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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 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.

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:

FWS 1206^①

No.	Option	Description
①	A	Standstill frequencies of the inputs X1/X2: 1 Hz/2 Hz
	C	1 Hz/1 Hz



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

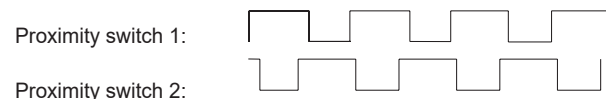
For special versions, which are not listed in the order code below 2.1, these specifications apply accordingly, provided that they correspond to the standard version.

2.3 Purpose

The fail-safe standstill monitor is designed for control cabinet mounting. Standstill monitors serve for the fail-safe detection of the machine standstill and control of solenoid interlocks. For the standstill detection, the signals of one or two proximity switches and an additional standstill signal are evaluated.

The additional standstill signal can be derived from an already available standstill signal of the machine, e.g. evaluation of a tachogenerator by a PLC or the standstill output of a frequency converter.

It is recommended to install the proximity switches on a disc cam so that at least one proximity switch is always actuated. This can be realised by a minimum 1:1 division of the disc cam. When the proximity switches are correctly installed, the following unique signal sequence should be obtained by the utilisation of the switching hysteresis of the proximity switches during the rotation of the disc cam.



The adjustment of the proximity switches is facilitated, when the cam has a 2:1 division (or higher).

Design

The fail-safe standstill monitor has a redundant dual-channel structure. It includes two safety relays with monitored positive guided contacts, which are controlled by two microprocessors, which are independent from one another. The series-wired NO contacts of the relays build the enabling paths

The feed cables of both proximity switches (power supply) must be laid so that in case of a wire breakage only one proximity switch is dead (star-shaped routing).



To determine the Performance Level (PL) to EN ISO 13849-1 of the entire safety function (e.g. sensor, logic, actuator), an assessment 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

Standards:	EN 60947-5-1, EN ISO 13849-1, EN ISO 13849-2
Enclosure:	glass-fibre reinforced thermoplastic, ventilated
Feedback circuit (Y/N):	yes
Standstill frequency:	Version A: X1/X2: 1 Hz / 2 Hz Version C: X1/X2: 1 Hz / 1 Hz
Rated operating voltage U_e :	24 VDC \pm 15%
Rated operating current I_e :	0.2 A
Rated insulation voltage U_i :	250 V
Internal electronic protection (Y/N):	no
Power consumption:	< 5 W
Readiness after switching on voltage:	< 1.5 s
Monitored inputs:	1- or 2-channel, p-type impulse generator
Short-circuit recognition:	no
Wire breakage detection:	yes
Earth connection detection:	yes
Hysteresis:	10% of the standstill frequency
Max. input frequency:	4000 Hz
Min. impulse duration:	125 μ s
Input resistance:	4 k Ω against GND
Input signal „1“:	10 ... 30 VDC
Input signal „0“:	0 ... 2 VDC
Max. cable length:	100 m of 0.75 mm ² conductor
Outputs:	
Stop category 0:	2
Stop category 1:	0
Number of safety contacts:	2
Number of auxiliary contacts:	0
Number of signalling outputs:	2
Signalling output:	2 semi-conductor outputs
Switching capacity of the safety contacts:	max. 6 A
Switching capacity of the signalling outputs:	Y1, Y2 = 100 mA
Required short-circuit current:	1000 A
Utilisation category to EN 60947-5-1:	AC-15: 230 V / 3 A DC-13: 24 V / 2 A
Rated impulse withstand voltage U_{imp} :	4 kV
Thermal test current I_{the} :	6 A
Contact load capacity:	max. 250 VAC, max. 6 A (cos ϕ =1)
Max. fuse rating of the safety contacts:	6 A gG D-fuse
Fuse rating of the signalling outputs:	short-circuit proof
Mechanical life:	20 million operations
LED display:	ISD
Ambient conditions:	
EMC rating:	to EMC-Directive
Overvoltage category:	III
Degree of pollution:	2
Resistance to vibration:	10 ... 55 Hz / amplitude 0.35 mm
Resistance to shock:	30 g / 11 ms
Environmental temperature:	0 °C ... +55 °C
Storage and transport temperature:	-25 °C ... +70 °C

Degree of protection:	Enclosure: IP40 Terminals: IP20 Clearance: IP54
Mounting:	snaps onto standard rail to EN 60715
Connection type:	Screw connection
Cable type:	solid strand or multi-strand lead
Cable section:	0.2 ... 2.5 mm ² (incl. conductor ferrules)
Tightening torque:	0,6 Nm
Weight:	190 g

2.5 Safety classification

Standards:	EN ISO 13849-1
PL:	d
Category:	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.
Mission time:	20 years

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



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.

5. Operating principle and settings

5.1 Operating principle after the operating voltage is switched on

The switch-on of the operating voltage is followed by an initialisation stage. After the check, the inputs of the fail-safe standstill monitor are evaluated. The cyclic frequency of the connected proximity switches is compared to a programmed limit frequency.

