

# XPSLCMUT1160

## Muting Safety Module for Safety Light Curtains User Manual

04/2015

Original Manual



---

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

No part of this document may be reproduced in any form or by any means, electronic or mechanical, including photocopying, without express written permission of Schneider Electric.

All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

© 2015 Schneider Electric. All rights reserved.

Schneider Electric Head Office  
35 Rue Joseph Monier  
CS 30323  
92506 Rueil-Malmaison, France

---

# Table of Contents

---



	<b>Safety Information</b> .....	<b>5</b>
	<b>About the Book</b> .....	<b>7</b>
<b>Chapter 1</b>	<b>Safety Requirements</b> .....	<b>11</b>
	Safety Requirements .....	<b>11</b>
<b>Chapter 2</b>	<b>Product Description</b> .....	<b>13</b>
	Muting Function Description .....	<b>14</b>
	Application Example .....	<b>18</b>
	Two-sensor Muting System .....	<b>19</b>
	Muting Override Allowed Function .....	<b>24</b>
	Operating Modes Description .....	<b>27</b>
	External Device Monitoring (EDM) .....	<b>29</b>
<b>Chapter 3</b>	<b>Installation, Wiring, and Startup</b> .....	<b>31</b>
	Installation and Electrical Connections .....	<b>32</b>
	Presentation .....	<b>35</b>
	Wiring .....	<b>38</b>
<b>Chapter 4</b>	<b>Troubleshooting</b> .....	<b>45</b>
	Troubleshooting .....	<b>45</b>
<b>Chapter 5</b>	<b>Technical Characteristics</b> .....	<b>47</b>
	Specifications .....	<b>48</b>
	Dimensions .....	<b>50</b>
	Accessories .....	<b>51</b>
<b>Glossary</b>	.....	<b>53</b>



---

# Safety Information

---



## Important Information

### NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

## **DANGER**

**DANGER** indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

## **WARNING**

**WARNING** indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

## **CAUTION**

**CAUTION** indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

## **NOTICE**

**NOTICE** is used to address practices not related to physical injury.

---

## PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

---

# About the Book

---



## At a Glance

### Document Scope

This manual describes the features, installation, wiring, and usage of the Muting safety module for safety light curtains

The XPSLCMUT1160 Muting safety module is an accessory device used to provide a safety rated muting function in conjunction with safety light curtain. Muting is defined as “bypassing the protective function on safety-related control system such as a safety light curtain, during a pre-determined operation of a machine”.

### Validity Note

The technical characteristics of the devices described in this manual also appear online. To access this information online:

Step	Action
1	Go to the Telemecanique Sensors home page <a href="http://www.tesensors.com">www.tesensors.com</a>
2	In the <b>Search</b> box, type the reference of a product or the name of a product range. <ul style="list-style-type: none"><li>● Do not include blank spaces in the reference/product range.</li><li>● To get information on grouping similar modules, use asterisks (*).</li></ul>
3	If you entered a reference, go to the <b>Product datasheets</b> search results and click on the reference that interests you. If you entered the name of a product range, go to the <b>Product Ranges</b> search results and click on the product range that interests you.
4	If more than one reference appears in the <b>Products</b> search results, click on the reference that interests you.
5	Depending on the size of your screen, you may need to scroll down to see the data sheet.
6	To save or print a data sheet as a .pdf file, click <b>Download XXX product datasheet</b> .

The characteristics that are presented in this manual should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the manual and online information, use the online information as your reference.

A QR code including the Telemecanique Sensors web address is located on the safety light curtain label. In the website, technical documents are available in various languages.

---

## QR Code

A QR code including the Telemecanique Sensors web address is present on the muting safety module label. Technical documents are available in various languages in this website.



## Related Documents

Title of documentation	Reference number
Quick start guide safety light curtain XUSL4E/XUSL2E	EAV65900
XUSL2E & XUSL4E user manual	EAV65898

You can download these technical publications and other technical information from our website at [www.tesensors.com](http://www.tesensors.com)

## Product Related Information

### **WARNING**

#### **IMPROPER SET UP OR INSTALLATION**

Read all responsibilities and requirements listed below before installing the XPSLCMUT1160 module.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### **WARNING**

#### **UNINTENDED EQUIPMENT OPERATION**

Muting can disable the safety functions of a machine. The proper installation, checkout, and operation of a machine and muting system in accordance with all applicable laws and standards, is critical to the safe operation of the machine.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**



## WARNING

### REDUCED PROTECTION LEVEL

When the XPSLCMUT1160 module is used with a Type 2 rated light curtain or another Type 2 device, the overall system protection is reduced to Category 2.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

Whether a specific machine application and XPSLCMUT1160 installation complies with safety regulations depends on several factors, including the proper application, installation, maintenance, and operation of the XPSLCMUT1160 and its associated sensors. These items are the responsibility of the purchaser, installer, and employer.

The employer is responsible for the selection and training of personnel to properly install, operate, and maintain the machine and its safeguarding systems.

Main reference standards:

Risk assessment / Safety level	Standard	Description
Risk assessment and risk reduction	EN ISO 12100	Safety of machinery - General principles for design - Risk assessment and risk reduction
Performance Level (PL)	EN ISO 13849-1:2008	Safety related part of control system - General principles for design
Safety Integrity Level Claim Limit (SILCL)	IEC 62061	Safety of machinery - Functional safety of safety-related electrical, electronic, and programmable electronic control systems
Category (Cat)	EN ISO 13849-1:2008	Safety related part of control system - General principles for design
Type	IEC 61496-1 IEC 61496-2	Electro_sensitive protective equipment - General requirements and tests Particular requirements for equipment using active opto-electronic protective devices (AOPDs)

### User Comments

We welcome your comments about this document. You can reach us by e-mail at [customer-support@tesensors.com](mailto:customer-support@tesensors.com).



---

# Chapter 1

## Safety Requirements

---

### Safety Requirements

#### Precautions

### WARNING

#### **IMPROPER SETUP OR INSTALLATION**

- This equipment must only be installed and serviced by qualified personnel.
- Read, understand, and follow the compliance in this manual before installing the XPSLCMUT1160 Muting safety module.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

#### Meeting Full Compliance

Use of the muting function requires special precautions by the safety system machine controller, installer, operator, and employer. The following information is only a partial list of requirements for muting applications and is not intended to be a complete guide to muting standards. The employer must contact the local safety authority for specific requirements regarding the machine, machine controller, and safety-related control system.

Schneider Electric provides the following information for reference only, and makes no claim regarding its accuracy, completeness, or effectiveness for a specific application.

- Mute the light curtain only during the non-hazardous portion of the machine cycle.
- If the machine tool has reversing capability that could cause a muting hazard, provide a control wiring diagram that includes an automatic method of preventing muting in the reverse direction.
- Depending on the risk assessment, provide one or more visual indicators that illuminate when the light curtain is in a muted condition.
- Ensure that the light curtain cannot enter a mute condition when a fault is present.
- Ensure that the mute indicators are visible from any normal machine operator position and from the position from which any muting adjustments are normally carried out.
- Provide two, independent muting signal sources to the XPSLCMUT1160. A single, simple cam-operated limit switch is inadequate as a muting signal source since its failure can remain undetected.
- Ensure that the guarded machine is able to stop anywhere in its cycle. Do not use a XPSLCMUT1160 as a cascaded system on a press with a full-revolution clutch.
- Ensure that additional guarding is used to limit access to any hazardous zone not covered by the safety-related device system.

