# 3VL Molded Case Circuit Breakers

*3VL Molded Case Circuit Breakers up to 1600 A*

- **General data**
- Design
- Function
- Integration
- Configuration
- Technical specifications
- Project planning aids
- Characteristic curves
- Dimensional drawings
- Schematics
- More information

# 3VF2 Molded Case Circuit Breakers

*3VF2 Molded Case Circuit Breakers up to 100 A*

- **General data**
- Technical specifications
- Project planning aids
- Dimensional drawings
**Introduction**

**Overview**

**Molded case circuit breakers**

3VL molded case circuit breakers up to 1600 A

<table>
<thead>
<tr>
<th>Type</th>
<th>VL160/3VL1</th>
<th>VL160/3VL2</th>
<th>VL250/3VL3</th>
<th>VL400/3VL4</th>
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</table>

**Rated current Iₙ**

at 50 °C ambient temperature

<table>
<thead>
<tr>
<th>16 ... 160</th>
<th>50 ... 160</th>
<th>200 ... 250</th>
<th>200 ... 400</th>
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</table>

**Number of poles**

| 3 | 4 | 3 | 4 | 3 | 4 |

**Rated operational voltage Uₑ**

AC 50/60 Hz

| 690 | 690 | 690 | 690 | 690 | 690 |

DC

| 500 | 500 | 600 | 600 | 600 | 600 |

**Solid-state releases**

- Thermal-magnetic
- Solid-state LCD ETU/ETU
- Replaceable PROFIBUS module COM10/COM20

**Dimensions**

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<th>B</th>
<th>C</th>
<th>D</th>
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<td>157</td>
<td>81</td>
<td>107</td>
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**Switching capacity**

<table>
<thead>
<tr>
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<th>55/55</th>
<th>25/20</th>
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<tbody>
<tr>
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<td>Up to 500/525 V AC</td>
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<tr>
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<tr>
<td>Up to 250 V DC</td>
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<tr>
<td>Up to 480 V AC</td>
<td>8</td>
<td>12</td>
<td>12</td>
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<tr>
<td>Up to 600 V AC</td>
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</tbody>
</table>

**High switching capacity H**

| Up to 240 V AC | 100/75 | 100/75 | 100/75 | 100/75 | 100/75 |
| Up to 415 V AC | 100/75 | 100/75 | 100/75 | 100/75 | 100/75 |
| Up to 440 V AC | 50/38  | 50/38  | 50/38  | 50/38  | 50/38  |
| Up to 500/525 V AC | 40/30 | 40/30 | 40/30 | 40/30 | 40/30 |
| Up to 690 V AC | 12/6   | 12/6   | 12/6   | 12/6   | 15/8   |
| Up to 250 V DC | 32/32  | 32/32  | 32/32  | 32/32  | 32/32  |
| Up to 500 V DC | 32/32  | 32/32  | 32/32  | 32/32  | 32/32  |
| Up to 600 V DC | --     | --     | --     | --     | --     |
| NEMA breaking capacity N | 50    | 50    | 50    | 50    | 50    |
| Up to 480 V AC | 12    | 12    | 12    | 12    | 12    |
| Up to 600 V AC | 12    | 12    | 12    | 12    | 12    |

**Very high switching capacity L**

| Up to 240 V AC | -- | 200/150 | 200/150 | 200/150 |
| Up to 415 V AC | -- | 100/75  | 100/75  | 100/75  |
| Up to 440 V AC | -- | 75/50   | 75/50   | 75/50   |
| Up to 500/525 V AC | -- | 50/38 | 50/38 | 50/38 |
| Up to 690 V AC | -- | 12/6   | 12/6   | 15/8   |
| Up to 250 V DC | -- | 32/32  | 32/32  | 32/32  |
| Up to 500 V DC | -- | 32/32  | 32/32  | 32/32  |
| Up to 600 V DC | -- | 32/32  | 32/32  | 32/32  |
| NEMA breaking capacity N | 75 | 75 | 75 | 75 |
| Up to 480 V AC | -- | 12    | 12    | 20    |
| Up to 600 V AC | -- | 12    | 12    | 20    |

Available

Not available

For 3VL molded case circuit breakers according to UL 489 see Catalog LV 16.

1) 3VF2 at 40 °C ambient temperature.
2) Rated DC voltage applies only for circuit breakers with thermal-magnetic overcurrent release.
Introduction

At 240 V AC, 415 V AC and 525 V AC max. 5 % overvoltage, at 440 V AC, 500 V AC and 690 V AC max. 10 % overvoltage, at 250/500/600 V DC max. 5 % overvoltage.

Rated current $I_{n}$ ≥ 25 A.

The maximum permitted DC voltage for each conducting path needs to be taken into account for DC switching applications, see the topic “Configuring”, “Switching of DC Currents”; time constant $t = 15$ ms.

The NEMA breaking capacity can be found on the rating plate of each IEC circuit breaker.
Withdrawable/plug-in bases
- Side walls for withdrawable version
- Phase barriers
- Flared front busbar connecting bars
- Straight connecting bars
- Multiple feed-in terminals for Al/Cu
- Box terminals for Cu
- Extended terminal covers
- Standard terminal covers
- Masking frames/cover frames for door cut-out
- Motorized operating mechanisms with spring energy store
- Front-operated rotary operating mechanisms
- Door-coupling rotary operating mechanisms
- SENTRON 3VL circuit breakers
- Internal accessories
- Solid-state releases (LCD ETU)
- Solid-state releases with communication function
- Thermal-magnetic overcurrent releases
- RCD modules
- Rear terminals – flat and round
- COM10 communication modules to the PROFIBUS DP
- COM20 communication modules to the PROFIBUS DP
- Battery power supplies with test function for solid-state releases

For additional information see Catalog LV 1.
Design

- Rated current range from 16 A to 1600 A
- Different switching capacity for each size

<table>
<thead>
<tr>
<th>N</th>
<th>Standard (45 to 55 kA)</th>
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</thead>
<tbody>
<tr>
<td>H</td>
<td>High (70 kA)</td>
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<tr>
<td>L</td>
<td>Very high (100 kA)</td>
</tr>
</tbody>
</table>

- No derating or loss of performance up to 50°C
- Solid-state releases from size 160 A (VL160), particularly for time-based discrimination and ground-fault protection
- 2 families of internal accessories
- Full range of external accessories e. g. terminals for aluminum cable.

All circuit breakers are supplied with integrated solid-state releases. The SENTRON VL160X to VL160 circuit breakers are available with busbar connection pieces or box terminals (up to 400 A; see “Main Connections, Basic Equipment and Options”, page 16/12). Auxiliary switches/alarm switches or auxiliary releases can be easily adapted by the customer, or they are also available ready installed if required. The breaking capacity is shown on the front of every circuit breaker.

- Standard switching capacity:
  \[ I_{cu} = 45 \text{ to } 55 \text{ kA at AC } 50/60 \text{ Hz } 380/415 \text{ V} \]
- High switching capacity:
  \[ I_{cu} = 70 \text{ kA at AC } 50/60 \text{ Hz } 380/415 \text{ V} \]
- Very high switching capacity:
  \[ I_{cu} = 100 \text{ kA at AC } 50/60 \text{ Hz } 380/415 \text{ V} \]

Standards and specifications

SENTRON 3VL circuit breakers comply with:
- IEC 60947-1, EN 60947-1,
- IEC 60947-2, EN 60947-2,
  Isolating features according to IEC 60947-2, EN 60947-2
  Disconnecting features (main control switches) according to EN 60204-1.

The SENTRON 3VL circuit breakers comply with IEC 60947-4-1, EN 60947-4-1. The motorized operating mechanisms with spring energy stores are always equipped with terminals. The leading auxiliary switches for the rotary operating mechanisms are always supplied with connecting cables.

Connection

The SENTRON VL160X to VL160 circuit breakers can be factory-fitted with incoming and outgoing box terminals which are suitable for stranded conductors, flexible copper bars and finely stranded conductors with end sleeves, as well as with screw terminals for flat connectors. Different feeder terminals are available for VL630 to VL1600 (sizes 630 A to 1600 A).

Appropriate accessories for screw terminal to fixed and flexible copper bars or cables are available for SENTRON VL160X to VL1600 circuit breakers.

SENTRON VL160X to VL1600 circuit breakers can be equipped with connecting bars. These are intended for connection of standard busbars and can be used for front or rear connection. The SENTRON VL1600 circuit breaker is supplied with front connecting bars.

The incoming and outgoing terminals for the circuit breaker can be freely selected. The electrical specifications remain the same. The infeed for circuit breakers with RCD modules can be connected above or below.

For 4-pole circuit breakers, the fourth pole (N pole) of the main current path is 100 % loadable with the rated current.

Bare conductors at the top connections must be insulated in the arc quenching space that is necessary above the arc chutes. Phase barriers or terminal covers can be used for this purpose.

For the SENTRON VL160X to VL1600 circuit breakers, the connections for the internal accessories (auxiliary releases, auxiliary switches and alarm switches) are supplied with terminal covers.

The auxiliary releases (shunt releases and undervoltage releases), auxiliary switches and alarm switches for all SENTRON 3VL circuit breakers can be connected easily and directly.

The motorized operating mechanisms with spring energy stores are always equipped with terminals. The leading auxiliary switches for the rotary operating mechanisms are always supplied with connecting cables.
**SENTRON VL160X circuit breakers**

The main components of the SENTRON VL160X circuit breakers are the three conducting paths with the incoming and outgoing terminals. The fixed and moving contacts are designed in such a way that the contacts are magnetically repelled if there is a short-circuit. In conjunction with the arcing chambers, a dynamic impedance is created that causes current limiting due to a reduction in the damaging effects of $P_t$ and $I_f$, energy that arises during short-circuits.

The release is preassembled and equipped with fixed or adjustable overload releases as well as with fixed short-circuit releases for each pole.

The circuit breaker is trip-free.

To the right and left of the operating mechanism, the double-insulated accessory compartments are situated for the auxiliary releases and auxiliary switches.

**SENTRON VL160 to VL630 circuit breakers**

The arrangement of the conducting path, main contact and switching mechanism corresponds to that of the SENTRON VL160X circuit breakers.

The releases for the SENTRON VL160 to VL630 have the following features:

- The releases are available in thermal-magnetic and solid-state versions.
- The thermal-magnetic releases have adjustable overload and short-circuit releases.

**SENTRON VL800 to VL1600 circuit breakers**

The arrangement of the conducting paths and switching mechanism corresponds with those of the SENTRON VL160X to VL630 circuit breakers.

The SENTRON VL800 to VL1600 circuit breakers are only available with solid-state releases.

As is the case for all versions of the SENTRON 3VL circuit breakers with solid-state releases, the current transformers are in the same enclosure as the releases. They send a signal which is proportional to the load current to the solid-state overcurrent release.

All SENTRON 3VL circuit breakers with solid-state releases measure the actual r.m.s. current. This type of measurement is the most accurate method. Currents in today’s electrical distribution systems with many harmonics are evaluated reliably.

**Overcurrent release systems**

The overcurrent release systems can be replaced by the customer using a special tool.

When the solid-state release has been installed in the circuit breaker, it is recommended that it is tested with the battery power supply using the 3VL9 000-8AP00 test function.

1. **Solid-state release system of the SENTRON VL160X to VL630 circuit breakers - thermal-magnetic**

The overcurrent and short-circuit releases function with bimetallic and magnetic releases. They are available in fixed set or adjustable versions.

The 4-pole circuit breakers for system protection can be equipped with solid-state releases for all four poles or without an solid-state release for the fourth pole (N). Depending on the size, circuit breakers are available with a release in the fourth pole (N) with 60 % or 100 % of the current of the 3 main current paths.

The circuit breakers for starter combination applications are usually combined with a motor contactor and a suitable overload relay.

2. **Solid-state release system for SENTRON VL160 to VL1600 circuit breakers, solid-state, ETU**

The solid-state overcurrent release system consists of:

- 3 current transformers
- Evaluation electronics with microprocessor
- Internal power supply, no external auxiliary voltage necessary
- Tripping solenoid

The 4-pole circuit breakers for system protection can be equipped with solid-state releases for all four poles or without an solid-state release for the fourth pole (N).

On ETU releases the neutral conductor protection is adjustable to 50 % or 100 %. On LCD ETU releases the neutral conductor protection is adjustable from 50 to 100 % or can be switched off.

For the LCD ETU on the SENTRON VL160 and VL250, the tripping solenoid is installed in the left accessory compartment.

The protection functions of the solid-state releases are maintained without additional auxiliary voltage. The solid-state releases are supplied with energy through circuit breaker-internal current transformers.

The solid-state release has to be activated for parameterizing. This requires a load current of at least 20 % of the respective rated current $I_{cu}$ of the circuit breaker. If this load current is not available, the necessary auxiliary power can be fed in through a 3VL9 000-8AP00 battery power supply. For communication-capable circuit breakers the release is supplied with energy through the communication module.

At the output of the solid-state overcurrent release module there is a tripping solenoid which trips in the case of overload or short-circuit.

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The solid-state release has to be activated for parameterizing. This requires a load current of at least 20 % of the respective rated current $I_{cu}$ of the circuit breaker. If this load current is not available, the necessary auxiliary power can be fed in through a 3VL9 000-8AP00 battery power supply. For communication-capable circuit breakers the release is supplied with energy through the communication module.

At the output of the solid-state overcurrent release module there is a tripping solenoid which trips in the case of overload or short-circuit.

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**General data**

The non-automatic air circuit breakers have an integrated short-circuit self-protection system eliminating the need for back-up fuses. Non-automatic air circuit breakers have no overload protection. 4-pole non-automatic air circuit breakers do not have a short-circuit release for the fourth pole (N).

<table>
<thead>
<tr>
<th>Circuit breaker specification</th>
<th>Icu (up to)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>55 kA at 415 V</td>
</tr>
<tr>
<td>H</td>
<td>70 kA at 415 V</td>
</tr>
<tr>
<td>L</td>
<td>100 kA at 415 V</td>
</tr>
</tbody>
</table>

These circuit breakers are indicated in the Technical specifications by orange backgrounds.
**RCD modules**

- Easy mounting
- Assembly kit for lateral mounting according to EN 60715 for SENTRON VL160X circuit breakers under Order No. 3VL9112-5GB30/3VL9112-5GB40
- A tripping button enables the function of the integrated RCD module to be tested.
- Protruding reset/tripping button (prevents the circuit breaker from being reclosed before the reset/tripping button has been reset)
- Circuit for remote-controlled tripping of the circuit breaker does not require an additional external voltage supply (for SENTRON VL160 to VL400 circuit breakers)
- LED displays which enable visual monitoring of the RCD module:
  - Green
  - Green + Yellow
  - Green + Yellow + Red
  - 25 % $I_A$ of the set $I_{n}$
  - 25 % $< I_A = 50 \%$ of the set $I_{n}$

- RCD alarm switch (changeover contact) for VL160 to VL400 to indicate a tripping operation by the RCD module
- 690 V AC application
- “Power disconnect” enables electrical testing without disconnecting the cables
- The functional properties of the circuit breaker are not adversely affected by the addition of the RCD module
- Internal power supply, no external voltage

(For diagrams see Catalog LV1 “Accessories”.)

**Abbreviations (functions)**

<table>
<thead>
<tr>
<th>L</th>
<th>= Long Time Delay = Overload protection</th>
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<tbody>
<tr>
<td>S</td>
<td>= Short Time Delay = Short-circuit protection (short-time delayed)</td>
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<tr>
<td>I</td>
<td>= Instantaneous = Short-circuit protection (instantaneous)</td>
</tr>
<tr>
<td>N</td>
<td>= Neutral Protection = Neutral conductor protection</td>
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<tr>
<td>G</td>
<td>= Ground Fault = Ground-fault protection</td>
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L, S, I, N, G designations according to IEC 60947-2, Appendix K
### General data

#### VL160 to VL1600 solid-state releases – Overview of functions

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1. Size-dependent.

