Susol Super Solution

MCCB

Low voltage circuit breakers

LS ELECTRIC

LS ELECTRIC continues
the value and the prominence of LG

New Name for LG Industrial Systems,
New Take-off for LS ELECTRIC

To advance to the next level,
LG Industrial Systems is reborn as LS ELECTRIC Co., Ltd.
LS ELECTRIC will continue to lead the future
of industrial electrics and automation by providing
Total Solution, a core essential
for competition in the 21st century industrial era.

Research & Development

We provide differentiated values.

The world-class Power Testing & Technology Institute guarantees certified products and global brands.

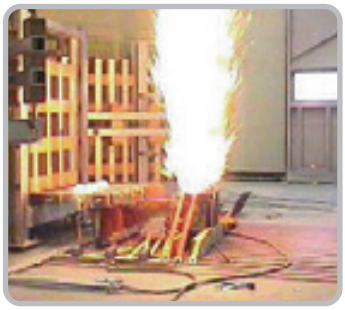
The PT&TI is an accredited testing laboratory that provides a worldwide testing service with a 1500MVA-capacity High Power Laboratory, a High Voltage Laboratory, and a Reliability Testing Laboratory. Its testing has been fully acknowledged and recognized by overseas testing certification bodies, such as KEMA of Netherlands, UL of America, and CE of the EU for its low voltage testing.

Global technology and R&D are behind the best industrial Electric power and automation products from LS ELECTRIC

Quality Test at PT&T

High Voltage Test / Impulse Test

Characteristics Test / VCB Characteristics Test



Short-Circuit Test / ACB Breaker Test

Environmental Test /
Non-stop High Temperature Test

Electro Technology R&D Center

The Electro Technology R&D Center focuses on overall research and development activities related to power supply systems such as low and high voltage equipment as well as integrated digital networks, automatic switchboards and integrated power protection.
The R&D Center maximizes energy efficiencies by integrating rapidly developing information & technology, communication, electronics and mechanical engineering, while concentrating its efforts in creating a safe and pleasant industrial environment.

- **Power Equipments**
  The R&D Center researches products and technologies related to low and high voltage circuit breakers and contactors as well as power transmission & distribution.
- **Electric Technology**
  The R&D Center analyzes and researches core technologies related to power equipment.
- **SCADA**
  The R&D Center carries out projects and technology research in the fields of SCADA and DAS.
- **Simulator**
  The R&D Center predicts probable electrocution hazards by conducting simulated analyses of power generation phenomena, and develops simulation technologies and products that can optimize the constituent facilities.

Power Testing & Technology Institute

PT&T is a KOLAS-qualified (Korea Laboratory Accreditation Scheme) accredited testing laboratory and provides worldwide testing service with its 1500MVA-capacity High Power Laboratory, High Voltage Laboratory and Reliability Testing Laboratory.
PT&T is also fully recognized by foreign testing and certification bodies of high reputation as CESI of Italy, KEMA of Netherlands, UL of America, etc. for its low voltage testings.

- **Available Tests**
  - Electro-Mechanical Tests
  - Insulation Performance Tests
  - Short-Circuit Tests
  - Reliability Evaluation Tests
  - Arc Tests
  - Environmental Tests
- **Research & Development**
  Testing Technology, Measuring & Analyzing Technology, Power Equipment Monitoring & Diagnostic Techniques, Reliability Testing & Evaluation Technology.

Solution provider

You can count on us.

New face & New resolution to become a global leader that gives top priority to customer values

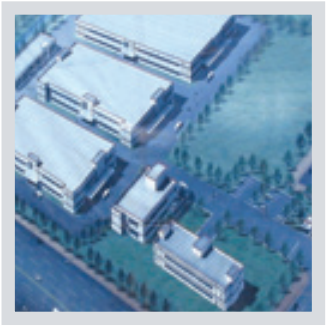
We promise you that LS will be reborn as a corporation that returns the best values to its customers.
We are committed to global product development, driving future growth, and expanding the overseas market share, as well as consolidating existing business.
Join us in a future where LS will become a genuine global leader.

Customer satisfaction with world-class products and services: LS ELECTRIC is committed to excellence!

Cheongju Plant (Korea)

Busan Plant (Korea)

Dalian Plant (China)



Wuxi Plant (China)

Hanoi Plant (Vietnam)

Electric Power Industry |

Electric Equipment & Systems

The electric equipment and systems of LS ELECTRIC, ranging from low to high voltage products, have not only acquired ISO 9001 and 14001 certification for their efficient design and excellent quality, but many other certificates, including KEMA, TÜV, CESI, ASTA, and KERI. The outstanding quality of the products that we are manufacturing conforms to international standards such as IEC, UL, ANSI, CCC, JIS, and KS.

We also provide Total Solutions that encompass customized designs and more advanced technology, as well as efficient production and installation, and highly accurate testing and analysis of power equipment.

Chonan Plant (Korea)

Wuxi Plant (China)

Automation Industry |

Automation Equipment, Industrial IT & RFID

LS ELECTRIC, a leading pioneer of the domestic automation business, developed the first ever PLC, Inverter (AC Drive), and DCS in Korean automation history. We now provide Total Solutions through the diverse application of our own products, ranging from controllers to control systems that are based on sophisticated technology and proven experience, to bring innovative change to distribution systems and logistics.

Susol Super Solution

MCCB

Molded Case Circuit Breakers

Susol Super Solution

MOLDED CASE CIRCUIT BREAKERS

GOOD DESIGN
Ministry of Commerce

product design award 2007

■ Design for technical strong point: The Susol MCCB

Susol series MCCB is available forworld best breaking capacity up to 150kA, and MS is seal structure for hidden electricity arc.
Susol product represents simultaneously simple and complicated design for using cut diamond motive to emphasis on the hardness of industrial product.
And we applied the identity of product image by designing same concept MCCB and MS which is installed to cubicle.

Susol series acquire the competitive power through getting the picking up GD product and wining iF design award.

Contents

Super Solution

For power distribution

- The highest breaking capacity
- Optimum coordination technique (Cascading & discrimination)
- Powerful engineering tools

For protection of motor & its control device

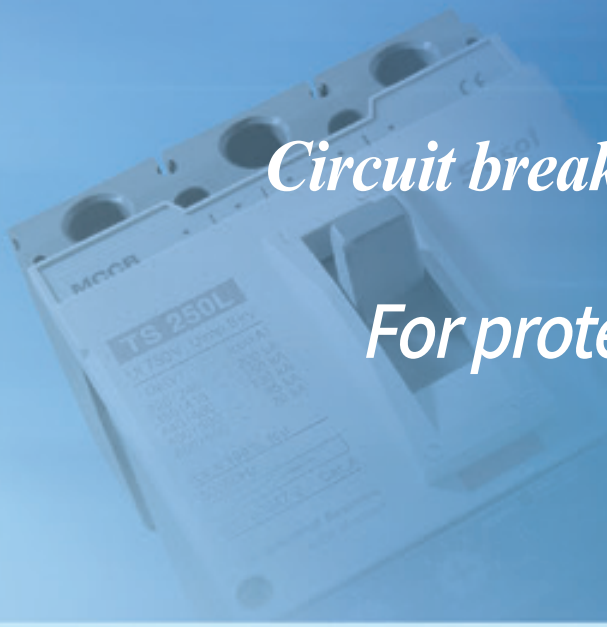
- Optimal overload protection
- Guaranteed type-2 coordination between circuit breaker and contactor, relay

For controlling and disconnecting circuits

For extensive applications

- Wide range of optimized auxiliaries and accessories

Global Leading Products



Circuit breakers

For protection of power distribution

Circuit breakers

For protection of motor & its control device

Disconnecting switches

For controlling and disconnecting circuits

Susol

Super solution

- **Super** Performance
- **Super** Breaking capacity
- **Super** Optimum coordination
- **Super** Extensive applications

Susol TE, TD, TS series

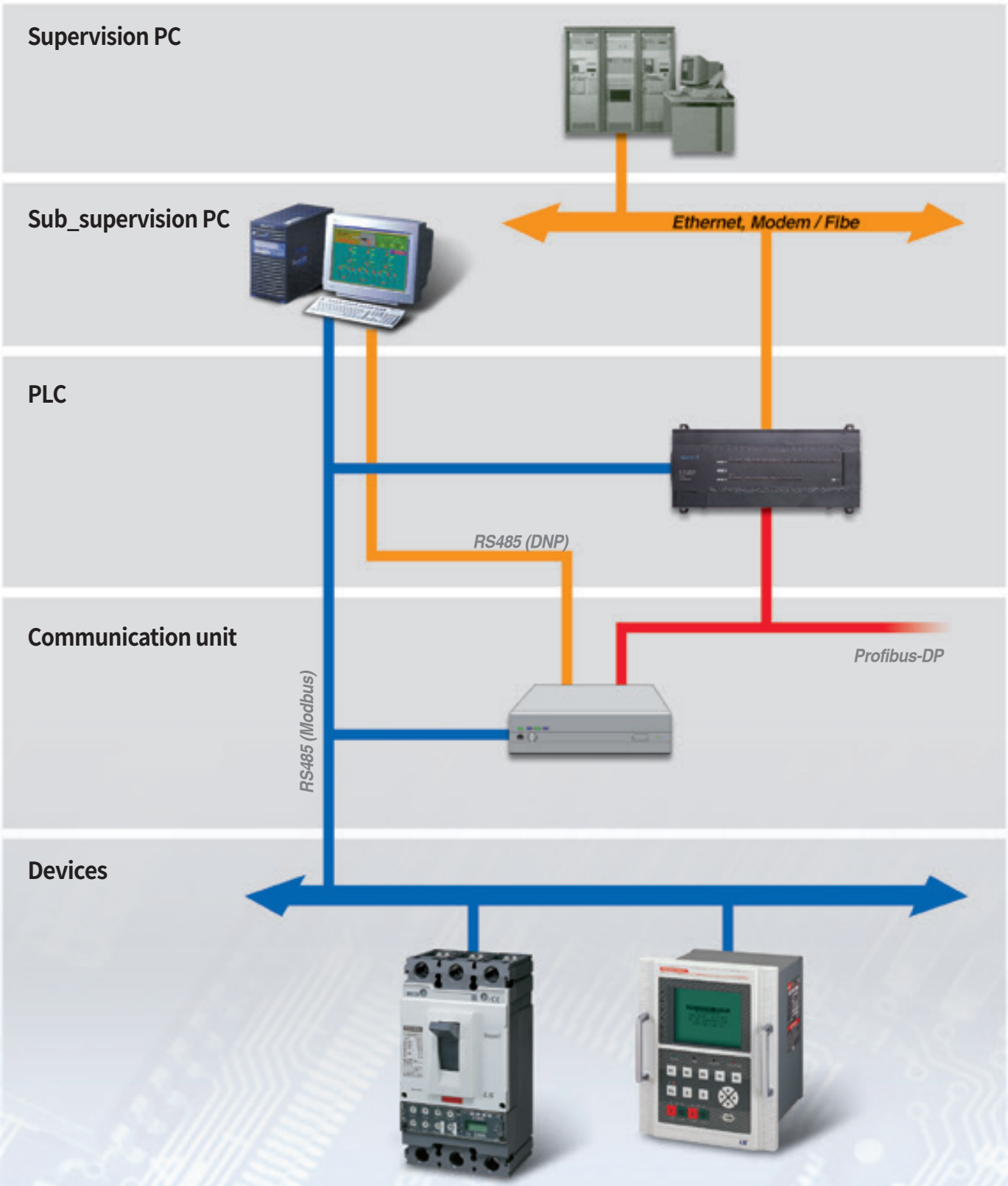
Circuit breakers and disconnecting switches

Susol circuit breakers provide superior performance in a compact package. They are used in cascade rated systems, allowing the use of lower interruption circuit breakers downstream, which lead to lower system cost.
While meeting IEC60947-2 service and interrupting ratings, these breakers provide unmatched flexibility by employing a wide variety of trip units including fixed thermal & magnetic, adjustable thermal-fixed magnetic, adjustable thermal adjustable magnetic, and electronic options.
Susol TE and TD circuit breaker is available in one frame size in ratings from 16 to 160 amperes and TS circuit breakers are available in three frame sizes in ratings from 40 to 1600 amperes and in interrupting capacities up to 150 kA at 415V AC.
Standard calibration is at 40℃ with optional 55℃ factory calibration available for applications where higher ambient temperatures are encountered.

Susol MCCB Communication

- **Communication interface:RS485 (ModBUS)**
- **Transmittable data :**
  - Reading of protection settings
  - The highest current of the three phases
  - Measurement: R, S, T and N phase current (RMS)
  - Fault reading: Type of fault, Fault phase
- **The setting of communication address**
  By using TR button and LCD display (Ammeter)
- **ZSI Enable/Occurrence**
- **Power source: DC24V Power is required**

Providing optimal solution



- MCCB(MODBUS) → CU → Profibus_DP → PLC → EtherNET → Supervision PC
- MCCB(MODBUS) → PLC → EtherNET → Supervision PC
- MCCB(MODBUS) → CU → RS485(DNP) → SUB_Supervision PC
- MCCB(MODBUS) → SUB_Supervision PC

Susol MCCB Residual Current Devices

■ Protection against earth leakage currents

The Susol circuit breaker can offer protection against earth leakage currents by using an add-on residual current device (RCD). RCD unit interfaces directly below the circuit breaker trip unit area without the use of any secondary wiring or connections

Residual Current Devices
RTU23/24, RTU33/34 and RTU43 for TS type MCCBs

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.

RCD type		RTU23	RTU24	RTU33	RTU34	RTU43
Number of poles		3*	4	3*	4	3*
Applicable circuit breaker	TS100	■	■			
	TS160	■	■			
	TS250	■	■			
	TS400			■	■	
	TS630			■	■	
	TS800					■
Protection charicteristics						
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				

* 3P modules may also be used on 2P circuit breakers.
** If the sensitivity is set to 30mA, the time delay setting is reduced to zero.

Susol MCCB Main characteristics

■ Susol series circuit breakers are suitable for

- Protection of power distribution
- Protection of motor & its control device
- Controlling and disconnecting circuits

■ Optimum technical support for

(Cascading, Discrimination, Type 2 coordination)

- Selecting economical protection system
- Quarantee safety of the installation
- Reducing the stress on components and damage
- Guarantee service continuity


MCCB
Susol
TS 160H
LS


Susol
LS


Susol
LS


Susol
LS


Susol
LS


MCCB
Susol
DIGITAL TRIP RELAY
TS 1600H
1600A
Susol
LS

A-1

Overview

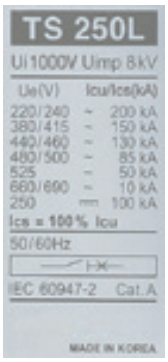
Range of LS low voltage circuit breakers

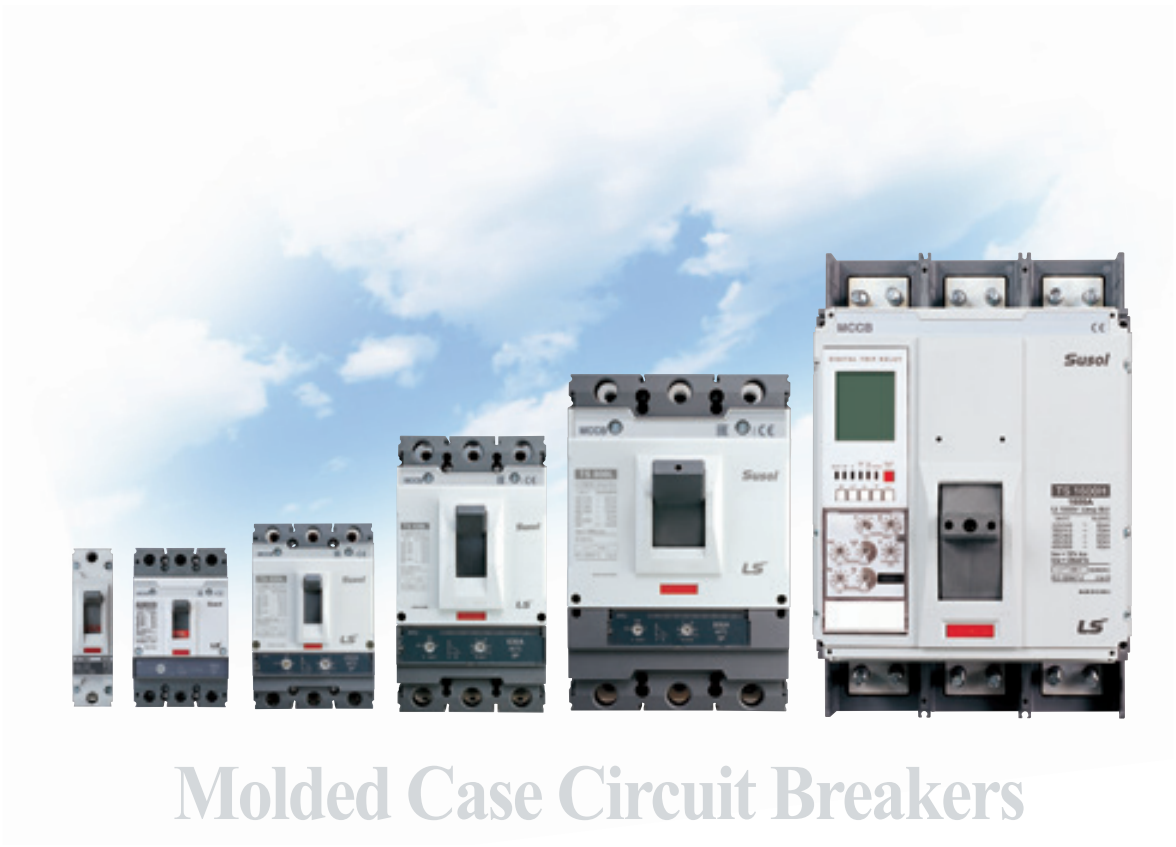
	Main switchboard		
Type of circuit breaker	ACB	MCCB	
Rated current, In	630~6300A	1000~1600A	
Breaking capacity, Icu	65~150kA	50~150kA	
Service breaking capacity (% Icu),Ics	100%	75~100%	
Utilization category	B	A, B	
Applied standard	IEC 60947-2	IEC 60947-2	
Image of circuit breaker			
Brand name	Susol/Metasol	Susol	
Image of brand	Susol·Metasol	Susol	
Series	AH, AS, AN	TS	

* 1pole MCCB

Main / Sub switchboard		Final distribution
MCCB	MCCB	MCB
16~800A	3~1200A	1~63A
37~150kA	10~85kA	10kA
100%	100%	75%
A	A	A
IEC 60947-2, UL489	IEC 60947-2	IEC60898, 60947-2, UL1077
		
Susol	Metasol	
Susol	Metasol	
TE, TD, TS	AB series	BK63H series

General





Molded Case Circuit Breakers

The new series of Susol circuit-breakers is available in four frame sizes
: 160, 250, 630, 800, 1600AF
The breakers are able to cover a range of service currents up to 1600A and are available in the fixed version and plug-in version.
The breaking capacities, at 380/415V, are classified by following letters:

S: 37kA for 100 and 160AF
N: 50kA for 160, 250 and 1600AF
65kA for 630 and 800AF
H: 75kA for 1600AF
85kA for 160, 250 and 630AF
100kA for 800AF
L: 150kA for 160, 250, 630, 800 and 1600AF

Susol circuit-breakers are climate-proof. The breakers are intended for use in rooms where there are no excessive operating conditions (e.g. dust, corrosive vapors, gases).
If the circuit-breakers are used in dusty or humid locations, suitable enclosures should be provided.
Sufficient fresh air supply must be provided if there are harmful gases (e.g. hydrogen-sulfide vapor) in the ambient air.

All Susol circuit breakers offer positive contact indication and are suitable for isolation in compliance with standards IEC 60947-1 and 2.

Susol circuit-breakers are suitable for protection of
- Power distribution systems supplied by transformers or generators
- Motor and generator

A switch-disconnector of Susol circuit breakers is available for for circuit control and isolation.

Susol series circuit breakers and auxiliaries comply with the following international standard:

IEC 60947-1

Low-voltage switchgear and controlgear
- Part 1: General rules

IEC 60947-2

Low-voltage switchgear and controlgear
- Part 2: Circuit-breakers

IEC 60947-3

Low-voltage switchgear and controlgear
- Part 3: Switches, disconnectors, switchdisconnectors and fuse-combination units

IEC 60947-4

Low-voltage switchgear and controlgear
- Part 4-1: Contactors and motor-starters
  Electromechanical contactors and motor starters Switches, disconnectors, switchdisconnectors
- Part 4-2: Contactors and motor-starters
  AC semiconductor motor controllers and starters
- Part 4-3: Contactors and motor-starters
  AC semiconductor controllers and contactors for non-motor loads

The following certificates are available on a request.
- CE Declaration of conformity
- Certificate of conformance test (CB) - IEC 60947
- Certificate of conformance test - CCC (China)
- Letter of origin

CE conformity marking

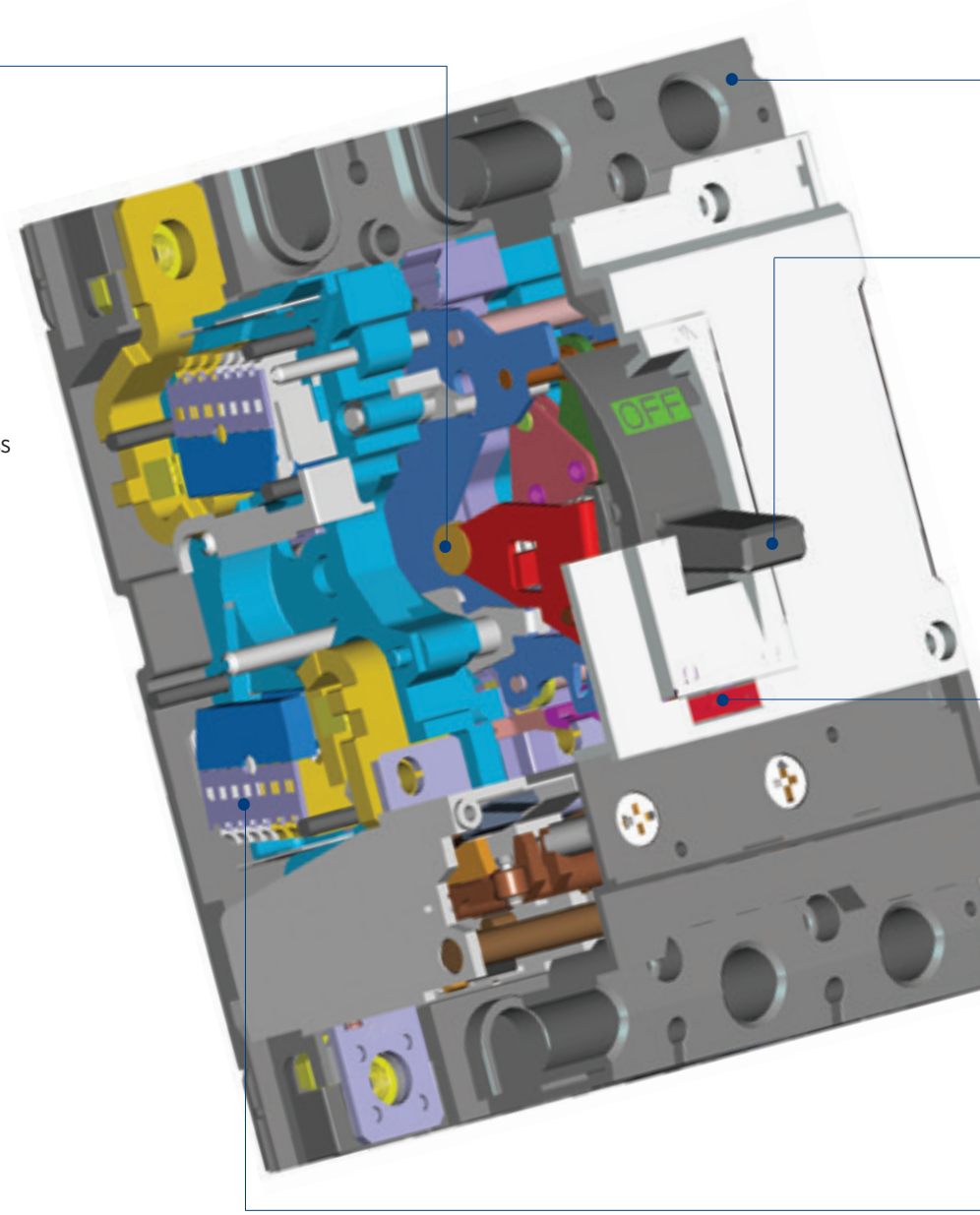
The CE conformity marking shall indicate conformity to all the obligations imposed on the manufacturer, as regards his products, by virtue of the European Community directives providing for the affixing of the CE marking.
When the CE marking is affixed on a product, it represents a declaration of the manufacturer or of his authorized representative that the product in question conforms to all the applicable provisions including the conformity assessment procedures. This prevents the Member States from limiting the marketing and putting into service of products bearing the CE marking, unless this measure is justified by the proved non-conformity of the product.