- The muting position (of the mute signal source) shall be secured against unauthorized adjustment by provision of special tools, key entry, electronics passwords, and the positioning and mounting of associated limit switches.
- The guarded machine must have a consistent stopping time and adequate control mechanisms.
- All safety-related machine control elements must be designed so that a fault in the control logic or failure of the control circuit does not lead to a failure or danger.
- Additional guarding may be required for access to dangerous areas not covered by the safety device system.
- Perform the test procedure at installation and after maintenance, adjustment, repair, or modification to the machine controls, tooling, dies or machine, or the XPSLCMUT1160 and safety device system.
- Follow all procedures in this manual for proper operation of the XPSLCMUT1160 Muting safety module.
- Additional measures may be necessary to ensure that the XPSLCMUT1160 does not fail when other forms of radiation are present in a particular application (for example, use of cableless control devices on cranes or radiation from weld spatter).

The enforcement of these requirements is beyond the control of Schneider Electric. The employer has the sole responsibility to follow the preceding requirements and any other procedures, conditions, and requirements specific to the machinery.

### Product Support

For more information about products and services in your country, visit [www.tesensors.com](http://www.tesensors.com).

---

# Chapter 2

## Product Description

---

### What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Muting Function Description	14
Application Example	18
Two-sensor Muting System	19
Muting Override Allowed Function	24
Operating Modes Description	27
External Device Monitoring (EDM)	29

## Muting Function Description

### Muting

Muting bypasses the protective function on safety-related control systems during a predetermined, non-hazardous portion of the machine operation.

The muting mode is active only when the correct sequence of muting sensor input signals is achieved. The object of the correct muting sensor selection and orientation is to always recognize the presence of the work piece material as the intended means to start or stop the muting sequence. Any entry into the detection zone by any animate or inanimate object, generating a sequence of the muting sensors different from the pre-determined one, will result in a stop signal being sent to the guarded machine.

When the system is in the muting state, an indicator lamp must be lit. This lamp must be visible to all personnel in the immediate area.

The XPSLCMUT1160 can be used with Type 2 or Type 4 safety light curtain system.

If the XPSLCMUT1160 is connected to a Type 4 safety light curtain with two auto-controlled PNP solid state outputs, the system thus formed is compliant with type 4 (IEC 61496-1), SILCL3 (IEC 62061), and PLe - Cat. 4 (EN ISO 13849-1:2008).

If the XPSLCMUT1160 is connected to a Type 2 safety light curtain with two auto-controlled PNP solid state outputs, the system thus formed is compliant with type 2 (IEC 61496-1), SILCL1, IEC 62061, and PLc - Cat. 2 (EN ISO 13849-1:2008).

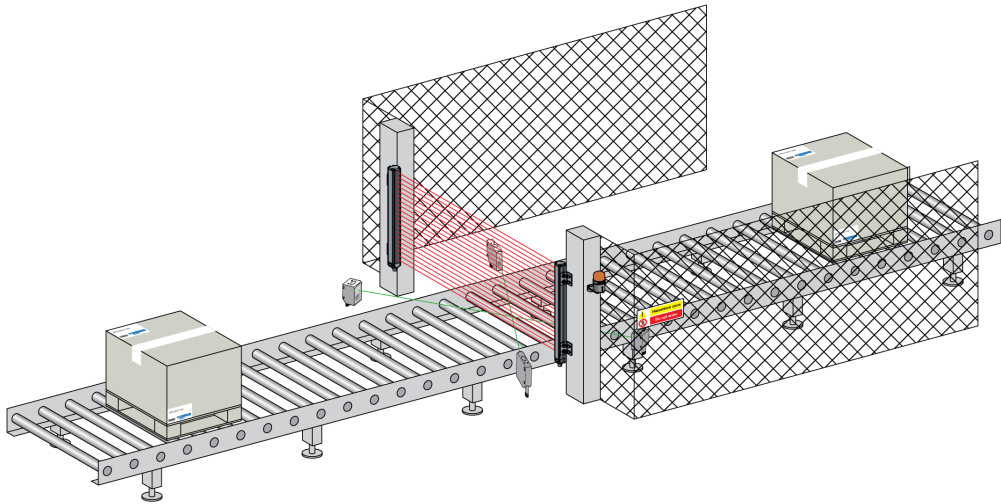
The response time of the muting module must be added to the response time of the safety light curtain system with which it is associated.

### **WARNING**

#### **UNEXPECTED OUTPUT OPERATION**

The response time of the XPSLCMUT1160 is 20 ms maximum.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**



## **⚠ WARNING**

### **IMPROPER MUTING UTILIZATION**

Muting state is a temporary bypass or disabling of the safety light curtain detection zone. It is the duty of any user or integrator to check whether the use of muting function is consistent with the application risk assessment.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## **⚠ WARNING**

### **IMPROPER MUTE INDICATION**

An indication that the protected area is muted must be provided and readily observable to the machine operator. The mute lamp is an important warning device to the machine operator, indicating that muting is active.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

 **WARNING**

**UNEXPECTED OUTPUT OPERATION**

Sensors position and sequence activation determine the muting function.

Verify that muting is functioning before commissioning the safety light curtain.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

 **WARNING**

**REDUCED PROTECTION LEVEL**

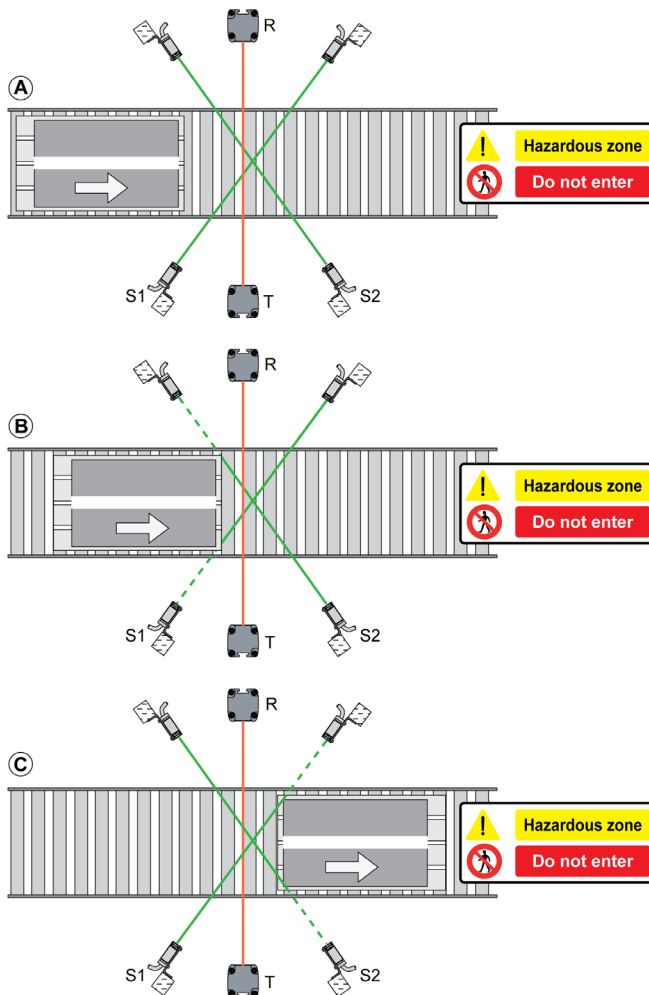
The circuit that performs the muting function shall have an appropriate safety-related performance (SIL or PL, see IEC 62061 and EN ISO 13849-1:2008). The safety-related performance of the circuit that performs the muting function shall not adversely affect the performance of the protective function.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**



## Muting Principle

The following figures present the principle of a muting sequence with two pairs of thru-beam photocells. In this example, the transported material moves in the direction of the hazardous zone:



- A** The object is not detected by the muting sensors.
- B** The object is detected by the muting sensors. When the two beams are interrupted, the muting function is activated. The object will cross the safety light curtain beam without stopping the machine.
- C** When at least one beam is cleared, the muting function is stopped.