2. TM up to Ia = 630 A.

3. Motor protection up to Ia = 500 A.
### General data

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<th>Order No. supplement</th>
<th>Rated current</th>
<th>Thermal image</th>
<th>Phase failure</th>
<th>Communication-capable</th>
<th>Ground-fault protection</th>
<th>Number of poles</th>
<th>Np poles protected</th>
<th>F (ON/OFF)</th>
<th>Tap class (C)</th>
<th>Time-magnetic release</th>
<th>Magnetic release</th>
<th>Solid-state release</th>
<th>LCD display</th>
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</tbody>
</table>

**Ground-fault protection**

1. Vectorial summation current formation (3-conductor system)
2. Vectorial summation current formation (4-conductor system)
3. Direct detection of ground-fault current in the neutral point of the transformer

1) Size-dependent.
2) TM up to \( I_\text{f} = 630 \, \text{A} \).
3) Motor protection up to \( I_\text{f} = 500 \, \text{A} \).
4) With COM20/COM21.
5) With COM10/COM11.
**Internal accessories (auxiliary switches, undervoltage releases, shunt releases)**

The SENTRON 3VL circuit breakers can be supplied with all the internal accessories (e.g. auxiliary switches, undervoltage releases or shunt releases). The available versions can be found in the tables with the Order No. supplements.

**Fixed-mounted, plug-in or withdrawable version**

The fixed-mounted circuit breaker is the basic version. This can be converted very easily into a plug-in or withdrawable version with the aid of the appropriate assembly kit. This kit contains blade contacts, a locking pin and terminal covers for the plug-in version. The assembly kit for the withdrawable version also contains side covers and a racking mechanism. Even with the masking frame mounted, it is still possible to move using the handle with the door closed.

**Operating mechanisms**

The basic versions of the SENTRON 3VL circuit breakers are equipped with a toggle lever as an operating mechanism which is also used as a switch position indicator. In addition to “ON” and “OFF”, “Tripped” is also indicated.

The toggle lever assumes the “tripped” position when the internal tripping mechanism is activated by an overcurrent tripping, e.g. an overload or short-circuit. The activation of an undervoltage release or shunt release also causes the toggle lever to assume the “tripped” position. The toggle lever must be put into the “OFF/RESET” position before the circuit breakers can be reclosed. It will then be possible to reset the internal tripping mechanism and reclose the main contacts on the circuit breaker (see illustration).

A toggle handle extension is supplied with the SENTRON VL1250 and VL1600 circuit breakers. This accessory must be ordered separately for SENTRON VL400 to VL800 circuit breakers, if required.

**Front-operated rotary operating mechanisms**

These operating mechanisms have been designed for direct mounting to the circuit breaker and change the toggle lever movement from a linear to a rotary motion.

A leading voltage can be applied to the undervoltage release of a circuit breaker with leading auxiliary switches which makes the circuit breaker ready-to-close.

**Door-coupling rotary operating mechanisms (complete operating mechanisms)**

Door-coupling rotary operating mechanisms and removable covers are available for circuit breakers which are installed into control cabinets and distribution boards. These are supplied as complete assembly kits, including an articulated-shaft mechanism.

With regard to the switching status indication and the “RESET” position, the same applies to the rotary operating mechanisms as to the toggle lever. The position of the operator lever (knob) indicates the status.

All rotary operating mechanisms can be locked in the OFF position with the help of suitable padlocks. This means that all SENTRON 3VL circuit breakers which have these operating mechanisms as well as the corresponding terminal covers can be used as main control switches.

**Motorized operating mechanisms**

The SENTRON VL160X to VL1600 circuit breakers (sizes 160 to 1600 A) can be equipped with motorized operating mechanisms for remote opening and closing during operation.

These motorized operating mechanisms for SENTRON VL160X to VL800 circuit breakers have a stored-energy feature (for synchronization) with a maximum ON period of $t_E \leq 100 \, \text{ms}$.

For SENTRON VL160X, VL160, VL250, VL1250 and VL1600 circuit breakers there are motorized operating mechanisms without a stored-energy feature for remote-controlled ON and OFF switching.

All motorized operating mechanisms are always supplied with a locking device for padlocks. Optional safety locks are also available for motorized operating mechanisms with stored-energy feature.

These locking devices can be used to block the operating mechanism electrically and mechanically. All remote-controlled operating mechanisms are equipped with a manual operation option for maintenance purposes.

The motorized operating mechanisms with stored-energy feature for VL160X to VL800 as well as the motorized operating mechanisms for VL1250 and VL1600 are each optionally equipped inside with a signaling contact (NO) for the following functions:

- Querying the AUTO/Manual selector switch for VL160X to VL800 (not possible with VL1250 to VL1600)
- Actuating the mechanical OFF/0 button
### General data

**Main connections, basic equipment and options**

<table>
<thead>
<tr>
<th>Circuit breakers</th>
<th>Connection overview and further options</th>
</tr>
</thead>
<tbody>
<tr>
<td>VL160X</td>
<td>Box terminals</td>
</tr>
<tr>
<td>VL160</td>
<td>Connection with screw terminal</td>
</tr>
<tr>
<td>VL250</td>
<td>Connection to front busbar</td>
</tr>
<tr>
<td>VL400</td>
<td>Connection to front busbar</td>
</tr>
<tr>
<td>VL630</td>
<td>Connection to front busbar</td>
</tr>
<tr>
<td>VL800</td>
<td>Connection to front busbar</td>
</tr>
<tr>
<td>VL1250</td>
<td>Connection to front busbar</td>
</tr>
<tr>
<td>VL1600</td>
<td>Connection to front busbar</td>
</tr>
</tbody>
</table>

- Scope of supply
- Optional scope of supply
- Available
- Not available
- Connecting terminal plate for flexible busbar; not for 690 V AC/600 V DC.
- Multiple feed-in terminal.
- Circular conductor terminal also available.

### Auxiliary releases and auxiliary switches

**Undervoltage releases, leading auxiliary switches**

If there is no voltage present, closing of the circuit breaker is not possible. If voltage is not applied to the releases, operation of the circuit breaker will result in no-load switching.

Frequent re-tripping should be avoided because of its adverse effect on the endurance of the circuit breaker.

All undervoltage releases are designed and tested so that they meet all applicable requirements in accordance with IEC 60947 (drop-out voltage 0.70 to 0.35 $U_n$).

A leading voltage can be applied to the undervoltage release of a circuit breaker with leading auxiliary switches which makes the circuit breaker ready-to-close.

For SENTRON 3VL circuit breakers, the leading auxiliary switch can be supplied with the front rotary operating mechanism or complete operating mechanism. For more detailed information please see "Selection and Ordering Data" for accessories in Catalog LV 1.

### Shunt releases

The shunt release is used for remote tripping of the circuit breaker.

The coil of the shunt release is designed for short-time operation only. A coil trip is implemented internally.

These devices operate according to IEC 60947 (tripping voltage 0.70 to 1.10 $U_n$).

It is not permissible to apply a continuous trip command to a shunt release to prevent closing when the circuit breaker is tripped.

A central tap is provided as standard for checking the conductivity of the coil.

### Possible complements for the insulated accessory subsections in the SENTRON 3VL circuit breakers

Before ordering, use the table above to check whether the required combination of shunt releases, undervoltage releases and auxiliary/alarm switches is feasible.
Auxiliary switches

Auxiliary switches are used for indication and control. The contacts of the auxiliary switch close and open together with the main contacts.

Alarm switch

The alarm switches (AS) are activated when the circuit breaker has been tripped due to an overcurrent e.g. overload or short-circuit. However, they are also activated if the circuit breaker has been tripped by a shunt release or undervoltage release.

Installation of internal accessories

The insulated accessory subsections for installing accessories (auxiliary releases and auxiliary switches/alarm switches) have the designations X1, X2 and X4.

The equipping of the circuit breaker with internal accessories and the configuration possibilities for circuit breakers with auxiliary releases and auxiliary/alarm switches depend on the mounting position and size of the circuit breaker (see the illustration "Possible Complements for the Insulated Accessory Subsections of the 3VL Circuit Breakers").

PLC control

The auxiliary and alarm switches can be used to send signals to programmable controllers. These switching blocks are part of the Siemens 3SB3 range.

Leading auxiliary switches

The leading auxiliary switches OFF to ON or ON to OFF are available as a retrofit set for rotary operating mechanisms.

Function

Current limiting

The SENTRON 3VL circuit breakers utilize the design principle of magnetic repulsion of the contacts. The contacts open before the anticipated peak value of the short-circuit current is achieved. The current-limiting effects of the SENTRON 3VL circuit breakers provide effective protection for system components against the thermal and dynamic effects of the short-circuit current in the event of an electrical fault.

Ground-fault protection

Ground-fault release "G" senses fault currents that flow to ground and that can cause fire in the plant. Several circuit breakers connected in series can provide graduated discrimination by means of the adjustable delay time.

The following measurement methods can be used to detect neutral conductor and ground-fault currents:

- Vectorial summation current formation (measurement method 1)
- Ground-fault detection in symmetrically loaded systems

The three phase currents are evaluated with the help of the vectorial summation current formation.

Ground-fault detection in asymmetrically loaded systems

The neutral conductor current is measured directly. For the 3-pole circuit breakers this measurement is only evaluated for ground-fault protection; for 4-pole circuit breakers it is also evaluated for neutral conductor overload protection.

The solid-state release determines the ground-fault current for the three phase currents and neutral conductor current by means of vectorial summation current formation.

For 4-pole circuit breakers, the fourth current transformer for the neutral conductor is installed internally.

For 4-pole circuit breakers, the fourth current transformer for the neutral conductor is installed internally.

Direct detection of the ground-fault current through a current transformer in the grounded neutral point of the transformer (measurement method 2)

The current transformer is installed directly in the grounded neutral point of the transformer.

Transformer protection

The SENTRON 3VL circuit breakers protect power distribution systems against overload and short-circuit on the low-voltage side of the infeed transformer. The resulting requirements with respect to current-based and/or time-based discrimination are reliably fulfilled by the SENTRON 3VL circuit breakers for system protection (equipped with thermal-magnetic (TM) or solid-state overcurrent releases (ETU or LCD ETU)).
Thermal-magnetic overcurrent releases TM

Application: system protection –
TM, LI/LIN function
Overload protection, fixed, short-circuit protection, fixed; see 'Selection and ordering data' for VL160X, releases installed in the switch enclosure

Application: system protection –
TM, LI/LIN function
Overload protection adjustable \( I_R = 0.8 \times I_n \),
short-circuit protection, fixed, see 'Selection and ordering data' for VL160X, releases installed in the switch enclosure

Application: system protection –
TM, LI/LIN function
Overload protection adjustable
\( I_R = 0.8 \times 1 \times I_n \),
short-circuit protection, adjustable
\( I_i = 5 \times 10 \times I_n \), for VL160 to VL630

Application: starter protection –
M, T function
Short-circuit protection, adjustable
\( I_i = 7 \times 15 \times I_n \), for VL160 to VL630

Solid-state releases ETU

For types VL160 to VL1600
General information:
- No auxiliary voltage for release required
- All ETUs have a thermal image
- Flashing green LED indicates faultless operation of microprocessor

Application: system protection – ETU10,
LI/LIN function
Overload protection \( I_R = 0.4 \times 0.45; 0.5 \text{ to } 0.95; 1 \times I_n \), time-lag class \( x \) = 2.5 to 30
Short-circuit protection (instantaneous)
\( I_i = 1.25 \text{ to } 11 \times I_n \)
Neutral conductor protection
\( I_N = 50 \% /100 \% \times I_R \), versions "TA" and "NA".

Application: system and generator protection –
ETU20, LS/LSIN function
Overload protection \( I_R = 0.4 \times 0.45; 0.5 \text{ to } 0.95; 1 \times I_n \)
Short-circuit protection (short-time delayed)
\( I_{sd} = 1.5 \text{ to } 10 \times I_R \), \( t_{sd} = 0 \text{ to } 0.5 \text{ s} \)
\( t \) is selectable on/off
Short-circuit protection (instantaneous)
\( I_i = 11 \times I_n \) (fixed)
Neutral conductor protection
\( I_N = 50 \% /100 \% \times I_R \), versions "TF" and "NF".

1) Operating temperature TM TU: 0 °C ... 75 °C.
2) Size-dependent, see Catalog LV 1, "Selection and ordering data".
Application: system protection – ETU12, LI/G/LING function
Overload protection \( I_R = 0.4; 0.45; 0.5 \) to 0.95;
1 × \( I_n \), time-lag class \( t_q = 2.5 \) to 30
Short-circuit protection (instantaneous) \( I_I = 1.25 \) to 11 × \( I_n \) 1)
For 4-pole circuit breakers:
Neutral conductor protection 50 %/100 % × \( I_R \)
Ground-fault protection: measurement method 1:
\( I_{I_1} = 0.6/1.0 \) \( I_n \), \( t_q = 0.1/0.3 \) s,
\( (G_p) \) vectorial summation current formation for the currents of the three phases/and neutral conductor
(four-conductor systems):
\( I_{I_1} = I_{I_2} \) versions “SL”, “SF”, “ML”, “MF”, “TN”, “NH” (for Order No. supplements see Catalog LV 1, “Selection and ordering data”).

Application: system and generator protection – ETU22, LSIG/LSING function
Overload protection \( I_R = 0.4; 0.45; 0.5 \) to 0.95;
1 × \( I_n \),
Short-circuit protection (short-time delayed) \( I_{I_2} = 1.5 \) to 10 × \( I_R \), \( t_d = 0 \) to 0.5 s,
**\( F \)** selectable on/off
Short-circuit protection (instantaneous) \( I_I = 11 \) × \( I_n \) (fixed) 1)
For 4-pole circuit breakers:
Neutral conductor protection 50 %/100 % × \( I_R \)
Ground-fault protection: measurement method 1:
\( I_{I_1} = 0.6/1.0 \) \( I_n \), \( t_q = 0.1/0.3 \) s,
\( (G_p) \) vectorial summation current formation for the currents of the three phases/and neutral conductor
(four-conductor systems):
\( I_{I_1} = I_{I_2} \) versions “SG”, “SH”, “MG”, “MH”, “TH”, “NH” (for Order No. supplements see Catalog LV 1, “Selection and ordering data”).

Application: motor protection – ETU10M, LI function
Overload protection, finely adjustable \( I_R = 0.41; 0.42 \) to 0.98; 0.99; 1 × \( I_n \),
trip class \( t_q = 10 \) (fixed)
Thermal image
Short-circuit protection (instantaneous) \( I_I = 1.25 \) to 11 × \( I_n \) 1)
with phase failure sensitivity (40 % \( I_n \) fixed).

Application: motor protection – ETU30M, LI function
Overload protection, finely adjustable \( I_R = 0.41; 0.42 \) to 0.98; 0.99; 1 × \( I_n \),
trip class \( t_q = 10, 20, 30 \)
Thermal image
Short-circuit protection (instantaneous) \( I_I = 6 \) to 11 × \( I_n \) with phase failure sensitivity (40 % \( I_n \) fixed).

