# Leuze electronic

the sensor people

L200 Safety Locking Devices



EN 2013/10 - 607320 We reserve the right to make technical changes

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# **△** Leuze electronic

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# 1 About this document

# 1.1 Other applicable documents

The information on the L200 safety locking device is divided into two documents. Document "L200 Application information" contains only the most important safety notices.

Table 1.1: Documents for the L200 safety locking device

Purpose and target group	Title	Source
Detailed information for all users	L200 Safe implementation and operation (this document)	On the Internet, download from: http://www.leuze.com/l200/
Basic information for technicians and operating company	L200 Application information	Print document part no. 607246 included in the delivery contents of the product

# 1.2 Used symbols and signal words

Table 1.2: Warning symbols and signal words

<u> </u>	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 serious 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

$\bigcap_{\square}$	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.
xxx	Placeholder in the product description for all variants

<sup>♥</sup> For the safe implementation, testing and operation, download document "L200 Safe implementation and operation" from http://www.leuze.com/l200/or request it from service.protect@leuze.de or tel. +49 8141 5350-111.

# 2 Safety

Before using the safety locking device, a risk evaluation must be performed according to valid standards (e.g. EN ISO 12100, EN ISO 13849-1). For mounting, operating and testing, document "L200 Safe implementation and operation", application information as well as all applicable national and international standards, regulations, rules and directives must be observed. Observe and print out relevant and supplied documents and distribute to the affected personnel.



## WARNING

# Serious accidents may result if the voltage supply is interrupted!

If the voltage supply to the electromagnet of an electromagnetically locked safety locking device is interrupted, the protective device may be opened immediately.

The following standards apply for the risk evaluation at the protective device prior to using the safety locking device:

- EN ISO 12100, Safety of machinery, risk assessment
- 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 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
- Electromagnetic compatibility 2004/108/EC
- Use of work equipment directive 2009/104/EG
- · Safety regulations
- · Accident-prevention regulations and safety rules
- · Industrial safety regulation and employment protection act
- · Product Safety Act
- For safety-related information you may also contact the local authorities (e.g., industrial inspectorate, employer's liability insurance association, labor inspectorate, occupational safety and health authority).

## 2.1 Approved purpose and foreseeable improper operation

### 2.1.1 Proper use

- The safety locking device must only be used after it has been selected in accordance with the
  respectively applicable instructions and relevant standards, rules and regulations regarding labor
  protection and safety at work, and after it has been installed on the machine, connected, commissioned, and checked by a competent person.
- When selecting the safety locking device it must be ensured that its safety-related capability meets or exceeds the required performance level PL, ascertained in the risk assessment.
- 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.



## WARNING

# A running machine can cause severe injuries!

Make certain that, during all conversions, maintenance work and inspections, the system is securely shut down and protected against being restarted.

L200 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 they prevent premature opening during the lag time before

the dangerous state has ended. Electromagnetic safety locking devices may only be used instead of spring-locked safety locking devices in exceptional cases and following appropriate risk evaluation. 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
- upon actuation of the emergency release button, the protective device can be opened immediately in the event of an emergency, even while the machine is running (this triggers a stop signal)

The emergency release button must only be accessible to operating personnel from within the closed protective device.

Furthermore, the L200 safety locking device must not be used under the following conditions:

- · 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
- · in the event of electromagnetic interference
- 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:

- Never unlock the safety locking device before the dangerous state has ended (Exception: Actuation of the emergency release button).
- Observe the permissible environmental conditions for storage and operation (see chapter 13 "Technical data").
- Immediately replace damaged safety locking devices according to these instructions.
- \$\text{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, actuator 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.
- The safety locking device must be exchanged after a maximum of 20 years.

#### 2.1.2 Foreseeable misuse

Any use other than that defined under the "approved purpose" or which goes beyond that use of the safety locking device is considered improper use!

