

Beyond™

Susol MCCB

Molded Case Circuit Breakers



LS ELECTRIC

MCCBs for power distribution 1600A

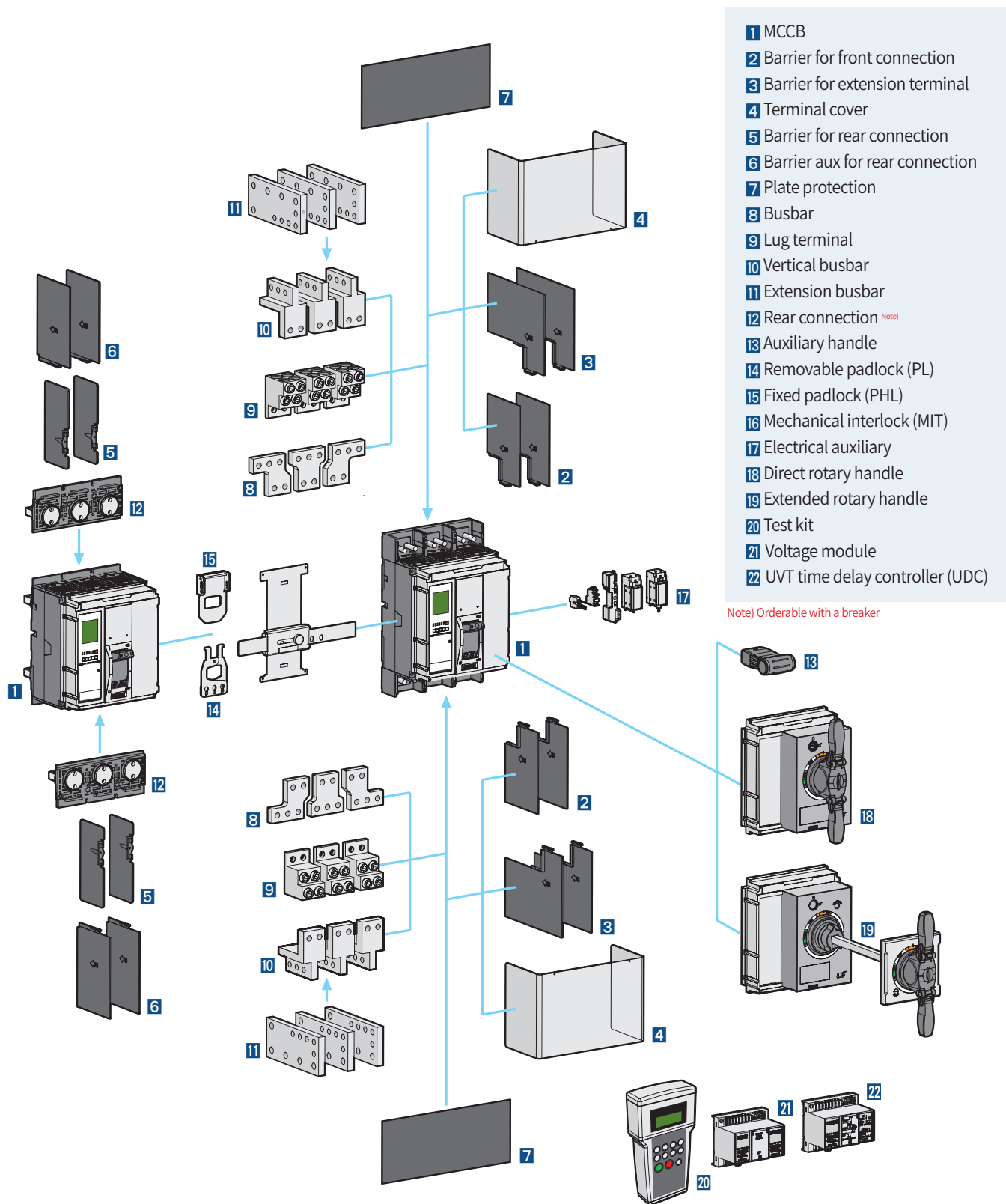
Electrical characteristics



| | | | | TS1000 | | | TS1250 | | TS1600 | | |
|---------------------------------------|---|----|-----------|---------------|------|------|--------|------|--------|------|--|
| Type | | | | TS1000 | | | TS1250 | | TS1600 | | |
| Ampere frame | | | | 1000 | | | 1250 | | 1600 | | |
| Pole | | | | 3, 4 | | | 3, 4 | | 3, 4 | | |
| Rated current,(A) | | In | -5~40°C | 800, 1000 | | | 1250 | | 1600 | | |
| | | | 50°C | 800, 1000 | | | 1250 | | 1560 | | |
| | | | 65°C | 800, 1000 | | | 1240 | | 1420 | | |
| Rated insulation voltage, (V) | | Ui | 1000 | | | 1000 | | 1000 | | | |
| Rated impulse withstand voltage, (kV) | | | Uimp | 8 | | | 8 | | 8 | | |
| Rated operational voltage, (V) | | Ue | AC50/60Hz | 690 | | | 690 | | 690 | | |
| | | | DC | - | | | - | | - | | |
| Rated short-circuit breaking capacity | | | | N | H | L | N | H | N | H | |
| IEC60947-2 AC50/60Hz (sym) | Rated ultimate short-circuit breaking capacity, (kA) (Icu) | | 220/240V | 55 | 75 | 200 | 55 | 75 | 55 | 75 | |
| | | | 380/415V | 50 | 70 | 150 | 50 | 70 | 50 | 70 | |
| | | | 440/460V | 50 | 65 | 130 | 50 | 65 | 50 | 65 | |
| | | | 480/500V | 40 | 50 | 100 | 40 | 50 | 40 | 50 | |
| | | | 660/690V | 35 | 45 | - | 35 | 45 | 35 | 45 | |
| | DC | | 250V 2P | - | - | - | - | - | - | - | |
| | | | 500V 2P | - | - | - | - | - | - | - | |
| | | | 750V 3P | - | - | - | - | - | - | - | |
| | Rated service breaking capacity (Ics) | | %Icu | 100% | 75% | 100% | 100% | 75% | 100% | 75% | |
| | Rated short-time withstand current (kA) (Icw) | | 1c | 25 | | 12 | 25 | | 25 | | |
| | | | 3c | - | | | - | | - | | |
| Overriding instantaneous protection | | | kA peak | 50 | | 30 | 50 | | 50 | | |
| Isolation | | | | ○ | | | ○ | | ○ | | |
| Category | | | | B | | A | B | | B | | |
| Life cycle <small>Note 1)</small> | Mechanical (operations) | | | 10000 | | 4000 | 10000 | | 10000 | | |
| | Electrical (operations) | | 440V | In/2 | 6000 | | 4000 | 5000 | | 5000 | |
| | | | | In | 5000 | | 3000 | 4000 | | 2000 | |
| | | | 690V | In/2 | 4000 | | 3000 | 3000 | | 2000 | |
| | | | | In | 2000 | | 2000 | 2000 | | 1000 | |
| Pollution degree | | | | 3 | | | 3 | | 3 | | |
| Dimension (mm) | | | 3-pole | 210×327×152.5 | | | | | | | |
| (W×H×D) | | | 4-pole | 280×327×152.5 | | | | | | | |
| Weight (kg) | | | 3-pole | 13 | | | | | | | |
| | | | 4-pole | 16.8 | | | | | | | |

