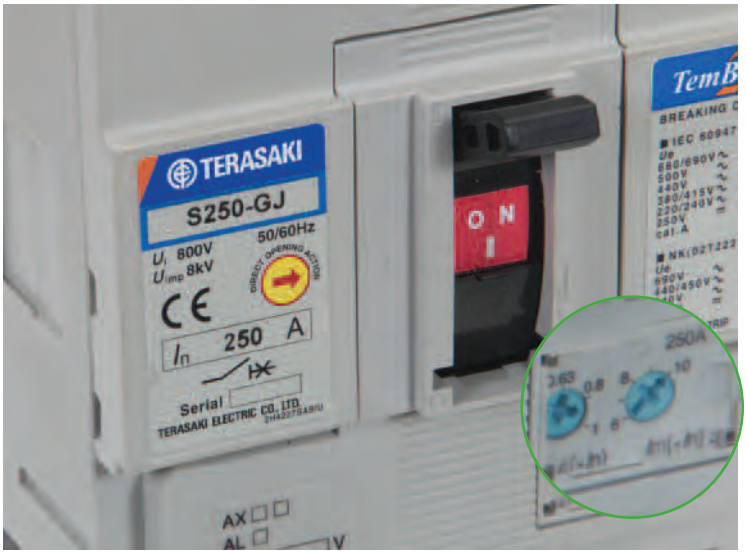
TemBreak 1 and 2 over-current relay data,dimensions and mounting

MCCB Technical data
Operating characteristics – TemBreak 2

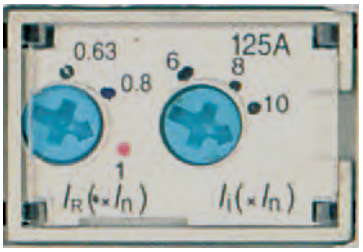
Thermal-Magnetic protection

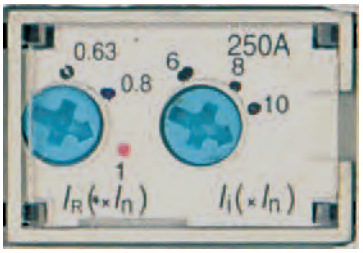
- TemBreak 2 MCCBs from 125 A frame to 400 A frame are available with thermal magnetic protection.
- All standard 3 and 4 MCCB pole models have adjustable thermal and magnetic trip characteristics.
- Earth leakage ELCB models have an adjustable thermal dial and fixed magnetic characteristics.

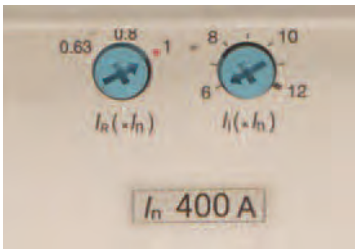


3 Pole MCCB with Adjustable thermal and adjustable magnetic characteristics.

Thermal and magnetic adjustment dials.







Adjustable inverse time and instantaneous trip.

Thermal adjustment dial fitted to ZS earth leakage CBs.

General

An adjustable magnetic characteristic allows short circuit protection to be matched to the load and supply characteristics. For example, motor inrush current or generator short circuit current.

Lowering the short circuit tripping threshold can allow a higher earth-loop impedance in an installation and provide end-of-cable protection with correct disconnection times.

Single pole MCCBs have fixed thermal and fixed magnetic characteristics.

Thermal magnetic protection units are especially suited to the following applications:

- Installations where harmonic distortion of current waveforms is likely.
  Thermal magnetic MCCBs inherently act on the RMS heating effect of current.
- DC circuits. Thermal magnetic MCCBs provide both DC overload and DC short circuit protection. Magnetic trip currents, (Ii), quoted in this catalogue are expressed in AC RMS Amperes. The instantaneous magnitudes of current required to operate the magnetic elements are higher than the AC RMS values by a factor of $\sqrt{2}$. When protecting DC circuits it is therefore recommended that the Ii setting is reduced accordingly.

Thermal magnetic protection
Operating characteristics

Single Pole MCCBs
Single pole models have fixed thermal and fixed magnetic characteristics.

Generator Protection
Generators may need specially modified protection characteristics, based on their short-circuit capability. If a generator is capable of delivering short-circuit current greater than six times its full load current, a standard TemBreak 2 thermal magnetic MCCB may be used, with I_i set at less than the available short-circuit current. (Note that MCCBs, with fixed magnetic characteristics may not be suitable for this application.)

A thermal magnetic MCCB with low instantaneous protection may be used where the generator short-circuit current is less than six times its full load current. These are modified versions of the standard MCCB.

Four pole MCCBs with low instantaneous protection have protection on the neutral pole as standard. The magnetic characteristic of MCCBs with low instantaneous protection is fixed at the following values:

Model	Current Rating In (A)
E125	$3xI_n$
S125	$3xI_n$
S160	$3xI_n$
E250	$3xI_n$
S250	$3xI_n$
E400	$3.5xI_n$
S400	$3.5xI_n$

Neutral Pole protection
Neutral pole protection is available as an optional extra on four pole thermal magnetic MCCBs. The thermal and magnetic elements in the neutral pole are related to those in the phase poles as follows:

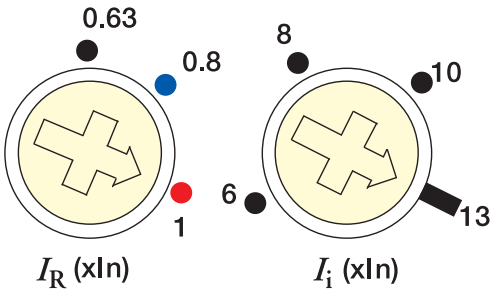
	Phase Trip Threshold	Neutral Trip Threshold
Thermal	I_r (adjustable)	I_N (adjustable)= I_n
Magnetic	I_i (adjustable)	I_i (adjustable)

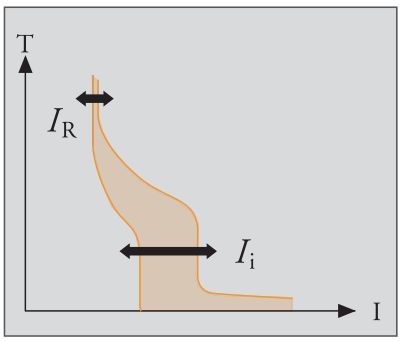
Motor protection
MCCBs feeding motors are often only required to provide protection from short-circuits. Overload protection is provided by a dedicated thermal or electronic overload relay. Tembreak 2 MCCBs without thermal protection elements are available for this application. Four pole MCCBs with magnetic trip only have protection on the neutral pole as standard.

MCCB Technical data

Operating characteristics – TemBreak 2

Thermal-Magnetic protection





ZS ELCB netting dials showing thermal adjustment dial.

Adjustment dials

1. I_R is the thermal element adjustment dial and is used to set the rated current to match the conductor rating. I_R can be set between 0.63 and 1.0 times I_n.

2. I_i can be set between 6 and 12 times on 125AF MCCBs with	20 A - 100 A	trip units
I_i can be set between 6 and 10 times on 125AF MCCBs with	125 A	trip units
I_i is fixed at 12 times on ZS125GJ 125AF ELCBs with	20 A – 100 A	trip units
I_i is fixed at 10 times on ZS125GJ 125AF ELCBs with	125 A	trip units
I_i can be set between 6 and 13 times on 250AF MCCBs with	20 A - 160 A	trip units
I_i can be set between 6 and 10 times on 250AF MCCBs with	250 A	trip units
I_i is fixed at 13 times on ZS250GJ 250AF ELCBs with	160 A	trip units
I_i is fixed at 10 times on ZS250GJ 250AF ELCBs with	250 A	trip units
I_i can be set between 6 and 12 times on 400AF MCCBs with	250 A - 400 A	trip units

3. The thermal and magnetic dial settings can be set in between the number increments.

Model, type and rated current of thermal elements

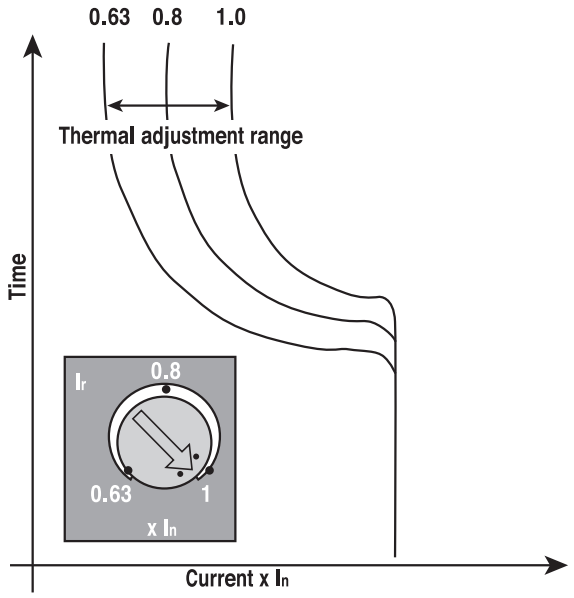
Model	Type	Current Rating In (A)
S100	-GF	15, 20, 30, 40, 50, 60, 75, 100 [1])
S100	-NF	15, 20, 30, 40, 50, 60, 75, 100 [1])
S125	-NF	16, 20, 25, 32, 40, 50, 63, 80, 100, 125 [1])
E125	-NJ	20, 32, 50, 63, 100, 125
S125	-NJ	20, 32, 50, 63, 100, 125
S125	-GJ	20, 32, 50, 63, 100, 125
ZS125	-GJ	20, 32, 50, 63, 100, 125
H125	-NJ	20, 32, 50, 63, 100, 125
L125	-NJ	20, 32, 50, 63, 100, 125
S160	-NF	16, 20, 25, 32, 40, 50, 63, 80, 100, 125, 160 [1])
S160	-NJ	20, 32, 50, 63, 100, 125, 160
S160	-GJ	50, 63, 100, 125, 160
H160	-NJ	160
L160	-NJ	160
E250	-NJ	20, 32, 50, 63, 100, 125, 160, 250
S250	-NJ	250
S250	-GJ	250
ZS250	-GJ	160, 250
H250	-NJ	250
L250	-NJ	250
E400	-NJ	250, 400
S400	-CJ	250, 400
S400	-NJ	250, 400
S400	-GJ	250, 400

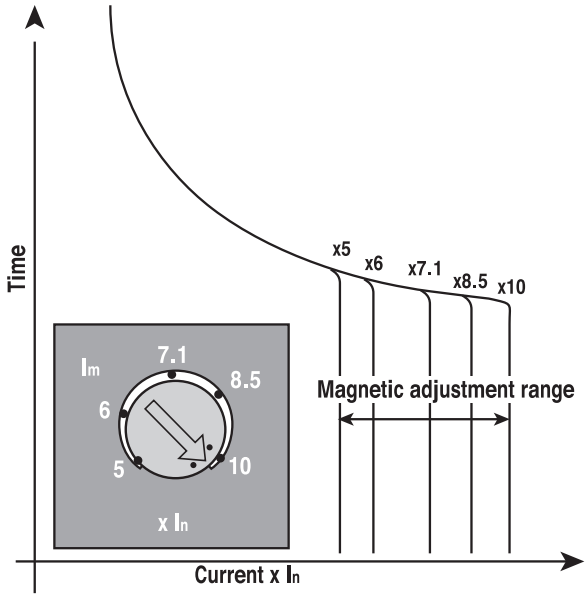
Notes: [1]) These MCCBs have fixed trip units (1, 2 pole types)

TemBreak 1 MCCB Technical data
Thermal - Magnetic MCCBs 630 - 800 A

Thermal adjustment
The rated current 'I_r' is continuously adjustable from 63 % to 100 % of its nominal current 'I_n'. There are three main points of calibration marked at 63 %, 80 % and 100 %, as shown in the diagram below.

