SCHMERSAL

EN Operating instructions. . . . . .pages 1 to 6
Original

Content

1. About this document

1.1 Function

This operating instructions manual provides all the information you need for the mounting, set-up and commissioning for the safe operation and disassembly of the safety-monitoring module. The operating instructions must be available in a legible condition and a complete version in the vicinity of the device.

1.2 Target group: authorised qualified personnel

All operations described in this operating instructions manual must be carried out by trained specialist personnel, authorised by the plant operator only.

Please make sure that you have read and understood these operating instructions and that you know all applicable legislations regarding occupational safety and accident prevention prior to installation and putting the component into operation.

The machine builder must carefully select the harmonised standards to be complied with as well as other technical specifications for the selection, mounting and integration of the components.

1.3 Explanation of the symbols used

Information, hint, note:
This symbol is used for identifying useful additional information.

Caution: Failure to comply with this warning notice could lead to failures or malfunctions.
Warning: Failure to comply with this warning notice could lead to physical injury and/or damage to the machine.

1.4 Appropriate use

The Schmersal range of products is not intended for private consumers.

The products described in these operating instructions are developed to execute safety-related functions as part of an entire plant or machine. It is the responsibility of the manufacturer of a machine or plant to ensure the correct functionality of the entire machine or plant.

The safety-monitoring module must be exclusively used in accordance with the versions listed below or for the applications authorised by the manufacturer. Detailed information regarding the range of applications can be found in the chapter "Product description".

1.5 General safety instructions

The user must observe the safety instructions in this operating instructions manual, the country specific installation standards as well as all prevailing safety regulations and accident prevention rules.

Further technical information can be found in the Schmersal catalogues or in the online catalogue on the Internet: products.schmersal.com.

The information contained in this operating instructions manual is provided without liability and is subject to technical modifications.

There are no residual risks, provided that the safety instructions as well as the instructions regarding mounting, commissioning, operation and maintenance are observed.

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1.6 Warning about misuse

In case of inadequate or improper use or manipulations of the safety-monitoring module, personal hazards or damages to machinery or plant components cannot be excluded.

1.7 Exclusion of liability

We shall accept no liability for damages and malfunctions resulting from defective mounting or failure to comply with this operating instructions manual. The manufacturer shall accept no liability for damages resulting from the use of unauthorised spare parts or accessories.

For safety reasons, invasive work on the device as well as arbitrary repairs, conversions and modifications to the device are strictly forbidden; the manufacturer shall accept no liability for damages resulting from such invasive work, arbitrary repairs, conversions and/or modifications to the device.

2. Product description

2.1 Ordering code

This operating instructions manual applies to the following types:

AES 1165-①

No.	Option	Description
①	2196 2250	Guard position message at Y output with error message at Y output

Only if the information described in this operating instructions manual are realised correctly, the safety function and therefore the compliance with the Machinery Directive is maintained.

2.2 Special versions

For special versions, which are not listed in the order code below 2.1, these specifications apply accordingly, provided that they correspond to the standard version.

2.3 Comprehensive quality insurance to 2006/42/EC

Schmersal is a certified company to appendix X of the Machinery Directive. As a result, Schmersal is entitled to autonomously conduct the conformity assessment procedure for the products listed in Appendix IV of the MD without involving a notified body. The prototype test certificates are available upon request or can be downloaded from the Internet at www.schmersal.com.

2.4 Purpose

The safety-monitoring modules for integration in safety circuits are designed for fitting in control cabinets. They are used for the safe evaluation of the signals of positive break position switches for safety functions or magnetic safety sensors on sliding, hinged and removable safety guards.

AES 1165

Monitoring of two safety switches, which are actuated by different safety guards (e.g. two guard doors, which are opened independently from one another).

Design

The safety-monitoring modules have a dual-channel structure. They contain two safety relays with monitored positively driven contacts. The NO contacts of the relays, which are wired in series, build the enabling contacts.

The entire concept of the control system, in which the safety component is integrated, must be validated to the relevant standards.

