1. About this document

1.1 Function
These operating instructions provide all the information required for mounting, set-up and commissioning to ensure the safe operation and disassembly of the safety switchgear. The operating instructions must be available in a legible condition and a complete version in the vicinity of the device.

1.2 Target group: authorised qualified personnel
All operations described in this operating instructions manual must be carried out by trained specialist personnel, authorised by the plant operator only.

Please make sure that you have read and understood these operating instructions and that you know all applicable legislations regarding occupational safety and accident prevention prior to installation and putting the component into operation.

The machine builder must carefully select the harmonised standards to be complied with as well as other technical specifications for the selection, mounting and integration of the components.

1.3 Explanation of the symbols used

Information, hint, note:
This symbol is used for identifying useful additional information.

Caution:
Failure to comply with this warning notice could lead to failures or malfunctions.

Warning:
Failure to comply with this warning notice could lead to physical injury and/or damage to the machine.

1.4 Appropriate use
The products described here were developed to adopt control and display functions as part of a complete system 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 products must be exclusively used in accordance with the versions listed below or for the applications authorised by the manufacturer. Detailed information regarding the range of applications can be found in the chapter “Product description”.

1.5 General safety instructions
The user must observe the safety instructions in this operating instructions manual, the country specific installation standards as well as all prevailing safety regulations and accident prevention rules.

Further technical information can be found in the Schmersal catalogues or in the online catalogue on the Internet: www.schmersal.net.

The information contained in this operating instructions manual is provided without liability and is subject to technical modifications.

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

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 ISO 13850 must be observed.
Operating instructions
Command and signalling devices

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 description
These operating instructions apply to the following types and programs:

2.1.1 Device heads of the command devices

<table>
<thead>
<tr>
<th>Basic component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pushbuttons and the illuminated pushbuttons:</td>
<td></td>
</tr>
<tr>
<td>1.DT/2/2</td>
<td>Pushbutton</td>
</tr>
<tr>
<td>1.DM/2</td>
<td>Pushbutton with diaphragm for dust protection</td>
</tr>
<tr>
<td>1.DL/2/2</td>
<td>Illuminated pushbutton</td>
</tr>
<tr>
<td>1.DLM/2</td>
<td>Illuminated pushbutton with diaphragm for dust protection</td>
</tr>
<tr>
<td>Indicator light:</td>
<td></td>
</tr>
<tr>
<td>1.ML/2</td>
<td>With flat collar</td>
</tr>
<tr>
<td>1.MLH/2</td>
<td>With high collar</td>
</tr>
<tr>
<td>Mushroom head impact button:</td>
<td></td>
</tr>
<tr>
<td>1.DP/3/2/2</td>
<td>without latching</td>
</tr>
<tr>
<td>1.DTP/3/2/2</td>
<td>Without latching (only N programme)</td>
</tr>
<tr>
<td>1.DLP/3/2/2</td>
<td>Illuminated, without latching (only N programme)</td>
</tr>
<tr>
<td>1.DRR/3/2/2</td>
<td>With latching, unlock by turning and pulling (pulling only in N programme)</td>
</tr>
<tr>
<td>1.DRZ/3/2/2</td>
<td>With latching, pull to unlock</td>
</tr>
<tr>
<td>Selector switch:</td>
<td></td>
</tr>
<tr>
<td>1.WS21/3/0</td>
<td>- with 2 positions:</td>
</tr>
<tr>
<td>1.WT21/6/0</td>
<td>- with 3 positions:</td>
</tr>
<tr>
<td>1.WS23/3/0</td>
<td>- with 3 positions:</td>
</tr>
<tr>
<td>1.WT32/3/0</td>
<td>- with 2 positions:</td>
</tr>
<tr>
<td>1.WTS32/3/0</td>
<td>- with 2 positions:</td>
</tr>
<tr>
<td>Key-operated selector switch:</td>
<td></td>
</tr>
<tr>
<td>1.SS21S/7/0</td>
<td>- with 2 positions:</td>
</tr>
<tr>
<td>1.ST21S/0/0</td>
<td>- with 1 momentary position:</td>
</tr>
<tr>
<td>1.SS23S/7/0</td>
<td>- with 3 positions:</td>
</tr>
<tr>
<td>1.ST23S/0/0</td>
<td>- with 3 positions:</td>
</tr>
<tr>
<td>1.SST32S/0/0</td>
<td>- with latching, switching</td>
</tr>
<tr>
<td>1.STS32S/0/0</td>
<td>- with latching, switching</td>
</tr>
<tr>
<td>Blankling plug for command device position:</td>
<td></td>
</tr>
<tr>
<td>NB, MBN, BN</td>
<td>Blankling plug</td>
</tr>
</tbody>
</table>

