SIEMENS

3TM

Vacuum contactor
7.2 kV - 12 kV

OPERATING INSTRUCTIONS
For your safety

Signal terms and definitions

Hazards are classified in accordance with ISO 3864-2 using the following keywords:

- DANGER, WARNING, or CAUTION, where there is a risk of personal injury
- NOTE, where there is a risk of material damage.

Hazards are classified and indicated in the operating instructions and on the vacuum contactor as follows:

⚠️ **DANGER**

Indicates an imminently hazardous situation.
If the hazard is not avoided, it will result in death or serious injury.

⚠️ **WARNING**

Indicates a potentially hazardous situation.
If the hazardous situation is not avoided, it could result in death or serious injury.

⚠️ **CAUTION**

Indicates a potentially hazardous situation.
If the hazardous situation is not avoided, it could result in minor or moderate injury.

>Note

Indicates a potentially harmful situation.
If the harmful situation is not avoided, the product or an item in its vicinity can sustain damage.

Qualified personnel

For the purpose of these operating instructions or the warning notices on the vacuum contactor, qualified personnel are persons who are familiar with the transport, storage, set-up, assembly, commissioning, operation, and maintenance of the product and who have qualifications relevant to their work, e.g.:

- Training and instruction, or authorisation to energise, de-energise, clear, earth, and tag circuits and devices in accordance with established safety practices.
- Training or instruction in the proper care and use of protective equipment in accordance with established safety practices.
- Training in first aid.

Product liability

>Note

Product liability claims are upheld only if the replacement of the purchased spare parts is performed by personnel that have been trained and certified by Siemens.
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## List of abbreviations

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<tr>
<th>Code</th>
<th>Abbreviation</th>
<th>Full Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANCE</td>
<td>Asociación de Normalización y Certificación, A.C.</td>
<td>(Association for Standardisation and Certification)</td>
</tr>
<tr>
<td>ANSI</td>
<td>American National Standard Institute</td>
<td></td>
</tr>
<tr>
<td>ASL</td>
<td>Sea level</td>
<td></td>
</tr>
<tr>
<td>AWG</td>
<td>American Wire Gauge</td>
<td></td>
</tr>
<tr>
<td>CSA</td>
<td>Canadian Standards Association</td>
<td></td>
</tr>
<tr>
<td>DIN</td>
<td>Deutsches Institut für Normung (German Institute</td>
<td>for Standardisation)</td>
</tr>
<tr>
<td>DIP</td>
<td>Dual in-line package</td>
<td></td>
</tr>
<tr>
<td>DNV GL</td>
<td>Det Norske Veritas AS (DNV) and Germanischer</td>
<td>Lloyd SE (GL)</td>
</tr>
<tr>
<td>EMC</td>
<td>Electromagnetic compatibility</td>
<td></td>
</tr>
<tr>
<td>EN</td>
<td>European standard</td>
<td></td>
</tr>
<tr>
<td>ESD</td>
<td>Electrostatic discharge</td>
<td></td>
</tr>
<tr>
<td>GB</td>
<td>Guobiao (Chinese standard)</td>
<td></td>
</tr>
<tr>
<td>IEC</td>
<td>International Electrotechnical Commission</td>
<td></td>
</tr>
<tr>
<td>MLFB</td>
<td>Maschinenlesbare Fabrikate Nummer (machine-reade</td>
<td>manufacturer number</td>
</tr>
<tr>
<td>NC</td>
<td>NC contact</td>
<td></td>
</tr>
<tr>
<td>NMX</td>
<td>Normas Mexicanas (Mexican standard)</td>
<td></td>
</tr>
<tr>
<td>NO</td>
<td>NO contact</td>
<td></td>
</tr>
<tr>
<td>O</td>
<td>Open</td>
<td></td>
</tr>
<tr>
<td>ops</td>
<td>Operating cycles</td>
<td></td>
</tr>
<tr>
<td>UL</td>
<td>Underwriters Laboratories</td>
<td></td>
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## Other applicable supplements for Operating Instructions 9229 0090

<table>
<thead>
<tr>
<th>Order no.</th>
<th>Title</th>
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<tbody>
<tr>
<td>9229 0091</td>
<td>Important information on unpacking, transporting, and storage</td>
</tr>
<tr>
<td>9229 0092</td>
<td>Removing and installing the electronic controller</td>
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<tr>
<td>9229 0093</td>
<td>Removing and installing shunt release Y1</td>
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<td>9229 0094</td>
<td>Removing and installing the auxiliary switches</td>
</tr>
<tr>
<td>9229 0095</td>
<td>Retrofitting, removing and installing the mechanical closing latching</td>
</tr>
<tr>
<td>9229 0096</td>
<td>Retrofitting, removing and installing the manual unlatching</td>
</tr>
</tbody>
</table>
Transport/storage/packaging

Transport

Transport weight
Refer to the delivery documents for the weight of the transport unit.

Note
Observe stacking height
For transport, no more identical transport units may be stacked on top of each other than indicated on the transport unit.
Observe loads specified on the transport unit.

Note
Secure load
For transport, secure the load in such a way that the transport unit is not at risk.

After receipt of delivery:

• Check the transport unit for damage.
• Major damage must be documented photographically.
• Ensure that any damage to the transport unit is confirmed by the transport company in writing.

Scope of delivery
Delivery includes:
• 3TM vacuum contactor
• Operating Instructions
• Device-specific circuit diagrams
• Connector (accessory pack)

Unpacking

Working equipment
Required tools:
- Knife/scissors.

Opening the transport unit
• Place the transport unit on a level, non-slip, and pressure-resistant surface.
• Open the box.

Note
Do not use the vacuum contactor if parts are broken, i.e. if you find cracks, flaking, bent metal parts, damaged plug-in contacts, tears, or bare cables.
Send it back in its original transport unit (see "Reuse of transport unit", page 6).
• Check that the delivery is complete.
• Check the vacuum contactor for damage.

Note
Transporting the vacuum contactor
Transporting the vacuum contactor by holding and lifting the auxiliary switches on the sides (23) leads to material damage.
Only transport the vacuum contactor by holding it under the operating mechanism box (34), the base plate (2), or the pole shells (7).
**Transport to the installation site**

Remove the accessory pack and store it safely in the packaging for later installation.

Due to the low weight, no lifting eyes are provided. The vacuum contactor can be lifted and transported without tools.

The fastening eyelets (*) can be used for lifting with a crane. Watch for shifting weight!

Lift the vacuum contactor out of the box by the provided points:
- Fastening eyelets (*)
- Base plate (2)
- Pole shell (7)
- Operating mechanism box (34)

**Reuse of transport unit**

**Reusing the transport unit**

The box and the filler materials can be reused if the vacuum contactor is to be transported again.

- Pack the vacuum contactor in reverse order.
- Close the box.
Storage

Note
During transport and storage, the vacuum contactor must be in the following condition:
- OPEN switch position
- Unlatched condition (only if unlatching is available).

Note
Risk of corrosion damage if stored improperly!
The vacuum contactor can be stored for up to a year in its transport unit if the storage conditions listed below are met.
If the storage conditions are not met, the vacuum contactor cannot be stored any longer than 6 months in the transport unit.
If storage of longer than one year is planned, unpack the vacuum contactor from the transport unit. Further storage must ensure that the vacuum contactor cannot be damaged.

