



EN	Operating instructions	pages 1 to 12
	Original	

Content

1 About this document	
1.1 Function	1
1.2 Target group: authorised qualified personnel	1
1.3 Explanation of the symbols used	1
1.4 Appropriate use	1
1.5 General safety instructions	1
1.6 Warning about misuse	1
1.7 Exclusion of liability	2
2 Product description	
2.1 Ordering code	2
2.2 Special versions	2
2.3 Purpose	2
2.4 Technical data	4
2.5 Safety classification	5
3 Mounting	
3.1 General mounting instructions	5
3.2 Dimensions	6
4 Electrical connection	
4.1 General information for electrical connection	7
4.2 Contact versions	7
4.3 Application examples	8
5 Set-up and maintenance	
5.1 Functional testing	10
5.2 Maintenance	10
6 Disassembly and disposal	
6.1 Disassembly	10
6.2 Disposal	10
7 EU Declaration of conformity	

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 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 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.

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 standard ISO 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:

Interlock EX-SHGV/①②/③/④+⑤-2G/D

No.	Option	Description
①	B	Lock barrel at the bottom
	L	Left-hand side locking cylinder
	R	Right-hand side locking cylinder
②	D1	Additional lock barrel (front)
	01	Without additional lock barrel
③	...	Key number
④	...	Key number of the additional lock barrel
⑤	BO	Straight actuator
	BOW	Angled actuator
	BOR	Radius actuator
	BOWR	Angled radius actuator

Accessories for solenoid Interlock EX-SHGV...

Material number	Designation
101196682	EX-BO
101197039	EX-BOR
101197041	EX-BOW
101197043	EX-BOWR

Key-operated selector switch EX-SHGV/ESS21S2/①/11033-3G/D

No.	Option	Description
①	...	Key number

Key-operated selector switch-interlocking device

EX-SVE①/②-③-24VDC

No.	Option	Description
①	1	1 key-operated selector switches
	2	2 key-operated selector switches
	3	3 key-operated selector switches
②	...	Key number
③		Magnet: 1 NC / 1 NO
		Key-operated selector switch: 1 NC / 1 NO
		NC contacts in series
	3NC	Magnet: 1 NC / 1 NO
		Key-operated selector switch: 2 NC / 1 NO
		NC contacts in series

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



In accordance with the Machinery Directive, the type plate of safety components is type plate labelled "Safety component".

Only if the information described in this operating instructions manual are realised correctly, the safety function and therefore the compliance with the Machinery Directive and the Explosion Protection Directive is maintained.

2.2 Special versions

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

2.3 Purpose

The trapped key system, consisting of the components EX-SHGV..., EX-SHGV/ESS... and EX-SVE..., has been designed to prevent, in conjunction with the control part of the machine, movable safety guards from being opened before hazardous conditions have been eliminated. If the control part of the machine transmits a signal to the EX-SVE... that the hazardous situation has been eliminated, the key can be withdrawn from the EX-SVE..., and as a result, the movable safety guard can be opened.

By turning the key-operated selector switch from the trapped position into the removable position, the NC contacts are positively opened and the NO contacts closed.



This combination can only be used for applications, in which the hazardous situation is eliminated without delay (e.g. run-on movements) after the switch-off command from the key-operated selector switch.



If a delay device (e.g. timer) is used to by-pass the stopping time, a failure of this device must not cause the delay time to be reduced.



Please implement the necessary organisational measures to ensure that only one main key is in use for each system. The user imperatively must ensure that a key number (coding) is only used just once in every plant (factory premises).



The safety switchgears are classified according to ISO 14119 as type 2 interlocking devices.



The installation and maintenance requirements to the standard series 60079 must be met.

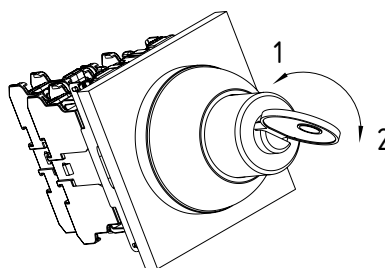
The user must evaluate and design the safety chain in accordance with the relevant standards and on the required safety level.



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

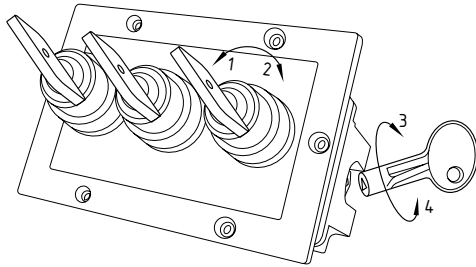
Key-operated selector switch EX-SHGV/ESS...

In position (1), the key is trapped and cannot be withdrawn. The NC contact(s) is/are closed. The NO contact(s) is/are opened. By turning the key into position (2), the NC contact(s) is/are positively opened and the NO contact(s) closed. In this position, the key can be withdrawn.



Key-operated selector switch-interlocking device EX-SVE...

