

Original operating instructions

L100 Safety Locking Devices



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Leuze electronic GmbH + Co. KG

In der Braike 1

D-73277 Owen / Germany

Phone: +49 7021 573-0

Fax: +49 7021 573-199

<http://www.leuze.com>

info@leuze.com

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1 About this document

1.1 Other applicable documents

The information on the L100 Safety Locking Device is divided into two documents. Document "L100 Application information" contains only the most important safety notices.

↳ For the safe implementation, testing and operation, download document L100 Safe implementation and operation from <http://www.leuze.com/l100/> or request it from service.schuetzen@leuze.de or tel. +49 8141 5350-111.

Table 1.1: Documents for the L100 Safety Locking Device

Purpose and target group	Title	Source
Detailed information for all users	L100 Safe implementation and operation (this document)	On the Internet, download from: http://www.leuze.com/l100/
Basic information for technicians and operating company	L100 Application information	Print document part no. 607244 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.
xxx	Placeholder in the product description for all variants

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 L100 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 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 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 directive 2004/108/EC
- Use of work equipment directive 89/655 EEC
- Safety regulations
- Accident-prevention regulations and safety rules
- Ordinance on Industrial Safety and Health and Labor Protection Act
- Device Safety Act

NOTICE	
	For safety-related information you may also contact the local authorities (e.g., industrial inspectorate, employer's liability insurance association, labor inspectorate, labor protection 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 again.

L100 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

Furthermore, the L100 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.
- ✚ 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, 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

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

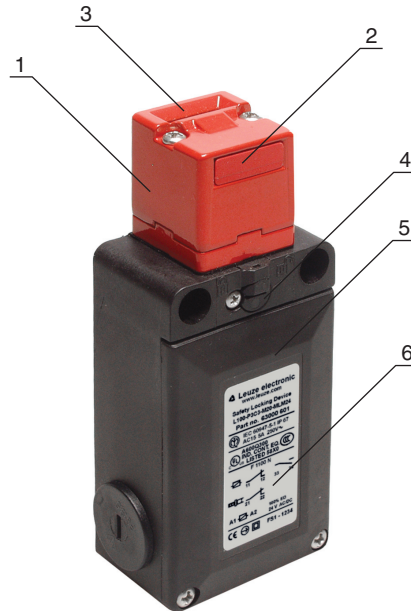
2.4 Exemption of liability

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
- reasonably foreseeable misuse is not taken into account

3 Device description

The Safety Locking Device of the L100 series is an electro-mechanical switching device in a housing made of glass-fibre-reinforced and non-combustible plastic; the device satisfies protection rating IP 66. By means of the funnel-shaped insertion opening, the actuator self-centers, even if the door is slightly misadjusted. For magnet supply voltage of 24V, the influences of inrush power on current supply can be reduced by adjusting via dip switch. The spring-actuated models (L100-Pxxx-SLM24) are equipped with an auxiliary release located below the deflection head.



- 1 Deflection head
- 2 Dust cover
- 3 Insertion opening for actuator
- 4 Auxiliary release (L100-Pxxx-SLM24)
- 5 Housing cover
- 6 Name plate (connection data, production code and year of manufacture)

Table 3.1: L100 Safety Locking Devices

Article	Part No.	Description
L100-P3C3-M20-SLM24	63000600	Mechanical locking (spring force), manual auxiliary release, slow action contacts M:(1NC+1NO) A:(1NC)
L100-P3C3-M20-MLM24	63000601	Electromagnetic locking, slow action contacts M:(1NC+1NO) A:(1NC)
L100-P4C3-M20-SLM24	63000602	Mechanical locking (spring force), manual auxiliary release, slow action contacts M:(2NC) A:(1NC)