<table>
<thead>
<tr>
<th>Storage room</th>
<th>Transport unit</th>
<th>Storage time</th>
<th>Temperature range</th>
<th>Class ¹)</th>
<th>Number of units per stack</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enclosed, dry, well ventilated, and as free from dust as possible, with a relative humidity of less than 95 %</td>
<td>Unopened</td>
<td>Max. 6 months</td>
<td>-40 °C to +70 °C</td>
<td>2K4</td>
<td>Max. 3</td>
</tr>
<tr>
<td></td>
<td>Unopened</td>
<td>Max. 1 year</td>
<td>-5 °C to +40 °C</td>
<td>2K4</td>
<td>Max. 3</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>Over 1 year ²)</td>
<td>-25 °C to +70 °C</td>
<td>2K4</td>
<td>0</td>
</tr>
</tbody>
</table>

¹) as per IEC 60721 Part 3-3

²) In the storage conditions given above, the capacitors must be reformed after one year. To do so, apply voltage via terminal A1/A2 of the electronic controller for at least 20 minutes.
WARNING

**Dangerous electrical voltage and mechanical movements**

When electrical devices are operated, certain parts are inevitably live under dangerous voltage, and mechanical parts may move very quickly, also when remotely controlled.

If the warning notices are not observed, serious injury or material damage may be the result.

Only personnel with the relevant qualifications may work on or in the vicinity of this device. These personnel must be familiar with all warnings and servicing activities specified in these operating instructions.

CAUTION

**Material damage caused by electrostatic discharge to the electronic controller**

Electrostatic discharge can cause material damage to the electronic controller and restrict its functionality.

To prevent damage to electronic components, discharge any existing electrostatic charges on hands or tools by touching grounded surfaces prior to touching electronic components and before removing the connector plugs.

Note

In the event of subsequent attachments or fittings, e.g. locking parts in connection with switchgear, ensure that

- fast moving parts are not additionally loaded with masses or forces and
- additional parts have sufficient clearance, in particular, from moving and live parts.

If the vacuum contactor is to be equipped with additional functions by the customer, we recommend consulting the factory, since tried and tested solutions are frequently available.
General information

Area of application
Vacuum contactors 3TM are 3-pole switching devices with an electromagnetic operating mechanism for high switching capacity and a rated voltage range from 7.2 kV to 12 kV.

Applications
Vacuum contactors 3TM comply with the protection class IP00 (stationary, weather-protected operation) as per EN 60529 and can be used
- with circuit breakers and fuses,
- for ambient temperatures from -40 °C to +70 °C,
- at various altitudes ranging from -1250 m to 5000 m ASL,
- for high mechanical vibrations or
- for use in seismic zones,
- on ships below deck,
- on open pit or mining equipment,
- in stationary or moving rail operation.

The technical data are affected by ambient conditions, installation position, and installation volume.

Function
Operational currents and overload currents are switched by the vacuum contactor. 3TM vacuum contactors operate in continuous, periodic, and short-term operation. Suitable for high frequency of operation and unlimited on-time.

Intended use
Vacuum contactors 3TM are suitable for switching any type of alternating current circuits under normal operating conditions, such as:
- Three-phase motors for reversing, turning, and direct operation,
- Transformers
- Capacitors, also back to back,
- Resistor consumers.

The vacuum contactor can be mounted:
- as a fixed installation (with busbars or cables with cable lugs),
- on a withdrawable part, or
- on a carriage.

Standards
Vacuum contactors 3TM comply with the following standards:
- IEC/DIN EN 62271-1 High-voltage switchgear and controlgear – Part 1: Common specifications
- IEC/DIN EN 62271-106 High-voltage switchgear and controlgear – Part 106: Contactors and controllers
- IEC/DIN EN 62271-200 High-voltage switchgear and controlgear – Part 200: AC metal-enclosed switchgear and controlgear
- GB/T14808 High voltage alternating current contactors and contactor-based motor-starters
- ANSI American National Standard (ANSI), harmonized ANCE, CSA, and UL Standard for medium-voltage ac contactors, controllers, and control centres
- UL 347 Medium-Voltage AC Contactors, Controllers, and Control Centers
- CSA C22.2 No. 253-09 Medium-Voltage AC Contactors, Controllers, and Control Centers
- NMX-J-564/106-ANCE Medium-Voltage AC Contactors, Controllers, and Control Centers
- IEC 61000-4 Electromagnetic compatibility (EMC)
- IEC 61000-6 Parasitic x-ray emittance and interference voltage
- IEC 60068 Environmental test procedures
- DNV GL Det Norske Veritas AS (DNV) and Germanischer Lloyd SE (GL) - Rules for Classification and Construction Ship Technology
**Type approval as per the German X-Ray Ordinance**
The vacuum interrupters installed in the switching devices are type-approved as sources of interference radiation according to § 8 of the German X-Ray Ordinance and they meet the requirements for sources of parasitic X-ray emitters according to Annex 2 No. 5 of the current German X-Ray Ordinance up to the rated voltage defined in the approval certificate.

Vacuum interrupters with the type identifier can be operated by the owner of the switchgear without licensing or notification. Keep a printed copy of the certificate in a suitable central location.

**Type approval as per UL**
The switching devices, installed materials and components are tested as per standard UL 347 and CSA C22.2 No. 253-09 and comply with the requirements.
Documentation via certificate no. E107759

**Type approval as per DNV GL**
The switching devices, installed materials and components are tested as per standard DNV GL, Rules for Classification and Construction Ship Technology, and comply with the requirements.
Documentation via certificate no. TAE00001N0

**Type approval as per GOST**
The switching devices comply with the specifications as per standard GOST P525565-2006 and GOST 1516.3-96.
Documentation via certificate no. 0060416
Design
The vacuum contactor is a 3-pole switching device consisting of:
- the high-voltage section with vacuum interrupters, customer terminals and position indicator on the front side,
- the low-voltage section with the solenoid actuator
- the electronic controller for the solenoid actuator and shunt release
- the auxiliary switches (freely accessible from the side).

Optionally available:
- Mechanical closing latching with shunt release Y1
- Manual unlatching (emergency stop) via push rod or draw bar.

Fig. 2 Front view - high-voltage side
Fig. 3 Rear view - mounting side

2 Base plate (mounting)
3 Vacuum interrupter
4 Upper terminal
5 Lower terminal
6 Position indicator (OPEN-CLOSED)
7 Pole shell
8 Rating plate
12 Push rod for manual unlatching (optional)
14 Unlatching (emergency stop), manual (optional)
17 Cover of manual unlatching
23 Auxiliary switch
24 Electronic controller
25 Cover of electronic controller
31 Operating mechanism lever
Fig. 4  Sectional view with mechanical closing latching with shunt release Y1 and manual unlatching - CLOSED switch position

2 Base plate (mounting)
3 Vacuum interrupter
4 Upper terminal
5 Lower terminal
7 Pole shell
9 Mechanical closing latching with shunt release Y1 (optional)
10 Cover for closing latching (optional)
11 Shunt release Y1 (optional)
12 Push rod for manual unlatching (optional)
14 Unlatching (emergency stop), manual (optional)
15 Draw bar for manual unlatching (optional)
21 Connector for supply voltage A1/A2
24 Electronic controller
25 Cover of electronic controller
30 Operating mechanism solenoid
31 Operating mechanism lever
**Installation position**

Observe the distances as per IEC 60071 insulation coordination or comply with the required air distances according to the national operational requirements.