## Application Example

### Application Information

This section contains several examples of how the XPSLCMUT1160 muting module may be used with various sensor arrangements to start and end the muting sequence.

<b><i>NOTICE</i></b>
<b>UNINTENDED EQUIPMENT OPERATION</b>
The photoelectric sensors used must be "Dark On" type and have PNP outputs.
<b>Failure to follow these instructions can result in equipment damage.</b>

XPSLCMUT1160 is a safety interface module between a safety light curtain system and 2 muting sensors. XPSLCMUT1160 is designed for two photoelectric muting sensors (e.g. thru-beam photocells). Other sensors technologies are not suitable. The XPSLCMUT1160 integrates muting logic and guided contact safety relays (2 NO contacts), one PNP output for the relays status monitoring, and one PNP output for the muting lamp.

### Selection and Orientation of Muting Sensors

Select and orient the muting sensors so that they recognize the presence of the work piece as the condition for starting or stopping the muting sequence. The presence of any person in the detection zone of the muting sensors must never initiate a muting sequence.

The proper selection, installation, and orientation of the muting sensors are the sole responsibility of the employer and installer. The following recommendations must be observed, especially in applications involving conveyors.

- Ensure that the muting sensors detect the material, and not the transportation means, such as a pallet, cart, or other transport device.
- Ensure that a person on the transport device cannot initiate muting and enter the hazardous zone.
- Do not allow interruption in the sensing of the material while the material passes the muting sensors. The detection of the material should be continuous over its length.
- When using photoelectric sensors, do not allow reflective material to interrupt or cause optical paths among different sensors. Do not allow sensors in adjacent areas to interfere with each other or provide false indication.
- Position the sensors such that before a new material is detected by the sensors, the previous material has passed the sensors, and all muting sensors are deactivated for a time.
- Consider the overall speed and cycle of the material as it moves through the process. Allow time for evaluating the muting sensors outputs before the material reaches the safeguarding device.
- Detect and prevent people from entering the hazardous zone of the machine. The safeguarding device must be able to send a stop signal to the machine before a person enters the hazardous zone. Other safeguarding methods, such as physical barriers or fences, may be necessary.

## Two-sensor Muting System

### Muting Sequence Description

In a correct signal sequence, the muting function is initialized when the two following conditions are fulfilled:

- The two muting sensors are activated within a maximum time interval of 4 seconds.
- The muting enabling command is active (terminal 11 at 24 Vdc).

The muting function ends when at least one of the following conditions is reached:

- At least one of the muting sensors is inactivated.
- The muting time-out limit is reached (30 seconds). In this case, the OSSDs switch to OFF state.

### **WARNING**

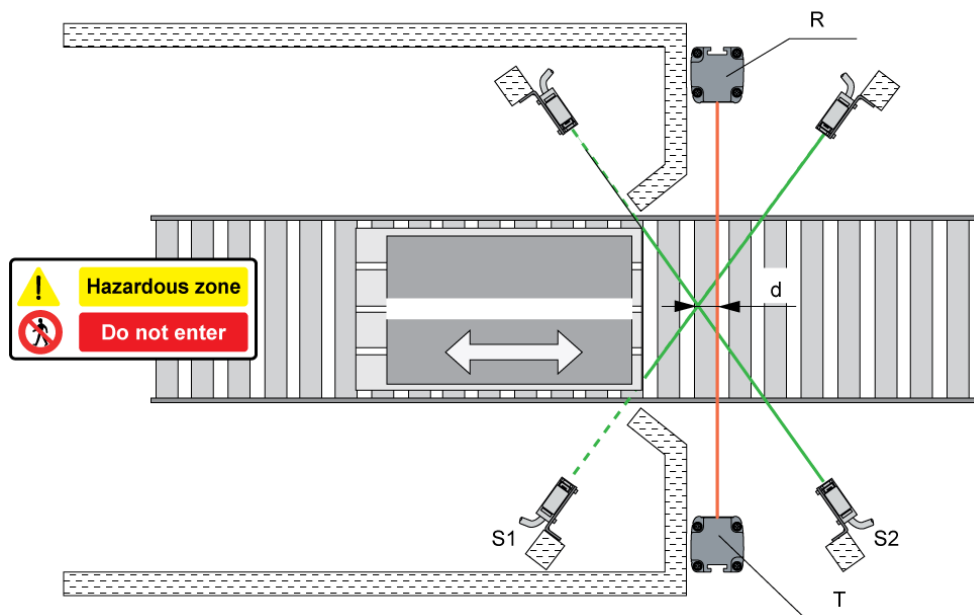
#### **IMPROPER SETUP OR INSTALLATION**

Position the muting sensors in such a way that personnel cannot activate the sensors in a sequence which permits them to pass through the safety light curtain protection field undetected.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## Positioning the Crossing Point of the Two Muting Sensors

The following illustration presents a conveyor belt muting system using a two-sensors configuration.



**S1-S2** Muting sensors

**R** Receiver of the safety light curtain

**T** Transmitter of the safety light curtain

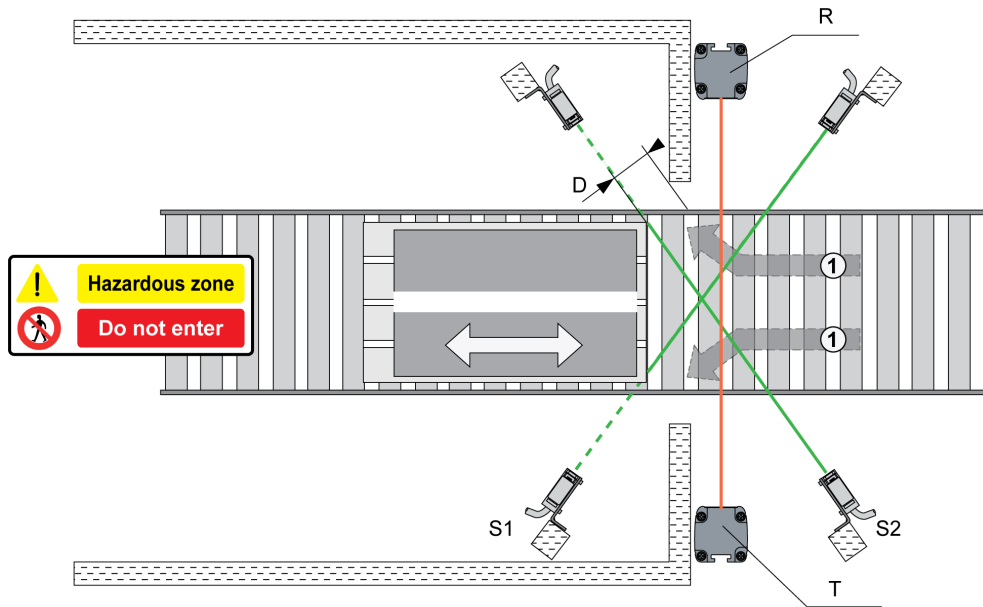
**d** Distance between the safety light curtain beam and the muting sensors crossing point.

**The installation must respect:  $d < 200 \text{ mm (7.87 in)}$ .**

The crossing point of the two light beams S1 and S2 must be located behind the detection zone of the safety light curtain in direction of the hazardous zone.