1) Size-dependent, see Catalog LV 1, “Selection and ordering data.”
Solid-state releases LCD ETU

General information:
- No auxiliary voltage for release required
- Current indicator
- Illuminated LCD display indicates faultless operation of microprocessor
- The overload status ($I > 105\% I_{n}$) is indicated by "overload" on the LCD display

Application: system protection – ETU40,
LI/LS/LSI/LSIN functions and motor protection –
ETU40M, LI function
Overload protection $I_R = 0.4$ to $1 \times I_{n}$,
time-lag class $t_R = 5$ to $30$ for ETU40M,
time-lag class $t_R = 2.5$ to $30$ for ETU40
Thermal image memory, selectable On/Off,
with phase failure sensitivity for ETU40M
(5 ... 50 % $I_R$ adjustable)
Short-circuit protection (short-time delayed) for
ETU40
$I_{sd} = 1.5$ to $10 \times I_{R}$, $t_{sd} = 0$ to $0.5$ s,

Application: system protection – ETU42,
LSIG/LSING function
Overload protection $I_R = 0.4$ to $1 \times I_{n}$,
time-lag class $t_R = 2.5$ to $30$
On/off selectable thermal image
Short-circuit protection (short-time delayed)
$I_{sd} = 1.5$ to $10 \times I_{R}$, $t_{sd} = 0$ to $0.5$ s,
$F_t$ selectable on/off
Short-circuit protection (instantaneous)
$I_i = 1.25$ to $11 \times I_{n}$

Ground-fault protection: measurement method 1:
($G_{eq}$) vectorial summation current formation for the
currents of the three phases and neutral conductor
(four-conductor systems):
$I_{an} = 0.4$ to $1 \times I_{n}$, versions "CL", "CM", "CN" (for Order No. supplements see Catalog LV 1, "Selection and ordering data").

For 4-pole circuit breakers:
Neutral conductor protection N: 50 to 100 % $I_n$
adjustable or can be switched off.

Integration

Mounting
The SENTRON 3VL circuit breakers are suitable for use in open
and enclosed switchboards and distribution systems. The rec-
ommended mounting positions for the SENTRON 3VL circuit
breakers are shown in the diagrams under "Technical specifica-
tions, permissible mounting positions".
### 3VL Molded Case Circuit Breakers up to 1600 A

#### General data

**Configuration**

**Communication**

Three alternatives are available for communication.

An LCD ETU (ETU40, ETU40M or ETU42) is required in addition for the more extensive communication with COM10, or a COM20 is used with a communication-capable ETU.

If less data is required, the SIMOCODE Professional can be used as interface. All versions can be switched on and off using an optional motorized operating mechanism.

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#### Transmittable data

<table>
<thead>
<tr>
<th>Commands</th>
<th>Data transmission through COM10</th>
<th>Data transmission through COM20</th>
<th>Data transmission through SIMOCODE Pro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch on/off</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Alarm and tripping memory, min./max. measured values and maintenance information</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

#### Operating statuses

<table>
<thead>
<tr>
<th>Status</th>
<th>Local</th>
<th>Remote</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF status trip position</td>
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<td>✓</td>
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</tbody>
</table>

#### Event signals

<table>
<thead>
<tr>
<th>Signal</th>
<th>Local</th>
<th>Remote</th>
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</thead>
<tbody>
<tr>
<td>Tripped signals with tripping current and time stamp</td>
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<td>✓</td>
</tr>
<tr>
<td>Alarm signals (e.g. overload)</td>
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<tr>
<td>Alarm signals with time stamp (e.g. overload, phase unbalance, current etc.)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Threshold value warning, with time stamp (e.g. phase currents)</td>
<td>✓</td>
<td>✓</td>
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</tbody>
</table>

#### Measured values

<table>
<thead>
<tr>
<th>Value</th>
<th>Local</th>
<th>Remote</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase currents and neutral conductor current, each with min./max. value and time stamp</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Phase currents, voltages, power</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

#### Parameter values

<table>
<thead>
<tr>
<th>Value</th>
<th>Local</th>
<th>Remote</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read and write</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Set values for SIMOCODE Pro</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

#### Maintenance information

<table>
<thead>
<tr>
<th>Value</th>
<th>Local</th>
<th>Remote</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device identification data</td>
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<td>✓</td>
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</tbody>
</table>

#### Time synchronization

<table>
<thead>
<tr>
<th>Local</th>
<th>Remote</th>
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<tbody>
<tr>
<td>✓</td>
<td>✓</td>
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</tbody>
</table>

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**Functions of the communication components**

<table>
<thead>
<tr>
<th>Function</th>
<th>Local</th>
<th>Remote</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission of the operating state (ON, OFF, tripped) to the PROFIBUS</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Display of measured values in release, change parameters through display</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Transmission of maximum value of present current in %</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Transmission of individual present phase currents incl. min./max. and time stamp</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Transmission of identification data</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Transmission of switch information on HTML basis locally to a PC</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Transmission of switch information on HTML basis through Ethernet</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Read out and adjust protection parameters through PROFIBUS</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

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**Required**

- Function can optionally be taken over by more than one release.
- Function can optionally be taken over by one of these adapters.

**Not necessary for this function, optionally combinable**

- Function not available
Switching of DC currents

The VL160X to VL630 circuit breakers (for system protection with TM, for starter combinations, non-automatic air circuit breakers) can also be used for DC switching and protection applications. The VL160 to VL1600 circuit breakers with solid-state releases (ETU) are not suitable for DC applications.

However, the maximum permitted DC current for each conducting path needs to be taken into account for DC switching applications.

For voltages above 250 V for VL160 to VL630, a series connection of 2 or 4 conducting paths is required.

As the current has to flow through all of the conducting paths, the following connections are recommended in order to satisfy the thermal tripping characteristics.

With DC applications, the response values of the instantaneous short-circuit releases ("I" releases ) are increased by 30 to 40%.

### Recommended connection/Maximum permitted DC voltage $U_e$

<table>
<thead>
<tr>
<th>Circuit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuit A</td>
<td>Circuit B&lt;sup&gt;1)&lt;/sup&gt;</td>
</tr>
<tr>
<td>250 V DC&lt;sup&gt;2)&lt;/sup&gt;</td>
<td>500 V DC&lt;sup&gt;3)&lt;/sup&gt;</td>
</tr>
<tr>
<td>500 V DC</td>
<td>600 V DC</td>
</tr>
<tr>
<td>600 V DC</td>
<td>600 V DC</td>
</tr>
</tbody>
</table>

<sup>1</sup>Circuit B: A current reduction to 75 % is necessary with 4 conducting paths. The characteristic curve is also shifted by the greater temperature rise.

<sup>2</sup>VL160X on request.

<sup>3</sup>4th pole (N) without overload and short-circuit releases, or 4th pole (N=100 %).

<sup>4</sup>With a non-grounded system, all poles must be disconnected.
### Technical specifications

<table>
<thead>
<tr>
<th>Type</th>
<th>VL160X 3VL1</th>
<th>VL160 3VL2</th>
<th>VL250 3VL3</th>
<th>VL400 3VL4</th>
<th>VL630 3VL5</th>
<th>VL800 3VL6</th>
<th>VL1250 3VL7</th>
<th>VL1600 3VL8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. rated current $I_{n}$</td>
<td>A 160</td>
<td>160</td>
<td>250</td>
<td>400</td>
<td>630</td>
<td>800</td>
<td>1250</td>
<td>1600</td>
</tr>
<tr>
<td>N pole</td>
<td>A 160</td>
<td>160</td>
<td>250</td>
<td>400</td>
<td>630</td>
<td>800</td>
<td>1250</td>
<td>1600</td>
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<tr>
<td>Rated insulation voltage $U_{i}$ acc. to IEC 60947-2</td>
<td>AC V 800</td>
<td>800</td>
<td>800</td>
<td>800</td>
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<td>Main current paths</td>
<td>AC V 690</td>
<td>690</td>
<td>690</td>
<td>690</td>
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<td>Auxiliary circuits</td>
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<td>Rated impulse withstand voltage $U_{imp}$</td>
<td>kV</td>
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<td>ECE</td>
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<td>NEMA 60 Hz</td>
<td>AC V 600</td>
<td>600</td>
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<td>Utilization categories</td>
<td>A A A A A A A</td>
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<tr>
<td>Permissible ambient temperature ($^\circ$C)</td>
<td>1) $-25 ... -75$</td>
<td>2.1</td>
<td>7.6</td>
<td>1.7</td>
<td>7.4</td>
<td>1.8</td>
<td>7.2</td>
<td>1.5</td>
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<td>Permissible load at various ambient temperatures</td>
<td>3)</td>
<td>86/80</td>
<td>86/80</td>
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<tr>
<td>Close to the circuit breaker, related to the rated current of the circuit breaker</td>
<td></td>
<td>93/95</td>
<td>93/95</td>
<td>93/95</td>
<td>93/95</td>
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<tr>
<td>TM/E&amp;TU Up to 50°C %</td>
<td>100/100</td>
<td>100/100</td>
<td>100/100</td>
<td>100/100</td>
<td>100/100</td>
<td>100/100</td>
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<tr>
<td>TM/E&amp;TU At 60°C %</td>
<td>93/95</td>
<td>93/95</td>
<td>93/95</td>
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<tr>
<td>TM/E&amp;TU At 70°C %</td>
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<td>86/80</td>
<td>86/80</td>
<td>86/80</td>
<td>86/80</td>
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<td>Circuit breakers for motor protection</td>
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<td>Up to 50°C %</td>
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<td>Circuit breakers for starter combinations and non-automatic circuit breakers</td>
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<td>Up to 50°C %</td>
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<td>At 70°C %</td>
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<tr>
<td>Weights of 3-pole circuit breakers</td>
<td>kg</td>
<td>--</td>
<td>1.5</td>
<td>1.6</td>
<td>4.2</td>
<td>7.8</td>
<td>14.2</td>
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<tr>
<td>Basic unit without solid-state release</td>
<td>kg</td>
<td>--</td>
<td>0.7</td>
<td>0.7</td>
<td>1.5</td>
<td>1.2</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Thermal-magnetic overcurrent release</td>
<td>kg</td>
<td>--</td>
<td>0.9</td>
<td>0.9</td>
<td>1.7</td>
<td>1.5</td>
<td>1.8</td>
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<tr>
<td>Solid-state release</td>
<td>kg</td>
<td>--</td>
<td>2.0</td>
<td>2.2</td>
<td>2.3</td>
<td>5.7</td>
<td>9.0</td>
<td>--</td>
</tr>
<tr>
<td>Basic unit</td>
<td>kg</td>
<td>--</td>
<td>2.4</td>
<td>2.5</td>
<td>5.9</td>
<td>9.3</td>
<td>16.0</td>
<td>25.0</td>
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<tr>
<td>With thermal-magnetic overcurrent release</td>
<td>kg</td>
<td>--</td>
<td>2.0</td>
<td>2.2</td>
<td>2.3</td>
<td>5.5</td>
<td>9.7</td>
<td>18.2</td>
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<tr>
<td>With solid-state release</td>
<td>kg</td>
<td>--</td>
<td>1.0</td>
<td>1.0</td>
<td>1.9</td>
<td>1.5</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Weights of 4-pole circuit breakers</td>
<td>kg</td>
<td>--</td>
<td>1.1</td>
<td>1.2</td>
<td>2.1</td>
<td>2.0</td>
<td>2.3</td>
<td>6.0</td>
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<tr>
<td>Basic unit</td>
<td>kg</td>
<td>2.5</td>
<td>3.0</td>
<td>3.2</td>
<td>7.4</td>
<td>11.2</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>With thermal-magnetic overcurrent release</td>
<td>kg</td>
<td>--</td>
<td>3.1</td>
<td>3.3</td>
<td>7.6</td>
<td>11.7</td>
<td>20.5</td>
<td>33.5</td>
</tr>
<tr>
<td>With solid-state release</td>
<td>kg</td>
<td>--</td>
<td>3.3</td>
<td>3.5</td>
<td>7.8</td>
<td>11.5</td>
<td>20.7</td>
<td>33.9</td>
</tr>
</tbody>
</table>

1. Circuit breaker cannot be used for direct current.
2. Rated DC data apply only for thermal-magnetic overcurrent releases.
3. On request.
4. Exception: 3VL molded case circuit breakers with TM TU: 0°C ... 75°C due to derating at low temperatures.
### General data

<table>
<thead>
<tr>
<th>Type</th>
<th>VL160X 3VL1</th>
<th>VL160 3VL2</th>
<th>VL250 3VL3</th>
<th>VL400 3VL4</th>
<th>VL630 3VL5</th>
<th>VL800 3VL6</th>
<th>VL1250 3VL7</th>
<th>VL1600 3VL8</th>
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</thead>
<tbody>
<tr>
<td>Endurance</td>
<td>Operating cycles 20000</td>
<td>20000</td>
<td>20000</td>
<td>20000</td>
<td>10 000</td>
<td>10 000</td>
<td>3000</td>
<td>3000</td>
</tr>
<tr>
<td>Electrical endurance</td>
<td>Operating cycles 10 000</td>
<td>10 000</td>
<td>10 000</td>
<td>10 000</td>
<td>5000</td>
<td>5000</td>
<td>1500</td>
<td>1500</td>
</tr>
<tr>
<td>Max. switching frequency</td>
<td>1/60</td>
<td>1/60</td>
<td>1/60</td>
<td>1/60</td>
<td>1/60</td>
<td>1/60</td>
<td>1/60</td>
<td>1/60</td>
</tr>
<tr>
<td>Connection types</td>
<td>See “Main Connections, Basic Equipment and Options”</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Conductor cross-sections

#### Box terminals
- Solid or stranded cable: Copper only, mm² 2.5 ... 95, 2.5 ... 50, 2.5 ... 50, 2.5 ... 120, 12 ... 10
- Flexible busbar, mm² 12 × 10, 12 × 10
- Connecting terminal plate for flexible busbar, mm² --, --

#### Circular conductor for cable
- Solid or stranded cable, mm² 16 ... 70, 10 ... 50, 10 ... 50, 25 ... 120, 25 ... 120

#### Multiple feed-in terminal
- Solid or stranded cable, Cu or Al, mm² --, --, --, --, --
- Finely stranded with end sleeve, mm² --, --, --, --, --

#### Direct connection of busbars
- Cu or Al, mm² 17 × 7, 22 × 7, 24 × 7, 32 × 10, 40 × 10
- Screw for connection with screw terminal

### Conductor cross-sections for control circuits with terminal connection

#### Screw terminals
- Solid or stranded cable, mm² 0.75 ... 1.5, 0.75 ... 1.0, 0.75 ... 1.0, 0.75 ... 1.5, 0.75 ... 1.5
- Finely stranded with end sleeve, mm² 0.75 ... 1.0, 0.75 ... 1.0, 0.75 ... 1.0, 0.75 ... 1.0, 0.75 ... 1.0

### Power loss per circuit breaker at max. rated current

#### System protection
- TM 0.8 ... 1.0, 12 ... 70, 15 ... 48, 32 ... 80, 60 ... 175, 85 ... 230
- ETU or LCD ETU, W = 90, 60, 90

#### For starter combinations or non-automatic air circuit breaker
- W 40, 40, 60, 90, 160, 250, 260

#### For motor protection
- W = 40, 60, 60, 90, 160

### Permissible mounting position

### Auxiliary and alarm switches

#### Conventional free-air thermal current \(I_{th}\)
- A 10, 10, 10, 10, 10, 10, 10, 10

#### Rated making capacity
- A 10, 10, 10, 10, 10, 10, 10, 10

#### AC
- Rated operational voltage, V 24, 48, 110, 230, 400, 600
- Rated operational current
  - AC-12, A 10
  - AC-15, A 10
  - AC-6, 10, 10, 6, 6, 6