IECEE CB SCHEME

The IECEE CB Scheme is the world's first truly international system for acceptance of test reports dealing with the safety of electrical and electronic products. It is a multilateral agreement among participating countries and certification organizations. A manufacturer utilizing a CB test report issued by one of these organizations can obtain national certification in all other member countries of the CB Scheme.
The Scheme is based on the use of international (IEC) Standards. If some members' national standards are not yet completely harmonized with IEC Standards, national differences are permitted if clearly declared to all other members. The CB Scheme utilizes CB Test Certificates to attest that product samples have successfully passed the appropriate tests and are in compliance with the requirements of the relevant IEC Standard and with the declared national differences of various member countries.
The main objective of the Scheme, is to facilitate trade by promoting harmonization of the national standards with international Standards and cooperation among product certifiers worldwide in order to bring product manufacturers a step closer to the ideal concept of "one product, one test, one mark, where applicable'.

Structure

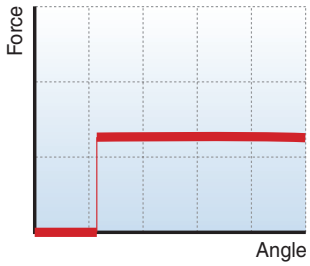
The primary components are: a switching mechanism, an automatic tripping device (and manual trip button), contacts, an arc-extinguishing device, terminals and a molded case.



Mechanism unit

- Unvarying contact force regardless of over travel
- RTA (Rapid Toggle Area)
  Open speed of moving contact is rapid by **optimized cam curve** regardless of trip signal

Optimized cam curve



Unvarying contact force

Molded case

- UL94 V-0 flame retarded
- High strength

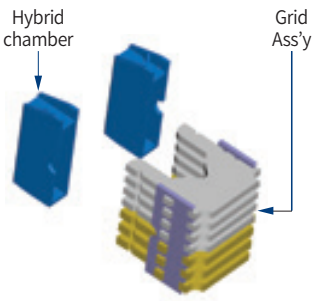
Trip button (push to trip)

- Enables tripping mechanically from outside, for confirming the operation of the accessory switches and the manual resetting function.

Note) Fault Alarm Switch, FAL is not operated by trip button.
FAL is applicable only to the breakers with electronic trip units.

Arc-Extinguishing unit

- PASQ Type Quenching Chamber
- Very superior to increasing arc voltage during short time
- PASQ ;
  - Puffer Assisted Self-Quenching
  - Patented by LS



Handle

- Function of indications
  - "ON" "OFF" "TRIP"
- Resetting
  When the handle indicates "tripped" position it must first be reset by moving the handle to the "OFF" position and then closing is possible
- Trip-Free even if the handle is held at "ON", the breaker will trip if an over current flows
- Suitable for Verification of the main contact position under abnormal conditions because the handle doesn't indicate open position

Marking and configuration

Rated frequency

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

Standard

Utilization category

Model (Rating and breaking capacity)
- TS: Series
- 250: Max. Ampere rating
- S: Standard
- N: Normal (Standard)
- H: High
- L: Current limiting

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

	160AF	250AF	630AF	800AF	1600AF
S	TE100S TE160S	-	-	-	-
N	TE100N TE160N TD100N TD160N	TS100N TS160N TS250N -	TS400N TS630N -	TS800N - -	TS1000N TS1250N TS1600N -
H	TD100H TD160H -	TS100H TS160H TS250H	TS400H TS630H -	TS800H - -	TS1000H TS1250H TS1600H
L	TD100L TD160L -	TS100L TS160L TS250L	TS400L TS630L -	TS800L - -	TS1000L - -

S	37kA	-	-	-	-
N	50kA	50kA	65kA	65kA	50kA
H	85kA	85kA	85kA	100kA	70kA
L	150kA	150kA	150kA	150kA	150kA

Product: Molded Case Circuit Breaker

Upstream connections

Fixing hole

Certificate plate

Indication of closed (I/ON) position

Brand name

Operating handle

Indication of open (O/OFF) position

Company logo

"push to trip" button

Rating of trip unit

Trip unit

Fixing hole

Downstream connections

Overview of trip units

On Susol circuit breakers, the thermal-magnetic and electronic trip units are interchangeable and may be rapidly fitted to the circuit breakers.
It is therefore easy to change the protection of a given circuit following a modification in an installation.
On TS400 and 630 circuit breakers, the electronic trip units are interchangeable plug-in modules.
Trip unit ETM offers a large number of protection settings.

Each Trip devices has different types of protection depending on the associated trip unit:

- Standard protection
- Protection of networks supplied by line distribution
- Protection of long cables
- Protection of DC networks
- Protection of motor-starters
- Service connection circuit breaker (for special subscriber contracts)

Susol TD100, TD160 circuit breakers may be equipped with either FTU or FMU.
The trip units are not interchangeable types and can be supplied only after fixed with circuit breakers.

Ampere ratings

MCCB frame type	Rated current, In[A]						
	Thermal magnetic release				Electronic release		DSU
	FTU	FMU	ATU	MTU	ETS	ETM	
TE100 TD100	16, 20, 25, 32, 40, 50, 63, 80, 100	16, 20, 25, 32, 40, 50, 63, 80, 100	-	-	-	-	-
TE160 TD160	100, 125, 160	100, 125, 160	-	-	-	-	160
TS100	40, 50, 63, 80, 100	40, 50, 63, 80, 100	-	1.6, 3.2, 6.3, 12, 20, 32, 50, 63, 100	40, 80	-	100
TS160	100, 125, 160	100, 125, 160	125, 16	32, 50, 63, 100, 160	40, 80, 160	-	160
TS250	125, 160, 200, 250	125, 160, 200, 250	125, 160, 200, 250	100, 160, 220	40, 80, 160, 250	-	250
TS400	300, 400	300, 400	300, 400	320	160, 250, 400	160, 250, 400	400
TS630	500, 630	500, 630	500, 630	500	160, 250, 400, 630	160, 250, 400, 630	630
TS800	700, 800	800	800	630	630, 800	630, 800	800

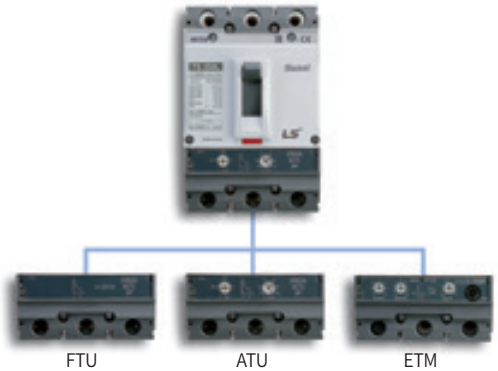
Types of trip units	
FTU	• Fixed thermal, Fixed magnetic
FMU	• Adjustable thermal, Fixed magnetic
ATU	• Adjustable thermal, Adjustable magnetic
MTU	• Magnetic only
ETS	• Electronic (LSI)
ETM	• Electronic (LSIG, Ammeter, Communication, Zone selective interlocking)
DSU	• Disconnecting switch

Trip unit identification

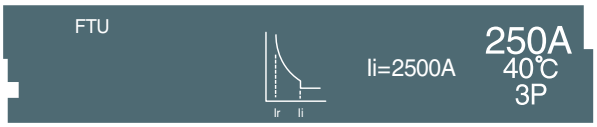
TS250 FMU

Trip unit function

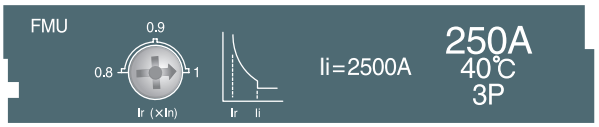
MCCB frame type



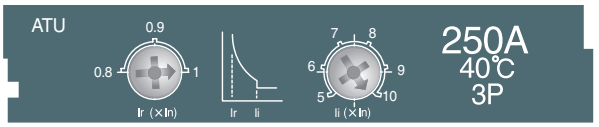
FTU Fixed-thermal, fixed-magnetic



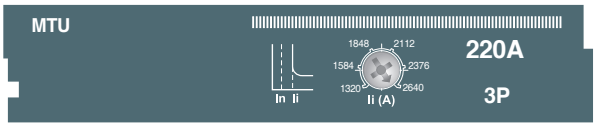
FMU Adjustable-thermal, fixed-magnetic



ATU Adjustable-thermal, adjustable-magnetic

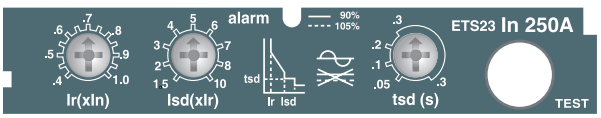


MTU Magnetic only

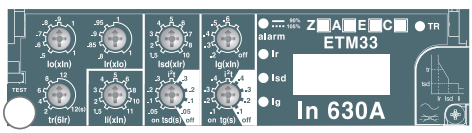


DSU Disconnecting switch

ETS Electronic (LSI)



ETM Electronic (LSIG, multi-function unit)



Double contactor structure

Optimize

Repulsion force

Shape of contactor

- Induce easily the arc mobility to grid direction
- Rapidly redeploy the arc from moving contactor
- Prevent contact tip from erosion

Open speed & contact force

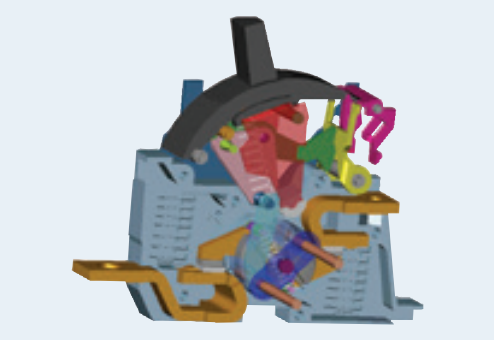


Fig. 3 “ON“ position

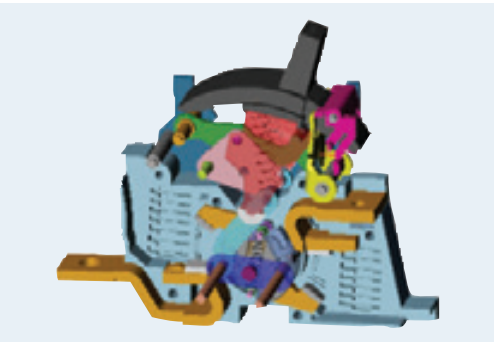


Fig. 4 “OFF“ position

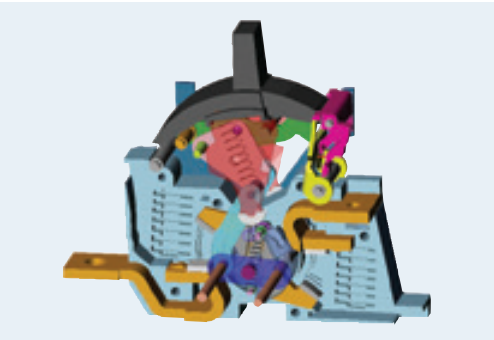
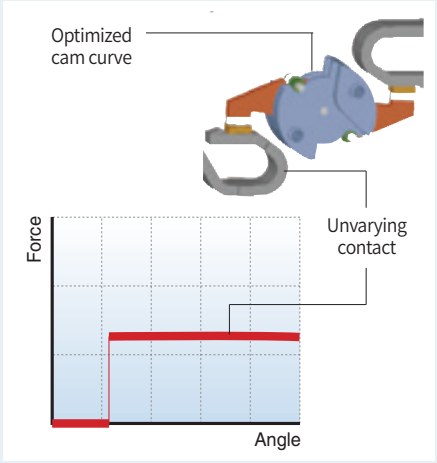


Fig. 5 “TRIP“ position

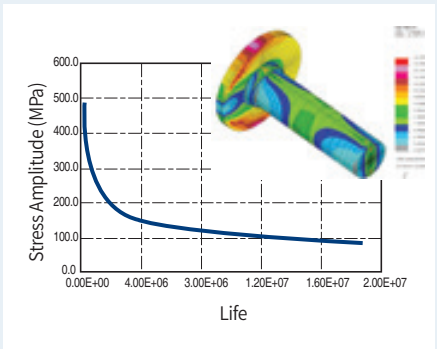
ON position

- Unvarying contact force regardless of over travel
- Open speed of moving contact is rapid by optimized cam curve regardless of trip signal
- Function of trip free



OFF position

- Push to trip in OFF position
  * Reset pin moment < Main spring moment
- Stability of endurance

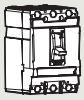
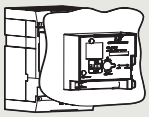
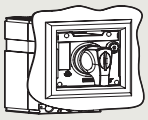
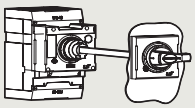


TRIP position

- Enables tripping mechanically from outside, for confirming the operation of the accessory switches and the manual resetting function

Degree of protection

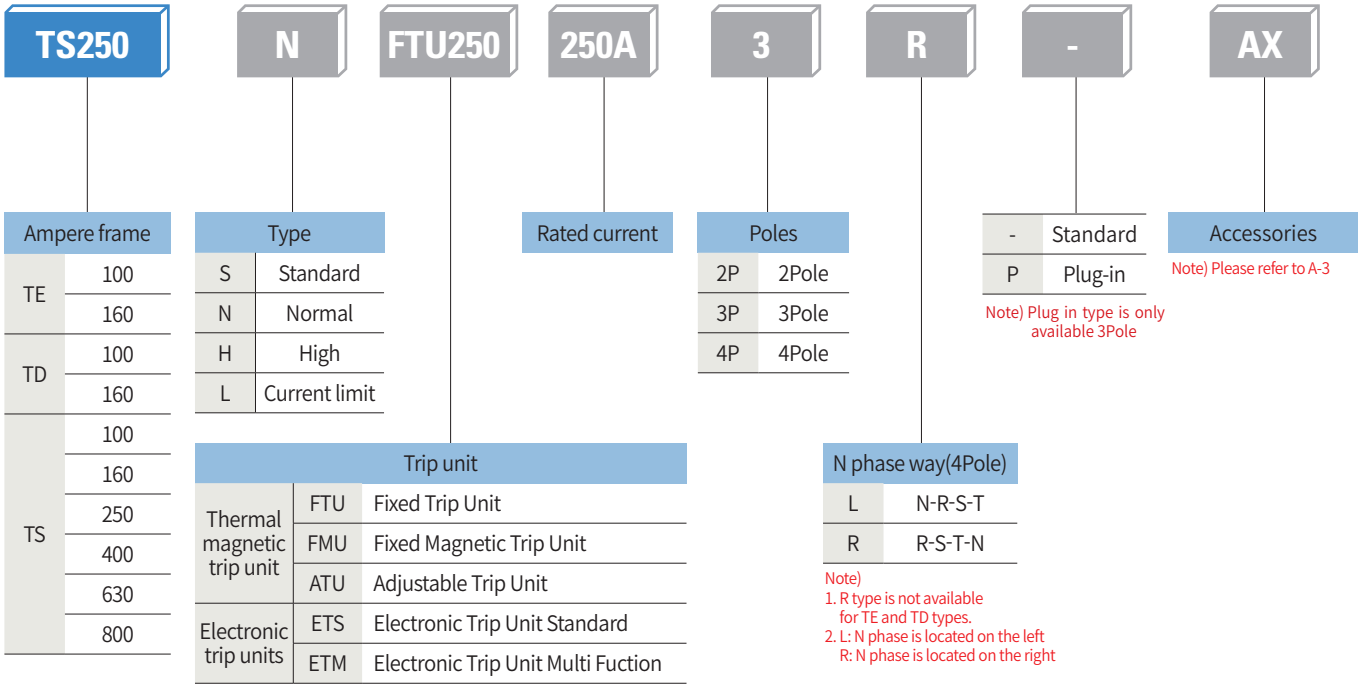
The table indicates the degrees of protection guaranteed by Susol circuit-breakers according to several type of installation. Basically, the fixed parts are always preset with IP20 degree of protection.
IP65 degree of protection can be obtained with the circuit-breaker installed in a switchboard fitted with an extended rotary handle operating mechanism transmitted on the compartment door.

Type	Degree of protection	IP	Protection of persons against access to hazardo us parts with:
 Circuit breaker	Full penetration of 12.5mm diameter sphere not allowed. The jointed test finger shall have adequate clearance from hazardous parts	IP20	Wire
 Circuit breaker with terminal cover	The access probe of 2.5mm diameter shall not penetrate.	IP30	Wire
 Plug-in circuit breaker	Full penetration of 12.5mm diameter sphere not allowed. The jointed test finger shall have adequate clearance from hazardous parts. * When the circuit breaker is installed and the supplied covers are mounted.	IP20 or IP30	Wire
 Circuit breaker with cover frame for door cutout	The access probe of 1.0mm shall not penetrate.	IP40	Wire
 Circuit breaker with cover frame and motor operator	The access probe of 1.0mm diameter shall not penetrate.	IP40	Wire
 Circuit breaker with cover frame and rotary direct handle	The access probe of 1.0mm diameter shall not penetrate.	IP40	Wire
 Circuit breaker with cover frame and rotary extended handle	Totally protected against ingress of dust and water jets fromany direction	IP65	Wire

Ordering

Susol TE, TD, TS up to 800AF MCCB

Trip unit: FTU, ATU, FMU, ETS, ETM



Ampere frame	
TE	100
	160
TD	100
	160
TS	100
	160
	250
	400
	630
	800

Type	
S	Standard
N	Normal
H	High
L	Current limit

Rated current

Poles	
2P	2Pole
3P	3Pole
4P	4Pole

-	Standard
P	Plug-in

Note) Plug in type is only available 3Pole

Accessories

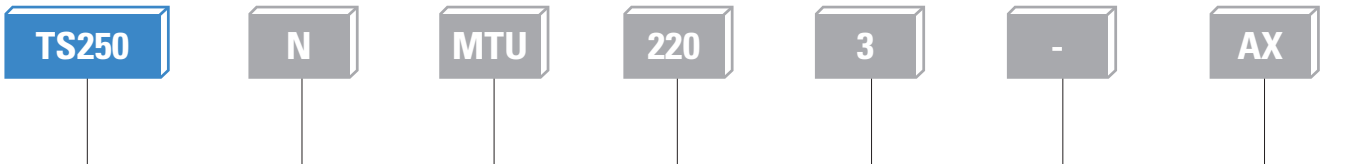
Note) Please refer to A-3

Trip unit		
Thermal magnetic trip unit	FTU	Fixed Trip Unit
	FMU	Fixed Magnetic Trip Unit
	ATU	Adjustable Trip Unit
Electronic trip units	ETS	Electronic Trip Unit Standard
	ETM	Electronic Trip Unit Multi Fuction

N phase way(4Pole)	
L	N-R-S-T
R	R-S-T-N

Note)
1. R type is not available for TE and TD types.
2. L: N phase is located on the left
   R: N phase is located on the right

Trip unit: MTU



Ampere frame	
TS	100
	160
	250
	400
	630
	800

Type	
N	Normal
H	High
L	Current limit

Magnetic only trip unit

Rated current

AF	Rated current
TS100	1.6, 3.2, 6.3, 12, 20, 32, 50, 63, 100
TS160	32, 50, 63, 80, 100, 160
TS250	100, 160, 220
TS400	320
TS630	500
TS800	630

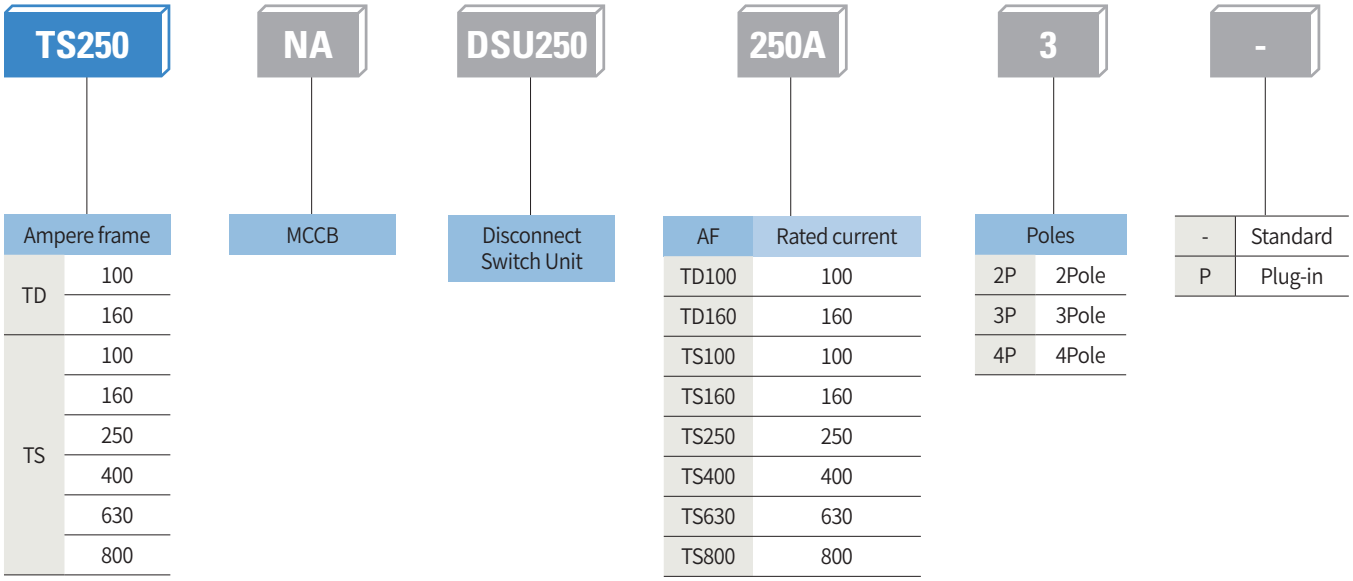
Poles	
3P	3Pole

-	Standard
P	Plug-in

Accessories

Note) Please refer to A-3

Trip unit: DSU



Ampere frame	
TD	100
	160
TS	100
	160
	250
	400
	630
	800

MCCB

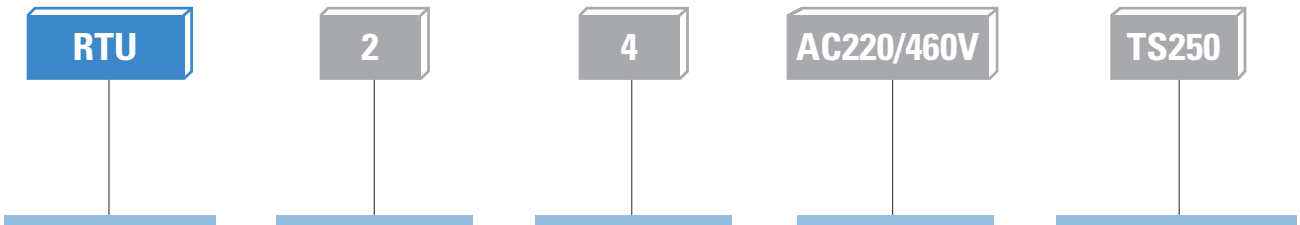
Disconnect Switch Unit

AF	Rated current
TD100	100
TD160	160
TS100	100
TS160	160
TS250	250
TS400	400
TS630	630
TS800	800