2.1.2 Contact elements of EF contact system (for E and N programme)

<table>
<thead>
<tr>
<th>Basic component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>- with screw terminals</td>
<td></td>
</tr>
<tr>
<td>EF/0.0/0</td>
<td>Contact element NC</td>
</tr>
<tr>
<td>EF/0.0/0</td>
<td>Contact element NO</td>
</tr>
<tr>
<td>EF/0.0/0</td>
<td>Double contact element 2 NC</td>
</tr>
<tr>
<td>EF/0.0/0/0</td>
<td>Double contact element 2 NO</td>
</tr>
<tr>
<td>EF/0.0/0/0</td>
<td>Double contact element NC/NO contacts with safety spring</td>
</tr>
<tr>
<td>- with flat plug-in connector</td>
<td></td>
</tr>
<tr>
<td>EF/0.0/0</td>
<td>Contact element NC</td>
</tr>
<tr>
<td>EF/0.0/0</td>
<td>Contact element NO</td>
</tr>
<tr>
<td>EF/0.0/0</td>
<td>Double contact element 2 NC</td>
</tr>
<tr>
<td>EF/0.0/0</td>
<td>Double contact element 2 NO</td>
</tr>
<tr>
<td>EF/0.0/0</td>
<td>Double contact element NC/NO contacts with safety spring</td>
</tr>
<tr>
<td>- with cage clamps</td>
<td></td>
</tr>
<tr>
<td>EF/0.0/0</td>
<td>Contact element NC</td>
</tr>
<tr>
<td>EF/0.0/0</td>
<td>Contact element NO</td>
</tr>
<tr>
<td>EF/0.0/0</td>
<td>Double contact element 2 NC</td>
</tr>
<tr>
<td>EF/0.0/0</td>
<td>Double contact element 2 NO</td>
</tr>
<tr>
<td>EF/0.0/0</td>
<td>Double contact element NC/NO</td>
</tr>
</tbody>
</table>

2.2 Colour of button surface:

| GB | yellow |
| RT | red |
| GN | green |
| WS | white |
| BL | blue |
| GR | grey |
| SW | Black (not for illuminating devices) |

Command and signalling devices

1 | Command and signalling devices:
| - E | "E" program |
| - N | "N" program |
| - R | "R" program |

2 | Colour of button surface:
| - GB | yellow |
| - RT | red |
| - GN | green |
| - WS | white |
| - BL | blue |
| - GR | grey |
| - SW | Black (not for illuminating devices) |

2.2.1 Option

<table>
<thead>
<tr>
<th>No.</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Normally-closed contact, with approx. contact travel in mm</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Normally-open contact, with approx. contact travel in mm</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>Mounting position on mounting flange / terminal ID</td>
</tr>
</tbody>
</table>
## 2.3 Purpose
The devices described in these operating instructions are not suitable for emergency stop applications. Emergency stop command devices are described in a separate set of operating instructions.

The devices described here are designed to be mounted in control panels or assembly housings. The command devices are only suitable for processing operation-relevant signals for purposes of machine control.

If sealing elements or dust protection membranes are not closed they could be damaged by cleaning agents and permanent UV exposure.