Magnetic adjustment
The magnetic adjustment is available on MCCBs of 630 A to 800 A. The magnetic setting 'I_m' is continuously adjustable from 500 % to 1000 % of its rated current 'I_n'. There are five main points of calibration marked as multiples of I_n; 5, 6, 7.1, 8.5 and 10. These are shown in the diagram below.





Example
XS630NJ/630 A MCCB set at I_r = 0.8 and I_m = 5.0

The rated current is calculated as 630 x 0.8 = 504 A
The magnetic setting is calculated as 630 x 5 = 3150 A

Note that the magnetic setting is a multiple of the nominal current I_n and not the rated current I_r.
All thermal and magnetic trip settings are expressed as AC RMS values.
All MCCBs are calibrated at 45 °C unless otherwise specified.

Breakers with adjustable magnetic trip

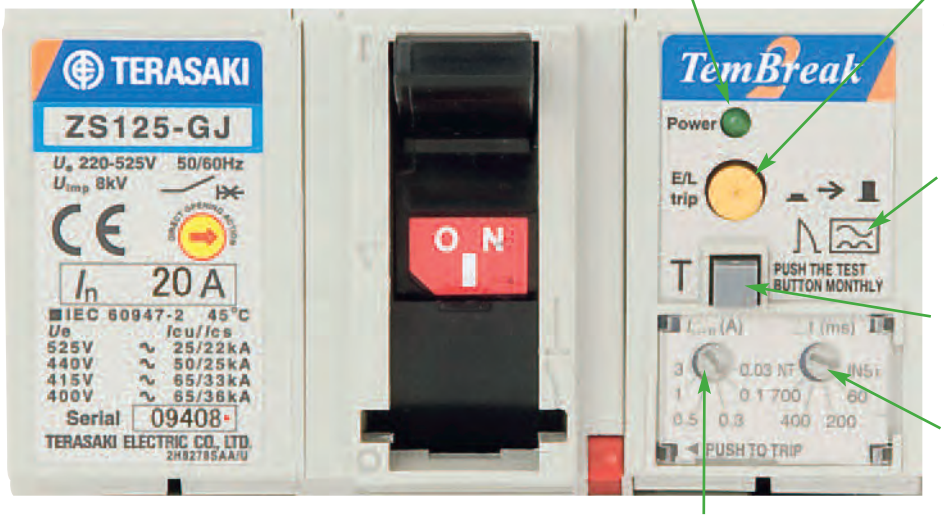
MCCB Cat. No.	Rated current (A)	Magnetic trip current (A) Scale 10	8.5	7.1	6	5
XS630NJ	630	6300	5355	4473	3780	3150
XH630PJ	630	6300	5355	4473	3780	3150
XS800NJ	800	8000	6800	5680	4800	4000
XH800PJ	800	8000	6800	5680	4800	4000

Notes: Settings; 3 poles can be adjusted simultaneously with one adjustment dial.

MCCB Technical data

Operating characteristics – TemBreak 2

ZS Earth leakage circuit breakers



Voltage presence LED

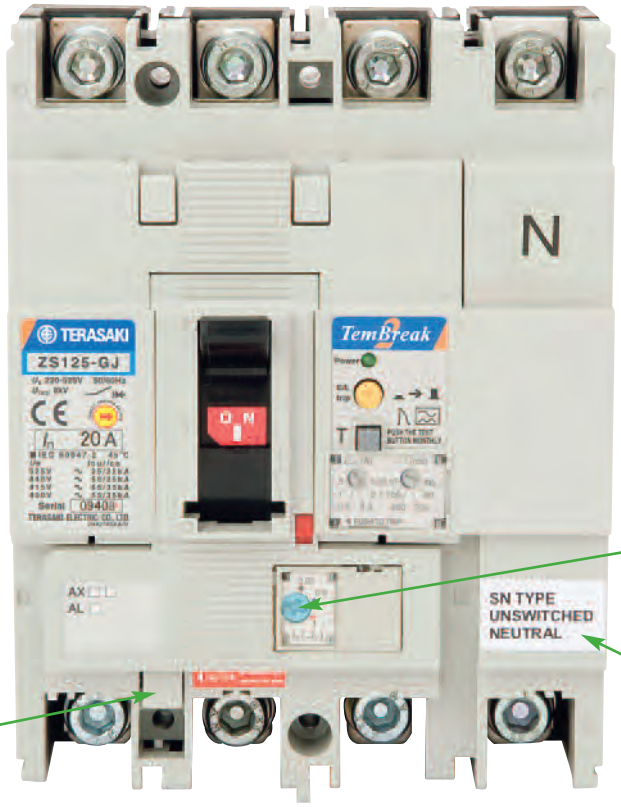
Trip indicator. The yellow button pops up to the indicate tripping due to residual current. When the breaker is reset, the button will retract.

Type A. Tripping is ensured for residual sinusoidal AC in the presence of residual pulsating DC

Test button. Press the button to test the residual current detection and tripping system

Adjustable time delay for residual current protection. Settings include zero and non-trip (NT)

Adjustable residual current tripping thresholds. 30 mA, 100 mA, 300 mA, 500 mA, 1000 mA and 3000 mA



Adjustable overload protection I_R can be set between 63 % and 100 % of I_N

Dielectric test device. Remove the plug to allow dielectric testing with the ELCB closed (ON)

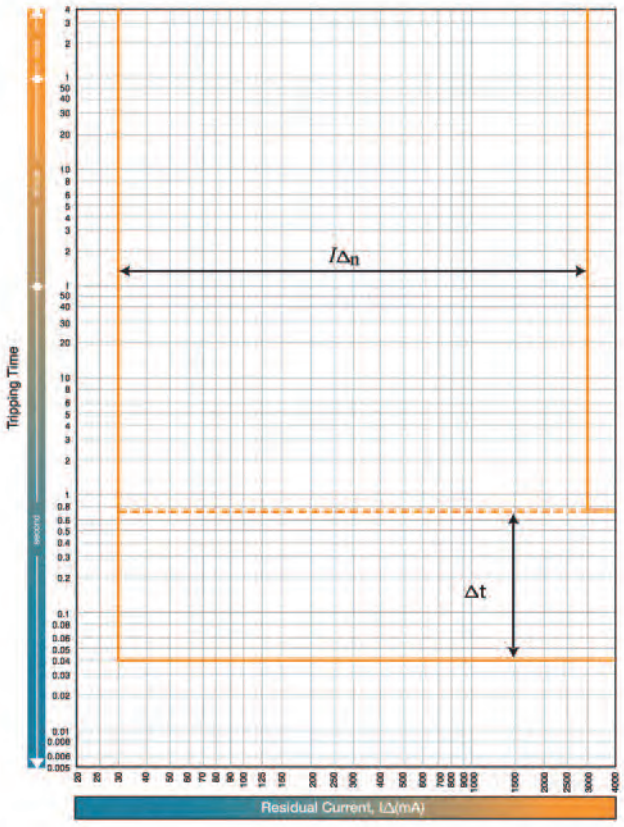
Switched or unswitched neutral types stocked.

MCCB Technical data

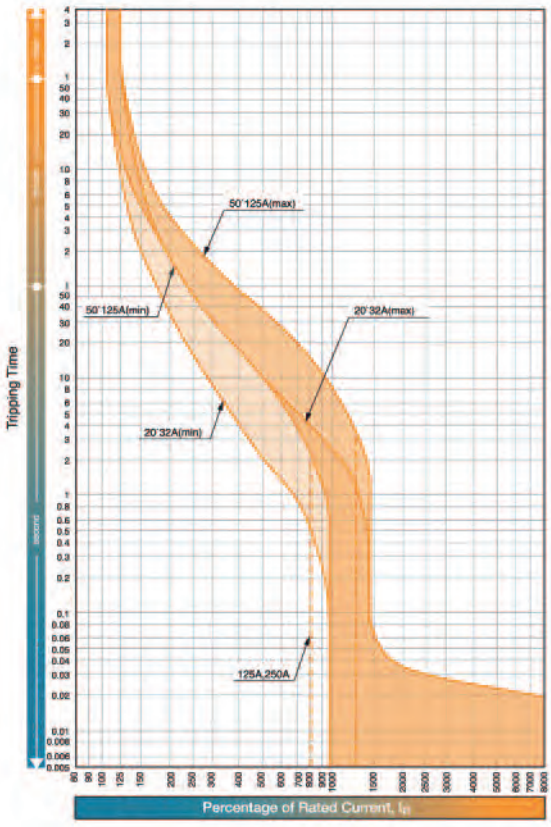
Operating characteristics – TemBreak 2

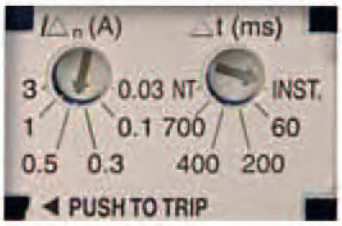
ELCB: ZS125GJ (125 AF), ZS250GJ (250 AF)

Residual current characteristic



Overload characteristic Short-circuit characteristic





IΔn is the adjustable tripping threshold for residual current (earth leakage) protection. It can be set between 30 mA and 3 A. Available settings are shown below:

Δt (ms) is a time delay which is introduced to the residual current (earth leakage) protection characteristic. Available settings are show below. It can also be set to 0 (max. actual tripping time is 40 ms) or NT (No Trip - tripping time = $_{\infty}$). The maximum breaking time at each setting is shown in brackets. Note that IΔn is set at 30 mA, Δt defaults to 0.

I_R is the adjustable tripping threshold for overload protection. it can be set between 0.63 and 1.0 times I_n ratings are shown below:

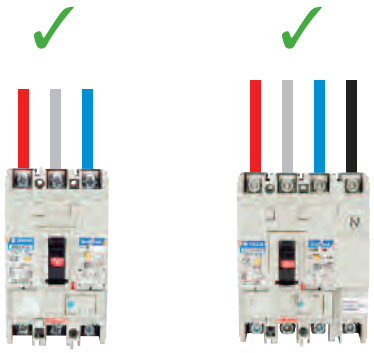
I_R is the tripping threshold for short-circuit protection. It is fixed at the values shown below:

Model	IΔn (A)	Δt (ms)	In (A)	I_i
ZS125GJ	0.03, 0.1, 0.3, 0.5, 1, 3	0 (40), 60 (195), 200 (365), 400 (620), 700 (950), NT (∞)	20, 32, 50, 63, 100	12 x I_n (+/ -20 %)
ZS125GJ	0.03, 0.1, 0.3, 0.5, 1, 3	0 (40), 60 (195), 200 (365), 400 (620), 700 (950), NT (∞)	125	10 x I_n (+/ -20 %)
ZS250GJ	0.03, 0.1, 0.3, 0.5, 1, 3	0 (40), 60 (195), 200 (365), 400 (620),700 (950), NT (∞)	160	13 x I_n (+/ -20 %)
ZS250GJ	0.03, 0.1, 0.3, 0.5, 1, 3	0 (40), 60 (195), 200 (365), 400 (620), 700 (950), NT (∞)	250	10 x I_n (+/ -20 %)

MCCB Technical data

ZS ELCB Connection diagrams (do's and donts)

1. ZS ELCB connection - 3 and 4 wire systems

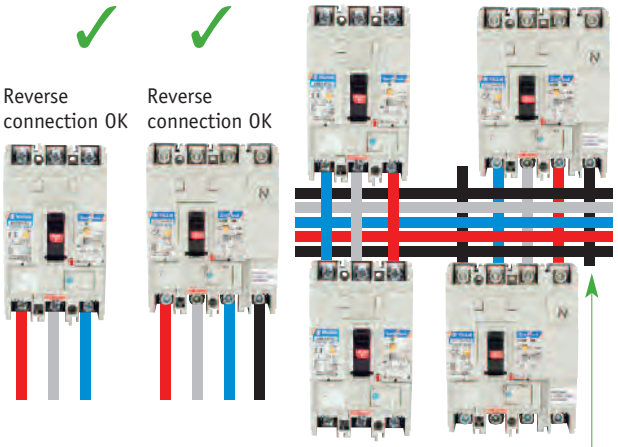


3 wire system (no Neutral)
E.g.: motor applications, and some markets outside Aust New Zealand