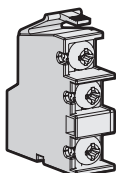
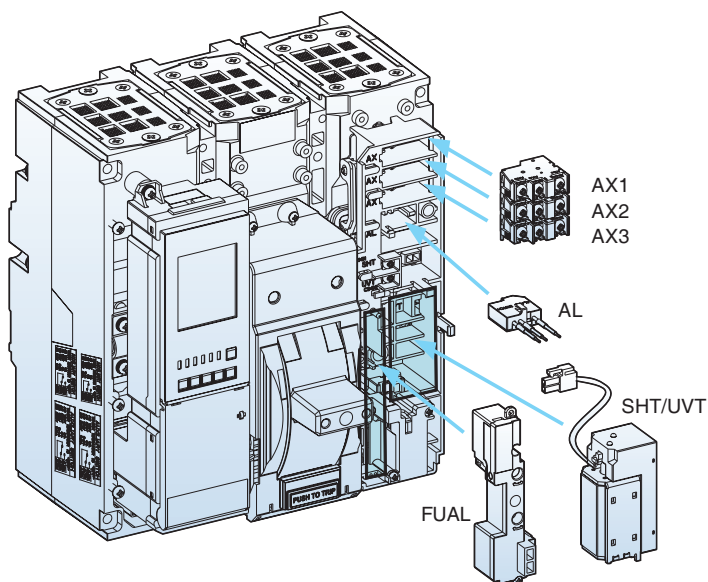
Note) 1. Life cycle means not guarantee but limitation
(Quality guarantee: On/Off frequency on the basis of IEC60947-2 within the term of guarantee.)

Accessories for TS series 1600A

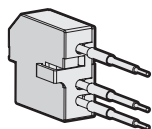


Electrical auxiliaries

The following devices are installed into TS1000 to 1600AF circuit breakers regardless of frame size. And, the electrical auxiliaries can be easily installed in the accessory compartment of the circuit breakers which is cassette type.



AX



AL

Auxiliary switch (AX)

Auxiliary switch is for applications requiring remote “ON” and “OFF” indication. Each switch contains two contacts having a common connection. One is open and the other closed when the circuit breaker is open, and vice-versa.

Alarm switch (AL)

Alarm switches indicate that the circuit breaker has tripped due to overload, short circuit, shunt trip, or undervoltage release conditions. They are particularly useful in automated plants where operators must be signaled about changes in the electrical distribution system.

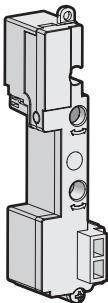
This switch features a closed contact when the circuit breaker is tripped automatically. In other words, this switch does not function when the breaker is operated manually. Its contact is open when the circuit breaker is reset.

Contact operation

| MCCB | ON | OFF | TRIP |
|----------------|----|-----|------|
| Position of AX | | | |
| Position of AL | | | |

Accessories for TS series 1600A

Electrical auxiliaries



FUAL

Indication switch FUAL

FUAL Indicates that the breaker has tripped due to FAL(overload, short circuit) and UAL(UVT, SHT) separately

| | |
|--|--|
| <p>Normal position CB no trip</p> | <p>FAL Normal Open / UAL Normal Open</p> |
| <p>FAL operation CB trip due to OCR</p> | <p>FAL Normal Close / UAL Normal Open</p> |
| <p>UAL operation CB trip due to UVT or SHT</p> | <p>FAL Normal Close / UAL Normal Close</p> |

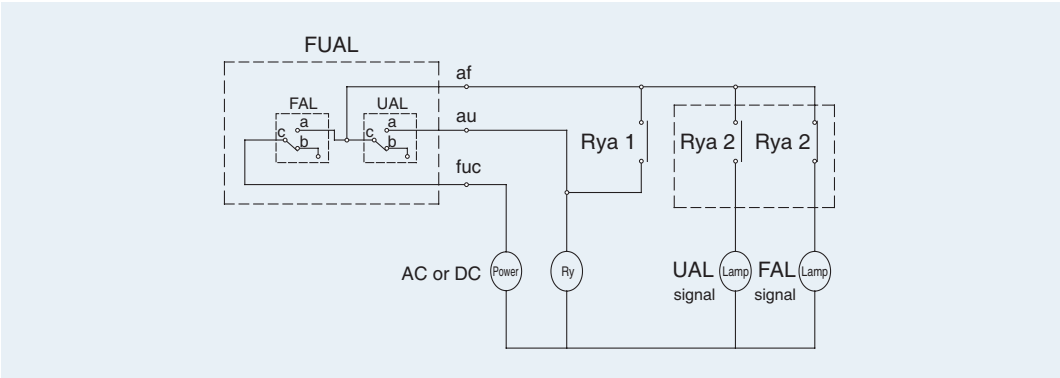


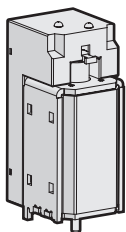
Figure. Example of Lock up Circuit for FUAL

⚠ Caution: Please use “Lock up Circuit” following under figure “Example of lock up circuit for FUAL”

⚠ Caution: When MCCB is tripped by SHT or UVT, the FAL signal appears for 20ms that is time of being transferred from “b”contact to “a” contact of control relay

⚠ Caution: When MCCB is tripped by SHT or UVT, the transfer time of Relay signal(Ryb2 off → Rya2 on) is 20ms. if FAL signal is connected with other sequence circuit such as Latch circuit or other lock up circuit it may cause to be miss operation. So, please do not use latch circuit or lock up circuit with FAL signal.

Electrical auxiliaries



SHT Shunt trip device

SHT is a control device which trips a circuit breaker from remote place, when applying voltage continuously or instantaneously over 200ms to coil terminals(C1, C2).
When UVT coil is installed, its location is changed.

