SCHMERSAL

EN Operating instructions. . . . . .pages 1 to 8
Original

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1. About this document

1.1 Function

This operating instructions manual provides all the information required for the mounting, set-up and commissioning to ensure the safe operation and disassembly of the 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 product 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 component, personal hazards or damage to machinery or plant components cannot be excluded. The relevant requirements of the standard EN 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.

x.000 / 07.2021 / v.A. - 101204262-EN / F / 2021-06-30 / AE-Nr. 13771

2. Product description

2.1 Ordering code

This operating instructions manual applies to the following types:

All information concerning the EX-RDRZ45RT emergency stop can be found in separate operating instructions.

EX-R①②③

No.	Option	Description
①	DT②–⑦	Pushbutton, Ø 28 mm, buttons in MS, coated
	DM②–⑦	Pushbutton with diaphragm, Ø 28 mm, buttons in MS, coated
	DL③–⑦	Illuminated pushbutton, Ø 28 mm, swivel in impact-resistant plastic
	DLM③–⑦	Illuminated pushbutton with diaphragm, Ø 28 mm, swivel in impact-resistant plastic
	MLH③–⑦	Indicator lights for LEDs, protruding swivel in impact-resistant plastic
	DP40②–⑦	Mushroom head impact button without latching, button Ø 37 mm in MS, coated
	DRZ45②,③,⑤	Mushroom head impact button with latching, device head in MS, coated, pull to unlock
	WT 21	Spring-return rotary selector switch with 2 positions
	WT 21.1	
	WS 21	Selector switch with 2 latched positions
	WS 21.1	
	WT 32	Spring-return rotary selector switch with 3 positions
	WT 32.1	
	WST 32	Spring-return rotary selector switch, 3 positions,
	WST 32.1	right: latching, left: switching
	WS 32	Selector switch with 3 latched positions
	WS 32.1	
	WTS 32	Maintained spring-return rotary selector switch
	WTS 32.1	with 3 positions, right: switching, left: latching
	SS21S1	Key-operated selector switch with 2 latched positions, Key withdrawal left only
	SS21S2	Key-operated selector switch with 2 latched positions, Key withdrawal right only
	SS21S12	Key-operated selector switch with 2 latched positions, Key withdrawal in both positions
	SS32S1	Key-operated selector switch with 3 latched positions, Key withdrawal left only
	SS32S2	Key-operated selector switch with 3 latched positions, Key withdrawal in the middle
	SS32S3	Key-operated selector switch with 3 latched positions, Key withdrawal right
	SS32S123	Key-operated selector switch with 3 latched positions, Key withdrawal in all three positions
	ST21S1	Key-operated spring-return selector switch with 1 touch position, automatic return to the zero position, latch position 55°, Key withdrawal left only
	ST32S2	Key-operated spring-return selector switch with 2 touch positions left and right, automatic return to the zero position, Key withdrawal only in the middle
	SST32S1	Key-operated selector switch pushbutton with 3 positions, touch position 35°, latch position 55°, left switching, right latching, key withdrawal left only
	SST32S2	Key-operated selector switch pushbutton with 3 positions, touch position 35°, latch position 55°, left switching, right latching, key withdrawal only in the middle
	STS32S2	Key-operated selector switch pushbutton with 3 positions, touch position 35°, latch position 55°, left switching, right latching, key withdrawal only in the middle

EX-R①②③

No.	Option	Description
	STS32S3	Key-operated selector switch pushbutton with 3 positions, touch position 35°, latch position 55°, left switching, right latching, key withdrawal right only
	F 03	Contact element with screw connection, 1 NO contact, Contact Label 3, 4
	F 10	Contact element with screw connection, 1 NC contact, Contact Label 1, 2
	LDE WS 24	White luminous element with integrated LED for illuminated pushbutton RDL / RDLM and indicator light RMLH
	B	blanking plug
②	BK	black
③	GB	yellow
④	RT	red
⑤	GN	green
⑥	WS	white
⑦	BL	blue

Only if the information described in this operating instructions manual are realised correctly, the safety function and therefore the compliance with the Explosion Protection 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 control devices and indicator lights of the series Ex-R as a category 2 equipment designed for use in gas hazardous areas of zone 1 and 2; and dust hazardous areas of Zone 21 and 22.

