

1 INFORMATION ON THIS DOCUMENT

1.1 Function

The present operating instructions provide information on installation, connection and safe use of the L300 series safety switch for interlock devices with or without guard interlocking, according to the EN ISO 14119 standard.


1.2 Addressed to: qualified personnel only


The operations you find explained in the present instruction sheet must exclusively be carried out by qualified personnel, who are perfectly able to understand them and have been duly authorised.

1.3 Original instructions

This document contains the original instructions.


2 SYMBOLS USED


 This symbol indicates any relevant complementary information.

 Warning: Disregarding this warning notice may result in breakage or malfunction and even the loss of the safety function.


3 MOUNTING INSTRUCTIONS

3.1 Choosing the type of actuator

 **Warning:** The switch is available with two RFID actuator types: one with a high coding level (UCA) and one with a low coding level (SCA). In the case where an actuator with a low coding level has been chosen, ensure that the additional specifications prescribed in paragraph 7.2 of the EN ISO 14119:2013 standard are respected during installation. Moreover, any other "SCA actuators" present in the same place where the switch has been installed must be segregated and kept under strict control in order to avoid any manipulation of the safety device.

 It is advisable to use actuators with a high coding level so as to make the installation safer and more flexible. This will render it unnecessary to screen the device, to fit it in non-accessible areas or to follow other prescriptions specified by the EN ISO 14119 standard for actuators with low coding level.


3.2 Selecting the operating principle

 **Warning:** The switch is available with two operating principles:

- Operating principle SLM24 = Actuator locked if electromagnet is deactivated (spring lock; unlock by activating I4 input).
- Operating principle MLM24 = Actuator locked if electromagnet is activated (spring lock; lock by activating I4 input).

Operation principle SLM24 keeps the door lock even in the case where the machine is disconnected from the power supply. Therefore, if the machine is subject to dangerous movements with inertia, all dangerous elements are made fully inaccessible (door locked) even in case of sudden power failure. On the contrary, if the machine structure allows a person to enter the danger area with the whole body and possibly end up being stuck inside the machine, the switch must be provided with an escape release button, in order to allow the trapped person to get out even in case of power failure.

Operation principle MLM24 keeps the door lock only when the machine is connected to the power supply. Therefore, before choosing this operation principle, carefully evaluate all dangers deriving from sudden power failure with a consequent possible immediate safety door release.

 In case of machines without stopping time, i.e. with dangerous elements being immediately blocked as soon as the safety door is opened, for which a safety switch was chosen merely to safeguard the production process, operation principle SLM24 or MLM24 can equally be used.

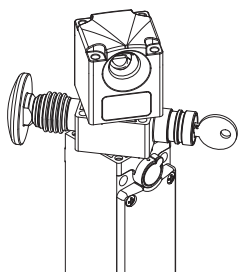
3.3 Selecting the operating mode for activation of safety outputs

Warning: The switch is available with two safety output activation modes:

- **Mode 1 (L300-Mx1x): Safety output active on safety door closed and locked**
- **Mode 2 (L300-Mx2x): Safety output active on safety door closed.**

When the switch and the actuator are correctly mounted on the safety door, a mode 1 switch will activate OSSD safety output only when the guard is both closed and the locking bolt is in the locked position, so the safety door cannot be opened with safety outputs on. Mode 1 switch is a coded type 4 interlock device with guard interlocking acc. to EN ISO 14119.


When the switch and the actuator are mounted on the guard correctly, a mode 2 switch will activate safety output OSSDs when the safety door is closed. This mode allows to lock/unlock the safety door while still keeping on the safety chain, typically for specific applications without stopping time, when the risk does not continue after the opening of the safety door. Care must be taken to evaluate if Mode 2 could be applied safely to the machinery to be protected: Mode 2 device is a high coded type 4 guard locking without lock following EN ISO 14119.




3.4 Device adjustment

If necessary, it is possible to adjust the position of the head and the auxiliary release (if present) in order to turn the device to the most appropriate position for the specific application. Fully remove the 4 screws from

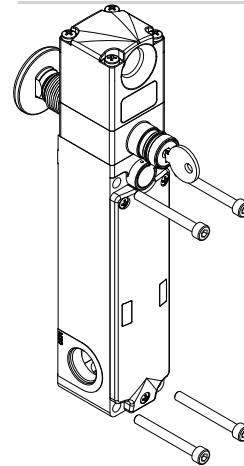
the head to independently turn either the head or the auxiliary release over an arc of 270°.


 **Warning:** Do not force the rotation beyond 270°, otherwise the device could be broken.


Once the adjustment has been completed, re-tighten the head screws with a torque of 0.8 to 1.2 Nm.

 **Warning:** In order to implement safety function number 4 (see par. 4.1) after head adjustment it is mandatory to fasten the two provided safety screws in place of two original screws, in opposite corner positions.

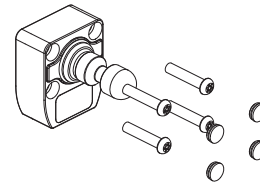
3.5 Device adjustment




 **Warning:** The device must be fixed to the machine by means of 4 M5 screws (not supplied) with a length of 45 mm or more. The device must never be fixed with less than 4 screws. The 4 fastening screws must be able to withstand a pull greater than 20,000 N exerted on the actuator. Tightening torque of 4 M5 screws of 2 ... 3 Nm

 It is advisable to install the device in the top part of the door, in order to prevent any dirt or work residues from getting inside the hole where the actuator is to be introduced. In order to avoid device tampering it is advisable to fix the device to the machine frame with non-removable fastening.