1. Rated voltage and characteristics of Trip coil

| Rated voltage [Vn] | | Operating voltage range [V] | Power consumption (VA or W) | | Trip time [ms] |
|--------------------|---------|-----------------------------|-----------------------------|--------------|----------------|
| DC [V] | AC [V] | | Inrush | Steady-state | |
| 24~30 | - | 0.6~1.1 Vn | 200 | 5 | Less than 40ms |
| 48~60 | 48 | 0.6~1.1 Vn | | | |
| 100~130 | 100~130 | 0.56~1.1 Vn | | | |
| 200~250 | 200~250 | 0.56~1.1 Vn | | | |
| - | 380~480 | 0.56~1.1 Vn | | | |

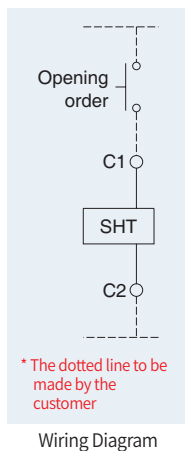
Note) Operating voltage range is the min. rated voltage standard for each rated voltage(Vn).

2. Specification of the wire

- Refer to the below table regarding the length and specification of wire when using trip coil with DC 24~30[V] or DC/AC 48~60[V] of rated voltage.

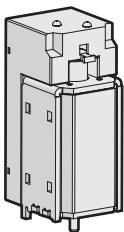
The maximum wire length

| | | Rated voltage [Vn] | | | |
|-------------------|------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| | | DC 24~30 [V] | | DC/AC 48 [V] | |
| Wire type | | #14 AWG (2.08mm ²) | #16 AWG (1.31mm ²) | #14 AWG (2.08mm ²) | #16 AWG (1.31mm ²) |
| Operating voltage | 100% | 95.7m | 61m | 457.8m | 287.7m |
| | 85% | 62.5m | 38.4m | 291.7m | 183.2m |



Accessories for TS series 1600A

Electrical auxiliaries



UVT Under Voltage Trip device

- If the voltage of the main or the control power is under voltage, UVT which is installed inside of the breaker breaks the circuit automatically. Please connect with UVT time-delay device in order to present the time delay function because UVT is technically instantaneous type.
- The closing of a circuit breaker is impossible mechanically or electrically if control power not supplied to UVT. To close the circuit breaker, 65~85% of rated voltage should be applied to both terminals of UVT coil (D1, D2).
- When using UVT coil, the double trip coil can not be used, and the location of trip coil is changed.

1. Rated voltage and characteristics of UVT coil

| Rated voltage [Vn] | | Operating voltage range [V] | | Power consumption (VA or W) | | Trip time [ms] |
|--------------------|---------|-----------------------------|-------------|-----------------------------|--------------|----------------|
| DC [V] | AC [V] | Pick up | Drop out | Inrush | Steady-state | |
| 24~30 | - | 0.65~0.85 Vn | 0.44~0.6 Vn | 200 | 5 | Less than 50ms |
| 48~60 | 48 | | | | | |
| 100~130 | 100~130 | | | | | |
| 200~250 | 200~250 | | | | | |
| - | 380~480 | | | | | |

Note) Operating voltage range is the min. rated standard for each rated voltage (Vh).

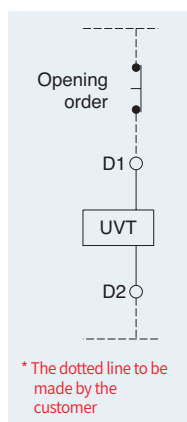
2. Specification of the wire

- Refer to the below table regarding the length and specification of wire when using trip coil with DC 24~30[V] or DC/AC 48~60[V] of rated voltage.

The maximum wire length

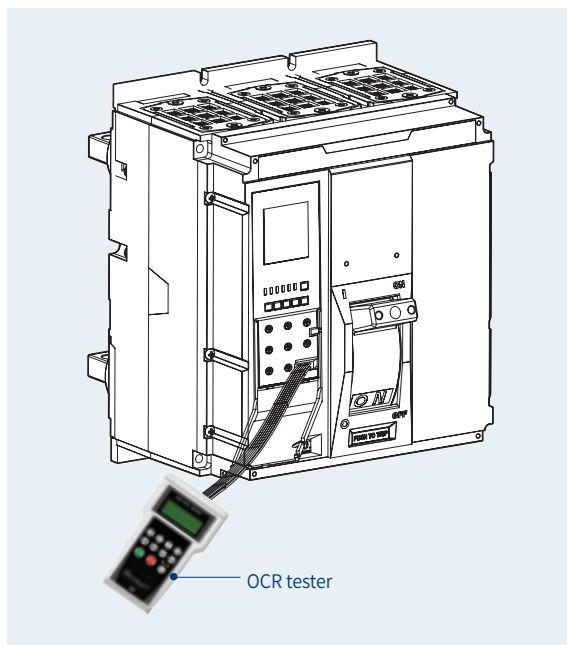
| | | Rated voltage [Vn] | | | |
|-------------------|------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| | | DC 24~30 [V] | | DC/AC 48 [V] | |
| Wire type | | #14 AWG (2.08mm ²) | #16 AWG (1.31mm ²) | #14 AWG (2.08mm ²) | #16 AWG (1.31mm ²) |
| Operating voltage | 100% | 48.5m | 30.5m | 233.2m | 143.9m |
| | 85% | 13.4m | 8.8m | 62.5m | 39.3m |

Note) In case of using UVT coil, the location of TC coil is changed.



Wiring Diagram

OCR Tester [OT]



- It is a device which can test for the operation of Trip Relay under no power condition.

1. Maximum 17 times rated current can be inputted.
2. It is possible to enter the current value and phase on each of R/S/T/N
3. Frequency is adjustable.
4. It is available to test for long time delay/short time delay/instantaneous/ground fault.

