SD, SE, SDE, SCO series
Multipole switchgear for rail vehicles:
Disconnected switches, Earthing Switches,
Disconnector with Earthing Switches, Change-Over-Switches
600 V to 3 kV
Catalogue F184.en
Applications

Use of functions disconnect, earthing, and change over-switching in railway applications for all rolling stock for voltage range up to 3 kV max:

- Traction inverter
- Auxiliary inverter
- Train power supply lines

1. **DC link**: interconnection of traction converters in the event of a fault
2. **Transformer switch**: switch for changing over from 25 kV 50 Hz auf 15 kV 16⅔ Hz on main transformer
3. **Disconnector and change over switch**: changes output of a traction inverter to the auxiliary loads (if auxiliary inverter is broken)
4. **Disconnecting and earthing** of high voltage busbar(s)
5. **Earthing** of circuits inside inverters

Further configurations: disconnecting and earthing of various circuits inside inverters according to customer requirements!

Standards

- **EN 50155**: Railway applications – Electronic equipment used on rolling stock
- **EN 50121-3-2**: Railway applications – Electromagnetic compatibility – Part 3-2: Rolling stock – Apparatus
- **EN 50124-1**: Railway applications – Insulation coordination – Part 1: Basic requirements – Clearances and creepage distances for all electrical and electronic equipment
- **EN 61373**: Railway applications – Rolling stock equipment – Shock and vibration tests
- **EN 60077-1**: Railway applications – Electric equipment for rolling stock – Part 1: General service conditions and general rules
- **EN 60077-2**: Railway applications – Electric equipment for rolling stock – Part 2: Electrotechnical components – General rules
- **EN 45545**: Railway applications – Fire protection on railway vehicles.
- **NF 16101/NF 16102**: Fire test to railway components

Switchgear for rolling stock

The switches of series SD, SE, SDE and SCO have a modular design and can be used for the function disconnect, earthing, disconnect and earthing as well as switching between two circuits (change-over). Switching between the individual switch positions is permissible without load only. The number of circuits can be individually adapted to the respective requirements. A combination of the above-mentioned functionalities within one device is simple to implement. The modularity is given not only to the number and functions of the switching chambers, but also to the possibilities of actuation by drive units.
Features

Four different types of drive units are available:

1. Manually operated by lever, mechanical interface on customer request
2. Electrically operated by motor-gear-unit, end positions controlled by digital encoder
3. Electrically operated by linear motor
4. Pneumatically operated drive (upon request)

Individual assembly of switching chambers / main contacts:

- NO – Normally open contact
- NC – Normally closed contact
- CO – Change-over-switch

Ordering code

Example: 

SD 03 MA 00 110 01

<table>
<thead>
<tr>
<th>Series</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>Disconnecting switch</td>
</tr>
<tr>
<td>SE</td>
<td>Earthing switch</td>
</tr>
<tr>
<td>SDE</td>
<td>Disconnector and earthing switch, combined</td>
</tr>
<tr>
<td>SCO</td>
<td>Change-over switch</td>
</tr>
</tbody>
</table>

Running number of variants; list of special design which are not fixed in ordering code above, like:
- Design of front panel, different keylock systems, number and configuration of the switching chambers, different installation variants on-roof / in-roof...

<table>
<thead>
<tr>
<th>Special design</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
</tr>
<tr>
<td>02</td>
</tr>
<tr>
<td>03</td>
</tr>
<tr>
<td>04</td>
</tr>
<tr>
<td>...</td>
</tr>
</tbody>
</table>

Nominal voltage

- SD 03: Un = 3 kV DC

Switching capability, Making

- 00: Making: Without load

Drive unit / activation unit

- MA: Manual
- MG: Motor-driven; motor gear unit
- ML: Motor-driven; linear motor
- MP: Pneumatic drive (upon request)

Control voltage

- 24 / 36 / 72 / 110V DC

Do you need support for a special application? Please contact us! We would be glad to assist you in the selection of the contactor that suits your application best.

The multipole switchgear on this catalogue are individual configurable for your application, but based on standard components.

