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 to ensure the safe operation and disassembly of the safety switchgear. 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 switchgear 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.

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

x.000 / Januar 2017 / vA. - 101196069-EN / F / 2017-01-12 / AE-Nr. 5813

1.6 Warning about misuse

In case of improper use or manipulation of the safety switchgear, personal hazards or damages to machinery or plant components cannot be excluded when safety switchgear is used. The relevant requirements of the standard EN 14119 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:

ZSD①-②

No.	Option	Description
①	5	2 NO contacts, 1 auxiliary contact (NC)
	6	2 NO contacts, 1 auxiliary contact (NC) with additional pushbutton (NO) in the device head
②		Without mounting angle
	H	With mounting angle, metal

Not all component variants, which are possible according to this order code, are available.

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 electromechanical enabling switches (handle switches) of the ZSD series are for instance used on industrial robots and automated production systems to activate the control functions for hazardous situations through other control devices.

An enabling device is an additional manually-operated control device, which is used in conjunction with the start equipment and enables a machine function, when it is continuously actuated.
The redundant contact configuration enables signal evaluation with common safety relay modules. The contact configuration enables the signal processing according to ISO 13849-1 PL e (level 2 ↔ 3) or PL c (level 2 ↔ 1).

2.4 Actuating features

Level	1	2	3	
NO contact 1-2	□	■		⊖
NO contact 3-4	□	■		⊖
Auxiliary contact 5-6	■	■	■	⊖

Suffix: White: open; black: closed; ⊖: positive break

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:	ISO 11161, ISO 10218, IEC 60947-5-1, IEC 60204-1, ISO 12100, EN 775, EN 60204-1, prEN ISO 11161, UL 508*, CSA C22.2 Nr. 14, JIS C8201-5-1, ANSI/RIA R 15.06
Ambient temperature:	–10 °C … +60 °C (without condensation)
Storage temperature:	–40 °C … +80 °C (without condensation)
Rel. air humidity:	45 … 85% (no condensation)
Degree of pollution:	3
Contact resistance:	max. 100 mΩ (initial value)
Insulation resistance:	100 mΩ (Megger 500 VDC)
Rated impulse withstand voltage:	
- without additional pushbutton:	2.5 kV;
- with additional pushbutton:	1.5 kV
Switching frequency:	1.200 s/h
Mechanical life:	
- of the NO contact's switch insert:	Level 1-2-1: min. 10^6 operations Level 1-2-3-1: min. 10^5 operations
Electrical life:	
- of the NO contact's switch insert:	10^5 operations (at full load)
Positive break travel:	7.4 mm
Minimum required force for positive break:	90 N
Resistance to shocks:	Operation: 100 m/s², Destructive: 1,000 m/s²
Resistance to vibrations:	Operation: 5 … 55 Hz, amplitude 0.5 mm min.; destructive: 16.7 Hz, amplitude 1.5 mm min.
Connection:	Screw terminals
Cable section:	0.14 … 1.5 mm²
Cable diameter:	7 … 13 mm
Cable gland:	M 20
Tensile strength of the connection:	20 N min.
Recommended tightening torque for the screws:	Enclosure screws: 1.2 ± 0.1 Nm Strain relief: 4.0 ± 0.3 Nm Screw terminals: 0.5 … 0.6 Nm Rubber cap screws: –* Board screws: –* * Do NOT remove!
Protection class:	IP65
Max. fuse rating:	50 A (250 V)
Protection of the contacts:	external (I_k = 1000 A) to EN 60947-5-1, Safety fuse 10 A quick blow
Recommended fuse:	250 V / 10 A quick-blow (IEC 60127-1)
Weight:	ZSD5: approx. 210 g; ZSD6: approx. 240 g

Electrical specification of the ZSD5/ZSD6 base device (without pushbutton)

Rated operating voltage U_e:	250 VAC/DC
Rated operating current I_e:	3.0 A
NO contacts:	
Ohmic load (AC-12):	30 V: –; 125 V: 3.0 A; 250 V: 1.5 A
Inductive load (AC-15):	30 V: –; 125 V: 1.5 A; 250 V: 0.75 A
Ohmic load (DC-12):	30 V: 2.0 A; 125 V: 0.4 A; 250 V: 0.2 A
Inductive load (DC-13):	30 V: 1.0 A; 125 V: 0.22 A; 250 V: 0.1 A
Contact configuration:	2 NO contacts
Auxiliary contact:	
Ohmic load (AC-12):	30 V: –; 125 V: 2.0 A; 250 V: 1.0 A
Inductive load (AC-15):	30 V: –; 125 V: 1.0 A; 250 V: 0.75 A
Ohmic load (DC-12):	30 V: 2.0 A; 125 V: 0.4 A; 250 V: 0.2 A
Inductive load (DC-13):	30 V: 2.3 A; 125 V: 0.22 A; 250 V: 0.1 A
Contact configuration:	1 NC contact
Additional pushbutton for ZSD6:	
Ohmic load (AC-12):	30 V: –; 125 V: 0.5 A; 250 V: –
Inductive load (AC-15):	30 V: –; 125 V: 0.3 A; 250 V: –
Ohmic load (DC-12):	30 V: 1.0 A; 125 V: 0.2 A; 250 V: –
Inductive load (DC-13):	30 V: 0.7 A; 125 V: 0.1 A; 250 V: –

*UL508:

a) If the device is to be used in a damp room, a suitable connection cable must be used.

b) This device has been tested for impact and fire resistance according to UL508.