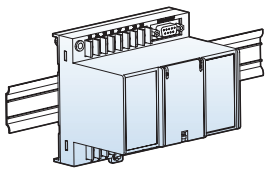
Configuration



| | |
|-----------------|--------------------------------|
| R S T N | R, S, T, N phase signal input |
| ↶ ↷ | Increase/Decrease signal input |
| ENT. ESC | Signal setting/Delete |
| START STOP | Waveform generation/Stop |
| 50Hz 60Hz Hz | Select frequency |

Accessories for TS series 1600A

UVT Time Delay Controller [UDC]



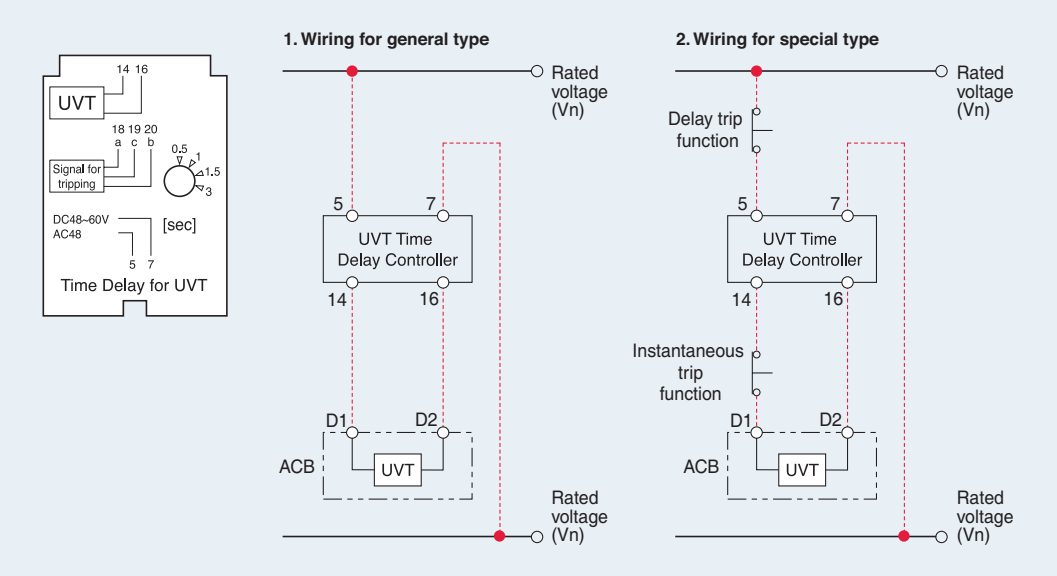
- UVT is a device which makes ACB tripped automatically to prevent the accident on load side due to under voltage or power breakdown.
There are two types, Instantaneous type and time delay type.
- It can be installed on the rail or to the cradle.
- Instantaneous type: only available with UVT coil.
- Time delay type: available by connecting UVT coil and UVT time delay controller.
- Common use for the all types.

1. The rated voltage and characteristic of UVT time delay controller

| Rated voltage [Vn] | | Operating voltage range [V] | | Power consumption (VA or W) | | Trip time [ms] |
|--------------------|---------|-----------------------------|--------------|-----------------------------|--------------|----------------|
| DC [V] | AC [V] | Pick up | Drop out | Inrush | Steady-state | |
| 48~60 | 48 | 0.65~0.85 Vn | 0.44~0.65 Vn | 200 | 5 | 0.5, 1, 1.5, 3 |
| 100~130 | 100~130 | | | | | |
| 200~250 | 200~250 | | | | | |
| - | 380~480 | | | | | |

Note) Operating voltage range is the min. rated standard for each rated voltage (Vh).

2. Wiring



* The wiring presented with red color should be set by users.

Rotary handle

The rotary handle operating mechanism is available in either the direct version or in the extended version on the compartment door.

It is always fitted with a compartment door lock and on a request it can be supplied with a key lock in the open position. There are direct rotary handle two and extended rotary handle.

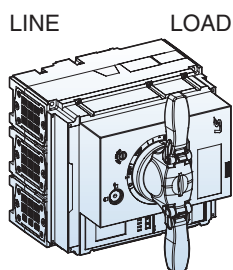
Direct rotary handle

Degree of protection IP40

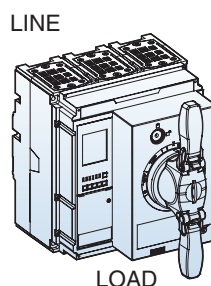
There are three types of direct rotary handle according to line load direction.

Indication of the three positions O(OFF), I(ON) and tripped. Circuit breaker locking capability in the OFF position by one to three padlocks, shackle diameter 5 to 6 mm (not supplied).

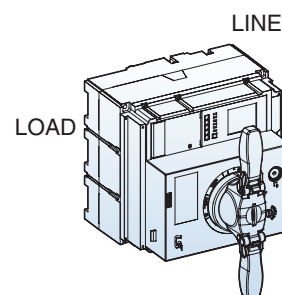
L Type



S Type

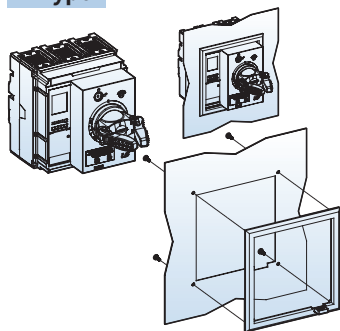


R Type

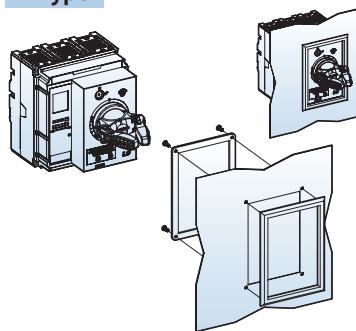


Door cut type for Direct rotary handle

A Type

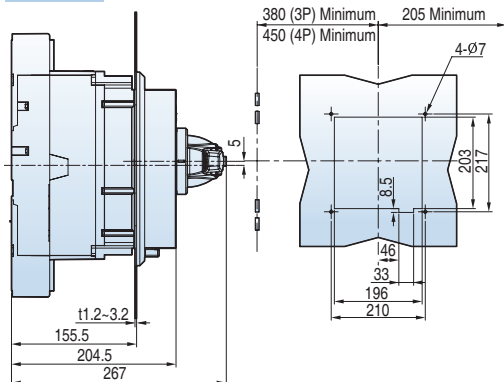


B Type

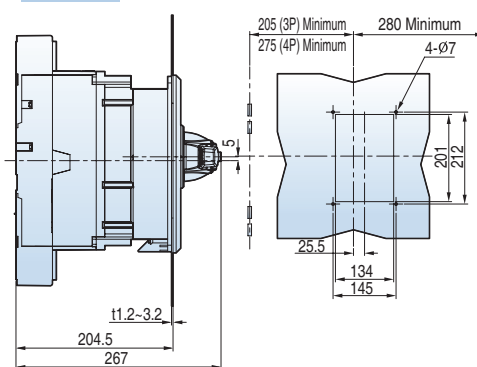


Dimension of door cut

A Type



B Type



Note) 1. In case of disassembling and assembling the main cover, screw should be tightened in specific torque of 1.5N.m (15.3kgf.cm)
2. In case of disassembling and assembling the main cover by over tightening torque, the parts of MCCB can be damaged.

