

# L10

## Safety Locking Device



GB 2008/12 607300  
We reserve the right to  
make technical changes

SAFE IMPLEMENTATION AND OPERATION

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# 1 About this document

## 1.1 Other applicable documents

The information on the L10 Safety Locking Device is divided into two documents. Document "Application information" contains only the most important safety notices.

- ↳ For the safe implementation, testing and operation, download document "Safe implementation and operation of the L10" from <http://www.leuze.com/l10> or request it from [service.schuetzen@leuze.de](mailto:service.schuetzen@leuze.de) or tel. +49 8141 5350-111.

Table 1.1: Documents for the L10 Safety Locking Device

Purpose and target group	Title	Source
Detailed information for all users	Safe implementation and operation (this document)	On the Internet, download from: <a href="http://www.leuze.com/l10">http://www.leuze.com/l10</a>
Basic information for technicians and machine operators	Application information	Print document part no. 607242 included in the delivery contents of the product

## 1.2 Used symbols and signal words

Table 1.2: Warning symbols and signal words




	Symbol for dangers
NOTICE	Signal word for property damage Indicates dangers that may result in property damage if the measures for danger avoidance are not followed.
CAUTION	Signal word for minor injury Indicates dangers that may result in minor injury if the measures for danger avoidance are not followed.
WARNING	Signal word for severe injury Indicates dangers that may result in severe or fatal injury if the measures for danger avoidance are not followed.
DANGER	Signal word for life-threatening danger Indicates dangers that will result in severe or fatal injury if the measures for danger avoidance are not followed.

Table 1.3: Other symbols

	Symbol for tips Text passages with this symbol provide you with further information.
	Symbols for action steps Text passages with this symbol instruct you to perform actions.

## 2 Safety

Before using the Safety Locking Device, a risk evaluation must be performed according to valid standards (e.g. EN ISO 12100-1, EN ISO 13849-1, EN ISO 14121). For mounting, operating and testing, document "Safe implementation and operation of the L10" as well as all applicable national and international standards, regulations, rules and directives must be observed (e.g. machinery directive, low-voltage directive, work-equipment directive, safety regulations, accident-prevention regulations, EN 1088, EN ISO 13849-1, EN 60204-1, EN 954-1). Observe and print out relevant and supplied documents and distribute to the affected personnel.

↳ Before beginning work with the Safety Locking Device, completely read and understand the documents applicable to the respective task.

The following standards apply for the risk evaluation at the protective device prior to using the Safety Locking Device:

- EN ISO 14121, Safety of machinery, risk evaluation
- EN ISO 12100-1, Safety of machinery
- EN ISO 13849-1, Safety-related parts of control systems

The realizable category of the integration in control circuits according to EN ISO 13849-1 and EN 954-1 is dependent on the used contact block and wiring.

In particular, the following national and international legal regulations apply for the start-up, technical inspections and work with Safety Locking Devices:

- Machinery directive 2006/42/EC
- Low voltage directive 2006/95/EC
- Use of work equipment directive 89/655 EEC
- Safety regulations
- Accident-prevention regulations and safety rules

## 2.1 Proper use

To ensure proper personnel protection, the Safety Locking Device must be mounted, connected and started-up by trained personnel. It must be in perfect condition and inspected regularly. The switching process must only be triggered by an actuator approved for this Safety Locking Device that is connected to the moveable guard in a non-detachable and tamperproof manner.

The rules and regulations for protection and safety at work and the recognised safety-related rules and regulations must be observed. These include:

- EN 1088, Interlocking devices associated with guards
- EN ISO 13849-1, Safety-related parts of control systems
- EN 60204-1, Electrical equipment of machines

L10 Safety Locking Devices must be connected in such a way that a dangerous state can only be activated while the protective device is closed and so that the dangerous state has ended before the protective device can be opened. They must not be used if the point of operation can be accessed during the lag time before the dangerous state has ended.