3.6 Fixing the actuator to the safety door



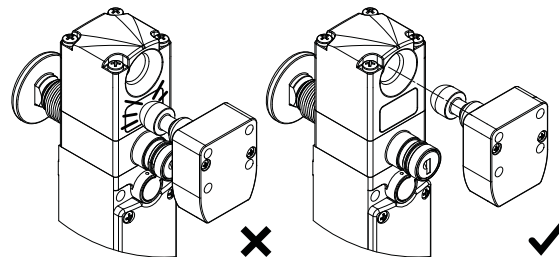
 **Warning:** As prescribed by the EN ISO 14119 standard, the actuator must be permanently fixed to the door frame.


For this purpose the actuator is provided with 4 safety screws (bits for safety screws Torx TR25). After the fixing operation, it is mandatory to plug the holes of the 4 screws using the caps supplied, so that it becomes more difficult to access the screws.

The actuator must always be fixed using at least 4 M5 screws with a length of 20 mm or more. The actuator must never be fixed with less than 4 screws. The 4 screws chosen for fixing (if different from those supplied) must be able to withstand a pull greater than 20,000 N exerted on the actuator. Tightening torque of 4 M5 screws = 2 ... 3 Nm

 For correct mounting, other means can also be used, such as rivets, non-removable one-way security screws or other equivalent mounting systems, as long as they are able to withstand a pulling force greater than 20,000 N.

3.7 Switch-actuator alignment




 **Warning:** Even though the device was designed to help alignment between the head and the respective actuator, excessive misalignment could cause the actuator to be damaged. Periodically check the alignment between the switch and the respective actuator.

Maximum misalignment permitted from the hole axis for rigid doors: +/- 2 mm vertical and horizontal.

The actuator must not hit the outside of the actuator inlet area, and must not be used as a centering device for the safety door.

In the case of application on swing doors, check that the radius between the axis of the actuator pin and the axis of the hinge fitted on the door is greater than 150 mm. Do not use a hammer for the adjustments, unscrew the screws and adjust the device manually, then tighten it in position.

This device is not suitable for applications in which the guard with the permanently attached actuator allows misalignments such as the actuator shaft not entering through the hole of the device head with the door completely closed.

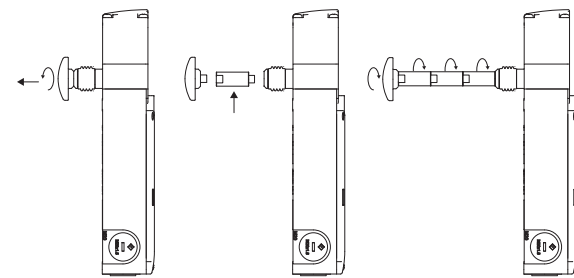
 The switch is provided with a through hole for inserting the actuator. In the case where it is used in dusty places, make sure not to obstruct the outlet

hole opposite the inlet hole. This way, any dust which may go inside the hole will always be allowed to come out of the opposite side.

3.8 Escape release button

Some of the switch versions are provided with a release button in order to allow any personnel accidentally trapped inside the machine to get out. This button, complying with the EN ISO 14119 standard, directly acts on the lock mechanism and immediately releases the actuator regardless of the operating state of the device. Moreover, after being activated, this button causes immediate opening of the OS1 and OS2 outputs in mode 1 switch and the O4 signal output. This button unlocks the door even if the device is not supplied with power. For correct installation of the escape release button, the following prescriptions must be observed:

- The escape release button must be clearly visible from inside the machine.
 - Button activation must be easy, immediate and unrelated to the machine operating status. To help recognize the button and make its function evident, identification stickers are available in various languages. Contact our commercial organisation (see paragraph SUPPORT).
 - The escape release button must not be made easy to activate by an operator standing outside the machine, when the safety door is closed.
 - To guarantee correct operation and handy resetting, a distance ranging from 10 to 35 mm must be kept between the wall from where the button protrudes and the release button.
 - The release button sliding area is to be kept clean. Any dirt or chemical substance getting inside the button can compromise device operation.
 - Check the button periodically (at least once a year) for correct operation.
 - Train the machine operators on correct button operation, to avoid any improper use (i.e. the button must not be used as a clothes-hook).
 - The release button must not be used as a machine emergency stop.
- For installation on walls thicker than 20 mm, extensions are available for the release button.



For correct installation of the extensions, the following prescriptions must be observed:

- Do not exceed an overall length of 500 mm between the release button and the switch.
- Always use some thread locker on each threaded coupling between the button, extensions and switch.
- Avoid twisting or bending the release button, if necessary use an appropriate sliding guide (pipe or bush) when the button and its extensions exceed a length of 100 mm.
- Tightening torque for button and extensions from 4 to 5 Nm.

3.9 Access control

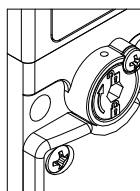
The safety locking device itself does not suffice to protect operators and maintenance engineers if they completely enter the danger zone, as an accidental closing of a safety door behind them can trigger a restart of the machine. If the release to restart is entirely dependent on the safety locking device, a mechanism to prevent this danger must be provided, for example a lock-out system which prevents the machine from restarting. A specific lock-out device is available as an accessory so as to prevent any unintended start of the machine with the operator still inside. Please contact our sales department (see paragraph CUSTOMER SERVICE).

