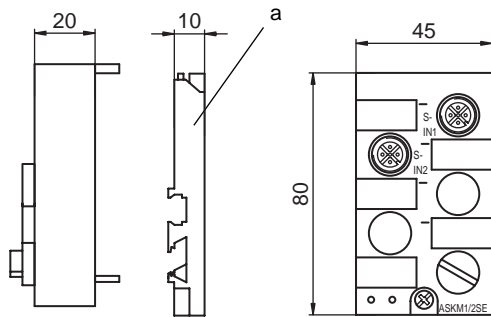


AS-interface Safety at Work

ASKM1 AS-interface Safety at Work coupling module

The ASKM1 safe coupling module allows electro-mechanical safety sensors with contact-based outputs, such as emergency STOP relays 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

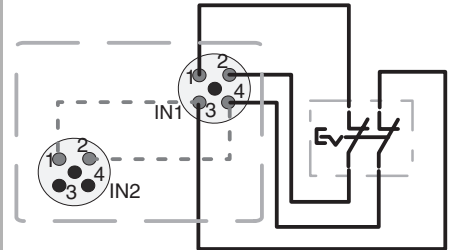
For more information go to www.leuze.com/askm.

Ordering information

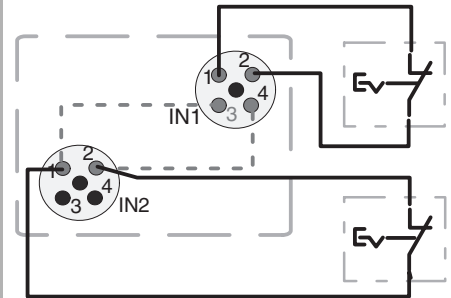
Art. no.	Article	Description
580000	ASKM1/2SE	Coupling module with 2 safe inputs
580001	ASKM1-MP	Mounting plate for ASKM1/2SE * coupling module
580002	ASKM1-PK	Parametering cable for AS-i parametering device APG-02

* Must always also be ordered for ASKM1/2SE

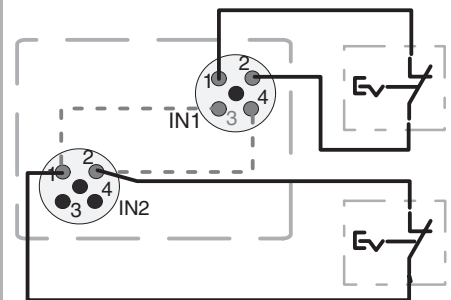
Electrical connection



Safety category 3: Protective door with a Safety Switch (2 break contacts)



Safety category 4: Protective door with two Safety Switches (1 break contact)



Safety category 4: Protective door with two Safety Switches (1 break contact)

ASKM1 COUPLING MODULE

Important technical data, overview

Safety category in accordance with EN 954-1	4
Operating voltage	AS-i (26.5 – 31.6 V)
Current consumption (total)	≤45 mA
Connection system	M12 (5-pin)
Protection rating	IP 67 (with ASKM1-MP mounting plate)
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

You will find additional information in the connecting and operating instructions at www.leuze.com/askm.

Functions

	Connectable electro-mechanical safety devices ^{*)}			
	Safety Switch	Emergency STOP relays, 1 and 2-channel	Single 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 safety categories see the ASKM1 connection examples on page 344.

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



Properties



Further information

	Page
● Electrical connection on AS-Interface	327

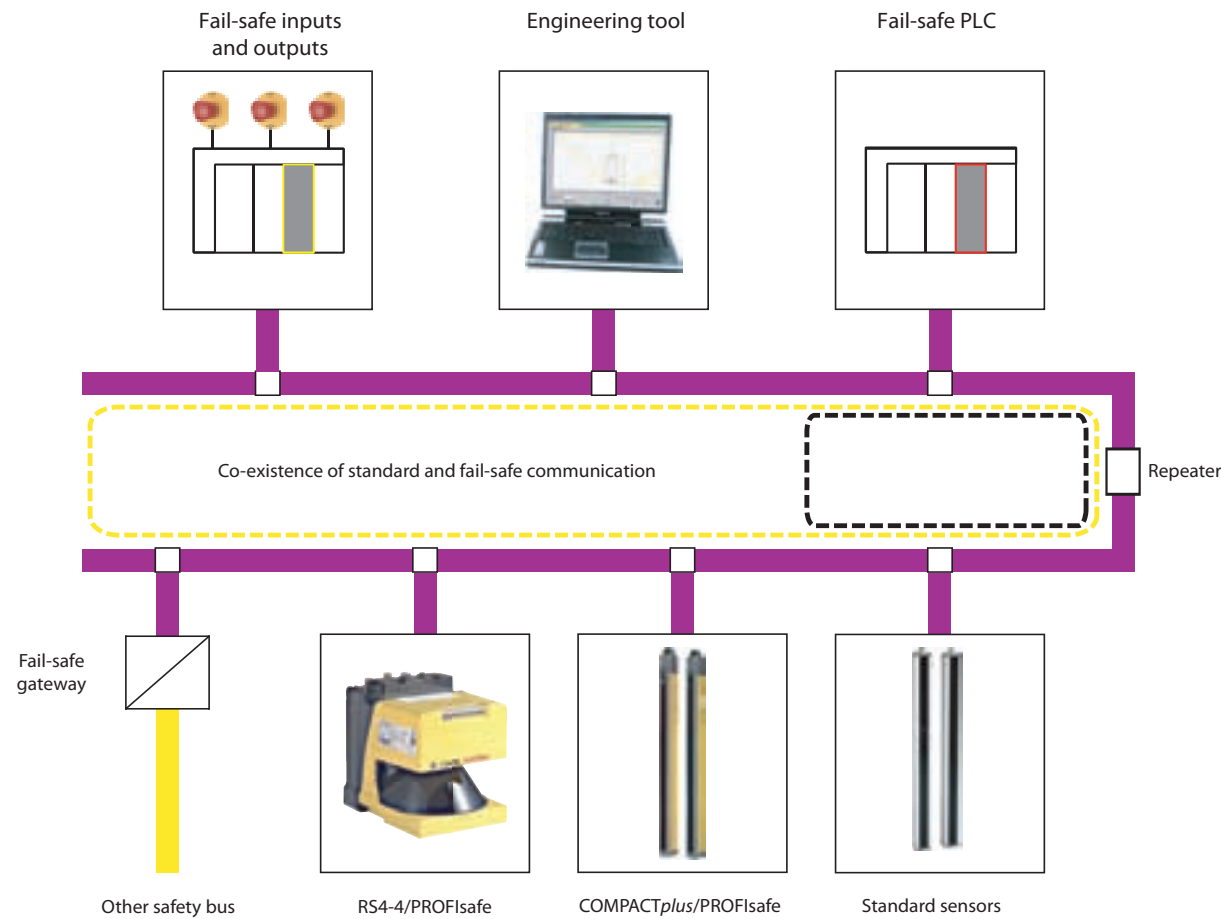


PROFIsafe Sensors

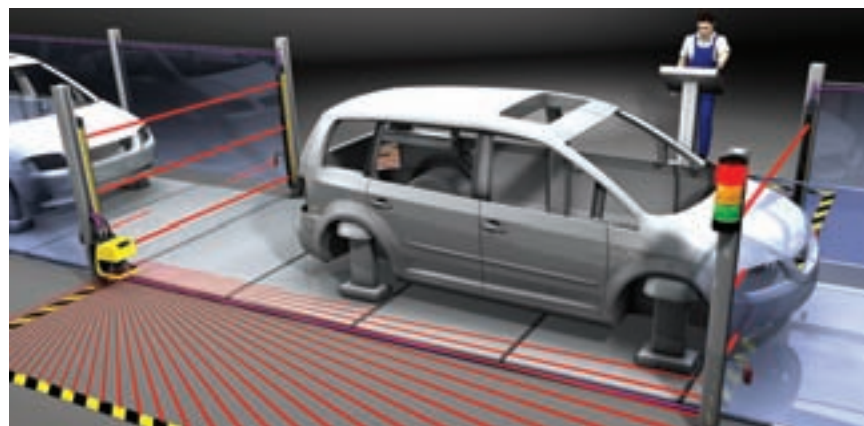
OVERVIEW

Overview of 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



Whether it be type 4 Safety Light Curtains, Multiple Light Beam Safety Devices or Safety Laser Scanners – via the integrated PROFIsafe 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 more 18 million PROFIBUS nodes installed in the industrial sector (2006).

The new V2 driver generation for PROFIsafe provides a standardized profile for the PROFIBUS and PROFINET bus systems, which are firmly established in numerous industries. PROFIsafe 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 RS4-4/PROFIsafe Safety Laser Scanner and the type 4 COMPACTplus/PROFI-safe Safety Light Curtain demonstrate their value with an integrated PROFIsafe interface and the support of the current PROFIsafe profile.



Machine Safety
Machine Safety Services
Safety Engineering Software
Safety Laser Scanners
Safety Light Curtains
Multiple Light Beam Safety Devices
Single Light Beam Safety Devices
AS-interface Safety at Work
PROFIsafe Sensors
Safety Switches and Safety Locking Devices



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 lumiflex 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 of 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 an active opto-electronic protective device 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 DP or on-site via an infrared interface. The detection zone contours and all other parameters can be easily generated via Windows® software with graphic input option. The zone pair (detection zone/warning zone) switchover is also possible during operation.

Typical areas of application

- Access and danger area 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 or via 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 area guarding
- Automated production cells with PROFIBUS DP networking

PROFIsafe sensors
p. 348

ROTOSCAN RS4/
PROFIsafe
p. 352

COMPACTplus/
PROFIsafe
p. 356

ROTOSCAN RS4/PROFIsafe SAFETY LASER SCANNERS

Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 3
Classification in accordance with IEC/EN 61508	SIL 2
Resolution (adjustable)	30 mm 40 mm 50 mm 70 mm 150 mm
Dimensions (W x H x D)	140 mm x 155 mm x 170 mm
Safety-related switching output (OSSD)	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

You will find additional information in the connecting and operating instructions at www.leuze.com/profisafe.

Functions

See ROTOSCAN RS4-4/RS4-4E on page 71.

For more information go to www.leuze.com/rotoscan.

PROFIsafe function extension

Diagnostics data transfer via PROFIBUS DP

Start/restart function (RES), selectable

Plus all functions and modules of the Safety PLC used

Special PROFIsafe features

- Easy project planning via GSD and parametering software
- Integrated PROFIsafe 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
- Direct access via PROFIBUS DP or infrared interface for on-site parametering and diagnostics
- Software with graphic input option for detection zone contours



Properties



Further information

	Page
● Ordering information, see ROTOSCAN RS4	72
● Electrical connection	350
● Technical data, see ROTOSCAN RS4	75
● Dimensional drawings	351
● Accessories dimensional drawings, see ROTOSCAN RS4	77
● Accessories ordering information, see ROTOSCAN RS4	78

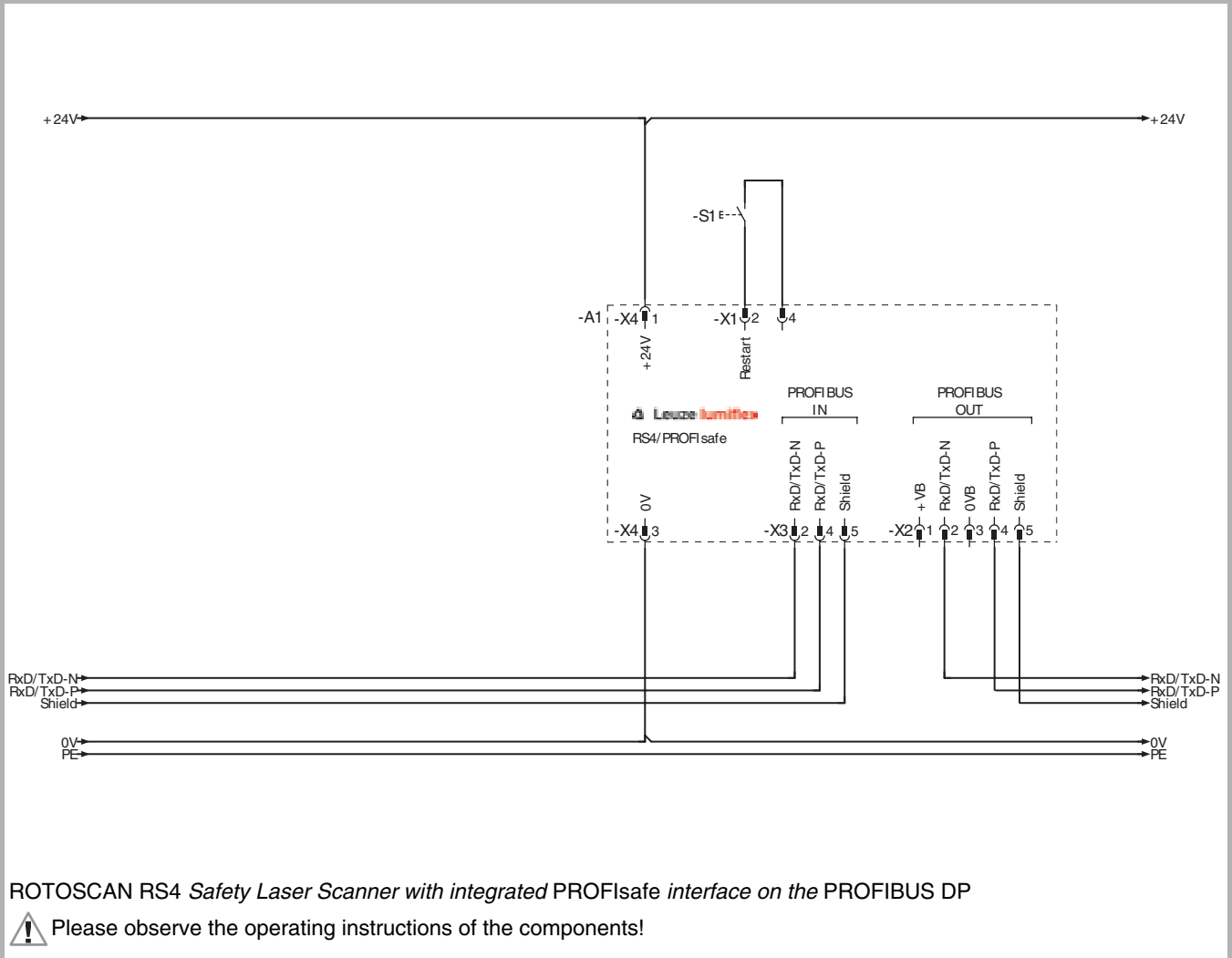




PROFIsafe Sensors

Electrical connection

ROTOSCAN RS4/PROFIsafe connection example



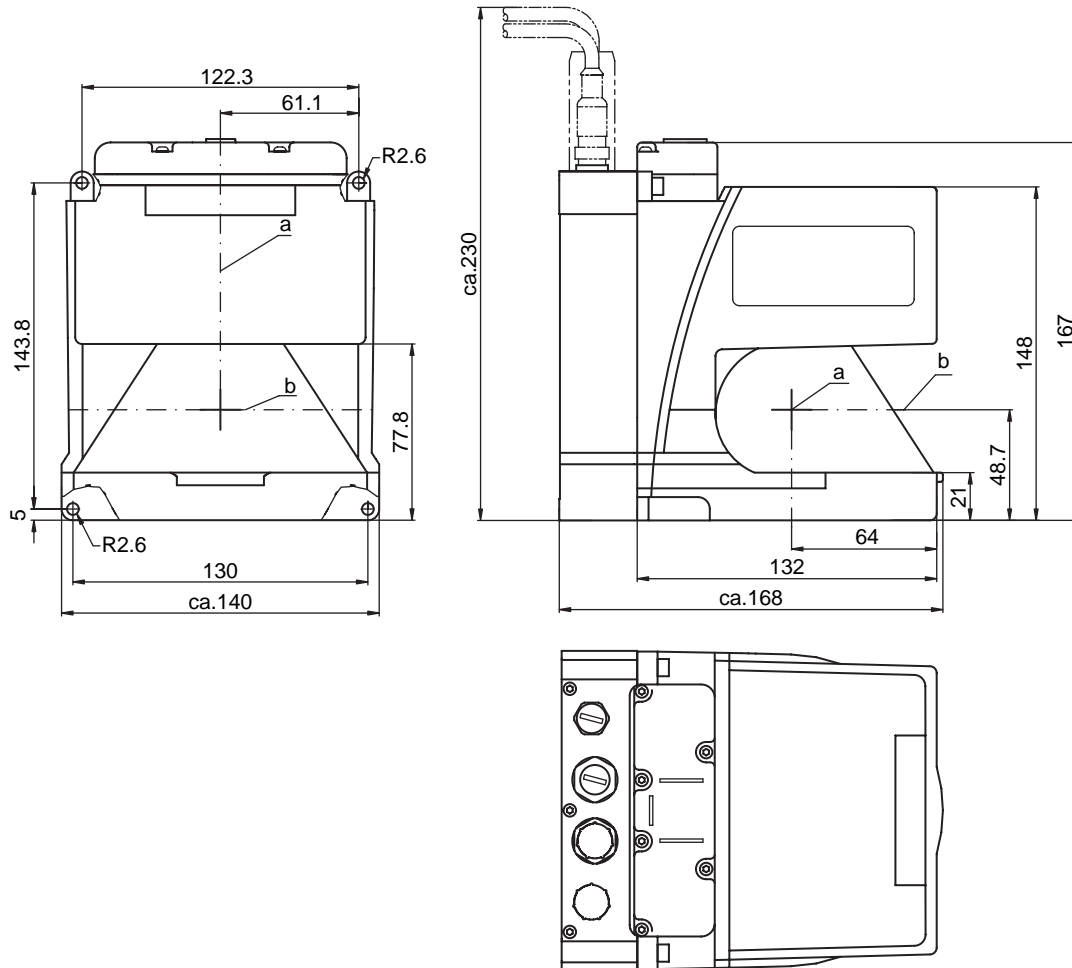
ROTOSCAN RS4 Safety Laser Scanner with integrated PROFIsafe interface on the PROFIBUS DP

Please observe the operating instructions of the components!

ROTOSCAN RS4/PROFIsafe SAFETY LASER SCANNERS

Dimensional drawings

ROTOSCAN RS4/PROFIsafe Safety Laser Scanner with integrated PROFIsafe interface



Ordering information

Ordering information, see ROTOSCAN RS4, page 72

www.leuze.com/rs4-profisafe/



Machine Safety

Machine Safety Services

Safety Engineering Software

Safety Laser Scanners

Safety Light Curtains

Multiple Light Beam Safety Devices

Single Light Beam Safety Devices

AS-interface Safety at Work

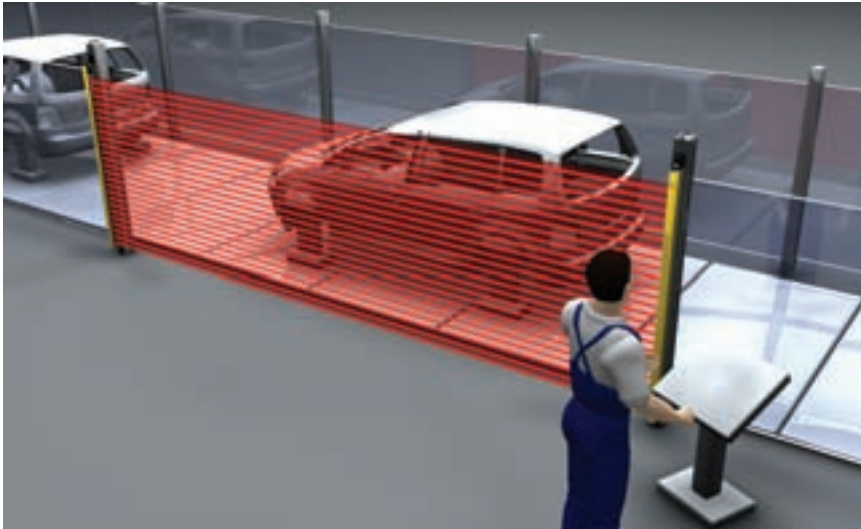
PROFIsafe Sensors

Safety Switches and Safety Locking Devices



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 PROFIsafe 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
- Parametering via switches or via SafetyLab PC software

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 made either via 6 internal switches or via the optical interface of the receiver, by teaching-in or with the aid of the easy to use diagnostics and parameterization software, SafetyLab. 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 a micro-switch. The download of the corresponding sensor parameters for this bus participant is performed automatically via the bus.

COMPACTplus/PROFIsafe

Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 4			
Classification in accordance with IEC/EN 61508	SIL 3			
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 (OSSD)	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, lamp, etc.			
Cyclic safe data	4 byte			
Acyclic data	Protective field individual beam data, error data, warnings			

You will find additional information in the connecting and operating instructions at www.leuze.com/compactplus-profisafe.

Function packages

Muting – see COMPACTplus-m from page 82

Blanking – see COMPACTplus-b from page 98

Cycle control – see COMPACTplus-i from page 112

For more information go to www.leuze.com/compactplus-m, www.leuze.com/compactplus-b and www.leuze.com/compactplus-i.

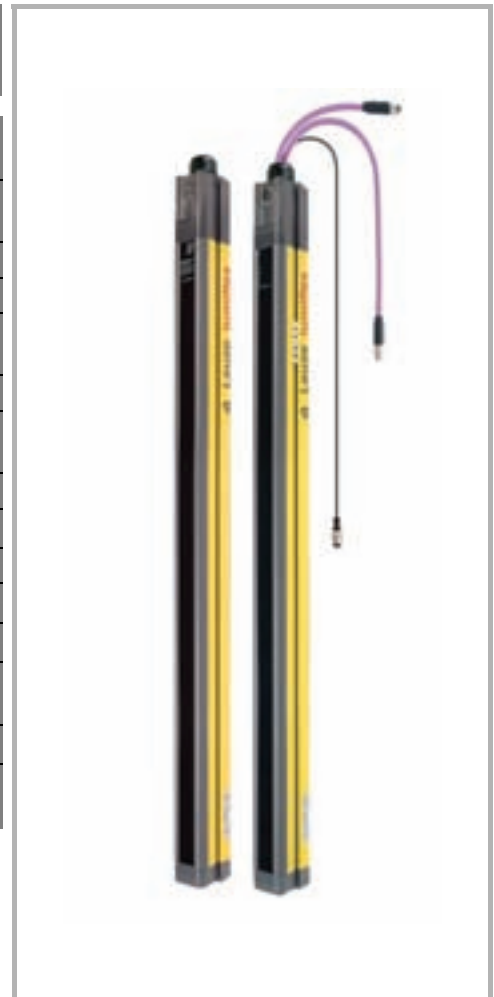
Function extension

For information on functions that are based on the SafetyLab PC software see page 83, 99, 113

PROFIsafe function extension

Diagnostics data transfer via PROFIBUS DP

Plus all functions and modules of the Safety PLC used



Properties



Further information

Page

● Ordering information	84, 100, 114
● Electrical connection	354
● Technical data	91, 107, 120
● Dimensional drawings	355

www.leuze.com/compactplus-profisafe/

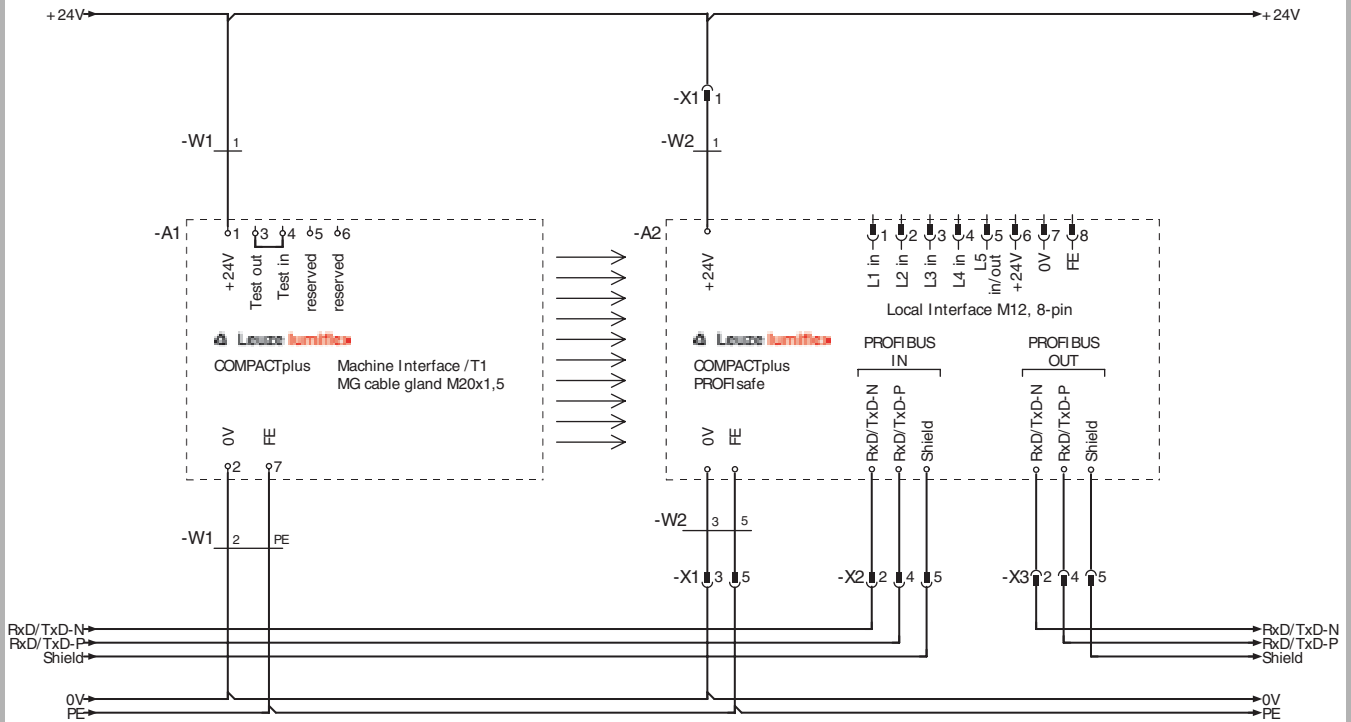





PROFIsafe Sensors

Electrical connection

COMPACTplus/PROFIsafe connection example

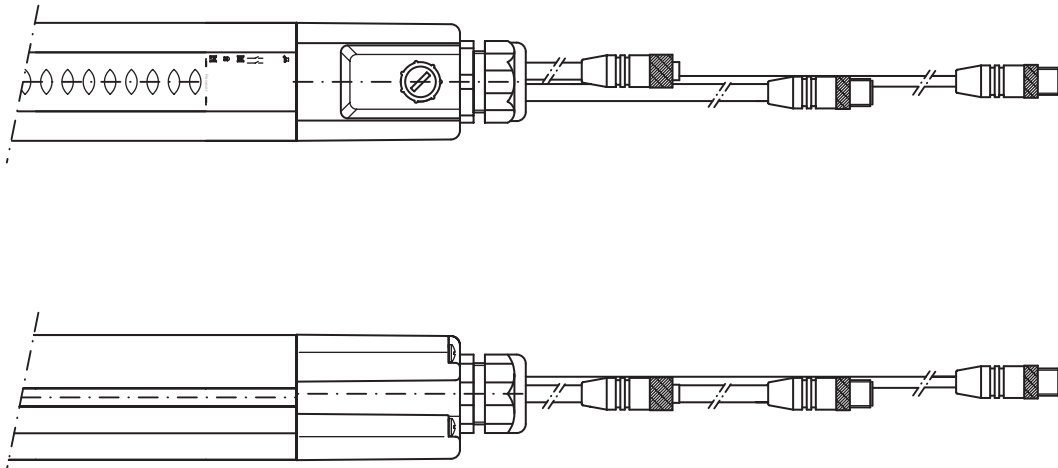


COMPACTplus Safety Light Curtain with integrated PROFIsafe interface on the PROFIBUS DP

 Please observe the operating instructions of the components!

Dimensional drawings

COMPACTplus/PROFIsafe Safety Light Curtain with integrated PROFIsafe interface



Ordering information

Ordering information, see COMPACTplus, page 84, 100, 114

www.leuze.com/compactplus-profisafe/





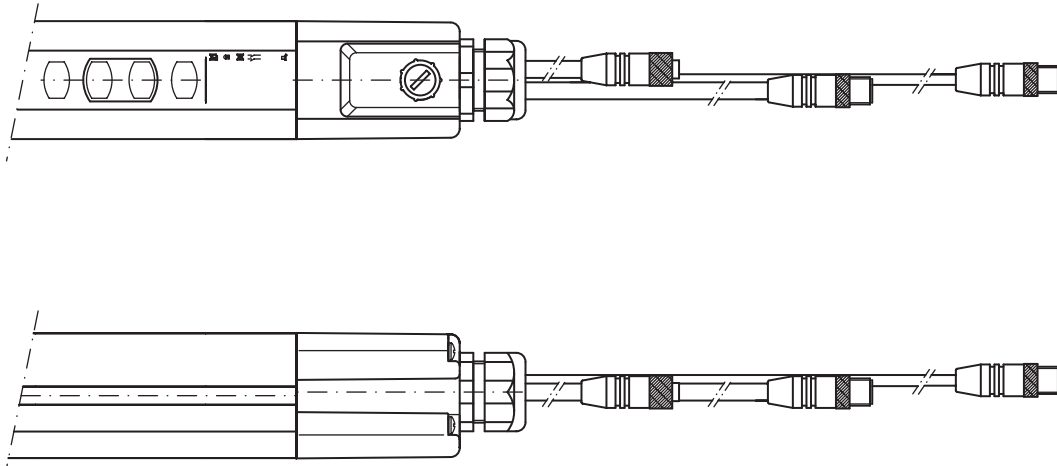
PROFIsafe Sensors

COMPACT*plus*/PROFIsafe Multiple Light Beam Safety Devices

Electrical connection

Connection example, see COMPACT*plus*/PROFIsafe Safety Light Curtain, page 354

CPRT-m muting transceiver with integrated PROFIsafe interface



Special PROFIsafe features

- Easy project planning via GSD and parametering software
- Integrated PROFIsafe 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
- Parametering via switches or via SafetyLab PC software

COMPACTplus/PROFIsafe

Important technical data, overview

Safety type in accordance with IEC/EN 61496	Type 4		
Classification in accordance with IEC/EN 61508	SIL 3		
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 (OSSD)	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, lamp, etc.		
Cyclic safe data	4 byte		
Acyclic data	Protective field individual beam data		

You will find additional information in the connecting and operating instructions at www.leuze.com/compactplus-profisafe.

Function packages

Multiple Light Beam Safety Device with muting – see COMPACTplus-m from page 188

Transceiver model with muting – see CPRT-m from page 188

For more information go to www.leuze.com/compactplus-cprt-m.

Function extension

For information on functions that are based on the SafetyLab PC software see page 83

PROFIsafe function extension

Diagnostics data transfer via PROFIBUS DP

Plus all functions and modules of the safety PLC used



Properties



Further information

Further information	Page
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www.leuze.com/compactplus-profisafe/





SAFETY SWITCHES AND SAFETY LOCKING DEVICES

OVERVIEW

Safety Switches and Safety Locking Devices selection table

Selection table



Safety Switches (without guard locking) on a CNC rotary machine

Safety Switches without guard locking are Safety Switches for position monitoring of protective doors or flaps. Safety Locking Devices keep the protective door locked and therefore prevent inadmissible access by people. All Leuze lumiflex 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.

Protective door bolt (above left), Safety Switch (above) and a selection of actuators (front) for tough industrial operation.



Safety Locking Device as access guarding on an automated system

		Features, type-dependent								
Safety Switch (without guard locking)	Safety Locking Device	External actuator	Internal actuator	Spring force-actuated guard interlocking 1)	Electro magnet-actuated guard interlocking 2)	Auxiliary unlocking, manual	Safety Switch contact set NC= Break contact for safety circuit NO= Make contact for signal circuit	Guard interlocking contact set NC= Break contact for safety circuit NO= Make contact for signal circuit	Article	Page
●		●					1NC/1NO		S10-01.103	362
●		●					2NC		S10-01.110	362
●		●					1NC ³⁾ /1NO		S10-P01	362
●			●				2NC/1NO		S40-1102	370
●			●				2NC/1NO		S40-1102/S ⁴⁾	370
●			●				1NC/1NO		S40-102	370
●			●				1NC/1NO		S40-102/S ⁴⁾	370
	●	●			●	●	1NC	1NC/1NO	L30-F/CS	376
	●	●			●	●	1NO	2NC	L30-F/ES	376
	●	●				●	1NC	1NC/1NO	L30-M/C	376
	●	●				●	1NO	2NC	L30-M/E	376
	●	●				●	1NO	1NC/1NO	L30-M/G	376
	●	●			●		1NC/1NO	1NC	L50-F	384
	●	●			●		1NC/1NO	1NC	L50-F/W	384
	●	●			●	●	1NC/1NO	1NC/1NO	L50-F/CWS	384
	●	●				●	1NC/1NO	1NC	L50-M	384
	●	●				●	1NC/1NO	1NC	L50-M/W	384
	●	●				●	1NC/1NO	1NC/1NO	L50-M/C	384

1) Closed current principle, person protection
 2) Working current principle, machinery and work equipment protection
 3) With step function against contact bounces
 4) Without second hinge





SAFETY SWITCHES

S10 Safety Switches



S10 Safety Switch on a CNC rotary machine

The S10 series Safety Switches are used for position monitoring of moveable guards (such as protective doors on industrial machinery and systems) and consequently protect people against hazardous situations. Safety Switches without guard interlocking can always be used when the dangerous movement has stopped before the entering person can reach the point of operation. The S10 series Safety Switches have a housing made of fiberglass-reinforced plastic with IP 67 protection rating. The models equipped with various contact sets enable control-related integration in accordance with safety categories 1 to 4 in accordance with EN 954-1. The deflecting head, which can be swivelled 4 x 90°, enables universal application.

