



*Beyond*  <sup>TM</sup>

**Susol MCCB**

Molded Case Circuit Breakers



**LS** ELECTRIC

# MCCBs for power distribution 1600A

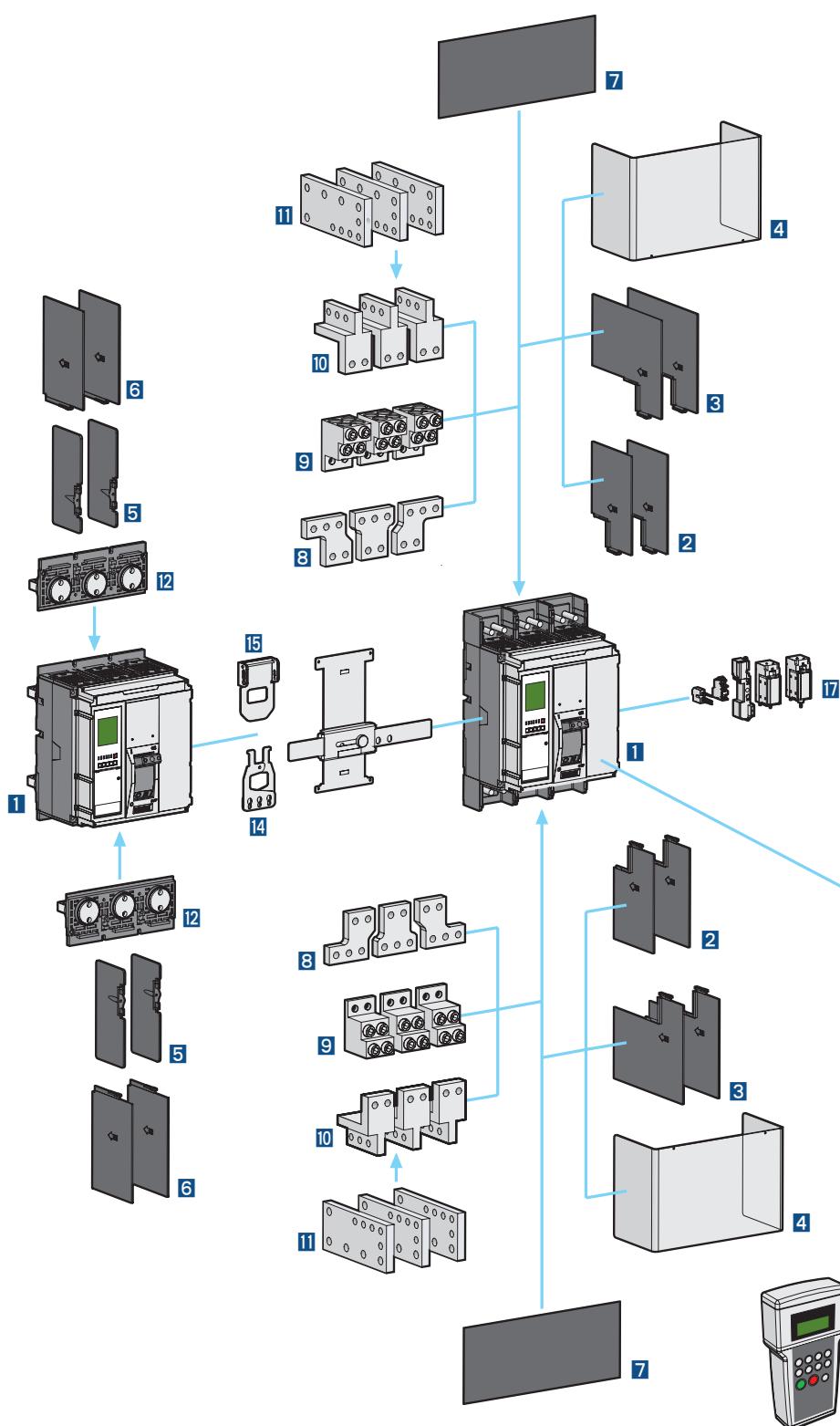
## Electrical characteristics



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

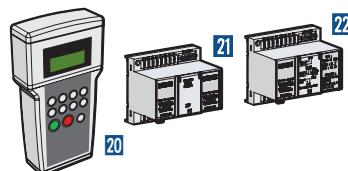
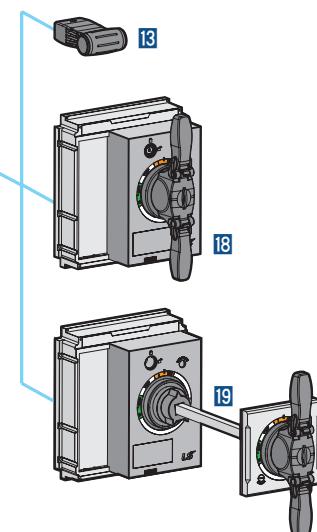
Note) 1. Life cycle means not guarantee but limitation  
(Quality guarantee: On/Off frequency on the basis of IEC60947-2 within the term of guarantee.)

