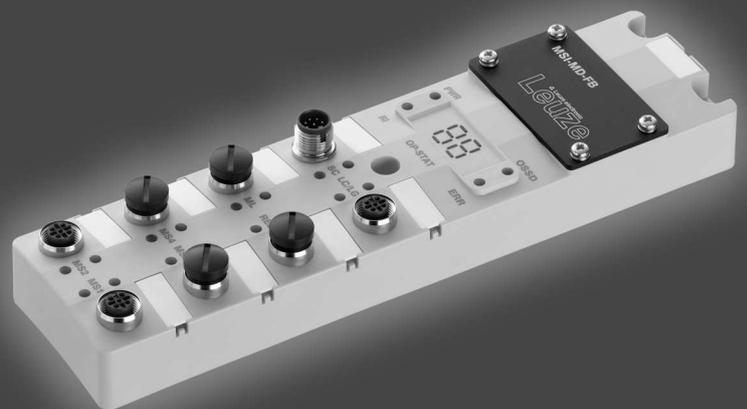




MSI-MD-FB Muting Controller



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1 About this document

1.1 Checklists

The checklists (see chapter 9 "Testing") serve as a reference for the machine manufacturer or supplier. They replace neither testing of the complete machine or system prior to the initial start-up nor their periodic testing by a competent person. The checklists contain minimum testing requirements. Depending on the application, other tests may be necessary.

1.2 Downloading the diagnosis software from the Internet

- ↪ Call up the Leuze home page: **www.leuze.com**
- ↪ Enter the type designation or part number of the device as the search term.
- ↪ The diagnosis software can be found on the product page for the device under the *Downloads* tab.

1.3 Used symbols and signal words

Tab. 1.1: Warning symbols and signal words

| | |
|---|--|
|  | Symbol indicating dangers to persons |
|  | Symbol indicating possible property damage |
| NOTE | 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 injuries 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 with which serious or fatal injury is imminent if the measures for danger avoidance are not followed. |

Tab. 1.2: Other symbols

| | |
|---|--|
|  | Symbol for tips Text passages with this symbol provide you with further information. |
|  | Symbol for action steps Text passages with this symbol instruct you to perform actions. |
|  | Symbol for action results Text passages with this symbol describe the result of the preceding action. |

Tab. 1.3: Terms and abbreviations

| | |
|--------------------|---|
| AOPD | Active Optoelectronic Protective Device (A ctive O ptoelectronic P rotective D evice) |
| Blanking | Deactivation of the protective function of individual beams or beam areas with monitoring for interruption |
| CS | Switching signal from a control or a machine interface (C ontroller S ignal) |
| EDM | Contacting monitoring (E xternal D evice M onitoring) |
| FG | Function group (F unction G roup) |
| LED | LED, display element in transmitter and receiver |
| MS1, MS2 | Muting sensor 1, 2 |
| MTTF _d | Mean time to dangerous failure (M ean T ime T o dangerous F ailure) |
| Muting | Temporary automatic suppression of the safety functions |
| OSSD | Safety-related switching output (O utput S ignal S witching D evice) |
| PFH _d | Probability of a dangerous failure per hour (P robability of dangerous F ailure per H our) |
| PL | P erformance L evel |
| Reduced resolution | Reduction of the detection capability of the protective field without monitoring for tolerating small objects in the protective field |
| RES | Start/restart interlock (Start/ RE start interlock) |
| Scan | Consecutive scans of the protective field from the first to the last beam |
| Safety sensor | System consisting of transmitter and receiver |
| SIL | S afety I ntegrity L evel |
| State | ON: device intact, OSSD switched on OFF: device intact, OSSD switched off Locking: device, connection or control / operation faulty, OSSD switched off (lock-out) |

2 Safety

Before using the safety relay, a risk assessment must be performed according to valid standards (e.g. EN ISO 12100:2010, EN ISO 13849-1:2015, EN 62061:2005+A1:2012). The result of the risk assessment determines the required safety level of the safety relay (see chapter 14 "Technical data").

For mounting, operating and testing, this document as well as all applicable national and international standards, regulations, rules and directives must be observed. Relevant and supplied documents must be observed, printed out and handed to affected persons.

↳ Before working with the safety relay, completely read and understand the documents applicable to your task.

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

- Machinery directive 2006/42/EC
- Low voltage directive 2014/35/EU
- EMC directive 2014/30/EU
- Use of work equipment directive 89/655/EEC supplemented by directive 95/63 EC
- OSHA 1910 Subpart O
- Safety regulations
- Accident-prevention regulations and safety rules
- Ordinance on Industrial Safety and Health and employment protection act
- Product Safety Law (ProdSG and 9. ProdSV)

NOTICE



For safety-related information you may also contact local authorities (e.g., industrial inspectorate, employer's liability insurance association, labor inspectorate, occupational safety and health authority).

2.1 Intended use and foreseeable misuse



DANGER



Electrically live systems pose a risk of electric shock!

- ↳ Make certain that, during all conversions, maintenance work and inspections, the system is securely shut down and protected against being restarted.
- ↳ Only have work on the electrical system and electronics performed by a competent person (see chapter 2.2 "Necessary competencies").

2.1.1 Intended use



WARNING



A running machine may result in serious injury!

- ↳ Make certain that the safety relay is correctly connected and that the protective function of the protective device is ensured.
- ↳ Make certain that, during all conversions, maintenance work and inspections, the system is securely shut down and protected against being restarted.

Only if the safety relay is correctly connected and correctly started up is the protective function of the protective device ensured. To prevent misuse and resulting dangers, the following must be observed:

- These operating instructions are included in the documentation of the system on which the protective device is mounted and are available to the operating personnel at all times.
- The safety relay is used as a safety monitoring device in combination with one or more safety sensors for safeguarding danger zones or points of operation on machines and systems.

- The safety relay may 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 (see chapter 2.2 "Necessary competencies").
- The safety relay must only be connected and commissioned in accordance with its specifications (technical data, environmental conditions, etc.).
- The acknowledgment unit for unlocking the start/restart interlock must be located outside of the danger zone.
- The entire danger zone must be visible from the installation site of the acknowledgment unit.
- When selecting the safety relay it must be ensured that its safety-related capability meets or exceeds the required performance level PL_r ascertained in the risk assessment (see chapter 14 "Technical data").
- The machine or system control must be electrically influenceable so that a switch command sent by the safety relay results in the immediate shutdown of the dangerous movement.
- The construction of the safety relay must not be altered. When manipulating the safety relay, the protective function is no longer guaranteed. Manipulating the safety relay also voids all warranty claims against the manufacturer of the safety relay.
- The safety relay must be inspected regularly by a competent person to ensure proper integration and mounting (see chapter 2.2 "Necessary competencies").
- The safety relay must be exchanged after a maximum of 20 years. Repairs or the exchange of wear parts do not extend the mission time.

2.1.2 Foreseeable misuse

Any use other than that defined under the "Approved purpose" or which goes beyond that use is considered improper use.

Alone, the safety relay is not a complete protective device. It is **not** suitable for use in the following cases:

- Applications in explosive or easily flammable atmospheres
- On machines or systems with long stopping times

2.2 Necessary competencies

The safety relay may only be configured, installed, connected, commissioned, serviced and tested in its respective application by persons who are suitably qualified for the given task. General prerequisites for suitably qualified persons:

- They have a suitable technical education.
- They are familiar with the relevant parts of the operating instructions for the safety relay and the operating instructions for the machine.

Task-specific minimum requirements for suitably qualified persons:

Configuration

Specialist knowledge and experience in the selection and use of protective devices on machines as well as the application of technical rules and the locally valid regulations on labor protection, safety at work and safety technology.

Mounting

Specialist knowledge and experience needed for the safe and correct installation and alignment of the safety relay with regard to the respective machine.

Electrical installation

Specialist knowledge and experience needed for the safe and correct electrical connection as well as safe integration of the safety relay in the safety-related control system.

Operation and maintenance

Specialist knowledge and experience needed for the regular inspection and cleaning of the safety relay – following instruction by the person responsible.

Servicing

Specialist knowledge and experience in the mounting, electrical installation and the operation and maintenance of the safety relay in accordance with the requirements listed above.

Commissioning and testing

- Experience and specialist knowledge in the rules and regulations of labor protection, safety at work and safety technology that are necessary for being able to assess the safety of the machine and the use of the safety relay, including experience with and knowledge of the measuring equipment necessary for performing this work.
- In addition, a task related to the subject matter is performed in a timely manner and knowledge is kept up to date through continuous further training - *Competent person* in terms of the German Betriebs-sicherheitsverordnung (Ordinance on Industrial Safety and Health) or other national legal regulations.

2.3 Responsibility for safety

Manufacturer and operating company must ensure that the machine and implemented safety relay 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 relay, verified by the initial test performed by a competent person (see chapter 2.2 "Necessary competencies")
- Imparting all relevant information to the operating company
- Adhering to all regulations and directives for the safe commissioning of the machine

The operator of the machine is responsible for:

- Instructing the operator
- Maintaining the safe operation of the machine
- Adhering to all regulations and directives for labor protection and safety at work
- Periodic testing by a competent person (see chapter 2.2 "Necessary competencies")

2.4 Disclaimer

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

- Safety relay is not used as intended.
- Safety notices are not adhered to.
- Reasonably foreseeable misuse is not taken into account.
- Mounting and electrical connection are not properly performed.
- Proper function is not tested (see chapter 9 "Testing").
- Changes (e.g., constructional) are made to the safety relay.

3 Device description

The MSI-MD-FB muting controller is used as a safety-relevant link between an active opto-electronic protective device (AOPD) and the machine control. The muting controller enables muting through intentional and temporary suppression of the protective function of the safety sensor, e.g., if objects are to be transported through the protective field.

The muting controller is mounted on machine parts or on a device column.

Connections

The muting controller allows the following connections:

- Up to four muting sensors
- A safety sensor (safety light barrier or safety light curtain)
- A muting indicator
- An acknowledgment unit
- A service USB interface (micro USB port) is available for diagnosis

Safety sensors and muting sensors

The muting controller supplies the safety sensor and the muting sensors with 24 V supply voltage.

The following safety sensors from Leuze electronic are released for connection to the muting controller:

- Safety light barriers of the MLD series
- Safety light curtains of the MLC series

NOTICE



The MSI-MD-FB muting controller is only released for the connection of the safety sensors from Leuze electronic, e.g., MLC 510 or MLD 510.

The following muting sensors from Leuze electronic are released for connection to the muting controller:

- All common series: 3 series, 5 series, 8 series, 25 series, 46 series, 49 series, 96 series

Muting functions

The device functions are set from the outside via covered DIP switch blocks on the muting controller.

The muting controller makes the following muting modes available:

- Timing controlled 2-sensor muting (parallel muting)
- Sequence controlled 2-sensor muting
- Sequence controlled 4-sensor muting

The muting controller features a muting enable function and a start/restart interlock.

The safety-related switching outputs (OSSDs) of the muting controller are designed as transistor outputs.

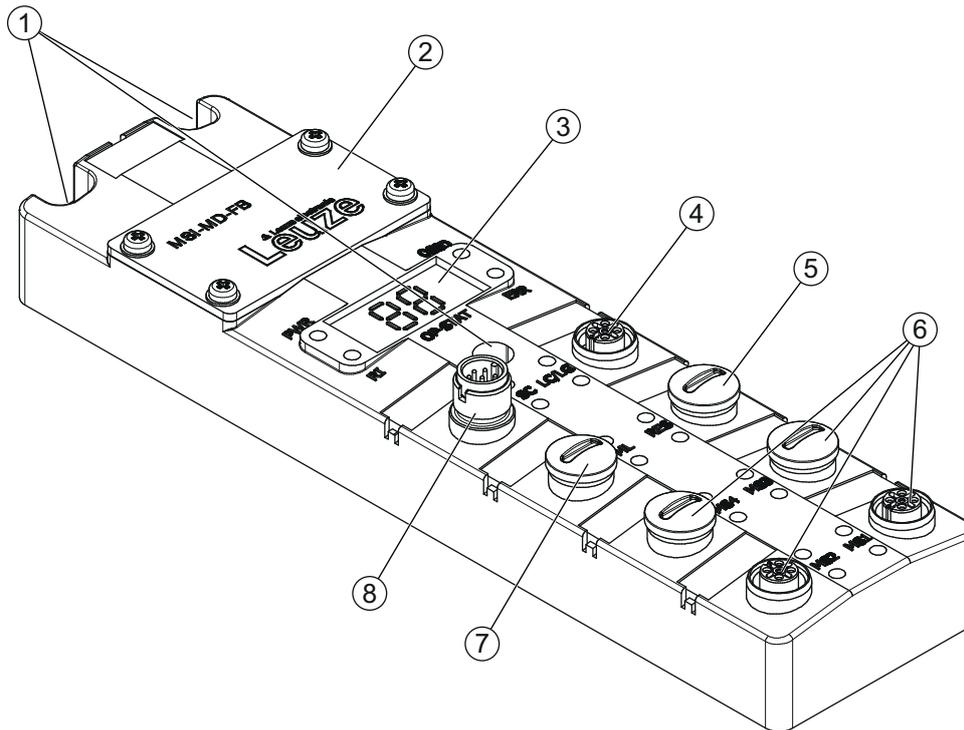
Degree of protection and standards

The muting controller is designed in degree of protection IP67

The muting controller meets the following standards:

- Performance Level PL e in accordance with EN ISO 13849
- Safety Integrity Level SIL 3 in accordance with IEC 61508

3.1 Device construction



- 1 Mounting eyes for M4 screws
- 2 Cover for the DIP switch blocks for configuring the muting function and the Micro USB connection for reading out diagnostics.
- 3 7-segment display
- 4 Connection for the safety sensor
- 5 Connection for acknowledgment unit
- 6 Connections for muting sensors
- 7 Connection for external muting indicator
- 8 Connection to the machine interface (OSSDs and supply voltage)

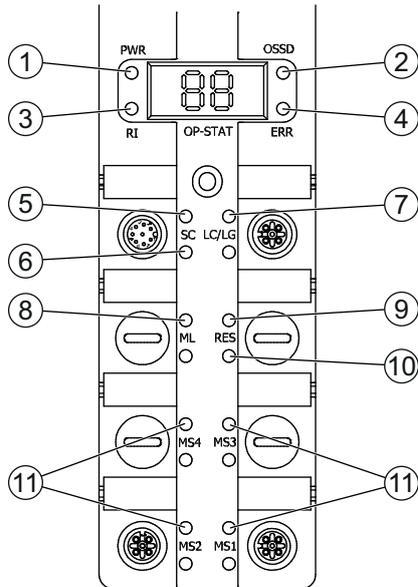
Fig. 3.1: Device construction of the muting controller

3.2 Display elements

The muting controller is equipped with the following display elements:

- Two-digit 7-segment display:
 - After switching on the muting controller and following the internal display test, the set operating mode is displayed in the configuration (see chapter 8.2 "Setting the operating mode").
 - User messages/notes and error messages are indicated by the alternating display of a letter and a two-digit number (see chapter 11.2 "Error messages 7-segment display").
- User messages / notes: U
 Error messages: F

- LED indicators for the status of the assigned input signals



- 1 PWR LED
- 2 OSSD LED
- 3 RI LED
- 4 ERR LED
- 5 SC LED (1)
- 6 SC LED (2)
- 7 LC/LG LED
- 8 ML LED
- 9 RES LED (1)
- 10 RES LED (1)
- 11 LED MS1 ... MS4

Fig. 3.2: LED indicators of the muting controller

| LED | Color | Description |
|-----|-------|--|
| 1 | PWR | Green Power (PWR) |
| 2 | OSSD | Red OSSDs in the OFF state |
| | | Green OSSDs in the ON state |
| 3 | RI | Yellow Restart active Safety sensor on The system is waiting for actuation of the acknowledgment unit |
| 4 | ERR | Red Fault |
| 5 | SC | Green Muting sensor alternative active |
| 6 | | White Muting signal from the machine interface active |
| 7 | LC/LG | OFF OSSDs of the safety sensor in the OFF state |
| | | Green OSSDs of the safety sensor in the ON state |
| 8 | ML | Blue Muting indicators: <ul style="list-style-type: none"> • OFF: no muting active • Continuous light: muting active; safety sensor is bypassed by means of muting • Flashing: muting error; e.g., timeout |

| LED | | Color | Description |
|-----|-------------|--------|--|
| 9 | RES | Yellow | Acknowledgment unit pressed (reset signal) |
| 10 | | Red | Ready for reset (ReadyForReset signal) The system is waiting for actuation of the acknowledgment unit |
| 11 | MS1 ... MS4 | Green | Muting sensor 1 ... 4 active |

3.3 Connection technology

The muting controller is equipped with the following connections:

- One connection for the OSSDs of the safety sensor
M12 socket, 5-pin, A-coded
- One connection for the machine interface (OSSDs of the muting controller and supply voltage)
M12 plug, 8-pin, A-coded
- Four connections for muting sensors MS1 ... MS4
M12 socket, 5-pin, A-coded
- One connection for the acknowledgment unit
M12 socket, 5-pin, A-coded
- One connection for an external muting indicator
M12 socket, 5-pin, A-coded
- One service USB connection for reading out diagnostics
USB port of type Micro-B-USB

NOTICE



Service USB connection not for safety-related operation!

- ↪ Service USB connection is not used for safety-related operation.
- ↪ Service USB connection is not accessible in normal operation. The cover in the housing of the muting controller, under which the service USB connection is located, is closed in normal operation.

NOTICE



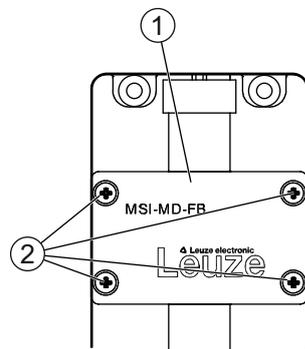
Sockets and connectors that are not connected are to be covered with end caps!

- ↪ Cover unconnected sockets and connectors with end caps.

3.4 Operational controls

The muting function is configured via two DIP switch blocks, each of which has eight switches (see chapter 8 "Starting up the device - Configuration").

The DIP switch blocks are located under a cover in the housing of the muting controller.



- 1 Cover
- 2 Screws for cover

Fig. 3.3: Cover for DIP switch blocks and service USB connection

4 Functions

By means of muting, the protective function of the safety sensor can be temporarily and properly suppressed, e.g. if objects are to be transported through the protective field. The OSSDs of the muting controller remain in the ON state in spite of interruption of one or more beams of the safety sensor.