Connection conditions:

- dangerous state can be activated only with closed protective device and locked locking device
- protective device cannot be opened while locking device is locked
- manual unlocking of the locking device while the machine is running triggers a STOP command; the dangerous state is ended before the protective device can be opened

Furthermore, the L10 Safety Locking Device must **not** be used under the following conditions:

- lag time of the dangerous state is greater than the minimum time delay of the manual actuator release
- high concentration of dust particles in the surrounding area
- rapidly changing ambient temperature (leads to condensation)
- in the event of strong physical shocks
- in explosive or easily flammable atmospheres
- the mounting locations are not sufficiently stable
- the safety of multiple persons is dependent on the function of this Safety Locking Device (e.g. nuclear power plants, trains, aircraft, motor vehicles, incinerators, medical devices)

Handling the Safety Locking Device:

- ↪ Observe the permissible environmental conditions for storage and operation (see chapter 14 "Technical data").
- ↪ Immediately replace damaged Safety Locking Devices according to these instructions.
- ↪ Use cable gland, insulation materials and connecting wires of the appropriate protection rating.
- ↪ Protect the Safety Locking Device from penetrating foreign bodies (e.g. shavings, sand and blasting agent).
- ↪ Before performing painting work, cover the actuation slot, knurled nut and name plate.
- ↪ Immediately clean any contamination from the Safety Locking Device that impacts function according to these instructions.
- ↪ Make no structural changes to the Safety Locking Device.

## **2.2 Competent personnel**

Prerequisites for competent personnel:

- suitable technical training
- knows the rules and regulations for occupational safety, safety at work and safety technology and can assess the safety of the machine
- knows the instructions for the Safety Locking Device and the machine
- was instructed by the responsible individuals on the mounting and operation of the machine and of the Safety Locking Device

## **2.3 Responsibility for safety**

Manufacturer and operator of the machine must ensure that the machine and implemented Safety Locking Device function properly and that all affected persons are adequately informed and trained.

The type and content of all imparted information must not lead to unsafe actions by users.

The manufacturer of the machine is responsible for:

- safe machine construction
- safe implementation of the Safety Locking Device
- imparting all relevant information to the operator
- adhering to all regulations and directives for the safe starting-up of the machine



The operator of the machine is responsible for:

- instructing the operating personnel
- maintaining the safe operation of the machine
- adhering to all regulations and directives for occupational safety and safety at work
- regular testing by competent personnel

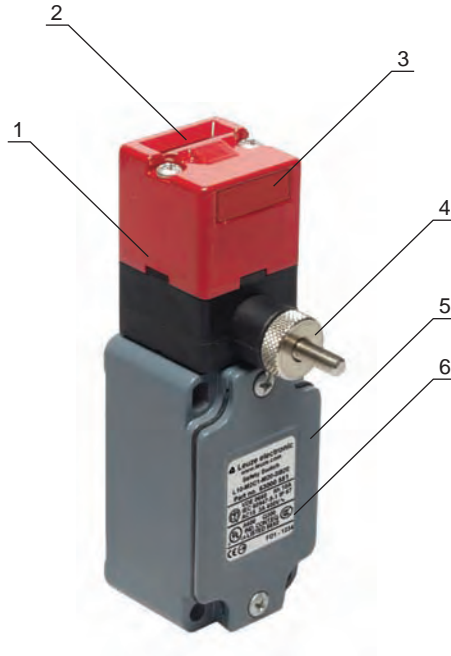
## **2.4 Exemption of liability**

Leuze electronic GmbH + Co. KG is not liable in the following cases:

- Safety Locking Device is not used as intended
- safety notices are not adhered to
- mounting and electrical connection are not properly performed
- proper function is not tested (see chapter 9 "Testing")
- modifications are made to the Safety Locking Device
- the manual delay time is not allowed to elapse (e.g. due to improper operation, use of auxiliary equipment or tampering)

**3 Device description**

The Safety Locking Device of the L10 series is an electro-mechanical switching device in a housing made of metal or glass-fibre-reinforced and non-combustible plastic; the device satisfies protection rating IP 67. By means of the funnel-shaped insertion opening, the actuator self-centres, even if the door is slightly misadjusted. The locking/unlocking delay is manually adjusted by means of a knurled nut.



- 1 Deflection head
- 2 Insertion opening for actuator
- 3 Dust cover
- 4 Knurled nut for locking/unlocking (delaysee chapter 14 "Technical data")
- 5 Housing cover
- 6 Name plate (connection data, production code and year of manufacture)

Table 3.1: L10 Safety Locking Devices

Article	Part No.	Description
L10-P2C1-M20-SB20	63000 550	Normal duty, plastic, time delay up to 20 s
L10-M2C1-M20-SB20	63000 551	Heavy duty, metal, time delay up to 20 s