# Accessories for TS series 1600A



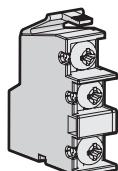
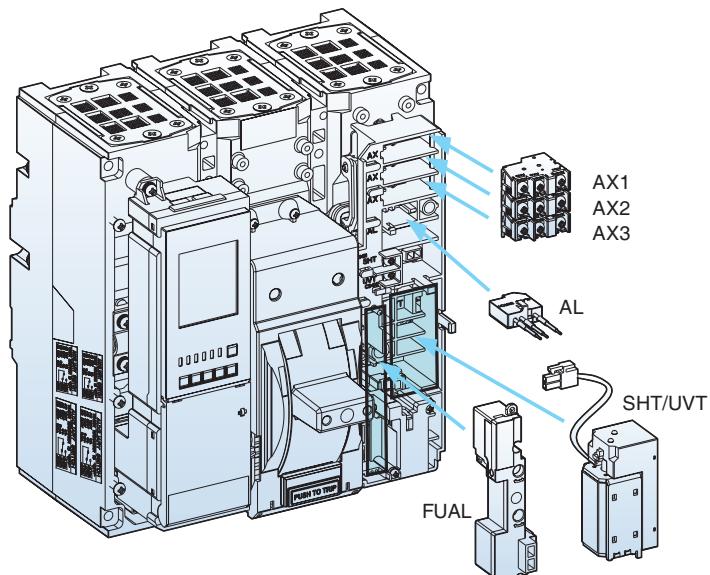
- 1 MCCB
- 2 Barrier for front connection
- 3 Barrier for extension terminal
- 4 Terminal cover
- 5 Barrier for rear connection
- 6 Barrier aux for rear connection
- 7 Plate protection
- 8 Busbar
- 9 Lug terminal
- 10 Vertical busbar
- 11 Extension busbar
- 12 Rear connection Note
- 13 Auxiliary handle
- 14 Removable padlock (PL)
- 15 Fixed padlock (PHL)
- 16 Mechanical interlock (MIT)
- 17 Electrical auxiliary
- 18 Direct rotary handle
- 19 Extended rotary handle
- 20 Test kit
- 21 Voltage module
- 22 UVT time delay controller (UDC)

Note) Orderable with a breaker

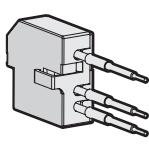


## Electrical auxiliaries

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.

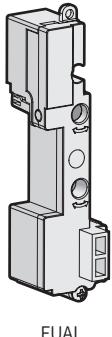
Its contact is open when the circuit breaker is reset.

### Contact operation

MCCB	ON	OFF	TRIP
Position of AX	AXc1 —○— AXa1 ○— AXb1	AXc1 —○— AXa1 ○— AXb1	
Position of AL	ALc1 —○— ALa1 ○— ALb1		ALc1 —○— ALa1 ○— ALb1

# 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

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

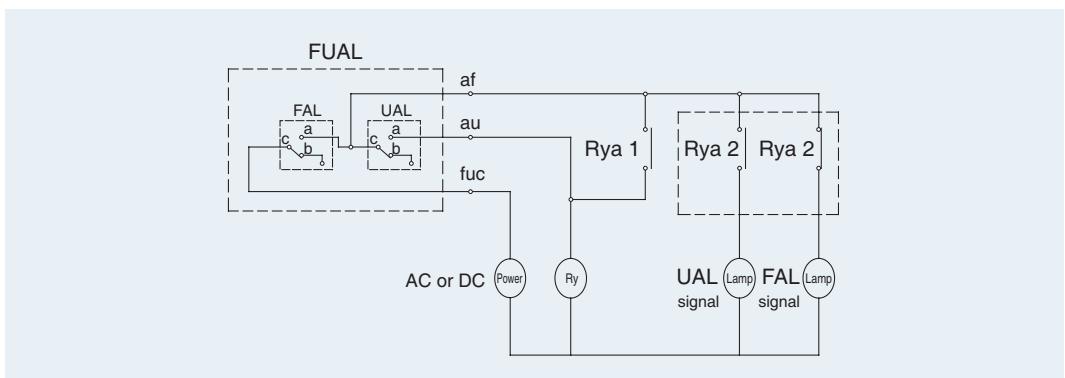


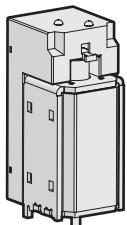
Figure. Example of Lock up Circuit for FUAL

**⚠ 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 look up circuit it may cause to be miss operation. So, please do not use latch circuit or look up circuit with FAL signal.

## Electrical auxiliaries



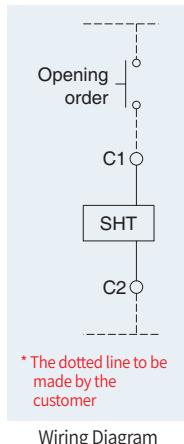
### SHT Shunt trip device

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.

