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 indicates 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: 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 improper use or manipulation of the safety switchgear, personal hazards or damages to machinery or plant components cannot be excluded. The relevant requirements of the standards EN ISO 14119 and EN ISO 13850 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:

SSW 303HV ①

No.	Option	Description
①		Pull-in delay 7 sec.
	2S	Pull-in delay 2 sec.

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 voltage at the inputs L1, L2 and L3

This device is designed as dual-channel fail-safe standstill monitor for monitoring the sensorless motor standstill (no adjustment required). The nominal motor voltage may amount up to 690 VAC.

The safety function is defined as the opening of the enabling contacts 13-14, 23-24 and 33-34 when voltage is detected at the inputs L1, L2 and L3. The safety-relevant current paths with the outputs contacts 13-14, 23-24 and 33-34 meet the following requirements under observation of a PFH value assessment (also refer to chapter 2.5 "Safety classification"):
– Control category 4 – PL e to DIN EN ISO 13849-1
– SIL 3 to IEC 61508
– corresponds to SIL CL 3 to EN 62061

To determine the Performance Level (PL) of the entire safety function (e.g. sensor, logic, actuator) to DIN EN ISO 13849-1, an analysis of all relevant components is required.

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

2.4 Technical Data

General data	
Standards:	EN 60204-1, DIN EN 60947-5-1, DIN EN ISO 13849-1, IEC 61508
Climate resistance:	EN 60068-2-78
Mounting:	snaps onto standard rail to EN 60715
Terminal designations:	EN 60947-1
Material of the housings:	glass-fibre reinforced thermoplastic, ventilated
Material of the contacts:	AgSnO, self-cleaning, positive drive
Weight:	360 g
Start conditions:	Automatic
Feedback circuit (Y/N):	yes
Pull-in delay:	typ. 7 sec. after the detection of the standstill (2 sec. variants: after typ. 2 sec.)
Drop-out delay:	< 15 ms, with rotary movement
Mechanical data	
Connection type:	plug-in screw connection
Cable section:	min. 0.25 mm² / max. 2.5 mm²
Connecting cable:	rigid or flexible
Tightening torque for the terminals:	0.6 Nm
Mechanical life:	10 million operations
Electrical life:	Derating curve available on request
Shock resistance to EN 60068-2-27:	150 m/s²
Resistance to vibrations to EN 60068-2-6:	5 Hz ≤ f < 8.4 Hz / 3.5 mm; 8.4 Hz ≤ f ≤ 150 Hz /10 m/s²
Ambient conditions	
Ambient temperature:	–25 °C … +55 °C
Storage and transport temperature:	–40 °C … +85 °C
Degree of protection:	Enclosure: IP40 Terminals: IP20 Clearance: IP54
Insulation values to EN 60664-1:	
Rated insulation voltage U_i:	
- Safety inputs L1, L2, L3:	690 V
- Safety contacts 13-14, 23-24, 33-34:	250 V
- Power supply A1, A2:	250 V
- Feedback circuit X1, X2:	63 V
Rated impulse withstand voltage U_{imp}:	
- Safety inputs L1, L2, L3:	8 kV
- Safety contacts 13-14, 23-24, 33-34:	6 kV
- Power supply A1, A2:	6 kV
- Feedback circuit X1, X2:	0.8 kV
Overvoltage category:	III
Degree of pollution:	2
EMC rating:	to EMC Directive
Electrical data	
Contact resistance in new state:	max. 100 mΩ
Power consumption:	max. 4 W / 8.5 VA
Rated operating voltage U_e:	24 VAC … 230 VAC: –10% / +10%, 24 VDC: –15% / +20%, residual ripple max. 10%
Frequency range:	50 Hz / 60 Hz (AC-operating voltage)
Fuse rating for the operating voltage (F1):	internal fuse T 1A / 250V
Nominal motor voltage L1, L2, L3:	max. 690 V
Monitored inputs	
Short-circuit recognition (Y/N):	No
Wire breakage detection (Y/N):	Yes
Earth leakage detection (Y/N):	Yes
Conduction resistance X1, X2:	max. 40 Ω
Outputs	
Number of safety contacts:	3
Number of auxiliary contacts:	3
Switching capacity of the safety contacts:	13-14; 23-24; 33-34: max. 250 V, 6 A ohmic (inductive in case of appropriate protective wiring); min. 10 V / 10 mA
Switching capacity of the auxiliary contacts:	41-42: 24 VDC / 2 A 51-52, 51-54: 24VDC / 0.1 A
Fuse rating of the safety contacts:	external (I_k = 1000 A) to EN 60947-5-1 Safety fuse 8 A quick blow, 6.3 A slow blow
Fuse rating for the auxiliary contacts:	2 A / 0.1 A slow blow

Utilisation category to DIN EN 60947-5-1:	AC-15: 230 VAC / 6 A DC-13: 24 VDC / 6 A

The data specified in this manual are applicable when the component is operated with rated operating voltage U_e ±0%.