Poles	
2P	2Pole
3P	3Pole
4P	4Pole

-	Standard
P	Plug-in

Trip unit: RTU



Model	
RTU	RCD

AF	
2	250AF
3	630AF
4	800AF

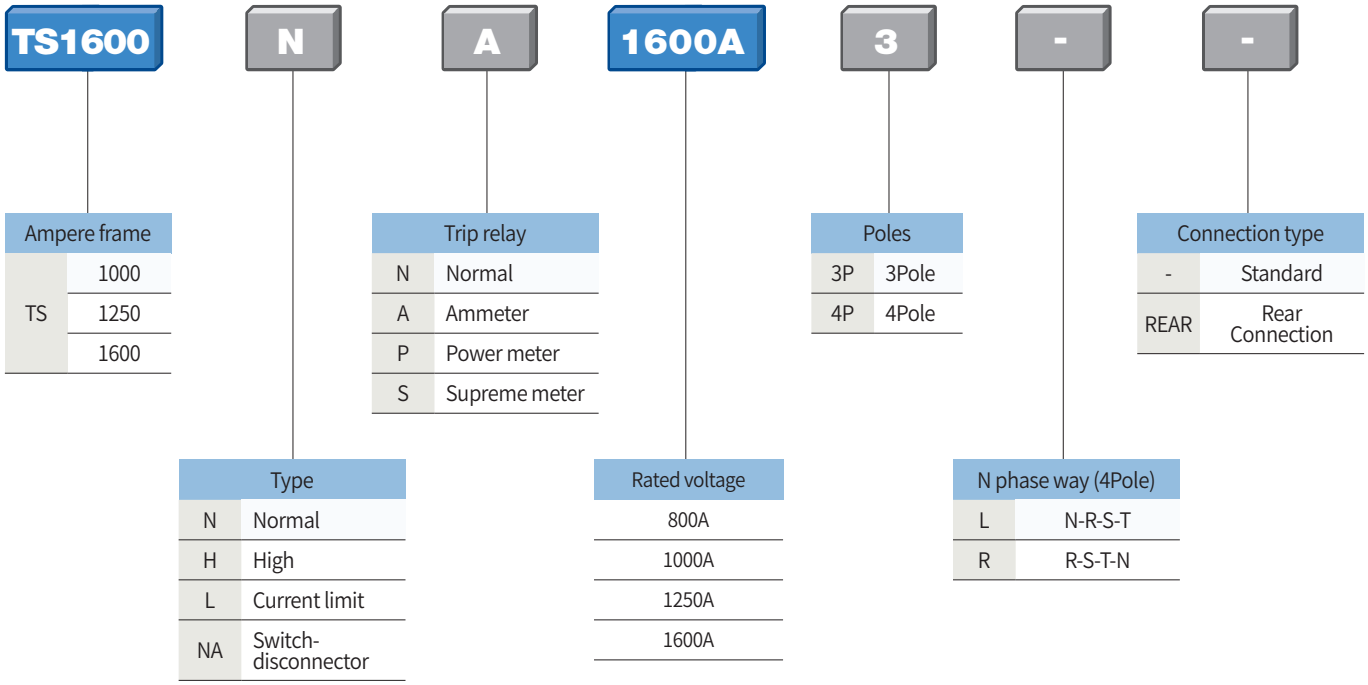
Pole	
3	3P
4	4P

Rated voltage
AC220/460V
AC460/690V

Applicable circuit breaker	
250AF	TS100/160, TS250
630AF	TS400 TS630
800AF	TS800 (3p only)

Ordering

Susol TS 1600AF MCCB



Ampere frame	
TS	1000
	1250
	1600

Type	
N	Normal
H	High
L	Current limit
NA	Switch-disconnector

Trip relay	
N	Normal
A	Ammeter
P	Power meter
S	Supreme meter

Rated voltage
800A
1000A
1250A
1600A

Poles	
3P	3Pole
4P	4Pole

N phase way (4Pole)	
L	N-R-S-T
R	R-S-T-N

Connection type	
-	Standard
REAR	Rear Connection

Trip relay

N	G	O
Trip relay type	Communication & protection	Control voltage & frequency
000 Without trip relay		

N	G	O
N Normal	G Without comm. + L/S/I/G	0 Self-Power, 60Hz
		5 Self-Power, 50Hz

* L/S/I/G configuration as standard
  -with LED indicators
  -without output contacts
* Ground fault system by vector sum

A	G	O
A Ammeter	G Without comm.	0 Self-Power, 60Hz
	Z Without comm. + Earth leakage	1 AC/DC 100V~250V, 60Hz
	E Without comm. + Earth leakage	2 DC 24V~60V, 60Hz
	C Comm.	5 Self-Power, 50Hz
	K Comm. + Earth leakage	6 AC/DC 100V~250V, 50Hz
	X Comm. + Earth leakage	7 DC 24V~60V, 50Hz

* L/S/I/G configuration as standard
* Ground fault system by vector sum(G,C)
* Earth leakage system
  - Z,K: External CT - LS ZCT applied(fault current 0.5~30A, 1600AF)
  - E,X: External CT - Private ZCT applied(fault current > 30A)
* Comm. And output contacts DO NOT work under self-power condition.
  (Only checking LED available)

P	C	1
P Power meter	C Comm.	1 AC/DC 100V~250V, 60Hz
	K Comm. + Earth leakage	2 DC 24V~60V, 60Hz
	X Comm. + Earth leakage	6 AC/DC 100V~250V, 50Hz
	A Comm. + Pre-trip alarm	7 DC 24V~60V, 50Hz

* L/S/I/G configuration as standard
* Ground fault system by vector sum
* Earth leakage system
  - K: External CT - LS ZCT applied(fault current 0.5~30A, 1600AF)
  - X: External CT - Private ZCT applied(fault current > 30A)
* Applicable to generator protection purpose
* Comm. And output contacts DO NOT work under self-power condition.
  (Only checking LED available)

S	C	1
S Supreme meter	C Comm.	1 AC/DC 100V~250V, 60Hz
	K Comm. + Earth leakage	2 DC 24V~60V, 60Hz
	X Comm. + Earth leakage	6 AC/DC 100V~250V, 50Hz
	A Comm. + Pre-trip alarm	7 DC 24V~60V, 50Hz

* L/S/I/G configuration as standard
* Ground fault system by vector sum
* Earth leakage system
  - K: External CT - LS ZCT applied(fault current 0.5~30A, 1600AF)
  - X: External CT - Private ZCT applied(fault current > 30A)
* Applicable to generator protection purpose
* Comm. And output contacts DO NOT work under self-power condition.
  (Only checking LED available)

Note) 1. L/S/I/G configuration as standard
2. Ground fault, earth leakage and pre-trip alarm functions are alternative.
3. The functions like Metering, Communication, ZSI, Remote reset and Digital output are NOT available only under Self-power condition.
4. Voltage module should be required for P and S types(supplied separately)


MCCB
Susol
DIGITAL TRIP RELAY
TS 1600H
1600A
Susol
LS

A-2
Main characteristics

MCCBs for power distribution

Electrical characteristics

				TE100		TE160		TD100			TD160		
Frame size			[AF]	100		160		100			160		
Rated current, In *			[A]	16~100		100, 125, 160		16, 20, 25, 32, 40, 60, 63, 80, 100			100, 125, 160, 1P: 16~160		
No. of poles				3,4		3,4		2*, 3, 4			1, 2*, 3, 4		
Rated operational voltage, Ue		AC	[V]	690		690		690			690, 1P; 240		
		DC	[V]	500		500		500			500, 1P:250		
Rated impulse withstand voltage, Uimp			[kV]	8		8		8			8		
Rated insulation voltage, Ui			[V]	750		750		1000			1000		
Rated ultimate short-circuit breaking capacity, Icu				S	N	S	N	N	H	L	N	H	L
	AC 50/60Hz	220/240V	[kA]	50	85	50	85	85	100	200	85 (1P:30)	100 (1P:50	200
		380/415V	[kA]	37	50	37	50	50	85	150	50	85	150
		440/460V	[kA]	25	37	25	37	50	70	130	50	70	130
		480/500V	[kA]	18	25	18	25	30	50	65	30	50	65
		525V	[kA]	-	-	-	-	22	35	50	22	35	50
		660/690V	[kA]	6	8	6	8	10	10	10	10	10	10
	DC	250V	[kA]	37	50	37	50	42	65	100	42 (1P:16)	65 (1P:25)	100
		500V(2poles in series)	[kA]	37	50	37	50	42	65	100	42	65	100
Rated service breaking capacity, Ics													
	AC 50/60Hz	220~525V	[%Icu]	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
		660/690V	[kA]	-	-	-	-	5	5	5	5	5	5
	DC		[%Icu]	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Rated short-circuit making capacity Icm													
	AC 50/60Hz	220/240V	[kA]	105	187	105	187	187	220	440	187 (1P:105)	220 (1P:105)	440
		380/415V	[kA]	77.7	105	77.7	105	105	187	330	105	187	330
		440/460V	[kA]	52.5	77.7	52.5	77.7	105	154	286	105	154	286
		480/500V	[kA]	36	52.5	36	52.5	63	105	143	63	105	143
		525V	[kA]	-	-	-	-	46	74	105	46	74	105
		660/690V	[kA]	9.2	13.6	9.2	13.6	17	17	17	17	17	17
Category of utilization				A		A		A			A		
Isolation behavior				●		●		●			●		
Trip unit (release)													
	Thermal-Magnetic												
	● fixed-thermal, fixed-magnetic		FTU	●		●		●			●		
	● adjustable-thermal, fixed-magnetic		FMU	●		●		●			●**		
	● adjustable-thermal, adjustable-magnetic		ATU	-		-		-			-		
	● magnetic only		MTU (3P)	-		-		-			-		
	Electronic												
	● LSI		ETS (3P, 4P)	-		-		-			-		
	● LSI		ETM (3P, 4P)	-		-		-			-		
	Option	Earth-fault protection, Ig		-		-		-			-		
		Zone selective interlocking, ZSI		-		-		-			-		
		Ammeter		-		-		-			-		
		Communication		-		-		-			-		
		Earth-leakage protection module		-		-		-			-		
Connection	fixed	front-connection		●		●		●			●		
		rear-connection		●		●		●			●**		
	plug-in	front-connection		-		-		●			●**		
		rear-connection		-		-		●			●**		
Life cycle ***	Mechanical		[operations]	25000		25000		25000			25000		
	Electrical @ 415 V AC		[operations]	10000		10000		10000			10000		
Basic dimensions, W×H×D (front connection)	1-pole		[mm]	-		-		-			35×140×86		
	3-pole		[mm]	76×130×82		76×130×82		90×140×86			90×140×86		
	4-pole		[mm]	101×130×82		101×130×82		120×140×86			120×140×86		
Weight (front connection)	1-pole		[kg]	-		-		-			0.57		
	3-pole		[kg]	1.05		1.05		1.5			1.5		
	4-pole		[kg]	1.35		1.35		1.8			1.8		
Reference standard				IEC60947-2		IEC60947-2		IEC60947-2			IEC60947-2		

※ Breaking capacity at 660/690V is for your reference. (not certified)
* Applicable to MCCBs equipped with FTU, FMU, ATU

* 2 pole MCCB in 3pole frame size
** Not applicable to 1pole

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

	TS100			TS160			TS250			TS400			TS630			TS800		
	100			160			250			400			630			800		
	40, 50, 63, 80, 100			(100)※, 125, 160			125, 160, 200, 250			300, 400			500, 630			700※※, 800		
	2*, 3, 4			2*, 3, 4			2*, 3, 4			2*, 3, 4			2*, 3, 4			2*, 3, 4		
	690			690			690			690			690			690		
	500			500			500			500			500			500		
	8			8			8			8			8			8		
	1000			1000			1000			1000			1000			1000		
	N	H	L	N	H	L	N	H	L	N	H	L	N	H	L	N	H	L
	100	120	200	100	120	200	100	120	200	100	120	200	100	120	200	100	120	200
	50	85	150	50	85	150	50	85	150	65	85	150	65	85	150	65	100	150
	50	70	130	50	70	130	50	70	130	65	85	130	65	85	130	65	100	130
	42	65	85	42	65	85	42	65	85	42	65	85	42	65	85	42	85	100
	22	35	50	22	35	50	22	35	50	22	35	50	22	35	50	22	35	50
	10	10	10	10	10	10	10	10	10	10	20	35	10	20	35	10	20	35
	50	85	100	50	85	100	50	85	100	50	85	100	50	85	100	50	85	100
	50	85	100	50	85	100	50	85	100	50	85	100	50	85	100	50	85	100
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	5	5	5	5	5	5	5	5	5	10	12	12	10	12	12	10	20	20
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	220	264	440	220	264	440	220	264	440	220	264	440	220	264	440	220	264	440
	105	187	330	105	187	330	105	187	330	143	187	330	143	187	330	143	220	330
	105	154	286	105	154	286	105	154	286	143	187	286	143	187	286	143	220	286
	88	143	187	88	143	187	88	143	187	88	143	187	88	143	187	88	187	220
	46	74	105	46	74	105	46	74	105	46	74	105	46	74	105	46	74	105
	17	17	17	17	17	17	17	17	17	17	40	74	17	40	74	17	40	74
		A			A			A			A			A			A	
		●			●			●			●			●			●	
		●			●			●			●			●			●	
		●			●			●			●			●			●	
		-			●			●			●			●			●	
		●			●			●			●			●			●	
		●			●			●			●			●			●	
		-			-			-			●			●			●	
		-			-			-			●			●			●	
		-			-			-			●			●			●	
		-			-			-			●			●			●	
		-			-			-			●			●			●	
		-			-			-			●			●			●	
		●			●			●			●			●			●	
		●			●			●			●			●			●	
		●			●			●			●			●			●	
		●			●			●			●			●			●	
		25000			25000			25000			20000			20000			10000	
		10000			10000			10000			10000			6000			3000	
		-			-			-			-			-			-	
		105×160×86			105×160×86			105×160×86			140×260×110			140×260×110			210×320×135	
		140×160×86			140×160×86			140×160×86			186.5×260×110			186.5×260×110			280×320×135	
		-			-			-			-			-			-	
		2			2			2			5.4			5.4			15.1	
		2.6			2.6			2.6			7.2			7.2			19.6	
		IEC60947-2			IEC60947-2			IEC60947-2			IEC60947-2			IEC60947-2			IEC60947-2	

※ The trip unit ATU is available from 125A
※※ 700A is only available for TS800FTU

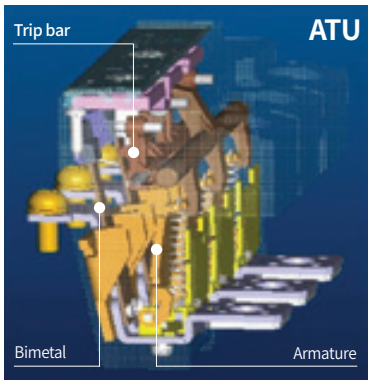
Thermal magnetic trip units Overview

Susol series circuit breakers can be installed with thermal magnetic trip units.
And, there are two kinds of trip units according to way of installation as follows.
- Built-in trip units for TE and TD series upto 160A
- Interchangeable trip units for TS series upto 800A

Function

Protection of power distribution
- Overload protection: Thermal protection with a fixed or adjustable threshold
- Short-circuit protection: Magnetic protection with a fixed or adjustable pick-up
- Protection of the fourth pole
  4P3D type (neutral unprotected)
  4P4D type 50% (neutral protection at 0.5×In)
  4P4D type 100% (neutral protection at 1×In)

Operation



Thermal magnetic types

- Time-Delay operation
  An overcurrent heats and warps the bimetal to actuate the trip bar by the bimetal characteristic.
- Instantaneous operation
  If the overcurrent is excessive, the armature is attracted and the trip bar actuated by electromagnetic force.

Ratings

Ratings(A) at 40℃ In		Thermal magnetic trip units(FTU/FMU/ATU) TE100 to TS800																	
		16	20	25	32	40	50	63	80	100	125	160	200	250	300	400	500	630	800
	TE100	●	●	●	●	●	●	●	●	●	-	-	-	-	-	-	-	-	-
	TD100	●	●	●	●	●	●	●	●	●	-	-	-	-	-	-	-	-	-
	TE160	-	-	-	-	-	-	-	-	●	●	●	-	-	-	-	-	-	-
	TD160	-	-	-	-	-	-	-	-	●	●	●	-	-	-	-	-	-	-
	TS100	-	-	-	-	●	●	●	●	●	-	-	-	-	-	-	-	-	-
	TS160	-	-	-	-	-	-	-	-	●	●	●	-	-	-	-	-	-	-
	TS250	-	-	-	-	-	-	-	-	-	●	●	●	●	-	-	-	-	-
	TS400	-	-	-	-	-	-	-	-	-	-	-	-	-	●	●	-	-	-
	TS630	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	●	●	-
	TS800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	●

Note) Rated current 700A is available for TS800FTU.

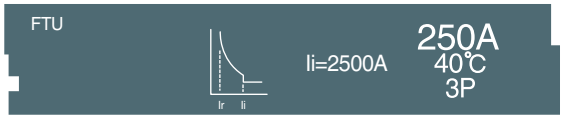
Thermal magnetic trip units Overview

Characteristics

Fixed thermal, fixed magnetic trip units

FTU

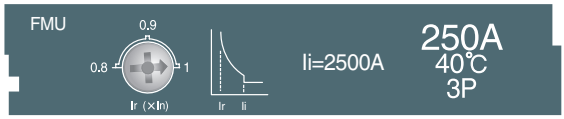
- Fixed thermal
  16A ... 800A rated currents
- Fixed magnetic
  400A ... 8000A tripping currents
- Applicable to TE100 ... TS800 frames



Adjustable thermal, fixed magnetic trip units

FMU

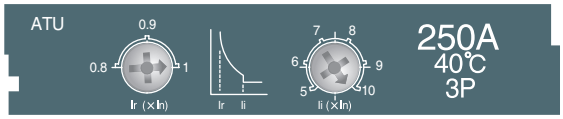
- Adjustable thermal
  16A ... 800A rated currents
  Adjustable : 0.8~1×In
- Fixed magnetic
  400A ... 8000A tripping currents
- Applicable to TE100 ... TS800 frames



Adjustable thermal, adjustable magnetic trip units

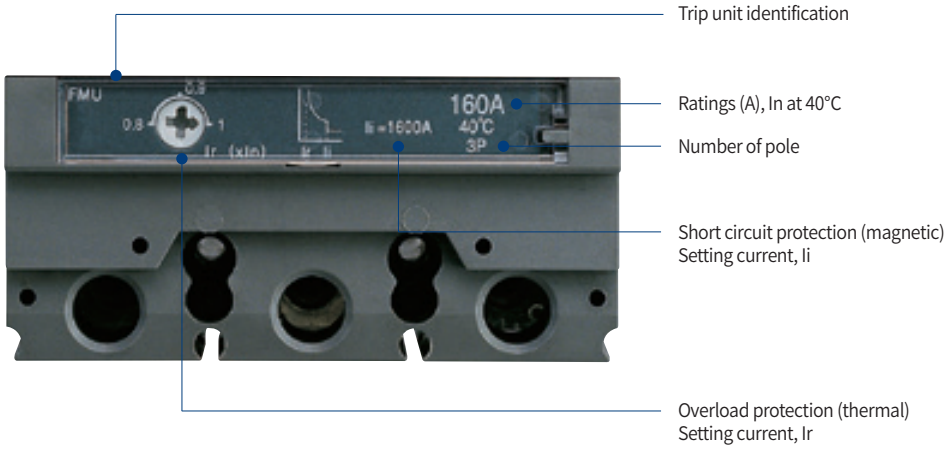
ATU

- Adjustable thermal
  100A ... 800A rated currents
  Adjustable : 0.8~1×In
- Adjustable magnetic
  500A ... 8000A tripping currents
  Adjustable : 5~10×In
- Applicable to TS160 ... TS800 frames



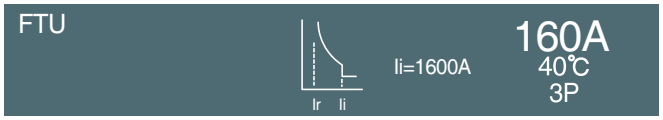
Thermal magnetic trip units
FTU, FMU for TE100, TD100, TE160, TD160

Configuration



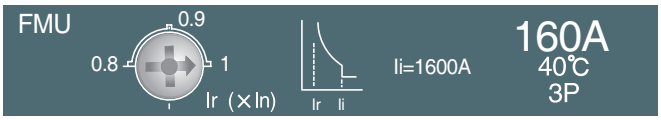
TE100 FTU, TD100 FTU, TE160 FTU, TD160 FTU

- Fixed thermal & magnetic trip unit

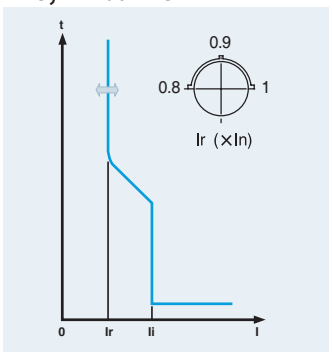


TE100 FMU, TD100 FMU, TE160 FMU, TD160 FMU

- Adjustable thermal & fixed magnetic trip unit



TE100 FTU, TD100 FTU, TE160 FTU, TD160 FTU



Catalogue numbering system

TD160 FMU

Trip unit function
- FTU : Fixed thermal & magnetic unit
- FMU : Adjustable thermal, fixed magnetic unit

MCCB frame type
- TE100 : TE100N, TE100H, TE100L
- TD100 : TD100N, TD100H, TD100L
- TE160 : TE160N, TE160H, TE160L
- TD160 : TD160N, TD160H, TD160L

Thermal magnetic trip units
FTU, FMU for TE100, TD100, TE160, TD160

Characteristics

Thermal magnetic trip units(FTU/FMU) ... TE100, TD100, TE160, TD160												
Rating(A) at 40°C In		16	20	25	32	40	50	63	80	100	125	160
	TE/TD100	●	●	●	●	●	●	●	●	●	-	-
	TE/TD160	-	-	-	-	-	-	-	-	●	●	●

