Snap-Action Switches

S870, S970 series
Snap-action switches with positive opening operation and self-cleaning contacts
Catalogue D70.en
Snap-action switches S870/S970 series

Single break SPDT switches with positive opening operation and wiping contacts

S870/S970 Series snap-action switches feature positive opening operation, which guarantees that even contacts which have become welded together due to a short-circuit will open reliably. Wiping contacts protected against dust, humidity and contaminants ensure high reliability even with small contact loads. Versions with gold contacts are especially suited for switching low voltages and small currents.

A defined as well as repeatable switching action is possible thanks to the snap mechanism whose switching speed is virtually independent of the actuation speed. That is why snap-action switches are preferred in applications with slow actuation speeds, where they are used, for instance, as motor switches, position switches, or gear limit switches.

Features

- **Variants for extreme conditions**: Ruggedized housing made from polyetherimide (PEI). Designed for use in harsh environments. Improved resistance to extremes of temperature, chemicals and impact.
- **Positive opening operation**: Reliable breaking of the normally closed (NC) circuit even if the contacts have become welded together, in compliance with IEC 60947-5-1, Annex K.
- **Single break contacts**: Changeover switch, also available as NC or NO versions with leads or cable connection. Compact design.
- **IP Rating**: Degrees of protection against dust, humidity, contaminants, or access to hazardous parts to IEC 60529:
  - Contacts: IP40, IP60 or IP67
  - Terminals: IP00, IP20 or IP67
- **Self-cleaning contacts**: Continuous low contact resistance ensures high contact reliability over the entire design life of the switch.
- **Contact material**: Silver or gold

Design and function

- **Actuator**
  - Standard: Push button
  - Actuator styles: roller lever, plain lever or simulated roller lever
- **Contact area**
  - Microswitch with SPDT, NC or NO contacts
  - Positive opening operation and wiping contacts
  - Contact material: Silver or gold
- **Mounting**
  - Ganging (side mount)
- **Terminals**
  - Flat tabs / solder lugs / PCB
  - M3 screws with saddle clamp
  - Factory-potted cable or leads

Applications

S970 switches are typically used with systems and components that require a high degree of safety and reliability, such as
- Limit switches for machine, door and plant control systems
- Control switches for the driver's desk of rail vehicles or crane consoles
- Switching elements for automation
- Safety limit switches for control systems and plant controls

Specifications subject to alterations!
Ordering code

Example: S870 W1D1a

<table>
<thead>
<tr>
<th>Series</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>S870</td>
<td>S870 Series, standard</td>
</tr>
<tr>
<td>S970</td>
<td>S970 Series, with improved resistance to temperature, chemicals and impact</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contact configuration</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>SPDT</td>
</tr>
<tr>
<td>O</td>
<td>SPST-NC</td>
</tr>
<tr>
<td>S</td>
<td>SPST-NO</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ingress protection rating</th>
<th>Contacts</th>
<th>Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IP40</td>
<td>IP00 (IP20&lt;sup&gt;*)&lt;/sup&gt;</td>
</tr>
<tr>
<td>2</td>
<td>IP60</td>
<td>IP00</td>
</tr>
<tr>
<td>3</td>
<td>IP67</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Screw-type</td>
</tr>
<tr>
<td>B</td>
<td>Leads, opposite actuator side, length = 500 mm</td>
</tr>
<tr>
<td>D</td>
<td>Flat tabs, 6.3 x 0.8 mm</td>
</tr>
<tr>
<td>F</td>
<td>PCB, 180°</td>
</tr>
<tr>
<td>G</td>
<td>Solder lugs</td>
</tr>
<tr>
<td>L</td>
<td>Cable, opposite actuator side, length = 500 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contact material</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Silver</td>
</tr>
<tr>
<td>4</td>
<td>Gold</td>
</tr>
</tbody>
</table>

**Actuator styles**
- Push button (standard) a
- Plain lever, short k
- Plain lever, long l
- Plain lever, medium m
- Roller lever, long r
- Roller lever, short t
- Simulated roller lever, medium u
- Simulated roller lever, long v

**Note:** This product catalogue comprises only stock items. For some variants minimum quantities apply. Please ask for conditions.