Accessories for TS series 1600A

Rotary handle

Extended rotary handle

Degree of protections IP55

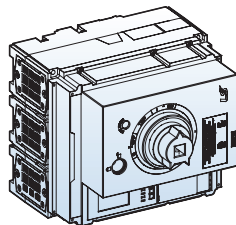
There are three types of extended rotary handle according to line & load direction.

With Extended rotary handles, can be operate MCCB at the back of switchboards, from the switchboard front.

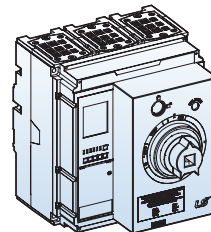
Indication of the three positions O(OFF), I(ON) and tripped circuit breaker locking capability in the OFF position by one to three padlocks, shackle diameter 5 to 6mm (not supplied).

When MCCB is on position, panel door is can't be open.

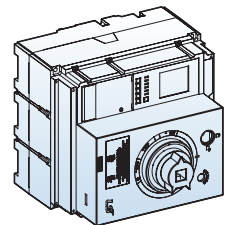
L Type



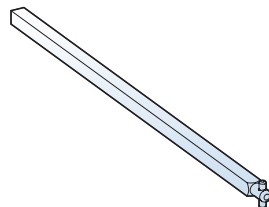
S Type



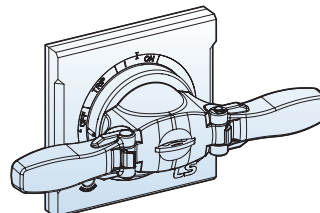
R Type



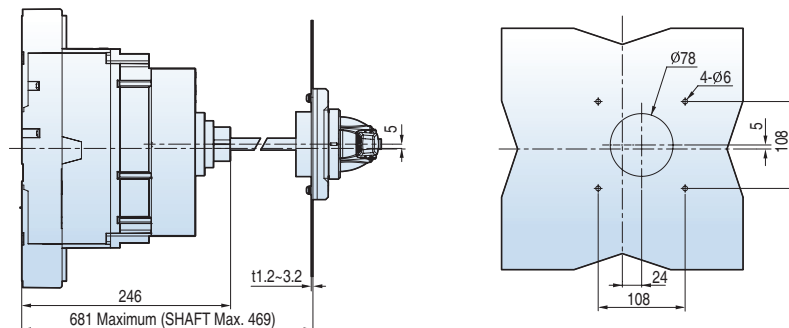
Shaft



Handle



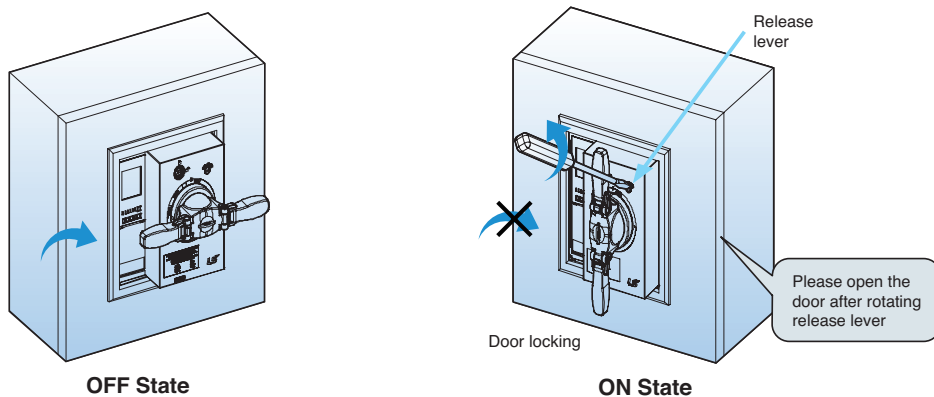
Dimension of door cut



Rotary handle

Locking system(Door lock)

The panel door can be locked at ON and TRIP position of rotary handle.
To open the panel door at ON position, just rotate release screw counterclockwise.
When MCCB is on position, panel door is can't be open.

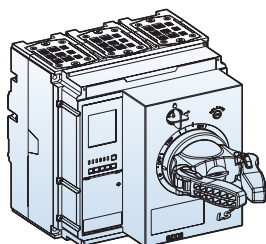


⚠ Caution

- If the door is opened with much pressure when the position of handle is ON or TRIP, the handle lock lever will be damaged

Key lock

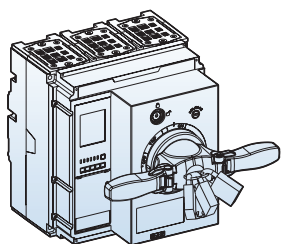
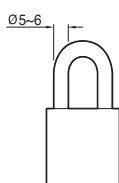
After locking handle, be sure that the key removed.



Key lock: locking OFF position

Locking by rotary handle with a key lock

A locking can be done by using the rotary handle which has key lock device.
The lock is used to lock the circuit-breaker in the OFF position.



Locking at ON or OFF position

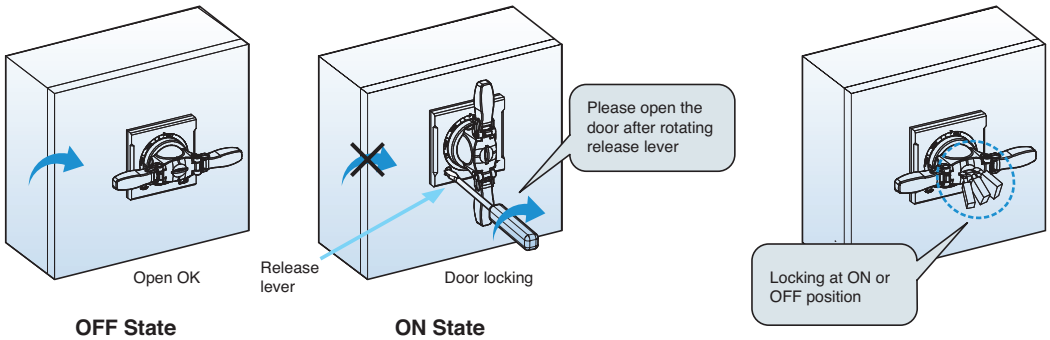
Padlocking by rotary handle

A padlocking can be also done by using the rotary handle.
The lock is used to lock the circuit-breaker in the ON and OFF position.
Maximum three (3) padlocks with shackle diameters ranging from 5 to 6mm may be used. (Padlocks are not supplied)

Rotary handle

Locking system(Door lock)

The panel door can be locked at ON and TRIP position of rotary handle.
To open the panel door at ON position, just rotate release screw clockwise.
When MCCB is on position, panel door is can't be open