E.g. using without non-detachably mounted actuator

- looping into the safety circuit parts that are not relevant to safety
- · using the locking device as a limit stop

## 2.2 Competent personnel

Prerequisites for competent personnel:

- suitable technical training
- knows the rules and regulations for labor protection, 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

△ Leuze electronic Safety

# 2.3 Responsibility for safety

Manufacturer and operating company 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 operating company
- · adhering to all regulations and directives for the safe starting-up of the machine

The operating company is responsible for:

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

## 2.4 Disclaimer

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
- · Reasonably foreseeable misuse is not taken into account

# 3 Device description

The safety locking device of the L200 series is an electro-mechanical switching device in a metal housing for heavy-duty applications satisfying protection rating IP 67. By means of the funnel-shaped insertion opening, the actuator self-centers, even if the door is slightly misadjusted. Two LEDs indicate the activation state of the magnet. The safety locking device is also available in versions with auxiliary release and emergency release button (see table 14.1). In the latter case, various extensions (accessories) enable optimal adaptation to the special requirements of local conditions.



- 1 Deflection head
- 2 Dust cover
- 3 Insertion opening for actuator
- 4 Auxiliary release (L200-M1C3-SLM24-L2G, L200-M1C3-SLM24-PB-L2G and L200-M0C3-SLM24-L2G)
- 5 Control LEDs
- 6 Housing cover
- 7 Name plate (connection data, production code and year of manufacture)
- 8 Emergency release button (L200-M1C3-SLM24-PB-L2G)

The actuation directions of the deflection head and emergency release button 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.

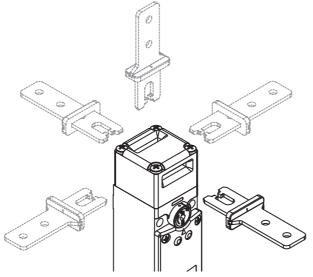


Figure 3.1: Approach directions

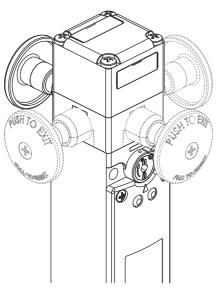


Figure 3.2: Actuation directions of the emergency release button

#### 4 Functions

# 4.1 Spring locking

With the L200-M1C3-SLM24-L2G, L200-M1C3-SLM24-PB-L2G and L200-M0C3-SLM24-L2G the safety contacts close when the actuator moves in, and the actuator is mechanically held in the locked position by the spring force. The dangerous process can be activated via the safety relay.

After the dangerous process has stopped, the operating voltage for unlocking the electromagnet is applied and the actuator is released. The protective device can be opened. In the event of failure of the operating voltage, release is also possible via the auxiliary release.

# 4.2 Electromagnetic locking

With the **L200-M1C3-MLM24-L2G**, the safety contact for the position monitoring of the protective device closes when the actuator is moved in. The electromagnet is energized and holds the actuator in the locked position. The dangerous process can be activated via the safety relay.

On release, the voltage supply to the electromagnet is interrupted. The electromagnet releases the actuator and the protective device can be opened.

# 4.3 Emergency release button

With the L200-M1C3-SLM24-PB-L2G, the protective device can be opened immediately following actuation of the emergency release button, even while the machine is running (in addition, a stop command is triggered).

# 4.4 LED display



Two LEDs are directly connected to the voltage supply of the magnet and indicate the activation.

# 5 Applications

L200 safety locking devices with spring locking are suitable for e.g. position monitoring and locking the following protective devices:

- · turning or swiveling moveable guards
- · laterally moveable protective gratings or sliding gates
- · heavy, moveable guards or sliding gates
- confusing or unclear danger zones (emergency release button)

Safety locking devices with electromagnetic lock are used primarily as locks for moveable guards to prevent undesired process interruptions.

# 6 Mounting



## **WARNING**

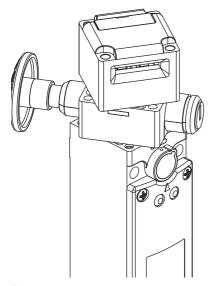
# Severe accidents may result if the safety locking device is not mounted properly!

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.