In position (1), the key(s) is/are trapped and cannot be withdrawn. The NC contacts of the key-operated selector switch are closed. The NO contacts are open. The NC contact of the magnet monitoring is closed and the NO contact is open. If the magnet is in de-energised condition, the keys cannot be turned and withdrawn. If the magnet is energised, it will unlock the key-operated selector switch. The NC contact of the magnet monitoring is opened and the NO contact closed. After the keys are turned into position (2), they can be withdrawn. In this position, the NC contacts of the key-operated selector switch are positively opened and the NO contacts closed. In this key position, the solenoid cannot switch to the "locked" position when the voltage supply is switched off.



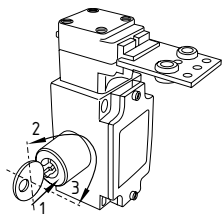
Manual release (during set-up, maintenance, etc.) The manual release is realised by turning the triangular key (included in delivery) to the right (3), so that the solenoid is pulled into the release position. The normal locking function is only restored after the triangular key has been returned to its original position (4). The manual release must be sealed after being put into operation (e.g. sealant etc.).

Interlocking device with key tumbler cylinder

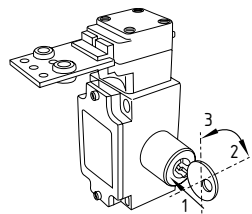
EX-SHGV/L01/...; EX-SHGV/R01/...; EX-SHGV/B01/...

Insert the key from a EX-SHGV/ESS... or EX-SVE... in the key tumbler cylinder (1) and turn it into position (2). The interlocking device is unlocked, the safety guard can be opened. The key can only be returned into position (3) and withdrawn, when the safety guard is closed.

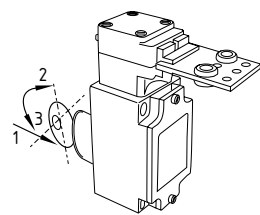
EX-SHGV/L01/...



EX-SHGV/R01/...



EX-SHGV/B01/...



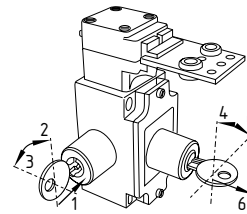
If on the basis of the risk assessment it cannot be excluded that persons are trapped inside the hazardous zone, the interlocking device with 2 lock barrels of type EX-SHGV/LD1/... or EX-SHGV/RD1... must be used.

Interlocking device with two key tumbler cylinders

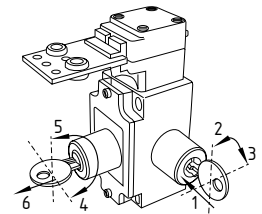
EX-SHGV/LD1/...; EX-SHGV/RD1/...

Insert the key from a EX-SHGV/ESS... or EX-SVE... in the key tumbler cylinder (1) and turn it into position (3). The interlocking device is unlocked, the safety guard can be opened. In this position, the second key (6) can be turned from position (4) into position (5) and withdrawn. The guard door cannot be locked by means of key (1) as long as the key (6) is inserted in the key tumbler cylinder and turned into position (4). In position (4), the key (6) cannot be withdrawn. The key (1) can only be returned to position (2) and withdrawn, if the key (6) is in position (4) and the safety guard is closed.

EX-SHGV/LD1/...



EX-SHGV/RD1/...



The interlocks may only be operated with a series EX-BO... actuator.

Conditions for safe operation

All devices and versions: The specified ambient temperature range must be adhered to.

EX-SHGV/ESS... and EX-SVE...: Due to their specific impact energy, the components must be fitted with a protection against mechanical stresses. The command devices must be installed in enclosures that meet the requirements of IP65 or higher in accordance with EN 60529 and pass the tests in accordance with EN IEC 60079-0, para. 26.4. The presence of small dust particles inside of the dust-proof IP65 enclosure must be excluded.

EX-SVE...: The user must provide for a protection against the permanent influence of UV rays.

The **EX-SHGV** devices are rated to type of protection "c" (protection by design safety) in accordance with EN ISO 80079-37. There is no potential source of ignition from these devices.

According to the EX marking, ignition protection type "c" applies exclusively to the EX-SHGV.

2.4 Technical data

Solenoid Interlock EX-SHGV:

Marking in accordance with the ATEX Directive:	Ⓔ II 2GD
Marking in accordance with standards:	Ex h 85°C X
Applied standards:	ISO 14119, EN ISO 80079-36, EN ISO 80079-37, EN IEC 60079-0
Enclosure / cover:	Aluminium / galvanised steel
Actuator and locking bolt:	Stainless steel / zinc die-cast
Coding level according to ISO 14119:	
- Actuator:	low
- Key:	high
Degree of protection:	IP65
Ambient temperature:	0 °C ... +70 °C
Actuating speed:	1 m/s
Actuating frequency:	max. 5/h
Mechanical life:	100.000 operations
Holding force F_{max} :	1,250 N; EX-SHGV/B...: 1,750 N
Holding force F_{Zh} :	950 N; EX-SHGV/B...: 1,300 N
Latching force:	5 N

Key-operated selector switch EX-SHGV/ESS:

Marking in accordance with the ATEX Directive:	Ⓔ II 3G Ⓔ II 3D
Marking in accordance with standards:	Ex tc IIIC T110°C Dc X Ex ic IIC T5 Gc X
Applied standards:	ISO 14119, EN IEC 60079-0, EN 60079-11, EN 60079-31
Installation diameter:	22.3 mm
Front plate thickness:	1 ... 6 mm
Mounting position:	any
Ambient temperature:	0 °C ... +70 °C
Max. impact energy:	4 J
Degree of protection:	Front-side: IP65 Wiring level: IP20 Wiring compartment: IP40
Front-ring material:	Brass/chromium-plated
Mounting:	with mounting flange
Actuating frequency:	max. 5/h
Mechanical life:	100.000 operations

Contact element (in combination with EX-SHGV/ESS...):

Contact material:	Silver
Contact type:	Change-over contact with double break type Zb, with galvanically separated contact bridges
Switching system:	⊖ EN 60947-5-1, slow action, NC contact with positive break
Connection:	screw terminals
Cable type:	solid and stranded wire
Cable section:	
- solid wire:	max. 2 x 0.5 ... 2.5 mm ²
- stranded wire:	max. 2 x 0.5 ... 1.5 mm ² with conductor ferrule
Potential equalisation:	Ring cable lug for M5 thread
Positive break travel:	approx. 2 mm after the opening point

Intrinsically safe to EN 60079-11:

Voltage U_i :	36 VDC
Current I_i :	100 mA
Power P_i :	0.9 W
Capacity C_i :	~ 0
Inductivity L_i :	~ 0

Key-operated selector switch-interlocking device EX-SVE:

Marking in accordance with the ATEX Directive:	Ⓔ II 3GD
Marking in accordance with standards:	Ex tc IIIC T85°C Dc X
Applied standards:	EN 60947-5-1, ISO 13849-1, ISO 14119, EN IEC 60079-0, EN 60079-31
Enclosure:	glass-fibre reinforced thermoplastic, self-extinguishing
Latching bolt:	Plastic
Contact material:	Silver
Degree of protection:	Front-side: IP65
Protection class:	II
Contact type:	Change-over contact with double break type Zb, with galvanically separated contact bridges
Switching system:	⊖ EN 60947-5-1, slow action, NC contact with positive break
Termination:	Connector plug with screw terminals
Cable type:	solid and stranded wire
Cable section:	
- solid wire:	0.2 ... 2.5 mm ²
- stranded wire:	0.2 ... 2.5 mm ² with conductor ferrules
Potential equalisation:	Ring cable lug for M5 thread
Rated impulse withstand voltage U_{imp} :	4 kV
Rated insulation voltage U_i :	250 V
Degree of pollution:	2
Overvoltage category:	II
Thermal test current I_{the} :	4 A
Utilisation category:	DC-13
Rated operating current/voltage I_e/U_e :	4 A / 24 VAC
Max. fuse rating:	4 A gG D-fuse to EN 60269-1
Positive break travel (unlocked):	2 x 3.5 mm
Positive break force (unlocked):	20 N
Magnet switch-on time:	100 %
Rated control voltage U_s :	24 VDC
Power consumption:	max. 8.5 W
Ambient temperature:	0 °C ... +50 °C
Max. impact energy:	4 J
Actuating frequency:	max. 5/h
Mechanical life:	100.000 operations

2.5 Safety classification

Safety classification Interlock EX-SHGV...:

Standards:	ISO 13849-1
MTTF _D :	150 years
Category:	applicable up to PL d
Mission time (dependent on actuation frequency):	20 years

Safety classification Key-operated selector switch EX-SHGV/ESS...:

Standards:	ISO 13849-1
B _{10D} (NC contact):	100,000
B _{10D} (NO contact):	100,000
Mission time:	20 years

Safety classification of EX-SVE... interlocking device/ key-operated selector switch release circuit and auxiliary contact:

Standards:	ISO 13849-1
Envisaged structure:	
- Basically:	applicable up to cat. 1 / PL c
- With 2-channel usage and fault exclusion mechanism:	applicable up to cat. 3 / PL d with suitable logic unit and evaluation of the diagnostics (signalling contacts) Release circuit, solenoid monitoring
B _{10D} NC contact:	100,000
B _{10D} NO contact at 10% ohmic contact load:	100,000
Mission time:	20 years

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

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



For ATEX-applications, the maximum life span of the device is 10 years.



If multiple safety components are wired in series, the Performance Level to ISO 13849-1 will be reduced due to the restricted error detection under certain circumstances.
Series-wiring for devices in ignition protection type is not permitted.