#### DC
- Rated operational voltage, V 24, 48, 110, 230
- Rated operational current
  - DC-12, A 10
  - DC-13, A 3, 1.5, 0.7, 0.3

#### Back-up fuse/miniature circuit breaker
- A 10 TDz/10, 10 TDz/10, 10 TDz/10, 10 TDz/10, 10 TDz/10, 10 TDz/10, 10 TDz/10, 10 TDz/10

#### Leading auxiliary switch with rotary operating mechanism

<table>
<thead>
<tr>
<th>Conventional thermal current (I_{th})</th>
<th>A2</th>
<th>A2</th>
<th>A2</th>
<th>A2</th>
<th>A2</th>
<th>A2</th>
<th>A2</th>
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</thead>
<tbody>
<tr>
<td>Rated making capacity</td>
<td>2  (ind. 0.5)</td>
<td>2  (ind. 0.5)</td>
<td>2  (ind. 0.5)</td>
<td>2  (ind. 0.5)</td>
<td>2  (ind. 0.5)</td>
<td>2  (ind. 0.5)</td>
<td>2  (ind. 0.5)</td>
<td>2  (ind. 0.5)</td>
</tr>
<tr>
<td>Rated operational voltage, V AC 230</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
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<tr>
<td>Rated breaking capacity, inductive, p.f. = 0.7</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
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<tr>
<td>Rated breaking capacity</td>
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<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
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<tr>
<td>Back-up fuse, quick</td>
<td>A 16</td>
<td>A 16</td>
<td>A 16</td>
<td>A 16</td>
<td>A 16</td>
<td>A 16</td>
<td>A 16</td>
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### Position indicator switches

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<th>A16</th>
<th>A16</th>
<th>A16</th>
<th>A16</th>
<th>A16</th>
<th>A16</th>
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</thead>
<tbody>
<tr>
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<td>16</td>
<td>16</td>
<td>16</td>
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<td>Rated operational voltage, V AC 250</td>
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<td>400</td>
<td>400</td>
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<tr>
<td>Rated operational current</td>
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<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
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<tr>
<td>Rated breaking capacity, inductive, p.f. = 0.7</td>
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<tr>
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<td>A 16</td>
<td>A 16</td>
<td>A 16</td>
<td>A 16</td>
<td>A 16</td>
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</tbody>
</table>

1) For VL400 to VL1600 circuit breakers with guide frame in lateral mounting position. Adapter set on request.

2) Permissible current load factor 0.9; only with internal accessories.

3) Not for 690 V AC/600 V DC.

4) Cross-sections according to IEC 60999.
### General data

#### Auxiliary and alarm switches

<table>
<thead>
<tr>
<th>Tripped signal switch in RCD module</th>
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<tbody>
<tr>
<td>Conventional thermal current $I_{th}$</td>
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<tr>
<td>Rated making capacity</td>
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<tr>
<td>Rated operational voltage V AC</td>
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#### Auxiliary releases

<table>
<thead>
<tr>
<th>Group 1: VL160X to VL400</th>
<th>Group 2: VL630 to VL1600</th>
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</thead>
<tbody>
<tr>
<td>Undervoltage releases</td>
<td></td>
</tr>
<tr>
<td>Response voltage:</td>
<td></td>
</tr>
<tr>
<td>Release (circuit breaker is tripped) V</td>
<td>0.35 ... 0.70 × $U_s$</td>
</tr>
<tr>
<td>Pick-up (circuit breaker can be closed) V</td>
<td>0.85 ... 1.1 × $U_s$</td>
</tr>
<tr>
<td>Power consumption (uninterrupted duty) at:</td>
<td></td>
</tr>
<tr>
<td>AC 50/60 Hz 24 V</td>
<td>VA 1.4</td>
</tr>
<tr>
<td>AC 50/60 Hz 110 ... 127 V</td>
<td>VA 1.0</td>
</tr>
<tr>
<td>AC 50/60 Hz 220 ... 250 V</td>
<td>VA 1.0</td>
</tr>
<tr>
<td>AC 50/60 Hz 208 V</td>
<td>VA 1.0</td>
</tr>
<tr>
<td>AC 50/60 Hz 277 V</td>
<td>VA 1.0</td>
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<tr>
<td>AC 50/60 Hz 380 ... 415 V</td>
<td>VA 1.0</td>
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<tr>
<td>AC 50/60 Hz 440 ... 480 V</td>
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<td>AC 50/60 Hz 500 ... 525 V</td>
<td>VA 1.0</td>
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<tr>
<td>AC 50/60 Hz 600 V</td>
<td>VA 1.0</td>
</tr>
<tr>
<td>12 V DC</td>
<td>W 0.8</td>
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<tr>
<td>24 V DC</td>
<td>W 0.8</td>
</tr>
<tr>
<td>48 V DC</td>
<td>W 0.8</td>
</tr>
<tr>
<td>60 V DC</td>
<td>W 0.8</td>
</tr>
<tr>
<td>110 ... 127 V DC</td>
<td>W 0.8</td>
</tr>
<tr>
<td>220 ... 250 V DC</td>
<td>W 0.8</td>
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<tr>
<td>Max. opening time</td>
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#### Shunt release

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<tr>
<th>Response voltage: U_s</th>
<th>U_s</th>
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<tbody>
<tr>
<td>Pick-up (circuit breaker is tripped) V</td>
<td>0.7 ... 1.1</td>
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<tr>
<td>Power consumption (short time) at:</td>
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</tr>
<tr>
<td>AC 50/60 Hz 24 V</td>
<td>VA 310</td>
</tr>
<tr>
<td>AC 50/60 Hz 48 ... 60 V</td>
<td>VA 335 ... 465</td>
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<tr>
<td>AC 50/60 Hz 110 ... 127 V</td>
<td>VA 470 ... 630</td>
</tr>
<tr>
<td>AC 50/60 Hz 208 ... 277 V</td>
<td>VA 585 ... 1000</td>
</tr>
<tr>
<td>AC 50/60 Hz 380 ... 600 V</td>
<td>VA 180 ... 500</td>
</tr>
<tr>
<td>24 V DC</td>
<td>W 360</td>
</tr>
<tr>
<td>48 ... 60 V DC</td>
<td>W 380 ... 590</td>
</tr>
<tr>
<td>110 ... 127 V DC</td>
<td>W 506 ... 680</td>
</tr>
<tr>
<td>220 ... 250 V DC</td>
<td>W 470 ... 580</td>
</tr>
<tr>
<td>Max. opening time</td>
<td>ms 50</td>
</tr>
</tbody>
</table>

#### Time-delay device for undervoltage release

| Rated control supply voltage U_s | V AC/DC 220 ... 250 | 220 ... 250 |
| Control voltage for undervoltage release | V DC 220 ... 250 | 220 ... 250 |

#### Conductor cross-sections

| Finely stranded with end sleeve | mm² 2 × (0.5 ... 1.5) | 2 × (0.5 ... 1.5) |
| Solid | mm² 2 × (0.5 ... 1.5) | 2 × (0.5 ... 1.5) |

#### Delay time/connection

| Undervoltage release | s 3/-- | 1.5/-- |
| Undervoltage release and auxiliary relay (3RH11) | s 0.6/-- | 0.3/-- |

1) Max. DC rated operational voltage 125 V, minimum load 50 mA at 5 V DC.
### General data

<table>
<thead>
<tr>
<th>Type</th>
<th>VL160X</th>
<th>VL160</th>
<th>VL250</th>
<th>VL400</th>
<th>VL630</th>
<th>VL800</th>
<th>VL1250</th>
<th>VL1600</th>
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<tr>
<td></td>
<td>3VL1</td>
<td>3VL2</td>
<td>3VL3</td>
<td>3VL4</td>
<td>3VL5</td>
<td>3VL6</td>
<td>3VL7</td>
<td>3VL8</td>
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<tr>
<td>Motorized operating mechanisms</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>--</td>
<td>--</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Motorized operating mechanism with energy store (synchronizable)</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>--</td>
<td>--</td>
<td>x</td>
<td>x</td>
<td>--</td>
</tr>
</tbody>
</table>

| Motorized operating mechanisms | Power consumption | VA/W | < 100 | < 100 | < 100 | --    | --    | < 250  | < 250  |
| Rated control supply | AC 50/60 Hz V | 42   | 110-127/220-240 | --    | --    | --    | 42-48/60 | 110-127/220-250 |
| DIAZED fuses (gG operational class, characteristic slow) | A | 2 | 2 | -- | -- | 4 | 2 |
| Miniature circuit breaker (C characteristic acc. to EN 60898) | A | 4 | 2 | -- | -- | 4 | 2 |
| Operating range | V | 0.85 ... 1.1 x U₀ | 0.85 ... 1.1 x U₀ | 0.85 ... 1.1 x U₀ | 0.85 ... 1.1 x U₀ | -- | -- | 0.85 ... 1.1 x U₀ |
| Minimum command duration at U₀ | ms | 50 | 50 | 50 | -- | -- | 50 | 50 |
| Max. command duration, depends on circuit | Non-maintained or continuous command | -- | -- | -- | -- | -- | -- | Non-maintained or continuous command |
| Total make-time | s | < 1 | < 1 | < 1 | -- | -- | -- | < 5 | < 5 |
| Break-time | s | < 1 | < 1 | < 1 | -- | -- | -- | < 5 | < 5 |
| Interval time between OFF and ON commands | s | > 2 | > 2 | > 2 | -- | -- | -- | > 5 | > 5 |
| Interval time between ON and OFF commands | s | > 2 | > 2 | > 2 | -- | -- | -- | > 5 | > 5 |
| Max. permissible switching frequency | 1/h | 120 | 120 | 120 | -- | -- | -- | 30 | 30 |

| Motorized operating mechanism with energy store (synchronizable) | Power consumption | VA/W | < 100 | < 100 | < 100 | < 200 | < 250 | < 250 | -- | -- |
| Rated control supply | AC 50/60 Hz V | 42-48/60 | 110-127/220-250 | -- | -- | -- | -- | -- |
| DIAZED fuses (gG operational class, characteristic slow) | A | 4 | 2 | -- | -- | -- | -- | -- |
| Miniature circuit breaker (C characteristic acc. to EN 60898) | A | 4 | 2 | -- | -- | -- | -- | -- |
| Operating range | V | 0.85 ... 1.1 x U₀ | 0.85 ... 1.1 x U₀ | 0.85 ... 1.1 x U₀ | 0.85 ... 1.1 x U₀ | -- | -- | 0.85 ... 1.1 x U₀ |
| Minimum command duration at U₀ | ms | 50 | 50 | 50 | 50 | 50 | 50 | 50 | -- | -- |
| Max. command duration, depends on circuit | Non-maintained or continuous command | -- | -- | -- | -- | -- | -- | -- |
| Total make-time | ms | < 100 | < 100 | < 100 | < 100 | < 100 | < 100 | -- | -- |
| Break-time | s | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | -- | -- |
| Interval time between OFF and ON commands | s | > 5 | > 5 | > 5 | > 5 | > 5 | > 5 | -- | -- |
| Interval time between ON and OFF commands | s | > 1 | > 1 | > 1 | > 1 | > 1 | > 1 | -- | -- |
| Max. permissible switching frequency | 1/h | 120 | 120 | 120 | 60 | 60 | 60 | -- | -- |

x: Available
--: Not available
1) Changeover contact also permissible, note dead times between ON and OFF commands.
Space requirements above arc chutes

The specific mounting instructions for the various sizes must be observed for plain conductors and busbars outside the arcing space.

For mounting instructions and manual refer to the Internet Manual for the SENTRON 3VL circuit breaker

This manual contains additional technical information, covering a product description, mode of operation, electrical wiring system and retrofitting.

The manual and operating instructions are available in PDF format at:
http://www.siemens.com/lowvoltage/manuals

<table>
<thead>
<tr>
<th>Circuit breakers</th>
<th>Switching capacity</th>
<th>Minimum enclosure volume m³</th>
<th>A ≤ 415 V</th>
<th>&gt;415...690 V</th>
<th>&gt;690 V</th>
<th>B ≤ 690 V</th>
<th>C ≤ 690 V</th>
<th>D ≤ 690 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>VL160X</td>
<td>Standard High</td>
<td>0.011</td>
<td>35</td>
<td>70</td>
<td>35</td>
<td>25</td>
<td>25</td>
<td>35</td>
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<tr>
<td>VL160</td>
<td>Standard High</td>
<td>0.011</td>
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<td>100</td>
<td>50</td>
<td>25</td>
<td>25</td>
<td>35</td>
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<td>VL250</td>
<td>Standard High Very high</td>
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<td>50</td>
<td>100</td>
<td>50</td>
<td>25</td>
<td>25</td>
<td>35</td>
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<tr>
<td>VL400</td>
<td>Standard High Very high</td>
<td>0.006</td>
<td>50</td>
<td>100</td>
<td>50</td>
<td>25</td>
<td>25</td>
<td>35</td>
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<tr>
<td>VL630</td>
<td>Standard High Very high</td>
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<td>100</td>
<td>50</td>
<td>25</td>
<td>25</td>
<td>35</td>
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<tr>
<td>VL800</td>
<td>Standard High Very high</td>
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<td>100</td>
<td>50</td>
<td>25</td>
<td>25</td>
<td>35</td>
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<tr>
<td>VL1250</td>
<td>Standard High Very high</td>
<td>0.22</td>
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<td>100</td>
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<td>30</td>
<td>30</td>
<td>50</td>
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<tr>
<td>VL1600</td>
<td>Standard High Very high</td>
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<td>100</td>
<td>100</td>
<td>100</td>
<td>30</td>
<td>100</td>
</tr>
</tbody>
</table>

Definition of the permissible safety clearances

Clearance between
A: circuit breaker and busbars (bare metal and grounded metal); terminal cover required above 600 V AC, 500 V DC
B: circuit breaker connection and floor
C: side of the circuit breaker and the side panels (bare metal and grounded metal)
D: circuit breaker and non-conducting parts with an insulation thickness of at least 3 mm (insulator, insulated busbar, painted plate)
General criteria for the selection of current transformers for measurement purposes

Standards

IEC 60044-1, EN 60044-1

Window-type current transformers

The conductor to be measured (busbar or cable) is passed through the window opening and constitutes the primary circuit of the window-type current transformer.

Pin-wound transformers: An economical solution especially for small primary currents of 5 A to 75 A is achieved when the conductor to be measured is pin-wound several times.

Rated primary current $I_{pn}$

Current transformers can be continuously loaded with 1.3 times the rated primary current ($I_{pn}$).

Rated secondary current $I_{sn}$

- 1 A: Particularly suitable for longer measuring leads. Cable losses of only 4% in contrast to 5 A current transformers.
- 5 A: 5 A current transformers generate 25 times the power losses on measuring leads as compared with 1 A current transformers. These stray losses result in higher power in the case of long cables. Only recommended for use with short measuring leads.

Accuracy class

- Class 1: Operation measurement, internal metering
  - Current error $\pm 1\%$ at $1 \times I_{pn}$ and $1.2 \times I_{pn}$

- Class 3: Coarse measurement
  - Current error $\pm 3\%$ at $0.5 \times I_{pn}$ and $1.2 \times I_{pn}$

Rated power $P_n$

The rated power of transformers is specified in VA. The actual load rating should be similar to the rated power; a lower actual load rating (underburden) increases the overcurrent factor and measuring devices may be damaged in case of a short-circuit, a higher actual load rating (overburden) has a negative effect on the accuracy. With a frequency of 60 Hz the rated power increases to 1.2 times. With $16\frac{2}{3}$ Hz the output power decreases to $\frac{1}{3}$ of the rated power.