4 wire system
E.g.: Power distribution systems which include a Neutral (4 wire is standard in Australia New Zealand)

2. ZS ELCB connection – reverse connection and NHP chassis

NHP Chassis require reverse connection for all MCB's, MCCB's and ELCB's



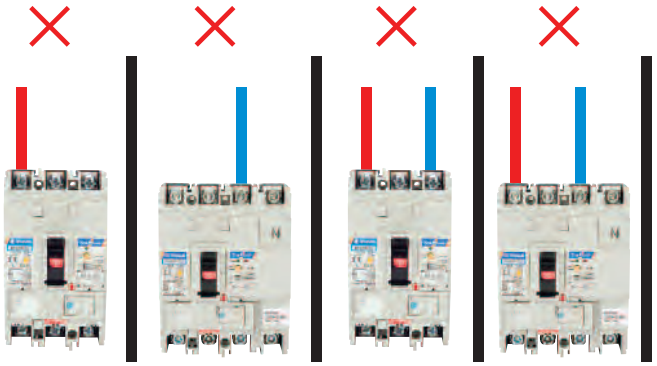
Reverse connection OK

Reverse connection OK

Note: When a ZS ELCB is reverse connected, the green power ON LED on the front panel of the ELCB will remain ON before and after any over current or earth leakage trip. As well, the yellow trip indicator button will pop out, and the black toggle on the breaker will move to the central "tripped" position.

Chassis Neutral bar must connect to ELCB Neutral pole so toggles align

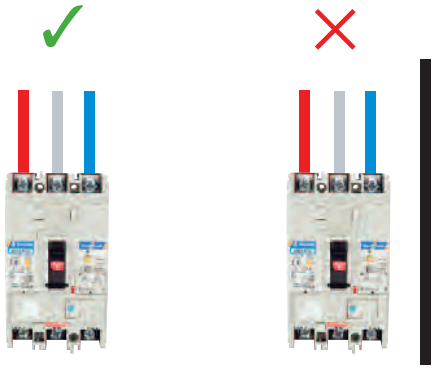
3. ZS ELCB connection: connecting 1 or 2 phases only (Refer box 5 for correct connection.)



1 or 3 phase (4 wire system system with Neutral)
When using a 3 or 4 pole ZS ELCB, if a Neutral is present in the system, it must be monitored by the ELCB so an imbalance will not occur.

Result: ELCB will trip if the Neutral is not connected

4. ZS ELCB connection: 3 pole types



3 wire system (no Neutral)
E.g.: motors

4 wire system
Cannot use a 3 pole ELCB in a 4 wire system where all 3 phases are to pass through the ELCB. The Neutral must be monitored by the ELCB. However 1 + N and 2 + N are ok for use with 3P ELCB's
Result: ELCB will trip

5. ZS ELCB connection: 3 pole types

✓ ✓ ✓ ✓ ✓ ✓

2 wire system –
using 1 phase + Neutral

2 wire system (no Neutral) –
using 2 phases only
(SWER – single wire earth return)

6. ZS ELCB connection: 4 pole types

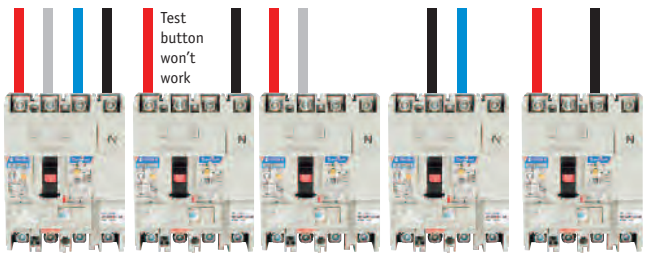
✓ ✓

4 wire system
E.g.: Standard power
distribution systems
using a Neutral

3 wire system - no Neutral
A 4 pole ELCB can be used
on a 3 wire system where
the 4th Neutral pole is not
used.

7. ZS ELCB connection: 4 pole types

✓ ✗ ✓ ✓ ✓

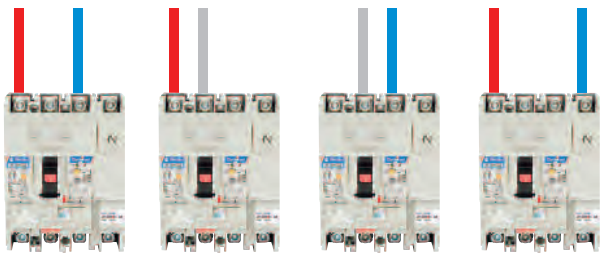


4 wire system
E.g.: Standard power
distribution systems
using a Neutral

2 wire system –
using 1 phase + Neutral

8. ZS ELCB connection: 4 pole types

✓ ✓ ✓ ✗

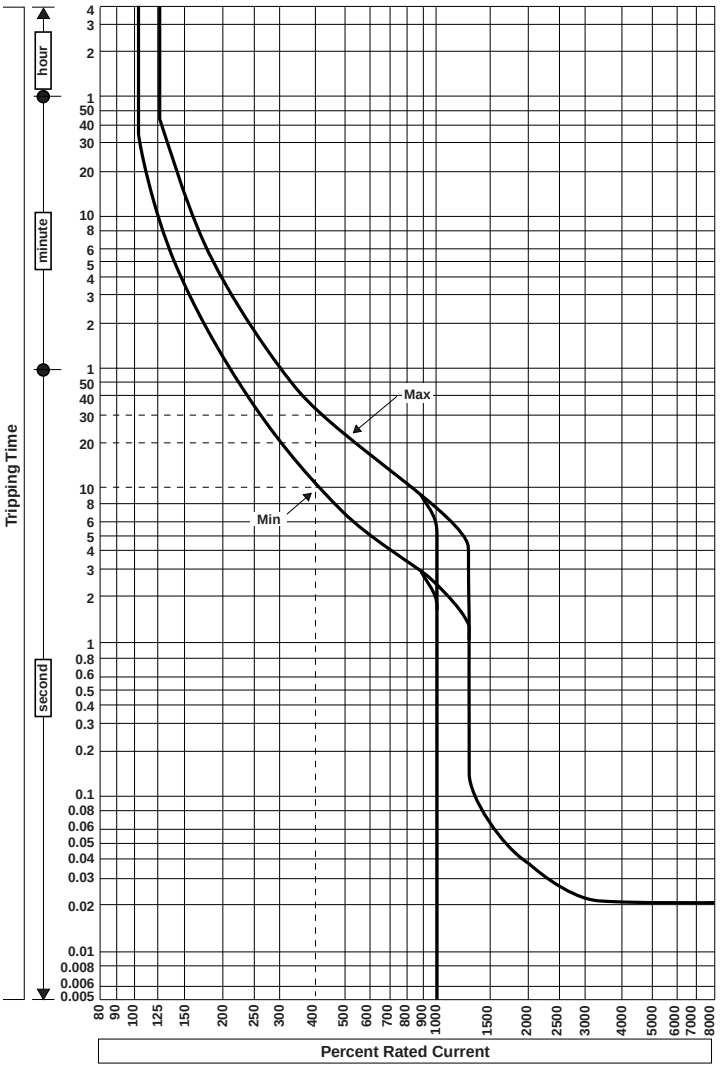


2 wire system (no Neutral) – using 2 phases only

5

TemBreak MCCB Technical data
Time/current and ambient compensation curves

Time/current characteristic curves



Example 1.
Using a TemBreak 2 S250NJ

The S250NJ set at its maximum thermal setting of 250 A, experiences an overload of 1000 A. What would be the tripping time?

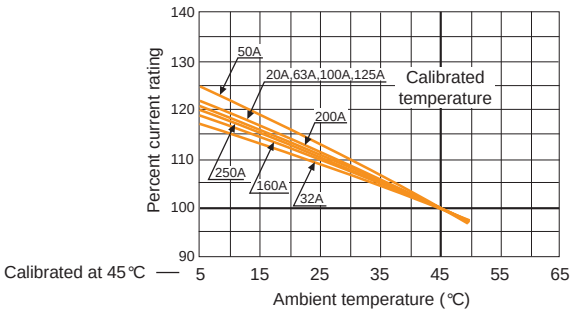
Solution

As the axis are 'percent' rated current, the overload as a percentage to rated current is

$$\frac{100\ A}{250} = 400\ \%$$

The maximum and minimum on the curve are the tolerance bands. Therefore at 400 % overload the tripping time would be as follows:
Maximum trip time ≈ 30 seconds
Minimum trip time ≈ 10 seconds
Average trip time ≈ 20 seconds
Due to strict quality control of the manufacturing and calibration processes, the characteristic curve of most MCCBs will follow the 'average' curve within the tolerance band.

Ambient compensating curves



Example 2.

The S250NJ is calibrated at 250 A for 45 ˚C ambient. If the temperature rose to 55 ˚C, what effect would this have?

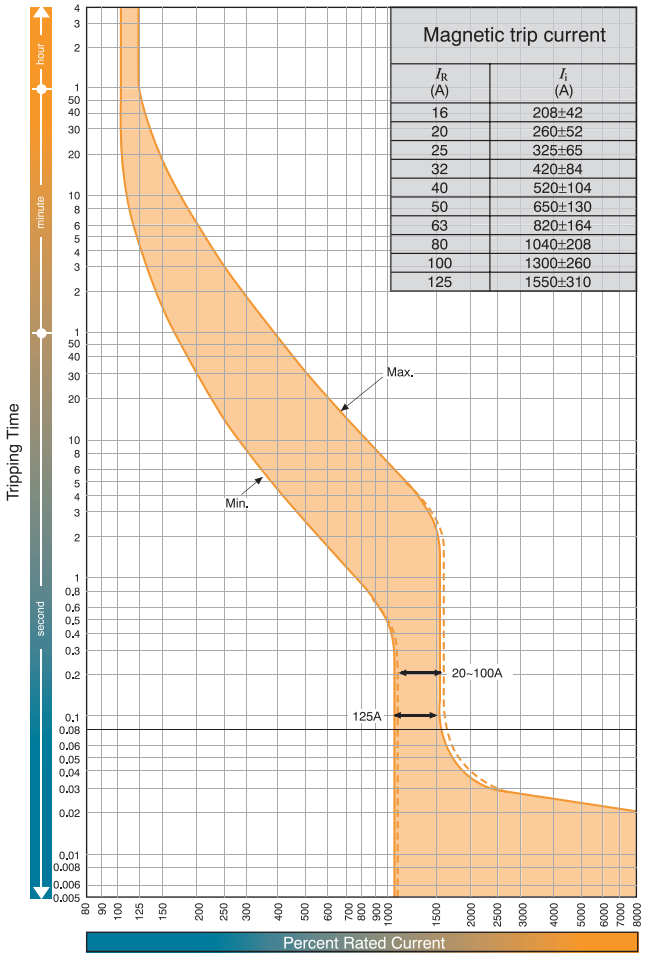
Solution

At 55 ˚C the ambient compensating factor is 93 %, i.e. 250 x 0.93 = 232.5 A
In other words the S250NJ would act as an MCCB set at 232.5 A, in 55 ˚C.