Overload protection(thermal)		
Current setting(A) Ir		
	FTU	Fixed
	FMU	Adjustable 0.8, 0.9, 1×In (3 settings)

Short - circuit protection(magnetic)			
Current setting(A) Ii			
	FTU	Fixed 400A	Fixed 10×In
	FMU	Fixed 400A	Fixed 10×In

Protection of N pole		
	4P3D	Neutral No protection
	4P4D	Neutral protection (100% Ir)

Setting details

Thermal overload protection

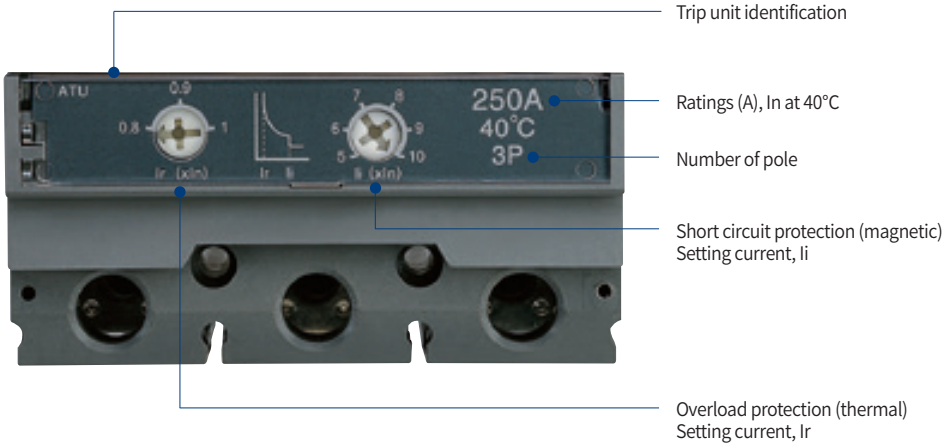
Trip unit type	Setting	Trip unit rating, In (A)										
	Ir	16	20	25	32	40	50	63	80	100	125	160
TE/TD100FTU	Fixed	16	20	25	32	40	50	63	80	100	-	-
TE/TD100FMU	0.8	12.8	16	20	25.6	32	40	50.4	64	80	-	-
	0.9	14.4	18	22.5	28.8	36	45	56.7	72	90	-	-
	1	16	20	25	32	40	50	63	80	100	-	-
TE/TD160FTU	Fixed	-	-	-	-	-	-	-	-	100	125	160
TE/TD160FMU	0.8	-	-	-	-	-	-	-	-	80	100	128
	0.9	-	-	-	-	-	-	-	-	90	112.5	144
	1	-	-	-	-	-	-	-	-	100	125	160

Magnetic short-circuit protection

Trip unit type	Setting current, Ir	Setting current, Ii		Trip unit rating, In (A)										
				16	20	25	32	40	50	63	80	100	125	160
TE/TD100FTU		Fixed	In×10	400	400	400	400	400	500	630	800	1000	-	-
TE/TD100FMU	0.8×In	Fixed	In×10	400	400	400	400	400	500	630	800	1000	-	-
	0.9×In	Fixed	In×10	400	400	400	400	400	500	630	800	1000	-	-
	1.0×In	Fixed	In×10	400	400	400	400	400	500	630	800	1000	-	-
TE/TD160FTU		Fixed	In×10	-	-	-	-	-	-	-	-	1000	1250	1600
TE/TD160FMU	0.8×In	Fixed	In×10	-	-	-	-	-	-	-	-	1000	1250	1600
	0.9×In	Fixed	In×10	-	-	-	-	-	-	-	-	1000	1250	1600
	1.0×In	Fixed	In×10	-	-	-	-	-	-	-	-	1000	1250	1600

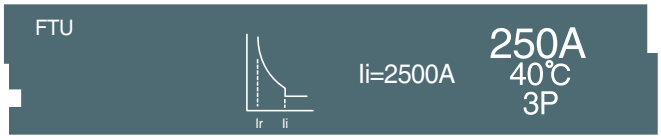
Thermal magnetic trip units
FTU, FMU for TS100, TS160, TS250
ATU for TS160, TS250

Configuration



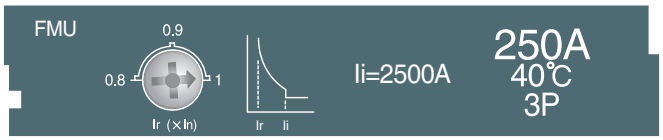
TS100 FTU, TS160 FTU, TS250 FTU

- Fixed thermal fixed magnetic trip unit



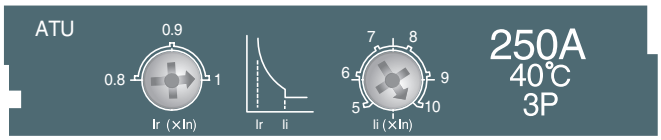
TS100 FMU, TS160 FMU, TS250 FMU

- Adjustable thermal fixed magnetic trip unit

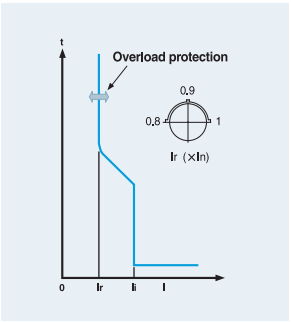


TS160 ATU, TS250 ATU

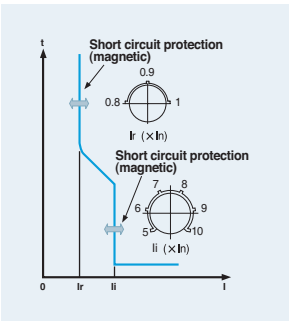
- Adjustable thermal adjustable magnetic trip unit



TS100 FMU, TS160 FMU, TS250 FMU



TS160 ATU, TS250 ATU



Thermal magnetic trip units
FTU, FMU for TS100, TS160, TS250
ATU for TS160, TS250

Characteristics

Thermal Magnetic trip units(FTU/FMU/ATU) ... TS100 to TS250										
Rating(A) at 40°C	In	40	50	63	80	100	125	160	200	250
	TS100	●	●	●	●	●	-	-	-	-
	TS160	-	-	-	-	●	●	●	-	-
	TS250	-	-	-	-	-	●	●	●	●

Overload protection(thermal)		
Current setting(A)	Ir	
	FTU	Fixed
	FMU	Adjustable 0.8 to×In
	ATU	Adjustable 0.8 to×In

Short - circuit protection(magnetic)		
Current setting(A)	Ii	
	FTU	Fixed 10×In
	FMU	Fixed 10×In
	ATU	Adjustable 5, 6, 7, 8, 9, 10×In (6 settings)

Protection of N pole		
	4P3D	Neutral No protection
	4P4D	Neutral protection (100% Ir)

Catalogue numbering system

TS250 FTU

Trip unit function
- FTU: Fixed thermal, fixed magnetic unit

MCCB frame type
- TS100: TS100N, TS100H, TS100L
- TS160: TS160N, TS160H, TS160L
- TS250: TS250N, TS250H, TS250L

TS250 FMU

Trip unit function
- FMU: Adjustable thermal, fixed magnetic unit

MCCB frame type
- TS100: TS100N, TS100H, TS100L
- TS160: TS160N, TS160H, TS160L
- TS250: TS250N, TS250H, TS250L

TS250 ATU

Trip unit function
- ATU: Adjustable thermal, adjustable magnetic unit

MCCB frame type
- TS160: TS160N, TS160H, TS160L
- TS250: TS250N, TS250H, TS250L

The trip unit ATU is available from 125A

Thermal magnetic trip units
FTU, FMU for TS100, TS160, TS250
ATU for TS160, TS250

Setting details

Thermal overload protection

Trip unit type	Setting Ir	Trip unit rating, In (A)								
		40	50	63	80	100	125	160	200	250
TS100FTU	Fixed	40	50	63	80	100	-	-	-	-
TS100FMU	0.8×In	32	40	50	64	80	-	-	-	-
	0.9×In	36	45	57	72	90	-	-	-	-
	1.0×In	40	50	63	80	100	-	-	-	-
TS160FTU	Fixed	-	-	-	-	100	125	160	-	-
TS160FMU	0.8×In	-	-	-	-	80	100	128	-	-
	0.9×In	-	-	-	-	90	113	144	-	-
	1.0×In	-	-	-	-	100	125	160	-	-
TS160ATU	0.8×In	-	-	-	-	-	100	128	-	-
	0.9×In	-	-	-	-	-	113	144	-	-
	1.0×In	-	-	-	-	-	125	160	-	-
TS250FTU	Fixed	-	-	-	-	-	125	160	200	250
TS250FMU	0.8×In	-	-	-	-	-	100	128	160	200
	0.9×In	-	-	-	-	-	113	144	180	225
	1.0×In	-	-	-	-	-	125	160	200	250
TS250ATU	0.8×In	-	-	-	-	-	100	128	160	200
	0.9×In	-	-	-	-	-	113	144	180	225
	1.0×In	-	-	-	-	-	125	160	200	250

Thermal magnetic trip units
FTU, FMU for TS100, TS160, TS250
ATU for TS160, TS250

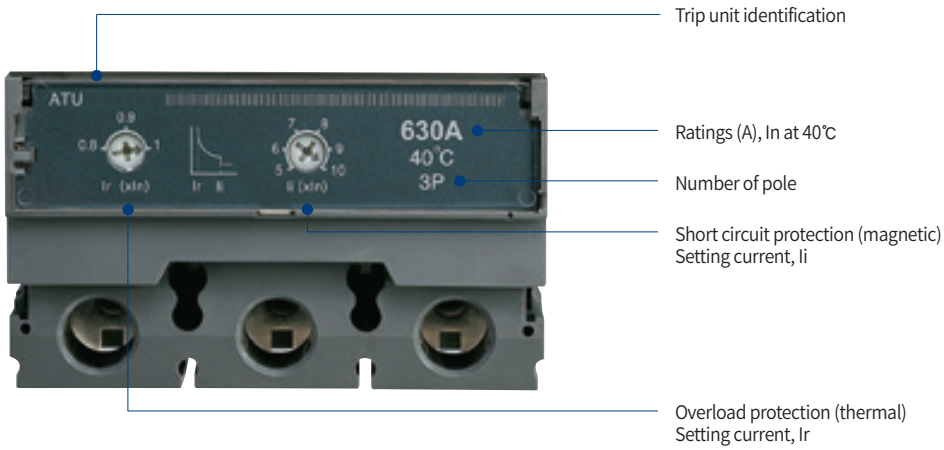
Setting details

Magnetic short-circuit protection

Trip unit type	Setting current, Ir	Setting current, Ii		Trip unit rating, In (A)								
				40	50	63	80	100	125	160	200	250
TS100FTU		Fixed	In×10	400	500	630	800	1000	-	-	-	-
TS100FMU	0.8×In	Fixed	In×10	400	500	630	800	1000	-	-	-	-
	0.9×In	Fixed	In×10	400	500	630	800	1000	-	-	-	-
	1.0×In	Fixed	In×10	400	500	630	800	1000	-	-	-	-
TS160FTU		Fixed	In×10	-	-	-	-	1000	1250	1600		
TS160FMU	0.8×In	Fixed	In×10	-	-	-	-	1000	1250	1600	-	-
	0.9×In	Fixed	In×10	-	-	-	-	1000	1250	1600	-	-
	1.0×In	Fixed	In×10	-	-	-	-	1000	1250	1600	-	-
TS160ATU	0.8×In	Adjustable	In×5	-	-	-	-	-	625	800	-	-
			In×6	-	-	-	-	-	750	960	-	-
			In×7	-	-	-	-	-	875	1120	-	-
			In×8	-	-	-	-	-	1000	1280	-	-
			In×9	-	-	-	-	-	1125	1440	-	-
			In×10	-	-	-	-	-	1250	1600	-	-
	0.9×In	Adjustable	In×5	-	-	-	-	-	625	800	-	-
			In×6	-	-	-	-	-	750	960	-	-
			In×7	-	-	-	-	-	875	1120	-	-
			In×8	-	-	-	-	-	1000	1280	-	-
			In×9	-	-	-	-	-	1125	1440	-	-
			In × 10	-	-	-	-	-	1250	1600	-	-
	1.0×In	Adjustable	In×5	-	-	-	-	-	625	800	-	-
			In×6	-	-	-	-	-	750	960	-	-
			In×7	-	-	-	-	-	875	1120	-	-
			In×8	-	-	-	-	-	1000	1280	-	-
			In×9	-	-	-	-	-	1125	1440	-	-
			In×10	-	-	-	-	-	1250	1600	-	-
TS250FTU		Fixed	In × 10	-	-	-	-	-	1250	1600	2000	2500
TS250FMU	0.8×In	Fixed	In×10	-	-	-	-	-	1250	1600	2000	2500
	0.9×In	Fixed	In×10	-	-	-	-	-	1250	1600	2000	2500
	1.0×In	Fixed	In×10	-	-	-	-	-	1250	1600	2000	2500
TS250ATU	0.8×In	Adjustable	In×5	-	-	-	-	-	625	800	1000	1250
			In×6	-	-	-	-	-	750	960	1200	1500
			In×7	-	-	-	-	-	875	1120	1400	1750
			In×8	-	-	-	-	-	1000	1280	1600	2000
			In×9	-	-	-	-	-	1125	1440	1800	2250
			In×10	-	-	-	-	-	1250	1600	2000	2500
	0.9×In	Adjustable	In×5	-	-	-	-	-	625	800	1000	1250
			In×6	-	-	-	-	-	750	960	1200	1500
			In×7	-	-	-	-	-	875	1120	1400	1750
			In×8	-	-	-	-	-	1000	1280	1600	2000
			In×9	-	-	-	-	-	1125	1440	1800	2250
			In×10	-	-	-	-	-	1250	1600	2000	2500
	1.0 × In	Adjustable	In×5	-	-	-	-	-	625	800	1000	1250
			In×6	-	-	-	-	-	750	960	1200	1500
			In×7	-	-	-	-	-	875	1120	1400	1750
			In×8	-	-	-	-	-	1000	1280	1600	2000
			In×9	-	-	-	-	-	1125	1440	1800	2250
			In×10	-	-	-	-	-	1250	1600	2000	2500

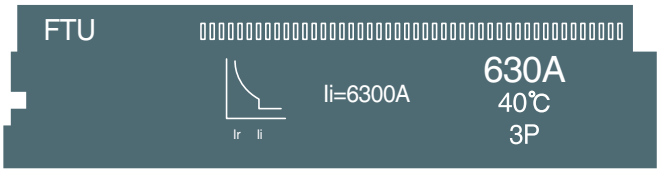
Thermal magnetic trip units
FTU, FMU, ATU for TS400, TS630

Configuration



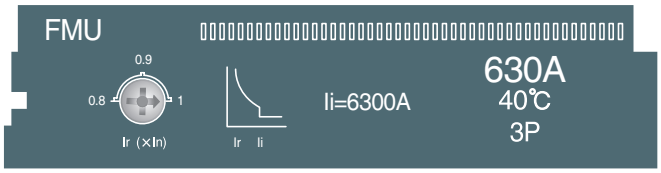
TS400 FTU, TS630 FTU

- Fixed thermal fixed magnetic trip unit



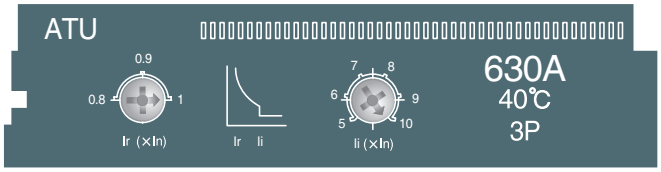
TS400 FMU, TS630 FMU

- Adjustable thermal fixed magnetic trip unit

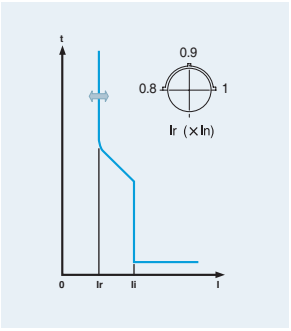


TS400 ATU, TS630 ATU

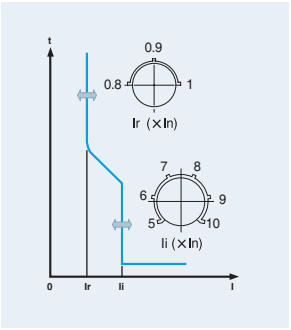
- Adjustable thermal adjustable magnetic trip unit



TS400 FMU, TS630 FMU



TS400 ATU, TS630 ATU



Thermal magnetic trip units FTU, FMU, ATU for TS400, TS630

Characteristics

Thermal Magnetic trip units(FTU/FMU/ATU) ... TS400 to TS630					
Rating(A) at 40°C In		300	400	500	630
	TS400	●	●	-	-
	TS630	-	-	●	●
Overload protection(thermal)					
Current setting(A) Ir					
	FTU	In=Ir (Fixed)			
	FMU	Adjustable 0.8, 0.9, 1×In (3 settings)			
	ATU	Adjustable 0.8, 0.9, 1×In (3 settings)			
Short - circuit protection(magnetic)					
Current setting(A) Ii					
	FTU	Fixed 10×In			
	FMU	Fixed 10×In			
	ATU	Adjustable 5, 6, 7, 8, 9, 10×In (6 settings)			
Protection of N pole					
	4P3D	Neutral No protection			
	4P4D	Neutral protection (100% Ir)			

Catalogue numbering system

TS630 ATU

Trip unit function
- FTU : Fixed thermal & magnetic unit
- FMU : Adjustable thermal & fixed magnetic unit
- ATU : Adjustable thermal & adjustable magnetic unit

MCCB frame type
- TS400 : TS400N, TS400H, TS400L
- TS630 : TS630N, TS630H, TS630L

Thermal magnetic trip units
FTU, FMU, ATU for TS400, TS630

Setting details

Thermal overload protection

Trip unit type	Setting Ir	Trip unit rating, In (A)			
		300	400	500	630
TS400FTU	Fixed	300	400	-	-
TS400FMU	0.8	240	320	-	-
	0.9	270	360	-	-
	1	300	400	-	-
TS400ATU	0.8	240	320	-	-
	0.9	270	360	-	-
	1	300	400	-	-
TS630FTU	Fixed	-	-	500	630
TS630FMU	0.8	-	-	400	504
	0.9	-	-	450	567
	1	-	-	500	630
TS630ATU	0.8	-	-	400	504
	0.9	-	-	450	567
	1	-	-	500	630

Thermal magnetic trip units
FTU, FMU, ATU for TS400, TS630

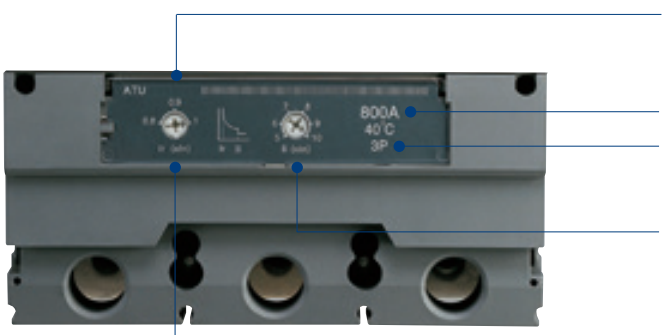
Setting details

Magnetic short-circuit protection

Trip unit type	Setting current, Ir	Setting current, Ii		Trip unit rating, In (A)			
				300	400	500	630
TS400FTU		Fixed	In×10	3000	4000	-	-
TS400FMU	0.8×In	Fixed	In×10	3000	4000	-	-
	0.9×In	Fixed	In×10	3000	4000	-	-
	1.0×In	Fixed	In×10	3000	4000	-	-
TS400ATU	0.8×In	Adjustable	In×5	1500	2000	-	-
			In×6	1800	2400	-	-
			In×7	2100	2800	-	-
			In×8	2400	3200	-	-
			In×9	2700	3600	-	-
			In×10	3000	4000		-
	0.9×In	Adjustable	In×5	1500	2000	-	-
			In×6	1800	2400	-	-
			In×7	2100	2800	-	-
			In×8	2400	3200	-	-
			In×9	2700	3600	-	-
			In×10	3000	4000	-	-
	1.0 × In	Adjustable	In×5	1500	2000	-	-
			In×6	1800	2400	-	-
			In×7	2100	2800	-	-
			In×8	2400	3200	-	-
			In×9	2700	3600	-	-
			In×10	3000	4000		-
TS630FTU		Fixed	In×10	-	-	5000	6300
TS630FMU	0.8×In	Fixed	In×10	-	-	5000	6300
	0.9×In	Fixed	In×10	-	-	5000	6300
	1.0×In	Fixed	In×10	-	-	5000	6300
TS630ATU	0.8×In	Adjustable	In×5	-	-	2500	3150
			In×6	-	-	3000	3780
			In×7	-	-	3500	4410
			In×8	-	-	4000	5040
			In×9	-	-	4500	5670
			In×10	-	-	5000	6300
	0.9×In	Adjustable	In×5	-	-	2500	3150
			In×6	-	-	3000	3780
			In×7	-	-	3500	4410
			In×8	-	-	4000	5040
			In×9	-	-	4500	5670
			In×10	-	-	5000	6300
	1.0×In	Adjustable	In×5	-	-	2500	3150
			In×6	-	-	3000	3780
			In×7	-	-	3500	4410
			In×8	-	-	4000	5040
			In×9	-	-	4500	5670
			In×10	-	-	5000	6300

Thermal magnetic trip units FTU, FMU, ATU for TS800

Configuration



Trip unit identification

Ratings (A), In at 40℃

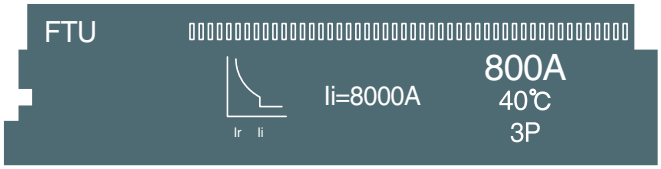
Number of pole

Short circuit protection (magnetic)
Setting current, Ii

Overload protection (thermal)
Setting current, Ir

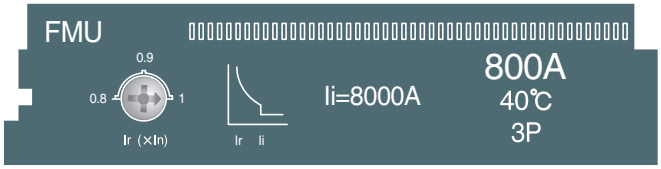
TS800 FTU

- Fixed thermal fixed magnetic trip unit



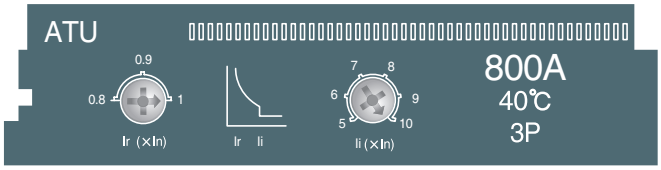
TS800 FMU

- Adjustable thermal fixed magnetic trip unit

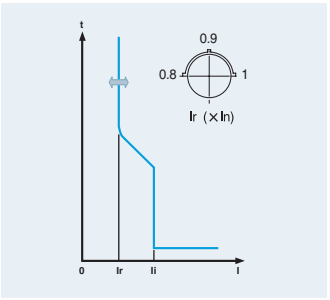


TS800 ATU

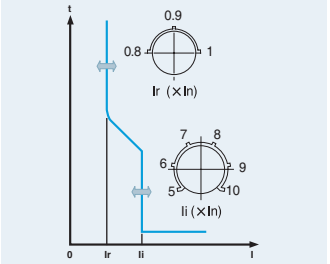
- Adjustable thermal adjustable magnetic trip unit