Safety classification of the guard locking function EX-SVE... / key release:

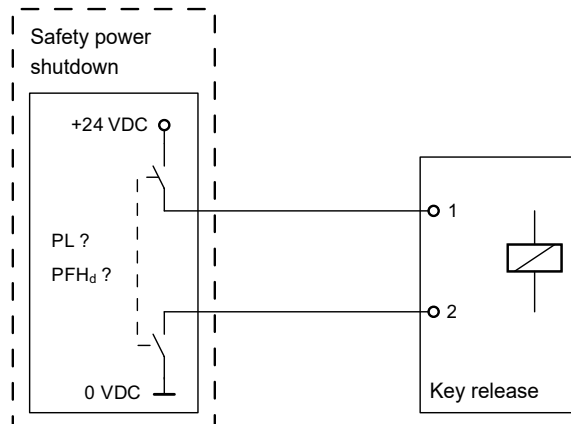
The key release must always be classified.

The following safety classification of the key release is based on the application of the principle of safety energy disconnection for the solenoid connection.

A fault exclusion for the locking device of the solenoid interlock of the interlocking device can be assumed by a fail-safe energy disconnection.

In this case, the locking device of the interlocking device does not have an effect on the failure probability of the key release.

The safety level of the key release is also determined by the external safety power shutdown.



Fault exclusion with regard to wiring routing must be observed.

3. Mounting

3.1 General mounting instructions



Please observe the relevant requirements of the standards ISO 12100, ISO 14119 and ISO 14120.

Solenoid Interlock EX-SHGV

Four mounting holes are provided for fixing the interlock.

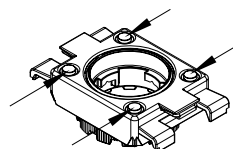
The solenoid interlock must not be used as an end stop. Any mounting position. The mounting position must be chosen so as to avoid the penetration of dirt in the used holes.

In case of painting activities, the components must be covered. If another actuating direction is desired, the four screws of the actuating head must be loosened. Turn the actuating head in the desired direction and retighten the screws (tightening torque 0.5 Nm). To satisfy manipulation protection requirements, the two standard screws must be replaced with the non-removable screws supplied. The actuator must be inserted when the actuating head is turned.

Key-operated selector switch EX-SHGV/ESS...



Before assembly, check the mounting flange to ensure that the four rubber tappets are present (see figure).



1. Assembly of operating elements and flange by turning the RMW mounting tool to the right (see Fig. 1):

2. Assemble the fourth contact element EX (NO) on the second level in the centre position (see Fig. 2) on the pre-assembled contact carrier (with three contact elements on the first level).

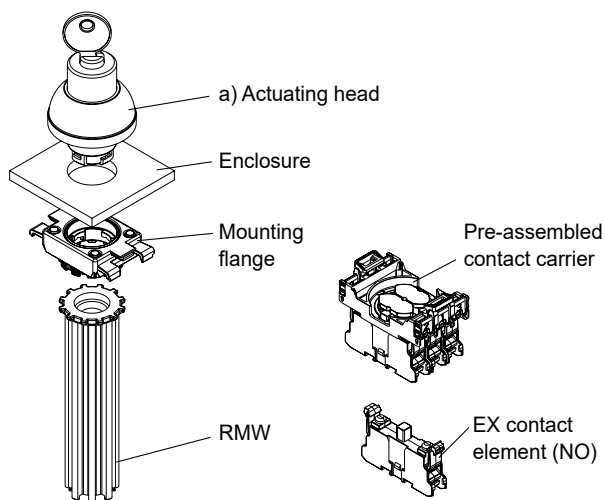


Fig. 1

Fig. 2

3. Assembly of the pre-assembled contact carrier onto the mounting flange (see Fig. 3): engage the contact carrier on one side of the mounting flange. Then repeat this process on the opposite side.

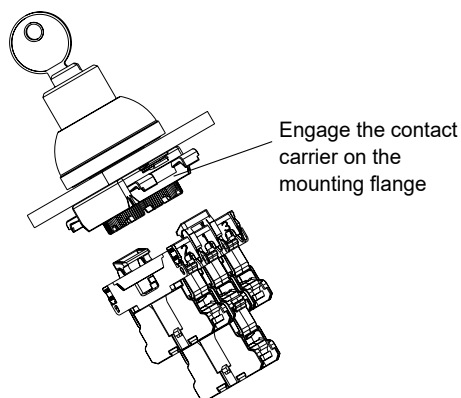


Fig. 3



Only fit onto clean, grease-free surface!

To ensure a smooth disassembly of the contact carrier, we recommend using a slot screwdriver of 5.5 mm wide.

Key-operated selector switch-interlocking device EX-SVE...

Six mounting holes are provided for fixing the device. Screws must be used that comply with ISO 7046 M4, A2 or A4 with a minimum length of 8 mm (tightening torque 1.2 Nm). Any mounting position. The mounting position however must be chosen so that the ingress of dirt and soiling in the lock barrel is avoided. In case of painting activities, the components must be covered.



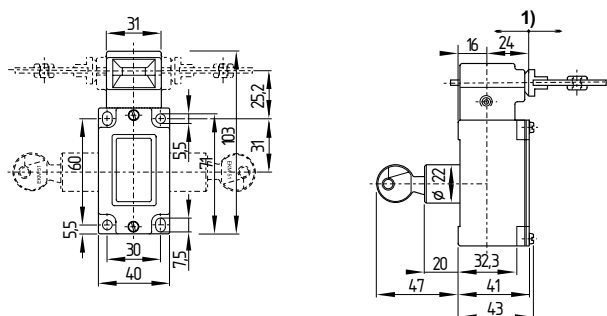
The key-operated selector switch interlocking device EX-SVE... must be installed in a switch cabinet/enclosure with degree of protection IP54 at a minimum.