2.5 Technical data

Standards:	EN 60947-5-1, EN 60947-5-3, EN ISO 13849-1
Start conditions:	Automatic
Feedback circuit available:	no
Start-up test:	no
Pull-in delay for automatic start:	adjustable 0.1 / 1.0 s
Drop-out delay in case of "emergency stop":	< 50 ms
Rated operating voltage Ue:	24 VDC ± 15%
Rated operating current I_e:	0.2 A
Rated insulation voltage U_i:	250 V
Rated impulse withstand voltage U_{imp}:	4,8 kV
Thermal test current I_{the}:	6 A
Internal electronic fuse:	no
Power consumption:	< 5 W
Monitored inputs:	
Cross-wire short detection:	yes
Wire breakage detection:	yes
Earth connection detection:	yes
Number of NC contacts:	2
Number of NO contacts:	2
Outputs:	
Stop category 0:	1
Stop category 1:	0
Number of safety contacts:	1
Number of auxiliary contacts:	0
Number of signalling outputs:	2
Switching capacity of the signalling outputs:	Y1-Y2 = 100 mA
Switching capacity of the safety contacts:	min. 10 mA max. 6 A
Utilisation category to EN 60947-5-1:	AC-15: 230 V / 3 A DC-13: 24 V / 2 A
Max. fuse rating:	6 A gG D-fuse
Mechanical life:	20 million operations
LED display:	ISD
Ambient conditions:	
Operating temperature:	0 °C ... +55 °C
Storage and transport temperature:	−25 °C ... +70 °C
Degree of protection:	Enclosure: IP40 Terminals: IP20 Clearance: IP54
Degree of pollution:	2
Mounting:	snaps onto standard rail to EN 60715
Connection type:	Screw connection
Min. cable section:	0.25 mm²
Max. Cable section:	2.5 mm², solid strand or multi-strand lead (including conductor ferrules)
Tightening torque:	0,6 Nm
Max. cable length:	1000 m of 0.75 mm² conductor
Weight:	190 g

2.6 Classification

Standards:	EN ISO 13849-1
PL:	up to d
Category:	up to 3
B_{10D} (light load):	20,000,000 switching cycles
B_{10D} (nominal load):	400,000 switching cycles
Mission time:	20 years

$$MTTF_D = \frac{B_{10D}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

n_{op} = average number of activations per year
d_{op} = average number of operating days per year
h_{op} = average number of operating hours per day
t_{cycle} = average demand rate of the safety function in s
(e.g. 4 × per hour = 1 × per 15 min. = 900 s)

3. Mounting

3.1 General mounting instructions
Mounting: snaps onto standard rails to EN 60715.

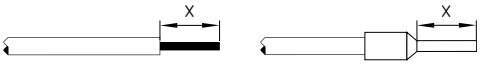
3.2 Dimensions
Device dimensions (H/W/D): 100 x 22.5 x 121 mm

4. Electrical connection

4.1 General information for electrical connection

The electrical connection may only be carried out by authorised personnel in a de-energised condition.

Settle length x of the conductor: 8 mm



Wiring examples: see appendix

5. Operating principle and settings

5.1 Operating principle after the operating voltage is switched on
1. The functioning of the safety-monitoring module is checked.
2. If the safety guards are closed, the enabling path of the safety-monitoring module will close.
3. The LED is green.
4. The cables and the connected safety switches are tested when the safety guards are opened (no start-up test). If a safety guard is opened, the enabling path of the safety-monitoring module is opened and the LED flashes yellow.

Inputs S1-S14/S22; S2-S14/S22
Connect a safety switch with one NC and one NO contact or two safety switches with one contact each or an emergency-stop button at input S14/S22.

Outputs
Enabling paths 13-14: NO contacts for safety functions

Additional outputs Y1/Y2
Transistors for signalling functions

AES 1165-2196:	Y1 Safety guard 1 open
	Y2 Safety guard 2 open
AES 1165-2250:	Y1 Safety guard 1 open or fault
	Y2 Safety guard 2 open or fault

The additional outputs Y1 and Y2 must not be integrated in the safety circuit; they may only be used for signalling purposes.

Extension of enable delay time
On safety guards with strong residual vibrations, the end position of a non-contact position switch is often "overrun". This causes the safety-monitoring module to generate an error message. To avoid this, the "enabling delay time" can be extended by removing the device cover and setting an internal bridge (jumper).

Bridge closed:	enabling delay time = 1.0 s
Bridge closed:	enabling delay time = 0.1 s (factory setting)

6. Set-up and maintenance

6.1 Functional testing
The safety function of the safety-monitoring module must be tested.
The following conditions must be previously checked and met:
1. Correct fitting of the safety-monitoring module
2. Fitting and integrity of the power cable

6.2 Maintenance
In the case of correct installation and adequate use, the safety-monitoring module features maintenance-free functionality.
A regular visual inspection and functional test, including the following steps, is recommended:
- Check the correct fixing of the safety monitoring module
- Check the cable for damage.