TS800 FMU



TS800 ATU



Catalogue numbering system

TS800 **ATU**

Trip unit function
- FTU : Fixed thermal & magnetic unit
- FMU : Adjustable thermal & fixed magnetic unit
- ATU : Adjustable thermal & adjustable magnetic unit

MCCB frame type
- TS800 : TS800N, TS800H, TS800L

Thermal magnetic trip units FTU, FMU, ATU for TS800

Characteristics

Thermal Magnetic trip units(FTU/FMU/ATU) ... TS800			
Rating(A) at 40°C In		700	800
	TS800	●	●

Overload protection(thermal)		
Current setting(A) Ir		
	FTU	Fixed
	FMU	Adjustable 0.8, 0.9,1×In (3 settings)
	ATU	Adjustable 0.8, 0.9,1×In (3 settings)

Note) 700A is only available for TS800FTU

Short - circuit protection(magnetic)		
Current setting(A) Ii		
	FTU	Fixed 10×In
	FMU	Fixed 10×In
	ATU	Adjustable 5, 6, 7, 8, 9, 10×In (6 settings)

Protection of N pole		
	4P3D	Neutral No protection
	4P4D	Neutral protection (100% Ir)

Setting details

Thermal overload protection

Trip unit type	Setting Ir	Trip unit rating, In (A) 700	800
TS800FTU	Fixed	700	800
TS800FMU	0.8	-	640
	0.9	-	720
	1	-	800
TS800ATU	0.8	-	640
	0.9	-	720
	1	-	800

Magnetic short-circuit protection

Trip unit typ	Setting current, Ir	Setting current, Ii		Trip unit rating, In (A) 700	800
TS800FTU		Fixed	In×10	7000	8000
TS800FMU	0.8×In	Fixed	In×10	-	8000
	0.9×In	Fixed	In×10	-	8000
	1.0×In	Fixed	In×10	-	8000
TS800ATU	0.8×In	Adjustable	In×5	-	4000
			In×6	-	4800
			In×7	-	5600
			In×8	-	6400
			In×9	-	7200
			In×10	-	8000
	0.9×In	Adjustable	In×5	-	4000
			In×6	-	4800
			In×7	-	5600
			In×8	-	6400
			In×9	-	7200
			In×10	-	8000
	1.0×In	Adjustable	In×5	-	4000
			In×6	-	4800
			In×7	-	5600
			In×8	-	6400
			In×9	-	7200
			In×10	-	8000

Overview of electronic trip units (Standard type)

Types: ETS23, ETS33, ETS43
3 frame size of circuit breaker: 250AF, 630AF, 800AF
The Trip units can be mounted on circuit breakers of N, H and L type from TS100 to TS800.
Test connector for trip unit (AC/DC 30mA ~ AC/DC 100mA)
Protection

- Overload protection
- Short-circuit protection

Ratings

		Trip units					
		ETS23			ETS33		ETS43
Rated current, In (A)	40	●	●	●	-	-	-
	80	●	●	●	-	-	-
	160	-	●	●	●	●	-
	250	-	-	●	●	●	-
	400	-	-	-	●	●	-
	630	-	-	-	-	●	●
	800	-	-	-	-	-	●
Applicable to		TS100 N/H/L	TS160 N/H/L	TS250 N/H/L	TS400 N/H/L	TS630 N/H/L	TS800 N/H/L

Current setting, Ir(A)

ETS	16	32	40	64	80	100	160	250	320	400	630	800
ETS23 for TS100N/H/L												
ETS23 for TS160N/H/L												
ETS23 for TS250N/H/L												
ETS33 for TS400N/H/L												
ETS33 for TS630N/H/L												
ETS43 for TS800N/H/L												

Setting values

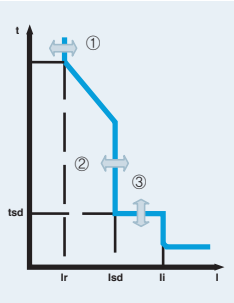
Overload protection (long time)		
Setting current (A)	Ir	0.4, 0.45, 0.5, 0.55, 0.6, 0.65, 0.7, 0.75, 0.8, 0.85, 0.9, 0.95, 1.0×In, 13 setting
Tripping time (s)		Fixed at 6×Ir , tolerance±20%

Short-circuit protection (short time)							
Tripping threshold (A)	Isd	adjustable 1.5, 2, 3, 4, 5, 6, 7, 8, 10×Ir, 9 settings, tolerance ±15%					
Time delay	tsd	setting time (ms)	50	100	200	300	4 settings I^2t is off
		operation time (ms)	30<t≤70	70<t≤140	140<t≤240	240<t≤350	

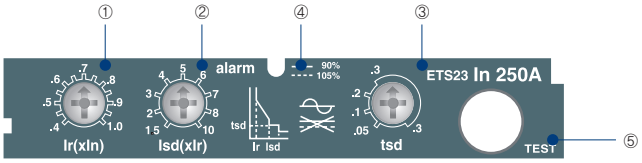
Short circuit protection (Instantaneous)		
Tripping threshold (A)	Ii	Fixed at 11×In

Overview of electronic trip units (Standard type)

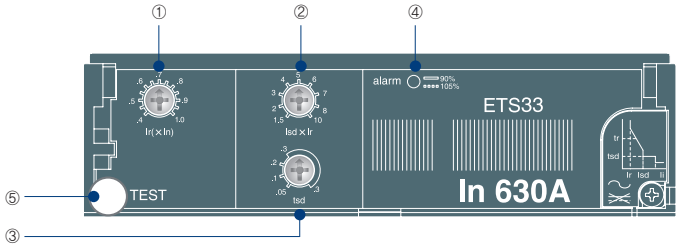
① Adjustable rated current setting (Ir)
② Adjustable short time delay current setting (Isd)
③ Adjustable time delay setting (tsd)
④ Alarm LED
90% Ir: ON,
105% Ir or more: ON-OFF
⑤ Test connector



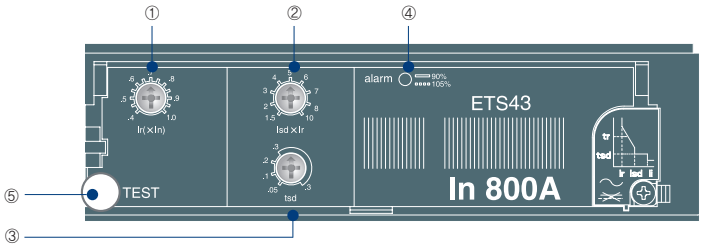
ETS23 for TS100/TS160/TS250



ETS33 for TS400/TS630



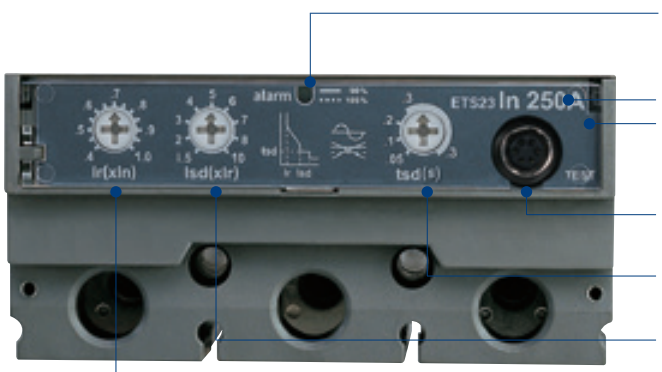
ETS43 for TS800



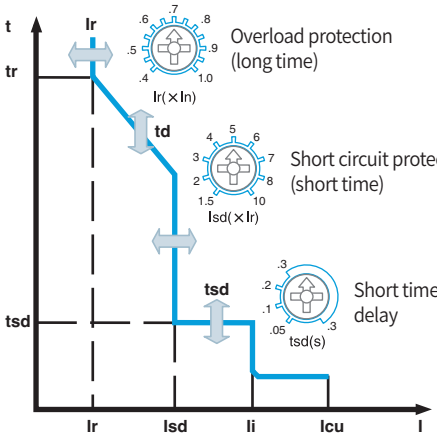
Electronic trip units (Standard)
ETS23 for TS100, TS160, TS250

Configuration

Electronic type, ETS23 for MCCBs TS100, TS160, TS250



Indication of alarm
Load: not less than 90% Ir → LED ON
Load: not less than 105% Ir → LED flickering
Trip unit identification
Trip unit rating, In
Test connector
Short time tripping delay
Short circuit protection (short time)
Overload protection (long time)



Overload protection (long time)

Short circuit protection (short time)

Short time tripping delay

Overload protection (long time)		
Setting current (A)	Ir	0.4, 0.45, 0.5, 0.55, 0.6, 0.65, 0.7, 0.75, 0.8, 0.85, 0.9, 0.95, 1.0×In 13 settings
Tripping time (s)		Fixed at 6×Ir , tolerance±20%

Short-circuit protection (short time)						
Tripping threshold (A)	Isd	1.5, 2, 3, 4, 5, 6, 7, 8, 10×Ir 9 settings, tolerance ±15%				
Time delay	tsd	setting time (ms)	50	100	200	300	4 settings
		operation time (ms)	30<t≤70	70<t≤140	140<t≤240	240<t≤350	

Short circuit protection (Instantaneous)		
Tripping threshold (A)	Ii	Fixed at 11×In

Catalogue numbering system

ETS 23 In250A

Trip unit frame
- 23 for TS100, TS160, TS250
- 33 for TS400, TS630
- 43 for TS800

Rated current, In
- 40, 80A for TS100
- 40, 80, 160A for TS160
- 40, 80, 160, 250A for TS250

Trip unit function
- ETS: Standard electronic trip unit

Electronic trip units (Standard)
ETS23 for TS100, TS160, TS250

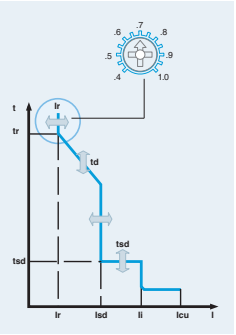
Current setting, Ir (A)

Standard electronic trip unit, ETS23

	16	32	40	64	80	100	160	250	320	400	630	800
Trip unit												
for TS100												
for TS160												
for TS250												

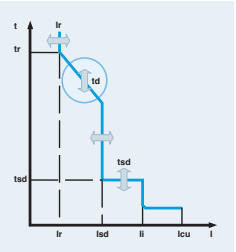
Setting details

Overload protection (long time)



Circuit breakers	TS100		TS160			TS250			
Trip unit rating, In(A)	40	80	40	80	160	40	80	160	250
Setting value	**Overload protection setting current Ir = Setting value (0.4~1) × In**								
0.4	16	32	16	32	64	16	32	64	100
0.45	18	36	18	36	72	18	36	72	113
0.5	20	40	20	40	80	20	40	80	125
0.55	22	44	22	44	88	22	44	88	138
0.6	24	48	24	48	96	24	48	96	150
0.65	26	52	26	52	104	26	52	104	163
0.7	28	56	28	56	112	28	56	112	175
0.75	30	60	30	60	120	30	60	120	188
0.8	32	64	32	64	128	32	64	128	200
0.85	34	68	34	68	136	34	68	136	213
0.9	36	72	36	72	144	36	72	144	225
0.95	38	76	38	76	152	38	76	152	238
1	40	80	40	80	160	40	80	160	250

Long time tripping delay, td (sec)

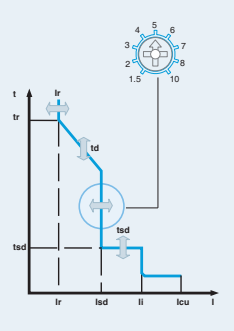


Tripping time (s)	Fixed at 6×Ir tolerance±20%

Electronic trip units (Standard)
ETS23 for TS100, TS160, TS250

Setting details

Short-circuit protection (short time)

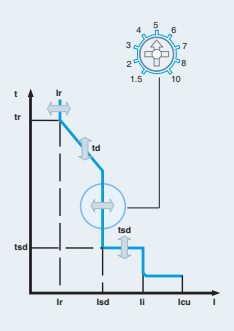


Circuit breakers		TS100		TS160			TS250			
Trip unit rating, In(A)		40	80	40	80	160	40	80	160	250
Setting value		Short time pick-up current setting, Isd = Setting value (1.5~10) × Ir								
0.4		24	48	24	48	96	24	48	96	150
0.45		27	54	27	54	108	27	54	108	169
0.5		30	60	30	60	120	30	60	120	188
0.55		33	66	33	66	132	33	66	132	206
0.6		36	72	36	72	144	36	72	144	225
0.65		39	78	39	78	156	39	78	156	244
0.7	1.5	42	84	42	84	168	42	84	168	263
0.75		45	90	45	90	180	45	90	180	281
0.8		48	96	48	96	192	48	96	192	300
0.85		51	102	51	102	204	51	102	204	319
0.9		54	108	54	108	216	54	108	216	338
0.95		57	114	57	114	228	57	114	228	356
1		60	120	60	120	240	60	120	240	375
0.4		32	64	32	64	128	32	64	128	200
0.45		36	72	36	72	144	36	72	144	225
0.5		40	80	40	80	160	40	80	160	250
0.55		44	88	44	88	176	44	88	176	275
0.6		48	96	48	96	192	48	96	192	300
0.65		52	104	52	104	208	52	104	208	325
0.7	2	56	112	56	112	224	56	112	224	350
0.75		60	120	60	120	240	60	120	240	375
0.8		64	128	64	128	256	64	128	256	400
0.85		68	136	68	136	272	68	136	272	425
0.9		72	144	72	144	288	72	144	288	450
0.95		76	152	76	152	304	76	152	304	475
1		80	160	80	160	320	80	160	320	500
0.4		48	96	48	96	192	48	96	192	300
0.45		54	108	54	108	216	54	108	216	338
0.5		60	120	60	120	240	60	120	240	375
0.55		66	132	66	132	264	66	132	264	413
0.6		72	144	72	144	288	72	144	288	450
0.65		78	156	78	156	312	78	156	312	488
0.7	3	84	168	84	168	336	84	168	336	525
0.75		90	180	90	180	360	90	180	360	563
0.8		96	192	96	192	384	96	192	384	600
0.85		102	204	102	204	408	102	204	408	638
0.9		108	216	108	216	432	108	216	432	675
0.95		114	228	114	228	456	114	228	456	713
1		120	240	120	240	480	120	240	480	750

Electronic trip units (Standard)
ETS23 for TS100, TS160, TS250

Setting details

Short-circuit protection (short time)

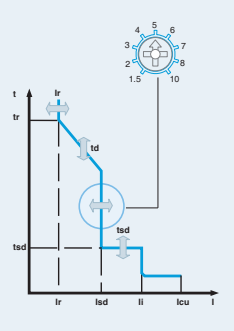


Circuit breakers		TS100		TS160			TS250			
Trip unit rating, In(A)		40	80	40	80	160	40	80	160	250
Setting value		Short time pick-up current setting, Isd = Setting value (1.5~10) × Ir								
0.4		64	128	64	128	256	64	128	256	400
0.45		72	144	72	144	288	72	144	288	450
0.5		80	160	80	160	320	80	160	320	500
0.55		88	176	88	176	352	88	176	352	550
0.6		96	192	96	192	384	96	192	384	600
0.65		104	208	104	208	416	104	208	416	650
0.7	4	112	224	112	224	448	112	224	448	700
0.75		120	240	120	240	480	120	240	480	750
0.8		128	256	128	256	512	128	256	512	800
0.85		136	272	136	272	544	136	272	544	850
0.9		144	288	144	288	576	144	288	576	900
0.95		152	304	152	304	608	152	304	608	950
1		160	320	160	320	640	160	320	640	1000
0.4		80	160	80	160	320	80	160	320	500
0.45		90	180	90	180	360	90	180	360	563
0.5		100	200	100	200	400	100	200	400	625
0.55		110	220	110	220	440	110	220	440	688
0.6		120	240	120	240	480	120	240	480	750
0.65		130	260	130	260	520	130	260	520	813
0.7	5	140	280	140	280	560	140	280	560	875
0.75		150	300	150	300	600	150	300	600	938
0.8		160	320	160	320	640	160	320	640	1000
0.85		170	340	170	340	680	170	340	680	1063
0.9		180	360	180	360	720	180	360	720	1125
0.95		190	380	190	380	760	190	380	760	1188
1		200	400	200	400	800	200	400	800	1250
0.4		96	192	96	192	384	96	192	384	600
0.45		108	216	108	216	432	108	216	432	675
0.5		120	240	120	240	480	120	240	480	750
0.55		132	264	132	264	528	132	264	528	825
0.6		144	288	144	288	576	144	288	576	900
0.65		156	312	156	312	624	156	312	624	975
0.7	6	168	336	168	336	672	168	336	672	1050
0.75		180	360	180	360	720	180	360	720	1125
0.8		192	384	192	384	768	192	384	768	1200
0.85		204	408	204	408	816	204	408	816	1275
0.9		216	432	216	432	864	216	432	864	1350
0.95		228	456	228	456	912	228	456	912	1425
1		240	480	240	480	960	240	480	960	1500

Electronic trip units (Standard)
ETS23 for TS100, TS160, TS250

Setting details

Short-circuit protection (short time)

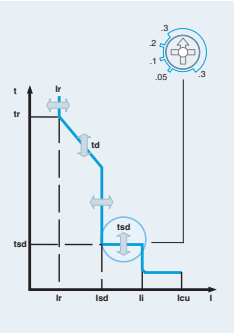


Circuit breakers		TS100		TS160			TS250			
Trip unit rating, In(A)		40	80	40	80	160	40	80	160	250
Setting value		Short time pick-up current setting, Isd = Setting value (1.5~10) × Ir								
0.4		112	224	112	224	448	112	224	448	700
0.45		126	252	126	252	504	126	252	504	788
0.5		140	280	140	280	560	140	280	560	875
0.55		154	308	154	308	616	154	308	616	963
0.6		168	336	168	336	672	168	336	672	1050
0.65		182	364	182	364	728	182	364	728	1138
0.7	7	196	392	196	392	784	196	392	784	1225
0.75		210	420	210	420	840	210	420	840	1313
0.8		224	448	224	448	896	224	448	896	1400
0.85		238	476	238	476	952	238	476	952	1488
0.9		252	504	252	504	1008	252	504	1008	1575
0.95		266	532	266	532	1064	266	532	1064	1663
1		280	560	280	560	1120	280	560	1120	1750
0.4		128	256	128	256	512	128	256	512	800
0.45		144	288	144	288	576	144	288	576	900
0.5		160	320	160	320	640	160	320	640	1000
0.55		176	352	176	352	704	176	352	704	1100
0.6		192	384	192	384	768	192	384	768	1200
0.65		208	416	208	416	832	208	416	832	1300
0.7	8	224	448	224	448	896	224	448	896	1400
0.75		240	480	240	480	960	240	480	960	1500
0.8		256	512	256	512	1024	256	512	1024	1600
0.85		272	544	272	544	1088	272	544	1088	1700
0.9		288	576	288	576	1152	288	576	1152	1800
0.95		304	608	304	608	1216	304	608	1216	1900
1		320	640	320	640	1280	320	640	1280	2000
0.4		160	320	160	320	640	160	320	640	1000
0.45		180	360	180	360	720	180	360	720	1125
0.5		200	400	200	400	800	200	400	800	1250
0.55		220	440	220	440	880	220	440	880	1375
0.6		240	480	240	480	960	240	480	960	1500
0.65		260	520	260	520	1040	260	520	1040	1625
0.7	10	280	560	280	560	1120	280	560	1120	1750
0.75		300	600	300	600	1200	300	600	1200	1875
0.8		320	640	320	640	1280	320	640	1280	2000
0.85		340	680	340	680	1360	340	680	1360	2125
0.9		360	720	360	720	1440	360	720	1440	2250
0.95		380	760	380	760	1520	380	760	1520	2375
1		400	800	400	800	1600	400	800	1600	2500

Electronic trip units (Standard)
ETS23 for TS100, TS160, TS250

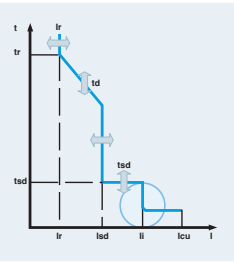
Setting details

Short time tripping delay setting, tsd (ms)



Time delay (tsd)	setting time (ms)	50	100	200	300	4 settings
	operation time (ms)	30<t≤70	70<t≤140	140<t≤240	240<t≤350	

Short circuit protection (Instantaneous), Ii (A)



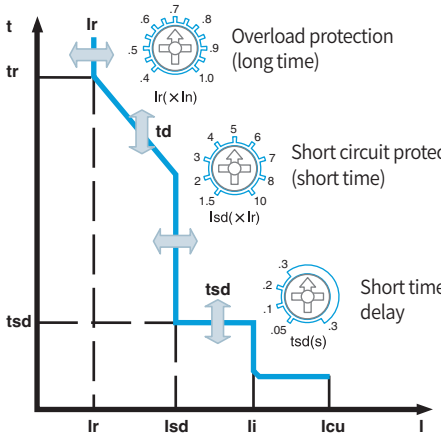
Tripping threshold (A), Ii	Fixed at 11×In

Electronic trip units (Standard)
ETS33 for TS400, TS630

Configuration

Electronic type, ETS33 for MCCBs TS400 & TS630

Indication of alarm
Load: not less than 90% Ir → LED ON
Load: not less than 105% Ir → LED flickering
Trip unit identification
Trip unit rating, In
Short-circuit protection (short time)
Short time tripping delay
Overload protection (long time)
Test connector



Overload protection (long time)

Short circuit protection (short time)

Short time tripping delay

Overload protection (long time)		
Setting current (A)	Ir	0.4, 0.45, 0.5, 0.55, 0.6, 0.65, 0.7, 0.75, 0.8, 0.85, 0.9, 0.95, 1.0×In 13 settings
Tripping time (s)		Fixed at 6×Ir , tolerance±20%

Short-circuit protection (short time)						
Tripping threshold (A)	Isd	1.5, 2, 3, 4, 5, 6, 7, 8, 10×Ir 9 settings, tolerance ±15%				
Time delay	tsd	setting time (ms)	50	100	200	300	4 settings
		operation time (ms)	30<t≤70	70<t≤140	140<t≤240	240<t≤350	

Short circuit protection (Instantaneous)		
Tripping threshold (A)	Ii	Fixed at 11×In

Catalogue numbering system

ETS 33 In630A

Trip unit frame
- 23 for TS100, TS160, TS250
- 33 for TS400, TS630
- 43 for TS800

Rated current, In
- 160, 250, 400A for TS400
- 160, 250, 400, 630A for TS630

Trip unit function
- ETS: Standard electronic trip unit

Electronic trip units (Standard)
ETS33 for TS400, TS630

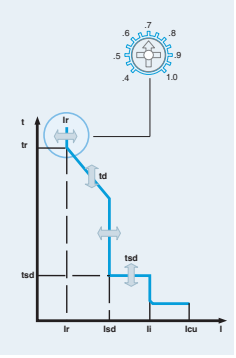
Current setting, Ir (A)

