Top 100
Global
Innovator
for 10 years

Susol
SMART MCCB
Molded Case Circuit Breakers

LS ELECTRIC

Susol

Smart Molded Case Circuit Breakers

Susol Smart MCCB, developed by combining digital technology with LS ELECTRIC's power equipment technology accumulated for more than 40 years, has functions for energy consumption and power management. Its relay and metering functions for line protection have been upgraded and it is possible to diagnose and maintain the device by collecting and analyzing data using an accessory device for connectivity.

The move towards energy digitalization is taking place in various fields. By applying Susol Smart MCCB to areas such as renewable energy, building, industry, EV charging infrastructure linked to low voltage, the LSIG relay function can safely protect the line.

Special features of Susol Smart MCCB

- Relay setting with Fine-tuning available: LSIG (long-time, short-time, instantaneous, ground fault)
- High accuracy meter precision: current +1.0%, voltage +0.5%, power and wattage +2.0%
- Diagnosis and maintenance of equipment
- Reinforced communication function (mobile, RS485, etc.)

CONTENTS

Introduction to the product

Selection and ratings of circuit breaker

Accessories

Characteristics curves, Dimensions and Mounting & Connection

Smart MCCB

Incorporating the cutting-edge digital technology...

More powerful Susol MCCB line-up!

Icu 150kA, Ui 1000V, Uimp 8kV, Ics=100%Icu

Susol Smart MCCB

TS100/160/250

105(W) x 160(H) x 86mm(D)

Rated current : 40~250A
Icu : 50kA(Ni), 85kA(Hi), 150kA(Li)

TD100/160

90(W) x 140(H) x 86mm(D)

Rated current : 16~160A
Icu : 50kA(N), 85kA(H), 150kA(L)

Susol MCCB

Rated current : 40~250A
Icu : 50kA(N), 85kA(H), 150kA(L)

Our Smart MCCBs are designed in the same sizes as the existing MCCBs.

Rated current : 250-630A
Icu : 65kA(Ni), 85kA(Hi), 150kA(Li)

Rated current : 630, 800A
Icu : 65kA(Ni), 100kA(Hi), 150kA(Li)

TS400/630

140(W) x 260(H) x 110mm(D)

Rated current : 300~630A
Icu : 65kA(N), 85kA(H), 150kA(L)

TS800

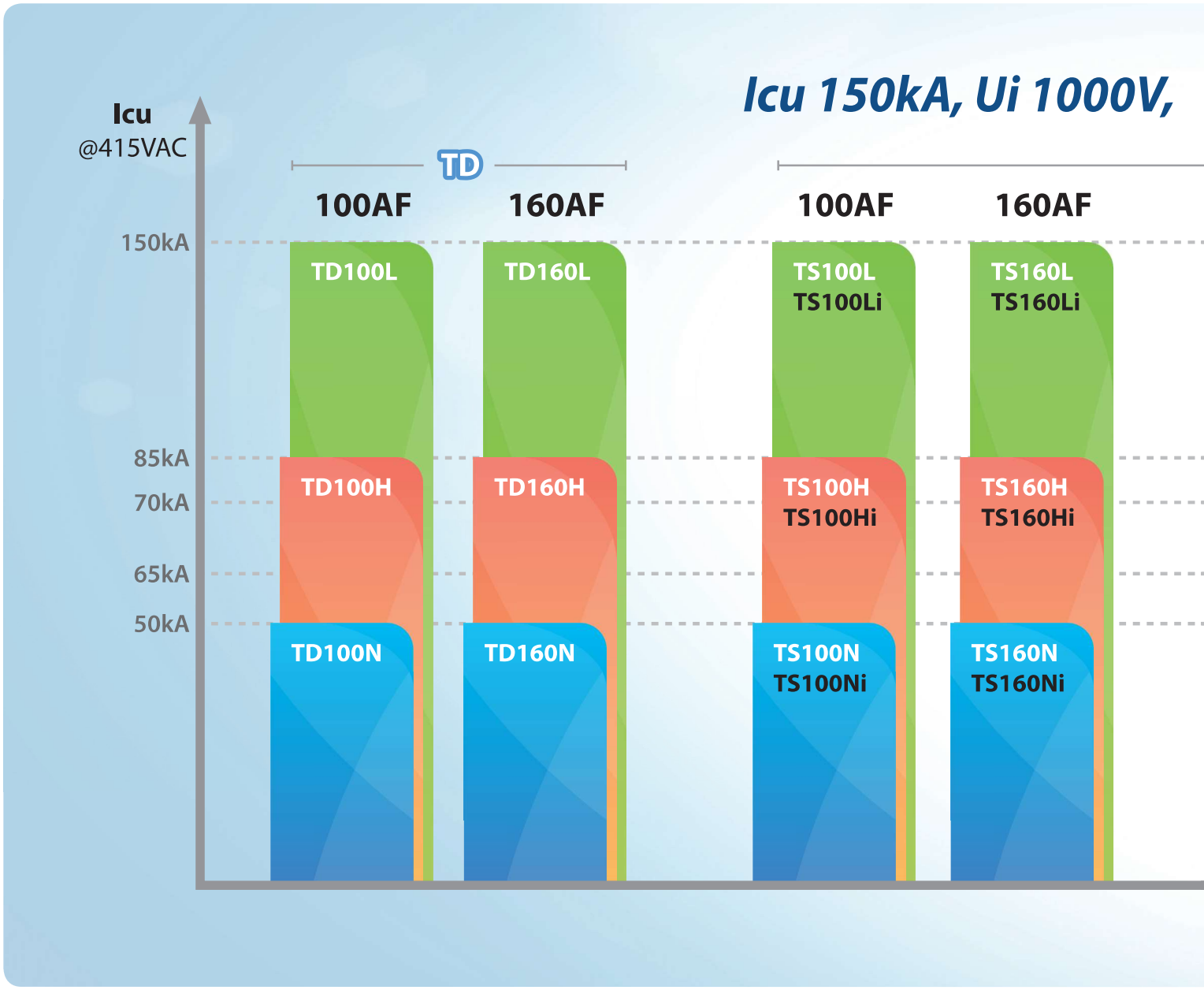
210(W) x 320(H) x 135mm(D)

Rated current : 700, 800A
Icu : 65kA(N), 100kA(H), 150kA(L)

TS1600

210(W) x327(H) x 152.5mm(D)

Rated current : 1000, 1250, 1600A
Icu : 50kA(N), 70kA(H), 150kA(L)



MCCB

TS-L/H/N series

Full line-up 100 to 1600AF

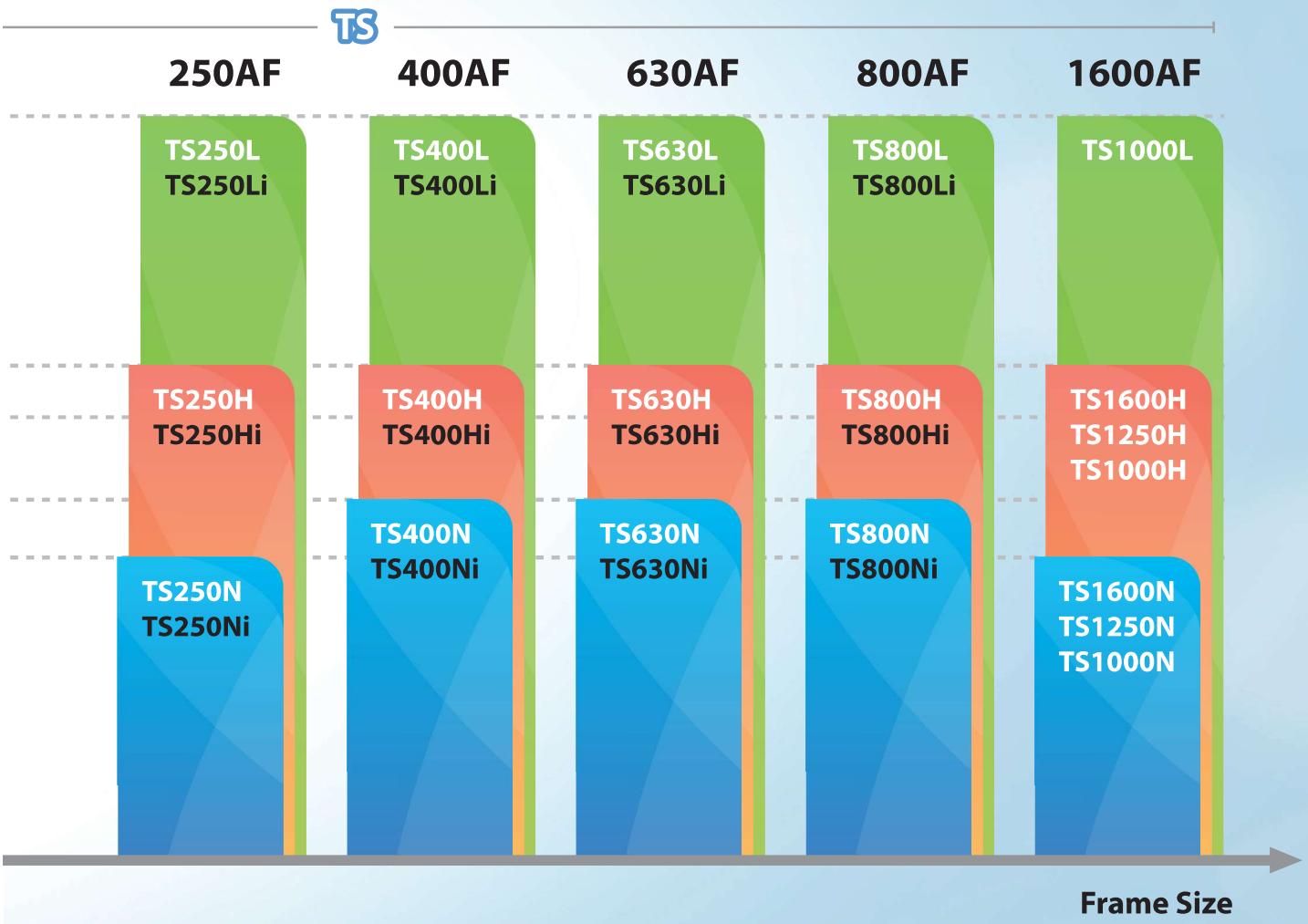
Performance

- Rated breaking capacity: 150kA@415V, Icu=100%Ics
- Rated insulation voltage: 1000V

Various trip units

- FTU, FMU, ATU, MTU
- ETS, ETM
- RCD units

Uimp 8kV, Ics = 100%Icu



Smart MCCB

TS-Li/Hi/Ni series

Line-up 100 to 800AF

The same electircal performance and dimension as Susol MCCB

- Rated breaking capacity: 150kA@415V, Icu=100%Ics
- Rated insulation voltage: 1000V

Smart trip units

- Relay setting with Fine-tuning available: LSIG (long-time, short-time, instantaneous, ground fault)
- High accuracy meter precision: current +1.0%, voltage +0.5%, power and wattage +2.0%
- Diagnosis and maintenance of equipment
- Reinforced communication function (mobile, RS485, etc.)

Smart MCCB

Electronic Smart

- **ETSi**
  Standard/LSIG relay, current measurement
- **ETMi**
  Multi-function/LSIG relay, current measurement, communication function
- **ETHi**
  High performance/LSIG relay, current/voltage/power measurement, communication function
- **ETLi**
  Limited performance/LSIG relay, power measurement, communication function, mobile communication

MCCB

Electronic

- **ETS**
  Standard(LSI)
- **ETM**
  Multi-function(LSIG)

Susol series

Optimal solution

- Simplified product range 160/250/630/800/1600AF (5Frame)
- High performance 150kA (Ics = Icu)
- Various trip units
- Variable Accessories available
- Communication functions

• Icu 150kA • Ui 1000V • Uimp 8kV • Ics=100%Icu

MCCB

Thermal magnetic

- **FTU**
  Fixed thermal,
  Fixed magnetic
- **FMU**
  Adjustable thermal,
  Fixed magnetic
- **ATU**
  Adjustable thermal,
  Adjustable magnetic

MCCB

Magnetic only

MCCB

Switch-Disconnectors

Smart MCCB

Incorporating the cutting-edge digital technology ...
More powerful Susol MCCB line-up!

Icu 150kA, Ui 1000V, Uimp 8kV, Ics=100%Icu

Tripping device

Trip unit

- **ETSi**
  Standard/LSIG relay, current measurement
- **ETMi**
  Multi-function/LSIG relay, current measurement, communication function
- **ETHi**
  High performance/LSIG relay, current/voltage/ power measurement, communication function
- **ETLi**
  Limited performance/LSIG relay, power measurement, communication function, mobile communication

Characteristics of Susol Smart MCCB

- Relay setting with Fine-tuning available: LSIG (long-time, short-time, instantaneous, ground fault)
- High accuracy meter precision: current +1.0%, voltage +0.5%, power and wattage +2.0%
- Diagnosis and maintenance of equipment
- Reinforced communication function (mobile, RS485, etc.)

Electronic trip device specification comparison

Type		Susol Smart MCCB				Susol MCCB	
		ETSi	ETMi	ETHi	ETLi	ETS	ETM
Frame size		250/ 630/ 800AF				250/ 630/ 800AF	630/ 800AF
Line protection	Long time, short circuit, instantaneous	■	■	■	■	■	■
	Ground fault	■	■	■	■	-	Option
Measurement information	Current	■	■	■	■	-	Option
	Voltage, frequency, power factor, energy, power quality, etc.	-	-	■	■	-	-
Device operation	System event, fault event (Up to 50)	-	■	■	■	-	Fault Trip
	Operating time, mechanical frequency, electrical frequency, trip frequency, load usage rate	-	■	■	■	-	-
	Contact wear rate	-	-	■	■	-	-
Communication	RS485	-	■	■	■	-	Option
	Mobile communication	-	-	-	■	-	-

• ETS/ ETSi : Standard • ETM/ ETMi : Multi-Function • ETHi : High-Performance • ETLi : Limited-Performance

Rated current : 40~250A
Icu : 50kA(Ni), 85kA(Hi), 150kA(Li)

TS100/160/250

105(W)×160(H)×86mm(D)

Rated current : 250~630A
Icu : 65kA(Ni), 85kA(Hi), 150kA(Li)

TS400/630

140(W)×260(H)×110mm(D)

Rated current : 630, 800A
Icu : 65kA(Ni), 100kA(Hi), 150kA(Li)

TS800

210(W)×320(H)×135mm(D)

Susol Smart MCCB

Susol Smart MCCB was developed by incorporating digital technology based on the power equipment technology accumulated for over 40 years. The relay and meter functions for line protection have been upgraded, and data can be collected and analyzed using an accessory device for connectivity between low-voltage devices, enabling diagnosis and maintenance of devices.
LS ELECTRIC takes the lead for a smart future with energy digitalization.

ETU of Susol Smart MCCB has

a variety of electronic trip units like basic type(ETSi) that measures current for each AF and rated current, an advanced type(ETMi) with communication function, and a high-end type(ETHi) that performs communication function and voltage measurement and ETLi type with mobile (BLE) communication.

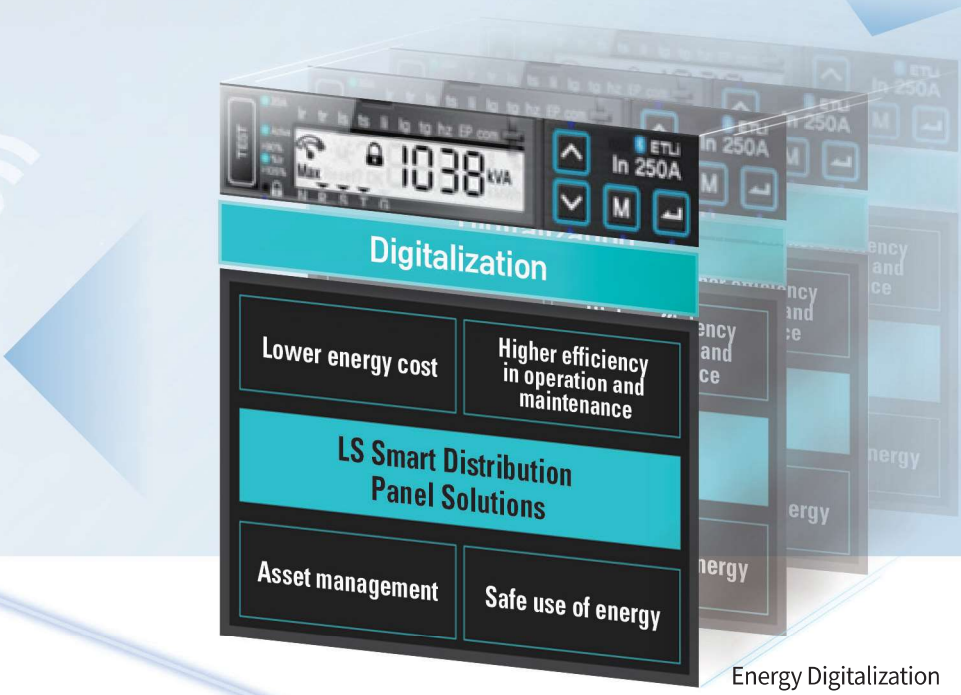
Susol Smart MCCB

Application field

The move towards energy digitalization is taking place in various fields. By applying Susol Smart MCCB to areas such as renewable energy, building, industry, EV charging infrastructure linked to low voltage, the LSIG relay function can safely protect the line.

Renewable energy | Infrastructure | Residential/commercial | Industrial | EV charging infrastructure

Susol Breakers + Digital Technology



Energy Digitalization

Smart solution

We provide unique smart solutions by applying digital technology to our reliable LS ELECTRIC systems/devices.

Characteristics of Smart MCCB

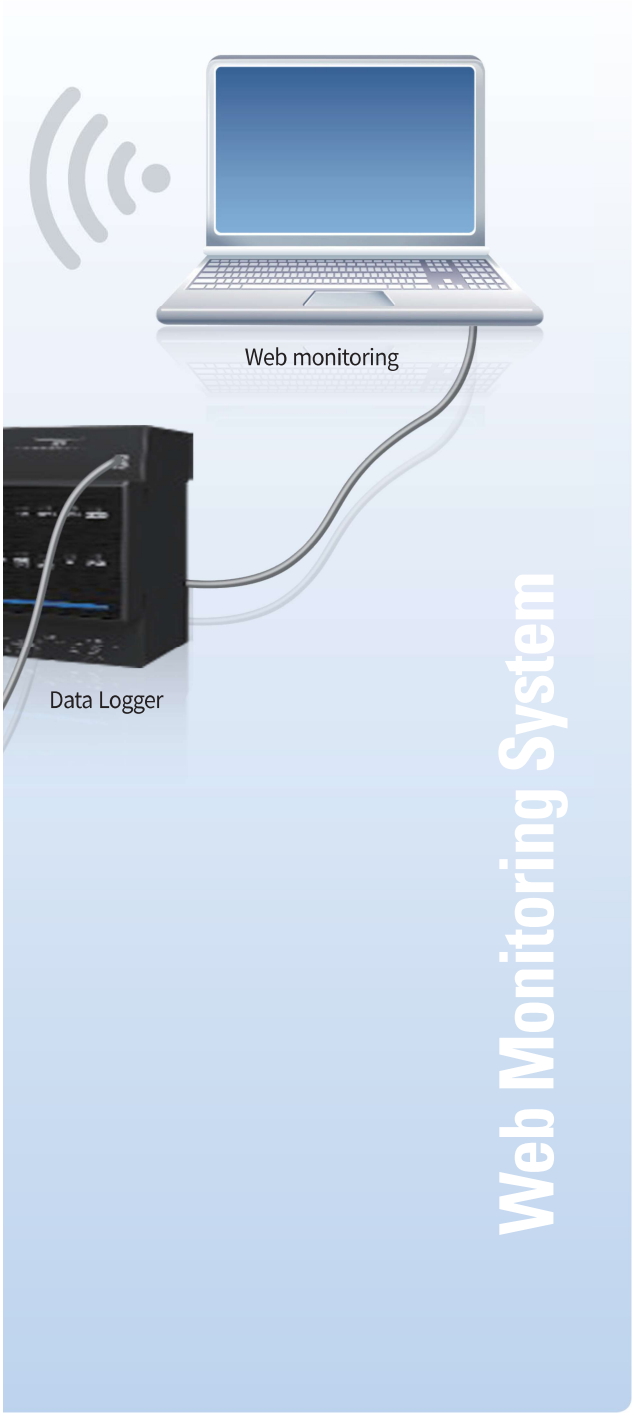
Provide Small and medium-sized smart device-based acceptable energy saving solution

- **Real-time monitoring/control**
  - Energy saving, maintenance cost reduction

Smart MCCB provides a function to safely monitor the electric/energy meter and relay elements of power facilities, and provides real-time remote control and monitoring functions for efficient operation through peripheral devices.

Provides convenience of ICT-based operation

- **Simplicity**
  - Easy access to user information
  - Convenient installation
- **Connectivity**
  - Ethernet-based standard communication
  - Web monitoring and control
- **Visibility**
  - Provides status information and pre-alarm function



Smart Mobile Controls

Smart Switchgear offers a short-range wireless Mobile App service to provide on-site monitoring and on-site maintenance convenience.

Mobile App. Services

- Real-time system and device operation status monitoring
- Provides energy use and failure analysis service measure

Smart Viewer　　Smart MCCB

Provide application for Mobile

- Provides device search and automatic recognition
- Device status and operation information inquiry
- Graphic chart by element

Gridsol CARE is a brand that refers to LS ELECTRIC's integrated digital power facility management service and proposes a new measure for energy management.
Gridsol CARE consists of upper level system, communication device, accessory device, Smart MCCB, ACB, and MCB. Through Gridsol CARE S/W, we provide a more efficient and stable system operation solution than before by performing power monitoring and control functions remotely.

Upper-level system

① **GridSol CARE Monitoring S/W(cloud)**
- Provides the monitoring function of LV panels by managing the data through a Cloud server (Any Time, Anywhere).
- Issues alerts when there is a device malfunction through SMS or E-mail.
- Access energy history and device history information.

② **GridSol CARE Operation S/W**
- Proves the monitoring and control function of LV panels by managing the data through a local server.

③ **GridSol CARE Maintenance S/W**
- Capable of device configuration and control, as well as project engineering.
- Automatically generates test reports.

④ **Panel HMI(3.5inch)**
- Provides 3.5 inch TFT Color LCD
- Real-time monitoring and I/O control of connected devices
- Can connect to up to eight ACBs, MCCBs, or M-Links.

⑤ **Panel HMI(7.0inch)**
- Provides 7 inch TFT Color LCD • Provides a Quick View of the device status, communication status, and hierarchy information.
- Details regarding device monitoring, control, and events.

⑥ **Mobile APP(Smart Viewer)**
- Smart MCCB (ETLi) data monitoring using BLE

Accessories

⑨ **T Connection Module**
- Making RS-485 Multi-Drop connectivity more convenient
- Terminal processing available

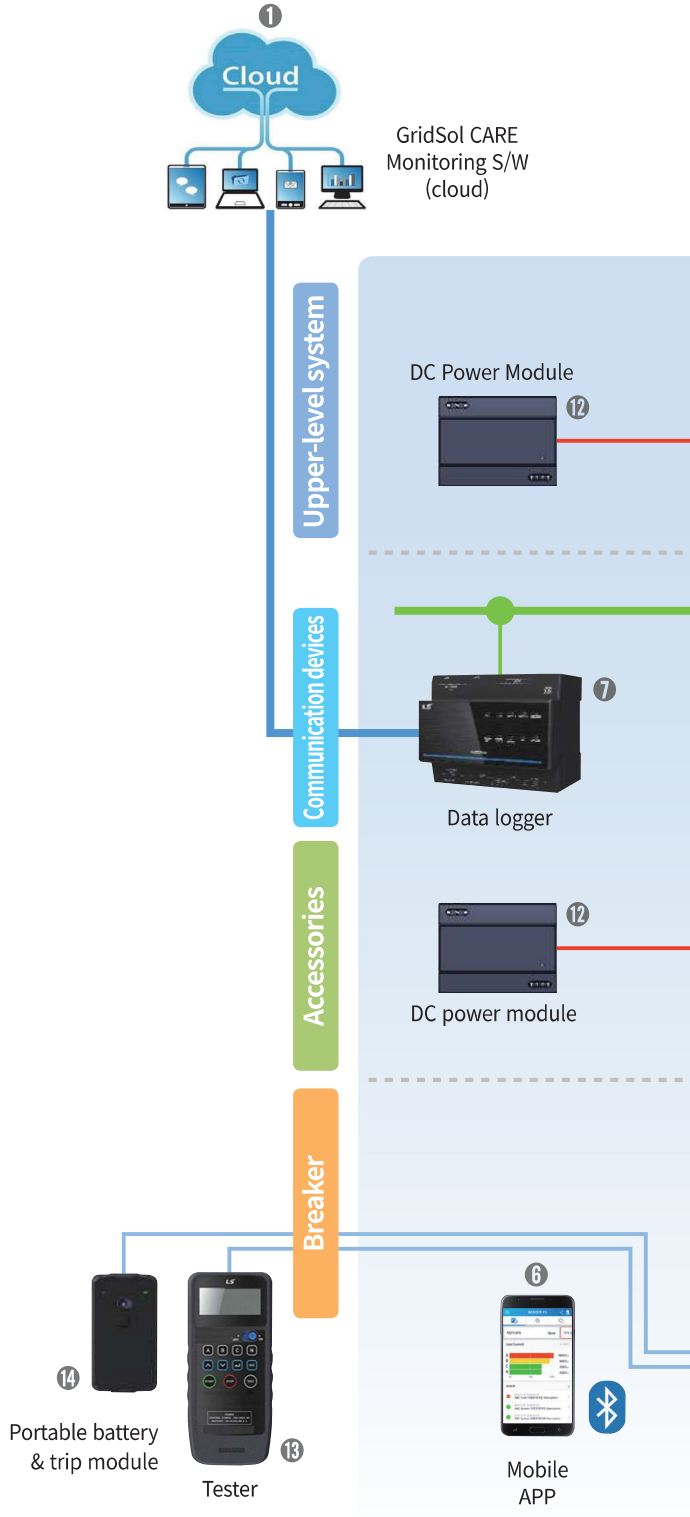
⑩ **M-LINK**
- Communication module to monitor and control the ON/OFF/Trip of MCCB
  - On/Off Monitoring: Connect an AX/AL add-on.
  - On/Off control: Connect a MOP add-on.

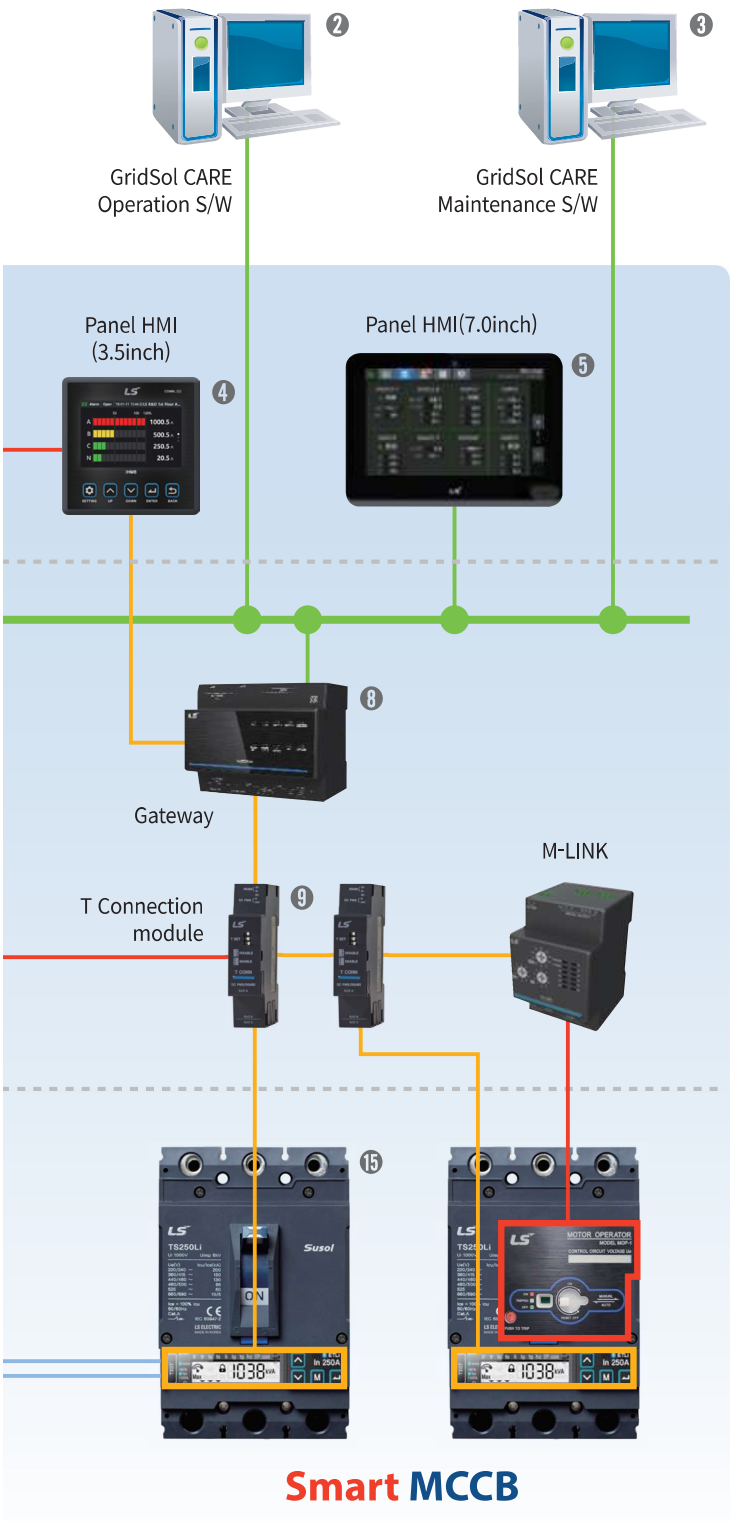
⑪ **MOP**
- An electrically driven opening/closing device that allows remote opening/closing of a breaker.
- Operation mode: automatic/manual

⑫ **DC Power Module**
- DC 24V output

⑬ **Tester**
- Functions: Calibration, device H/W settings, relay settings, relay tests, device control, system info. access, saving, and accessing test history
- Test items: the overload long time, short-circuit short-time, instantaneous, ground fault, and PTA of breakers

⑭ **Portable Battery & Trip Module**
- Supplies a Smart MCCB with DC power
- Verifies the trip operation of Smart MCCBs





Internet
Ethernet
RS485
Hardwire
Tester cable

Communication devices

⑦ **Data Logger**
- Accesses the GridSol CARE LV cloud and transmits the data.
- Includes gateway functions.

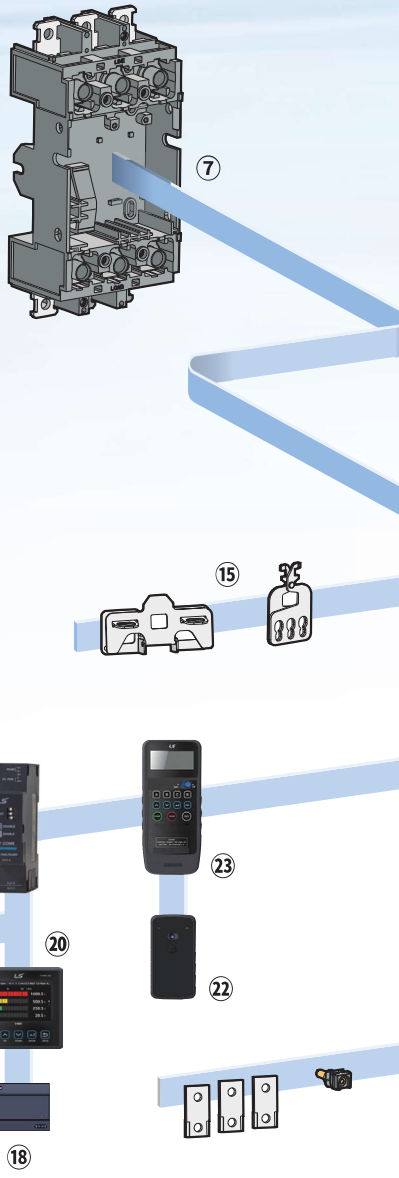
⑧ **Gateway**
- Auto discovery, auto time sync
- Periodic data gathering and high-speed response processing
- Non-periodic data bypass
- Webs service support

Breaker

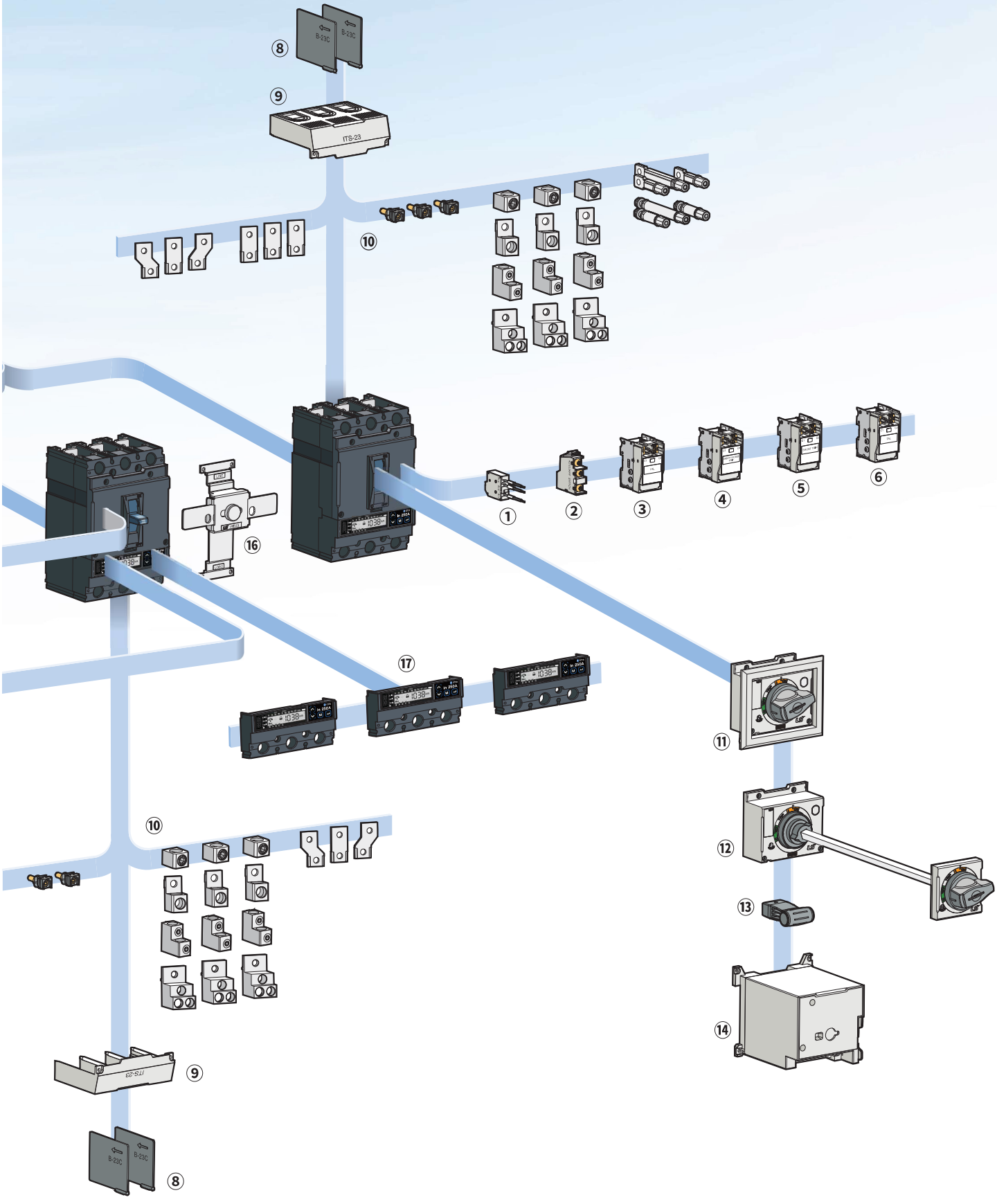
⑮ **Smart MCCB**
- A Susol MCCB with an ETU (Electronic trip unit)
- Equipped with IoT functions and upgraded measurement precision, measurement items, and relay functions

Accessories

Use our accessories to upgrade the functions of breakers.
Our Smart Susol MCCBs are the breakers for systems that provide more diverse and smart accessories compared to existing models.