MCCB Technical data
Operating characteristics – TemBreak 2

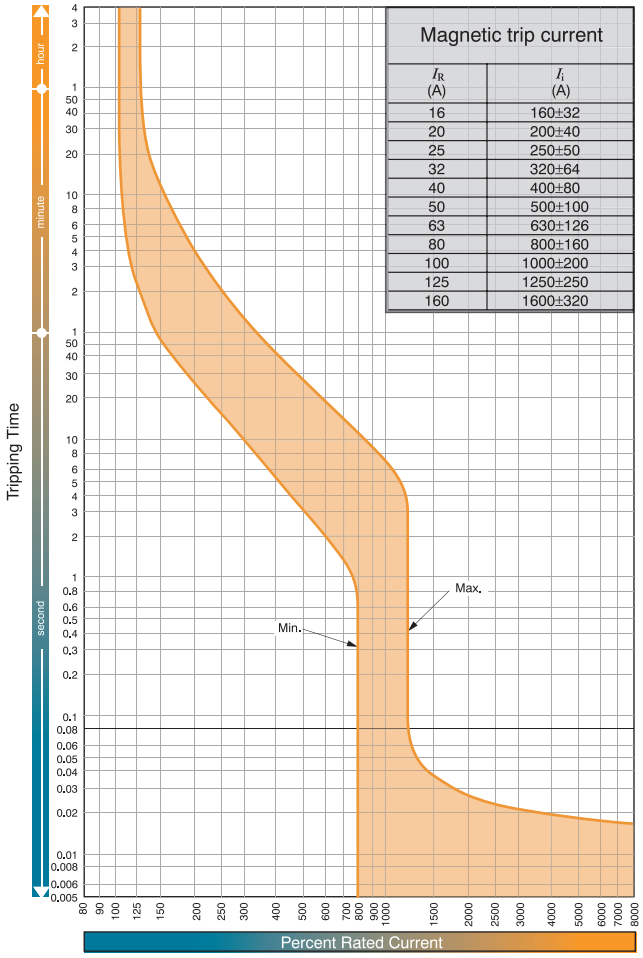
Single Pole MCCBs

S125-NF
Time/current characteristic curves



Magnetic trip current	
I_R (A)	I_i (A)
16	208±42
20	260±52
25	325±65
32	420±84
40	520±104
50	650±130
63	820±164
80	1040±208
100	1300±260
125	1550±310

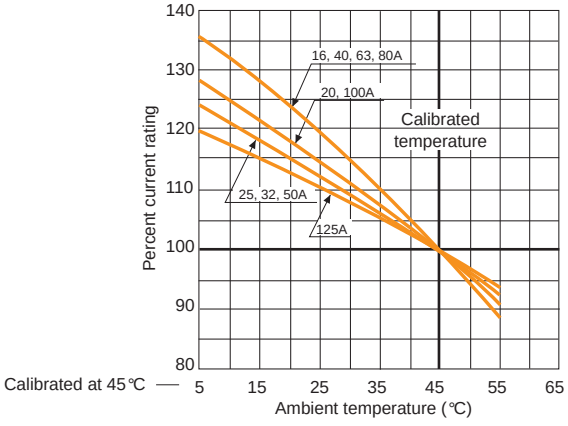
S160-NF
Time/current characteristic curves



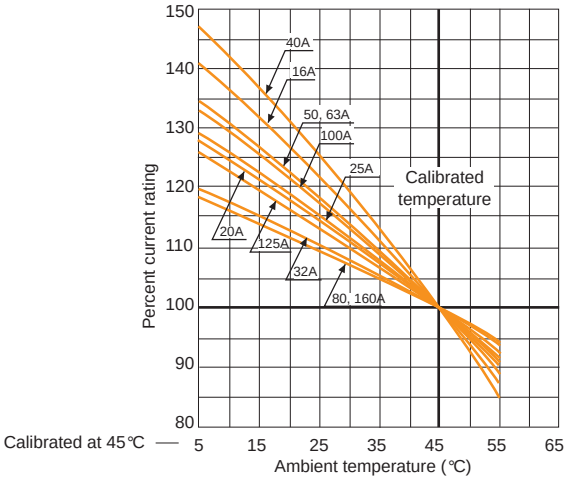
Magnetic trip current	
I_R (A)	I_i (A)
16	160±32
20	200±40
25	250±50
32	320±64
40	400±80
50	500±100
63	630±126
80	800±160
100	1000±200
125	1250±250
160	1600±320

Refer Applications, section 13, for temperature derating charts

Ambient compensating curves



Ambient compensating curves



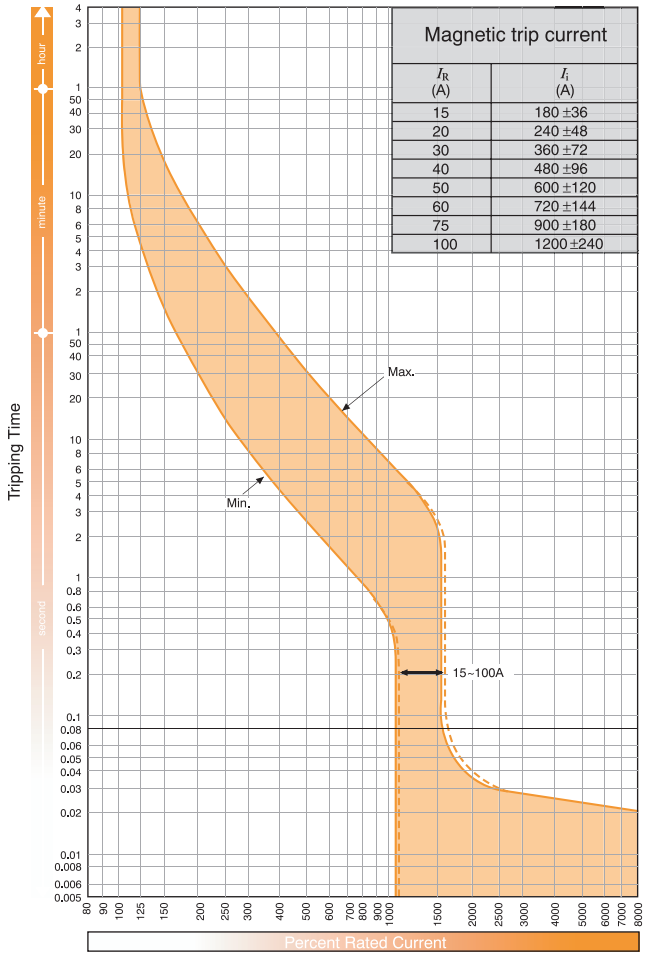
MCCB Technical data

Operating characteristics – TemBreak 2

Two Pole and 125 A frame MCCBs

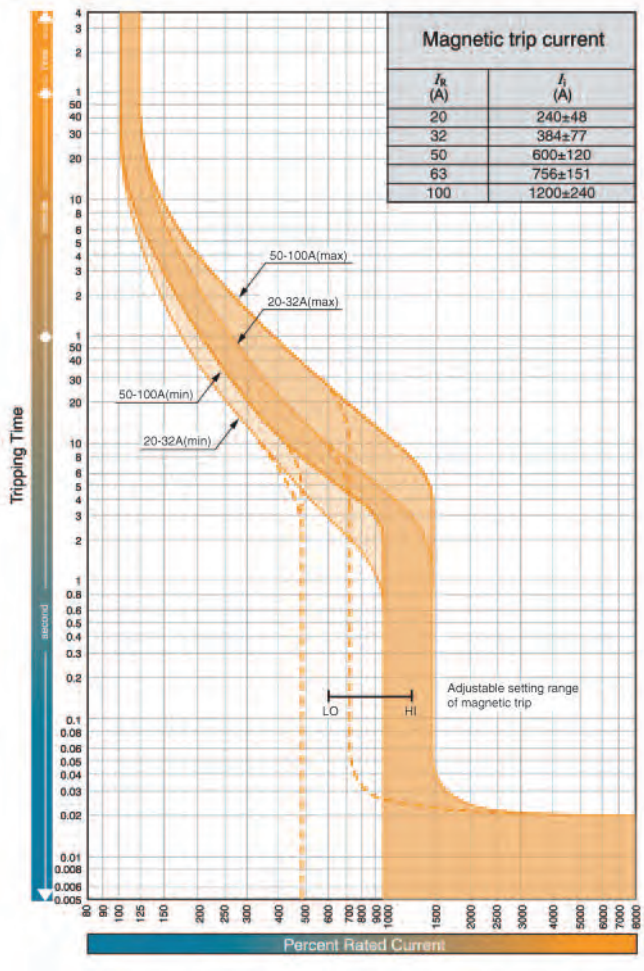
S100GF

Time/current characteristic curves



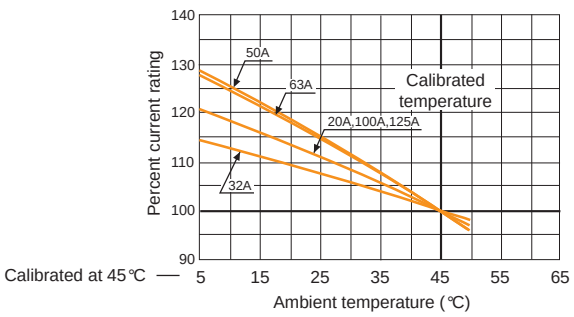
E125-NJ, S125-NJ, S125-GJ

Time/Current characteristic curves



Refer Applications, section 13, for temperature derating charts

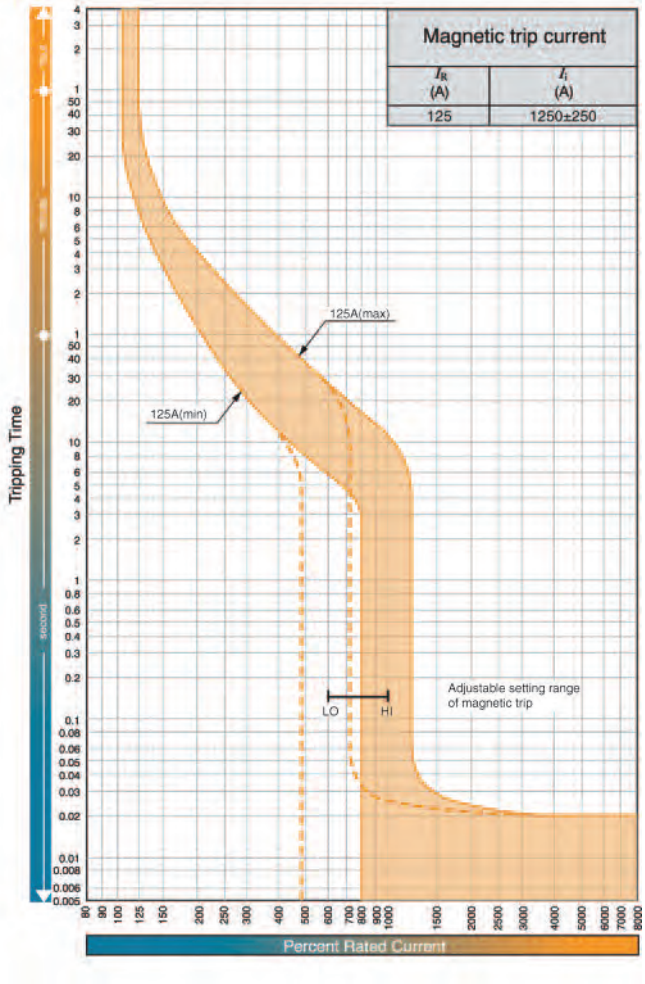
Ambient compensating curves



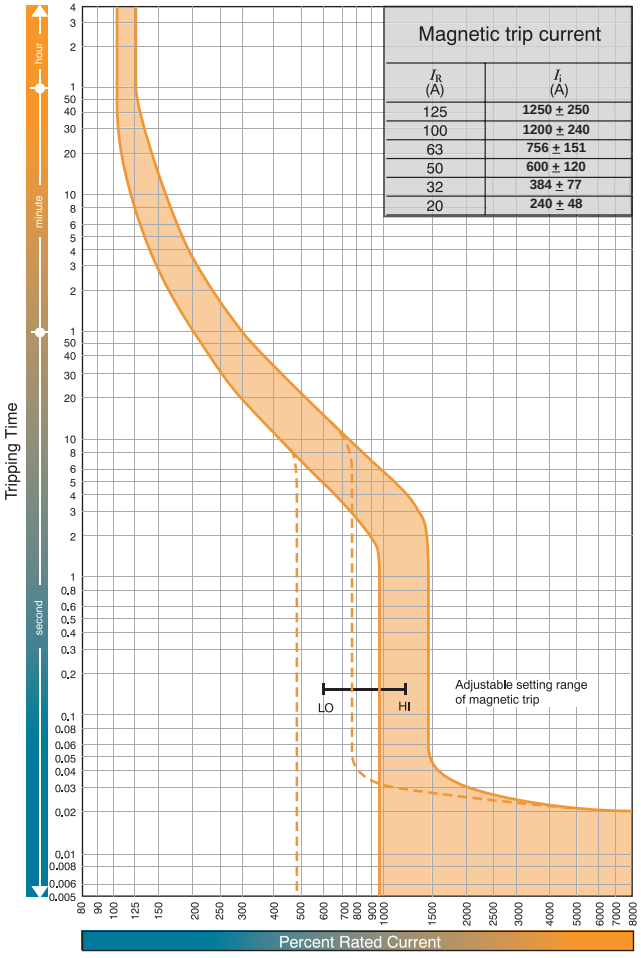
MCCB Technical data
Operating characteristics – TemBreak 2

