



EN Operating instructions. pages 1 to 6
Original

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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 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: www.schmersal.net.

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



The entire concept of the control system, in which the safety component is integrated, must be validated to EN ISO 13849-2.

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

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. The relevant requirements of the standard EN 1088 must be observed.

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.

The safety-monitoring module must only be used when the enclosure is closed, i.e. with the front cover fitted.

2. Product description

2.1 Ordering code

This operating instructions manual applies to the following types:

AES 233 ①

No.	Option	Description
①	5	without start-up test
	6	with start-up test

AES 253 ①

No.	Option	Description
①	5	without start-up test
	6	with start-up test



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 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 as well as emergency stop control devices.

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.

2.4 Technical data

Standards: IEC / EN 60204-1; EN 60947-5-1;
IEC 60947-5-3; EN ISO 13849-1;
IEC 61508; BG-GS-ET-14; BG-GS-ET-20

Start conditions:	Automatic or start button
Feedback circuit available:	yes
Start-up test:	AES ...5: no; AES ...6: yes
Pull-in delay for automatic start:	adjustable 0.1 / 1.0 second
Drop-out delay in case of "emergency stop":	≤ 30 ms
Rated operating voltage U_e :	24 ... 230 VAC/DC
Rated operating current I_e :	0.3 A
Rated insulation voltage U_i :	250 V
Rated impulse withstand voltage U_{imp} :	4 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:	no
Number of NC contacts:	convertible 1NC → 2NC
Number of NO contacts:	convertible 1NO → 0NO

Outputs:

Stop category 0:	AES 2335/6: 3; AES 2535/6: 4
Stop category 1:	0
Number of safety contacts:	AES 2335/6: 3; AES 2535/6: 4
Number of auxiliary contacts:	AES 2335/6: 0; AES 2535/6: 1
Number of signalling outputs:	2 transistor outputs 24 VDC, Y1 + Y2 = max. 100 mA, p-type, short-circuit proof

Max. switching capacity of the safety contacts:	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
Protection class:	Enclosure: IP40 Terminals: IP20 Clearance: IP54

Degree of pollution:	2
Mounting:	snaps onto standard DIN rail to EN 60715
Connection type:	Screw connection
Min. cable section:	0.2 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:	AES 2335 / 2336: 290 g; AES 2535 / 2536: 300 g

Dimensions (H x W x D):	100 x 45 x 121 mm
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2.5 Safety classification

Standards:	EN ISO 13849-1; IEC 61508
PL:	up to d
Control category:	up to 3
PFH-value:	1,0 x 10 ⁻⁷ / h; Applicable for applications with up to max. 50,000 switching cycles / year and max. 80 % contact load. Diverging applications upon request.
SIL:	up to 2
Service life:	20 years

3. Mounting

3.1 General mounting instructions

Mounting: snaps onto standard DIN rails to EN 60715.

3.2 Dimensions

Device dimensions (H/W/D): 100 x 45 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.

Wiring examples: see appendix



As far as the electrical safety is concerned, the protection against unintentional contact of the connected and therefore electrically interconnected apparatus and the insulation of the feed cables must be designed for the highest voltage, which can occur in the device.



To avoid EMC disturbances, the physical ambient and operational conditions at the place where the product is installed, must meet the provisions laid down in the paragraph "Electromagnetic Compatibility (EMC)" of DIN EN 60204-1.

5. Operating principle and settings

5.1 Operating principle after the operating voltage is switched on Without start-up test AES 2335 / AES 2535

1. The functionality of the safety-monitoring module is tested.
2. If the safety guard is closed or the emergency stop button released, the enabling paths of the safety-monitoring module will close. The LED is green.
3. The cable and the connected safety switch are only tested when the safety guard is opened or the emergency stop button when actuated

With start-up test AES 2336 / AES 2536

1. The functionality of the safety-monitoring module is tested.
2. The safety guard or the emergency stop button must be actuated, in order to check the cables and the connected safety switch (start-up test).
3. If the safety guard is closed or the emergency stop button released, the enabling paths of the safety-monitoring module will close. The LED is green.

If the safety guard is opened or the emergency-stop button is actuated, the enabling paths of the safety-monitoring module will open. The machine is stopped and the LED flashes yellow. In the AES 2535 and AES 2536 versions, the NC contact 51/52 is simultaneously closed. This contact however must not be integrated in the safety circuit.

Inputs 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.

Feedback circuit X1/X2

Connect the feedback circuit of the external contactor with positive action contacts and/or a start button to the inputs X1 and X2 or bridge the inputs X1 and X2.

Safety switch with two NC contacts X3/X4

For safety switches with two NC contacts, a bridge must be established between X3 and X4. In this configuration, the short-circuit detection becomes inoperative.

Conversion of the output function X5/X6

By using a bridge between X5 and X6, the output function of the additional outputs can be modified. This control can also be realised when e.g. a PLC is running (24 VDC at terminal X6).