**Special variants:**
If you need a special variant of the switch, please do not hesitate to contact us. Maybe the type of switch you are looking for is among our many special designs. If not, we can also supply customized designs. In this case minimum quantities apply.

*<sup>1</sup> Only for versions with connected leads or cable
*<sup>2</sup> Only for versions with screw-type terminals

**Ordering code**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Identification</th>
<th>Version (sealed to)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP rating: contacts / terminals</td>
<td></td>
<td>IP40/00 IP60/00 IP67/67</td>
</tr>
</tbody>
</table>

| Actuator styles | a | k | l | m | r | t | u | v |

| Terminals | A | B | D | F | G | L |

| Contact material | 1 | 4 |

| Series | Contacts | Ingress protection rating (IP code) | Contact material |

| S870 / S970 | W / O / S | 1 / 2 / 3 | 1 / 4 |

**Terminals**
- M3 screws with saddle clamp A
- Leads, opposite actuator side, length 500 mm B
- Flat tabs 6.3 x 0.8 D
- PCB terminals, 180° F
- Solder lugs G
- Cable, opposite actuator side, length 500 mm L

**Example:**

- S870 W1D1a / S970 W1D1a
- Sealed to IP40/IP00
- Push button (standard)
- Flat tabs 6.3x0.8

- S870 W2D1a / S970 W2D1a
- Sealed to IP60/IP00
- Push button (standard)
- Flat tabs 6.3x0.8

- S870 W1F1 u / S970 W1F1 u
- Sealed to IP40/IP00
- Simulated roller lever, medium
- Solder lugs

- S870 W3L1 a / S970 W3L1 a
- Sealed to IP67/IP67
- Roller lever, short
- Leads

- S870 W1A1 t / S970 W1A1 t
- Sealed to IP40/IP00
- Roller lever, short
- Screw-type terminals
### Specifications