The distance **d** should be shorter than 200 mm (7.87 in) to avoid personnel entering the hazardous zone without been detected.

## Positioning the Two Muting Sensors



**S1-S2** Muting sensors

**R** Receiver of the safety light curtain

**T** Transmitter of the safety light curtain

**D** Path width to the hazardous zone as the muting sequence starts.

**1** Possible ways of intrusion while the pallet is crossing the muting area

**The installation must respect:  $D < 200 \text{ mm}$  (7.87 in).**

**D** depends on the position of the muting sensors S1 and S2 and the location of the fences or physical barriers.

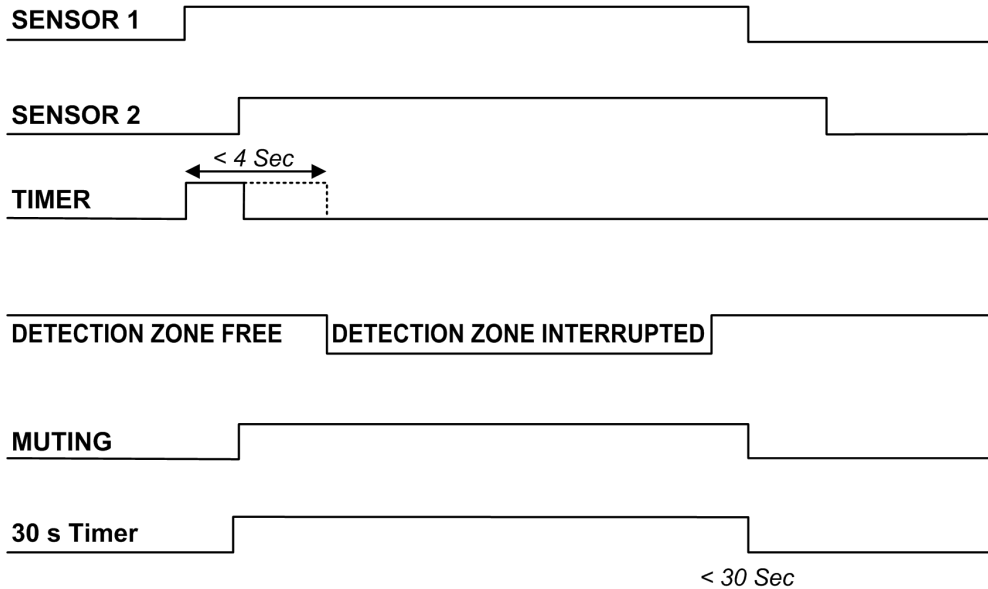
In this example, if we consider  $D > 200 \text{ mm}$  (7.87 in), there are possible ways of intrusion (1) while the muting function is triggered. Personnel can thus access the hazardous zone without stopping the machine.

**NOTE:** Refer to IEC TS 62046 for more muting operation details.

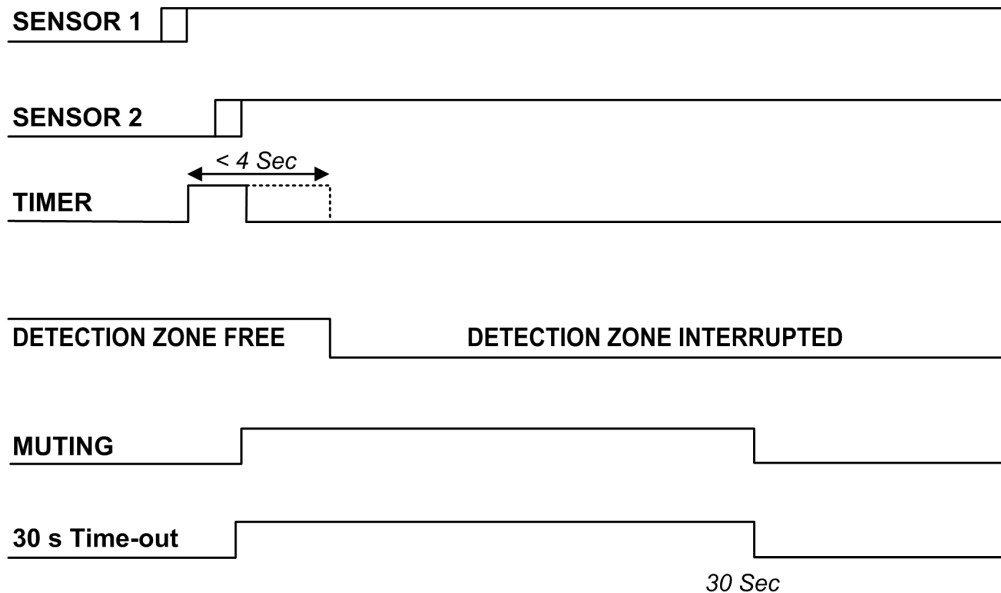
### Muting Sequence

The following timing diagrams show the correct signal sequence.

The following timing diagram shows a sequence when the object passes the safety light curtain without stopping the machine:



The following timing diagram shows a sequence when the object is stopped and always detected by the muting sensors and the safety light curtain. After the muting time-out, the muting function stops and the module stops the machine



**NOTE:** The terminal 11 commands the muting function. It should be generated at the appropriate time by the machine control system (e.g. When the muting function is needed). It has no effect on the deactivation of the muting function. If the enabling command is not used (Muting function permanently enable), fix the terminal 11 at 24 Vdc.

Muting is a temporary automatic suspension of the safety function. The time limit is always mandatory. If the time-out limit of 30 seconds is too short for a particular machine cycle, the configuration without time monitoring ( $t = \text{infinite}$ ) can be selected. In this case, alternative solutions or additional measures should be implemented to detect the condition of a muting function permanently active caused by accumulation of detected faults or by the muting sensors activated permanently.

For example, for the application of guarding the openings of a conveyor system (palletizer) by monitoring appropriate signals generated by the transport system to determinate if and when a pallet is in the detection zone.

## Muting Override Allowed Function

### Overview

The override allowed feature provides a mean for supervisory personnel to momentarily override the machine stop signal of the safety light curtain with XPSLCMUT1160. This feature is for use when the machine stops due to incorrect muting activation sequences and with the detection zone obstructed.

In this case, the safety light curtain safety outputs (OSSDs) are in the OFF state and/or a minimum of one muting sensor is active.

The system then enters the override allowed state (Override request) and the muting LED is blinking ([see page 35](#)).

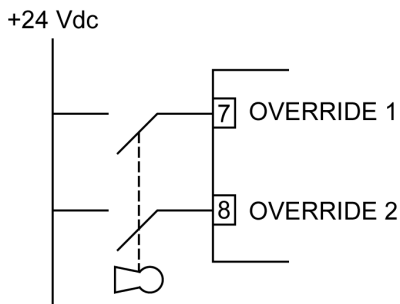
When the override request is active, the OSSDs are activated. It is then possible to remove any material obstructing the protected zone.