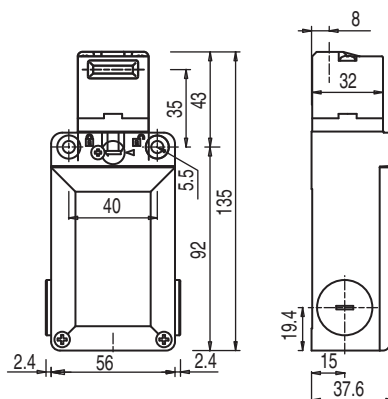


Figure 3.1: Dimensions of L100-P3C3-M20-SLM24 and L100-P4C3-M20-SLM24 in mm

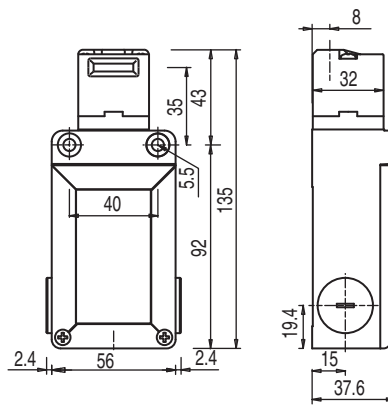


Figure 3.2: Dimensions of L100-P3C3-M20-MLM24 in mm

The deflection head can be turned in 90° increments and set to 5 approach directions. A selection of different actuators ensures that the Safety Locking Device can be mounted in any position.

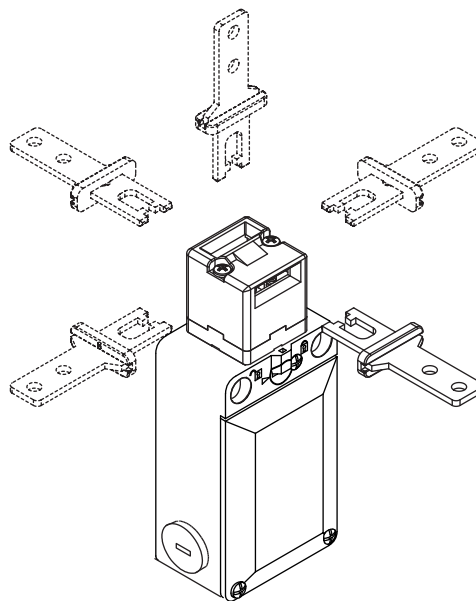


Figure 3.3: Approach directions

4 Functions

4.1 Spring locking

With the **L100-P3C3-M20-SLM24** and **L100-P4C3-M20-SLM24**, 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 switching device.

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 **L100-P3C3-M20-MLM24**, 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 switching device.

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

5 Applications

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

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

By the option of reducing inrush power influences on current supply, it allows the installation of 2 or more switches to be connected to same power supply.

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. ↪ 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

- ↪ Unscrew the 2 screws on the deflection head.
- ↪ Turn the deflection head in the desired direction.

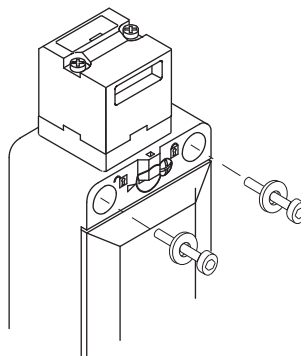


- ↪ Tighten the 2 screws on the deflection head with 0.7–0.9Nm.
- ↪ Close unused opening with the dust cover.

6.2 Mounting the Safety Locking Device

Prerequisites for mounting:

- deflection head has been set
 - 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
 - auxiliary release is accessible to qualified personnel
 - accessible to qualified personnel for testing and replacement
- ↪ Position washers and screw down Safety Locking Device with 2–3Nm.

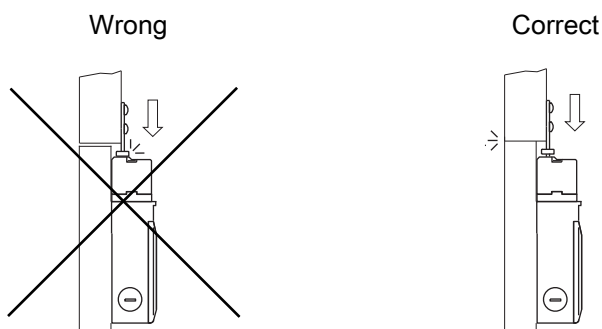


6.3 Mounting the actuator

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.

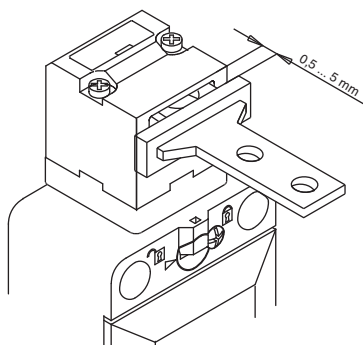
Prerequisites for proper function:

- 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“.



↪ Align actuator.