#### S870 / S970 series

<table>
<thead>
<tr>
<th>IP Rating: Contacts / Terminals</th>
<th>Standard</th>
<th>IP40/IP00 + IP40/IP20</th>
<th>IP60/IP00</th>
<th>IP67/IP67</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact configuration</td>
<td>IEC 60947</td>
<td>1x SPDT, Form C, single break contacts, 3 terminals / 1x SPST-NC, Form B single break contacts, 2 terminals / 1x SPST-NO, Form A, single break contacts, 2 terminals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conventional thermal current $I_{th}$</td>
<td>IEC 60947 UL 508</td>
<td>10 A @ $T = 85^\circ$ C</td>
<td>10 A @ $T = 85^\circ$ C</td>
<td></td>
</tr>
<tr>
<td>Rated insulation voltage $U_{i}$</td>
<td>IEC 60947 UL 508</td>
<td>250 V</td>
<td>300 V</td>
<td></td>
</tr>
<tr>
<td>Pollution degree</td>
<td>IEC 60947 UL 508</td>
<td>PD3</td>
<td>S870: PD3 / S970: PD2</td>
<td></td>
</tr>
<tr>
<td>Rated impulse withstand voltage $U_{imp}$</td>
<td>IEC 60947</td>
<td>4 kV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overvoltage category</td>
<td>IEC 60947</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utilization category</td>
<td>Silver contacts</td>
<td>AC-15, 230 V AC / 1.5 A</td>
<td>DC-13, 60 V DC / 0.5 A</td>
<td>DC-13, 24 V DC / 2 A</td>
</tr>
<tr>
<td>Gold contacts</td>
<td>IEC 60947</td>
<td>AC-15, 230 V AC / 1 A</td>
<td>DC-13, 60 V DC / 0.5 A</td>
<td>DC-13, 24 V DC / 2 A</td>
</tr>
<tr>
<td>Silver contacts</td>
<td>UL 508*3</td>
<td>AC 240 V / 1.5 A</td>
<td>DC 60 V / 0.5 A</td>
<td></td>
</tr>
<tr>
<td>Contact gap, typical</td>
<td>---</td>
<td>3.0 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact force, typical</td>
<td>---</td>
<td>0.3 N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact resistance, typical, no leads connected</td>
<td>---</td>
<td>100 mQ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive opening force *2</td>
<td>IEC 60947</td>
<td>20 N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actuator travel for positive opening operation</td>
<td>IEC 60947</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum actuator travel *2</td>
<td>IEC 60947</td>
<td>3.0 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actuation speed</td>
<td>IEC 60947</td>
<td>1.0 m/s max.</td>
<td>0.1 mm/s min.</td>
<td></td>
</tr>
<tr>
<td>Vibration resistance, 10 ... 500 Hz all directions (without aux. actuator at 10 µs max. opening time)</td>
<td>IEC 60068-2-6</td>
<td>50 g</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shock resistance (without aux. actuator at 10 µs max. opening time)</td>
<td>IEC 60068-2-27</td>
<td>70 g, half sinus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-circuit protection for silver contacts *3</td>
<td>IEC 60269-2</td>
<td>10 A gG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching frequency, max.</td>
<td>IEC 60947</td>
<td>300 operations/minute</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actuation force *2</td>
<td>IEC 60947</td>
<td>2.4 N max.</td>
<td>3.0 N max.</td>
<td>3.0 N max.</td>
</tr>
<tr>
<td>Release force *2</td>
<td>IEC 60947</td>
<td>0.5 N min.</td>
<td>0.5 N min.</td>
<td>0.5 N min.</td>
</tr>
<tr>
<td>Ingress protection rating (IP code)</td>
<td>IEC 60529</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contacts</td>
<td>Screw-type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminals</td>
<td>Flat tabs</td>
<td>IP40</td>
<td>IP60</td>
<td></td>
</tr>
<tr>
<td>Flat tabs / Solder lugs</td>
<td>PCB / Leads / Cable</td>
<td>IP20</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Mechanical endurance</td>
<td>IEC 60947</td>
<td>IP40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>IEC 60947</td>
<td>IP00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flat tabs / PCB / Solder lugs</td>
<td>S870</td>
<td>S970</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leads *4</td>
<td>S870/S970</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable *4</td>
<td>S870/S970</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Silver (Ag90Ni10) or gold (AuNi3Ag26)</td>
<td>brass, silver or gold plated</td>
<td>8570: silicon, blue / S970: silicon, red</td>
<td>S870: PC, light green, transparent / S970: PEI amber, transparent</td>
</tr>
<tr>
<td>Contacts</td>
<td>---</td>
<td></td>
<td></td>
<td>S870: PC, black / S970: PEI, black</td>
</tr>
<tr>
<td>Terminals</td>
<td>---</td>
<td></td>
<td></td>
<td>Insulation: PVC / leads: AWG 18</td>
</tr>
<tr>
<td>Seal *4</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housing, upper part</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housing, lower part</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable / Leads *4</td>
<td>UL/CSA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mounting position</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight, no leads connected</td>
<td>---</td>
<td>approx. 7 g, no aux. actuator / cable / leads</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Approvals</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- Data for gold contacts upon request
- Measured next to push button
- General Purpose
- Others upon request
- A slower release actuation may occur by rapidly changing air pressure
- Only versions sealed to IP60/IP00 and IP67/IP67

*Subject to change*
### Dimension and circuit diagrams

**Dimensions S870 W1D1a / S970 W1D1a**

Circuit diagram

**SPDT:**

```
1  2
```

**S870 W1D1a / S970 W1D1a**

- S870 W1D1a SPDT
- S870 W1D1a Contacts IP40
- S870 W1D1a Flat tabs 6.3x0.8 mm
- S870 W1D1a Contact material silver
- S870 W1D1a Push button (standard)
- S970 W1D1a SPDT
- S970 W1D1a Contacts IP40
- S970 W1D1a Flat tabs 6.3x0.8 mm
- S970 W1D1a Contact material silver
- S970 W1D1a Push button (standard)