Maximum voltage for equipment $U_m$

This is the rms value of the maximum voltage between the conductors of a system. For this voltage the insulation must be rated at normal operating conditions. 4NC5 current transformers are suitable for 720 V.

Overcurrent limiting factor $FS$

The overcurrent limiting factor is expressed using the characters $FS$ and a factor, e.g. $FS5$ or $FS10$.

When a short-circuit current flows through the primary winding of a current transformer, the load on the measuring devices connected to the current transformer is the lower the smaller the overcurrent limiting factor is.

Rated short-time thermal current $I_{th}$

The rated short-time thermal current $I_{th}$ is the rms value of the primary current with a duration of one second, whose heat effect the current transformer can resist without being damaged in the event of a short-circuited secondary winding.

Rated impulse current $I_{dyn}$

The rated impulse current $I_{dyn}$ is the highest instantaneous value of the current after a short-circuit whose force the current transformer can resist without being damaged. The rated impulse current is specified as peak value.
# General data

**Standards**
- IEC 60044-1, EN 60044-1

**Rated primary current \( I_{pn} \)**
- A
- 50 ... 1500
- 5 ... 75, for use as pin-wound transformer for low currents

**Rated secondary current \( I_{sn} \)**
- A
- 1 or 5

**Maximum voltage for equipment \( U_{mn} \)**
- V
- 720

**Frequency**
- Hz
- 50 ... 60

**Rated overcurrent limiting factor \( F_S \)**
- FS

**Max. uninterrupted current**
- \( 1.2 \times I_{pn} \)

**Rated short-time thermal current \( I_{th} \)**
- \( 60 \times I_{pn} \)

**Rated impulse current \( I_{dyn} \)**
- \( 2.5 \times I_{th} \) or \( 150 \times I_{pn} \)

**Accuracy class**
- 1 (3)

**Ambient temperature**
- °C
- +55 at \( 1.0 \times I_{pn} \)
- +40 at \( 1.2 \times I_{pn} \)
- -10 minimum value

**Max. busbar temperature**
- °C
- +120

**Molded-plastic class**
- E (max. 120 °C continuously)

**Insulation**
- Thermoplast enclosure, halogen-free

**Test voltage**
- kV
- 3 AC

**Secondary terminals**
- Double terminals using M4 captive screws, finger-safe to EN 61140

<table>
<thead>
<tr>
<th>Solid</th>
<th>mm²</th>
<th>2 \times (2.5 ... 6)</th>
</tr>
</thead>
</table>

| Two-wire | mm² | 2 \times (1.5 ... 4) |

**Terminals with same polarity**
- Primary → secondary
- K/P1 → k/S1
- L/P2 → l/S2

**Mounting**
- Either busbar or foot mounting
3VL Molded Case Circuit Breakers

3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

Characteristics curves

- General information: The indicated tripping values for the inverse-time delayed solid-state releases (thermal overload releases, "L" releases) are mean values taken from the spread of all setting ranges from the cold state and under even load conditions on the conducting paths.

The tripping characteristics of the instantaneous (electromagnetic) short-circuit releases ("I" releases) are based on the phase rated current \(I_{n}\), which also represents the upper value of the setting range on circuit breakers with adjustable thermal overload releases. With a lower operational current there is a correspondingly higher multiple for the tripping current of the "I" releases.

The shown characteristic curve for the circuit breaker relates to a specific setting range. It is, however, also valid as a schematic representation of circuit breakers with other current ranges.

"L" = Thermal release.
"I" = Instantaneous (electromagnetic) short-circuit release

The time/current characteristic, the current limiting characteristics and the \(I^2t\) characteristic curves were determined according to IEC 60947 and EN 60947.

The time/current characteristic of the inverse-time delayed overload release (thermal overload release, \(L\) overload release) for DC and AC with a frequency of 50/60 Hz.

For thermomagnetic releases (TM) the following applies:

The characteristic curves apply to the cold state; at operating temperature, the tripping times of the thermal releases are reduced to approximately 25 %.

Under normal operating conditions, all three poles of the device must be loaded. The three main current paths must be connected in series in order to protect single-phase or DC loads.

Tripping characteristic curves of the SENTRON VL160, VL250, VL400 and VL630 circuit breakers for motor/generator protection with solid-state releases.

The tripping times of the inverse-time delayed solid-state releases apply to the non-preloaded (cold) state. In the operating/warm state (after application of a load at the rated current), the tripping times are reduced to approx. 33 %. After a tripping operation due to overcurrent, the tripping times are reduced in accordance with the dynamic tripping response (see diagram), as a result of which a cooling time of a few minutes is required before the next motor start.

Time/current characteristic curves, current limiting characteristic curves and \(I^2t\) curves can be ordered from "Technical Assistance" (e-mail: technical-assistance@siemens.com) or downloaded from the following Internet site:

http://www.siemens.com/lowvoltage/characteristics

Schematic representation of the time/current characteristic curve for SENTRON VL160 circuit breakers for system protection, \(I_{cu}\), 100 kA max. at 415 V, adjustable "I" release.

Dynamic tripping response (thermal image)
Note:
The 5.5 mm extension at each end of the SENTRON VL250 (3VL3) circuit breaker only applies when using box terminals or circular conductor terminals (B).
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids
VL160X (3VL1), VL160 (3VL2) and VL250 (3VL3), 3- and 4-pole, up to 250 A

Operating mechanisms
Motorized operating mechanism with stored-energy mechanism

Motorized operating mechanism for VL160X (3VL1)

Motorized operating mechanism for VL160 (3VL2) and VL250 (3VL3)

Front-operated rotary operating mechanism

(1) Safety locks
(2) Front-operated rotary operating mechanism
(3) Padlock
(4) Masking frame for door cut-out (for circuit breaker with operating mechanism)
(5) Step for cover
(6) Outside surface of cabinet door
(7) Motorized operating mechanism with stored-energy mechanism
(8) Terminal insulation
3VL Molded Case Circuit Breakers

3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL160X (3VL1), VL160 (3VL2) and VL250 (3VL3), 3- and 4-pole, up to 250 A

Terminals and phase barriers

<table>
<thead>
<tr>
<th>Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>J</th>
<th>K</th>
<th>L</th>
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<tbody>
<tr>
<td>VL160X (3VL1)</td>
<td>242</td>
<td>126</td>
<td>116</td>
<td>222</td>
<td>266.5</td>
<td>138.5</td>
<td>222</td>
<td>116</td>
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<tr>
<td>VL160 (3VL2)</td>
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<td>120</td>
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<td>143</td>
<td>238</td>
<td>120</td>
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<td>VL250 (3VL3)</td>
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<td>238</td>
<td>120</td>
<td>22</td>
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Circuit breaker with rear terminals – long and short

<table>
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<th>B</th>
<th>C</th>
<th>D</th>
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<tr>
<td>VL250 (3VL3)</td>
<td>75.5</td>
<td>149</td>
<td>101</td>
<td>199</td>
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</tbody>
</table>
Project planning aids

3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Terminal covers

Terminal covers, standard

<table>
<thead>
<tr>
<th>Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
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<td>96</td>
<td>182</td>
<td>326.5</td>
<td>168.5</td>
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<tr>
<td>VL160</td>
<td>101</td>
<td>199</td>
<td>343</td>
<td>173</td>
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<tr>
<td>VL250</td>
<td>101</td>
<td>199</td>
<td>343</td>
<td>173</td>
</tr>
</tbody>
</table>

Extended terminal covers

(1) Front connecting bars
(2) Terminal covers (standard)
(3) Terminal covers (extended)
(4) Masking frame for door cut-out
(5) Outside surface of cabinet door
(6) Installation level
**3VL Molded Case Circuit Breakers**

**3VL Molded Case Circuit Breakers up to 1600 A**

**Project planning aids**

**VL160X (3VL1), VL160 (3VL2) and VL250 (3VL3), 3- and 4-pole, up to 250 A**

**Locking devices for toggle levers**

---

**Rear interlocking modules**

Rear interlocking module
for plug-in/withdrawable circuit breakers,
with front connection, without/with RCD module
(withdrawable version only without RCD module)

For more detailed dimensional drawings see "Mounting Instructions for Rear Interlocking Module".

---

**Type** | **A**
--- | ---
Without RCD module | VL160X (3VL1), VL160 (3VL2), VL250 (3VL3)
With RCD module – only "plug-in version" | VL160X (3VL1), VL160 (3VL2), VL250 (3VL3)

---

**Mounting plate, example 1, not included in scope of supply**

**Mounting plate, example 2, not included in scope of supply**
Project planning aids

VL160X (3VL1), VL160 (3VL2) and VL250 (3VL3), 3- and 4-pole, up to 250 A

Accessories

Circuit breaker with door-coupling rotary operating mechanism

Masking frame for door cut-out for circuit breaker with toggle lever

Masking frame for door cut-out for circuit breaker with operating mechanism

(2) Door-coupling rotary operating mechanism
(3) Masking frame for door cut-out (for circuit breaker with operating mechanism)
(4) Masking frame for door cut-out (for circuit breaker with toggle lever)
(5) Terminal covers
(6) Outside surface of cabinet door
(7) Installation level
(10) Support bracket
(11) Extension
(12) Center line of drive shaft
**3VL Molded Case Circuit Breakers up to 1600 A**

**Project planning aids**

**VL160X (3VL1), VL160 (3VL2) and VL250 (3VL3), 3- and 4-pole, up to 250 A**

**Door cut-outs**

Door cut-out for toggle lever (without masking frame)

Door cut-out for toggle lever (with masking frame)

Door cut-out for front-operated rotary operating mechanism with stored-energy mechanism (without masking frame)

Door cut-out for door-coupling rotary operating mechanism

Hole pattern and cut-out for plug-in base with rear connecting bars

**Note:** A minimum distance between reference point Y and the door hinge is required for the door cut-outs.

### Combination

<table>
<thead>
<tr>
<th>Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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<tbody>
<tr>
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Project planning aids

3VL Molded Case Circuit Breakers up to 1600 A

VL160X (3VL1), VL160 (3VL2) and VL250 (3VL3), 3- and 4-pole, up to 250 A

Plug-in bases and accessories

Plug-in base with front connecting bars

Hole pattern for plug-in base with front connecting bars

Plug-in base with rear flat bar connection

(1) Plug-in base with rear terminal covers
(2) Plug-in base
(3) Plug-in base with rear flat bar connection
(4) Masking frame for door cut-out (for circuit breaker with toggle lever)
(5) Terminal covers (standard)
(6) Outside surface of cabinet door
(7) Installation level
(8) Plug-in base with front connecting bars
(9) Plug-in base with terminal covers on the front
(10) Phase barriers
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL160X (3VL1), 3- and 4-pole, up to 160 A

Plug-in bases and accessories

SENTRON VL160X (3VL1) circuit breakers with motorized operating mechanism with stored-energy mechanism, mounted on plug-in base

(1) Plug-in base with terminal covers
(2) Plug-in base
(3) Circuit breaker
(4) Masking frame for door cut-out
   (for circuit breaker with operating mechanism)
(5) Terminal covers (standard)
(6) Outside surface of cabinet door
(7) Installation level
(8) Motorized operating mechanism with stored-energy mechanism
(9) Front-operated rotary operating mechanism

SENTRON VL160X (3VL1) circuit breakers with front-operated rotary operating mechanism mounted on plug-in base

90° angle connecting adapter
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL160 (3VL2) and VL250 (3VL3), 3- and 4-pole, up to 250 A

Withdrawable version and accessories
SENTRON VL160 (3VL2) and VL250 (3VL3) circuit breakers with motorized operating mechanism with stored-energy mechanism (connected position)
SENTRON VL160 (3VL2) and VL250 (3VL3) circuit breakers with motorized operating mechanism with stored-energy mechanism (disconnected position)

SENTRON VL160 (3VL2) and VL250 (3VL3) circuit breakers with front-operated rotary operating mechanism (connected position)
SENTRON VL160 (3VL2) and VL250 (3VL3) circuit breakers with front-operated rotary operating mechanism (disconnected position)

(1) Plug-in base with terminal covers
(2) Plug-in base
(3) Circuit breaker
(4) Masking frame for door cut-out
(5) Terminal covers (standard)
(6) Outside surface of cabinet door
(7) Installation level
(8) Motorized operating mechanism with stored-energy mechanism
(9) Front-operated rotary operating mechanism
(10) Locking device for racking mechanism
(11) Racking mechanism
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL160 (3VL2) and VL250 (3VL3), 3- and 4-pole, up to 250 A
Withdrawable version and accessories

SENTRON VL160 (3VL2) and VL250 (3VL3) circuit breakers with extended escutcheon (connected position)

SENTRON VL160 (3VL2) and VL250 (3VL3) circuit breakers with extended escutcheon (disconnected position)

Dimensions of extended escutcheon

Dimensions of withdrawable version

(1) Plug-in base with terminal covers
(2) Plug-in base
(3) Circuit breaker
(4) Masking frame for door cut-out
   (for circuit breaker with operating mechanism)
(5) Terminal covers (standard)
(6) Outside surface of cabinet door
(7) Installation level
(8) Extended escutcheon
(10) Locking device for racking mechanism
(11) Racking mechanism
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL400 (3VL4), 3- and 4-pole, up to 400 A

Circuit breakers

SENTRON VL400 (3VL4) circuit breakers

Motorized operating mechanism with stored-energy mechanism

Front-operated rotary operating mechanism

1. Safety lock
2. Front-operated rotary operating mechanism
3. Padlock
4. Masking frame for door cut-out (for circuit breaker with operating mechanism)
5. Outside surface of cabinet door
6. Motorized operating mechanism with stored-energy mechanism
7. Installation level
8. Toggle lever extension
VL400 (3VL4), 3- and 4-pole, up to 400 A

Terminals and phase barriers

(1) Phase barrier
(2) Front connecting bars
(3) Terminal covers (standard)
(4) Rear terminal (long)
(5) Rear terminal (short)
(7) Installation level
(8) Rear flat connector (long)
(9) Rear flat connector (short)
(10) Flared front busbar connecting bars
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL400 (3VL4), 3- and 4-pole, up to 400 A

Terminal covers

Circuit breaker installation instructions

Front connecting bars

Rear interlocking modules

Rear interlocking module
for plug-in/withdrawable circuit breakers
for front connection, without/with RCD module

For more detailed dimensional drawings see "Mounting Instructions for Rear Interlocking Module".

<table>
<thead>
<tr>
<th>Type</th>
<th>A</th>
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</thead>
<tbody>
<tr>
<td>Without RCD module</td>
<td>VL400 (3VL4) 289</td>
</tr>
<tr>
<td>With RCD module</td>
<td>VL400 (3VL4) 449</td>
</tr>
</tbody>
</table>
**3VL Molded Case Circuit Breakers up to 1600 A**

**Project planning aids**

**VL400 (3VL4), 3- and 4-pole, up to 400 A**

**Interlocks**

**Locking devices for toggle levers**

---

**Accessories**

**Plug-in base for door-coupling rotary operating mechanism**

---

**Masking frame for door cut-out for circuit breaker with toggle lever**

---
3VL Molded Case Circuit Breakers

3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL400 (3VL4), 3- and 4-pole, up to 400 A

Door cut-outs

Door cut-out for toggle lever operating mechanism (without masking frame)

Door cut-out for front-operated rotary operating mechanism and motorized operating mechanism with stored-energy mechanism (without masking frame)

Door cut-out for door-coupling rotary operating mechanism

Door cut-out for front-operated rotary operating mechanism, motorized operating mechanism with stored-energy mechanism and extended escutcheon (with masking frame)

Door cut-out for toggle lever operating mechanism (with masking frame)

Door cut-out for door-coupling rotary operating mechanism

Door cut-out for front-operated rotary operating mechanism, motorized operating mechanism with stored-energy mechanism and extended escutcheon (with masking frame)

Hole pattern and cut-out for plug-in base with rear flat connection bars

Hole pattern and cut-out for plug-in base

Hole pattern and cut-out for rear terminals

Note:
A minimum distance between reference point Y and the door hinge is required for the door cut-outs.