① AX
② AL
③ FAL
④ UVT
⑤ SHT
⑥ TAL
⑦ Plug-in kit
⑧ Insulation barrier
⑨ Terminal cover (Short, Long)
⑩ Connection terminals
⑪ Direct rotary handle
⑫ Extended rotary handle
⑬ Aux. handle
⑭ Motor operator (MOP)
⑮ Locking devices (Removable, Fixed)
⑯ Mechanical interlock device
⑰ Trip units
⑱ DC power module
⑲ T connection module
⑳ Panel display(3.5inch)
㉑ Panel display(7.0inch)
㉒ Portable Battery & Trip Module
㉓ Tester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Ordering

TS 250 Ni ETHi 160A 4P R

Base format	Frame size (AF)	Breaking capacity (kA)	Trip units	Rated current (A)	No. of poles (P)	N-pole arrangement
TS	100	Ni	ETSi	40	3P	- : 3P
	160	Hi	ETMi	100	4P	L : N-A-B-C
	250	Li	ETHi	160		R : A-B-C-N
	400		ETLi	250		
	630			400		
	800			630		
				800		

Selection and ratings of circuit breaker

Marking and configuration

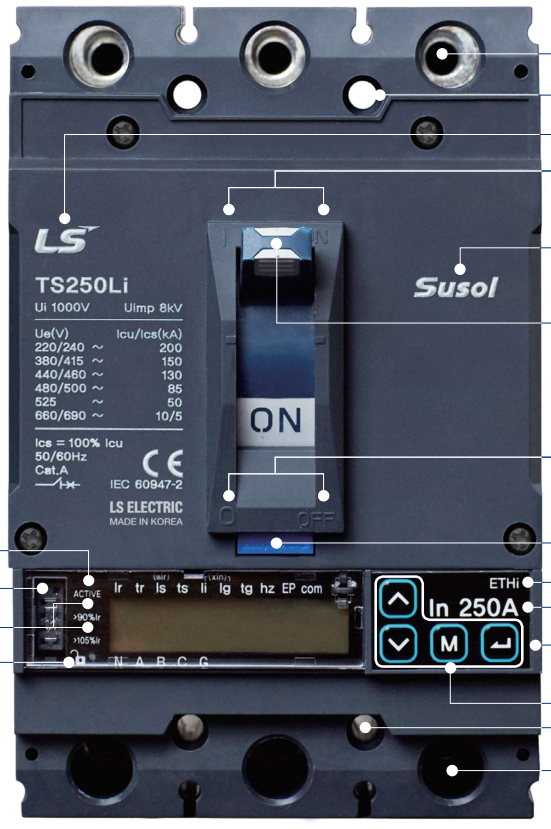
Rated frequency

Category

Symbol indicating suitability for isolation as defined by IEC 947-2

Standard

Certification mark



Alarm Indication LED

Test terminal

Overcurrent indication LED

Unlock Key

Model (Rating and breaking capacity)

- TS : TS Series
- 250 : Max. Ampere rating
- Ni : Normal (Standard)
- Hi : High
- Li : Limited

Standardized characteristics

- Ui : Rated insulation voltage
- Uimp : Impulse withstand voltage
- Ue : Rated operational voltage
- Icu : Ultimate breaking capacity
- Ics : Service breaking capacity

	250AF	630AF	800AF
Ni	TS100Ni TS160Ni TS250Ni	TS400Ni TS630Ni -	TS800Ni - -
Hi	TS100Hi TS160Hi TS250Hi	TS400Hi TS630Hi -	TS800Hi - -
Li	TS100Li TS160Li TS250Li	TS400Li TS630Li -	TS800Li - -

Ni	50kA	65kA	65kA
Hi	85kA	85kA	100kA
Li	150kA	150kA	150kA

Upstream connections
Fixing hole
Company logo
Indication of closed (I/ON) position
Brand name
Operating handle
Indication of open (O/OFF) position
"push to trip" button
Trip device type
Rating of trip unit
Trip unit
Operation button
Fixing hole
Downstream connections

CB Test certificate by UL

- Ref. Certificate No.: DK-85164-UL
- Standard No. IEC60947-2

IEC IECEE CB SCHEME

Ref. Certif. No.
DK-85164-UL

IEC SYSTEM FOR MUTUAL RECOGNITION OF TEST CERTIFICATES FOR ELECTRICAL EQUIPMENT (IECEE) CB SCHEME

CB TEST CERTIFICATE

Product	Molded-Case Circuit Breaker
Name and address of the applicant	LSIS CO LTD 127 LS-ro Dongan-gu Anyang-si, 14119 Gyeonggi-do Korea
Name and address of the manufacturer	LSIS CO LTD 127 LS-ro Dongan-gu Anyang-si, 14119 Gyeonggi-do Korea
Name and address of the factory Note: When more than one factory, please report on page 2	LSIS CO LTD 95 Baekbong-ro Heungdeok-gu Cheongju-si, 361-720 Chungcheongbuk-do Korea ☐ Additional information on page 2
Ratings and principal characteristics	See Page 2
Trademark (if any)	LSIS LS산전 LS
Type of Customer's Testing Facility (CTF) Stage used	CTF Stage 2
Model / Type Ref.	TS100E, TS100Ei, TS100H, TS100Hi, TS100L, TS100Li, See Page 2
Additional information (if necessary may also be reported on page 2)	☐ Additional information on page 2
A sample of the product was tested and found to be in conformity with	IEC 60947-1:2007/AMD1:2010, IEC 60947-1:2007/AMD2:2014, IEC 60947-1:2007, IEC 60947-2:2016
As shown in the Test Report Ref. No. which forms part of this Certificate	4788765951 issued on 2019-06-21

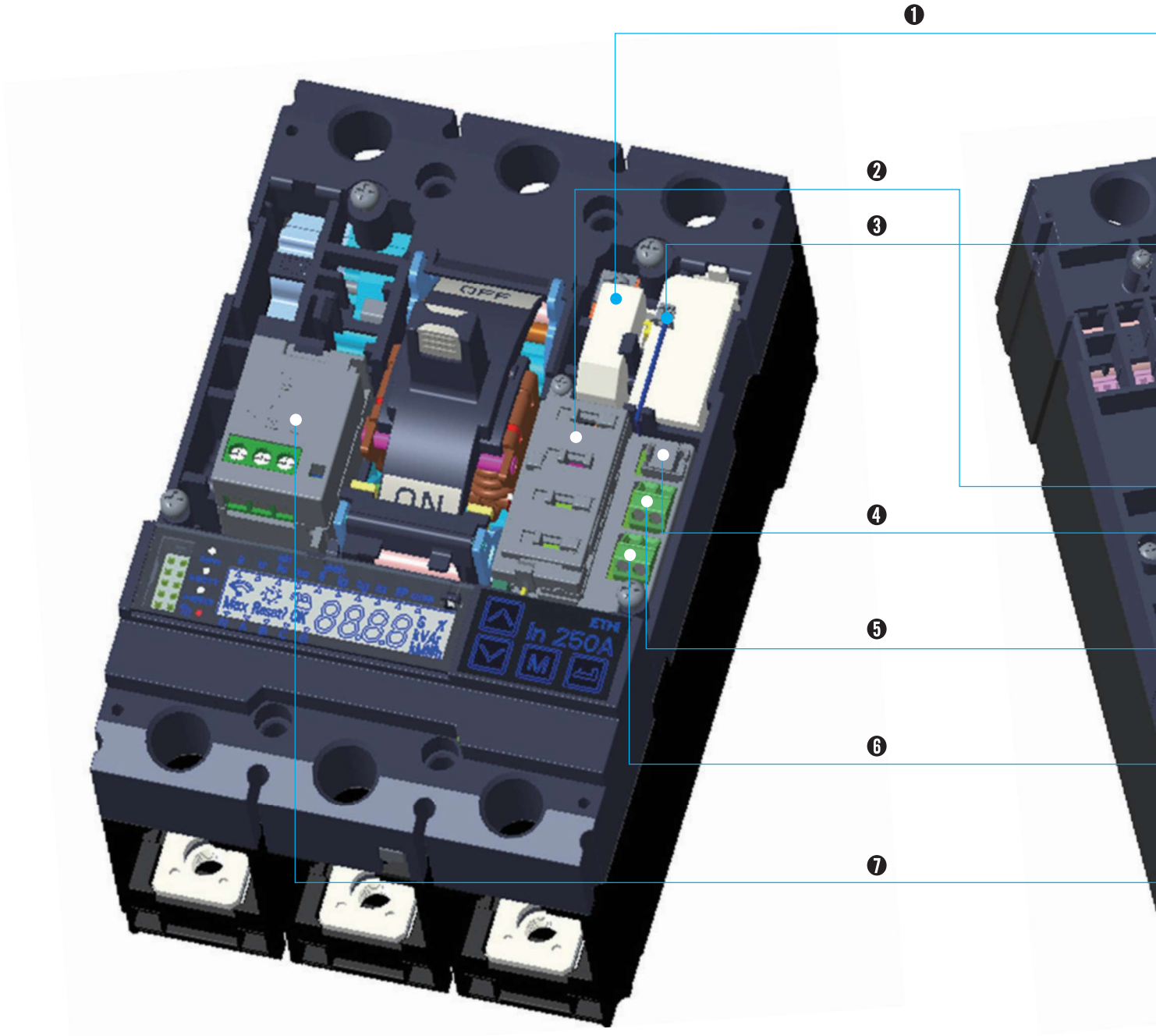
This CB Test Certificate is issued by the National Certification Body

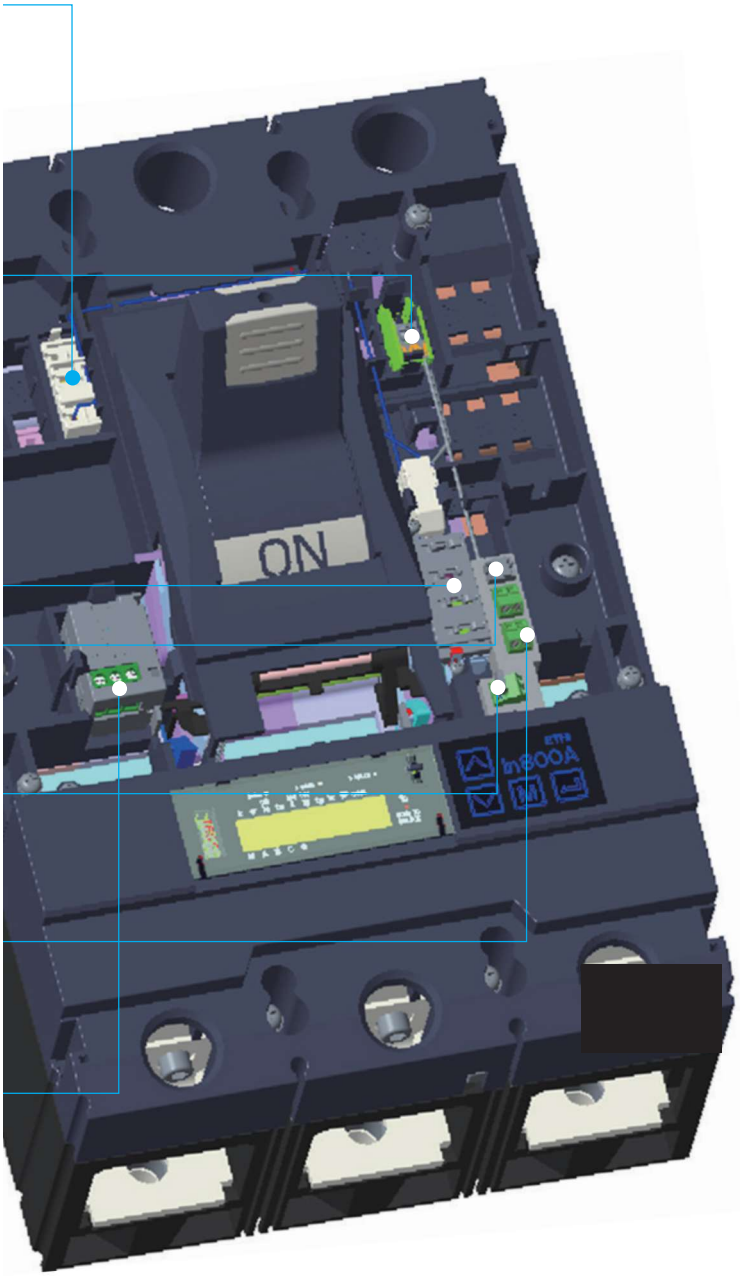
☒ UL (US), 333 Pfingsten Rd IL 60062, Northbrook, USA
☐ UL (Demko), Borupvang 5A DK-2750 Ballerup, DENMARK
☐ UL (JP), Marunouchi Trust Tower Main Building 8F, 1-8-3 Marunouchi, Chiyoda-ku, Tokyo 100-0005, JAPAN
☐ UL (CA), 7 Underwriters Road, Toronto, M1R 3B4 Ontario, CANADA
For full legal entity names see www.ul.com/ncbnames

Date: 2019-06-28
Signature:
Jan-Erik Storgaard

Internal structure

A Susol breaker is composed of opening/closing control devices, trip units, contacts, arc extinguishing parts, terminals, and supporting frames.





❶ AXL Device

- It is a mechanical S/W that transmits the ON, OFF, and TRIP status of the breaker to the ETU. This device is installed in Smart MCCB with the communication function(ETMi/ETHi/ETLi)

❷ Trip Coil

- A device that trips a circuit breaker by receiving the signal from the electronic trip unit.

❸ NVT (Neutral voltage tap)

- Device used for voltage and power measurement (ETHi/ETLi) in the Smart MCCB 3-pole trip unit
- N-phase voltage terminal (3 Pole only)

❹ EXIO (external power and communication connection)

- Provides convenience when connecting multiple devices to the RS485 multi-drop communication line
- DC 24V/communication

❺ ZSI output terminal

- Connecting cables: Awg24~28
- Input terminal Z1, Z2 / Output terminal Z3, Z4

❻ NCT input terminal

- Connecting cables: Awg24~28
- Input terminals N1, N2

❼ TAL (Trip Alarm)

- External transmission of DC 12V output and breaker status signal according to the relay setting when performing overcurrent relay operation

Rating

MCCB (Frame)

Optional
- Model numbering (Example: TS100)
- mber of poles (Example: 3poles)
- Breaking capacity (Example: Ni 50kA/460V)

Electronic trip unit

Trip unit

Optional
- Trip Unit type (Exampl : ETSi)
- Rated current (Example: 100A)

ETSi (basic type)
LSIG relay, current measurement

ETMi (Multi-function)
LSIG relay, current measurement, communication function

ETHi (High-Performance)
LSIG relay, current/voltage/power measurement, communication function

ETLi (Limited)
power measurement, communication function, mobile communication

MCCB

Basic type			TS100			TS160		
Frame size		[AF]	100			160		
No. of poles			3, 4			3, 4		
Rated ultimate short-circuit breaking capacity, Icu	Type		Ni	Hi	Li	Ni	Hi	Li
	220/240V	[kA]	100	120	200	100	120	200
	380/415V	[kA]	50	85	150	50	85	150
	440/460V	[kA]	50	70	130	50	70	130
	480/500V	[kA]	42	65	85	42	65	85
	525V	[kA]	22	35	50	22	35	50
	660/690V	[kA]	10	10	10	10	10	10

Trip unit (LSIG)

Rated current, In	40, 100	40, 100, 160
Overload protection setting current(Long time), Ir		
Tripping time(Long time), tr		
Short circuit protection, Isd		
Tripping time(Short circuit), tsd		
Instantaneous protection setting current, Ii		
Ground fault protection setting current, Ig		
Tripping time(Ground fault), tg		
Additional functions		

	TS250			TS400			TS630			TS800		
	250			400			630			800		
	3, 4			3, 4			3, 4			3, 4		
	Ni	Hi	Li	Ni	Hi	Li	Ni	Hi	Li	Ni	Hi	Li
	100	120	200	100	120	200	100	120	200	100	120	200
	50	85	150	65	85	150	65	85	150	65	100	150
	50	70	130	65	85	130	65	85	130	65	100	130
	42	65	85	42	65	85	42	65	85	42	85	100
	22	35	50	22	35	50	22	35	50	22	35	50
	10	10	10	10	20	35	10	20	35	10	20	35

	40, 100, 160, 250	250, 400	250, 400, 630	630, 800
	0.4~1.0 x In (1A unit)			
	0.5, 1 2, 4, 8, 16 (second)			
	1.5 ~ 10 x Ir (0.5 unit)			
	I^2t Off : 0, 0.1, 0.2, 0.3, 0.4 (second) I^2t On : 0.1, 0.2, 0.3, 0.4 (second)			
	40~160A : 1.5 ~ 15 x In (0.5 unit) 250~400A : 1.5 ~ 12 x In (0.5 unit) 630~800A : 1.5 ~ 11 x In (0.5 unit)			
	40A : 0.45 ~ 1.0 x In (0.05 unit) 100A : 0.35 ~ 1.0 x In (0.05 unit) 160A : 0.25 ~ 1.0 x In (0.05 unit) In > 160A : 0.2 ~ 1.0xIn (0.05 unit)			
	I^2t Off : 0, 0.1, 0.2, 0.3, 0.4 (second) I^2t On : 0.1, 0.2, 0.3, 0.4 (second)			
	Selective protection (ZSI)			

Rating

Basic type				TS100			TS160		
Frame size			[AF]	100			160		
Rated current, In			[A]	40, 100			40, 100, 160		
No. of poles				3, 4			3, 4		
Rated operational voltage, Ue		AC	[V]	690			690		
Rated impulse withstand voltage, Uimp			[kV]	8			8		
Rated insulation voltage, Ui			[V]	1000			1000		
Rated ultimate short-circuit breaking capacity, Icu				Ni	Hi	Li	Ni	Hi	Li
	AC 50/60Hz	220/240V	[kA]	100	120	200	100	120	200
		380/415V	[kA]	50	85	150	50	85	150
		440/460V	[kA]	50	70	130	50	70	130
		480/500V	[kA]	42	65	85	42	65	85
		525V	[kA]	22	35	50	22	35	50
		660/690V	[kA]	10	10	10	10	10	10
Rated service breaking capacity, Ics	AC 50/60Hz	220/240V	[kA]	100	120	200	100	120	200
		380/415V	[kA]	50	85	150	50	85	150
		440/460V	[kA]	50	70	130	50	70	130
		480/500V	[kA]	42	65	85	42	65	85
		525V	[kA]	22	35	50	22	35	50
		660/690V	[kA]	5	5	5	5	5	5
Rated short-circuit making capacity, Icm	AC 50/60Hz	220/240V	[kA]	220	264	440	220	264	440
		380/415V	[kA]	105	187	330	105	187	330
		440/460V	[kA]	105	154	286	105	154	286
		480/500V	[kA]	88	143	187	88	143	187
		525V	[kA]	46	74	105	46	74	105
		660/690V	[kA]	17	17	17	17	17	17
Category of utilization				A			A		
Isolation behavior				●			●		
Trip unit, Electronic		ETSi		●			●		
		ETMi		●			●		
		ETHi		●			●		
		ETLi		●			●		
Connection	fixed	front-connection		●			●		
		rear-connection		●			●		
	plug-in	front-connection		●			●		
		rear-connection		●			●		
Life cycle	Mechanical		[operations]	20,000			20,000		
	Electrical @ 415 V AC		[operations]	10,000			10,000		
Dimensions (front connection), W×H×D		3-pole	[mm]	105×160×86			105×160×86		
		4-pole	[mm]	140×160×86			140×160×86		

	TS250			TS400			TS630			TS800		
	250			400			630			800		
	40, 100, 160, 250			250, 400			250, 400, 630			630, 800		
	3, 4			3, 4			3, 4			3, 4		
	690			690			690			690		
	8			8			8			8		
	1000			1000			1000			1000		
	Ni	Hi	Li	Ni	Hi	Li	Ni	Hi	Li	Ni	Hi	Li
	100	120	200	100	120	200	100	120	200	100	120	200
	50	85	150	65	85	150	65	85	150	65	100	150
	50	70	130	65	85	130	65	85	130	65	100	130
	42	65	85	42	65	85	42	65	85	42	85	100
	22	35	50	22	35	50	22	35	50	22	35	50
	10	10	10	10	20	35	10	20	35	10	20	35
	100	120	200	100	120	200	100	120	200	100	120	200
	50	85	150	65	85	150	65	85	150	65	100	150
	50	70	130	65	85	130	65	85	130	65	100	130
	42	65	85	42	65	85	42	65	85	42	85	100
	22	35	50	22	35	50	22	35	50	22	35	50
	5	5	5	10	12	12	10	12	12	10	20	20
	220	264	440	220	264	440	220	264	440	220	264	440
	105	187	330	143	187	330	143	187	330	143	220	330
	105	154	286	143	187	286	143	187	286	143	220	286
	88	143	187	88	143	187	88	143	187	88	187	220
	46	74	105	46	74	105	46	74	105	46	74	105
	17	17	17	17	40	74	17	40	74	17	40	74
	A			A			A			A		
	●			●			●			●		
	●			●			●			●		
	●			●			●			●		
	●			●			●			●		
	●			●			●			●		
	●			●			●			●		
	●			●			●			●		
	●			●			●			●		
	●			●			●			●		
	20,000			15,000			15,000			8,000		
	10,000			6,000			6,000			3,000		
	105×160×86			140×260×110			140×260×110			210×320×135		
	140×160×86			186.5×260×110			186.5×260×110			280×320×135		

Smart trip units (ETSi, ETMi, ETHi, ETLi)

Trip unit exterior

Trip unit type

ETU of Susol Smart MCCB has a variety of electronic trip units like basic type(ETSi) that measures current for each AF and rated current, an advanced type(ETMi) with communication function, and a high-end type(ETHi) that performs communication function and voltage measurement and ETLi type with mobile (BLE) communication.

ETSi (Standard)

ETMi (Multi-Function)

ETHi (High-Performance)

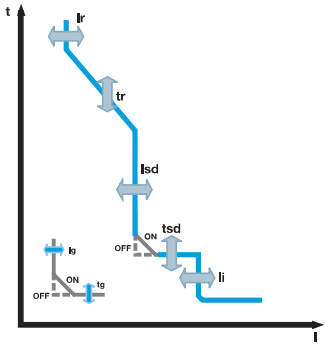
ETLi (Limited)

- **ETSi**
  Standard/LSIG relay, current measurement
- **ETMi**
  Multi-function/LSIG relay, current measurement, communication function
- **ETHi**
  High performance/LSIG relay, current/voltage/power measurement, communication function
- **ETLi**
  Limited performance/LSIG relay, power measurement, communication function, mobile communication

Trip unit rated current

AF	Rated current
100AF	40A, 100A
160AF	40A, 100A, 160A
250AF	40A, 100A, 160A, 250A
400AF	250A, 400A
630AF	250A, 400A, 630A
800AF	630A, 800A

Trip unit features

ETU		ETSi	ETMi	ETHi	ETLi
Relay (setting)					Long time Short-time Instantaneous Ground fault
Button		●	●	●	●
LCD		●	●	●	●
Status LED		●	●	●	●
Test port		●	●	●	●
Measurement	Current	●	●	●	●
	Power	-	-	●	●
Communication	RS485	-	●	●	●
	BLE	-	-	-	●

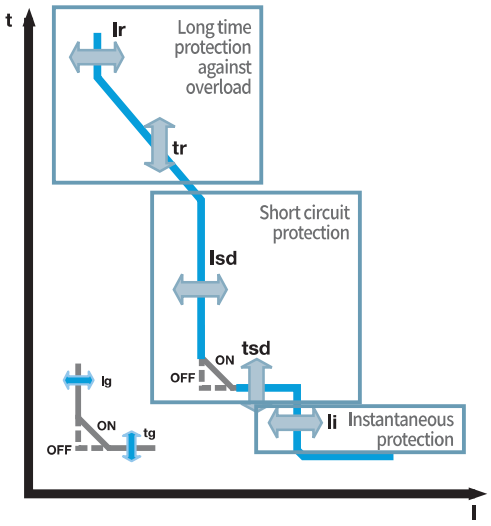
Smart trip units (ETSi, ETMi, ETHi, ETLi)

Overcurrent protection relay

Smart MCCB's ETU basically performs relay operation function for long time, short-time, instantaneous and ground fault, and provides an alarm indicating LED related to overcurrent display.
Relay item setting for relay operation can be set by using the button on the front of ETU.
To change the relay action setting, press the 'unlock' button, change the setting in the 'unlock' state ( ) and after completing the setting, press the 'unlock' button to switch to the 'lock' state ( ).
During the setting change, if there is no button input for more than 1 minute, the device automatically switches to the 'lock' state ( ).

Type		ETSi	ETMi	ETHi	ETLi
Relay setting	Ir, tr, Isd, tsd, Ii, Ig, tg	●	●	●	●

Characteristic curve



1) Overload protection(Long time): The operating current (Ir)and operating time (tr) can be set.

2) Short-circuit protection(Short time): The operating current (Isd) and operating time (tsd) can be set.

3) Instantaneous protection: The operating current (Ii) can be set.

4) Ground fault protection: You can set whether to use ground fault relay, operating current (Ig) and operating time (tg).

5) N - phase protection: N-phase protection relay can be set for a 4Pole.
- Off: No protection
- 100%: N-phase protection for 100% × Ir
- 50%: N-phase protection for 50% × Ir
- OSN: When Ir is set to '<0.63xIn', N-phase protection for 160%×Ir
(Used under load conditions that contain a lot of harmonics)

6) ZSI (Zone Selective Interlocking: Selective breaking in a protected area.

* Set the relay so that malfunction does not occur by inrush current.
(In the case of a motor or capacitor load, inrush current may occur several times of the rated current.)

Relay specification table

Protection	Setting range								Remark
Long time protection	Current setting Ir (A)	Rated current			Min(0.4xIn)			Max(1.0xIn)	fine adjustments in 1A step
		40A			16A			40A	
		100A			40A			100A	
		160A			64A			160A	
		250A			100A			250A	
		400A			160A			400A	
		630A			252A			630A	
		800A			320A			800A	
	Time delay tr (s) Accuracy ±20%	Setting		0.5	1	2	4	8	16
		Operation time	1.5×Ir	11	22	45	90	180	360
			6×Ir	0.5	1	2	4	8	16
			7.2×Ir	0.35	0.7	1.4	2.8	5.5	11
Short time protection	Current setting Isd (A) Accuracy ±10%	1.5×Ir ~ 10×Ir (18 steps)							fine adjustment In 0.5×Ir steps
	Time delay tsd (s) Accuracy ±20%	Setting	I^2tOff		0	0.1	0.2	0.3	0.4
			I^2tOn		-	0.1	0.2	0.3	0.4
		I^2tOff Operation time	Non-tripping		0.02	0.08	0.14	0.24	0.35
			Maximum break		0.08	0.14	0.24	0.35	0.50
Instantaneous protection	Current setting Ii (A) Accuracy ±15%	Setting	Rated current		Range				fine adjustments in 0.05×In steps
			40A ~ 160A		1.5×In ~ 15×In(28 steps)				
			250A ~ 400A		1.5×In ~ 12×In(22 steps)				
			630A ~ 800A		1.5×In ~ 11×In(20 steps)				
		Non-tripping time: 10ms, Maximum break time: 60ms							
Ground leakage protection	Current setting Ig (A) Accuracy ±10%	Setting	Rated current		Range				fine adjustments in 0.05×In steps
			40A		0.45×In ~ 1.0×In(12 steps)				
			100A		0.35×In ~ 1.0×In(14 steps)				
			160A		0.25×In ~ 1.0×In(16 steps)				
			In > 160A		0.2×In ~ 1.0×In(17 steps)				
	Time delay tg (s) Accuracy ±25%	Setting	I^2tOff		0	0.1	0.2	0.3	0.4
			I^2tOn		-	0.1	0.2	0.3	0.4
		I^2tOff Operation time	Non-tripping		0.02	0.08	0.14	0.24	0.35
			Maximum break		0.08	0.14	0.24	0.35	0.50

Smart trip units (ETSi, ETMi, ETHi, ETLi)

Measurement

Type		ETU Type				Display		
		ETSi	ETMi	ETHi	ETLi	ETU	HMI (3.5")	HMI (7.0")
Current	Each Phases and neural (Ia, Ib, Ic, In)	●	●	●	●	●	●	●
	Highest current of the each Phases and neural (Imax of Ia, Ib, Ic, In)	●	●	●	●	●		
	Ground fault (Ig)	●	●	●	●	●		
	Highest Ground fault current (Imax of Ig)	●	●	●	●	●		
	Average of phases: Iavg=(Ia+Ib+Ic)/3	●	●	●	●			
	Unbalance: Iunbal(%) = (Imax – Iavg)/Iavg	●	●	●	●			
Voltage	Phase voltage(Va, Vb, Vc)/ Line voltage(Vab, Vbc, Vca)			●	●	●	●	●
	Average voltage: Vavg =(Va(Vab)+Vb(Vbc)+Vc(Vca))/3			●	●			
	Unbalance: Vunbal(%) = (Vmax – Vavg)/Vavg			●	●			
Frequency	Hz			●	●		●	
Power	Active, Reactive, Apparent (total, each phase)			●	●	●	●	●
Power factor	Power Factor (total, each phase)			●	●		●	●
Energy	Active, Reactive, Apparent			●	●	●	●	●
Demand (Previous, Max)	Current (Ia, Ib, Ic)		●	●	●		●	
	Power (Active, Reactive, Apparent)			●	●		●	●
Power Quality	THDV: Total Harmonic Distortion V			●	●		●	
	THDI: Total Harmonic Distortion I		●	●	●		●	

Measurement accuracy

- Reference standards: IEC 61557-12
- Current: Three phase (0.2 ~ 0.4In : ± 1.5%, 0.4 ~ 1.2In : ± 1.%0), single phase (0.2 ~ 1.2In : ± 2.0%)
- Voltag: ±0.5%
- Power and Energy: Class 2

Type		Error range	Error
Power / Energy	PF 1.0	0.2~0.4In	±2.5%
		0.4~1.2In	±2.0%
	PF 10	0.4~0.8In	±2.5%
	PF 0.5(Lag) PF 0.8(Lead)	0.8~1.2In	±2.0%

ZSI function

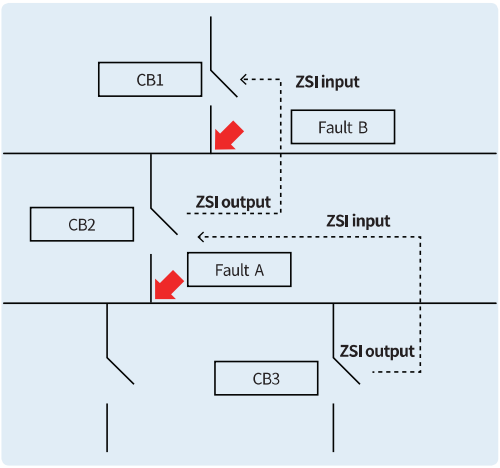
The ZSI function is used to minimize the impact upon MCCB and other electric devices under accident conditions by reducing the delay time which the device eliminates the failure.

1) While a short time delay or a ground fault occurs in the system where ZSI is set, the device at the point of failure generates a ZSI signal to suppress the operation of the host(upper) device.

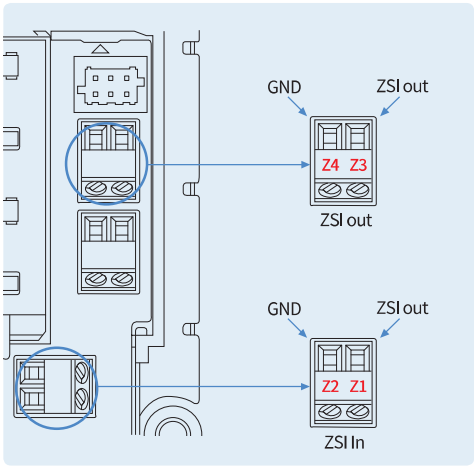
2) The MCCB at the point of failure operates at the minimum operating time regardless of the set time to eliminate the fault.

3) The upper circuit breaker that receives the ZSI input signal operates according to the set short time delay or the ground fault operation delay time for cascading in the system, but the upper circuit breaker that did not receive the ZSI input signal from the lower circuit breaker operates at the minimum operation time regardless of the set time.

For normal ZSI operation, the operation time must be set correctly for cascading so that lower devices operate before upper devices in case of a short time delay and ground fault.



[ZSI operation]



[External I/O Board]

※ Whether to use the ZSI function can be set in the ZSI PIN connection status and relay setting mode.
(ZSI use: ZSI pin removed, ZSI not used: ZSI pin fastened)
- When ZSI is set to enable, the ZSI function is activated.
- ZSI input signal is received through External I/O Board input terminal.

Diagnosis and maintenance

Smart MCCB's ETU can save various operation contents such as device operation and setting change. It can also check its contents through communication and HMI.

Record

1) System event
- Recordable up to 50 events including the type and time of the event
- If it exceeds 50, it is deleted sequentially from the oldest event (Roll-Over)

2) Fault event
- In the event of an accident due to relay operation, up to 50 records including the type and time of occurrence can be recorded.
- If it exceeds 50, it is deleted sequentially from the oldest event (Roll-Over)
- Accident waveform recording: Record up to 2 (current and voltage waveforms, 8 cycles)

3) Max. Demand and Max. Power value
- Record the occurrence value and occurrence time

4) Device operation
- Operation/breaker On (input) time (hour)
- Number of Mechanical/electrical/trip count
- Contacts wear rate (%): wear rate according to the number of electric opening and closing of the main body
- Load Profile (load usage rate): Usage time according to the used load (hour)
  There are 4 levels (0~49%In, 50~79%In, 80~89%In, >90%In)

Device management

Device information can be obtained by using ETUs with communication function.
- Communication related items (communication address, speed etc.)