---

**Dimensions S870 W2D1a / S970 W2D1a**

Circuit diagram

**SPDT:**

```
1  2
```

**S870 W2D1a / S970 W2D1a**

- S870 W2D1a SPDT
- S870 W2D1a Contacts IP60
- S870 W2D1a Flat tabs 6.3x0.8 mm
- S870 W2D1a Contact material silver
- S870 W2D1a Push button (standard)
- S970 W2D1a SPDT
- S970 W2D1a Contacts IP60
- S970 W2D1a Flat tabs 6.3x0.8 mm
- S970 W2D1a Contact material silver
- S970 W2D1a Push button (standard)

---

**Dimensions S870 W3L1a / S970 W3L1a**

Circuit diagram

**SPDT:**

```
1  4
2
```

**S870 W3L1a / S970 W3L1a**

- S870 W3L1a SPDT
- S870 W3L1a Contacts IP67
- S870 W3L1a Cable, length 500 mm
- S870 W3L1a Contact material silver
- S870 W3L1a Push button (standard)
- S970 W3L1a SPDT
- S970 W3L1a Contacts IP67
- S970 W3L1a Cable, length 500 mm
- S970 W3L1a Contact material silver
- S970 W3L1a Push button (standard)

---

**Dimensions S870 W3L1a / S970 W3L1a**

- Leads AWG18 / blue
- Leads AWG18 / grey
- Leads AWG18 / black

---

Subject to change / Dimensions in mm
### Actuator styles, actuator positions

**S870/S970 series**

- **Push button (standard)**  
  Actuator style [a]  
  ![Actuator IP40 IP60/IP67](image)

- **Plain lever, short**  
  Actuator style [k]  
  ![Actuator](image)

- **Plain lever, long**  
  Actuator style [l]  
  ![Actuator](image)

- **Plain lever, medium**  
  Actuator style [m]  
  ![Actuator](image)

<table>
<thead>
<tr>
<th>Actuator position</th>
<th>Push button (standard) [a]</th>
<th>Dimension [&lt;] in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free position</td>
<td>16.0 ± 0.1</td>
<td></td>
</tr>
<tr>
<td>Operating position</td>
<td>14.8 ± 0.2</td>
<td></td>
</tr>
<tr>
<td>Release position</td>
<td>15.1 ± 0.2</td>
<td></td>
</tr>
<tr>
<td>Total positive opening travel</td>
<td>13.3</td>
<td></td>
</tr>
<tr>
<td>Total travel position</td>
<td>13.0</td>
<td></td>
</tr>
<tr>
<td>Movement differential (between operating and release position)</td>
<td>0.3 (typical)</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** To ensure the proper working of the positive opening operation it is necessary to depress the plunger to the point of total positive opening travel. However, it must not be pushed beyond total travel position. Data is valid for new switches.

<table>
<thead>
<tr>
<th>Actuator position</th>
<th>Plain lever [k]</th>
<th>Dimension [&lt;] in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lever length</td>
<td>25.7</td>
<td></td>
</tr>
<tr>
<td>Free position</td>
<td>17.5 ± 0.2</td>
<td></td>
</tr>
<tr>
<td>Operating position</td>
<td>15.9 ± 0.3</td>
<td></td>
</tr>
<tr>
<td>Release position</td>
<td>16.2 ± 0.3</td>
<td></td>
</tr>
<tr>
<td>Total positive opening travel</td>
<td>13.7</td>
<td></td>
</tr>
<tr>
<td>Total travel position</td>
<td>13.4</td>
<td></td>
</tr>
<tr>
<td>Movement differential (between operating and release position)</td>
<td>0.3 (typical)</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** To ensure the proper working of the positive opening operation it is necessary to depress the plunger to the point of total positive opening travel. However, it must not be pushed beyond total travel position. Data is valid for new switches.

<table>
<thead>
<tr>
<th>Actuator position</th>
<th>Plain lever [l]</th>
<th>Dimension [&lt;] in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lever length</td>
<td>49.2</td>
<td></td>
</tr>
<tr>
<td>Free position</td>
<td>21.4 ± 0.5</td>
<td></td>
</tr>
<tr>
<td>Operating position</td>
<td>18.0 ± 0.6</td>
<td></td>
</tr>
<tr>
<td>Release position</td>
<td>18.8 ± 0.6</td>
<td></td>
</tr>
<tr>
<td>Total positive opening travel</td>
<td>13.2</td>
<td></td>
</tr>
<tr>
<td>Total travel position</td>
<td>12.9</td>
<td></td>
</tr>
<tr>
<td>Movement differential (between operating and release position)</td>
<td>0.8 (typical)</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** To ensure the proper working of the positive opening operation it is necessary to depress the plunger to the point of total positive opening travel. However, it must not be pushed beyond total travel position. Data is valid for new switches.