3.10 Auxiliary release with a tool or lock

Some of the switch versions are provided with an auxiliary release in order to allow handy installation (release with a tool) or to permit opening only for authorised personnel (lock release). Both these mechanical devices act inside the switch like the escape release button described previously. Therefore, they also unlock the door in case of no power. These auxiliary release may only be operated by qualified personnel who has received adequate training on the dangers deriving from their use.

How to use the auxiliary release with a tool:

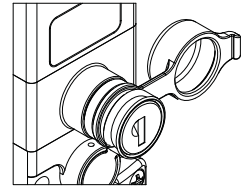
- Unscrew the locking screw with a PH1 cross-head screwdriver.
- Turn the hexagonal-hole bush clockwise by 180°.
- Do not force the bush beyond 180°.
- To avoid any improper use of the auxiliary release with a tool, it is advisable to seal the device through the appropriate hole found in the upper part, or to seal the screw cross head with a few drops of paint.
- After each activating operation, it is advisable to reseal the device.
- For particular applications, versions are available without any



auxiliary release device.

How to use the auxiliary release with lock:

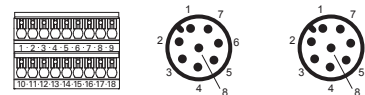
- Open the protection cap.
- Insert the key supplied with the switch and turn clockwise by 180°.
- Do not force the key beyond 180°.
- Each time the key is extracted, close the rubber cap.
- The release key must only be made available to the machine maintenance engineer and kept in a secluded place.
- The release key must not be made available to the machine operator.
- For particular applications, versions are available without any auxiliary release device.



3.11 Connections

Warning: The device is provided with safe electronic semiconductor outputs (OSSDs). These outputs behave in a different way as compared to an electromechanical contact. The use and installation of a safety device with semiconductor outputs are only allowed when all the characteristics of this particular type of outputs are known in detail.

To open the device cover, use a PH2 cross-head screwdriver and tighten the screws with a torque ranging from 0.8 to 1.2 Nm.



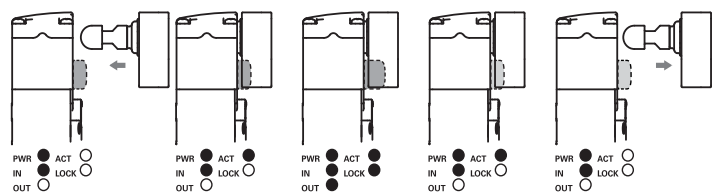
Internal terminal block	M12 connector 8-pin Stand-alone connection	M12 male connector 8-pin Series connection with connector type Y	Connections	
1	3	3	A2	Power supply input 0 V
2	3	3	B2	Auxiliary power supply input 0 V
3	8	8	I4	Electromagnet activation input
4	2	/	O3	Signal output for inserted actuator
5	5	5	O4	Signal output for inserted and locked actuator
6	6	/	I3	Actuator programming input
10	1	1	A1	Power supply input +24 VDC
11	1	1	B1	Auxiliary power supply output +24 VDC, max. 8 A
12	/	2	IS1	Safety input
13	/	6	IS2	Safety input
14	/	/	I5	EDM input (a)
15	4	4	OS1	Safety output
16	7	7	OS2	Safety output

Warning: terminals 7, 8, 9, 17 and 18 must not be used.

(a) Only available in version L300-M5xx

3.12 RFID sensor switching points

The RFID sensor placed in the device recognises the actuator when it is found at a distance of 0 to 3 mm. Within this field, the O3 signal output and the ACT LED are activated to signal the guard-closed condition. In this condition, it is possible to obtain output locking by means of the I4 input. After the locking operation, the LOCK LED and the O4 output are activated; at the same time the RFID sensor increases its releasing distance, so as to ensure that no vibrations or impacts occurring with the guard locked may cause the OS1, OS2 and O4 outputs to open accidentally. If the I4 input is activated or deactivated, without the actuator being present, the device does not carry out any locking and does not activate any of the OS1, OS2, or O4 outputs. In order to open the protection, I4 input must be used; with the protection released, the O4 output will be deactivated and the LOCK LED will be switched off. At this point, the RFID sensor will bring its intervention distance back to the initial values and, after the guard has been opened, the O3 output and the ACT LED will be deactivated.



4 OPERATION

4.1 Definitions

State of the switch:

- OFF: the device is off, not powered.
- POWER ON: status immediately following switching on, when the device carries

out internal tests.

- RUN: status in which the device works normally.
- ERROR: error status in which the safety outputs are deactivated. Indicates that a fault is present inside or outside the device, such as:
 - short circuit between safety outputs (OS1 and OS2),
 - short circuit between a safety output and ground,
 - short circuit between a safety output and the supply voltage,
 - excessive misalignment between a switch and a locked actuator,
 - excess of maximum holding force with failure of the relating device in locked condition,
 - excess of maximum or minimum ambient temperature admitted,
 - internal error.

Safety functions:

The safety functions are defined as follows:

- 1) The OSSD safety outputs must be deactivated when the guard is detected as unlocked (not available on 'Mode 2' versions).
- 2) The OSSD safety outputs must be deactivated when RFID tag is not detected anymore.
- 3) The OSSD safety outputs must be deactivated when at least one safety input channel (IS1 or IS2) is not active.
- 4) The device must keep the protection closed and locked when the electromagnet is active ('MLM24' mode) or inactive ('SLM24' mode) and the applied force is lower than the declared F_{2h} value.