Type			ETU Type				Display	
			ETSi	ETMi	ETHi	ETLi	ETU	HMI (3.5")
Event record	System	Status change, Setting change, System control, etc.(Up to 50) - Event type and time	-	●	●	●	-	●
	Fault	Long time/short-time/instantaneous/ ground fault(Up to 50) - Fault type, value and time	-	●	●	●	-	●
Maximum value record	Demand	Ia, Ib, Ic	-	●	●	●	-	●
		Active/reactive/apparent	-		●	●	-	●
	Power	Active/reactive/apparent	-		●	●	●	-
Device operation	Operating time (hour)		-	●	●	●	-	●
	On time (hour)		-	●	●	●	-	●
	Mechanical count (number of times)		-	●	●	●	-	●
	Electrical count (number of times)		-	●	●	●	-	●
	Trip count (number of times)		-	●	●	●	-	●
	Contact wear rate (%)		-	-	●	●	-	●
	Load profile		-	●	●	●	-	●

Types of events

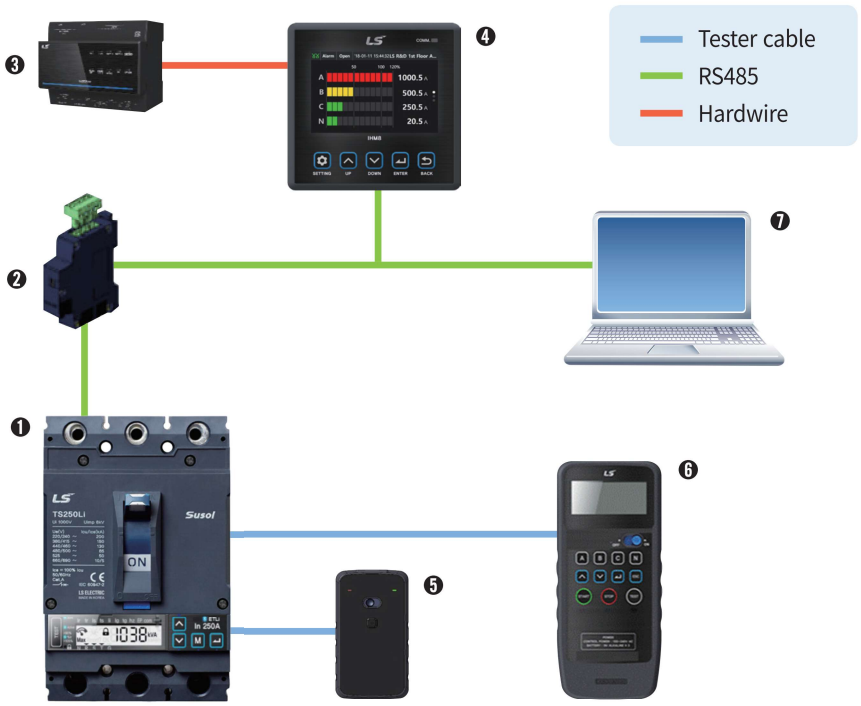
Items		Settings	Description
System event	Status change	Operation Status Inside a Device	Operating the Unlock Key
			Current Direction (forward/backward)
			Device Restart
			Local/Remote
		Device DI status	Trip status (Trip/None trip)
			CB Status (On/Off)
			ZSI DI
		Device DO status	Trip pulse output
			ZSI DO
		Device malfunction (self-diagnostics)	Memory failure
			RTC failure
			Mechanical count alarm
			Electrical count alarm
			Contact life alarm
			Device overheat
		Others	MTD Status
	Change settings	System configuration	Factory Configuration
			System Configuration
		Relay configuration	Long time
			Short-time
			Instantaneous
			Ground fault
			N-phase protection
			Use of ZSI
	System control	Data Clear	Fault reset
			System event buffer clear
			Fault event buffer clear
			Energy reset
			Max demand reset
			Max power reset
			Max Internal temperature reset
			Load profile clear
			Operation time[hour] reset
			On time[hour] reset
			Max. W reset by Key
			Max. Var reset by Key
			Max. VA reset by Key
			Wh reset by Key
			Varh reset by Key
			VAh reset by Key
			Test trip by Key
		Device DO and CB control * (Operation)	CB ON
			CB OFF
			CB RESET
Fault event	Long time	Relay occurrence/return	
	Short-time		
	Instantaneous		
	Ground fault		

* Dedicated MOP coming soon in 2022.

Smart trip units (ETSi, ETMi, ETHi, ETLi)

Composition of Smart MCCB

Smart MCCB provides special functions in combination with digital accessory modules.
When external power (DC 24V) is applied, data like MCCB status information can be transmitted through communication with the display device or the upper operating S/W.
Multi-drop connection of device power and communication is feasible by using the T-Connection module.
The portable battery module can be connected to the test port to supply power to the MCCB, and a simple trip test can be performed.
In addition, relay test and relay setting are possible by connecting a tester to the test port.



Number	Description	Remarks
❶	Smart MCCB	MCCB product
❷	ITCM	T-Connection module
❸	IPM	DC power module
❹	IHM8	Display module
❺	IPBM	Portable battery & trip module
❻	Tester기	OCR Tester
❼	Communication	Higher-level operating software

Communication

Remote communication (RS485)

1) Communication protocol: Modbus RTU
2) Communication speed: 9,600, 19,200, 38,400 bps
3) Communication distance: Max. 5m (between devices), can be connected to up to 16 devices
4) DC 24V power supplied from outside
5) Slave addresses: 1 ~ 247
6) Transmitted information: Device status, measurement values, setting information, and record data, etc.

※ Communication available only when there is an outer power supply.

Tester Port communication

1) DC 12V power supplied from outside
2) Connected devices: OCR teste, IPBM: Input the relay test current signal.

BLE communication

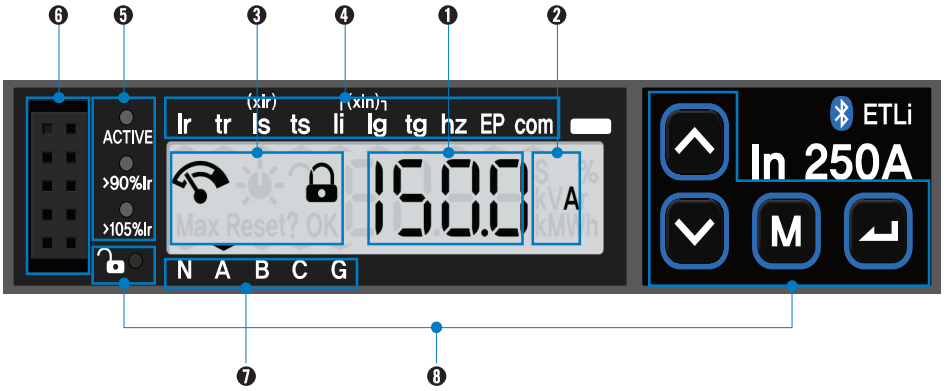
1) Communication range: 1m (in an open space)
2) Transmitted information: Device status, measurement values, setting information, and record data, etc.

※ Communication available only when there is an outer power supply.

* When the device is re-energized, the device time will be reset to 01:01:01, January 1, 2018.

Smart trip units (ETSi, ETMi, ETHi, ETLi)

Trip unit external



Number	Description	Remarks
❶	Indicated value	Indicates the relevant information and data value.
❷	Unit	The unit of the displayed item.
❸	Display mode and settings dis-play	(Measurement), Max, (Settings), (Lock), Reset?, OK
❹	Display the relay element and other indications	Hz (frequency), EP (external power), com (communication)
❺	Indication LED	Active and Alarm LED
❻	Test Port	The test port to provide communication and power
❼	Each phase and ground fault	G (ground fault)
❽	Key Interface	The key to be used in manipulating the screen and change settings.

Indication LED

Indicates the operation and load status of the device by the change of the color of the LED.

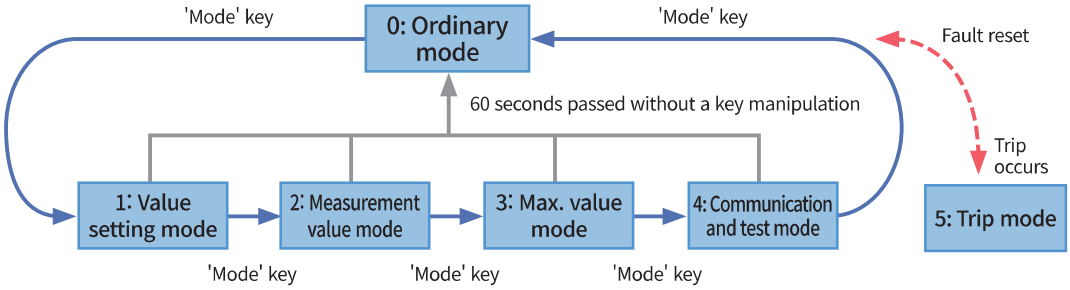
LED		Color	Remarks
	Active	Blue	Blinks when there is a failure in engaging external power (DC24V) or self-power operating current.
	>90%Ir	Orange	Blinks when the load current is 90% or higher of the Ir current setting.
	>105%Ir	Red	Blinks when the load current is 105% or higher of the Ir current setting.

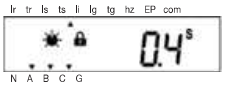
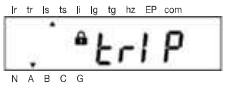
※ The condition of using self-power
- 250AF : Rated power 40A (15A or higher), Rated current 100 ~ 250A (30A or higher)
- 630AF, 800AF : 50A or higher

LCD Indication Mode

LCD Display

The ETU indicates the corresponding item for each display mode when the unit is running on external power or self-power.



Item	display item	A sample for indication
Ordinary mode	The current for each phase is indicated in the order of A, B, C, and N.	 : Phase A current
Value setting mode	Operating frequency ➞ long time current ➞ long time time ➞ short-time current ➞ short-time time ➞ Instantaneous current ➞ Use of ground fault ➞ Ground fault current ➞ Ground fault time ➞ N-phase protection ➞ Use of ZSI ➞ ···	 : tsd setting
Measurement value mode	Current value for each phase ➞ Ground fault current ➞ Va(Vab) ➞ Vb(Vbc) ➞ Vc(Vca) ➞ Active power ➞ Reactive power ➞ Apparent power ➞ ···	 : Vrs voltage value
Max. value mode	Current value ➞ Ground fault current ➞ Va(Vab) ➞ Vb(Vbc) ➞ Vc(Vca) ➞ Active power ➞ Reactive power ➞ Apparent power ➞ Forward active energy ➞ Forward reactive energy ➞ Apparent energy ➞ ···	 : Max value (T-phase)
Communication and test mode	Communication address ➞ Communication speed ➞ Configuration by communication ➞ DO output selection ➞ Relay display mode selection ➞ Feeder/Incoming ➞ Trip test ➞ ···	 : Comm. address
Trip mode	'Trip' ➞ Fault current ➞ ···	 : Trip display

Key types

You can manipulate the keys to view the display items on the Led and make changes to settings.

While making changes with the relay settings, you can press the 'Unlock' key or the 'Mode' key twice to exit the mode. Or, you will exit the configuration mode if there is no key operation for 60 seconds, as well.

Number	Description		Remarks
: Unlock	Engage/disengage the settings edit mode.		Can be used when making changes with the settings.
: UP	Increase the setting values.		Can be used when making changes with the settings.
: Down	Decrease the setting values.		
M : Mode	Change the display mode.		Cycle the display mode.
: Enter	Long (two seconds or longer)	Select and confirm the item.	Can be used to make changes with the settings, resetting the max. values, and run trip tests.
	Short	Change the indicated items	Progressive item display (showing the subsequent items)

Change settings

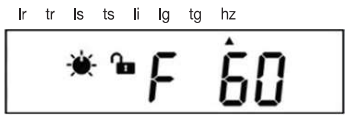
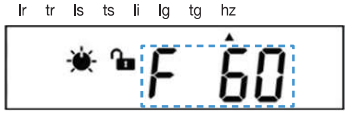
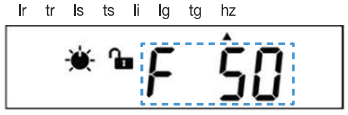
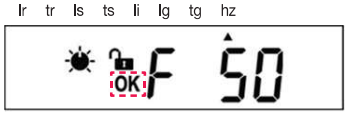
You can change the settings of the equipment only when the equipment is in 'unlock' mode.
To change settings, press ( ) to see whether the equipment is in 'unlock' mode.
* The first screen you will see once 'unlock' mode is activated is the operating frequency item of the relay setting mode.

Press Enter to make changes with the relay settings. Press Mode to change system settings. (Page 48)

Changing the relay configuration

Changing settings operating frequency

ex) 60Hz ➞ 50Hz

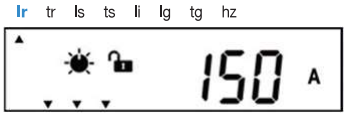
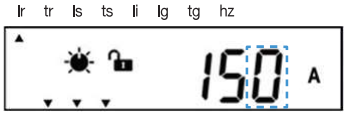
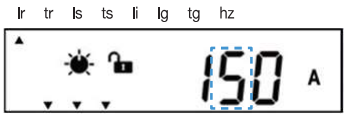
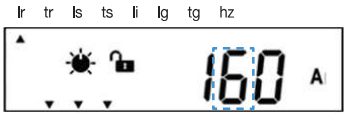
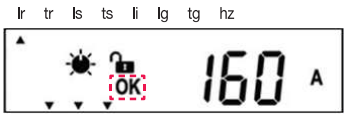
Steps	LCD display	Remarks
		Press 'unlock' to display the operating frequency
(Long)		Select the item to change (blink)
		Change the item's value (blink)
(Long)		Confirm the changes you made (shows 'OK')

※ F: Frequency

Changing the relay configuration

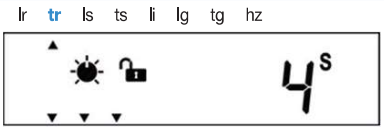
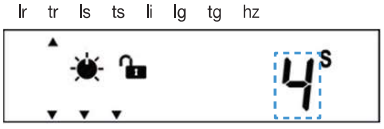
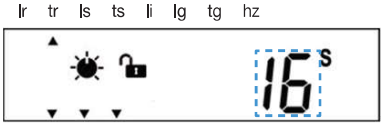
Change settings long time operating current (Ir)

ex) 150A ➞ 160A

Steps	LCD display	Remarks
(short)		Press Enter in the relay setting mode to move to the rated current (Ir) item. (See the configuration status in the LCD display.)
(Long)		Select the item to change (The position where the change is to be made will blink.)
M		Move to the position where the setting is to be changed. (The position where the change is to be made will blink.)
		Change the item's value (blink)
(Long)		Confirm the changes you made (shows 'OK')

Change settings long time operating time (tr)

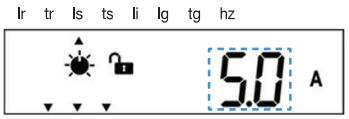
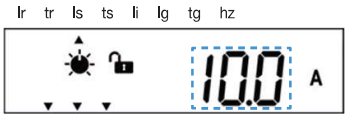
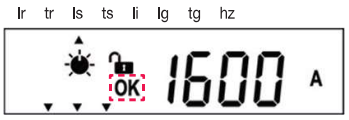
ex) 4s ➞ 16s

Steps	LCD display	Remarks
(short)		Press Enter in the relay setting mode to move to the overload long time (tr) item. (Check the LCD display for setting status.)
(Long)		Select the item to change (blink)
		Change the item's value (blink)
(Long)		Confirm the changes you made (shows 'OK')

Changing the relay configuration

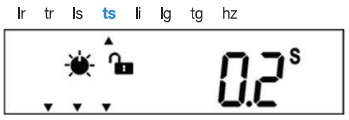
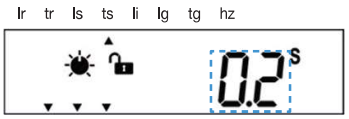
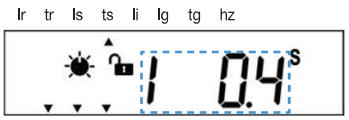
Change settings short-time operating current (Isd)

ex) 5xIr ➞ 10xIr

Steps	LCD display	Remarks
(short)		Press Enter in the relay setting mode to move to the short-circuit operating current (Isd) item. (Check the setting status in the LCD display.)
(Long)		Select the item to change (blink)
		Change the item's value (blink)
(Long)		Confirm the changes you made (shows 'OK')

Change settings short-time operating time (tsd)

ex) 0.2s(I²t Off) ➞ 0.4s(I²t On)

Steps	LCD display	Remarks
(short)		Press Enter in the relay setting mode to move to the short-circuit short-time operating time (tsd). (Check the setting status in the LCD display.)
(Long)		Select the item to be changed (blink)
		Change the item's value (blink) (The "I" at the beginning stands for the I²t On-time.)
(Long)		Confirm the changes you made (shows 'OK')

Changing the relay configuration

Change settings instantaneous operating current (Ii)

ex) 10xIn ➞ 12xIn

Steps	LCD display	Remarks
(short)	Ir tr Is ts Ii Ig tg hz 2500 A	Press Enter in the relay setting mode to move to the instantaneous operating current (Ii) item. (Check the setting status in the LCD display.)
(Long)	Ir tr Is ts Ii Ig tg hz 100 A	Select the item to be changed (blink)
	Ir tr Is ts Ii Ig tg hz 120 A	Change the item's value (blink)
(Long)	Ir tr Is ts Ii Ig tg hz OK 3000 A	Confirm the changes you made (shows 'OK')

Change the settings to decide whether to use ground fault or not.

ex) Not Use ➞ Use

Steps	LCD display	Remarks
(short)	Ir tr Is ts Ii Ig tg hz dISA A	Press Enter in the relay setting mode to move to the settings to enable/disable ground fault. (Check the LCD display for the status of the setting.)
(Long)	Ir tr Is ts Ii Ig tg hz dISA A	Select the item to be changed (blink)
	Ir tr Is ts Ii Ig tg hz EnbL A	Change the item's value (blink)
(Long)	Ir tr Is ts Ii Ig tg hz OK EnbL A	Confirm the changes you made (shows 'OK')

※ dISA: Disable (Not use)
EnbL: Enable (Use)

Changing the relay configuration

Change settings ground fault operating current (Ig)

ex) 0.4xIn ➡ 1.0xIn

Steps	LCD display	Remarks
(short)	Ir tr Is ts Ii **Ig** tg hz 100.0 A	Press Enter in the relay setting mode to move to the ground fault current (Ig) setting. (Check the setting status in the LCD display.)
(Long)	Ir tr Is ts Ii Ig tg hz 0.40 A	Select the item to be changed (blink)
	Ir tr Is ts Ii Ig tg hz 1.00 A	Change the item's value (blink)
(Long)	Ir tr Is ts Ii Ig tg hz OK 2 50.0 A	Confirm the changes you made (shows 'OK')

Change settings ground fault operating time (tg)

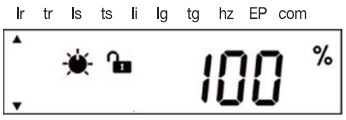
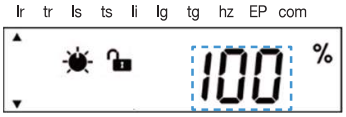
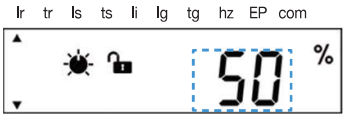
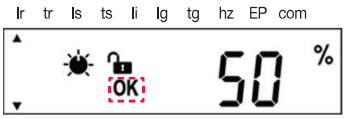
ex) 0.2s(I^2t On) ➡ 0.4s(I^2t Off)

Steps	LCD display	Remarks
(short)	Ir tr Is ts Ii Ig **tg** hz 1 0.2 s	Press Enter in the relay setting mode to move to the ground fault activation time (tg) setting. (See the setting status in the LCD display.)
(Long)	Ir tr Is ts Ii Ig tg hz 1 0.2 s	Select the item to be changed (blink)
	Ir tr Is ts Ii Ig tg hz 0.4 s	Change the item's value (blink) (The absence of the "I" at the beginning stands for the I^2t Off time.)
(Long)	Ir tr Is ts Ii Ig tg hz OK 0.4 s	Confirm the changes you made (shows 'OK')

Changing the relay configuration

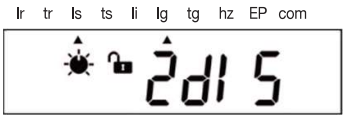
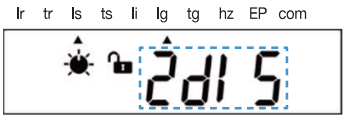
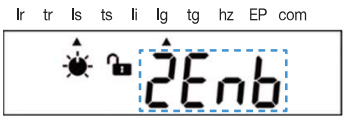
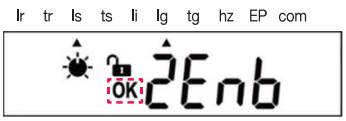
Changing the N-phase protection settings

ex) 100% ➞ 50%

Steps	LCD display	Remarks
(short)		Press Enter in the relay setting mode to move to the N-phase protection setting. (Check the status of the setting in the LCD display.)
(Long)		Select the item to be changed (blink)
		Change the item's value (blink)
(Long)		Confirm the changes you made (shows 'OK')

ZSI enable settings change

ex) Disable ➞ Enable

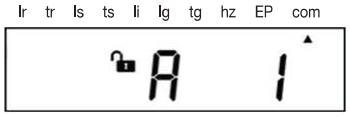
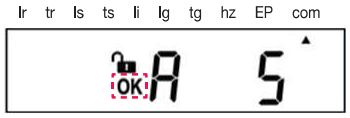
Steps	LCD display	Remarks
(short)		Press Enter in the relay setting mode to move to ZSI Enable setting. (Check the status of the setting in the LCD display.)
(Long)		Select the item to be changed (blink)
		Change the item's value (blink)
(Long)		Confirm the changes you made (shows 'OK')

※ Zdl 5: ZSI Disable
ZEnb: ZSI Enable

Change system settings

Changing communication address settings

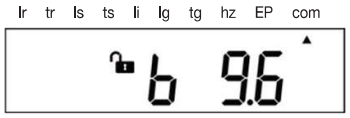
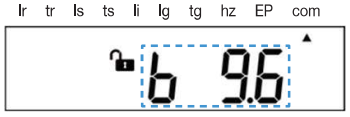
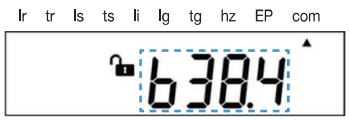
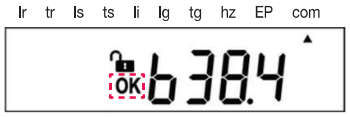
ex) 1 ➞ 5

Steps	LCD display	Remarks
		Press Mode in the relay setting mode to display the communication address setting of the system setting mode. (Check the LCD display for the setting status.)
 (Long)		Select the item to be changed (blink).
		Change the item's value (blink)
 (Long)		Confirm the changes you made (shows 'OK')

※ A: Address

Changing the communication speed

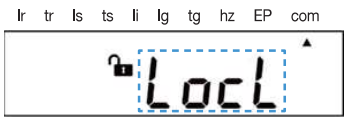
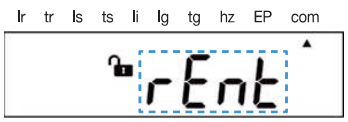
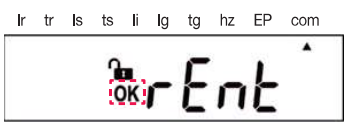
ex) 9,600 ➞ 38,400 bps

Steps	LCD display	Remarks
 (short)		Press Mode in the relay setting mode to move to the system setting mode. Then, press Enter to move to the communication speed setting. (Check the status of the setting in the LCD display.)
 (Long)		Select the item to be changed (blink)
		Change the item's value (blink)
 (Long)		Confirm the changes you made (shows 'OK')

Change system settings

Enable/disable remote configuration via network

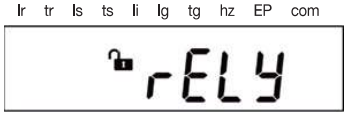
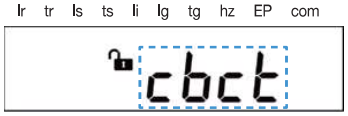
ex) Local ➞ Remote

Steps	LCD display	Remarks
M (short)		Press mode in the relay setting mode to move to the system setting mode. Then, press Enter to move to the enable/disable remote configuration settings. (Check the status of the setting in the LCD display.)
(Long)		Select the item to be changed (blink).
		Change the item's value (blink)
(Long)		Confirm the changes you made (shows 'OK')

※ It is possible to change the settings remotely only when the 'Remote' mode is active.
LocL: Local
rEnt: Remote

Changing the DO output settings

ex) Display relay operation ➞ CB Control

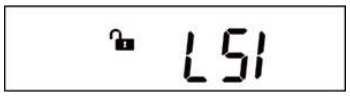
Steps	LCD display	Remarks
M (short)		Press Mode in the relay setting mode to move to the system setting mode. Then, press Enter to move to the DO output setting. (Check the status of the setting on the LCD display.)
(Long)		Select the item to be changed (blink).
		Change the item's value (blink)
(Long)		Confirm the changes you made (shows 'OK')

※ CB Control: It is possible to control the CB using a dedicated MOP.
(The dedicated MOP with a communication function will become available starting from 2022.)
rELy: Relay
cbct: CB Control

Change system settings

Change the settings for displaying relay operations

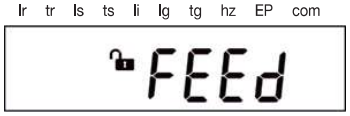
ex) LSI ➡ LG

Steps	LCD display	Remarks
M (short)	Ir tr Is ts Ii Ig tg hz EP com 	Press Mode in the relay setting mode to move to the system setting mode. Then, press Enter to move to the relay operation display mode. (Check the LCD display for setting status.)
(Long)	Ir tr Is ts Ii Ig tg hz EP com 	Select the item to be changed (blink)
^ v	Ir tr Is ts Ii Ig tg hz EP com 	Change the item's value (blink)
(Long)	Ir tr Is ts Ii Ig tg hz EP com 	Confirm the changes you made (shows 'OK')

※ 1) LSI - DO1: Long time, DO2: Short-time/Instantaneous
2) LG - DO1: Long time, DO2: Ground fault
3) LSIG - DO1: Long time/Ground fault, DO2: Short-time/Instantaneous/Ground fault

Changing the Feeder/Incoming setting

ex) Feeder ➡ Incoming

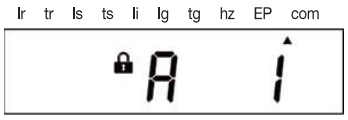
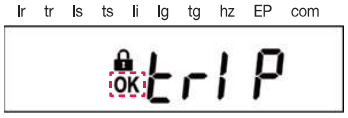
Steps	LCD display	Remarks
M (short)	Ir tr Is ts Ii Ig tg hz EP com 	Press Mode in the relay setting mode to move to the system configuration mode. Then, press Enter to move to the Feeder/Incoming setting. (Check the LCD display for setting status.)
(Long)	Ir tr Is ts Ii Ig tg hz EP com 	Select the item to be changed (blink)
^ v	Ir tr Is ts Ii Ig tg hz EP com 	Change the item's value (blink)
(Long)	Ir tr Is ts Ii Ig tg hz EP com 	Confirm the changes you made (shows 'OK')

※ FEEd: Feeder
Inco: Incoming

Perform other resets

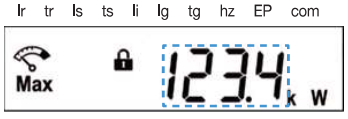
Trip Test

The trip test for confirming the operation of MTD.

Steps	LCD display	Remarks
M		Press the 'Mode' button briefly to move to the communication and test display mode.
(short)		Press 'Enter' briefly to move to the trip test item.
(Long)		Select trip test (blink).
(Long)		Perform a trip test (Shows OK.)

Max. Value Reset

Power and energy data reset

Steps	LCD display	Remarks
M		Press 'Mode' briefly to move to the max. value display mode.
(short)		Press 'Enter' briefly to move to the item that you wish to reset.
(Long)		Select the data to be rest (blink.)
(Long)		Reset the data. (Shows 'OK.')

Perform other resets

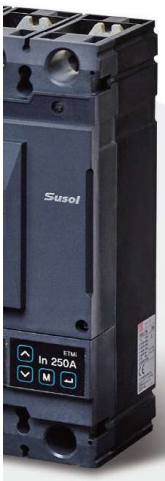
Fault reset

Perform a fault reset when there is an accident.

Steps	LCD display	Remarks
		LCD display screen in case of an accident
(Long)		Press and hold down 'Enter' to prepare for rault reset (blink)
(Long)		Reset the data. (Shows 'OK.')

Memo


TS800Li
Susol
ON
TS250Li
In 800A
In 250A



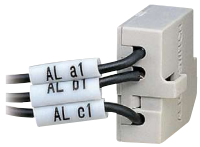
Accessory

Possible configuration of electrical auxiliaries

UVT

SHT


AX



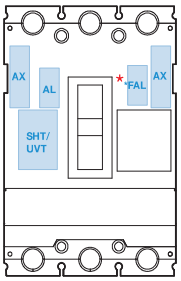
AL

Maximum possibilities

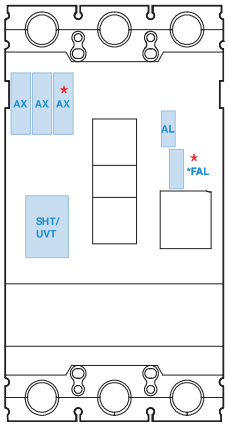
Phase	Accessory	TS100	TS160	TS250	TS400	TS630	TS800
R (Left)	AX	1	1	1	3	3	3
	AL	1	1	1	-	-	-
	AX	1	1	1	1	1	1
T (Right)	AX	1	1	1	-	-	-
	AL	-	-	-	1	1	2
	FAL	1	1	1	1	1	1

Where to install accessories

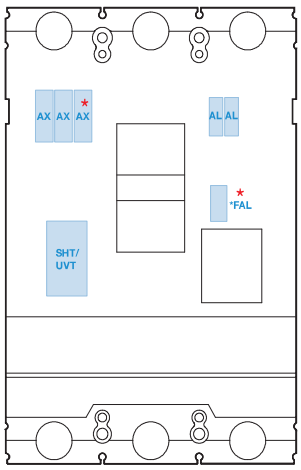
TS100, 160, 250



TS400, 630



TS800



Note 1) ETMi, ETHi, and ETLi types cannot use *FAL or *AX.
Note 2) SHT/UVT/TAL cannot be used simultaneously.

Auxiliary switch and Alarm switch

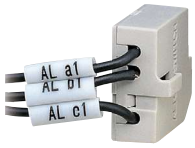
AX

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

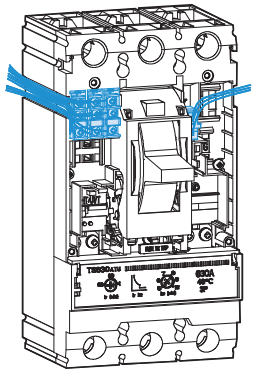
Alarm switches offer provisions for immediate audio or visual indication of a tripped breaker due to overload, short circuit, shunt trip, or undervoltage release conditions.
They are particularly useful in automated plants where operators must be signaled about changes in the electrical distribution 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.



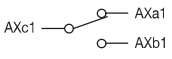
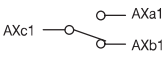
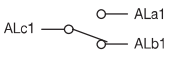
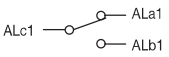
AL

Fault alarm switch, FAL

FAL Indicates that the breaker has tripped due to overload or short circuit.
And, it can be applied to only circuit breakers with electronic trip units.



Contact operation

MCCB	ON	OFF	TRIP
Position of AX			
Position of AL, FAL			

Technical data

Conventional thermal current Ith		5A			
Rated operational current (Ie)	Voltage (Ue)	Current (Ie)		Minimum load current	Applicable MCCB
		Resistance	Inductance		
AC 50/60Hz	125V	5	3	5V DC 160mA 5V DC 160mA	TS100, TS160 TS250, TS400 TS630, TS800
	250V	3	2		
	500V	-	-		
DC	30V	4	3		
	125V	0.4	0.4		
	250V	0.2	0.2		

Under-Voltage Trip (UVT)

UVT

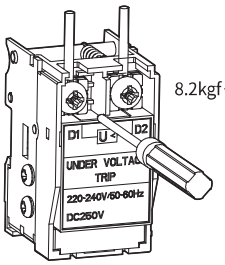
The undervoltage release automatically opens a circuit breaker when voltage drops to a value ranging between 35% to 70% of the line voltage. The operation is instantaneous, and after tripping, the circuit breaker cannot be re-closed again until the voltage returns to 85% of line voltage.

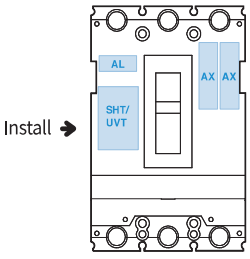
Continuously energized, the undervoltage release must be operating before the circuit breaker can be closed. The undervoltage release can be easily installed in the left accessory compartment of the Susol TS circuit breakers.

- Range of tripping voltage: 0.35 ~ 0.7Vn
- MCCB making is possible voltage: 0.85Vn (exceed)
- Frequency (only AC): 45Hz ~ 65Hz

Rating

	Control voltage (V)	Consumption			Applicable MCCB
		AC (VA)	DC (W)	mA	
Power consumption	AC/DC 24V	0.64	0.65	27	TS100, TS160 TS250, TS400 TS630, TS800
	AC/DC 48V	1.09	1.10	23	
	AC/DC 110~130V	0.73	0.75	5.8	
	AC 200~240V/DC 250V	1.21	1.35	5.4	
	AC 380~440V	1.67	-	3.8	
	AC 440~480V	1.68	-	3.5	
Max. opening time (ms)		50			
Tightening torque of terminal screw		8.2 kgf·cm			
Transformer operating voltage (V)					
- Drop (Circuit breaker trips)		35~70% Vn			
- Rise (Circuit breaker can be switched on)		85% Vn			





This is installed on the left-hand side of the handle of the breaker. It cannot be used simultaneously with the SHT (voltage trip unit).

Electrical auxiliaries (SHT)

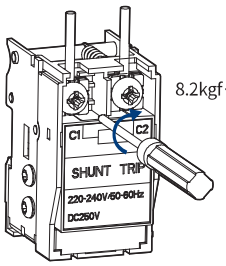
SHT

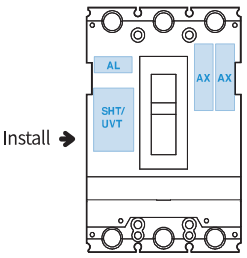
The shunt release opens the mechanism in response to an externally applied voltage signal.
The releases include coil clearing contacts that automatically clear the signal circuit when the mechanism has tripped.
The shunt release can be installed in the left accessory compartment of the Susol TS circuit breakers.

- Range of operational voltage: 0.7 ~ 1.1Vn
- Frequency (only AC): 45Hz ~ 65Hz

Rating

	Control voltage (V)	Consumption			Applicable MCCB
		AC (VA)	DC (W)	mA	
Power consumption	DC 12V	-	0.36	30	TS100, TS160 TS250, TS400 TS630, TS800
	AC/DC 24V	0.58	0.58	24	
	AC/DC 48V	1.22	1.23	25	
	AC/DC 110~130V	1.36	1.37	10.5	
	AC 220~240V/DC250V	1.80	1.88	7.5	
	AC 380~500V	1.15	-	2.3	
Max.opening time (ms)		50			
Tightening torque of terminal screw		8.2 kgf·cm			





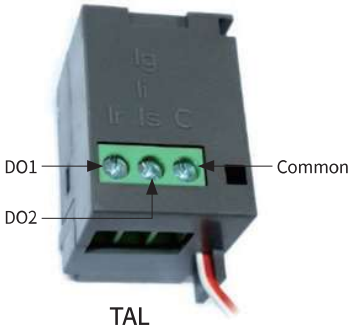
This is installed on the left-hand side of the handle of the breaker. It cannot be used simultaneously with the UVT (undervoltage trip unit).