3.2 Dimensions

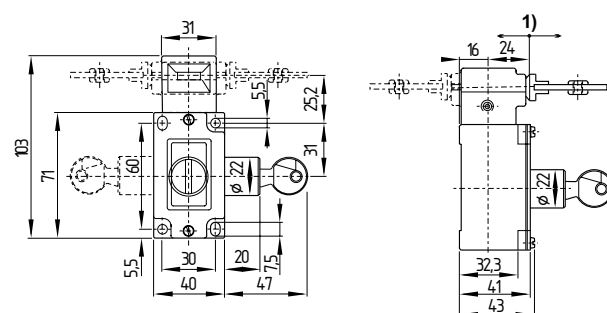
All measurements in mm.

Interlocking device

EX-SHGV/R01/...; EX-SHGV/L01/...; EX-SHGV/B01/...

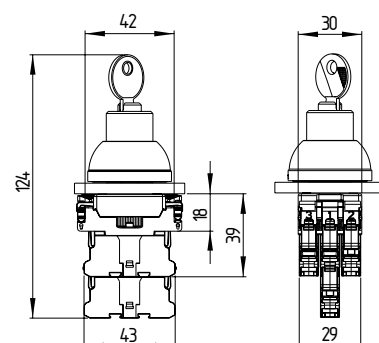


EX-SHGV/RD1/...; EX-SHGV/LD1/...



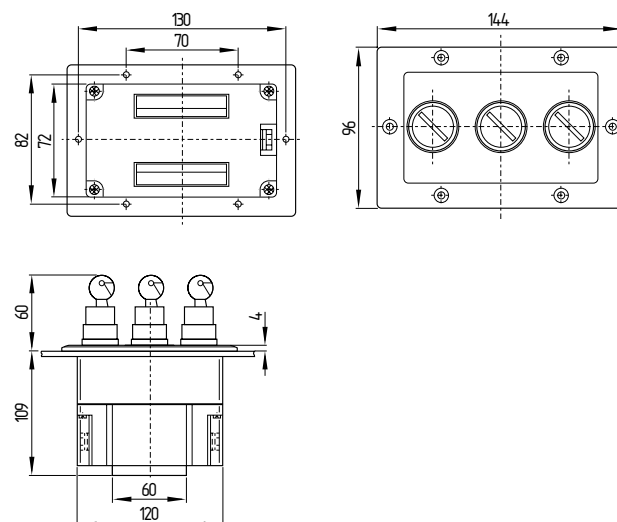
Key-operated selector switch

EX-SHGV/ESS21S2/.../103



Key-operated selector switch-interlocking device

EX-SVE...



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: 7 mm



After connecting, the contact elements must be cleaned (i.e. excess cable, etc.).

The fixing screws of the contact element must be tightened with 0.8 Nm tightening torque.



Connection to the external potential equalisation terminal must be carried out in accordance with EN 60079-14 section 6.3. A ring cable lug of size M5 must be used for connection of the wire.

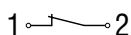
4.2 Contact versions

Key-operated selector switch

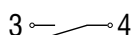
The contacts are shown with the key-operated selector switch in a non-actuated condition and the key in unremovable condition.

EX-SHGV/ESS21S2/.../11033

2 x NC contact



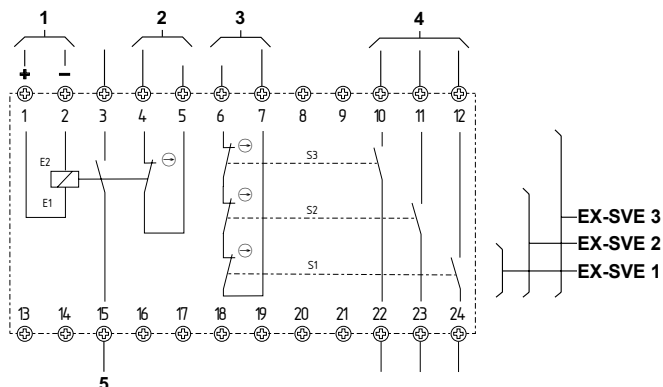
2 x NO contact



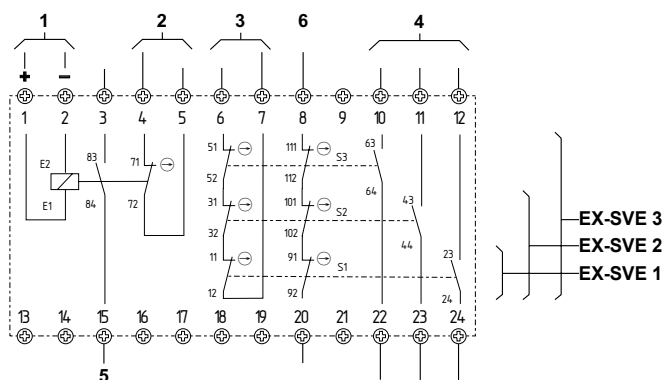
Key-operated selector switch-interlocking device

The contacts are shown with the key-operated selector switch in a non-actuated condition, the key in unremovable condition and the solenoid in de-energised condition.