<table>
<thead>
<tr>
<th>Actuator position</th>
<th>Plain lever [m]</th>
<th>Dimension [&lt;] in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lever length</td>
<td>34.9</td>
<td></td>
</tr>
<tr>
<td>Free position</td>
<td>19.0 ± 0.25</td>
<td></td>
</tr>
<tr>
<td>Operating position</td>
<td>16.7 ± 0.35</td>
<td></td>
</tr>
<tr>
<td>Release position</td>
<td>17.3 ± 0.35</td>
<td></td>
</tr>
<tr>
<td>Total positive opening travel</td>
<td>13.5</td>
<td></td>
</tr>
<tr>
<td>Total travel position</td>
<td>13.2</td>
<td></td>
</tr>
<tr>
<td>Movement differential (between operating and release position)</td>
<td>0.6 (typical)</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** To ensure the proper working of the positive opening operation it is necessary to depress the plunger to the point of total positive opening travel. However, it must not be pushed beyond total travel position. Data is valid for new switches.
Actuator styles, actuator positions (continued)

- **Roller lever, long** Actuator style \(\text{r}\)
  
  - Lever length \(22.6\) mm
  - Free position \(22.4 \pm 0.3\) mm
  - Operating position \(21.1 \pm 0.4\) mm
  - Release position \(21.4 \pm 0.4\) mm
  - Total positive opening travel \(19.3\) mm
  - Total travel position \(19.0\) mm
  - Movement differential (between operating and release position) \(0.3\) mm (typical)

  **Note:** To ensure the proper working of the positive opening operation it is necessary to depress the plunger to the point of total positive opening travel. However, it must not be pushed beyond total travel position. Data is valid for new switches.

- **Roller lever, short** Actuator style \(\text{t}\)
  
  - Lever length \(19.1\) mm
  - Free position \(21.9 \pm 0.3\) mm
  - Operating position \(20.7 \pm 0.4\) mm
  - Release position \(21.0 \pm 0.4\) mm
  - Total positive opening travel \(19.3\) mm
  - Total travel position \(19.0\) mm
  - Movement differential (between operating and release position) \(0.3\) mm (typical)

  **Note:** To ensure the proper working of the positive opening operation it is necessary to depress the plunger to the point of total positive opening travel. However, it must not be pushed beyond total travel position. Data is valid for new switches.

- **Simulated roller lever, medium** Actuator style \(\text{u}\)
  
  - Lever length \(22.6\) mm
  - Free position \(22.4 \pm 0.3\) mm
  - Operating position \(21.1 \pm 0.4\) mm
  - Release position \(21.4 \pm 0.4\) mm
  - Total positive opening travel \(19.3\) mm
  - Total travel position \(19.0\) mm
  - Movement differential (between operating and release position) \(0.3\) mm (typical)

  **Note:** To ensure the proper working of the positive opening operation it is necessary to depress the plunger to the point of total positive opening travel. However, it must not be pushed beyond total travel position. Data is valid for new switches.

- **Simulated roller lever, long** Actuator style \(\text{v}\)
  
  - Lever length \(27.6\) mm
  - Free position \(23.3 \pm 0.3\) mm
  - Operating position \(21.5 \pm 0.4\) mm
  - Release position \(22.0 \pm 0.4\) mm
  - Total positive opening travel \(19.2\) mm
  - Total travel position \(18.8\) mm
  - Movement differential (between operating and release position) \(0.3\) mm (typical)

  **Note:** To ensure the proper working of the positive opening operation it is necessary to depress the plunger to the point of total positive opening travel. However, it must not be pushed beyond total travel position. Data is valid for new switches.
## Terminals

### M3 screws terminal style [A]

![Diagram of M3 screws terminal style]