Typical areas of application

- Access guarding on machinery with position monitoring of protective doors
- Hand protection with position monitoring of flaps and covers
- Lateral monitoring of sliding protective grids or sliding doors

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p. 390

Important technical data, overview

Switch type	Locking device without guard interlocking in accordance with EN 1088
Housing material	Fiberglass-reinforced, thermo-plastic plastic
Actuator	External reed actuator
Actuator force (push in)	10 N
Actuator force (pull out)	20 N
Contact equipment	S10-01.103: 1 break contact, 1 make contact S10-01.110: 2 break contacts S10-P01: 1 break contact, 1 make contact
Cable entry	1 x PG13.5
Protection rating	IP 67

Functions

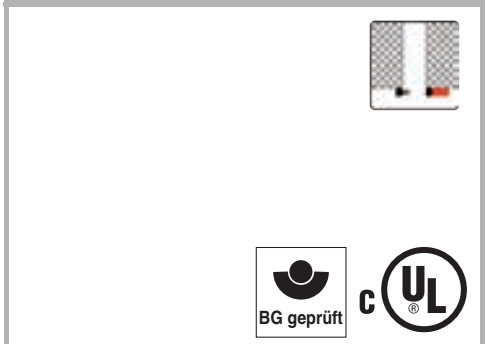
Locking device without guard interlocking in accordance with EN 1088
Control-related integration up to safety category 4 in accordance with EN 954-1
Actuator return heads, 4 x 90°, can be offset

Special features

- BBG and UL Approval (EN 1088, IEC/EN 947, DIN VDE 0660)
- Small construction, 40 mm profile mounting possible
- Insulating material encapsulated model
- Universal use with 4 actuator starting directions
- Variable starting radius with radius actuator
- Ball latch in the return head for fixing the actuator
- Self-centering with funnel-shaped entry opening
- Contact sets suitable for integration up to safety category 4



Properties



Further information Page

● Ordering information	362
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● Dimensional drawings	364
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● Accessories ordering information	367





SAFETY SWITCHES

Ordering information

S10

Included in delivery: Mounting instructions, screws

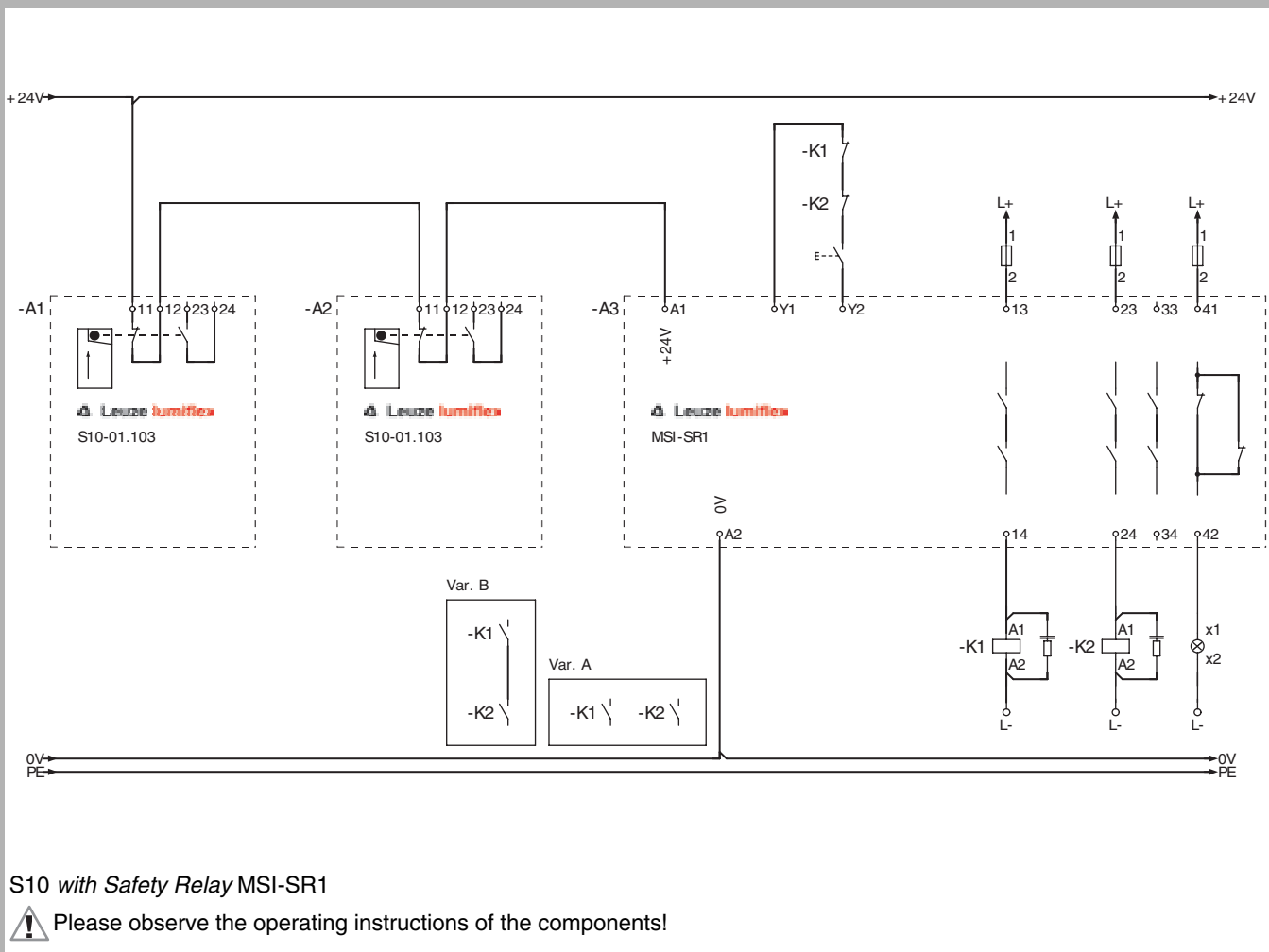
Functions: Locking device without guard interlocking in accordance with EN 1088

S10 with separate actuator *

Art. no.	Article	Description	Contact set
640000	S10-01.103	Safety Switch	1NC/1NO, slide contacts
640001	S10-01.110	Safety Switch	2NC, slide contacts
640002	S10-P01	Safety Switch	1NC/1NO, step contacts

* Actuators must be ordered separately, see accessories, page 367

Electrical connection



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Technical data

General system data	
Switch type	Interlock device without guard interlocking in accordance with EN 1088
Housing material	Fiberglass-reinforced, thermo-plastic plastic
Actuator	External reed actuator
Actuator force (push in)	10 N
Actuator force (pull out)	20 N
Contact equipment	S10-01.103: 1 break contact, 1 make contact S10-01.110: 2 break contacts S10-P01: 1 break contact, 1 make contact
Cable entry	1 x PG13.5
Protection rating	IP 67
Ambient temperature, operation	-25...+70 °C
Switching frequency	Max. 6000 switching cycles/hr
Mechanical life time	Min. 1x10 ⁶ switching cycles
Switching principle	Slide contacts or step contacts (depending on model)
Switching voltage	Min. 24 V DC
Switching current	Min. 10 mA (24 V DC)
Contact material	FK-Ag, silver-plated, passivated
Usage category in accordance with IEC/EN 947-5-1	AC-15/250 V AC/8 A DC-13/24 V DC/5 A (S10-P01: AC-15/250 V AC/6 A; DC-13/24 V DC/4 A)
Dimensions	See dimensional drawing
Control circuit nominal voltage	440 V AC
Control circuit continuous current	S10-01.103: Max. 10 A S10-01.110: Max. 10 A S10-P01: Max. 6 A
Connection system	Cable gland, 0.5 to 2.5 mm ² rigid or up to 1.5 mm ² flexible

You will find additional information at www.leuze.com/s10.

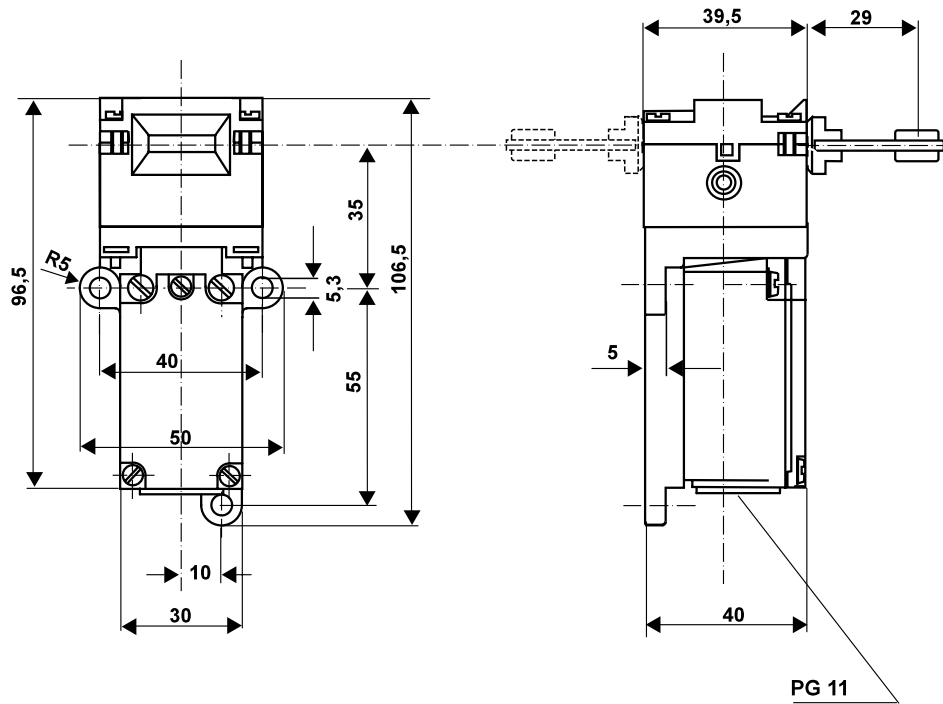




SAFETY SWITCHES

Dimensional drawings

S10 Safety Switch



Dimensions in mm

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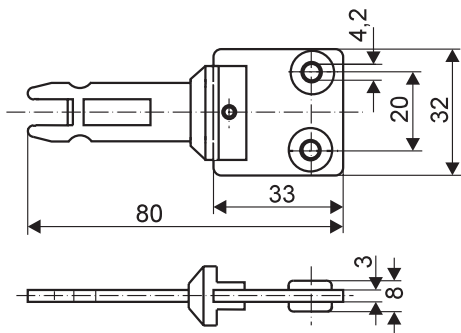
L30
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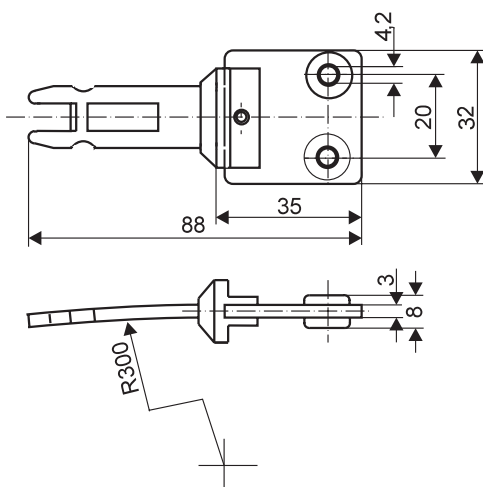
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Accessories dimensional drawings

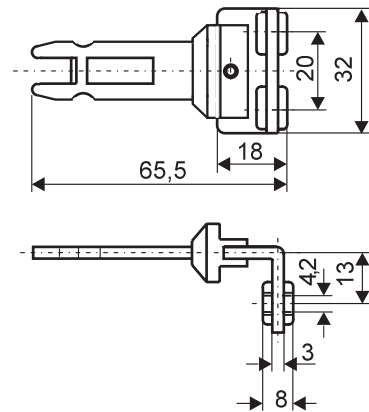
Actuator



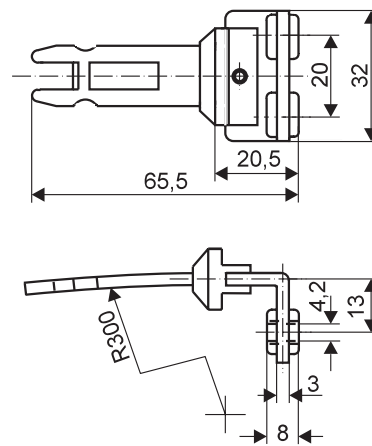
Actuator: CO-S10-L50



Radius actuator, COR-S10-L50



Actuator, angled: CW-S10-L50



Radius actuator, angled CWR-S10-L50

Dimensions in mm

www.leuze.com/s10/

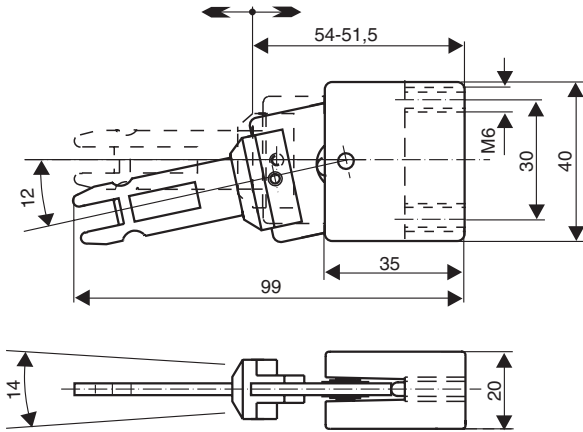




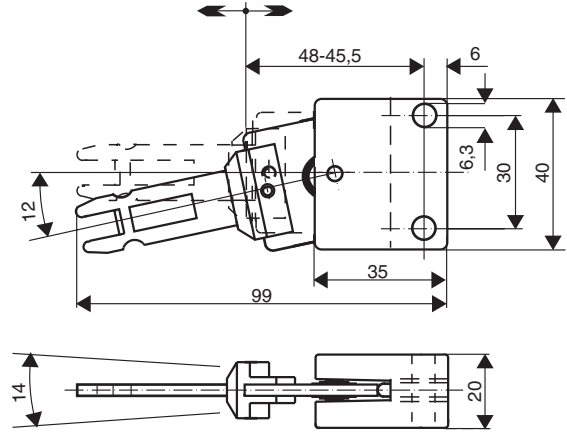
SAFETY SWITCHES

Accessories dimensional drawings

Actuator



Telescopic actuator, mounting from the rear,
COF/HIS.1-S10-L50



Telescopic actuator, mounting from above,
COF/HIS.2-S10-L50

Dimensions in mm

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Accessories ordering information

Actuator for S10			
Art. no.	Article	Description	Length, design
640049	CO-S10-L50	Actuator	Straight
640055	COR-S10-L50	Radius actuator	Straight
640056	CW-S10-L50	Actuator	Angled
640057	CWR-S10-L50	Radius actuator	Angled
640058	COF/HIS.1-S10-L50	Telescopic actuator, mounting from the rear	Straight
640059	COF/HIS.2-S10-L50	Telescopic actuator, mounting from above	Straight
640060	CK-S10-L50	Shortened actuator	Straight
640061	CWK-S10-L50	Shortened actuator	Angled

Machine Safety

Machine Safety
Services

Safety
Engineering
Software

Safety Laser
Scanners

Safety Light
Curtains

Multiple
Light Beam
Safety Devices

Single
Light Beam
Safety Devices

AS-interface
Safety at Work

PROFIsafe
Sensors



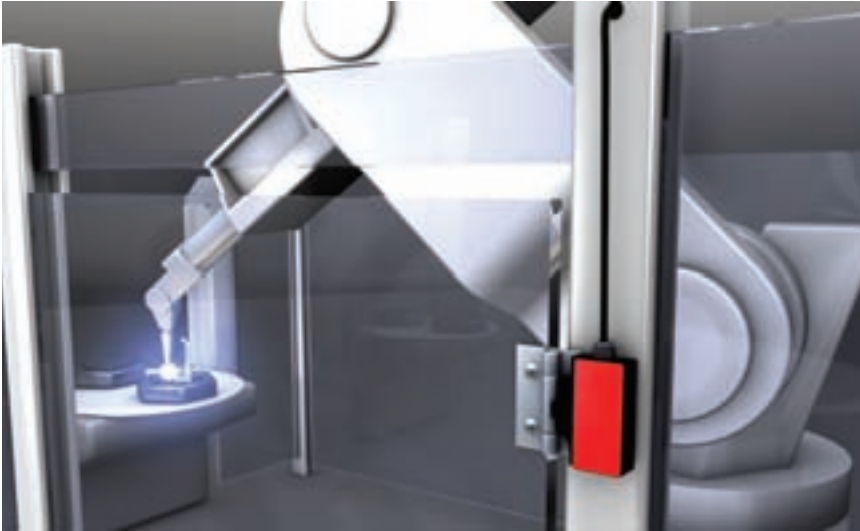
www.leuze.com/s10/

Safety Switches
and Safety Lock-
ing Devices



SAFETY SWITCHES

S40 Safety Hinge Switch



Door monitoring on a robot station with S40 safety hinge switch

S40 series safety hinge switches are used for protecting people at industrial machinery and systems. They are used for position monitoring of hard guards that can rotate (e.g. protective doors) with a monitoring switch (without guard interlocking) integrated into the hinge. The S40 series switches unite the Safety Switch and door hinge functions in one component. The hinge is especially suited for mounting on 40 mm aluminium profiles, but also on square pipes or machine covers. The second hinge (same type) for door mounting is also included in the delivery.

Typical areas of application

- Monitoring of rotating or swivelling protective doors
- Hand protection with position monitoring of flaps and covers

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Important technical data, overview

Switch type	Interlock device without guard interlocking in accordance with EN 1088
Housing material	Fiberglass-reinforced, thermo-plastic plastic
Actuator	Internal (Safety Switch in the hinge)
Actuator force (at hub end)	12 N
Mechanical load rating	Max. moment of inertia 3 kN/m at 1 m hinge distance
Contact equipment	SS40-1102: 2 break contacts, 1 make contact S40-102: 1 break contact, 1 make contact
Cable entry	2 x PG13.5
Protection rating	IP 65

Functions

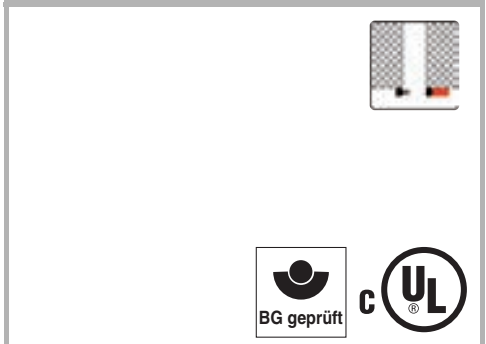
Interlock device without guard interlocking in accordance with EN 1088
Control-related integration in accordance with safety category 1 to 4 in accordance with EN 954-1
Mechanical hinge with integrated Safety Switch

Special features

- **BG and UL Approval (EN 1088, IEC/EN 947, DIN VDE 0660)**
- **Significantly easier mounting with rotating protective devices**
- **Easier setup compared with interlocking units with work-intensive cam disks**
- **Opening of the safety contacts in the switch from approx. 3.5° opening angle of the protective device**
- **Maximum protective device opening angle of 135°**
- **Contact sets for integrating up to safety category 4 in accordance with EN 954-1**
- **Mounting on 40 mm trade-standard aluminum profile systems**
- **Optional mounting hinge sets for 30, 35, and 45 mm aluminum profile systems**



Properties



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SAFETY SWITCHES

Ordering information

S40

Included in delivery: Mounting instructions, screws, 1 additional hinge (only with S40-1102 and S40-102)

Functions: Interlocking device without guard interlocking in accordance with EN 1088, mechanical hinge with integrated Safety Switch

S40 with integrated actuator

Art. no.	Article	Description	Contact set
640010	S40-1102	Hinge switch with additional switch (for 40mm profile)	2NC/1NO, slide contacts
640070	S40-1102/S	Hinge switch without additional hinge (for 40 mm profile)	2NC/1NO, slide contacts
640011	S40-102	Hinge switch with additional switch (for 40 mm profile)	1NC/1NO, slide contacts
640071	S40-102/S	Hinge switch without additional hinge (for 40 mm profile)	1NC/1NO, slide contacts
S40 hinge switch for 30 mm /35 mm /45 mm profile width available on request!			

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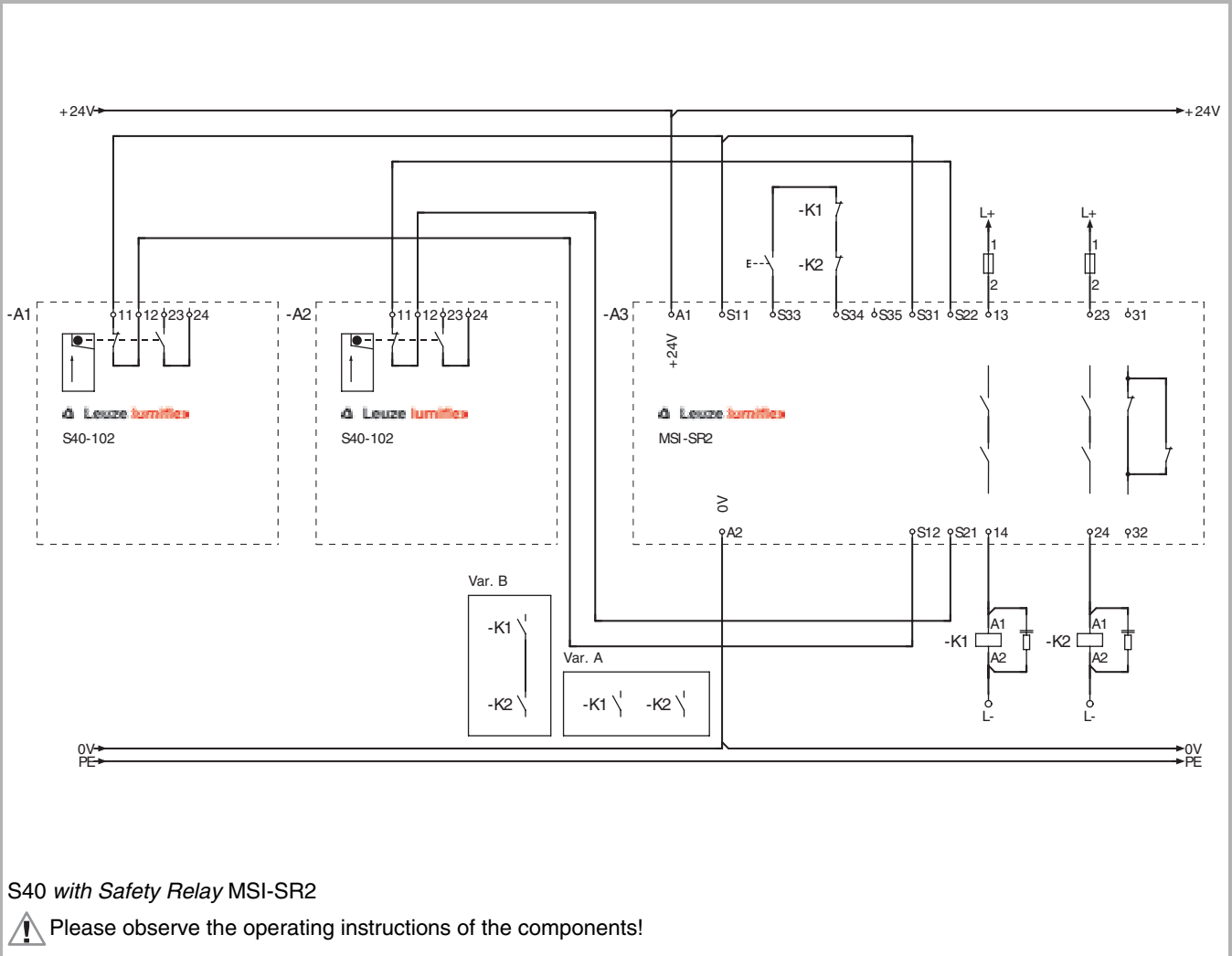
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Electrical connection

S40 connection example



Machine Safety

Machine Safety Services

Safety Engineering Software

Safety Laser Scanners

Safety Light Curtains

Multiple Light Beam Safety Devices

Single Light Beam Safety Devices

AS-interface Safety at Work

PROFIsafe Sensors

Safety Switches and Safety Locking Devices



SAFETY SWITCHES

Technical data

General system data	
Switch type	Interlock device without guard interlocking in accordance with EN 1088
Housing material	Fiberglass-reinforced, thermo-plastic plastic
Actuator	Internal (Safety Switch in the hinge)
Mechanical load rating	Max. moment of inertia 3 kN/m at 1 m hinge distance
Actuator force (at hub end)	12 N
Contact equipment	SS40-1102: 2 break contacts, 1 make contact S40-102: 1 break contact, 1 make contact
Cable entry	2 x PG13.5
Protection rating	IP 65
Ambient temperature, operation	-25...+65 °C
Switching frequency	Max. 1200 switching cycles/hr
Mechanical life time	Min. 1x10 ⁶ switching cycles
Switching principle	Slide contacts
Switching voltage	Min. 5 V DC
Switching current	Min. 1 mA (5 V DC)
Contact material	AgNi 10, gold-plated, separate switch chambers
Usage category in accordance with IEC/EN 947-5-1	AC-15/250 V AC/2 A DC-13/24 V DC/1 A
Dimensions	See dimensional drawing
Control circuit nominal voltage	250 V AC
Control circuit continuous current	Max. 2 A
Connection system	Cable gland, 0.5 to 1.5 mm ²

You will find additional information at www.leuze.com/s40.

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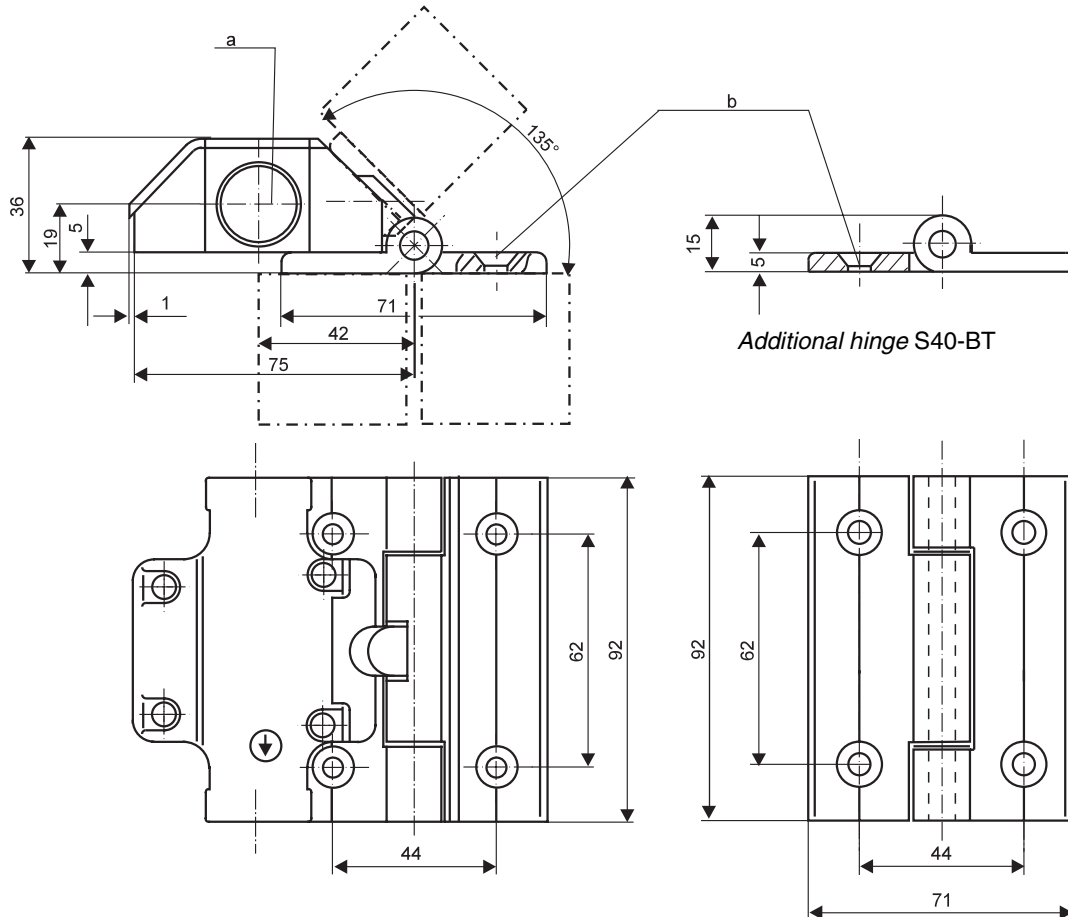
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Dimensional drawings

S40 safety hinge switch



a = PG13.5
b = Countersink for M6-DIN 9655

Dimensions in mm

Accessories ordering information

Art. no.	Article	Description
640065	S40-BT	Additional hinge, suitable for S40 series





SAFETY LOCKING DEVICES

L30 Safety Locking Devices



L30 Safety Locking Device as access guarding

Safety Locking Devices prevent protective doors from being opened manually with their interlock function. The access to the danger area is only then released by an electric signal when either the dangerous movement has stopped (person protection) or an uninterrupted work process has been finished (machine protection). The slender and narrow construction of the L30 series makes it especially well suited for use on rotating doors on aluminium profile systems. The L30 Safety Locking Devices are available in a spring force-actuated version for person protection and in a magnet force-actuated version for machine protection. Faulty locking device and auxiliary unlocking are further plus points of these safety components. A constructive feature ensures that the interlocking only becomes effective when the protective doors are also closed. Interlocking with open protective device is consequently ruled out. The contact set enables the safety-based integration up to category 4 in accordance with EN 954-1.

Typical areas of application

- Access guarding on machines with subsequent dangerous movements with position monitoring and guard interlocking of moveable guards
- Prevention of undefined interruptions of the production process with guard interlocking of moveable guards

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Important technical data, overview

Switch type	Interlock device with guard interlocking in accordance with EN 1088				
Housing material	Fiberglass-reinforced, thermo-plastic plastic				
Actuator	External reed actuator				
Actuator force (push in)	10 N				
Actuator force (pull out)	20 N				
Interlocking force	1750 N, max. door weight, 40 kg				
Interlocking type (type-dependent)	L30-M/.. series: Electro-magnetic L30-F/.. series: Mechanical (spring-force)				
Contact equipment		Door indicator contact		Interlocking pos.	
		Break contact	Make contact	Break contact	Make contact
	L30-M/C:	1		1	1
	L30-M/E:		1	2	
	L30-M/G:		1	1	1
	L30-F/CS:	1		1	1
	L30-F/ES:		1	2	
Cable entry	2 x PG13.5				
Protection rating	IP 67				

Functions

Interlock device with guard interlocking in accordance with EN 1088
Actuator return heads, 4 x 90°, can be offset
Faulty locking device for preventing interlocking with opened protective device
Contact set for safety-related integration up to category 4 in accordance with EN 954-1
Electro-magnetic guard interlocking (L30-M/.. series)
Mechanical guard interlocking, spring-force (L30-M/.. series)
Manual auxiliary unlocking for unlocking the guard interlocking in switched off state (L30-F/CS, L30-F/ES)

Special features

- **BG and UL Approval (EN 1088, IEC/EN 947, DIN VDE 0660)**
- **Slender L-shape construction (45 mm wide) for optimum integration in rotating protective devices of profile systems**
- **Universal use with 4 actuator starting directions**
- **Variable starting radius with radius and telescopic actuator**
- **Self-centering with funnel-shaped entry opening**
- **Dust protection screen against penetration of dirt particles with opened protective device**



Properties



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SAFETY LOCKING DEVICES

Ordering information

L30

Included in delivery: Mounting instructions, mounting material,
L30-F.../S: Triangular key for auxiliary unlocking

Functions: Locking device with guard interlocking in
acc. with EN 1088

L30 with separate actuator *

Art. no.	Article	Description	Contact set (magnet - switch)
640020	L30-M/C	Safety Locking Device	1NC - 1NC/1NO
640021	L30-M/E	Safety Locking Device	1NO - 2NC
640022	L30-M/G	Safety Locking Device	1NO - 1NC/1NO
640023	L30-F/CS	Safety Locking Device	1NC - 1NC/1NO
640024	L30-F/ES	Safety Locking Device	1NO - 2NC

* Actuators must be ordered separately, see accessories, p. 381

Article info for L30

Article	Description
L30	Safety Locking Devices
-M	Magnet force-actuated
-F	Spring force-actuated
/C	Contact set: 2 break contacts and 2 make contacts
/G	Contact set: 1 make and 1 break / 1 make
/E	Contact set: 1 break and 1 make contact
/W	All contacts performed separately
/S	With auxiliary unlocking

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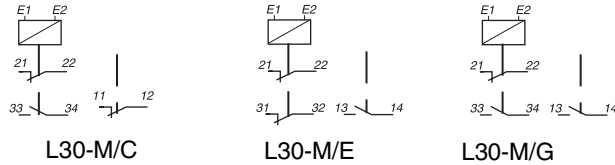
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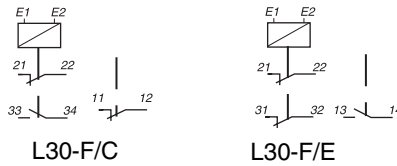
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Electrical connection

L30-M contact assignment



L30-F contact assignment



Contact state: protective door closed, guard interlocking locked
 Break contact 11-12 for position monitoring the moving protective device (door position detection)
 Break contact 21-22 (31-32) for detecting interlocking position (magnet position detection)

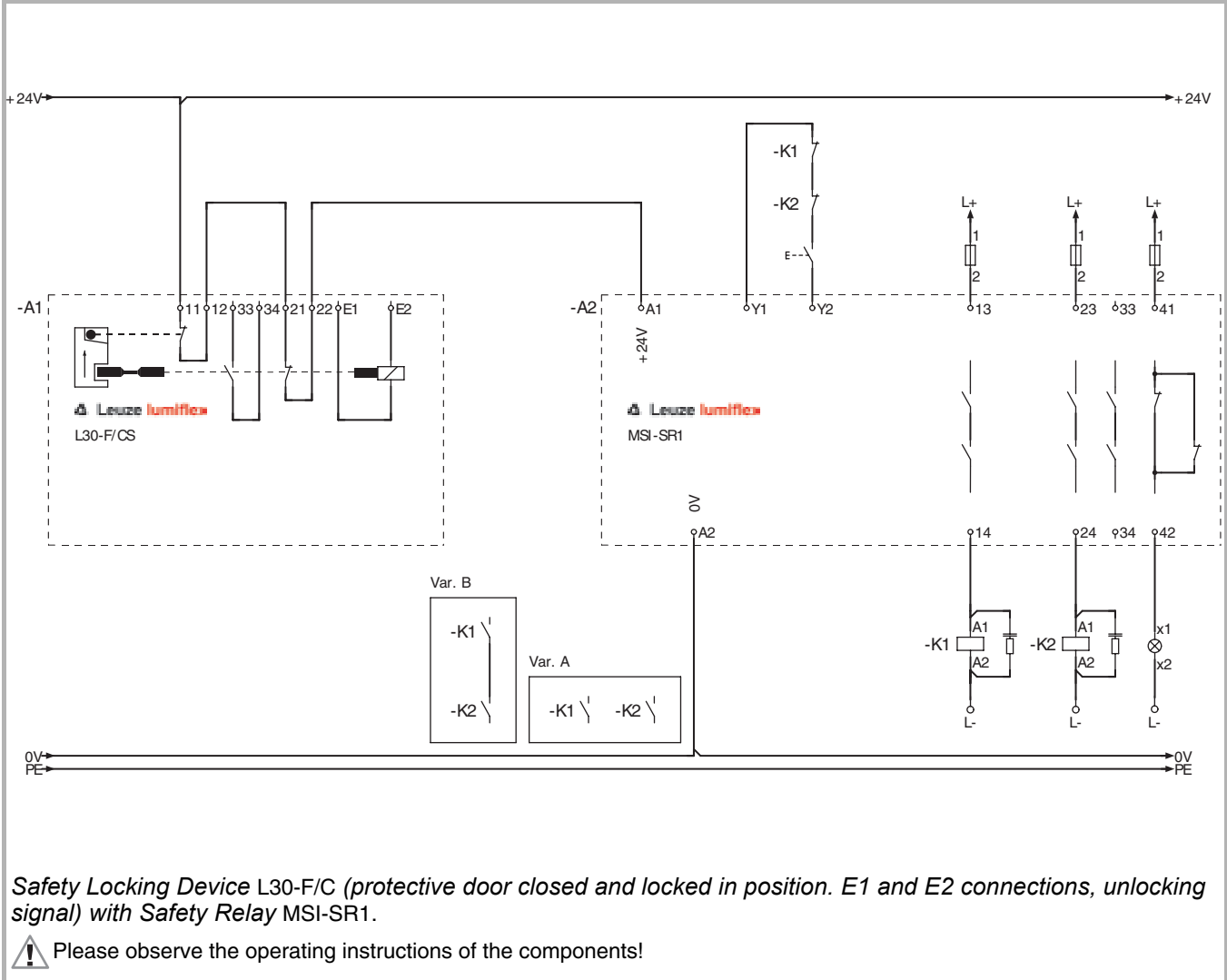




SAFETY LOCKING DEVICES

Electrical connection

L30 connection example



Technical data

General system data	
Switch type	Interlock device with guard interlocking in accordance with EN 1088
Housing material	Fiberglass-reinforced, thermo-plastic plastic
Actuator	External reed actuator
Actuator force (push in)	10 N
Actuator force (pull out)	20 N
Interlocking force	Max. 1750 N, max. door weight 40 kg
Interlocking type (type-dependent)	L30-M/.. series: Electro-magnetic L30-F/.. series: Mechanical (spring-force)
Contact equipment	L30-M/C: Door indicator contact, 1 break; interlocking position, 1 make, 1 break L30-M/E: Door indicator contact, 1 make; interlocking position, 2 break L30-M/G: Door indicator contact, 1 make; interlocking position, 1 break, 1 make L30-F/CS: Door indicator contact, 1 break; interlocking position, 1 break, 1 make L30-F/ES: Door indicator contact, 1 make; interlocking position, 2 break
Cable entry	2 x PG13.5
Protection rating	IP 67; perbutan, oil and petrol-resistant
Ambient temperature, operation	0...+50 °C
Switching frequency	Max. 120 switching cycles/hr
Mechanical life time	Min. 2x10 ⁶ switching cycles
Switching principle	Slide contacts
Switching voltage	Min. 24 V DC
Switching current	Min. 10 mA (24 V DC)
Contact material	FK-Ag, silver-plated, passivated
Usage category in accordance with IEC 947-5-1	AC-15/250 V AC/8 A DC-13/24 V DC/5 A
Rated insulation voltage, U _i	440 V, test voltage 2.500 V
Withstand impulse voltage U _{imp}	2.5 kV
Magnet operating voltage	24 V DC +5 % / -10 %
Duty cycle	100 %
Current consumption	24 V DC: 300 mA cold, 250 mA warm
Dimensions	See dimensional drawing
Connection system	Cable gland, 2 x 0.5 to 2.5 mm ² rigid, flexible (with conductor sleeves) to 1.5 mm ²

You will find additional information at www.leuze.com/l30/.