Trip alarm relay, TAL

The TAL (trip alarm relay) is a device that is used to display the trip status signal of the Smart MCCB breaker.

Applicable breakers

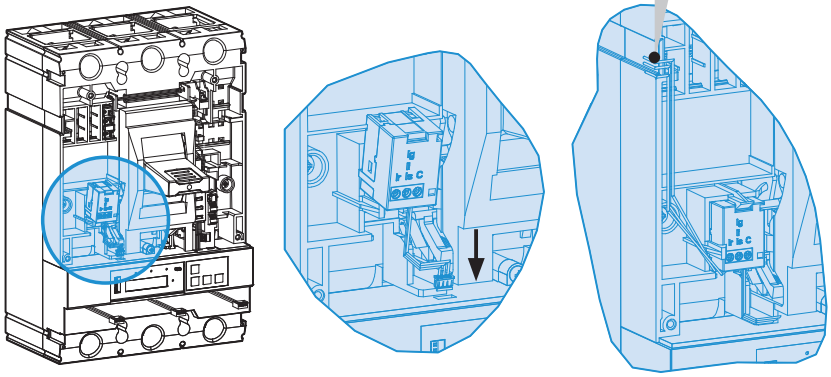
- TS100Ni/Hi/Li ETMi/ETHi/ETLi
- TS160Ni/Hi/Li ETMi/ETHi/ETLi
- TS250Ni/Hi/Li ETMi/ETHi/ETLi
- TS400Ni/Hi/Li ETMi/ETHi/ETLi
- TS630Ni/Hi/Li ETMi/ETHi/ETLi
- TS800Ni/Hi/Li ETMi/ETHi/ETLi



TAL

Assemble TAL on “SHT/UVT/TAL” marking.
Attach the TAL in the area that is marked SHT/UVT/TAL.

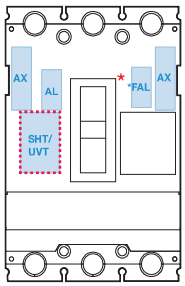
TAL Lead Wire
AWG 22 ~ 26



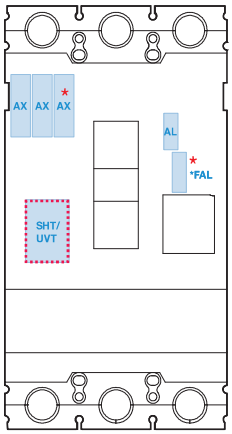
Assemble the connector according to indicated direction.

Where to install accessories

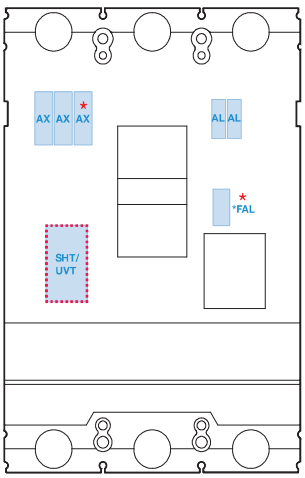
TS100, 160, 250



TS400, 630

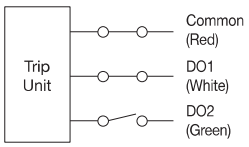
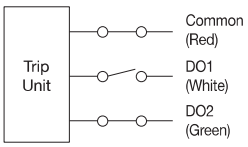


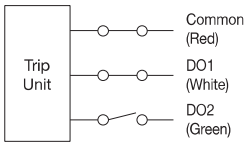
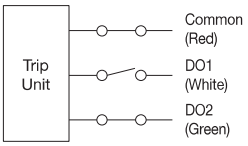
TS800

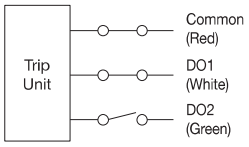
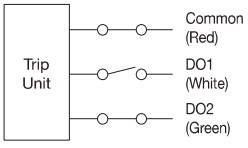
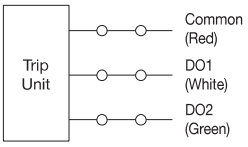


Note 1) ETMi, ETHi, and ETLi types cannot use *FAL or *AX.
Note 2) SHT/UVT/TAL cannot be used simultaneously.

Contact operation status

Relay Cfg.	Ir (Long time)	Isd/Ii (Short-time/ Instantaneous)	Ig (Ground fault)
LSI			-

Relay Cfg.	Ir (Long time)	Isd/Ii (Short-time/ Instantaneous)	Ig (Ground fault)
LG		-	

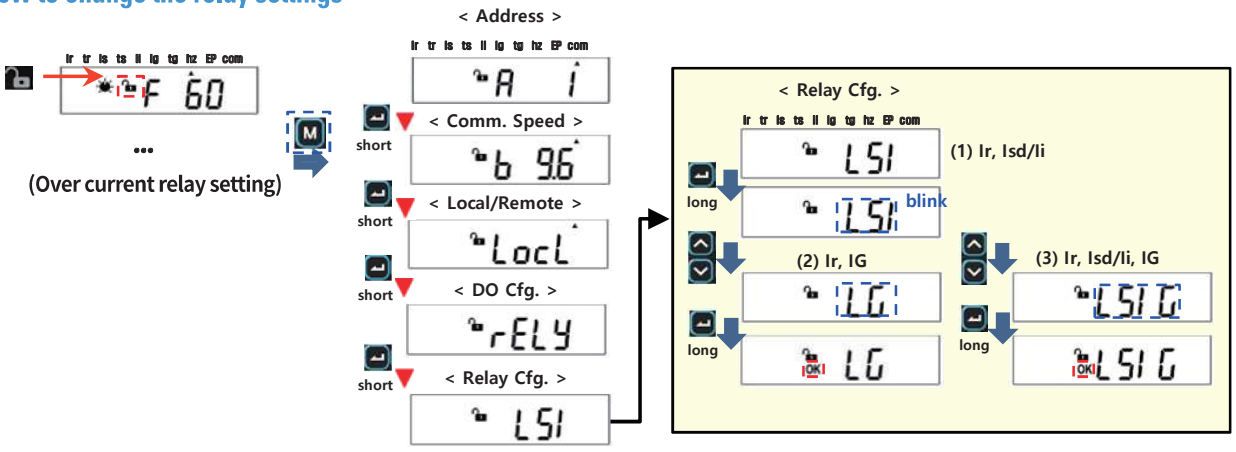
Relay Cfg	Ir (Long time)	Isd/Ii (Short-time/ Instantaneous)	Ig (Ground fault)
LSIG			

※ LSI : Long time, Short-time/ Instantaneous Protection
LG : Long time, Ground fault Protection
LSIG : Long time, Short-time / Instantaneous, Ground fault Protection

TAL contact rated voltage and current

Items	AC		DC	
	Voltage	Current	Voltage	Current
Resistance load	250VAC	3A	30VDC	3A

How to change the relay settings



1. Press 'Unlock' while the ETU is energized.
2. Press 'Mode' to access the system settings change mode.
3. Press 'Enter' to move to the 'Relay Cfg.' screen.
4. Once you are in the 'Relay Cfg.' Screen, press, and hold down 'Enter' to access the change settings mode.

* When you are in the change settings mode, the indicated item will blink.

5. While in the change settings mode, press 'Up/Down' to edit the setting.

* For Relay, you can choose 'LSI,' 'LG,' or 'LSIG.'

	Ir (Long time)		Isd/Ii (Short-time/Instantaneous)		Ig (Ground fault)	
	DO1	DO2	DO1	DO2	DO1	DO2
LSI	●			●		
LG	●					●
LSIG	●			●	●	●

6. To confirm the changes you made with the Relay settings, press and hold down 'Enter.'

* Once the changes you made are confirmed, the LCD display will show 'OK,' and the screen will stop blinking.

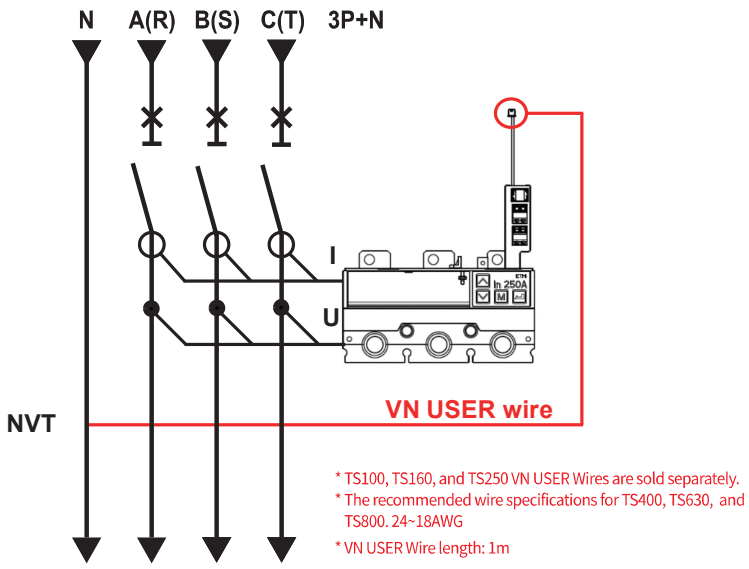
Neutral voltage tap, NVT

The NVT wiring type is used to measure the voltage and power in a Smart MCCB 3-pole Trip Unit (ETHi/ETLi.)
An electronic trip unit is connected to the NVT through a VT terminal.

Applicable trip units

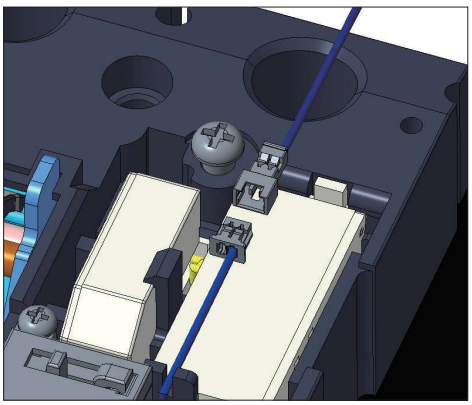
- TS100Ni/Hi/Li 3P ETHi/ETLi
- TS160Ni/Hi/Li 3P ETHi/ETLi
- TS250Ni/Hi/Li 3P ETHi/ETLi
- TS400Ni/Hi/Li 3P ETHi/ETLi
- TS630Ni/Hi/Li 3P ETHi/ETLi
- TS800Ni/Hi/Li 3P ETHi/ETLi

NVT wiring type

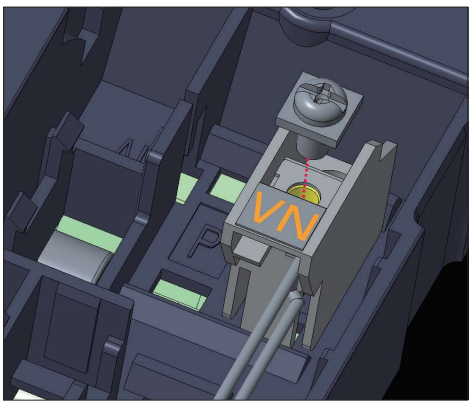


* TS100, TS160, and TS250 VN USER Wires are sold separately.
* The recommended wire specifications for TS400, TS630, and TS800. 24~18AWG
* VN USER Wire length: 1m

Where to install accessories



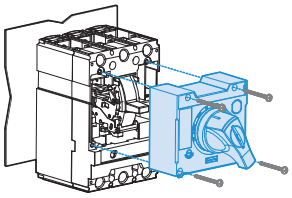
TS100, TS160, TS250



TS400, TS6300, TS800

Rotary handle

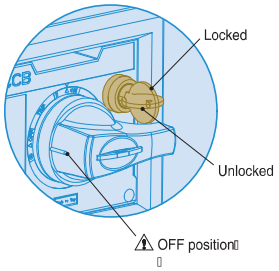
The rotary handle operating mechanism is available in either the direct version or in the extended version on the compartment door.
It is always fitted with a compartment door lock and on a request it can be supplied with a key lock in the open position.



Direct rotary handles

Direct rotary handles

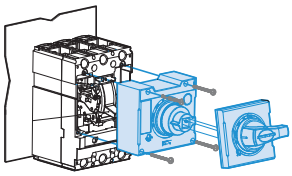
MCCB	Rotary handle
TS100, 160, 250	DH2
TS400, 630	DH3
TS800	DH4



Direct rotary handle with a key lock

Direct rotary handle with a key lock

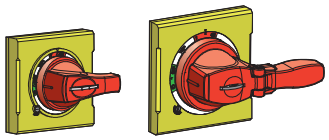
MCCB	Padlockable device	Lock function
TS100, 160, 250	DHK2	Lock in On or Off position
TS400, 630	DHK3	
TS800	DHK3	



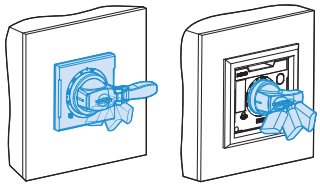
Extended rotary handles

Extended rotary handles

MCCB	Padlockable device
TS100, 160, 250	EH2
TS400, 630	EH3
TS800	EH4



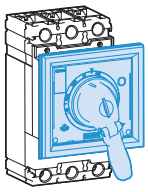
Red/Yellow color handle available

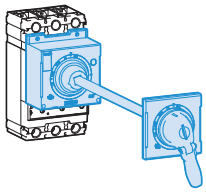


Padlocks for direct or extended handle

Padlocks can be used to lock the breaker in the ON or OFF position.

Rotary handle



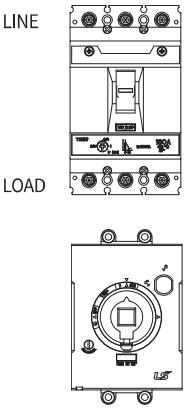


Degree of protections

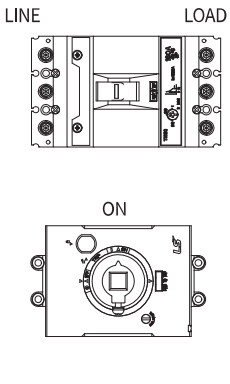
Type	Degree of protection	IP
Circuit breaker with cover frame and rotary direct handle	The access probe of 1.0mm diameter shall not penetrate.	IP40
Circuit breaker with cover frame and rotary extended handle	Totally protected against ingress of dust and water jets from any direction	IP65

Type suffix according to the mounting position

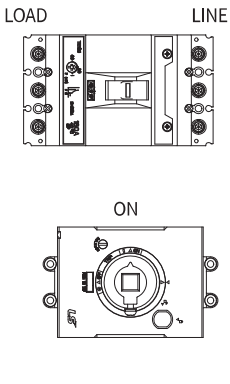
S-Type



L-Type



R-Type



Locking device

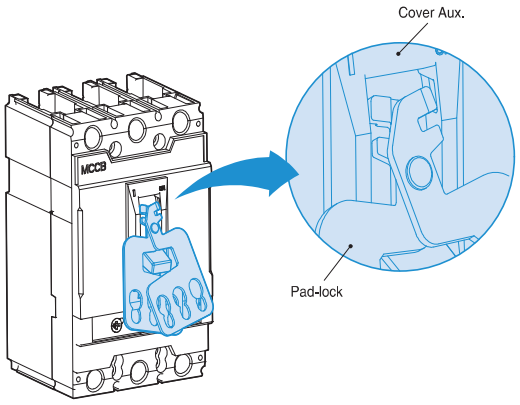
Removable locking device

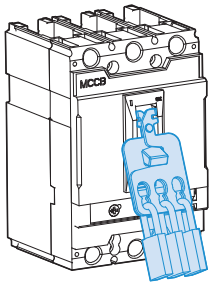
Removable locking device is available for all TS circuit-breakers.
The locking device is designed to be easily attached to the circuit-breaker.

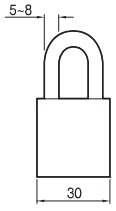
This device allows the handle to be locked in the “OFF” position.
Locking in the OFF position guarantee isolation according to IEC 60947-2.

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)

MCCB	Padlockable device	Function
TS100, 160, 250	PL2	“OFF” position
TS400, 630	PL3	
TS800	PL4	







Padlock dimensions

Locking device

Fixed locking device

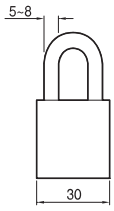
Fixed locking device is available for all TS circuit-breakers.
This device allows the handle to be locked in the “ON” and “OFF” position.
Locking in the OFF position guarantee isolation according to IEC 60947-2.

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

MCCB	Padlockable device	Function
TS100, 160, 250	PHL2	Lock in Off or On position
TS400, 630	PHL3	
TS800	PHL4	

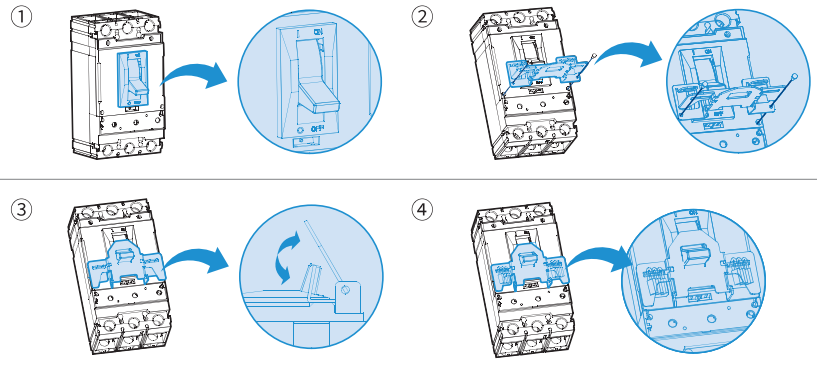
How to use

The locking device for the toggle handle is designed to be easily attached to the front of circuit-breaker.
① Please set the toggle handle in the position of ”On” or ”Off”.
② Install the lock device onto the front of auxiliary cover of circuit breaker.
③ Folding the wings of lock device as shown in picture ③.
④ The padlock to be used shall be that which is commercially available with the nominal dimension. (30mm nominal dimension, 5~8mm diameter)



Padlock dimensions

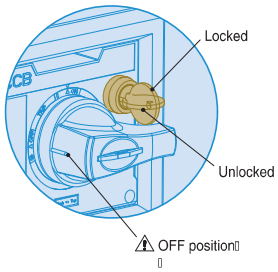
TS100 ~ TS800



Locking by rotary handle with a key lock

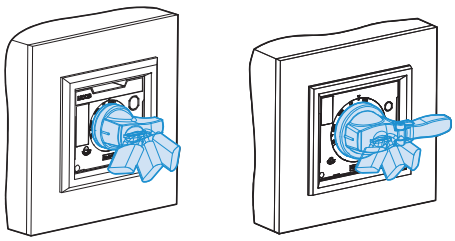
A locking can be done by using the rotary handle which has key lock device.
The lock is used to lock the circuit-breaker in the OFF position.

MCCB	Padlockable device	Function
TS100, 160, 250	DHK2	Lock in Off position
TS400, 630	DHK3	
TS800	DHK4	



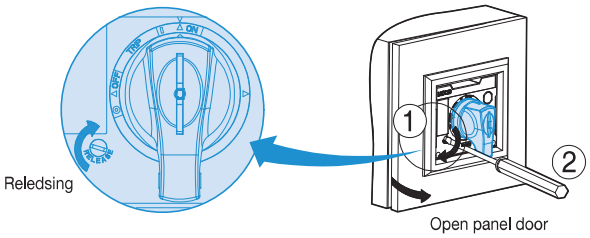
Padlocking by rotary handle

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 8mm may be used.
(Padlocks are not supplied)



Releasing panel door lock at ON position

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.



Terminals

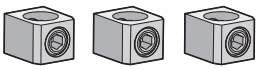
Terminal mounter

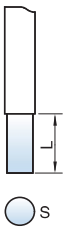
It is supplied with Susol MCCBs as an standard part of circuit-breaker.
Connecting part with terminal for bus bar, cable with lug.

MCCB	Type
TS100, 160, 250	TM2
TS400, 630	-
TS800	-

Inner lug terminal

Bare cable connectors for Susol TS series circuit-breakers.
Can be used for both aluminum and copper cables.

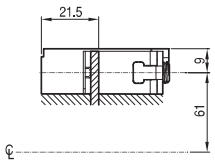




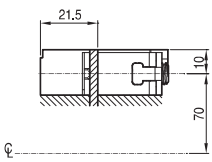
MCCB	Type	Pole	Set quantity	Cable connection possibilities	Conductor size	
TS100, 160, 250	SBT23 SBT24	3 4	1 Set (3EA) 1 Set (4EA)	1	L(mm) S(mm²)Cu/Al Tightening torque (kgf·cm)	21 10~150 120~147
TS400, 630	SBT33 Note1) SBT34	3 4	1 Set (3EA) 1 Set (4EA)	1	L(mm) S(mm²)Cu/Al Tightening torque (kgf·cm)	30 70~300 367~428
PB12, 13	IBT13 Note2) IBT14	3 4	1 Set (3EA) 1 Set (4EA)	1	L(mm) S(mm²)Cu/Al Tightening torque (kgf·cm)	18 2.5~95 306
PB22, 23	IBT23 Note2) IBT24	3 4	1 Set (3EA) 1 Set (4EA)	1	L(mm) S(mm²)Cu/Al Tightening torque (kgf·cm)	21 10~150 306

Note) 1. IBT3 for TS630 can be applied in case that rate current is upto 400A.
2. IBT13, 23 are for Plug-in base.

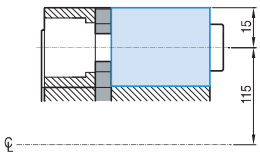
SBT13, 14



SBT23, 24



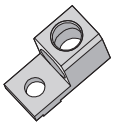
IBT33, 34(TS400)



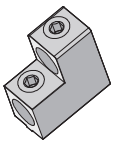
Extended lug terminal

The extended box terminals for TS circuit breakers can be used for cooper cables/bars and aluminum cables. There (3) kinds of terminals.

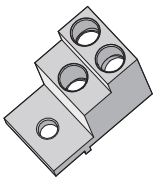
- For TS100, TS160, TS250: 1-cable connector (EBT23, EBT24)
- For TS400, TS630: 2-cable connector (EBT33, EBT34)
- For TS800: 3-cable connector (EBT43, EBT44)



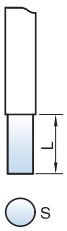
1-cable connector



2-cable connector

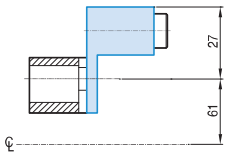


3-cable connector

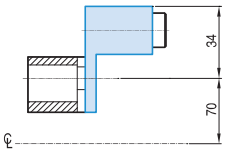


MCCB	Type	Pole	Set quantity	Cable connection possibilities	Conductor size	
TS100, 160, 250	EBT23 EBT24	3 4	1 Set (3EA) 1 Set (4EA)	1	L(mm)	24
					S(mm²)Cu/Al	10~150
					Tightening torque (kgf·cm)	306
TS400, 630	EBT33 EBT34	3 4	1 Set (3EA) 1 Set (4EA)	1	L(mm)	33 or 62
					S(mm²)Cu/Al	2×85 to 2×240
					Tightening torque (kgf·cm)	367~428
TS800	EBT43 EBT44	3 4	1 Set (3EA) 1 Set (4EA)	1	L(mm)	25~48
					S(mm²)Cu/Al	3×85 to 3×240
					Tightening torque (kgf·cm)	367~428

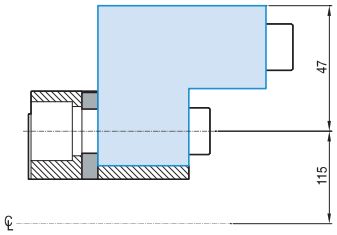
EBT13, 14



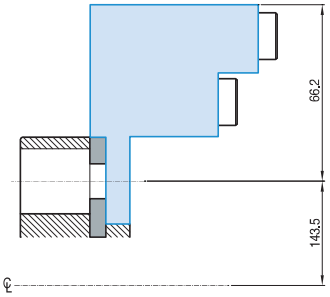
EBT23, 24



EBT33, 34



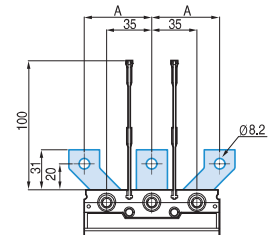
EBT43, 44



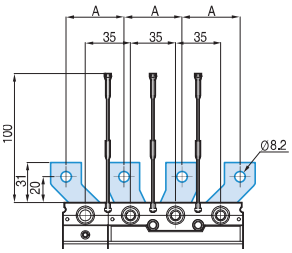
Terminals

Spreader
100~250AF

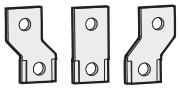
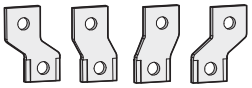
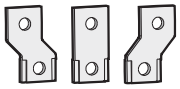
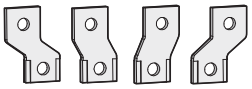
As an optional part of circuit-breaker
Can increase the pitch of the terminals.



TS100, 160, 250 3P

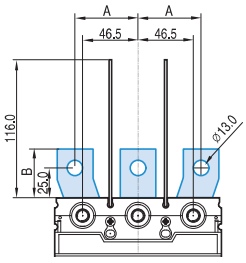


TS100, 160, 250 4P

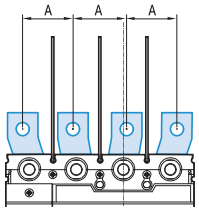
MCCB	Pole	Type	Size (mm)	Feature
TS100, 160, 250	2P	SP22a	45	
	3P	SP23a		
	4P	SP24a		
	2P	SP22b	52.5	
	3P	SP23b		
	4P	SP24b		

Spreader
400~800AF

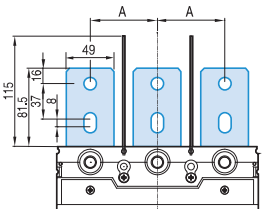
As an optional part of circuit-breaker
Can increase the pitch of the terminals.



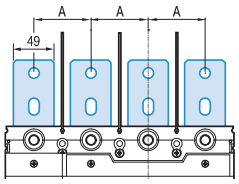
TS400, 630 3P



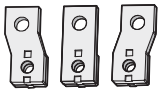
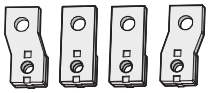
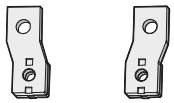
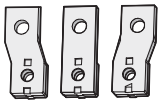
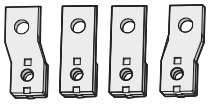
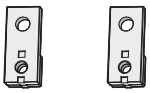
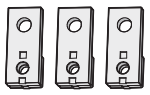
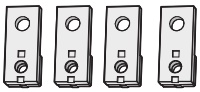
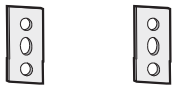
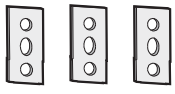
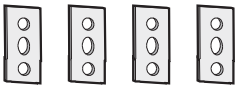
TS400, 630 4P



TS800 3P



TS800 4P

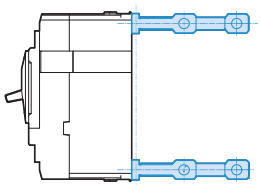
MCCB	Pole	Type	Size (mm)		Feature
TS400, 630	2P	SP32a	52.5	41	
	3P	SP33a			
	4P	SP34a			
	2P	SP32b	70	54	
	3P	SP33b			
	4P	SP34b			
	2P	SPS32	46.5	41	
	3P	SPS33			
	4P	SPS34			
TS800	2P	SPS42	70	81.5	
	3P	SPS43			
	4P	SPS44			

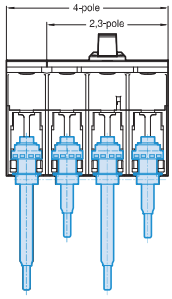
Terminals

Rear connection terminal

Rear connection terminals are used to adapt Susol TS circuit-breakers to switchboards or other applications that require rear connection.
These can be connected directly to circuit breakers without any modification

There are two kinds of rear connection terminals.
- Flat type
- Round type

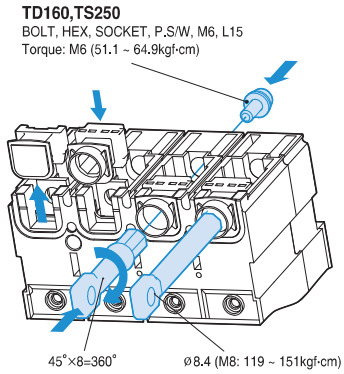


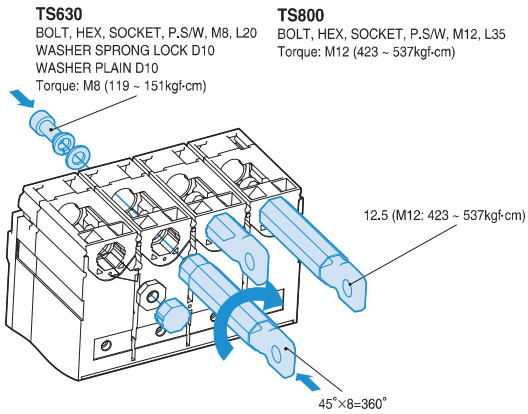


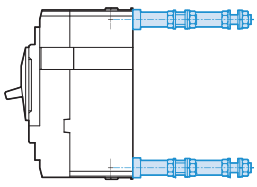
Flat type

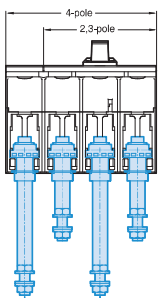
Flat type (Flat vertical terminals)

MCCB	2-pole	3-pole	4-pole
TS100, 160, 250	RTB22	RTB23	RTB24
TS400, 630	RTB32	RTB33	RTB34
TS800	RTB42	RTB43	RTB44









Round type

Round type (Round threaded terminals)

MCCB	2-pole	3-pole	4-pole
TS100, 160, 250	RTR22	RTR23	RTR24
TS400, 630	-	-	-
TS800	-	-	-

Terminal cover

The terminal covers are applied to the circuit-breaker to prevent accidental contact with live parts and thereby guarantee protection against direct contacts.

Long type covers, ITL

IP40 degree of protection
For fixed circuit-breakers with front, front extended, front for cables terminals.

Short type covers, ITS

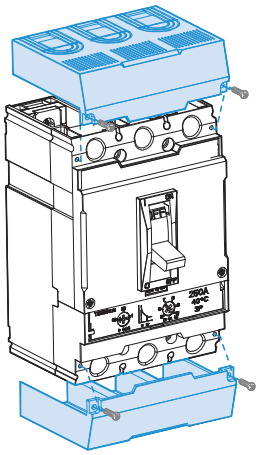
IP40 degree of protection
For fixed circuit-breakers with rear terminals and for moving parts of plug-in

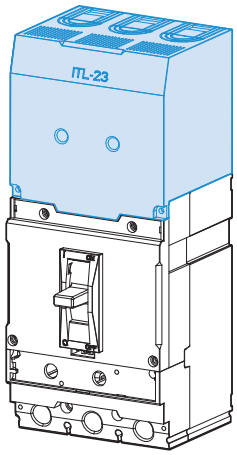
Short type covers

Long type covers

MCCB		Terminal cover	
Frame type	Pole	Long type	Short type
TS100, 160, 250	2P, 3-pole	ITL23	ITS23
	4-pole	ITL24	ITS24
TS400, 630	2P, 3-pole	ITL33	ITS33
	4-pole	ITL34	ITS34
TS800	2P, 3-pole	ITL43	ITS43
	4-pole	ITL44	ITS44

Note1) 2P in 3pole mold case



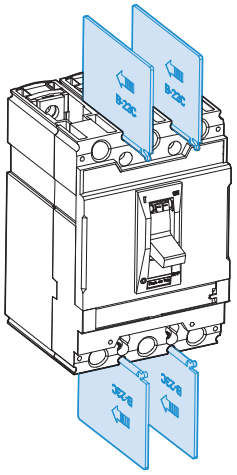


Insulation barrier

Insulation barriers

These allow the insulation characteristics between the phases at the connections to be increased.
They are mounted from the front, even with the circuit-breaker already installed, inserting them into 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 by side.

Applied MCCB	Set quantity
TS100, 160, 250	B-23C
TS400, 630	B-33C
TS800	B-43C



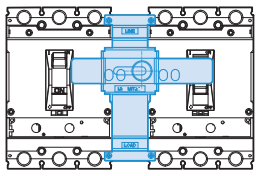
Mechanical interlock

Mechanical Interlock
(Padlocks are not supplied)

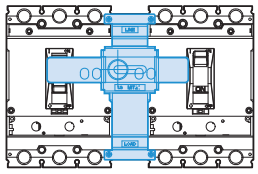
The mechanical interlock (MIT) can be applied on the front of two breakers mounted side by side, in either the 3-pole or 4-pole version and prevents simultaneous closing of the two breakers. Fixing is carried out directly on the cover of the breakers.

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 sourcechangeover system.

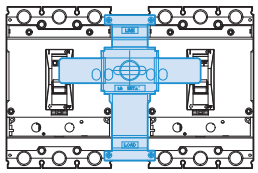
Operation



Left MCCB: ON/OFF is possible
Right MCCB: Off lock

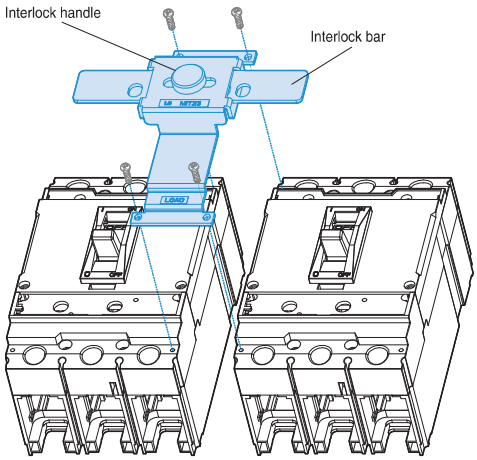


Left MCCB: Off lock
Right MCCB: ON/OFF is possible



Both MCCBs are of locked

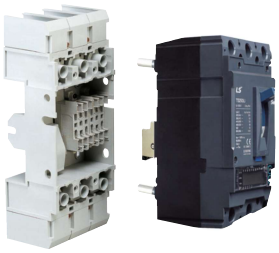
MCCB		Interlock
Frame type	Pole	
TS100, 160, 250	3-pole	MIT23
	4-pole	MIT24
TS400, 630	3-pole	MIT33
	4-pole	MIT34
TS800	3-pole	MIT43
	4-pole	MIT44



Plug-in system

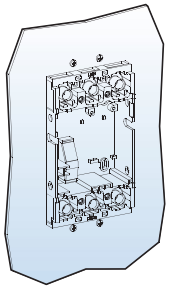
The plug-in base is the fixed part of the plug-in version of the circuit-breaker.
It will be installed directly on the back plate of panel.
The circuit-breaker is racked out by unscrewing the top and bottom fixing screws.

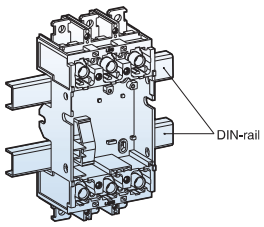
Plug-in base makes it possible to extract and/or rapidly replace the circuit breaker without having to touch connections for ship and important installations.