- b Mounting may only be performed by competent personnel.
- \$\times\$ Observe standards, regulations and these instructions.
- Protect the housing and deflection head from materials penetrating the enclosure (environmental conditions see chapter 13 "Technical data").
- ♦ Test to ensure proper function.

# 6.1 Adjusting the deflection head

- \$ Unscrew the 4 screws on the deflection head.
- \$\text{Turn the deflection head (and, if applicable, the emergency release button) in the desired direction.



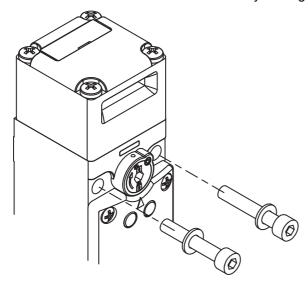
- ♥ Tighten the 4 screws on the deflection head with 0.8–1.2Nm.
- Street Close unused opening with the dust cover.

# 6.2 Mounting the safety locking device

Prerequisites for mounting:

- deflection head is set (and, if applicable, emergency release button)
- · fully assembled
- \$ 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
  - · accessible to qualified personnel for testing and replacement
  - · auxiliary release is accessible to qualified personnel
  - emergency release button is only accessible to operating personnel from within the closed protective device

\$ Position washers and screw down safety locking device with 2–3Nm.



# 6.3 Mounting the actuator

# **NOTICE**

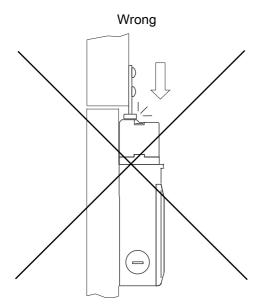
# The safety locking device may be damaged if mounted improperly!

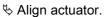
Use separate mechanical limit stop for the moving part of the protective device.

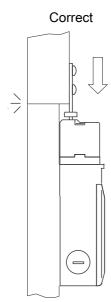
Align actuator so that it does not hit or rub against the edges of the insertion opening.

# Prerequisites for proper function:

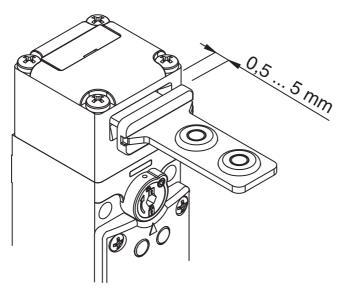
- · actuator is not deformed or damaged
- actuator is appropriate for the safety locking device Proper function is ensured only with original accessories (see chapter 14.1 "Accessories").







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





## 7 Electrical connection



# WARNING

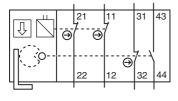
Serious accidents may result if the electrical connection is faulty!

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 13 "Technical data")
- · cable gland with appropriate protection rating
- maximum current load is observed (see chapter 13 "Technical data")



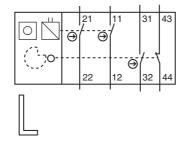
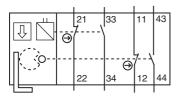


Figure 7.1: Contact block 3NC + 1NO (L200-M1C3-SLM24-PB-L2G, L200-M1C3-SLM24-L2G, L200-M1C3-MLM24-L2G)



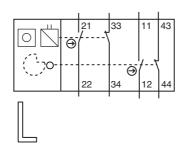


Figure 7.2: Contact block 2NC + 2NO (L200-M0C3-SLM24-L2G)

The two green LEDs are already connected to the voltage supply of the electromagnet and do not need to be connected.

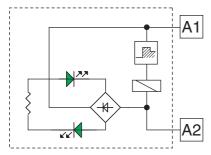


Figure 7.3: Wiring of the electromagnet via terminals A1 and A2



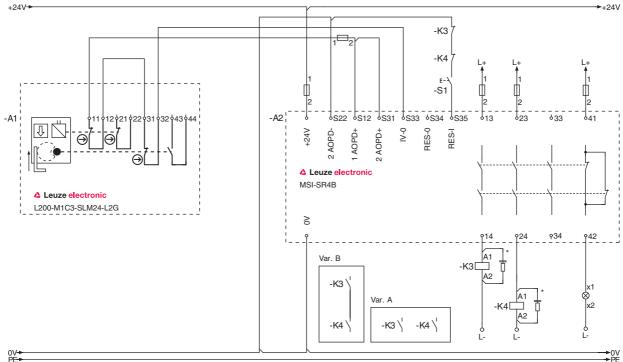
## DANGER

Risk of death by electric shock!