EX-SVE.../...



EX-SVE.../.../-3Ö...



Key

- ⊖ Positive break
- ① Solenoid connection
- ② Enabling circuit solenoid monitoring
- ③ Enabling circuit key-operated selector switch channel 1
- ④ Auxiliary contacts key-operated selector switch
- ⑤ Auxiliary contact solenoid

4.3 Application examples

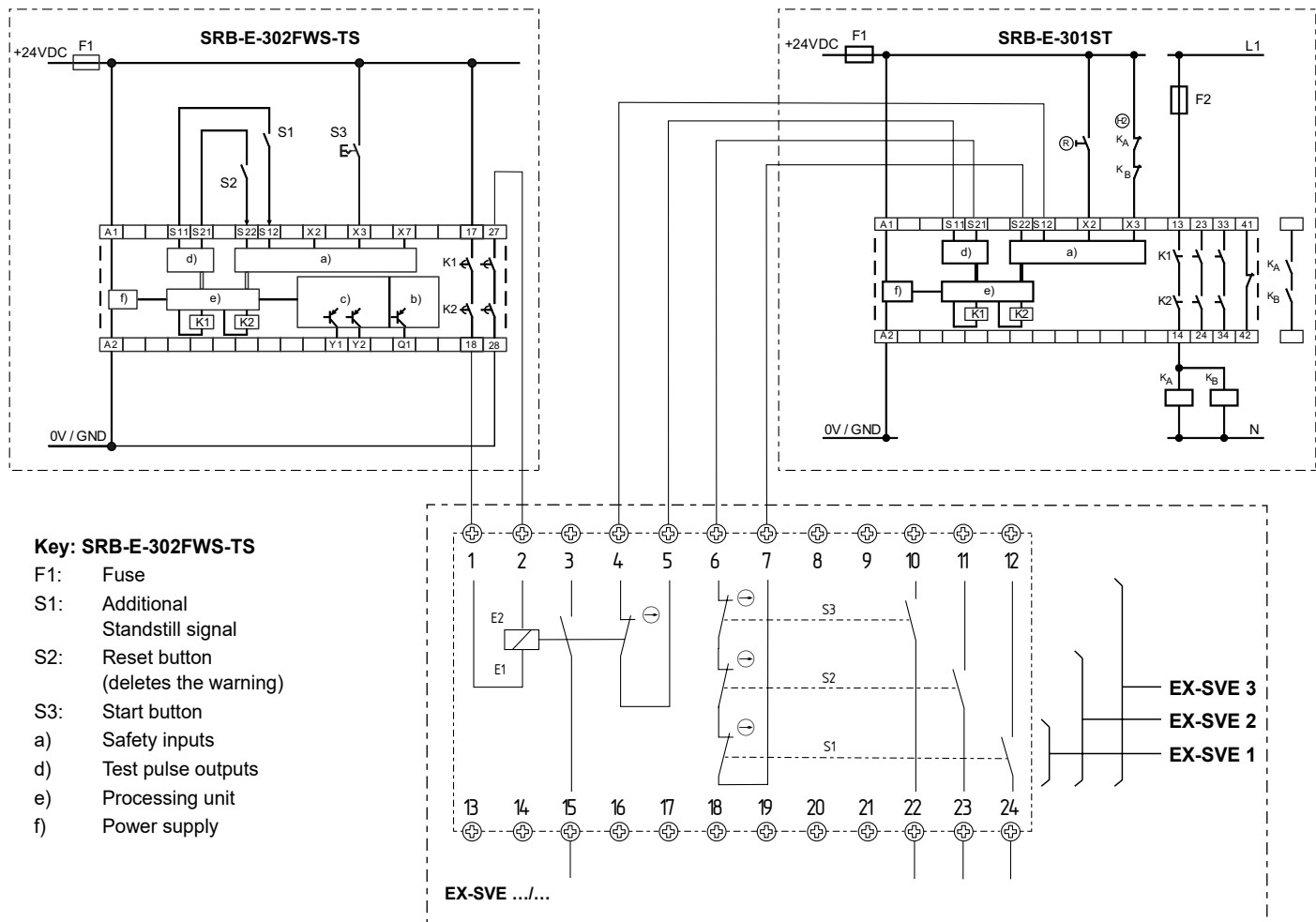
The application examples shown are suggestions. They however do not release the user from carefully checking whether the switchgear and its set-up are suitable for the individual application.



Additional information on connection and settings can be found in the SRB-E-302FWS-TS and SRB-E-301ST operating instructions. The solenoid monitoring and key-operated selector switch release circuits must be integrated into the additional safety monitoring.