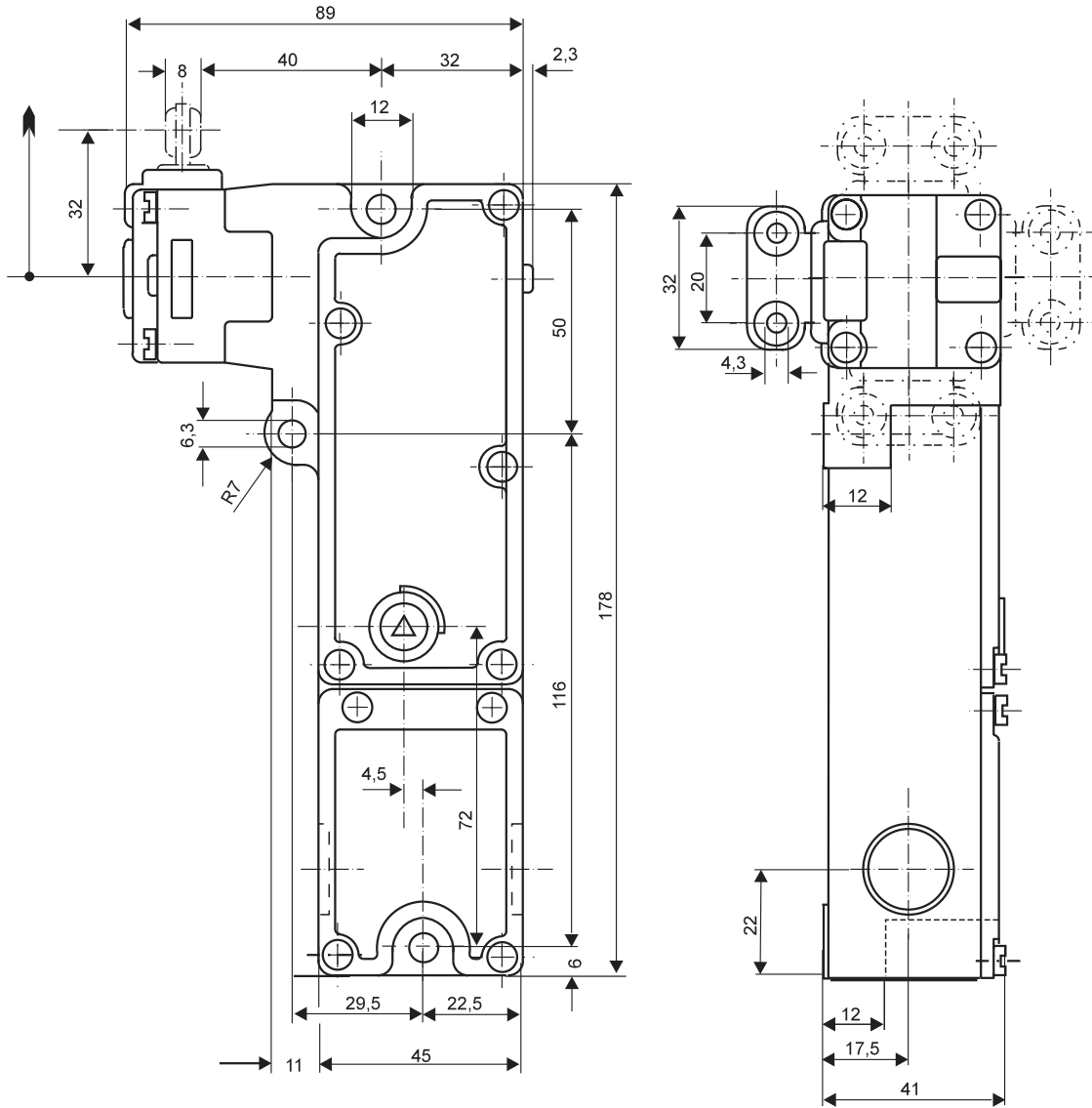




SAFETY LOCKING DEVICES

Dimensional drawings

Safety Locking Device L30



Dimensions in mm

Accessories dimensional drawings

See accessories, S10 all actuators, page 366

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Accessories ordering information

Actuators for L30

Art. no.	Article	Description	Length, design
640050	CO-L30	Actuator	Straight
640051	CW-L30	Actuator	Angled
640052	COF-L30	Telescopic actuator	Straight
640053	CORF/15-L30	Actuator, with preloaded spring	Straight
640054	CORF/7.5-L30	Actuator, with preloaded spring	Straight

L30 – Accessories

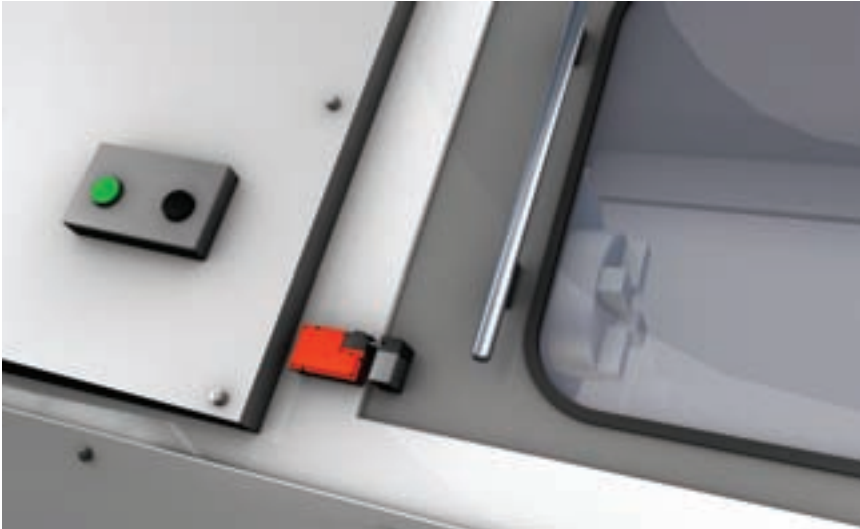
Art. no.	Article	Description
640062	APL-L30	Adapter plate for profile mounting, suitable for L30 series
640063	K/75-L30-L50	Triangular key, angled for auxiliary unlocking, suitable for L30 & L50 series
640064	PG-L30	PG cover set with front-side cable exit, suitable for L30 series





SAFETY LOCKING DEVICES

L50 Safety Locking Device



Safety Locking Device L50 on a CNC rotary machine

Typical areas of application

- Access guarding on machines with subsequent dangerous movements with position monitoring and guard interlocking of moveable guards
- Prevention of undefined interruptions of the production process with guard interlocking of moveable guards
- Difficult, harsh conditions (e.g. effect of coolants, oil, petrol)

The heavy duty Safety Locking Devices of the L50 series with protective rating greater than IP 67 are oil and petrol-resistant and also withstand difficult, harsh environmental conditions. They are available in the L50-F/.. spring-force actuated version for people protection and in the magnet-force actuated L50-M/.. version for machine protection. The contact set enables safety-based integration up to category 4 in accordance with EN 954-1.

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Important technical data, overview

Switch type	Interlock device with guard interlocking in accordance with EN 1088				
Housing material	Fiberglass-reinforced, thermo-plastic plastic				
Actuator	External reed actuator				
Actuator force (push in)	10 N				
Actuator force (pull out)	20 N				
Interlocking force	1500 N, max. door weight, 40 kg				
Interlocking type (type-dependent)	L50-M/.. series: Electro-magnetic L50-F/.. series: Mechanical (spring-force)				
Contact equipment		Door indicator contact		Interlocking pos.	
		Break contact	Make contact	Break contact	Make contact
	L50-M:	1	1	1	
	L50-M/W:	1	1	1	
	L50-M/C:	1	1	1	1
	L50-F:	1	1	1	
	L50-F/CS:	1	1	1	1
Cable entry	1 x PG13.5				
Protection rating	>IP67				

Functions

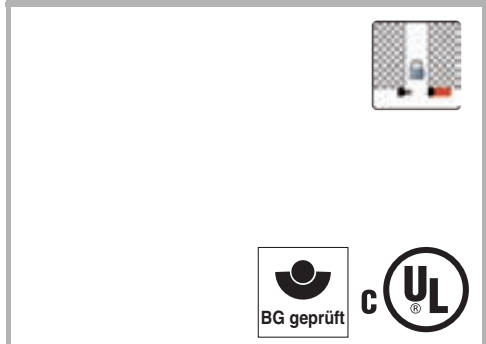
Interlock device with guard interlocking in accordance with EN 1088
Control-related integration up to safety category 4 in accordance with EN 954-1
Actuator return heads, 3 x 90°, can be offset
Faulty locking device for preventing interlocking with opened protective device
Contact set for safety-related integration up to category 4 in accordance with EN 954-1
Electro-magnetic guard interlocking (L50-M/.. series)
Mechanical guard interlocking, spring-force (L50-M/.. series)
Manual auxiliary unlocking for unlocking the guard interlocking in switched off state (L50-F/CNS)

Special features

- **BG and UL Approval (EN 1088, IEC/EN 947, DIN VDE 0660)**
- **Heavy duty; use also possible under harsh environmental conditions**
- **Universal use with 3 actuator starting directions**
- **Variable starting radius with radius and telescopic actuator**
- **Self-centering with funnel-shaped entry opening**



Properties



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SAFETY LOCKING DEVICES

Ordering information

L50

Included in delivery: Mounting instructions, 1 CO-S10-L50 standard actuator, mounting material, L50-F/CW: Triangular key for auxiliary unlocking

Functions: Locking device with guard interlocking in acc. with EN 1088

L 50, use for heavy duty (> IP67) with separate actuator *

Art. no.	Article	Description	Contact set (magnet - switch)
640030	L50-M	Safety Locking Device	1NC/1NO - 1NC
640031	L50-M/W	Safety Locking Device	1NC/1NO - 1NC
640032	L50-M/C	Safety Locking Device	1NC/1NO - 1NC/1NO
640033	L50-F	Safety Locking Device	1NC/1NO - 1NC
640034	L50-F/W	Safety Locking Device	1NC/1NO - 1NC
640035	L50-F/CWS	Safety Locking Device	1NC/1NO - 1NC/1NO

* Actuators must be ordered separately, see accessories, page 389

Article info for L50

Article	Description
L50	Safety Locking Devices
-M	Magnet force-actuated
-F	Spring force-actuated
/C	Contact set: 2 break contacts and 2 make contacts
/G	Contact set: 1 make and 1 break / 1 make
/E	Contact set: 1 break and 1 make contact
/W	All contacts performed separately
/S	With auxiliary unlocking

L50

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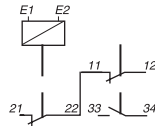
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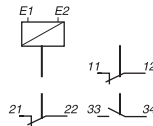
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Electrical connection

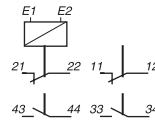
L50-M contact assignment



L50-M

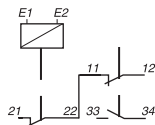


L50-M/W

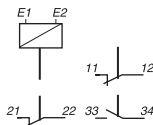


L50-M/C

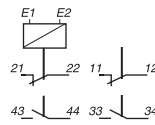
L50-F contact assignment



L50-F



L50-F/W



L50-F/CWS

Contact state: protective door closed, guard interlocking locked
 Break contact 11-12 for position monitoring the moving protective device (door position detection)
 Break contact 21-22 (31-32) for detecting interlocking position (magnet position detection)

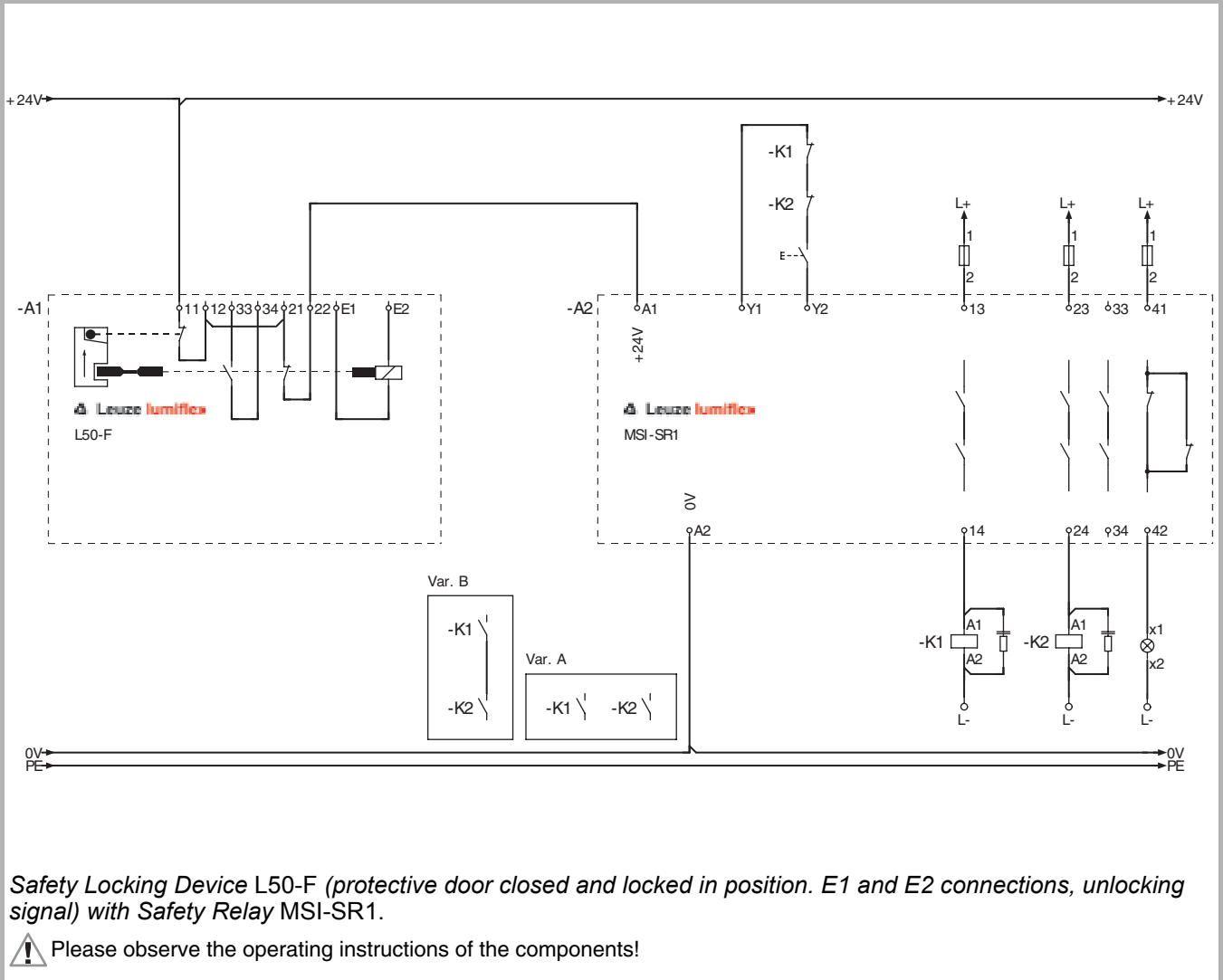




SAFETY LOCKING DEVICES

Electrical connection

L50 connection example



Technical data

General system data	
Switch type	Interlock device with guard interlocking in accordance with EN 1088
Housing material	Fiberglass-reinforced, thermo-plastic plastic
Actuator	External reed actuator
Actuator force (push in)	10 N
Actuator force (pull out)	20 N
Interlocking force	1500 N, max. door weight, 40 kg
Interlocking type (type-dependent)	L50-M/.. series: Electro-magnetic L50-F/.. series: Mechanical (spring-force)
Contact equipment	L50-M: Door signal contact, 1 break, 1 make; interlocking position, 1 break L50-M/W: Door signal contact, 1 break, 1 make; interlocking position, 1 break L50-M/C: Door signal contact, 1 break, 1 make; interlocking position, 1 break, 1 make L50-F: Door signal contact, 1 break, 1 make; interlocking position, 1 break L50-F/W: Door signal contact, 1 break, 1 make; interlocking position, 1 break L50-F/CS: Door signal contact, 1 break, 1 make; interlocking position, 1 break, 1 make
Cable entry	1 x PG13.5
Protection rating	>IP67; perbutan, oil and petrol-resistant
Ambient temperature, operation	L50-M/.. series: -25...+40 °C L50-F/.. series: -25...+80 °C
Switching frequency	Max. 120 switching cycles/hr
Mechanical life time	Min. 2x10 ⁶ switching cycles
Switching principle	Slide contacts
Switching voltage	Min. 24 V DC
Switching current	Min. 10 mA (24 V DC)
Contact material	FK-Ag, silver-plated, passivated
Usage category in accordance with IEC 947-5-1	AC-15/250 V AC/8 A DC-13/24 V DC/5 A
Rated insulation voltage, U _i	440 V, test voltage 2.500 V
Withstand impulse voltage U _{imp}	2.5 kV
Magnet operating voltage	24 V DC +5 % / -10 %
Duty cycle	100 %
Current consumption	24 V DC: 300 mA cold, 250 mA warm
Dimensions	See dimensional drawing
Connection system	Cable gland, 2 x 0.5 to 2.5 mm ² rigid, flexible (with conductor sleeves) to 1.5 mm ²

You will find additional information at www.leuze.com/l50/.

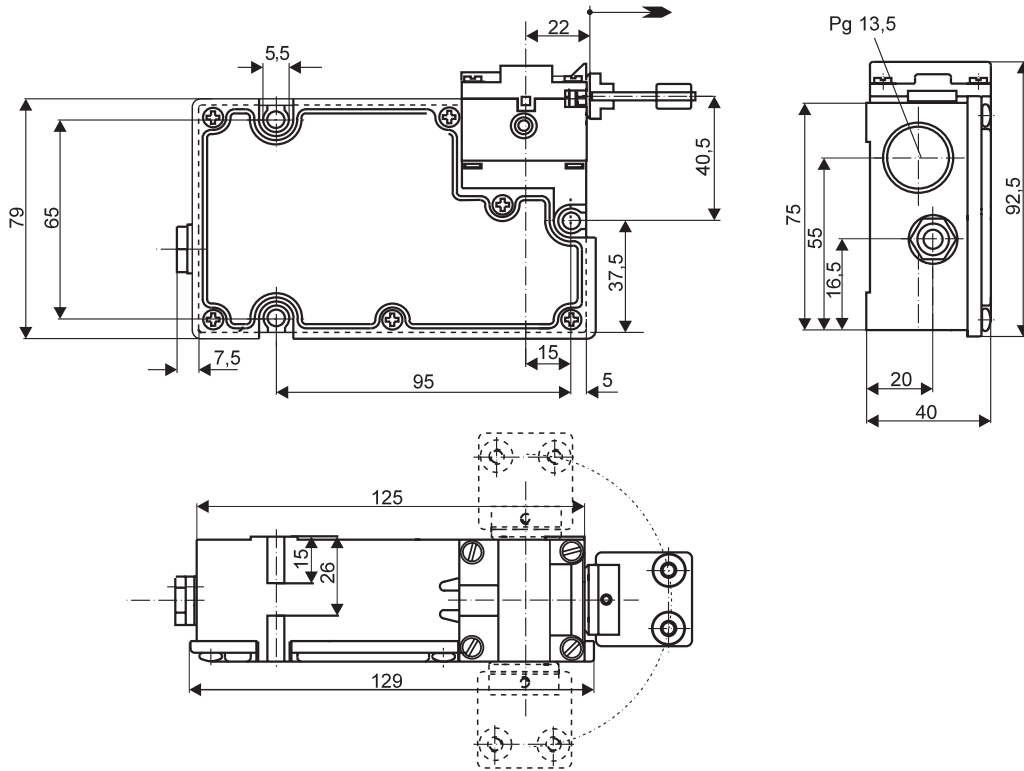




SAFETY LOCKING DEVICES

Dimensional drawings

Safety Locking Device L50



Dimensions in mm

Accessories dimensional drawings

See accessories, S10 all actuators, page 366

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Accessories ordering information

Actuators for L50

Art. no.	Article	Description	Length, design
640049	CO-S10-L50	Actuator	Straight
640055	COR-S10-L50	Radius actuator	Straight
640056	CW-S10-L50	Actuator	Angled
640057	CWR-S10-L50	Radius actuator	Angled
640058	COF/HIS.1-S10-L50	Telescopic actuator, mounting from the rear	Straight
640059	COF/HIS.2-S10-L50	Telescopic actuator, mounting from above	Straight
640060	CK-S10-L50	Shortened actuator	Straight
640061	CWK-S10-L50	Shortened actuator	Angled

L50 – Accessories

Art. no.	Article	Description
640063	K/75-L30-L50	Triangular key, angled for auxiliary unlocking, suitable for L30 & L50 series

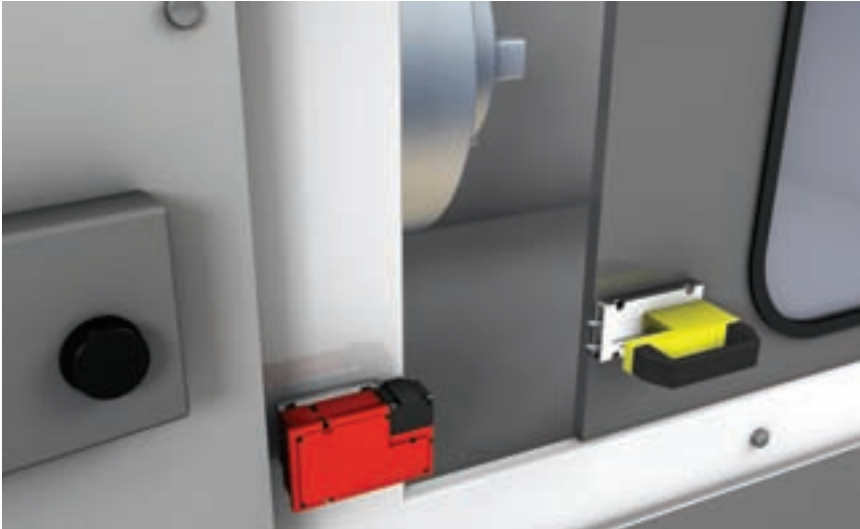
www.leuze.com/l50/





PROTECTIVE DOOR BOLT

Protective door bolt BS, BL



Protective door bolt BL and Safety Locking Device L50 on a protective door

Harmonized accessories help to reduce installation expense and enable versatile and application-oriented use. The BL and BS series protective door bolts with integrated telescopic actuators are used as preassembled add-on support for the Leuze lumiflex S10 Safety Switches and L50 Safety Locking Devices. They save the user from having to perform their own adjustment actions, and also act as end stops and protect the Safety Switches from damage. The protective door bolts are available as light BL version and heavy duty BS version (8 mm sheet steel carrier plate and plastic guide). Both accessory components can be used for adding-on on right and left closing protective doors (mounting rotated by 180°).

Typical areas of application

- Add-on support and bolt actuator for mechanical protective doors with S10 Safety Switches and L50 Safety Locking Devices
- Aluminum profile systems, square pipes, machine covers

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p. 360

S40
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L50
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BS, BL
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BS, BL

Functions

Add-on support for S10 Safety Switch; L50 with door handle and integrated Safety Switch actuator

Mechanical end stop function for protecting the Safety Switch

Special features

- Quick and easy mounting on aluminum profiles, square pipes and covers
- Universal use for right or left closing protective doors
- Slot hole for 3 shackle type connectors against unintentional locking

Ordering information

BS, BL

Included in delivery:
Mounting plate

Functions: Add-on support for S10 Safety Switch; L50 with door handle and integrated Safety Switch actuator

Art. no.	Article	Description
640040	BL-S10	Protective door bolt, for all versions – S10
640041	BL-L50	Protective door bolt, for all versions – L50
640042	BS-L50	Protective door bolt, for all versions – L50

640040 BL-S10 Protective door bolt, for all versions – S10

640041 BL-L50 Protective door bolt, for all versions – L50

640042 BS-L50 Protective door bolt, for all versions – L50

You will find additional information at www.leuze.com/bl-bs.



Properties



Further information

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| ● S10 Safety Switches | 360 |
| ● L50 Safety Locking Device | 382 |

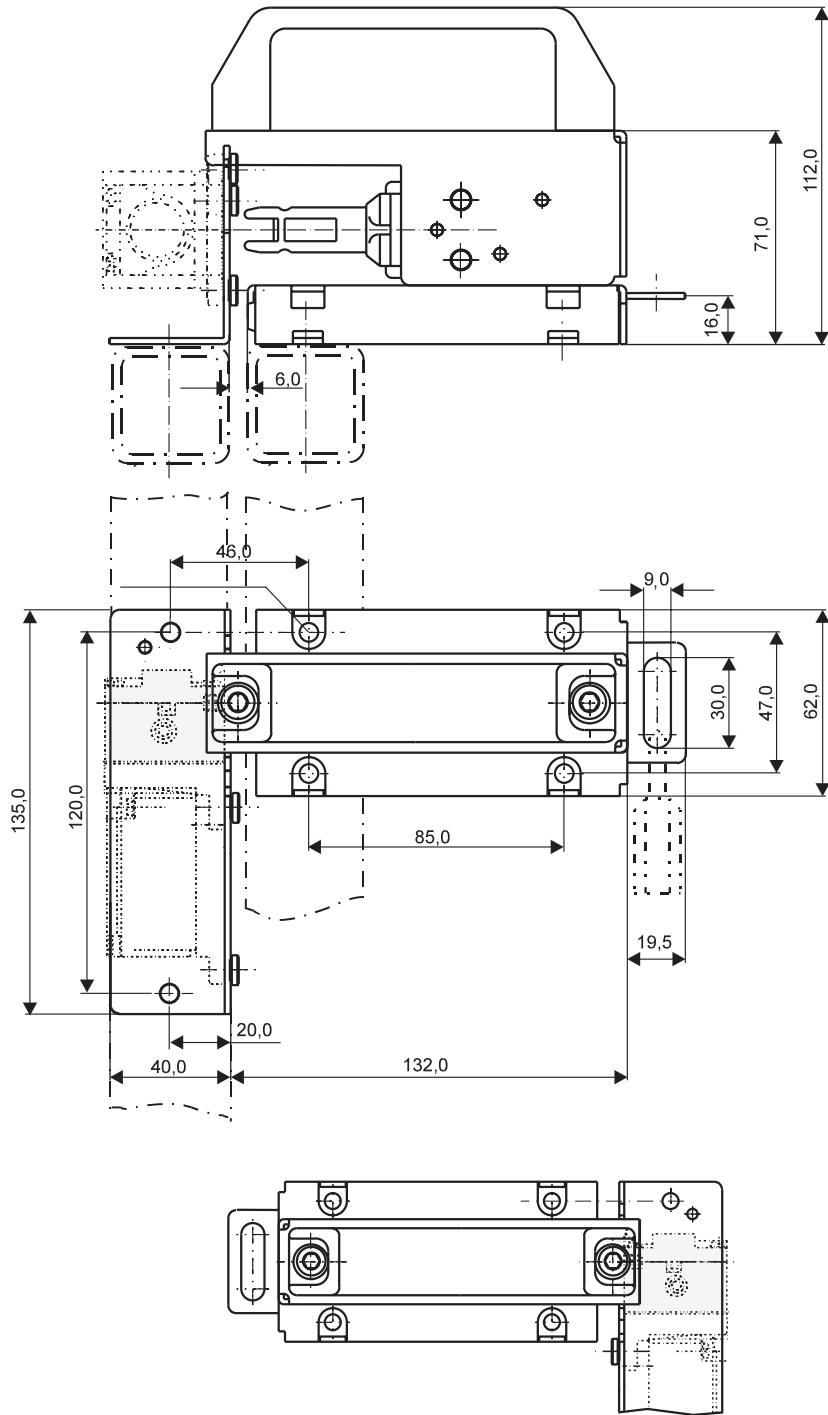




PROTECTIVE DOOR BOLT

Dimensional drawings

Protective door bolt BS, BL



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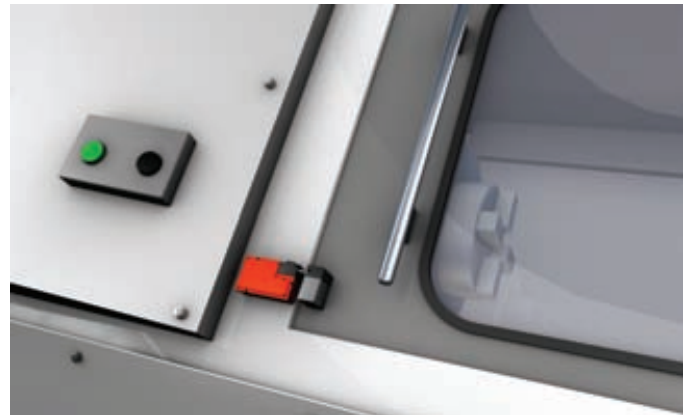


SAFETY RELAYS

OVERVIEW

Safety Relays selection table

Selection table



Safety Locking Device connected to an MSI Safety Relay for guarding the sliding door of a machine tool

With the MSI series Safety Relays, depending on the application, optical safety sensors, switches, buttons or Safety Mats can be connected to the safety circuit of the machine control system. The right interfaces must be used here, and in addition to a high level of reliability and long life time, a compact construction size is often also required. The MSI relays take these requirements into account with their mechanical and electrical design in an ideal way, and also enable an economical integration into any kind of safety-related faulty connection situation.



Safety Light Curtain with an MSI Safety Relay, MSI-SR2/F as danger area guarding with start/restart interlock on a robot cell

Space-saving and reliable: The MSI Safety Relay family (from left to right: MSI-SR1, MSI-SR2/F, MSI-SR3, MSI-RM2)



Features

Safety category/ safety type	Connectable safety components	OSSDs, relay, 3 make, 1 break	OSSDs, relay, 2 make, 1 break	OSSDs, relay, 2 changeover	RES, dynamic	RES, via AOPD	EDM, static in the reset circuit	EDM, via AOPD	Article	Page
Safety category up to 2 in acc. with EN 954-1	Safety Switch without guard locking, section emergency STOP	●			●		●		MSI-SR1	402
Safety category up to 4 in acc. with EN 954-1 *	Safety Switch without guard locking, section emergency STOP button, type 4		●		●		●		MSI-SR2	406
	Safety Light Curtains, single or Multiple Light Beam Safety Devices Type 3 Safety Laser Scanner		●		●		●		MSI-SR2-F	406
Safety category up to 4 in acc. with EN 954-1 *	Four-wire or two-wire Safety Mats (with potential-free make contacts)		●		●		●		MSI-SR3	412
Safety type: Type III C in acc. with EN 574 *	Two-hand switching device		●						MSI-2H	416
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	398

* Depending on the category of the upstream protective device

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www.leuze.com/relays/





SAFETY RELAYS

MSI-RM2



Guarding a paternoster shelf with SOLID-2E Safety Light Curtain and MSI-RM2 relay module

Opto-electronic 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. MSI-RM2 corresponds with IEC 60204-1 and complies with the safety category up to max. category 4 in acc. with EN 954-1 specified with the respective safety sensor.

Typical areas of application

- Connection of active opto-electronic protective devices with electronic outputs, integrated contactor monitoring (EDM) and start/restart interlock (RES) on machine control systems.

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MSI-SR2/F
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MSI-RM2

Important technical data, overview

Safety category in accordance with EN 954-1	up to 4 (depending on the category of the upstream protective device)
Supply voltage	24 V AC/DC $\pm 20\%$
Safety-related switching outputs (OSSDs)	2 release outputs (changeover)
Signal output	Relay output (break)
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 113.6 mm

Functions

- Signal conversion of electronic outputs of active opto-electronic protective devices on potential-free relay contacts

Special features

- Suitable up to category 4 (depending on the category of the upstream protective device)
- Monitoring external contactors in the signal circuit with 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



Properties



Further information

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SAFETY RELAYS

Ordering information

MSI-RM2

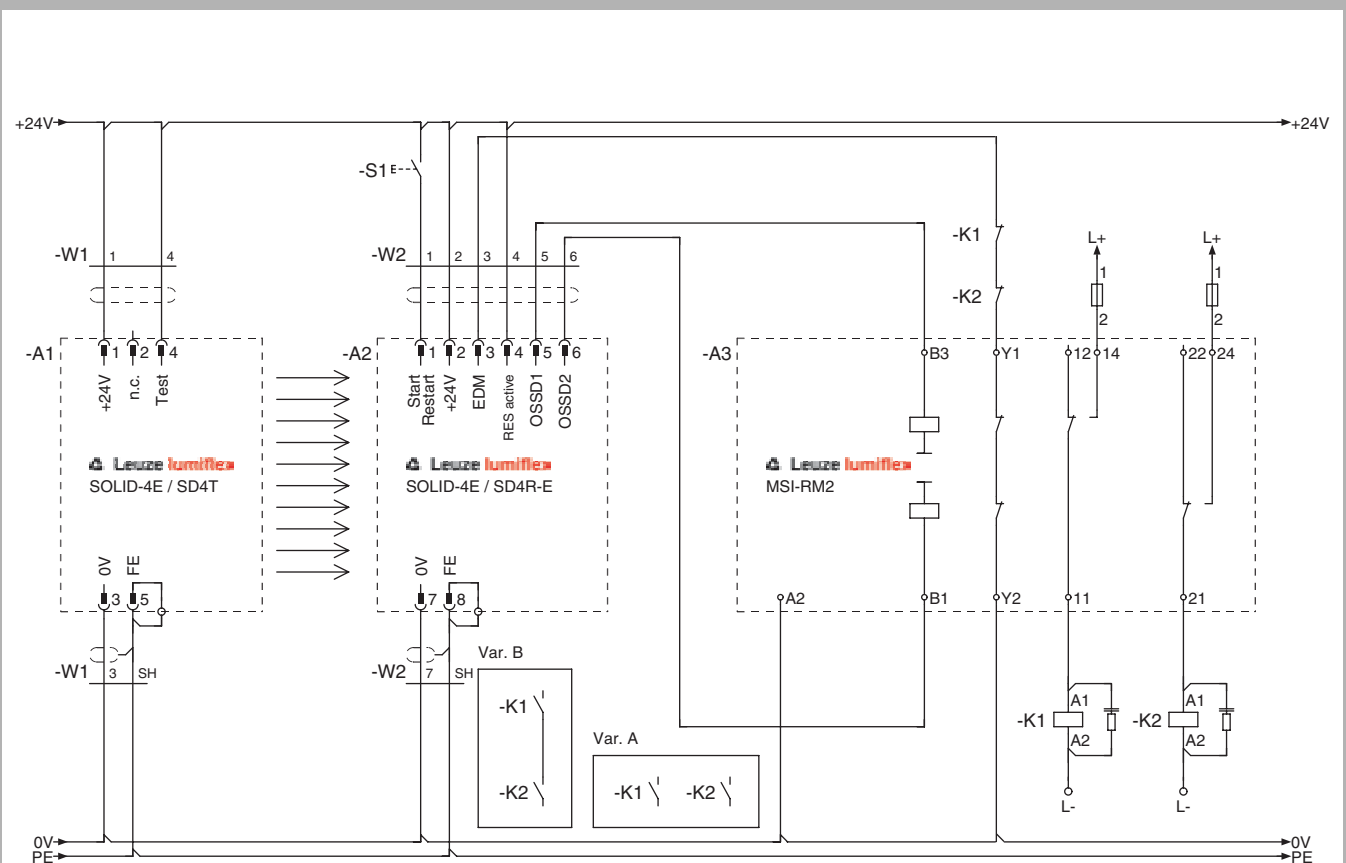
Included in delivery: 1 connecting and operating instructions manual

Functions: Relay module for opto-electronic protective devices in acc. with IEC/EN 60204-1, EN 954-1, EN 50205, IEC/EN 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 with SOLID-4E Safety Light Curtain

Please observe the operating instructions of the components!