Interrupt the voltage supply to the safety locking device.

Unscrew the housing cover.

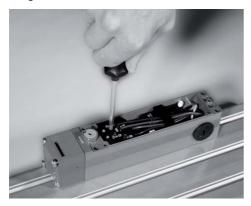
Connect the contact block according to the application-specific circuit diagram.
+24V►



Spark extinction circuit, suitable spark extinction provided

Figure 7.4: Connection example L200-M1C3-SLM24-L2G

♥ Tighten cable terminal screws with 0.6–0.8Nm.



♥ Tighten the housing cover with 0.8–1.2Nm.

# 8 Starting up the device



# **WARNING**

# Severe 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 (exception in emergencies: emergency release button).

# 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.

Leuze electronic **Testing** 

#### 9 **Testing**

L200 safety locking devices are maintenance-free.

- Always replace the entire safety locking device including actuator.
- \$\foating\$ 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 13 "Technical data").
- 🔖 Test to ensure proper mechanical and electrical function (see chapter 9.2 "To be performed periodically by competent personnel").

#### 9.2 To be performed periodically by competent personnel

#### Mechanical function

- \$\text{Stop the dangerous state and open the protective device.}
- \$ Check that the components are securely fastened.
- ♦ Test the cable entry for leaks.
- \$ Check safety locking device and actuator for damage, deposits, deformation and wear.
- \$\text{ If present, test auxiliary release.}
- \$ If present, test emergency release button.
- \$\text{Test several times whether the actuator can be easily moved into the safety locking device.

#### **Electrical function**



# ⚠ WARNING

#### Severe accidents 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.
- Solution Close the protective device and start the machine.
- ♦ Make certain that the protective device cannot be opened until after the machine has been shut down and the safety locking device has been released.
- Make certain that the dangerous state ends before the protective device can be opened.



#### DANGER

## Risk of life-threatening injury while the machine is running!

- Do not remain in the danger zone while testing the emergency release button.
- \$\forall \text{ If present, test whether actuation of the emergency release button immediately releases the actuator and stops the machine.

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



# ↓ WARNING

#### Severe accidents 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.
- 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.
- Nake certain that the protective device cannot be opened until after the machine has been switched off and the safety locking device has been released.

# 10 Cleaning

There must be no soiling (e.g. shavings or 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

♥ For disposal observe the applicable national regulations regarding electronic components.

# 12 Service and support

Telephone number for 24-hour standby service: +49 (0) 702 573-0

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

E-mail:

service.protect@leuze.de

Return address for repairs: Service Center Leuze electronic GmbH + Co. KG In der Braike 1 D-73277 Owen / Germany

# 13 Technical data

Table 13.1: General

Switch type	Interlock device with guard interlocking according to EN 1088
Actuator, external	AC-AHLxx series: straight, angled, resilient, alignable
Lock type	L200-M1C3-SLM24-L2G: spring force L200-M0C3-SLM24-L2G: spring force L200-M1C3-SLM24-PB-L2G: spring force L200-M1C3-MLM24-L2G: electromagnetic
Lock actuation	L200-M1C3-SLM24-L2G: spring L200-M0C3-SLM24-L2G: spring L200-M1C3-SLM24-PB-L2G: spring L200-M1C3-MLM24-L2G: electromagnet
Approach actuation directions	1 x above, 4 x lateral (90°)
Approach speed	min. 1 mm/s, max. 0.5 m/s
Actuation force (pull-out)	30 N
Mechanical life time in accordance with IEC 60947-5-1	1 x 10 <sup>6</sup> switching cycles
Actuation frequency according to IEC 60947-5-1	max. 600 per hour
Service life (T <sub>M</sub> ) in accordance with EN ISO 13849-1	20 years
Number of cycles before dangerous failure (B10d) according to EN 61810-2	5,000,000
Usage category according to EN 60947-5-1	AC 15 (Ue / Ie): 250 V / 5 A DC 13 (Ue / Ie): 24 V / 6 A 125 V / 1.1 A 250 V / 0.4 A
Maximum load when using 5-pin cables: Maximum load when using 8-pin cables:	24 V / 4 A (see chapter 14.1 "Accessories")
waximum load when using o-pin cables.	24 V / 4 A (see chapter 14.1 "Accessories")
Dimensions (dimensional drawings)	see chapter 13.1 "Dimensions"