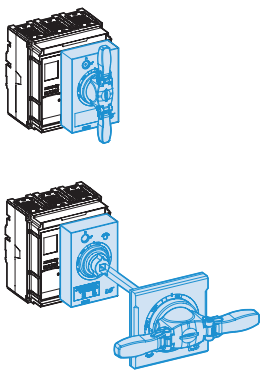


⚠ Caution

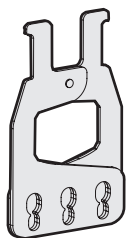
- If the door is opened with much pressure when the position of handle is ON or TRIP, the handle lock lever will be damaged

Degree of protections

| Type | Degree of protection | IP |
|---|---|------|
| Circuit breaker with cover frame and rotary direct handle | The access probe of 1.0mm diameter shall not penetrate. | IP40 |
| Circuit breaker with cover frame and rotary extended handle | Totally protected against ingress of dust and water jets from any direction | IP65 |



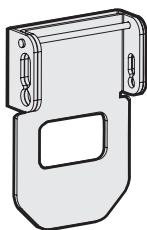
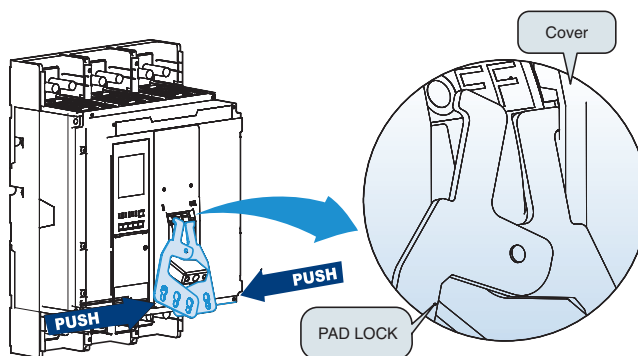
Locking devices



Removable padlock (PL)

This device allows the handle to be locked in the “OFF” position. Locking in the OFF position guarantee isolation according to IEC 60947-2.

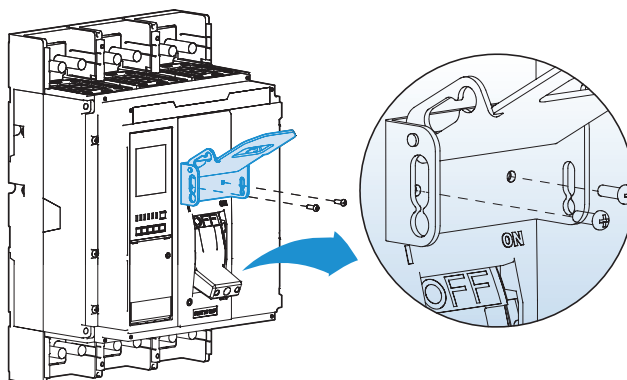
The locking device for the toggle handle can be installed in 3-pole and 4-pole circuit-breakers. Maximum three (3) padlocks with shackle diameters ranging from 5 to 8mm may be used. (Padlocks are not supplied)



Fixed padlock (PHL)

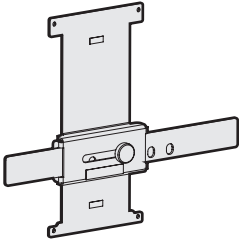
This device allows the handle to be locked in the “ON” and “OFF” position. Locking in the OFF position guarantee isolation according to IEC 60947-2.

The locking device for the toggle handle can be installed in 3-pole and 4-pole circuitbreakers. Maximum three (3) padlocks with shackle diameters ranging from 5 to 8mm may be used. (Padlocks are not supplied)



Accessories for TS series 1600A

Locking devices



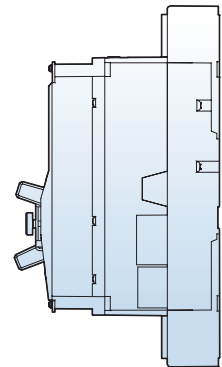
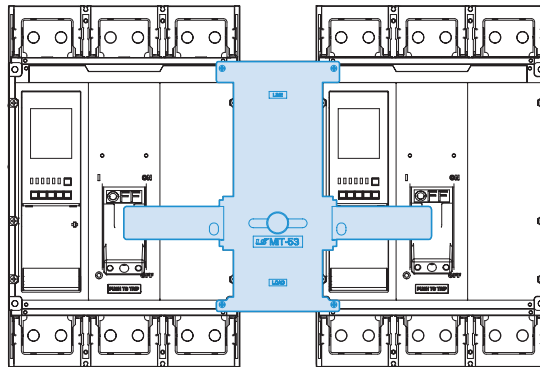
Mechanical interlock (MIT)

The mechanical interlock (MIT) can be applied on the front of two breakers mounted side by side, in either the 3-pole or 4-pole version and prevents simultaneous closing of the two breakers.

Fixing is carried out directly on the cover of the breakers.

The front interlocking plate allows installation of a padlock in order to fix the position.
(possibility of locking in the O-O position as well)

This mechanical interlocking device is very useful and simple for consisting of manual source changeover system



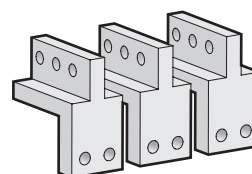
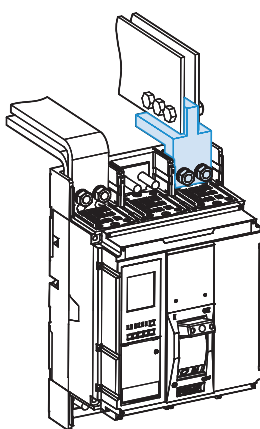
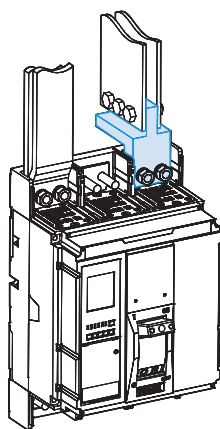
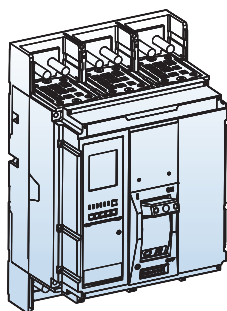
Terminal

Front connection of Fixed devices

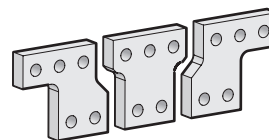
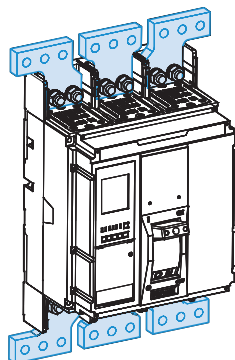
Bars

Fixed, front-connection Susol TS1600AF devices are equipped with terminals comprising captive screws for direct connection of bars.