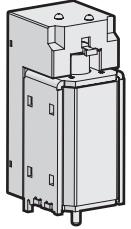
The maximum wire length

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

# Accessories for TS series 1600A

## Electrical auxiliaries

### UVT Under Voltage Trip device

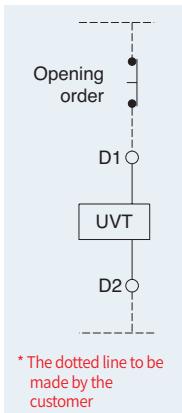


- If the voltage of the main or the control power is under voltage, UVT which is installed inside of the breaker breaks the circuit automatically. Please connect with UVT time-delay device in order to present the time delay function because UVT is technically instantaneous type.
- The closing of a circuit 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	-					
48~60	48					
100~130	100~130	0.65~0.85 Vn	0.44~0.6 Vn	200	5	Less than 50ms
200~250	200~250					
-	380~480					

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



Wiring Diagram

#### 2. Specification of the wire

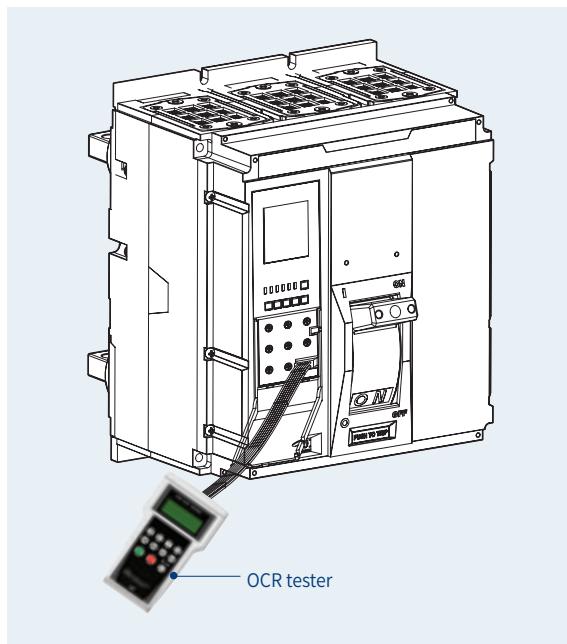
- Refer to the below table regarding the length and specification of wire when using trip coil with DC 24~30[V] or DC/AC 48~60[V] of rated voltage.

The maximum wire length

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

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

## 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

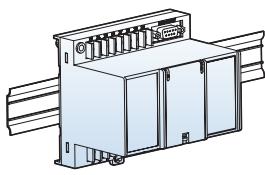


	R, S, T, N phase signal input
	Increase/Decrease signal input
	Signal setting/Delete
	Waveform generation/Stop
	Select frequency

## 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.

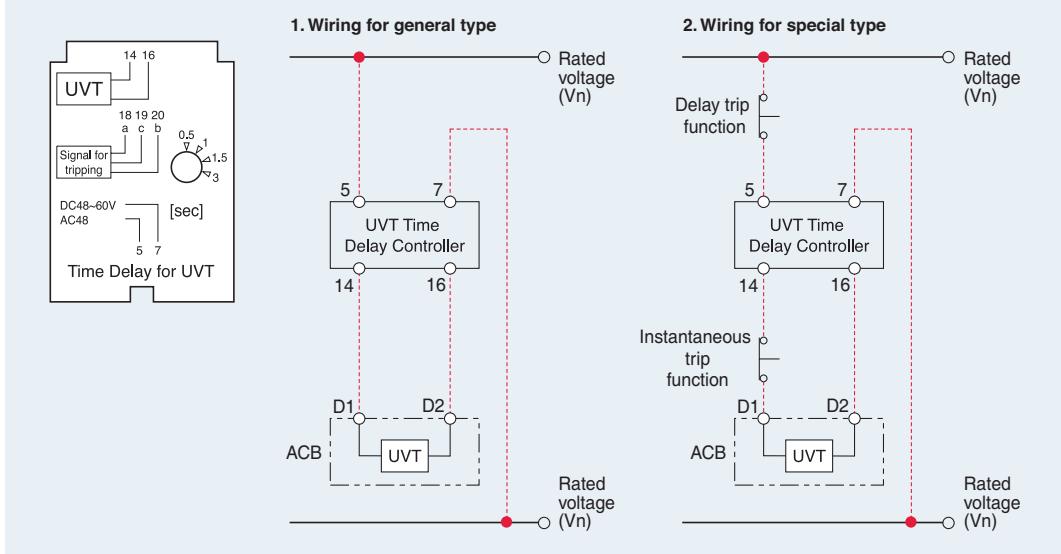


## 1. The rated voltage and characteristic of UVT time delay controller

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.