2.5 Safety classification

Standards:	DIN EN ISO 13849-1, IEC 61508, EN 62061
PL:	up to e
Control category:	up to 4
DC:	99% (high)
CCF:	> 65 points
PFH value:	≤ 2.00 × 10^{-8}/h
SIL:	up to 3
Mission time:	20 years

The PFH value applies to the combinations of contact load (current through enabling contacts) and number of switching cycles ($n_{op/y}$) mentioned in the table below. At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t_{cycle}) for the relay contacts.
Diverging applications upon request.

Contact load	$n_{op/y}$	t_{cycle}
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

3. Mounting

3.1 General mounting instructions

Mounting: snaps onto standard rails to EN 60715.

Snap the bottom of the enclosure slightly tilted forwards in the standard rail and push down until it latches in position.

3.2 Dimensions

Device dimensions (H/W/D): 120 x 45 x 121 mm

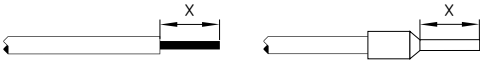
4. Electrical connection

4.1 General information for electrical connection

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

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.

Settle length x of the conductor: 7 mm



Wiring examples: see appendix

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 EN 60204-1.

Arrangement of the measurement wires

The provisions in accordance with EN 60204-1 for the options and conditions relating to connection of the safety relay module to the motor phases and for assignment of the excess current protective devices must be taken into account.
The following conditions must be observed:
- A wire cross-section of minimum 1.5 mm2 must be met for the measurement wires.
- A parallel load on the measurement wires to the safety relay module is not permissible.
- The measurement wires have been designed so that cross-faults and short-circuits are ruled out, e.g. by means of protected routing or routing solely within the same installation frame.
- If the wire cross-section is reduced, the part of the wire between the point where the current-carrying capacity is reduced and the safety switchgear must not be longer than 3 m.

The motor manufacturer's installation instructions must be observed.

5. Operating principle and settings

5.1 LED functions

- U_B: Status operating voltage (LED is on, when the operating voltage on the terminals is ON)
- A: channel A (on, when frequency at channel A)
- B: channel B (on, when frequency at channel B)
- OUT: enabling signal (on when 13-14, 23-24, 33-34 closed)
- ERR: error (on in case of malfunction)

5.2 Description and coding of the terminals

Voltages:	A1	+24 VDC/24 VAC … 230 VAC
	A2	0 VDC/24 VAC … 230 VAC
Outputs:	13-14	First safety enabling circuit
	23-24	Second safety enabling circuit
	33-34	Third safety enabling circuit
	41-42	Auxiliary contact NC
Start:	X1-X2	Feedback circuit
Outputs ERR:	51-52	Auxiliary contact NC = 1, function
	51-54	OK Auxiliary contact NO = 1, Error detected

Error detection:
Wire breakage or difference in the monitoring circuits L1, L2, L3 are detected as errors and lead to an ERR message.

Auxiliary contacts must not be used in safety circuits.

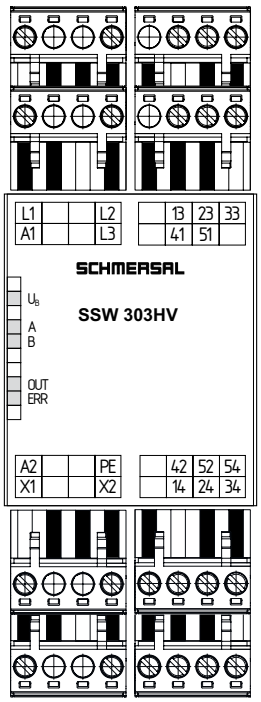


Fig. 1

5.3 Notes

Functional description

The safety-monitoring module checks the correct position of all internal relay contacts. During start-up, every motor generates an induced voltage caused by residual magnetism, which is evaluated by the safety-monitoring module. Any interruption of the motor cable is detected and recognised as well.

To activate the SSW 303HV, the connected motor must be standing still and the feedback input X1/X2 must be closed.

When the SSW 303HV is connected to cable lengths > 10 m, failures can occur.

We therefore recommend:
– short and shielded connecting cables between the safety-monitoring module and the motor,
– lay cables to other high-capacity consumers (motors etc.) or strong interference sources (frequency converters) at sufficient distance and if possible not parallel to the signal input lines (L1, L2, L3) of the safety-monitoring module.

When using frequency converters, please observe that
– the terminal stage of the frequency converter is switched off when the motor is at standstill,
– there is no position control when the motor is at standstill.

