



**EN** Operating instructions..... pages 1 to 6  
Translation of the original operating instructions

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**ES** Encontrará el manual de instrucciones actual en su idioma oficial de la UE en nuestra página de Internet [www.schmersal.net](http://www.schmersal.net).

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**IT** Il manuale d'istruzioni aggiornato nella vostra lingua (lingua ufficiale UE) è scaricabile in Internet all'indirizzo [www.schmersal.net](http://www.schmersal.net).

**JP** EU公用語で書かれた最新の取扱説明書は、インターネット ([www.schmersal.net](http://www.schmersal.net)) からダウンロードできます。

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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 proper functionality of the entire machinery 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](http://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.

## 2 Product description

### 2.1 Ordering code

This operating instructions manual applies to the following types:

#### AES 1165.3-①-②

No.	Option	Description
①	2214	Additional output with safety guard status: Safety guard closed
	2316	Additional output with safety guard status: error-free and closed
②	-1	Inputs with NC / NO contact:
	-2	Inputs with NC / NC contact:



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 Destination and use

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 include two safety relays with monitored positive action 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 60947-5-3; EN ISO 13849-1; IEC 61508; BG-GS-ET-14; BG-GS-ET-20
Start conditions	Automatic
Feedback circuit available:	no
Start-up test:	no
Pull-in delay for automatic start:	adjustable 0.1 / 1.0 second
Drop-out delay in case of emergency stop:	< 50 ms
Rated operating voltage $U_e$ :	24 VAC
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 $I_{the}$ :	4 A
Internal electronic fuse:	no
Power consumption:	< 5 W
<b>Input monitoring:</b>	
Cross-wire short detection:	no
Wire breakage detection:	yes
Earth leakage detection:	yes
Number of NC contacts:	suffix -1: 2; suffix -2: 4
Number of NO contacts:	suffix -1: 2; suffix -2: 0
<b>Outputs:</b>	
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:	2 potential-free contacts
Switching capacity of the safety contacts:	min. 10 mA max. 6 A
Utilisation category to EN 60947-5-1:	AC-15: 250 V / 2 A DC-13: 24 V / 2 A
Max. fuse rating:	4 A gG D-fuse
Mechanical life:	> 50 million operations
LED indication:	Wiring diagram
<b>Ambient conditions:</b>	
Operating temperature:	0°C ... +55°C
Storage and transport temperature:	-25°C ... +70°C
Protection class:	Enclosure: IP 40 Terminals: IP 20 Wiring compartment: IP 54
Degree of pollution:	2
Fixing:	Snaps onto standard DIN rails to DIN EN 60715
Connection type:	Screw terminals
Min. cable section:	0.25 mm <sup>2</sup>
Max. cable section:	2.5 mm <sup>2</sup> , solid strand or multi-strand lead (including conductor ferrules)
Tightening torque:	0.6 Nm
Max. cable length:	1000 m with 0.75 mm <sup>2</sup> cable
Weight:	160 g
Dimensions (H/W/D):	75 x 22.5 x 110 mm

### 2.5 Safety classification

Standards:	EN ISO 13849-1; IEC 61508
PL:	up to d
Control category:	up to 3
PFH value:	$1.0 \times 10^{-7}$ / 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): 75 x 22.5 x 110 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

### 5 Operating principle and settings

#### Operating principle after the operating voltage is switched on

1. The function of the safety-monitoring module is tested.
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

##### Terminal A1; A2

Supply voltage 24 VAC

##### Inputs S1-S14/S22; S2-S14/S22

Connect switches with one NC and one NO contact or with two NC contacts to the inputs S1/S2, depending on the device type, see above.

##### Terminals S1-S13; S1-S21

Both terminals supply the necessary supply voltage for the safety switches (24 VDC).

#### Outputs

##### Enabling path 13-14

Normally-open contact for safety functions

##### Additional outputs Y1/Y2

AC devices: NO contacts,

DC devices: transistors for signalling functions

AES 1165.3-2214-1/-2: Y1 Safety guard 1 closed

Y2 Safety guard 2 closed

AES 1165.3-2316-1/-2: Y1 Safety guard 1 authorized operation

Y2 Safety guard 2 authorized operation

#### Expansion 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 second

Bridge closed: enabling delay time = 0.1 second  
(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.