Mounting box, 1 control unit: EX-EBG 311.O
Mounting box, 3 control units: EX-EBG 633.O
Mounting box, 5 control units: EX-EBG 665.O

When installing multiple devices into an assembly housing from another manufacturer, the resulting weakening of the housing structure must be taken into account.

Gas atmospheres

Please use the control devices and indicator lights in conjunction with equipment of the appropriate "intrinsic safe" ignition protection type, which is authorised for the corresponding field of application:
Zone 1: intrinsically safe current circuits of category ia or ib
(EN 60079-11 / ABNT NBR IEC 60079-11)
Zone 2: intrinsically safe current circuits of category ia, ib or ic
(EN 60079-11 / ABNT NBR IEC 60079-11)

Dust atmospheres

For Zone 21 and 22, the installation of the cables or wires is realised with the appropriate ignition protection type (e.g. increased safety, EN 60079-7). No intrinsically safe current circuits are required.

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

Especially the capacitive and inductive parts of the intrinsically safe current circuit must be observed.
For non-linear current circuits, Appendix A to EN 60079-11 (ABNT NBR IEC 60079-11) (assessment of intrinsically safe current circuits) must be included in the overall assessment.
For intrinsically safe current circuits with protection level ib, a safety coefficient of 1.5 must be includet in the calculations, in accordance with EN 60079-11 (ABNT NBR IEC 60079-11) paragraph 5.3.

During installation in intrinsically safe current circuits (Ex i), it must be borne in mind that the device may only be connected to a single, approved electrical apparatus (e.g. SRB 200EXi-..., barrier, isolated switch amplifier). The safety data of both devices must be compared.

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

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

Conditions for safe operation
The user must provide for a protection against the permanent influence of UV rays when certain control devices are used.
The command devices and indicator lights are suitable for installation in the installation housing of type EX-EBG… (manufacturer: Schmersal) or another enclosure suitable for the zone. Alternatively operating panels (material: stainless steel or metal with painted surface) can be used. These enclosures must meet the requirements of IP65 or higher to EN 60529 as well as the test criteria to EN IEC 60079-0 (ABNT NBR IEC 60079-0) paragraph 26.4.

The presence of small dust particles inside of the dust-proof IP65 enclosure must be excluded.

The specifications in the operating instructions manual or in the technical data of the EU-type examination certificate regarding the maximum impact energy must be observed. If certain control devices are used, this component must be equipped with a mechanical protection.
The types of the Ex-R programme, the Ex-EBG enclosure and the cable entries have different authorised ambient temperatures. The ambient temperature range of the assembly concerned results from the range of the most critical individual module. To this effect, the operating manuals or the tables in appendix to the EU-type examination certificate must be respected and observed.

2.4 Technical data

EX-R command and signalling devices:

Designation in accordance with the ATEX Directive:	⟨Ex⟩ II 2GD
Designation in accordance with standards:	Ex ib IIC Gb Ex tb IIIC Db
ATEX:	TÜV 08 ATEX 7685 U
IECEx:	TUR 16.0031 U
INMETRO:	TÜV 20.0598 U

For Ex-R control devices and indicator lights in Ex-EBG enclosure:

Designation in accordance with the ATEX Directive:	⟨Ex⟩ II 2GD
Designation in accordance with standards:	Ex ib IIC T4 Gb Ex tb IIIC T110°C Db
ATEX:	TÜV 08 ATEX 7630 X
IECEx:	TUR 16.0030 X
INMETRO:	TÜV 20.0599 X
Applied standards:	EN 60947-5-1, EN 60947-5-5, EN 60947-1
- ATEX:	EN IEC 60079-0, EN 60079-11, EN 60079-31
- IECEx:	IEC 60079-0, IEC 60079-11, IEC 60079-31
- INMETRO:	ABNT NBR IEC 60079-0, ABNT NBR IEC 60079-11, ABNT NBR IEC 60079-31

Ambient temperature T_{amb}:	
- Blanking plug:	−20°C … +55°C
- Pushbutton:	−20°C … +55°C
- Illuminated pushbutton:	−20°C … +55°C
- Light element:	−20°C … +55°C
- Mushroom head impact button (with/without latching):	−20°C … +55°C
- Key-operated selector switch/Selector switch/Spring-return rotary selector switch:	0°C … +55°C
- Selector switches/spring-return rotary selector switches/maintained spring-return rotary selector switches:	0°C … +55°C

Note external heat and/or cold source.