- Front side: High-voltage section with protection class IP00.
- Rear side: Low-voltage section with protection class IP20.

**Installation position**

The vacuum contactor 3TM can be installed in four positions.

1) Wall mounting, vertical
2) Supine position, horizontal
3) Wall mounting, vertical, rotated 180°
4) Suspended, with reduced parameters (after consultation with manufacturer)

*) Observe distance to high-voltage and grounded components!

**Fig. 5 Installation position**

**High-voltage section**

The high-voltage section consists of individual, autonomous pole shells, which can receive the correspondingly dimensioned vacuum interrupters. This makes variable distances between the pole centres possible (120 mm and 150 mm).

**Solenoid actuator**

The vacuum interrupters are actuated by a common solenoid actuator. This solenoid actuator has a very low holding capacity in continuous operation. The vacuum interrupters work synchronously in the same direction.

The solenoid actuator and the shunt release of the vacuum contactor 3TM can be actuated with AC or DC.

Vacuum contactors 3TM work according to a defined closing and opening time, which can be configured and extended by an additional closing and opening delay. Both delay values are independent of each other and are added to the closing and opening times.

**Electronic controller**

The electronic controller controls the supply of energy to the solenoid actuator on closing. The closing current is controlled to a specified level. The current is switched to the holding current after a specified time. The holding current reduces the vacuum contactor’s energy supply during operation.

The voltage supply of the magnetic unlatching is not affected. The customer is to deal with the signal control. The maximum signal duration is to be observed, since the shunt release solenoid only has a limited continuous current strength of 500 ms.

The inrush current (peak) is dependent on the control voltage.

**Control voltage terminals**

The electronic controller has terminals for the following:

- the control voltage A1/A2,
  as well as independent thereof
- the supply voltage for the magnetic unlatching E1/E2 (optional).
The electronic controller also allows the configuration of additional closing and opening delays. If no configuration is selected, only the natural closing and opening time of the switching device is active. Configuration is done via a 6-pin DIP switch S2 on the electronics assembly (matrix, see Chapter “Configuring the controller”, p. 48).

**Auxiliary switch**

The auxiliary switches are mounted on the side of the operating mechanism box and are not wired. The wiring is carried out on the customer’s premises using screw terminals.

**Mechanical closing latching**

(Applies only to vacuum contactors with closing latching)

When the vacuum contactor is closed, the mechanical closing latching is activated. The solenoid actuator is held and automatically separated from the voltage supply once the latching position is reached.

Switching in the de-energised holding mode (control voltage circuit A1/A2) is carried out automatically via the electronic controller.
Electromagnetic unlatching and manual unlatching

Unlatching is done via:
- Electromagnetic unlatching, remote-controlled
- Manual unlatching via push rod or draw bar.

The remote tripping is carried out via the electromagnetic shunt release Y1 (9). If manual unlatching (emergency-stop) via the push rod or draw bar is not available, the shunt release Y1 can be carefully manually actuated from the rear side of the vacuum contactor in a de-energised state and for test purposes (see details in Fig. 8).

Manually operated unlatching (emergency-stop) is performed with a push rod or draw bar (12, 15) with approx. 30 N. The customer is to mount M4 threaded rods for the push rod or draw bar with fitting end pieces or other suitable terminators. Tightening torque 3 ±0.5 Nm.

Subsequent ordering

If no latching or unlatching is available but is planned for backfit, the following modules can be subsequently ordered and mounted:
- Mechanical closing latching with shunt release Y1
- Manually operated unlatching mechanical system (emergency-stop) with push rod or draw bar

See chapter “Mounting the mechanical closing latching (optional) and manual unlatching (optional)”, p. 35.

A description of the installation is only supplied with the operating instructions of the retrofit kit.

Rating plate

| a | Manufacturer |
| b | Type designation |
| c | Classification according to the IEC standard |
| d | Classification according to the UL standard |
| e | Classification according to further standard |
| f | DNV GL Certificate |
| g | MLFB, as on the order |
| h | Special versions and additional equipment |
| i | Factory number, as on the order |
| j | Rated voltage $U_r$ |
| k | Rated lightning impulse withstand voltage $U_{p}$ |
| l | Rated short-duration power frequency withstand voltage $U_{d}$ |
| m | Rated frequency $f_r$ |
| n | Rated switching current $I_e$ for utilisation categories AC-1 to AC-4 |
| o | Rated short-circuit breaking current $I_{sc}$ |
| p | Rated supply voltage $U_a$ |
| q | Rated short-circuit breaking current $I_{sc}$ |
| r | Thermal current $I_{th}$ |
| s | Additional closing delay $t_c$ |
| t | Additional opening delay $t_o$ |
| u | Unlatching voltage $U'$ |
| v | Altitude above sea level $h$ |
| w | Mechanical stress, values given for vibrations and shock |
| x | Weight $m$ |
| y | Date of manufacture $y$ |

Fig. 9 Example - rating plate for vacuum contactor 3TM

9229 0090 176 0A
2017-12-07
### Technical data

#### Electrical data

<table>
<thead>
<tr>
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<th>3TM</th>
<th>3121</th>
<th>3231</th>
<th>3331</th>
<th>3431</th>
<th>3531</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage $U_r$</td>
<td>kV</td>
<td>7.2</td>
<td>7.2</td>
<td>7.2</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Rated frequency $f_r$</td>
<td>Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50-60</td>
</tr>
<tr>
<td>Rated operating current $I_o$ (at ambient temperatures ranging from -40 °C to +70 °C)</td>
<td>A</td>
<td>400</td>
<td>450</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermal current $I_{th,*}$</td>
<td>A</td>
<td>315</td>
<td>450</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage $U_p$</td>
<td>kV</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>Rated short-duration power frequency withstand voltage $U_d$</td>
<td>kV</td>
<td>20</td>
<td>20</td>
<td>32</td>
<td>28**</td>
<td>42</td>
</tr>
</tbody>
</table>

***) Depending on ambient conditions and temperature

***) 29 kV for UL

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#### Mechanical data

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<th>3231</th>
<th>3331</th>
<th>3431</th>
<th>3531</th>
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</thead>
<tbody>
<tr>
<td>Maximum mechanical switching frequency, without latching and unlatching</td>
<td>ops/h</td>
<td>1,200</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical service life, without latching and unlatching in an ambient temperature range</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>from -5 °C to +55 °C</td>
<td>ops</td>
<td>0.25 million</td>
<td>1 million</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>from +55 °C to +70 °C</td>
<td>ops</td>
<td>0.1 million</td>
<td>0.25 million</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>from -25 °C to -5 °C</td>
<td>ops</td>
<td>0.1 million</td>
<td>0.25 million</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical service life with latching and unlatching</td>
<td>ops</td>
<td>200,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>kg</td>
<td>20 to 25</td>
<td></td>
<td></td>
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</tr>
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#### Solenoid actuator