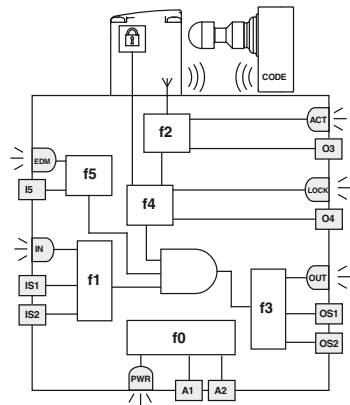
EDM function (on selected versions). External Device Monitoring is a function that allows the device to monitor the state of external contactors. The activation/deactivation state of external contactors must follow the OSSDs state of the L300 switch within a maximum delay time (see the section 4.7).

4.2 Operation description

Note: The following operation description refers to a device with safety outputs active when the protection is closed and locked (mode 1).

A device with active safety outputs when protection is closed (mode 2) differs in the activation of the safety outputs OS1 and OS2 without a locking verification of the protection being performed by function f4.

After being correctly installed by following the present instructions, the safety device can be supplied with power. The sequence below shows the logic functions which interact inside the safety device.



In the initial "POWER ON" status, function f0 of the safety device carries out an internal self-diagnosis which, if successfully completed, brings the device to the "RUN" operating state. If the test is not passed due to an internal fault, the device enters the "ERROR" status. On EDM versions, at power on, the EDM signal is checked and it must be active within 500 ms from device startup. If the positive EDM signal is not present after this time span has elapsed, function f5 puts the device in the error state.

The "RUN" operating state indicates normal operation: Function f1 evaluates the IS1 and IS2 inputs, while at the same time function f2 checks that the actuator is present, and function f4

checks that the actuator has been locked. On EDM versions, f5 additionally checks the coherence of the EDM signal with the status change of the external contactor as well as the operating state "Safety outputs off".

When these three conditions occur, function f3 of the device activates the OS1 and OS2 safety outputs.

The IS1 and IS2 inputs of the device are usually activated simultaneously and therefore they are monitored, in terms of their status and their coherence. The device deactivates the safety outputs and signals a condition of non-coherent inputs by means of IN LED green/orange flashing, in the case where only one of the two inputs is deactivated. In order to reactivate the safety outputs, both inputs must be deactivated first.

During the RUN status, function f0 cyclically carries out internal tests in order to highlight any faults. Any internal error being detected brings the device to the "ERROR" status (PWR LED with red fixed light), which immediately deactivates the safety outputs.

The "ERROR" status can be reached even in the case of short circuits occurring between the safety outputs (OS1 and OS2) or a short circuit of an output towards earth or towards the power supply. Also in this case, function f3 deactivates the safety outputs, and the error status is indicated by the OUT LED red flashing light. The O3 signal output is activated during the "RUN" status when the actuator is inserted in the device, regardless of the status of the IS1 and IS2 inputs. The status of this output is displayed by means of the ACT LED.

The O4 signal output is activated during the "RUN" status when the actuator has been inserted and locked inside the device, regardless of the status of the IS1 and IS2 inputs. The status of this output is displayed by means of the LOCK LED. The actuator locking and releasing operations are controlled by means of the I4 input.

4.3 Actuator replacement

The I3 input can be used, at all times, to replace the coded actuator with a second actuator. By activating this input, the device gets ready for programming mode with the IN LED orange light flashing, it deactivates all the OS1, OS2, O3 and O4 outputs and then releases the actuator. Keep the input active while inserting the second actuator. The completed adoption of the second actuator will be confirmed by the IN LED being switched off. At this point, it is possible to deactivate the I3 input. The

device will automatically be brought to the restarting condition.

The first actuator will no longer be recognised.

The second actuator will have to be adequately fixed to the protection as explained in point 3.6.

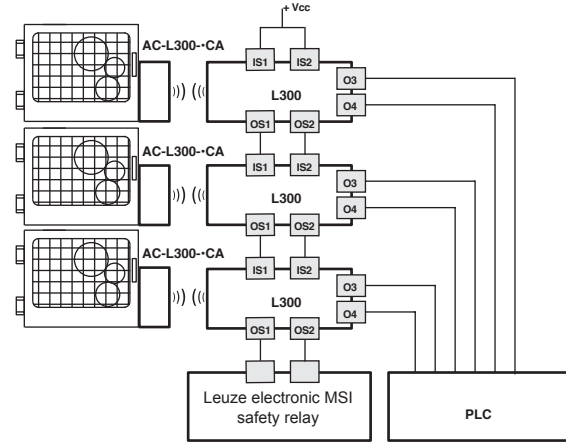
This operation must not be carried out as a repair or maintenance operation.

In the case where the device stops working correctly, replace the entire device and not just the actuator.

4.4 Connection in series with safety modules

It is possible to install several devices in cascade connection up to a maximum number of 32 units, while maintaining safety category 4 / PL e according to EN ISO 13849-1 standard and SIL CL 3 integrity level according to EN 62061 standard.

Check that the PFH_d and $MTTF_d$ values of the system comprising the device cascade, as well as the safety module meet the SIL/PL requirements prescribed for the application.



With this connection method, observe the following directions:

- Connect the inputs of the first device in the chain to the power supply.
- The OS1 and OS2 safety outputs of the last device in the chain must be evaluated by a safety module.
- Only use the device cascade with the safety modules which are compatible with the characteristics of the OS1/OS2 safety outputs. (See paragraph 4.7 COUPLING).