Table 13.2: Safety

Protection class	IP 67
Contact protection	grounding
Recoil tolerance	4.5 mm
Interlocking force	max. 2500 N

Contact allocation	magnet: 2NC actuator: 1NC + 1NO (L200-M1C3-SLM24-L2G, L200-M1C3-SLM24- PB-L2G, L200-M1C3-MLM24-L2G) magnet: 1NC + 1NO actuator: 1NC + 1NO (L200-M0C3-SLM24-L2G)
Contact material	silver alloy
Switching principle	slow-action contact
Contact opening	force-fit
Rated insulation voltage	250 V AC, 300 V DC
Conventional thermal current	max. 10 A
Short-circuit protection according to IEC 60269-1	magnet: 0.5 A, 24 V, type gG safety circuit: 10 A, 500 V, type gG
Magnet operating voltage and tolerance	24 V DC (-10 % +25 %)
Switch-on time	100 %
Power consumption	average, 9 VA

# Table 13.3: Housing

Housing material	metal
------------------	-------

# Table 13.4: Connection

Number of cable entries	3
Type of cable entry	M20 x 1.5
Conductor cross-section (stranded)	1 x 0.34 mm <sup>2</sup> 2 x 1.5 mm <sup>2</sup>

## Table 13.5: Environment

Temperature range, operation	−25 +60°C
Dirt level, external, according to EN 60947-1	3

These tables do not apply in combination with additional M12 plug or connecting cable except where these components are explicitly mentioned.