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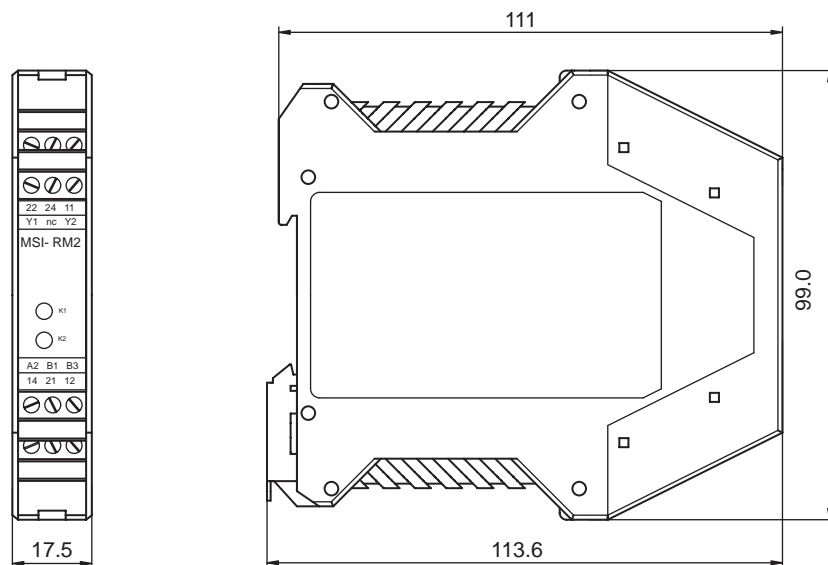
MSI-2H
p. 414

Technical data

General system data	
Safety category in acc. with EN 954-1	up to 4 (depending on the category of the upstream protective device)
Supply voltage	24 V DC $\pm 20\%$ (via OSSDs of the connected AOPD)
Current consumption	1.5 W (supply via AOPD)
Safety-related switching outputs (OSSDs)	2 release outputs (changeover)
Signal output	Relay output (break)
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
Installation	on 35 mm DIN rails

You will find additional information in the connecting and operating instructions at www.leuze.com/rm2.

Dimensional drawings



Safety Relay, MSI-RM2





SAFETY RELAYS

MSI-SR1



Guarding a CNC rotary machine with S10 Safety Switches and MSI-SR1 Safety Relay

Automatic running processes that only rarely require an operator intervention are often encapsulated or fenced-off. Protective doors and sliding protective cages with Safety Switches or guard interlockings are used in these situations. The MSI-SR1 Safety Relay provides reliable monitoring of these devices. It enables a single-channel connection of safety-relevant signal providers, such as Safety Switches and safety position switches, and as an emergency STOP switching device or protective door monitor it guarantees people protection against hazardous production processes in accordance with EN 60204-1 Stop-0 and EN 954-1 up to category 2.

Typical areas of application

- Single-channel protective door monitoring in acc. with EN 954-1 category 2
- Single-channel emergency STOP circuit in acc. with EN 954-1 category 22

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MSI-SR1

Important technical data, overview

Safety category in acc. with EN 954-1	2, in combination with single-channel control, internal setup, category 3
Stop category in accordance with IEC/EN 60204-1	0
Supply voltage	24 V AC/DC -15 % to +10 %
Safety-related switching outputs (OSSDs)	3 relay outputs (make)
Signal output	Relay output (break)
Response time	40 ms
Ambient temperature, operation	-25...+55 °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)
- Contact multiplication

Special features

- Single-channel protective door monitoring in acc. with category 2, internal setup, category 3
- 3 release circuits, 1 break contact as signal circuit
- Potential-free safety related switching outputs
- LED displays, K1 and K2, supply voltage
- Housing width, 22.5 mm



Properties



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SAFETY RELAYS

Ordering information

MSI-SR1

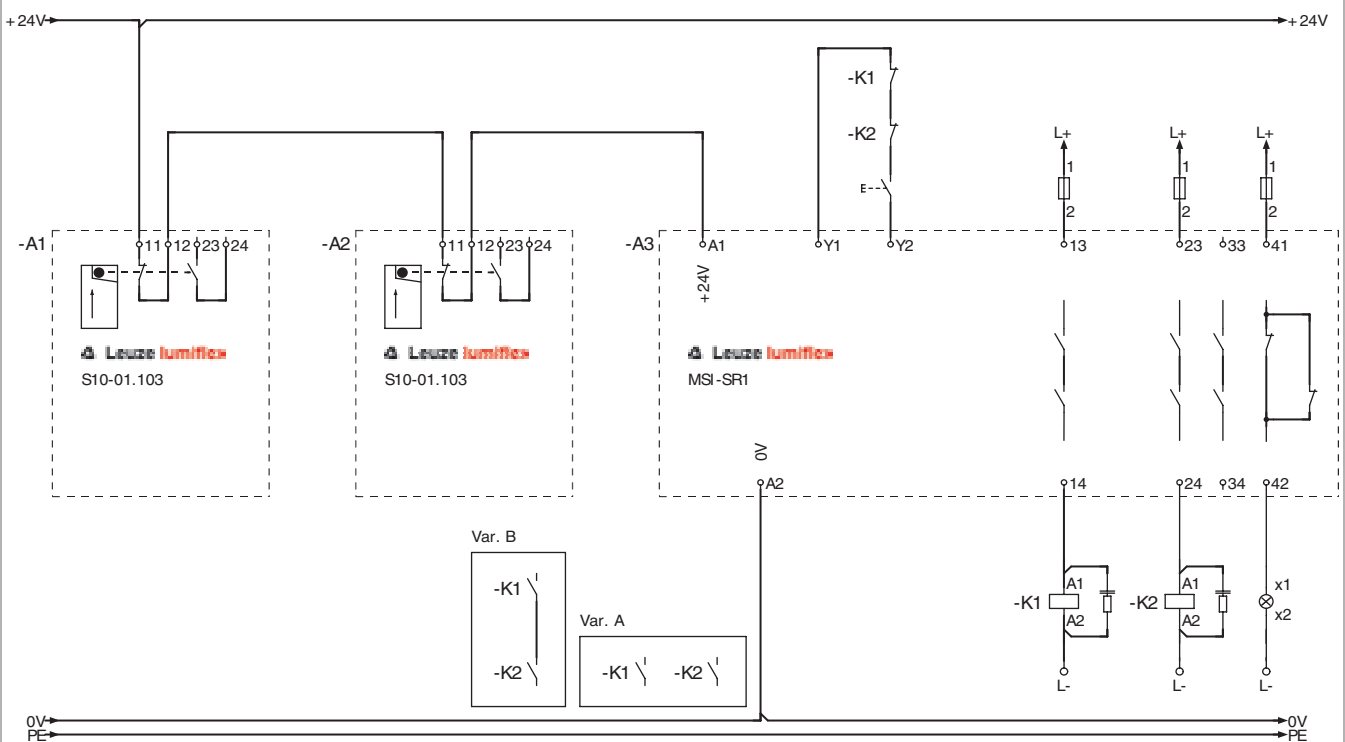
Included in delivery: 1 connecting and operating instructions manual

Functions: Emergency STOP switching device and protective door monitors in acc. with IEC/EN 60204-1 Stop Category 0, EN 954-1 Category 2 (internal setup in acc. with category 3)

MSI-SR1 Safety Relay category 3

Art. no.	Article	Description
549910	MSI-SR1	Emergency STOP switching device, category 2 (internal setup, category 3)

Electrical connection



MSI-SR1 as link between Safety Switches S10 and machine control system

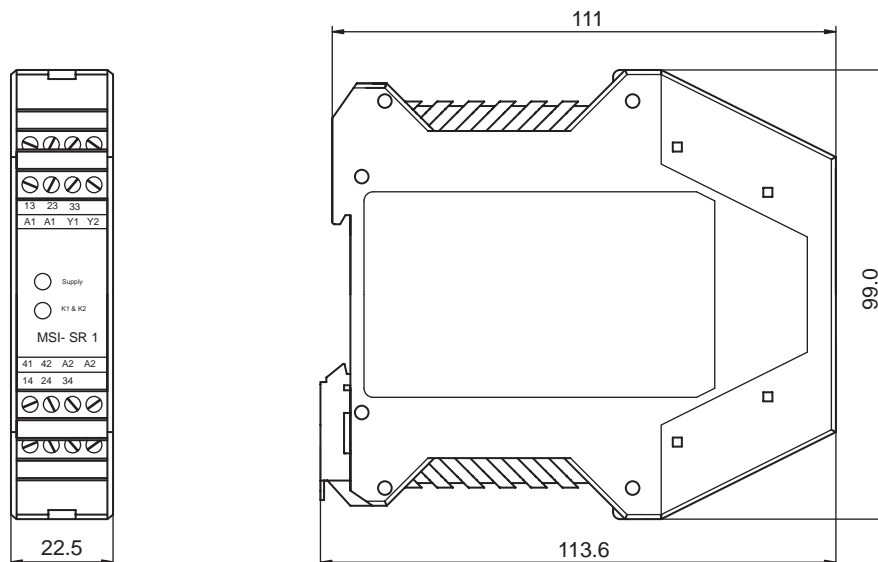
Please observe the operating instructions of the components!

Technical data

General system data	
Safety category in acc. with EN 954-1	2, in combination with single-channel control, internal setup, category 3
Stop category in accordance with IEC/EN 60204-1	0
Supply voltage	24 V AC/DC -15 % to +10 %
Current consumption	1.4 W (AC) / 1.3 W (DC)
Safety-related switching outputs (OSSDs)	3 relay outputs (make)
Signal output	Relay output (break)
Continuous current per current path	Max. 3 A
Response time	40 ms
Restart delay time	50 ms
Admissible input line resistance	<70 Ω
Ambient temperature, operation	-25...+55 °C
Safety class	II
Protection rating	IP 20
Connection system	Screw terminals
Dimensions (W x H x D)	22.5 mm x 99 mm x 113.6 mm
Installation	on 35 mm DIN rails

You will find additional information in the connecting and operating instructions at www.leuze.com/sr1.

Dimensional drawings



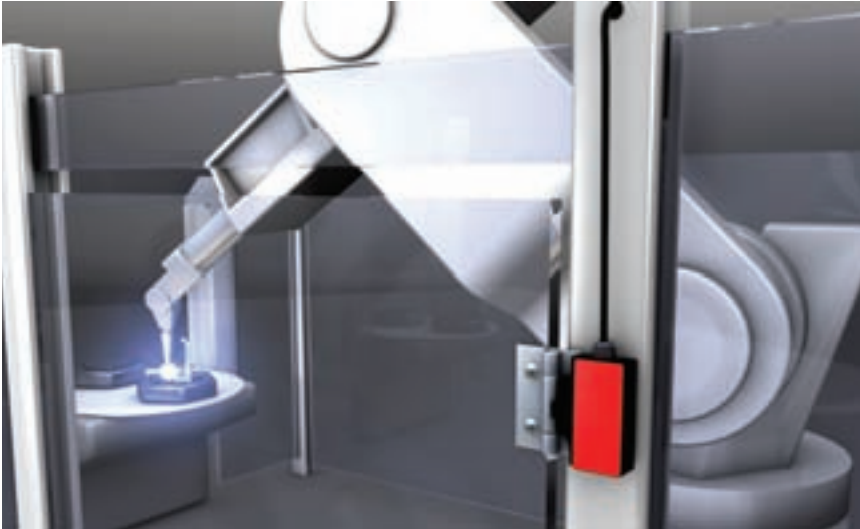
Safety Relay, MSI-SR1



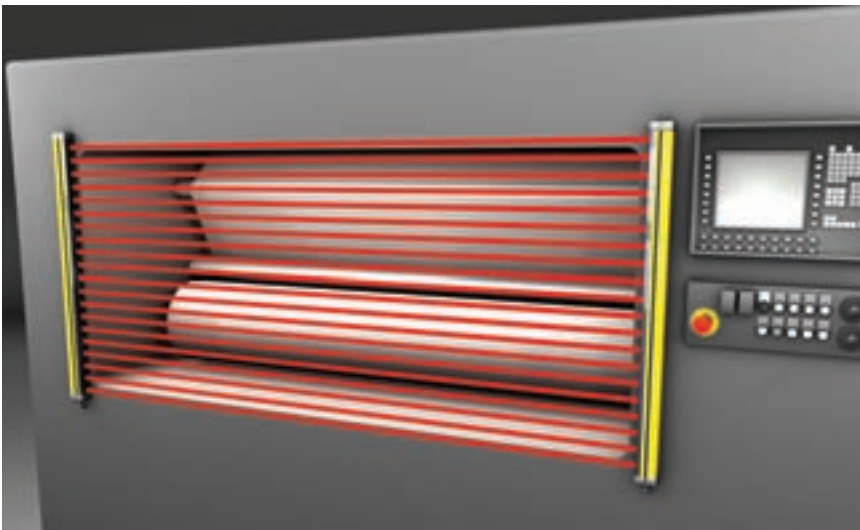


SAFETY RELAYS

MSI-SR2, MSI-SR2/F



Guarding a robot area with S40 Safety Switches and MSI-SR2 Safety Relay



Guarding a printing machine with COMPACT Safety Light Curtain and MSI-SR2/F Safety Relay

If Safety Switches or active opto-electronic protective devices are used for guarding danger areas, as the standard link the MSI-SR2 Safety Relay establishes the connection to the machine control system. It acts as an emergency STOP switching device or protective door monitor in acc. with EN 60204-1, STOP-0 and EN 954-1, Category 4, for monitoring emergency STOP control devices or Safety Switches. If fast automatic restart is the case, for example, with aptly-named "pick-and-place" systems, then the quicker, "fast" variant is recommended. MSI-SR2/F is equipped as sequential circuit for opto-electronic protective devices with a shorter restart delay time (0.2 s).

Typical areas of application

- Two-channel emergency STOP circuit in acc. with EN 954-1 up to and incl. category 4
- MSI-SR2 is the preferred option as two-channel protective door monitoring in acc. with EN 954-1 up to and incl. category 4
- MSI-SR2/F is the preferred option as sequential circuit for safety light barriers, type 4, with relay or transistor outputs

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MSI-SR2, MSI-SR2/F

Important technical data, overview

Safety category in acc. with EN 954-1	up to 4 (depending on the category of the upstream protective device)
Stop category in accordance with IEC/EN 60204-1	0
Supply voltage	24 V AC/DC $\pm 20\%$
Safety-related switching outputs (OSSDs)	2 relay outputs (make)
Signal output	Relay output (break)
Response time	20 ms
Restart delay time (automatic start)	MSI-SR2: 0.5 - 1 s MSI-SR2/F: Up to 230 ms
Ambient temperature, operation	0...+50 °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)
- Simultaneity monitoring
- Cross circuit monitoring

Special features

- Monitored start/restart button
- 2 release circuits, 1 break contact as signal circuit
- Potential-free safety related switching outputs
- LED displays, K1 and K2, supply voltage
- Housing width, 22.5 mm



Properties



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SAFETY RELAYS

Ordering information

MSI-SR2

Included in delivery: 1 connecting and operating instructions manual

Functions: Emergency STOP switching device and protective door monitors in acc. with IEC/EN 60204-1 Stop Category 0, EN 954-1 Category 4

MSI-SR2/F

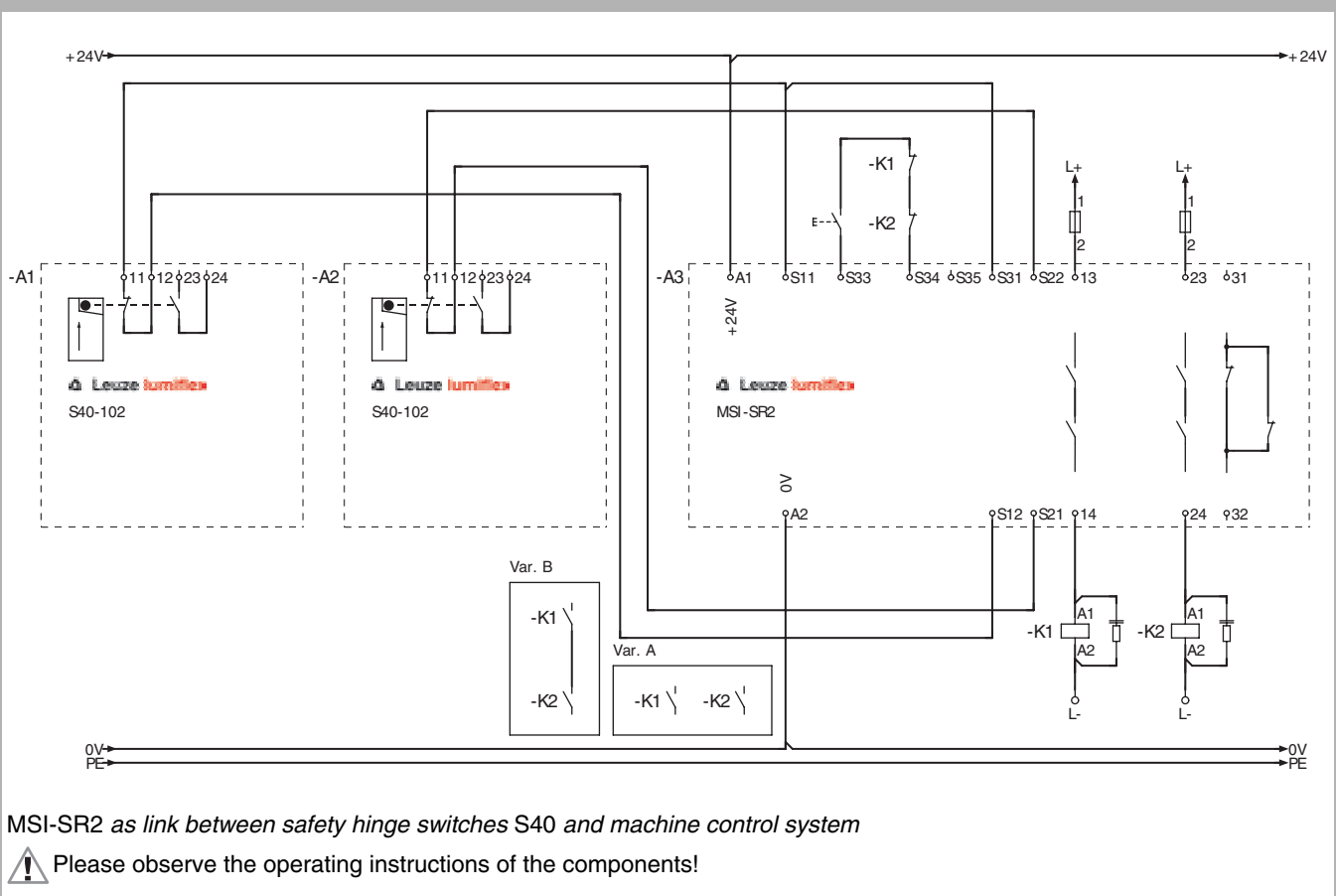
Included in delivery: 1 connecting and operating instructions manual

Functions: Emergency STOP switching device and safety sequential circuit in acc. with IEC/EN 60204-1 Stop Category 0, EN 954-1 Category 4

MSI-SR2, -SR2/F Safety Relay category 4

Art. no.	Article	Description
549911	MSI-SR2	Emergency STOP switching device, category 4
549915	MSI-SR2/F	Emergency STOP switching device, category 4, also for fast automatic start

Electrical connection



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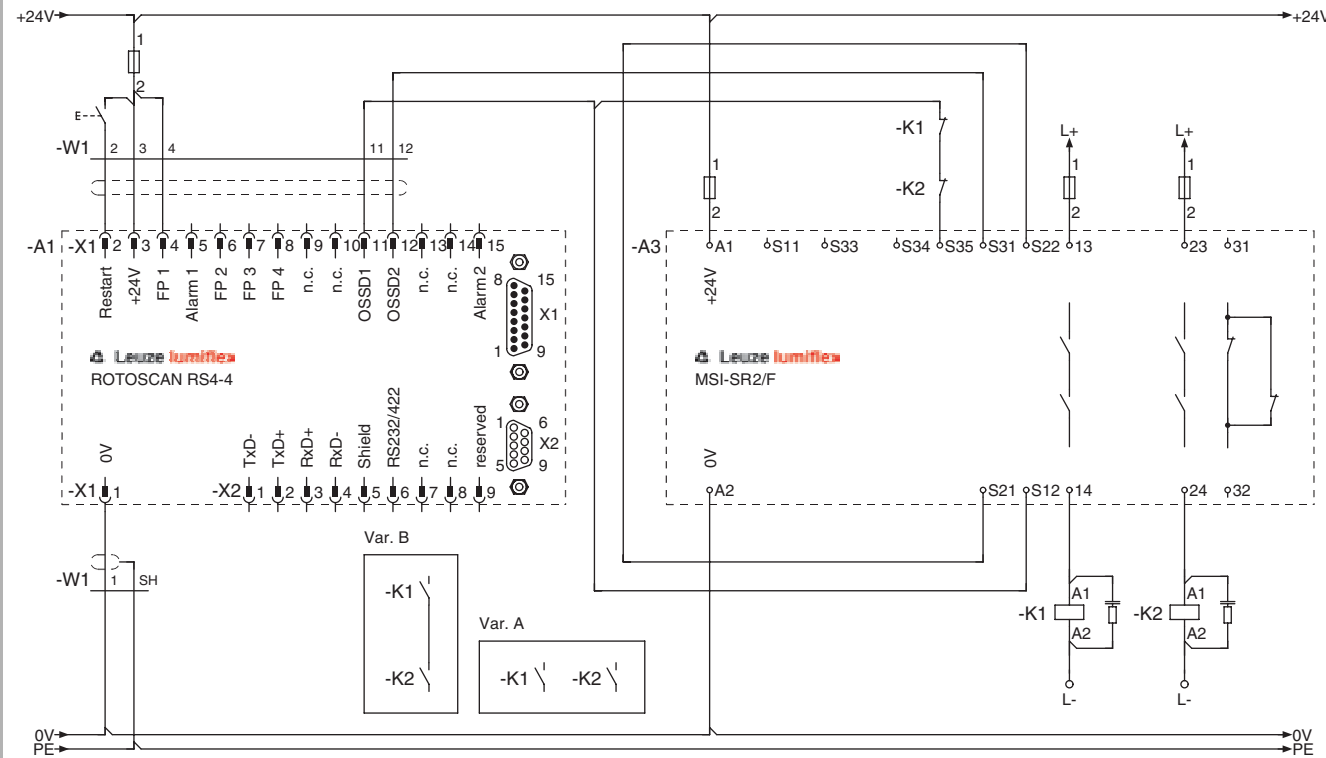
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MSI-SR2, MSI-SR2/F

Electrical connection

MSI-SR2/F connection example



MSI-SR2/F as link between ROTOSCAN RS4 Laser Scanner and machine control system

Please observe the operating instructions of the components!





SAFETY RELAYS

Technical data

General system data	
Safety category in acc. with EN 954-1	up to 4 (depending on the category of the upstream protective device)
Stop category in accordance with IEC/EN 60204-1	0
Supply voltage	24 V AC/DC $\pm 20\%$
Current consumption	2.1 W (AC) / 1.7 W (DC)
Safety-related switching outputs (OSSDs)	2 relay outputs (make)
Signal output	Relay output (break)
Continuous current per current path	Max. 3 A
Response time	20 ms
Restart delay time (manual start)	70 ms
Restart delay time (automatic start)	MSI-SR2: 0.5 - 1 s MSI-SR2/F: Up to 230 ms
Start impulse time, S34, S35	> 80 ms
Time window for simultaneity monitoring	MSI-SR2: Approx. 0.5 s
	MSI-SR2/F: 50 ms
Input current	Max. 320 mA, $\tau = 7.5$ ms
Admissible input line resistance	<70 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)	22.5 mm x 99 mm x 113.6 mm
Installation	on 35 mm DIN rails

You will find additional information in the connecting and operating instructions at www.leuze.com/sr2.

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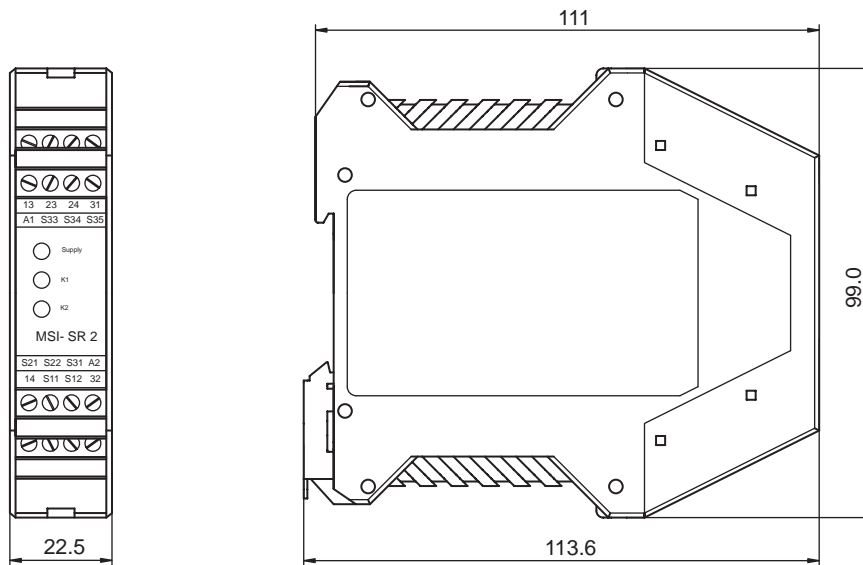
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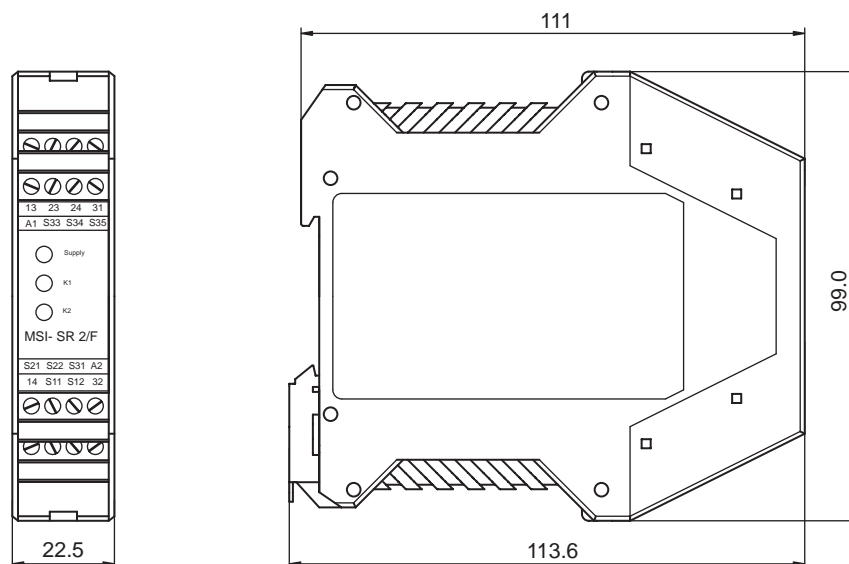
MSI-SR2, MSI-SR2/F

Dimensional drawings

Safety Relay MSI-SR2



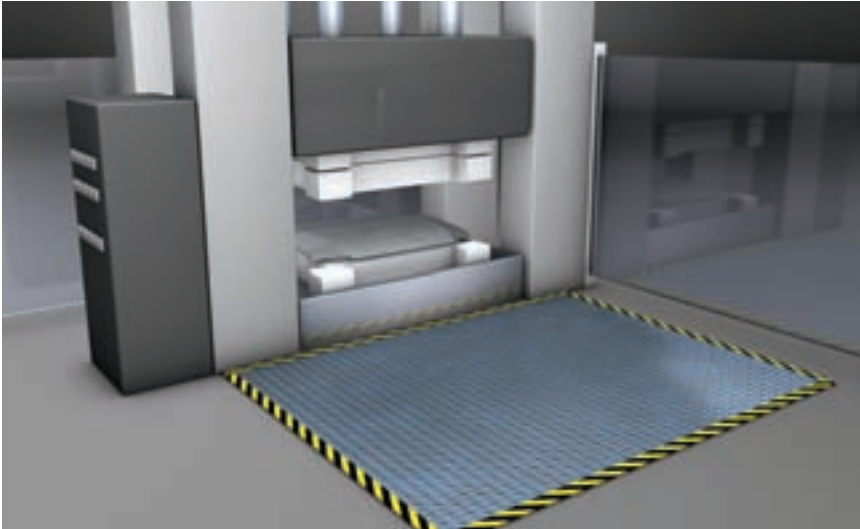
Safety Relay MSI-SR2/F





SAFETY RELAYS

MSI-SR3



Guarding a danger area with Safety Mat and MSI-SR3 Safety Relay

In certain applications the use of Safety Mats is preferred because of the environmental conditions. The MSI-SR3 Safety Relay is the link between the Safety Mat and the machine control system. It acts as an emergency STOP switching device or protective door monitor for protecting people from hazardous production processes in accordance with EN 60204-1 Stop-0 and EN 954-1 Category 4. The option of connecting two-wire and four-wire Safety Mats and- Safety Strips allows flexible use of the MSI-SR3.

Typical areas of application

- Monitoring of two and four-wire Safety Mats in accordance with EN 954-1 up to and incl. category 4
- Two-channel protective door monitoring in accordance with EN 954-1 up to category 4
- Single-channel emergency STOP circuit in acc. with EN 954-1 category 2
- Two-channel emergency STOP circuit in acc. with EN 954-1 up to and incl. category 4

MSI-SR3

Important technical data, overview

Safety category in acc. with EN 954-1	up to 4 (depending on the category of the upstream protective device)
Stop category in accordance with IEC/EN 60204-1	0
Supply voltage	24 V AC/DC ±20 %
Safety-related switching outputs (OSSDs)	2 relay outputs (make)
Signal output	Relay output (break)
Response time	20 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)
- Simultaneity monitoring
- Cross circuit monitoring

Special features

- Monitored start/restart button
- Monitoring of four-wire Safety Mats
- Monitoring of two-wire Safety Mats/Safety Strips
- Two-channel control with cross circuit monitoring
- Simultaneity monitoring, 0.5 s
- 2 release circuits, 1 break contact as signal circuit
- Potential-free safety related switching outputs
- LED displays, K1 and K2, supply voltage
- Housing width, 22.5 mm



Properties



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SAFETY RELAYS

Ordering information

MSI-SR3

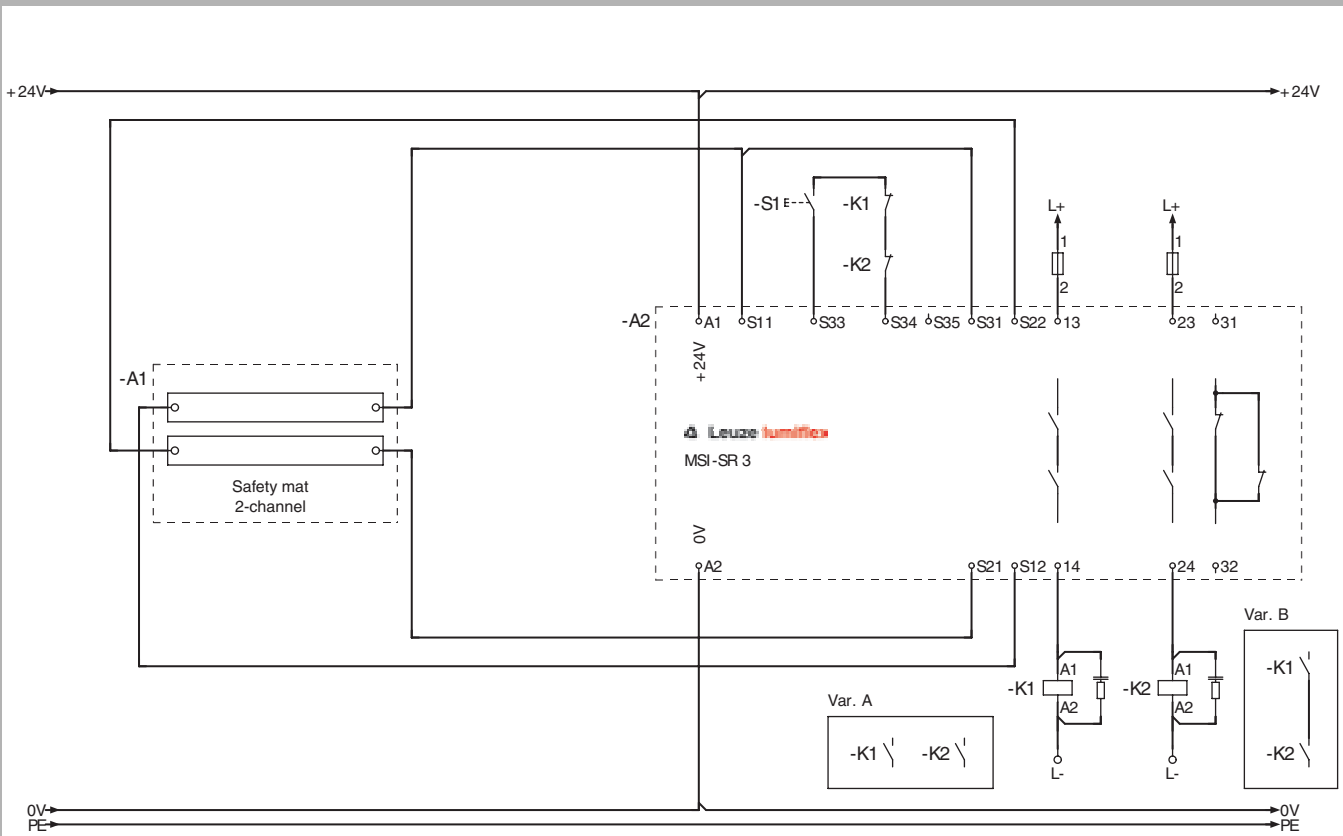
Included in delivery: 1 connecting and operating instructions manual

Functions: Emergency STOP switching device, protective door monitor, Safety Mats/Safety Strips monitoring device in acc. with IEC/EN 60204-1 Stop Category 0, EN 954-1 Category 4

MSI-SR3 Safety Relay category 4

Art. no.	Article	Description
549909	MSI-SR3	Emergency STOP switching device, category 4, Safety Mats connection, protective door monitors

Electrical connection



MSI-SR3 as link between four-wire Safety Mat and machine control system

Please observe the operating instructions of the components!

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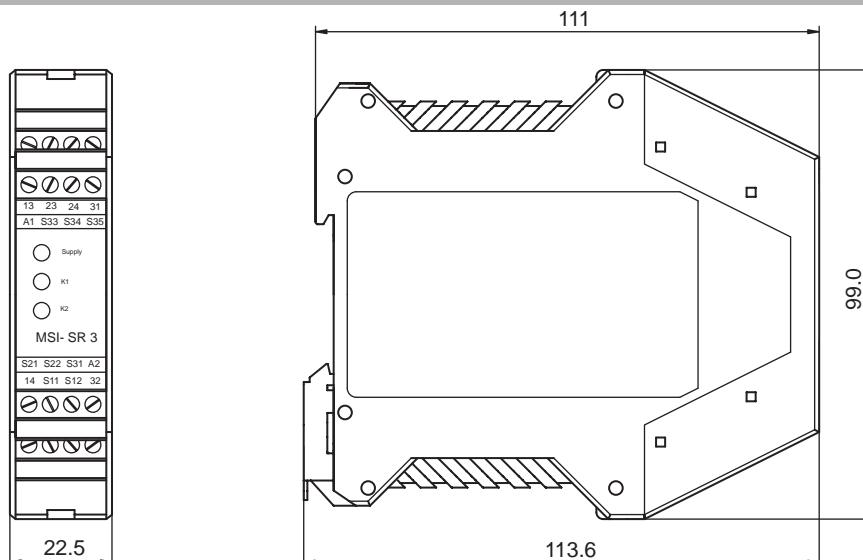
MSI-2H
p. 414

Technical data

General system data	
Safety category in acc. with EN 954-1	up to 4 (depending on the category of the upstream protective device)
Stop category in accordance with IEC/EN 60204-1	0
Supply voltage	24 V AC/DC $\pm 20\%$
Current consumption	2.1 W (AC) / 1.9 W (DC)
Safety-related switching outputs (OSSDs)	2 relay outputs (make)
Signal output	Relay output (break)
Continuous current per current path	Max. 3 A
Response time	20 ms
Restart delay time (manual start)	70 ms
Restart delay time (automatic start)	0.5 - 1 s
Start impulse time, S34, S35	>80 ms
Time window for simultaneity monitoring	Approx. 0.5 s
Input current	Max. 320 mA, $\tau=7.5$ ms
Admissible input line resistance	<70 Ω
Ambient temperature, operation	0...+55 °C
Ambient temperature, storage	-25...+70 °C
Safety class	II
Protection rating	IP 20
Connection system	Screw terminals
Dimensions (W x H x D)	22.5 mm x 99 mm x 113.6 mm
Installation	on 35 mm DIN rails

You will find additional information in the connecting and operating instructions at www.leuze.com/sr3.