- Observe the limits of the output line stray capacity, as specified in the electrical data. (See paragraph 6.3.2 – ELECTRICAL DATA OF OS1/OS2 SAFETY OUTPUTS).

- Check that the cascade response time fulfills the requirements of the safety function to be obtained.
- The chain response time must be calculated taking into account the response time of each device.

4.5 Operation state: Mode 1 (safety outputs active on locked protection)

PWR LED	IN LED	OUT LED	ACT LED	LOCK LED	EDM ^a	Sensor state	Description
O	O	O	O	O	O	OFF	Device off.
Green /red, alternating	Green /red, alternating	Green /red, alternating	Green /red, alternating	Green /red, alternating	Green /red, alternating	POWER ON	Internal tests at switching on.
Green	O	O	*	*	Green	RUN	Device with safety outputs not active.
Green	Green	*	*	*	*	RUN	Activation of safety inputs.
Green	Green / orange, flashing	O	*	*	*	RUN	Non-coherence of safety inputs. Recommended action: check for presence and/or wiring of inputs.
Green	*	*	Green	*	*	RUN	Actuator in safe area. O3 signal output active.
Green	*	*	Green	Green	O	RUN	Actuator in safe area and locked, O3 and O4 outputs active.
Green	Green	Green	Green	Green	O	RUN	Activation of the IS1 and IS2 safety inputs. Actuator in safe area and locked, O3, O4 and safety outputs active.
Green	*	Red, flashing	*	*	*	ERROR	Error on safety outputs. Recommended action: check for any short circuits between the outputs, outputs and earth or outputs and power supply, then restart the device.

Green	0	0	Red, flashing	0	0	ERROR	Actuator detection error. Check for physical integrity of the device, if faulty replace the entire device. If undamaged, realign the actuator with the switch and restart the device.
Red	0	0	0	0	0	ERROR	Internal error. Recommended action: restart the device. If the fault persists, replace the device.
Green	*	0	*	*	Green	RUN	EDM signal active (external relay OFF) ^a
Green	Green	Green	Green	Green	0	RUN	EDM signal not active (external relay ON) ^a
Green	0	0	0	0	Red, flashing	ERROR	Error in EDM function ^a

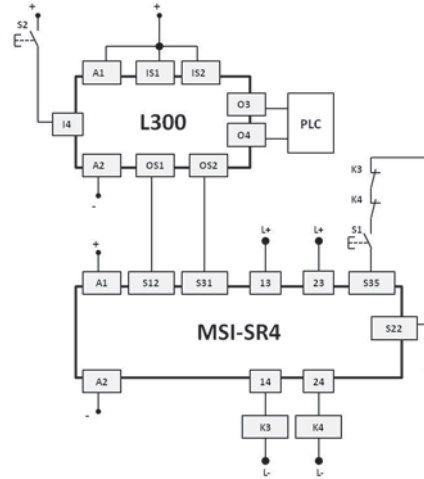
0 = off
* = indifferent
(a) Only available in version L300-M5xx.

4.6 Operation state: Mode 2 (safety outputs active on closed safety door)

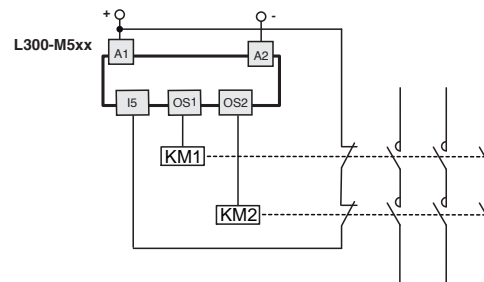
PWR LED	IN LED	OUT LED	ACT LED	LOCK LED	EDM ^a	Sensor state	Description
0	0	0	0	0	0	OFF	Device off.
Green /red, alternating	Green /red, alternating	Green /red, alternating	Green /red, alternating	Green /red, alternating	Green /red, alternating	POWER ON	Internal tests at switching on.
Green	0	0	*	*	Green	RUN	Device with safety outputs not active.
Green	Green	*	*	*	*	RUN	Activation of safety inputs.
Green	Green / orange, flashing	0	*	*	*	RUN	Non-coherence of safety inputs. Recommended action: check for presence and/or wiring of inputs.
Green	*	*	Green	*	*	RUN	Actuator in safe area. O3 signal output active.
Green	*	*	Green	Green	*	RUN	Actuator in safe area and locked, O3 and O4 outputs active.
Green	Green	Green	Green	*	0	RUN	Activation of IS1 and IS2 safety inputs. Actuator in safe area, O3 and safety outputs active.
Green	0	Red, flashing	0	0	0	ERROR	Error on safety outputs. Recommended action: check for any short circuits between the outputs, outputs and earth or outputs and power supply, then restart the device.
Green	0	0	Red, flashing	0	0	ERROR	Actuator detection error. Check for physical integrity of the device, if faulty replace the entire device. If undamaged, realign the actuator with the switch and restart the device.
Red	0	0	0	0	0	ERROR	Internal error. Recommended action: restart the device. If the fault persists, replace the device.
Green	*	0	*	*	Green	RUN	EDM signal active (external relay OFF) ^a
Green	Green	Green	Green	Green	0	RUN	EDM signal not active (external relay ON) ^a
Green	0	0	0	0	Red, flashing	ERROR	Error in EDM function ^a

0 = off
* = indifferent
(a) Only available in version L300-M5xx.