Degree of protection to EN 60529:	IP65
Verified impact energy (according to EN IEC 60079-0 / ABT NBR IEC 60079-0):	
- Blanking plug:	7 J
- Pushbutton:	7 J
- Illuminated pushbutton:	4 J
- Indicator light:	4 J
- Mushroom head impact button (with/without latching):	4 J
- Key-operated selector switch/Selector switch/Spring-return rotary selector switch:	4 J
- Selector switches/spring-return rotary selector switches/maintained spring-return rotary selector switches:	4 J
UV exposure:	Ex-RDL, Ex-RDLM, Ex-RMLH: The user must provide for a protection against the permanent influence of UV rays.

General technical data:

Design:	round
Installation diameter:	22.3 mm
Spacing:	40 × 50 mm; selector switch, mushroom head impact button with latching: 50 × 60 mm
Front plate thickness:	1 … 6 mm With identification label:1...5 mm
Mounting position:	any
Switching frequency:	1,000 / h, 600 / h (EX-RDRZ45)
Actuating stroke:	4 mm
Actuating force:	
- Blanking plug:	approx. 1.5 N
- Pushbutton with diaphragm:	approx. 2.0 N
- Illuminated pushbutton:	approx. 1.5 N
- Mushroom head impact button:	approx. 2.0 N
- Key-operated selector switch/Selector switch/Spring-return rotary selector switch:	approx. 0.2 N
- Selector switches/spring-return rotary selector switches/maintained spring-return rotary selector switches:	approx. 0.2 N
Mechanical life (operations):	
- Pushbutton:	1×10^6
- Illuminated pushbutton:	1×10^6
- Mushroom head impact button:	
- with latching:	1×10^5
- without latching:	1×10^6
- Key-operated selector switch/Selector switch/Spring-return rotary selector switch:	1×10^5
- Selector switches/spring-return rotary selector switches/maintained spring-return rotary selector switches:	3×10^5
Materials:	Swivels: PC Front ring: brass, chromium-plated Buttons: MS coated Identification label: stainless steel Emergency stop label (yellow): PVC film
Fixing:	With mounting flange, max. tightening torque: 2 Nm
Shock resistance to EN 60068-2-27:	< 50 g
Resistance to vibration to EN 60068-2-6:	5 g
Designation:	Labels, symbols (printed)

Contact elements:
EX-relevant data:

Ambient temperature $T_{amb:}$	−20°C … +55°C

Note external heat and/or cold source.

Mounting position:	any
Number of:	contact elements: max. 2 (Pos. 2, 3) Light element: 1 (Pos. 1)
Dust Ex-zones:	
Voltage U:	Contact element: 250 V Light element: 24 V ± 10%
Current I:	Contact element: 5 A Light element: 30 mA
Power P:	Contact element: max. 1,500 W Light element: 0.9 W
Intrinsically safe to EN 60079-11 (ABNT NBR IEC 60079-11):	
Voltage U_i:	Contact element: 250 V Light element: 30 VDC
Current I_i:	Contact element: - Ex ib: 3.3 A - Ex ic: 5 A Light element: not relevant (internal current limitation 30 mA)
Power P_i:	not relevant
Capacity C_i:	typ. 0
Inductivity L_i:	typ. 0
Overvoltage category:	III
Resistance to pressure shocks to EN 60079-11 (ABNT NBR IEC 60079-11) paragraph 10.3:	safe separation against earth; Connection of the cables in case of multiple or different Ex-i current circuits: use conductor ferrules with protective collar. Bare wires must not protrude beyond the clamping disc.

Contact/light element:
General technical data:

Switching frequency:	1,200 / h
Switching points:	NC contact: approx. 1 mm NO contact: approx. 2.5 mm
Contact reliability:	5 VDC / 1 mA
Proof of positive opening:	2.5 kV impulse voltage
Positive break travel:	approx. 2 mm after the opening point
Actuating force at stroke end:	typ. 4.5 N
Connection:	screw terminals
Cable sections single-strand:	single-strand wire: 2 × (0.5 … 2.5 mm²) multi-strand wire with conductor ferrules with protective collar: 2 × (0.5 … 1.5 mm²)
Tightening torque for the connecting screw:	max. 1 Nm

2.5 Safety classification

Standards:	EN ISO 13849-1
B_{10D} (NC contact):	100,000
Mission time:	20 years

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

(Determined values can vary depending on the application-specific parameters hop, dop and tcycle as well as the load.)