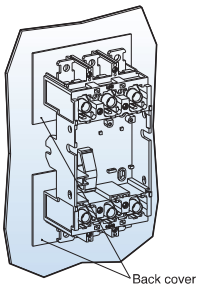


MCCB	Pole	Arrangement	Type	Means
TS100, 160, 250	2	Single line	PB22	
	3	Single line	PB23	
TS400, 630	2	Single line	PB32	
	3	Single line	PB33	
TS800	2	Single line	PB42	
	3	Single line	PB43	

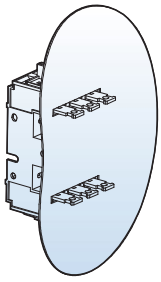
Front connection

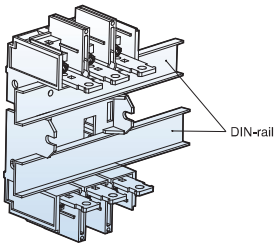






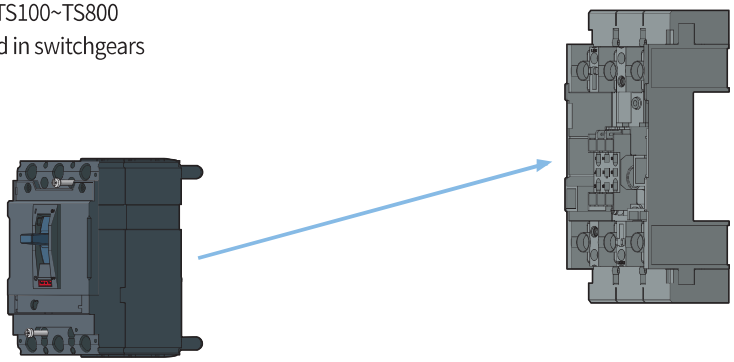
Rear connection





Normal type Plug-in MCCB: PB□type

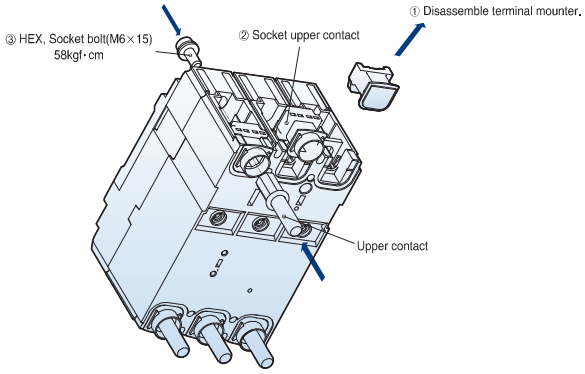
MCCB rating: TS100~TS800
Generally used in switchgears



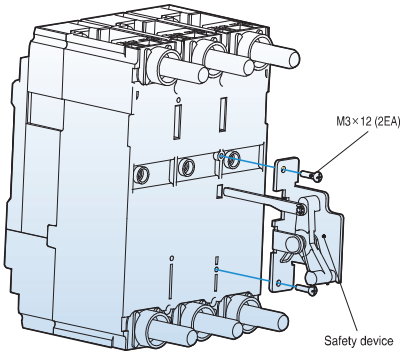
Assembling procedure

TS100, 160, 250

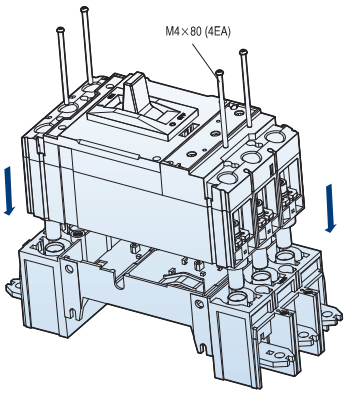
1. Conversion to Plug-in MCCB



2. Assembling safety device



3. Assembling MCCB and plug-in device

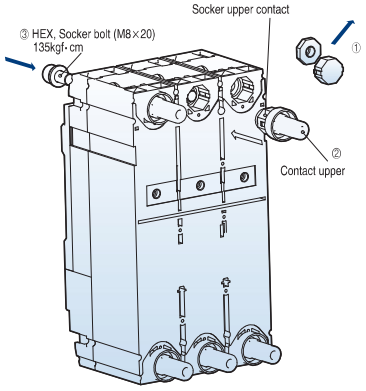


Plug-in device

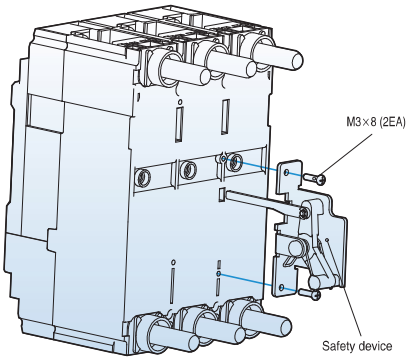
Assembling procedure

TS400, 630

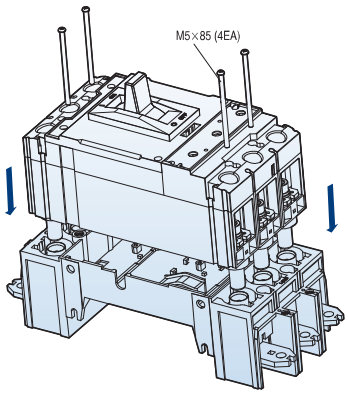
1. Conversion to Plug-in MCCB



2. Assembling safety device



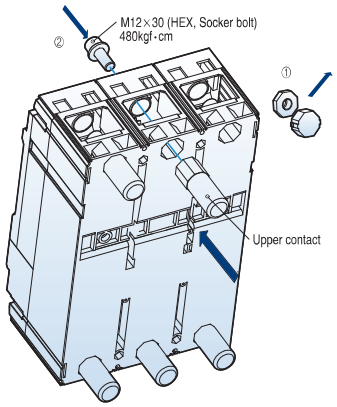
3. Assembling MCCB and plug-in device



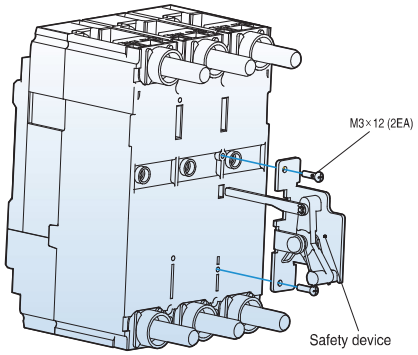
Assembling procedure

TS800

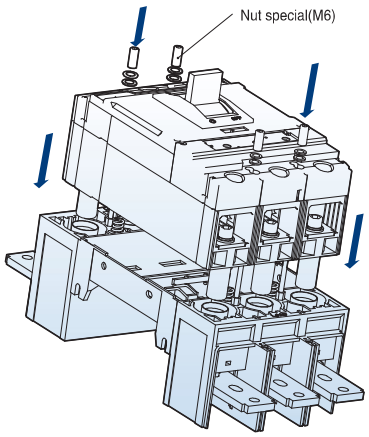
1. Conversion to Plug-in MCCB



2. Assembling safety device



3. Assembling MCCB and plug-in device



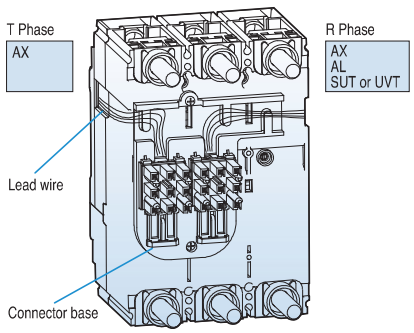
Connector KIT

Electric auxilialy circuit(AX, AL, SHT, UVT) from Breaker via one to three connector KIT(nine wires each).
These are made of moving part on Breaker and fixed part on plug-in base up to 800AF.

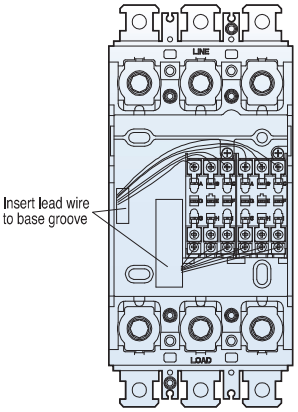
Breaker Max.	Fixed part		Moving part	
	Max. Installed Q'TY	Description	Q'TY	Description
TS250	2	SPARE PART ASS'Y, CONNECOR KIT	1	SPARE PART ASS'Y, BASE CONNECTOR,TS250
TS400/630	3		1	SPARE PART ASS'Y, BASE CONNECTOR,TS630
TS800	3		1	SPARE PART ASS'Y, BASE CONNECTOR,TS800

TS250

Moving part

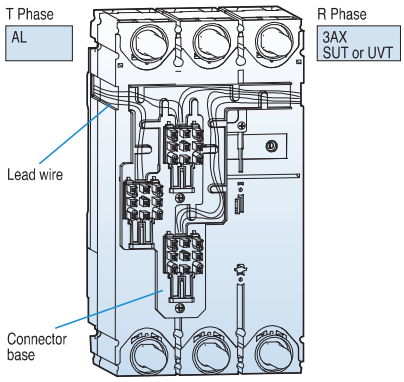


Fixed part

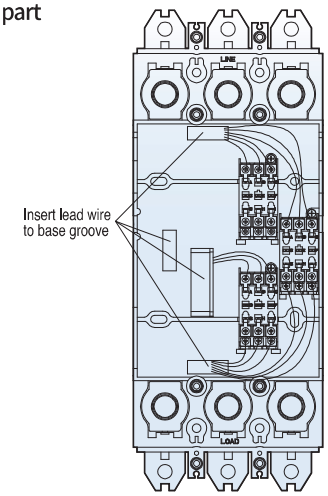


TS400/630

Moving part

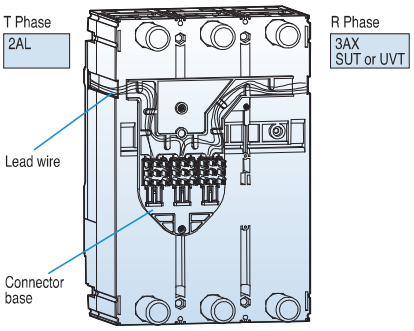


Fixed part

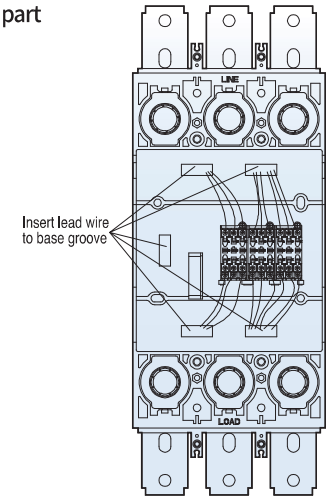


TS800

Moving part

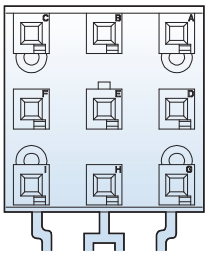


Fixed part



Read wire color

Moving part

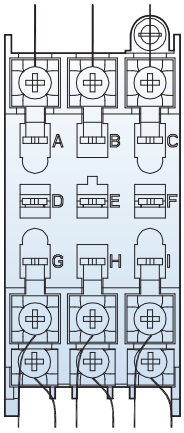


Lead wire color

A: Red	B: White	C: Black
D: Blue	E: Yellow	F: Green
G: Gray	H: Orange	I: Brown

Note) Useless lead wires should be ended for
Preventing an electric accident.

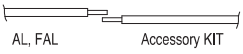
Fixed part



Lead wire color

A: Red	B: White	C: Black
D: Blue	E: Yellow	F: Green
G: Gray	H: Orange	I: Brown

Note) Useless lead wires should be ended
forPreventing an electric accident.
- To connent AL and FAL solder the wire and
insulates the wire



Motor operator

Motor operators can also be operated by manual. The motor drives a mechanism which switches TS toggle handle to the “ON” and “OFF/RESET” positions.
• The manual actuator handle is located on the front of the cover.
• Manual or Automatic operation can be selected.
• Applicable to 2, 3 and 4-pole breakers.

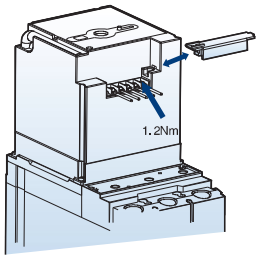
The motor operator is an essential device for constructing a remote operated automatic source-changeover system to ensure a continuous supply of electrical power at following certain installations:
• Commercial sector: Hospital, Tall building, Bank, Insurance companies, Shopping centers
• Industry: Ships, Assembly lines at plant, Military sites, Port and Railway installation

Model and rating

TS250 + MOP2

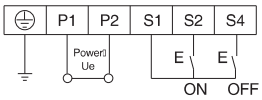
Smart MCCB	Type	Control voltage	Actuation current (A)	Response time (ms)		Consumption (W)	Mechanical service life (operations)	No. of operations per hour
				Closing	Opening			
TS100, 160, 250	MOP2	① DC 24V ② AC 100~110V/ DC 110V ③ AC 230/DC 220V	≤5A (DC 24V) ≤2A (AC)	350	230	14	25,000	120
TS400, 630	MOP3			500	350	35	20,000	60
TS800	MOP4			700	420	35	10,000	20

Wiring connection



Standard connection

Circuit breaker On and Off controlled by remote operation and manual operation

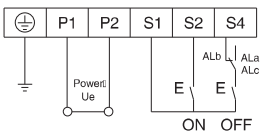


Connection with alarm switch (AL)

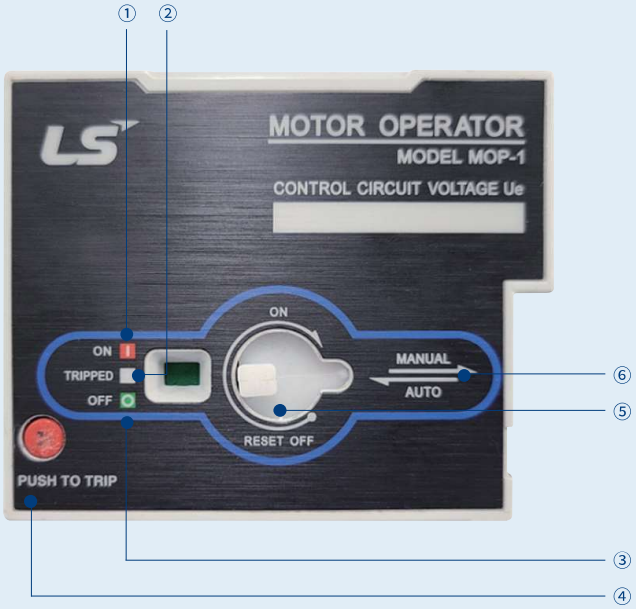
1) The below connection diagram is the method of using a alarm switch (AL) without shunt or undervoltage trip.
2) After clearing the fault surely, manual reset is mandatory in case of tripping due to an electrical fault.

Connection with FAL (only for the breakers with electronic trip unit ETS or ETM)

1) The below connection diagram is the method of using a FAL for circuit breakers with electronic trip unit.
2) After clearing the fault surely, manual reset is mandatory in case of tripping due to an electrical fault.

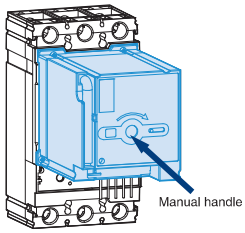


Exterior description



1. On position indication (Red color)
2. Trip position indication (White color)
3. Off position indication (Green color)
4. Button for push to trip (available for only for and TS630AF)
5. On/Off/Reset selection lever
6. Manual/Auto selection lever

Manual operation

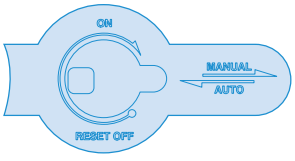


1) Insert the manual handle into the slot of Motor Operator surface and rotate it clockwise.
2) It must be rotated just 180° clockwise for safe operation of micro switch in the motor operator.
3) Return the manual handle after the manual operation
4) Turn the slide switch back to the position of AUTO.

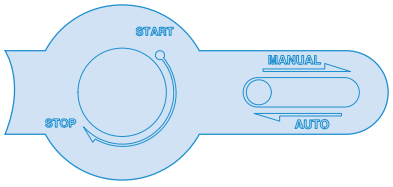
CAUTION: When the circuit breaker is tripped by trip button in the OFF status,
it is impossible to operate motor operator automatically It must be reset by manual operation.

Automatic operation

1) Set the slide switch to AUTO, then internal power is closed automatically.
2) ating frequency should be less than these below regulated values.
   TS250Ni/Hi/Li:180 operations per hour
3) Use the ON/OFF switch in the range of regulated values.
4) It may interfere near communication equipments because of internal switching power supply.
   It's recommended that a noise filter be installed to power supply.
5) Please do not input ON/OFF signals at the same time during the automatic operation.
6) If the circuit breaker has a UVT attached inside, charge a UVT on the rated voltage before performing MOTOR OPERATOR.



[TS100, 160, 250]



[TS400, 630, 800]

Residual Current Devices (RCD)

Summary

The Smart Susol circuit breaker can offer protection against earth leakage currents by using an add-on residual current device (RCD). In particular, the TS100, TS160 and TS250 circuit breakers can be combined with the RTU23/24 of residual current device, the TS400 and TS600 circuit breakers can be combined with the RTU33/34 of residual current device and the TS800 circuit breaker can be combined with the RTU43 of residual current device. In all cases the RCD unit interfaces directly below the circuit breaker trip unit area without the use of any secondary wiring or connections.

The Smart Susol circuit breaker and an RCD unit combination can be connected like any stand-alone breaker and are available as fixed or plug-in devices. The main connection interface of the RCD is an exact replacement of the breaker connection area, thus allowing the use of all standard breaker terminals.

Overview

Apart from the protection against overloads typical of automatic circuit breakers, the residual current circuit breaker derived from them also guarantee protection of people against earth leakage currents, thereby ensuring protection against direct contacts, indirect contacts and fire hazards.-(ELCB)

The RCD unit has numerous current and time settings and an override blocking the time settings when set to 30mA. The earth leakage test button tests the electrical and mechanical operation of the device. In order to allow for a dielectric test of the breaker and RCD combination without damaging the electronics, the dielectric plug is placed within the setting area. The RCD unit may be equipped with an alarm switch (FAL) to remotely indicate tripping due to an earth leakage current.

Compliance with standards

- IEC 60947-2 (industrial), Appendix B
- IEC 61009 (residential)
- IEC 60755, class A, immunity to DC components up to 6mA
- VDE664, operation down to -25°C

Remote indications

RCD unit may be equipped with an alarm contact (FAL-fault alarm switch) to remotely indicate tripping due to an earth leakage current.

Power supply

RCD unit are self-supplied internally by the distribution-system voltage and therefore do not require any external source. They continue to function even when supplied by only two phases.

Configuration

- Intermediate terminal shield
- Sealable fixing screw for the intermediate terminal
- Dielectric plug(1)
  - Lift this plug before the dielectric test
- Test push-button
- Reset push-button
- Sealable fixing screw for
- Trip time delay settings(2)
- Sensitivity settings
- Slot for FAL auxiliary switch (optional)
- Sealing point for plate blocking access to the settings
- Rating plate

- If the sensitivity is set to 30 mA, there is no time delay. Whatever the time-delay setting.

Ratings and Selection

RTU23 RTU24 RTU33 RTU34 RTU43

RCD type		RTU23	RTU24	RTU33	RTU34	RTU43
Number of poles		3*	4	3*	4	3*
Applicable circuit breaker	TS100	■	■			
	TS160	■	■			
	TS250	■	■			
	TS400			■	■	
	TS630			■	■	
	TS800					■
Sensitivity	I△n (A)	(adjustable) 0.03-0.3-1-3-10				
Time delay **	Intentional time delay (ms)	(adjustable) 0-60-150-300-600				
	Max. breaking time (ms)	(adjustable) 40-150-300-600-990				
Rated voltage	AC 50/60 Hz	220~460V / 460~690V				
MCCB	L×H×D (mm)	105×160×86	140×160×86	140×260×110	186.5×260×110	210×320×135
MCCB + RCD		105×240×86	140×240×86	140×370×110	186.5×370×110	210×450×135
RCD		105×80×86	140×80×86	140×110×110	186.5×110×110	210×130×135
MCCB + RCD	Weight (kg)	2.7	1.1	8.1	3.9	16.3
RCD		1.0	3.7	2.6	11.1	4.6

Note) 1. RTU can not be applied to 63A or less MTU type MCCB.
2. RTU can not be applied to MCCB (Electronic trip unit) + D/E-Handle
3. RTU24, RTU34: Only combination of N-R-S-T type MCCB is possible

External accessory

Panel HMI (3.5inch)

Specification

Model name	Rated voltage	Power consumption	Temperature range	
IHM8	DC24V(±20%)	3.0W or less	Operate	-20 ~ +60(°C)
			Store	-30 ~ +80(°C)

- Color TFT LCD (3.5” or more) + LED backlight
- User operation : cancel, move (up), move (down), confirm, set
- Displays communication status LED
- Supports two languages (English and chinese)
- Supports upgrade function through USB port (PC manager connection)
- Sub-device connection through RS-485 communication
  : Connects up to 8 sub-devices
  : 9,600, 19,200, 38,400, 57,600bps support
- Fail safe and termination selection switch applied

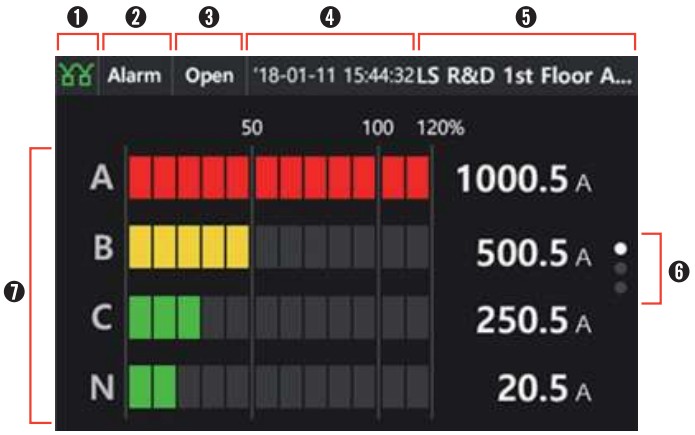
Display screen

- **Basic information of circuit breaker**
  - Number of poles, rated voltage, rated current, communication address, communication speed, control method
  - Manufacturer, model name, H/W version, S/W version, communication version, serial number
- **Current/Time of circuit breaker relay**
  - Long time delay, short-time delay, instantaneous, ground fault
- **Measurement data of circuit breaker**
  - Voltage, current, active/reactive/apparent power for each phase
  - Energy : EP, EQ, rEP, rEQ, ES display
  - PQ (Power Quality) : Freq, PF, THD, TDD
  - Max Demand : Current value for each phase, active/reactive/apparent power
- **Breaker operation history**
  - Operating time, circuit breaker close time
  - Number of electrical operations, number of mechanical+electrical operations, number of trip operations
  - Contact consumption rate (0~100%)
- **Circuit breaker DI/DO status information and control**
- **History of events that occurred in the circuit breaker (save 20)**
- **Fault history of circuit breaker (save 20)**

Target device

Type	Model name
Smart MCCB	Susol Smart MCCB
Smart ACB	Susol ACB STU, Metasol ACB STU
MCB	MCB Connected with M LINK

Screen description



❶ Communication connection status display

- ''Communication connected' or 'Communication not connected' is indicated by the RS485 communication icon.

❷ Alarm display

- If there is no alarm, it is shaded. When a new alarm is generated, 'Alarm' is displayed.

❸ Contact status display

- Displays the breaker's contact status ('Close', 'Open', 'Trip').

❹ Time display

- Displays the time (year-month-day hour : minute : second) of the connected device.

❺ Name display

- Displays the name of the connected device.

❻ Page display

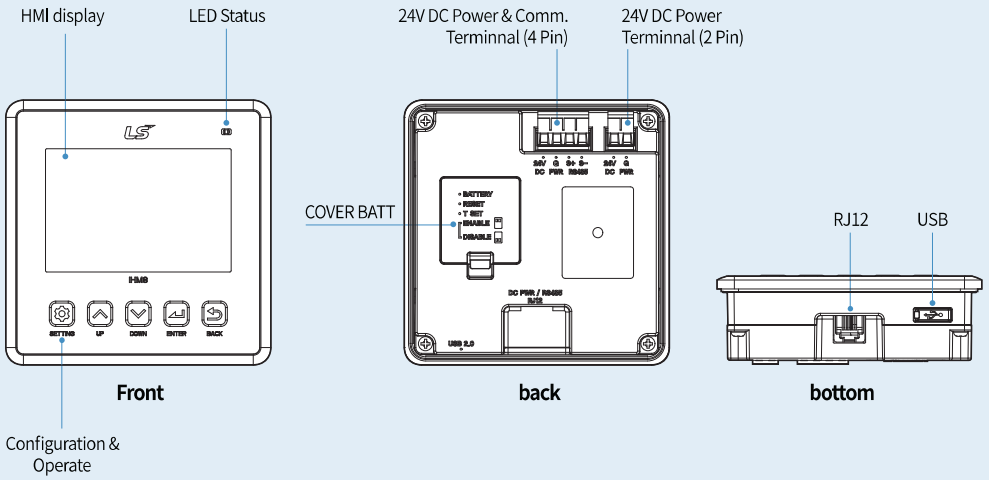
- Displays the number of connected devices and brightly displays the order of the currently displayed screen.

❼ Load current display

- It is displayed as 'A/B/C' or 'A/B/C/N' depending on the load connection.
- The size and color of the graph change depending on the load factor.
- Displays the load current value.

* The screen configuration of ACB and M LINK is different from that of MCCB, so please refer to the user manual.

Exterior description



Panel HMI (7.0inch)

Specification

Model name	Rated voltage	Power consumption	Temperature range	
IHM32	DC24V(±20%)	23.0W or less	Operation	0 ~ +50 °C
			Storage	-20 ~ +60 °C

- Color TFT LCD (7.0” or more) + LED backlight
- User operation: Touch pad
- Indication of device communication status
- Supports two languages (English and chinese)
- Support upgrade function through USB port
- Sub-device connection through ethernet communication
  : Up to 32 sub-devices (up to 40 devices can be connected for E TAG)
  : Up to 16 sub-devices can be selected and displayed (screen output)

Display screen

- **Dashboard**
  - Full information display: Displays communication status with gateway, panel name, and system date/time
  - Quick View: Displays representative information of the device selected for monitoring in the form of icons
  - Alarm: Displays the alarm information of the device selected for monitoring in the form of a list
  - Event: Displays the event information of the device selected for monitoring in the form of a list
  - Setting: Gateway IP for communication linkage, device selection for monitoring, user password, etc.

- **Device Details**
  - Monitoring: Displays device status, communication status, measurement data, operation time, DI/DO status
  - Control: Performs device On/Off control
  - Management: Display and reset history and count data information
  - Event: Displays incident event, device operation and abnormal event
  - View setting: Displays device setting value and relay element setting value
  - Device information display: Displays device-specific information such as device ID and device name

Target device

Type	Model name
Communication device	Data Logger, Gateway, Ethernet Converter, E COLLECTOR
Accessory device	M LINK, TRIO, Thermal CAM
Circuit breaker	Susol ACB STU, Metasol ACB STU, Susol Smart MCCB
Measurement device	GIMAC1000, GIMAC-B, E TAG, MMP, DMPi, Energy Meter

Screen description

Quick View, View All

Display form	Description
ACB STU	Displays device communication status, device name, and device status
TRIO	Displays device communication status, device name, and analog input point (AI #1) value
MCCB	Displays device communication status, device name, and device status
M Link	Displays device communication status, device name, DI/DO status
SEMPR	Displays device communication status, device name, and device status
DMPi	Displays device communication status, device name, and measurement value

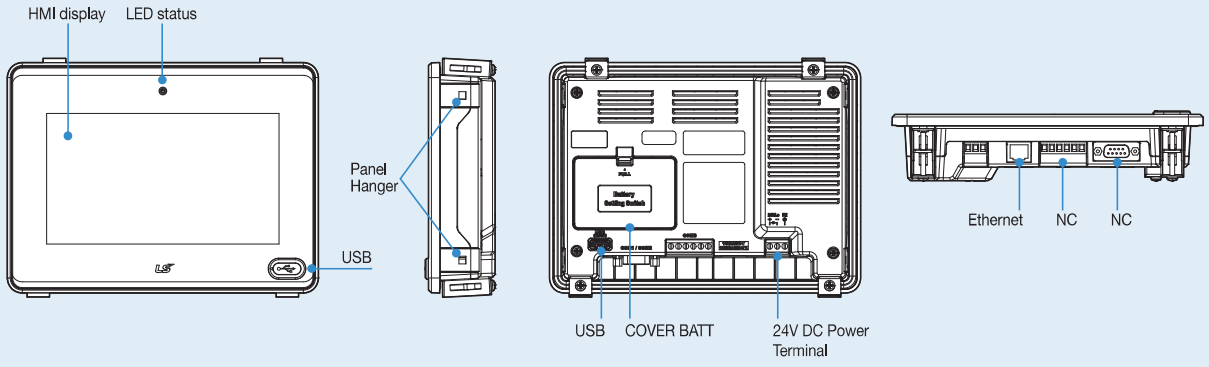
Quick View, View divided

Display form	Description
ACB STU	Displays device communication status, device name, device status, value of Vab, Tot P
TRIO	Displays device communication status, device name, and analog input point (AI # 1) value
MCCB	Displays device communication status, device name, device status, and values of Ia, Ib, and Ic
M Link	Displays device communication status, device name, DI, DO, Mode status, control mode value
SEMPR	Displays device communication status, device name, device status, and values of Ia, Ib, and Ic
DMPi	Displays device communication status, device name, and values of Ia, Ib, and Ic

Detailed screen of device

Display form	Description
Monitoring	Displays selected device monitoring data(Device status, communication status, measurement data, operation time, DI/DO status)
Control	Control command (device On/Off)
Management	Display and reset history and count data
Event	Event and alarm list display
Settings	Displays set value information, relay element set value
Device information	Displays device-specific information such as device ID and device name
Group	The category name of the individual information item
Label	Name of individual information item

Exterior description



T Connection Module

Specification

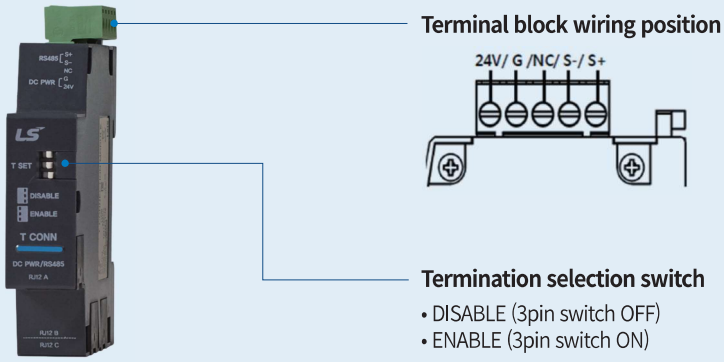
T Connection Module is a branch module that can provide convenience when connecting multiple RS485 communication devices through multi-drop communication. It also provides termination processing when the device is located at the end.

Type	Details
Model name	ITCM
Rated voltage	DC24V(±10%)
Basic function	Multi-drop connection
	Termination Selection
Mounting method	DIN-Rail, Screw (Screw not supplied)
Size	17.8(W) × 81(H) × 65.6(D), unit : mm

Applicable breaker

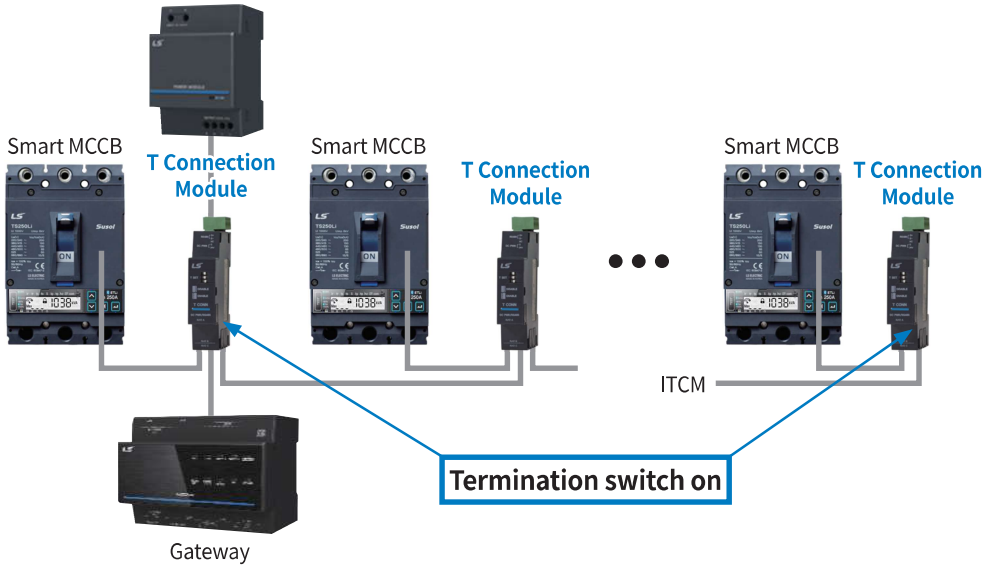
• Susol Smart MCCB • ACB STU • MCB connected by M-link

Exterior description



Device usage example

When you wish to connect n number of devices excluding the upper system, you can conveniently configure them using n number of ITCM. Stable RS485 multi-drop is possible by deadening.

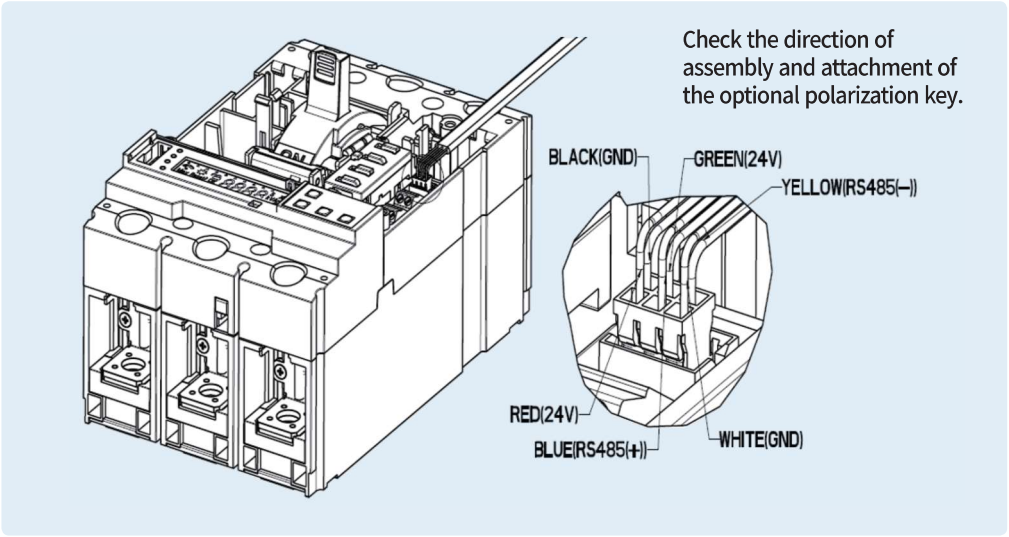


Communication/power connection cable

Specification

This is a communication/power connection cable used to connect Smart MCCB, T connection module and panel display (3.5 inch), etc.
There are three types: 0.35m, 1.3m, and 3m in length.