To check the proximity switches, a second comparison between the signal of the safety contact and the detected frequency is executed. If the value drops below the programmed frequency and the contact of the contactor indicates a standstill of the motor (contact closed), both safety relays are actuated and the enabling paths are closed. If one of the standstill conditions no longer is fulfilled (frequency or condition of the contactor), the safety relays are disabled.

When the motor is started through the contactor, the function of the proximity switches is tested. Five seconds after the contactor start-up, the programmed limit frequency must be exceeded at the cyclic inputs. If not, the fail-safe standstill monitor signals an error. Error messages cause the safety relays to be disabled.

When two proximity switches are connected

If the programmed upper or lower limit frequency is exceeded, the frequencies of both proximity switches are compared. A divergence of over 30% will be considered faulty and signalled. The yellow LED is flashing (refer to ISD table).

Inputs X1-X4

X1: connection for proximity switch 1

X2: connection for proximity switch 2 or bridge to X1

X3: connection for reset button

The reset input has a double function. A rising flank (0/1) at X3 deletes all detected errors of the fail-safe standstill monitor and causes the relays to be disabled. A static High signal (closed contact) changes the function of output Y2. Instead of a simple error message, the impulse sequence is emitted for every detected error in accordance with the "Error indication" table.

X4: connection for an additional standstill signal "high": standstill

Outputs

Enabling paths 13/14, 23/24

NO contacts for safety function

Additional outputs Y1/Y2

Y1: Authorized operation, the enabling path is closed

Y2: "error" or impulse sequence to "Error indication" table



The additional outputs Y1 and Y2 must not be integrated in the safety circuit. If only one proximity switch is connected, the inputs X1 and X2 must be bridged.

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

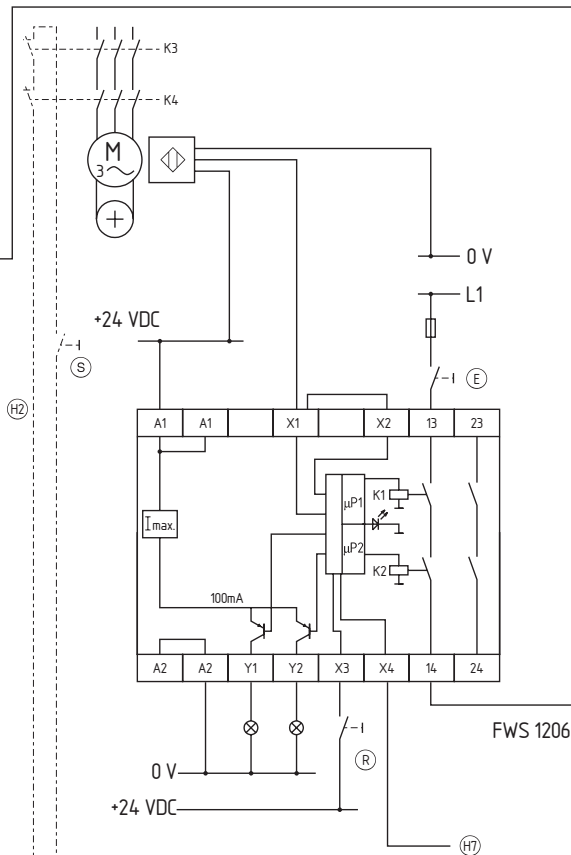
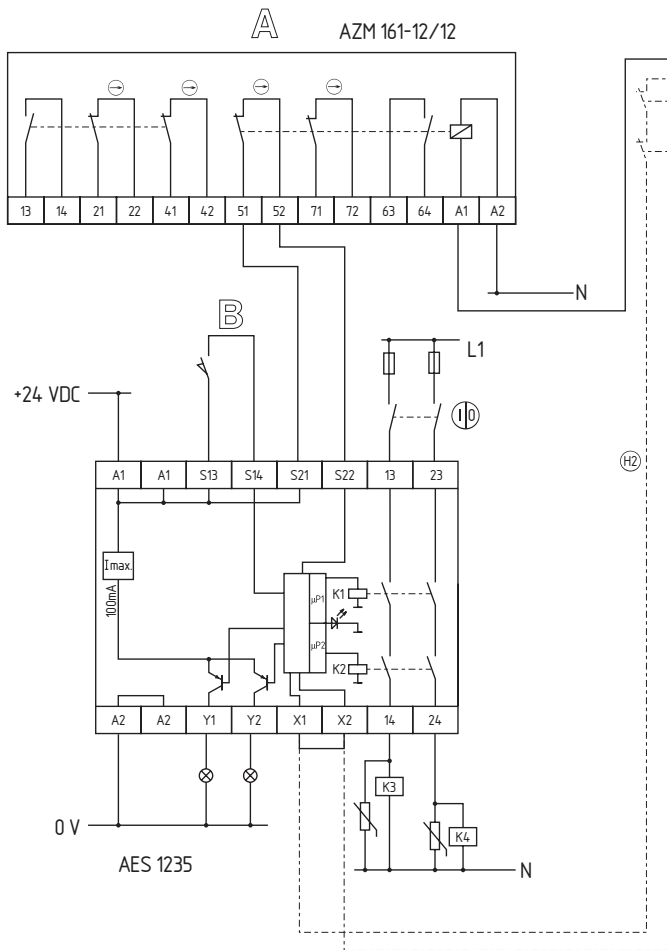
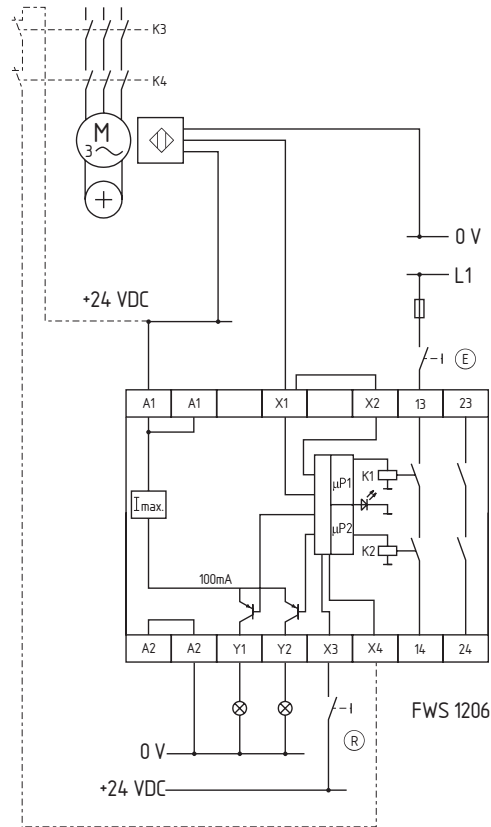
The application examples shown are suggestions. They however do not release the user from carefully checking whether the switchgear and its set-up are suitable for the individual application.