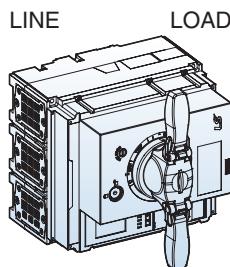
### Direct rotary handle

#### Degree of protection IP40

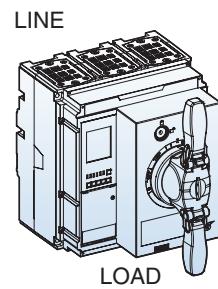
There are three types of direct rotary handle according to line load direction.

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).

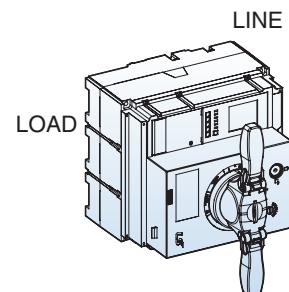
**L Type**



**S Type**

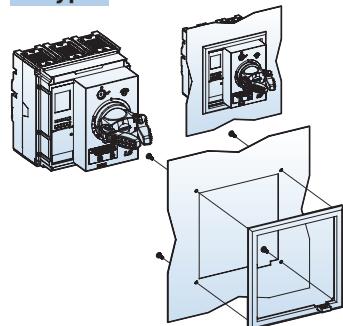


**R Type**

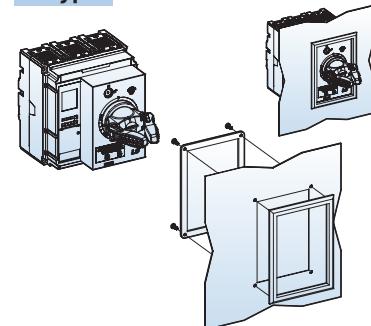


#### Door cut type for Direct rotary handle

**A Type**

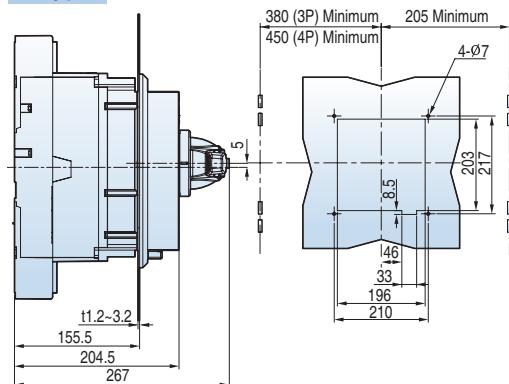


**B Type**

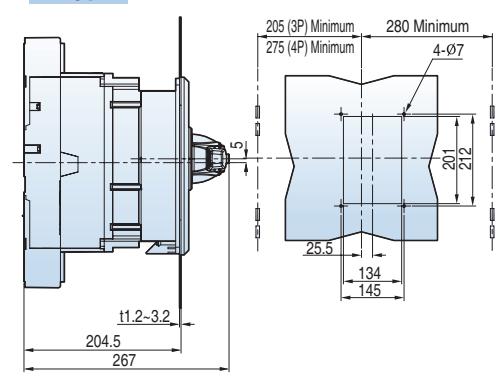


#### Dimension of door cut

**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

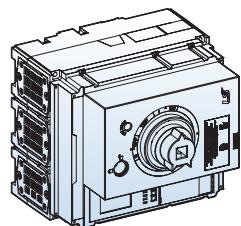
There are three types of extended rotary handle according to line & load direction.

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

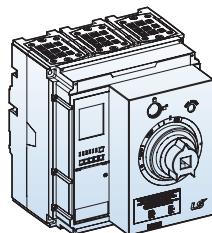
Indication of the three positions O(OFF), I(ON) and tripped circuit breaker locking capability in the OFF position by one to three padlocks, shackle diameter 5 to 6mm (not supplied).

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

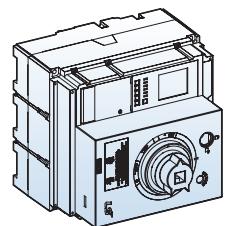
L Type



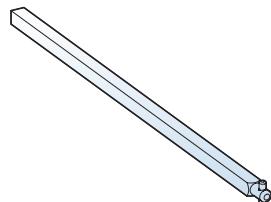
S Type



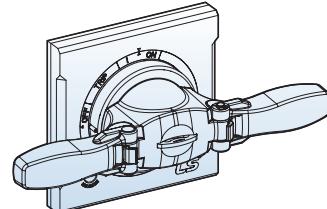
R Type



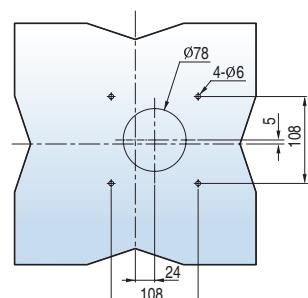
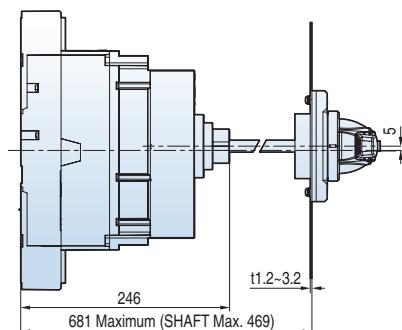
Shaft