<table>
<thead>
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<th>3431</th>
<th>3531</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated supply voltage $U_a$ (-20 % to +10 %)</td>
<td>V</td>
<td>110 V DC/AC to 125 V DC/AC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start-up power loss, maximum (for 10 ms per closing) at a stable power supply (without voltage reductions due to overload)</td>
<td>(VA)</td>
<td>1400</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start-up power loss, average (100 ms per closing)</td>
<td>(VA)</td>
<td>700</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holding mode power loss</td>
<td>(VA)</td>
<td>10 to 20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On-time (standard)*1 and at -40 °C to +55 °C</td>
<td>ms</td>
<td>46 ±10 at 1.0 x $U_a$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On-time (standard) +70 °C</td>
<td>ms</td>
<td>40 ±10 at 1.0 x $U_a$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optional additional adjustable on-time delay*, additional closing delay</td>
<td>ms</td>
<td>50 ±10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off-time (without latching mounted)</td>
<td>ms</td>
<td>35 ±10 at 1.0 x $U_a$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off-time (without latching mounted) at -40 °C</td>
<td>ms</td>
<td>45 ±10 at 1.0 x $U_a$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off-time (without latching mounted) at +70 °C</td>
<td>ms</td>
<td>30 ±10 at 1.0 x $U_a$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optional additional off-time delay*, additional opening delay</td>
<td>ms</td>
<td>65 ±10, 115 ±10, 170 ±10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On-time with latching system</td>
<td>ms</td>
<td>46 ±10 at 1.0 x $U_a$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Off-time, disconnection time (with the electrical or mechanical trigger) | ms | 30 ±10 at 1.0 x $U_a$

Fig. 12   Rated data of solenoid actuator

<table>
<thead>
<tr>
<th>Latching and unlatching</th>
<th>3TM</th>
<th>3121</th>
<th>3231</th>
<th>3331</th>
<th>3431</th>
<th>3531</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated release voltage $U_a$ (-20 % to +10 %)</td>
<td>V</td>
<td>24 V DC to 60 V DC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>V</td>
<td>110 V DC/AC to 125 V DC/AC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>V</td>
<td>220 V DC/AC to 240 V DC/AC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power loss of the shunt release</td>
<td>(VA)</td>
<td>160</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Required signal duration (for release signal)</td>
<td>ms</td>
<td>100 to 500</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 13   Rated data for latching and unlatching

<table>
<thead>
<tr>
<th>Auxiliary switch</th>
<th>3TM</th>
<th>3121</th>
<th>3231</th>
<th>3331</th>
<th>3431</th>
<th>3531</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection class on the front side</td>
<td></td>
<td>IP 20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated insulation level at pollution degree 3</td>
<td>V</td>
<td>690</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated short-duration power frequency withstand voltage $U_d$</td>
<td>kV</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated operating current $I_e$ at rated voltage $U_r$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utilisation category AC 12 for alternating current</td>
<td>AC 24 V</td>
<td>A</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC 230 V</td>
<td>A</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utilisation category AC 14 for alternating current</td>
<td>AC 125 V</td>
<td>A</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utilisation category AC 15 for alternating current</td>
<td>AC 24 V</td>
<td>A</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC 230 V</td>
<td>A</td>
<td>5.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC 400 V</td>
<td>A</td>
<td>3.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utilisation category DC 13 for direct current</td>
<td>DC 24 V</td>
<td>A</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DC 60 V</td>
<td>A</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DC 110 V</td>
<td>A</td>
<td>1.14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DC 220 V</td>
<td>A</td>
<td>0.48</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminal cross-sections of auxiliary switches as per IEC EN 60947-5-1</td>
<td>mm$^2$</td>
<td>2 x (0.5 to 1.0), 2 x (0.75 to 2.5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>for AWG terminals</td>
<td>AWG</td>
<td>2 x (18 to 12)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 14   Rated data for auxiliary switches
Vacuum contactors are suitable for use in the following climate classes according to IEC 60721:

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3K41)</td>
<td>Peak value of the 24-hour mean: +75 °C</td>
</tr>
<tr>
<td>3K8H2)</td>
<td>to -40 °C</td>
</tr>
<tr>
<td>3B1</td>
<td>Without occurrence of salt fog and simultaneous condensation</td>
</tr>
<tr>
<td>3M3</td>
<td>Restriction: Clean insulation parts</td>
</tr>
<tr>
<td>3C23)</td>
<td>Max. per day</td>
</tr>
<tr>
<td>3S24)</td>
<td>Max. per month</td>
</tr>
</tbody>
</table>

*) see also "Mechanical data", Fig. 11
Installation altitudes

**Note**
The installation altitude for the vacuum contactor is set at the factory according to the ordering option.

As standard, 3TM vacuum contactors can be used at -1250 m to +2000 m. For higher operation heights, a configuration from 2000 m to 5000 m can be ordered.

**Insulation capacity**
The insulation capacity of insulation in air declines with rising altitude due to the lower air density. As per IEC 62271-102, the rated lightning impulse voltage values given in Fig. 11 are valid up to an installation altitude of 1000 m above sea level.

Above an altitude of 1000 m, the insulation level must be corrected as shown in Fig. 16:

\[
U \geq U_0 \cdot K_a
\]

- **U** Rated withstand voltage U under standard reference atmosphere
- **U_0** required rated withstand voltage for the installation location
- **K_a** Altitude correction factor

\[
K_a = e^{m \cdot (H - 1000)/8150}
\]

Calculating the altitude correction factor \(K_a\):

\[
H = \text{Installation altitude in metres}
\]

\[
m = 1 \text{ for AC voltage, lighting impulse voltage (between phases, phase-to-earth, applied longitudinally)}
\]

**Example**
For a required rated withstand voltage of 75 kV at an altitude of 2,500 m, an insulation level of at least 90 kV under standard reference atmosphere conditions is required:

\[
90 \text{ kV} \geq 75 \text{ kV} \cdot e^1 \cdot (2500 - 1000)/8150
\]

\[
= 75 \text{ kV} \cdot 1.2
\]
**Description**

**Dimensional drawings**

**Fig. 17** Example - Distance between pole centres 120 mm, with auxiliary switches 4NO + 4NC

**Fig. 18** Example - Distance between pole centres 150 mm, with auxiliary switches 4NO + 4NC

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>Rated current</th>
<th>Distance of the terminals</th>
<th>Distance between pole centres</th>
<th>Height</th>
<th>Width</th>
<th>Depth</th>
<th>Distance of the mounting holes</th>
<th>Width of the base plate</th>
<th>Threads in the upper and lower terminals</th>
<th>Mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.2 kV - 12 kV</td>
<td>450 A</td>
<td>210</td>
<td>120</td>
<td>310</td>
<td>340</td>
<td>280</td>
<td>256</td>
<td>250</td>
<td>M10</td>
<td>20-22</td>
</tr>
<tr>
<td>7.2 kV - 12 kV</td>
<td>450 A</td>
<td>210</td>
<td>150</td>
<td>310</td>
<td>400</td>
<td>280</td>
<td>256</td>
<td>250</td>
<td>M10</td>
<td>23-25</td>
</tr>
</tbody>
</table>

*) with 4NC and 4NO

**Fig. 19** Rated data of 3TM vacuum contactor, with auxiliary switches 4NO + 4NC
*Fig. 20  Example - Distance between pole centres 120 mm, with auxiliary switches 6NO + 6NC