### Override Modes Configuration

Two modes are selectable according to the wiring below:

- Override with maintained action control
- Override with pulse control

#### Override with maintained action control:



Type of override control	Terminal 7	Terminal 8	OPERATION
Maintained action (Spring return key)	24 Vdc	24 Vdc	Override request
	Not Connected (0 Vdc)	Not Connected (0 Vdc)	Override not requested

In this example, the override is activated by a key selector switch with spring return driving terminal 7 and terminal 8 to 24 Vdc. (maximum delay for both state changes = 400 ms)

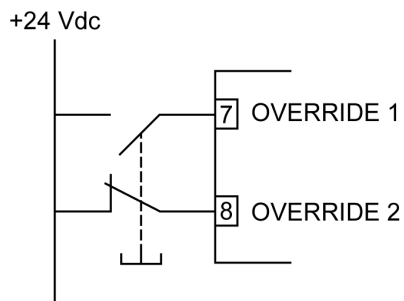


The override is interrupted by one of the following causes:

- The key selector is released.
- The maximum override duration of 15 minutes is elapsed.
- The detection zone is cleared and the muting sensors are inactivated again

When the override is interrupted, the OSSDs outputs switch OFF as well as the muting lamp and the system goes back to normal operation. (Allowing a new override command);

#### Override with pulse control:



Type of override control	Terminal 7	Terminal 8	OPERATION
Pulsed action (Push button)	24 Vdc	Not Connected (0 Vdc)	Override request
	Not Connected (0 Vdc)	24 Vdc	Override not requested

In this example, the override is activated by a push-button return switching terminal 7 to 24 Vdc and terminal 8 to 0 Vdc. (maximum delay for both state changes = 400 ms).

Terminal 7 and terminal 8 are not monitored during the override.

The maximum override duration is 15 minutes (repeatable)

The override can only be restarted by a new pressure on the push button only if:

- The total override time after 'n' successive commands does not exceed 60 minutes (Timer 1)
- The number of successive commands does not exceed 30. (Counter 1)

Timer 1 and counter 1 are reset when a correct muting sequence occurs or in case of power OFF/power ON system reset.

The override ends when the detection zone is cleared, the muting sensors are inactivated again and the safety light curtain is operational. (No need of any other command).

 **WARNING**

**IMPROPER INSTALLATION**

During the module installation, the operator must ensure to avoid short circuit between contacts 7 and 8.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

 **DANGER**

**HAZARDOUS SITUATION**

The override with pulse command automatically activates the outputs of the light curtain until both of the safety light curtain and the muting sensors are free of obstacle again. During this period, the safety light curtain is unable to protect access to the guarded opening. Therefore, all operations must be carried out by qualified personnel.

**Failure to follow these instructions will result in death or serious injury.**

## Operating Modes Description

### Automatic or Manual Start/Restart Modes

XPSPCMUT1160 allows automatic or manual Start/Restart mode according to the wiring configuration below.

Operating modes selection		
Terminal 6	Terminal 15	Operation
0 Vdc	24 Vdc	Automatic Start
24 Vdc	24 Vdc through a NO contact	Manual Start/Restart
0 Vdc	0 Vdc	Forbidden
24 Vdc	24 Vdc	

In automatic mode, when the safety light curtain system senses an object entering the detection zone, the machine changes from Run state to Stop state and remains in the Stop state until the obstruction is removed. Once the detection zone is clear, the safety light curtain system automatically changes from Stop state to Run state.

In manual Start/Restart mode, to enter the Run state, the detection zone of the safety light curtain system must be clear, and the operator must press the Start button.

## WARNING

### IMPROPER SETUP

It is mandatory to use manual mode (Start/Restart interlock activated) in case in which the safety-related device controls an access protecting a hazardous zone and once an operator has passed through the opening and may remain in the hazardous zone without being detected (Use as trip device according to IEC 61496).

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## ***NOTICE***

### **UNINTENDED EQUIPMENT OPERATION**

The Start/Restart command is effective after the operator has pressed the start button, meaning a transition sequence 0 Vdc →24 Vdc on the start command.

The duration of the start command must be at least 100 ms.

**Failure to follow these instructions can result in equipment damage.**

## ***NOTICE***

### **IMPROPER AUTOMATIC START UTILIZATION**

The manual Start/Restart is required in most safety applications. If you use the automatic start function, check that this automatic start mode is compatible with the safety level assessed in the application risk analysis.

**Failure to follow these instructions can result in equipment damage.**

## **WARNING**

### **UNINTENDED EQUIPMENT OPERATION**

Manual Start/Restart mode is mandatory:

- If the safety device controls an aperture to protect a hazardous zone.
- If the safety -related device is used as a “trip device” (according to IEC 61496).

The Restart command must be installed outside the hazardous zone in such way that the whole working and hazardous zone are observable. It must not be possible to access the Start/Restart command inside the hazardous zone.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## **CAUTION**

### **CONFIGURATION SYSTEM**

Check correct functioning of the entire safety system (module + light curtain) following each reinstallation. Especially, if the original operating mode was manual, ensure that the module has been reconfigured in this mode.

**Failure to follow these instructions can result in injury or equipment damage.**

## External Device Monitoring (EDM)

### Overview

EDM monitoring is an important safety function.

The EDM monitors the safety light curtain system interface to the guarded machine to:

- Confirm that the external devices driven by the OSSDs (switching devices, such as contactors, relays) are responding correctly to the safety light curtain system.
- Detect any inconsistency between the two external devices (i.e. control relays) which prevents a stop signal from reaching the machine primary control elements (for example, power contactors or electrovalve relays).

The EDM controls the external contactors K1/K2. To achieve this, normally closed contacts of the external contactors (connected in series) are monitored. The control of the correct switching of K1 and K2 is performed 300 ms after the real command of the OSSDs.

To perform this function, the contactors K1/K2 must have:

- Normally closed mirror contact, according to IEC 60947-4-1 (Annex F) for power contactors.
- Linked contacts (or force-guided contacts), according to IEC 60947-5-1 (Annex L) or EN 50205 for auxiliary contactors or control relays.



---

# Chapter 3

## Installation, Wiring, and Startup

---

### What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Installation and Electrical Connections	32
Presentation	35
Wiring	38

## Installation and Electrical Connections

### Recommendation

#### **WARNING**

##### **HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH**

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly rated voltage sensing device to confirm that the power is OFF where and when indicated.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating this equipment and any associated products.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

#### **WARNING**

##### **UNINTENDED EQUIPMENT OPERATION**

- Place devices dissipating the most heat at the top of the cabinet and ensure adequate ventilation.
- Avoid placing this equipment next to or above devices that could cause overheating.
- Install the equipment in a location providing the minimum clearances from all adjacent structures and equipment as directed in this document.
- Install all equipment in accordance with the specifications in the related documentation.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**



## WARNING

### UNINTENDED EQUIPMENT OPERATION

- Install and operate this equipment according to the conditions described in the environmental characteristics.
- Do not exceed any of the rated values specified in the characteristic tables.
- Install the XPSLCMUT1160 module in an environment with a protection rating of at least IP54.
- If more XPSLCMUT1160 modules must be installed in the same board panel, in order to avoid overheating, maintain between them one minimal distance of 20 mm (0.78 in).
- The XPSLCMUT1160 module must be supplied with a 24 Vdc  $\pm$ 20%.
- The XPSLCMUT1160 module must be powered by a Safety Extra Low Voltage (SELV) or a Protected Extra Low Voltage (PELV).
- During the installation of the XPSLCMUT1160 module, be sure to avoid short circuits between the terminal 17 and 18.
- The XPSLCMUT1160 module and the associated safety light curtains must be energized on the same power supply

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### Characteristics of the Output Circuit

The power supply must meet the requirements of IEC 60204-1 and IEC 61496-1. The SELV Schneider Electric part number ABL8RPS24\*\*\* is recommended. For more information, refer to power supply ([see page 51](#)).

For the output circuit, the XPSLCMUT1160 uses two guided contact safety relays.