Damaged or defective components must be replaced.

7. Disassembly and disposal

7.1 Disassembly
The safety monitoring module must be disassembled in the de-energised condition only.

7.2 Disposal
The safety monitoring module must be disposed of in an appropriate manner in accordance with the national prescriptions and legislations.

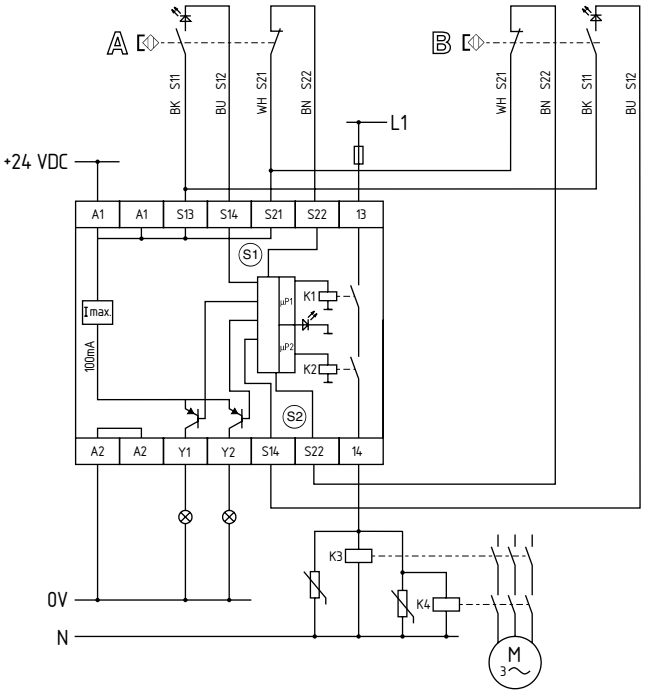
8. Appendix

8.1 Wiring examples

The application examples shown are suggestions. They however do not release the user from carefully checking whether the switchgear and its set-up are suitable for the individual application.

The wiring diagram is shown with guard doors closed and in a de-energised condition. Inductive loads (e.g. contactors, relays, etc.) are to be provided with suitable interference suppression circuitry. Do not connect additional loads to terminal S..

AES 1165-2196
AES 1165-2250



Key

A - B Non-contact safety sensor

8.2 Integral System Diagnostics (ISD)

The safety monitoring modules LED display to show the different switching conditions and faults. The following tables show the different switching conditions.

Tables switching condition indication

Diagnostic LED	System condition
The LED is green.	Enabling paths closed
LED flashes yellow (0.5 Hz)	Enabling paths open
LED flashes yellow (2 Hz)	Safety guard closed, however no authorised operation; possible cause: incorrect operation (only one contact was actuated when the safety guard was opened) or voltage drop or feedback loop not closed → perform start-up test

AES 1165 with two additional LED indications.

Indication (yellow) LED	System condition
1 impulse	Safety guard 1 open
2 impulses	Safety guard 2 open

Table error indications

Indication (orange) LED	Error	Cause
1 impulse	Inputs S1	Defective supply voltage lead, defective switch, erroneous fitting of the switch; switch only partially actuated* for at least 5 s
2 impulses	Inputs S2	refer to errors inputs S1
3 impulses	Inputs S1 and S2	refer to errors inputs S1
4 impulses	Interference signals at the inputs (no safe evaluation assured)	Too high capacitive or inductive interference at the switch's cables or the supply voltage lead
5 impulses	One or both relays did not close within the monitoring time	Too low operating voltage $U_{e;}$ Defective relay
6 impulses	Relay not disabled upon the actuation of the switch	Welded relay contact
7 impulses	Dynamic monitoring of both channels (cross-monitoring) failure	Fault in one channel; internal data transmission interrupted

* Partial actuation: position of the switch, in which only one contact was actuated.

Deleting the error message

The error message is deleted once the fault has been rectified and after the connected switch has been actuated to check the various functions (open and then close the safety guard).

9. Declaration of conformity

We declare under our sole responsibility that the products mentioned comply with all relevant provisions of the directives and regulations listed below and conform to the following standards.

Relevant Directives:	Machinery Directive	2006/42/EC
	EMC-Directive	2014/30/EU
	RoHS-Directive	2011/65/EU

CE

Applied standards:	DIN EN 60947-5-1:2018
	DIN EN ISO 13849-1:2016
	DIN EN ISO 13849-2:2013

The currently valid declaration of conformity can be downloaded from the internet at products.schmersal.com.

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