*Fig. 21  Example - Distance between pole centres 150 mm, with auxiliary switches 6NO + 6NC

<table>
<thead>
<tr>
<th>Rated voltage $U_r$</th>
<th>Rated current</th>
<th>Distance of the terminals</th>
<th>Distance between pole centres</th>
<th>Height</th>
<th>Width$^1$</th>
<th>Depth</th>
<th>Distance of the mounting holes</th>
<th>Width of the base plate</th>
<th>Threads in the upper and lower terminals</th>
<th>Mass $\text{kg}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.2 kV - 12 kV</td>
<td>450 A</td>
<td>mm</td>
<td>210</td>
<td>120</td>
<td>310</td>
<td>362</td>
<td>280</td>
<td>256</td>
<td>250</td>
<td>M10</td>
</tr>
<tr>
<td>7.2 kV - 12 kV</td>
<td>450 A</td>
<td>mm</td>
<td>210</td>
<td>150</td>
<td>310</td>
<td>422</td>
<td>280</td>
<td>256</td>
<td>250</td>
<td>M10</td>
</tr>
</tbody>
</table>

$^1$ with 6NC and 6NO

*Fig. 22  Rated data of 3TM vacuum contactor, with auxiliary switches 6NO + 6NC
Circuit diagrams

Fig. 23  Example 110 V to 125 V, with auxiliary switches 4NO + 4NC - without closing latch

Only terminals A1 and A2 are to be used. Terminals E1 and E2 are available, but not assigned (de-energised).

Colours of insulating sleeves of connector plugs
-X7.1 red  -X7.2 yellow
-X5.1 black  -X5.2 white
Fig. 24  Example 110 V to 125 V, with auxiliary switches 4NO + 4NC - with mechanical closing latching and shunt release Y1

Terminals E1 and E2 are assigned independent of A1 and A2.
Fig. 25 Example 220 V to 240 V, with auxiliary switches 4NO + 4NC - without closing latch

Only terminals A1 and A2 are to be used. Terminals E1 and E2 are available, but not assigned (de-energised).

Colours of insulating sleeves of connector plugs
-X7.1 red
-X6.1 black
-X6.2 yellow
-X5.2 white
Fig. 26  Example 220 V to 240 V, with auxiliary switches 4NO + 4NC - with mechanical closing latching and shunt release Y1

Terminals E1 and E2 are assigned independent of A1 and A2.

Colours of insulating sleeves of connector plugs
- X7.1 red
- X6.1 black
- X6.2 yellow
- X5.2 white
Fig. 27 Example 110 V to 125 V, with auxiliary switches 6NO + 6NC - without closing latch

Only terminals A1 and A2 are to be used. Terminals E1 and E2 are available, but not assigned (de-energised).

COLOURS OF INSULATING SLEEVES OF CONNECTOR PLUGS

-X7.1 red
-X7.2 yellow
-X5.1 black
-X5.2 white
Fig. 28 Example 110 V to 125 V, with auxiliary switches 6NO + 6NC - with mechanical closing latching and shunt release Y1

Terminals E1 and E2 are assigned independent of A1 and A2.

Colours of insulating sleeves of connector plugs:
- X7.1 red
- X7.2 yellow
- X5.1 black
- X5.2 white
Only terminals A1 and A2 are to be used. Terminals E1 and E2 are available, but not assigned (de-energised).

Colours of insulating sleeves of connector plugs

- X7.1 red
- X6.1 black
- X6.2 yellow
- X5.2 white
Fig. 30  Example 220 V to 240 V, with auxiliary switches 6NO + 6NC - with mechanical closing latching and shunt release Y1

Terminals E1 and E2 are assigned independent of A1 and A2.
**DANGER**

Risk of injury!
- Do not touch live parts!
- When work is performed on the switchgear, the switchgear must be de-energised and earthed!
- The work described in the following sections must only be performed when the switchgear has been de-energised:
  - Take safety measures to prevent it from being switched back on!
  - Observe industrial safety regulations!
  - Ensure that the vacuum contactor is mounted and commissioned only by qualified personnel who are familiar with the operating instructions and observe the warning notices.

**Installation**

**CAUTION**

Inadequate ventilation leads to material damage.
The customer is to ensure there is adequate ventilation in the installation space or in the switch cabinet (see "Installation position", p. 15).

**Note**

Transporting the vacuum contactor

Transporting the vacuum contactor by holding and lifting the auxiliary switches on the sides leads to material damage.

Only transport the vacuum contactor by holding it under the operating mechanism box, the base plate, or the pole shells (see "Transport to the installation site", Fig. 1).

**Note**

Attaching the vacuum contactor

Attaching the vacuum contactor with shear, tensile, or compressive stresses can lead to material damage.

Attach the vacuum contactor by the specified mounting points without shear, tensile, or compressive stresses.
Due to the special shape of the mounting holes on the 3TM vacuum contactor, it is possible to position it safely on loose, pre-assembled screws.

Mount the 3TM vacuum contactor tension-free and torsion-free at the four specified mounting points (*) on a frame, wall, or on a withdrawable part.

Mounting screws M10, strength 8.8, tightening torque 48 Nm

Earthing

Connect the earthing conductor on the earthing terminal (22) to the high-voltage protective earth as specified (DIN EN 50341).

Mount the contact washer (SN 70093), ring cable lug of the earthing conductor and washer with the hexagonal bolt M12 (see Fig. 32) on the earthing terminal (22) and tighten to 105 Nm.

If the vacuum contactor is installed into an earthed metal frame and is connected so it is permanently electrically conductive, no separate earthing is required.

In this case, place contact washers (SN 70093) under the screw heads when fastening the vacuum contactor.
Mounting the mechanical closing latching (optional) and manual unlatching (optional)

If the 3TM vacuum contactor is prepared for backfit, the mechanical closing latching with shunt release Y1 and manual unlatching can be mounted in accordance with the supplied assembly drawing.

9 Mechanical closing latching with shunt release Y1  
11 Shunt release Y1  
12 Push rod for manual unlatching  
13 Coupling point for customer connection  
14 Manual unlatching, mechanism  
15 Draw bar for manual unlatching

Connecting the low voltage

Wiring the auxiliary switches

Connect the low-voltage connecting cables in the customer's switch cabinet in such a way that safe operation as per supplied circuit diagram is guaranteed.

The auxiliary switches (23) are not wired in the as-delivered condition.

The connecting cables are to be mounted by the customer as a flexible flex with wire end ferrules. Cross-sections can be found in the supplied data sheet (see also "Rated data for auxiliary switches", Fig. 14, p. 19).

Fig. 33 Mounted mechanical closing latching and manual unlatching  
Fig. 34 Mounted manual unlatching with draw bar or push rod (view, vacuum contactor in horizontal orientation)

Fig. 35 Auxiliary switch without wiring, as-delivered condition
Installation

Removing the side plate

- Remove the screws on the side plate (33) and remove the side plate (see Fig. 36).