- Screw-type terminals M3 with captive screws

### Leads, on side opposite actuator terminal style [B]

![Diagram of leads, on side opposite actuator]

- Leads, on side opposite actuator
- Lead AWG18 / grey
- Lead AWG18 / blue
- Lead AWG18 / black

### Flat tabs, straight terminal style [D]

![Diagram of flat tabs, straight]

- Flat tabs, straight
- Flat tabs 6.3 x 0.8 mm

---

**Note:**
- Single and multiple-wire conductors with wire gauges AWG 20 ... 15 (0.5 mm² ... 1.5 mm²) can be clamped with or without wire end ferrules.
- 2 conductors max. with the same wire gauge can be clamped per terminal.
- Tightening torque of terminal screws should be 1 Nm max.

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**Dimensions in mm / Subject to change**
## Terminals (continued)

### PCB terminals, straight terminal style [F]

Subject to change / Dimensions in mm

Note:
- **Hand soldering:**
  - Soldering apparatus: Hand-held soldering iron
  - Solder: Flux-filled solder wire, lead-free
  - Temperature/duration: 400 °C; 5 s max.

- **Selective soldering:**
  - Soldering apparatus: Selective soldering station
  - Solder: Lead-free solder for selective and wave soldering
  - Temperature/duration: 300 °C; 2.5 s; 3 mm wave distance; Flux time 1 s

- **Wave soldering:**
  - Soldering apparatus: Wave soldering station, 1 wave (Wörthmann wave)
  - Solder: Lead-free solder for selective and wave soldering
  - Temperature/duration: 260 °C; 5 s; 66 mm wave distance; Conveyor speed 0.8 m/min
  - Preheating approx. 113 s at 110 ... 145 °C (typical)

* PCB: 1.6 mm; through-contacted

### Solder lugs, straight terminal style [G]

Subject to change / Dimensions in mm

Note:
- **Hand soldering:**
  - Soldering apparatus: Hand-held soldering iron
  - Solder: Flux-filled solder wire, lead-free
  - Temperature/duration: 400 °C; 5 s max., pre-tinned leads

### Cable, on side opposite actuator terminal style [L]

Subject to change / Dimensions in mm

Note:
- **Contact configuration:**

<table>
<thead>
<tr>
<th>Lead</th>
<th>Contact configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 / black</td>
<td>● ● ●</td>
</tr>
<tr>
<td>2 / grey</td>
<td>● ● ●</td>
</tr>
<tr>
<td>4 / blue</td>
<td>● ● ●</td>
</tr>
</tbody>
</table>

  Lead AWG 18 / blue
  Lead AWG 18 / grey
  Lead AWG 18 / black
  Cable Y - UL 2517

Subject to change
Mounting  S870/S970 series

Ganging (side mount)
- through the two transversal holes in the body of the switch by means of a collar screw or threaded bolt.
  Tightening torque 0.7 Nm max.
- Alternatively, DUO-Clips or retaining rings can be used.

Mounting on PCB (only S870 Wx/Fxx / S970 Wx/Fxx)
- Holes for PCB terminals, straight

Mounting plates  S870/S970 series

For mounting the switches on uninsulated surfaces use mounting plates with the following features:
- Suitable for side mounting of the switch on the left and on the right
- Material: polyamide PA66, flammability rating UL 94V-0

Long mounting plate, ordering code: MP g

Short mounting plate, ordering code: MP k

Mounting  S870/S970 series

Snap-action switches are designed for actuation with and without a roller lever.
A roller lever, however, is required if the direction of actuation deviates more than ±15° from the plunger axis.
The following illustration shows the use of cam discs and linear actuators using the example of the S870/S970 with roller lever, long.