Muting modes

The muting controller supports the following muting modes:

- Timing controlled 2-sensor muting (see chapter 4.1 "Timing controlled 2-sensor muting")
- Sequence controlled 2-sensor muting (see chapter 4.2 "Sequence controlled 2-sensor muting")
- Sequence controlled 4-sensor muting (see chapter 4.3 "Sequence controlled 4-sensor muting")

The muting mode is set via the DIP switch blocks (see chapter 8 "Starting up the device - Configuration").

Muting timeout

Configurable time limit for the muting function (muting timeout):

- 20 seconds
- 2 minutes
- 10 minutes
- 100 hours

Muting timeout is set via the DIP switch blocks (see chapter 8 "Starting up the device - Configuration").

Muting sensors

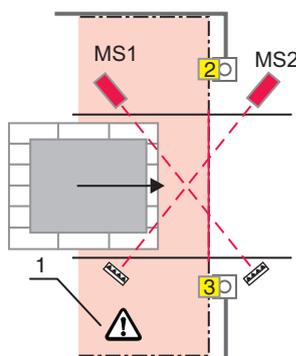
Muting is initiated automatically and via mutually independent muting signals by muting sensors.

- Photoelectric sensors or scanning sensors can be connected to the muting controller as muting sensors (see chapter 15 "Ordering information and accessories").
- The state of a muting sensor is transferred on pin 4 of the connection on the muting controller.
- The muting signals of the muting sensors are debounced:
 - Pickup delay: 60 ms
 - Slow release: 300 ms

4.1 Timing controlled 2-sensor muting

Muting is initiated automatically and via two mutually independent muting signals. These signals must be active during the entire duration of the muting operation. Muting may not be initiated by a single sensor signal, nor may it be fully initiated by software signals.

The protective function of the entire protective field is deactivated during timing controlled muting.



- 1 Danger zone
- 2 Receiver of the safety sensor
- 3 Transmitter of the safety sensor
- MS1 Muting sensor 1
- MS2 Muting sensor 2

Fig. 4.1: Arrangement of muting sensors for timing controlled 2-sensor muting in an exit application

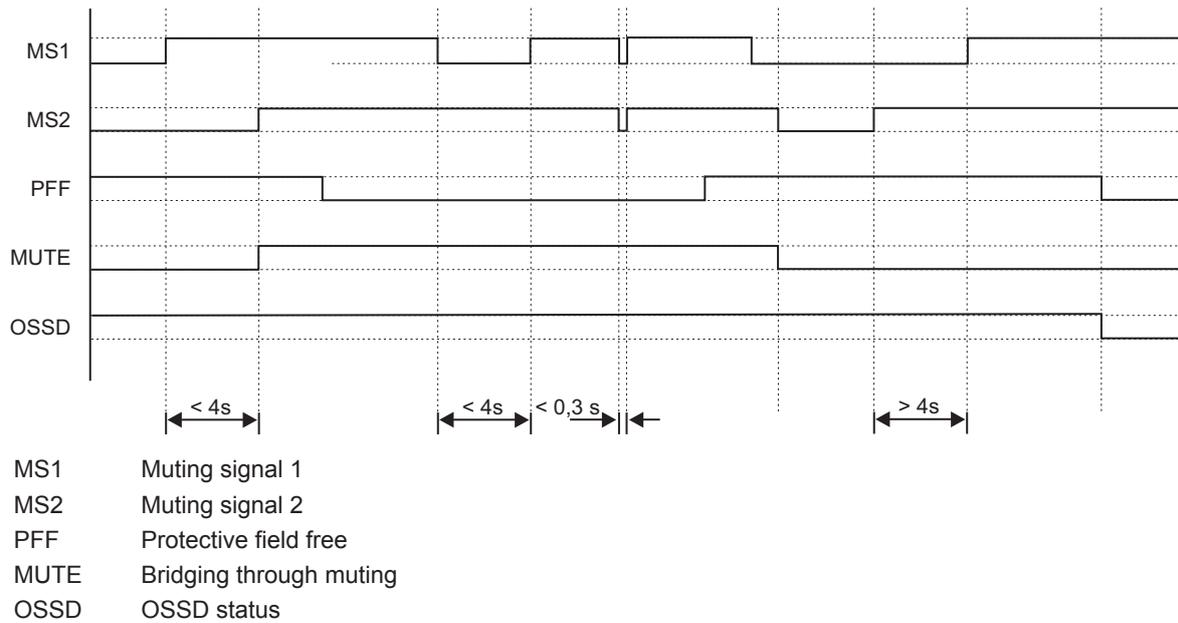


Fig. 4.2: Timing controlled muting - timing

The material can move in both directions. Often, an arrangement consisting of crossed beams from retro-reflective photoelectric sensors is used (see chapter 6.2 "Arrangement of the muting sensors").

Timing controlled muting is used in the following cases:

- Moving-in applications: diffuse sensors in the danger zone detect the muting object through the protective field. The scanning range must be set to a sufficiently small value (see chapter 6 "Mounting").
- Exit applications: a photoelectric sensor in the danger zone works diagonally to the transport direction together with a simultaneously activated machine interface signal, which derives from the drive of the transport equipment, for instance (see chapter 6 "Mounting").

DANGER

Risk of death if installation is not performed correctly!

Follow the instructions for the correct arrangement of the muting sensors (see chapter 6.2 "Arrangement of the muting sensors").

Activating timing controlled 2-sensor muting

- ↳ Activate timing controlled 2-sensor muting by configuring via the DIP switch blocks (see chapter 8 "Starting up the device - Configuration").

NOTICE

Following malfunctions or operationally related interruptions (e.g. failure and restoration of the supply voltage, violation of the concurrency condition during activation of the muting sensors), the system can be manually reset with the acknowledgment unit and overridden (Muting restart).

Timing controlled 2-sensor muting remains active even during brief interruptions of each single sensor signal (shorter than 0.3 s).

For muting override or muting restart, the maximum muting timeout time is 10 minutes.

Timing controlled 2-sensor muting is ended in the following cases:

- The signals of the two muting sensors are simultaneously inactive for a duration of more than 0.3 second.
- The signal of a muting sensor is inactive for a duration of more than 2 seconds.
- The configured muting time limit (muting timeout, 20 seconds, 2 minutes, 10 minutes or 100 hours) has elapsed (see chapter 8 "Starting up the device - Configuration").

NOTICE



If muting is ended, the safety sensor functions again in normal protective mode, i.e. the OSSDs switch off as soon as the protective field is interrupted.

4.1.1 Timing controlled 2-sensor muting with Muting-enable

With the muting enable function, muting is enabled or disabled via an external muting enable signal. The muting enable function is activated and deactivated via the DIP switch blocks (see chapter 8 "Starting up the device - Configuration").

- If the muting enable signal is applied, a valid muting sequence initiates muting.
 - The muting enable signal must be applied at least 60 ms before muting is initiated.
 - The muting enable signal must not be applied for more than 100 hours.
- If the muting enable signal is not applied, no muting is possible, even with a valid muting sequence.

4.1.2 Extend muting timeout

To extend the muting timeout, the muting enable signal (+24 V) must be applied before muting is initiated. If the muting enable signal switches to 0 V during muting, e.g., by a high-pass signal, the muting timeout is extended as long as 0 V continues to be present.

If the extension of the muting timeout ends (muting enable signal switches to +24 V), muting is still possible for the remaining muting timeout time.

4.2 Sequence controlled 2-sensor muting

Sequence controlled 2-sensor muting is used for exiting danger zones if there is only limited space available outside of the danger zone. Material transport is only permissible in one direction due to the arrangement of the muting sensors.

Muting sensors MS1 and MS2 are positioned within the danger zone and arranged so that they are activated in sequence. MS1 is activated first; MS2 must be activated after MS1 within 20 ms to 8 h.

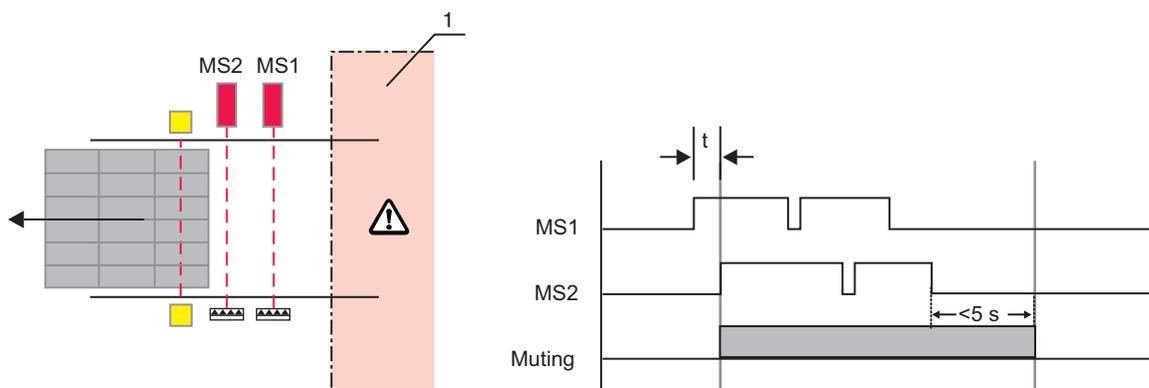
Once the muting area is clear again, the muting state ends with a delay of 5 s. If a valid muting sequence is detected within 5 s, a new muting sequence is started.

DANGER



Risk of death by through incorrect arrangement of the muting sensors!

Only select sequence controlled 2-sensor muting for material exits (see chapter 6.2 "Arrangement of the muting sensors").

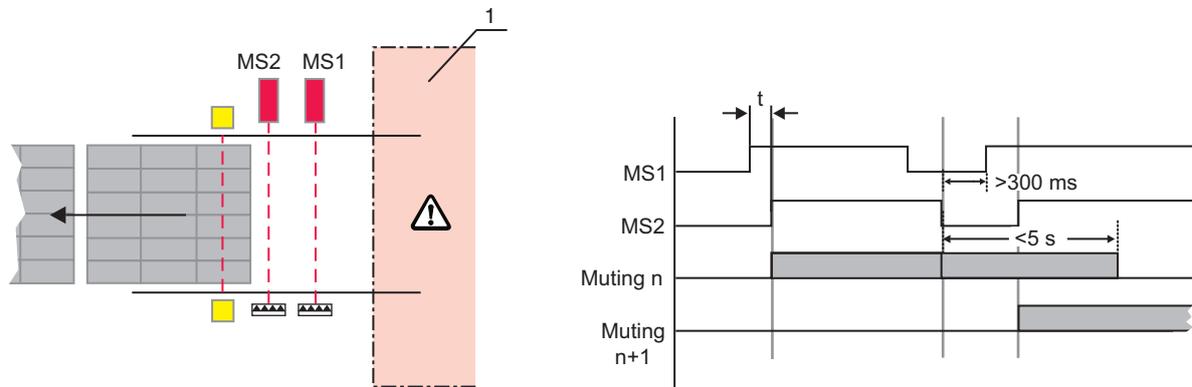


- 1 Danger zone
- MS1 Muting sensor 1
- MS2 Muting sensor 2
- t Time frame in which both muting sensors must be activated (8 h)

Fig. 4.3: Sequence controlled 2-sensor muting – arrangement of the muting sensors and timing

Sequence controlled 2-sensor muting for tight sequences of objects

Sequence controlled 2-sensor muting can also be used if objects that are positioned close to one another are to be moved through the protective field. The distance between the individual objects must be large enough that at least one muting sensor is always free between two successive objects for at least 2 s.



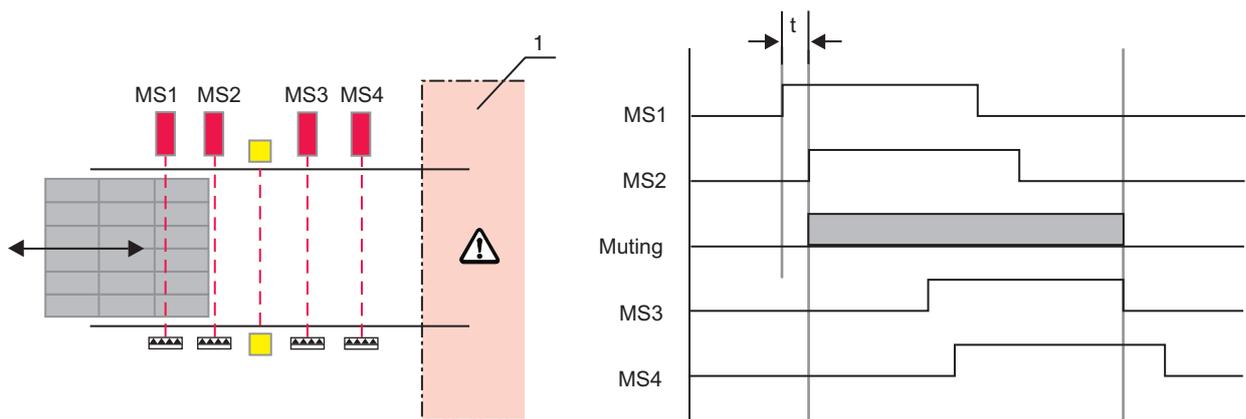
- 1 Danger zone
- MS1 Muting sensor 1
- MS2 Muting sensor 2
- t < 8 h

Fig. 4.4: Muting for tight sequences of objects – arrangement of the muting sensors and timing

4.3 Sequence controlled 4-sensor muting

Sequence controlled 4-sensor muting is used when the muting sensor light beams should not cross, but instead must be parallel, due to special application situations, e.g. with reflective materials or under disruptive environmental conditions.

- The MS1 ... MS4 muting sensors must be activated in sequence. Sequence:
 - MS1 > MS2 > MS3 > MS4
 - MS4 > MS3 > MS2 > MS1
- To accept muting from the input to the output area of the muting path, all four muting sensors must be activated briefly.
- Muting ends when the third muting sensor is free.



- 1 Danger zone
- MS1 Muting sensor 1
- MS2 Muting sensor 2
- MS3 Muting sensor 3
- MS4 Muting sensor 4
- t Time frame in which both muting sensors must be activated (8 h)

Fig. 4.5: Sequence controlled 4-sensor muting – arrangement of the muting sensors and timing

Sequence controlled 4-sensor muting for tight sequences of objects

If tight sequences of objects are to be moved through the protective field, the distance between the individual objects must be large enough that one muting sensor between two successive objects is always free.

4.4 Overriding and muting restart

Following malfunctions or operationally related interruptions (e.g., power failure, sequence errors for sequence-controlled muting, violation of the simultaneity condition during timing controlled 2-sensor muting on activation of the muting sensors), the system can be manually reset with the acknowledgment unit and overridden.

- Muting override must only be initiated if at least one muting sensor is activated and the OSSDs of the muting controller are switched off.
- Muting override is maintained only if at least one muting sensor is activated.
- The muting controller switches on its OSSDs when muting override is activated.
- For muting override or muting restart, the maximum muting timeout time is 10 minutes.

| |
|---|
|  WARNING |
| <div style="display: flex; align-items: center;">  <div> <p>Unauthorized muting restart may result in serious injury!</p> <ul style="list-style-type: none"> ↳ A qualified person (see chapter 2.2 "Necessary competencies") must observe the procedure exactly. ↳ Make certain that the danger zone can be viewed from the acknowledgment unit and that the entire process can be observed by the responsible person. ↳ Before and during the muting restart, ensure that there are no people in the danger zone. </div> </div> |
| NOTICE |
| <div style="display: flex; align-items: center;">  <div> <p>If the safety sensor or the muting controller responds with an error message, perform an error reset (see chapter 4.5 "Error reset").</p> </div> </div> |

- ↳ Press and release the acknowledgment unit within 0.2 to 4 s.
- ↳ Press the acknowledgment unit again and keep the acknowledgment unit pressed down.
- ⇒ The muting controller switches on.

Both muting signals are activated:

The muting controller switches to muting mode.

A muting signal is activated:

Muting is initiated when the acknowledgment unit is released. The second muting signal must be activated within a maximum of 4 s in order to continue muting. If the second muting signal is not activated within this time, muting is ended.

No muting signal is activated:

Muting is ended immediately even if the acknowledgment unit is not released.

For sequence controlled 2-sensor muting, overriding is performed as follows:

- ↳ Press and release the acknowledgment unit within 0.2 to 4 s.
- ↳ Press the acknowledgment unit again for maximum 5 s.
- ⇒ The muting controller switches on.

Muting controller with muting enable; a muting signal is activated:

Muting is initiated when the acknowledgment unit is released. The second muting signal must be activated within a maximum of 4 s in order to continue muting. If the second muting signal is not activated within this time, muting is ended.

4.5 Error reset

If an internal or external error is detected by the safety sensor or the muting controller, the muting controller switches to the interlock state.

To reset the safety circuit to the initial state, reset the muting controller via the reset signal.

- The reset signal can be set via the connected acknowledgment unit or via a component in the machine interface.
- The source of the reset signal can be set via the DIP switch blocks (see chapter 8 "Starting up the device - Configuration").
- Duration of the reset signal: 0.2 s to 4 s

Manual error reset

Reset signal via the connected acknowledgment unit

- ↳ Press and release the acknowledgment unit within 0.2 to 4 s.

4.6 Restart

Following a violation of the protective field, the OSSDs are re-enabled via the reset signal.

- The restart can be started manually via the connected acknowledgment unit or via a component in the control (see chapter 8 "Starting up the device - Configuration").
- The reset signal can be set via the connected acknowledgment unit or via a component in the machine interface.
- The source of the reset signal can be set via the DIP switch blocks (see chapter 8 "Starting up the device - Configuration").
- Duration of the reset signal: 0.2 s to 4 s

4.7 Acknowledging/resetting

The ReadyForReset signal signals via the RES LED that the system is waiting for actuation of the acknowledgment unit/reset button.

- The RES LED illuminates red if the OSSDs of the safety sensor are switched on and the OSSDs of the muting controller are switched off.
- The RES LED flashes red if the system is expecting a muting restart, depending on the status of the muting sensors. The OSSDs of the safety sensor must be switched off.
- The RES LED flashes red if a muting error occurs.
 - If a muting error occurs together with a protected field violation, the OSSDs are switched off when muting is terminated.
 - If a muting error occurs in a free protective field, the OSSDs remain switched on.