Subject to change
# Specifications

**SD, SE, SDE, SCO series**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>SD (Disconnecting)</th>
<th>SE (Earthing)</th>
<th>SDE (Disconnecting and earthing)</th>
<th>SCO (Change-over)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Switching chamber</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of voltage</td>
<td>DC, AC (f &lt; 60 Hz)</td>
<td>DC, AC (f &lt; 60 Hz)</td>
<td>DC, AC (f &lt; 60 Hz)</td>
<td>DC, AC (f &lt; 60 Hz)</td>
</tr>
<tr>
<td>Number of fixed contacts, configuration</td>
<td>1 ... 10, NC / NO / CO</td>
<td>1 ... 20, NC / NO / CO</td>
<td>1 ... 20, NC / NO / CO</td>
<td>1 ... 20, NC / NO / CO</td>
</tr>
<tr>
<td>Nominal voltage $U_{n}$</td>
<td>3,000 V</td>
<td>3,000 V</td>
<td>3,000 V</td>
<td>3,000 V</td>
</tr>
<tr>
<td>Rated operating voltage $U_{o}$</td>
<td>3,600 V</td>
<td>3,600 V</td>
<td>3,600 V</td>
<td>3,600 V</td>
</tr>
<tr>
<td>Rated insulation voltage $U_{im}$</td>
<td>4,800 V</td>
<td>4,800 V</td>
<td>4,800 V</td>
<td>4,800 V</td>
</tr>
<tr>
<td>Rated impulse withstand voltage $U_{mi}$</td>
<td>25 kV</td>
<td>25 kV</td>
<td>25 kV</td>
<td>25 kV</td>
</tr>
<tr>
<td>Pollution degree</td>
<td>PD3</td>
<td>PD3</td>
<td>PD3</td>
<td>PD3</td>
</tr>
<tr>
<td>Overvoltage category</td>
<td>OV3</td>
<td>OV3</td>
<td>OV3</td>
<td>OV3</td>
</tr>
<tr>
<td>Conventional thermal current $I_{Th}$</td>
<td>500 A $^1$</td>
<td>---</td>
<td>500 A $^1$</td>
<td>500 A $^1$</td>
</tr>
<tr>
<td>Making capacity, breaking capacity</td>
<td>without load</td>
<td>without load</td>
<td>without load</td>
<td>without load</td>
</tr>
<tr>
<td>Rated short-time withstand current $I_{sw}$</td>
<td>4 kA / 50 kA</td>
<td>4 kA / 50 kA</td>
<td>4 kA / 50 kA</td>
<td>4 kA / 50 kA</td>
</tr>
<tr>
<td>Critical current range</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>Design</td>
<td>Cooper, silver plated</td>
<td>Cooper, silver plated</td>
<td>Cooper, silver plated</td>
<td>Cooper, silver plated</td>
</tr>
<tr>
<td>Terminals</td>
<td>Bolt, MB</td>
<td>Bolt, MB</td>
<td>Bolt, MB</td>
<td>Bolt, MB</td>
</tr>
<tr>
<td>Torque</td>
<td>20 Nm max.</td>
<td>20 Nm max.</td>
<td>20 Nm max.</td>
<td>20 Nm max.</td>
</tr>
</tbody>
</table>

**Auxiliary contacts**

- **Number / type**: 1 per position / S826 (Schaltbau snap-action switches, see catalogue D26) or $^2$
- **Contact material**: Silver
- **S826 switching capacity (T = 5 ms)**: 16 A @ 24 V DC; 13.5 A @ 80 V DC; 7 A @ 110 V DC
- **Terminals**: Terminal block, connector or $^2$

**Drive unit**

- **Motor voltage $U_{MA}$**: 24 / 36 / 72 / 110 V DC
- **Control voltage encoder $U_{SE}$**: 24 V DC
- **Tolerance motor and control voltage**: -30 % ... +25 % $U_j$
- **Switching positions**
  - Manual: lever or $^2$
  - Motor gear unit with digital encoder
  - Linear motor unit with digital encoder
- **Change over time**
  - Motor gear unit with digital encoder
  - Linear motor unit with digital encoder
- **Terminals**: Terminal block, connector or $^2$
- **Interlock**: $^4$
  - Key lock switches / square key locks / key multiplier / pad locks / electromagnetic

**Mounting**

- **Mounting**: 4x Screw M10 or $^2$
- **Position**: horizontal, vertical

**Degree of protection**

- **IP00**

**Mechanical endurance**

- **(IEC 60077-2; IEC 60077-2)**: 125,000 operating cycles

**Vibration / Shock**

- **(IEC 61373)**: Category 1, Class B

**Housing**

- **Switching chamber**: Fiberglass reinforced plastic
- **Frame**: Stainless steel or $^2$

**Ambient conditions**

- **Operating temperature**
  - Manual: -50 °C ... +40 °C
  - Motor gear unit/linear motor unit: -40 °C ... +70 °C
- **Storage temperature**
  - Manual: -50 °C ... +70 °C
  - Motor gear unit/linear motor unit: -40 °C ... +85 °C
- **Altitude**
  - Manual: < 2,000 m above sea level
  - Motor gear unit/linear motor unit: < 75 % im yearly average

**Weight**

- **Manual**: approx. 25 kg $^4$
- **Motor gear unit**: approx. 35 kg $^4$
- **Linear motor unit**: approx. 30 kg $^4$