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.

Avoid laying proximity switch connection cables in areas where strong interference signals are present (e.g. frequency converters or cable leads from powerful electric motors), the utilisation of shielded cables may be necessary.

Key

- A+B Safety switches
- Ⓜ Feedback circuit
- Ⓡ Additional standstill signal
- Ⓢ On/off switch
- Ⓞ Start button
- ⓔ Release button
- Ⓡ reset button





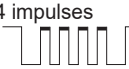




8.2 Integral System Diagnostics (ISD)

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)	When two proximity switches are connected, only one switch has exceeded the lower limit frequency, the enabling paths are open
LED flashes yellow (2 Hz)	The motor is running, the limit frequency has been exceeded. The enabling paths are open


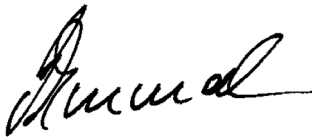
Table error indications

Indication (orange) LED	Error	Cause
1 impulse 	Frequency sensor 1 too low, Error input X1	Defective lead Defective proximity switch
2 impulses 	Frequency sensor 2 too low, Error input X2	Defective lead or defective proximity switch Only one proximity switch: bridge X1/X2 is missing
4 impulses 	Interference at inputs, no safe evaluation	Too high capacitive or inductive interference at the inputs 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	May be due to contact welding
7 impulses 	Malfunction of internal data lines	Interruption of the internal data transfer due to a high capacitive or inductive interference on the internal data lines
8 impulses 	Contact error	The condition of the additional standstill signal does not correspond with the detected frequencies, e.g. the additional standstill signal signals a standstill, whereas the proximity switches signal that the limit frequency is exceeded.

Deleting the error message

The fault message will be deleted once the fault has been rectified and a rotational movement has been detected for the input signals check. All fault messages will also be deleted when the reset button is pushed.

9. EU Declaration of conformity

EU Declaration of conformity		
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:	FWS 1206	
Type:	See ordering code	
Description of the component:	Fail-safe standstill monitor	
Relevant Directives:	Machinery Directive	2006/42/EC
	EMC-Directive	2014/30/EU
	RoHS-Directive	2011/65/EU
Applied standards:	EN 60947-5-1:2017 + AC:2020 EN ISO 13849-1: 2015 EN ISO 13849-2: 2012	
Notified body, which approved the full quality assurance system, referred to in Appendix X, 2006/42/EC:	TÜV Rheinland Industrie Service GmbH Am Grauen Stein, 51105 Köln ID n°: 0035	
Person authorised for the compilation of the technical documentation:	Oliver Wacker Möddinghofe 30 42279 Wuppertal	
Place and date of issue:	Wuppertal, August 4, 2023	
		
	Authorised signature Philip Schmersal Managing Director	

FWS1206-D-EN



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