Type	0.35m	1.3m	5m
Model name	EXIO L350	EXIO L1300	EXIO L3000
Basic function	Communication / power connection		



Exterior description

M LINK

It is a digital input/output and communication module for monitoring the status of on-site contacts, remote control of on-site contacts, and measuring on-site analog values on the low-voltage panel monitoring and control system.

Features

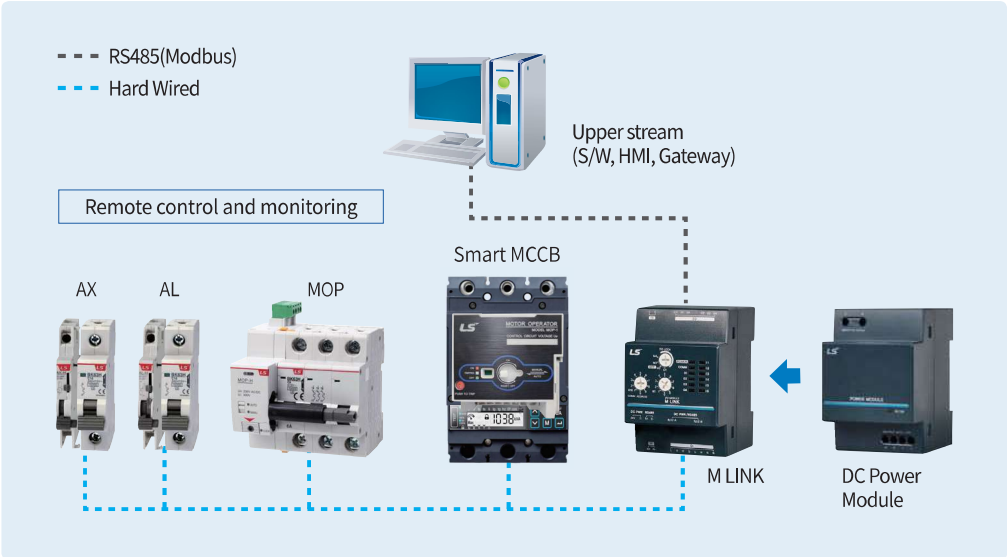
Type			Details
Model name			INM-DC24V-DI6/DO4
Rated voltage			DC24V
Power consumption			1.3W or less
Function			Monitoring function: DI contact monitoring
			Control function: DO contact control
			Analog input value measurement: AI contact input value measurement
			Communication function: RS485 (Modbus)
Input/output contacts	DI	Number of contacts	6 (6 DI, COM.4)
			Note] COM contacts are the same in electrical circuit
		Connection method	Hardwired, pluggable
		Contact method	Dry contact
	DO	Number of contacts	4 (4 DO, 2 Com.)
		Connection method	Hardwired, pluggable
		Rated voltage/current	250Vac/3A, 30Vdc/3A
		Contact method	Non-Latch, A contact (Normal Open)
	AI	Number of contacts	1개 (AI+, AI-)
		Connection method	Hardwired, pluggable
		Input range	DC 4-20mA
Protocol			Modbus RTU
Communication method			RS485
Size			4(W)×81(H)×65(D), uni t: mm
Use temperature			-25 ~ +60 °C
Storage temperature			-40 ~ +80 °C
Ambient humidity			Within 85% RH, no condensation

Exterior description

Device usage example

It can be used a digital input/output (DI/DO) communication module for on/off/trip status monitoring and on/off control of the Circuit breaker (MCB/MCCB). It also provides DI/DO operation function according to the operation mode (M1~M4, DO LOCK) for user convenience.

Operation mode	Function and usage
M1	General DI/DO operation
M2	Remote circuit breaker control
M3	Remote/on-site circuit breaker control
M4	On-site load control (DI/DO linkage control)
DO Lock	General DI operation (DO cannot be controlled)



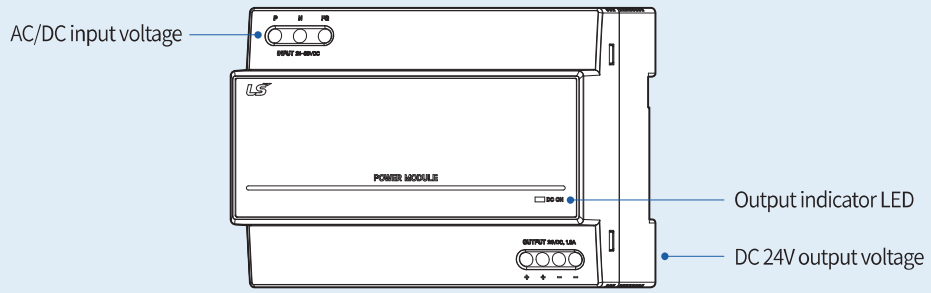
DC Power Module

The DC Power Module is a power supply device that supplies DC24V.
It is composed of 4 types according to the rated voltage of the input.

Specification

Type	Specification			
Model name	IPM6P-DC30V /DC24V24W	IPM6P-DC125V /DC24V24W	IPM6P-AC415V /DC24V24W	IPM6P-AC240V /DC24V60W
Rated voltage	24-30VDC	48-125VDC	380-415VAC	100-240VAC
Input range	20-33VDC	40-138VDC	323-457VAC	85-264VAC
Frequency	-		50/60Hz(45-65Hz)	
Output voltage	24VDC(±5%)			
Output current	1A			2.5A
Use temperature	-25~+60°C			
Storage temperature	-40~+85°C			
Mounting method	Din-rail, Screw(Screw not supplied)			

Exterior description



Device combination

It can be used for the device that uses DC 24V as an input power supply and can be combined with Smart LV panel components. It can be combined with 24 ~ 60W DC power module.

			
ACB STU Atype - 3W, P/Stype - 5W	Smart MCCB - 1W	M-Link - 1.3W	Panel HMI(3.5 inch) - 3W
			
TRIO – 5W	Ethernet / Converter - 1W	Gateway - 11W	E-Collector - 5W
			
Panel HMI(7.0 inch) - 23W	Thermal imaging camera- 2W		

Device usage example

1) Composition of Smart MCCB + M LINK panel

- If Smart MCCB 6EA, M LINK 8EA and panel HMI (3.5 inch) 2EA are connected to 24W DC power module ((6 × 1W) + (8 × 1.3W) + (2 × 3W)), it can be used stably.
- The T connection module is a necessity for device branching. The power consumption is close to zero.

2) Composition of ACB+Smart MCCB+M LINK panel

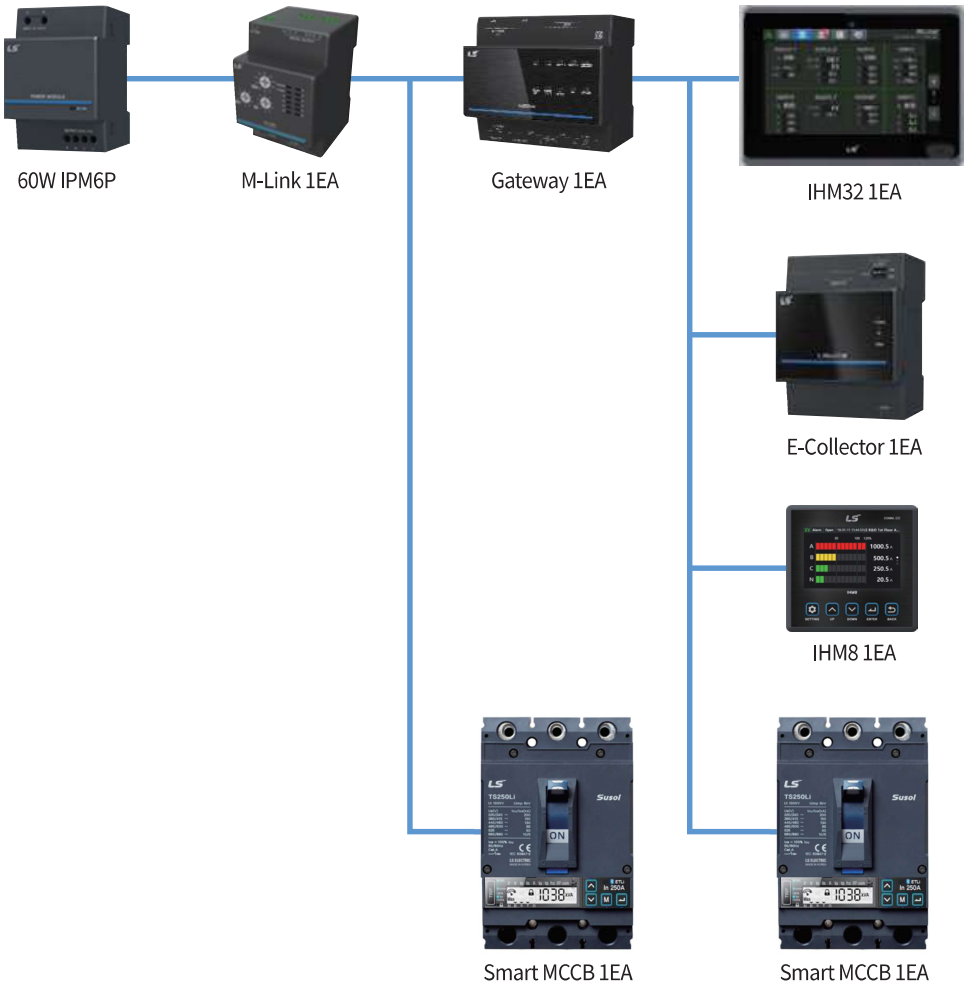
- If ACB 1EA, Smart MCCB 3EA, M LINK 4EA and Panel HMI (3.5 inch) 1EA are connected to 24W DC power module (5W + (3 × 1W) + (4 × 1.3W) + 3W), it can be used stably.
- The T connection module is a necessity for device branching. Power consumption is close to zero.

DC Power Module

Product combination (example)

3) Smart LV Feeder panel composition

- Use 60W IPM6P to compose a Smart LV feeder panel. The sum of the power consumption of M-Link and gateway, IHM32, E-collector, IHM8, and Smart MCCB 2EA is (1.3W + 11W + 23W + 5W + 3W + 1*2W) 45.3W, which will enable using the system in a stabilized manner.
- ITCM is a required item for branching the product, and the power consumption is almost 0.



4) You can make different combinations of LV panels to fit your purpose.

⚠ User Precautions (Danger)

※ Make sure that the upper-level breaker is OFF when installing or maintaining the product.
- There is a risk of serious injuries or even death due to electrocution.

※ Do not contact the exposed part of the terminals while the system is energized.
- There is a risk of serious injuries or even death due to electrocution.

⚠ Check before use

※ Make sure the specification of the product matches the specification of your order.
- If the ratings of the product are different, it may result in burn damage of the product or a fire.

※ Check for loose/dislocated items or damages during transportation.
- Product damages may lead to a failure or a malfunction.

※ To install or maintain the product, make sure the job is performed by a qualified technician.
- Erroneous installation or maintenance work may result in a malfunction or an accident.

⚠ User Precautions (Caution)

※ Make sure that the power cable is connected to the INPUT.
- An erroneous wiring can result in damage to the product.

※ Make sure to use the rated input voltage indicated on the product.
- An incorrect input voltage may damage the product.

※ The input/output lines must be separated from a high-voltage cable or a power cable by at least 10cm so that the equipment is not affected by noises or fluctuations of magnetic fields.
- Erroneous installation or maintenance work may result in a malfunction or an accident.

※ Do not disassemble or modify the product unless you are authorized to do so.
- This may result in a failure or a malfunction, even injuries or a fire.

※ Operate the product within its operating temperature range.
- Otherwise, the product may be damaged, or the performance may be affected negatively.

External accessory

i-Tester

The i-Tester (Intelligent Tester) is an accessory to test-drive ACB/MCCB. As a stand-alone type, it not only performs various relay tests such as manual/auto/user tests, but also has various functions such as self-calibration function, device information setting, relay setting, and device status checking. In addition, it supports 256×128 graphic LCD and supports not only English but also Chinese and Russian languages. It has the function to output the test and test results in the same way using the upper Manager S/W.

Features

- **Calibration function**
  - The calibration function of i-Tester is used to calibrates the error using the output value set in i-Tester and the measurement current data.
- **Device H/W setting function**
  - It consists of the part to set the system configuration and time of the device and the part to set the language and time of the i-Tester itself.
- **Relay setting function**
  - It consists of the part to check the current relay element of the device and the part to set the relay.
- **Relay test**
  - As a part for testing the relay, it is composed of manual/automatic/user tests so that various relay tests can be conducted.
- **Control function**
  - It provides a function to clear or reset the device data and to control DO and CB.
- **System information**
  - It consists of the device information, relay status, and tester system information.
- **Test history**
  - It consists of a part to check the test history stored in i-Tester and a part to delete the saved history information.

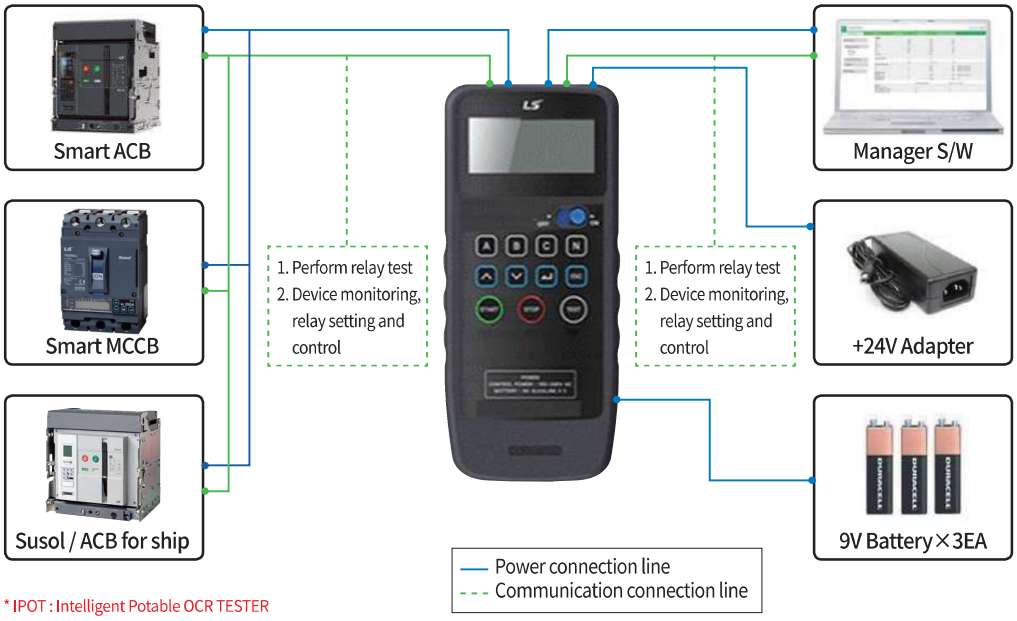
Specification

Type	Details
Model name	IPOT
Rated voltage	DC24V adapter, 9V alkaline battery 3EA, USB or rechargeable battery (10000mAH or more)
HMI	Graphic LCD module(256×128 Graphic LCD)
Supported language	English, Chinese, Russian
Key functions	· Device information checking function (information, DI, DO, self-diagnosis) · Relay and H/W information setting function · Device control and reset function · Relay test function - Manual/auto/user test function · Test history storage (up to 255) and output (PDF) function
LCD composition	Navigation TREE configuration for all
Size	98(W)×210.5(H)×43.5(D), unit : mm

Exterior description

Type	Details
❶ Power switch	Power On/Off function
❷ LCD	256×128 graphic LCD
❸ KEY PAD	Menu navigation, setting and operation buttons
❹ Adapter terminal	DC24V power input terminal
❺ USB terminal	USB communication connection terminal (USB2.0)
❻ Signal port	Signal terminals for device testing
❼ Battery	Equipped with 9V alkaline batteries (×3ea)

Device usage example



* IPOT : Intelligent Potable OCR TESTER

Target device

Circuit breaker	Smart ACB(STU), Susol/Metasol ACB(OCR), Smart MCCB, TS1600

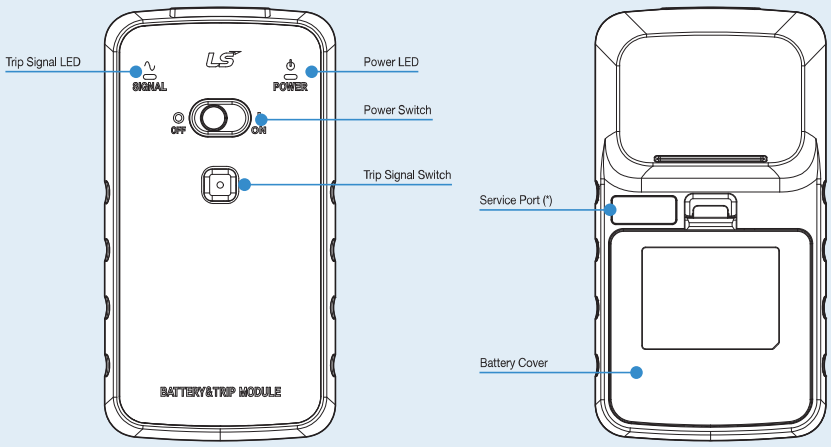
Portable Battery & Trip Module

It is a portable battery module that can power the Smart MCCB and test the trip function.
The user can change and check the settings by applying power to the Smart MCCB while carrying this device, and easily check the trip function, which is the most important function.

Specification

Type		Details
Target device		Smart MCCB
Input power		AA size serial battery 2EA (battery specification : DC1.5V)
Output	Power supply	DC 12V(±5%)
	Trip signal	AC 0.9V, 60Hz(±15%)
Device operating time (battery replacement time)		More than 8 hours of continuous use ※The usage time can be changed depending on the battery capacity
Switch	Power supply	Slide switch, power supply On/Off
	Trip signal	Tact switch, Trip signal On/Off
LED	Power supply	Orange, DC 12V output status display
	Trip signal	Green, AC 0.9V Trip signal output status display
Size		72(W) × 135(H) × 34.5(D)

Exterior description



Operation method

❶ Check the power switch off status of the portable battery module.
※ If the battery is connected while the power switch is on, an error may occur in the device.

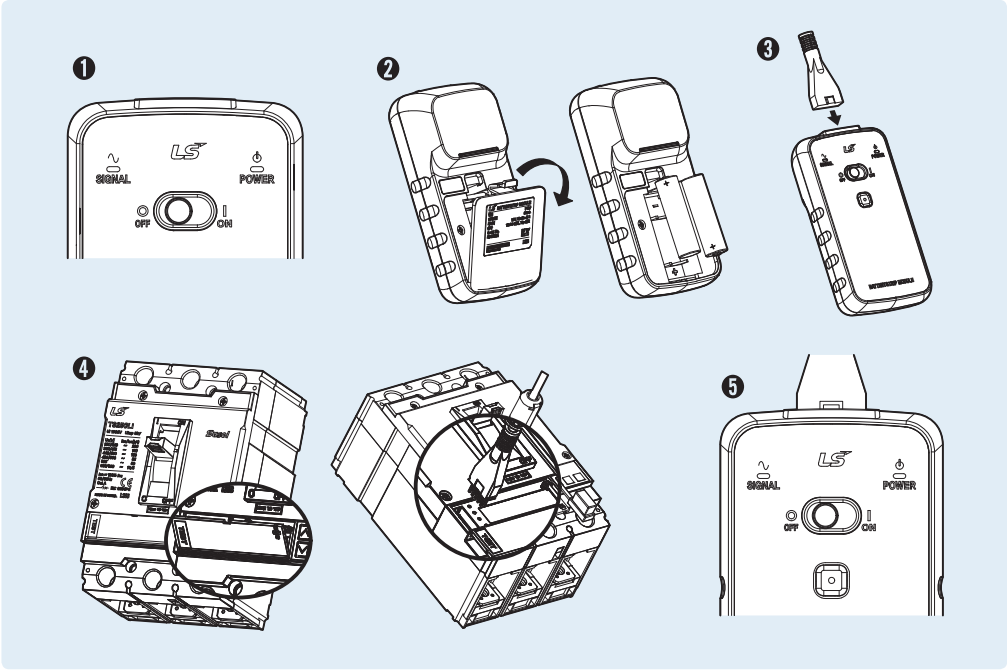
❷ Open the battery cover on the back and install 2EA of AA size batteries.

❸ Close the battery cover and connect the tester cable.

❹ Open the glass cover of Smart MCCB and connect the Tester cable to the TEST port.
※ If the direction of the tester cable does not match, an error may occur in the device.
※ If the Tester cable is connected while the power switch is on, an error may occur in the device.

❺ Operate the power switch of the portable battery module to On.
- Check that the power is turned on to the Smart MCCB,
and check and opearte the Smart MCCB settings using the Smart MCCB key.
- The Trip test of Smart MCCB can be performed using the Trip button of the portable battery module.

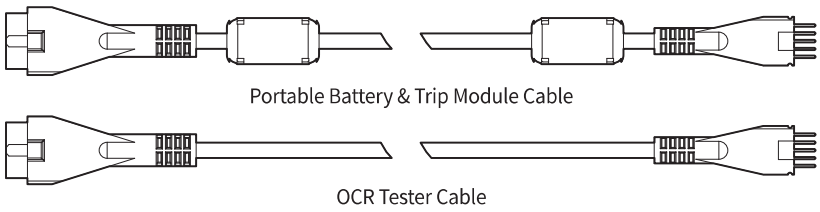
❻ After using the portable battery module, operate the power switch to the Off status.



Tester Cable

The test cable is used to connect a portable battery module and a Smart MCCB.

Tester Cable Specifications



Model name	Items	length
Portable Battery & Trip Module Cable	Apply filter beads	1M
OCR Tester Cable	Exclude filter beads	

⚠ User Precautions (Danger)

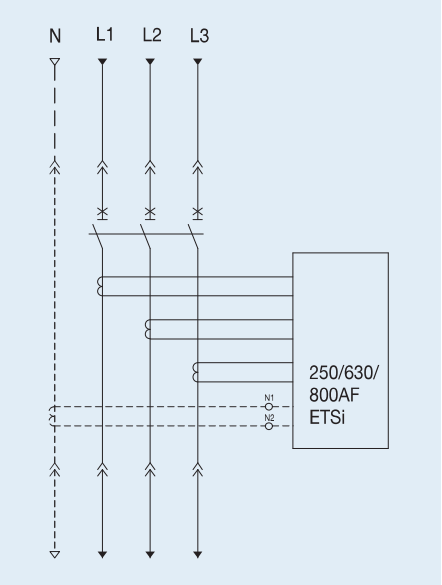
※ If the power supply LED is not turned on after turning on the power switch, replace the battery.
※ Be mindful of the direction of the tester cable when using one.
※ Tester cables are sold separately.

Wiring diagram (State of operation)

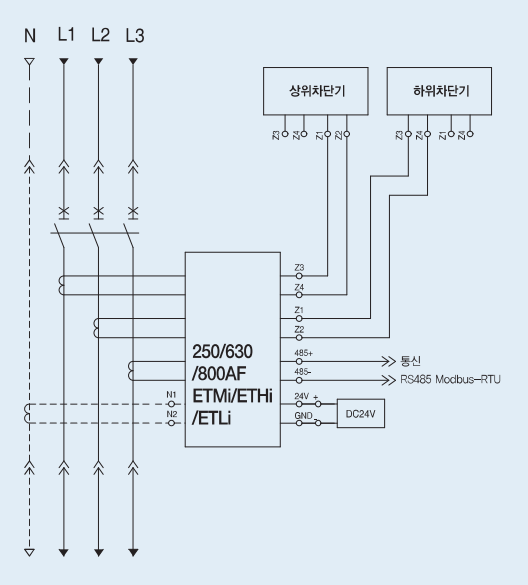
ETSi
ETMi
ETHi
ETLi

The diagram is shown in the following conditions:

- Fixed version circuit-breaker (depending on type of circuit-breaker)
- Circuit breakers open.
- Releases not tripped



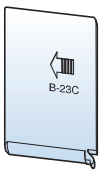
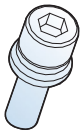
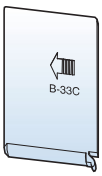
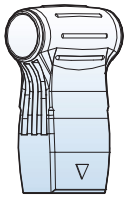
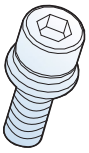
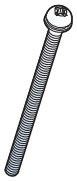
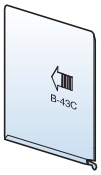
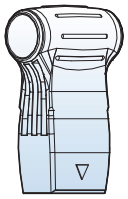
Three-pole circuit-breaker with
250/630/800AF ETSi electronic release



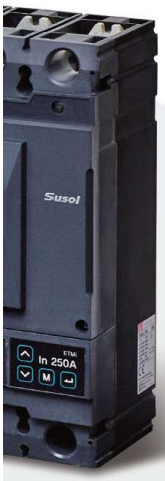
Three-pole circuit-breaker with
250/630/800AF ETMi/ETHi/ETLi electronic release

Standard accessories

The following accessories for mounting, connection, insulation, handle operation are standard items and are packed with Susol TS series circuit breakers.

	Screw for connection of terminals, Spreader	Screw for mounting	Nut for mounting	Insulation barrier	Auxiliary handle
TS100 TS160 TS250	 M8×20	 M4×75			
	3P : 6pcs 4P : 8pcs	3P : 2pcs 4P : 4pcs		3P : 4pcs 4P : 6pcs	
TS400 TS630	 M10×30	 M5×85	 M5		
	3P : 6pcs 4P : 8pcs	3P : 4pcs 4P : 4pcs	3P : 4pcs 4P : 4pcs	3P : 4pcs 4P : 6pcs	1pc
TS800	 M12×35	 M6×100	 M6		
	3P : 6pcs 4P : 8pcs	3P : 4pcs 4P : 4pcs	3P : 4pcs 4P : 4pcs	3P : 4pcs 4P : 6pcs	1pc


LS
TS800Li
Susol
ON
In 800A
TS250Li
In 250A
TS630Li



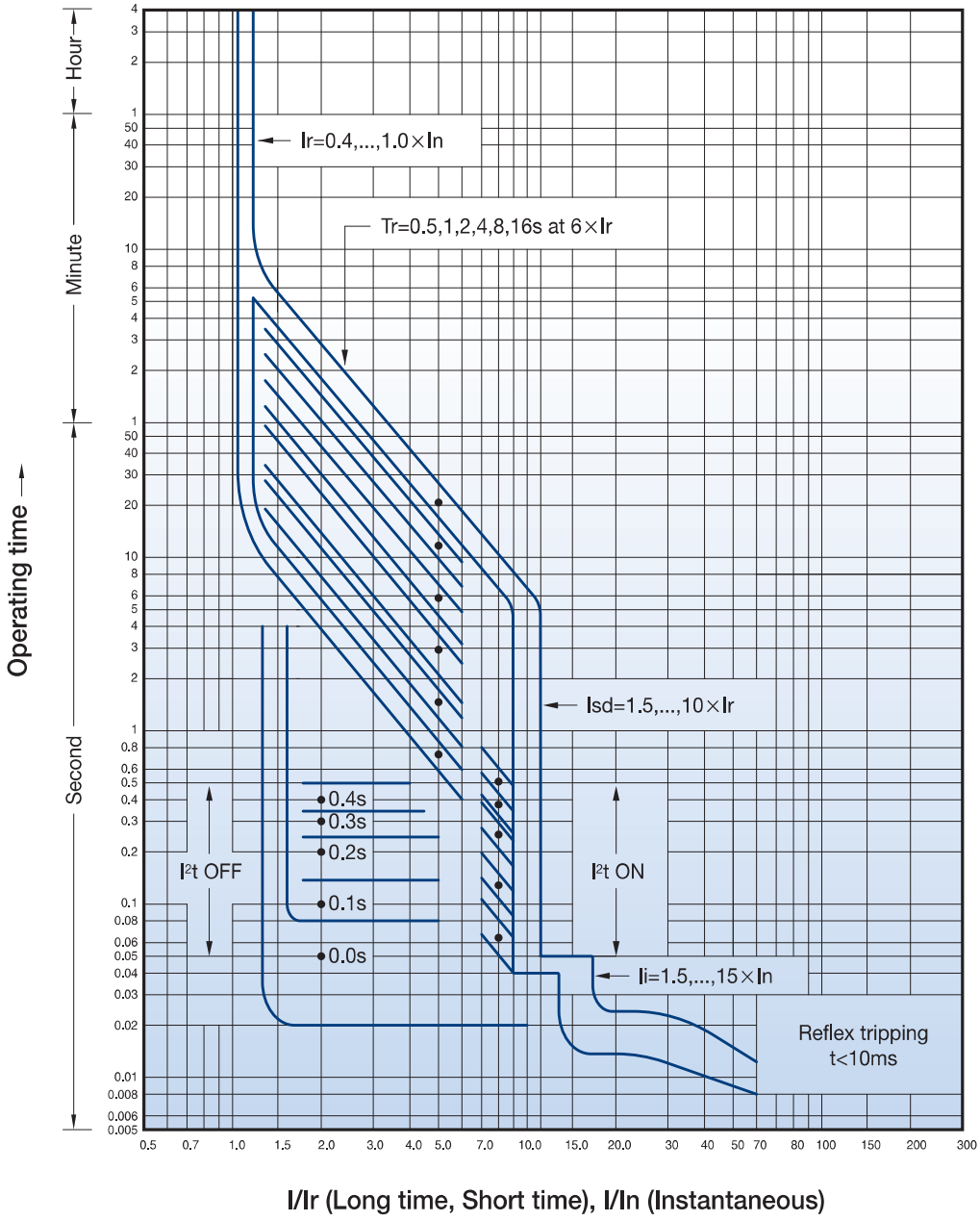
Characteristics curves, Dimensions and Mounting & Connection

Characteristics curves

Electronic trip unit, ETSi, ETMi, ETHi, ETLi

TS100Ni/Hi/Li
TS160Ni/Hi/Li
TS250Ni/Hi/Li

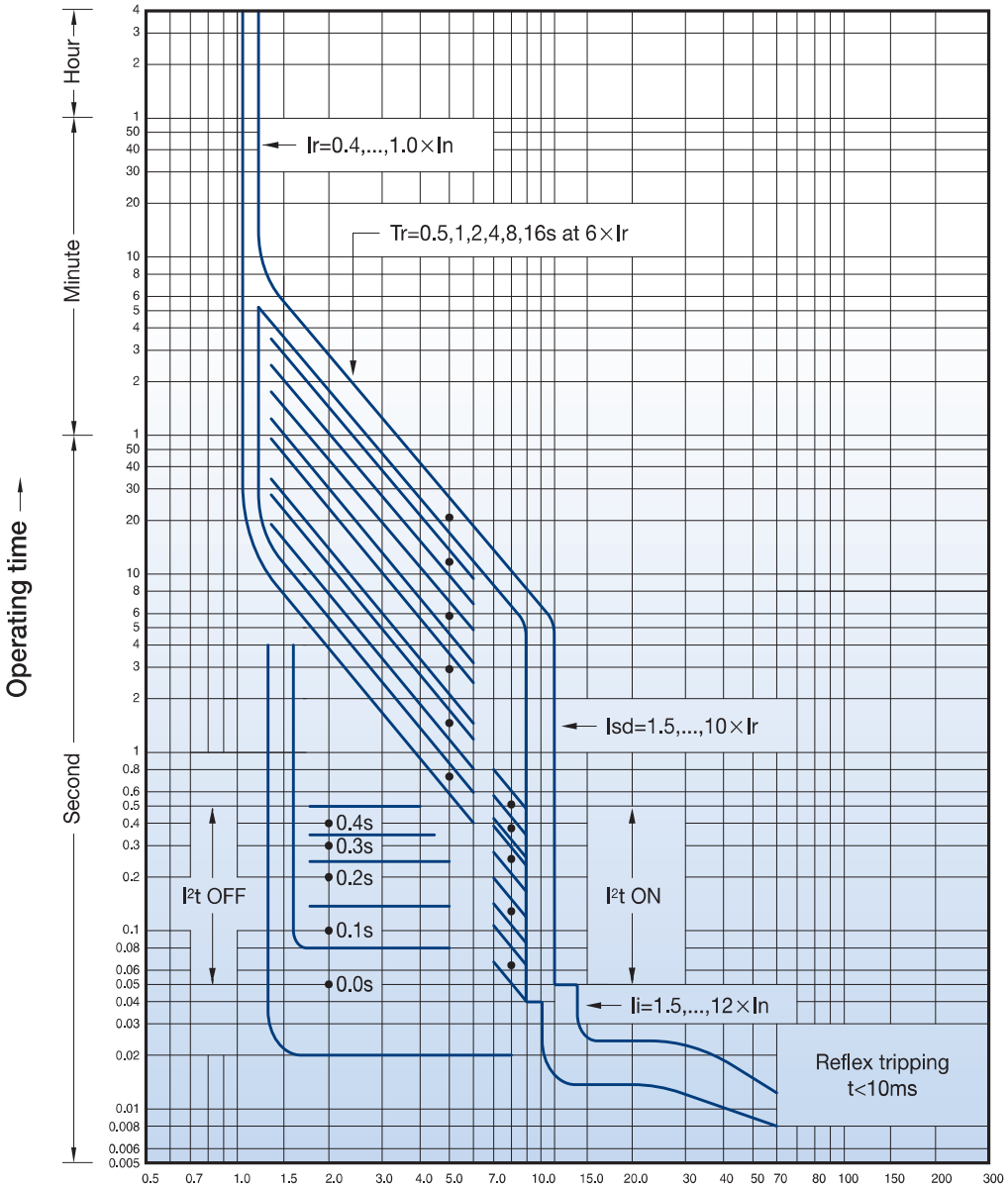
Rated current 40 ~ 160A



Electronic trip unit, ETSi, ETMi, ETHi, ETLi

Rated current 250 ~ 400A

TS250Ni/Hi/Li
TS400Ni/Hi/Li



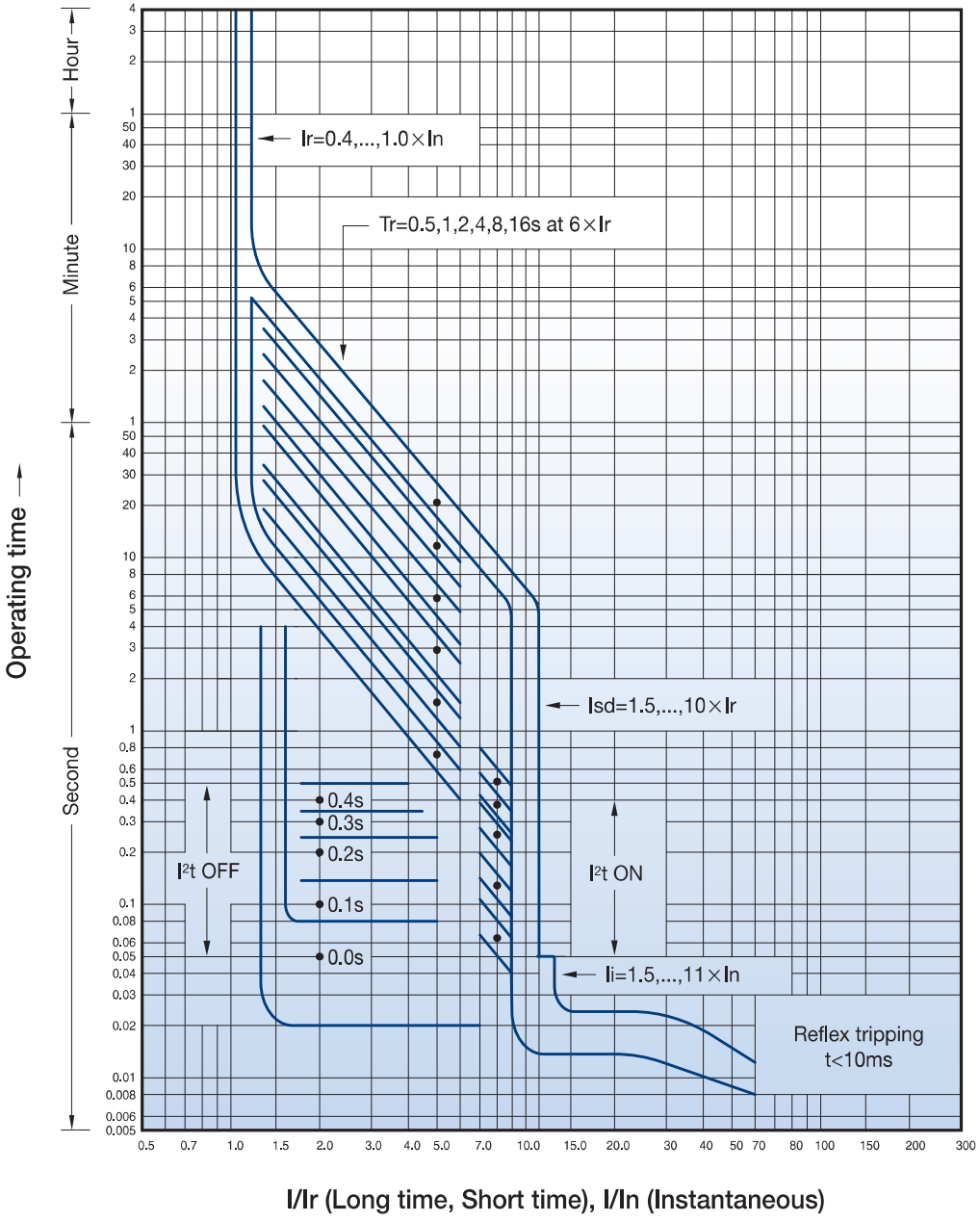
I/Ir (Long time, Short time), I/In (Instantaneous)