Mounting the side plate

- Connect the auxiliary switch (23) in accordance with the circuit diagram.
- If present, remove the label from the switching lever (45).
- Insert a screwdriver in the recess (*) in the switching lever (45) for the auxiliary switch (23).
- Position the side plate (33) and move the switching lever (45) with the screwdriver so that the switching lever (45) fits easily in the opening in the cam (44) (see Fig. 37).
- Securely screw on the side plate (33).
- The correct position is achieved when the switching lever (45) can only be moved slightly back and forth.

If the switching lever (45) can be moved far in one direction after installation, the switching lever (45) is not inserted in the cam (44) and the above steps must be repeated.

Wiring the connectors for the electronic controller

The electronic controller (24) for the vacuum contactor is the interface to the customer-side connection. Protection with appropriate fuses is performed by the customer. Use the respective 2-pole plug or screw connectors supplied in the accessory pack according to the supplied circuit diagram.

**Note**

Connectors for A1/A2 and E1/E2 can become loose through repeated disconnection.
When installing a new vacuum contactor, use only the new connectors provided in the accessory pack and rewire.

To protect against the effects of oscillations and vibrations, the connectors are wired (see also Fig. 38 and Fig. 39):
• without shear, tensile, or compressive stresses
• without exceeding the permissible connector cross-sections
• under consideration of the potential voltage drops due to long cables
• with cables routed in an S configuration
• using suitable fastening elements to secure the cables

If long cables are necessary for control circuits, malfunctions can occur on closing or opening under certain conditions. The maximum allowable single cable length $l_{\text{all}}$ can be calculated based on the following formula:

$$l_{\text{all}} = \frac{5 \cdot U_S^2 \cdot u_{SL}}{R_{SL} \cdot P_{\text{close}} \cdot \cos \phi_{close}}$$

for direct current

for alternating current

Where:
- $U_S$ is the rated control voltage in V
- $R_{SL}$ is the ohmic resistance per conductor and km of control cable in $\Omega/km$
- $u_{SL}$ is the voltage drop along control cable in $%$
- $P_{\text{close}}$ is the contactor inrush current in VA/W
- $\cos \phi_{close}$ is the power factor of contactor solenoid on closing

Fig. 38 Terminals of the electronic controller

Fig. 39 Optimum cable routing and securing

16  Connector for latching E1/E2
21  Connector for supply voltage A1/A2
24  Electronic controller
25  Cover of the electronic controller
Functional check with applied low voltage

When low voltage is applied, the release, closing, and opening of the vacuum contactor can be checked.

**DANGER**

Danger to life – high voltage!
Closing without safety precautions can result in death or serious injury. Test the vacuum contactor in the switchbay with high voltage applied only after faultless functioning has been ascertained (see "Commissioning", p. 29).

Electrical connection of the prime conductor
Connection variants:
- Busbars
- Power cable with cable lug
- RCA connectors

**Note**
Clean the cable lugs or busbars and grease with Vaseline prior to installation.

**Note**
The contact surfaces of the terminals must not be damaged

Upper and lower terminals
Observe the use of M10 threads and screw-in depths of 17 mm
Tightening torque 35 Nm
For installation dimensions, see “Dimensional drawings”, p. 22.
**Preparing contact surfaces**

**Note**

Clean silver-plated contact areas with a cloth; do not brush.
Different connection materials (Al/Cu) must not be cleaned with the same cleaning tools.
Silver-plated parts must not be bolted to aluminium bars!

Use a steel brush to carefully brush (cross-wise) the contact surfaces of the cable lugs or busbars until they are metallic bright and wipe off any residue using a clean cloth.

After cleaning, very lightly grease the bare contact surfaces with acid-free Vaseline (e.g. Shell-Vaseline 8420) and screw together immediately.

![Fig. 42 Cleaning the contact surfaces of the poles](image1)

![Fig. 43 Cleaning the contact surfaces of the busbars](image2)
Installation

Mounting the busbars
Adjust the busbars in such a way that, before fastening, they lie flat easily and fit the holes on the contact surfaces of the upper and lower terminal.

Fig. 44 Busbars mounted at an angle
Fig. 45 Busbars mounted in a straight position

Corresponding to the rated current strength, use M10 screws and nuts - strength class 8.8 - and the appropriate spring elements and washers for connection of the busbars.

- Tightening torque M10: 48 ±4 Nm
- Tightening torques apply to greased threads only.

Attach the busbars or flexible braid tension-free and torsion-free to the upper and lower terminals.

Further steps for connecting the prime conductors are not described herein and are performed by the customer.
Operation

DANGER

Danger to life due to electric shock!

Electric shock can result in death, serious injury, or considerable material damage.
- Do not touch live parts!
- Ensure that the vacuum contactor is operated only by qualified personnel who are familiar with the operating instructions and observe the warning notices!
- Check through all of the items on the checklist and ensure correct functioning before commissioning!

Commissioning

Dielectric tests

To test the vacuum contactor in a state without supply and control voltage, it is necessary to short-circuit and earth the terminals for supply and control voltage A1/A2 and, if applicable, E1/E2 for the supply voltage for magnetic unlatching.

Subsequently the following tests can be performed:
- Dielectric test of the main circuit as per DIN EN 62271-1 (Chapter 7.1.) and
- Dielectric test of the auxiliary and control circuits as per DIN EN 62271-1 (Chapter 7.2.4.).

Before commissioning, check the following points to ensure that the vacuum contactor is functioning faultlessly.

<table>
<thead>
<tr>
<th>Checklist</th>
<th>✓</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the information on the rating plate match the order data (see p. 17)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ensure correct operating voltage.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check the control feed voltage and the performance data of the low-voltage network are correct.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If necessary, clean the vacuum contactor (details on this in section “Cleaning” on p. 45).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check that a stable supply voltage is applied with a short-time load exceeding 1.7 kW, otherwise the switching device will not reach the closing position or reach it with a delay.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If necessary, check the functionality of the manual unlatching (EMERGENCY STOP) in conjunction with the switch cabinet door.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check that screw connections are tightened securely.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check the plug connections for a firm seat.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check the functioning of the auxiliary switches.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If necessary, check and adjust the customer's devices.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If the DIP switch setting has been changed by the customer:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check the correct setting of the DIP switch on the electronic controller (see p. 48).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check changed MLFB entries on the rating plate.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Continued on the next page
Operation

<table>
<thead>
<tr>
<th>Checklist</th>
<th>✓</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check the unlatching. If manual unlatching (emergency-stop) via the push rod or draw bar is not available, the shunt release (-Y1) can be manually actuated in a de-energised state and for test purposes (see Fig. 8 on p. 16).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test the electric switching repeatedly before the vacuum contactor is put into operation in the network.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

⚠️ WARNING

Do not commission the vacuum contactor if there are malfunctions.

If the malfunctions or damage cannot be remedied, contact a sales representative or Siemens Service and, if necessary, send back the vacuum contactor in the original packaging.