In order to avoid any inadvertent switch-off or malfunction (ERR-LED) of the safety-monitoring module, please ensure that
– external influences do not trigger any movement of the motor,
– no rotary movement of the motor can occur as soon as the self-test is started (i.e. motor at standstill, LEDs A and B simultaneously flashing).

The PE connection terminal must be connected to the safety conductor system.

5.4 Application hints

Single-channel control (star contactor is not pulled-in) (Fig. 2)

- If the application does not allow for the star contactor to be pulled in after the motor is switched off, a single-channel control of the SSW 303HV can be realised.
- Category 1 – PL c to DIN EN ISO 13849-1
  - (H1) = Signal processing
  - (H2) = Monitoring
  - (H3) = Feedback circuit

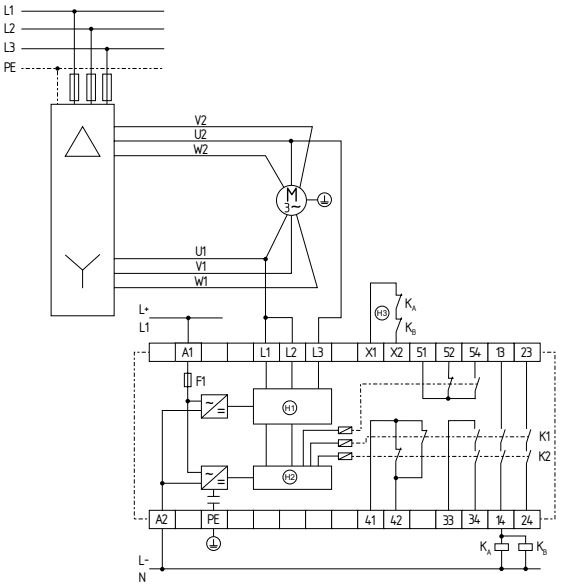


Fig. 2

Dual-channel control (star contactor pulled-in, also when motor is stationary) (Fig. 3)

- In case of automatic star delta start or pole changing, the star contactor must be pulled in during the measurement process.
- Category 4 – PL e to DIN EN ISO 13849-1 possible.
  - (H1) = Signal processing
  - (H2) = Monitoring
  - (H3) = Feedback circuit

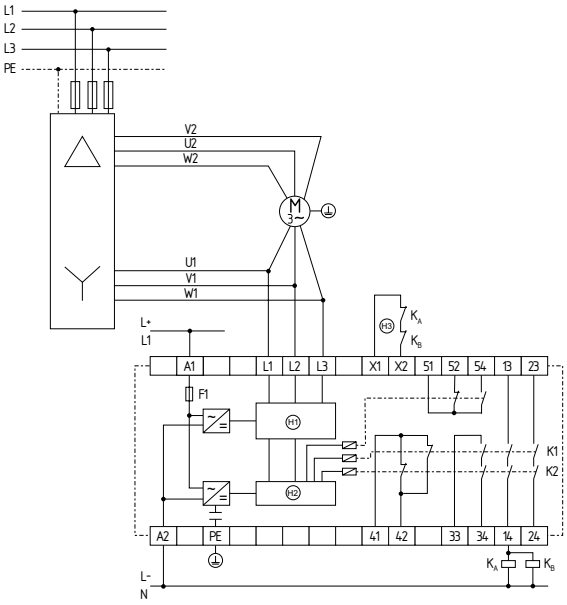


Fig. 3

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 fixing
2. Check the integrity of the cable entry and connections
3. Check the safety-monitoring module's enclosure for damage.
4. Check the electrical function of the connected sensors and their influence on the safety-monitoring module and the downstream actuators

6.2 Maintenance

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

1. Check the correct fixing of the safety-monitoring module
2. Check the cable for damages
3. Check electrical function

If a manual functional check is necessary to detect a possible accumulation of faults, then this must take place during the intervals noted as follows:

- at least every month for PL e with category 3 or category 4 (according to DIN ISO 13849-1) or SIL 3 with HFT (hardware fault tolerance) = 1 (according to EN62061)
- at least every 12 months for PL d with category 3 (according to DIN EN ISO 13849-1) or SIL 2 with HFT (hardware fault tolerance) = 1 (according to EN 62061).

Damaged or defective components must be replaced.

7. Disassembly and disposal

7.1 Disassembly

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

Unlock the bottom of the enclosure by means of a slot screwdriver, push up and hang out slightly tilted forwards.