125 A Frame MCCBs

E125-NJ, S125-NJ S125-GJ,
Time/current characteristic curves

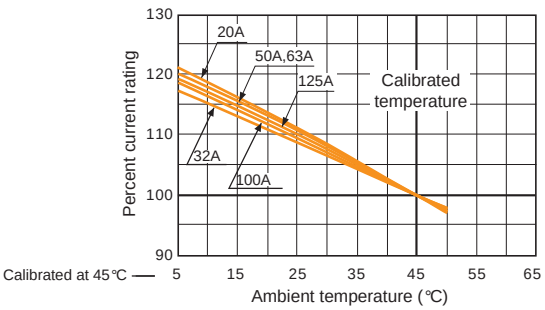


H125-NJ, L125-NJ
Time/current characteristic curves



Refer Applications, section 13, for temperature derating charts

Ambient compensating curves

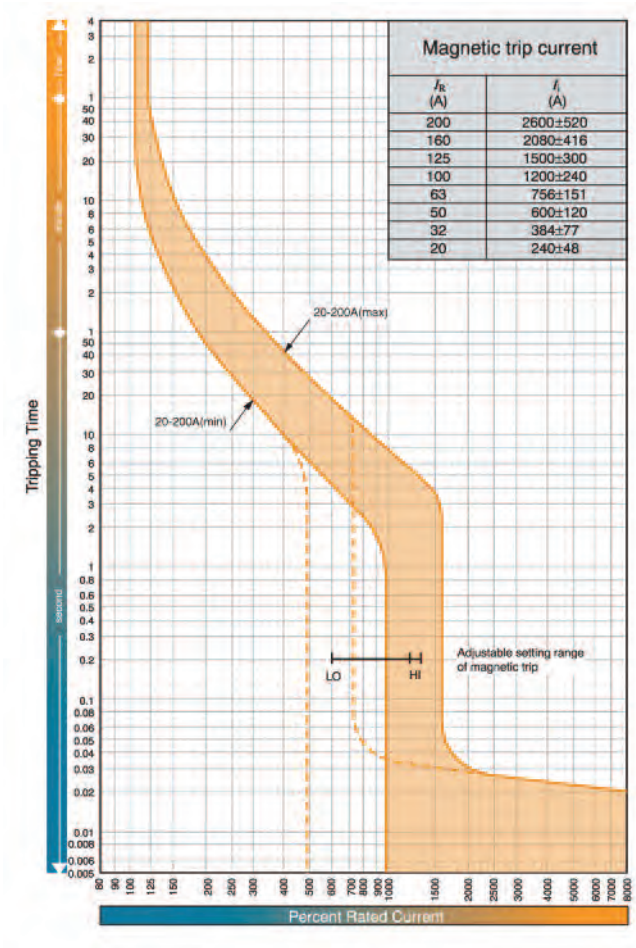


5

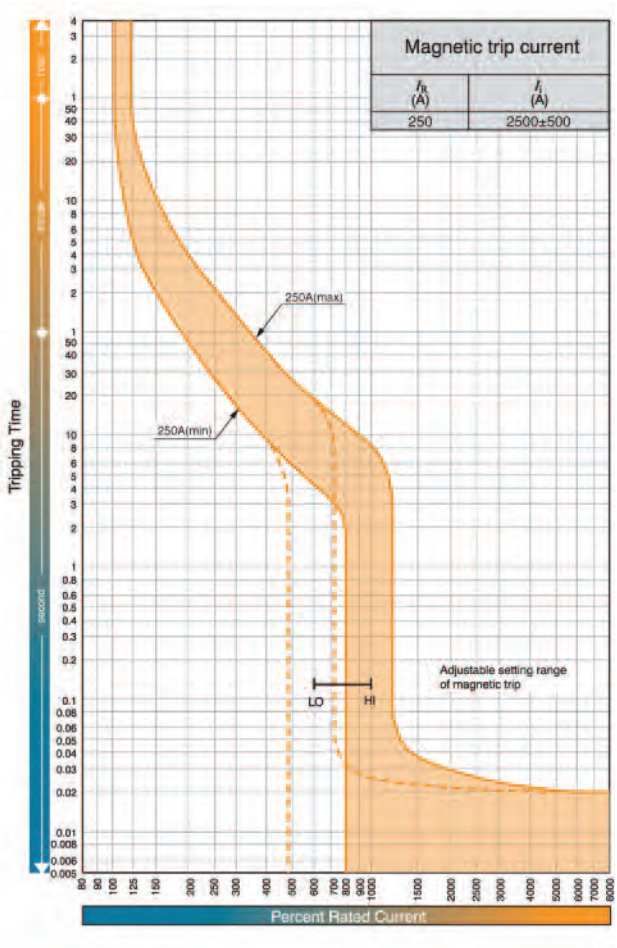
MCCB Technical data
Operating characteristics – TemBreak 2