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



↪ 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 Reducing the influence of inrush power on the current supply

NOTICE



For installation of 2 or more switches connected to the same power supply, the following measure can be taken in order to reduce influences of the inrush power on the current supply.

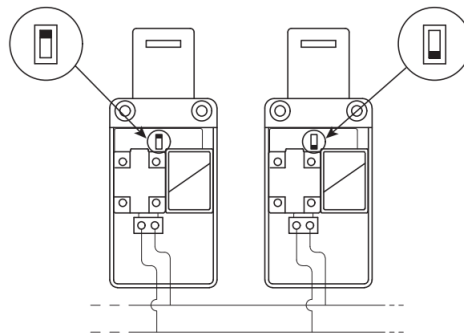
⚠ DANGER!



Risk of death by electric shock!

↪ Interrupt the voltage supply to the Safety Locking Device.

- ↪ Disconnect the power supply.
- ↪ Unscrew the housing cover.
- ↪ Remove the two screws on the black protective cover of the electromagnet.
- ↪ Remove the protective cover.
- ↪ Move the dip-switch with a pin so that each switch has a different combination (see figure below). If more than 2 switches are installed, repeat the combinations for any next set of 2 switches.



- ↪ Mount the black protective cover and screw down with 0.8Nm.
- ↪ Tighten the housing cover with 0.7–0.9Nm.

7.2 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“

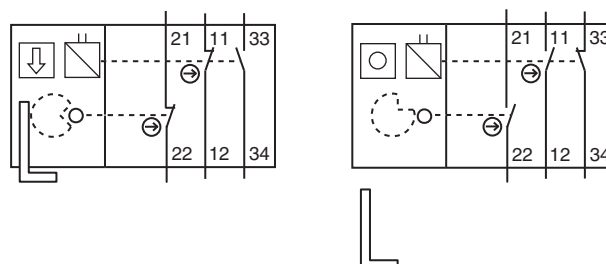


Figure 7.1: Contact block 2NC + 1NO (L100-P3xxx)

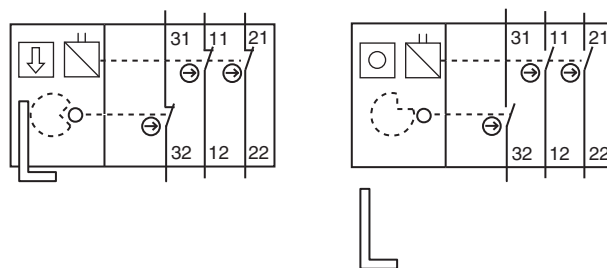
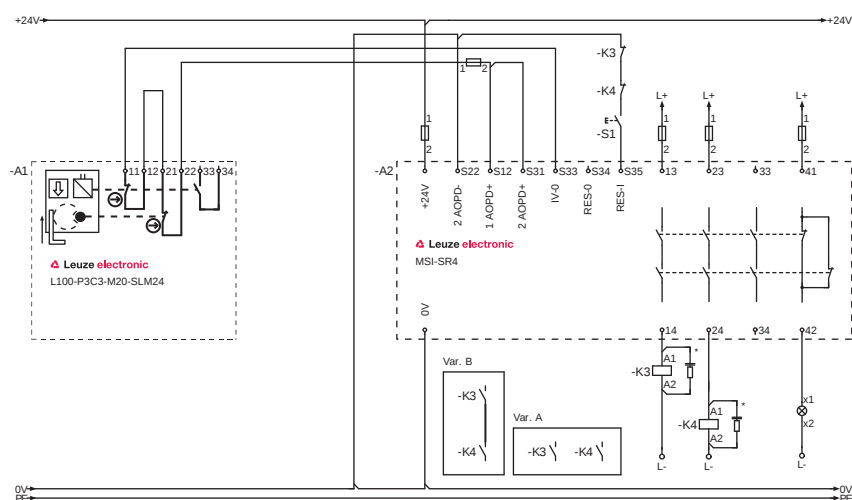


Figure 7.2: Contact block 2NC + 1NC (L100-P4xxx)

⚠ DANGER!**Risk of death by electric shock!**

✋ Interrupt the voltage supply to the Safety Locking Device.

- ✋ Unscrew the housing cover.
- ✋ Connect the electromagnet via terminals A1 and A2.
- ✋ Connect the contact block according to the application-specific circuit diagram.