$^1$ Per switching chamber
$^2$ Customer specific / upon request
$^3$ Depending on the number of switching chambers
$^4$ Switchgear with 3 switching chambers, each additional plus approx. 3 kg

Subject to change
**Switching chamber**  Disconnecting, change-over, earthing

- **Disconnecting, change-over**
  Switching chamber with 2 positions and 4 blade contacts

- **Disconnecting, change-over**
  Switching chamber with 4 positions and 3 blade contacts

- **Disconnecting, change-over**
  Switching chamber with 4 positions and 2 blade contacts

- **Disconnecting, earthing**
  Switching chamber with 2 positions and 4 blade contacts for earthing of 3 circuits

- **Disconnecting, change-over, earthing**
  Switching chamber with 4 positions and 3 blade contacts for earthing of 2 circuits

- **Disconnecting, change-over, earthing**
  Switching chamber with 4 positions and 2 blade contacts for earthing of 1 circuit

**Switching chamber**  Earthing

- **Earthing**
  Switching chamber with 4 blade contacts for earthing of 4 circuits

- **Earthing**
  Switching chamber with 3 blade contacts for earthing of 3 circuits

- **Earthing**
  Switching chamber with 2 blade contacts for earthing of 2 circuits

*Shown are example configurations*  
We are happy to realize your required switching configuration. Do not hesitate to contact us. Our aim is to implement your switching function by the optimum number of switching chambers.

*The requested switching configuration will be realized by the:*  
- Number of switching chambers  
- Number of switching positions  
- Number and type of blade contacts  
- Type of actuation

Subject to change
SD/SE/SDE/SCO 03 MA xxx xx  Dimension diagram  SD, SE, SDE, SCO series

- Switchgear with 2 HV switching chambers, manual actuation and HV indicators (LED)

SD/SE/SDE/SCO 03 MG xxx xx  Dimension diagram  SD, SE, SDE, SCO series

- Switchgear with 3 HV switching chambers and motor gear unit
**SD/SE/SDE/SCO 03 ML xxx xx** Dimension diagram

- Switchgear with 3 HV switching chambers and linear motor unit

![Dimension Diagram](image1)

**SD/SE/SDE/SCO 03 MA xxx xx** Dimension diagram

- Switchgear with 1 HV switching chamber, manual actuation and 2 key switches

![Dimension Diagram](image2)
**SE 03 MA xxx xx** Dimension diagram

- Switchgear with 3 HV switching chambers, manual actuation and 5 times key multiplier

- Handle. 250 Nm max.
- High-voltage terminals M8
- HV-A switching chamber
- HV-B switching chamber
- HV-C switching chamber
- 4x mounting for screws M10

**SE 01 MA xxx xx** Dimension diagram

- Switchgear with 1 HV switching chambers, manual actuation

- High-voltage terminals M8
- HV-A switching chamber
- 2x aux. switches feedback switching position
- Earthing terminal M8
- Earthing terminal M6
- 4x mounting for screws M10
Mounting instructions, start up

Subject to change

Mounting instructions

- For connection of the main contacts with a thermal current of 400 A, Schaltbau recommends the use of bus bars or wires with the following dimensioning:
  - Cable cross-section > 200 mm² or
  - bus bars with 25 x 8 mm
- Multipole disconnectors with function of earthing switch: Schaltbau recommends a cross-section of 50 mm² min.
- For earthing of the housing Schaltbau recommends a green-yellow or transparent PE-wire with a minimal cable cross-section of 10 mm²
- The minimum distances to voltage-carrying parts must be observed! The dimension drawings are provided for this purpose. Please refer to our operating manuals.
- Weight of different variants depends on the number of switching chambers – each chamber more/less means higher/lower weight of approx. 3 kg.
- Depth of different variants depends on the number of switching chambers – each chamber more/less means a higher/lower depth of 40 mm.
- Do you need some help? For selecting the disconnector, earthing switch, change-over-switch that suits your application best do not hesitate to ask our advice.

Start up

Before start up make sure that:
- The switch is properly secured to the chassis of car (check if screws are fixed)
- HV wires are properly connected at HV-contacts/terminals
- Low voltage wires are properly connected
- Earthing wires are properly connected to housing of device

Before energize the HV system, check if configuration of HV-contacts and blades accords with HV electrical schema. Use a multimeter!

Due to change

Maintenance instructions

- For detailed maintenance, safety and mounting instructions please refer to our operating manuals!

Safety instructions

- Defective parts must be replaced immediately!
- Do not exceed the current value stated in data sheet
- Do not operate any handling under electrical load
- Before maintenance operation ensure that the devices is completely deenergized
- Use only original spare parts
Electrical Components and Systems for Railway Engineering and Industrial Applications

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
- Enabling switches
- 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