These relays are rated by the manufacturer for voltage and current values above those indicated in the technical data. However, to assure correct insulation and to avoid damage or premature ageing, protect each output line with a 4 A slow-blow fuse and check that load characteristics comply with the indications given in the table below.

Characteristic	Description	Value
Voltage	Minimum switching voltage	18 Vdc
	Maximum switching voltage	250 Vac
Current	Minimum switching current	20 mA
	Maximum switching current	2 A

Minimum switching ratings of outputs: The device is capable to switch the low voltage loads (minimum 18 Vdc / 20 mA) provided that the contact has never been used with higher loads.

### Warnings Regarding the Connection Cables

For connections of more than 50 m (164 ft) between light curtain and XPSLCMUT1160, cables with a cross-section of at least 1 mm<sup>2</sup> must be used.

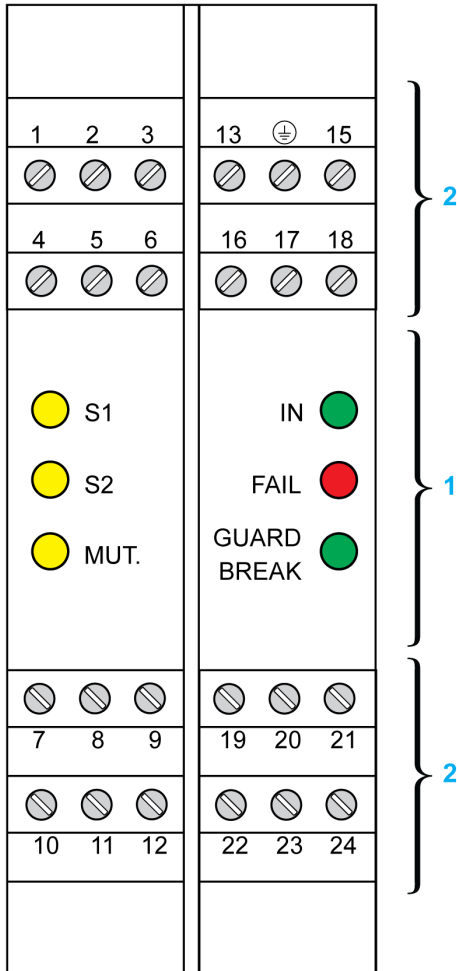
It is good practice to separate the power supply of the XPSLCMUT1160 from that of other electrical appliances (electrical motors, inverters, frequency variators) or other sources of disturbance.

The path of the connection cables between the control unit and the sensors, the connection referring to the test command and feedback contacts connected to terminal 20 must be different from that of other power cables.

## Presentation

### Presentation

The following figure shows the main elements of a XPSLCMUT1160 module:



- 1 Status LEDs
- 2 Screw terminals

Status LEDs

LED state			Description
LED	Color	Status	
S1	Yellow	OFF	Muting sensor 1 free
		ON	Muting sensor 1 interrupted
S2	Yellow	OFF	Muting sensor 2 free
		ON	Muting sensor 2 interrupted
MUT	Yellow	OFF	Correct operation
		ON	Muting active
		Flashing	<ul style="list-style-type: none"> <li>● Override request</li> <li>● Muting fail (Only with <b>FAIL</b> LED ON) <sup>(1)</sup></li> </ul>
IN	Green	OFF	Curtain interrupted
		ON	Curtain free
FAIL	Red	OFF	No failure detected
		ON	Failure detected <sup>(1)</sup>
GUARD BREAK	Green Red Yellow	Green	Output relays closed
		Red	Output relays opened
		Red flashing	The number of blinkings shows the detected failure (Only with <b>FAIL</b> LED ON) <sup>(1)</sup>
		Yellow	Curtain free - Output relays opened (Only in manual operative mode)

(1) For more details, refer to the troubleshooting part ([see page 45](#)).

## Status LED in the Main Usual Module States

LED state			Description
IN (Green)	FAIL (Red)	GUARD BREAK (Red/Yellow/Green)	
ON	ON	Red	Power up test
OFF	OFF	Red	Muting sensor interrupted Output relays opened
ON	OFF	Yellow	Muting sensor free Output relays opened
ON	OFF	Green	Muting sensor free Output relays closed

LED state			Description
S1 (Yellow)	S2 (Yellow)	MUT (Yellow)	
ON	ON	ON	Power up test
OFF	OFF	OFF	Both muting sensors are free
ON	OFF	OFF	Muting sensor 1 interrupted
OFF	ON	OFF	Muting sensor 2 interrupted
ON	ON	ON	Muting active
Shows the sensor_1 status	Shows the sensor_2 status	Blinking	Override request

## Wiring

### Safety Light Curtain Wiring

# NOTICE

## IMPROPER SETUP

The safety light curtain must be configured in automatic start and without EDM, according to the schematic below.

**Failure to follow these instructions can result in equipment damage.**

This table describes the appropriate wiring configuration of the safety light curtain receiver (XUSL2E or XUSL4E):

Configuration	Automatic start/restart without EDM feedback loop
Pin4: Configuration_A	24 Vdc
Pin5: K1_K2 Feedback/ Restart	24 Vdc
Pin6: Configuration_B	0 Vdc
Figures	

## Muting Module Pin-Out

The following table presents the I/O of the XPSLCMUT1160 module:

Terminals	Signal name	Signal type	Description
1	SENSOR 1	Input	Muting sensor n° 1
2	SENSOR 2	Input	Muting sensor n° 2
3	24VDC	Input	Power supply 24 Vdc
4	TIMEOUT 1	Input	Timeout selection n° 1 <sup>(1)</sup>
5	TIMEOUT 2	Input	Timeout selection n° 2 <sup>(1)</sup>
6	MAN/AUTO	Input	Manual/Automatic Start/Restart configuration <sup>(3)</sup>
7	OVERRIDE 1	Input	Override selection n° 1 (maintained or pulse action) <sup>(2)</sup>
8	OVERRIDE 2	Input	Override selection n° 2 (maintained or pulse action) <sup>(2)</sup>
9	Not Connected	-	Do not connect
10	MUTING LAMP	Output	Muting lamp output
11	MUTING ENABLE	Input	External muting enable input
12	Relay K1 (NO)	Output	Safety output 1 (NO)
13	0VDC	Input	Power supply 0 Vdc
14	PE	-	Ground connection
15	RESTART	Input	Restart command input <sup>(3)</sup>
16	Not Connected	-	Do not connect
17	INPUT1 BARR	Input	OSSD1 safety light curtain
18	INPUT2 BARR	Input	OSSD2 safety light curtain
19	Not Connected	-	Do not connect
20	K1/K2 (Feedback)	Input	K1K2 external contactors feedback
21	SYSTEM STATUS	Output	Output safety relays status: <ul style="list-style-type: none"> <li>● Output relays opened: 0 Vdc</li> <li>● Output relays closed: 24 Vdc</li> </ul>
22	Relay K1 (NO)	Output	Safety output 1 (NO)
23	Relay K2 (NO)	Output	Safety output 2 (NO)
24	Relay K2 (NO)	Output	Safety output 2 (NO)
<p><b>(1)</b> Refer to Selection of the muting time-out (<a href="#">see page 40</a>)  <b>(2)</b> Refer to Selection of the override (<a href="#">see page 40</a>)  <b>(3)</b> Refer to Selection of the operating mode (<a href="#">see page 40</a>)</p>			

### Selection of the Muting Time-Out

TERMINAL 4	TERMINAL 5	Duration timeout
0 Vdc	24 Vdc	30 s
24 Vdc	0 Vdc	Infinite
0 Vdc	0 Vdc	Forbidden
24 Vdc	24 Vdc	

### Selection of the Override

TERMINAL 7	TERMINAL 8	Type of override control	Operation
24 Vdc	24 Vdc	Maintained action (Spring return key)	Override request
Not Connected (0 Vdc)	Not Connected (0 Vdc)		Override not requested
24 Vdc	Not Connected (0 Vdc)	Pulsed action (Push button)	Override request
Not Connected (0 Vdc)	24 Vdc		Override not requested

### Selection of the Operating Mode Manual/Automatic Start/Restart

TERMINAL 6	TERMINAL 15	Operation
0 Vdc	24 Vdc	Automatic Start
24 Vdc	24 Vdc through a NO contact	Manual Start/Restart
0 Vdc	0 Vdc	Forbidden
24 Vdc	24 Vdc	

### Selection of the Operating Mode EDM (External Device Monitoring)

The EDM controls the external contactors K1/K2. To achieve this, normally closed contacts of the external contactors (connected in series) are monitored. The control of the correct switching of K1 and K2 is performed 300 ms after the real command of the OSSDs.