Handle



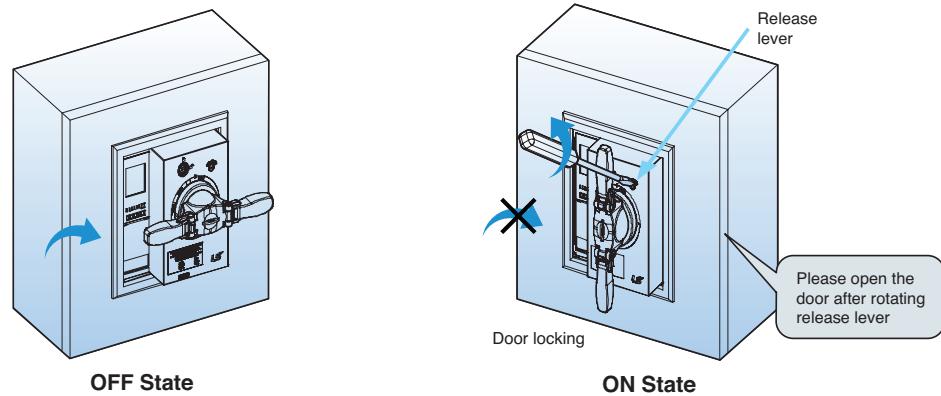
Dimension of door cut



## 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.

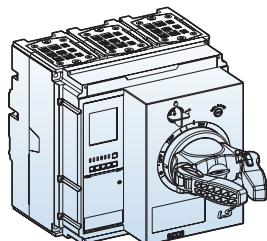


### ⚠ Caution

- 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

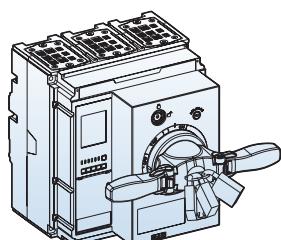
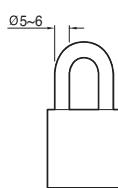
After locking handle, be sure that the key removed.



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

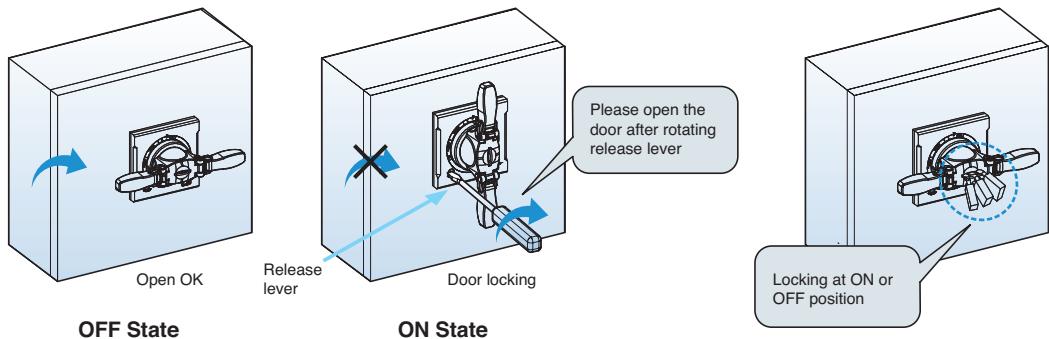
A padlocking can be also done by using the rotary handle. The lock is used to lock the circuit-breaker in the ON and OFF position. Maximum three (3) padlocks with shackle diameters ranging from 5 to 6mm may be used. (Padlocks are not supplied)

# Accessories for TS series 1600A

## Rotary handle

### Locking system(Door lock)

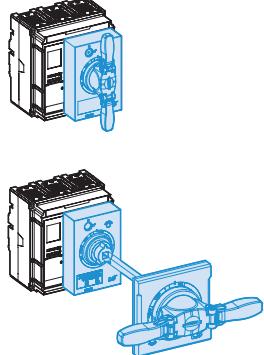
The panel door can be locked at ON and TRIP position of rotary handle.  
To open the panel door at ON position, just rotate release screw clockwise.  
When MCCB is on position, panel door is can't be open



### ⚠ 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

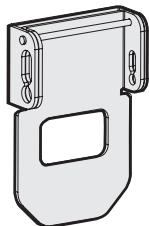
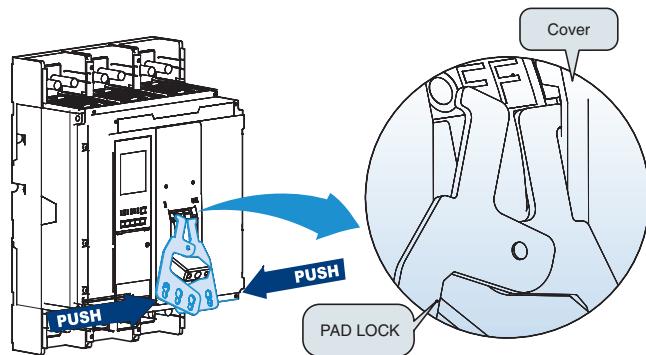
## Locking devices