If multiple switchgears are wired in series, the Performance Level to EN 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.**

3. Mounting

3.1 General mounting instructions

The installation may only be carried out with the system de-energised and by authorised personnel.

Before assembly, check the mounting flange to ensure that the four rubber tappets are present (see figure 1).

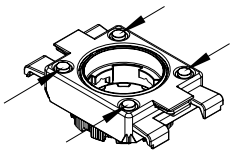


Fig. 1

1. Assembly of operating elements and flange by turning the RMW mounting tool to the right (see Fig. 2):
   a) Actuating head
   b) Mounting flange
2. Opening the contact fitting (see Fig. 3)
3. Preliminary fitting of the contact elements onto the contact carrier (see Fig. 4): only the outward positions may be equipped*:
   a) Contact carrier:
   Prior to the assembly of the contact elements onto the contact carrier, the two plunger segments must be fitted onto the central contact element through simple insertion in the trapezoid grooves to the left and the right.

The contact elements must only be fitted in the outmost position of the contact carrier, so that in case of voltages > 150 V the necessary air clearances and creepage distances are ensured.

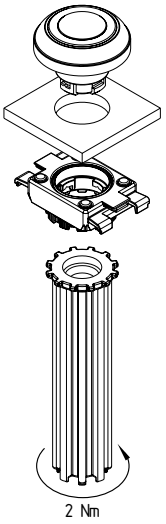


Fig. 2

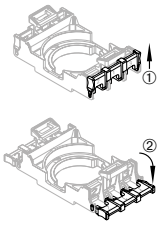


Fig. 3

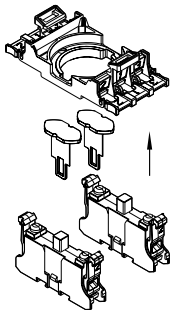


Fig. 4

4. Closing and pressing down the contact fitting (see Fig. 5): the contact fittings to the left and the right are folded up 90° and then pressed down until they engage. In this way, the contact elements are additionally mechanically secured to the contact carrier.

5a. Assembly of the pre-assembled contact carrier onto the mounting flange (Fig. 6): engage the contact carrier on one side of the mounting flange. Then repeat this process on the opposite side.

5b. Mounting of the light elements onto the contact carrier in central position:
Proceed as described for the contact element in steps 2 to 5.
After the contact carrier is snapped onto the mounting flange, the contact lugs are automatically fixed (Fig. 7). This precludes incorrect assembly. The correct assembly should be checked once more. The RLDE light element must always be mounted in central position onto the contact carrier (Pos. 1).

6. Assembly and dimensions of the Ex-RB blanking plug, fix the Ex-RB blanking plug by tightening the slotted head screw with a screwdriver (tightening torque 2 Nm).

If contact and light elements are used with a contact carrier, the assembly of the plunger elements on the contact element is omitted.

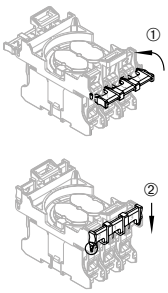


Fig. 5

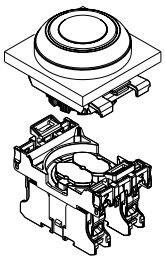


Fig. 6a

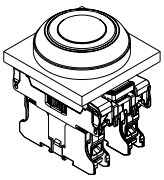


Fig. 6b

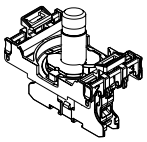
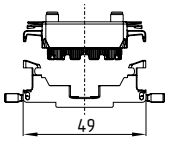


Fig. 7

Only fit onto clean, grease-free surface!
After assembly of the contact elements, both contact lugs (to the left and the right of the contact elements) must be folded up 90° and then pressed down until they engage.
To ensure a smooth disassembly of the contact carrier, we recommend using a slot screwdriver of 5.5 mm wide.