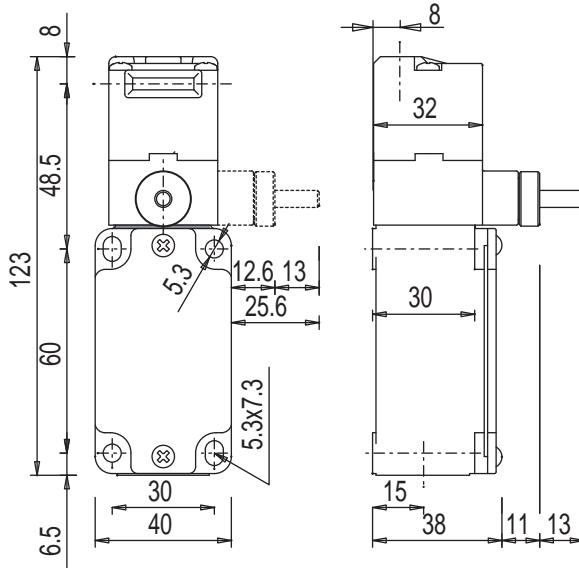


Figure 3.1: Dimensions L10-P2C1-M20-SB20 in mm

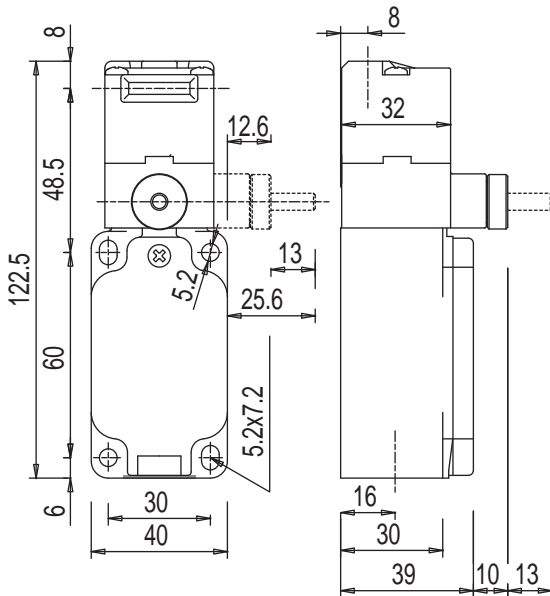


Figure 3.2: Dimensions L10-M2C1-M20-SB20 in mm

The actuation directions of the deflection head and knurled nut can be adjusted in 90° increments. By means of 5 possible approach directions and a selection of different actuators, the Safety Locking Device can be mounted in any position.

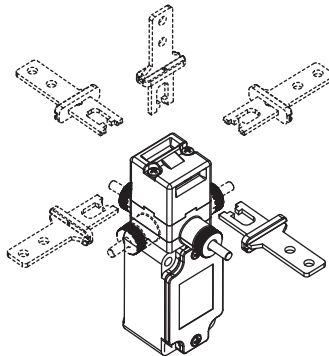


Figure 3.3: Approach directions

## 4 Functions

The positive-opening contacts close if:

- the actuator is moved in
- the locking device is locked

The dangerous state can only be activated via the safety switching device while the safety contacts are closed. During the first clockwise turns of the knurled nut, the contacts are opened and a STOP signal is transmitted to the downstream safety switching device. The actuator is not released until the knurled nut has been turned to the right limit stop and the locking device has unlocked. During this manual time delay (delay time see chapter 14 "Technical data"), the dangerous state must be stopped in order for the protective device to be opened safely. The Safety Locking Device can only be locked if the actuator is moved in.

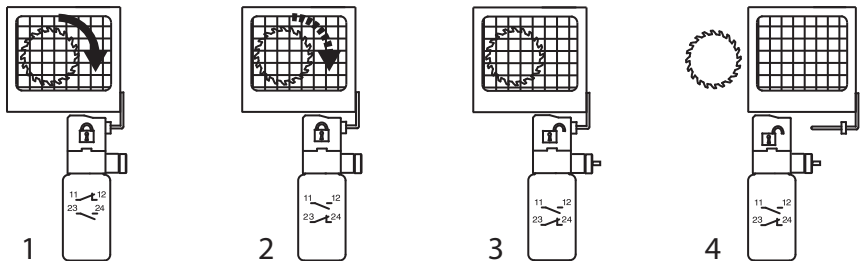


Figure 4.1: Example for the manual delay

- 1 Machine is running, locking device is locked
- 2 Machine coasts as the knurled nut is turned
- 3 Machine has stopped, locking device is unlocked
- 4 Protective device can be opened

## 5 Applications



The manual locking/unlocking function makes the L10 Safety Locking Device suitable for systems with protective devices that are used only occasionally or that are located relatively far away on which no magnet activation is provided.