Combination | A
---|---
Circuit breaker only | 150
Circuit breaker + plug-in base + motorized operating mechanism with stored-energy mechanism | 150
Circuit breaker + plug-in base + front-operated rotary operating mechanism | 200
Circuit breaker + withdrawable version | 200
VL400 (3VL4), 3- and 4-pole, up to 400 A
Plug-in bases and accessories

Hole pattern for plug-in base with front connecting bars

(1) Plug-in base with rear terminal covers
(2) Plug-in base
(3) Plug-in base with rear flat connecting bars
(5) Terminal covers (standard)
(6) Outside surface of cabinet door
(7) Installation level
(8) Plug-in base with front connecting bars
(9) Plug-in base with terminal covers on the front
(10) Phase barrier
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL400 (3VL4), 3- and 4-pole, up to 400 A

Plug-in bases and accessories

Plug-in base for front-operated rotary operating mechanism (connected position)

Plug-in base for front-operated rotary operating mechanism (disconnected position)

Plug-in base for motorized operating mechanism with stored-energy mechanism (connected position)

Plug-in base for motorized operating mechanism with stored-energy mechanism (disconnected position)

(1) Plug-in base with terminal covers
(4) Masking frame for door cut-out
   (for circuit breaker with operating mechanism)
(5) Terminal covers (standard)
(6) Outside surface of cabinet door
(7) Installation level
(8) Motorized operating mechanism with stored-energy mechanism
(9) Front-operated rotary operating mechanism
(10) Locking device for racking mechanism
(11) Racking mechanism
VL400 (3VL4), 3- and 4-pole, up to 400 A
Plug-in bases and accessories

Plug-in base for extended escutcheon
(connected position)

Plug-in base for extended escutcheon
(disconnected position)

Extended escutcheon mounted on withdrawable version

(1) Plug-in base with terminal covers
(4) Masking frame for door cut-out
   (for circuit breaker with operating mechanism)
(5) Terminal covers (standard)
(6) Outside surface of cabinet door
(7) Installation level
(8) Extended escutcheon
(10) Locking device for racking mechanism
(11) Racking mechanism
Project planning aids

VL630 (3VL5), 3- and 4-pole, up to 630 A

Circuit breakers

SENTRON VL630 (3VL5) circuit breakers

Operating mechanisms

Motorized operating mechanism with stored-energy mechanism

Front-operated rotary operating mechanism

(1) Safety lock
(2) Front-operated rotary operating mechanism
(3) Padlock
(4) Masking frame for door cut-out (for circuit breaker with operating mechanism)
(5) Step for cover
(6) Outside surface of cabinet door
(7) Motorized operating mechanism with stored-energy mechanism
(8) Installation level
3VL Molded Case Circuit Breakers

3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL630 (3VL5), 3- and 4-pole, up to 630 A

Terminals and phase barriers

(1) Phase barrier
(2) Front connecting bars
(3) Terminal covers (standard)
(4) Rear terminal (horizontal connection)
(5) Rear terminal (vertical connection)
(7) Installation level
(8) Flared front busbar connecting bars

Terminal covers

(2) Front connecting bars
(3) Terminal covers (standard)
(4) Terminal covers (extended)
(7) Installation level
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL630 (3VL5), 3- and 4-pole, up to 630 A

Interlocks

Locking devices for toggle levers

Rear interlocking modules

Rear interlocking module for plug-in/withdrawable circuit breakers for front connection

For more detailed dimensional drawings see mounting instructions for: “Rear Interlocking Module”.

<table>
<thead>
<tr>
<th>Type</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
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<th>g</th>
<th>h</th>
<th>i</th>
<th>k</th>
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<tbody>
<tr>
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<td>69.1</td>
<td>11.7</td>
<td>5.1</td>
<td>24.8</td>
<td>90.0</td>
</tr>
</tbody>
</table>

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3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL630 (3VL5), 3- and 4-pole, up to 630 A

Accessories

Door-coupling rotary operating mechanism

Masking frame for door cut-out for circuit breaker with toggle lever

Masking frame for door cut-out for circuit breaker with operating mechanism

Toggle handle extension

(3) Circuit breaker
(4) Toggle handle extension
(5) Terminal covers (standard)
(6) Outside surface of cabinet door
(7) Installation level
(9) Door-coupling rotary operating mechanism
(10) Masking frame for door cut-out
   (for circuit breaker with toggle lever)
(11) Masking frame for door cut-out
    (for circuit breaker with operating mechanism)
(12) Support bracket
### Project planning aids

#### VL630 (3VL5), 3- and 4-pole, up to 630 A

**Door cut-outs**

- Door cut-out for door-coupling rotary operating mechanism

- Door cut-out for front-operated rotary operating mechanism, motorized operating mechanism with stored-energy mechanism and extended escutcheon (without masking frame)

- Door cut-out for front-operated rotary operating mechanism, motorized operating mechanism with stored-energy mechanism and extended escutcheon (with masking frame)

### Combination

<table>
<thead>
<tr>
<th>Combination</th>
<th>A</th>
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</thead>
<tbody>
<tr>
<td>Circuit breaker only</td>
<td>150</td>
</tr>
<tr>
<td>Circuit breaker + plug-in base + motorized operating mechanism</td>
<td>150</td>
</tr>
<tr>
<td>Circuit breaker + plug-in base + front-operated rotary operating</td>
<td>200</td>
</tr>
<tr>
<td>Circuit breaker + withdrawable version</td>
<td>200</td>
</tr>
</tbody>
</table>

Note: A minimum distance between reference point Y and the door hinge is required for the door cut-outs.
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3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL630 (3VL5), 3- and 4-pole, up to 630 A
Plug-in bases and accessories
Plug-in base with terminal covers on the front

Hole pattern for plug-in base, front connecting bars

Plug-in base, with terminal covers, rear flat connecting bars

Plug-in base

(1) Plug-in base with rear terminal covers
(2) Plug-in base
(3) Plug-in base with rear flat connecting bars
(4) Masking frame for door cut-out
(for circuit breaker with toggle lever)
(5) Terminal covers (standard)
(6) Outside surface of cabinet door
(7) Installation level
(8) Plug-in base with front connecting bars
(9) Plug-in base with terminal covers on the front
(10) Phase barrier
(11) Terminal face
Project planning aids

VL630 (3VL5), 3- and 4-pole, up to 630 A

Withdrawable version and accessories

SENTRON VL630 (3VL5) circuit breakers with rotary operating mechanism, withdrawable version (connected position)

SENTRON VL630 (3VL5) circuit breakers with rotary operating mechanism, withdrawable version (disconnected position)

SENTRON VL630 (3VL5) circuit breakers with motorized operating mechanism with stored-energy mechanism, withdrawable version (connected position)

SENTRON VL630 (3VL5) circuit breakers with motorized operating mechanism with stored-energy mechanism, withdrawable version (disconnected position)

(1) Plug-in base with terminal covers
(4) Masking frame for door cut-out
   (for circuit breaker with operating mechanism)
(5) Terminal covers (standard)
(6) Outside surface of cabinet door
(7) Installation level
(8) Motorized operating mechanism with stored-energy mechanism
(9) Front-operated rotary operating mechanism
(10) Locking device for racking mechanism
(11) Racking mechanism
VL630 (3VL5), 3- and 4-pole, up to 630 A
Withdrawable version and accessories

SENTRON VL630 (3VL5) circuit breakers with extended escutcheon, withdrawable version (connected position)

SENTRON VL630 (3VL5) circuit breakers with extended escutcheon, withdrawable version (disconnected position)

SENTRON VL630 (3VL5) circuit breakers with extended escutcheon, withdrawable version

1. Plug-in base with terminal covers
2. Plug-in base
3. Masking frame for door cut-out
4. Terminal covers (standard)
5. Terminal covers (standard)
6. Outside surface of cabinet door
7. Installation level
8. Extended escutcheon
9. Locking device for racking mechanism
10. Racking mechanism

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3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL800 (3VL6), 3- and 4-pole, up to 800 A

Circuit breakers

SENTRON VL800 (3VL6) circuit breaker

Circuit breaker installation instructions

Operating mechanisms

Motorized operating mechanism with stored-energy mechanism

Front-operated rotary operating mechanism

(1) Safety lock
(2) Front-operated rotary operating mechanism
(3) Padlock
(4) Masking frame for door cut-out (for circuit breaker with operating mechanism)
(5) Step for cover
(6) Outside surface of cabinet door
(7) Motorized operating mechanism with stored-energy mechanism
(8) Installation energy mechanism
(9) Toggle lever extension

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**3VL Molded Case Circuit Breakers up to 1600 A**

**VL800 (3VL6), 3- and 4-pole, up to 800 A**

**Withdrawable versions**

Withdrawable version with front-operated rotary operating mechanism

- **Insert position**

Withdrawable version with front-operated rotary operating mechanism

- **Withdraw position**

Withdrawable version with motorized operating mechanism with stored-energy mechanism

- **Insert position**

Withdrawable version with motorized operating mechanism with stored-energy mechanism

- **Withdraw position**

---

(1) Connected position
(2) Masking frame for door cut-out
(3) Outside surface of cabinet door
(4) Installation level
(5) Disconnected position
Project planning aids

**VL 800 (3VL6), 3- and 4-pole, up to 800 A**

Withdrawable version with extended escutcheon (without masking frame)

Insert position

Withdraw position

(1) Connected position
(2) Masking frame for door cut-out
(3) Outside surface of cabinet door
(4) Installation level
(5) Disconnected position
3VL Molded Case Circuit Breakers

3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL800 (3VL6), 3- and 4-pole, up to 800 A
Withdrawable versions

Hole pattern and cut-out for withdrawable versions
with rear flat bar connection

Terminals and phase barriers

(1) Phase barrier
(2) Front connecting bars
(7) Installation level
(8) Flared front busbar connecting bars

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3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL800 (3VL6), 3- and 4-pole, up to 800 A

Terminal covers

(2) Front connecting bars
(3) Terminal covers (standard)
(4) Terminal covers (extended)
(7) Installation level
(8) Rear terminal (mounted horizontally)
(9) Rear terminal (mounted vertically)

Interlocks

Locking devices for toggle levers

<table>
<thead>
<tr>
<th>Type</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
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<td>5.1</td>
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</tr>
</tbody>
</table>
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL800 (3VL6), 3- and 4-pole, up to 800 A

Rear interlocking modules

Rear interlocking module
3-pole circuit breaker

For more detailed dimensional drawings see "Mounting Instructions for Rear Interlocking Module".

Rear interlocking module
4-pole circuit breaker
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL800 (3VL6), 3- and 4-pole, up to 800 A

Accessories

Door-coupling rotary operating mechanism

Masking frame for door cut-out for circuit breaker with toggle lever

Masking frame for door cut-out for circuit breaker with operating mechanism

Toggle handle extension

(3) Circuit breaker
(4) Toggle handle extension
(5) Terminal covers (standard)
(6) Outside surface of cabinet door
(7) Installation level
(9) Door-coupling rotary operating mechanism
(10) Masking frame for door cut-out (for circuit breaker with toggle lever)
(11) Masking frame for door cut-out (for circuit breaker with operating mechanism)
(12) Support bracket
(13) Center line of drive shaft
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL800 (3VL6), 3- and 4-pole, up to 800 A

Door cut-outs

Door cut-out
- Door-coupling rotary operating mechanism

Door cut-out for toggle lever
- (without masking frame)

Door cut-out for toggle lever
- (with masking frame)

Door cut-out for front-operated rotary operating mechanism,
- motorized operating mechanism with stored-energy mechanism and extended escutcheon (without masking frame)

Door cut-out for front-operated rotary operating mechanism,
- motorized operating mechanism with stored-energy mechanism and extended escutcheon (with masking frame)

Combination A

<table>
<thead>
<tr>
<th>Combination</th>
<th>A</th>
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</thead>
<tbody>
<tr>
<td>Circuit breaker only</td>
<td>150</td>
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<tr>
<td>Circuit breaker + plug-in base +</td>
<td>150</td>
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<tr>
<td>motorized operating mechanism with stored-energy mechanism</td>
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<tr>
<td>Circuit breaker + plug-in base + front-</td>
<td>200</td>
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<tr>
<td>operated rotary operating mechanism</td>
<td></td>
</tr>
<tr>
<td>Circuit breaker + withdrawable version</td>
<td>200</td>
</tr>
</tbody>
</table>

Note:
A minimum distance between reference point Y and the door hinge is required for the door cut-outs.

D > A from table + (P x 5)
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL1250 (3VL7) and VL1600 (3VL8), 3- and 4-pole, up to 1600 A

Circuit breakers

SENTRON VL1250 (3VL7) circuit breaker

Circuit breaker installation instructions

SENTRON VL1600 (3VL8) circuit breaker

Circuit breaker installation instructions

(1) Toggle handle extension
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL1250 (3VL7) and VL1600 (3VL8), 3- and 4-pole, up to 1600 A

Operating mechanisms

Motorized operating mechanism

Front-operated rotary operating mechanism

(1) Masking frame for door cut-out
   (for circuit breaker with operating mechanism)
(2) Motorized operating mechanism
(3) Front-operated rotary operating mechanism
(4) Outside surface of cabinet door
(5) Installation level
(6) Safety lock
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL1250 (3VL7) and VL1600 (3VL8), 3- and 4-pole, up to 1600 A

Withdrawable versions

Withdrawable version with front-operated rotary operating mechanism

Insert position

Withdrawable version with front-operated rotary operating mechanism

Withdraw position

Withdrawable version with motorized operating mechanism with stored-energy mechanism

Insert position

Withdrawable version with motorized operating mechanism with stored-energy mechanism

Withdraw position

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VL1250 (3VL7) and VL1600 (3VL8), 3- and 4-pole, up to 1600 A

Withdrawable versions

Withdrawable version with extended escutcheon (without masking frame)

Insert position

Withdrawable version with extended escutcheon (without masking frame)

Withdraw position

Hole pattern and cut-out for withdrawable versions with rear flat bar connection
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL1250 (3VL7) and VL1600 (3VL8), 3- and 4-pole, up to 1600 A

Terminals and phase barriers

Terminal covers

(1) Phase barrier
(2) Front connecting bars
(3) Installation level

(1) Front connecting bars
(2) Terminal covers (short) – only for SENTRON VL1250 (3VL7) circuit breakers
(3) Terminal covers (extended)
(4) Installation level
(5) Rear terminal (mounted horizontally)
(6) Rear terminal (mounted vertically)
(7) Phase barriers
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL1250 (3VL7) and VL1600 (3VL8), 3- and 4-pole, up to 1600 A

Terminal covers

Only SENTRON VL1250 (3VL7) circuit breakers

(1) Front connecting bars
(2) Terminal covers (short) – only for SENTRON VL1250 (3VL7) circuit breakers
(3) Terminal covers (extended)
(4) Installation level
(5) Rear terminal (mounted horizontally)
(6) Rear terminal (mounted vertically)
(7) Phase barriers

Only SENTRON VL1600 (3VL8) circuit breakers

(1) Front connecting bars
(2) Terminal covers (short) – only for SENTRON VL1250 (3VL7) circuit breakers
(3) Terminal covers (extended)
(4) Installation level
(5) Rear terminal (mounted horizontally)
(6) Rear terminal (mounted vertically)
(7) Phase barriers
Project planning aids

3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL1250 (3VL7) and VL1600 (3VL8), 3- and 4-pole, up to 1600 A

Rear interlocking modules

For more detailed dimensional drawings see "Mounting Instructions for Rear Interlocking Module".