5

S160-NJ/GJ, E250-NJ, S250-NJ/GJ
Time/current characteristic curves

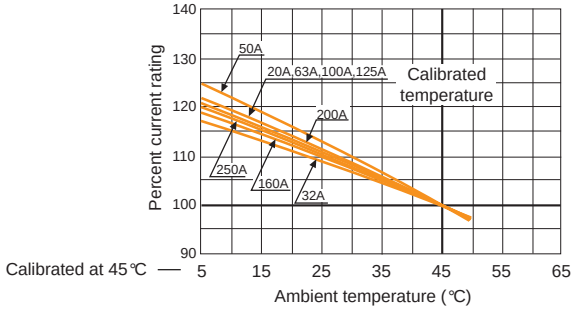


E250-NJ, S250-NJ, S250-GJ
Time/current characteristic curves



Refer Applications, section 13, for temperature derating charts

Ambient compensating curves



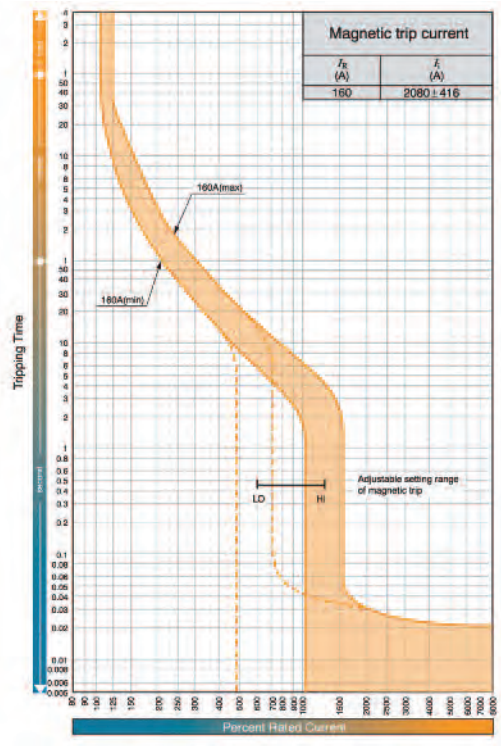
MCCB Technical data

Operating characteristics – TemBreak 2

160 A and 250 A Frame MCCBs

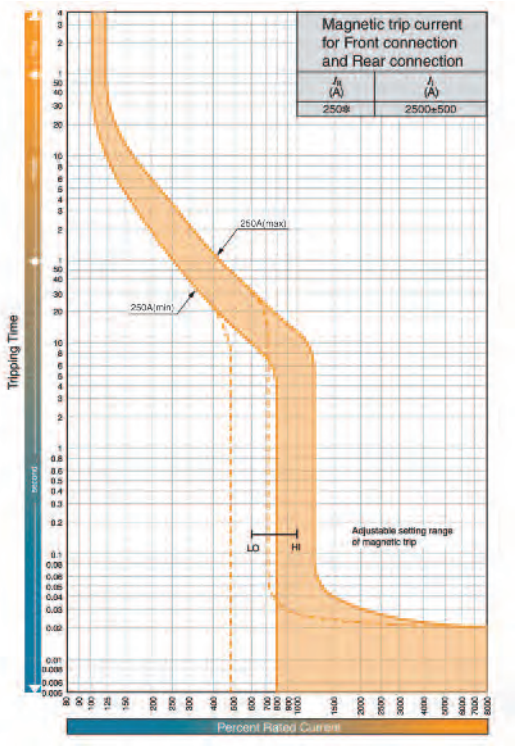
S160-NJ, H250-NJ, L160-NJ, L250-NJ

Time/current characteristic curves

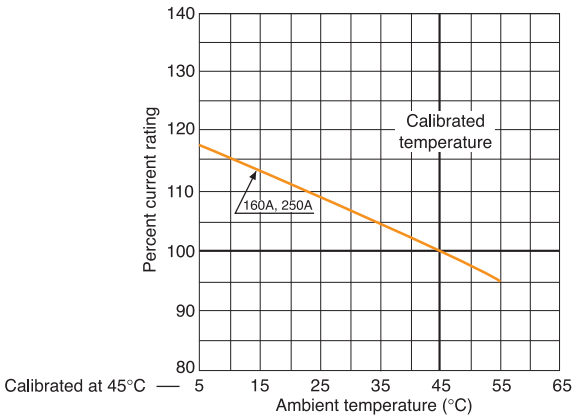


H250-NJ, L250-NJ

Time/current characteristic curves



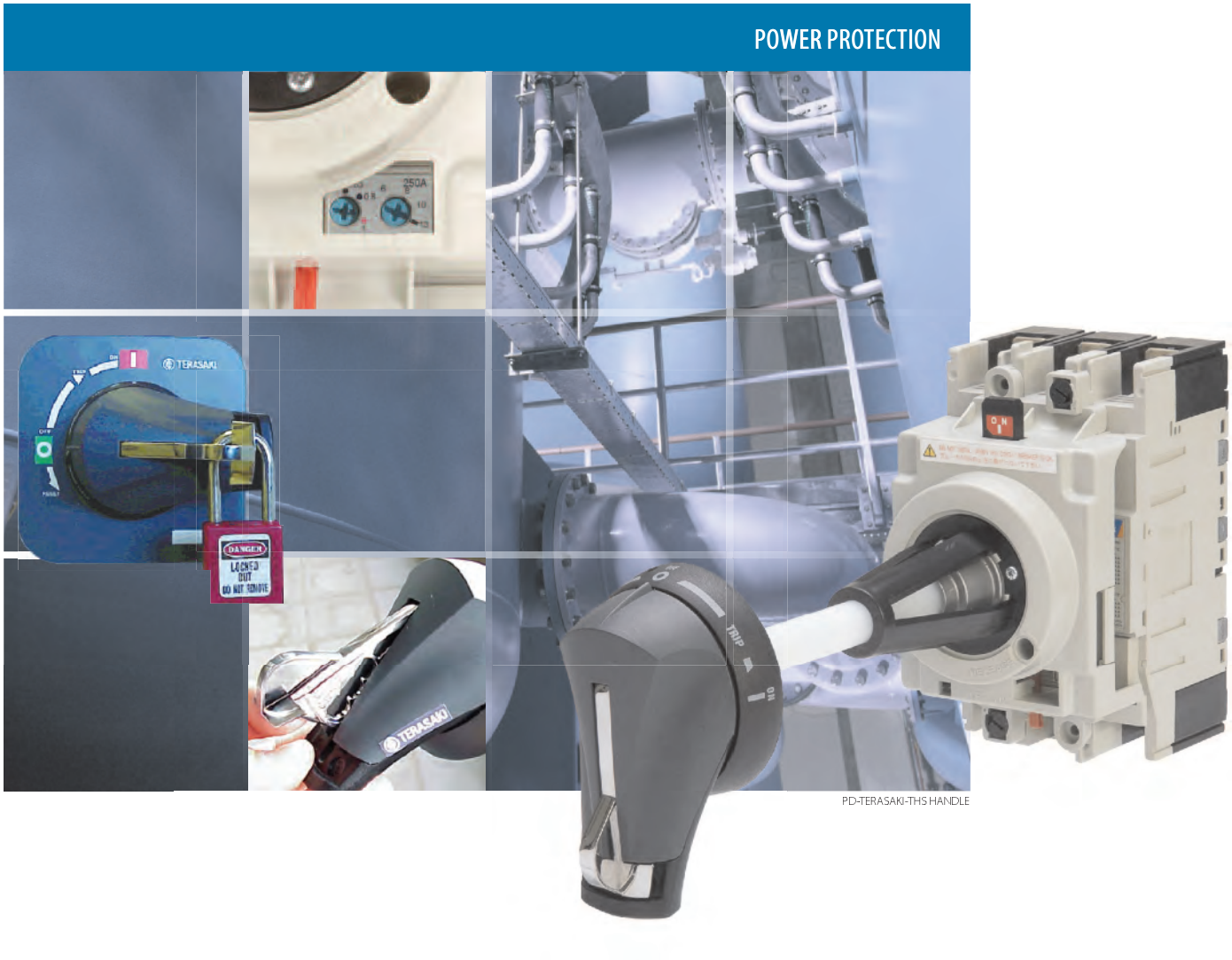
Ambient compensating curves



Note: For plug-in connection Max. rating 225 A I_i = 2925±585 A

T1HS / T2HS HANDLES

For Terasaki moulded case circuit breakers up to 1600 A.



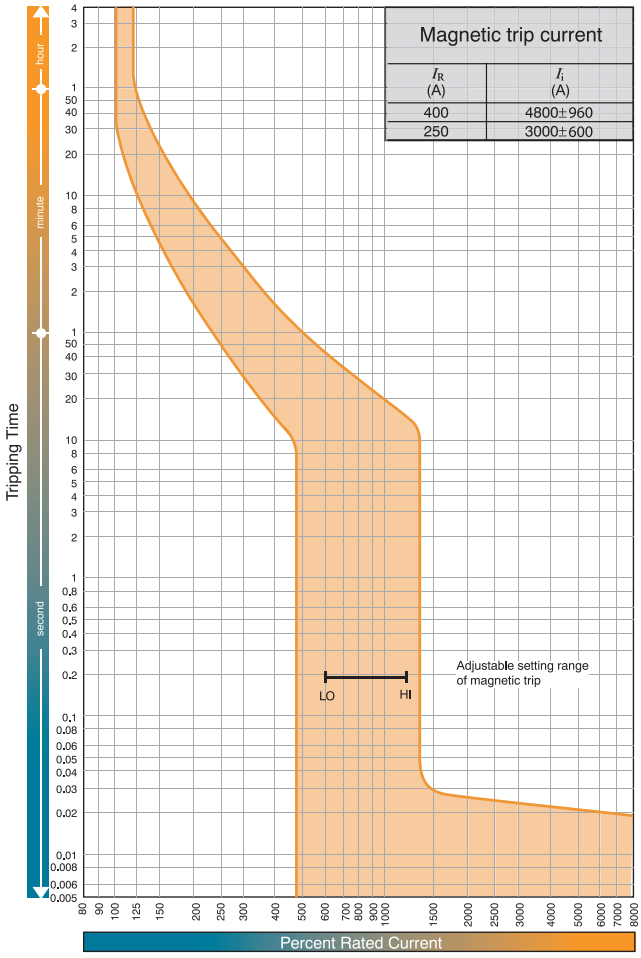
- IP55 rated plastic handle
- Long variable depth shaft supplied standard
- Heavy duty metal locking lever standard
- Internal door interlocking components are all metal
- All handles mount in a 31-37 mm hole
- Short lever handles on MCCBs to 250 A, longer types 400 - 1600 A
- 105 mm^2 or 130 mm^2 escutcheon plates are optional
- Handles are padlockable in the OFF position as standard
- ON padlocking optional via on site handle modification
- Accepts up to three 4 - 8 mm locks or multi lock devices
- Door opens when handle is switched to OFF position
- Door will not open when handle is padlocked OFF
- Door defeat function standard
- Door defeat non functional when padlocked OFF
- Padlock option for handle mechanism mounted on MCCB
- All handle mechanisms allow MCCB dial setting viewing and access
- For IP 65 applications T1HP/T2HP handles are available
- ON indication flag on handle mechanism
- Prosafe trapped key interlock options

TERASAKI
Innovators in Protection Technology

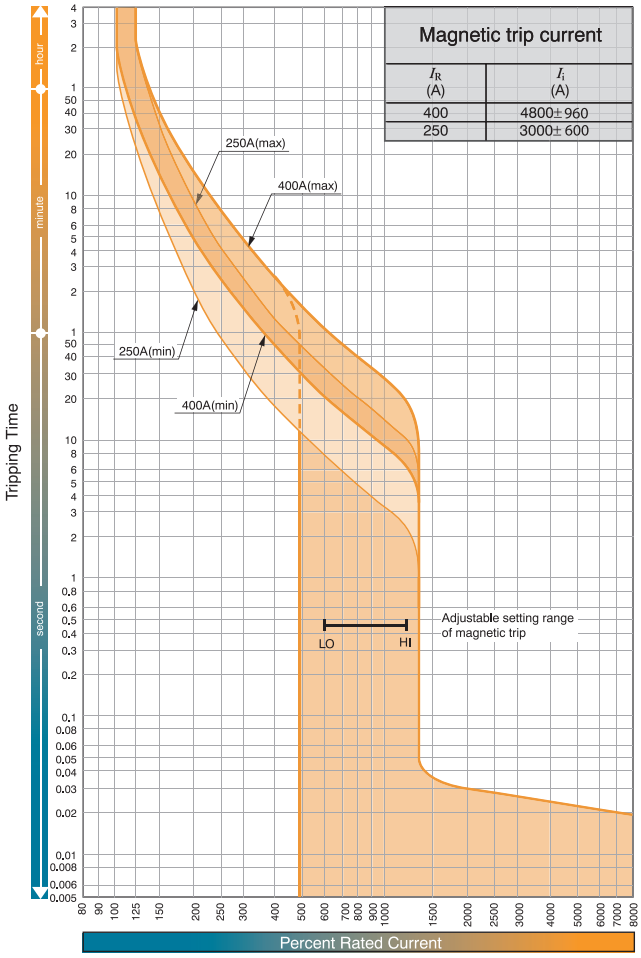
MCCB Technical data
Operating characteristics – TemBreak 2

400 A Frame

E400-NJ, S400-CJ/NJ/GJ
Time/current characteristic curves

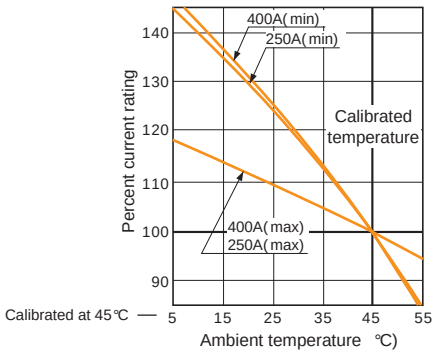


H400-NJ, L400-NJ
Time/current characteristic curves

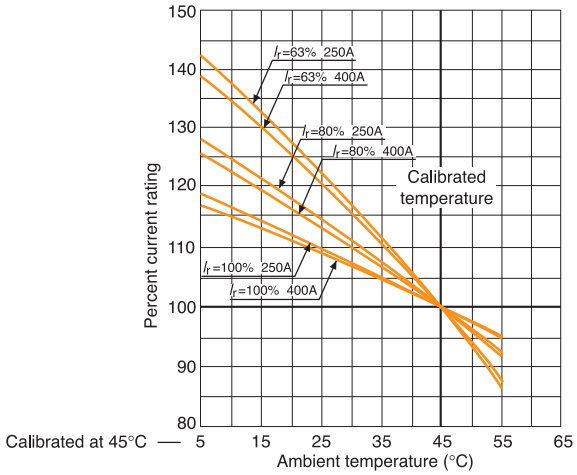


Refer Applications, section 13, for temperature derating charts

Ambient compensating curves



Ambient compensating curves

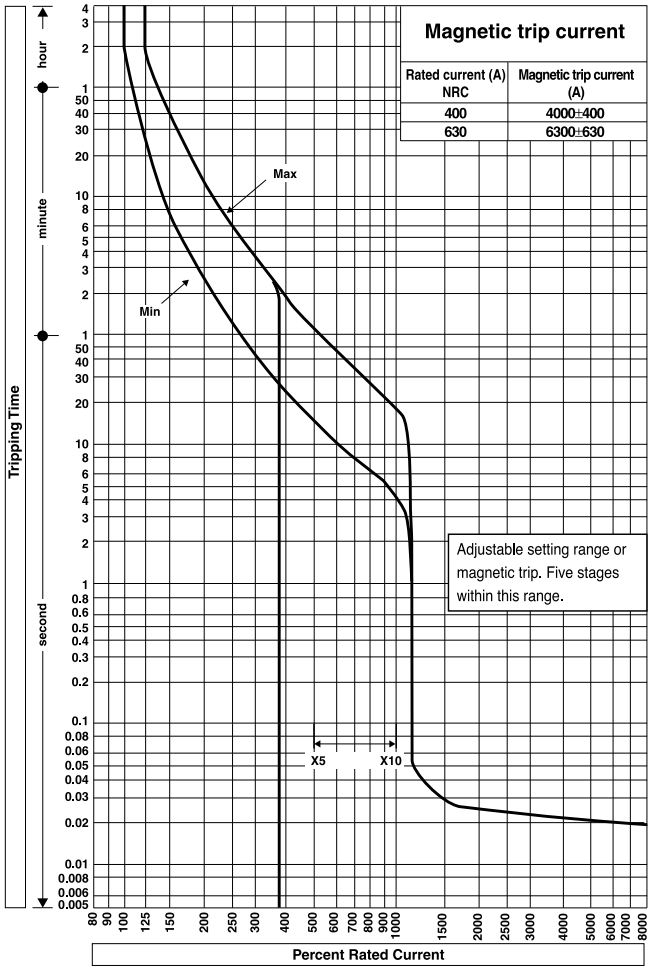


TemBreak 1 MCCB Technical data

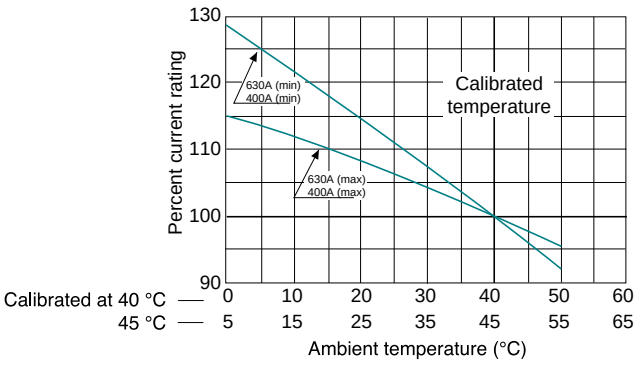
Time/current and ambient compensation curves