## 2.4 Technical data

### Command and signalling devices:

#### 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

**Actuating stroke:**
- 4 mm ... 5 mm

**Actuating force:**
- Pushbutton:
  - 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:
  - approx. 0.2 N
- Spring-return rotary selector switch/maintained spring-return rotary selector switch:
  - approx. 0.2 N

**Mechanical life:**
- Push button:
  - 1 x 10⁶ switching cycles
- Illuminated push button:
  - 1 x 10⁶ switching cycles
- Palm button with detent:
  - 1 x 10⁶ switching cycles
- Palm button without detent:
  - 1 x 10⁶ switching cycles
- Key selector switch/button/selector switch:
  - 3 x 10⁵ switching cycles
- Selector switch/button/selector switch/key switch:
  - 3 x 10⁶ switching cycles

**Calotte/collar material:**
- N program:
  - Plastic
- E and R program:
  - Glass and plastic

**Front ring material:**
- N program:
  - Plastic chrome-plated
- E and R program:
  - Aluminium, anodised

**Button material:**
- N program:
  - Plastic
- E and R program:
  - Aluminium, anodised

**Selector switch grip material:**
- N program:
  - Plastic
- E and R program:
  - Plastic

**Protection class:**
- N programme:
  - IP67, IP69K
- E and R programme:
  - IP65

**Ambient temperature:**
- -25°C ... + 75°C
- Selector switch, key-operated selector switch:
  - 0°C ... +75°C

**Fixing with mounting flange:**
- ELM, EFM

**Max. tightening torque of mounting flange:**
- 0.6 Nm

**Shock resistance to IEC 60068-2-27:**
- < 50 g

**Resistance to vibrations to EN 60068-2-6:**
- 5 g

**Device designation:**
- Designation labels:
  - Laser-etched or engraved
- Symbols:
  - Printed, laser-etched or engraved
Operating instructions
Command and signalling devices
E programme, N programme and R programme

Contact/light element:

General technical data:

- Standards: IEC 60947-5-1
- Switching frequency: 1200/h
- Mechanical life: 10,000,000 operations
- Resistance to shock: 30 g / 18 ms
- Resistance to vibration: 20 g / 10 ... 150 Hz
- Switching points: Depends on contact element used
  - NC contact: approx. 1 mm ... 3 mm
  - NO contact: approx. 2 mm ... 4 mm
- Switching system: Slow action, NC contacts with positive break
- Contact types: with galvanically separated contact bridges
- Thermal test current I_{\text{th}}:
  - EF contact elements: 10 A
  - RF contact elements: 6 A
- Max. fuse rating:
  - EF contact elements: 10 A gG
  - RF contact elements: 6 A gG
- Suitable low voltage:
  - EF contact elements: 5 VDC / 3.2 mA
  - RF contact elements: 5 VDC / 1 mA
- Utilisation category:
  - EF contact elements: AC-15: 250 V / 8 A
    DC-13: 24 V / 5 A
  - RF contact elements: AC-15: 250 V / 6 A
    DC-13: 24 V / 3 A
- Rated insulation voltage U_{i}:
  - 400 V
- Rated impulse withstand voltage U_{imp}:
  - 4 kV
- Degree of pollution: 3
- Overvoltage category: III
- Climatic resistance to DIN EN 60068: Part 2-30
- Temperature range: -25 °C ... + 60 °C
- Proof of positive opening: 2.5 kV impulse voltage
- Positive break travel: approx. 2 mm after the opening point
- Actuating force at end of stroke: approx. 8 ... 15 N, depending on contact element used
- Connection:
  - Screw terminals
  - Plug-in terminals
  - Clamp terminals
- Cable sections:
  - Single core: 2 x (0.5 ... 2.5 mm²)
  - Fine wire with ferrules with protective collars: 2 x (0.5 ... 1.5 mm²)
  - Flat connector: 6.3 mm x 0.8 mm / 2 x 2.8 mm x 0.8 mm
- Tightening torque for the connecting screw: max. 1 Nm
- Material:
  - Enclosure: plastic, glass-fibre reinforced thermoplastic, self-extinguishing
  - Contacts: fine silver, spring bronze or brass carrier
- Protection class:
  - Wiring compartments: IP40
  - Terminals: IP20
    (with plug-in connector depending on the connector plug used)
- Approvals: cULus (with exception of cage clamps)

3. Mounting

3.1 General mounting instructions for E and N programme

1. Mount control elements and mounting flange by tightening both screws of mounting flange using size 2 cross-point screwdriver (see fig. 1)

   When tightening the screws, ensure the mounting flange is screwed on evenly and does not move.