Dimensional drawings



Safety Relay, MSI-SR3





SAFETY RELAYS

MSI-2H



Guarding a feeding-in area with two-hand control station and two-hand control relay MSI-2H

When manually fed presses, after placing in the work piece the operator must press two hand-activated buttons outside the danger area 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 area and the existing safety requirements are satisfied. The MSI-2H Safety Relay is the link between these activation elements und the machine control system; it acts as two-hand relay in accordance with EN 574 Type III C, EN 954-1 Category 4. 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 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 in accordance with EN 954-1 up to category 4

MSI-RM2
p. 396

MSI-SR1
p. 400

MSI-SR2,
MSI-SR2/F
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MSI-2H

Important technical data, overview

Safety category in acc. with EN 954-1	up to 4 (depending on the category of the upstream protective device)
Stop category in accordance with IEC/EN 60204-1	0
Supply voltage	24 V AC/DC –15 % to +10 %
Safety-related switching outputs (OSSDs)	2 relay outputs (make)
Signal output	Relay output (break)
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

- Automatic start/restart
- Start/restart interlock (RES), optionally with/without
- Static contactor Monitoring (EDM)
- Simultaneity monitoring of the two-hand buttons
- Cross circuit monitoring

Special features

- Two-hand relay in accordance with EN 574 Type III C
- 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 break contact as signal circuit
- Potential-free safety related switching outputs
- LED displays, K1 and K2, supply voltage
- Housing width, 22.5 mm



Properties



Further information

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SAFETY RELAYS

Ordering information

MSI-2H

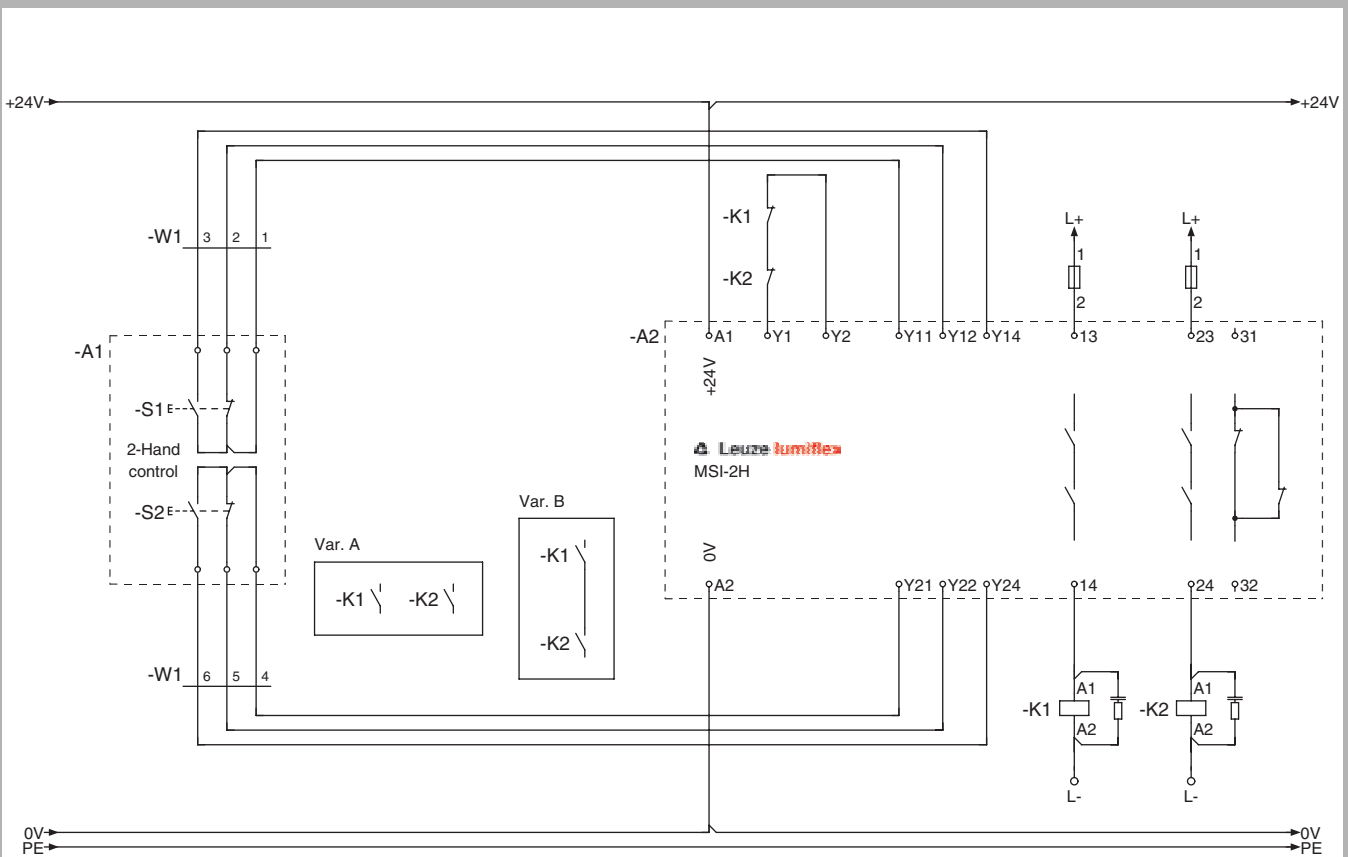
Included in delivery: Connecting and operating instructions

Functions: Two-hand control relay in acc. with EN 574 Type III C, EN 954-1 Category 4 and protective door monitors in acc. with IEC/EN 60204-1 Stop Category 0

MSI-2H Safety Relay category 4

Art. no.	Article	Description
549912	MSI-2H	Emergency STOP relay, category 4, for connecting two-hand control devices

Electrical connection



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-SR2,
MSI-SR2/F
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MSI-SR3
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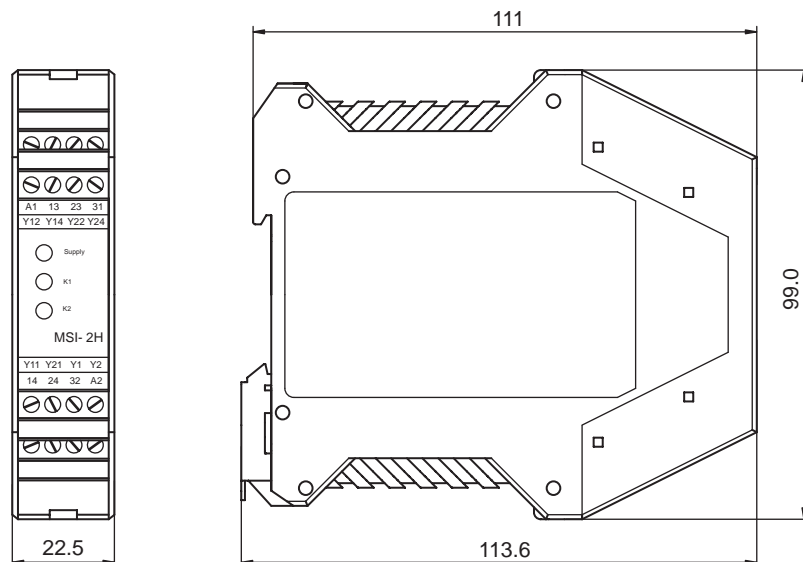
MSI-2H
p. 414

Technical data

General system data	
Safety category in acc. with EN 954-1	up to 4 (depending on the category of the upstream protective device)
Stop category in accordance with IEC/EN 60204-1	0
Supply voltage	24 V AC/DC -15 % to +10 %
Current consumption	2.1 W (AC) / 1.9 W (DC)
Safety-related switching outputs (OSSDs)	2 relay outputs (make)
Signal output	Relay output (break)
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
Safety class	II
Protection rating	IP 20
Connection system	Screw terminals
Dimensions (W x H x D)	22.5 mm x 99 mm x 113.6 mm
Installation	on 35 mm DIN rails

You will find additional information in the connecting and operating instructions at www.leuze.com/2h/.

Dimensional drawings



Safety Relay, MSI-2H





SAFETY INTERFACES

OVERVIEW

Safety Interfaces selection table

Selection table



Single-cycle control of an off-centre press with a COMPACT Safety Light Curtain and the MSI-i/R safety interface

In addition to the standard version of the MSI safety interfaces, the x-version types provide the user with additional inputs for connecting further safety-related components, e.g. Safety Switches or emergency STOP buttons. A relay switching cycle counter with warning output enables preventive maintenance with these devices; several outputs inform about the device status.

All MSI safety interface have a diagnostics interface for the PC-supported visualization of input, output and internal system states. This allows wiring and cabling errors, insufficient input information and the system status to be quickly and easily detected.

MSI safety interfaces – the modular system for economical complete solutions (from left to right: MSI-i/R, MSI-sx/Rx, MSI-mix/Rx, MSI-mxE/Rx)



Muting solution with ROBUST Multiple Light Beam Safety Device and MSI-m/R safety interface

MSI safety interfaces connect safety sensors with the machine control system. The devices are highly reliable and have long life times, and with their compact, connection-optimized design enable fast and space-saving integration into the control cabinet.

MSI modules are set up like safety control units in redundant switching systems. In contrast to the control units they do not have to be programmed. The devices satisfy category 4 in accordance EN 954-1 and provide various safety-relevant additional functions, such as start/restart interlock, contactor monitoring, test monitoring of type 2 sensors, single/double-cycle control or muting.

Safety category EN 61496	Connectable safety components	Special functions	Features, type-dependent																Article	Page							
			Number of test outputs	Number of safety inputs	Number of additional safety inputs	RES / EDM, selectable	Machine cycle signal input	1-cycle / 2-cycle control	Number of muting signal inputs	Number of muting indicator outputs	Double muting	Output, muting indicator warning	Output, muting status	Output, muting error	Collective output, protective fields free	Fault output	OSSDs, relay, 2 make	OSSDs, relay, 2 make, 1 break			Relay switching cycle monitoring	SSD error signal, 1 make contact	Output, RES status	Output, OSSD status			
Up to type 4	Type 2, type 4 AOPDs Type 3 Safety Laser Scanners Safety Switch without guard interlocking, section emergency STOP button		2	2	●																		MSI-s/R	422			
			2	4	●										●	●		●	●	●	●	●	●	MSI-sx/Rx	422		
		Cycle control	2	2	●	●	●										●	●						●	●	MSI-i/R	428
			2	4	●	●	●										●	●		●	●	●	●	●	●	MSI-ix/Rx	428
		Muting	2	2	●				4	2		●	●	●	●	●	●	●						●	●	MSI-m/R	434
			2	4	4	●			4	2	●	●	●	●	●	●	●	●						●	●	MSI-mx/Rx	434
		Muting, UL, up to 60°C	2	2	●				4	2		●	●	●	●	●	●	●						●	●	MSI-mE/R	440
			2	4	4	●			4	2	●	●	●	●	●	●	●	●						●	●	MSI-mxE/Rx	440
		Cycle control Muting bypass	2	2	●	●	●		2	2		●	●	●	●	●	●	●						●	●	MSI-mi/R	446
			2	4	4	●	●	●		2	2		●	●	●	●	●	●						●	●	MSI-mix/Rx	446
Type 2	AOPDs		1	1	●																		TNT 35	452			

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- MSI-i/R, MSI-ix/Rx p. 426
- MSI-m/R, MSI-mx/Rx p. 432
- MSI-mE/R / MSI-mxE/Rx p. 438
- MSI-mi/R, MSI-mix/Rx p. 444
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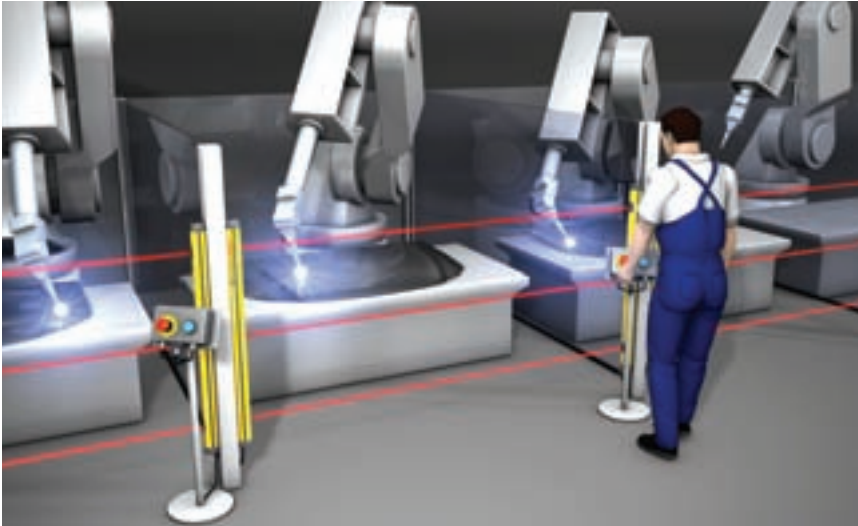
www.leuze.com/interfaces/





SAFETY INTERFACES

MSI-s/R, MSI-sx/Rx



MSI safety interfaces provide important functions for the efficient flow of automated production processes

When increased functionality is required in automated production processes the MSI-s and MSI-sx safety interfaces are preferred over Safety Relays. These safety interfaces, type 4 in accordance with IEC/EN 61496-1 and category 4 in accordance with EN 954-1, can be flexibly connected as the link between opto-electronic protective devices and the machine control unit. In addition to standard functions such as start/restart interlock and contactor monitoring they also feature a type 2 test monitoring. The MSI-sx ("extended") model also enables the connection of emergency STOP control devices or Safety Switches. Furthermore switching cycles can also be counted and automatically signal when a pre-selected value is reached. Preventive maintenance is possible with this warning in good time before a device failure, which in turn provides additional reliability with regard to system availability.

Special features

- Combined guarding types by connecting up to 4 AOPDs
- Additional emergency STOP button or Safety Switch can be connected (MSI-sx/Rx)
- Relay switching cycle counting for preventive maintenance (MSI-sx/Rx)
- Potential-free safety related switching outputs
- Contact load rating, 5 A
- Plug-in connection terminals and output modules
- Interface for PC-supported diagnostics and easy start-up
- Housing width, 35 mm

Typical areas of application

- MSI-s/R as interface module between opto-electronic protective devices, type 4, type 3 or type 2 and the machine control system
- MSI-sx/Rx for systems with combined application of light beam devices, Safety Switches and emergency STOP buttons; stop category 0 (IEC 60204-1)

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MSI-sx/Rx
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MSI-i/R,
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MSI-mE/R /
MSI-mxE/Rx
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MSI-mi/R,
MSI-mix/Rx
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p. 450

Important technical data, overview

Safety type in acc. with IEC/EN 61496-1 (Annex A)	Type 4
Safety category in acc. with EN 954-1	up to 4 (depending on the category of the upstream protective device)
Stop category in acc. with IEC/EN 60204-1	0
Supply voltage	24 V DC, ±20 %
Response time	22 to 64 ms depending on safety sensor
Safety-related switching outputs (OSSDs)	MSI-s/R: 2 relay outputs (make) MSI-sx/Rx: 3 relay outputs (2 make, 1 break)
Secondary switching device (SSD), only MSI-sx/Rx	Relay output (make)
Ambient temperature, operation	0...+55 °C
Temperature range, storage	-25...+70 °C
Dimensions (W x H x D)	35 mm x 99 mm x 113.6 mm

Functions

	MSI-s/R	MSI-sx/Rx
Max. number of AOPDs type 2 or emergency STOP control devices (category 2)	2	4
Max. number of AOPDs type 4 or emergency STOP control devices (category 4)	1	2
Start/restart function (RES), optionally with/without	●	●
Static contactor Monitoring (EDM)	●	●
Dynamic contactor monitoring (EDM)	●	●
Cross circuit monitoring	●	●
PC diagnostics interface	●	●
Relay switching cycle counter for preventive maintenance		●
System error signal output		●
Secondary switching device (SSD) – output		●



Properties



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SAFETY INTERFACES

Ordering information

MSI-s/R, MSI-sx/Rx

Included in delivery: Connecting and operating instructions

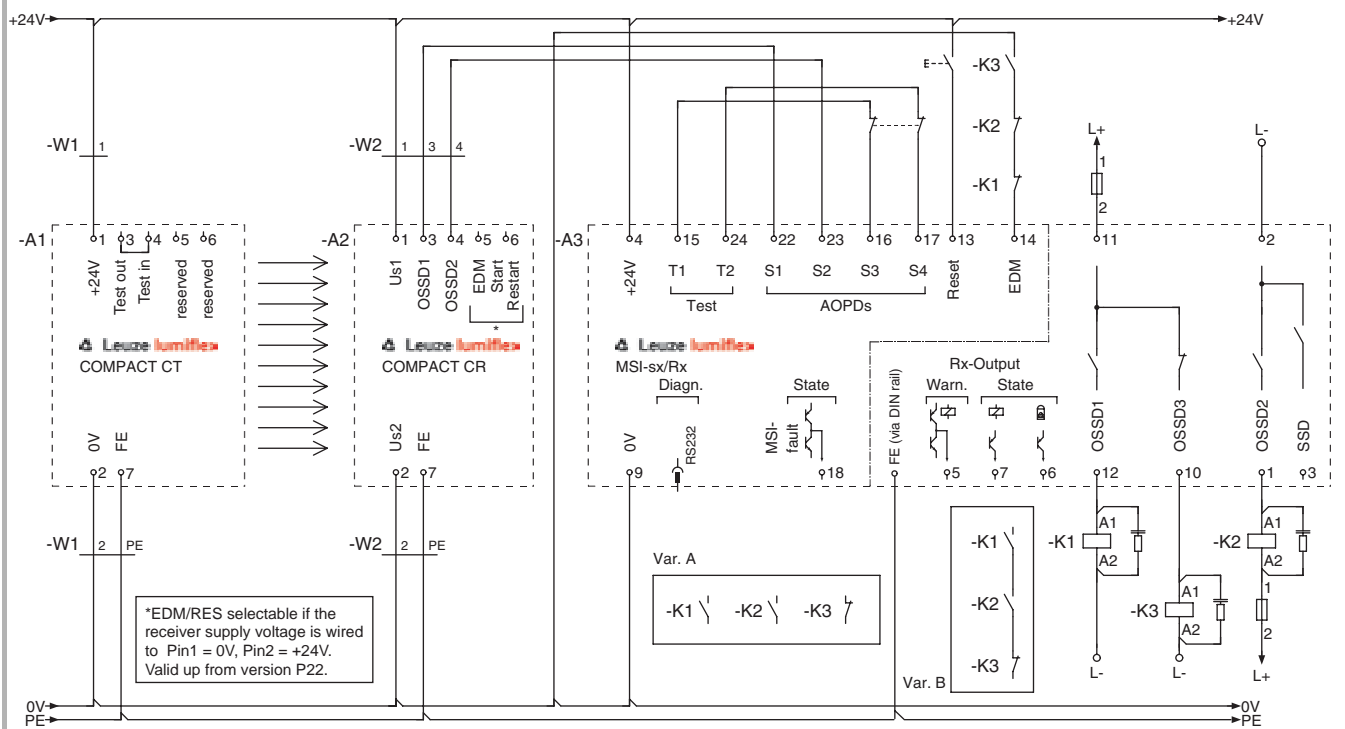
Functions: Start/restart interlock, contactor monitoring, PC diagnostics interface

MSI-s/R, MSI-sx/Rx

Art. no.	Article	Description	Safety-related switching output
549900	MSI-s/R	Type 4 safety interface	Relay output
549901	MSI-sx/Rx	Type 4 safety interface, extended functions	Relay output

Electrical connection

MSI-sx/Rx connection example



Safety interface MSI-sx/Rx with Safety Light Curtain COMPACT and Safety Switches S10

Please observe the operating instructions of the components!

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Technical data

General system data	
Safety type in acc. with IEC/EN 61496-1 (Annex A)	Type 4
Safety category in acc. with EN 954-1	up to 4 (depending on the category of the upstream protective device)
Stop category in acc. with IEC/EN 60204-1	0
Supply voltage	24 V DC, ±20 %
Response time	22 ms with connection of type 4 AOPD with transistor output 64 ms with connection of type 4 AOPD with relay output 64 ms with connection of type 2 AOPD 64 ms with connection of Safety Switches (electro-mechanical)
Restart delay time	100 ms
Safety class	II
Protection rating	IP 20
Ambient temperature, operation	0...+55 °C
Ambient temperature, storage	-25...+70 °C
Relative humidity	Max. 93 %
Dimensions (W x H x D)	35 mm x 99 mm x 113.6 mm
Installation	on 35 mm DIN rails
Connection system	Plug-in, encoded screw terminals up to 2.5 mm ²
Current consumption	Approx. 200 mA without external load
Safety-related switching outputs (OSSDs)	MSI-s/R: 2 relay outputs (make) MSI-sx/Rx: 3 relay outputs (2 make, 1break)
Secondary switching device (SSD), only MSI-sx/Rx	Relay output (make)
Switching voltage, switching current (for OSSDs)	60 V DC, 250 V AC, 5 A maximum, 20 mA minimum
Test outputs T1 and T2	Test interval, 200 ms Test pulse width delayed, 24 ms each Response time, type 2 AOPD on test request, 2...18 ms
Control inputs	
Start/restart function (RES)	Potential-free make contact (button or key switch)
Contact monitoring (EDM)	Feedback of positive-guided contacts of sequential contactors
Signal outputs	
OSSD status	pnp transistor output
Start/restart interlock status	pnp transistor output
Additional signal outputs, MSI-sx/Rx	
MSI error	Push-pull transistor output
Pre-selected switching cycles reached	Push-pull transistor output
Connectable safety sensors	
Safety sensors (AOPDs)	MSI-s/R: 1 type 4 or type 3 AOPD or up to 2 type 2 AOPDs MSI-sx/Rx: Up to 2 type 4 or type 3AOPDs or up to 4 type 2 AOPDs
Safety Switch/emergency STOP button	MSI-s/R: Up to 2 Safety Switches in accordance with EN 1088 and section emergency STOP button in accordance with EN 418 MSI-sx/Rx: Up to 4 Safety Switches in accordance with EN 1088 and section emergency STOP button in accordance with EN 418

You will find additional information in the connecting and operating instructions and at www.leuze.com/msi-s/.

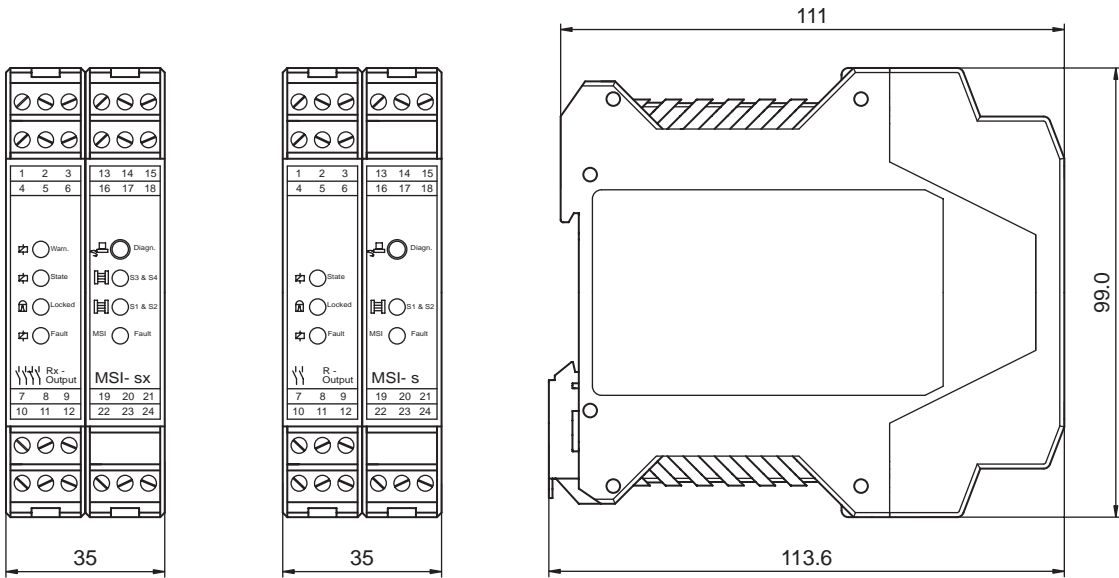




SAFETY INTERFACES

Dimensional drawings

MSI-s/R, MSI-sx/Rx safety interfaces



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MSI-sx/Rx
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MSI-ix/Rx
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MSI-mx/Rx
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MSI-mE/R /
MSI-mxE/Rx
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MSI-mi/R,
MSI-mix/Rx
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Accessories ordering information

Art. no.	Article	Description	Length, design
Diagnostics set			
549932	MSI-SWC	MSI diagnostics set contains: MSI diagnostics software, Ger/Eng user manual, diagnostics cable	3 m
Diagnostics cable			
549953	MSI-CB-3000	Diagnostics cable	3 m
549955	MSI-CB-5000	Diagnostics cable	5 m
549950	MSI-CB-10000	Diagnostics cable	10 m
Power supplies			
549940	MSI-AC115	Power supply, 115 V AC --> 24 V DC / 0.6 A, unregulated	
549908	MSI-AC230	Power supply, 230 V AC --> 24 V DC / 0.6 A, unregulated	
520060	SITOP power	Power supply, 120/230 V AC --> 24 V DC / 5 A, regulated	
520061	LOGO! Power	Power supply, 120/230 V AC --> 24 V DC / 1.3 A, regulated	

MSI diagnostics software

All MSI safety interface modules have an RS 232 diagnostics interface for the PC-supported visualization of input and outputs states and internal system states. This allows wiring and cabling errors, insufficient input information and the system status to be quickly and easily detected. You will find more information at www.leuze.com/msi-diag.





SAFETY INTERFACES

MSI-i/R, MSI-ix/Rx



The cycle control function of the MSI safety interfaces allows efficient semi-automatic processes

With manual feeding-in at a machine it saves time if the safety sensor system gives a start command to the machine directly after the work piece has been fed in, i.e. without additional button actuation. This semi-automatic process, which is frequently required with the use of presses, can be enabled with the cycle control function of the MSI-I safety interfaces. The device, type 4 in accordance with IEC EN 61496-1 and category 4 in accordance with EN 954-1, acts as the link between the opto-electronic protective devices and the machine control system; it enables an efficient production with higher ergonomics – both in the single-cycle process (one protective field penetration/release) and in the double-cycle process. The connection of an additional type 4 or type 2 protective device for the rear area monitoring is also possible. Compared with the MSI-i, the extended MSI-ix/Rx variant enables the connection of up to four opto-electronic protective devices and an emergency STOP button or a Safety Switch.

Special features

- Single or double-cycle operation with 30 s / 30 min time monitoring
- Light curtain cycle control and constant rear area monitoring (MSI-ix/Rx)
- Additional emergency STOP button or Safety Switch can be connected (MSI-ix/Rx)
- Relay switching cycle counting for preventive maintenance (MSI-ix/Rx)
- Potential-free safety related switching outputs
- Contact load rating, 5 A
- Plug-in connection terminals and output modules
- Interface for PC-supported diagnostics and easy start-up
- Housing width, 35 mm

Typical areas of application

- Interface module for light curtain cycle control
- Mechanical and hydraulic presses
- Cycle control and rear room monitoring on deburring machines

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MSI-sx/Rx
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MSI-ix/Rx
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MSI-m/R,
MSI-mx/Rx
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MSI-mE/R /
MSI-mxE/Rx
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MSI-mi/R,
MSI-mix/Rx
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Important technical data, overview

Safety type in acc. with IEC/EN 61496-1 (Annex A)	Type 4
Safety category in acc. with EN 954-1	up to 4 (depending on the category of the upstream protective device)
Stop category in acc. with IEC/EN 60204-1	0
Supply voltage	24 V DC, $\pm 20\%$
Response time	22 to 64 ms depending on safety sensor
Safety-related switch outputs (OSSDs)	MSI-i/R: 2 relay outputs (make) MSI-ix/Rx: 3 relay outputs (2 make, 1 break)
Secondary switching device (SSD), only MSI-ix/Rx	Relay output (make)
Ambient temperature, operation	0...+55 °C
Temperature range, storage	-25...+70 °C
Dimensions (W x H x D)	35 mm x 99 mm x 113.6 mm

Functions

	MSI-i/R	MSI-ix/Rx
Max. number of AOPDs type 2 or emergency STOP control devices (category 2)	2	4
Max. number of AOPDs type 4 or emergency STOP control devices (category 4)	1	2
Start/restart function (RES), optionally with/without	●	●
Static contactor Monitoring (EDM)	●	●
Dynamic contactor monitoring (EDM)	●	●
Cross circuit monitoring	●	●
PC diagnostics interface	●	●
Cycle control (single and double cycle)	●	●
30 s time monitoring for cycle operation	●	●
Relay switching cycle counter for preventive maintenance		●
System error signal output		●
Secondary switching device (SSD) – output		●



Properties



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SAFETY INTERFACES

Ordering information

MSI-i/R, MSI-ix/Rx

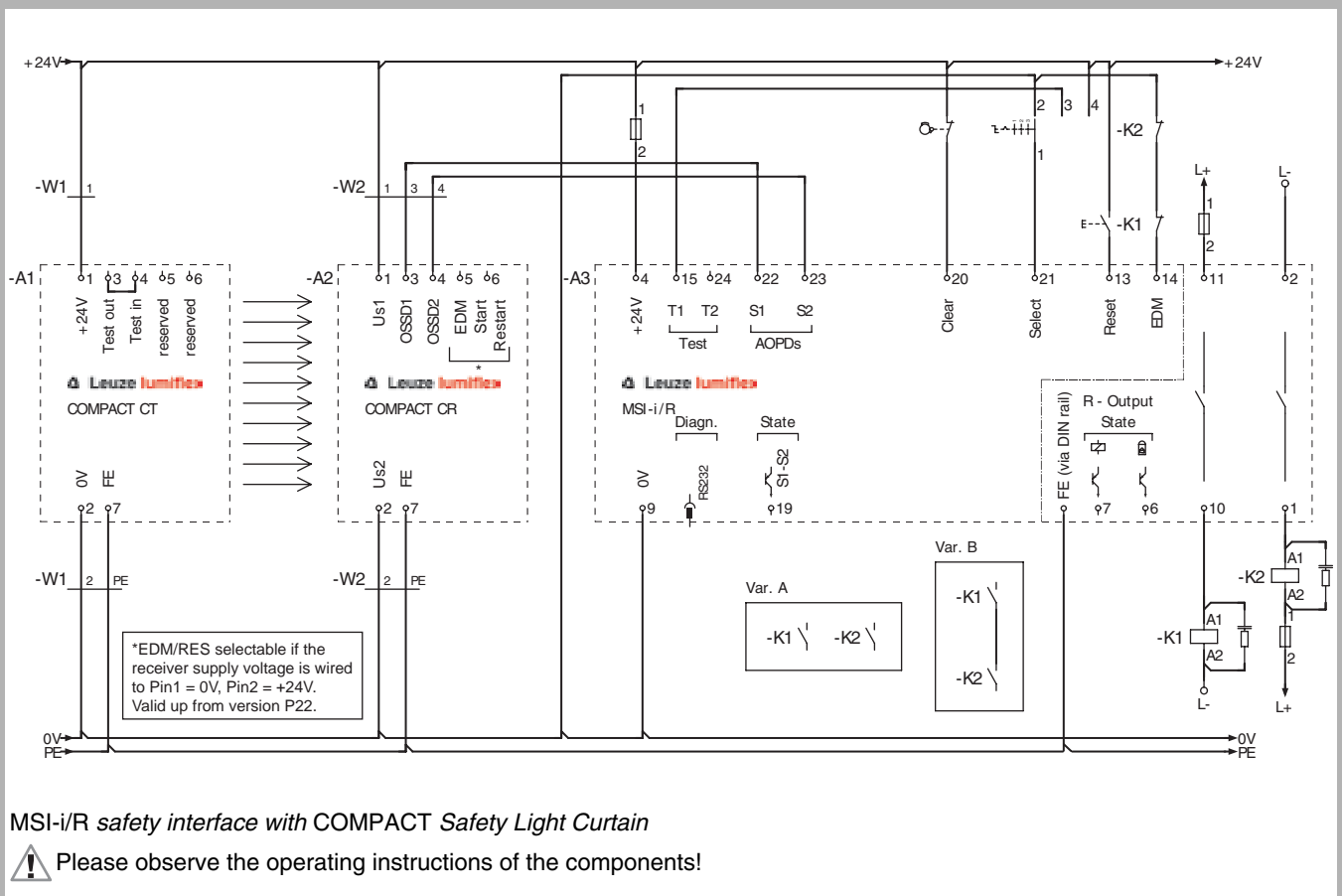
Included in delivery: Connecting and operating instructions

Functions: Cycle control, start/restart interlock, contactor monitoring, PC diagnostics interface

MSI-i/R, MSI-ix/Rx

Art. no.	Article	Description	Safety-related switching output
549902	MSI-i/R	Type 4 safety interface, cycle control	Relay output
549903	MSI-ix/Rx	Type 4 safety interface, cycle control, extended functions	Relay output

Electrical connection



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MSI-mx/Rx
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MSI-mE/R /
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MSI-mi/R,
MSI-mix/Rx
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Technical data

General system data	
Safety type in acc. with IEC/EN 61496-1 (Annex A)	Type 4
Safety category in acc. with EN 954-1	up to 4 (depending on the category of the upstream protective device)
Stop category in acc. with IEC/EN 60204-1	0
Supply voltage	24 V DC, $\pm 20\%$
Response time	22 ms with connection of type 4 AOPD with transistor output 64 ms with connection of type 4 AOPD with relay output 64 ms with connection of type 2 AOPD 64 ms with connection of Safety Switches (electro-mechanical)
Restart delay time	100 ms
Safety class	II
Protection rating	IP 20
Ambient temperature, operation	0...+55 °C
Ambient temperature, storage	-25...+70 °C
Relative humidity	Max. 93 %
Dimensions (W x H x D)	35 mm x 99 mm 113.6 mm
Installation	on 35 mm DIN rails
Connection system	Plug-in, encoded screw terminals up to 2.5 mm ²
Current consumption	Approx. 200 mA without external load
Safety-related switching outputs (OSSDs)	MSI-i/R: 2 relay outputs (make) MSI-ix/Rx: 3 relay outputs (2 make, 1 break)
Secondary switching device (SSD), only MSI-ix/Rx	Relay output (make)
Switching voltage, switching current (for OSSDs)	60 V DC, 250 V AC, 5 A maximum, 20 mA minimum
Test outputs T1 and T2	Test interval, 200 ms Test pulse width delayed, 24 ms each Response time, type 2 AOPD on test request, 2...18 ms
Selecting cycle modes	Operating mode key switch or jumper for constant operating mode
Cycle deletion	Break contact for 24 V DC in machine cycle With connection of type 4 AOPD with relay output, min. 60 ms break time With connection of type 2 AOPD, min. 60 ms break time
Control inputs	
Start/restart function (RES)	Potential-free make contact (button or key switch)
Contact monitoring (EDM)	Feedback of positive-guided contacts of sequential contactors
Signal outputs	
OSSD status	pnp transistor output
AOPDs status	pnp transistor output
Start/restart function status (RES)	pnp transistor output





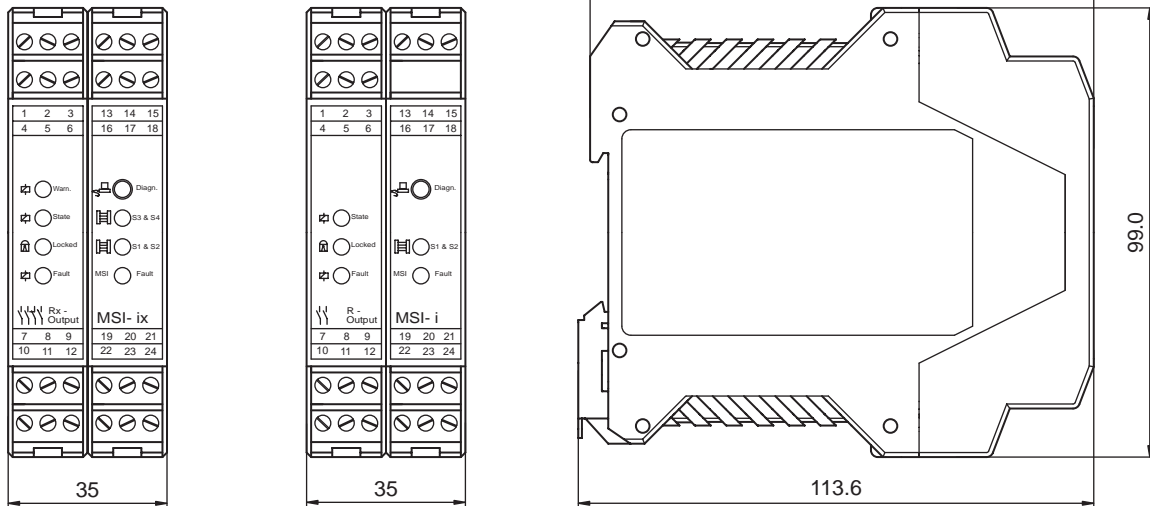
SAFETY INTERFACES

Technical data

Additional signal outputs, MSI-ix/Rx	
MSI error	Push-pull transistor output
Pre-selected switching cycles reached	Push-pull transistor output
Connectable safety sensors	
Safety sensors (AOPDs)	MSI-i/R: 1 Type 4 or type 3 AOPD or up to 2 type 2 AOPDs MSI-ix/Rx: Up to 2 type 4 or type 3AOPDs or up to 4 type 2 AOPDs
Safety Switch/emergency STOP button	MSI-i/R: Up to 2 Safety Switches in accordance with EN 1088 and section emergency STOP button in accordance with EN 418 MSI-ix/Rx: Up to 4 Safety Switches in accordance with EN 1088 and section emergency STOP button in accordance with EN 418

You will find additional information in the connecting and operating instructions and at www.leuze.com/msi-i.