Characteristics curves

Electronic trip unit, ETSi, ETMi, ETHi, ETLi

Rated current 630 ~ 800A

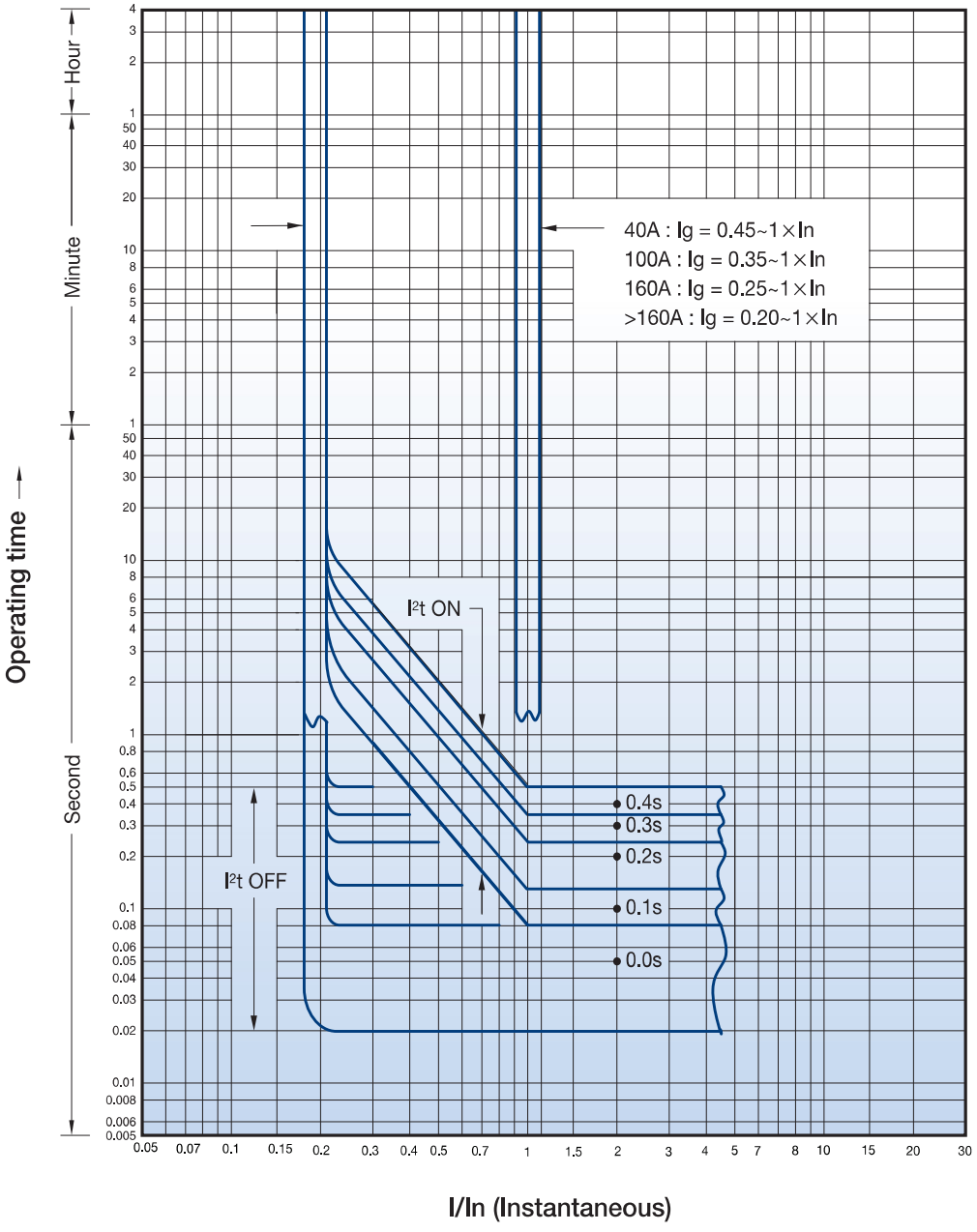
TS630Ni/Hi/Li
TS800Ni/Hi/Li



I/Ir (Long time, Short time), I/In (Instantaneous)

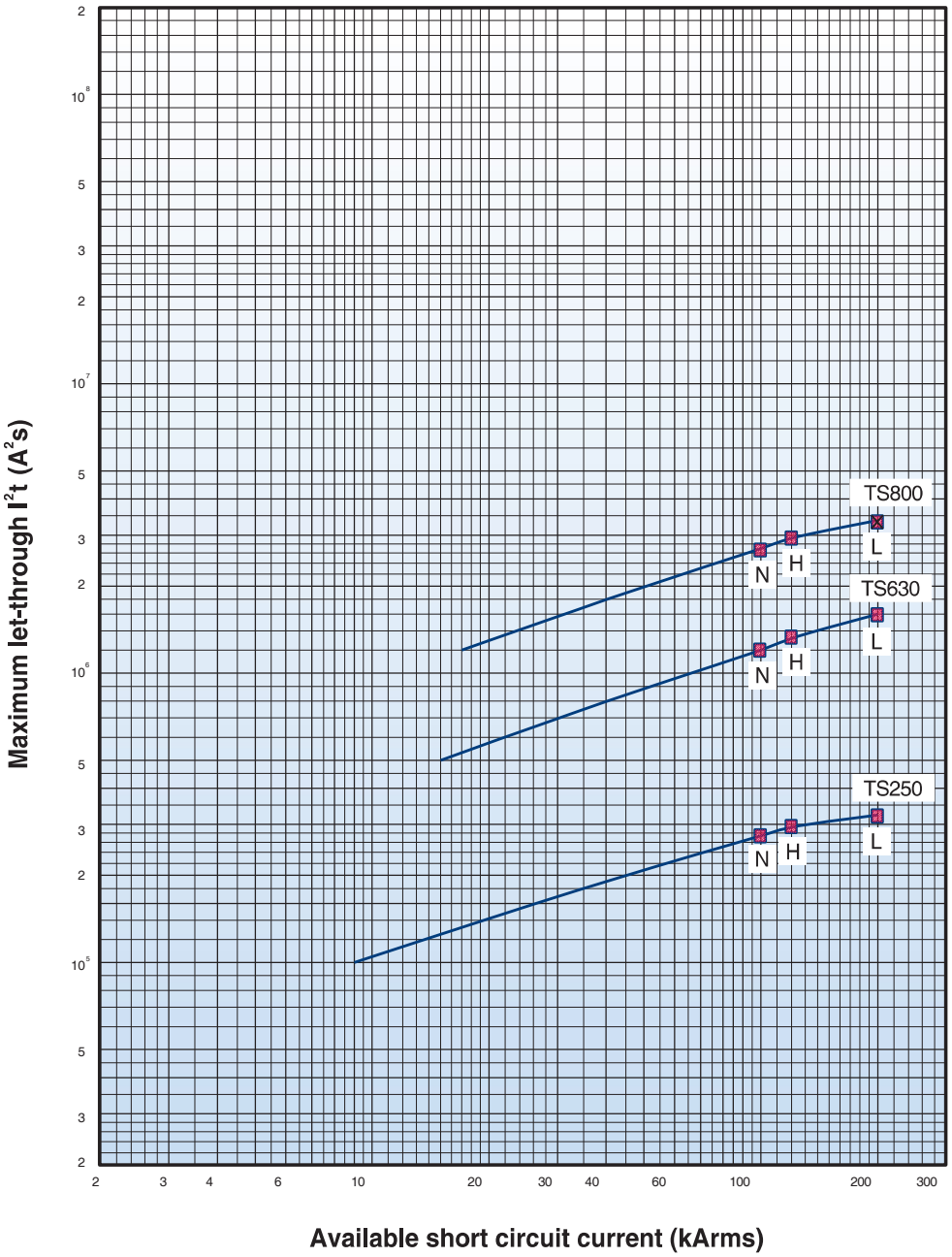
Ground fault, ETSi, ETMi, ETHi, ETLi

TS100Ni/Hi/Li
TS160Ni/Hi/Li
TS250Ni/Hi/Li
TS630Ni/Hi/Li
TS800Ni/Hi/Li



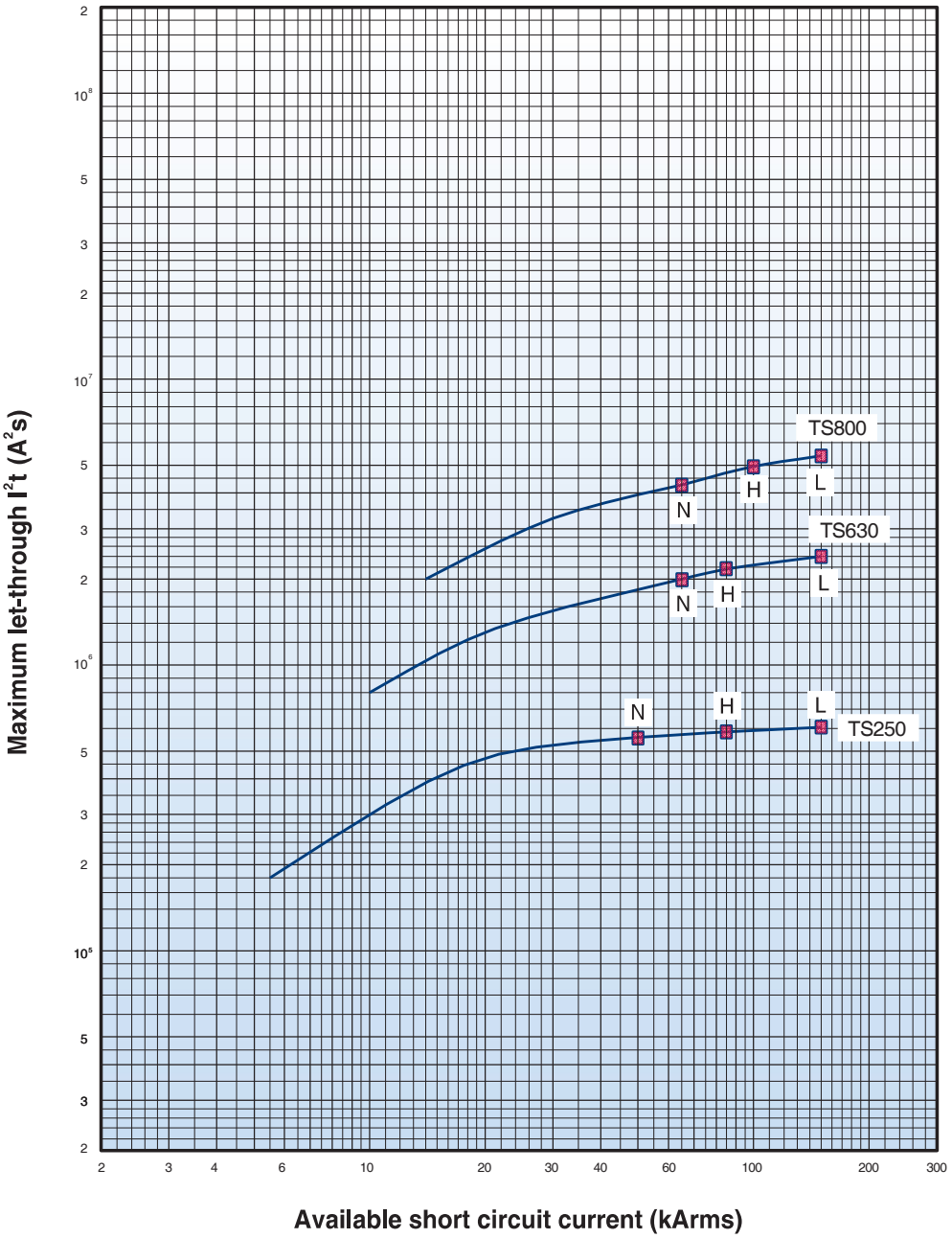
let-through energy curves

220/240V
Thermal stress



Specific let-through energy curves

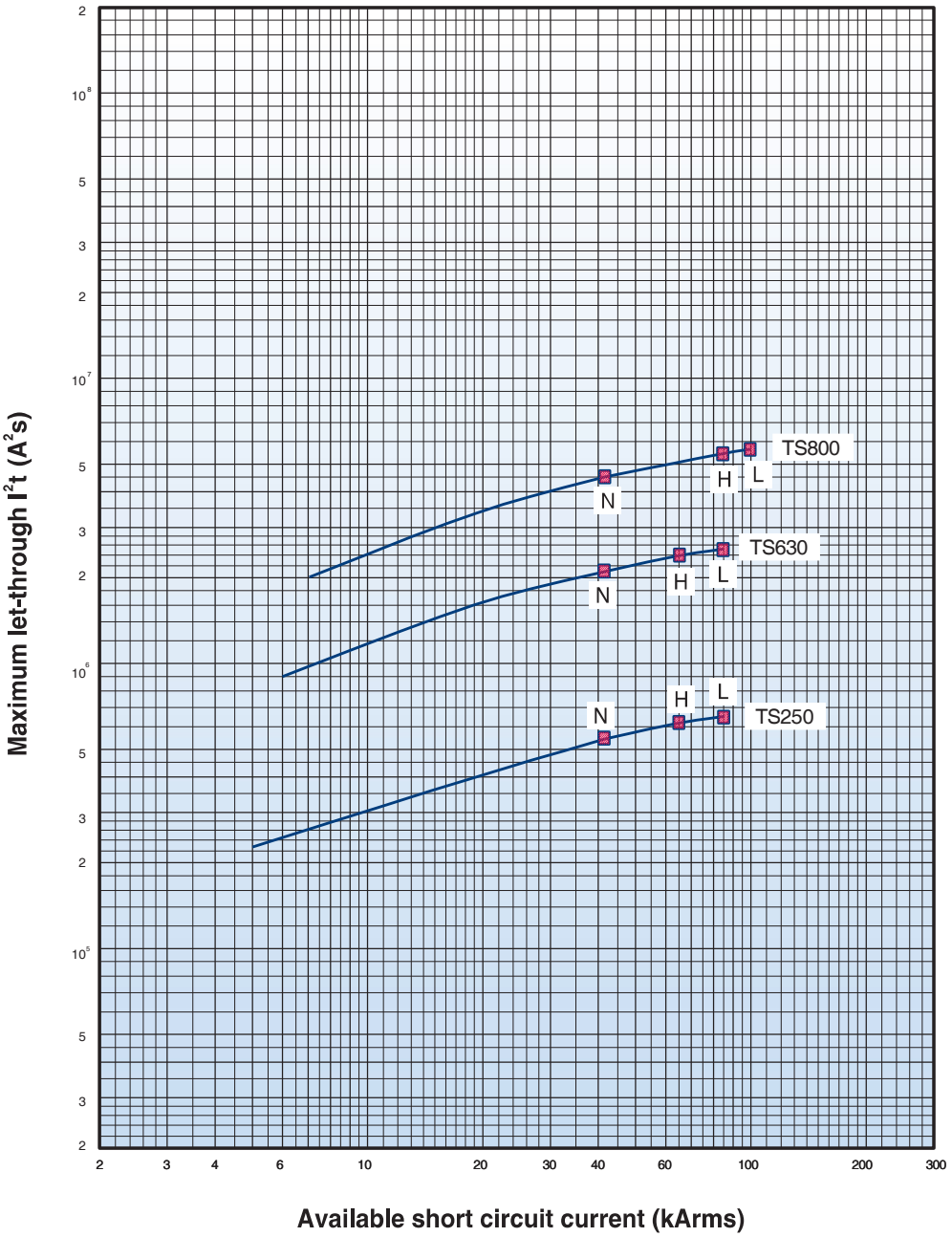
380/415V
Thermal stress



Characteristics curves

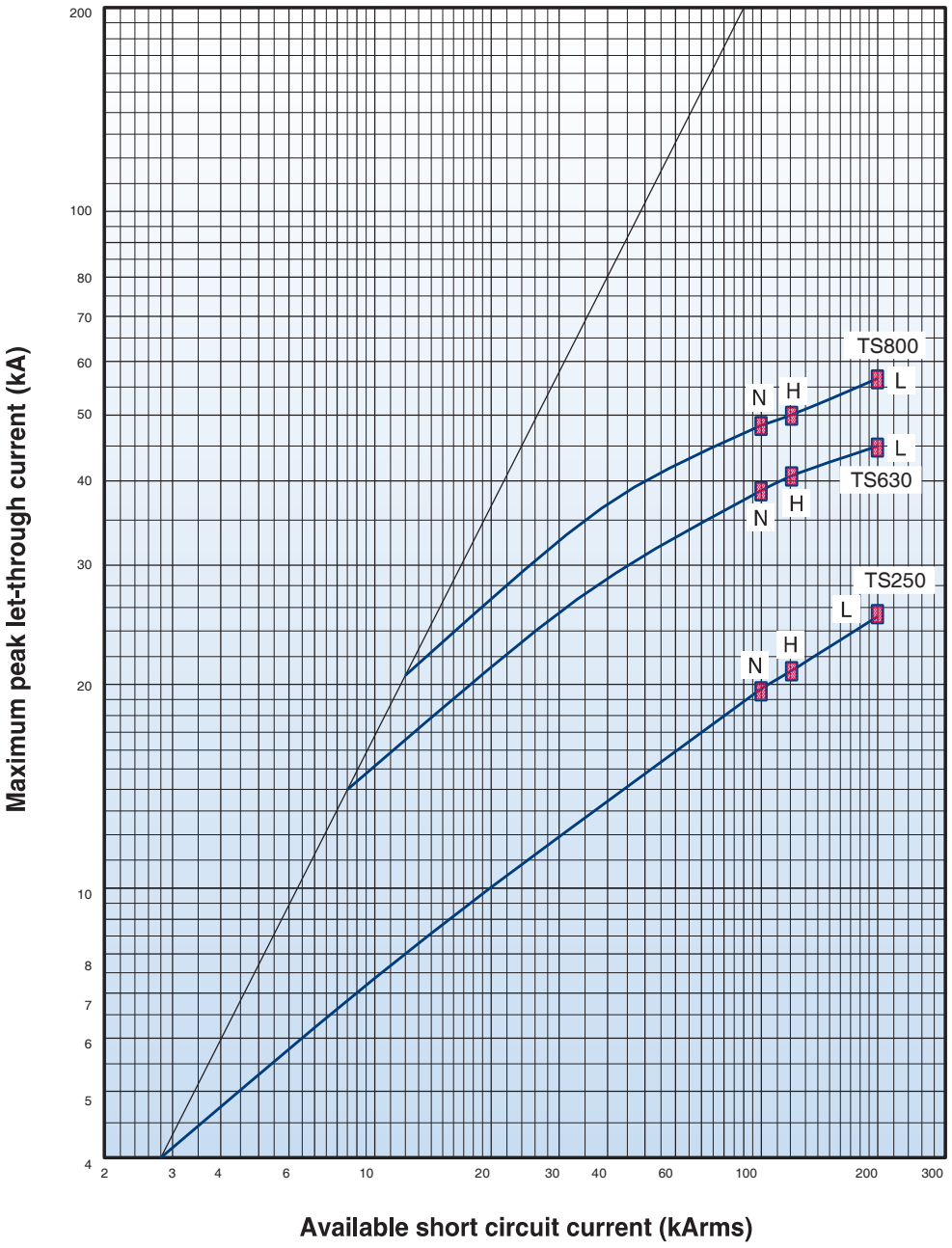
Specific let-through energy curves

480/500V
Thermal stress



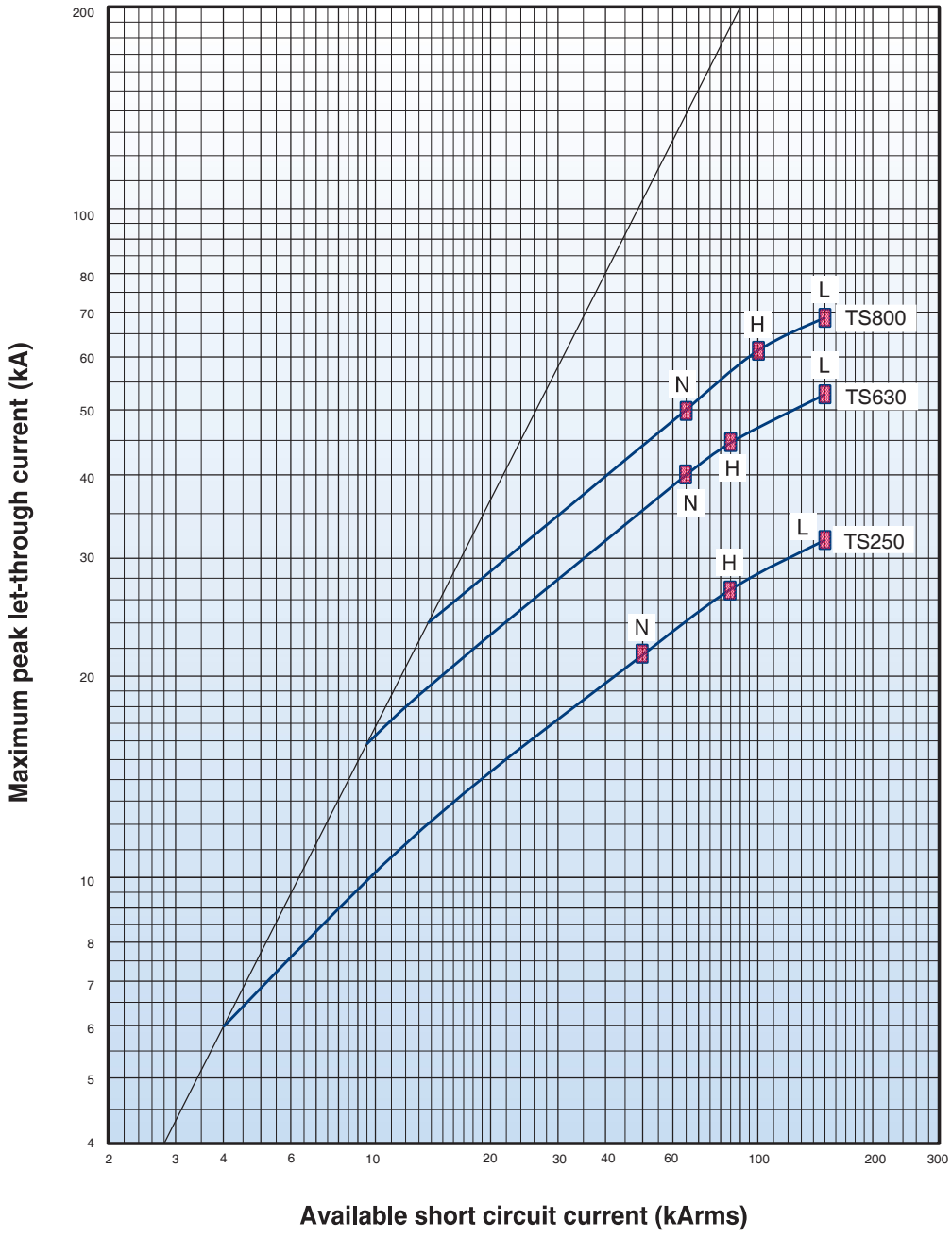
Current-limiting curves

220/240V
Peak current



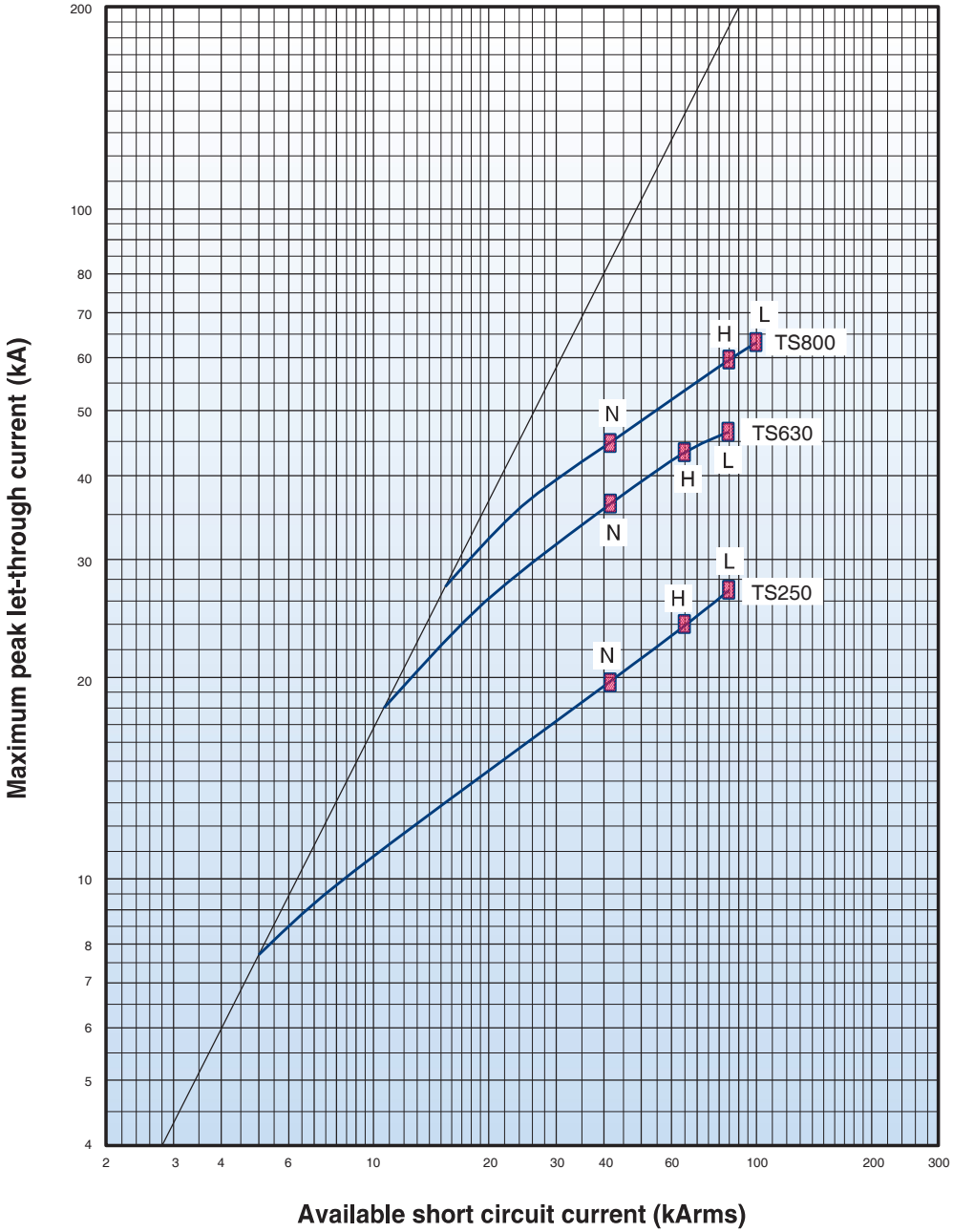
Current-limiting curves

380/415V
Peak current



Current-limiting curves

480/500V
Peak current

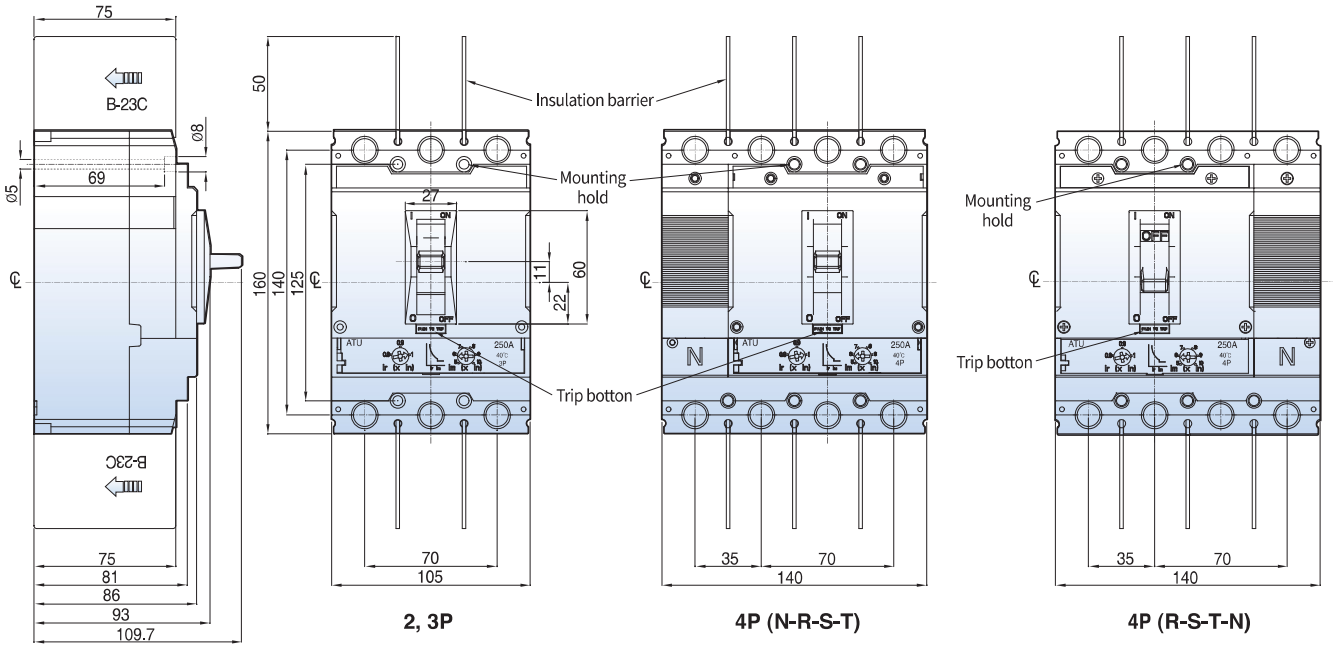


Dimensions

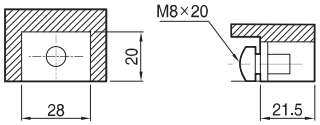
Circuit breaker

TS100, 160, 250

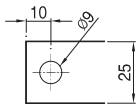
[mm]



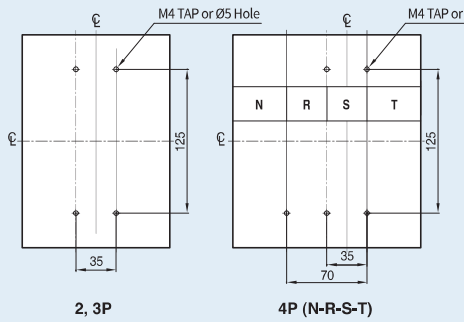
Terminal section



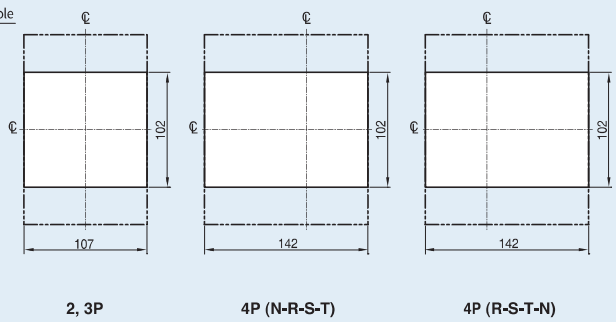
Conductor



Panel drilling

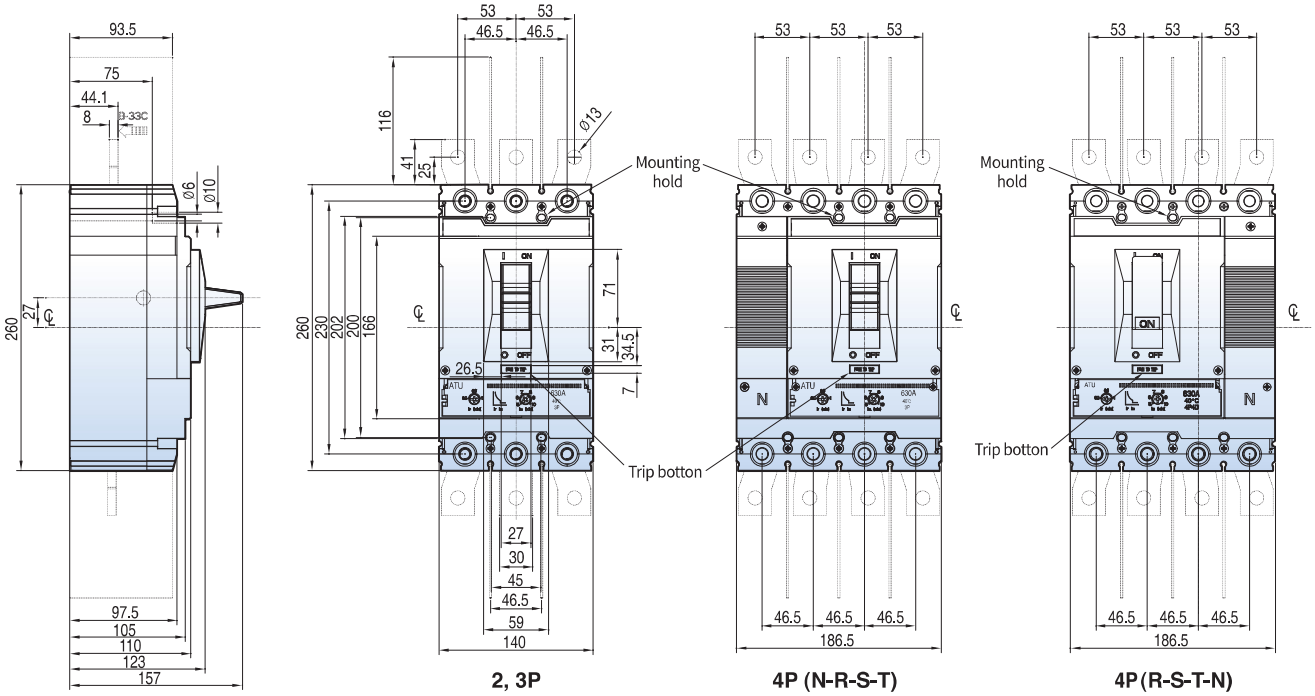


Front panel cutting

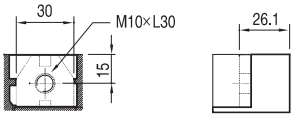


TS400, 630

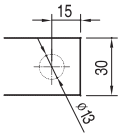
[mm]