### 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.

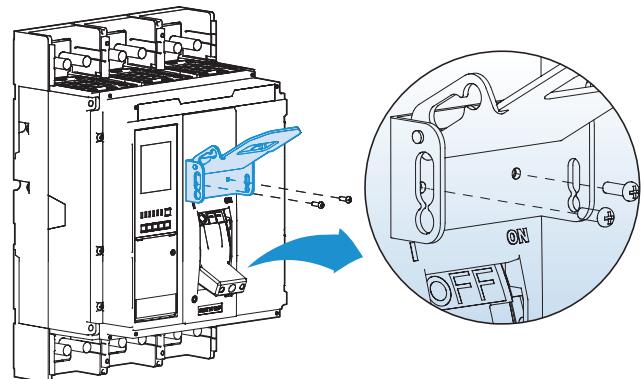
The locking device for the toggle handle can be installed in 3-pole and 4-pole circuit-breakers. Maximum three (3) padlocks with shackle diameters ranging from 5 to 8mm may be used.  
(Padlocks are not supplied)



### Fixed padlock (PHL)

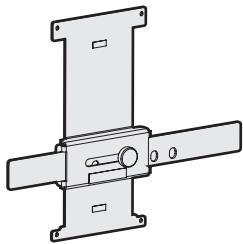
This device allows the handle to be locked in the “ON” and “OFF” position.  
Locking in the OFF position guarantee isolation according to IEC 60947-2.

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



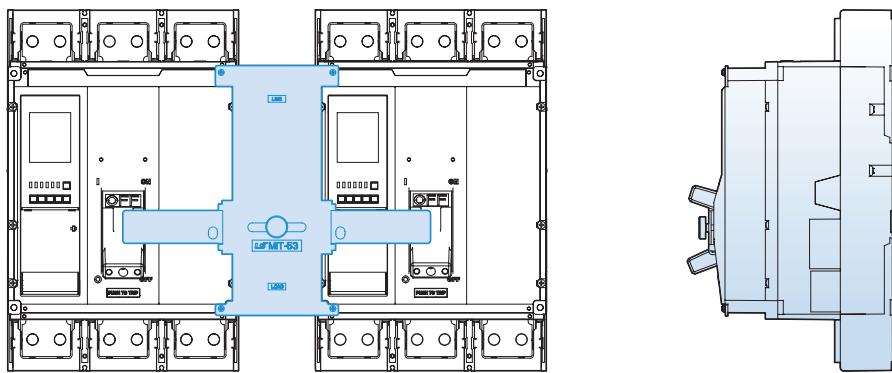
### Mechanical interlock (MIT)

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



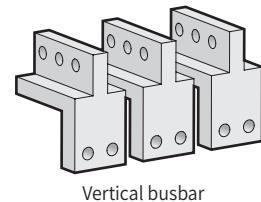
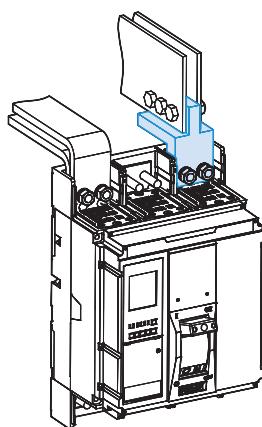
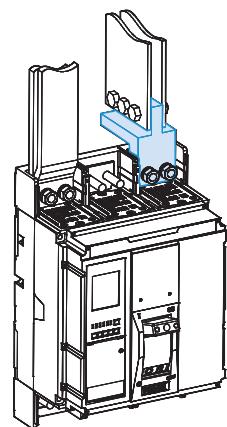
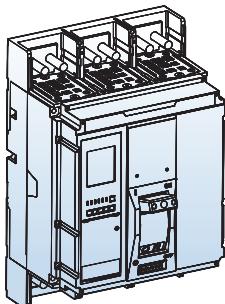
## Terminal

### Front connection of Fixed devices

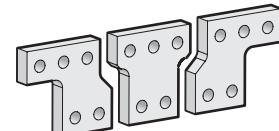
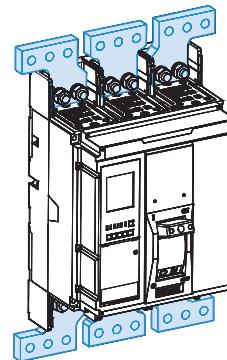
#### Bars

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.