Dimensional drawings



MSI-i/R, MSI-ix/Rx safety interfaces

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MSI-sx/Rx
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MSI-mxE/Rx
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Accessories ordering information

Art. no.	Article	Description	Length, design
Diagnostics set			
549932	MSI-SWC	MSI diagnostics set contains: MSI diagnostics software, Ger/Eng user manual, diagnostics cable	3 m
Diagnostics cable			
549953	MSI-CB-3000	Diagnostics cable	3 m
549955	MSI-CB-5000	Diagnostics cable	5 m
549950	MSI-CB-10000	Diagnostics cable	10 m
Power supplies			
549940	MSI-AC115	Power supply, 115 V AC --> 24 V DC / 0.6 A, unregulated	
549908	MSI-AC230	Power supply, 230 V AC --> 24 V DC / 0.6 A, unregulated	
520060	SITOP power	Power supply, 120/230 V AC --> 24 V DC / 5 A, regulated	
520061	LOGO! Power	Power supply, 120/230 V AC --> 24 V DC / 1.3 A, regulated	

MSI diagnostics software

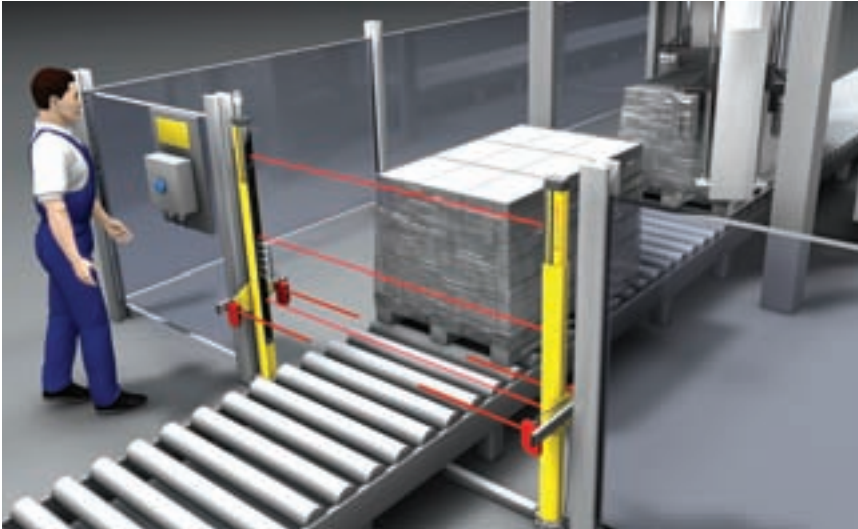
All MSI safety interface modules have an RS 232 diagnostics interface for the PC-supported visualization of input and outputs states and internal system states. This allows wiring and cabling errors, insufficient input information and the system status to be quickly and easily detected. You will find more information at www.leuze.com/msi-diag.





SAFETY INTERFACES

MSI-m/R, MSI-mx/Rx



MSI safety interface with muting function for efficient material flow in a packaging application

Integrated muting functions enable continuous material flow, e.g. for automated production cells or packaging stations, while maintaining the protective function. The protective device assumes the control here of the muting indicator and in the event of a fault in the muting sequence guarantees the safe exit of the material to be conveyed out of the muting line. With the MSI-m safety interface modules, highly productive muting solutions are very easily implemented in combination with safety sensors. MSI-m is a safety interface, type 4 in accordance with IEC/EN 61496-1 and category 4 in accordance with EN 954-1, and as the link between the opto-electronic protective devices and the machine control system is equipped for numerous muting function types, be it sequential or Parallel Muting. The MSI-mx version even enables parallel double muting for entry and exit areas and the integration of several additional safety-related components, such as emergency STOP button or protective door switch. This extremely compact combination can also further reduce the costs with the implementation of muting processes.

Special features

- Sequential Muting or Parallel Muting with automatic mode detection
- MSI-mx for separate muting of two AOPDs and connection of additional Safety Switch
- Relay switching cycle counting for preventive maintenance (MSI-mx/Rx)
- Standard initiators, light beam devices or limit switch can be connected as muting sensors
- 2 monitored muting indicators, warning output with muting indicator failure
- Potential-free safety related switching outputs
- Interface for PC-supported diagnostics function for fast start-up
- Housing width, 35 mm

Typical areas of application

- MSI-m for muting (bridging the protective device during the material transport) at entry or exit of automated production cells
- MSI-mx as muting system solution for connecting light beam devices, hanging flaps and emergency STOP control devices
- Packaging machinery, palletizers, production cells in the automotive industry

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MSI-sx/Rx
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MSI-m/R,
MSI-mx/Rx
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MSI-mE/R /
MSI-mxE/Rx
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MSI-mi/R,
MSI-mix/Rx
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MSI-m/R, MSI-mx/Rx

Important technical data, overview

Safety type in acc. with IEC/EN 61496-1 (Annex A)	Type 4
Safety category in acc. with EN 954-1	up to 4 (depending on the category of the upstream protective device)
Stop category in acc. with IEC/EN 60204-1	0
Supply voltage	24 V DC, ±20 %
Response time	22 to 64 ms depending on safety sensor
Safety-related switching outputs (OSSDs)	MSI-m/R: 2 relay outputs (make) MSI-mx/Rx: 3 relay outputs (2 make, 1 break)
Secondary switching device (SSD), only MSI-mx/Rx	Relay output (make)
Ambient temperature, operation	0...+55 °C
Temperature range, storage	-25...+70 °C
Dimensions (W x H x D)	52.5 mm x 99 mm 113.6 mm

Functions

	MSI-m/R	MSI-mx/Rx
Max. number of AOPDs type 2 or emergency STOP control devices (category 2)	2	4
Max. number of AOPDs type 4 or emergency STOP control devices (category 4)	1	2
Additional connectable Safety Switch (category 4)	0	2
Start/restart function (RES), optionally with/without	●	●
Dynamic contactor monitoring (EDM)	●	●
PC diagnostics interface	●	●
Sequential Muting	●	●
Parallel Muting	●	●
Parallel double muting on two areas	●	●
Muting time monitoring (select/deselect)	●	●
Warning, defective muting indicator	●	●
Muting signal output		●
Relay switching cycle counter for preventive maintenance		●
System error signal output		●
Secondary switching device (SSD) – output		●



Properties



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SAFETY INTERFACES

Ordering information

MSI-m/R, MSI-mx/Rx

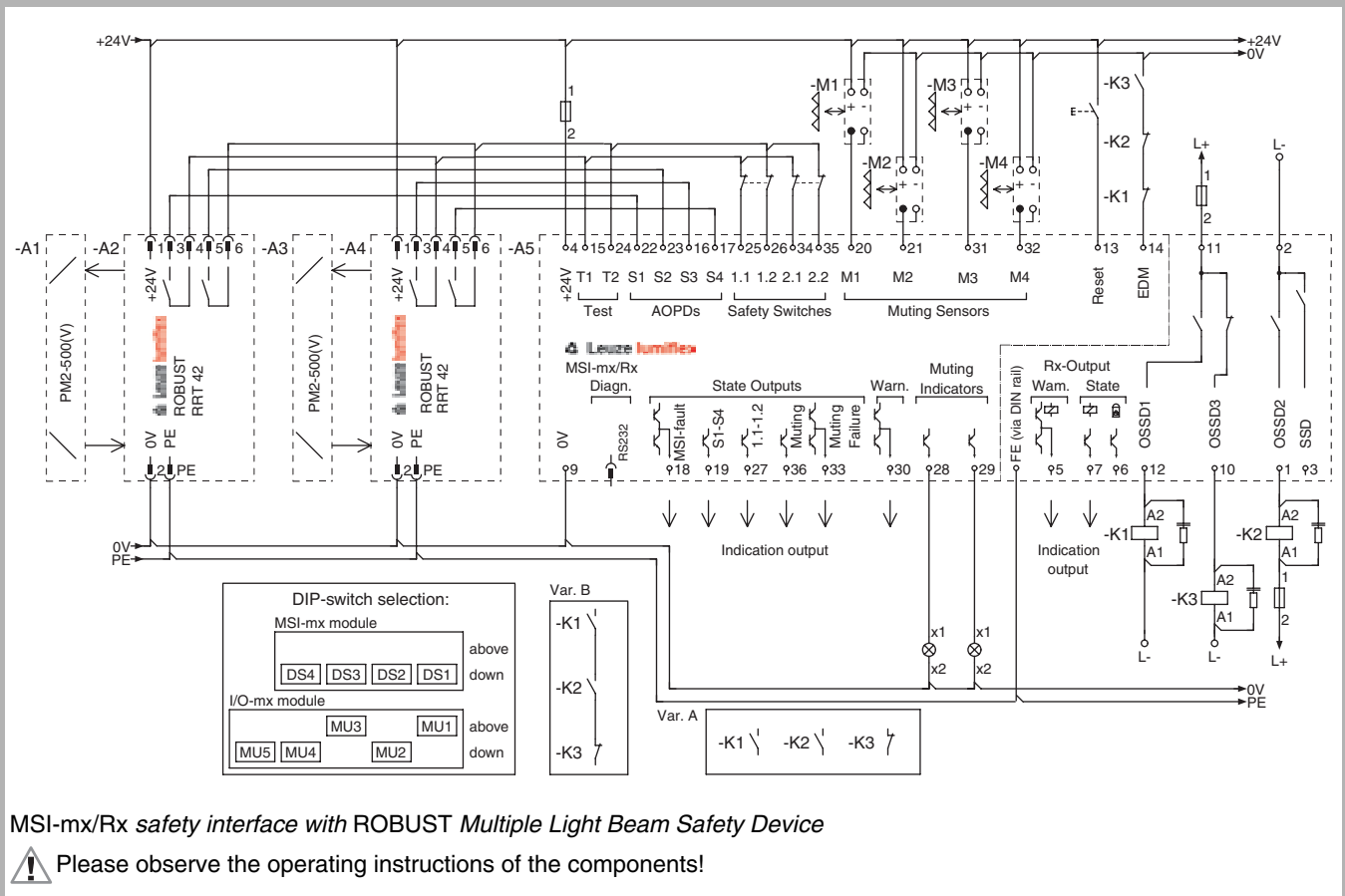
Included in delivery: Connecting and operating instructions

Functions: Muting, start/restart interlock, contactor monitoring, PC diagnostics interface

MSI-m/R, MSI-mx/Rx

Art. no.	Article	Description	Safety-related switching output
549904	MSI-m/R	Type 4 safety interface, muting	Relay output
549905	MSI-mx/Rx	Type 4 safety interface, muting, extended functions	Relay output

Electrical connection



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MSI-mE/R /
MSI-mxE/Rx
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MSI-mi/R,
MSI-mix/Rx
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Technical data

General system data	
Safety type in acc. with IEC/EN 61496-1 (Annex A)	Type 4
Safety category in acc. with EN 954-1	up to 4 (depending on the category of the upstream protective device)
Stop category in acc. with IEC/EN 60204-1	0
Supply voltage	24 V DC, $\pm 20\%$
Response time	22 ms with connection of type 4 AOPD with transistor output 64 ms with connection of type 4 AOPD with relay output 64 ms with connection of type 2 AOPD 64 ms with connection of Safety Switches (electro-mechanical)
Restart delay time	100 ms
Safety class	II
Protection rating	IP 20
Ambient temperature, operation	0...+55 °C
Ambient temperature, storage	-25...+70 °C
Relative humidity	Max. 93 %
Dimensions (W x H x D)	52.5 mm x 99 mm x 113.6 mm
Installation	on 35 mm DIN rails
Connection system	Plug-in, encoded screw terminals up to 2.5 mm ²
Current consumption	Approx. 200 mA without external load
Safety-related switching outputs (OSSDs)	MSI-m/R: 2 relay outputs (make) MSI-mx/Rx: 3 relay outputs (2 make, 1 break)
Outputs, muting displays	2 pnp transistor outputs for lamps, 24 V DC/max. 5 W LED-lamp, 24 V DC/0.5 W to 5 W
Secondary switching device (SSD), only MSI-mx/Rx	Relay output (make)
Switching voltage, switching current (for OSSDs)	60 V DC, 250 V AC, 5 A maximum, 20 mA minimum
Test outputs T1 and T2	Test interval, 200 ms Test pulse width delayed, 24 ms each Response time, type 2 AOPD on test request, 2...18 ms
Control inputs	
Start/restart function (RES)	Potential-free make contact (button or key switch)
Contact monitoring (EDM)	Feedback of positive-guided contacts of sequential contactors
Muting sensors M1 – M4 (separate connecting cables required)	Muting sensors, not testable Muting sensors, testable (response time 2...18 ms)
Signal outputs	
OSSD status	pnp transistor output
AOPDs status	pnp transistor output
Start/restart function status (RES)	pnp transistor output
Status, muting error	Push-pull transistor output





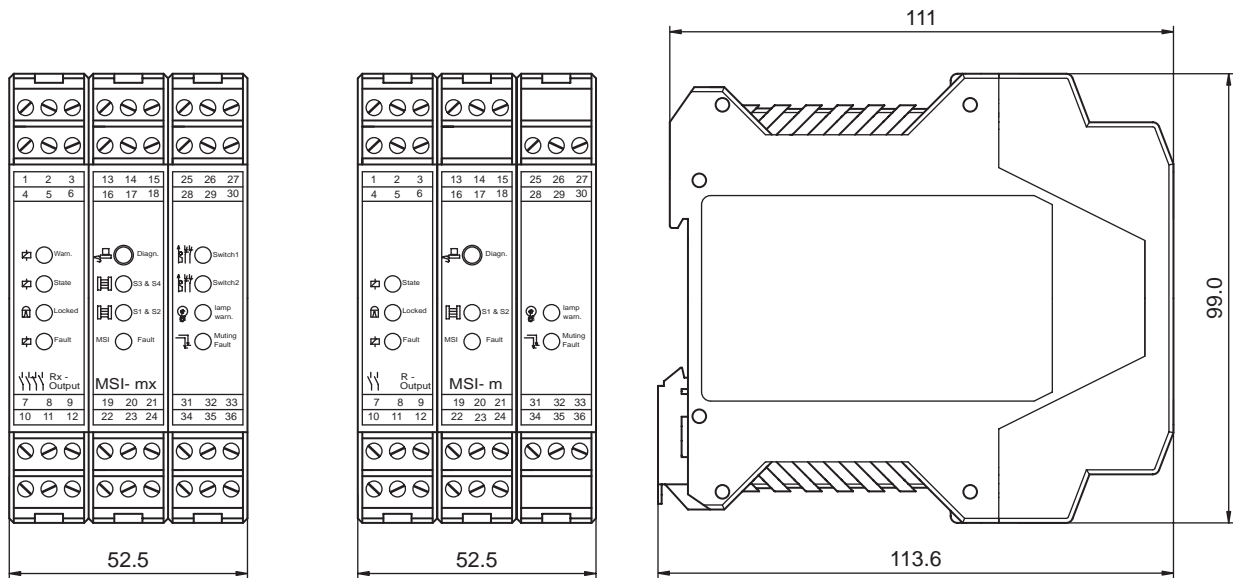
SAFETY INTERFACES

Technical data

Additional signal outputs, MSI-mx/Rx	
MSI error	Push-pull transistor output
Status, muting	pnp transistor output
Status, Safety Switch	pnp transistor output
Pre-selected switching cycles reached	Push-pull transistor output
Muting indicator, defective	Push-pull transistor output
Connectable safety sensors	
Safety sensors (AOPDs)	MSI-m/R: 1 Type 4 or type 3 AOPD or up to 2 type 2 AOPDs MSI-mx/Rx: Up to 2 type 4 or type 3AOPDs or up to 4 type 2 AOPDs
Safety Switch/emergency STOP button	MSI-mx/Rx: Up to 3 Safety Switches in accordance with EN 1088 and section emergency STOP button in accordance with EN 418

You will find additional information in the connecting and operating instructions and at www.leuze.com/msi-m.

Dimensional drawings



MSI-m/R, MSI-mx/Rx safety interfaces

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MSI-sx/Rx
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MSI-ix/Rx
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MSI-mE/R /
MSI-mxE/Rx
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MSI-mi/R,
MSI-mix/Rx
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Accessories ordering information

Art. no.	Article	Description	Length, design
Diagnostics set			
549932	MSI-SWC	MSI diagnostics set contains: MSI diagnostics software, Ger/Eng user manual, diagnostics cable	3 m
Diagnostics cable			
549953	MSI-CB-3000	Diagnostics cable	3 m
549955	MSI-CB-5000	Diagnostics cable	5 m
549950	MSI-CB-10000	Diagnostics cable	10 m
Power supplies			
549940	MSI-AC115	Power supply, 115 V AC --> 24 V DC / 0.6 A, unregulated	
549908	MSI-AC230	Power supply, 230 V AC --> 24 V DC / 0.6 A, unregulated	
520060	SITOP power	Power supply, 120/230 V AC --> 24 V DC / 5 A, regulated	
520061	LOGO! Power	Power supply, 120/230 V AC --> 24 V DC / 1.3 A, regulated	

MSI diagnostics software

All MSI safety interface modules have an RS 232 diagnostics interface for the PC-supported visualization of input and outputs states and internal system states. This allows wiring and cabling errors, insufficient input information and the system status to be quickly and easily detected. You will find more information at www.leuze.com/msi-diag.

Further accessories ordering information

See also

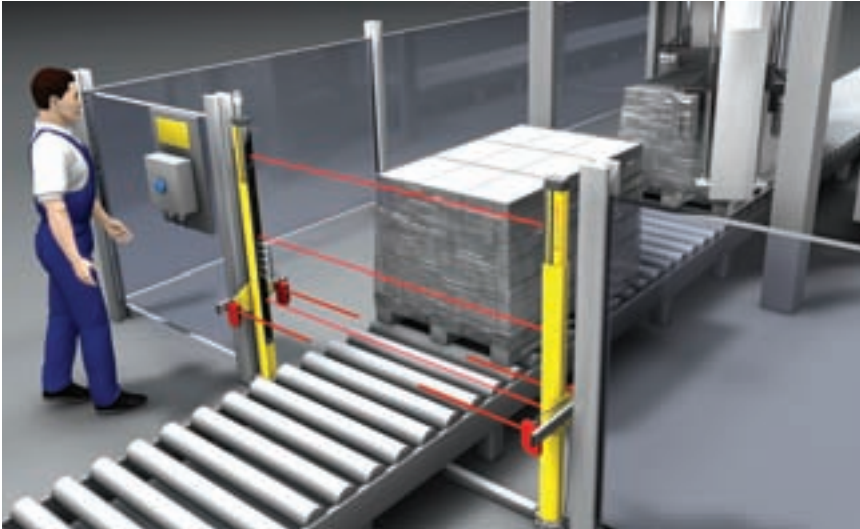
- MMS Muting Mounting Systems, page 466
- Muting indicator, page 470
- Muting sensors, page 472
- ROBUST 42, 43, 44, page 252





SAFETY INTERFACES

MSI-mE/R / MSI-mxE/Rx



MSI-mE safety interfaces with UL approval for muting procedures with the use of a wrapping machine

The MSI-mE or MSI-mxE safety interface, type 4 in accordance with IEC/EN 61496-1 and category 4 in accordance with EN 954-1, has an identical scope of functions to the muting interfaces, MSI-m/R and MSI-mx/Rx and meets the increased temperature requirements of UL 508.

Typical areas of application

- MSI-mE for muting (bridging the protective device during material transport) at entry or exit of automated production cells
- MSI-mxE as muting system solution for connecting light beam devices, hanging flaps and emergency STOP control devices
- Packaging machinery, palletizers, production cells in the automotive industry

Special features

- UL and CSA certified
- Sequential Muting or Parallel Muting with automatic mode detection
- MSI-mx for separate muting of two AOPDs and connection of additional Safety Switch
- Standard initiators, light beam devices or limit switch can be connected as muting sensors
- 2 monitored muting indicators, warning output with muting indicator failure
- Potential-free safety related switching outputs
- Plug-in connection terminals and output modules
- Interface for PC-supported diagnostics function for fast start-up
- Housing width, 53 mm

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MSI-sx/Rx
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MSI-i/R,
MSI-ix/Rx
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MSI-mx/Rx
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MSI-mxE/Rx
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MSI-mi/R,
MSI-mix/Rx
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Important technical data, overview

Safety type in acc. with IEC/EN 61496-1 (Annex A)	Type 4
Safety category in acc. with EN 954-1	up to 4 (depending on the category of the upstream protective device)
Stop category in acc. with IEC/EN 60204-1	0
Supply voltage	24 V DC, ±20 %
Response time	22 to 64 ms depending on safety sensor
Safety-related switching outputs (OSSDs)	MSI-mE/R: 2 relay outputs (make) MSI-mxE/Rx: 3 relay outputs (2 make, 1 break)
Secondary switching device (SSD), only MSI-mxE/Rx	Relay output (make)
Ambient temperature, operation	0...+55 °C
Temperature range, storage	-25...+70 °C
Dimensions (W x H x D)	70 mm x 99 mm 113.6 mm

Functions

	MSI-mE/R	MSI-mxE/Rx
Max. number of type 2 AOPDs or emergency STOP control devices (category 2)	2	4
Max. number of type 4 AOPDs or emergency STOP control devices (category 4)	1	2
Additional connectable Safety Switch (category 4)	0	2
Start/restart function (RES), optionally with/without	●	●
Static contactor Monitoring (EDM)	●	●
Dynamic contactor monitoring (EDM)	●	●
Cross circuit monitoring	●	●
PC diagnostics interface	●	●
Sequential Muting	●	●
Parallel Muting	●	●
Parallel double muting on two areas	●	●
Muting time monitoring (select/deselect)	●	●
Warning, defective muting indicator	●	●
Muting signal output		●
Relay switching cycle counter for preventive maintenance		●
System error signal output		●
Secondary switching device (SSD) – output		●



Properties



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● Electrical connection, see MSI-m/R and MSI-mx/Rx	434
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SAFETY INTERFACES

Ordering information

MSI-mE/R, MSI-mxE/Rx

Included in delivery: Connecting and operating instructions

Functions: Muting, start/restart interlock, contactor monitoring, PC diagnostics interface

MSI-mE/R, MSI-mxE/Rx

Art. no.	Article	Description	Safety-related switching output
549980	MSI-mE/R	Type 4 safety interface, muting, UL/CSA, ext. temperature range, 60°C	Relay output
549982	MSI-mxE/Rx	Type 4 safety interface, muting, extended functions, UL/CSA, ext. temperature range, 60°C	Relay output

Electrical connection

Connection example corresponds with MSI-m/R and MSI-mx/Rx safety interface on page 434

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MSI-sx/Rx
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MSI-i/R,
MSI-ix/Rx
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MSI-m/R,
MSI-mx/Rx
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MSI-mE/R /
MSI-mxE/Rx
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MSI-mi/R,
MSI-mix/Rx
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Technical data

General system data	
Safety type in acc. with IEC/EN 61496-1 (Annex A)	Type 4
Safety category in acc. with EN 954-1	up to 4 (depending on the category of the upstream protective device)
Stop category in acc. with IEC/EN 60204-1	0
Supply voltage	24 V DC, $\pm 20\%$
Response time	22 ms with connection of type 4 AOPD with transistor output 64 ms with connection of type 4 AOPD with relay output 64 ms with connection of type 2 AOPD 64 ms with connection of Safety Switches (electro-mechanical)
Restart delay time	100 ms
Safety class	II
Protection rating	IP 20
Ambient temperature, operation	0...+55 °C
Ambient temperature, storage	-25...+70 °C
Relative humidity	Max. 93 %
Dimensions (W x H x D)	70 mm x 99 mm 113.6 mm
Installation	on 35 mm DIN rails
Connection system	Plug-in, encoded screw terminals up to 2.5 mm ²
Current consumption	Approx. 200 mA without external load
Safety-related switching outputs (OSSDs)	MSI-mE/R: 2 relay outputs (make) MSI-mxE/Rx: 3 relay outputs (2 make, 1 break)
Outputs, muting displays	2 pnp transistor outputs for lamps, 24 V DC/max. 5 W LED-lamp, 24 V DC/0.5 W to 5 W
Secondary switching device (SSD), only MSI-mxE/Rx	Relay output (make)
Switching voltage, switching current (for OSSDs)	60 V DC, 250 V AC, 5 A maximum, 20 mA minimum
Test outputs T1 and T2	Test interval, 200 ms Test pulse width delayed, 24 ms each Response time, type 2 AOPD on test request, 2...18 ms
Control inputs	
Start/restart function (RES)	Potential-free make contact (button or key switch)
Contact monitoring (EDM)	Feedback of positive-guided contacts of sequential contactors
Muting sensors M1 – M4 (separate connecting cables required)	Muting sensors, not testable Muting sensors, testable (response time 2...18 ms)





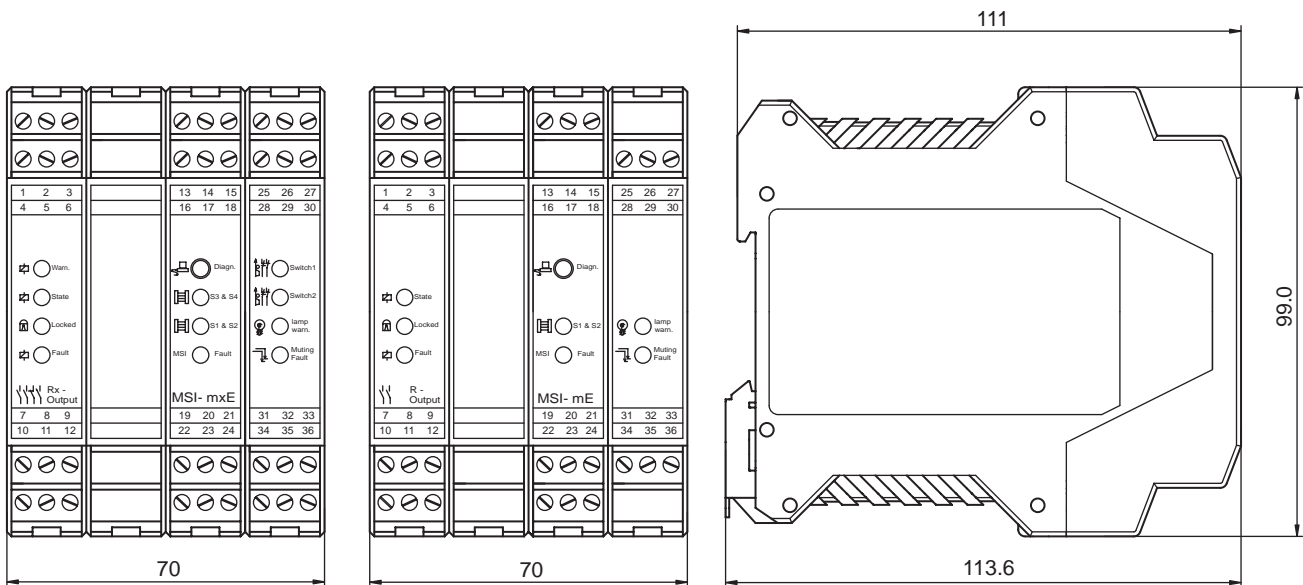
SAFETY INTERFACES

Technical data

Signal outputs	
OSSD status	pnp transistor output
AOPDs status	pnp transistor output
Start/restart function status (RES)	pnp transistor output
Status, muting error	Push-pull transistor output
Additional signal outputs, MSI-mxE/Rx	
MSI error	Push-pull transistor output
Status, muting	pnp transistor output
Status, Safety Switch	pnp transistor output
Pre-selected switching cycles reached	Push-pull transistor output
Muting indicator, defective	Push-pull transistor output
Connectable safety sensors	
Safety sensors (AOPDs)	MSI-mE/R: 1 type 4 or type 3 AOPD or up to 2 type 2 AOPDs MSI-mxE/Rx: Up to 2 type 4 or type 3AOPDs or up to 4 type 2 AOPDs
Safety Switch/emergency STOP button	MSI-mxE/Rx: Up to 3 Safety Switches in accordance with EN 1088 and section emergency STOP button in accordance with EN 418

You will find additional information in the connecting and operating instructions and at www.leuze.com/msi-mxe.

Dimensional drawings



MSI-mE/R / MSI-mxE/Rx safety interfaces

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MSI-sx/Rx
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MSI-ix/Rx
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MSI-m/R,
MSI-mx/Rx
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MSI-mE/R /
MSI-mxE/Rx
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MSI-mi/R,
MSI-mix/Rx
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Accessories ordering information

Art. no.	Article	Description	Length, design
Diagnostics set			
549932	MSI-SWC	MSI diagnostics set contains: MSI diagnostics software, Ger/Eng user manual, diagnostics cable	3 m
Diagnostics cable			
549953	MSI-CB-3000	Diagnostics cable	3 m
549955	MSI-CB-5000	Diagnostics cable	5 m
549950	MSI-CB-10000	Diagnostics cable	10 m
Power supplies			
549940	MSI-AC115	Power supply, 115 V AC --> 24 V DC / 0.6 A, unregulated	
549908	MSI-AC230	Power supply, 230 V AC --> 24 V DC / 0.6 A, unregulated	
520060	SITOP power	Power supply, 120/230 V AC --> 24 V DC / 5 A, regulated	
520061	LOGO! Power	Power supply, 120/230 V AC --> 24 V DC / 1.3 A, regulated	

MSI diagnostics software

All MSI safety interface modules have an RS 232 diagnostics interface for the PC-supported visualization of input and outputs states and internal system states. This allows wiring and cabling errors, insufficient input information and the system status to be quickly and easily detected. You will find more information at www.leuze.com/msi-diag.

Further accessories ordering information

See also

- MMS Muting Mounting Systems, page 466
- Muting indicator, page 470
- Muting sensors, page 472
- ROBUST 42, 43, 44, page 252





SAFETY INTERFACES

MSI-mi/R, MSI-mix/Rx



An MSI safety interface with combined cycle control and muting function enables efficient work cycles on a manually fed press

A reliable hand and finger protection is the highest priority when work pieces have to be manually fed in on machines. In addition to these protective functions the Safety Light Curtains can also assume a control function (cycle control) and automatically activate the machine movement after feeding in or taking out the work piece. The combination of cycle control and muting enables operator interventions here during the process phases that are not hazardous. The MSI-mi safety interface, type 4 in accordance with IEC/EN 61496-1 and category 4 in accordance with EN 954-1 combines these two functions as the link between the opto-electronic protective devices and the machine control system. With a manually fed press, for example, this allows finished processed work pieces to be taken out, even when the stamp is being raised, which consequently enables an especially efficient work cycle with good ergonomics. In addition to the connection of a Safety Light Curtain for controlling the machine, the MSI-mix model also enables connection of an additional opto-electronic protective device for constant rear area monitoring. This model also provides additional contacts for controlling downstream actuators, and emergency STOP buttons and Safety Switches can also be connected.