# 13.1 Dimensions

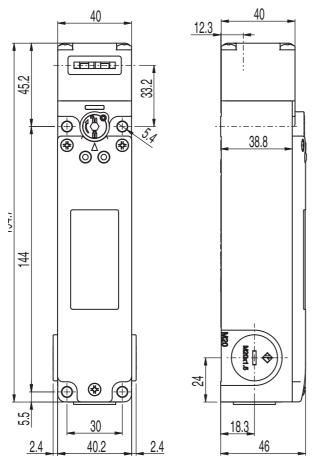


Figure 13.1: Dimensions of L200-M1C3-SLM24-L2G in mm

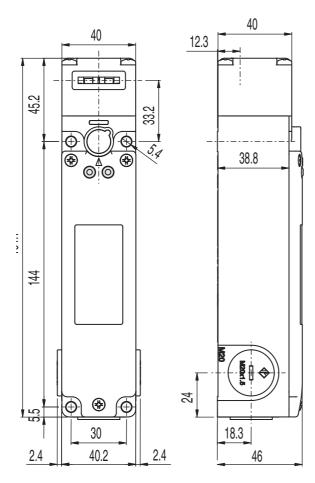


Figure 13.2: Dimensions of L200-M1C3-MLM24-L2G in mm

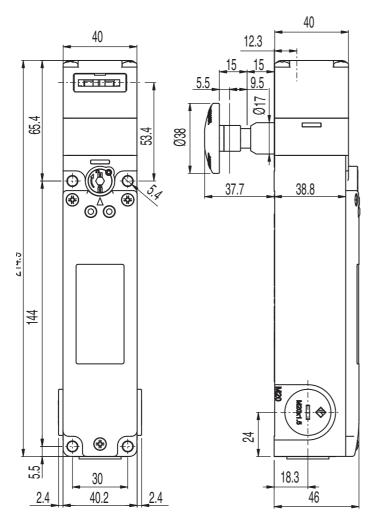


Figure 13.3: Dimensions of L200-M1C3-SLM24-PB-L2G in mm

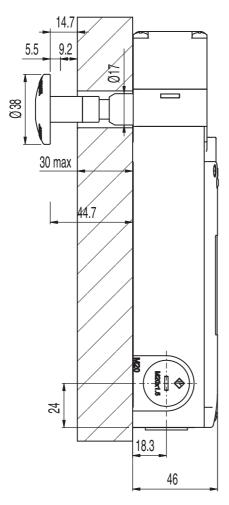


Figure 13.4: Dimensions of L200-M1C3-SLM24-PB-L2G in mm

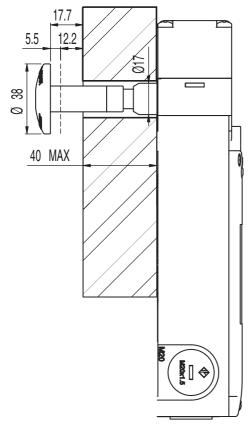


Figure 13.5: Dimensions of AC-PB40-L200 in mm

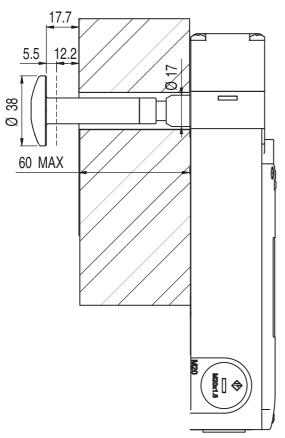


Figure 13.6: Dimensions of AC-PB60-L200 in mm

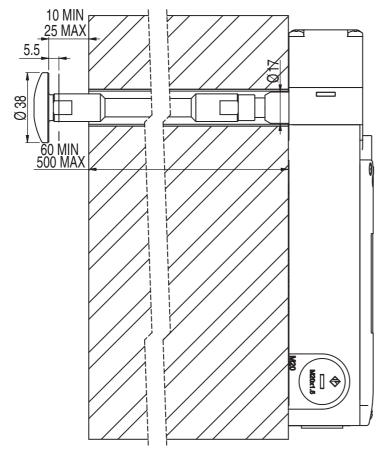


Figure 13.7: Dimensions of AC-PB500-L200 in mm

# 14 Ordering information and accessories

Table 14.1: L200 safety locking devices

Article	Part no.	Description
L200-M1C3-SLM24-L2G	63000650	Mechanical locking, auxiliary release
L200-M0C3-SLM24-L2G	63000653	Mechanical locking, auxiliary release
L200-M1C3-MLM24-L2G	63000651	Electromagnetic locking
L200-M1C3-SLM24-PB-L2G	63000652	Mechanical locking, auxiliary release, emergency release button

# 14.1 Accessories

Table 14.2: Actuators of the AC-AHL series for the L200 safety locking device

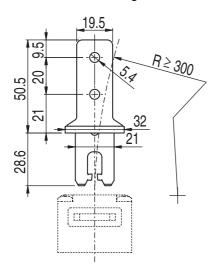
Article	Part no.	Description
AC-AHL-S	63000740	L-series, straight
AC-AHL-A	63000741	L-series, angled
AC-AHL-RM	63000742	L-series, straight, rubber-mounted fastening
AC-AHL-F4J2-TK	63000743	L-series, straight, flexible in 4 directions, adjustable in 2 directions, turning head