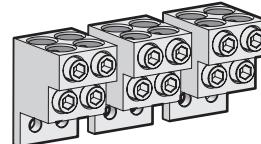
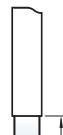
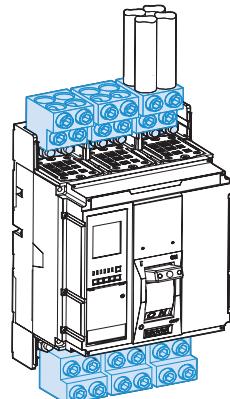
Vertical busbar



Busbars

#### Bare cables

Lug terminals may be used to connect four 85 up to 240mm<sup>2</sup> copper or aluminum cables for each phases. Bare cable connection is possible for rating up to and including 1250A



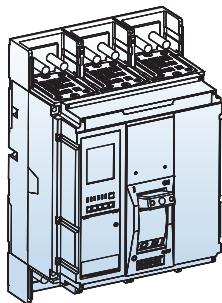
Lug terminal



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

# Accessories for TS series 1600A

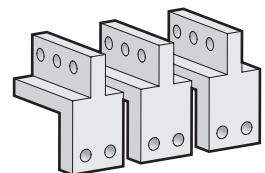
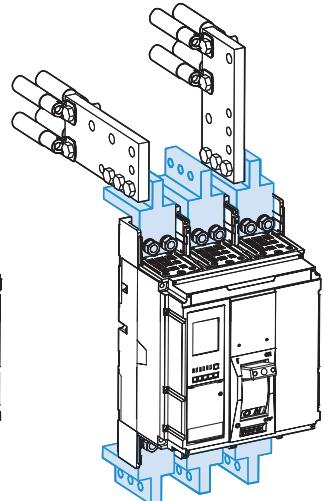
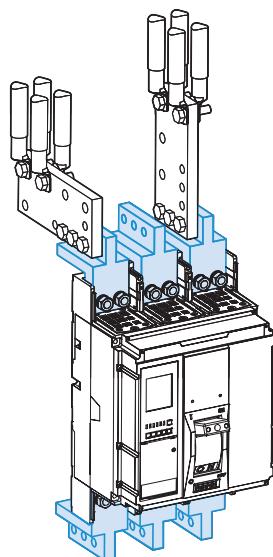
## Terminal



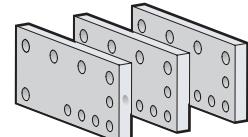
### Crimped Terminals

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



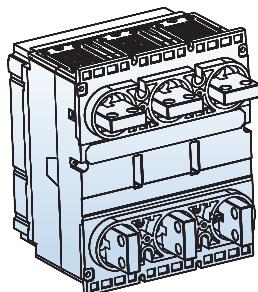
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## Terminal



### Rear connection of Fixed devices

(Orderable with a breaker)

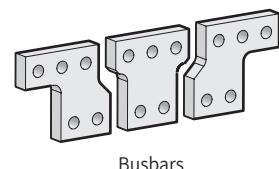
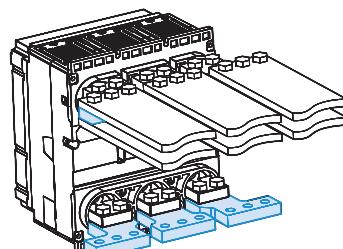
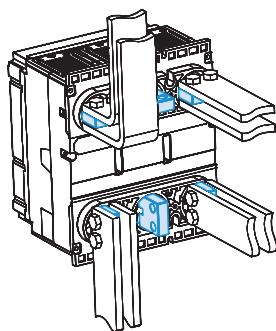
#### Bars

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.

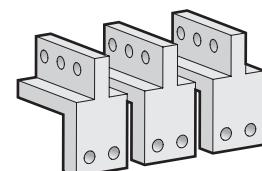
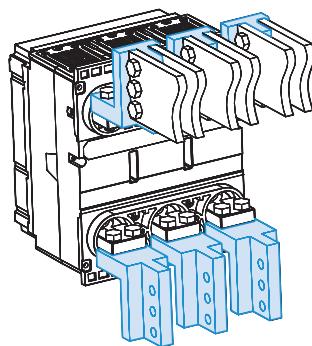
Busbars are available to increase the pole pitch to 95mm

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.