5 Applications

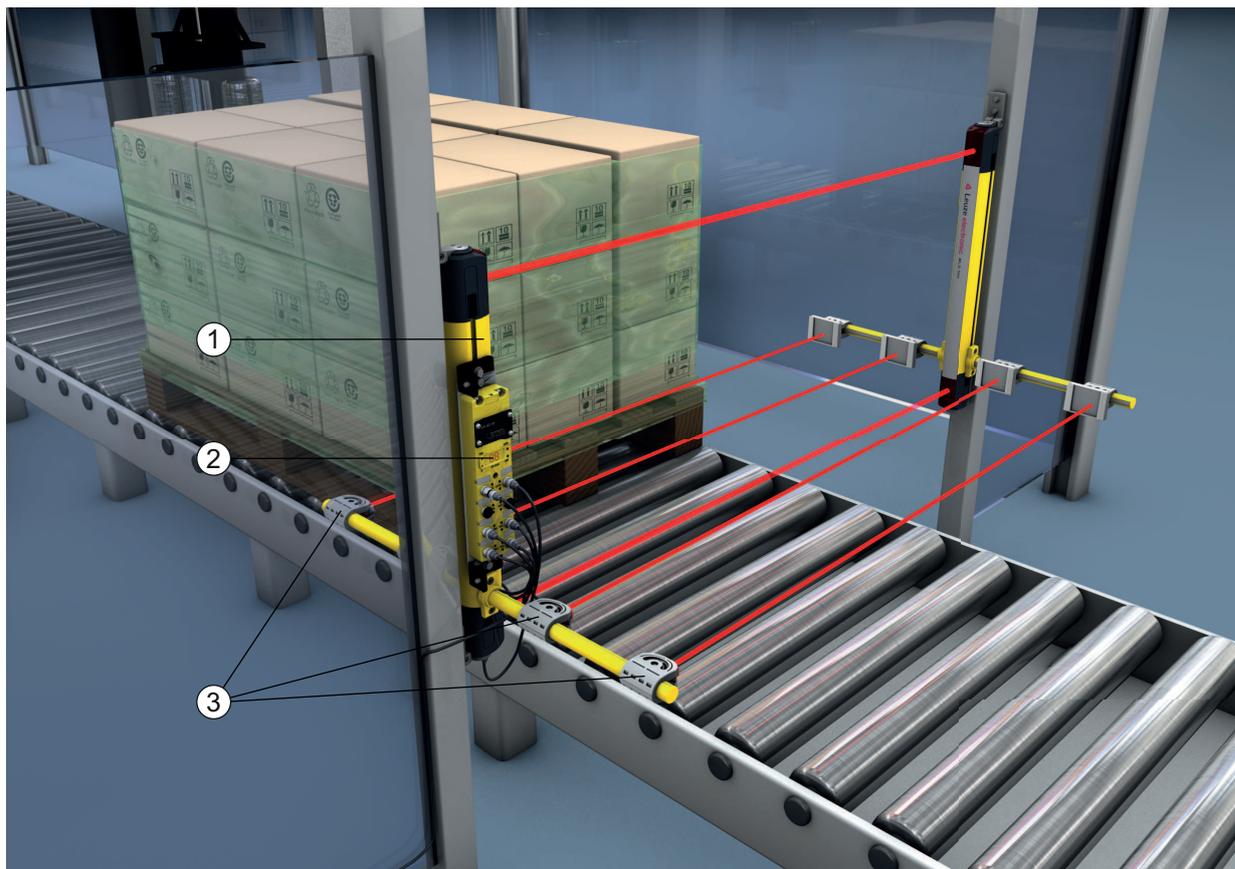
5.1 Access guarding with timing controlled muting



- 1 Safety sensor
- 2 Muting controller
- 3 Muting sensors
- 4 Acknowledgment unit

Fig. 5.1: Access guarding with timing controlled muting for an application with a pallet wrapping machine

5.2 Access guarding with sequence controlled muting



- 1 Safety sensor
- 2 Muting controller
- 3 Muting sensors

Fig. 5.2: Access guarding on the roller conveyor with sequence controlled muting

6 Mounting

- ↪ Mount the muting sensors (see chapter 6.2 "Arrangement of the muting sensors").
- ↪ Mount the muting controller (see chapter 6.1 "Mounting the muting controller").
- ↪ Make the electrical connection of the muting controller (see chapter 7 "Electrical connection").

NOTICE



↪ When mounting and aligning the safety sensor, observe the respective operating instructions.

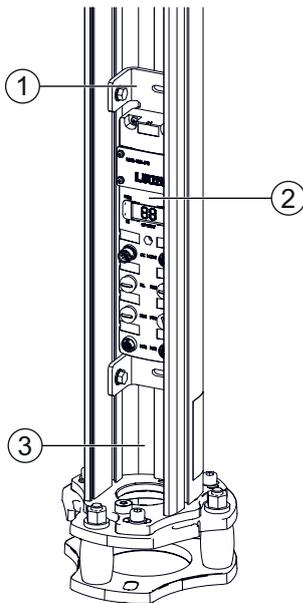
6.1 Mounting the muting controller

You can mount the muting controller as follows:

- Mount in the UDC device column of the receiver of the safety sensor
- Mount on the UDC device column of the receiver of the safety sensor
- Mount on the system via M4 fastening holes

6.1.1 Mounting in the UDC device column

Mount the muting controller in the UDC device column of the receiver of the safety sensor, e.g., below the receiver. The necessary mounting bracket is available as an accessory (see chapter 15 "Ordering information and accessories").

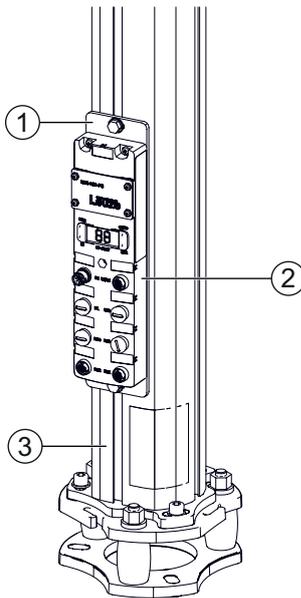


- 1 Mounting bracket BT-MSI-MD-FB-L
- 2 Muting controller
- 3 UDC device column

Fig. 6.1: Mounting in the UDC device column

6.1.2 Mounting on the UDC device column

Mount the muting controller on the side or on the rear of the UDC device column of the receiver of the safety sensor. The required mounting plate is available as an accessory (see chapter 15 "Ordering information and accessories").



- 1 Mounting plate BT-MSI-MD-FB
- 2 Muting controller
- 3 UDC device column

Fig. 6.2: Mounting on side/rear on the UDC device column

6.1.3 Mounting on the system

Mount the muting controller on the system via three mounting eyes for M4 screws.

6.2 Arrangement of the muting sensors

Muting sensors detect material and supply the signals necessary for muting. Standard IEC/TS 62046 provides basic information on arranging the muting sensors. This information must be observed when mounting the muting sensors.

|  WARNING | |
|--|--|
|  | <p>Improper installation may result in serious injury!</p> <p>If the distance between transmitter and receiver is larger than the width of the object so that gaps of more than 180 mm are created, suitable measures, e.g. through additional guarding, must be taken to stop the dangerous movement before persons enter the area.</p> <ul style="list-style-type: none"> ↪ Make sure that no persons can reach the danger zone alongside the transport material during muting. ↪ Make sure that muting is only temporarily activated and only as long as the access to the danger zone is blocked by the transport material. |
| NOTICE | |
|  | <p>If accessible distances exist between the transport material and the safety sensor, PS mats or wicket gates monitored with safety switches have been tried, tested and proven as additional safeguards. Such measures prevent injuries caused, for example, by crushing in the access area.</p> |

6.2.1 Basic information

Before you begin with the selection and mounting of the muting sensors (Selecting optoelectronic muting sensors), please note the following:

- Muting must be triggered by two independent muting signals and must not be fully dependent on software signals, e.g. from a PLC.
- Always mount muting sensors so that the minimum distance to the protective device is maintained (see chapter 6.2.3 "Minimum distance for optoelectronic muting sensors").
- Always mount the muting sensors so that the material is detected and not the transport device, e.g. the pallet.
- Material must be allowed to pass through unimpeded.

| | |
|--|---|
|  WARNING | |
|  | <p>Unintentionally triggered muting may result in serious injury!</p> <ul style="list-style-type: none"> ↳ Mount the muting sensors in such a way that muting cannot be unintentionally triggered by a person, e.g. by simultaneously activating the muting sensors with a foot. ↳ Mount the muting indicator so that it is always visible from all sides. |

6.2.2 Selecting optoelectronic muting sensors

Muting sensors detect material and supply the signals necessary for muting. If muting conditions are fulfilled, the safety sensor can use the signals from the muting sensors to bridge the protective function. The signals can be generated by e.g. optoelectronic sensors from Leuze electronic.

Any transducers which output a +24 VDC switching signal when detecting the permitted transport material can still be used as muting sensors:

- Photoelectric sensors (transmitter/receiver or retro-reflective photoelectric sensors) whose beam paths intersect behind the protective field within the danger zone.
- Diffuse sensors that scan along the side of the transport material (make sure scanning range is set correctly).
- A photoelectric sensor and an acknowledgment signal from the conveyor drive or a PLC signal, provided they are activated independently of each other and fulfill the simultaneity conditions.
- Switching signals from induction loops that are activated e.g. by a high-lift truck.
- Roller conveyor switches which are activated by the transport material and arranged so that they cannot be simultaneously actuated by a person.

↳ When arranging the muting sensors, take the filter times of the signal inputs into account (switch on filter time approx. 60 ms, switch-off filter times approx. 300 ms).

| | |
|---|--|
| NOTICE | |
|  | <p>When using muting sensors with push-pull output, a time difference of at least 20 ms is necessary for the muting signals.</p> |

6.2.3 Minimum distance for optoelectronic muting sensors

The minimum distance is the distance between the protective field of the AOPD and the detection points of the muting sensor light beams. This distance must be maintained when mounting the muting sensors to prevent the pallet or material from reaching the protective field before the muting signals can bridge the protective function of the AOPD. The minimum distance is dependent on the time needed by the system to process the muting signals (approx. 120 ms).

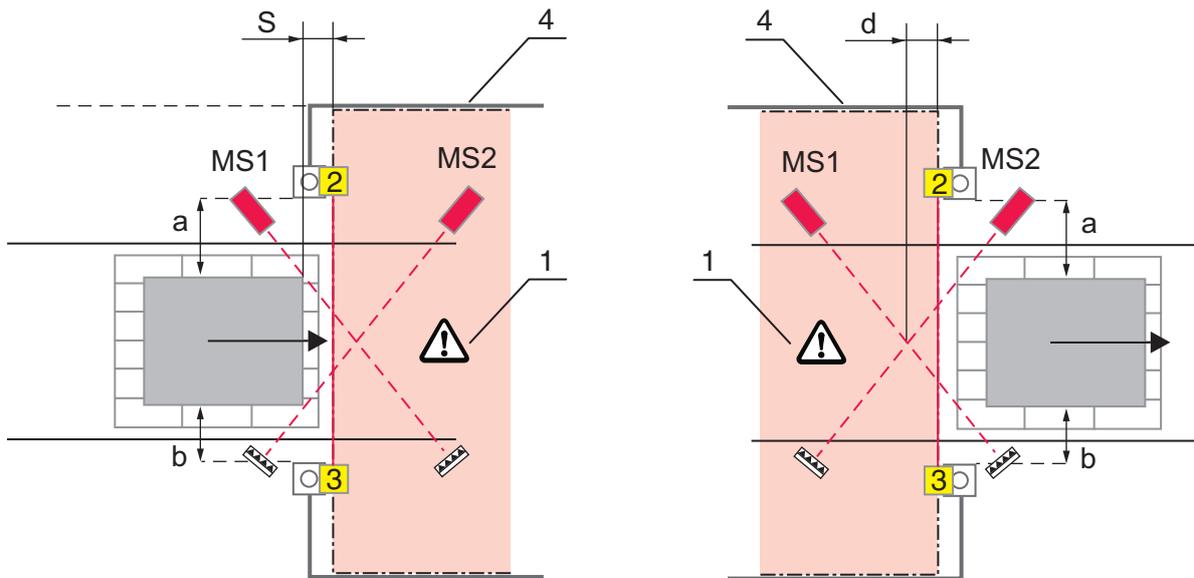
- ↳ Calculate the minimum distance depending on the application case for the timing controlled 2-sensor muting (see chapter 6.2.4 "Arrangement of the muting sensors for timing controlled 2-sensor muting").
- ↳ When arranging the muting sensors, make certain that the calculated minimum distance to the protective field is maintained.

6.2.4 Arrangement of the muting sensors for timing controlled 2-sensor muting

When doing so, both the MS1 and MS2 sensors must be arranged so that they can be activated simultaneously within 4 s by the transport material but cannot be simultaneously activated by a person within this time. Arrangements with crossed beams are often used. The intersection point is located here within the danger zone. This prevents muting from being triggered unintentionally. With this arrangement, an object can be transported through the protective field in both directions.

NOTICE

Muting accessories from Leuze electronic, for example muting sensor sets and matching device columns, facilitate the installation of muting applications significantly.



- 1 Danger zone
- 2 Receiver
- 3 Transmitter
- MS1 Muting sensor 1
- MS2 Muting sensor 2
- S Minimum distance between the protective field of the AOPD and the detection points of the muting-sensor light beams
- a,b Distance between muting object and other fixed edges or objects (<200 mm)
- d Distance from the intersection point of the muting-sensor light beams to the protective-field plane (<50 mm)

Fig. 6.3: Typical arrangement of the muting sensors for timing controlled 2-sensor muting (example acc. to IEC TS 62046)

With timing controlled 2-sensor muting, the beams from the muting sensors should intersect behind the protective field of the safety sensor, i.e. within the danger zone, to prevent muting from being triggered unintentionally.

Distances a and b between fixed edges and the muting object (e.g. transport material) must be such that a person cannot enter through these openings undetected while the pallet passes through the muting zone. However, if it is assumed that persons are located here, the risk of crushing must be prevented, e.g. with wicket gates, which are integrated electrically into the safety circuit.

Minimum distance S

$$S \geq v \cdot 0,12 \text{ s}$$

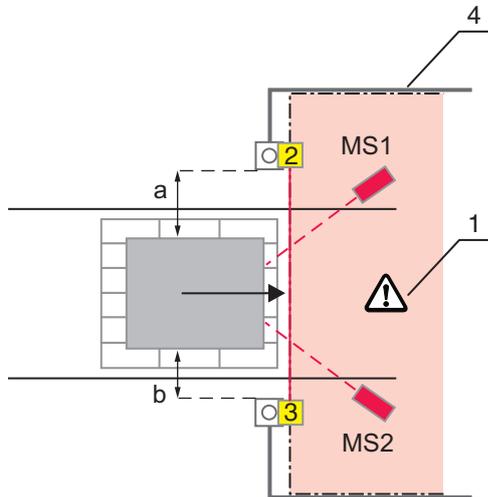
- S [mm] = Minimum distance between the protective field of the AOPD and the detection points of the muting-sensor light beams
- v [m/s] = Speed of the material

Distance d should be as small as practical

d [mm] = Distance from the intersection point of the muting-sensor light beams to the protective-field plane < 200 mm

Arrangement of diffuse sensors

An additional option for arranging the muting sensors is shown in the following figure. The diffuse sensors are arranged and set within the danger zone so that their scanning points detect a valid, approaching muting object within the danger zone, but a person is not able to reach both scanning points simultaneously.



- 1 Danger zone
- 2 Receiver
- 3 Transmitter
- MS1 Muting sensor 1
- MS2 Muting sensor 2
- a,b Distance between muting object and other fixed edges or objects (<200 mm)

Fig. 6.4: Muting with two diffuse sensors

Height of the muting-sensor light beams

The two light beams of the muting sensors must have a minimum height of H.

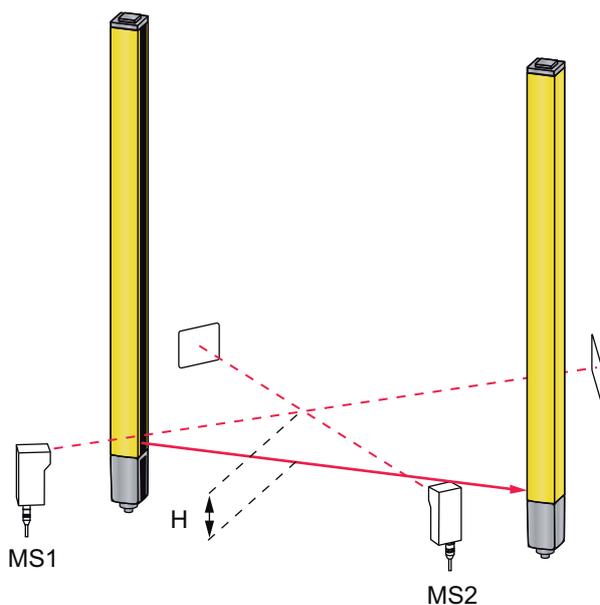


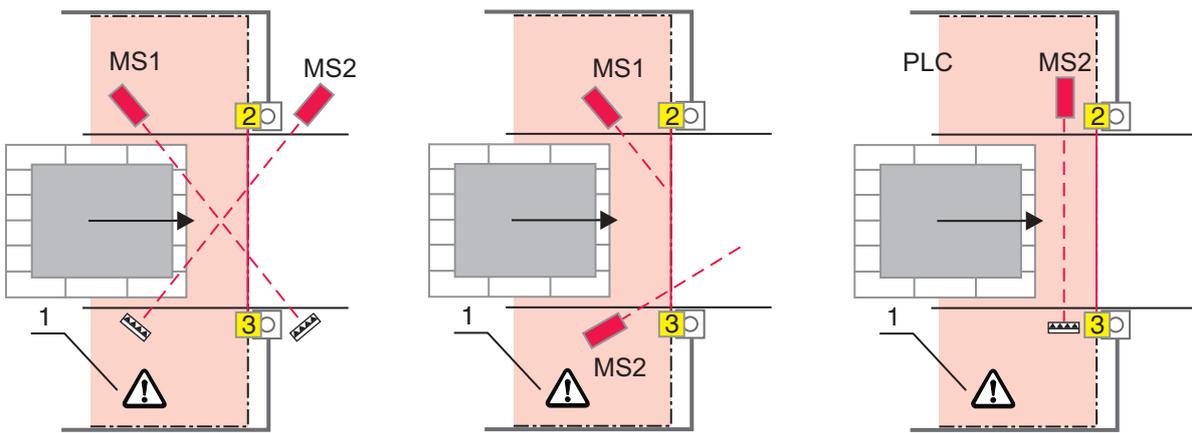
Fig. 6.5: Arrangement of the muting sensors with respect to height

- ↪ Mount the muting sensors so that the intersection point of their light beams is at the same height or higher than the lowest light beam of the safety sensor.
- ↪ This prevents—or hinders—manipulation with the feet since the protective field is interrupted before the muting-sensor light beam.