The Safety Locking Device is suitable for e.g. the following protective devices:

- turning or swivelling moveable guards
- laterally moveable protective gratings or sliding gates
- seldom used maintenance doors or covers

## 6 Mounting



### **WARNING**

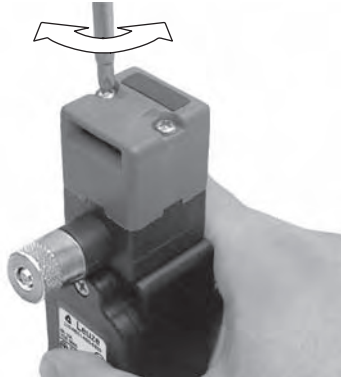
**Serious accidents may result if the Safety Locking Device is not mounted properly!**

The protective function of the Safety Locking Device is only ensured if used in the intended area of application and if it is mounted professionally.

- ↪ Mounting may only be performed by competent personnel.
- ↪ Observe standards, regulations and these instructions.
- ↪ Protect the housing and deflection head from materials penetrating the enclosure (environmental conditions see chapter 14 "Technical data").
- ↪ Test to ensure proper function.

### 6.1 Adjusting the deflection head

- ↪ Loosen the 2 screws on the deflection head.



- ↪ If necessary, loosen the 4 screws on the locking/unlocking unit.

- ↪ Turn the deflection head and the locking/unlocking unit in the desired directions.



- ↪ If necessary, retighten the 4 screws on the locking/unlocking unit with 0.8–1.2Nm.
- ↪ Replace the 2 screws on the deflection head with the supplied safety screws and tighten with 0.8–1.2Nm.
- ↪ Close unused opening with the dust cover.

## 6.2 Mounting the Safety Locking Device

Prerequisites for mounting:

- deflection head has been set
  - fully assembled
  - the 2 screws on the deflection head have been replaced with the supplied safety screws
- ↪ Select the mounting location so that the following conditions are satisfied:
    - Safety Locking Device and actuator can be well matched to one another and permanently mounted
    - knurled nut is easily accessible to the operating personnel

- ↪ Position washers and screw down Safety Locking Device with 2–3Nm.



### 6.3 Mounting the actuator

#### **NOTICE**

**The Safety Locking Device may be damaged if mounted improperly!**

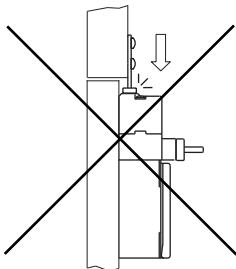
- ↪ Use separate mechanical limit stop for the moving part of the protective device.
- ↪ Align actuator so that it does not hit or rub against the edges of the insertion opening.

Prerequisites for proper function:

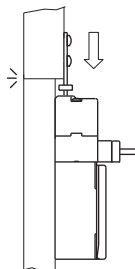
- actuator is not deformed or damaged
- actuator is appropriate for the Safety Locking Device  
Proper function is ensured only with original accessories (see chapter 13 "Accessories").



Wrong

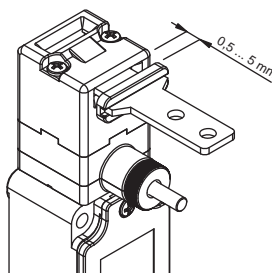


Correct



↪ Align actuator.

Play for the actuator in the closed state: 0.5–5 mm.



- ↳ Secure actuator with rivets or tamperproof screws so that it cannot be detached.



## 7 Electrical connection



### WARNING

**Serious accidents may result if the electrical connection is faulty!**

↪ Electrical connection may only be performed by competent personnel.

### 7.1 Connecting the contact block

Prerequisites:

- temperature stability of the cable insulation material must be greater than the maximum temperature of the housing (see chapter 14 "Technical data")
- cable gland with appropriate protection rating
- maximum current load is observed (see chapter 14 "Technical data")

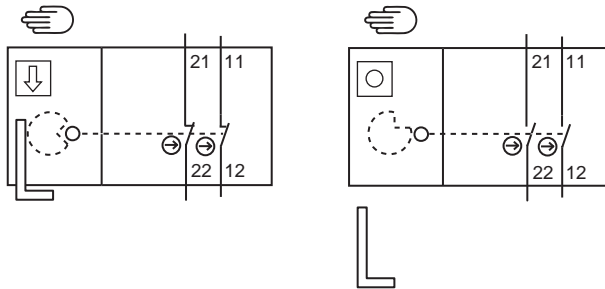


Figure 7.1: Contact block 2 NC (L10-P2C1-M20-SB20, L10-M2C1-M20-SB20)



### DANGER

**Risk of death by electric shock!**

↪ Interrupt the voltage supply to the Safety Locking Device.