Special features

- Single or double-cycle operation with 30 s / 30 min time monitoring
- Light curtain cycle control and constant rear area monitoring (MSI-mix/Rx)
- Additional emergency STOP button or Safety Switch can be connected (MSI-mix/Rx)
- Relay switching cycle counting for preventive maintenance (MSI-mix/Rx)
- Standard initiators, light beam devices or limit switch can be connected as muting sensors
- Potential-free safety related switching outputs
- Plug-in connection terminals and output modules
- Interface for PC-supported diagnostics function for fast start-up
- Housing width, 35 mm

Typical areas of application

- Interface module for light curtain cycle control with bypassfunction (muting)
- Mechanical and hydraulic presses
- Cycle control and rear area monitoring on press brakes

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MSI-sx/Rx
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MSI-i/R,
MSI-ix/Rx
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MSI-m/R,
MSI-mx/Rx
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MSI-mE/R /
MSI-mxE/Rx
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MSI-mi/R,
MSI-mix/Rx
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MSI-mi/R, MSI-mix/Rx

Important technical data, overview

Safety type in acc. with IEC/EN 61496-1 (Annex A)	Type 4
Safety category in acc. with EN 954-1	up to 4 (depending on the category of the upstream protective device)
Stop category in acc. with IEC/EN 60204-1	0
Supply voltage	24 V DC, ±20 %
Response time	22 to 64 ms depending on safety sensor
Safety-related switching outputs (OSSDs)	MSI-mi/R: 2 relay outputs (make) MSI-mix/Rx: 3 relay outputs (2 make, 1 break)
Secondary switching device (SSD), only MSI-mix/Rx	Relay output (make)
Ambient temperature, operation	0...+55 °C
Temperature range, storage	-25...+70 °C
Dimensions (W x H x D)	52.5 mm x 99 mm x 113.6 mm

Functions

	MSI-mi/R	MSI-mix/Rx
Max. number of type 2 AOPDs or emergency STOP control devices (category 2)	2	4
Max. number of type 4 AOPDs or emergency STOP control devices (category 4)	1	2
Additional connectable Safety Switch (category 4)	0	2
Start/restart function (RES), optionally with/without	●	●
Dynamic contactor monitoring (EDM)	●	●
PC diagnostics interface	●	●
Cycle control (single and double cycle)	●	●
30 s time monitoring for cycle operation	●	●
Parallel Muting	●	●
Muting time monitoring (select/deselect)	●	●
Warning, defective muting indicator	●	●
Muting signal output		●
Relay switching cycle counter for preventive maintenance		●
System error signal output		●
Secondary switching device (SSD) – output		●



Properties



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SAFETY INTERFACES

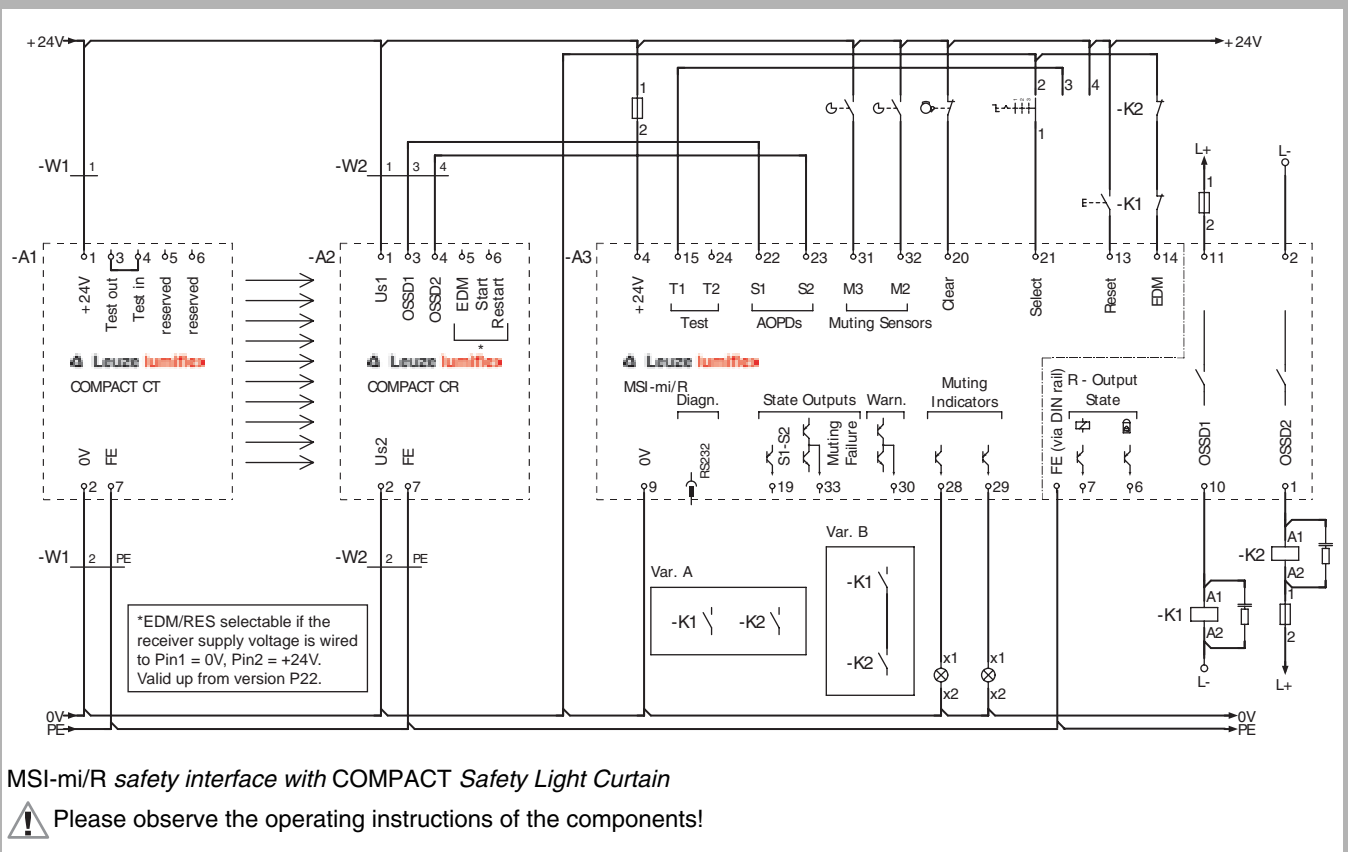
Ordering information

MSI-mi/R, MSI-mix/Rx
Included in delivery: Connecting and operating instructions

Functions: Muting, cycle control, start/restart interlock, contactor monitoring, PC diagnostics interface

MSI-mi/R, MSI-mix/Rx			
Art. no.	Article	Description	Safety-related switching output
549906	MSI-mi/R	Type 4 safety interface, muting and cycle control	Relay output
549907	MSI-mix/Rx	Type 4 safety interface, muting and cycle control, extended functions	Relay output

Electrical connection



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Technical data

General system data	
Safety type in acc. with IEC/EN 61496-1 (Annex A)	Type 4
Safety category in acc. with EN 954-1	up to 4 (depending on the category of the upstream protective device)
Stop category in acc. with IEC/EN 60204-1	0
Supply voltage	24 V DC, ±20 %
Response time	22 ms with connection of type 4 AOPD with transistor output 64 ms with connection of type 4 AOPD with relay output 64 ms with connection of type 2 AOPD 64 ms with connection of Safety Switches (electro-mechanical)
Restart delay time	100 ms
Safety class	II
Protection rating	IP 20
Ambient temperature, operation	0...+55 °C
Ambient temperature, storage	-25...+70 °C
Relative humidity	Max. 93 %
Dimensions (W x H x D)	52.5 mm x 99 mm x 113.6 mm
Installation	on 35 mm DIN rails
Connection system	Plug-in, encoded screw terminals up to 2.5 mm ²
Current consumption	Approx. 200 mA without external load
Safety-related switching outputs (OSSDs)	MSI-mi/R: 2 relay outputs (make) MSI-mix/Rx: 3 relay outputs (2 make, 1 break)
Outputs, muting displays	2 pnp transistor outputs for lamps, 24 V DC/max. 5 W LED-lamp, 24 V DC/0.5 W to 5 W
Secondary switching device (SSD), only MSI-mix/Rx	Relay output (make)
Switching voltage, switching current (for OSSDs)	60 V DC, 250 V AC, 5 A maximum, 20 mA minimum
Test outputs T1 and T2	Test interval, 200 ms Test pulse width delayed, 24 ms each Response time, type 2 AOPD on test request, 2...18 ms
Control inputs	
Start/restart function (RES)	Potential-free make contact (button or key switch)
Contacting monitoring (EDM)	Feedback of positive-guided contacts of sequential contactors
Selecting cycle modes	Operating mode key switch or jumper for constant operating mode
Cycle deletion	Break contact for 24 V DC in machine cycle With connection of type 4 AOPD with relay output, min. 60 ms break time With connection of type 2 AOPD, min. 60 ms break time
Muting sensors M2 and M3 (separate connecting cables required)	Muting sensors, not testable Muting sensors, testable (response time 2...18 ms)
Signal outputs	
OSSD status	pnp transistor output
AOPDs status	pnp transistor output
Start/restart function status (RES)	pnp transistor output
Status, muting error	Push-pull transistor outputs





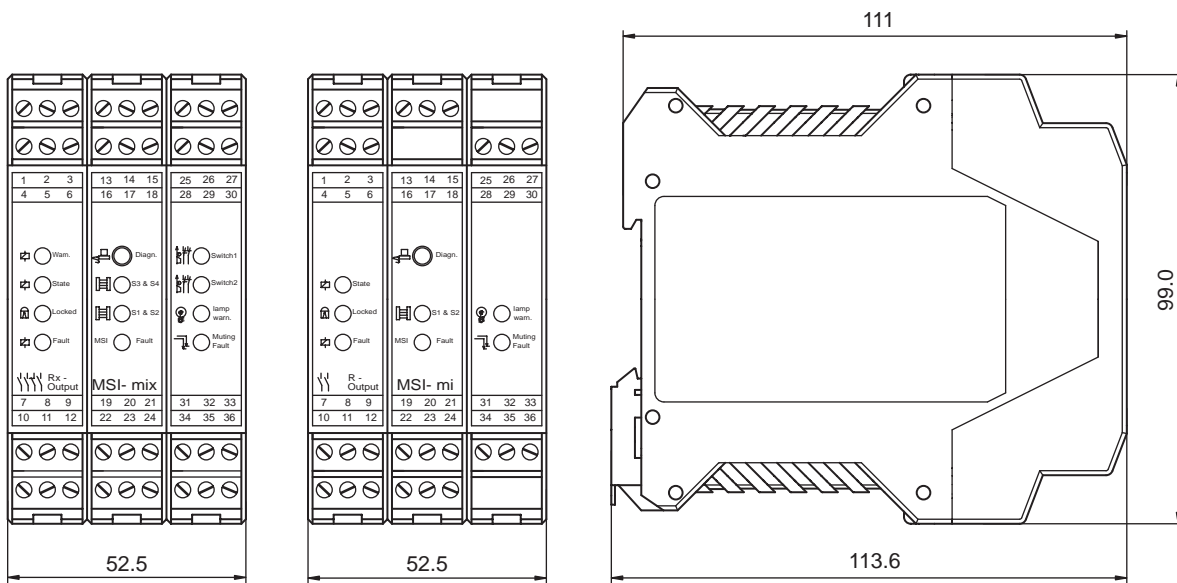
SAFETY INTERFACES

Technical data

Additional: MSI-mix/Rx signal outputs	
MSI error	Push-pull transistor output
Status, muting	pnp transistor output
Status, Safety Switch	pnp transistor output
Pre-selected switching cycles reached	Push-pull transistor output
Muting indicator, defective	Push-pull transistor output
Connectable safety sensors	
Safety sensors (AOPDs)	MSI-mi/R: 1 type 4 or type 3 AOPD or up to 2 type 2 AOPDs MSI-mix/Rx: Up to 2 type 4 or type 3AOPDs or up to 4 type 2 AOPDs
Safety Switch/emergency STOP button	MSI-mix/Rx: Up to 3 Safety Switches in accordance with EN 1088 and section emergency STOP button in accordance with EN 418

You will find additional information in the connecting and operating instructions and at www.leuze.com/msi-mi.

Dimensional drawings



MSI-mi/R, MSI-mix/Rx safety interfaces

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MSI-sx/Rx
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MSI-i/R,
MSI-ix/Rx
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MSI-m/R,
MSI-mx/Rx
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MSI-mE/R /
MSI-mxE/Rx
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MSI-mi/R,
MSI-mix/Rx
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TNT35
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Accessories ordering information

Art. no.	Article	Description	Length, design
Diagnostics set			
549932	MSI-SWC	MSI diagnostics set contains: MSI diagnostics software, Ger/Eng user manual, diagnostics cable	3 m
Diagnostics cable			
549953	MSI-CB-3000	Diagnostics cable	3 m
549955	MSI-CB-5000	Diagnostics cable	5 m
549950	MSI-CB-10000	Diagnostics cable	10 m
Power supplies			
549940	MSI-AC115	Power supply, 115 V AC --> 24 V DC / 0.6 A, unregulated	
549908	MSI-AC230	Power supply, 230 V AC --> 24 V DC / 0.6 A, unregulated	
520060	SITOP power	Power supply, 120/230 V AC --> 24 V DC / 5 A, regulated	
520061	LOGO! Power	Power supply, 120/230 V AC --> 24 V DC / 1.3 A, regulated	

MSI diagnostics software

All MSI safety interface modules have an RS 232 diagnostics interface for the PC-supported visualization of input and outputs states and internal system states. This allows wiring and cabling errors, insufficient input information and the system status to be quickly and easily detected. You will find more information at www.leuze.com/msi-diag.





SAFETY INTERFACES

TNT 35



Guarding a wood processing center with SLS 46 Single Light Beam Safety Devices and TNT 35 test monitoring

TNT 35 is a Test Monitoring Unit for the periodic testing of "testable" optoelectronic protective devices. Both components, sensor and TNT 35, form an AOPD in accordance with IEC/EN 61496-1, 2. Up to 6 type 2 sensors can be connected to the TNT 35 via a series connection. In addition to testable Leuze electronic type 2 Single Light Beam Safety Devices, the ECO type 2 Safety Light Curtains and the ROBUST type 2 Multiple Light Beam Safety Devices can also be connected. The machine's functional sequence remains unimpaired by the periodic internal function tests.

Typical areas of application

- Print and paper processing machinery in acc. with EN 1010
- Power-operated windows, doors and gates in acc. with ZH 1/494
- Storage installations in acc. with ZH 1/482 and DIN 15185/2
- Textile machinery in acc. with VGB 76 or DIN ISO 11111
- Packaging machinery in acc. with VBG 76 or prEN 415-2, 3 and 4
- Meat processing machinery in acc. with VBG 79
- Machinery used in the chemicals, rubber and plastics industries in acc. with VBG 22
- Wood processing machinery in acc. with ZH 3.1 to 3.19 and ZH 1/56a

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MSI-sx/Rx
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MSI-i/R,
MSI-ix/Rx
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MSI-m/R,
MSI-mx/Rx
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MSI-mE/R /
MSI-mxE/Rx
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MSI-mi/R,
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Important technical data, overview

Safety type in accordance with IEC/EN 61496-1	Type 2
Safety category in accordance with EN 954-1	2
Stop category in acc. with IEC/EN 60204-1	0
Supply voltage	24 V DC, ±15 %
Response time	<20 ms
Interval for periodic testing	2 s
Max. number of type 2 sensors in series connection	6 (total response time of the sensor series connection, 60 ms)
Safety-related switching outputs (OSSDs)	2 relay outputs (make)
Ambient temperature, operation	-20...+60 °C
Ambient temperature, storage	-30...+70 °C
Dimensions (W x H x D)	45 mm x 99 mm 113.6 mm

Functions

Test Monitoring Unit for periodic testing of 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**
- **Selectable start and restart interlock**
- **Selectable integrated contactor monitoring (EDM)**
- **LED-displays for all important functions and operating states**
- **Low space-requirement in the control cabinet with compact construction**



Properties



Further information

Further information	Page
● Ordering information	452
● Electrical connection	453
● Technical data	454
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● ROBUST 22, 23, 24	270
● ECO	176
● Type 2 single beam safety devices	282





SAFETY INTERFACES

Ordering information

TNT 35

Included in delivery: 1 connecting and operating instructions manual

Functions: Periodic testing, start/restart interlock, contactor monitoring

Art. no.	Article	Description	Safety-related switching output
50033058	TNT 35	Test Monitoring Unit, type 2	Relay output

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MSI-sx/Rx
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MSI-i/R,
MSI-ix/Rx
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MSI-m/R,
MSI-mx/Rx
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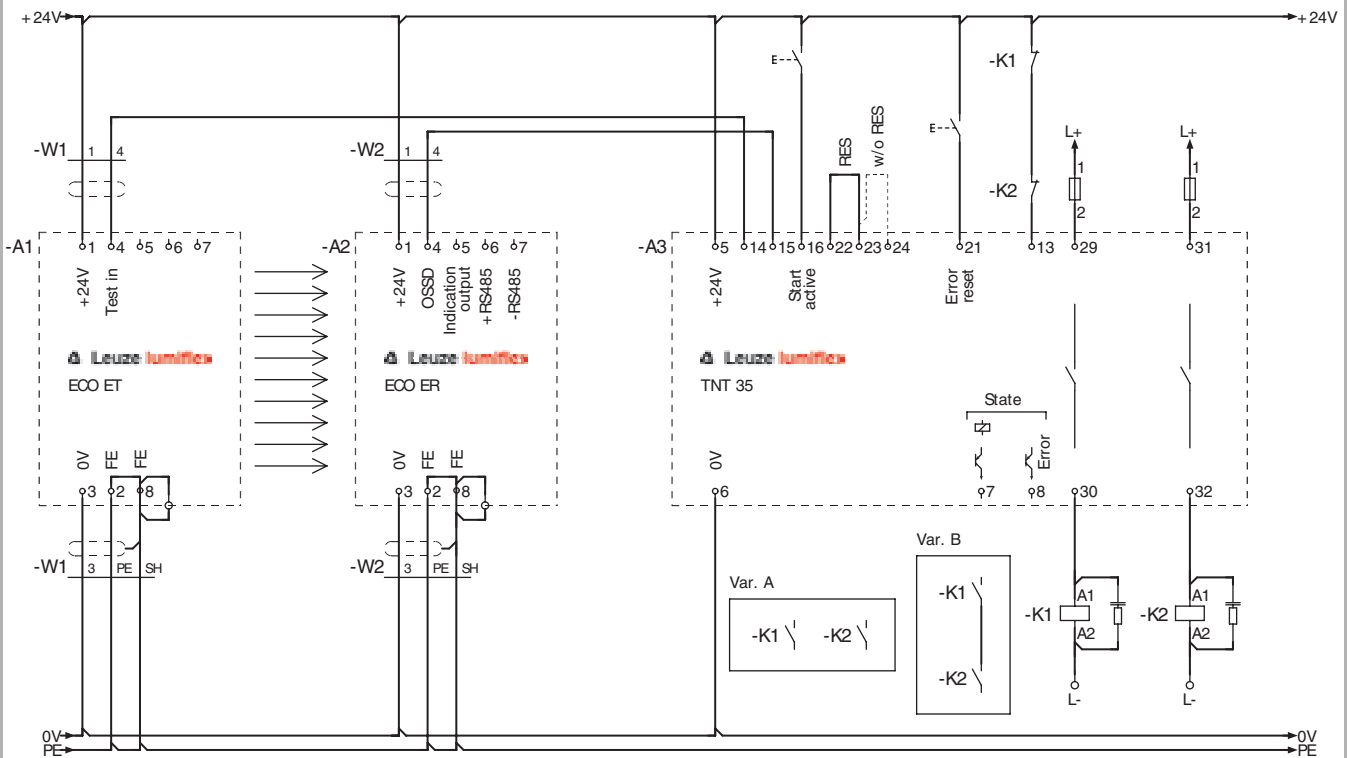
MSI-mE/R /
MSI-mxE/Rx
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MSI-mi/R,
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Electrical connection

TNT 35 connection example



TNT 35 Test Monitoring Unit with ECO type 2 Safety Light Curtain

Please observe the operating instructions of the components!





SAFETY INTERFACES

Technical data

General system data	
Safety type in accordance with IEC/EN 61496-1	Type 2
Safety category in acc. with EN 954-1	2
Stop category in acc. with IEC/EN 60204-1	0
Interval for periodic testing	2 s
Max. number of type 2 sensors in series connection	6 (total response time of the sensor series connection, 60 ms)
Supply voltage	24 V DC, $\pm 15\%$
Response time	<20 ms
Sensor response time for test request	Time window 0.5 – 60 ms
Protection rating	IP 40 (only suitable for use in electrical operating rooms/control 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 99 mm 113.6 mm
Installation	on 35 mm DIN rails
Connection system	Cable gland, up to 2.5 mm ²
Current consumption	Approx. 200 mA without external load
Safety-related switching outputs (OSSDs)	2 relay outputs (make)
Switching voltage, switching current (for OSSDs)	Max. 250 V AC, max. 4 A
Connectable safety sensors (AOPDs)	ROBUST type 2 Multiple Light Beam Safety Devices, ECO type 2 Safety Light Curtains, type 2 single beam safety devices, see 282
Control inputs	
Receiver input	Potential-free opto-coupling input, (high-active), input current approx. 10 mA
Start/restart function (RES)	Potential-free opto-coupling input (high-active), input current approx. 10 mA
Contact monitoring (EDM)	Potential-free opto-coupling input (high-active), input current approx. 10 mA
Control output	
Transmitter activation	pnp transistor output (high-active)
Signal outputs	
Safety on	pnp transistor output, 100 mA
Safety with TNT 35/7-24V	Potential-free relay contact
Error	pnp transistor output, 100 mA

You will find additional information in the connecting and operating instructions at www.leuze.com/tnt35.

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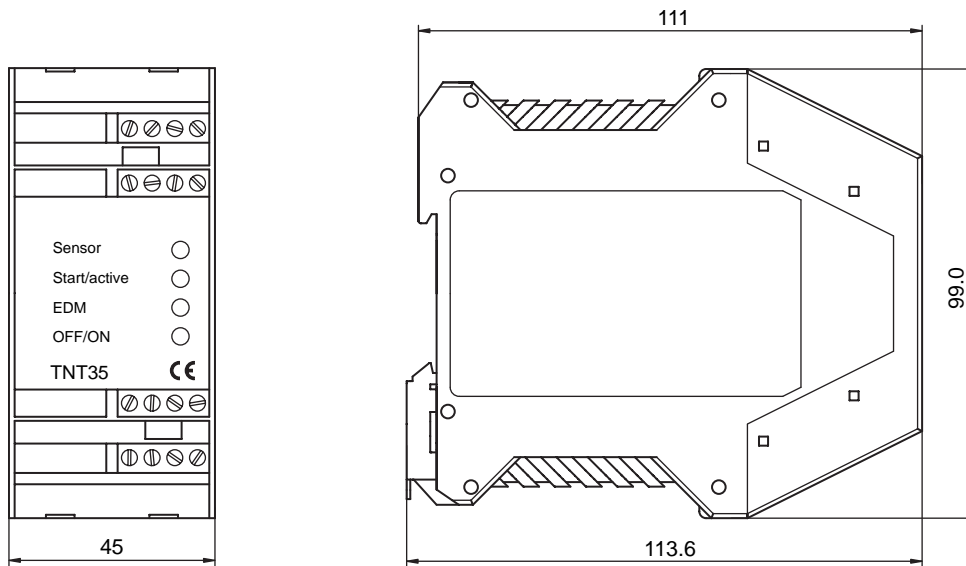
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Dimensional drawings

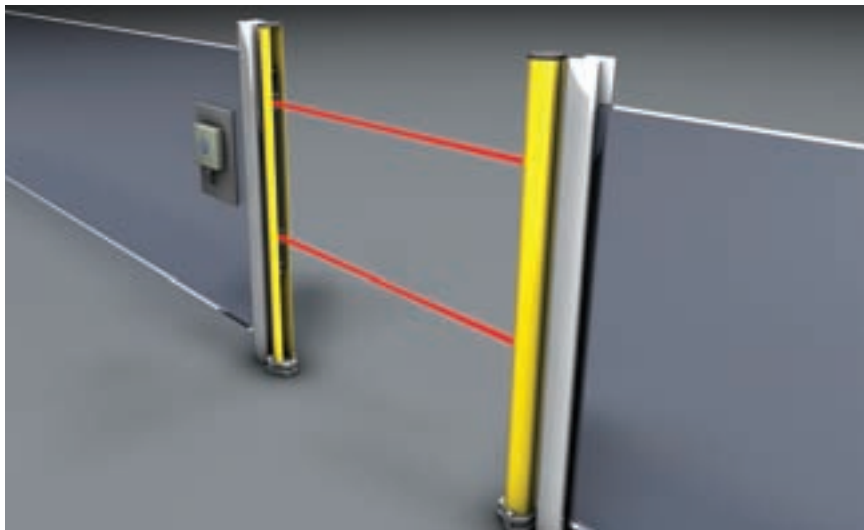
TNT 35 Test Monitoring Unit





ACCESSORIES

UDC, DC Device Columns



Free-standing opto-electronic protective devices are subject to special requirements with regard to mounting, stability and alignment quality. The UDC/DC mounting columns enable the free-standing mounting of Leuze lumiflex Multiple Light Beam Safety Devices and Safety Light Curtains on the floor. Firmly anchored in the floor, they reliably protect the sensors against damaging 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).

Free-standing floor fixing for Multiple Light Beam Safety Devices and Safety Light Curtains

Areas of application and ordering information

Accessories		Suitable for sensors with complete installation						
Device columns		Safety Light Curtain (protective height in mm)				Multiple Light Beam Safety Device		
Art. no.	Article	COMPACT	COMPACT-plus	SOLID-4, 2	ECO*	ROBUST	COMPACT	COMPACT-plus-m
549810	UDC-1000	Up to 900 mm	Up to 750 mm	Up to 900 mm	Up to 900 mm	2-beam	2-beam	2-beam
549813	UDC-1300	Up to 1200 mm	Up to 1050 mm	Up to 1200 mm	Up to 1200 mm	All	All	All
549816	UDC-1600	Up to 1500 mm	Up to 1350 mm	Up to 1500 mm	Up to 1500 mm	All	All	All
549819	UDC-1900	Up to 1800 mm	Up to 1650 mm	Up to 1800 mm	Up to 1800 mm	All	All	All
549410	DC-1000	Up to 900 mm	Up to 750 mm	Up to 900 mm	Up to 900 mm	2-beam	2-beam	2-beam
549413	DC-1300	Up to 1200 mm	Up to 1050 mm	Up to 1200 mm	Up to 1200 mm	All	All	All
549416	DC-1600	Up to 1500 mm	Up to 1350 mm	Up to 1500 mm	Up to 1500 mm	All	All	All
549419	DC-1900	Up to 1800 mm	Up to 1650 mm	Up to 1800 mm	Up to 1800 mm	All	All	All
Accessories for DC device columns								
430092	MS-DC/MC	DC/MC column accessories set						
346172	CP_UDC/DC	Cover, open at the top for UDC/DC						

*) The ECO protective and mounting profile is required for mounting ECO.

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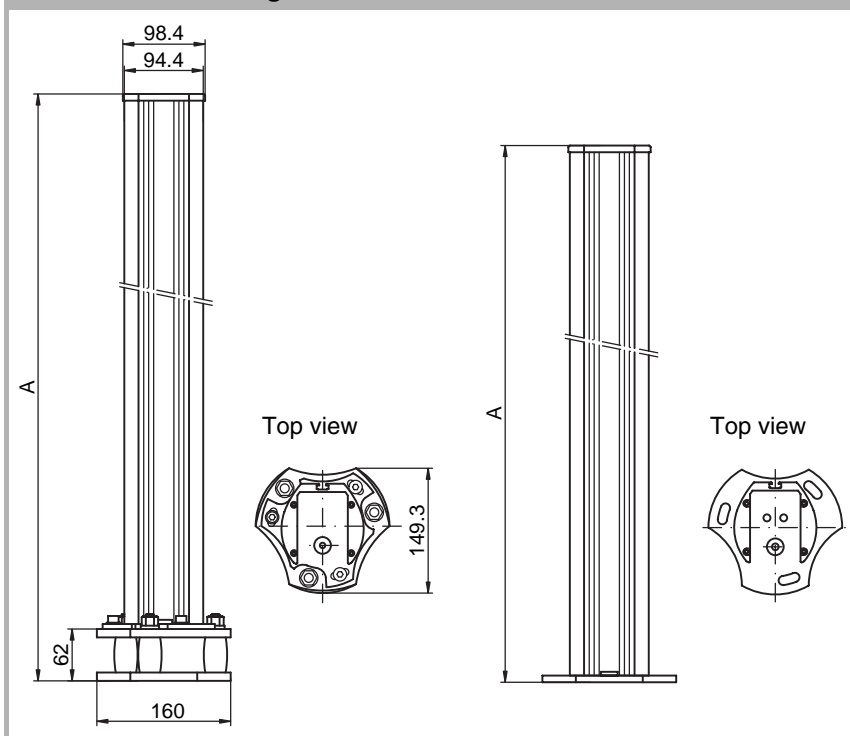
UDC, DC DEVICE COLUMNS

Features

	UDC	DC
Easy installation, quick vertical and axial alignment in just a few steps	●	●
Robust profile construction in high quality design	●	●
Complete mounting set for floor fixing included with delivery	●	●
Automatic resetting after mechanical impacts with special spring elements	●	
Height setting via lateral drill holes	●	●
Easy vertical height setting with mounting support included with delivery		

You will find additional information at www.leuze.com/udc

Dimensional drawings



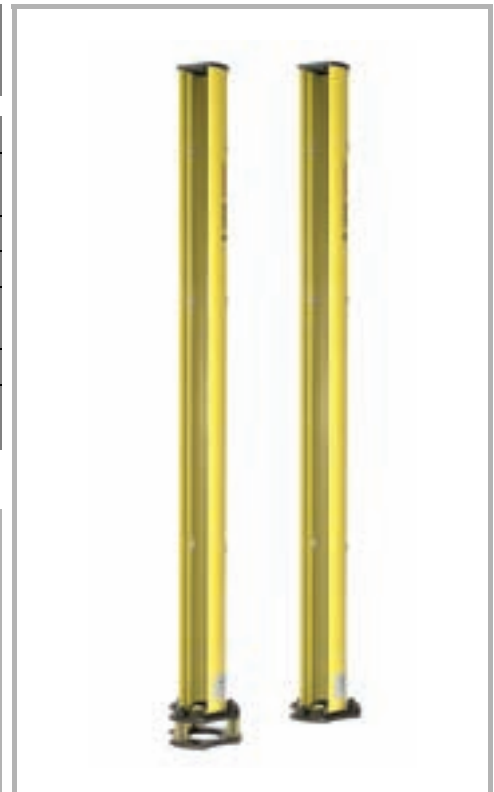
UDC dimensions table

Article	Dim. A
UDC-1000	1060
UDC-1300	1360
UDC-1600	1660
UDC-1900	1960

DC dimensions table

Article	Dim. A
DC-1000	1000
DC-1300	1300
DC-1600	1600
DC-1900	1900

Dimensions in mm



Further information

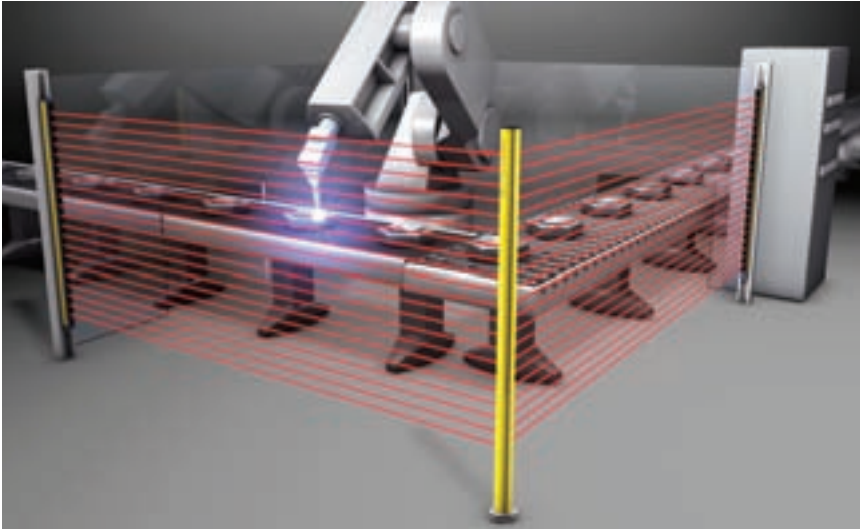
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● Areas of application and ordering information	456
● UMC, MC	460





ACCESSORIES

UMC, MC Deflecting Mirror Columns/continuous mirror



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 area 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).

Multiple side access guarding with Safety Light Curtain and beam deflection with mirror columns

Areas of application and ordering information

Accessories		Suitable for sensors			
Deflecting Mirror Column		Safety Light Curtain (protective height in mm)			
Art. no.	Article	COMPACT	COMPACTplus	SOLID-4, SOLID-2	ECO*
549710	UMC-1000	Up to 900 mm	Up to 900 mm	Up to 900 mm	Up to 900 mm
549713	UMC-1300	Up to 1200 mm	Up to 1200 mm	Up to 1200 mm	Up to 1200 mm
549716	UMC-1600	Up to 1500 mm	Up to 1500 mm	Up to 1500 mm	Up to 1500 mm
549719	UMC-1900	Up to 1800 mm	Up to 1800 mm	Up to 1800 mm	Up to 1800 mm
549310	MC-1000	Up to 900 mm	Up to 900 mm	Up to 900 mm	Up to 900 mm
549313	MC-1300	Up to 1200 mm	Up to 1200 mm	Up to 1200 mm	Up to 1200 mm
549316	MC-1600	Up to 1500 mm	Up to 1500 mm	Up to 1500 mm	Up to 1500 mm
549319	MC-1900	Up to 1800 mm	Up to 1800 mm	Up to 1800 mm	Up to 1800 mm
Accessories for MC Deflecting Mirror Columns					
430092	MS-DC/MC	DC/MC column accessories set			

*) The ECO protective and mounting profile is required for mounting ECO.

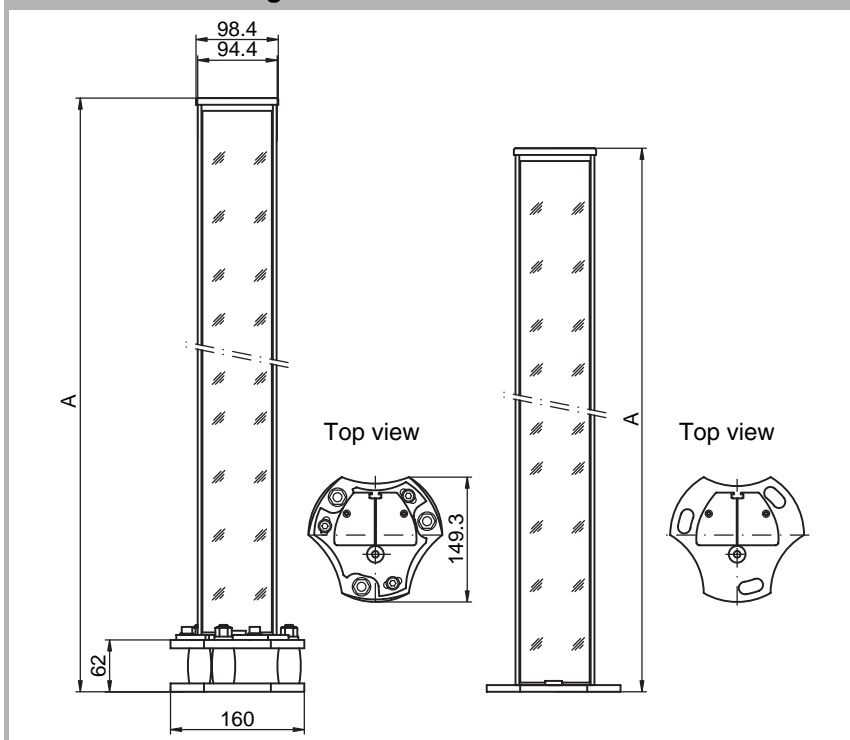
UMC, MC WITH CONTINUOUS MIRROR

Features

	UMC	MC
Easy installation, quick vertical and axial alignment in just a few steps	●	●
Continuous mirror surface for beam deflecting of Safety Light Curtains	●	●
Robust profile construction in high quality design	●	●
Automatic resetting after mechanical impacts with special spring elements	●	
Complete mounting set for floor fixing included with delivery	●	

You will find additional information at www.leuze.com/udc.

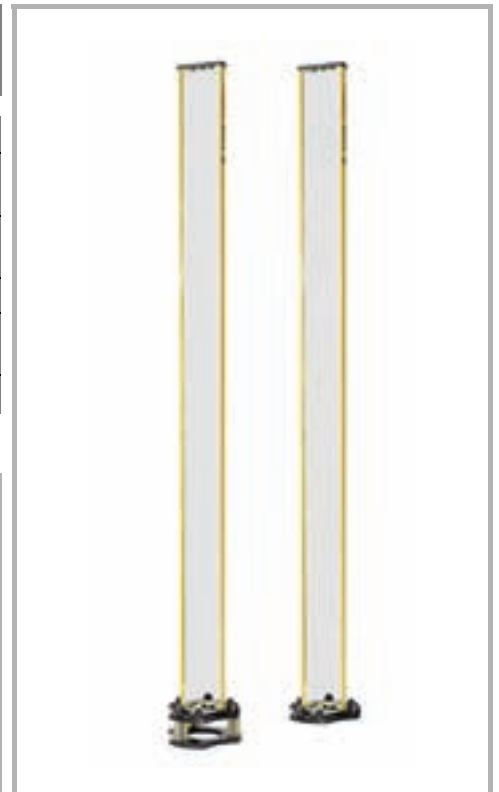
Dimensional drawings



UMC dimensions table		
Article	Dim. A	Dim. D
UMC-1000	1060	974
UMC-1300	1360	1274
UMC-1600	1660	1574
UMC-1900	1960	1874

MC dimensions table		
Article	Dim. A	Dim. D
MC-1000	1000	974
MC-1300	1300	1274
MC-1600	1600	1574
MC-1900	1900	1874

Dimensions in mm



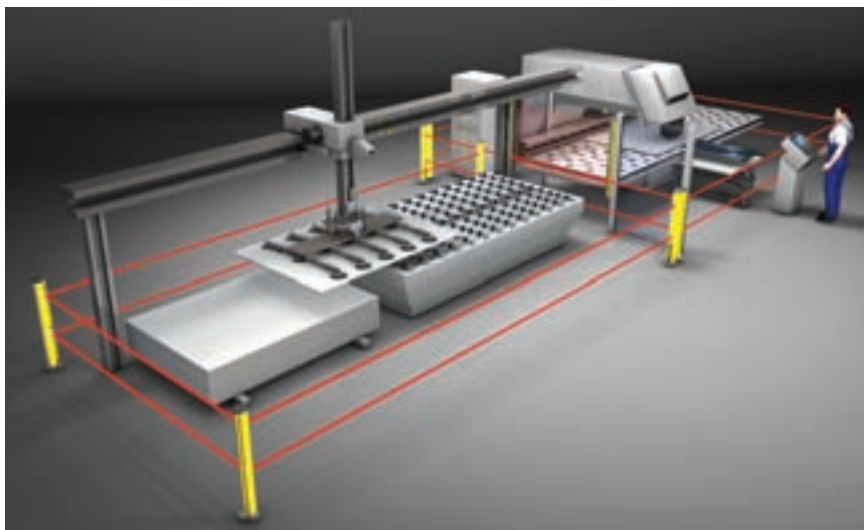
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● Laser alignment aids	478





ACCESSORIES

UMC, MC Deflecting Mirror Columns/individual mirrors



Use of UMC/MC Deflecting Mirror Columns enables cost-effective light beam device solutions for multiple side danger area 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 (UDC model) ensure an automatic resetting after mechanical impacts.