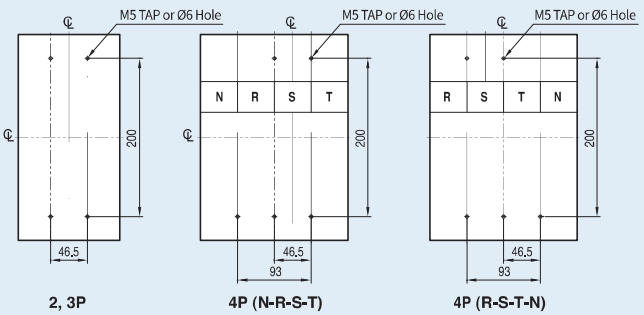
Terminal section



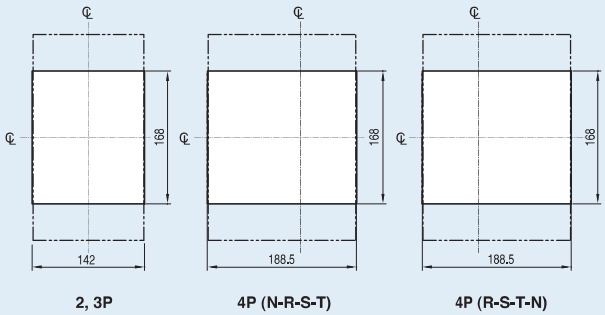
Conductor



Panel drilling



Front panel cutting

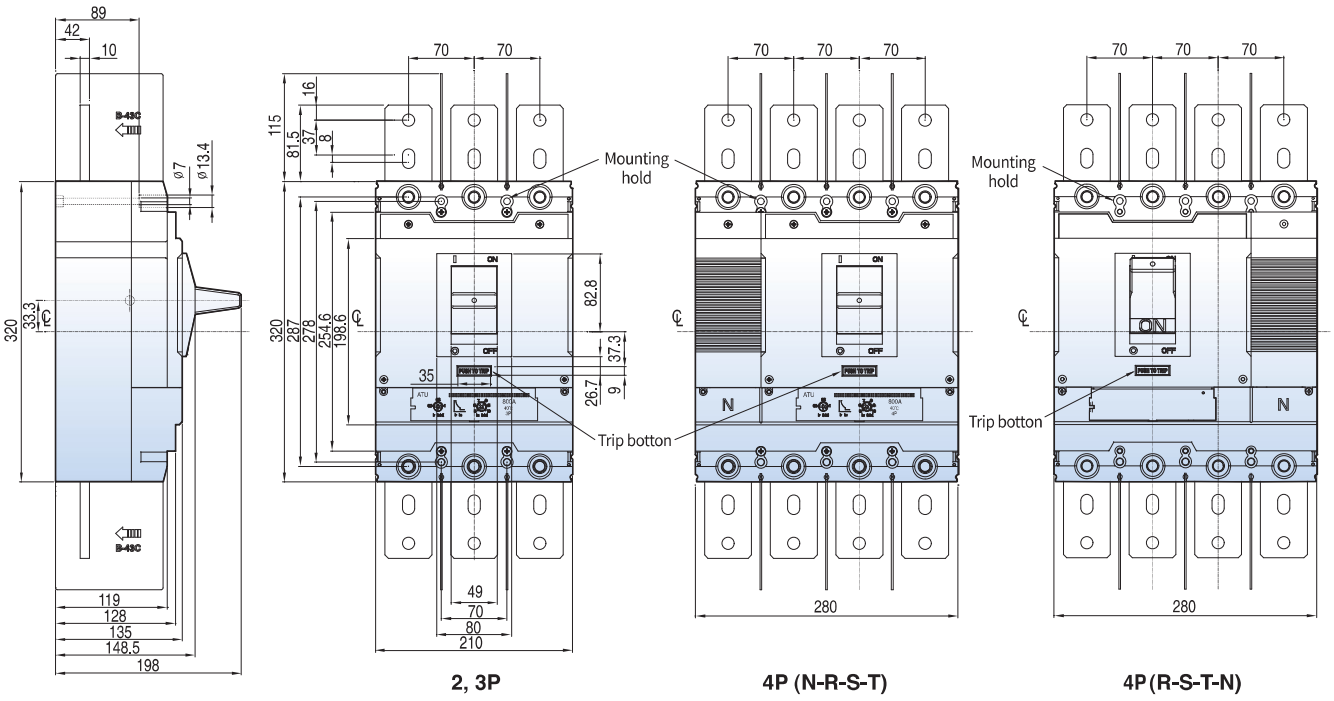


Dimensions

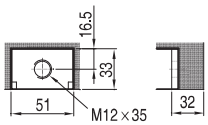
Circuit breaker

TS800

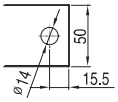
[mm]



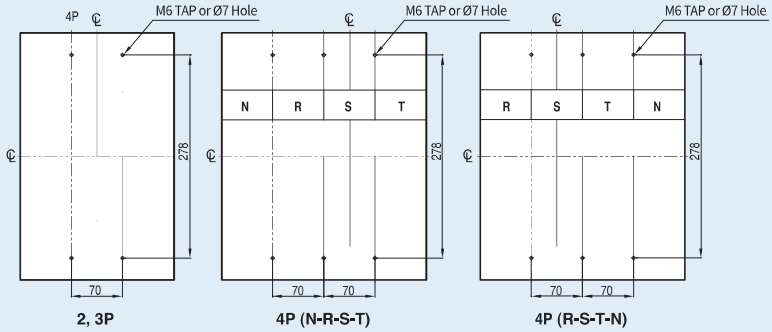
Terminal section



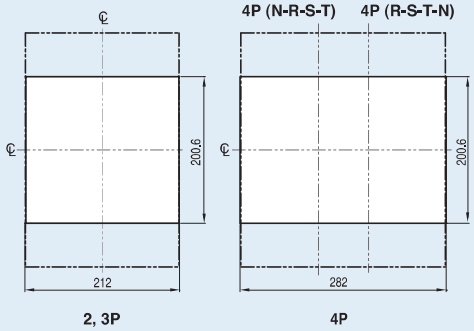
Conductor



Panel drilling



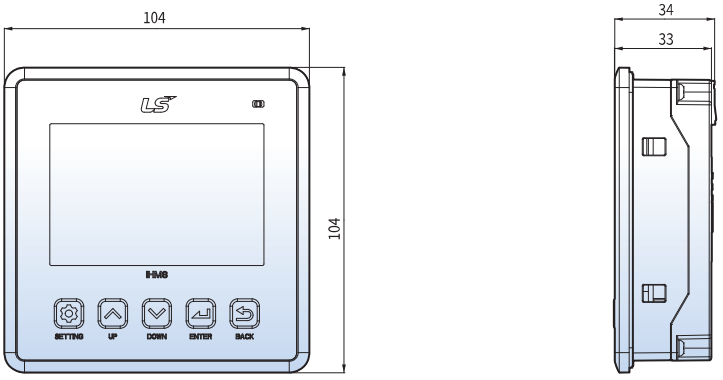
Front panel cutting



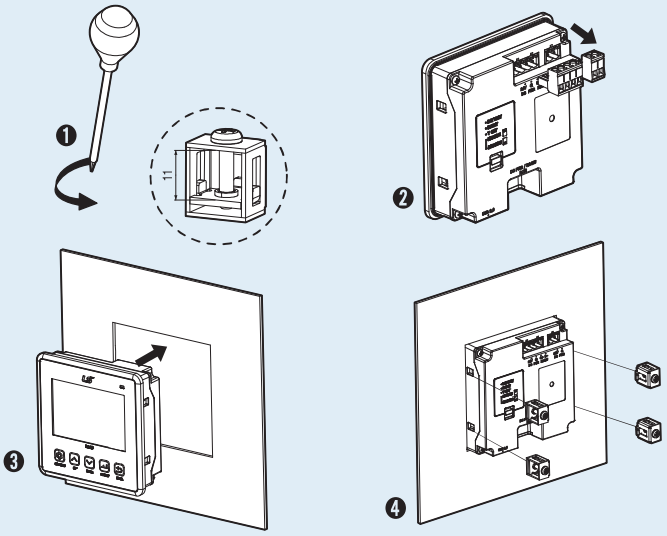
Panel HMI (3.5inch)

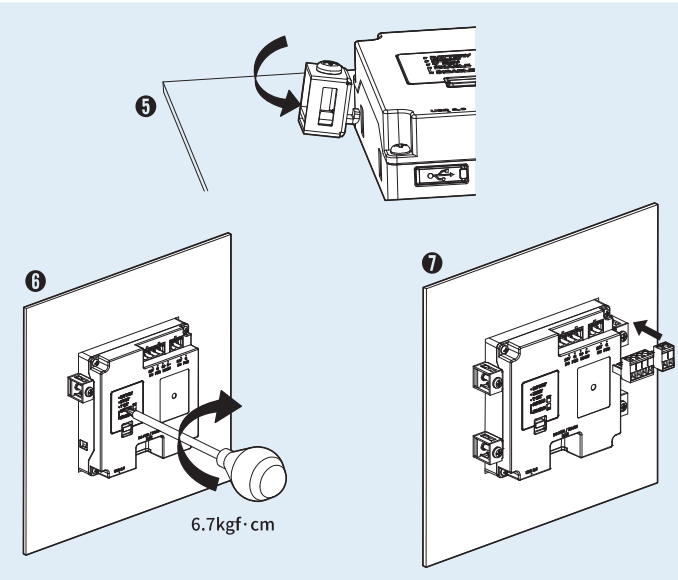
Dimension

[mm]



Mounting method



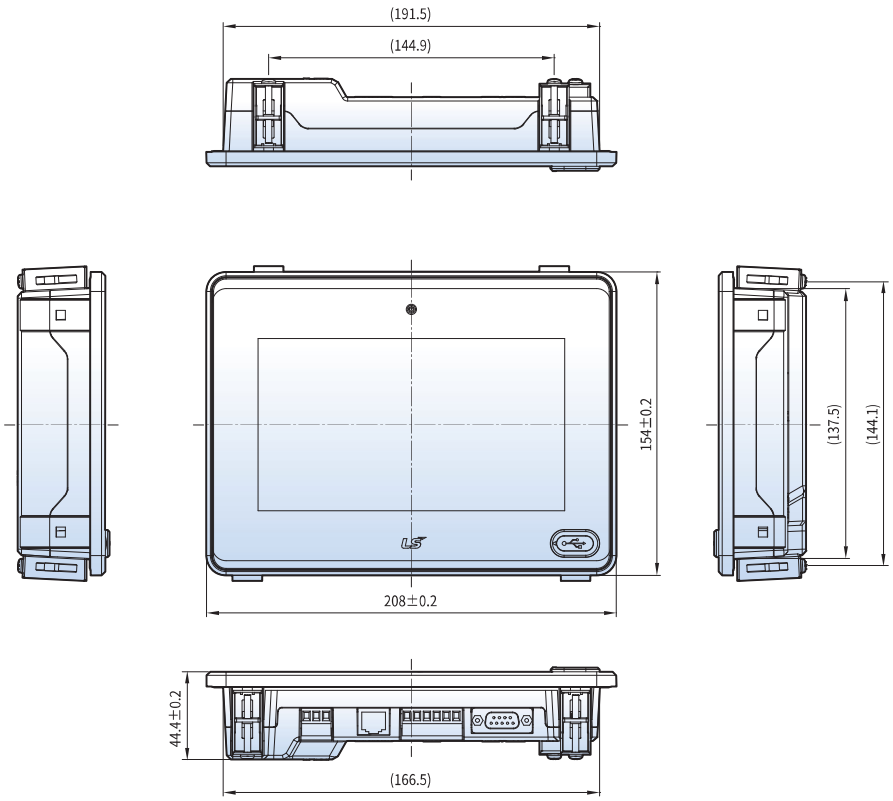


Dimensions

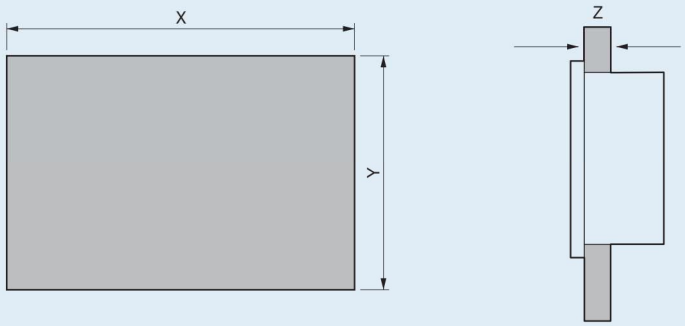
Panel HMI (7.0inch)

Dimension

[mm]



Mounting method

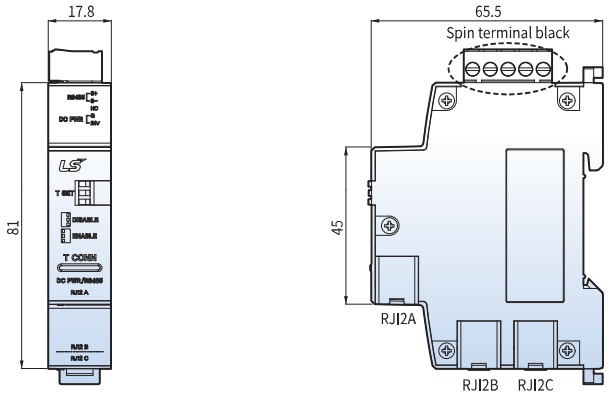


Items	X (width)		Y (height)		Z (depth)
Panel HMI(3.5Inch)	98	+0.3 -0	96.4	+0.3 -0	1.6 ~ 3
Panel HMI(7.0Inch)	192	+1 -0	138	+1 -0	1.6 ~ 95

T Connection Module

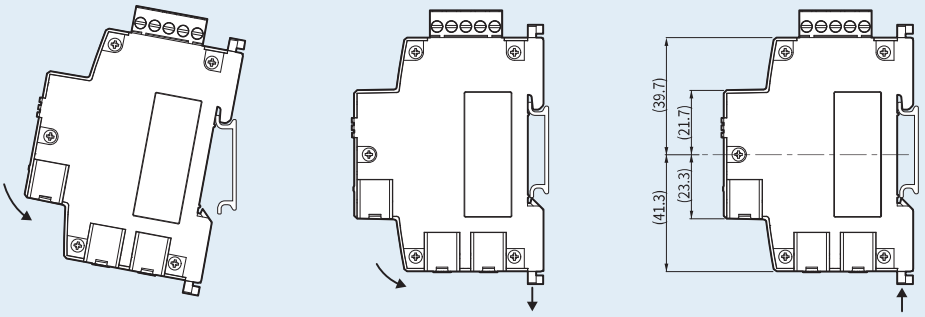
Dimension

[mm]



Mounting method

DIN-RAIL mounting

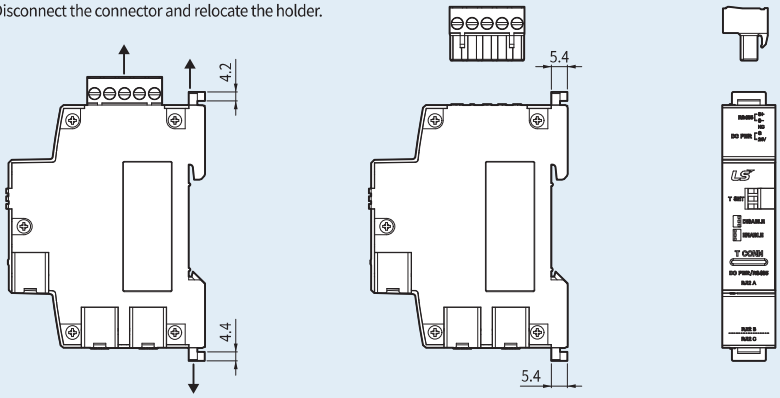


* The DIN-RAIL pushes the holder.

* The holder's tension will turn it to the original position.

Screw mounting

* Disconnect the connector and relocate the holder.



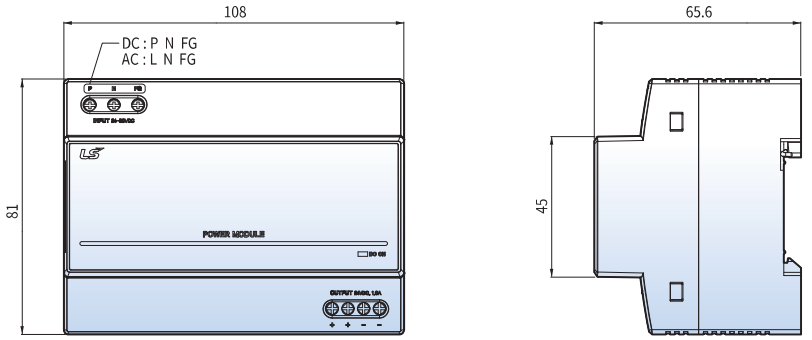
* The screws are not included (Ø3.5 recommended).

Dimensions

DC Power Module

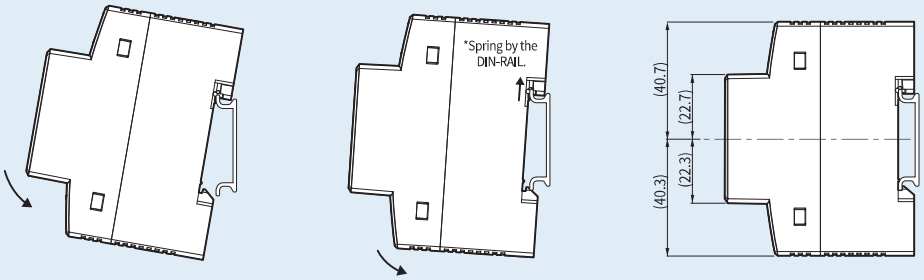
Dimension

[mm]

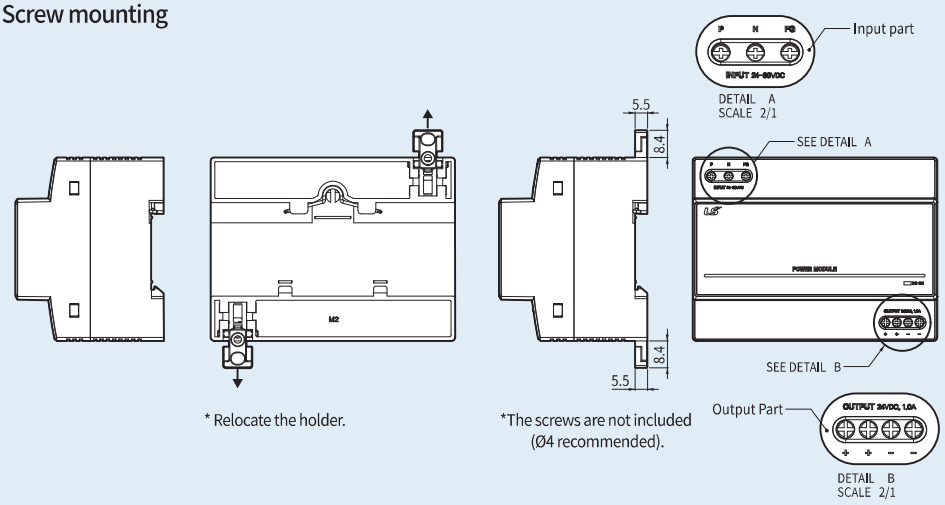


Mounting method

DIN-RAIL mounting

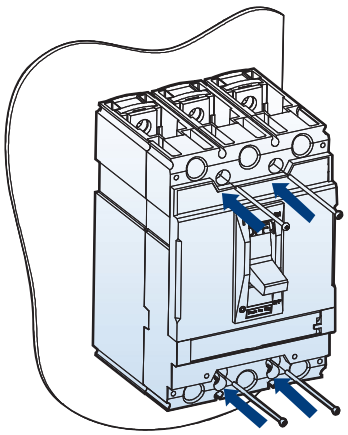


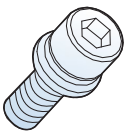
Screw mounting



Fixed mounting

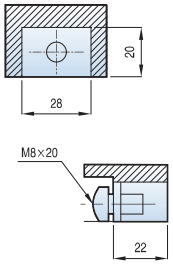
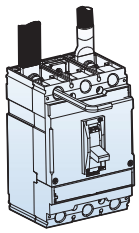
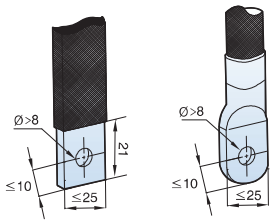
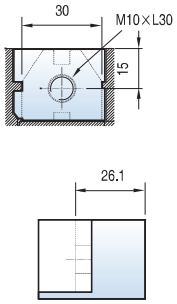
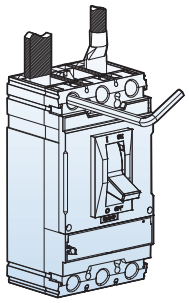
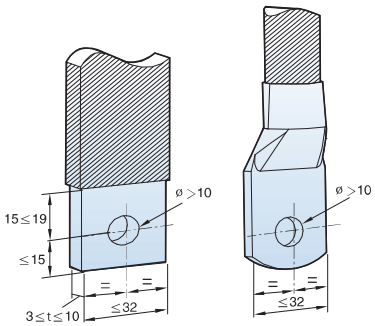
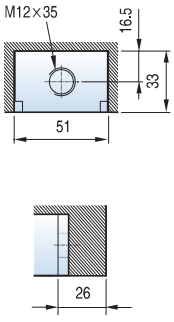
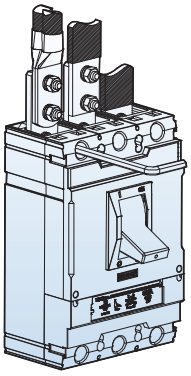
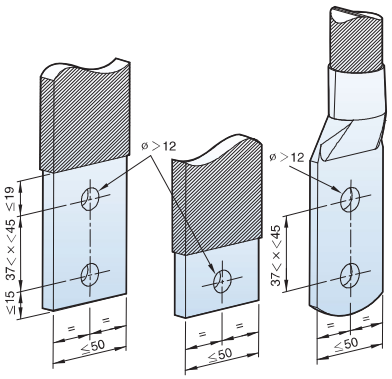
Susol TS circuit-breakers can be directly connected to the mounting plate.
If busbars or terminals are used to connect the circuit breaker
on the back of the mounting plate,
the appropriate safety clearances must be observed.



	TS100, TS160, TS250	TS400, TS630	TS800
Screw for mounting	 3Pole : 2EA(M4×75) 4Pole : 4EA(M4×75)	 3Pole : 4EA(M5×85) 4Pole : 4EA(M5×85)	 3Pole : 4EA(M6×100) 4Pole : 4EA(M6×100)
Nut for mounting	- 	 3Pole : 4EA(M5) 4Pole : 4EA(M5)	 3Pole : 4EA(M6) 4Pole : 4EA(M6)
Screw for connection of terminals, Spreader	 3Pole : 6EA(M8×20) 4Pole : 8EA(M8×20)	 3Pole : 6EA(M10×30) 4Pole : 8EA(M10×30)	 3Pole : 6EA(M12×35) 4Pole : 8EA(M12×35)
	Torque: Max 147kgf·cm	Torque: Max 490kgf·cm	Torque: Max 630kgf·cm

Mounting & Connection (100~800AF)

Connecting terminal & conductor

Breaker type	Terminal (mm)	Torque (mm)	Conductor (mm)
TS100 TS160 TS250		 Max 78kgf·cm	
TS400 TS630		 Max 490kgf·cm	
TS800		 Max 490kgf·cm	

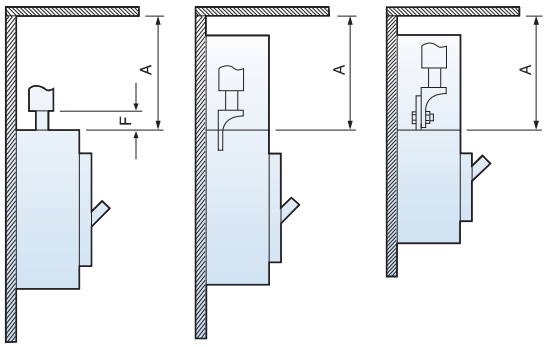
Safety clearance

When installing a circuit breaker, safety clearances must be kept between the breaker and panels, bars and other protection devices installed nearby. These safety clearances are depend on the ultimate breaking capacity and are defined by tests carried out in accordance with standard IEC 60947-2.

When a short circuit interruption occur, high temperatures pressures are present in and above the arc chambers of the circuit-breaker. In order to allow the pressure to be distributed and to prevent fire and arcing or short-circuit currents, safety clearances are required.

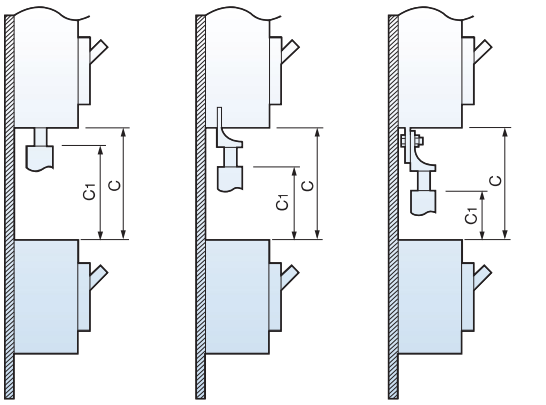
A: Insulation distance to ceiling for installation in metallic cubicle

	A(mm)	
	415V	240V
TS100Ni, TS160Ni, TS250Ni	35	30
TS100Hi, TS160Hi, TS250Hi	35	30
TS100Li, TS160Li, TS250Li	35	30
TS400Ni, TS630Ni	60	50
TS400Hi, TS630Hi	60	50
TS400Li, TS630Li	60	50
TS800Ni	100	80
TS800Hi	100	80
TS800Li	100	80



If there is another breaker above the breaker
C1 : Minimum distance for superimposed circuit breakers
C : C1+ the dimension of exposed conducting part

	C1(mm)		C (mm)
	415V	240V	
TS100Ni, TS160Ni, TS250Ni	35	30	The dimension of exposed conduct
TS100Hi, TS160Hi, TS250Hi	35	30	
TS100Li, TS160Li, TS250Li	35	30	
TS400Ni, TS630Ni	60	50	
TS400Hi, TS630Hi	60	50	
TS400Li, TS630Li	60	50	
TS800Ni	100	80	
TS800Hi	100	80	
TS800Li	100	80	



Direct connection of cable

Connection by using a cable terminal or ring terminal

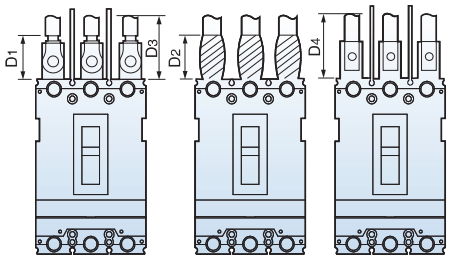
Connection by using a cable terminal with extended terminal

Safety clearance

D: Insulated length of main terminal of circuit breaker

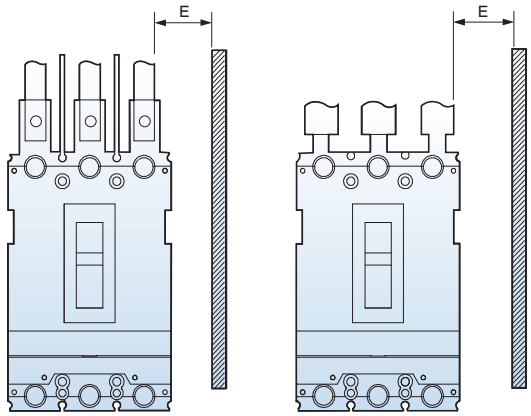
D1: Connection by ring terminal after taping
D2: Connection by bar after taping
D3: Connection by ring terminal using insulation barrier
D4: Connection by bar using insulation barrier

	D1 (mm)	D2 (mm)	D3 (mm)	D4 (mm)
TS100Ni, TS160Ni, TS250Ni	The dimension of exposed conduct + 20	100	The dimension of exposed conduct + 20	100
TS100Hi, TS160Hi, TS250Hi		100		100
TS100Li, TS160Li, TS250Li		100		100
TS400Ni, TS630Ni		200		200
TS400Hi, TS630Hi		200		200
TS400Li, TS630Li		200		200
TS800Ni		200		200
TS800Hi		200		200
TS800Li		200		200



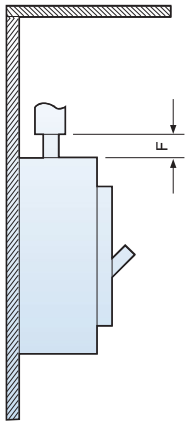
E: Distance from a side of breaker to side plate

	E(mm)	
	415V	240V
TS100Ni, TS160Ni, TS250Ni	25	15
TS100Hi, TS160Hi, TS250Hi	25	15
TS100Li, TS160Li, TS250Li	25	15
TS400Ni, TS630Ni	20	15
TS400Hi, TS630Hi	20	15
TS400Li, TS630Li	20	15
TS800Ni	45	20
TS800Hi	45	20
TS800Li	45	20



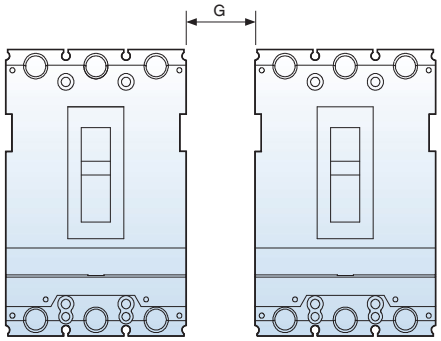
F: The dimension of exposed conducting part

	F (mm)
TS100Ni, TS160Ni, TS250Ni	10
TS100Hi, TS160Hi, TS250Hi	10
TS100Li, TS160Li, TS250Li	10
TS400Ni, TS630Ni	10
TS400Hi, TS630Hi	10
TS400Li, TS630Li	10
TS800Ni	10
TS800Hi	10
TS800Li	10



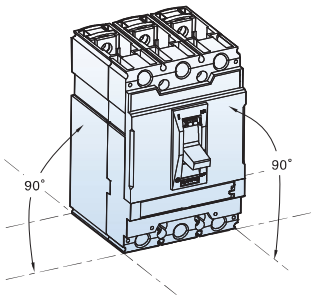
G: Minimum center distance for two horizontally installed circuit-breakers

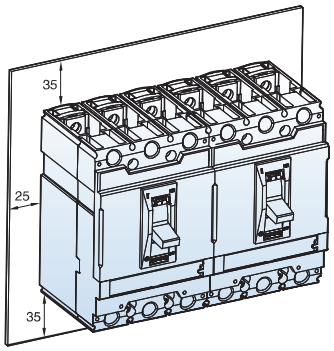
	G (mm)
TS100Ni, TS160Ni, TS250Ni	0
TS100Hi, TS160Hi, TS250Hi	0
TS100Li, TS160Li, TS250Li	0
TS400Ni, TS630Ni	0
TS400Hi, TS630Hi	0
TS400Li, TS630Li	0
TS800Ni	0
TS800Hi	0
TS800Li	0

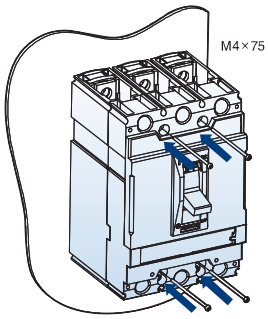


Example of installation

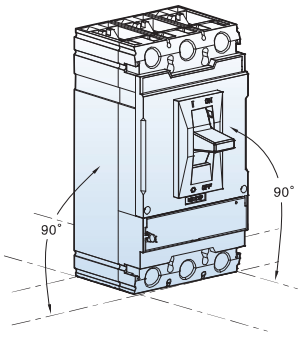
TS100Ni/Hi/Li
TS160Ni/Hi/Li
TS250Ni/Hi/Li

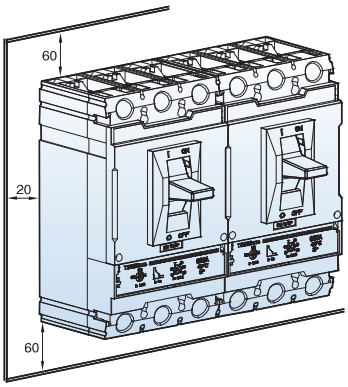


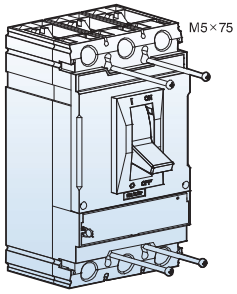




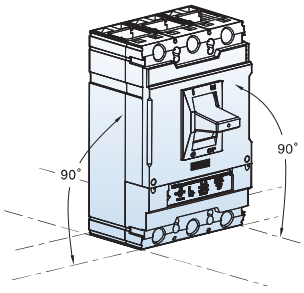
TS400Ni/Hi/Li
TS630Ni/Hi/Li

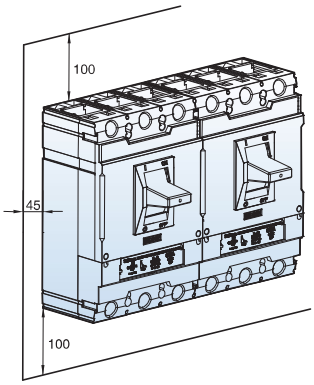


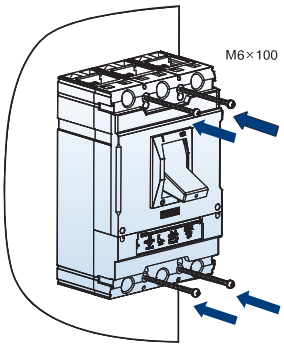




TS800Ni/Hi/Li







Memo

Memo

FUTURING SMART ENERGY

We open up a brighter future through
efficient and convenient energy solutions.

Safety Instructions

- For your safety, please read user's manual thoroughly before operating.
- Contact the nearest authorized service facility for examination, repair, or adjustment.
- Please contact qualified service technician when you need maintenance.
  Do not disassemble or repair by yourself!
- Any maintenance and inspection shall be performed by the personnel having expertise concerned.

- According to The WEEE Directive, please do not discard the device with your household waste.

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