3-pole version

4-pole version
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL1250 (3VL7) and VL1600 (3VL8), 3- and 4-pole, up to 1600 A

Interlocks

Locking devices for toggle levers

<table>
<thead>
<tr>
<th>Type</th>
<th>a</th>
<th>b</th>
<th>c</th>
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</tr>
</tbody>
</table>

Accessories

Door-coupling rotary operating mechanism

Masking frame for door cut-out for circuit breaker with toggle lever

(1) Masking frame for door cut-out (for circuit breaker with toggle lever)
(2) Door-coupling rotary operating mechanism
(3) Outside surface of cabinet door
(4) Support bracket
(5) Installation level
Project planning aids

VL1250 (3VL7) and VL1600 (3VL8), 3- and 4-pole, up to 1600 A

Door cut-outs

- Door cut-out for toggle lever (without masking frame)
- Door cut-out for front-operated rotary operating mechanism and motorized operating mechanism (without masking frame)
- Door cut-out for door-coupling rotary operating mechanism
- Door cut-out for toggle lever (with masking frame)
- Door cut-out for front-operated rotary operating mechanism, motorized operating mechanism and extended escutcheon (with masking frame)
- Door cut-out for door-coupling rotary operating mechanism (without masking frame)

Current transformers

- Current transformer for neutral conductors for ground-fault protection in 4-wire three-phase systems for SENTRON VL160 (3VL2)/VL250 (3VL3) circuit breakers
- Current transformer for neutral conductors for ground-fault protection in 4-wire three-phase systems for SENTRON VL630 (3VL5)/VL800 (3VL6) circuit breakers

For more dimensional drawings (for current transformers for 3VL4, 3VL7, 3VL8) see mounting instruction for current transformers.
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL160X (3VL1) to VL800 (3VL6), 3- and 4-pole, up to 800 A

Interlock with Bowden wire

Combination options

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<thead>
<tr>
<th>3VL9 300-8LA00</th>
<th>3VL9 400-8LA00</th>
<th>3VL9 600-8LA00</th>
<th>3VL9 800-8LA00</th>
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<tbody>
<tr>
<td>For VL160X (3VL1), VL160 (3VL2) and VL250 (3VL3)</td>
<td>For VL400 (3VL4)</td>
<td>For VL630 (3VL5) and VL800 (3VL6)</td>
<td>For VL1250 (3VL7) and VL1600 (3VL8)</td>
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</table>

Interlock with Bowden wire

<table>
<thead>
<tr>
<th>3VL9 300-8LA00</th>
<th>3VL9 400-8LA00</th>
<th>3VL9 600-8LA00</th>
<th>3VL9 800-8LA00</th>
</tr>
</thead>
<tbody>
<tr>
<td>For VL160X (3VL1), VL160 (3VL2) and VL250 (3VL3)</td>
<td>--</td>
<td>--</td>
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<tr>
<td>3VL9 400-8LA00</td>
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<tr>
<td>For VL400 (3VL4)</td>
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<tr>
<td>3VL9 600-8LA00</td>
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</tr>
<tr>
<td>For VL630 (3VL5) and VL800 (3VL6)</td>
<td>--</td>
<td>--</td>
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</tr>
<tr>
<td>3VL9 800-8LA00</td>
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<td>--</td>
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</tr>
<tr>
<td>For VL1250 (3VL7) and VL1600 (3VL8)</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

✓ Combination possible
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL160X (3VL1) to VL400 (3VL4), 3- and 4-pole, up to 400 A

8US1 busbar adapter system

8US10 11-4SL01
(40 mm system)

8US12 11-4SL00
(60 mm system)

8US12 11-4SL01
(60 mm system)

8US19 27-4AF01
(60 mm system)
VL160X (3VL1) with RCD module, 3- and 4-pole, up to 160 A

Circuit breakers

SENTRON VL160X (3VL1) circuit breaker with RCD module

Circuit breaker installation instructions
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL160X (3VL1) with RCD module, 3- and 4-pole, up to 160 A

Terminals and phase barriers

(1) Phase barrier
(2) Front connecting bars
(3) Terminal covers (standard)
(4) Threaded rear terminals, threaded bolt (long)
(5) Threaded rear terminals, threaded bolt (short)
(6) Outside surface of cabinet door
(7) Installation level
(8) Rear terminal, long flat connector
(9) Rear terminal, short flat connector
(10) Flared front busbar connecting bars
(11) Masking frame for door cut-out
    (for circuit breaker with RCD module)
VL160X (3VL1) with RCD module, 3- and 4-pole, up to 160 A

Terminal covers

(2) Front connecting bars
(3) Terminal covers (standard)
(4) Terminal covers (extended)
(5) Masking frame for door cut-out
   (for circuit breaker with RCD module)
(6) Outside surface of cabinet door
(7) Installation level
(8) Rear terminal, long flat connector
(9) Rear terminal, short flat connector
(10) Rear terminal, long
(11) Rear terminal, short
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL160X (3VL1) with RCD module, 3- and 4-pole, up to 160 A

Door cut-outs

Hole pattern, cut-out for rear terminals

![Hole pattern diagram]

Door cut-out for toggle lever (with masking frame)

![Door cut-out diagram with masking frame]

Door cut-out for toggle lever (without masking frame)

![Door cut-out diagram without masking frame]

Note:
A minimum distance between reference point Y and the door hinge is required for the door cut-outs.

<table>
<thead>
<tr>
<th>Combination</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuit breaker only</td>
<td>100</td>
</tr>
<tr>
<td>Circuit breaker + plug-in base</td>
<td>100</td>
</tr>
<tr>
<td>+ motorized operating mechanism</td>
<td></td>
</tr>
<tr>
<td>Circuit breaker + plug-in base</td>
<td></td>
</tr>
<tr>
<td>+ front-operated rotary operating mechanism</td>
<td>200</td>
</tr>
</tbody>
</table>

Combination A

- D > A from table + (P × 5)

Circuit breaker with laterally attached RCD module

![Circuit breaker diagram with RCD module]

(1) Outside surface of cabinet door
(2) Fixing bracket
(3) Installation level
(4) Standard mounting rail TH 75 according to EN 60715 (to be provided by the customer)
VL160X (3VL1) with RCD module, 3- and 4-pole, up to 160 A

Plug-in bases and accessories

Hole pattern and cut-out for plug-in base with rear flat bar connection

Hole pattern for plug-in base with front connecting bars

(1) Plug-in base with rear terminal covers
(2) Plug-in base for circuit breaker with RCD module
(3) Plug-in base with rear flat bar connection
(4) Masking frame for door cut-out (for circuit breaker with RCD module)
(5) Terminal cover (standard)
(6) Outside surface of cabinet door
(7) Installation level
(8) Plug-in base with front connecting bars
(9) Plug-in base with terminal covers on the front
(10) Phase barrier
Project planning aids

VL160 (3VL2) and VL250 (3VL3) with RCD module, 3- and 4-pole, up to 250 A

Circuit breakers

SENTRON VL160 (3VL2) and VL250 (3VL3) circuit breakers with RCD module

Circuit breaker installation instructions

(1) Circuit breaker
(2) RCD module

Note for the SENTRON VL250 (3VL3) circuit breaker: The 5 mm extension (overall height 307 mm) at each end only applies when using box terminals and circular conductor terminals.
3VL Molded Case Circuit Breakers up to 1600 A

VL160 (3VL2) and VL250 (3VL3) with RCD module, 3- and 4-pole, up to 250 A

Terminals and phase barriers

(1) Phase barrier
(2) Front connecting bars
(3) Terminal covers (standard)
(4) Rear terminals (long)
(5) Rear terminals (short)
(6) Outside surface of cabinet door
(7) Installation level
(8) Rear flat connector (long)
(9) Rear flat connector (short)
(10) Flared front busbar connecting bars
(11) Masking frame for door cut-out (for circuit breaker with RCD module)
(12) Masking frame for door cut-out (for circuit breaker with toggle lever)
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL160 (3VL2) and VL250 (3VL3) with RCD module, 3- and 4-pole, up to 250 A

Terminal covers

(1) Masking frame for door cut-out (for circuit breaker with RCD module)
(2) Front connecting bars
(3) Terminal covers (standard)
(4) Terminal covers (extended)
(5) Masking frame for door cut-out (for circuit breaker with toggle lever)
(6) Outside surface of cabinet door
(7) Installation level

For dimensions of the lower masking frame, "VL160X (3VL1) with RCD module, 3- and 4-pole, up to 160 A", "Terminal covers", see bottom of page 16/75.
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL160 (3VL2) and VL250 (3VL3) with RCD module, 3- and 4-pole, up to 250 A

Door cut-outs

Door cut-out for toggle lever (without masking frame)

Door cut-out for toggle lever (with masking frame)

Door cut-out for door-coupling rotary operating mechanism

Door cut-out for front-operated rotary operating mechanism and motorized operating mechanism (with masking frame)

Door cut-out for front-operated rotary operating mechanism (without masking frame)

Hole pattern, cut-out for rear terminal studs

Note:
A minimum distance between reference point Y and the door hinge is required for the door cut-outs.

Combination | A
---|---
Circuit breaker only | 100
Circuit breaker + plug-in base + motorized operating mechanism with stored-energy mechanism | 100
Circuit breaker + plug-in base + front-operated rotary operating mechanism | 200
Circuit breaker + withdrawable version | 200

Door hinge point

D > A from table + (P x 5)
3VL Molded Case Circuit Breakers

3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL160 (3VL2) and VL250 (3VL3) with RCD module, 3- and 4-pole, up to 250 A

Plug-in bases and accessories

Hole pattern and cut-out for plug-in base with rear flat bar connection

Hole pattern for plug-in base with front connecting bars

(1) Plug-in base with rear terminal covers
(2) Plug-in base for circuit breaker with RCD module
(3) Plug-in base with rear flat bar connection
(4) Masking frame for door cut-out (for circuit breaker with RCD module)
(5) Terminal cover (standard)
(6) Outside surface of cabinet door
(7) Installation level
(8) Plug-in base with front connecting bars
(9) Plug-in base with terminal covers on the front
(10) Phase barrier

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3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL160 (3VL2) and VL250 (3VL3) with RCD module, 3- and 4-pole, up to 250 A

Plug-in bases and accessories

SENTRON VL160 (3VL2) and VL250 (3VL3) circuit breakers with RCD module and motorized operating mechanism with stored-energy mechanism (connected position)

SENTRON VL160 (3VL2) and VL250 (3VL3) circuit breakers with RCD module and motorized operating mechanism with stored-energy mechanism (disconnected position)

SENTRON VL160 (3VL2) and VL250 (3VL3) circuit breakers with RCD module and front-operated rotary operating mechanism (connected position)

SENTRON VL160 (3VL2) and VL250 (3VL3) circuit breakers with RCD module and front-operated rotary operating mechanism (disconnected position)

(1) Safety lock
(2) Front-operated rotary operating mechanism
(3) Padlock
(4) Motorized operating mechanism with stored-energy mechanism
(5) Masking frame for door cut-out (for circuit breaker with operating mechanism)
(6) Outside surface of cabinet door
(7) Installation level
(8) Masking frame for door cut-out (for circuit breaker with RCD module, motorized operating mechanism)
(9) Masking frame for door cut-out (for circuit breaker with RCD module, toggle lever/rotary operating mechanism)
(10) RCD extended escutcheon
(11) Locking device for racking mechanism
(12) Racking mechanism
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids
VL160 (3VL2) and VL250 (3VL3) with RCD module, 3- and 4-pole, up to 250 A

Plug-in bases and accessories
SENTRON VL160 (3VL2) and VL250 (3VL3) circuit breakers with RCD module and extended escutcheon (connected position)
SENTRON VL160 (3VL2) and VL250 (3VL3) circuit breakers with RCD module and extended escutcheon (disconnected position)

(2) Front-operated rotary operating mechanism
(3) Circuit breaker extended escutcheon
(4) Motorized operating mechanism with stored-energy mechanism
(5) Masking frame for door cut-out
   (for circuit breaker with operating mechanism)
(6) Outside surface of cabinet door
(7) Installation level
(8) Masking frame for door cut-out
   (for circuit breaker with RCD module, motorized operating mechanism)
(9) Masking frame for door cut-out
   (for circuit breaker with RCD module, toggle lever/rotary operating mechanism)
(10) RCD extended escutcheon
(11) Locking device for racking mechanism
(12) Racking mechanism
VL400 (3VL4) with RCD module, 3- and 4-pole, up to 400 A

Circuit breakers

SENTRON VL400 (3VL4) circuit breaker with RCD module

Mounting hole pattern for SENTRON VL400 (3VL4) circuit breaker with RCD front connecting bar

(1) Masking frame for door cut-out (for circuit breaker with RCD module)
(5) Masking frame for door cut-out (for circuit breaker with toggle lever)
(6) Outside surface of cabinet door
(7) Installation level
(8) Circuit breaker
(9) RCD module
Project planning aids

VL400 (3VL4) with RCD module, 3- and 4-pole, up to 400 A

Terminals and phase barriers

(1) Phase barrier
(2) Front connecting bars
(3) Terminal covers (standard)
(4) Rear terminals (long)
(5) Rear terminals (short)
(7) Installation level
(8) Rear flat connector (long)
(9) Rear flat connector (short)
(10) Flared front busbar connecting bars
VL400 (3VL4) with RCD module, 3- and 4-pole, up to 400 A

Terminal covers

(2) Front connecting bars
(3) Terminal covers (standard)
(4) Terminal covers (extended)
(7) Installation level
(8) Cut-out
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL400 (3VL4) with RCD module, 3- and 4-pole, up to 400 A

Door cut-outs

Door cut-out for toggle lever (with masking frame)

Door cut-out for front-operated rotary operating mechanism (without masking frame)

Door cut-out for door-coupling rotary operating mechanism

Door cut-out for front-operated rotary operating mechanism, motorized operating mechanism with stored-energy mechanism and extended escutcheon (with masking frame)

Door cut-out for rear terminal studs

Note:
A minimum distance between reference point Y and the door hinge is required for the door cut-outs.