2. Mount contact elements of EF contact system by snapping on in positions 1 to 3 to mounting flange (see Fig. 2). Middle position (pos. 3) is reserved for mounting lighting elements on devices with lights (see fig. 3).

   On devices with lights, no plunger segments may be installed in the mounting flange. If using contact and light elements on the mounting flange, the light element must be mounted first and in the middle position (pos. 3).

   Contact elements of the EF contact system must be fitted in the second locking position and must, therefore, lie flush on the mounting flange after fitting.

Fig. 1

Fig. 2

Fig. 3

Only fit onto clean and grease-free surface!
3.2 General mounting instructions for R programme

1. Mount control elements and mounting flange by tightening both screws of mounting flange using size 2 cross-point screwdriver (see section 3.1, Fig. 1)

When tightening the screws, ensure the mounting flange is screwed on evenly and does not move.

2. Mount contact elements of RF contact system by snapping on in positions 1 to 3 to mounting flange (see fig. 4). Middle position (pos. 3) is reserved for mounting lighting elements on devices with lights (see fig. 5).

Fig. 4
Fig. 5

On devices with lights, no plunger segments may be installed in the mounting flange.

Contact elements of the RF contact system are fitted in the first locking position and, therefore, lie flush on the mounting flange after fitting. If using contact and light elements on the mounting flange, the light element must be mounted first and in the middle position (pos. 3). No contact element may be mounted to the light element.

Only fit onto clean and grease-free surface!

3.3 Dimensions
All measurements in mm.

EF contact system (for E and N programme)

RF contact system (for R programme)

Single row contact elements

Double row contact elements

A maximum of 4 contact elements may be used on devices with latching. The fourth element must be mounted in the centre (pos. 3).
Operating instructions
Command and signalling devices

Mounting flange and 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.
- After wiring, the contact elements must be cleaned (i.e. remove excess cables etc.).
- The bevel on the mounting flange is indicated by position 1.

4.2 Contact variants of contact system

Refer to ordering code, chapter 2.1

- A mixture between command device programs and contact systems is not permissible on all devices.

5. Set-up and maintenance

5.1 Functional testing

The function of the component must be tested. The following conditions must be checked and met:
1. Correct fixing of the fitted component
2. Check the integrity of the 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 command device and the contact element
2. Remove particles of dust and soiling
3. Check the integrity of the connections

Damaged or defective components must be replaced.

6. Disassembly and disposal

6.1 Removal of E, N and R programme

1. Removal of the EF contact elements is carried out with the aid of a size 2 cross-point screwdriver (see fig. 8).
   Removal of the RF contact elements is carried out with the aid of a cross-point screwdriver with the recommended width of 5.5 mm (see Fig. 9).

   With the light element mounted, the contact elements at pos. 1 and pos. 2 must be removed first. The light element is then removed.

2. Removal of the mounting flange is carried out by loosening the screws on the mounting flange. The mounting flange is then turned approx. 45° in anti-clockwise direction and removed (see fig. 10).

6.2 Disposal

The switch 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
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: E, N and R program

Type: See ordering code

Description of the component: Command and signalling devices
optionally as illuminated signalling devices,
Push, illuminated, palm buttons and switches,
Selector switches and buttons,
key selector switches and key selector buttons
in conjunction with contact element EF and RF or light elements and voltage senders EL* and RL*

Relevant Directives:
Low Voltage Directive 2014/35/EU
EMC-Directive * 2014/30/EU
RoHS-Directive 2011/65/EU

Applied standards: DIN EN 60947-5-1:2010

Place and date of issue: Wuppertal, May 9, 2017

Authorised signature
Philip Schmersal
Managing Director

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