Enable delay time X7/X8

By bridging the connections X7/X8, the enable delay time (i.e. time during which after the first closing of the guard, bouncing of the switch contacts or of the entire guard is possible without error message) can be extended from 0.1 s to 1 s. The enable delay time simultaneously is the minimum time, expiring between the guard being closed and the relays being activated.

Outputs

Enabling paths 13-14,
23-24, 33-34, (43-44): NO contacts for safety function

Additional contact (51-52): NC contact for signalling purposes

Additional outputs Y1/Y2:

without bridge (X5/X6):	Y1: indication "release"
	Y2: indication "no release"
with bridge (X5/X6):	Y1: indication "guard open"
	Y2: indication "fault"

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

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.



The device has to be integrated into the periodic check-ups according to the Ordinance on Industrial Safety and Health, however at least 1x/year.

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.

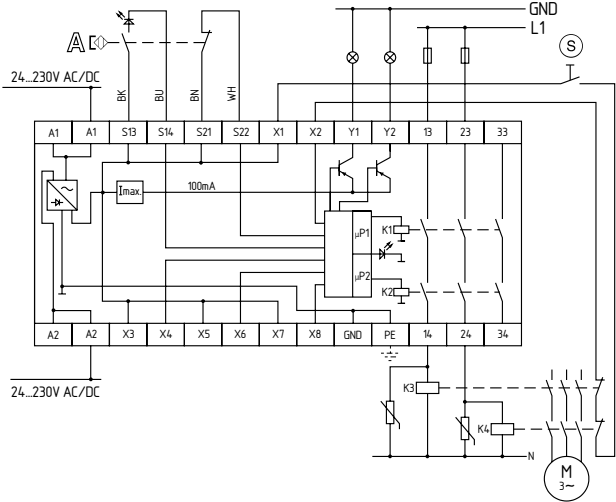
8. Appendix

8.1 Wiring examples

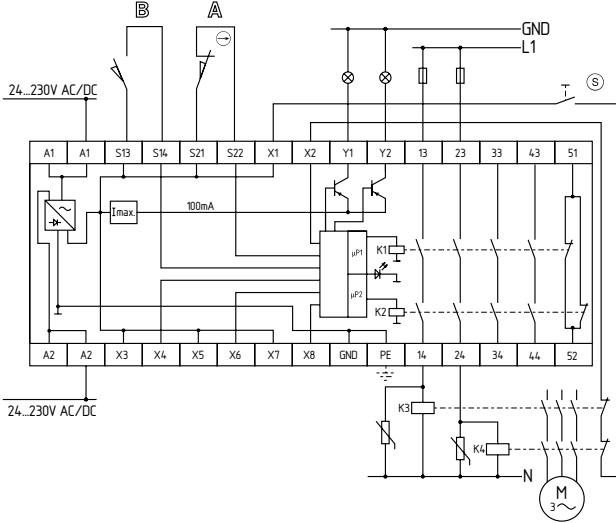
The application examples shown are suggestions. They however do not release the user from carefully checking whether the switchgear and its set-up are suitable for the individual application.

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 2335/2336



AES 2535/2536



- Key
- Positive break
- A [] Non-contact safety sensor
- A + B Safety switch
- Start button

8.2 Integral System Diagnostics (ISD)

The LED indication of the safety-monitoring modules shows the different switching conditions and errors. The following tables show the different switching conditions.

Tables switching condition indication

Table with 2 columns: Diagnostic LED, System condition. Rows describe LED states: green (enabling paths closed), yellow flash at 0.5 Hz (enabling paths open), and yellow flash at 2 Hz (safety guard closed, no release).

In case of error messages, the LED lights orange intermittently. During these intermissions, the LED flashes one up to seven times with short pulses.

Table error indications

Table with 3 columns: Indication (orange) LED, Error, Cause. Rows list error types: 1 impulse (defective supply voltage), 4 impulses (interference signals), 5 impulses (relays not closing), 6 impulses (welded relay contact), and 7 impulses (dynamic monitoring failure).

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

Deleting the error message

The error message is deleted, when the error cause is eliminated and the AES can check all functions. In case of an error of switch 1 or switch 2, actuate the switch concerned (open the safety guard and close it again). For all other errors, both switches must be actuated.

9. EU Declaration of conformity

EU Declaration of conformity



Original

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We hereby certify that the hereafter described components both in their basic design and construction conform to the applicable European Directives.

Name of the component: AES 2135/2136,
AES 2335/2336, AES 2535/2536,
AES 2355/2356, AES 2365/2366,
AES 2555/2556, AES 2565/2566

Type: See ordering code

Description of the component: Safety-monitoring module

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

Applied standards: DIN EN 60947-5-1:2010,
DIN EN ISO 13849-1:2016,
DIN EN ISO 13849-2:2013

Notified body for the prototype test: DGUV Test
Prüf- und Zertifizierungsstelle
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ID n°: 0340

EU-prototype test certificate: ET 17046

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Place and date of issue: Wuppertal, November 10, 2017

AES2135-2566-D-EN

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The currently valid declaration of conformity can be
downloaded from the internet at www.schmersal.net.



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