4.7 Coupling



L300 with MSI-SR4 safety relay
2 channels / category 4 / up to SIL 3 PL 3
Connections with EDM
Category 4 / up to SIL 3 / PL e



5 DIRECTIONS FOR CORRECT DEVICE USE

5.1 Installation



Warning: The installation must exclusively be carried out by qualified personnel. The OS1 and OS2 safety outputs of the device must be connected to a safety module (or safety PLC) for their supervision. The O3 and O4 signal outputs are not safety outputs and cannot be used individually in a safety circuit to determine the "protection closed" state.

- Do not deform or modify the device for any reason whatsoever.
- Do not exceed the tightening torques specified in the present manual.
- The device carries out an operator protection function. Any inadequate installation or tampering can cause people serious injuries and even death.
- These devices must neither be avoided (for example by bridging the contacts), nor removed, nor turned or made inefficient in any other way.
- If the machine where the device is installed is used for a purpose other than that specified by the producer, the switch may not provide the operator with efficient protection.
- Before commissioning the machine and also periodically, check for correct switching of the outputs and correct operation of the system comprising the device and associated safety module.
- The safety category of the system comprising the safety switch also depends on external devices and their connection.
- Before installation, make sure that each part of the device is intact.
- Before installation, ensure that the connection cables are not powered.
- Avoid excessive bending of connection cables in order to prevent any short circuits or power failures.
- Do not paint or varnish the device.
- Do not perforate the device; to insert electrical cables only use one of the three M20x1.5 threaded cable inlets found on the device. Do not use the device as a support or rest for other structures, such as cable ducts or sliding guides.
- Before commissioning, make sure that the entire machine or system complies with all applicable standards and EMC directive requirements.
- Do not apply excessive force on the device, after the actuator has been fully inserted.
- The switch fitting surface must always be smooth and clean.
- Should the installer be unable to fully understand the documentation, the product must not be installed and the necessary assistance may be requested (See paragraph SUPPORT).
- When the device is installed on a mobile frame and the actuator is installed on a mobile door, ensure that the device cannot be damaged by simultaneous opening of the frame and the door.
- After installation, check for correct operation of the auxiliary release (if present) and the escape release button (if present).
- Always keep the present operation directions enclosed with the manual of the machine to which the device is fitted.
- The present operation directions must be kept in such a way as to be readily available during the entire period when the device is used.

5.2 Not to be used in the following types of environment

- An environment where continuous temperature changes cause condensation inside the device.
- An environment where the application causes the device to be subject to strong impact or vibration.
- An environment where explosive or flammable gases are present.
- An environment where the device may become coated with ice.
- An environment containing strongly aggressive chemicals, where the products coming into contact with the device may impair its physical or functional integrity.
- An environment where contaminated agents can get in the hole found in the switch head and be deposited inside, which can lead to sealing gasket damage, can stop the fixing pin from sliding or damage it.

5.3 Mechanical stop

- Even if the switch is provided with a rubber bumper positioned between the actuator and the switch, the door must always be provided with an independent end-limit mechanical stop on closing. All that to protect the device from being knocked when the door is slammed hard.
- Do not use the switch as a mechanical door stop.

5.4 Impacts, vibrations and wear

- In case of any damage or wear, the entire device must be replaced.
- Avoid any collision with the device. Impacts and excessive vibrations may fail to guarantee correct device operation.

5.5 Maintenance



Warning: Do not disassemble or try to repair the device. In case of any malfunction or fault, replace the entire device.



Warning: Correct operation cannot be guaranteed when the device is deformed or damaged.

The installer is responsible for establishing the sequence of functional tests to which the installed device is to be subject for complete maintenance.

The testing sequence can vary according to machine complexity and circuit diagram, therefore the functional test sequence detailed below is to be considered as minimal and not exhaustive.

At least once a year or after prolonged stoppage, carry out the following checking operations:

- 1) Lock the protection and start the machine. It must be impossible for the protection to be opened.
- 2) With the machine stationary and the protection open, the machine must not be allowed to start.
- 3) When the escape release button (if fitted) is pressed, the protective device must open freely and the machine must not start. Each time the release button is activated, the machine must stop and the safety door must open immediately. The release button must slide freely, without sticking, and be tightly screwed in. The signs placed inside the machine, indicating the function of the release button (if fitted), must be intact, clean and clearly readable.
- 4) With the protection closed but not locked, the machine must not be allowed to start (not applicable to safety output activation in mode 2, see par. 3.3).
- 5) All external parts must be undamaged.
- 6) If the device is damaged, replace it completely.
- 7) The actuator must be securely locked to the safety door. Make sure that none of the operating personnel's tools can be used to disconnect the actuator from the door.
- 8) The device has been created for applications in dangerous environment, therefore its mission time is limited. 20 years after its production date, the device must be totally replaced, even when still working. The production date is found next to the product code (See paragraph 5.10 – MARKING).

5.6 Precautions during wiring

- Check that the power supply is correct before supplying the device with power.
- Keep the loading within the reference values of the respective electrical usage categories.
- Disconnect the power supply before accessing the device connections.
- Only connect and disconnect the device when the power is off.
- Do not open the internal device cover under any circumstances.
- Discharge static electricity before handling the product, by making contact with a metal mass connected to earth. Any strong ESD could damage the device.
- Power the safety switch and other connected devices from one single SELV-type source and in conformity with the relevant standards.
- Always connect the protection fuse (or equivalent device) in series with the power supply for each device (See paragraph 6.3 – ELECTRICAL DATA).
- The device contains two PUSH-IN spring-operated terminal strips for connecting the following electrical leads:

The cross section of wires or leads with wire-end sleeve is at least 0.34 mm² (AWG 22) and no more than 1.5 mm² (AWG 16).