2.6 Safety classification

Standards:	ISO 13849-1, IEC 61508
SIL:	Level 2 ↔ 1: STOP 0: up to 2 Level 2 ↔ 3: STOP 1: up to 3
PL:	Level 2 ↔ 1: up to c Level 2 ↔ 3: up to e
Category:	Level 2 ↔ 1: STOP 1: up to 2 Level 2 ↔ 3: STOP 0: up to 4
CCF:	> 65 points
Service life:	20 years
B_{10D} value (for one channel):	100.000

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

For an average annual demand rate of nop = 126,720 cycles per year, Performance Level PL e can be obtained at maximum load.

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

tcycle = average demand rate of the safety function in s

(e.g. 4 × per hour = 1 × per 15 min. = 900 s)

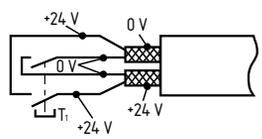
(Specifications can vary depending on the application-specific parameters h_{op}, d_{op} and t_{cycle} as well as the load.)

Actuating features

The redundant contact configuration enables signal evaluation with common safety relay modules. The contact configuration enables the signal processing according to ISO 13849-1 PL e (level 2 ↔ 3) or PL c (level 2 ↔ 1).

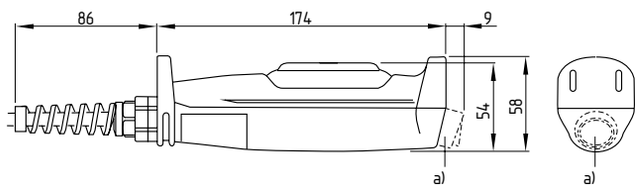
3. Mounting

The monitoring device must be equipped with a cross-wire short monitoring. In addition to that, the enabling channels must be wired as shown below. A 4-strand double shielded cable must be used.



3.1 Dimensions

Dimensions of the ZSD enabling switch



a) only for ZSD6

4. Electrical connection

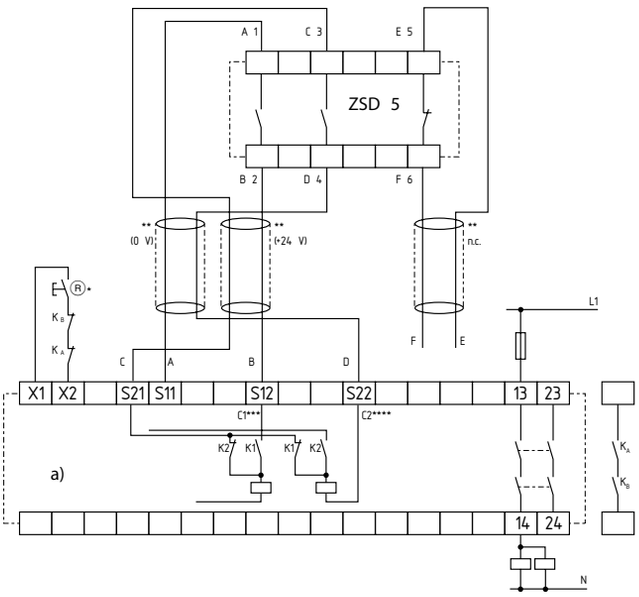
4.1 Important notes

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

If the device is to be used in a damp room, a suitable connection cable must be used.

After wiring, the contact elements must be cleaned (i.e. remove excess cables etc.).

4.2 Wiring of the ZSD5

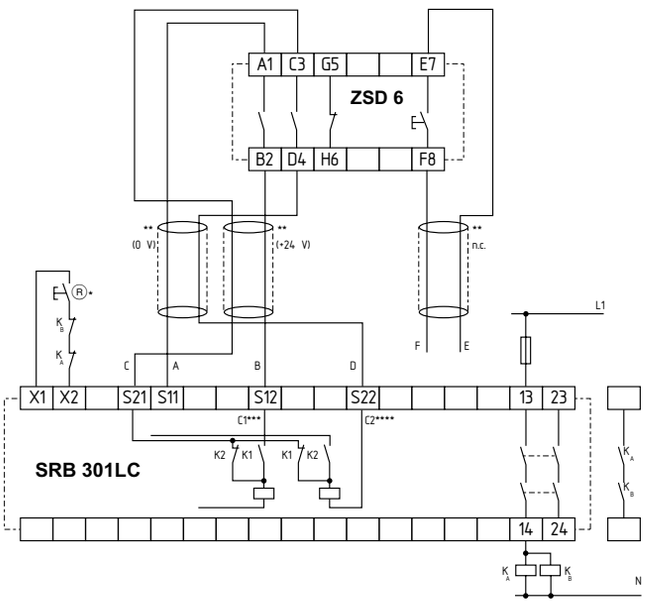


a) SRB 301ST / preferred SRB 301MC / SRB 301LC
* External reset button in series with the feedback circuit. If the feedback circuit is not required, establish a bridge. If the reset button is bridged, an automatic start takes place.
** Screen
*** C1 = channel 1 with cross-wire detection:
**** C2 = channel 2 with cross-wire detection:

Colour	internal	external
A) pink	1	NO contact 1-2 (24 V)
B) yellow	2	
C) green	3	NO contact 3-4 (0 V)
D) grey	4	
E) brown	5	Auxiliary contact 5-6 (n.c.)
F) white	6	
Shielded	grey-pink	0 V
Shielded	yellow-green	24 V
Shielded	brown-white	n.c.

Increase in capacity or number of contacts by means of contactors or relays with positive-guided contacts.

4.3 Wiring of the ZSD6



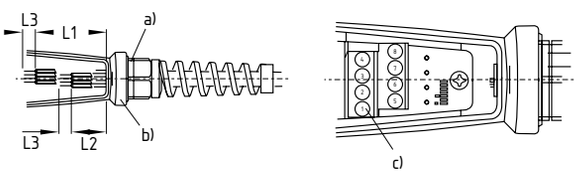
* External reset button in series with the feedback circuit. If the feedback circuit is not required, establish a bridge. If the reset button is bridged, an automatic start takes place.
** shielded
*** C1 = channel 1 with cross-wire detection:
**** C2 = channel 2 with cross-wire detection:

Colour	internal	external
A) pink	1	NO contact 1-2
B) yellow	2	
C) green	3	NO contact 3-4
D) grey	4	
E) brown	7	Pushbutton 7-8
F) white	8	
G)	5	Auxiliary contact 5-6
H)	6	
Shielded	grey-pink	0 V
Shielded	yellow-green	24 V
Shielded	brown-white	n.c.

Increase in capacity or number of contacts by means of contactors or relays with positive-guided contacts.

4.4 Strand lengths

Connection 1 … 4: L1 = 40 mm; L3 = 6 mm
Connection 5 … 8: L2 = 27 mm



a) M20 nut;
b) Handle switch;
c) Connection number

Note: Strand section 0.14 … 1.5 mm² (1 strand per connection)

5. Set-up and maintenance

5.1 Functional testing

The safety function of the enabling switch must be tested. The following conditions must be checked and met:

- Check the integrity of the cable entry and connections
- Check the enabling switch for damages

5.2 Maintenance

A regular visual inspection and functional test, including the following steps, is recommended:

- Check the correct fixing of the enabling switch and the contact elements.
- Remove particles of dust and soiling.
- Check cable entry and connections.

Damaged or defective components must be replaced.

6. Disassembly and disposal

6.1 Disassembly

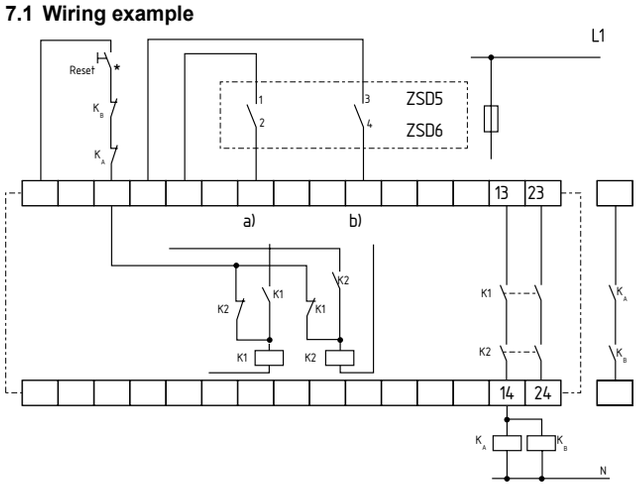
The safety switchgear must be disassembled in a de-energised condition only.

6.2 Disposal

The safety switchgear must be disposed of in an appropriate manner in accordance with the national prescriptions and legislations.

7. Appendix

7.1 Wiring example



8. EU Declaration of conformity

EU Declaration of conformity

SCHMERSAL

Original

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Germany
Internet: www.schmersal.com

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: ZSD5 / ZSD6

Type: See ordering code

Description of the component: Enabling switches

Relevant Directives:

Machinery Directive	2006/42/EC
Low Voltage Directive	2014/35/EU
RoHS-Directive	2011/65/EU

Applied standards: EN 60947-5-1/A1:2009,
EN 60947-5-8:2006

Person authorised for the compilation of the technical documentation: Oliver Wacker
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Place and date of issue: Wuppertal, January 3, 2017

Authorised signature
Philip Schmersal
Managing Director

ZSD5_6-C-EN

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

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