NOTICE

i To increase safety and make manipulation more difficult, MS1 and MS2 should, if possible, be mounted at different heights (i.e. no point-shaped intersection of the light beams).

6.2.5 Arrangement of the muting sensors for timing controlled 2-sensor muting especially for exit applications



- 1 Danger zone
- 2 Receiver
- 3 Transmitter
- MS1 Muting sensor 1
- MS2 Muting sensor 2
- PLC PLC signal

Fig. 6.6: Arrangement of the muting sensor for timing controlled 2-sensor muting in an exit application

NOTICE

i The installation height of the muting sensor is not significant here, since manipulation within the danger zone can be ruled out.

The two muting signals must be activated simultaneously within 4 s and the PLC signal MS1 must be independent of the photoelectric sensor signal. An additional arrangement (see figure above) utilizes diffuse sensors which are arranged and set so that the scanning area of one of the two sensors does not extend out of the danger zone. This assumes that the transport material no longer stops when MS1 is exited.

NOTICE

i The muting function remains active up to 4 s after MS1 becomes free. This arrangement is also impossible to manipulate with safety light curtains up to a resolution of 40 mm from outside of the danger zone, as the protective field is interrupted before MS1 is reached.

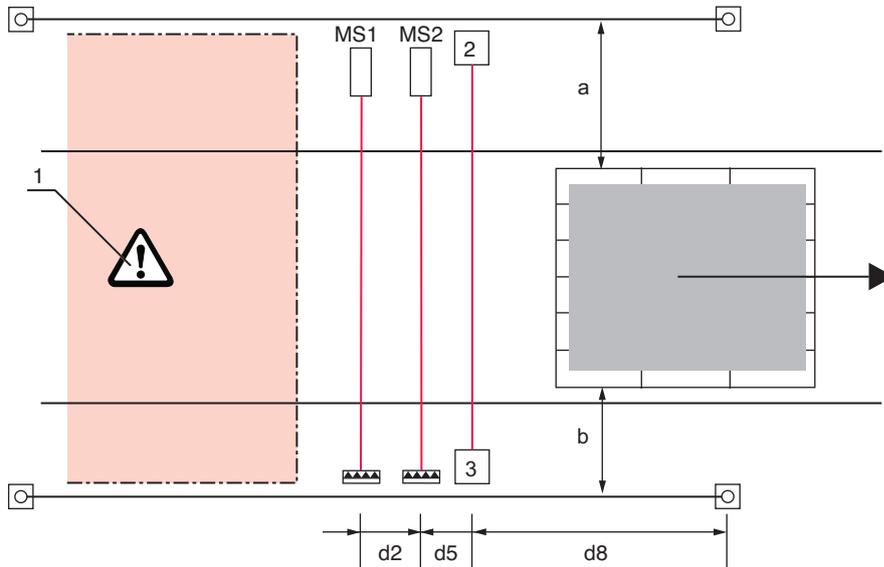
6.2.6 Arrangement of the muting sensors with sequence controlled 2-sensor muting

With this muting operating mode, material transport is only permissible in one direction due to the arrangement of the muting sensors (see chapter 4.2 "Sequence controlled 2-sensor muting").

DANGER

Risk of death by through incorrect arrangement of the muting sensors!

Only select sequence controlled 2-sensor muting for material exits (see chapter 4.2 "Sequence controlled 2-sensor muting").



- 1 Danger zone
- 2 Muting transceiver
- 3 Passive deflecting mirror
- MS1 Muting sensor 1
- MS2 Muting sensor 2
- a, b Distance between pallet and hard guard
- d2 Distance between MS1 and MS2
- d5 Distance from the light-beam of MS2 vertically to the protective-field plane
- d8 Distance from the end of the mechanical protective device, e.g. a hard guard, to the protective field

Fig. 6.7: Typical arrangement of the muting sensors for sequence controlled 2-sensor muting (example acc. to IEC TS 62046)

Distances a and b between fixed edges and the muting object (e.g. transport material) must be such that a person cannot enter through these openings undetected while the pallet passes through the muting zone. However, if it is assumed that persons are located here, the risk of crushing must be prevented, e.g. with wicket gates, which are integrated electrically into the safety circuit.

Distance d5, minimum (minimum distance)

$$d5 \geq v \cdot 0,05s$$

- d5 [mm] = Distance from the light-beam of MS2 vertically to the protective-field plane
- v [m/s] = Speed of the material

Distance d5, maximum

$$d5 < 200 \text{ mm}$$

d5 [mm] = Distance from the light-beam of MS2 vertically to the protective-field plane

Distance d2

$$d2 > 250 \text{ mm}$$

d2 [mm] = Distance between MS1 and MS2

Height of the muting-sensor light beams

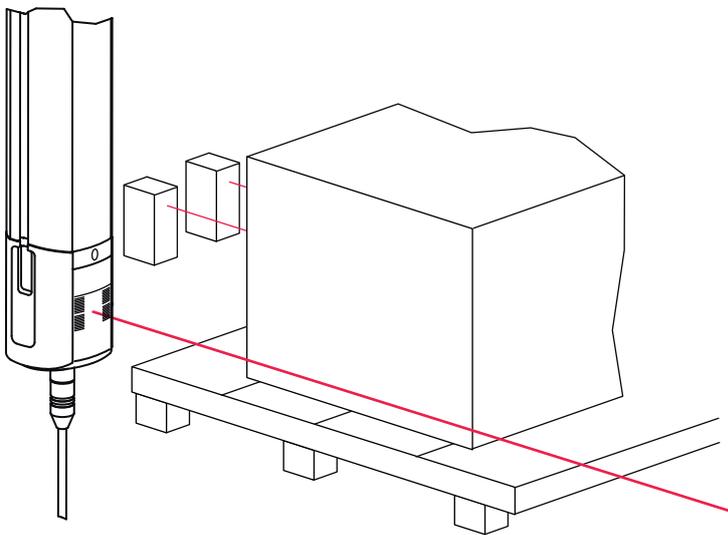


Fig. 6.8: Arrangement of the muting sensors with respect to height

NOTICE



The muting sensors should be located above the lowest beam of the safety sensor.

- ↪ Select the height of the light beams of the muting sensors so that they are above the lowest beam of the safety sensor and detect the transport material and not the pallet or transport device.
- ↪ Otherwise, you must take additional measures to prevent people from entering the danger zone on top of the pallet or transport device.

Distance d8 from the end of the mechanical protective device to the protective field

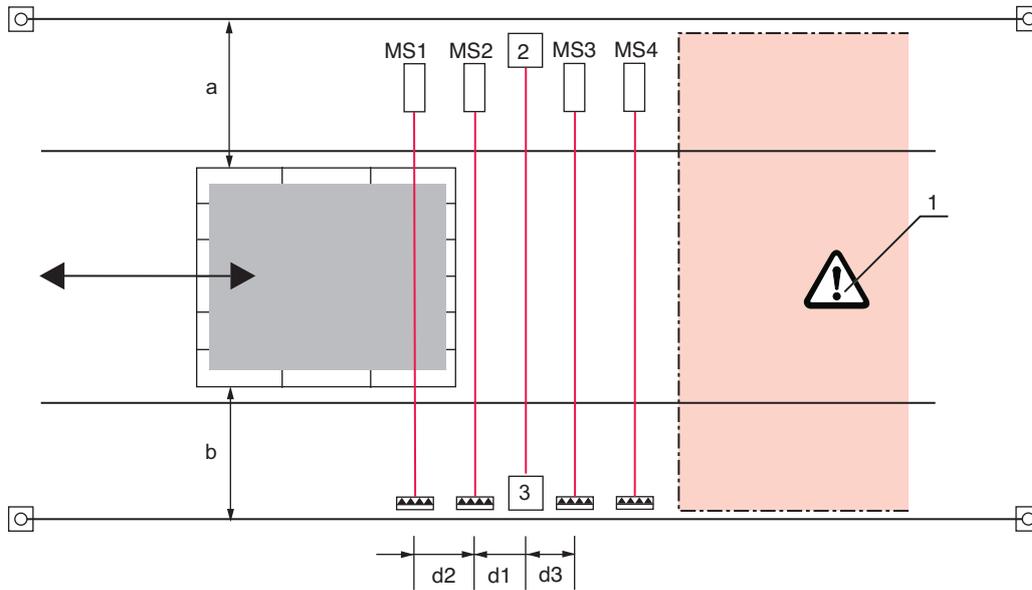
$$d8 \geq v_{\max} \cdot 5s - 200 \text{ mm}$$

d8 [mm] = Distance from the end of the mechanical protective device, e.g. a hard guard, to the protective field

v [m/s] = Maximum speed of the material

6.2.7 Arrangement of the muting sensors with sequence controlled 4-sensor muting

With this muting operating mode, material transport is permissible in both directions. The muting sensor light beams are parallelly arranged (see chapter 4.3 "Sequence controlled 4-sensor muting").



- 1 Danger zone
- 2 Muting transceiver
- 3 Passive deflecting mirror
- MS1 Muting sensor 1
- MS2 Muting sensor 2
- MS3 Muting sensor 3
- MS4 Muting sensor 4
- a, b Distance between pallet and hard guard
- d1 Distance between MS2 and AOPD
- d2 Distance between MS1 and MS2
- D3 Distance between MS3 and AOPD
- d5 Distance from the light-beam of MS2 vertically to the protective-field plane
- d8 Distance from the end of the mechanical protective device, e.g. a hard guard, to the protective field

Fig. 6.9: Typical arrangement of the muting sensors for sequence controlled 4-sensor muting (example acc. to IEC TS 62046)

Distances a and b between fixed edges and the muting object (e.g. transport material) must be such that a person cannot enter through these openings undetected while the pallet passes through the muting zone. However, if it is assumed that persons are located here, the risk of crushing must be prevented, e.g. with wicket gates, which are integrated electrically into the safety circuit.

Distance d1

$$d1 < 200\text{mm}$$

d1 [mm] = Distance from MS2 muting sensor to AOPD

Distance d3

$$d3 < 200\text{mm}$$

D3 [mm] = Distance from MS3 muting sensor to AOPD

Distance d2

$$d2 > 250 \text{ mm}$$

d2 [mm] = Distance between MS1 and MS2

Distance a,b

$$a \leq 180 \text{ mm}$$

a [mm] = Distance from the end of the mechanical protective device, e.g. a hard guard, to the protective field

Height of the muting-sensor light beams

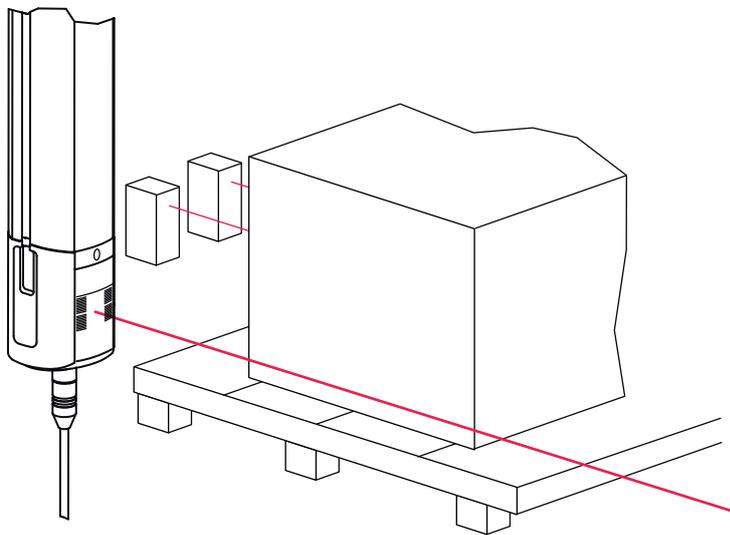


Fig. 6.10: Arrangement of the muting sensors with respect to height

NOTICE



The muting sensors should be located above the lowest beam of the safety sensor.

- ↪ Select the height of the light beams of the muting sensors so that they are above the lowest beam of the safety sensor and detect the transport material and not the pallet or transport device.
- ↪ Otherwise, you must take additional measures to prevent people from entering the danger zone on top of the pallet or transport device.

7 Electrical connection

| | |
|--|--|
|  WARNING | |
|  | <p>Faulty electrical connection or improper function selection may result in serious injury!</p> <ul style="list-style-type: none"> ↪ Only allow qualified persons (see chapter 2.2 "Necessary competencies") to perform the electrical connection. ↪ For access guarding, activate the start/restart interlock and make certain that it cannot be unlocked from within the danger zone. ↪ Select the safety-relevant functions for the safety sensor. Observe the operating instructions for the safety sensor. ↪ Always loop both safety-related switching outputs OSSD1 and OSSD2 of the muting controller into the work circuit of the machine. |

| | |
|--|---|
|  WARNING | |
|  | <p>Muting faults may result in serious injury!</p> <ul style="list-style-type: none"> ↪ Connect the muting signals so that they are separated and protected and a short circuit between the cables is impossible. |

| | |
|---|---|
| NOTICE | |
|  | <p>Laying cables!</p> <ul style="list-style-type: none"> ↪ Lay all connection cables and signal lines within the electrical installation space or permanently in cable ducts. ↪ Lay the cables and lines so that they are protected against external damages. ↪ For further information: see EN ISO 13849-2, Table D.4. |

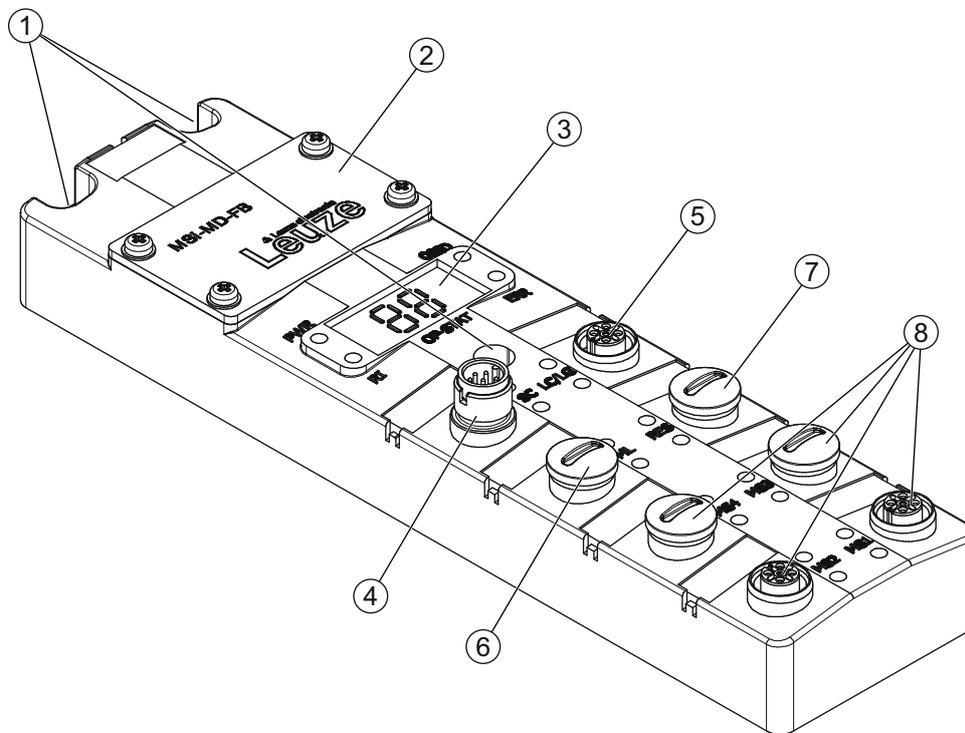
| | |
|---|---|
| NOTICE | |
|  | <p>Protective Extra Low Voltage (PELV)</p> <p>The muting controller is designed in accordance with protection class III for supply with PELV (Protective Extra-Low Voltage).</p> |

| | |
|---|--|
| NOTICE | |
|  | <p>Use in the USA and Canada</p> <p>For use in the USA and Canada, use is only permitted in Class 2 circuits in accordance with the NEC (National Electric Code).</p> |

7.1 Connecting the muting controller

The muting controller is equipped with the following connections:

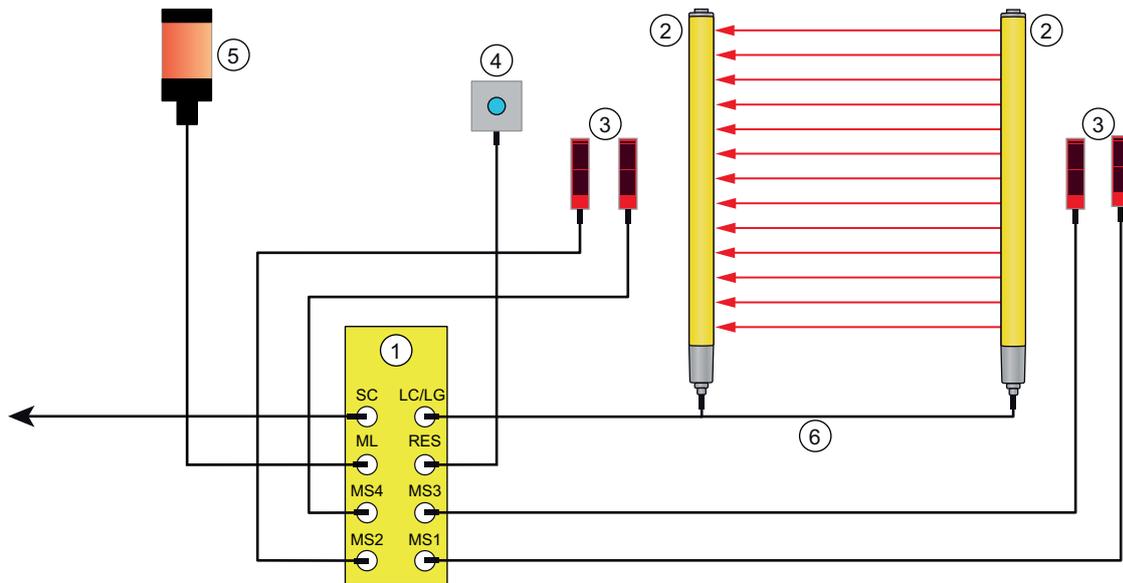
- One connection for the OSSDs of the safety sensor
M12 socket, 5-pin, A-coded
- One connection for the machine interface (OSSDs of the muting controller and supply voltage)
M12 plug, 8-pin, A-coded
- Four connections for muting sensors 1 ... 4
M12 socket, 5-pin, A-coded
- One connection for the reset button/acknowledgment unit
M12 socket, 5-pin, A-coded
- One connection for an external muting indicator
M12 socket, 5-pin, A-coded
- One service USB connection for reading out diagnostics
USB port of type Micro-B



- 1 Mounting eyes for M4 screws
- 2 Cover for the DIP switch blocks for configuring the muting function and the Micro USB connection for reading out diagnostics.
- 3 7-segment display
- 4 Connection to the machine interface (OSSDs and supply voltage)
- 5 Connection for the safety sensor
- 6 Connection for external muting indicator
- 7 Connection for acknowledgment unit
- 8 Connections for muting sensors

Fig. 7.1: Muting controller connections

- ↪ Connect the muting controller to the machine interface (see chapter 7.2 "Pin assignment of the machine interface").
- ↪ Connect the safety sensor to the muting controller (see chapter 7.3 "Pin assignment of safety sensor").
- ↪ Connect the acknowledgment unit to the muting controller (see chapter 7.4 "Pin assignment of the acknowledgment unit").
- ↪ If necessary, connect the external muting indicator to the muting controller (see chapter 7.5 "Pin assignment of muting indicator").
- ↪ Connect the muting sensors to the muting controller (see chapter 7.6 "Pin assignment of muting sensors").