* Spark extinction circuit, suitable spark extinction provided

Figure 7.3: Connection example L100-P3C3-M20-SLM24

- ✋ 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 unlocked prematurely! ↳ 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

L100 Safety Locking Devices are maintenance free. Nevertheless, they must be replaced after maximum 800,000 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 „To be performed periodically by competent personnel“.

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 Safety Locking Device and actuator for damage, deposits, deformation and wear.
- ↪ If present, test auxiliary release.
- ↪ 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.
- ↪ 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.

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.
- ↪ 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.

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

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

12 Service and support

Telephone number for 24-hour standby service:
+49 (0) 7021/ 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 16.00 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 - Teck / Germany

NOTICE



Leuze electronic offers a regular safety inspection by a competent person.

13 Accessories

Table 13.1: Actuators of the AC-AH series for the L100 Safety Locking Device

Article	Part No.	Description
AC-AH-S	63000720	Straight
AC-AH-A	63000721	Angled
AC-AH-F4	63000722	Straight, flexible, 4 directions
AC-AH-F2J2	63000723	Straight, flexible, 2 directions, alignable 2 directions
AC-AH-F1J2	63000724	Straight, flexible, 1 direction, alignable 2 directions
AC-AH-F4J2-TK	63000725	Straight, flexible, 4 directions, alignable 2 directions, rotatable head

Table 13.2: Accessories for the L100 Safety Locking Device

Article	Part No.	Description
AC-A-M20-12NPT	63000843	Adapter, M20 x 1.5 on 1/2 NPT
AC-PLP-8	63000844	Built-in plug, M12, plastic, with internal 8-pin connection cable
AC-KL-AH	63000846	Actuator interlock, for locking the actuator introduction
CB-M12-5000E-5GF	678055	PUR, 5-pin, 5 m, 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
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