↪ Unscrew the housing cover.

↪ Connect the contact block according to the circuit diagram.

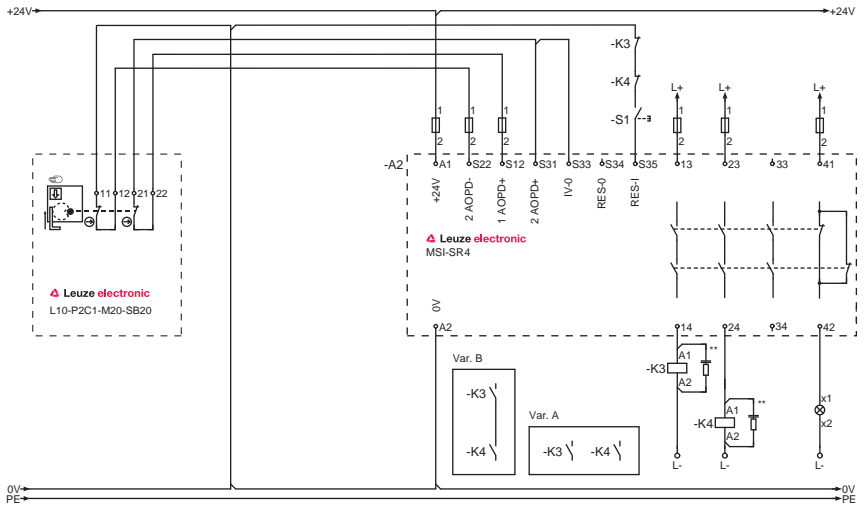


Figure 7.2: Connection example L10-P2C1-M20-SB20 and L10-M2C1-M20-SB20

⚠ Tighten cable terminal screws with 0.6–0.8Nm.



- ↪ Tighten the housing cover with 0.7–0.9Nm.



## 8 Setting the device into service



### **WARNING**

**Serious accidents may result if the Safety Locking Device is not used properly!**

- ↪ Before unlocking the Safety Locking Device and opening the protective device, wait until the dangerous state has ended.

Prerequisites:

- Safety Locking Device is mounted and connected according to these instructions
- operating personnel have been trained in the correct use

- ↪ Test the function of the Safety Locking Device (see chapter 9 "Testing").

The Safety Locking Device is then ready for use.

## 9 Testing

L10 Safety Locking Devices are maintenance free. Nevertheless, they must be replaced after maximum 500,000 switching cycles.

- ↪ Always replace the entire Safety Locking Device including actuator.
- ↪ For the testing intervals, observe nationally applicable regulations.
- ↪ Document all tests in a comprehensible manner.

### 9.1 To be performed prior to the initial start-up by competent personnel

- ↪ Check whether the Safety Locking Device is operated according to its specified environmental conditions (see chapter 14 "Technical data").
- ↪ Test to ensure proper mechanical and electrical function (see chapter 9.2).

### 9.2 To be performed periodically by competent personnel

#### Mechanical function

- ↪ Stop the dangerous state and open the protective device.
- ↪ Check that the components are securely fastened.
- ↪ Test the cable entry for leaks.
- ↪ Check the Safety Locking Device, knurled nut and actuator for damage, deposits, deformation and wear.
- ↪ Test the locking/unlocking function after actuating the knurled nut.
- ↪ Test several times whether the actuator can be easily moved into the Safety Locking Device.

#### Electrical function




#### **WARNING**

**Severe injuries may result if tests are not performed properly!**

- ↪ Make certain that there are no persons in the danger zone.
- ↪ Stop the dangerous state and open the protective device.
- ↪ Make certain that the machine cannot be started while the protective device is open.
- ↪ Close the protective device, turn the knurled nut to the left limit stop and start the machine.
- ↪ Make certain that the protective device cannot be opened.

- ↪ Test whether the machine stops as soon as the knurled nut is turned clockwise.
- ↪ Make certain that the protective device does not open until the knurled nut has been turned to the right limit stop.
- ↪ Make certain that the dangerous state ends before the protective device can be opened.

### 9.3 To be performed daily by the operating personnel

 <b>WARNING</b>
<b>Severe injuries may result if tests are not performed properly!</b>
↪ Make certain that there are no persons in the danger zone.