3.2 Dimensions



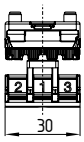


Fig. 8: EX-RLM

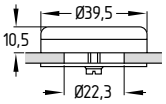


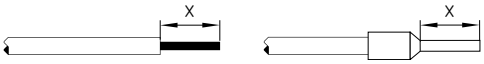
Fig. 9: Blanking plug

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



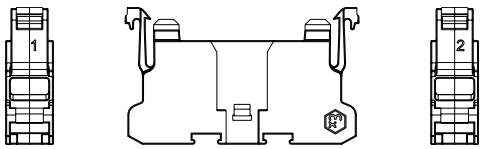
After wiring, the contact elements incl. enclosure must be cleaned (i.e. remove excess cables etc.).

The fixing screws of the contact element must be tightened with 1 Nm tightening torque.

Contact variants
EX-RF 03: 1 NO
EX-RF 10: 1 NC

At least one contact with positive break must be integrated in the safety circuit.

Contact assignment as per the contact numbering



5. Set-up and maintenance

5.1 Functional testing

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

1. Correct fixing of the fitted component
2. Check the integrity of the cable entry and connections
3. Check the command device for damage.

5.2 Maintenance

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

1. Check the correct fixing of the emergency stop command device and the contact element
2. Remove particles of dust and soiling
3. Check cable entry and connections

Damaged or defective components must be replaced.

6. Disassembly and disposal

6.1 Disassembly

1. Disassembly of the contact carrier from the mounting flange (see Fig. 10): 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.
2. Contact carrier disassembled and opening the contact lugs (see Fig. 11): lift both contact lugs to release them from the catch mechanism and then fold them 90° up. After that, the contact or light elements can be disassembled.

3a: Disassembly of the contact elements (see Fig. 12a)

3b: Disassembly of the light element (Fig. 12b):
Disassembly from the contact carrier: insert the screwdriver in the latch of the a) contact element / b) light element. Slightly move the screwdriver in the directiof the a) contact element / b) light element to press the latch outwards. The a) contact element / b) light element is released from the contact carrier.

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

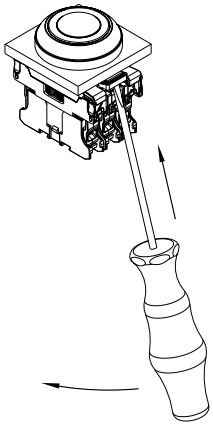


Fig. 10

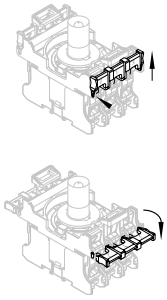


Fig. 11

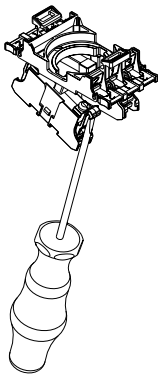


Fig. 12a

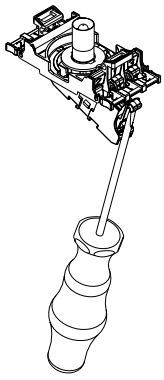


Fig. 12b

6.2 Disposal

The switchgear and mounting box 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

SCHMERSAL

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:	EX-R	EX-R with EX-EBG
Type:	see ordering code	
Marking:	⟨Ex⟩ II 2G Ex ib IIC Gb ⟨Ex⟩ II 2D Ex tb IIIC Db	⟨Ex⟩ II 2G Ex ib IIC T4 Gb ⟨Ex⟩ II 2D Ex tb IIIC T110°C Db
Description of the component:	Command and illuminated signals with/without assembly housing	
Relevant Directives:	Explosion Protection Directive (ATEX) 2014/34/EU RoHS-Directive 2011/65/EU	
Applied standards:	EN IEC 60079-0:2018 EN 60079-11:2012 EN 60079-31:2014	
Notified body, which approved the full quality assurance system, referred to in Appendix IV, 2014/34/EU:	TÜV Rheinland Industrie Service GmbH Am Grauen Stein, 51105 Köln ID n°: 0035	
Notified Body for the certification:	TÜV Rheinland Industrie Service GmbH Am Grauen Stein, 51105 Köln ID n°: 0035	
EU-type examination certificate:	TÜV 08 ATEX 7685 U TÜV 08 ATEX 7630 X	
Person authorised for the compilation of the technical documentation:	Oliver Wacker Möddinghofe 30 42279 Wuppertal	
Place and date of issue:	Wuppertal, July 1, 2021	

Authorised signature
Philip Schmersal
Managing Director

EX-R-H-DE

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

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