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 example

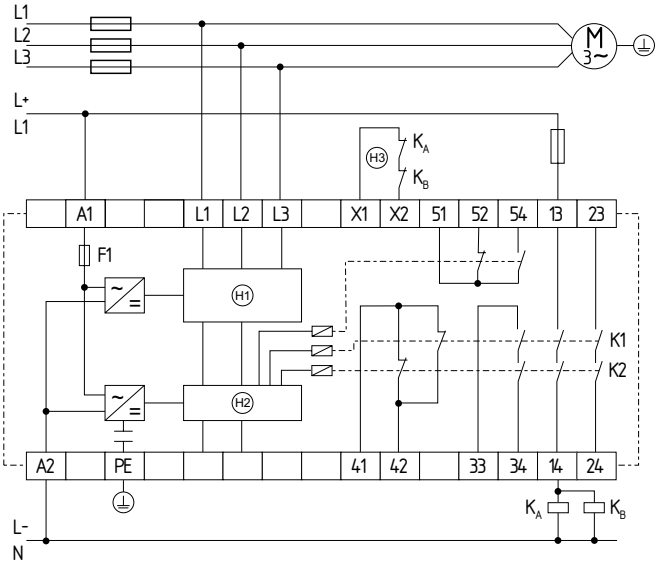


Fig. 4
H1 = Signal processing
H2 = Monitoring
H3 = Feedback circuit

Wiring example 1 (see Fig. 5)
- If the feedback circuit is not required, establish a bridge.

When the SSW 303HV safety-monitoring module is used, an automatic restart after a shutdown in case of emergency must be prevented by the upstream control to EN 60204-1 paragraph 9.2.3.4.2.

Fig. 5

Wiring example 2 (see Fig. 6)
- The control is realised through 3 phases of the AC network.
- Wire breakage between the motor windings is detected.
- Category 4 – PL e to DIN EN ISO 13849-1 possible.

When the SSW 303HV safety-monitoring module is used, an automatic restart after a shutdown in case of emergency must be prevented by the upstream control to EN 60204-1 paragraph 9.2.3.4.2.

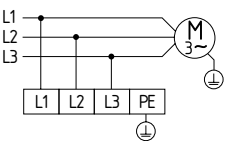


Fig. 6

Wiring example 3 (see Fig. 7)
- The control is realised through L1 and N of the AC network.
- Wire breakage between the motor windings is detected.
- Category 1 – PL e to DIN EN ISO 13849-1 possible.

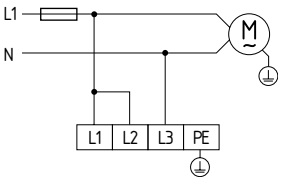


Fig. 7

Wiring example 4 (see Fig. 8)
- Single-channel control
- Suitable for increase in capacity or number of contacts by means of contactors or relays with positive-guided contacts.
- If the feedback circuit is not required, establish a bridge.

H2 = Feedback circuit

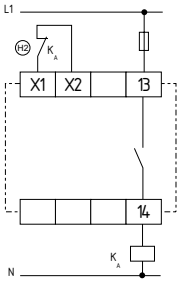


Fig. 8

Wiring example 5 (see Fig. 9)
- Dual-channel control
- Suitable for increase in capacity or number of contacts by means of contactors or relays with positive-guided contacts.
- If the feedback circuit is not required, establish a bridge.

H2 = Feedback circuit

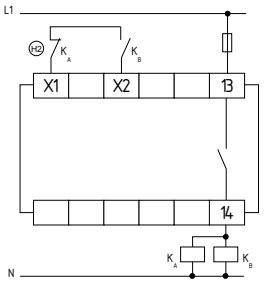


Fig. 9

9. EU Declaration of conformity

EU Declaration of conformity

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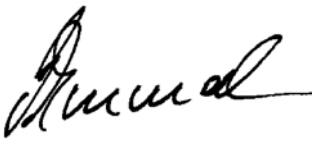
Original

K.A. Schmersal GmbH & Co. KG
Möddinghofe 30
42279 Wuppertal
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:	SSW303HV
Description of the component:	Safety-monitoring module for motor standstill monitoring
Relevant Directives:	Machinery Directive 2006/42/EC EMC-Directive 2014/30/EU RoHS-Directive 2011/65/EU
Applied standards:	DIN EN 60947-5-1:2018, DIN EN ISO 13849-1:2016, DIN EN ISO 13849-2:2013
Notified body for the prototype test:	DGUV Test Prüf- und Zertifizierungsstelle Elektrotechnik Fachbereich Energie Textil Elektro Medienerzeugnisse Gustav-Heineman-Ufer 130, 50968 Köln ID n°: 0340
EC-prototype test certificate:	ET 20025
Person authorised for the compilation of the technical documentation:	Oliver Wacker Möddinghofe 30 42279 Wuppertal
Place and date of issue:	Wuppertal, 27. July 2020



Authorised signature
Philip Schmersal
Managing Director

SSW303HV-C-EN

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

K.A. Schmersal GmbH & Co. KG
Möddinghofe 30, 42279 Wuppertal
Germany
Phone: +49 202 6474-0
Telefax: +49 202 6474-100
E-Mail: info@schmersal.com
Internet: www.schmersal.com