Troubleshooting

<table>
<thead>
<tr>
<th>Incident</th>
<th>Troubleshooting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacuum contactor does not respond</td>
<td>• Check the DIP switch S2 position and reset if necessary (see matrix Fig. 52).</td>
</tr>
<tr>
<td>Closing is blocked</td>
<td>• Send it back to the manufacturer 1).</td>
</tr>
<tr>
<td>Failure of the control voltage $U_a$</td>
<td>• Check the connectors on the electronic controller for a firm seat.</td>
</tr>
<tr>
<td></td>
<td>• Check the cable connection to the connectors.</td>
</tr>
<tr>
<td></td>
<td>• If a new vacuum contactor is installed, use only the connectors provided in the accessory pack (see p. 36).</td>
</tr>
<tr>
<td>Defective shunt release</td>
<td>• Order a spare part and mount according to the supplied instructions.</td>
</tr>
<tr>
<td>Vacuum contactor does not return to the starting position or the initial state</td>
<td>• Inspect the contact welding and remedy by means of no-load switchings.</td>
</tr>
<tr>
<td></td>
<td>• For existing closing latching, actuate the manual unlatching (no-load switching permissible).</td>
</tr>
<tr>
<td>Vacuum contactor does not latch</td>
<td>• Send it back to the manufacturer 1).</td>
</tr>
<tr>
<td>Manual unlatching is blocked</td>
<td>• Check that the unlatching mechanism is attached to the coupling point and reattach with max. 4 Nm. While doing so, prevent the threaded rod from twisting.</td>
</tr>
</tbody>
</table>

1) Complete vacuum contactor

First closing operation

If all functions have been checked and are OK, switch on the high voltage while observing all of the safety regulations and operational requirements.
Maintenance and servicing

**DANGER**

**Risk of injury!**

Working on the opened and closed vacuum contactor can lead to fatal injuries.

- Before beginning maintenance work, note the 5 safety rules for high-voltage equipment specified in EN 50110-1, namely:
  - Isolate from the power supply
  - Secure against reclosing
  - Verify that the equipment has been de-energised
  - Earth and short-circuit
  - Cover or cordon off neighbouring live parts
- Open the vacuum contactor by hand and operate the mechanical unlatching if necessary. This ensures that the vacuum contactor is open.
- The vacuum contactor is to be taken out of the system/switch cabinet for maintenance work.

**Inspections**

The following work is to be carried out as part of the regular inspections:

- Visual inspections during storage, see “Storage” on p. 7
- Visual inspections during operation
- Screws and terminals are firmly attached
- Earthing connection firmly established and not damaged
- Labelling is clearly legible
- Insulation capacity not hampered by deposits, see “Cleaning” on p. 45
- Check the limit dimension of switching stroke of the vacuum interrupters, depending on the mechanical and electrical strain or switching frequency, every 100,000 switchings or once a year. See “Checking the switching stroke of vacuum interrupters” on p. 43
- Regular function check of closing latching and then unlatching with manual trip, see “Mechanical closing latching”, on p. 16
- Measurement of conductance of auxiliary switch contacts.

**Checking the switching stroke of vacuum interrupters**

Reliable switching of the 3TM vacuum contactor is only ensured if the switching stroke of the vacuum interrupters is not below the minimum of 3.5 mm and does not exceed the maximum of 7.5 mm.

The switching stroke can vary depending on current, elapsed service life, and switching frequency. If the value goes below the limit, arcing between the contacts in the vacuum interrupter can negatively affect opening.

Correct functioning of the bellows for the vacuum interrupters can be compromised if the limit is violated.

The switching stroke must be regularly checked. If the limit is reached, the switching stroke can be readjusted once.

If the limit is then exceeded again, the vacuum contactor must be replaced.

If the specified limits for mechanical or electrical service life are reached, the vacuum contactor must be replaced and readjustment is not permissible.
Maintenance

Limit

Limit: \(a - b = \min. \geq 3.5 \text{ mm} \text{ or max. } \leq 7.5 \text{ mm}\)

a OPEN switch position
b CLOSED switch position

Adjusting the switching stroke of vacuum interrupters

Torsional loading of the draw bar (40) of the vacuum interrupters (3) must be prevented. The switching stroke must be readjusted to the same distance for all vacuum interrupters.

Fig. 46 OPEN switch position

Fig. 47 CLOSED switch position

Fig. 48 OPEN switch position - cross-sectional view

7 Pole shell
40 Draw bar for vacuum interrupter
41 Locking nut
42 Adjusting nut
43 Spherical seat

If the permissible limit for the difference between "a" and "b" is reached, the interrupters can be readjusted as follows:

- Remove the vacuum contactor from the switchgear if necessary
- Measure the distance between the top edge of the pole shell (7) and the top edge of the draw bar (40), see Fig. 46 and Fig. 47 in the OPEN and CLOSED conditions. This is done by switching the vacuum contactor CLOSED and OPEN again.
- Use a size 12 open-end spanner to keep the adjusting nut (42) from turning.
- Use an additional size 13 open-end spanner to loosen the locking nut (41) over the adjusting nut (42) and the spherical seat (43).
- To readjust the switching stroke:
  - If the value is below the limit - turn the adjusting nut (42) clockwise at least
one turn, approx. 1.5 mm lower. A complete turn corresponds to approx. 1.25 mm.
- If the value is above the limit - turn the adjusting nut (42) counter-clockwise at least one turn, approx. 1.5 mm higher.
- Use the open-end spanner to prevent the adjusting nut (42) from turning and securely tighten the locking nut (41).
- Visual inspection for uniform switching movement of the vacuum interrupters. This is done by manually switching the vacuum contactor CLOSED and OPEN again.
- Function check of mechanical parameters such as on-time and off-time, see “Rated data of solenoid actuator”, Fig 12.
- Repeat steps as necessary until all limits have been set.
- After successful adjustment - install the vacuum contactor in the switchgear.

Cleaning

The insulating parts must be clean if their insulation capacity is to be guaranteed. Rub the insulating parts with a moist cloth.

As a cleaning agent, use only warm water with a mild, liquid household detergent added and leave to dry.

Accessories and spare parts

Replacing spare parts

To ensure that the device operates reliably, spare parts must be replaced only by trained and certified personnel.

<table>
<thead>
<tr>
<th>Accessory/spare part</th>
<th>Order number</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Instructions, German</td>
<td>9229 0090 176</td>
<td>Catalogue supplement - ZL03</td>
</tr>
<tr>
<td>Electronic controller 48 V-60 V DC/AC</td>
<td>3TY5902-0AA0</td>
<td>Standard design</td>
</tr>
<tr>
<td>Electronic controller 110 V-240 V DC/AC</td>
<td>3TY5902-0AA1</td>
<td>Standard design</td>
</tr>
<tr>
<td>Shunt release Y1</td>
<td></td>
<td>Release voltage</td>
</tr>
<tr>
<td>DC 24 V</td>
<td>3TY5903-0AB0</td>
<td></td>
</tr>
<tr>
<td>DC 30 V</td>
<td>3TY5903-0AC0</td>
<td></td>
</tr>
<tr>
<td>DC 48 V</td>
<td>3TY5903-0AD0</td>
<td></td>
</tr>
<tr>
<td>DC 60 V</td>
<td>3TY5903-0AE0</td>
<td></td>
</tr>
<tr>
<td>DC 110 V</td>
<td>3TY5903-0AF0</td>
<td></td>
</tr>
<tr>
<td>DC 125 V</td>
<td>3TY5903-0AG0</td>
<td></td>
</tr>
<tr>
<td>DC 220 V</td>
<td>3TY5903-0AH0</td>
<td></td>
</tr>
<tr>
<td>DC 250 V</td>
<td>3TY5903-0AJ0</td>
<td></td>
</tr>
<tr>
<td>AC 100 V</td>
<td>3TY5903-0AL0</td>
<td></td>
</tr>
<tr>
<td>AC 110 V</td>
<td>3TY5903-0AM0</td>
<td></td>
</tr>
<tr>
<td>AC 115 V</td>
<td>3TY5903-0AN0</td>
<td></td>
</tr>
<tr>
<td>AC 120 V</td>
<td>3TY5903-0AP0</td>
<td></td>
</tr>
<tr>
<td>AC 230 V</td>
<td>3TY5903-0AQ0</td>
<td></td>
</tr>
</tbody>
</table>
For spare part orders, indicate the type and serial number of the vacuum contactor in accordance with the rating plate.