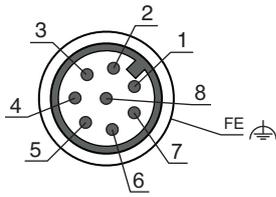
- 1 Muting controller
- 2 Safety sensor
- 3 Muting sensors
- 4 Acknowledgment unit
- 5 Muting indicators
- 6 Y interconnection cable CB-M12-Y1x

Fig. 7.2: Example: Connection of the muting controller

- ↪ Set the operating mode of the muting controller (see chapter 8 "Starting up the device - Configuration").

7.2 Pin assignment of the machine interface

SC: M12 plug, 8-pin, A-coded

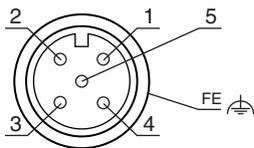


Tab. 7.1: Pin assignment of the machine interface

| Pin | Color | Signal | IN/OUT | Description |
|-----|--------|---------|--------|--|
| 1 | White | Reset | IN | Reset signal from the machine interface |
| 2 | Brown | +24 V | | Supply voltage |
| 3 | Green | MS1 | IN | +24 V if muting 'good' detected Muting signal from the machine interface |
| 4 | Yellow | Error | OUT | Fault in the muting controller: <ul style="list-style-type: none"> +24 V: fault in the muting controller 0 V: no fault; muting controller in operation |
| 5 | Gray | OSSD1 | OUT | +24 V if OSSD1 of the muting controller is active |
| 6 | Pink | OSSD2 | OUT | +24 V if OSSD2 of the muting controller is active |
| 7 | Blue | 0 V | | Supply voltage |
| 8 | Red | M-EN/TO | IN | Signal muting enable/muting timeout |
| FE | | | | Housing of the M12 plug Functional earth/shield |

7.3 Pin assignment of safety sensor

LC/LG: M12 socket, 5-pin, A-coded

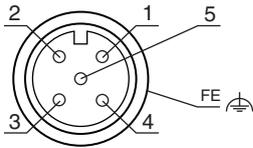


Tab. 7.2: Pin assignment of safety sensor

| Pin | Color | Signal | IN/OUT | Description |
|-----|-------|--------|--------|--|
| 1 | Brown | +24 V | | Supply voltage for safety sensor, short-circuit proof |
| 2 | White | OSSD1 | IN | OSSD1 of the safety sensor; +24 V if OSSD1 is active |
| 3 | Blue | 0 V | | Supply voltage for safety sensor |
| 4 | Black | OSSD2 | IN | OSSD2 of the safety sensor; +24 V if OSSD2 is active |
| 5 | Gray | FE | | FE - functional earth, shield |
| FE | | | | Housing of the M12 socket FE - functional earth, shield |

7.4 Pin assignment of the acknowledgment unit

RES: M12 socket, 5-pin, A-coded

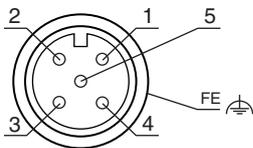


Tab. 7.3: Pin assignment of the acknowledgment unit

| Pin | Color | Signal | IN/OUT | Description |
|-----|-------|---------------|--------|--|
| 1 | Brown | +24 V | | Supply voltage |
| 2 | White | ReadyForReset | OUT | LED lighting for the acknowledgment unit Signal indicating that the system is waiting for actuation of the acknowledgment unit. |
| 3 | Blue | GND | | Supply voltage |
| 4 | Black | Reset | IN | Switching signal reset |
| 5 | Gray | n.c. | | This pin is not contacted at the device |
| FE | | | | Housing of the M12 socket FE - functional earth, shield |

7.5 Pin assignment of muting indicator

ML: M12 socket, 5-pin, A-coded

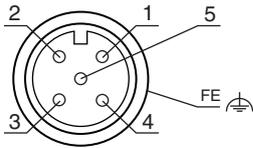


Tab. 7.4: Pin assignment of muting indicator

| Pin | Color | Signal | IN/OUT | Description |
|-----|-------|--------|--------|--|
| 1 | Brown | +24 V | | Supply voltage |
| 2 | White | Muting | OUT | +24 V if muting active |
| 3 | Blue | GND | | Supply voltage |
| 4 | Black | Muting | OUT | +24 V if muting active |
| 5 | Gray | n.c. | | This pin is not contacted at the device |
| FE | | | | Housing of the M12 plug Functional earth/shield |

7.6 Pin assignment of muting sensors

MS1, MS2, MS3, MS4: Four connections for muting sensors MS1 ... MS4; M12 socket, 5-pin, A-coded



Tab. 7.5: Pin assignment of muting sensor

| Pin | Color | Signal | IN/OUT | Description |
|-----|-------|--------|--------|--|
| 1 | Brown | +24 V | | Supply voltage |
| 2 | White | n.c. | | This pin is not contacted at the device |
| 3 | Blue | GND | | Supply voltage |
| 4 | Black | Muting | IN | +24 V if muting 'good' detected |
| 5 | Gray | n.c. | | This pin is not contacted at the device |
| FE | | | | Housing of the M12 socket FE - functional earth, shield |

7.7 Pin assignment of service USB

Micro-USB-B socket, 5-pin

NOTICE

 The service USB interface of the muting controller is connected to the USB interface on the PC with a standard USB cable (plug combination - Micro-USB-B type / Type A).

7.8 Circuit diagram examples

7.8.1 Timing controlled 2-sensor muting

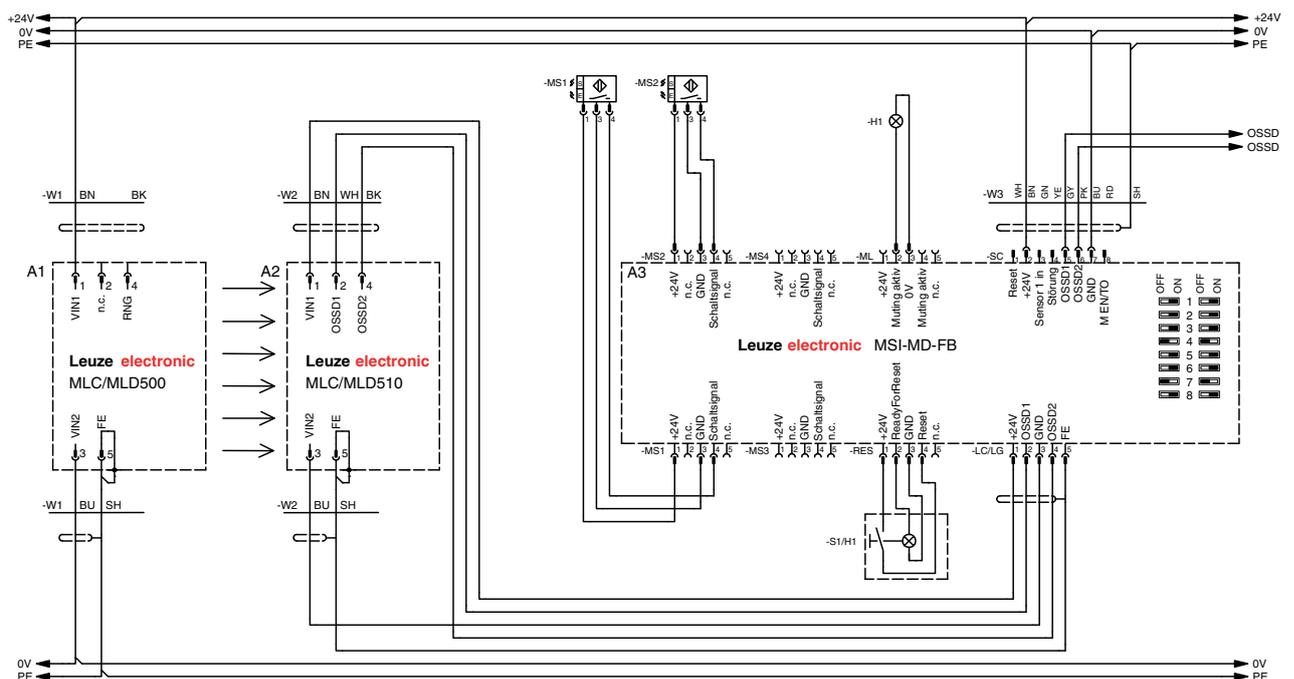


Fig. 7.3: Circuit diagram example: timing controlled 2-sensor muting

- Muting controller MSI-MSI-MD-FB and safety sensor MLC 510 or MLD 510

- Muting timeout: 10 minutes

7.8.2 Sequence controlled 2-sensor muting

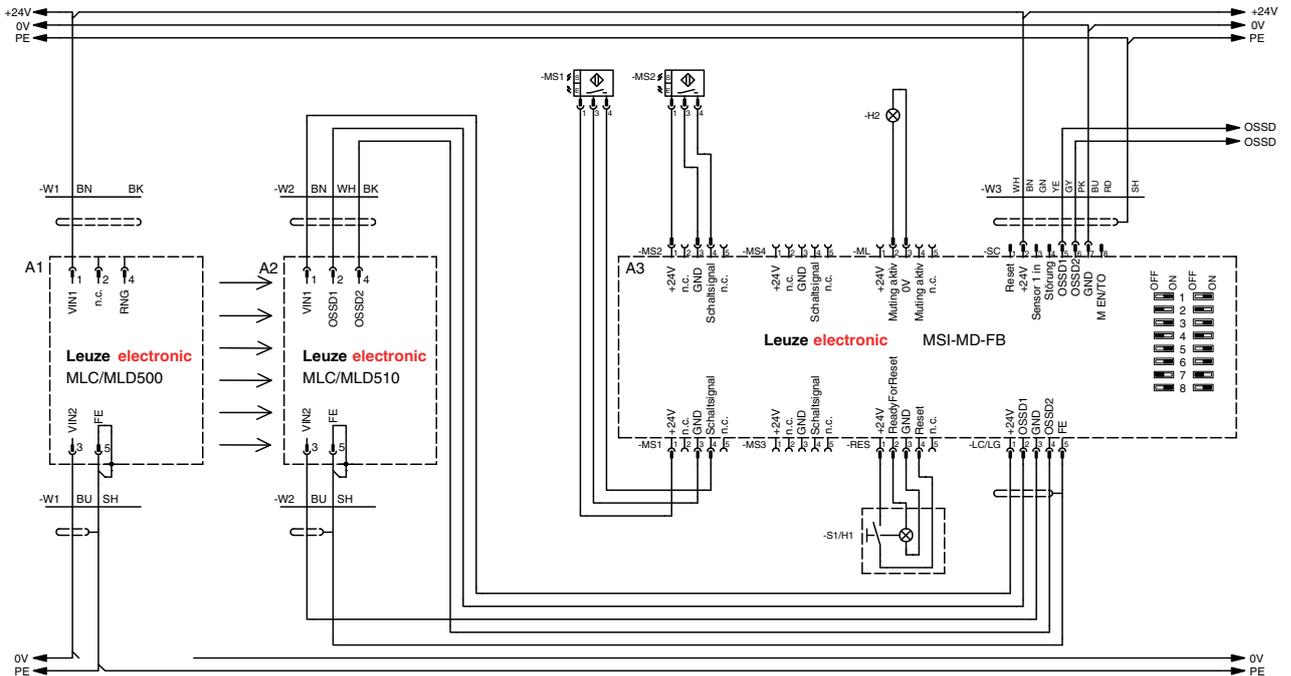


Fig. 7.4: Circuit diagram example: sequence controlled 2-sensor muting

- Muting controller MSI-MSI-MD-FB and safety sensor MLC 510 or MLD 510
- Muting timeout: 10 minutes

7.8.3 Sequence controlled 4-sensor muting

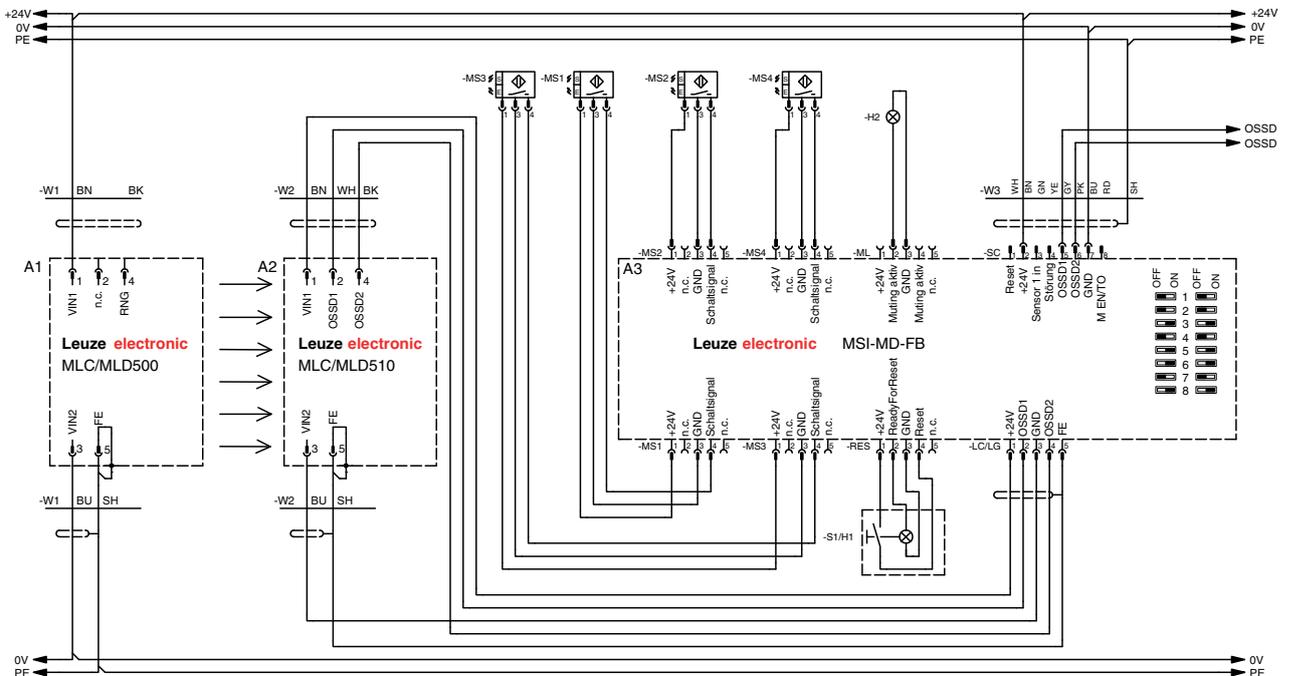


Fig. 7.5: Circuit diagram example: sequence controlled 4-sensor muting

- Muting controller MSI-MSI-MD-FB and safety sensor MLC 510 or MLD 510
- Muting timeout: 10 minutes

8 Starting up the device - Configuration

8.1 Overview

The function of the muting controller is set via two DIP switch blocks, each of which has eight switches. The DIP switch blocks are located behind a cover in the housing of the muting controller and are not accessible in normal operation.

Parameter

You can set the following parameters for the function of the muting controller:

| DIP switch | Function | Settings |
|------------|-----------------------------------|---|
| 1 | Number of the muting sensors | 2-sensor muting 4-sensor muting |
| 2 | Muting mode | Timing controlled muting Sequence controlled muting |
| 3 | Muting-enable / timeout extension | With muting-enable / timeout extension Without muting-enable / timeout extension |
| 4 | Restart | Automatically via machine interface signal Manually via acknowledgment unit |
| 5 | Source for muting signal | Muting sensor 1 Machine interface |
| 6 | Source for reset signal | Acknowledgment unit Machine interface |

Procedure

- ↪ Disconnect the muting controller from voltage.
- ↪ Remove the cover from the housing of the muting controller (four screws; see chapter 3.4 "Operational controls").
- ↪ Set the operating mode of the muting controller via the DIP switch blocks (see chapter 8.2 "Setting the operating mode").
- ↪ Remount the cover on the housing on the muting controller.
 - ⇒ Tighten the screws with a torque wrench. Torque: 0.6 ... 0.8 Nm
- ↪ Connect the muting controller to the voltage supply
- ↪ Restart the muting controller.
 - ⇒ After the device is started, the 7-segment display shows the set operating mode.

NOTICE



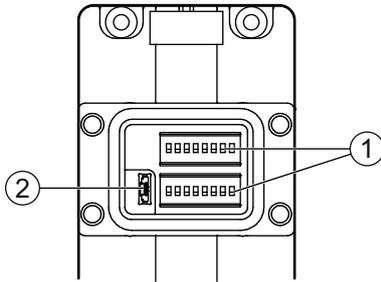
Error when configuring the muting controller in process mode!