XS630CJ, XS630NJ, XH630PJ

Time/current characteristic curves



Ambient compensating curves

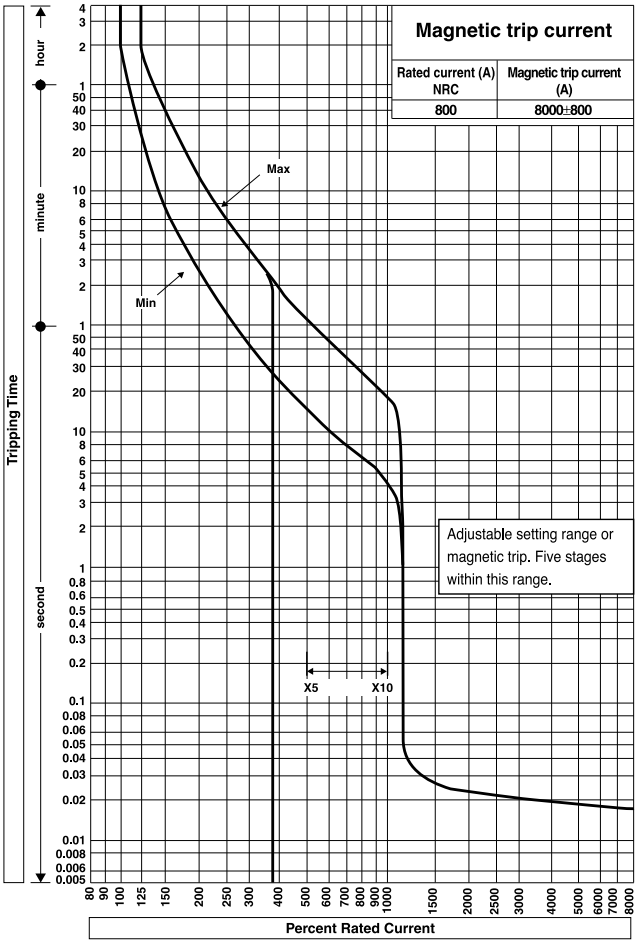


TemBreak 1 MCCB Technical data

Time/current and ambient compensation curves

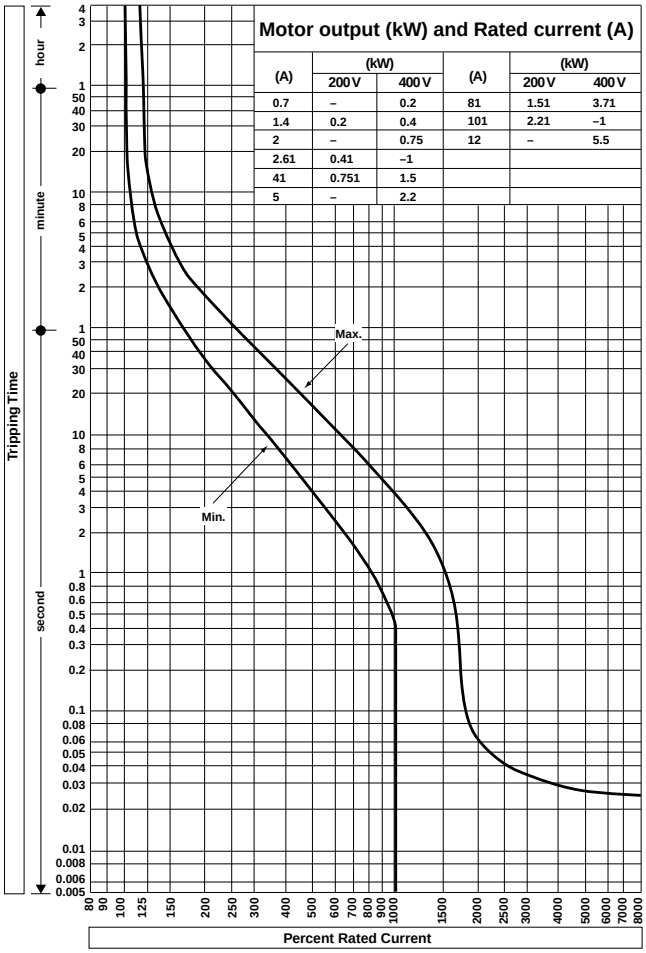
XS800NJ, XH800PJ

Time/current characteristic curves

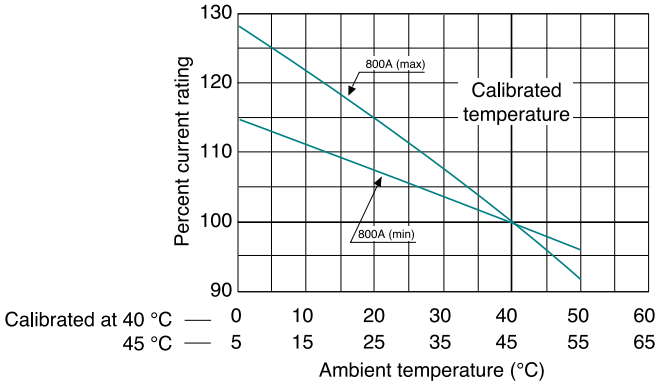


XM30PB

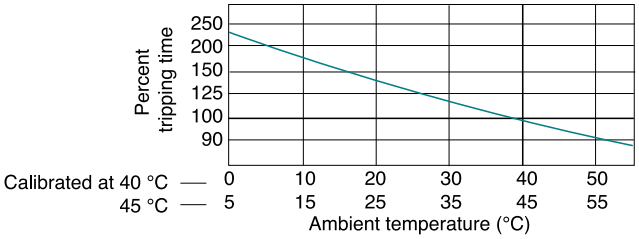
Time/current characteristic curves



Ambient compensating curves



Ambient compensating curves



5

TemBreak 2 MCCB Technical data
Electronic overcurrent relay (OCR)

Tembreak 2 moulded case circuit breakers are available with electronic overcurrent relays in 2 frame sizes: 250 A and 400/630 A. Current ratings range from 16 Amperes to 630 Amperes [1]). The overcurrent relays are easy to adjust – simply select the current rating via a dial adjustment and, depending on the application, a dial selectable pre-set characteristic curve can also be selected.

Standard overcurrent relay

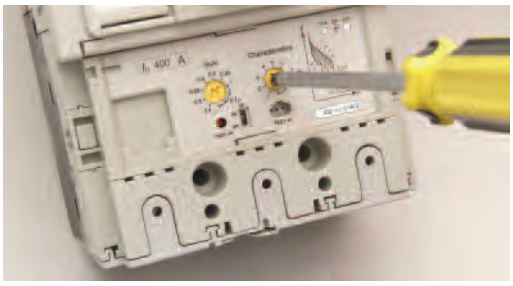
Features:

- Electronic overcurrent protection, for general and selectivity applications
- 250 A and 400 A: Seven (7) characteristic curves, 630 A: Six (6) characteristic curves
- Trip unit ratings; 125 A, 250 A, 400 A, 630 A
- Long time, Short time & Instantaneous trip times vary depending on the characteristic curve selected
- Base current I_r is adjustable from 40 % - 100 % of the nominal rated current I_n.

OCR Options:

- Ground fault trip on 400/630 A models
- Neutral pole protection for 4 pole MCCBs
- Pre-trip alarm
- Special curve characteristics are available [1])

TemBreak 2



Electronic OCR adjustment setting

Configuring the STANDARD Overcurrent relay

The standard TemBreak 2 OCR can be configured allowing the user to adjust the rated current (I_{Rated}) of the MCCB and select a predetermined tripping curve. This allows the user to tailor the MCCBs tripping characteristics to suit the requirements of the electrical load.

Setting the rated current

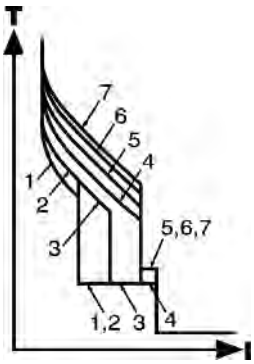
The TemBreak 2 MCCB OCR **rated current** is adjustable from 40% - 100% of the **nominal** rated current (I_n). This is a desirable feature where the demand of the protected electrical load increases over time. As the load demand increases, the rating of the breaker can be adjusted accordingly to meet the system requirements. For example, an S250PE TemBreak 2 MCCB can be configured to operate with an expected load of 125 A. The OCR can be set by rotating the rated current I_R (A) selector switch to "0.5". This has the effect of setting the rated current of the S250PE to $I_{Rated} = I_n$ (250 A) x I_R (0.5) = 125 A.
It should be noted that the I_R dial is adjustable according to the numbered increments 0.4, 0.5, 0.63, 0.8, 0.9, 0.95 and 1.0 only. The I_R dial is not infinitely adjustable between these numbered increment values.

Curve selection

The predetermined curve characteristic switch simplifies the OCR trip settings by reducing the number of often misunderstood variables that need to be specified. This enables users of various technical abilities to set the OCR to match the required electrical load and service application. For example, if an electrical contractor was required to configure an S400 A TemBreak 2 MCCB for use in a three phase Squirrel-cage motor application, curve 5 would be the correct setting as it provides class 10 general purpose motor protection.