### Accessories available for order

<table>
<thead>
<tr>
<th>Type</th>
<th>Part Number</th>
<th>Release voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical closing latching with shunt release Y1</td>
<td>3TY5903-0AR0</td>
<td></td>
</tr>
<tr>
<td>AC 240 V</td>
<td>3TX5903-0AR0</td>
<td>Release voltage</td>
</tr>
<tr>
<td>DC 24 V</td>
<td>3TX5903-0AB0</td>
<td></td>
</tr>
<tr>
<td>DC 30 V</td>
<td>3TX5903-0AC0</td>
<td></td>
</tr>
<tr>
<td>DC 48 V</td>
<td>3TX5903-0AD0</td>
<td></td>
</tr>
<tr>
<td>DC 60 V</td>
<td>3TX5903-0AE0</td>
<td></td>
</tr>
<tr>
<td>DC 110 V</td>
<td>3TX5903-0AF0</td>
<td></td>
</tr>
<tr>
<td>DC 125 V</td>
<td>3TX5903-0AG0</td>
<td></td>
</tr>
<tr>
<td>DC 220 V</td>
<td>3TX5903-0AH0</td>
<td></td>
</tr>
<tr>
<td>DC 250 V</td>
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<td></td>
</tr>
<tr>
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<td>3TX5903-0AL0</td>
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</tr>
<tr>
<td>AC 110 V</td>
<td>3TX5903-0AM0</td>
<td></td>
</tr>
<tr>
<td>AC 115 V</td>
<td>3TX5903-0AN0</td>
<td></td>
</tr>
<tr>
<td>AC 120 V</td>
<td>3TX5903-0AP0</td>
<td></td>
</tr>
<tr>
<td>AC 230 V</td>
<td>3TX5903-0AQ0</td>
<td></td>
</tr>
<tr>
<td>AC 240 V</td>
<td>3TX5903-0AR0</td>
<td></td>
</tr>
<tr>
<td>Manual unlatching with</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Push rod</td>
<td>3TX5904-0AA1</td>
<td>M4 threaded rods without terminators</td>
</tr>
<tr>
<td>- Draw bar</td>
<td>3TX5904-0AA0</td>
<td></td>
</tr>
<tr>
<td>Auxiliary switch (S1.1) with 2NO + 2NC, left</td>
<td>3TY5901-0AA0</td>
<td>Mounted on side plate, without wiring</td>
</tr>
<tr>
<td>Auxiliary switch (S1.2) with 2NO + 2NC, right</td>
<td>3TY5901-0AB0</td>
<td></td>
</tr>
<tr>
<td>Auxiliary switch (S1.1) with 3NO + 3NC, left</td>
<td>3TY5901-0BA0</td>
<td></td>
</tr>
<tr>
<td>Auxiliary switch (S1.2) with 3NO + 3NC, right</td>
<td>3TY5901-0BB0</td>
<td></td>
</tr>
</tbody>
</table>

**Vaseline (contact grease)**
- e. g. Atlantic white, Atlantic Mineralölwerk GmbH

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3AX1133-4A</td>
<td>Pasty consistency, flash point 210 °C, low acid</td>
</tr>
</tbody>
</table>
Replacing the electronic controller

⚠️ CAUTION

Material damage caused by electrostatic discharge to the electronic controller

Electrostatic discharge can cause material damage to the electronic controller and restrict its functionality.

To prevent damage to electronic components, discharge any existing electrostatic charges on hands or tools by touching grounded surfaces prior to touching electronic components and before removing the connector plugs.

ℹ️ Note

Store all disassembled screws, washers, and nuts safely for reuse.

If the electronic controller is to be replaced, then remove and mount according to the supplied assembly drawing.

Fig. 50  Electronic controller with cover

Fig. 51  Electronic controller with cover removed

Setting the electronic controller

If necessary: Using the DIP switches S2 (26) and the set-up matrix, have the customer adjust the settings on the electronic controller (see Fig. 52, p. 48).
Configuring the controller

Observe the following when reordering the switching device:
If the factory-supplied configuration is changed by the customer, the MLFB on the rating plate is invalid and the warranty is void. Despite this, the MLFB on the rating plate must then be changed. Line g, s to v, see “Example - rating plate for vacuum contactor 3TM”, page 17, Fig. 9.

1) Average values under normal conditions. Deviations possible under different ambient conditions.
2) If closing latching is available, the opening delay is disabled and DIP switch S2 in 3 and 4 is to be left OPEN

Fig. 52 Matrix of the positions of the DIP switches S2 (shown in black) for additional closing and opening delay
Manufacturer's product liability
The manufacturer's product liability shall be excluded if at least one of the following criteria applies:
1. Original Siemens spare parts are not used.
2. Fitters carrying out replacements have not been trained and certified by Siemens.
3. Parts have been incorrectly mounted or adjusted.
4. Settings are not made in accordance with Siemens specifications.

Disposal
The materials of the vacuum contactor should be recycled if possible. Disposal of the vacuum contactor with minimum environmental impact is possible on the basis of existing legal regulations.

Metal
The switching device's metal components can be recycled as mixed scrap, although it is more environmentally sustainable to dismantle the unit as thoroughly as possible into sorted scrap and residual mixed scrap.

Electronics
Electronic scrap must be disposed of in accordance with applicable regulations.

Materials
The vacuum contactor consists of the following materials:
• Steel (partly phosphatised, galvanised and CrVI-free passivated)
• Copper or aluminium (partly silver-plated)
• Plastics (cycloaliphatic epoxy resin, polyamide, polyester, polycarbonate, ABS-PC mixture; partly glass fibre reinforced)
• Rubber materials
• Ceramics
• Lubricant

For further information regarding declarable or restricted substances in this product, please contact by e-mail:
• materialcompliance.ms.ehs@siemens.com

Packaging
If the packaging is no longer needed, it can be fully recycled.

Hazardous substances
When delivered by Siemens, the product does not contain any hazardous substances within the scope of the Hazardous Substances Ordnance applicable to the territory of the Federal Republic of Germany. The switching devices are free from asbestos, halogens, and lead. For operation outside the Federal Republic of Germany, the applicable local laws and regulations must be complied with.

Further information
Contact your Siemens Service Centre if you require further information.

Service
Siemens Service contact persons can be found under:

Customer service
• Telephone: +49 180/524 7000
• Fax: +49 180/524 2471
• On the internet under web address www.siemens.com/energy-support
• By email: support.energy@siemens.com
or from any local Siemens representative.
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23 Auxiliary switch S1.1/S1.2
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41 Locking nut
42 Adjusting nut
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