Table 14.3: Accessories for the L200 safety locking device

Article	Part no.	Description
AC-A-M20-12NPT	63000843	Adapter, M20 x 1.5 on 1/2 NPT
AC-PLM-8	63000845	Built-in plug, M12, metal, with internal 8-pin connection cable
AC-KL-AHL	63000847	Actuator interlock, for locking the actuator introduction
AC-Exit-PB	63000749	Stick-on label Push To Exit
AC-PB15-L200	63000750	Extension of the emergency release button, length 15 mm with screws
AC-PB30-L200	63000751	Extension of the emergency release button, length 30 mm with screws
AC-PB40-L200	63000752	Extension of the emergency release button, length 40 mm with screws
AC-P605-L200	63000753	Extension of the emergency release button, length 60 mm with screws
AC-PB500-L200	63000754	Extension of the emergency release button, length 60 to 500 mm with screws and two mounting brackets
CB-M12-5000E-5GF	678055	PUR, 5-pin, 5m, shielded, M12 coupling, straight, prefabricated on one end
CB-M12-10000E-5GF	678056	PUR, 5-pin, 10 m, shielded, M12 coupling, straight, prefabricated on one end
CB-M12-15000E-5GF	678057	PUR, 5-pin, 15 m, shielded, M12 coupling, straight, prefabricated on one end

Article	Part no.	Description
CB-M12-25000E-5GF	678058	PUR, 5-pin, 25 m, shielded, M12 coupling, straight, prefabricated on one end
CB-M12-5000E-8GF	678060	PUR, 8-pin, 5 m, shielded, M12 coupling, straight, prefabricated on one end
CB-M12-10000E-8GF	678061	PUR, 8-pin, 10 m, shielded, M12 coupling, straight, prefabricated on one end
CB-M12-15000E-8GF	678062	PUR, 8-pin, 15 m, shielded, M12 coupling, straight, prefabricated on one end
CB-M12-25000E-8GF	678063	PUR, 8-pin, 25 m, shielded, M12 coupling, straight, prefabricated on one end

# 14.1.1 Dimensional drawings: accessories



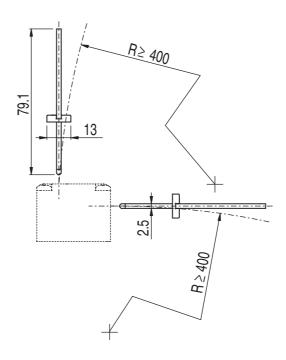
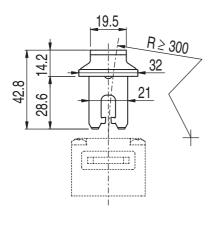


Figure 14.1: AC-AHL-S actuator



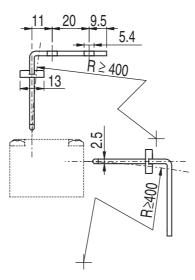


Figure 14.2: AC-AHL-A actuator

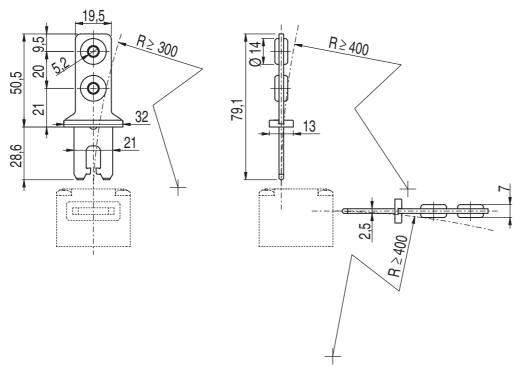


Figure 14.3: AC-AHL-RM actuator

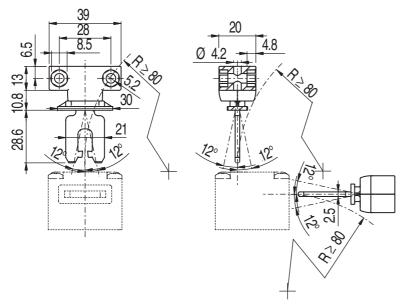


Figure 14.4: AC-AHL-F4J2-TK actuator

#### 15 **EC Declaration of Conformity**



the sensor people

**EG-KONFORMITÄTS-ERKLÄRUNG** (ORIGINAL)

**EC DECLARATION OF CONFORMITY** (ORIGINAL)

**DECLARATION CE DE CONFORMITE** (ORIGINAL)

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