To monitor K1 and K2 safety contactors contacts, follow the wiring instructions below:

TERMINAL 20	TERMINAL 21	Operation
24 Vdc through K1_K2 NC feedback contacts in serie	Not connected (0 Vdc)	External Device Monitoring (EDM) active (K1 and K2 contacts monitoring)
Terminal 20 connected to terminal 21		No External Device Monitoring (EDM not used)

The K1 and K2 contacts must be able to switch a current of 20 mA and a voltage of 24 Vdc.



## Wiring Example with Start/Restart and EDM Functions

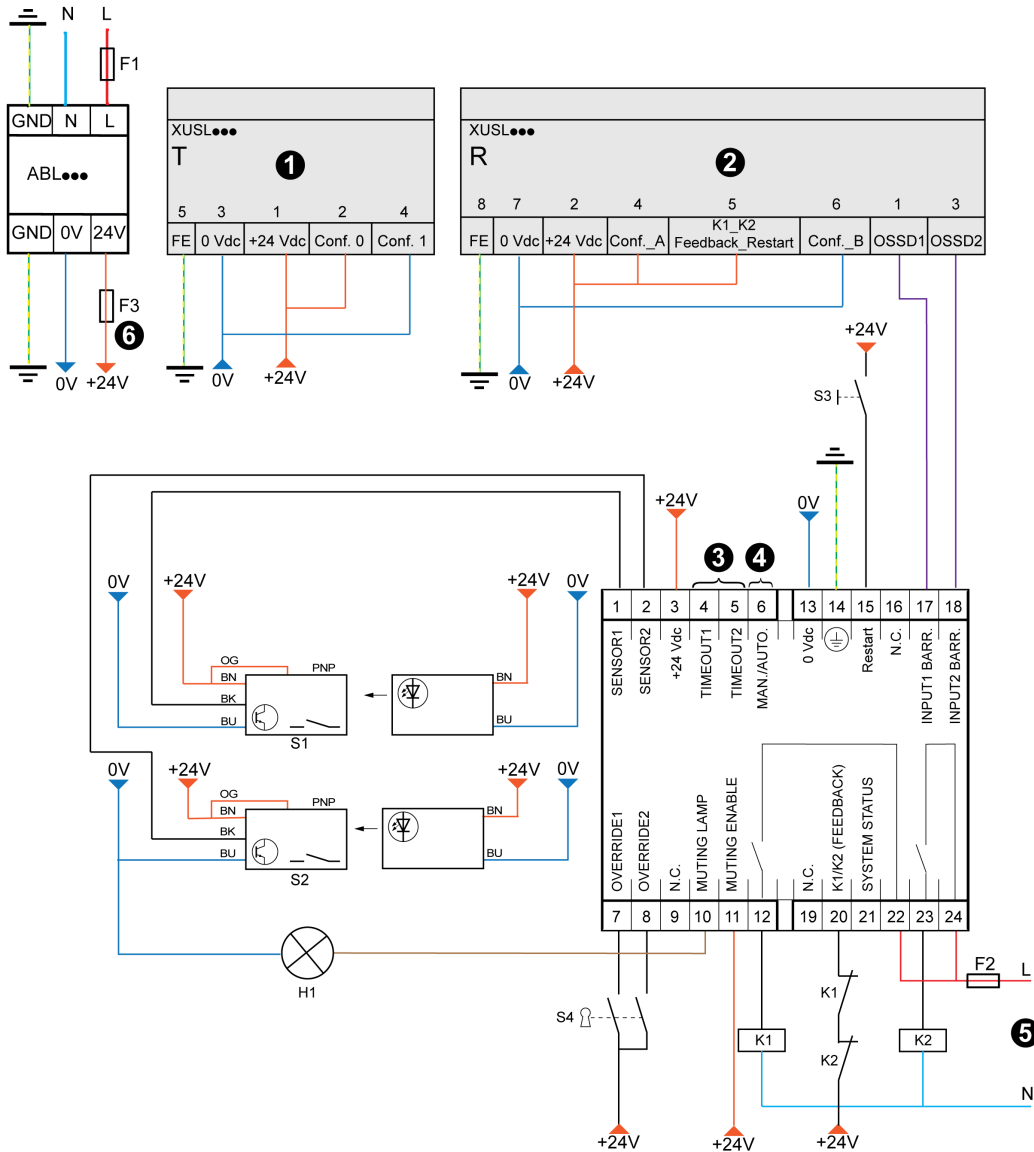
### ***NOTICE***

#### **IMPROPER SETUP**

The safety light curtain must be configured in Automatic start and without EDM, according to the schematic below.

**Failure to follow these instructions can result in equipment damage.**

The following figure presents a wiring diagram example:



- 1 Transmitter of the safety light curtain
- 2 Receiver of the safety light curtain
- 3 Refer to time-out wiring configuration ([see page 40](#))

- 4** Refer to Manual/Automatic Start/Restart wiring configuration ([see page 40](#))
- 5** Fuse maximum 250 Vac / 4 A
- 6** Fuse maximum 24 Vdc / 1 A
- S1-S2** Muting sensor n° 1 and muting sensor n° 2  
(Photocells thru-beam dark-on PNP type)
- S3** Restart push button
- S4** Override push button
- H1** Muting lamp

<b><i>NOTICE</i></b>
<b>UNINTENDED EQUIPMENT OPERATION</b> The K1 and K2 relays must have force-guided contacts. <b>Failure to follow these instructions can result in equipment damage.</b>



# Chapter 4

## Troubleshooting

### Troubleshooting

#### XPSLCMUT1160 Troubleshooting

These tables describe the XPSLCMUT1160 troubleshooting:

LED state			Detected fault description
IN (Green)	FAIL (Red)	Guard/Break (Red/Green)	
OFF	ON	2 flashes	Internal Fault
		3 flashes	Internal relays fault
		4 flashes	K1_K2 external relays fault
		5 flashes	User configuration failure
		6 flashes	User configuration changed without system restart: Switch OFF and restart the module to solve the problem. At the switch ON verify the user configuration.
		7 flashes	Possible overload or SYSTEM STATUS connection ERROR

LED state			Detected fault description
S1 (Yellow)	S2 (Yellow)	MUT. (Yellow)	
OFF	OFF	2 flashes	Wrong connection of the muting lamp, lamp not present or in overload
		3 flashes	Muting timeout wrong configuration
		4 flashes	Wrong override configuration at the power up
Shows the sensor_1 status	Shows the sensor_2 status	5 flashes	Instable Muting sensor
Blinking	Blinking	Blinking	Override with pulse command expired