Other connection possibilities for bars include vertical-connection adapters for edgewise bars and spreaders to increase the pole pitch to 95 mm.



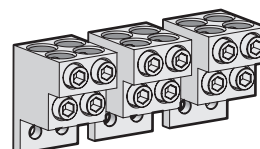
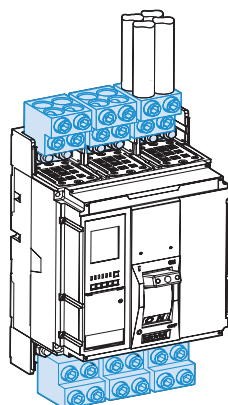
Vertical busbar



Busbars

Bare cables

Lug terminals may be used to connect four 85 up to 240mm² copper or aluminum cables for each phases. Bare cable connection is possible for rating up to and including 1250A

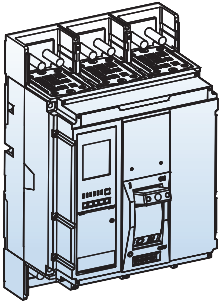


Lug terminal

| | |
|---------------------------|---------------|
| L(mm) | 25~55 |
| S(mm ²) Cu/Al | 4×85 to 4×240 |
| Torque(kgf · cm) | 564 |

Accessories for TS series 1600A

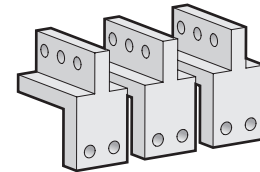
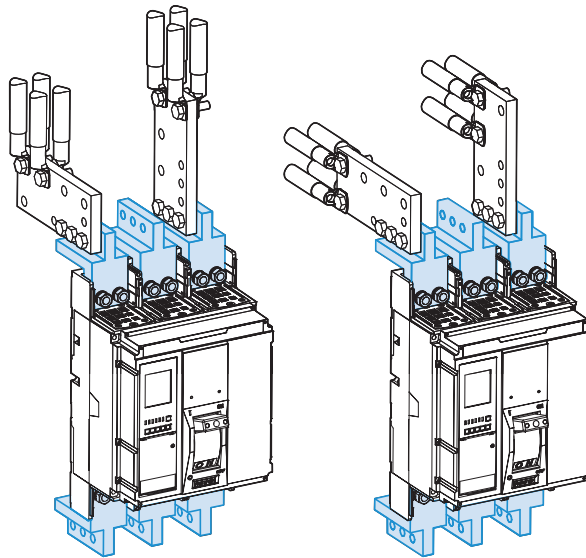
Terminal



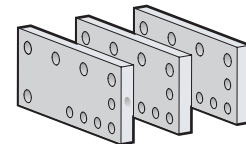
Crimped Terminals

Crimped terminals are combined with the vertical and extension busbars. One to four cables with crimped terminals ($\pm 300\text{mm}^2$) may be connected.

To ensure stability, connectors must be fixed and insulated between the terminal extensions.



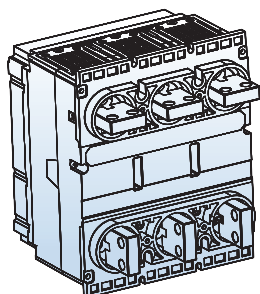
Vertical busbar



Extension busbars



Terminal



Rear connection of Fixed devices

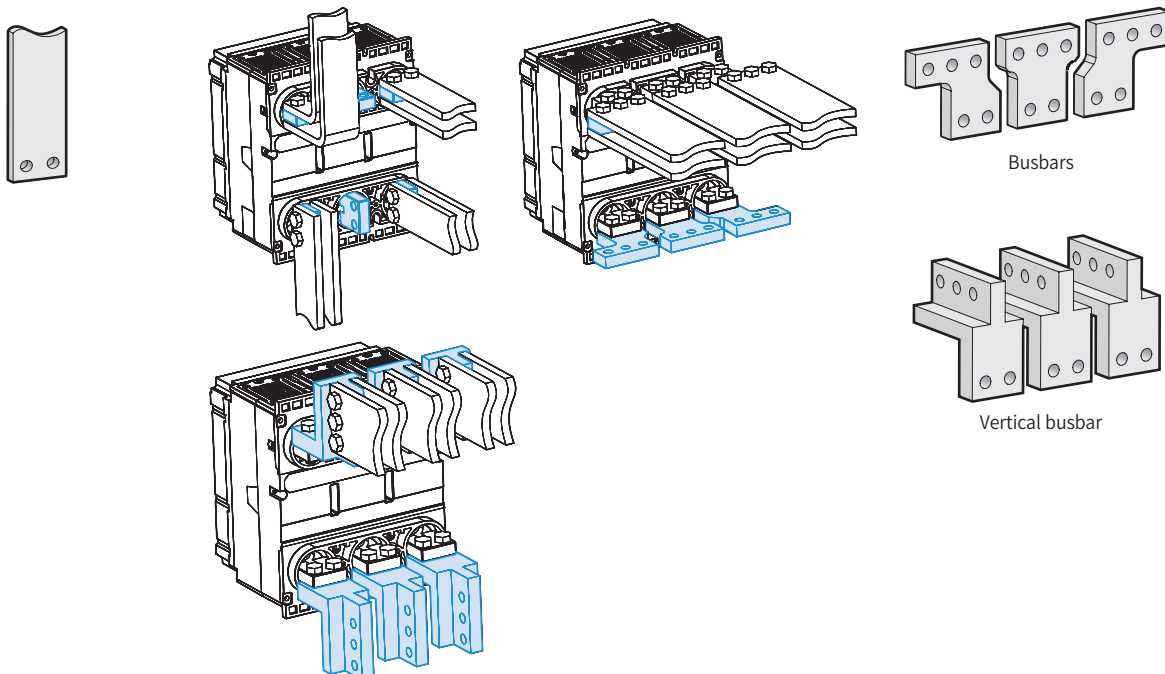
(Orderable with a breaker)

Bars

Rear connection devices equipped with horizontal or vertical connectors may be directly connected to flat or edgewise busbars, depending on the position of the connectors. Busbars are available to increase the pole pitch to 95mm