13.1 Accessory dimensional drawings

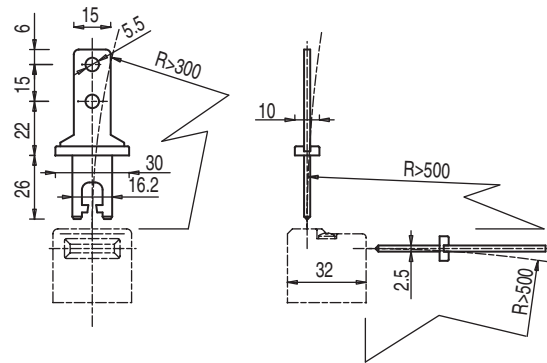


Figure 13.1: AC-AH-S actuator

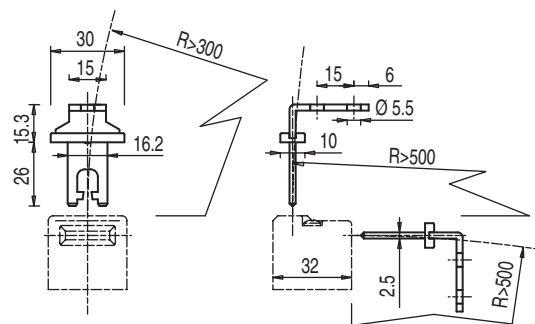


Figure 13.2: AC-AH-A actuator

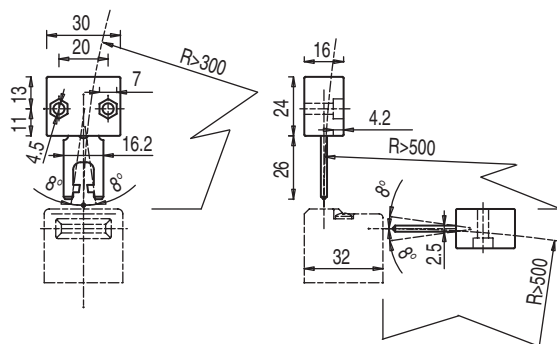


Figure 13.3: AC-AH-F4 actuator

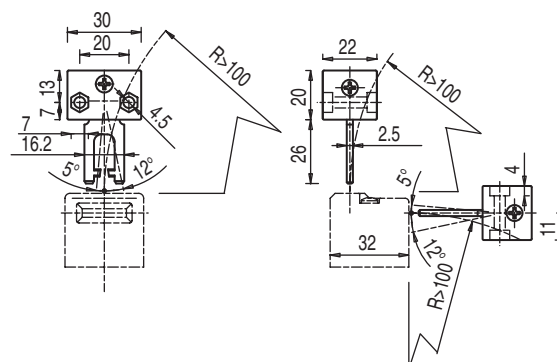


Figure 13.4: AC-AH-F2J2 actuator

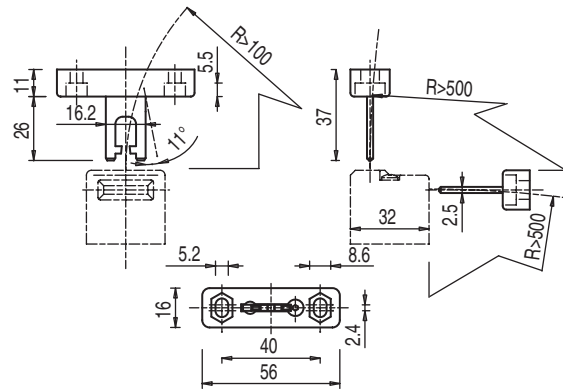


Figure 13.5: AC-AH-F1J2 actuator

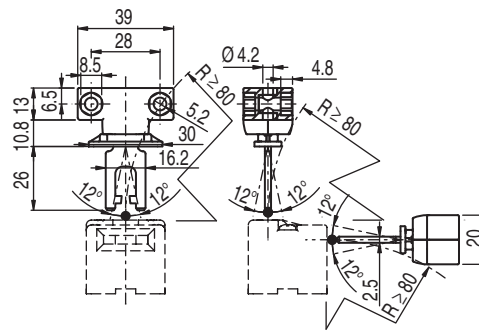


Figure 13.6: AC-AH-F4J2-TK actuator

14 Technical data

Table 14.1: General

Switch type	Interlock device with locking according to EN ISO 14119
Actuator, external	AC-AHxx series: straight, angled, spring-mounted, adjustable
Lock type	L100-Pxxx-SLM24: spring force L100-Pxxx-MLM24: electromagnetic
Lock actuation	L100-Pxxx-SLM24: spring L100-Pxxx-MLM24: electromagnet
Approach actuation directions	1 x above, 4 x side (90°)
Approach speed	min. 1 mm/s, max. 0.5 m/s
Actuation force (pull-out)	30 N
Actuation path, min. with forced separation	10 mm
Mechanical life time in accordance with IEC 60947-5-1	0.8 x 10 ⁶ switching cycles
Actuation frequency according to IEC 60947-5-1	max. 600 per hour
Service life (T _M) 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 (U _e / I _e): 250 V / 6 A 400 V / 4 A 500 V / 1 A DC 13 (U _e / I _e): 24 V / 6 A 125 V / 1.1 A 250 V / 0.4 A
Maximum load when using 5-pin cables: Maximum load when using 8-pin cables:	24 V / 4 A see chapter 13 „Accessories“ 24 V / 2 A see chapter 13 „Accessories“
Dimensions (dimensional drawings)	see chapter 3

Table 14.2: Safety

Protection rating	IP 66
Contact protection	protective insulation O
Recoil tolerance	4.5 mm
Interlocking force	max. 1100 N
Contact allocation	L100-P3xxx: magnet: 1NC + 1NO, actuator: 1NC L100-P4xxx: magnet: 2NC, actuator: 1NC

Contact material	silver alloy
Switching principle	slow-action contact
Opening of contact	positive-forced
Rated insulation voltage	400 V AC
Conventional thermal current	max. 10A
Short-circuit protection according to IEC 60269-1	magnet: 1.0A, 24V, type aM safety circuit: 10A, 500V, type aM
Magnet operating voltage and tolerance	24VDC (−10% to +25%)
Switch-on time	100%
Power consumption	average 20VA
Switch-on power limit, adjustable	4-way

Table 14.3: Housing

Housing material	fiberglass-reinforced, thermo-plastic plastic, self-extinguishing
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Table 14.4: Connection

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

Table 14.5: Environment

Temperature range, operation	−25 ... +60 °C
Degree of contamination, external, according to EN 60947-1	3

NOTICE



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

15 EC Declaration of Conformity

The L100 Safety Locking Device have been developed and manufactured in compliance with applicable European standards and directives.

You can find the declaration of conformity at **www.leuze.com** in the download area of the corresponding product.