Standard electronic trip unit, ETS33

	16	32	40	64	80	100	160	250	320	400	630	800
Trip unit												
for TS400												
for TS630												

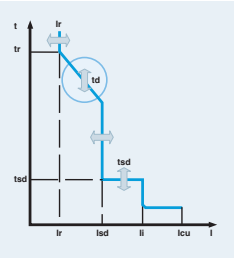
Setting details

Overload protection (long time)



Circuit breakers	TS400			TS630			
Trip unit rating, In(A)	160	250	400	160	250	400	630
Setting value	**Overload protection setting current Ir = Setting value (0.4~1)×In**						
0.4	64	100	160	64	100	160	252
0.45	72	113	180	72	113	180	284
0.5	80	125	200	80	125	200	315
0.55	88	138	220	88	138	220	347
0.6	96	150	240	96	150	240	378
0.65	104	163	260	104	163	260	410
0.7	112	175	280	112	175	280	441
0.75	120	188	300	120	188	300	473
0.8	128	200	320	128	200	320	504
0.85	136	213	340	136	213	340	536
0.9	144	225	360	144	225	360	567
0.95	152	238	380	152	238	380	599
1	160	250	400	160	250	400	630

Long time tripping delay, td (sec)

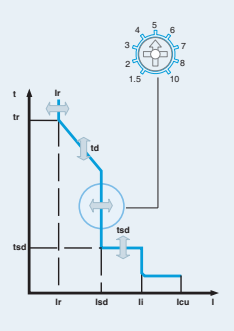


Tripping time (s)	Fixed at 6×Ir tolerance±20%

Electronic trip units (Standard)
ETS33 for TS400, TS630

Setting details

Short-circuit protection (short time)

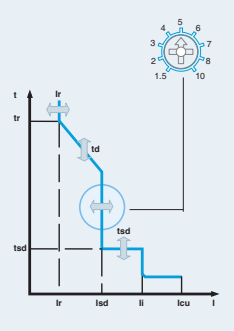


Circuit breakers		TS400			TS630			
Trip unit rating, In(A)		160	250	400	160	250	400	630
Setting value		Short time pick-up current setting, Isd = Setting value (1.5~10) × Ir						
0.4	1.5	96	150	240	96	150	240	378
0.45		108	169	270	108	169	270	425
0.5		120	188	300	120	188	300	473
0.55		132	206	330	132	206	330	520
0.6		144	225	360	144	225	360	567
0.65		156	244	390	156	244	390	614
0.7		168	263	420	168	263	420	662
0.75		180	281	450	180	281	450	709
0.8		192	300	480	192	300	480	756
0.85		204	319	510	204	319	510	803
0.9		216	338	540	216	338	540	851
0.95		228	356	570	228	356	570	898
1		240	375	600	240	375	600	945
0.4	2	128	200	320	128	200	320	504
0.45		144	225	360	144	225	360	567
0.5		160	250	400	160	250	400	630
0.55		176	275	440	176	275	440	693
0.6		192	300	480	192	300	480	756
0.65		208	325	520	208	325	520	819
0.7		224	350	560	224	350	560	882
0.75		240	375	600	240	375	600	945
0.8		256	400	640	256	400	640	1008
0.85		272	425	680	272	425	680	1071
0.9		288	450	720	288	450	720	1134
0.95		304	475	760	304	475	760	1197
1		320	500	800	320	500	800	1260
0.4	3	192	300	480	192	300	480	756
0.45		216	338	540	216	338	540	851
0.5		240	375	600	240	375	600	945
0.55		264	413	660	264	413	660	1040
0.6		288	450	720	288	450	720	1134
0.65		312	488	780	312	488	780	1229
0.7		336	525	840	336	525	840	1323
0.75		360	563	900	360	563	900	1418
0.8		384	600	960	384	600	960	1512
0.85		408	638	1020	408	638	1020	1607
0.9		432	675	1080	432	675	1080	1701
0.95		456	713	1140	456	713	1140	1795
1		480	750	1200	480	750	1200	1890

Electronic trip units (Standard)
ETS33 for TS400, TS630

Setting details

Short-circuit protection (short time)

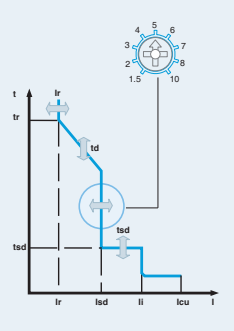


Circuit breakers		TS400			TS630			
Trip unit rating, In(A)		160	250	400	160	250	400	630
Setting value		Short time pick-up current setting, Isd = Setting value (1.5~10) × Ir						
0.4		256	400	640	256	400	640	1008
0.45		288	450	720	288	450	720	1134
0.5		320	500	800	320	500	800	1260
0.55		352	550	880	352	550	880	1386
0.6		384	600	960	384	600	960	1512
0.65		416	650	1040	416	650	1040	1638
0.7	4	448	700	1120	448	700	1120	1764
0.75		480	750	1200	480	750	1200	1890
0.8		512	800	1280	512	800	1280	2016
0.85		544	850	1360	544	850	1360	2142
0.9		576	900	1440	576	900	1440	2268
0.95		608	950	1520	608	950	1520	2394
1		640	1000	1600	640	1000	1600	2520
0.4		320	500	800	320	500	800	1260
0.45		360	563	900	360	563	900	1418
0.5		400	625	1000	400	625	1000	1575
0.55		440	687.5	1100	440	688	1100	1733
0.6		480	750	1200	480	750	1200	1890
0.65		520	813	1300	520	813	1300	2048
0.7	5	560	875	1400	560	875	1400	2205
0.75		600	938	1500	600	938	1500	2363
0.8		640	1000	1600	640	1000	1600	2520
0.85		680	1063	1700	680	1063	1700	2678
0.9		720	1125	1800	720	1125	1800	2835
0.95		760	1188	1900	760	1188	1900	2993
1		800	1250	2000	800	1250	2000	3150
0.4		384	600	960	384	600	960	1512
0.45		432	675	1080	432	675	1080	1701
0.5		480	750	1200	480	750	1200	1890
0.55		528	825	1320	528	825	1320	2079
0.6		576	900	1440	576	900	1440	2268
0.65		624	975	1560	624	975	1560	2457
0.7	6	672	1050	1680	672	1050	1680	2646
0.75		720	1125	1800	720	1125	1800	2835
0.8		768	1200	1920	768	1200	1920	3024
0.85		816	1275	2040	816	1275	2040	3213
0.9		864	1350	2160	864	1350	2160	3402
0.95		912	1425	2280	912	1425	2280	3591
1		960	1500	2400	960	1500	2400	3780

Electronic trip units (Standard)
ETS33 for TS400, TS630

Setting details

Short-circuit protection (short time)

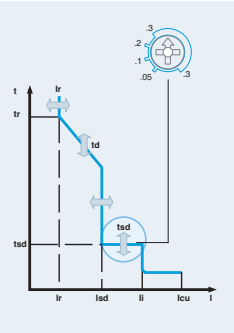


Circuit breakers		TS400			TS630			
Trip unit rating, In(A)		160	250	400	160	250	400	630
Setting value		Short time pick-up current setting, Isd = Setting value (1.5~10) × Ir						
0.4		448	700	1120	448	700	1120	1764
0.45		504	788	1260	504	788	1260	1984
0.5		560	875	1400	560	875	1400	2205
0.55		616	963	1540	616	963	1540	2425
0.6		672	1050	1680	672	1050	1680	2646
0.65		728	1138	1820	728	1138	1820	2867
0.7	7	784	1225	1960	784	1225	1960	3087
0.75		840	1313	2100	840	1313	2100	3308
0.8		896	1400	2240	896	1400	2240	3528
0.85		952	1488	2380	952	1488	2380	3749
0.9		1008	1575	2520	1008	1575	2520	3969
0.95		1064	1663	2660	1064	1663	2660	4190
1		1120	1750	2800	1120	1750	2800	4410
0.4		512	800	1280	512	800	1280	2016
0.45		576	900	1440	576	900	1440	2268
0.5		640	1000	1600	640	1000	1600	2520
0.55		704	1100	1760	704	1100	1760	2772
0.6		768	1200	1920	768	1200	1920	3024
0.65		832	1300	2080	832	1300	2080	3276
0.7	8	896	1400	2240	896	1400	2240	3528
0.75		960	1500	2400	960	1500	2400	3780
0.8		1024	1600	2560	1024	1600	2560	4032
0.85		1088	1700	2720	1088	1700	2720	4284
0.9		1152	1800	2880	1152	1800	2880	4536
0.95		1216	1900	3040	1216	1900	3040	4788
1		1280	2000	3200	1280	2000	3200	5040
0.4		640	1000	1600	640	1000	1600	2520
0.45		720	1125	1800	720	1125	1800	2835
0.5		800	1250	2000	800	1250	2000	3150
0.55		880	1375	2200	880	1375	2200	3465
0.6		960	1500	2400	960	1500	2400	3780
0.65		1040	1625	2600	1040	1625	2600	4095
0.7	10	1120	1750	2800	1120	1750	2800	4410
0.75		1200	1875	3000	1200	1875	3000	4725
0.8		1280	2000	3200	1280	2000	3200	5040
0.85		1360	2125	3400	1360	2125	3400	5355
0.9		1440	2250	3600	1440	2250	3600	5670
0.95		1520	2375	3800	1520	2375	3800	5985
1		1600	2500	4000	1600	2500	4000	6300

Electronic trip units (Standard)
ETS33 for TS400, TS630

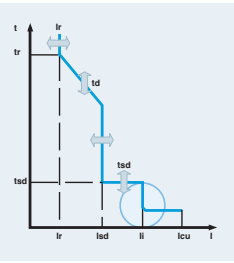
Setting details

Short time tripping delay setting, tsd (ms)



Time delay (tsd)	setting time (ms)	50	100	200	300	4 settings
	operation time (ms)	30<t≤70	70<t≤140	140<t≤240	240<t≤350	

Short circuit protection (Instantaneous), Ii (A)

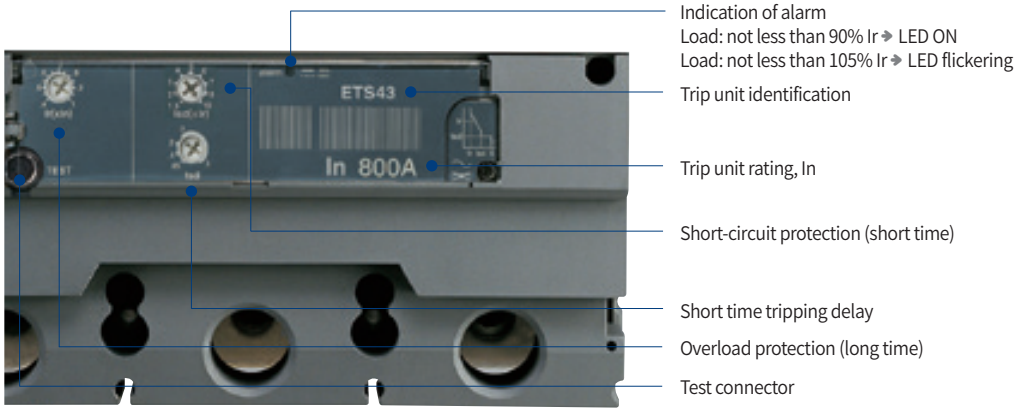


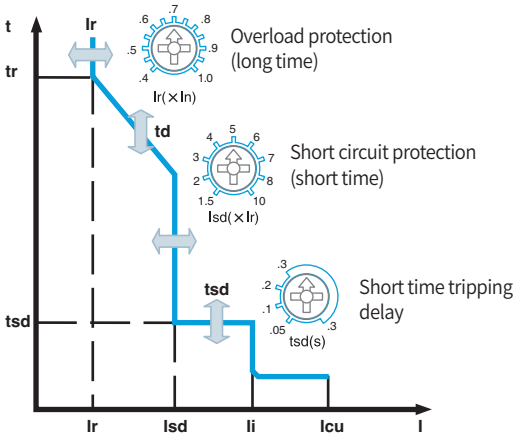
Tripping threshold (A), Ii	Fixed at 11×In

Electronic trip units (Standard)
ETS43 for MCCBs TS800

Configuration

Electronic type, ETS43 for MCCBs TS800





Overload protection (long time)		
Setting current (A)	Ir	0.4, 0.45, 0.5, 0.55, 0.6, 0.65, 0.7, 0.75, 0.8, 0.85, 0.9, 0.95, 1.0×In 13 settings
Tripping time (s)		Fixed at 6×Ir , tolerance±20%

Short-circuit protection (short time)						
Tripping threshold (A)	Isd	1.5, 2, 3, 4, 5, 6, 7, 8, 10×Ir 9 settings, tolerance ±15%				
Time delay	tsd	setting time (ms)	50	100	200	300	4 settings
		operation time (ms)	30<t≤70	70<t≤140	140<t≤240	240<t≤350	

Short circuit protection (Instantaneous)		
Tripping threshold (A)	Ii	Fixed at 11×In

Catalogue numbering system

ETS 43 In800A

Trip unit frame
- 23 for TS100, TS160, TS250
- 33 for TS400, TS630
- 43 for TS800

Rated current, In
- 630, 800A for TS800

Trip unit function
- ETS: Standard electronic trip unit

Electronic trip units (Standard)
ETS43 for MCCBs TS800

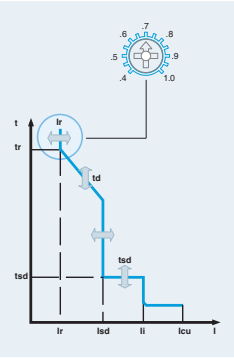
Current setting, Ir (A)

Standard electronic trip unit, ETS43

	16	32	40	64	80	100	160	250	320	400	630	800
Trip unit for TS800												

Setting details

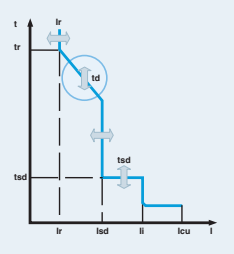
Overload protection (long time)



Circuit breakers	TS800	
Trip unit rating, In(A)	630	800

Setting value	Overload protection setting current Ir = Setting value (0.4~1) × In	
0.4	252	320
0.45	284	360
0.5	315	400
0.55	347	440
0.6	378	480
0.65	410	520
0.7	441	560
0.75	473	600
0.8	504	640
0.85	536	680
0.9	567	720
0.95	599	760
1	630	800

Long time tripping delay, td (sec)

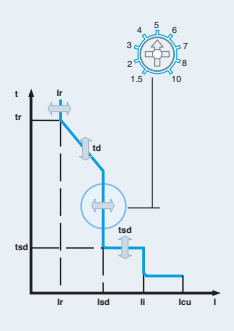


Tripping time (s)	Fixed at 6 × Ir tolerance ±20%

Electronic trip units (Standard)
ETS43 for MCCBs TS800

Setting details

Overload protection (long time)

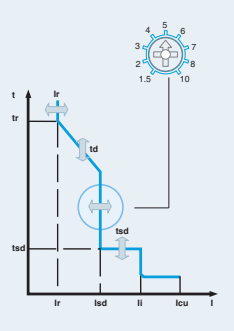


Circuit breakers		TS800	
Trip unit rating, In(A)		630	800
Setting value		Short time pick-up current setting, Isd = Setting value (1.5~10) × Ir	
0.4	1.5	378	480
0.45		425	540
0.5		473	600
0.55		520	660
0.6		567	720
0.65		614	780
0.7		662	840
0.75		709	900
0.8		756	960
0.85		804	1020
0.9		850.5	1080
0.95		898	1140
1		945	1200
0.4	2	504	640
0.45		567	720
0.5		630	800
0.55		693	880
0.6		756	960
0.65		819	1040
0.7		882	1120
0.75		945	1200
0.8		1008	1280
0.85		1071	1360
0.9		1134	1440
0.95		1197	1520
1		1260	1600
0.4	3	756	960
0.45		851	1080
0.5		945	1200
0.55		1040	1320
0.6		1134	1440
0.65		1229	1560
0.7		1323	1680
0.75		1418	1800
0.8		1512	1920
0.85		1607	2040
0.9		1701	2160
0.95		1796	2280
1		1890	2400

Electronic trip units (Standard)
ETS43 for MCCBs TS800

Setting details

Overload protection (long time)

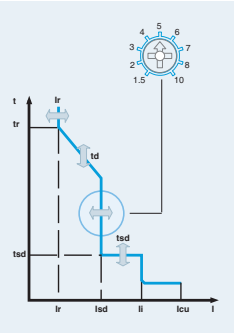


Circuit breakers		TS800	
Trip unit rating, In(A)		630	800
Setting value		Short time pick-up current setting, Isd = Setting value (1.5~10) × Ir	
0.4	4	1008	1280
0.45		1134	1440
0.5		1260	1600
0.55		1386	1760
0.6		1512	1920
0.65		1638	2080
0.7		1764	2240
0.75		1890	2400
0.8		2016	2560
0.85		2142	2720
0.9		2268	2880
0.95		2394	3040
1		2520	3200
0.4	5	1260	1600
0.45		1418	1800
0.5		1575	2000
0.55		1733	2200
0.6		1890	2400
0.65		2048	2600
0.7		2205	2800
0.75		2363	3000
0.8		2520	3200
0.85		2678	3400
0.9		2835	3600
0.95		2993	3800
1		3150	4000
0.4	6	1512	1920
0.45		1701	2160
0.5		1890	2400
0.55		2079	2640
0.6		2268	2880
0.65		2457	3120
0.7		2646	3360
0.75		2835	3600
0.8		3024	3840
0.85		3213	4080
0.9		3402	4320
0.95		3591	4560
1		3780	4800

Electronic trip units (Standard)
ETS43 for MCCBs TS800

Setting details

Short-circuit protection (short time)

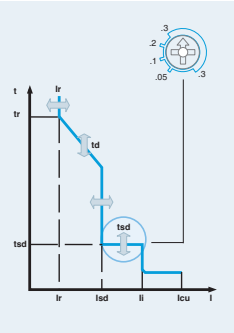


Circuit breakers	TS800	
Trip unit rating, In(A)	630	800
Setting value	Short time pick-up current setting, Isd = Setting value (1.5~10) × Ir	
0.4	1764	2240
0.45	1985	2520
0.5	2205	2800
0.55	2426	3080
0.6	2646	3360
0.65	2867	3640
0.7	3087	3920
0.75	3308	4200
0.8	3528	4480
0.85	3749	4760
0.9	3969	5040
0.95	4190	5320
1	4410	5600
0.4	2016	2560
0.45	2268	2880
0.5	2520	3200
0.55	2772	3520
0.6	3024	3840
0.65	3276	4160
0.7	3528	4480
0.75	3780	4800
0.8	4032	5120
0.85	4284	5440
0.9	4536	5760
0.95	4788	6080
1	5040	6400
0.4	2520	3200
0.45	2835	3600
0.5	3150	4000
0.55	3465	4400
0.6	3780	4800
0.65	4095	5200
0.7	4410	5600
0.75	4725	6000
0.8	5040	6400
0.85	5355	6800
0.9	5670	7200
0.95	5985	7600
1	6300	8000

Electronic trip units (Standard)
ETS43 for MCCBs TS800

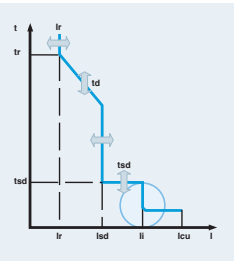
Setting details

Short time tripping delay setting, tsd (ms)



Time delay (tsd)	setting time (ms)	50	100	200	300	4 settings
	operation time (ms)	30<t≤70	70<t≤140	140<t≤240	240<t≤350	

Short circuit protection (Instantaneous), Ii (A)



Tripping threshold (A), Ii	Fixed at 11×In

Electronic trip units (Multifunction)
Overview

Types : ETM33, ETM43
Range of overload protection setting current (Ir): 64~630A (ETM33), 250~800A (ETM43)
Two frame size of circuit breakers: 630AF, 800AF
Trip units ETM33 and ETM43 can be mounted on circuit breakers of N, H and L type TS400 / TS630 / TS800

Ratings

Rated current, In(A)

Rated current, In (A)	Trip unit		
	ETM33		ETM43
160	●	●	-
250	●	●	●
400	●	●	●
630	-	●	●
800	-	-	●
Circuit breakers	TS400 N/H/L	TS630 N/H/L	TS800 N/H/L

Current setting, Ir(A)

Trip unit		ETM33	ETM33	ETM43
Overload protection setting current, Ir(A)	64	●	●	-
	80	●	●	-
	100	●	●	-
	160	●	●	-
	250	●	●	●
	400	●	●	●
	630	-	●	●
	800	-	-	●
Applicable circuit breakers		TS400 N/H/L	TS630 N/H/L	TS800 N/H/L

Electronic trip units (Multifunction)
Overview

Setting values

Overload protection (long time)	
Setting current (A) Ir	Adjustable 0.4 ~ 1.0×In, 30 settings
Tripping time (s) at 6×Ir	Adjustable 2, 4, 6, 8,12 5 settings, tolerance±20%

Short-circuit protection (short time)						
Tripping threshold (A) Isd	Adjustable 1.5, 2, 3, 4, 5, 6, 7, 8, 10×Ir, 9 settings, tolerance ±15%					
Time delay (tsd)	setting time (ms)	100	200	300	400	4 settings I^2t is off
	operation time (ms)	60<t≤140	140<t≤230	230<t≤350	350<t≤500	

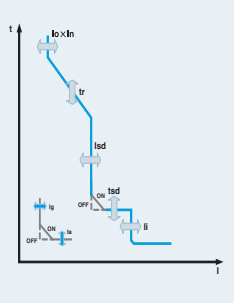
Short-circuit protection (instantaneous)	
Tripping threshold (A) Ii	Adjustable 1.5, 2, 4, 5, 6, 8, 10, 11×In, 9 settings

Indication of tripping reason	
LED indication	Ir, Isd, Ii, (Ig)

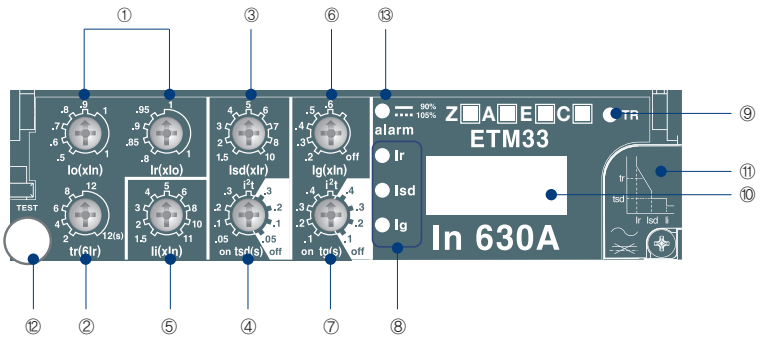
Option for TS400ETM to TS800ETM						
Ammeter (A)	Maximum load phase current and R,S,T,N phase current					
Earth fault protection (E)	Adjustable tripping threshold (A), 0.2~1×In, 9 setting					
	setting time (ms)	100	200	300	400	4 settings I^2t is off
	operation time (ms)	60<t≤140	140<t≤230	230<t≤350	350<t≤500	
Communication (C)	Setting, R, S, T, N phase current, tripping reason					
ZSI (Z)	ZSI input and output signal					