The cross section of leads with pre-insulated wire-end sleeves is at least 0.34 mm² (AWG 22) and no more than 0.75 mm² (AWG 18).

Stripping length of electrical leads: min. 8 mm - max. 12 mm

5.7 Additional prescriptions for safety applications with personal protection functions

Provided that all previous prerequisites are fulfilled, and the devices installed are intended to ensure personnel protection, the following additional regulations are also to be observed:

- In all cases, device operation implies the knowledge and observance of the following standards: EN 60947-5-3, EN ISO 13849-1, EN 62061, EN 60204-1, EN ISO 14119, EN ISO 12100.
- Correct operation of safety devices must be checked periodically, at intervals established by the machine manufacturer according to the machine danger level, and in any case must be checked at least once a year.

5.8 Limitations of use

- The device can be used as a component within a system having safety category 4 / PL e according to EN ISO 13849-1 standard and integrity level SIL CL 3 according to EN 62061 standard.
- Use the device by following the instructions, keeping to its operating limits and respecting the current safety standards.
- The devices have specific application limitations (minimum and maximum ambient temperature, mechanical working life, degree of protection etc.). These limitations are met by the device only if considered individually and not as combined with others.
- The manufacturer's liability is to be excluded in the following cases:
 - Use not conforming to the intended purpose.
 - Failure to observe safety instructions.
 - Fitting operations not carried out by qualified and authorized personnel.
 - Omission of functional tests.
- For the cases listed below, contact our assistance service (see paragraph CUSTOMER SERVICE):
 - Nuclear power stations, trains, airplanes, motorcars, incinerators, medical appliances or any other applications where the safety of two or more persons depends on correct device operation.
 - Cases not mentioned on the instruction sheet.

5.9 Functional tests before commissioning the device

The device installer is responsible for establishing the sequence of functional tests to which the installed device is to be subject before machine commissioning. The testing sequence can vary according to machine complexity and circuit diagram, therefore the functional test sequence detailed below is to be considered as minimal and not exhaustive.

- 1) Lock the protection and start the machine. It must be impossible for the protection to be opened.
- 2) With the machine stationary and the protection open, the machine must not be allowed to start.
- 3) When the escape release button (if fitted) is pressed, the protective device must open freely and the machine must not start.
- 4) When the auxiliary release (if fitted) is activated, the protection must open freely and the machine must not start.
- 5) With the protection closed but not locked, the machine must not be allowed to start (not applicable to safety output activation in mode 2, see par. 3.3).
- 6) The actuator must be securely locked to the safety door. Make sure that none of the operating personnel's tools can be used to disconnect the actuator from the door.

5.10 Marking

The outside of the device is provided with external marking positioned in a visible place.

Marking includes:

- Producer trademark
- Part number
- Batch number and production date. Example: A14 NG1-411. The first character of the production batch indicates the production month (A=January, B=February etc...). The second and third characters indicate the production year (14 =2014, 15=2015 etc...).

6 TECHNICAL DATA

6.1 Housing

Metal housing, with powder coating.
Three M20x1.5 threaded cable inlets
Degree of protection:

IP67 acc. to EN 60529
IP69K acc. to ISO 20653

with cable gland (or other equivalent connection system) having equal or higher degree of protection

6.2 General specifications

SIL integrity level (SIL CL):	Up to SIL 3 according to EN 62061
Performance Level (PL):	Up to PL e according to
EN ISO 13849-1	
Safety category:	Up to 4 acc. to EN ISO 13849-1
Locking with guard interlocking, contact-free, coded:	Type 4 according to EN ISO 14119
Encoding level acc. to EN ISO 14119:	Low level with SCA actuator High level with UCA actuator
PFH _d :	8.07 E-10
MTTF _d (single channel):	1883 years
DC:	High
Mission time:	20 years
Ambient temperature:	From -20°C to +50°C
Storage temperature:	From -40°C to +75°C
Maximum operation altitude:	2000 m
Time for starting the switching operation:	2 s
Maximum actuation frequency with actuator lock and release:	600 switching cycles*/h
Mechanical life expectancy:	1 million switching cycles*
Maximum actuating speed:	0.5 m/s
Minimum actuation speed:	1 mm/s
Fitting position:	Any
Maximum force before breakage F _{1max} :	9750 N according to ISO 14119
Maximum locking force F _{2n} :	7500 N according to ISO 14119
Play of locked actuator:	4 mm
Extraction force of unlocked actuator:	30 N

* (One switching cycle contains two movements, one for closing and one for opening acc. to EN 60947-5-1 standard)

6.3 Electrical data

Rated operating voltage U_e :	24 VDC $\pm 10\%$ SELV
Operating current at U_e voltage:	
- minimum:	40 mA
- with electromagnet activated:	0.4 A
- with electromagnet activated and all outputs at maximum power:	1.2 A
Rated insulation voltage U_i :	32 VDC
Thermal nominal current I_{th} :	0.25 A
Rated impulse withstand voltage U_{imp} :	1.5 kV
External protection fuse:	1.5 A type F
Overvoltage category:	III
Electrical life expectancy:	1 million switching cycles
Electromagnet switch-on time:	100% ED
Electromagnet power consumption:	9 W
Pollution degree:	3 according to EN 60947-1