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 Columns			Multiple Light Beam Safety Device			
Art. no.	Article	Description	ROBUST	COMPACT	COMPACT plus-m	COMPACT laser
549702	UMC-1002	2 individual mirrors at a distance of 500 mm	2-beam	2-beam	2-beam	2-beam
549703	UMC-1303	3 individual mirrors at a distance of 400 mm	3-beam	3-beam	3-beam	3-beam
549704	UMC-1304	4 individual mirrors at a distance of 300 mm	4-beam	4-beam	4-beam	
549302	MC-1002	2 individual mirrors at a distance of 500 mm	2-beam	2-beam	2-beam	2-beam
549303	MC-1303	3 individual mirrors at a distance of 400 mm	3-beam	3-beam	3-beam	3-beam
549304	MC-1304	4 individual mirrors at a distance of 300 mm	4-beam	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				

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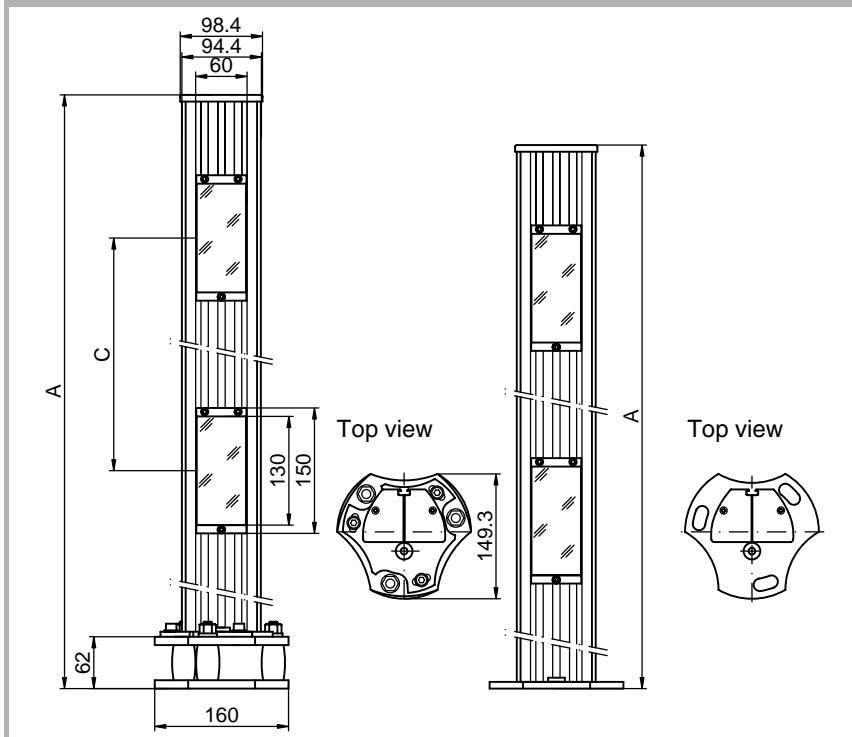
UMC, MC WITH INDIVIDUAL MIRRORS

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	●	
Suitable for COMPACT/laser with integrated laser alignment aid	●	●

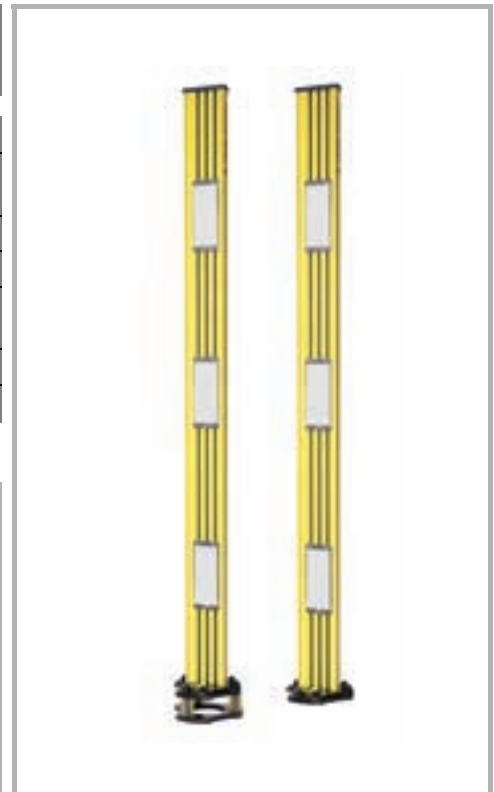
You will find additional information at www.leuze.com/udc.

Dimensional drawings



UMC dimensions table				MC dimensions table			
Article	Dim. A	Dim. B	Dim. C	Article	Dim. A	Dim. B	Dim. C
UMC-1002	1060	500	400	MC-1002	1000	500	400
UMC-1303	1360	400	300	MC-1303	1300	400	300
UMC-1304	1360	300	300	MC-1304	1300	300	300

Dimensions in mm



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ACCESSORIES

UM60 Deflecting Mirrors



The combination of Safety Light Curtains and UM60 Deflecting Mirrors enables cost-effective, multiple side danger area 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 nuts 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 height in mm)			
Art. no.	Article	COMPACT	COMPACT ^{plus}	SOLID-4, SOLID-2	ECO
529601	UM60-150	Up to 150 mm	Up to 150 mm	Up to 150 mm	Up to 150 mm
529602	UM60-225	Up to 225 mm	Up to 225 mm	Up to 225 mm	Up to 225 mm
529603	UM60-300	Up to 300 mm	Up to 300 mm	Up to 300 mm	Up to 300 mm
529604	UM60-450	Up to 450 mm	Up to 450 mm	Up to 450 mm	Up to 450 mm
529606	UM60-600	Up to 600 mm	Up to 600 mm	Up to 600 mm	Up to 600 mm
529607	UM60-750	Up to 750 mm	Up to 750 mm	Up to 750 mm	Up to 750 mm
529609	UM60-900	Up to 900 mm	Up to 900 mm	Up to 900 mm	Up to 900 mm
529610	UM60-1050	Up to 1050 mm	Up to 1050 mm	Up to 1050 mm	Up to 1050 mm
529612	UM60-1200	Up to 1200 mm	Up to 1200 mm	Up to 1200 mm	Up to 1200 mm
529613	UM60-1350	Up to 1350 mm	Up to 1350 mm	Up to 1350 mm	Up to 1350 mm
529615	UM60-1500	Up to 1500 mm	Up to 1500 mm	Up to 1500 mm	Up to 1500 mm
529616	UM60-1650	Up to 1650 mm	Up to 1650 mm	Up to 1650 mm	Up to 1650 mm
529618	UM60-1800	Up to 1800 mm	Up to 1800 mm	Up to 1800 mm	Up to 1800 mm

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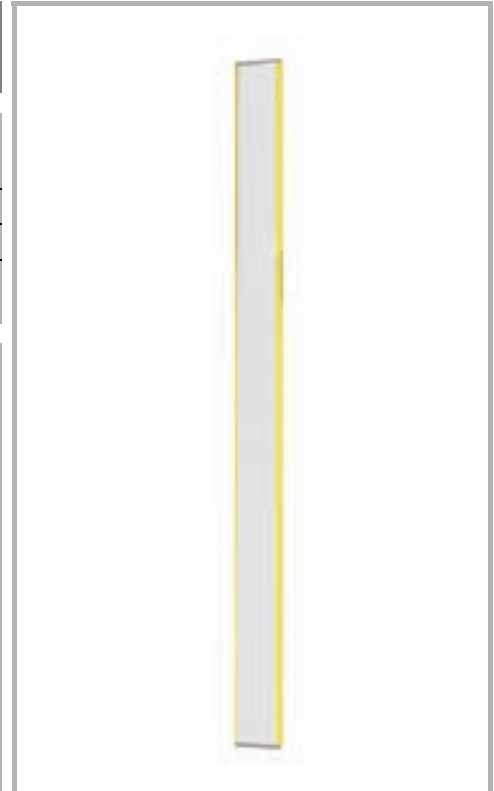
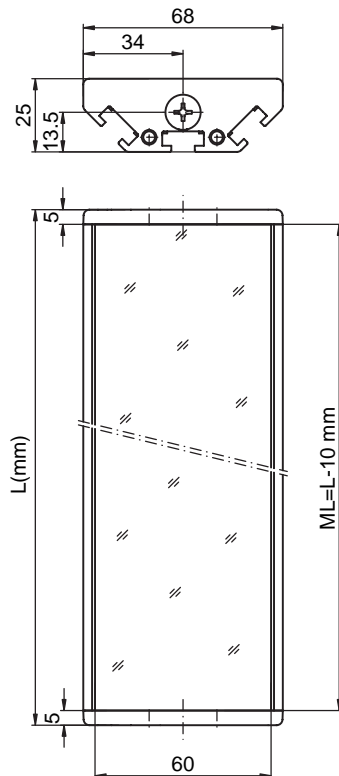
UM60 DEFLECTING MIRRORS

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



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

UM – Accessories

Art. no.	Article	Description
347453	BT-UM	Bracket, UM60
560300	BT-SSD	Bracket, swiveling with shock absorbers (from a length of 1200 mm, min. 2 x 560300)
560120	BT-S	Mounting set consisting of 2 L-type brackets incl. 2 screws
430105	BT-UM60	Mounting set consisting of 2 UM60 brackets incl. screws

Further information

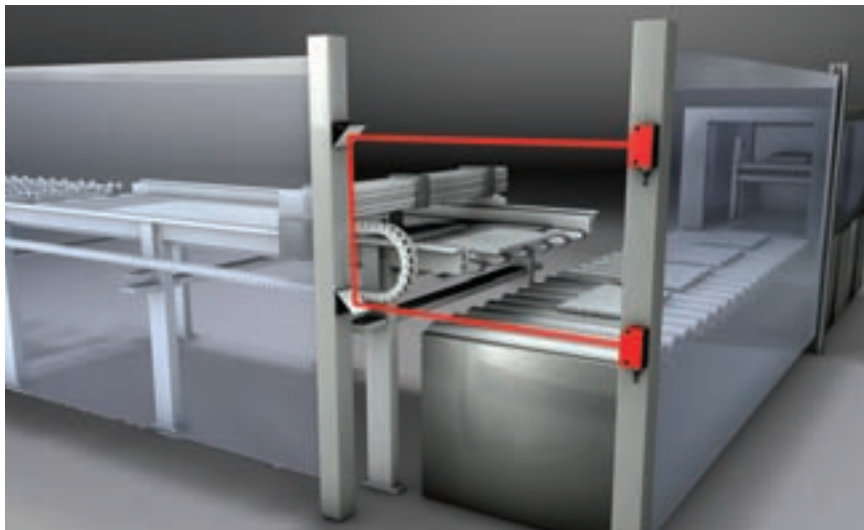
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● Dimensional drawing, accessories, see BT-L and BT-SSD	110





ACCESSORIES

US Deflecting Mirrors



L-shape and 2-beam guardings can be implemented with the US 2 Deflecting Mirror series in combination with single 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

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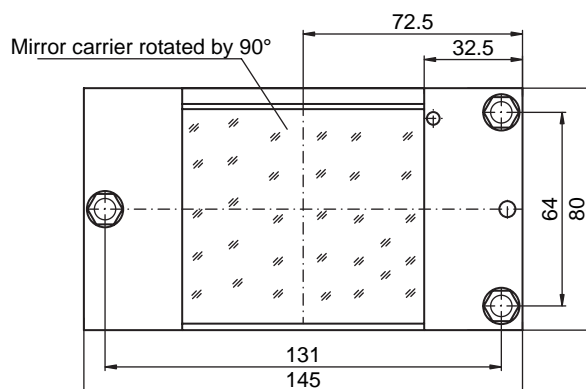
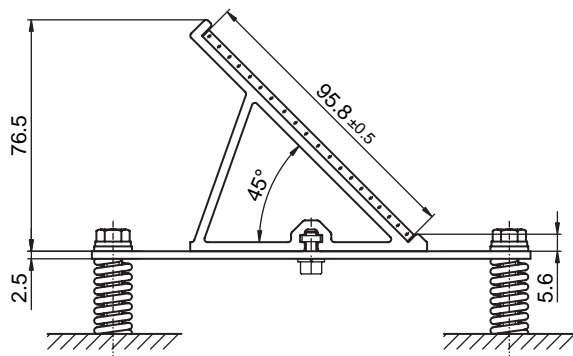
US 1, US 2 DEFLECTING MIRRORS

Features

	US 2	US 2.1	US 2.2
Precise alignment in all 3 axes	●		
Glass mirror in extruded aluminum profile	●	●	●
Mirror can rotate by 90° on mounting plate	●		

You will find additional information at www.leuze.com/us2

Dimensional drawings



US 2 Deflecting Mirror



Further information

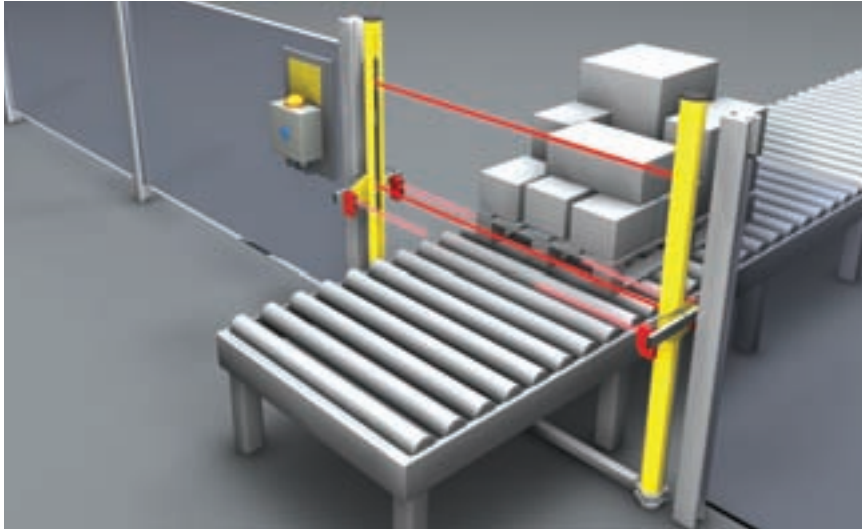
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ACCESSORIES

MMS Muting Mounting Systems



Installation and initial operation times can be significantly reduced with the correct accessories. The MMS muting mounting systems are fully factory-side preassembled mounting brackets for light beam devices and reflectors in 2- and 4-sensor muting applications. In combination with the DC or UDC device columns and the multiple safety light beam devices of the ROBUST, COMPACT and COMPACT^{plus} series, complete muting solutions can be implemented optimally harmonized with one another.

Muting mounting system for mounting muting sensors and reflectors on free-standing mounting columns, DC/UDC

Ordering information

Art. no.	Article	Description	Installation
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	Fully assembled
548801	MMS-P-1000	Muting mounting system, passive side, full length 1.000 mm with 2 reflectors, TKS 30x50	Fully assembled
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	Fully assembled
548806	MMS-P-1000-S	Muting mounting system for Sequential Muting, passive side, full length 1.000 mm with 4 reflectors, TKS 30x50	Fully assembled
548804	MMS-A-350	Muting mounting system, active side, full length 350 mm with 2 rods, 12 mm for light beam device mounting systems	Fully assembled
548803	MMS-P-350	Muting mounting system, passive side, full length 350 mm with 2 reflectors, TKS 30x50	Fully assembled
430305	MMS-A-2N55	Muting mounting system for slot mounting directly on the device without DC/UDC column for 2 sensors, with angled rods, 55x100x12 mm for light beam device mounting systems	Complete without sensor mounting bracket

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UMC, MC
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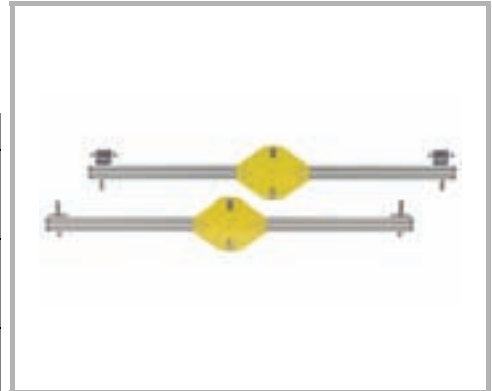
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MMS MUTING MOUNTING SYSTEMS

Features

	MMS-A-xxxx	MMS-P-xxxx	MMS-A-2N55
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 and vertical positioning of the sensors and reflectors	●	●	
Mounting of muting Sensors with 12 mm V2A rods	●	●	●
Reflectors preassembled on rods in delivery	●	●	

You will find additional information at www.leuze.com/mms.



Further information	Page
● Dimensional drawings	468
● DC/UDC	456

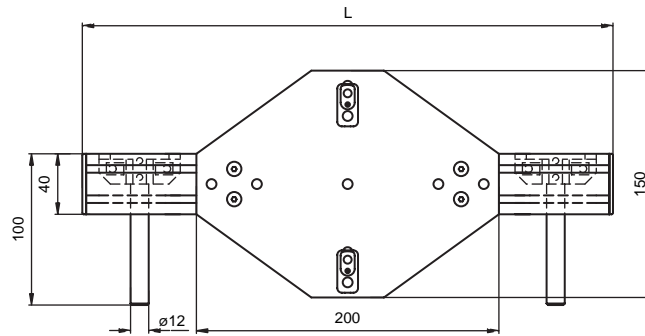




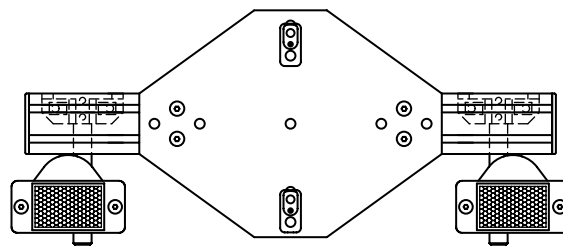
ACCESSORIES

Dimensional drawings

Muting mounting system MMS-A-350, active side, 350 mm



Muting mounting system MMS-P-350, passive side, 350 mm



Muting mounting system, alternatively available in 1000 mm

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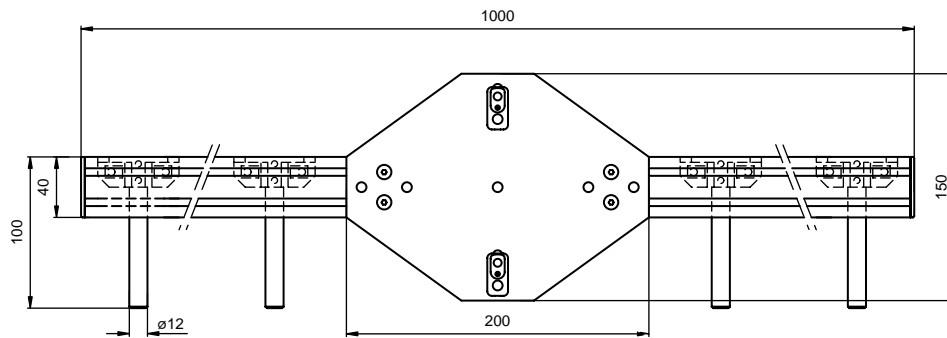
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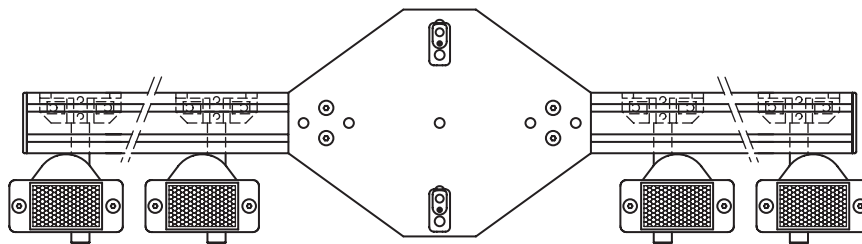
MMS MUTING MOUNTING SYSTEMS

Dimensional drawings

Muting mounting system MMS-A-1000-S, active side, 1000 mm




Muting mounting system MMS-P-1000-S, passive side, 1000 mm





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	●
	MS70/ LED.01	660620	LED-muting indicator, yellow, 24 V, complete with connection element for column mounting and base with 110 mm tube	●	●	●	IP 65	●
	MS70/ LED.02	660621	LED-muting indicator, yellow, 24 V, complete with connection element for bracket mounting	●	●	●	IP 65	●

You will find additional information at www.leuze.de/muting-lamps/

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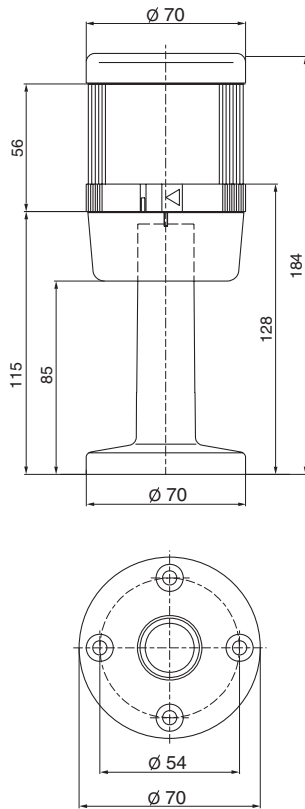
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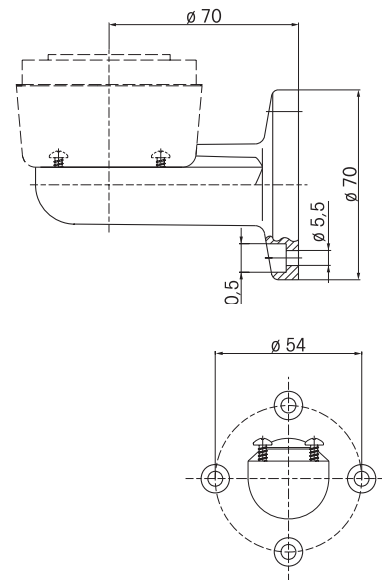
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Dimensional drawings

Muting indicator



MS70 LED.01








Bracket mounting connection element, MS70 LED.02





ACCESSORIES

Muting sensors – Features and ordering information

Series	Dimensions in mm	Housing material		Functional principle	Typical limit range	Light source			Response time	
		Plastic	Metal			Infrared light	Red light	Laser		
	BR 3	11 x 32 x 17	●		One-way light beam device	0 ... 8.5m		●		0.5ms
					Reflection light beam device	0.02 ... 6m		●	●	0.5ms
					Reflection light scanner	5 ... 500mm		●		0.5ms
					Refl. light scanner with backgr. blanking	7 ... 180mm		●		0.5ms
	BR 25	15 x 39 x 29	●		One-way light beam device	0 ... 12m		●		1ms
					Reflection light beam device	0.05 ... 15m		●	●	1ms
					Reflection light scanner	5 ... 800mm		●		1ms
					Refl. light scanner with backgr. blanking	5 ... 800mm	●	●		1ms
	BR 18	15 x 50 x 33		●	Reflection light beam device	0 ... 5m		●		0.33ms
	BR 8	15 x 48 x 38	●		One-way light beam device	0 ... 100m		●	●	0.18ms
					Reflection light beam device	0 ... 20m		●	●	0.18ms
					Reflection light scanner	5 ... 800mm		●		0.33ms
					Refl. light scanner with backgr. blanking	5 ... 400mm		●	●	0.25ms
	BR 95	17 x 66 x 35	●		One-way light beam device	0 ... 20m	●	●		0.5ms
					Reflection light beam device	0 ... 9m		●		0.5ms
					Reflection light scanner	10 ... 900mm	●	●		0.5ms
					Refl. light scanner with backgr. blanking	20 ... 500mm	●	●		0.5ms

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Muting sensors – Features and ordering information

Series	Dimensions in mm	Housing material		Functional principle	Typical limit range	Light source			Response time
		Plastic	Metal			Infrared light	Red light	Laser	
 BR 46	18 x 72 x 43	●		One-way light beam device	0 ... 50m	●			2.5 ms
				Reflection light beam device	0.05 ... 18m		●		1 ms
				Refl. light scanner with backgr. blanking	10 ... 1000mm	●	●		2.5 ms
 BR 96	30 x 90 x 70	●	●	One-way light beam device	0 ... 150m	●	●		1 ms
				Reflection light beam device	0 ... 28m	●	●		0.5 ms
				Reflection light scanner	20 ... 1200mm	●	●		0.5 ms
				Refl. light scanner with backgr. blanking	10 ... 5500mm	●	●	●	1.67 ms
 BR 412	M12 x 55		●	One-way light beam device	0 ... 8m		●		1 ms
				Reflection light beam device	0.05 ... 1.6m		●		0.7 ms
				Reflection light scanner	0 ... 400mm		●		0.7 ms
 BR 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	●			0.5 ms
 BR 618	M18 x 60		●	One-way light beam device	0 ... 12m	●			1 ms
				Reflection light beam device	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





ACCESSORIES

Connection cables – Areas of application and ordering information

Here you will find connection cables specifically for our sensors for quick and easy initial operation



Art. no.	Article	Description	Suitable for		
Device connection cables		Socket	Cable	Plug	
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
50024748	KB-095-1000-3AW	M12, straight, 3-pin	1 m	M12, angled, 3-pin	AS-i Safety sensors
50024749	KB-095-2000-3AW	M12, straight, 3-pin	2 m	M12, angled, 3-pin	AS-i Safety sensors
426042	CB-8N-10000-12GF	Hirschmann, straight, 12-pin	10 m	Open, 12-wire	COMPACT ^{plus} /T2, /R2, ROBUST-MCB
426044	CB-8N-25000-12GF	Hirschmann, straight, 12-pin	25 m	Open, 12-wire	COMPACT ^{plus} /T2, /R2, ROBUST-MCB
426043	CB-8N-50000-12GF	Hirschmann, straight, 12-pin	50 m	Open, 12-wire	COMPACT ^{plus} /T2, /R2, ROBUST-MCB
548405	CB-M12-5000S8-8GF	M12, straight, 8-pin	5 m, PUR, UL, shielded	Open, 8-wire	ECO
548305	CB-M12-5000S8-8WF	M12, angled, 8-pin	5 m, PUR, UL, shielded	Open, 8-wire	ECO
548410	CB-M12-10000S8-8GF	M12, straight, 8-pin	10 m, PUR, UL, shielded	Open, 8-wire	ECO
548415	CB-M12-15000S8-8GF	M12, straight, 8-pin	15 m, PUR, UL, shielded	Open, 8-wire	ECO
548315	CB-M12-15000S8-8WF	M12, angled, 8-pin	15 m, PUR, UL, shielded	Open, 8-wire	ECO
548450	CB-M12-50000S8-8GF	M12, straight, 8-pin	50 m, PUR, UL, shielded	Open, 8-wire	ECO
429071	CB-M12-5000S-5GF	M12, straight, 5-pin	5 m, PVC, UL, shielded	Open, 5-wire	SOLID
429072	CB-M12-5000S-5WF	M12, angled, 5-pin	5 m, PVC, UL, shielded	Open, 5-wire	SOLID

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Connection cables – Areas of application and ordering information

Art. no.	Article	Description			Suitable for
Device connection cables		Socket	Cable	Plug	
429081	CB-M12-5000S-8GF	M12, straight, 8-pin	5 m, PVC, UL, shielded	Open, 8-wire	SOLID
429082	CB-M12-5000S-8WF	M12, angled, 8-pin	5 m, PVC, UL, shielded	Open, 8-wire	SOLID
429073	CB-M12-10000S-5GF	M12, straight, 5-pin	10 m, PVC, UL, shielded	Open, 5-wire	SOLID
429074	CB-M12-10000S-5WF	M12, angled, 5-pin	10 m, PVC, UL, shielded	Open, 5-wire	SOLID
429083	CB-M12-10000S-8GF	M12, straight, 8-pin	10 m, PVC, UL, shielded	Open, 8-wire	SOLID
429084	CB-M12-10000S-8WF	M12, angled, 8-pin	10 m, PVC, UL, shielded	Open, 8-wire	SOLID
429075	CB-M12-15000S-5GF	M12, straight, 5-pin	15 m, PVC, UL, shielded	Open, 5-wire	SOLID
429076	CB-M12-15000S-5WF	M12, angled, 5-pin	15 m, PVC, UL, shielded	Open, 5-wire	SOLID
429085	CB-M12-15000S-8GF	M12, straight, 8-pin	15 m, PVC, UL, shielded	Open, 8-wire	SOLID
429086	CB-M12-15000S-8WF	M12, angled, 8-pin	15 m, PVC, UL, shielded	Open, 8-wire	SOLID
429171	CB-M12-25000S-5GF	M12, straight, 5-pin	25 m, PVC, UL, shielded	Open, 5-wire	SOLID
429172	CB-M12-25000S-5WF	M12, angled, 5-pin	25 m, PVC, UL, shielded	Open, 5-wire	SOLID
429181	CB-M12-25000S-8GF	M12, straight, 8-pin	25 m, PVC, UL, shielded	Open, 8-wire	SOLID
429182	CB-M12-25000S-8WF	M12, angled, 8-pin	25 m, PVC, UL, shielded	Open, 8-wire	SOLID
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-M12-2000-4GM/B	M12, straight, 4-pin	2 m, PUR, UL	Open, 4-wire, jumper between 1-4, 2-3	RS4/A1, RS4/P1
Connection cable /T1 Transmitter to sensor socket M12/5					
150677	CB-M12-10000-5WM	Open, 5-wire	10 m, PUR, UL	M12, angled, 5-pin	COMPACTplus





ACCESSORIES

Connection cables – Areas of application and ordering information

Art. no.	Article	Description			Suitable for
Local connection cable		Socket	Cable	Plug	
520066	AC-SCC2	2 x M12, straight, 3-pin	2 x 1.5 m + 0.3 m	M12, angled, 8-pin	COMPACT <i>plus</i>
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, start buttons					
150680	CB-M12-1500-3GF/GM	M12, straight, 3-pin	1.5 m, PUR	M12, straight, 3-pin	COMPACT <i>plus</i> , ROBUST-MCB
150681	CB-M12-1500-3GF/WM	M12, straight, 3-pin	1.5 m, PUR	M12, angled, 3-pin	COMPACT <i>plus</i> , ROBUST-MCB
150682	CB-M12-5000-3GF/GM	M12, straight, 3-pin	5 m, PUR	M12, straight, 3-pin	COMPACT <i>plus</i> , ROBUST-MCB
150683	CB-M12-5000-3GF/WM	M12, straight, 3-pin	5 m, PUR	M12, angled, 3-pin	COMPACT <i>plus</i> , ROBUST-MCB
150684	CB-M12-15000-3GF/GM	M12, straight, 3-pin	15 m, PUR, UL	M12, straight, 3-pin	COMPACT <i>plus</i> , ROBUST-MCB
150685	CB-M12-15000-3GF/WM	M12, straight, 3-pin	15 m, PUR	M12, angled, 3-pin	COMPACT <i>plus</i> , ROBUST-MCB
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> , ROBUST-MCB
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> , ROBUST-MCB
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> , ROBUST-MCB
150717	CB-M12-2000-5GM	Open, 5-wire	2 m, PUR, UL	M12, straight, 5-pin	COMPACT <i>plus</i> , ROBUST-MCB
150718	CB-M12-5000-5GM	Open, 5-wire	5 m	M12, straight, 5-pin	COMPACT <i>plus</i> , ROBUST-MCB

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Connection cables – Areas of application and ordering information

Art. no.	Article	Description			Suitable for
Signal distribution connection cable		Socket	Cable	Plug	
520069	CB-M12-ACT4/1	2 x M12, straight, 4-pin	-	M12, straight, 4-pin	All
548040	CB-M12-ACY3/1	2 x M12, straight, 3-pin	-	M12, straight, 3-pin	All
PC cable					
50104078	ASM1-PK	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
549950	CB-D9-10000-C	SUB-D, 9-pin	10 m	Jack connector, straight, 3.5 mm	MSI
549953	CB-D9-3000-C	SUB-D, 9-pin	3 m	Jack connector, straight, 3.5 mm	MSI
549955	CB-D9-5000-C	SUB-D, 9-pin	5 m	Jack connector, straight, 3.5 mm	MSI
Cascading cable					
50032841	KB-Y-SRK96-600-4	2 x M12, 4-pin	0.6 m	M12, straight, 4-pin	SRK 96
Copier cable for AS-i monitor program					
50104079	ASM1-DK	RJ45 plug, 8-pin	0.3 m	RJ45, 8-pin	ASM1, ASM1E





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 lumiflex opto sensors and Deflecting Mirrors.

Laser beaming!

Never look directly into the laser beam.
Please also inform people close-by of this!
Laser class 2.

Accessories		Suitable for sensors								
Laser alignment aid		Safety Light Curtain				Multiple Light Beam Safety Device			Single beam safety device	Laser Scanner
Art. no.	Article	COMPACT	COMPACT-plus	SOLID-2 SOLID-4	ECO	ROBUST	COMPACT	COMPACT plus-m	SLS 78/R	RS4
549000	LA-78					●			●	●
560020	LA-78U	●	●	●	●	●	●	●		
520004	LA-78UDC	●	●	●	●*	●	●	●		

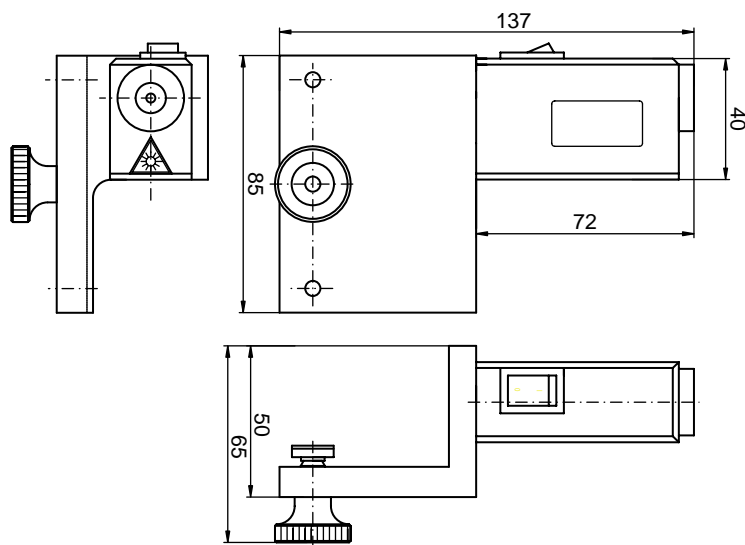
*) With ECO protective and mounting profile
You will find additional information at www.leuze.com/la

LA LASER ALIGNMENT AIDS

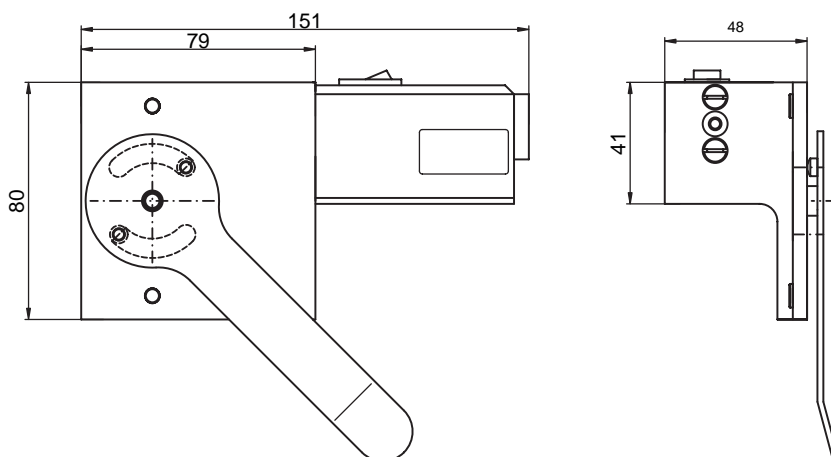
Features

	LA-78	LA-78U	LA-78UDC
Red light laser, laser class 2	●	●	●
Robust aluminum housing	●	●	●
Battery-operated	●	●	●
For special use in the DC or UDC floor columns			●

Dimensional drawings



Installation: ROBUST, SLS 78/R



Installation: UDC



Properties



Further information

- Ordering information

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GLOSSARY

Properties

**Point of operation guarding:
Light Curtain with finger
resolution**



Applies for resolution $d = 14$ mm, is selected when working is required close to the point of operation and/or where space is restricted.

**Point of operation guarding:
Light Curtain with hand
resolution**



Applies for resolutions "d" between 14 mm and 40 mm
Additional "C" required with calculation of the safety distance

**Danger area guarding,
presence sensing:
Light Curtain**



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.

Access guarding: Light Curtain



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.

**Access guarding: Multiple
Light Beam Safety Device**



Access guarding or perimeter guarding at danger areas. Additional "C" = 850 mm, start/restart interlock obligatory.

**Danger area guarding, pres-
ence sensing: Laser Scanner**



Is selected in the preliminary stage for stationary machines or industrial conveyor trucks/transfer carriages. Detection zones and warning zones can be switched over.

**Passage guarding: Laser
Scanner**



Is selected for switchable detection zones 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.

**Point of operation guarding:
Laser Scanner**



Switchable overlapping detection zones 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.

Safety Locking Devices



Safety Locking Devices keep moveable guards in a closed position. Use with long machine stopping times.

**Safety Switches (without guard
locking)**



Position monitoring of moveable guards. Opening the hard guard generates a stop command. Calculation of the safety distance required.

Abbreviations and technical terms

Response time	Time between penetration/entry into the active protective field and the actual switching off of the OSSDs.
AOPD	Active Opto-electronic 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.
EDM	External Device Monitoring (contactor monitoring)
ESPE	Electro Sensitive Protective Equipment
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 control 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 (Output Signal Switching Device).
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).
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.
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.
Contactor monitoring (EDM)	The contactor monitoring monitors the break contacts of downstream positive-guided contactors and relays.





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Liebigstr. 4
D-82256 Fürstenfeldbruck, Germany
Tel: +49 (0) 8141 / 5350-0
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