Electronic trip units (Multifunction) Overview

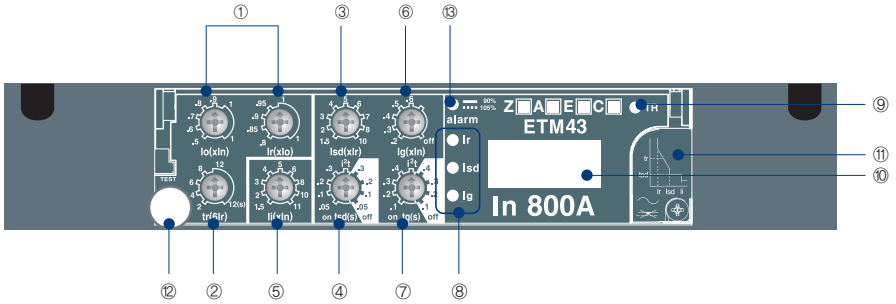
① Adjustable rated current setting (Ir)
② Adjustable long time setting (tr)
③ Adjustable short time current setting (Isd)
④ Adjustable time delay setting (tsd)
⑤ Adjustable instantaneous current setting (Ii)
⑥ Adjustable earth fault current setting (Ig)
⑦ Adjustable earth fault delay setting (tg)
⑧ Indication LED
⑨ TR (trip reason) button
⑩ Display LCD (Ammeter)
⑪ Auxiliary power
⑫ Test connector
⑬ Alarm LED



ETM33 for TS400/TS630

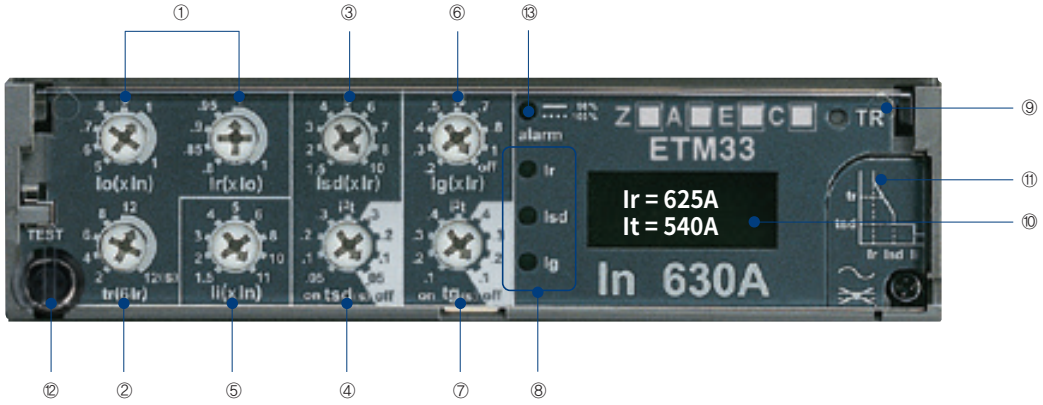


ETM43 for TS800

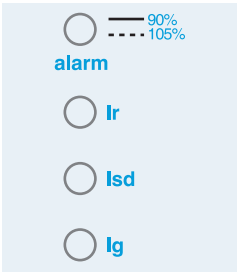


Electronic trip units (Multifunction)
ETM33 for TS400, TS630

Configuration



① Adjustable rated current setting (Ir)
② Adjustable long time setting (tr)
③ Adjustable short time current setting (Isd)
④ Adjustable time delay setting (tsd)
⑤ Adjustable instantaneous current setting (Ii)
⑥ Adjustable earth fault current setting (Ig)
⑦ Adjustable earth fault delay setting (tg)
⑧ Indication LED
⑨ TR (trip reason) button
⑩ Display LCD (Ammeter)
⑪ Battery
⑫ Test connector
⑬ Alarm LED
90% Ir : ON, 105% Ir or more: ON-OFF



Alarm indication

The LED lights and remains lit when the load exceeds 90 % of Ir.
The LED blinks for an overload(≥105% Ir), warning that the circuit breaker may trip.

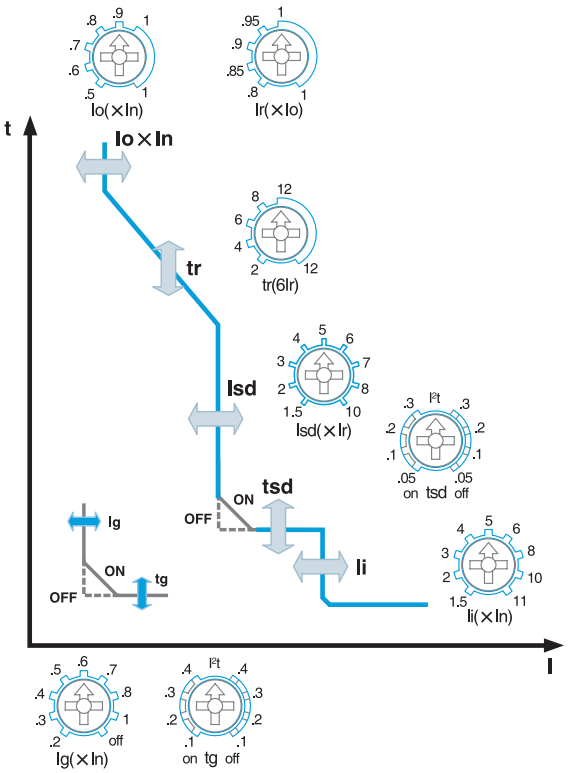
Fault indications

LEDs indicate the type of fault that caused tripping:
Ir : overload
Isd : short-circuit (short time, instantaneous)
Ig : earth fault
If push the TR button to indicate the tripping reason, the indication LED of tripping is ON.
The information is however stored in memory and the LED can be reilluminated by pressing the TR button.
The LED automatically goes off and the memory is cleared when the circuit breaker is reset.
In normal condition, if push TR button, all indication LED is ON for testing auxiliary power and LED.

Electronic trip units (Multifunction)
ETM33 for TS400, TS630

Tripping characteristics

Trip unit, ETM33



Long time protection against overloads

Io = Coarse adjustment (function of In)
Ir = Fine adjustment
tr = Long time delay

Short circuit protection

Isd = Short circuit threshold,
tsd = Short circuit time delay
I^2t curve in position ON or OFF

Instantaneous protection

Ii = Instantaneous threshold

Earth fault protection

Ig = Insulation fault threshold
tg = Earth fault time delay
I^2t curve in position ON or OFF

Catalogue numbering system

ETM 33 In600A

Trip unit frame
- 33 for TS400, TS630
- 43 for TS800

Rated current, In
- 160, 250, 400A for TS400
- 160, 250, 400, 630A for TS630

Trip unit function
- ETM : Multifunction electronic trip unit

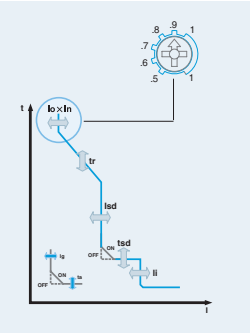
Electronic trip units (Multifunction)
ETM33 for TS400, TS630

Setting details

Overload protection setting current, Ir(A)

Trip unit type		16	32	40	64	80	100	160	250	320	400	630	800
ETM33	for TS400												
	for TS630												

Overload protection (long time)



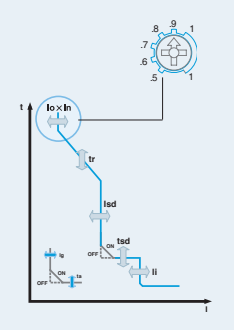
Type of trip unit	TS400ETM		
Rated current, In(A)	160	250	400

Setting value Coarse, Io	Setting value Fine, Ir	Short time pick-up current setting, Isd = Setting value (1.5~10) × Ir		
0.5	0.8	64	100	160
	0.85	68	106.25	170
	0.9	72	112.5	180
	0.95	76	118.75	190
	1	80	125	200
0.6	0.8	76.8	120	192
	0.85	81.6	127.5	204
	0.9	86.4	135	216
	0.95	91.2	142.5	228
	1	96	150	240
0.7	0.8	89.6	140	224
	0.85	95.2	148.75	238
	0.9	100.8	157.5	252
	0.95	106.4	166.25	266
	1	112	175	280
0.8	0.8	102.4	160	256
	0.85	108.8	170	272
	0.9	115.2	180	288
	0.95	121.6	190	304
	1	128	200	320
0.9	0.8	115.2	180	288
	0.85	122.4	191.25	306
	0.9	129.6	202.5	324
	0.95	136.8	213.75	342
	1	144	225	360
1	0.8	128	200	320
	0.85	136	212.5	340
	0.9	144	225	360
	0.95	152	237.5	380
	1	160	250	400

Electronic trip units (Multifunction)
ETM33 for TS400, TS630

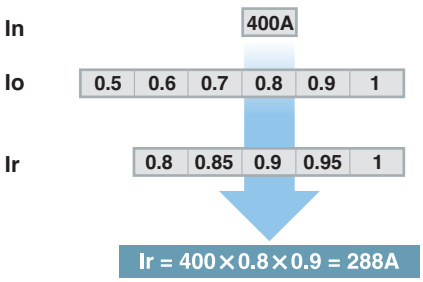
Setting details

Overload protection (long time)



Type of trip unit		TS630ETM			
Rated current, In(A)		160	250	400	630
Setting value Coarse, Io	**Setting value Fine, Ir**	**Overload protection setting current, Ir (A)**			
0.5	0.8	64	100	160	252
	0.85	68	106.25	170	267.75
	0.9	72	112.5	180	283.5
	0.95	76	118.75	190	299.25
	1	80	125	200	315
0.6	0.8	76.8	120	192	302.4
	0.85	81.6	127.5	204	321.3
	0.9	86.4	135	216	340.2
	0.95	91.2	142.5	228	359.1
	1	96	150	240	378
0.7	0.8	89.6	140	224	352.8
	0.85	95.2	148.75	238	374.85
	0.9	100.8	157.5	252	396.9
	0.95	106.4	166.25	266	418.95
	1	112	175	280	441
0.8	0.8	102.4	160	256	403.2
	0.85	108.8	170	272	428.4
	0.9	115.2	180	288	453.6
	0.95	121.6	190	304	478.8
	1	128	200	320	504
0.9	0.8	115.2	180	288	453.6
	0.85	122.4	191.25	306	481.95
	0.9	129.6	202.5	324	510.3
	0.95	136.8	213.75	342	538.65
	1	144	225	360	567
1	0.8	128	200	320	504
	0.85	136	212.5	340	535.5
	0.9	144	225	360	567
	0.95	152	237.5	380	598.5
	1	160	250	400	630

Setting example :

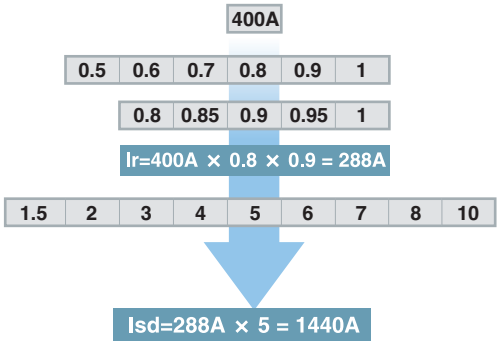


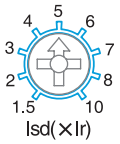
Electronic trip units (Multifunction)
ETM33 for TS400, TS630

Short circuit protection

The short circuit threshold, Isd is a multiple of the overload setting, Ir.

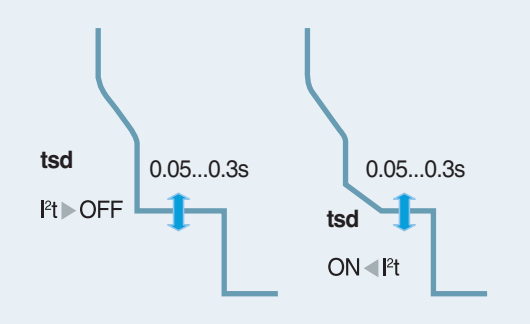
Setting example :

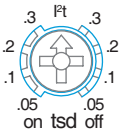




The breaker trips when the current exceeds 2880 A.

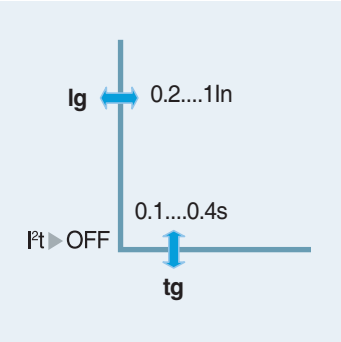
Short circuit time delay

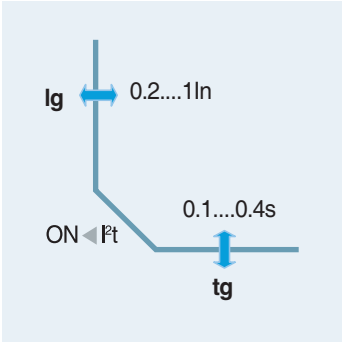


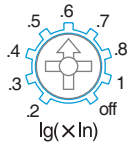


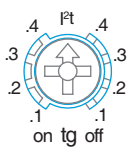
Earth fault protection(E), optional

The ETM trip units measure the vectorial sum of the three phase current and, if present, that of the neutral conductor.
If the sum of these values exceeds the set current thresholds for a period of time greater than the time delay, the breaker is tripped.









Ig = insulation fault threshold
tg = earth fault time delay

Electronic trip units (Multifunction)
ETM33 for TS400, TS630

Ammeter (A), optional

The Ammeter device has an accuracy of ±10%.
The highest phase current is displayed in upper line.
In under line, R, S and T phase current is scrolled autom.

Ammeter display limits:

- minimum current ≥ 0.3×In (one phase)
- maximum current ≤ 10×In

Zone selective interlocking (ZSI), optional

Zone Selective Interlocking is mainly used in systems with high rated current and short circuit current values, with safety and service continuity requirements.
This type of discrimination can be achieved with circuit breakers equipped with specially designed electronic trip units (ETM for TS circuit breakers).

Zone selective interlocking (ZSI) is a system designed

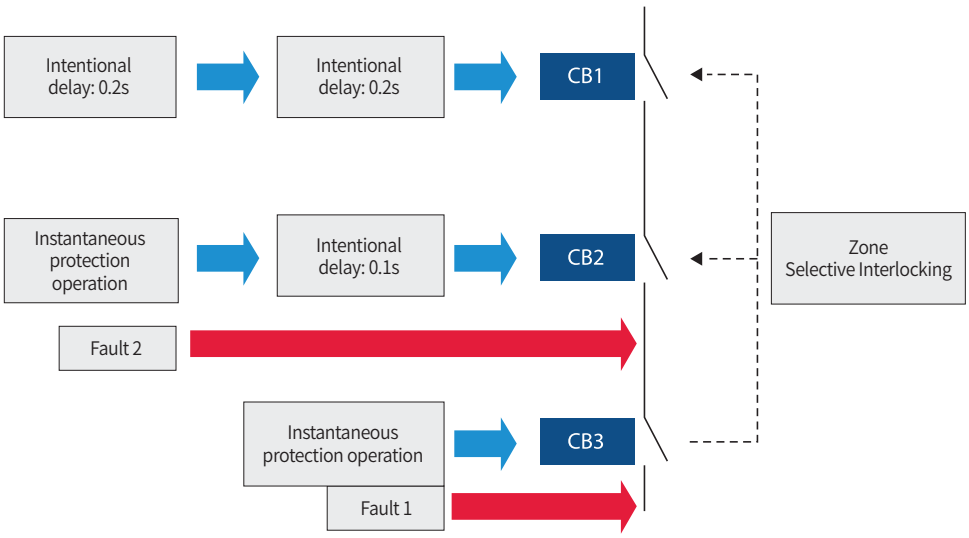
- to reduce the stress on electrical distribution components during short-circuit or earth fault conditions.
- to reduce the tripping times (Lower than hundred milliseconds).
- to reduce the damage caused by the fault and of interferences to the power supply system;

A number of circuit breakers are interconnected one after another by a pilot-wire.

Power source: DC24V Power is required.

Operation

- With ZSI, ETM trip unit detects the fault and then send the signal to upstream circuit breaker which applies the set time delay and ignore its present short-time and or/ earth fault delay and clear the fault with no intentional delay.
- Without ZSI, ETM trip unit detects the fault and then trips the circuit breaker with intentional delay



Electronic trip units (Multifunction)
ETM33 for TS400, TS630

Communication(C), optional

Communication interface: RS485 (Modbus-RTU)

The Modbus RS485 system is an open bus on which communicating Modbus devices are installed. All kinds of PLCs and computers can be connected to the bus.

Transmitted data :

- Protection setting values
- Highest current of the three phases
- Measurement: R, S, T and N phase current
- Fault reading: Type of fault (Overload, short-circuit, etc)

The setting of communication address using TR button and LCD display (Ammeter).

Power source: DC24V Power is required.

Combination of options

☐ A(Ammeter)
☐ E(Earth fault protection)
☐ A+E
☐ A+C(Communication)
☐ A+E+C
☐ Z(Zone selective interlocking)
☐ Z+A
☐ Z+E
☐ Z+A+E
☐ Z+A+C
☐ Z+A+E+C

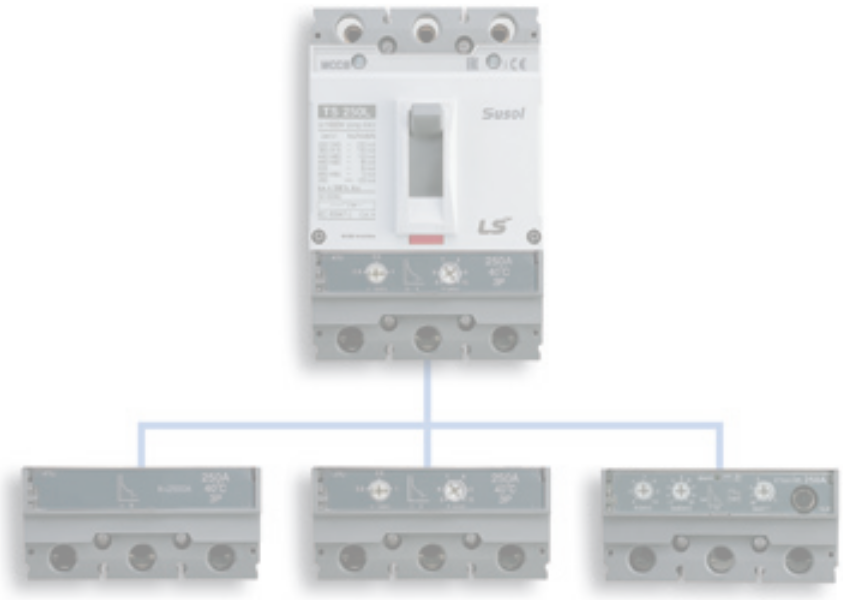
Electronic trip units (Multifunction)
ETM33 for TS400, TS630

Menu structure of the electronic trip unit (ETM)

I	r	-	1	2	6	0	A
I	s	-			6	5	A

→ Display current value (RMS) of phase which is carrying maximum in each phase

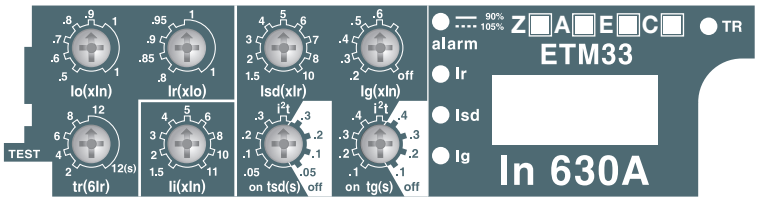
→ Display current value (RMS) of each phase at an interval of every 2 seconds.



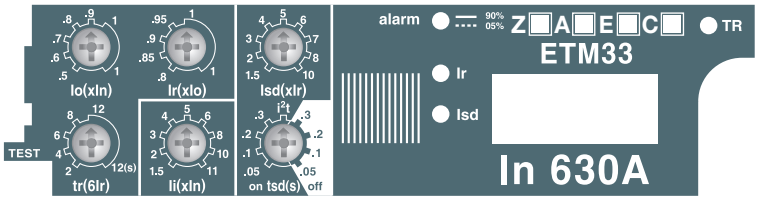
Electronic trip units (Multifunction)
ETM33 for TS400, TS630

Feature of trip unit according to option

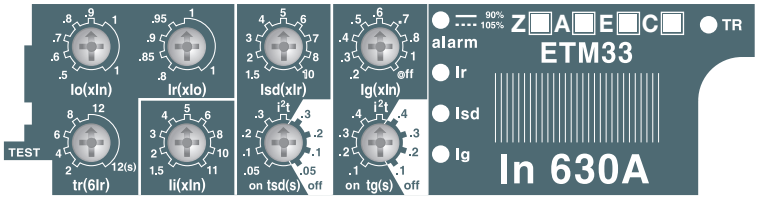
ETM33 A+E
ETM33 A+E+C
ETM33 Z+A+E
ETM33 Z+A+E+C



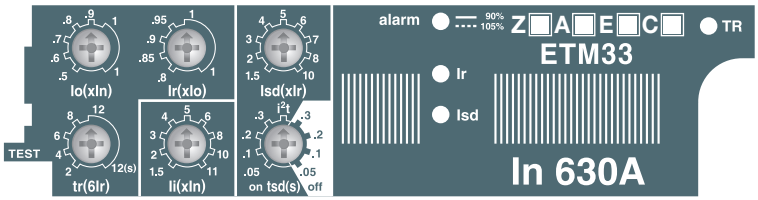
ETM33 A
ETM33 A+C
ETM33 Z+A
ETM33 Z+A+C



ETM33 E
ETM33 Z+E

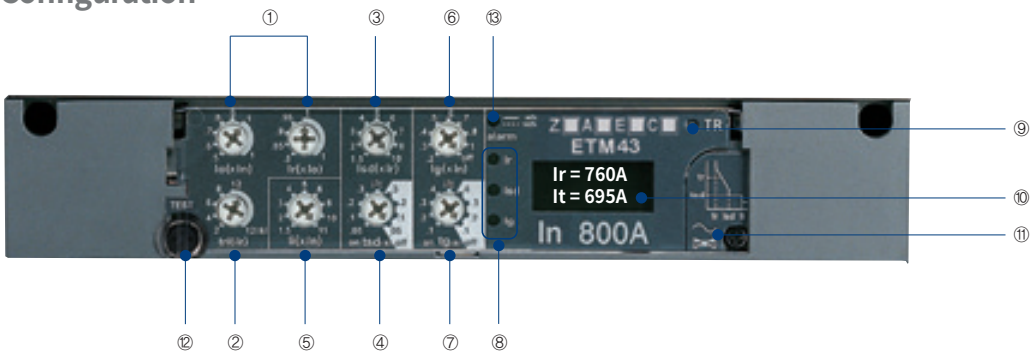


ETM33
ETM33 Z

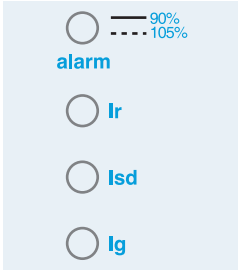


Electronic trip units (Multifunction)
ETM43 for TS800

Configuration



① Adjustable rated current setting (Ir)
② Adjustable long time setting (tr)
③ Adjustable short time current setting (Isd)
④ Adjustable time delay setting (tsd)
⑤ Adjustable instantaneous current setting (Ii)
⑥ Adjustable earth fault current setting (Ig)
⑦ Adjustable earth fault delay setting (tg)
⑧ Indication LED
⑨ TR (trip reason) button
⑩ Display LCD (Ammeter)
⑪ Battery
⑫ Test connector
⑬ Alarm LED
90% Ir : ON, 105% Ir or more: ON-OFF



Alarm indication

The LED lights and remains lit when the load exceeds 90 % of Ir.
The LED blinks for an overload(≥105% Ir), warning that the circuit breaker may trip.