Example: Cam disk, diameter 50 mm

Example: Cam disk, diameter 20 mm

Example: Linear cam

Dimensions in mm / Subject to change
Mounting instructions:
- Snap-action switches should be mounted by qualified professional staff only.
- Observe the required clearance and creepage distances. This is also applicable for connected wires.
- It is necessary to use insulating plates when ganging or mounting switches on uninsulated surfaces.
- The switches can be mounted in any orientation.
- When mounting the switches make sure to use 2 fastening elements (e.g. screws).
- Only use adequate fastening elements such as cylinder head or collar screws and DUO-clips, including washers. The value for maximum tightening torque must not be exceeded.
- The actuator should not be pre-tensioned when in the free position. When actuated the actuator should travel beyond the operating position for at least 50% of the predefined overtravel, all the way to the total travel position.
- Avoid tilting the screw when mounting to prevent mechanical tension on the housing.
- To ensure the proper function of the positive opening operation it is necessary to depress the plunger to the total travel position.
- To prevent mechanical destruction of the switch, make sure that actuation of the switch does not exceed the specified total travel position. Avoid using the switch as a mechanical end stop.
- High-impact actuation of the switch can have a negative effect on its mechanical life.
- When securing stripped wire ends in the terminal clamp, make sure the wire insulation is flush with the clamp.
- Prevent a transfer of forces to the switch terminals, and ensure that connected leads have a functioning strain relief.

Non-permissible environmental conditions:
- Cleaning agents, adhesives, solvents, or screw-retaining varnish must be compatible with polycarbonate (S870) and polyetherimide (S970) respectively. Never use chemicals not compatible with polycarbonate for S870 Series switches or not compatible with polyetherimide for S970 Series snap-action switches.
- Using such chemicals can result in cracks, deformation, breakage and dissolution of the housing or complete destruction of the respective switch.
- Switches sealed to IP 67 are immersion protected. That means there is no ingress of water in a harmful quantity when a new switch (which is not operated) is immersed in water (1 m depth) for 30 minutes. This degree of protection cannot be warranted, however, when chemicals not compatible with polycarbonate are used for S870 Series switches or not compatible with polyetherimide for S970 Series switches.

Standards

- IEC 60947-1: Low-voltage switchgear and controlgear, Part 1: General rules
- IEC 60947-5-1, Annex K: Special requirements for control switches with direct opening action
- UL508: Industrial control equipment
- IEC 60529: Degrees of protection provided by enclosures (IP Code)
- UL 94V-0: Flammability Standard
- Dimensions according to DIN 41636-2, type A
- DIN EN ISO 13849-1: Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design
- IEC 60068-2-6: Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)

Safety instructions

- In case of moisture of any kind or impact of aggressive substances, chemicals, solvents or acids appropriate protective measures must be taken by the user in accordance with IEC 60364-4-41:2005, modified (Low-voltage electrical installations - Part 4-41: Protection for safety - Protection against electric shock). One such measure is the limitation of the voltage range.
- Be sure to make regular visual inspections.
- Improper handling of the switch, e.g. when hitting the floor with some impact, can result in breakage, visible cracks and deformation.
- The switch suitability has to be confirmed by the customer for the specific application, and under application conditions.
- For applications with both a high ambient temperature of >40°C and a high Ith current, a correction factor i.a.w. DIN EN 60204-1 Tab. 6 and Table D.1 must be applied for the wire and current.

For other applicable standards please refer to the specifications table on page 4.

Defective parts must be replaced immediately!

For a detailed list of all safety instructions see here: schaltbau.info/safety2en
Connectors

- Connectors manufactured to industry standards
- Connectors to suit the special requirements of communications engineering (MIL connectors)
- Charging connectors for battery-powered machines and systems
- Connectors for railway engineering, including UIC connectors
- Special connectors to suit customer requirements

Snap-action switches

- Snap-action switches with positive opening operation
- Snap-action switches with self-cleaning contacts
- Snap-action switch made of robust polyetherimide (PEI)
- Snap-action switch with two galvanically isolated contact bridges
- Special switches to suit customer requirements

Contactors

- Single and multi-pole DC contactors
- High-voltage AC/DC contactors
- Contactors for battery powered vehicles and power supplies
- Contactors for railway applications
- Terminal bolts and fuse holders
- DC emergency disconnect switches
- Special contactors to suit customer requirements

Electrics for rolling stock

- Equipment for driver’s cab
- Equipment for passenger use
- High-voltage switchgear
- High-voltage heaters
- High-voltage roof equipment
- Equipment for electric brakes
- Design and engineering of train electrics to customer requirements