If the switch position of the DIP switch blocks is changed in process mode, an error is triggered and the OSSDs switch off.

- ↪ Only set the configuration of the muting controller while the device is in a voltage-free state.

8.2 Setting the operating mode

The muting controller is equipped with two DIP switch blocks, each with eight switches for setting the configuration.



- 1 DIP switch blocks
- 2 Service USB connection

Fig. 8.1: Muting controller without cover

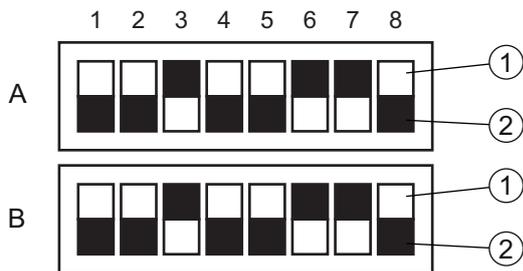
Switch position of the DIP switch blocks

NOTICE



Error for different switch positions in the DIP switch blocks!
 An error is triggered for different switch positions in the DIP switch blocks and the OSSDs switch off.

↳ When configuring, make certain that the switch position is identical in both DIP switch blocks.



- A DIP switch block A
- B DIP switch block B
- 1 Switch position ON
- 2 Switch position OFF

Fig. 8.2: Example: switch position of the DIP switch blocks

Tab. 8.1: Assignment of the DIP switches

| DIP switch | Function | ON | OFF |
|------------|-----------------------------------|--|---|
| 1 | Number of the muting sensors | 4-sensor muting | 2-sensor muting |
| 2 | Muting mode | Sequence controlled muting | Timing controlled muting |
| 3 | Muting-enable / timeout extension | With muting-enable / timeout extension | Without muting-enable / timeout extension |
| 4 | Restart | Manual restart | Automatic restart |
| 5 | Source for muting signal | Muting signal from the machine interface | Muting signal from muting sensor 1 |
| 6 | Source for reset signal | Reset signal via control | Reset signal via acknowledgment unit |
| | | | |
| 7/8 | Muting timeout | OFF/OFF: 20 seconds | |
| | | OFF/ON: 2 minutes | |
| | | ON/OFF: 10 minutes | |
| | | ON/ON: 100 hours | |

Setting the operating mode

The following table lists the permissible operating modes that can be set via the DIP switch blocks.

After the device is started, the 7-segment display of the muting controller shows the set operating mode.

| NOTICE | |
|---|--|
|  | <p>Error in event of impermissible setting of DIP switches!</p> <p>If a DIP switch configuration is set that does not correspond to that of a permissible operating mode, an operating mode error is triggered and the OSSDs switch off.</p> <p>↳ Only set one of the DIP-switch configurations listed in the operating mode table.</p> |
| NOTICE | |
|  | <p>Restart interlock for access guarding!</p> <p>For access guarding, a restart interlock is required.</p> <p>↳ If the <i>automatic restart interlock</i> is configured in the muting controller, you must carry out the restart interlock, e. g. via the machine interface.</p> |

Tab. 8.2: Operating modes

| DIP switch | 1 | 2 | 3 | 4 | 5 | 6 |
|----------------|--------------------------|-------------------|-----------------------------------|-----------|--------------------------|---------------------------|
| Function | Number of muting sensors | Muting mode | Muting-enable / timeout extension | Restart | Source for muting signal | Source for restart signal |
| Operating mode | | | | | | |
| 1 | 2-sensor | Timing controlled | Without | Automatic | Muting sensor 1 | Acknowledgment unit |
| 2 | 2-sensor | Timing controlled | Without | Automatic | Muting sensor 1 | Machine interface |
| 3 | 2-sensor | Timing controlled | Without | Automatic | Machine interface | Acknowledgment unit |

| DIP switch | 1 | 2 | 3 | 4 | 5 | 6 |
|-----------------------|--------------------------|---------------------|-------------------------------------|-----------|--------------------------|---------------------------|
| Function | Number of muting sensors | Muting mode | Muting-enabled / time-out extension | Restart | Source for muting signal | Source for restart signal |
| Operating mode | | | | | | |
| 4 | 2-sensor | Timing controlled | Without | Automatic | Machine interface | Machine interface |
| 5 | 2-sensor | Timing controlled | Without | Manual | Muting sensor 1 | Acknowledgment unit |
| 6 | 2-sensor | Timing controlled | Without | Manual | Muting sensor 1 | Machine interface |
| 7 | 2-sensor | Timing controlled | Without | Manual | Machine interface | Acknowledgment unit |
| 8 | 2-sensor | Timing controlled | Without | Manual | Machine interface | Machine interface |
| 9 | 2-sensor | Timing controlled | With | Automatic | Muting sensor 1 | Acknowledgment unit |
| 10 | 2-sensor | Timing controlled | With | Automatic | Muting sensor 1 | Machine interface |
| 11 | 2-sensor | Timing controlled | With | Automatic | Machine interface | Acknowledgment unit |
| 12 | 2-sensor | Timing controlled | With | Automatic | Machine interface | Machine interface |
| 13 | 2-sensor | Timing controlled | With | Manual | Muting sensor 1 | Acknowledgment unit |
| 14 | 2-sensor | Timing controlled | With | Manual | Muting sensor 1 | Machine interface |
| 15 | 2-sensor | Timing controlled | With | Manual | Machine interface | Acknowledgment unit |
| 16 | 2-sensor | Timing controlled | With | Manual | Machine interface | Machine interface |
| 17 | 2-sensor | Sequence controlled | Without | Automatic | Muting sensor 1 | Acknowledgment unit |
| 18 | 2-sensor | Sequence controlled | Without | Automatic | Muting sensor 1 | Machine interface |
| 19 | 2-sensor | Sequence controlled | Without | Automatic | Machine interface | Acknowledgment unit |
| 20 | 2-sensor | Sequence controlled | Without | Automatic | Machine interface | Machine interface |
| 21 | 2-sensor | Sequence controlled | Without | Manual | Muting sensor 1 | Acknowledgment unit |
| 22 | 2-sensor | Sequence controlled | Without | Manual | Muting sensor 1 | Machine interface |
| 23 | 2-sensor | Sequence controlled | Without | Manual | Machine interface | Acknowledgment unit |
| 24 | 2-sensor | Sequence controlled | Without | Manual | Machine interface | Machine interface |

| DIP switch | 1 | 2 | 3 | 4 | 5 | 6 |
|-----------------------|--------------------------|---------------------|-------------------------------------|-----------|--------------------------|---------------------------|
| Function | Number of muting sensors | Muting mode | Muting-enabled / time-out extension | Restart | Source for muting signal | Source for restart signal |
| Operating mode | | | | | | |
| 49 | 4-sensor | Sequence controlled | Without | Automatic | Muting sensor 1 | Acknowledgment unit |
| 50 | 4-sensor | Sequence controlled | Without | Automatic | Muting sensor 1 | Machine interface |
| 51 | 4-sensor | Sequence controlled | Without | Automatic | Machine interface | Acknowledgment unit |
| 52 | 4-sensor | Sequence controlled | Without | Automatic | Machine interface | Machine interface |
| 53 | 4-sensor | Sequence controlled | Without | Manual | Muting sensor 1 | Acknowledgment unit |
| 54 | 4-sensor | Sequence controlled | Without | Manual | Muting sensor 1 | Machine interface |
| 55 | 4-sensor | Sequence controlled | Without | Manual | Machine interface | Acknowledgment unit |
| 56 | 4-sensor | Sequence controlled | Without | Manual | Machine interface | Machine interface |

9 Testing

| | |
|--|--|
|  WARNING | |
|  | <p>A running machine may result in serious injury!</p> <ul style="list-style-type: none"> ↪ Make certain that, during all conversions, maintenance work and inspections, the system is securely shut down and protected against being restarted. |
| NOTICE | |
|  | <ul style="list-style-type: none"> ↪ The safety relays must be exchanged after a maximum of 20 years. ↪ Always exchange the entire safety relay. ↪ Observe any nationally applicable regulations regarding the tests. ↪ Document all tests in a comprehensible manner. |

9.1 Before the initial start-up and following modifications

| | |
|--|--|
|  WARNING | |
|  | <p>Unpredictable machine behavior during initial start-up may result in serious injury!</p> <ul style="list-style-type: none"> ↪ Make certain that there are no people in the danger zone. |

↪ Before they begin work, train the operators on their respective tasks. The training is the responsibility of the operating company.

↪ Attach notes regarding daily testing in the respective national language of the operator on the machine in a highly visible location, e.g. by printing out the corresponding chapter (see chapter 9.3 "Periodically by the operator").

↪ Test the electrical function and installation according to this document.

Acc. to IEC/TS 62046 and national regulations (e.g. EU directive 2009/104/EC), tests are to be performed by qualified persons (see chapter 2.2 "Necessary competencies") in the following situations:

- Prior to initial commissioning
- Following modifications to the machine
- After longer machine downtime
- Following retrofitting or new configuration of the machine

↪ Before preparing, check the most important criteria for the optoelectronic safety device and the safety relay. This check does not replace testing by qualified persons (see chapter 2.2 "Necessary competencies").

↪ Not until proper function of the optoelectronic safety device and the safety relay is ascertained may they be integrated in the control circuit of the system.

9.2 Regularly by qualified persons

The reliable interaction of safety sensor, safety relay and machine must be regularly tested by qualified persons (see chapter 2.2 "Necessary competencies") in order to detect changes to the machine or impermissible tampering.

Acc. to IEC/TS 62046 and national regulations (e.g., EU directive 2009/104/EC), tests of elements which are subject to wear must be performed by qualified persons (see chapter 2.2 "Necessary competencies") at regular intervals. Testing intervals may be regulated by nationally applicable regulations (recommendation acc. to IEC/TS 62046: 6 months).

↪ Only allow testing to be performed by qualified persons (see chapter 2.2 "Necessary competencies").

↪ Observe the nationally applicable regulations and the time periods specified therein.

9.3 Periodically by the operator

The function of the safety relay must be checked depending on the given risk according to the following checklist so that damage or prohibited tampering can be detected.

Depending on the risk assessment, the test cycle must be defined by the integrator or operating company (e.g., daily, on shift changes, ...) or is specified by national regulations or regulations of the employer's liability insurance association and may be dependent on the machine type.

Due to complex machines and processes, it may be necessary under certain circumstances to check some points at longer time intervals. Observe the classification in "Test at least" and "Test when possible".

| NOTICE | |
|---|---|
|  | For larger distances between transmitter and receiver of the safety sensor and when using deflecting mirrors, a second person may be necessary. |

|  WARNING | |
|--|--|
|  | <p>Unpredictable machine behavior during the test may result in serious injury!</p> <ul style="list-style-type: none"> ↪ Make certain that there are no people in the danger zone. ↪ Before they begin work, train the operators on their respective tasks and provide suitable test objects and an appropriate test instruction. |

9.3.1 Checklist – periodically by the operator

| NOTICE | |
|---|---|
|  | ↪ If you answer one of the items on the following check list with no , the machine must no longer be operated. |

| When possible, test during running operation: | Yes | No |
|--|------------|-----------|
| Protective device with approach function: during machine operation, the protective field is interrupted with the test object – are the obviously dangerous machine parts stopped without noticeable delay? | | |
| Protective device with presence detection: the protective field is interrupted with the test object – does this prevent operation of the obviously dangerous machine parts? | | |

Tab. 9.1: Checklist – regular function test by trained operators/persons

| Test at least: | Yes | No |
|---|------------|-----------|
| Are safety relay, safety sensor, connectors, command devices, and connection and inter-connection cables securely mounted and free of obvious signs of damage, change or tampering? | | |
| Are all point of operations at the machine accessible only through one or more protective fields of safety sensors? | | |
| Are all additional protective devices mounted correctly (e.g., safety guard)? | | |
| Does the start/restart interlock prevent the automatic start-up of the machine after the safety sensor/safety relay has been switched on or activated? | | |

| Test at least: | Yes | No |
|---|-----|----|
| <p>Test the effectiveness of the safety sensor/safety relay:</p> <ul style="list-style-type: none"> Interrupt an active beam or the protective field (see figure) during operation with a suitable, opaque test object: <div data-bbox="555 349 948 824" data-label="Image"> </div> <p style="text-align: center;">Checking the protective field function with test rod</p> <ul style="list-style-type: none"> Is the dangerous movement shut down immediately? | | |

10 Care, maintenance and disposal

Cleaning

- ↪ Clean the device with a soft cloth as needed; use a cleaning agent (commercially available glass cleaner) if necessary.

NOTICE



Do not use aggressive cleaning agents!

- ↪ Do not use aggressive cleaning agents such as thinner or acetone for cleaning the device. Use of improper cleaning agents can damage the 7-segment display.

Maintenance

The device does not normally require any maintenance by the operator.

Repairs to the device must only be performed by the manufacturer.

- ↪ For repairs, contact your responsible Leuze electronic subsidiary or Leuze electronic customer service (see chapter 13 "Service and support").

Disposing

- ↪ For disposal observe the applicable national regulations regarding electronic components.

11 Diagnostics and troubleshooting

11.1 What to do in case of failure?

After switching on the muting controller, the display elements (see chapter 3.2 "Display elements") assist in checking the correct functionality and in fault-finding.

In case of failure, you can read a message from the 7-segment display. With the error message you can determine the cause of the error and initiate measures to rectify it.

| NOTICE | |
|---|--|
|  | <p>If the light curtain responds with an error display, you will often be able to eliminate the cause yourself!</p> <ul style="list-style-type: none"> ↳ Switch off the machine and leave it switched off. ↳ Analyze and eliminate the cause of the fault using the following table. ↳ If you are unable to rectify the fault, contact the Leuze electronic branch responsible for you or call the Leuze electronic customer service (see chapter 13 "Service and support"). |

With the *Sensor Studio* diagnosis software, you can create a service file that you can send to Leuze electronic customer service in the event of service requests (see chapter 12 "Diagnosis software Sensor Studio"). The service file contains all available information on the muting controller, as well as configuration and settings.

11.2 Error messages 7-segment display

User messages/notes and error messages are indicated by the alternating display of a letter and a two-digit number.

Tab. 11.1: Messages of the 7-segment display (F: internal device error, E: external error, U: usage info during application errors)

| Error | Cause/description | Remedies and measures | Behavior of the muting controller |
|--------------|---|---|-----------------------------------|
| F[No. 0-255] | Internal error | In the event of an unsuccessful restart, contact customer service. | |
| OFF | Very high overvoltage (± 40 V) | Supply the device with the correct voltage. | |
| E01 | Cross connection between OSSD1 and OSSD2 | Check the wiring between OSSD1 and OSSD2. | Automatic reset |
| E02 | Overload on OSSD1 | Check the wiring or exchange the connected component (reducing the load). | Automatic reset |
| E03 | Overload on OSSD2 | Check the wiring or exchange the connected component (reducing the load). | Automatic reset |
| E04 | High-impedance short circuit to VCC OSSD1 | Check the wiring. Exchange the cable, if applicable. | Automatic reset |
| E05 | High-impedance short circuit to VCC OSSD2 | Check the wiring. Exchange the cable, if applicable. | Automatic reset |
| E06 | Short circuit against GND at OSSD1 | Check the wiring. Exchange the cable, if applicable. | Automatic reset |
| E07 | Short circuit against +24 V at OSSD1 | Check the wiring. Exchange the cable, if applicable. | Automatic reset |
| E08 | Short circuit against GND at OSSD2 | Check the wiring. Exchange the cable, if applicable. | Automatic reset |
| E09 | Short circuit against +24 V at OSSD2 | Check the wiring. Exchange the cable, if applicable. | Automatic reset |

| Error | Cause/description | Remedies and measures | Behavior of the muting controller |
|--------------|--|--|--|
| E10, E11 | OSSD error, source unknown | Check the wiring. Exchange the cable and the receiver if necessary. | Automatic reset |
| E14 | Undervoltage (< +16 V) | Supply the device with the correct voltage. | Automatic reset |
| E15 | Overvoltage (> +31 V) | Supply the device with the correct voltage. | Automatic reset |
| E16 | Overvoltage (> +40 V) | Supply the device with the correct voltage. | Locking |
| E18 | Ambient temperature too high (> 90°) | Ensure correct environmental conditions | Automatic reset |
| E19 | Ambient temperature too low (< -35°) | Ensure correct environmental conditions | Automatic reset |
| E39 | Actuation duration for the acknowledgment unit exceeded | Press the acknowledgment unit. If the restart is unsuccessful, check the wiring of the reset button. | Automatic reset |
| E42 | Muting enable signal on +24 V for too long | Check the actuation of the muting enable signal | Acknowledgment unit |
| E80 | Invalid operating mode | Check the configuration of the operating mode and restart. | Locking |
| E87 | Operating mode changed | Check the configuration of the operating mode and restart. | Locking |
| E89 | Switch position of the DIP switch blocks changed during operation. | Check the configuration of the operating mode and restart. | Locking |
| E97 | Linkage of electronic safety-related switching outputs: OSSDs did not switch simultaneously | Check the wiring. | Locking |
| U10 | Invalid command received via the interface | Check the connection to the USB interface | Automatic reset |
| U30 | Sequence error between muting sensor 1 and muting sensor 2 | Check the arrangement and alignment of the muting sensors. | Automatic reset |
| U31 | Sequence error between muting sensor 2 and muting sensor 3 | Check the arrangement and alignment of the muting sensors | Automatic reset |
| U32 | Sequence error between muting sensor 3 and muting sensor 4 | Check the arrangement and alignment of the muting sensors | Automatic reset |
| U33 | Sequence error if all muting sensors are activated and muting sensor 1 should be free | Check the arrangement and alignment of the muting sensors | Automatic reset |
| U34 | Sequence error if muting sensors 2 to 4 are activated and muting sensor 2 should be free | Check the arrangement and alignment of the muting sensors | Automatic reset |
| U35 | Sequence error if muting sensor 3 and muting sensor 4 are activated and muting sensor 3 should be free | Check the arrangement and alignment of the muting sensors | Automatic reset |