Application example 1:

Fail-safe time-delay monitoring SRB-E-302FWS-TS for solenoid control and safety evaluation SRB-E-301ST with EX-SVE... for applications to PL d.



Key: SRB-E-302FWS-TS

- F1: Fuse
- S1: Additional Standstill signal
- S2: Reset button (deletes the warning)
- S3: Start button
- a) Safety inputs
- d) Test pulse outputs
- e) Processing unit
- f) Power supply

Key: EX-SVE.../...

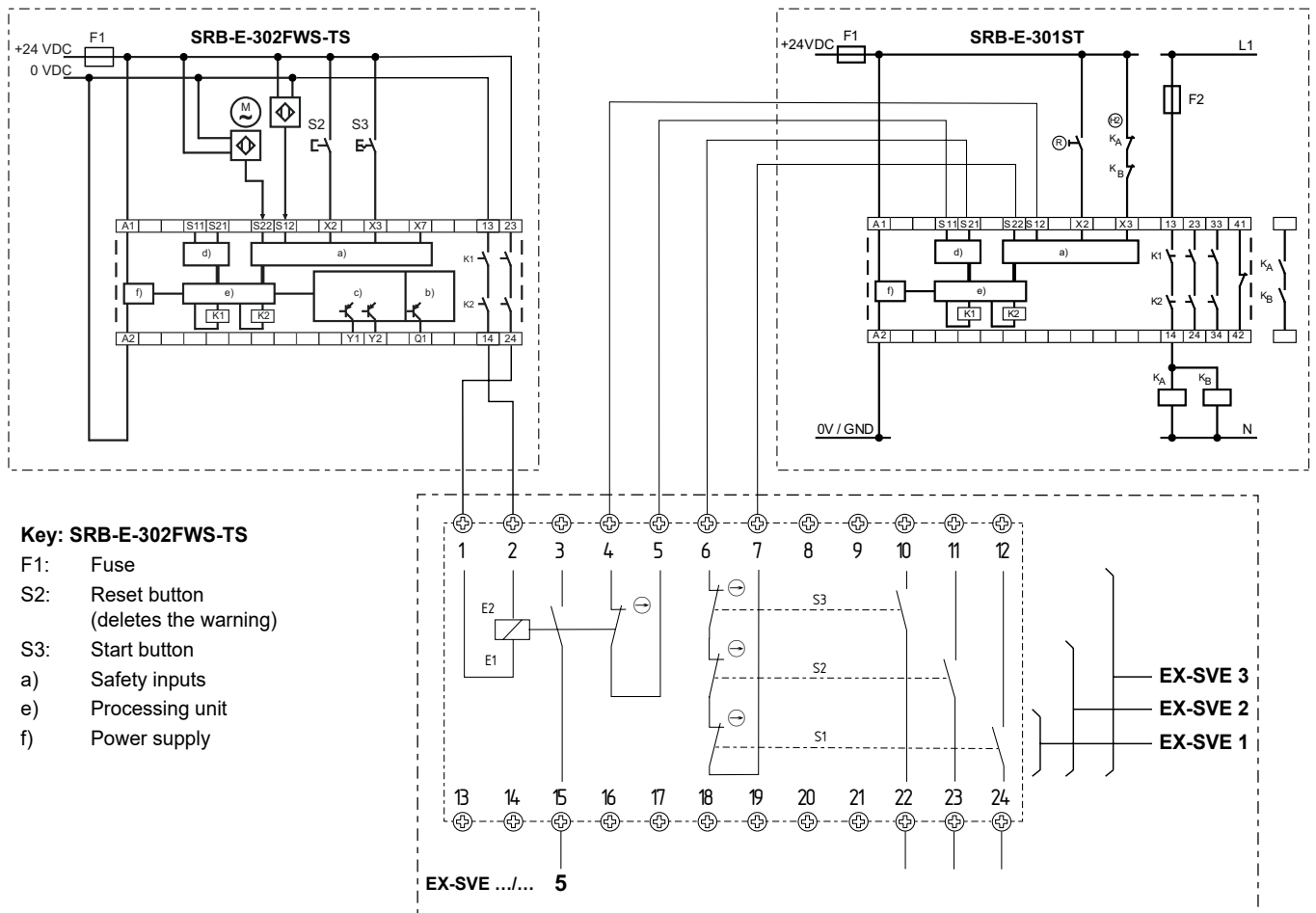
- 1/2: Solenoid connection (NC)
- 4/5: Enabling circuit solenoid monitoring (NC)
- 6/7: Enabling circuit key-operated selector switch (NO)
- 3/15: Solenoid auxiliary contact (NO) (connection to e.g. machine control)
- 10/22: Key-operated selector switch auxiliary contacts (NO) (connection to e.g. machine control)
- 11/23: Key-operated selector switch auxiliary contacts (NO) (connection to e.g. machine control)
- 12/24: Key-operated selector switch auxiliary contacts (NO) (connection to e.g. machine control)
- EX-SVE1, EX-SVE2, EX-SVE3: Key-operated selector switches 1, 2 or 3

Key: SRB-E-301ST

- F1, F2: Fuse
- a) Safety inputs
- d) Test pulse outputs
- e) Processing unit
- f) Power supply
- (R) Start button
- (H2) Feedback circuit

Application example 2:

Safe standstill monitoring SRB-E-302FWS-TS for solenoid control and safety evaluation SRB-E-301ST with EX-SVE... for applications to PL d.