- ↪ Stop the dangerous state and open the protective device.
- ↪ Check the Safety Locking Device and actuator for damage or tampering.
- ↪ Make certain that the machine cannot be started while the protective device is open.
- ↪ Close the protective device and start the machine.
- ↪ Test whether the dangerous state ends before the protective device can be opened.

## 10 Cleaning

There must be no soiling (e.g. shavings and dust) present, especially in the deflection head of the Safety Locking Device.

Prerequisites for cleaning:

- protective device is opened and machine is switched off
- voltage supply for the Safety Locking Device is interrupted
- ↪ Periodically clean the Safety Locking Device while the protective device is opened (e.g. with vacuum cleaner).

## 11 Disposing

- ↳ The nationally valid regulations for electro-mechanical components are to be observed when disposing.

## 12 Service and support

Contact data:

Leuze electronic GmbH + Co. KG  
Liebigstraße 4  
D-82256 Fürstfeldbruck  
Phone: +49 8141 5350-111

## 13 Accessories

Table 13.1: Actuators of the AC-AH series for the L10 Safety Locking Device

Article	Part No.	Description
AC-AH-S	63000 720	Straight
AC-AH-A	63000 721	Angled
AC-AH-F4	63000 722	Straight, flexible, 4 directions
AC-AH-F2J2	63000 723	Straight, flexible, 2 directions, alignable 2 directions
AC-AH-F1J2	63000 724	Straight, flexible, 1 direction, alignable 2 directions
AC-AH-F4J2-TK	63000 725	Straight, flexible, 4 directions, alignable 2 directions turning head



## 14 Technical data

Table 14.1: General

Switch type	Interlock device with locking according to EN 1088
Actuator, external	AC-AHxx series: straight, angled, resilient, alignable
Lock type	mechanical
Lock actuation	mechanical, manual unlocking
Approach actuation directions	1 x above, 4 x side (90°)
Approach speed	min. 1 mm/s, max. 0.5 m/s
Actuation force (extraction)	10 N
Mechanical life time in accordance with IEC 60947-5-1	0.5 x 10 <sup>6</sup> switching cycles
Actuation frequency according to IEC 60947-5-1	max. 360 per hour
Life time according to EN ISO 13849-1	on request
Number of cycles until the dangerous failure (B10d) in accordance with EN 61810-2 with DC1 (ohmic load) with AC1 (ohmic load) with DC13 (inductive load) with AC15 (inductive load) low load (20% rated load)	on request
Usage category according to EN 60947-5-1	AC 15 (Ue / Ie): 250V / 6 A 400V / 4 A 500V / 1 A  DC 13 (Ue / Ie): 24V / 6 A 125V / 1.1 A 250V / 0.4 A
Dimensions (dimensional drawings)	see chapter 3 "Device description"

Table 14.2: Safety

Protection rating	IP 67
Contact protection	L10-P2C1-M20-SB20: protective insulation O L10-M2C1-M20-SB20: grounding
Recoil tolerance	4.5mm
Interlocking force	max. 1000N
Manual delayed actuator release	approx. 20 seconds
Contact allocation	2 NC
Contact material	silver alloy
Switching principle	slow-action contact
Opening of contact	positive-forced
Rated insulation voltage	500VAC, 600VDC
Conventional thermal current	max. 10A
Short-circuit protection according to IEC 60269-1	10A, 500V, type aM

Table 14.3: Housing

Housing material	L10-P2C1-M20-SB20: fiberglass-reinforced, thermo-plastic plastic, self-extinguishing  L10-M2C1-M20-SB20: metal
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Table 14.4: Connection

Number of cable entries	1
Type of cable entry	M20 x 1.5
Conductor cross-section (stranded)	1 x 0.5mm <sup>2</sup> to 2 x 2.5mm <sup>2</sup>

Table 14.5: Environment

Temperature range, operation	-25 ... +80°C
Degree of contamination, external, according to EN 60947-1	3

**15 EC Declaration of Conformity**

Leuze electronic GmbH + Co. KG  
Liebigstraße 4  
D-82256 Fürstenfeldbruck

We hereby declare that the L10 Safety Locking Device (see name plate for part no.) in the form in which it is marketed by us conforms with the relevant safety and health requirements of the listed EC directives <sup>1</sup> (including all changes) and that the listed standards <sup>1</sup> were used in its design and construction.

Fürstenfeldbruck, 15 September 2008

ppa. Dr. Holger Lehmitz  
Director of the Safety Systems Division

ppa. Werner Lehner  
Director of Product Management  
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