 **WARNING**

**TROUBLESHOOTING**

If the failure does not correspond to one of the detected fault described above or the operator cannot remedy to the malfunction, stop the machine and contact your customer support in your country.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

---

# Chapter 5

## Technical Characteristics

---

### What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Specifications	48
Dimensions	50
Accessories	51

## Specifications

### Conformity/Approvals

Characteristic	Value
Conforming to standards	Type 4: IEC 61496-1, IEC 61496-2 SILCL3: IEC 62061 Cat.4, PL=e: EN ISO 13849-1:2008
Safety category	4
Approvals	cULus, CE, TÜV

### Environment

Characteristic	Value
Ambient air temperature	0...55°C (32...131 °F)
Enclosure protection rating	IP 20
Terminal block protection rating	IP 2X
Device lifetime	20 years

### Electrical Characteristics

Characteristic	Value
Response time	20 ms maximum
Power supply	24 Vdc ± 20%
Power requirement	5 W maximum
Output	2 relays NO contacts Switching capacity according to IEC/EN 60 947-5-1 AC 15: 230 Vac / 2 A DC 13: 24 Vdc / 2 A
External relay control (EDM)	2 NC contacts (20 mA; 24 Vdc)
Number of connectable curtains	1 (with 2 PNP safety static outputs)
System status output	100 mA; 24 Vdc
Maximum length of connections	100 m (328 ft)
Status indicators	IN: barrier status S1 - S2: muting sensor status MUT: muting status FAIL: detected failure status GUARD BREAK: system status



Characteristic	Value
Muting sensors inputs	2 muting sensors (24 Vdc; PNP; dark-ON) Maximum current: 10 mA
Muting enable input	24 Vdc, PNP
Muting lamp output	24 Vdc / 0.5 - 5 W (filament bulb)
Connections	Terminal block with protection against reversal of polarity

### Other Characteristics

Characteristic	Value
Operating modes	Manual or Automatic, selectable from terminal block
Fastening	Fast attachment to rail according to EN 50022-35
Dimensions (h x w x d)	99 x 35 x 114.5 mm (3.54 x 1.38 x 4.51 in)
Weight	150 g (5.29 oz)
B10d (relay outputs)	800 000
Response time (tr)	20 ms

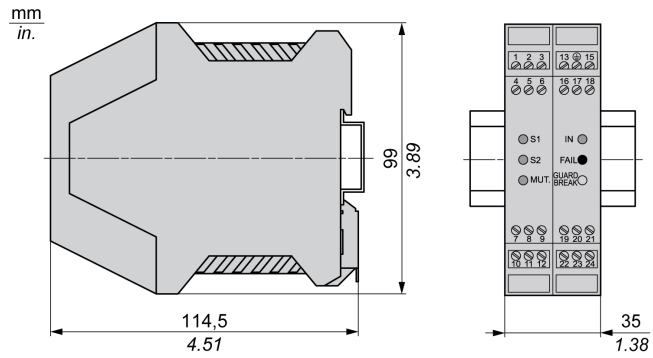
### Safety Characteristics

Load	Number of commutations	PFHd	DCavg	MTTFd	PL	CCF
		IEC 61508	EN ISO 13849-1:2008			
2A@230 Vac	1 every 30 s	2.80 E-08	98.89%	25.97	d	80%
	1 every min	1.71 E-08	98.78%	49.92	e	
	1 every hour	6.58 E-09	96.68%	100		
	1 every day	6.42 E-09	96.25%			
0,5A@24 Vdc	1 every 30 s	5.03 E-08	98.94%	13.25	d	
	1 every min	2.80 E-08	98.89%	25.97	e	
	1 every hour	6.76 E-09	97.01%	100		
	1 every day	6.43 E-09	96.28%			

## Dimensions

### XPSLCMUT1160 Dimensions

The following illustration describes the XPSLCMUT1160 dimensions:

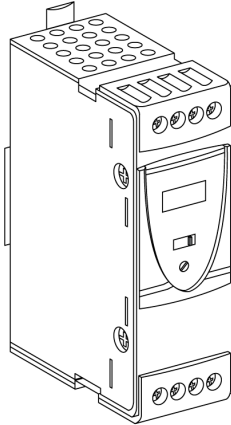


## Accessories

### Accessories

The power supply must meet the requirements of IEC 60204-1 and IEC 61496-1.

The SELV Schneider Electric part number ABL8RPS24\*\*\* is recommended:



The following table presents some ABL8RPS24\*\*\* power supply for the XPSLCMUT1160:

Input voltage	Secondary			Reset	Conforming to standard EN 61000-3-2	Reference	Weight
	Output voltage (V)	Nominal power (W)	Nominal current (A)				
<ul style="list-style-type: none"> <li>● Single to phase (N-L1) 100...120 Vac -15% +10% (50 Hz or 60 Hz)</li> <li>● Phase to phase (L1-L2) 200...500 Vac -15% +10% (50 Hz or 60 Hz)</li> </ul>	24...28.8	72	3	Auto/ Manual	Yes	ABL8RPS24030	0.3 kg 0.66 lb
		120	5			ABL8RPS24050	0.7 kg 1.54 lb
		240	10			ABL8RPS24100	1.0 kg 2.2 lb

ABL8RPS24\*\*\* Operating temperature range -25...60 °C (-13...140 °F) without derating.





## A

### **ANSI**

American National Standards Institute. The administrator and coordinator of the U.S. private sector standardization system.

## B

### **B10**

B10 is number of operations (number of the operating cycles for the relay outputs) at which 10% of the population have failed.

B10d is the expected time at which 10% of the population will have failed in a “dangerous” mode. Without specific knowledge of which mode in which a component is being used, and hence what constitutes a dangerous failure, it can generally be assumed that 50% of failures are dangerous, therefore  $B10d = 2 \times B10$ .

## C

### **Control-reliable**

The device, system, or interface shall be designed, constructed, and installed such that a single component failure within the device, interface, or system shall not prevent normal stopping action from taking place, but shall prevent a successive machine cycle (ANSI B11.191).

## D

### **Detection zone**

The zone within which a specified test piece is detected by the safety light curtain system.

## E

### **EDM/MPCE (External Device Monitoring/Machine Primary Control Element Monitoring)**

A means by which the light curtain monitors the state of external control devices.

### **ESPE**

Electro-sensitive protective equipment.

## O

### **OFF state**

The state in which the output circuit is interrupted (open) and does not allow current to flow.

### **ON state**

The state in which the output circuit is complete (closed) and allows the flow of current.

### **OSHA**

Occupational Safety and Health Administration. This is a U.S. government agency.

### **Output Safety Switching Device (OSSD)**

The component of the safety light curtain connected to the machine control system which, when the light curtain detection zone is interrupted, responds by going to OFF state. This is also known as a safety output.

## R

### **Response time**

Time taken by the protective device to transmit the signal to stop the main engine.

## S

### **Safety Integrated Level (SIL)**

The failure mode evaluation based on the risk assessment in accordance with IEC 61508. Estimation of the required SIL is performed for each safety-related control function (SRCF) and is divided into parameters for the determination of the safety integrity requirements, which is assigned to a safety integrity level. Level 3 is the highest and Level 1 the lowest level.

### **Safety Integrated Level Claim Limit (SILCL)**

Maximum SIL that can be claimed for safety function of any subsystem.

The failure mode evaluation based on the risk assessment in accordance with IEC 62061. Estimation of the required SILCL is performed for each safety-related control function (SRCF) and the external technical device (for example, additional control device) is taken into account.