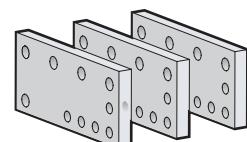
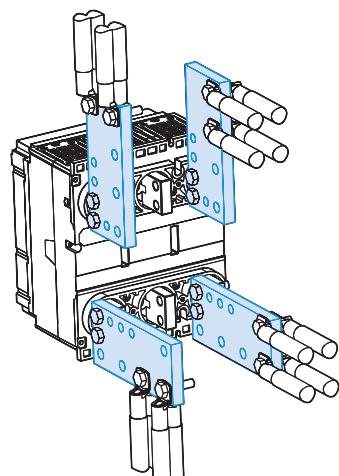
Busbars



Vertical busbar

#### Crimped Terminals

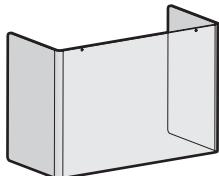
Crimped terminals enable connection of one to four cables with crimped terminals ( $\pm 300\text{mm}^2$ )  
To ensure stability, connectors must be fixed and insulated between the terminal extensions



Extension busbars

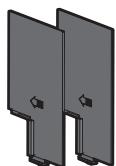
# Accessories for TS series 1600A

## Insulation



### Terminal cover

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

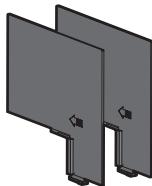


### Barrier

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

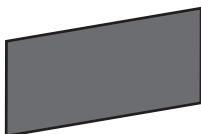
### Barrier for front connection

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



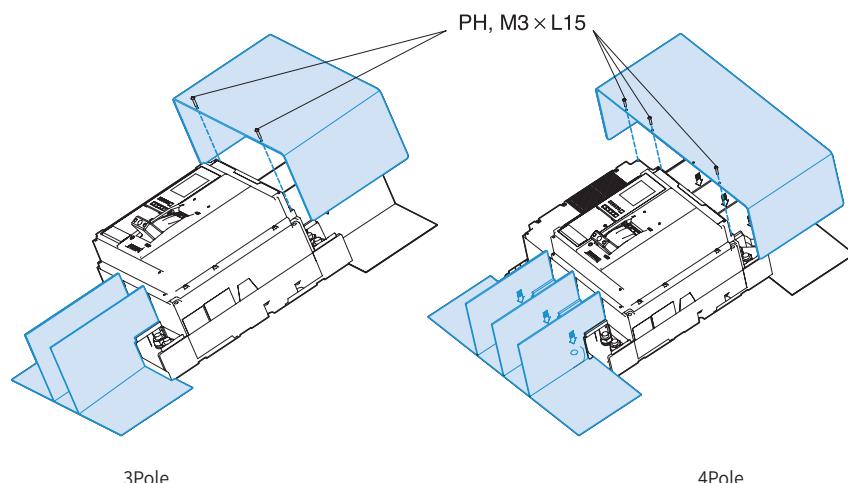
### Barrier for extension terminal

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



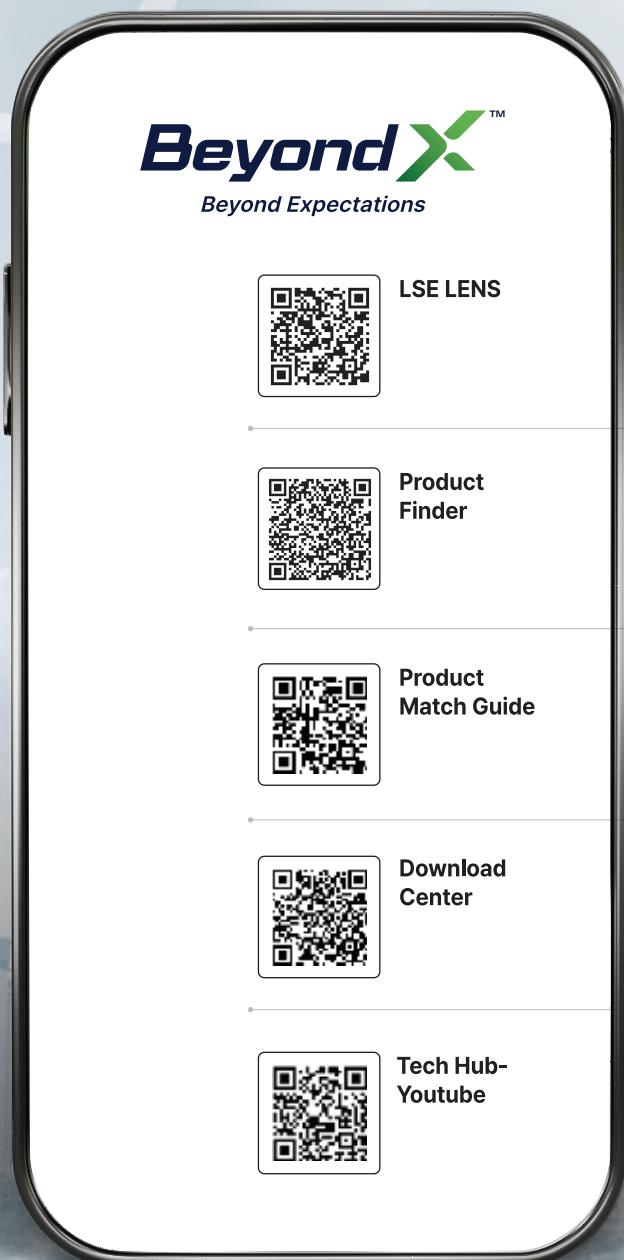
### Plate protection

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



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