| Error | Cause/description | Remedies and measures | Behavior of the muting controller |
|-------|--|---|-----------------------------------|
| U41 | Concurrency expectation of the muting signals not met: second signal outside tolerance of 4 s | Check the arrangement of the muting sensors or the programming of the machine interface if required. | Automatic reset |
| U43 | Muting end before protective field release | Select a valid muting condition. | Automatic reset. |
| U44 | Sequence error if muting sensor 1 and muting sensor 2 are activated and muting sensor 2 should be free | Check the arrangement and alignment of the muting sensors | Automatic reset |
| U45 | Sequence error if muting sensors 1 to 3 are activated and muting sensor 3 should be free | Check the arrangement and alignment of the muting sensors | Automatic reset |
| U46 | Sequence error if all muting sensors are activated and muting sensor 4 should be free | Check the arrangement and alignment of the muting sensors | Automatic reset |
| U47 | Sequence error between muting sensor 2 and muting sensor 1 | Check the arrangement and alignment of the muting sensors | Automatic reset |
| U48 | Sequence error between muting sensor 3 and muting sensor 2 | Check the arrangement and alignment of the muting sensors | Automatic reset |
| U49 | Sequence error between muting sensor 4 and muting sensor 3 | Check the arrangement and alignment of the muting sensors | Automatic reset |
| U50 | Muting restart without valid muting configuration of the muting sensors | Check the mounting of the muting sensors and the activation of the muting signals. | Automatic reset |
| U51 | Only one muting signal active in case of protective field violation, the second muting signal is missing | Check the mounting of the muting sensors and the activation of the muting signals. | Automatic reset |
| U52 | Oscillating muting sensor detected | Check the wiring or whether the muting sensor is defective. Exchange the muting sensor if necessary. | Automatic reset. |
| U55 | Time limit for override exceeded | Check the further processing of the OSSD signals and the design of the muting system. | Automatic reset |
| U56 | Acknowledgment unit was actuated with interrupted protective field and without activated muting sensor | Check the arrangement and connections of the muting sensors and carry out muting restart again if required. | Automatic reset |
| U58 | Muting timeout elapsed | Actuate the acknowledgment unit | Automatic reset |
| U59 | A muting sensor has switched on and off again multiple times without muting having been triggered | Check the arrangement and alignment of the muting sensors. | Automatic reset |
| U60 | Error at transition from one activated muting sensor to two activated muting sensors | Check the arrangement and alignment of the muting sensors. | Automatic reset |

| Error | Cause/description | Remedies and measures | Behavior of the muting controller |
|-------|--|---|-----------------------------------|
| U61 | Sequence error when clearing the first muting sensor | Check the arrangement and alignment of the muting sensors | Automatic reset |
| U62 | Sequence error when clearing the second muting sensor | Check the arrangement and alignment of the muting sensors | Automatic reset |
| U63 | Time limit from the activation of the first muting sensor to the activation of the second muting sensor exceeded | Check the arrangement and alignment of the muting sensors | Automatic reset |
| U64 | Time limit for override exceeded | Check the further processing of the OSSD signals and the design of the muting system. | Automatic reset |
| U73 | Restarting the device | Only an entry in the error memory - no display | Automatic reset |
| U80 | Acknowledgment unit actuated although none is configured | Check the setting for the acknowledgment unit | Automatic reset |
| U81 | Incorrect reset signal, e.g., reset signal via acknowledgment unit, even though reset signal is configured via machine interface | Check the setting for the reset signal. | Automatic reset |
| U82 | Muting enable activated even though not configured | Check the setting for muting enable. | Automatic reset |
| U83 | Muting sensor 1 signal via muting sensor even though configured via machine interface | Check the setting for muting sensor 1. | Automatic reset |
| U84 | Muting sensor 1 signal via machine interface even though configured via muting sensor | Check the setting for muting sensor 1. | Automatic reset |
| U85 | Signals from muting sensor 3 or muting sensor 4 in 2-sensor muting | Check the design of the muting system. | Automatic reset |

12 Diagnosis software Sensor Studio

The *Sensor Studio* diagnosis software makes available a graphical user interface for diagnosis of the safety sensor via the service interface of the muting controller.

With the *Sensor Studio* diagnosis software, you can create a service file that you can send to Leuze electronic customer service in the event of service requests. The service file contains all available information on the muting controller, as well as configuration and settings.

NOTICE



Only use the *Sensor Studio* diagnosis software for products manufactured by Leuze electronic. The *Sensor Studio* diagnosis software is offered in the following languages: German, English, French, Italian and Spanish. The FDT frame application of the *Sensor Studio* supports all languages; all languages may not be supported in the device DTM (Device Type Manager).

The *Sensor Studio* diagnosis software is designed according to the FDT/DTM concept:

- In the Device Type Manager (DTM), you will find the diagnosis displays for the safety sensor and the muting controller.
- The individual DTM configurations of a project can be called up via the frame application of the Field Device Tool (FDT).
- Communication DTM for MSI-MD-FB muting controller: *LeCommInterface*
- Device DTM for MSI-MD-FB muting controller

Procedure for the installation of the software and hardware:

- ↪ Install the *Sensor Studio* diagnosis software on the PC.
- ↪ Install the communication and device DTM. Communication and device DTM are included in the *Le-AnalysisCollectionSetup* installation package.
- ↪ Create device DTM for MSI-MD-FB muting controller in the project tree of the *Sensor Studio* FDT frame.
- ↪ Connect the muting controller to the PC via the USB service interface

NOTICE



Service USB connection not for safety-related operation!

- ↪ Service USB connection is not used for safety-related operation.
- ↪ Service USB connection is not accessible in normal operation. The cover in the housing of the muting controller, under which the service USB connection is located, is closed in normal operation.

12.1 System requirements

To use the *Sensor Studio* diagnosis software, you need a PC or laptop with the following specifications:

Tab. 12.1: System requirements for *Sensor Studio* installation

| | |
|--|--|
| Operating system | Windows XP or higher (32 bit, 64 bit) Windows Vista Windows 7 Windows 8 |
| Computer | Processor type: 1 GHz or higher Serial COM interface CD-ROM drive Main memory (RAM): at least 64 MB Keyboard and mouse or touchpad |
| Graphics card | At least 1024 x 768 pixels |
| Required hard disk capacity for <i>Sensor Studio</i> and communication DTM | 35 MB |

NOTICE



Administrator privileges on the PC are necessary for installing *Sensor Studio*.

12.2 Installing the Sensor Studio diagnosis software

NOTICE



You can find the installation files of the *Sensor Studio* diagnosis software on a data carrier in the scope of delivery of the muting controller. For subsequent updates, you can find the most recent version of the *Sensor Studio* installation software on the Internet at www.leuze.com (see chapter 1.2 "Downloading the diagnosis software from the Internet").

12.2.1 Installing the Sensor Studio FDT frame

NOTICE



First install the software!

- ↪ Do not yet connect the device to the PC.
- ↪ First install the software.

NOTICE



If FDT frame software is already installed on your PC, you do not need the *Sensor Studio* installation.

You can install the communication DTM and the device DTM in the existing FDT frame. Communication DTM and device DTM are included in the *LeAnalysisCollectionSetup* installation package.

- ↪ Insert the data carrier and start the PC.
 - ⇒ The installation will start automatically.
- ↪ If installation does not start automatically, double-click the file *SensorStudioSetup.exe*.

| NOTICE | |
|---|---|
|  | If you want to call up the menu of the data carrier, double-click the file <i>start.exe</i> . |

↳ Follow the instructions on the screen.

12.2.2 Install the communication DTM and device DTM

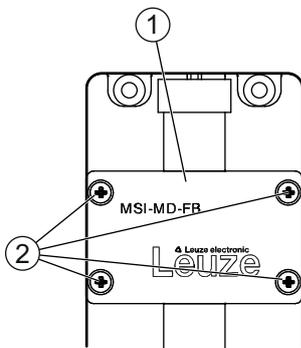
Prerequisites:

- ✓ An FDT frame is installed on the PC.
- ↳ Start the *LeAnalysisCollection.exe* file from the installation package and follow the instructions on the screen.

12.2.3 Connecting device to PC

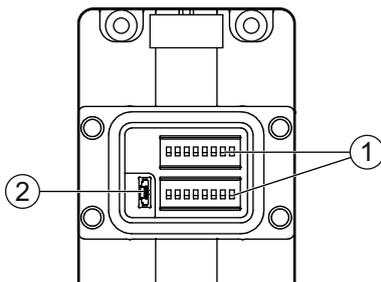
The muting controller is connected to the PC via the service USB connection (see chapter 7 "Electrical connection").

- ↳ Remove the cover from the housing of the muting controller (four screws).



- 1 Cover
- 2 Screws for cover

Fig. 12.1: Cover for DIP switch blocks and service USB connection



- 1 DIP switch blocks
- 2 Service USB connection

Fig. 12.2: Muting controller without cover

- ↳ Connect the service USB connection of the muting controller to the PC.

| NOTICE | |
|---|--|
|  | The service USB interface of the muting controller is connected to the USB interface on the PC with a standard USB cable (plug combination - Micro-USB-B type / Type A). |

NOTICE

- ↪ After reading out the diagnosis, remount the cover on the housing on the muting controller.
- ↪ Tighten the screws with a torque wrench. Torque: 0.6 ... 0.8 Nm

12.3 Starting Sensor Studio

Prerequisites:

- ✓ The safety sensor and the muting controller are correctly mounted (see chapter 6 "Mounting") and connected (see chapter 7 "Electrical connection").
- ✓ The muting controller is connected to the PC via the Mini-USB service interface (see chapter 12.2.3 "Connecting device to PC").
- ✓ The Sensor Studio diagnosis software is installed on the PC (see chapter 12.2 "Installing the Sensor Studio diagnosis software").
- ↪ Start the *Sensor Studio* configuration software by double-clicking the [*Sensor Studio*] icon.
- ⇒ The **mode selection** of the Project Wizard is displayed.
- ↪ Select the **Device selection without communication connection (offline)** configuration mode and click on [Next].
- ⇒ The Project Wizard displays the device selection list of the configurable devices.

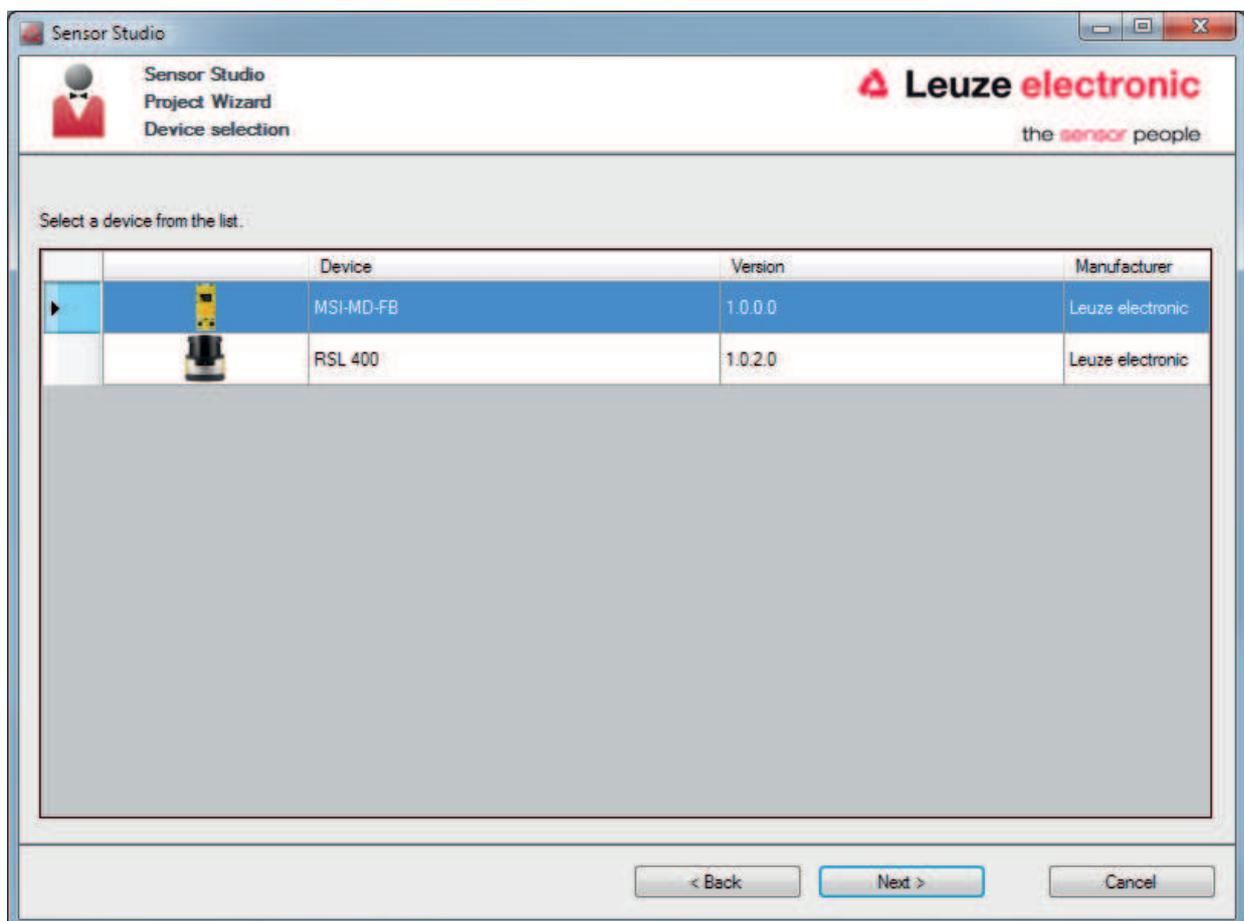


Fig. 12.3: Device selection for MSI-MD-FB muting controller

- ↪ Select **MSI-MD-FB** in the **device selection** and click on [Next].
- ⇒ The device manager (DTM) of the connected muting controller starts with the offline view for the *Sensor Studio* project.
- ↪ Establish the online connection to the connected muting controller.
 - ⇒ In the *Sensor Studio* FDT frame, click on the [Establish connection with device] button.
 - ⇒ In the *Sensor Studio* FDT frame, click on the [Upload parameters to device] button.

⇒ The current configuration data is displayed in the device manager (DTM).

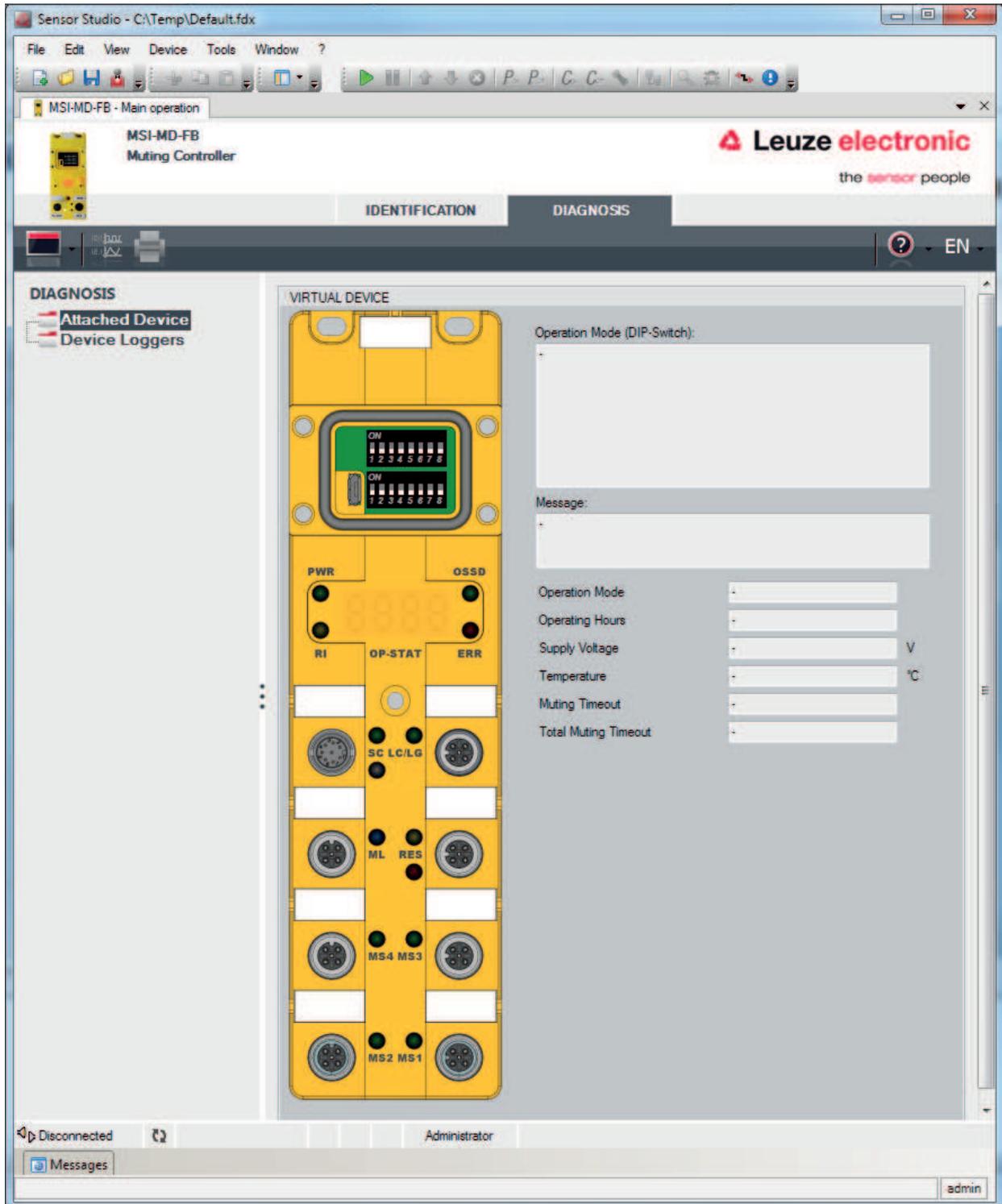


Fig. 12.4: Project: Device manager for MSI-MD-FB muting controller

- ↳ The menu of the *Sensor Studio* device manager (DTM) can be used to read out the configuration and data of the connected muting controller.
 - ⇒ The user interface of the *Sensor Studio* device manager (DTM) is largely self-explanatory.
 - ⇒ The online help system provides information on the menu items and diagnosis parameters. Select the **Help** menu item in the menu [?].

12.4 Exiting Sensor Studio

After completing the configuration settings, close the *Sensor Studio* configuration software.

- ↳ Exit the program via **File > Exit**.
- ↳ Save the configuration settings as a configuration project on the PC.