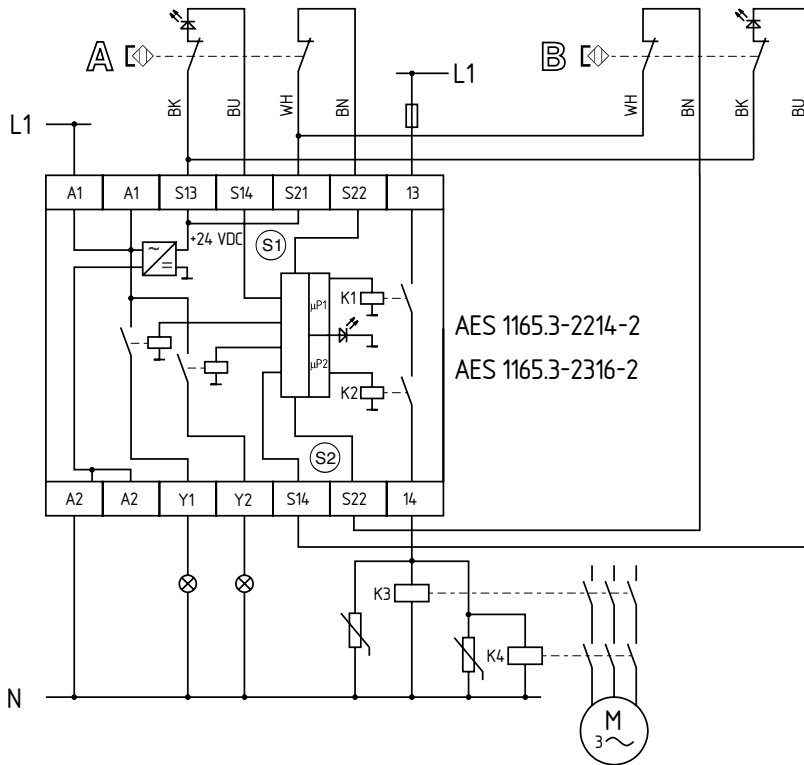
### 8 Appendix

#### 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 1165.3-xxxx-2



**Legend**

**A - B** Non-contact safety sensor

**8.2 Integral System Diagnostics (ISD)**

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

**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 <sub>e</sub> ; defective relay
6 impulses	Relay not disabled upon the actuation of the switch	relay contact welding
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 fault 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).

### 8.3 Declaration of conformity

	
<h2>EC Declaration of conformity</h2>	
Translation of the original declaration of conformity valid as of December 29, 2009	K.A. Schmersal GmbH Industrielle Sicherheitsschaltssysteme Möddinghofe 30, D - 42279 Wuppertal Germany Internet: www.schmersal.com
We hereby certify that the hereafter described safety components both in its basic design and construction conform to the applicable European Directives.	
<b>Name of the safety component:</b>	AES 1155 / AES 1156 / AES 1165 / AES 1166
<b>Description of the safety component:</b>	Safety-monitoring module for non-contact safety switches and safety relay combination in connection with the BNS series magnetic safety switches
<b>Harmonised EC-Directives:</b>	2006/42/EC EC-Machinery Directive 2004/108/EC EMC-Directive
<b>Person authorized for the compilation of the technical documentation:</b>	Ulrich Loss Möddinghofe 30 42279 Wuppertal
<b>Notified body, which approved the full quality assurance system, referred to in Appendix X, 2006/42/EC:</b>	TÜV Rheinland Industrie Service GmbH Alboinstrasse 56 12103 Berlin ID n°: 0035
<b>Place and date of issue:</b>	Wuppertal, October 7, 2009
AES 1155-B-EN	
	Authorised signature Heinz Schmersal Managing Director



#### Note

The currently valid declaration of conformity can be downloaded from the internet at [www.schmersal.net](http://www.schmersal.net).



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