5. Set-up and maintenance

5.1 Functional testing

The safety function of the safety components must be tested. The following conditions must be previously checked and met:

1. Fitting of the solenoid interlock and the actuator.
2. Check the integrity of the cable entry and connections.
3. Check the switch enclosure for damage.

5.2 Maintenance

We recommend the following checks at regular intervals:

1. Check for tight installation of the actuator and the switch.
2. Remove particles of dust and soiling.
3. Check cable entry and connections.
4. Functional test min. once annually in accordance with ISO 14119



Adequate measures must be taken to ensure protection against tampering either to prevent tampering of the safety guard, for instance by means of replacement actuators.

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.

Disassembling the key-operated selector switch EX-SHGV/ESS...



To ensure a smooth disassembly of the contact carrier, we recommend using a slot screwdriver of 5.5 mm wide.

1. Disassembly of the contact carrier from the mounting flange (see Fig. 4): Insert the screwdriver in the latch of the mounting flange. Slightly move the screwdriver in the direction of the contact element to press the latch outwards. In this way, the contact carrier is released from the mounting flange. Then repeat this process on the opposite side.

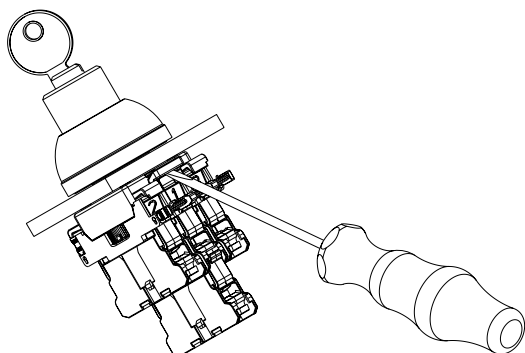


Fig. 4

2. Opening of the contact lugs and disassembly of the contact elements (see Fig. 5 and 6): lift both contact lugs to release them from the catch mechanism and then fold them 90° up. Now, the contact elements can be disassembled.

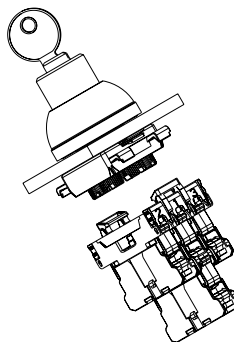


Fig. 5

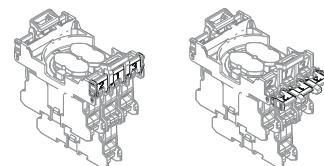


Fig. 6

3. Disassembly of the contact element on level two (see Fig. 7)

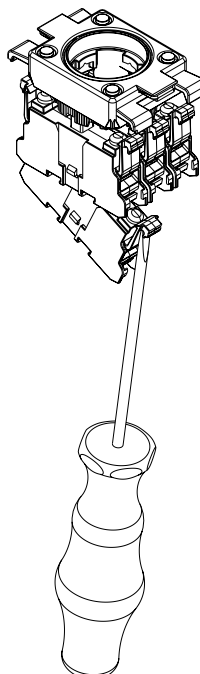


Fig. 7

6.2 Disposal

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

7. EU Declaration of conformity

EU Declaration of conformity



Original

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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 and designation of the component:	EX-SHGV	⊕ II 2GD Ex h 85°C X
	EX-SHGV/ESS	⊕ II 3G Ex ic IIC T5 Gc X
		⊕ II 3D Ex tc IIIC T110°C Dc X
	EX-SVE	⊕ II 3D Ex tc IIIC T85°C Dc X

Type: See ordering code

Description of the component: Interlocking device with electromagnetic interlock for safety functions

Relevant Directives:	Machinery Directive	2006/42/EC
	Explosion Protection Directive (ATEX)	2014/34/EU
	RoHS-Directive	2011/65/EU

Applied standards: EN 60947-5-1:2017
ISO 14119:2014
ISO 13849-1:2015
EN IEC 60079-0:2018
EN 60079-11:2012
EN 60079-31:2014
EN ISO 80079-36:2016
EN ISO 80079-37:2016

Notified body for the prototype test: TÜV Rheinland Industrie Service GmbH
Am Grauen Stein, 51105 Köln
ID n°: 0035

EC-prototype test certificate: 01/205/5754.00/20

Person authorised for the compilation of the technical documentation: Oliver Wacker
Möddinghofe 30
42279 Wuppertal

Conformity with the explosion protection directive 2014/34/EU (ATEX) is declared by the manufacturer without involving a test center.

Place and date of issue: Wuppertal, January 23, 2023

Authorised signature
Philip Schmersal
Managing Director

EX-SHGV_EX-SVE-G-EN



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



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