12.5 Diagnosis parameters

In this chapter, you will find information and explanations on the diagnosis parameters of the device manager (DTM) for the MSI-MD-FB muting controller.

NOTICE



This chapter does not include a complete description of the *Sensor Studio* diagnosis software. Complete information on the FDT frame menu and on the functions in the device manager (DTM) can be found in the online help system.

The device manager (DTM) for MSI-MD-FB muting controller of the *Sensor Studio* diagnosis software offers the following diagnosis menu:

- Connected device (see chapter 12.5.1 "Connected device")
- Logging (see chapter 12.5.2 "Logging")

NOTICE



The online help system displays information on the menu items and diagnosis parameters for each function. Select the **Help** menu item in the menu [?]

The *Sensor Studio* diagnosis software offers the following buttons:

- [Create device summary]:
Creates and saves device information in a PDF file. The file contains all available information on the muting controller, as well as configuration and settings.
- [Data recorder]: Recording the device data.
 - Changes are saved and output with a time stamp.
 - Clicking on the button starts the recording; a second click stops the recording.
 - The recording is output as a csv file.

12.5.1 Connected device

Overview of the set configuration of the muting controller.



Fig. 12.5: Connected device menu

12.5.2 Logging

List of events reported by the muting controller. Using the logging, it is possible to establish the cause of the fault so that measures can be taken to rectify the fault.

13 Service and support

24-hour on-call service at:
+49 7021 573-0

Service hotline:
+49 7021 573-123

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

14 Technical data

14.1 General specifications

Tab. 14.1: Safety-relevant technical data

| | |
|---|--|
| Performance Level (PL) | PL e, Cat. 4 in accordance with EN ISO 13849 |
| Safety Integrity Level (SIL) | SIL 3 in accordance with IEC 61508 |
| SIL Claim Limit (SILCL) | SILCL 3 in accordance with IEC/EN 62061 |
| Probability of a dangerous failure per hour (PFH _d) | 2.5+10E-9 |
| Mission time (T _M) | 20 years |

Tab. 14.2: General system data

| | |
|---|---|
| Connection technology | M12 connectors, 5-pin, female M12 connectors, 8-pin, male |
| Supply voltage U _v | +24 V, ± 20 %, compensation necessary at 20 ms voltage dip, min. 250 mA (+ external load) |
| Residual ripple of the supply voltage | ± 5 % within the limits of U _v |
| Current consumption | 150 mA (without load) |
| Protection class | III |
| Degree of protection | IP 67 acc. to EN 60529 |
| Reaction time | ≤ 5 ms |
| Ambient temperature, operation | -30 ... +60 °C |
| Ambient temperature, storage | -40 ... +70 °C |
| Relative humidity (non-condensing) | 0 ... 95 % |
| Vibration resistance | 10 - 55 Hz in acc. with IEC/EN 60068-2-6; 0.35 mm amplitude |
| Shock resistance | 100 m/s ² acceleration, 16 ms acc. to IEC/EN 60068-2-6 |
| Dimensions | (L x W x H) 225 mm x 60 mm x 37 mm |
| Weight | 560 g |
| Maximum length of the connection cable to the machine interface | 50 m Only permissible with a maximum additional current demand ≤ 160 mA |
| Torque for the screws of the cover | 0.6 ... 0.8 Nm |

Tab. 14.3: Muting data

| | |
|----------------------|---|
| Muting modes | <ul style="list-style-type: none"> • Sequence controlled 2-sensor muting • Sequence controlled 4-sensor muting • Timing controlled 2-sensor muting |
| Muting timeout times | <ul style="list-style-type: none"> • 20 seconds • 2 minutes • 10 minutes • 100 hours |

Tab. 14.4: Technical data of the electronic safety-related switching outputs (OSSDs)

| Safety-related PNP transistor outputs (short-circuit monitored, cross-circuit monitored) | Minimum | Typical | Maximum |
|--|--|----------------------|---------------|
| Switching voltage high active ($U_v - 1.5V$) | 18 V | 24 V | 27 V |
| Switching voltage low | | 0 V | +2.5 V |
| Switching current | | 300 mA | 380 mA |
| Residual current | | <2 μA | 200 μA |
| Load capacity | | | 0.3 μF |
| Load inductivity | | | 2 H |
| Permissible wire resistance for load | | | <200 Ω |
| | Note the additional restrictions due to cable length and load current. | | |
| Permissible wire cross section | | 0.25 mm ² | |
| Test pulse width | | 60 μs | 340 μs |
| Test pulse distance | (5 ms) | 60 ms | |
| OSSD restart delay time | | 100 ms | |

Tab. 14.5: Status signals and control signals

| Signal | Input/Output | Values |
|--|--------------|--|
| Reset | Input | 24 V, 15 mA |
| ReadyForReset | Output | 24 V, 80 mA |
| ML | Output | 24 V, 80 mA Input and output currents |
| MS1 ... MS4 | Input | 24 V, max. 250 mA |
| Sum of the input/output currents: < 1 A | | |
| Permissible leakage current for control outputs: max. 0.7 mA | | |

NOTICE



The safety-related transistor outputs perform the spark extinction. With transistor outputs, it is therefore neither necessary nor permitted to use the spark extinction circuits recommended by contactor or valve manufacturers (RC elements, varistors or recovery diodes), since these considerably extend the decay times of inductive switching elements.

14.2 Dimensioned drawings

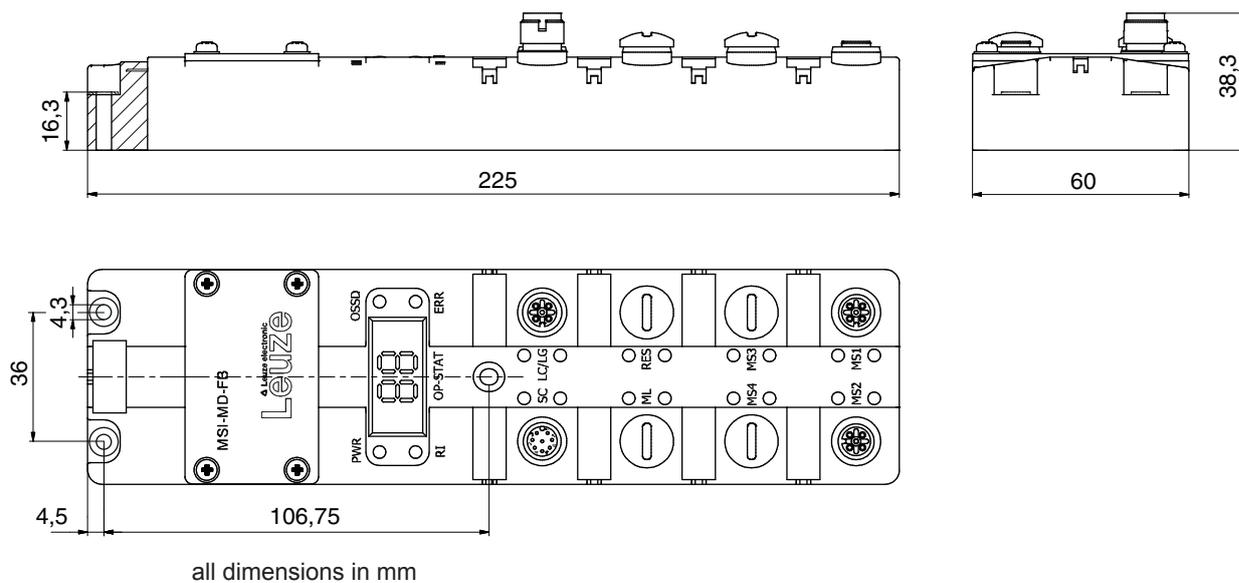


Fig. 14.1: Dimensioned drawing of MSI-MD-FB muting controller

14.3 Dimensioned drawings - Accessories

Mounting plate BT-MSI-MD_FB

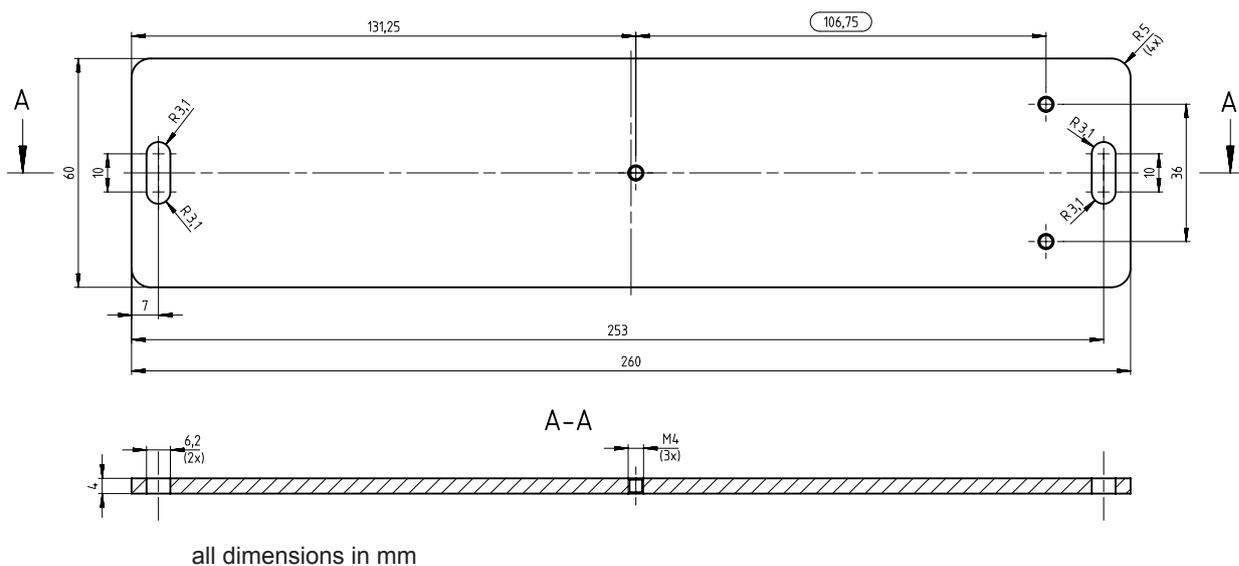
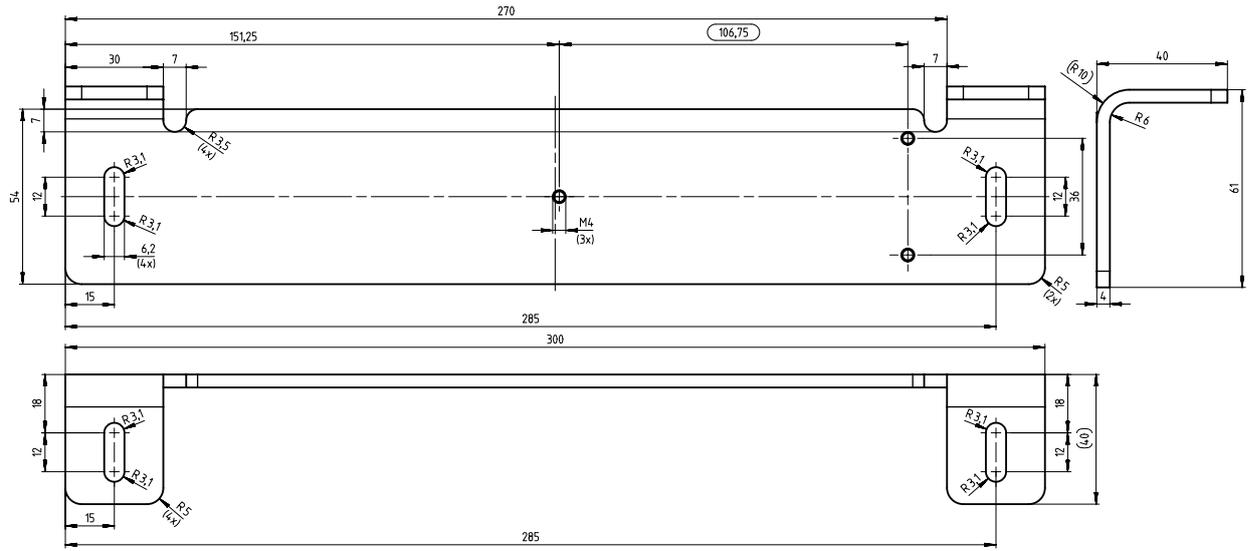


Fig. 14.2: Mounting plate BT-MSI-MD_FB

Mounting bracket BT-MSI-MD_FB-L



all dimensions in mm

Fig. 14.3: Mounting bracket BT-MSI-MD_FB-L

15 Ordering information and accessories

15.1 Type overview

Tab. 15.1: Part numbers

| Part no. | Part designation | Description |
|----------|------------------|-------------------|
| 549992 | MSI-MD-FB | Muting controller |

15.2 Accessories

Tab. 15.2: Connection cables

| Part no. | Article | Description |
|---|-------------------|--|
| Connection cables for connecting muting controller MSI-MD-FB to the machine interface | | |
| 678060 | CB-M12-5000E-8GF | 5 m connection cable with straight socket |
| 678061 | CB-M12-1000E-8GF | 10 m connection cable with straight socket |
| 678062 | CB-M12-15000E-8GF | 15 m connection cable with straight socket |
| 678063 | CB-M12-55000E-8GF | 25 m connection cable with straight socket |
| 678064 | CB-M12-50000E-8GF | 50 m connection cable with straight socket |
| 678070 | CB-M12-5000E-8WF | 5 m connection cable with angled socket |
| 678071 | CB-M12-10000E-8WF | 10 m connection cable with angled socket |
| 678072 | CB-M12-15000E-8WF | 15 m connection cable with angled socket |
| 678073 | CB-M12-25000E-8WF | 25 m connection cable with angled socket |
| 678074 | CB-M12-50000E-8WF | 50 m connection cable with angled socket |

Tab. 15.3: Interconnection cables

| Part no. | Article | Description |
|--|---------------------|--|
| Interconnection cables (Y-cable) for connecting transmitter and receiver of safety light barrier MLD and safety light curtain MLC to the muting controller | | |
| 548951 | CB-M12-Y1A | Y interconnection cable with pin 4 on 24 V |
| 548952 | CB-M12-Y1B | Y interconnection cable with pin 4 open |
| 678033 | CB-M12-2500S-5GF/GM | Interconnection cable recommended for MLDx10-RTx connection |
| 678035 | CB-M12-5000S-5GF/GM | Interconnection cable recommended for MLDx10-RTx connection |

Tab. 15.4: Display and confirmation units

| Part no. | Article | Description |
|----------|----------|-------------------------------|
| 426290 | AC-ABF10 | Display and confirmation unit |

Tab. 15.5: Mounting technology

| Part no. | Article | Description |
|----------|----------------|--|
| 427302 | BT-MSI-MD-FB | Mounting plate for mounting muting controller MSI-MD-FB on side or rear on UDC/DC columns or for wall mounting |
| 427303 | BT-MSI-MD-FB-L | Mounting bracket for interior mounting of muting controller MSI-MD-FB in UDC/DC columns |

Tab. 15.6: Muting indicators

| Part no. | Article | Description |
|----------|-----------------------|--|
| 660611 | MS70/LED-M12-2000-4GM | LED muting indicator with connection cable 2 m |

Tab. 15.7: Software

| | |
|---|--|
| Diagnosis software <i>Sensor Studio</i> Download at www.leuze.com | <i>Sensor Studio</i> designed according to the FDT/DTM concept. Contains: communication DTM and device DTM |
|---|--|

16 EC Declaration of Conformity



**EG-KONFORMITÄTS-
ERKLÄRUNG**

**EC DECLARATION
OF CONFORMITY**

**DECLARATION CE
DE CONFORMITE**

Hersteller:

Manufacturer:

Constructeur:

Leuze electronic GmbH + Co. KG
In der Braike 1, PO Box 1111
73277 Owen, Germany

Produktbeschreibung:

Description of product:

Description de produit:

**Zubehörfunktion für
berührungslos wirkende
Schutzeinrichtung
Sicherheitsbauteil nach
2006/42/EG Anhang IV
MSI-MD-FB
Seriennummer siehe
Typenschild**

**Accessory function for
sensitive protective equipment
safety component in acc. with
2006/42/EC annex IV
MSI-MD-FB
Serial no. see name plates**

**Fonction accessoire pour
équipements de protection
sensibles Elément de sécurité
selon 2006/42/CE annexe IV
MSI-MD-FB
N° série voir plaques
signalétiques**

Die alleinige Verantwortung
für die Ausstellung dieser
Konformitätserklärung trägt
der Hersteller.

This declaration of conformity
is issued under the sole
responsibility of the
manufacturer.

La présente déclaration de
conformité est établie sous la
seule responsabilité du
fabricant.

Der oben beschriebene
Gegenstand der Erklärung
erfüllt die einschlägigen
Harmonisierungsrechts-
vorschriften der Union:

The object of the declaration
described above is in
conformity with the relevant
Union harmonisation
legislation:

L'objet de la déclaration décrit
ci-dessus est conforme à la
législation d'harmonisation de
l'Union applicable:

Angewandte EG-Richtlinie(n):

Applied EC Directive(s):

Directive(s) CE appliquées:

**2006/42/EG (*1)
2014/30/EG**

**2006/42/EC (*1)
2014/30/EC**

**2006/42/CE (*1)
2014/30/CE**

Angewandte harmonisierte Normen / Applied harmonized standards / Normes harmonisées appliquées :

EN 55011: 2009 + A1: 2010

EN 61496-1: 2013 (Type 4) (*1)

**EN ISO 13849-1: 2008
+ AC: 2009 (*1)**

Angewandte technische Spezifikationen / Applied technical specifications / Spécifications techniques
appliquées :

**EN 61508-1: 2010 (SIL1/SIL3) (*1)
EN 61508-4: 2010 (SIL1/SIL3) (*1)**

EN 61508-2: 2010 (SIL1/SIL3) (*1)

EN 61508-3: 2010 (SIL1/SIL3) (*1)

Notified Body

(*1) TÜV-SÜD PRODUCT SERVICE GmbH Zertifizierungsstelle Ridlerstraße 65 D-80339 München / NB 0123

Dokumentationsbevollmächtigter ist der genannte Hersteller, Kontakt: quality@leuze.de.

Authorized for documentation is the stated manufacturer, contact: quality@leuze.de.

Autorisé pour documentation est le constructeur déclaré, contact: quality@leuze.de

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