Combination | A
---|---
Circuit breaker only | 150
Circuit breaker + plug-in base + motorized operating mechanism with stored-energy mechanism | 150
Circuit breaker + plug-in base + front-operated rotary operating mechanism | 200
Circuit breaker + withdrawable version | 200

D > A from table + (P × 5)
**3VL Molded Case Circuit Breakers up to 1600 A**

**Project planning aids**

**VL400 (3VL4) with RCD module, 3- and 4-pole, up to 400 A**

*Plug-in bases and accessories*

---

**Hole pattern and cut-out for plug-in base with rear flat bar connection**

**Hole pattern for plug-in base with front connecting bars**

(1) Plug-in base with terminal covers  
(2) Plug-in base  
(3) Plug-in base with rear flat bar connection  
(5) Terminal covers (standard)  
(7) Installation level  
(8) Plug-in base with front connecting bars  
(9) Plug-in base with terminal covers on the front  
(10) Phase barrier

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3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

VL400 (3VL4) with RCD module, 3- and 4-pole, up to 400 A

Plug-in bases and accessories

SENTRON VL400 (3VL4) circuit breakers with RCD module, withdrawable, with motorized operating mechanism with stored-energy mechanism (connected position)

SENTRON VL400 (3VL4) circuit breakers with RCD module, withdrawable, with motorized operating mechanism with stored-energy mechanism (disconnected position)

SENTRON VL400 (3VL4) circuit breakers with RCD module, plug-in, with front-operated rotary operating mechanism (connected position)

SENTRON VL400 (3VL4) circuit breakers with RCD module, plug-in, with front-operated rotary operating mechanism (disconnected position)

(1) Safety lock
(2) Front-operated rotary operating mechanism
(3) Padlock
(4) Motorized operating mechanism with stored-energy mechanism
(5) Masking frame for door cut-out
(6) Outside surface of cabinet door
(7) Installation level
(8) Masking frame for door cut-out
(9) Masking frame for door cut-out
(10) RCD extended escutcheon
(11) Locking device for racking mechanism
(12) Racking mechanism
VL400 (3VL4) with RCD module, 3- and 4-pole, up to 400 A

Plug-in bases and accessories

SENTRON VL400 (3VL4) circuit breakers with RCD module, withdrawable, with extended escutcheon (connected position)

SENTRON VL400 (3VL4) circuit breakers with RCD module, withdrawable, with extended escutcheon (disconnected position)

(1) Safety lock
(2) Front-operated rotary operating mechanism
(3) Circuit breaker extended escutcheon
(4) Motorized operating mechanism with stored-energy mechanism
(5) Masking frame for door cut-out (for circuit breaker with operating mechanism)
(6) Outside surface of cabinet door
(7) Installation level
(8) Masking frame for door cut-out
(for circuit breaker with RCD module, motorized operating mechanism)
(9) Masking frame for door cut-out
(for circuit breaker with RCD module, toggle lever/rotary operating mechanism)
(10) RCD extended escutcheon
(11) Locking device for racking mechanism
(12) Racking mechanism
8UC door-coupling rotary operating mechanisms

8UC71 and 8UC72 door-coupling rotary operating mechanisms, sizes 1 and 2

8UC71 and 8UC72 door-coupling rotary operating mechanisms, sizes 1 and 2

8UC73 door-coupling rotary operating mechanisms, size 3

8UC60 coupling driver

<table>
<thead>
<tr>
<th>Coupling drivers</th>
<th>a</th>
<th>b</th>
<th>Shaft length</th>
</tr>
</thead>
<tbody>
<tr>
<td>With tolerance compensation</td>
<td>+5 ±1.5</td>
<td>x +23.5</td>
<td></td>
</tr>
<tr>
<td>Without tolerance compensation</td>
<td>+1.5 ±2.5</td>
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<td></td>
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</table>

Sizes 1, 2, 3

Handles with masking plate, sizes 1 to 3

1) Length of extension shaft can be cut to fit mounting depth. Extension shaft also available in 600 mm length.

1) Padlock feature of handle pulled out.
4NC current transformers for measuring purposes

Window openings

- For busbars
  - Number
  - Width x Thickness mm
  - For circular conductors

<table>
<thead>
<tr>
<th>Number</th>
<th>Width x Thickness mm</th>
<th>max. mm</th>
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<tbody>
<tr>
<td>1</td>
<td>12 x 5</td>
<td>17.5 Ø</td>
</tr>
<tr>
<td>2</td>
<td>12 x 10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 x 5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 x 10</td>
<td></td>
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<tr>
<td></td>
<td>40 x 5</td>
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<tr>
<td></td>
<td>40 x 10</td>
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</tbody>
</table>

COM20/COM21 (communication module for SENTRON 3VL)

COM10/COM11 (communication module for SENTRON 3VL)
Schematics

The graphical symbols used in the circuit diagrams provide information about the type, circuit and mode of operation of the devices according to DIN 40713, but contain no information about the design.

As it is not possible to show all of the potential combinations here, it may be necessary to alter the schematics accordingly for different versions.

The purpose of these circuit diagrams is merely to help improve the understanding of the way in which the devices function.

Connection diagram for SENTRON VL160X (3VL1) to VL630 (3VL5), 3- and 4-pole circuit breakers for system protection with thermal-magnetic overcurrent releases

Internal circuit diagram for SENTRON VL160 (3VL2) and VL250 (3VL3), 3- and 4-pole circuit breakers for system protection and motor protection with solid-state releases

Internal circuit diagram for SENTRON VL400 (3VL4) circuit breaker for motor protection and SENTRON VL400 (3VL4) to VL1600 (3VL8), 3- and 4-pole circuit breakers for system protection with solid-state releases
Motorized operating mechanism with stored-energy mechanism for SENTRON VL160X (3VL1) to VL250 (3VL3) circuit breakers without undervoltage release

Note: A separate alarm switch (7-8) can be incorporated for automatic charging after a release.

Automatic closing of a tripped circuit breaker is not recommended, in order to prevent a switch of the circuit breaker to a fault in the protected circuit.

Motorized operating mechanism with stored-energy mechanism for SENTRON VL400 (3VL4) to VL800 (3VL6) circuit breakers without undervoltage release

Note: A separate alarm switch (7-8) can be incorporated for automatic charging after a release.

Motorized operating mechanism with stored-energy mechanism for SENTRON VL400 (3VL4) to VL800 (3VL6) circuit breakers with undervoltage release

Note: A separate alarm switch (7-8) can be incorporated for automatic charging after a release.

Automatic closing of a tripped circuit breaker is not recommended, in order to prevent a switch of the circuit breaker to a fault in the protected circuit.

Motorized operating mechanism with stored-energy mechanism for SENTRON VL160X (3VL1) to VL250 (3VL3) circuit breakers with undervoltage release

Note: A separate alarm switch (7-8) can be incorporated for automatic charging after a release.

Automatic closing of a tripped circuit breaker is not recommended, in order to prevent a switch of the circuit breaker to a fault in the protected circuit.
**Project planning aids**

Motorized operating mechanism for SENTRON VL1250 (3VL7) and VL1600 (3VL8) circuit breakers without undervoltage release

- S0: OFF (to be provided by customer)
- S1: ON (to be provided by customer)
- S2: Lock out
- S4: Interlock open
- F: Fuse in control circuit
- S01: Remote control
- K1: Contactor relay

Note: A separate alarm switch (7-8) can be incorporated for automatic charging after a release. Automatic closing of a tripped circuit breaker is not recommended, in order to prevent a switch of the circuit breaker to a fault in the protected circuit.

Motorized operating mechanism for SENTRON VL1250 (3VL7) and VL1600 (3VL8) circuit breakers with undervoltage release

- S0: OFF (to be provided by customer)
- S1: ON (to be provided by customer)
- S01: Remote control
- K1, K2, K3: Contactor relays for motor control
- F: Fuse in control circuit

* Alarm switch contact 7-8 causes a switch reset to RESET, i.e. reclosing capability after tripping. Without this contact the result would be a "closing lockout", i.e. reconnection after a trip is not possible until the switch is reset to RESET by the "OFF" command (S0).

Motorized operating mechanism for VL160X (3VL1) to VL250 (3VL3) circuit breakers without undervoltage release

- S0: OFF (to be provided by customer)
- S1: ON (to be provided by customer)
- K1, K2: Contactors relays for motor control
- F: Fuse in control circuit

Motorized operating mechanism for VL160X (3VL1) to VL250 (3VL3) circuit breakers with undervoltage release

- S0: OFF (to be provided by customer)
- S1: ON (to be provided by customer)
- S01: EMERGENCY-STOP or remote tripping
- K1, K2, K3: Contactors relays for motor control
- F: Fuse in control circuit

* Alarm switch contact 7-8 causes a switch reset to RESET, i.e. reclosing capability after tripping. Without this contact the result would be a "closing lockout", i.e. reconnection after a trip is not possible until the switch is reset to RESET by the "OFF" command (S0).
3VL Molded Case Circuit Breakers

3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

Undervoltage release and shunt release for SENTRON VL160X (3VL1) to VL1600 (3VL8) circuit breakers

“S contact” is integrated into shunt release

Undervoltage release and shunt release for SENTRON VL160X (3VL1) to VL1600 (3VL8) circuit breakers

O1 Circuit breaker
A Solid-state evaluation unit
F Tripping solenoid with local tripping display and reset
TEST Test button
S0 Remote tripping (to be set by customer)

4-pole circuit breaker for SENTRON VL160 (3VL2), VL250 (3VL3) and VL400 (3VL4) circuit breakers with remote trip and RCD alarm switch. 3-pole version similar, but without N pole.
3VL Molded Case Circuit Breakers
3VL Molded Case Circuit Breakers up to 1600 A

Project planning aids

4NC current transformers for measuring purposes
Terminal designation acc. to IEC 60185/VDE 0414-1

More information

Manual for the SENTRON 3VL circuit breaker
This manual contains additional technical information, covering a product description, mode of operation, electrical wiring system and retrofitting.

The manual and operating instructions are available in PDF format at:
http://www.siemens.com/lowvoltage/manuals

SENTRON manual for communication solutions
Free download at
http://www.siemens.com/lowvoltage/manuals
See also the chapter “Air Circuit Breakers” under “3WL Air Circuit Breakers/Non-Automatic Air Circuit Breakers up to 6300 A (AC)”, “Accessories/Components”.

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<table>
<thead>
<tr>
<th>Technical specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td><strong>Standards</strong></td>
</tr>
<tr>
<td><strong>Max. rated current ( I_n )</strong></td>
</tr>
<tr>
<td><strong>Rated insulation voltage ( U_i )</strong></td>
</tr>
<tr>
<td><strong>Main current paths</strong></td>
</tr>
<tr>
<td><strong>Control circuits</strong></td>
</tr>
<tr>
<td><strong>Rated impulse withstand voltage ( U_{imp} )</strong></td>
</tr>
<tr>
<td><strong>Main current paths</strong></td>
</tr>
<tr>
<td><strong>Control circuits</strong></td>
</tr>
<tr>
<td><strong>Rated operational voltage ( U_e ), 50/60 Hz</strong></td>
</tr>
<tr>
<td><strong>Permissible ambient temperature</strong></td>
</tr>
<tr>
<td><strong>Permissible load</strong></td>
</tr>
<tr>
<td><strong>At various ambient temperatures close to the circuit breaker, related to the rated current of the circuit breaker</strong></td>
</tr>
<tr>
<td>Circuit breakers</td>
</tr>
<tr>
<td>for system protection</td>
</tr>
<tr>
<td>At 40 °C</td>
</tr>
<tr>
<td>50 °C</td>
</tr>
<tr>
<td>60 °C</td>
</tr>
<tr>
<td>70 °C</td>
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<tr>
<td><strong>Rated short-circuit breaking capacity</strong></td>
</tr>
<tr>
<td><strong>Rated ultimate short-circuit breaking capacity ( I_{cu} )</strong></td>
</tr>
<tr>
<td><strong>Up to 415 V</strong></td>
</tr>
<tr>
<td><strong>Rated service short-circuit breaking capacity ( I_{cs} )</strong></td>
</tr>
<tr>
<td><strong>Up to 415 V</strong></td>
</tr>
<tr>
<td><strong>Rated short-circuit making capacity ( I_{cm} )</strong></td>
</tr>
<tr>
<td><strong>Up to 415 V</strong></td>
</tr>
<tr>
<td><strong>Main control switch properties acc. to IEC 60947-2</strong></td>
</tr>
<tr>
<td><strong>in conjunction with lockable rotary operating mechanisms</strong></td>
</tr>
<tr>
<td><strong>EMERGENCY-STOP switch properties</strong></td>
</tr>
<tr>
<td><strong>Mechanical endurance</strong></td>
</tr>
<tr>
<td><strong>Switching frequency</strong></td>
</tr>
<tr>
<td><strong>Conductor cross-sections and connection types for main conductors (copper or aluminum)</strong></td>
</tr>
<tr>
<td>Connection type</td>
</tr>
<tr>
<td>solid or stranded</td>
</tr>
<tr>
<td>To 40 A</td>
</tr>
<tr>
<td>45 to 100 A</td>
</tr>
<tr>
<td>125 A</td>
</tr>
<tr>
<td><strong>Circular conductor terminal</strong></td>
</tr>
<tr>
<td><strong>Conductor cross-sections for control circuits</strong></td>
</tr>
<tr>
<td>With terminal connection or terminal strip, solid</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Power loss per circuit breaker</strong></td>
</tr>
<tr>
<td><strong>At max. rated current ( I_n )</strong></td>
</tr>
<tr>
<td>with 3-phase symmetrical load</td>
</tr>
<tr>
<td>- System protection</td>
</tr>
<tr>
<td><strong>Permissible mounting positions</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Auxiliary switches</strong></td>
</tr>
<tr>
<td><strong>Conventional thermal current ( I_{th} )</strong></td>
</tr>
<tr>
<td><strong>Rated making capacity</strong></td>
</tr>
<tr>
<td><strong>AC (AC-15)</strong></td>
</tr>
<tr>
<td>- Rated operational voltage</td>
</tr>
<tr>
<td>- Rated operational current</td>
</tr>
<tr>
<td><strong>DC current (DC-13)</strong></td>
</tr>
<tr>
<td>- Rated operational voltage</td>
</tr>
<tr>
<td>- Rated operational current</td>
</tr>
<tr>
<td><strong>Back-up fuse</strong></td>
</tr>
<tr>
<td><strong>Auxiliary releases</strong></td>
</tr>
<tr>
<td><strong>Shunt release (f-release)</strong></td>
</tr>
<tr>
<td><strong>Response voltage</strong></td>
</tr>
<tr>
<td>- Pick-up (circuit breaker is tripped)</td>
</tr>
<tr>
<td><strong>Power consumption (short time) at:</strong></td>
</tr>
<tr>
<td>AC 50/60 Hz 12–24 V</td>
</tr>
<tr>
<td>AC 50/60 Hz 48–60 V</td>
</tr>
<tr>
<td>AC 50/60 Hz 48–127 V</td>
</tr>
<tr>
<td>12 – 24 V DC</td>
</tr>
<tr>
<td>48 – 60 V DC</td>
</tr>
<tr>
<td>110 – 125 V DC</td>
</tr>
<tr>
<td>220–250 V DC</td>
</tr>
<tr>
<td><strong>Max. duration of operational voltage</strong></td>
</tr>
<tr>
<td><strong>Max. opening time</strong></td>
</tr>
</tbody>
</table>
3VF2 Molded Case Circuit Breakers
3VF2 Molded Case Circuit Breakers up to 100 A

Project planning aids

Dimensional drawings

3VF2 circuit breakers, 3- and 4-pole

Arcing spaces
Minimum clearances from adjacent grounded parts and from non-insulated live parts at rated voltage. The distance of at least 2 cm between large covers and the arc chute openings should be observed for the 3VF2.

Plain conductors and busbars must be insulated within the arcing space.

Type  a
3VF2, 3-pole  78
3VF2, 4-pole  101

Accessories for 3VF2 circuit breakers, 3- and 4-pole

3VF2 223-1.A00 front-operated rotary operating mechanism with knob
for 3VF2

3VF2 224–1NB.0 terminal cover
for 3VF2

3VF2 220–1CA10 cover with cap dimension 45 mm for 3VF2

3VF2 220–1AA00 cover frame for door cut-out for 3VF2

Door-coupling rotary operating mechanism, complete 8UC61.2–BD22 (rotary operating mechanism) and 3VF9 223-1JA00 (front-operated rotary operating mechanism with shaft end) for 3VF2

3VF9 224–1LD.0 rear terminal for 3VF2

1) As-supplied, shorten shaft to suit if necessary. With lengths > 130 mm a support is necessary.