6.3.1 Electrical data for IS1/IS2/I3/I4/I5/EDM inputs

Rated operating voltage U_e :	24 VDC
Rated current consumption:	5 mA

6.3.2 Electrical data for OS1/OS2 safety outputs

Rated operating voltage U_e :	24 VDC
Output type:	PNP-OSSD
Maximum current per output I_e :	0.25 A
Minimum current per output I_e :	0.5 mA
Usage category:	DC13; $U_e=24$ VDC, $I_e=0.25$ A
Short-circuit detection:	Yes
Overcurrent protection:	Yes
Internal self-resetting protection fuse:	1.1 A

Electrical life expectancy:	1 million switching cycles
Time for deactivation impulses on safety outputs:	<300 μ s
Maximum capacity admitted between output and ground:	<200 nF

Maximum capacity admitted between output and ground: <200 nF
Length of connection cable max. 50 m
Cable lengths and cross sections influence pulses to the safety outputs. The capacity of the connection cables may not exceed the values listed above.
Response time for OS1 and OS2 safety outputs on input deactivation:

- Typical 7 ms
- Maximum 15 ms

Response time on door release:

- Typical 7 ms
- Maximum 12 ms

Maximum delay for EDM input signal state change: 500 ms

6.3.3 Electrical data for O3/O4 signal outputs

Rated operating voltage U_e :	24 VDC
Output type:	PNP
Maximum current for I_e output:	0.1 A;
Usage category:	DC12; $U_e=24$ VDC, $I_e=0.1$ A
Short-circuit detection:	No
Overcurrent protection:	Yes
Internal self-resetting protection fuse:	1.1 A

6.3.4 RFID sensor data

Assured operating distance S_{ao} :	2 mm
Assured cut-out distance S_{ar} :	4 mm (actuator not locked) 10 mm (actuator locked)
Rated switching distance S_n :	2.5 mm
Repeatability:	$\leq 10\%$ S_n
Switching hysteresis:	$\leq 20\%$ S_n
Maximum switching frequency:	1Hz
Minimum distance between 2 identical devices to avoid reciprocal radio interferences:	2 mm

6.4 Standards conformity:

EN ISO 14119, EN 60947-5-3, EN 60947-1, EN 60204-1, EN ISO 12100, EN 0529, EN 61000-6-2, EN 61000-6-3, BG-GS-ET-19, IEC 61508, SN 29500, EN ISO 13849-1, EN ISO 13849-2, EN 62061, EN 61326-1, EN 61326-3-1, EN 61326-3-2, ETSI 301 489-1, ETSI 301 489-3, ETSI 300 330-2, UL 508, CSA 22.2 No. 14

6.5 Conforming to the requirements prescribed by:

Machinery directive 2006/42/EC
EMC directive 2004/108/EC
R&TTE 1999/05/EC directive

Statements acc. to FCC Part 15: This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

7 DISPOSAL

At the end of its mission time, the device must be disposed of properly, according to the rules in force in the country in which the disposal takes place.

8 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 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

9 EC CONFORMITY DECLARATION

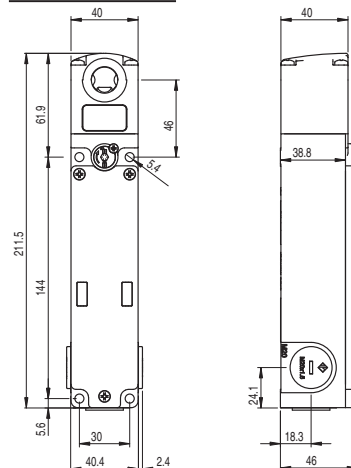
Leuze electronic GmbH + Co. KG
In der Braike 1, D-73277 Owen/Germany

We hereby declare that the L300 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 (see section 6.4, including all changes) and that the listed standards (see section 6.5, including all changes) were used in its design and construction.
Owen / Germany, 2015/12

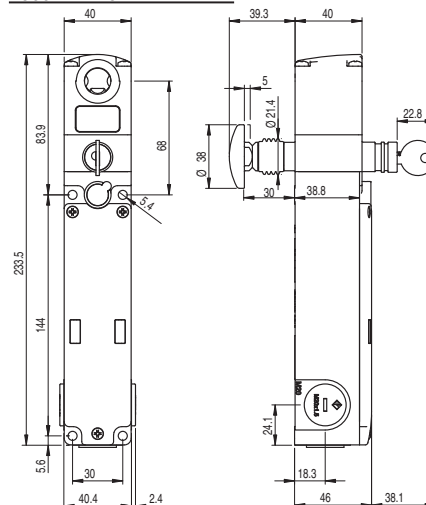
Ulrich Balbach, Managing Director

10 DIMENSIONAL DRAWINGS

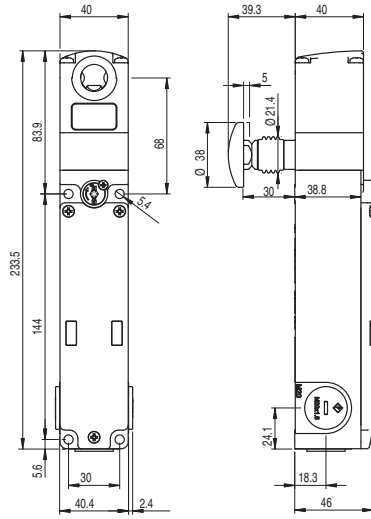
L300-MxxC3-xxxxx



L300-MxxC3-xxxxx-KYPB



L300-MxxC3-xxxxx-PB



AC-L300-xCA