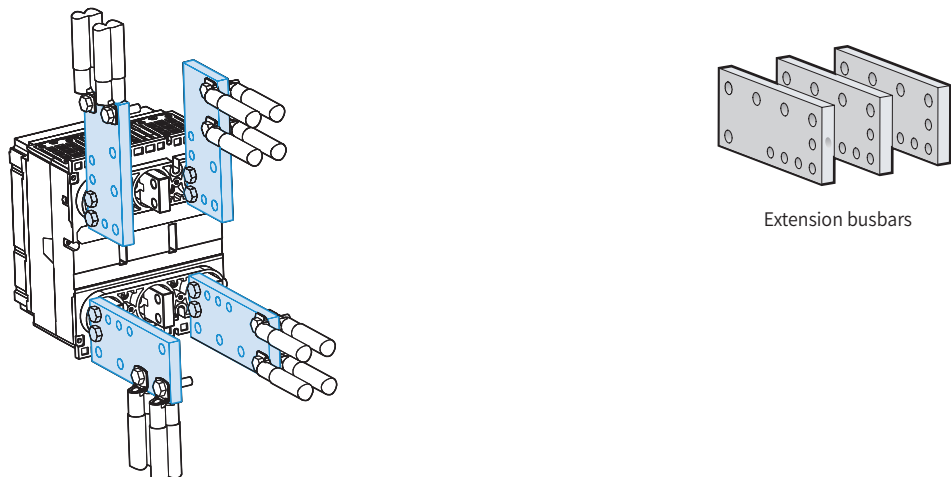
The standard type of rear connection type is horizontal type.

If customer want to connect busbars with vertical or combination(horizontal and vertical) please order separately.



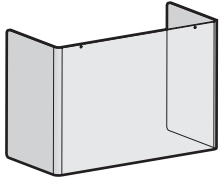
Crimped Terminals

Crimped terminals enable connection of one to four cables with crimped terminals($\pm 300\text{mm}^2$) To ensure stability, connectors must be fixed and insulated between the terminal extensions



Accessories for TS series 1600A

Insulation



Terminal cover

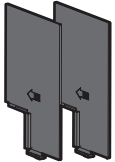
Mounted on fixed, front-connection devices, it insulates power-connection points.

Barrier

These barriers are insulated between the phases for increase insulation level. It also can be easily mounted, even the circuit-breaker already installed, inserting them in the corresponding slots.

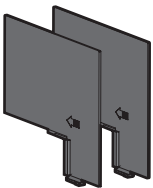
They are incompatible with both the insulating terminal covers.

It is possible to mount the phase separating partitions between two circuit-breakers side



Barrier for front connection

paking unit: 2ea/3Pole, 3EA/4Pole



Barrier for extension terminal

paking unit: 2ea/3Pole, 3EA/4Pole

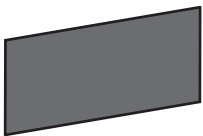
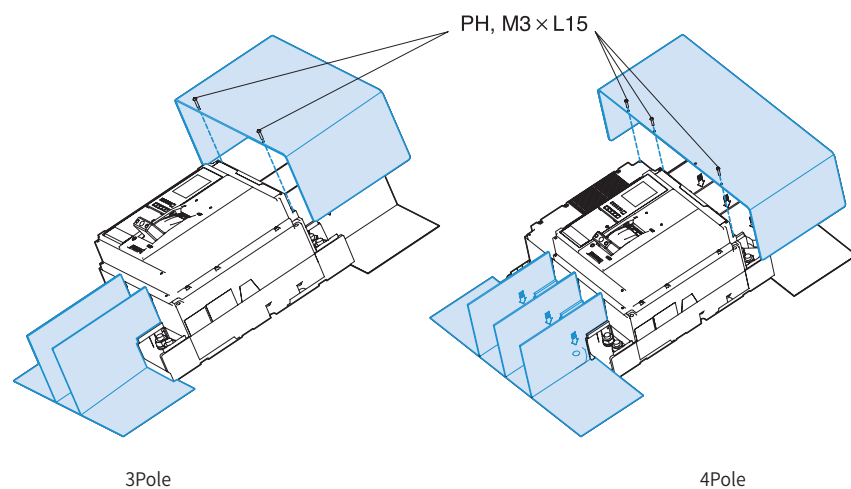


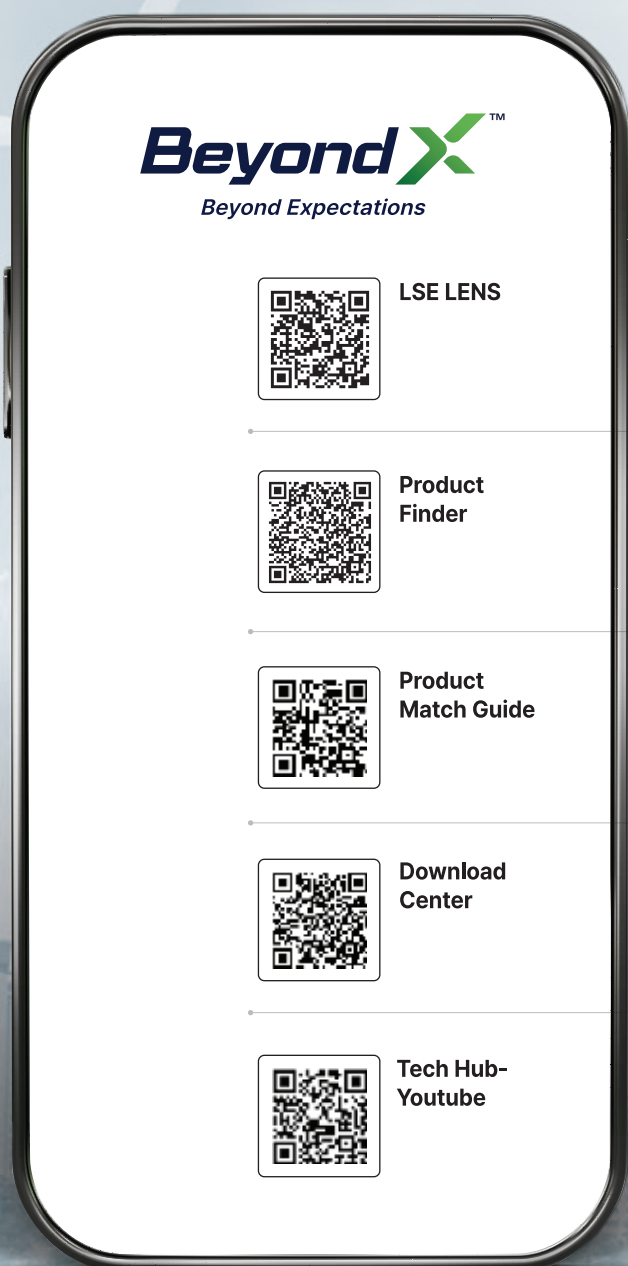
Plate protection

paking unit: 1ea/3Pole, 1ea/4Pole



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