Fault indications

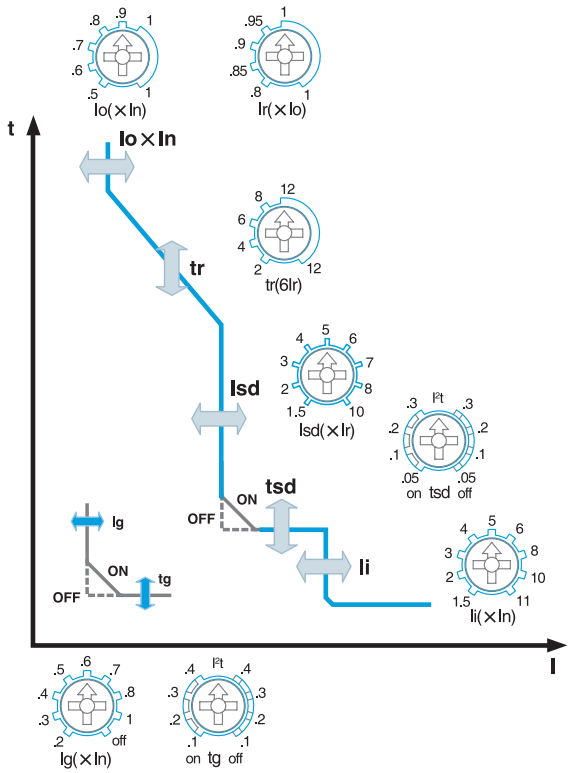
LEDs indicate the type of fault that caused tripping:
Ir : overload
Isd : short-circuit (short time, instantaneous)
Ig : earth fault

The information is however stored in memory and the LED can be reilluminated by pressing the TR button.
The LED automatically goes off and the memory is cleared when the circuit breaker is reset.
In normal condition, if push TR button, all indication LED is ON for testing auxiliary power and LED.

Electronic trip units (Multifunction)
ETM43 for TS800

Tripping characteristics

Trip unit for TS800 circuit breaker



Long time protection against overloads

Io = Coarse adjustment (function of In)
Ir = Fine adjustment
tr = Long time delay

Short circuit protection

Isd = Short circuit threshold,
tsd = Short circuit time delay
I^2t curve in position ON or OFF

Instantaneous protection

Ii = Instantaneous threshold

Earth fault protection

Ig = Insulation fault threshold
tg = Earth fault time delay
I^2t curve in position ON or OFF

Catalogue numbering system

ETM 43 In800A

Trip unit frame
- 33 for TS400, TS630
- 43 for TS800

Rated current, In
- 630, 800A for TS800

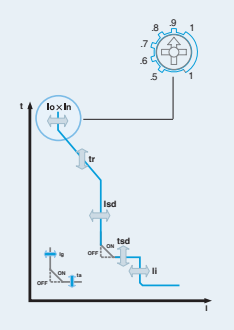
Trip unit function
- ETM: Multi function electronic trip unit

Electronic trip units (Multifunction)
ETM43 for TS800

Setting details

Trip unit rating, In

Trip unit type	16	32	40	64	80	100	160	250	320	400	630	800
ETM33 for TS800												



Overload protection (long time)

Type of trip unit	TS800ETM	
Rated current, In(A)	630	800

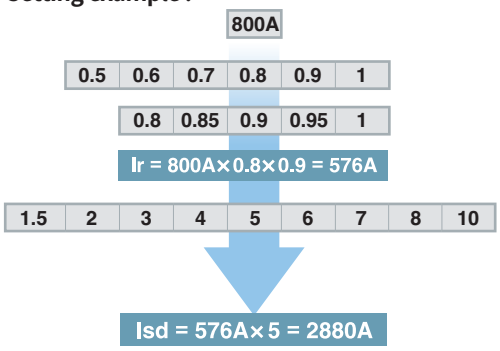
Setting value Coarse, Io	Setting value Fine, Ir	Overload protection setting current, Ir (A)	
0.5	0.8	252	320
	0.85	267.75	340
	0.9	283.5	360
	0.95	299.25	380
	1	315	400
0.6	0.8	302.4	384
	0.85	321.3	408
	0.9	340.2	432
	0.95	359.1	456
	1	378	480
0.7	0.8	352.8	448
	0.85	374.85	476
	0.9	396.9	504
	0.95	418.95	532
	1	441	560
0.8	0.8	403.2	512
	0.85	428.4	544
	0.9	453.6	576
	0.95	478.8	608
	1	504	640
0.9	0.8	453.6	576
	0.85	481.95	612
	0.9	510.3	648
	0.95	538.65	684
	1	567	720
1	0.8	504	640
	0.85	535.5	680
	0.9	567	720
	0.95	598.5	760
	1	630	800

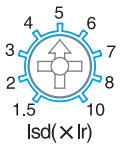
Electronic trip units (Multifunction)
ETM43 for TS800

Short circuit protection

The short circuit threshold, Isd is a multiple of the overload setting, Ir.

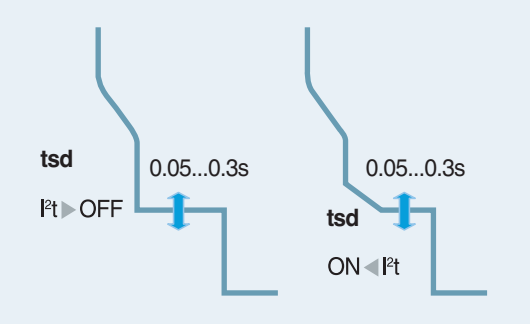
Setting example :

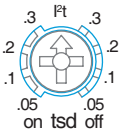




The breaker trips when the current exceeds 2880 A.

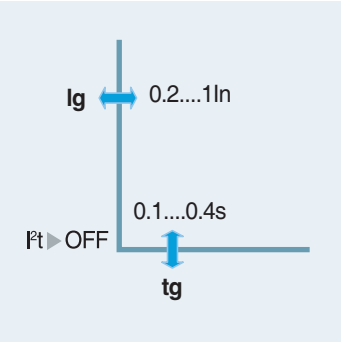
Short circuit time delay

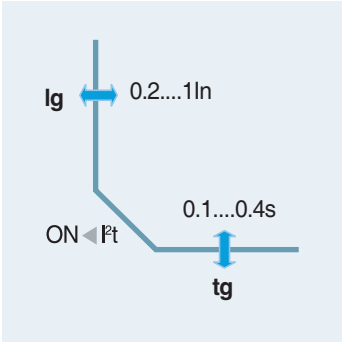


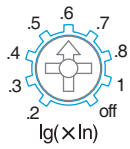


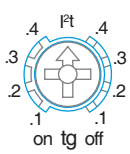
Earth fault protection(E), optional

The ETM trip units measure the vectorial sum of the three phase current and, if present, that of the neutral conductor.
If the sum of these values exceeds the set current thresholds for a period of time greater than the time delay, the breaker is tripped.









Ig = insulation fault threshold
tg = earth fault time delay

Electronic trip units (Multifunction)
ETM43 for TS800

Ammeter (A), optional

The Ammeter device has an accuracy of ±10%.
The highest phase current is displayed in upper line.
In under line, R, S and T phase current is scrolled autom.

Ammeter display limits:

- minimum current ≥ 0.3×In (one phase)
- maximum current ≤ 10×In

Zone selective interlocking (ZSI), optional

Zone Selective Interlocking is mainly used in systems with high rated current and short circuit current values, with safety and service continuity requirements.
This type of discrimination can be achieved with circuit breakers equipped with specially designed electronic trip units (ETM for TS circuit breakers).

Zone selective interlocking (ZSI) is a system designed

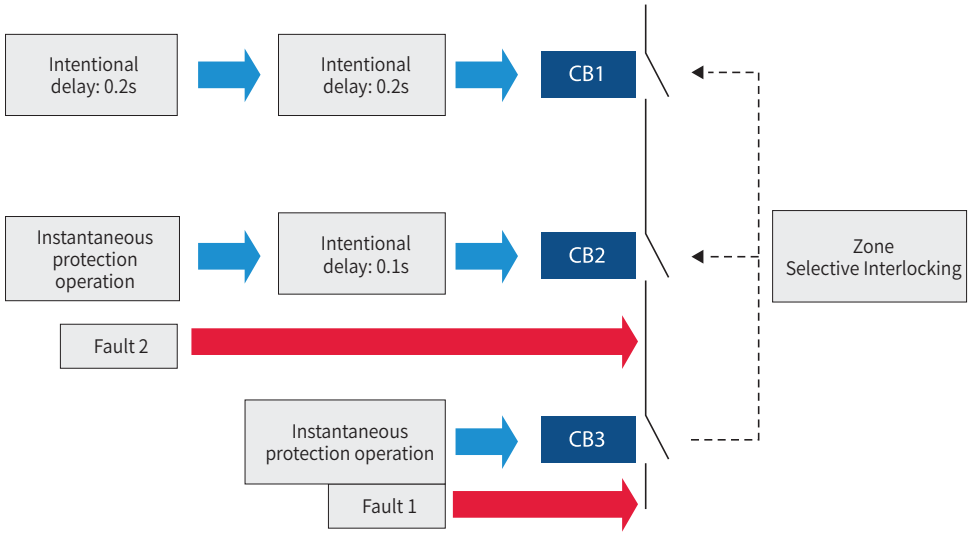
- to reduce the stress on electrical distribution components during short-circuit or earth fault conditions.
- to reduce the tripping times (Lower than hundred milliseconds).
- to reduce the damage caused by the fault and of interferences to the power supply system;

A number of circuit breakers are interconnected one after another by a pilot-wire.

Power source: DC24V Power is required.

Operation

- With ZSI, ETM trip unit detects the fault and then send the signal to upstream circuit breaker which applies the set time delay and ignore its present short-time and or/earth fault delay and clear the fault with no intentional delay.
- Without ZSI, ETM trip unit detects the fault and then trips the circuit breaker with intentional delay



Electronic trip units (Multifunction)
ETM43 for TS800

Communication(C), optional

Communication interface: RS485 (Modbus-RTU)

The Modbus RS485 system is an open bus on which communicating Modbus devices are installed. All kinds of PLCs and computers can be connected to the bus.

Transmitted data :

- Protection setting values
- Highest current of the three phases
- Measurement: R, S, T and N phase current
- Fault reading: Type of fault (Overload, short-circuit, etc)

The setting of communication address using TR button and LCD display (Ammeter).

Power source: DC24V Power is required.

Combination of options

☐ A(Ammeter)
☐ E(Earth fault protection)
☐ A+E
☐ A+C(Communication)
☐ A+E+C
☐ Z(Zone selective interlocking)
☐ Z+A
☐ Z+E
☐ Z+A+E
☐ Z+A+C
☐ Z+A+E+C

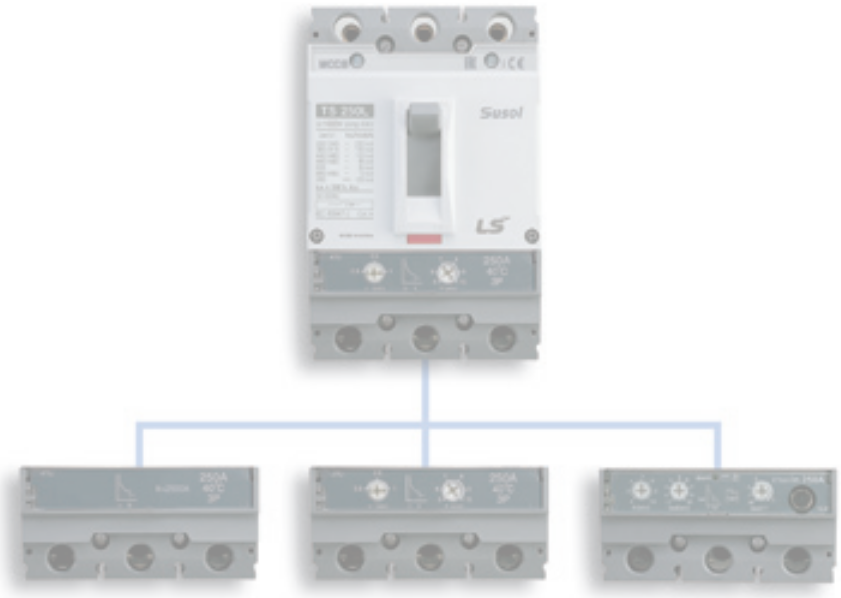
Electronic trip units (Multifunction)
ETM43 for TS800

Menu structure of the electronic trip unit (ETM)

I	r	-	1	2	6	0	A
I	s	-			6	5	A

→ Display current value (RMS) of phase which is carrying maximum in each phase

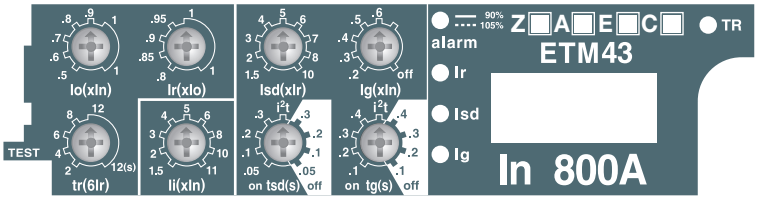
→ Display current value (RMS) of each phase at an interval of every 2 seconds.



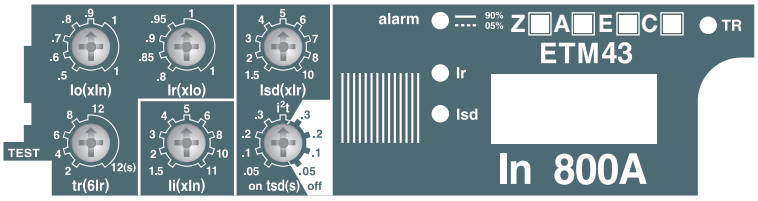
Electronic trip units (Multifunction)
ETM43 for TS800

Feature of trip unit according to option

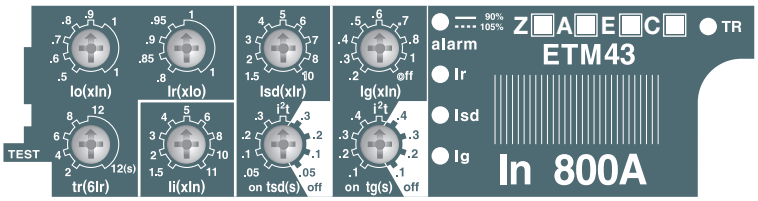
ETM43 A+E
ETM43 A+E+C
ETM43 Z+A+E
ETM43 Z+A+E+C



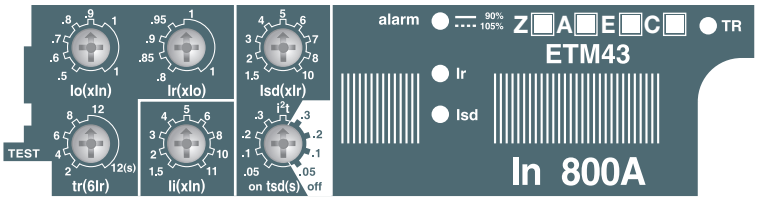
ETM43 A
ETM43 A+C
ETM43 Z+A
ETM43 Z+A+C



ETM43 E
ETM43 Z+E



ETM43
ETM43 Z



MCCBs for motor protection

Electrical characteristics

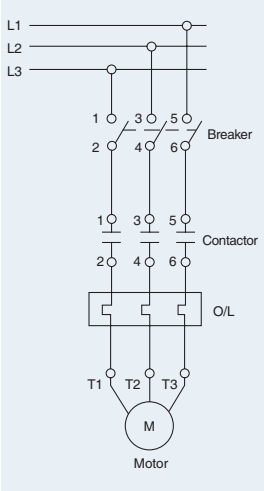
				TS100			TS160		
Frame size			[AF]	100			160		
Rated current, In *			[A]	1.6, 3.2, 6.3, 12, 20, 32, 50, 63, 100			32, 50, 63, 100, 160		
No. of poles				3			3		
Rated operational voltage, Ue		AC	[V]	690			690		
		DC	[V]	500			500		
Rated impulse withstand voltage, Uimp			[kV]	8			8		
Rated insulation voltage, Ui			[V]	1000			1000		
Rated ultimate short-circuit breaking capacity, Icu				N	H	L	N	H	L
	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	220~525V	[%Icu]	100%	100%	100%	100%	100%	100%
		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 (release)									
	● magnetic only		MTU	●			●		
Connection	fixed	front-connection		●			●		
		rear-connection		●			●		
	plug-in	front-connection		●			●		
		rear-connection		●			●		
Life cycle ***	Mechanical		[operations]	25000			25000		
	Electrical @ 415 V AC		[operations]	10000			10000		
Basic dimensions, W×H×D (front connection)	3-pole		[mm]	105×160×86			105×160×86		
Weight (front connection)	3-pole		[kg]	2			2		
Reference standard				IEC60947-2			IEC60947-2		

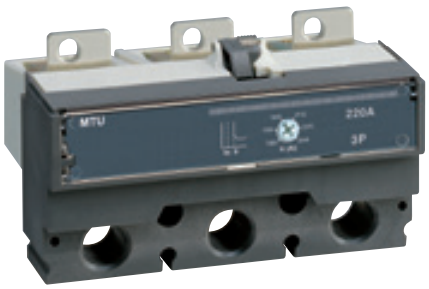
※ Breaking capacity at 660/690V is for your reference. (not certified)
* Life cycle means not guarantee but limitation
(Quality guarantee: On/Off frequency on the basis of IEC60947-2 within the term of guarantee.)




	TS250			TS400			TS630			TS800		
	250			400			630			800		
	100, 160, 220			320			500			630		
	3			3			3			3		
	690			690			690			690		
	500			500			500			500		
	8			8			8			8		
	1000			1000			1000			1000		
	N	H	L	N	H	L	N	H	L	N	H	L
	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%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	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		
	●			●			●			●		
	●			●			●			●		
	●			●			●			●		
	●			●			●			●		
	●			●			●			●		
	●			●			●			●		
	25000			20000			20000			10000		
	10000			10000			6000			3000		
	105×160×86			140×260×110			140×260×110			210×320×135		
	2			5.4			5.4			15.1		
	IEC60947-2			IEC60947-2			IEC60947-2			IEC60947-2		

Magnetic only trip unit
MTU for TS100, TS160, TS250, TS400, TS630, TS800





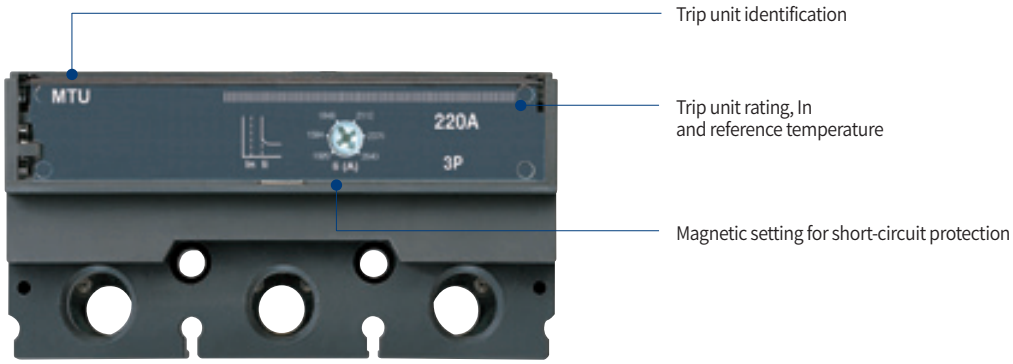
Magnetic only release

For the protection of motors from 1.6 to 250kW(400V), TS100 to TS800 circuit Breakers must be equipped with a special trip unit MTU adjustable thresholds.

This assembly ensures: Short-circuit protection (magnetic trip unit with adjustable thresholds); Suitability for isolation. For the TS100 to TS800 circuit breakers, trip unit MTU is interchangeable.

The circuit breakers presented here: Provide protection against short-circuits; Are suitable for isolation as defined by IEC60947-2 standard.

Configuration



Catalogue numbering system

TS250 **MTU**

Magnetic only release

MCCB frame type
- TS100: TS100N, TS100H, TS100L
- TS160: TS160N, TS160H, TS160L
- TS250: TS250N, TS250H, TS250L
- TS400: TS400N, TS400H, TS400L
- TS630: TS630N, TS630H, TS630L
- TS800: TS800N, TS800H, TS800L

Magnetic only trip unit
MTU for TS100, TS160, TS250, TS400, TS630, TS800

Characteristics

Magnetic trip units(MTU)

Rating(A)	In
N / H / L	TS100
	TS160
	TS250
	TS400
	TS630
	TS800

TS100 to TS800													
1.6	3.2	6.3	12	20	32	50	63	100	160	220	320	500	630
●	●	●	●	●	●	●	●	●	-	-	-	-	-
-	-	-	-		●	●	●	●	●	-	-	-	-
-	-	-	-	-				●	●	●	-	-	-
-	-	-	-	-	-	-	-	-			●	-	-
-	-	-	-	-	-	-	-	-	-	-		●	-
-	-	-	-	-	-	-	-	-	-	-	-	-	●

Short - circuit protection(magnetic)

Pick - up	Ii

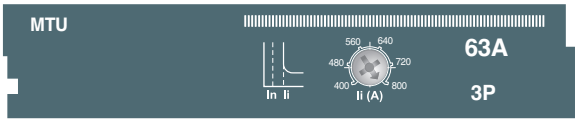
setting
6..12×In (6 Point)

Setting details

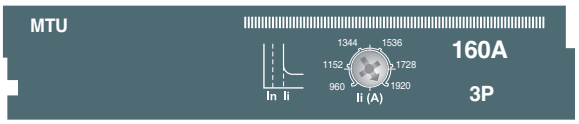
MTU In	6×In	..	..	..	..	12×In
1.6	10	12	14	16	18	20
3.2	20	24	28	32	36	40
6.3	40	48	56	64	72	80
12	70	84	98	112	126	140
20	120	144	168	192	216	240
32	190	228	266	304	342	380
50	300	360	420	480	540	600
63	400	480	560	640	720	800

MTU In	6×In	..	..	..	..	12×In
100	600	720	840	960	1080	1200
160	960	1152	1344	1536	1728	1920
220	1320	1584	1848	2112	2376	2640
320	1920	2304	2688	3072	3456	3840
500	3000	3600	4200	4800	5400	6000
630	3780	4536	5292	6048	6804	7560

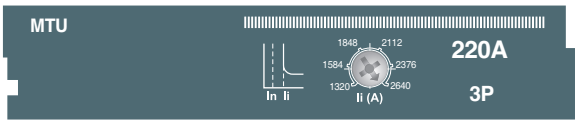
TS100 MTU
- Adjustable magnetic only unit



TS160 MTU
- Adjustable magnetic only unit



TS250 MTU
- Adjustable magnetic only unit



TS400 MTU, TS630 MTU, TS800 MTU
- Adjustable magnetic only unit