Seven (7) selectable OCR curves (32 - 400 A)
Six (6) selectable OCR curves (630 A)

1. Generator protection
2. General feeder LOW SCP
3. General feeder MEDIUM SCP
4. General feeder HIGH SCP
5. Motor protection Class 10
6. Motor protection Class 20
7. Motor protection Class 30 [2])

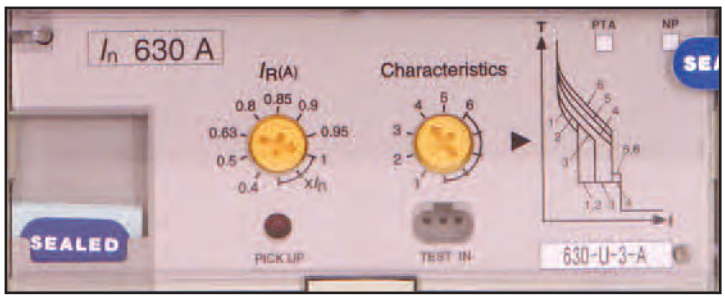


Notes: (**SCP** = Short circuit protection)
[1]) Availability of special curves pending plus, 16 A - 40 A electronic trip unit MCCBs
[2]) 630 A MCCBs have six (6) selectable curves.
Disregard characteristic 7 @ 630 A

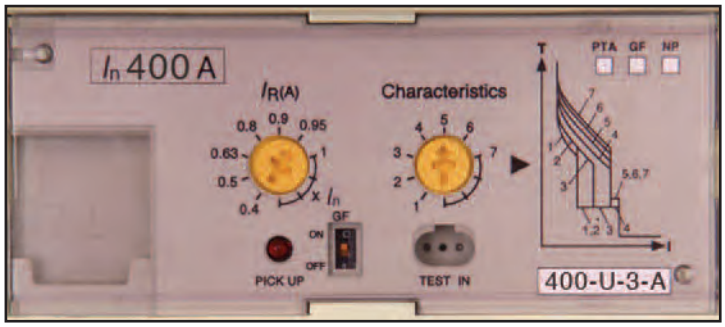
MCCB Technical data

TemBreak 2 MCCBs with Electronic overcurrent protection

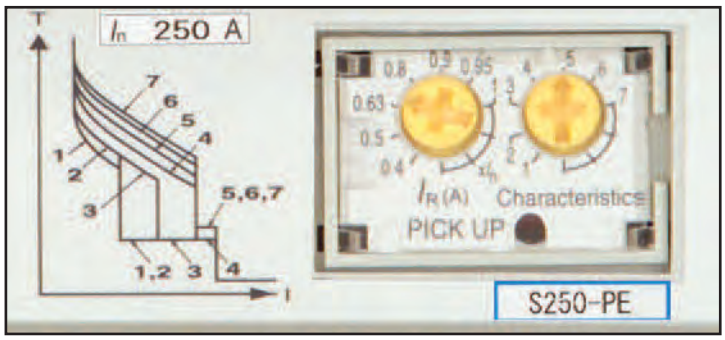
OCR Adjustment and setting detail



630 A OCR Fascia



400 A OCR Fascia



250 A OCR Fascia

Adjustment dials

The left adjustment dial sets the rated current to match the conductor rating. The right adjustment dial selects (one of six on 630 A models) preset characteristics. The effects of the left adjustment dial (labelled I_R(A)), and the right adjustment dial (labelled Characteristics) are detailed in the time/current graph tables on the following pages.

Tolerance of characteristics

Characteristic	Ref.	Tolerance
Long time delay (LTD)	t_R	+/- 20%
Short time delay (STD)	I_{sd}	+/- 15%
	t_{sd}	Total clearing time +50 ms, resettable time -20 ms
Instantaneous (Inst)	I_i	+/- 20%
Preferential trip alarm (PTA)	I_p	+/- 10%
	t_p	+/- 10%
Ground fault trip (GF)	I_g	+/- 15%
	t_g	Total clearing time +50 ms, resettable time -20 ms
Neutral protection (NP)	I_N	+/- 15%

TemBreak 2 MCCB Technical data
Optional functions for TemBreak 2 electronic MCCBs

Three optional functions are available:

Ground Fault Trip (G)
This function trips the MCCB after time delay, tg, if the ground fault current exceeds the preset threshold, Ig. Ground fault protection can be enabled and disabled by operating a DIP switch on the electronic protection unit. An external current transformer is available if the groiund fault trip function is required on a 3 pole MCCB, in a 3 phase, 4 wire system. Refer following pages for more information.

Neutral Protection (N)
Neutral protection trips the MCCB after time delay. ^{t}N, if current in the neutral conductor exceeds the rated current, In, of the MCCB. The time delay characteristic is identical to that of the overload characteristic (L).

For example an S250PE TemBreak 2 MCCB with a nominal current, I_n, of 250 A would have a neutral protection threshold of I_N (1.0) x I_n (250) = 250 A.

- The standard setting of I_n is 100% of I_n. For any other setting, specify when ordering.
- When Neutral pole protection is installed the breaker must be set at 100% of its I_n rating for the Neutral protection to function. For other settings contact NHP.

Pre-Trip alarm (P)
An LED and volt-free output contact are activated after a time delay, t_p, if the load current exceeds the preset threshold, I_p. Refer following pages for more infomation.

Option ordering
Optional functions must be specified when ordering the breaker. Options can be selected by identifying the appropriate 'code' from the table below and appending this code after the MCCB type designation. For example, to select a 4 pole, 400 AF MCCB, front connect, with a nominal current (I_n) of 400 A, featuring ground fault (G) and pre-trip alarm (P) options, the correct description would be:
Cat No. S400-GE APG 3400: with ground fault and pre-trip alarm options, with a 400 A trip unit.

Optional functions

I_n (A)	No of Poles	Cat. No / Code	Ground fault (G)	Neutral protection (N)	Pre-trip alarm (P)
125 250	3	AP	–	–	Yes
	4	AP	–	–	Yes
	4	AN	–	Yes	–
	4	APN	–	Yes	Yes
250 [1] 400	3	AP	–	–	Yes
	3	AG [1]	Yes	–	–
	3	APG [1]	Yes	–	Yes
	4	AP	–	–	Yes
	4	AN	–	Yes	–
	4	APN	–	Yes	Yes
	4	AGN [1]	Yes	Yes	–
	4	APGN [1]	Yes	Yes	Yes
630	3	AP	–	–	Yes
	3	AG	Yes	–	–
	3	APG	Yes	–	Yes
	4	AP	–	–	Yes
	4	AN	–	Yes	–
	4	APN	–	Yes	Yes
	4	AGN	Yes	Yes	–
	4	APGN	Yes	Yes	Yes

Notes: [1]) Ground fault is not available with MCCBs fitted with a 250 A trip unit. However, 400 A versions are adjustable down to 160 A.

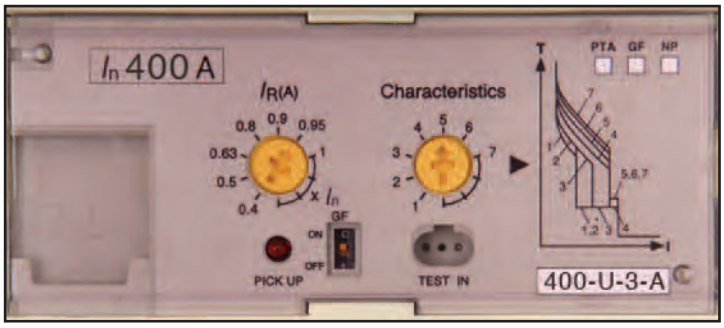
TemBreak 2 MCCB Technical data
Optional functions for TemBreak 2 electronic MCCBs

Ground Fault Trip (G)

This function trips the MCCB after time delay, t_g, if the ground fault current exceeds the preset threshold, I_g.

The default time delay, t_g is set to 0.2 seconds and the load current threshold, I_g is 20 % of the nominal current. For example an S400GE TemBreak2 MCCB with a nominal current (I_n) 400 A would have a ground fault trip threshold of I_g (0.2) x I_n (400 A) = 80 A.

Ground fault protection can be enabled and disabled by operating a DIP switch on the electronic protection unit. An external current transformer is available if the ground fault trip function is required on a 3 pole MCCB, in a 3 phase, 4 wire system (3 phase + neutral). 4 pole ground fault MCCBs have an internal 4th CT as standard.



400 A OCR Fascia with Ground Fault function.

5

How to specify a ground fault MCCB

The ground fault function must be specified at the time of order. Descriptions for electronic MCCBs to include a 1-4 digit alphabetic coed after the type designation, which details the combinations of optional features. For example:

S400-GE APG 3 400 - includes pre-trip and ground fault trip.
The table below lists codes for ground fault MCCB.

In	No. of poles	Cat. No./ code	Ground fault (G)	Neutral protection (N)	Pre-trip alarm (P)
400 [1)]	3	AG	Yes	–	–
	3	APG	Yes	–	Yes
	4	AGN	Yes	Yes	–
	4	APGN	Yes	Yes	Yes
630	3	AG	Yes	–	–
	3	APG	Yes	–	Yes
	4	AGN	Yes	Yes	–
	4	APGN	Yes	Yes	Yes

Notes: [1)] MCCB with 250 A trip unit not available with Ground Fault. A 400 A trip unit is adjustable down to 160 A.

TemBreak 2 MCCB Technical data

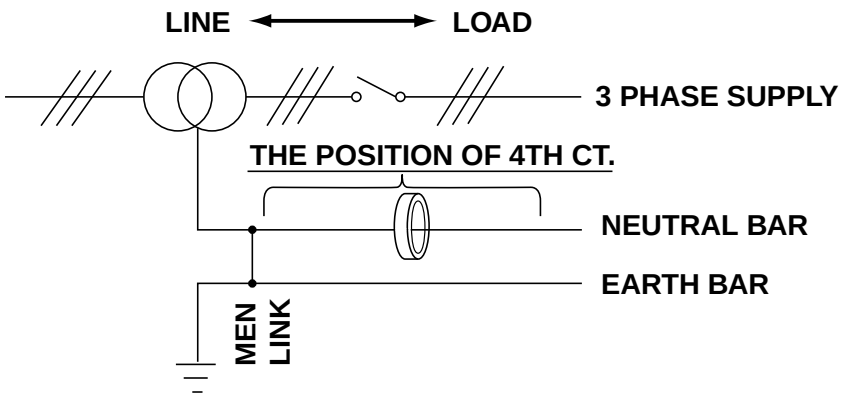
Optional functions for TemBreak 2 electronic MCCBs

Ground fault trip (G)

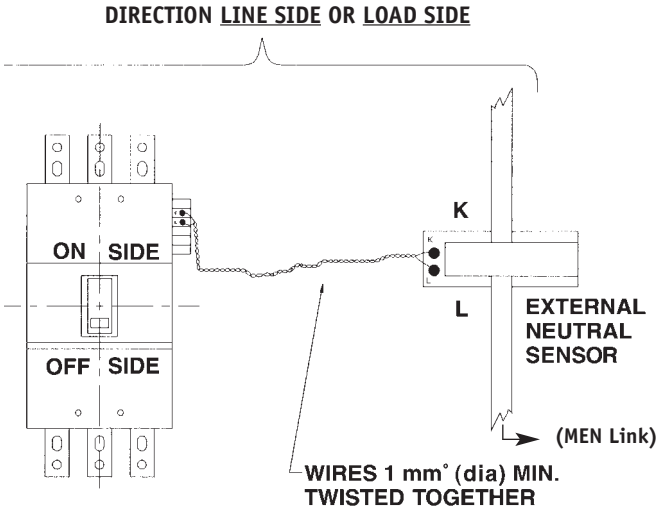
External neutral sensor (4th CT)

External neutral sensors are required whenever optional earth fault is used on 3 phase 4 wire systems.

The position and direction of 4th CT

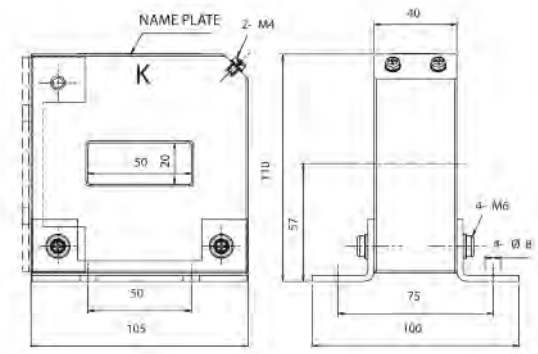


The direction of 4th CT



Note: MCCBs with the GF option can be forward or reverse connected. The CT connections K and L must be connected as shown in the diagram regardless of whether the MCCB is forward or reverse fed. If not, tripping will result.

External Neutral CT Dimensions (mm)



Optional 4th CT types T2GB

	Cat. No
400 A	T2GB40N04A
630 A	T2GB40N06A

TemBreak 2 MCCB Technical data
Optional functions for TemBreak 2 electronic MCBs

Function - features
Pre-trip alarm (P)

An LED and volt-free output contact are activated after a time delay, t_p if the load current exceeds the preset threshold I_p.

The default time delay, t_g is set to 40 seconds and the load currents threshold, I_p is 80 % of the rated current. For example an S250PE TemBreak 2 MCCB with an I_{rated} setting of 125 A would have a pre-trip alarm threshold of I_p (0.8) x I_{rated} (125)=100 A.

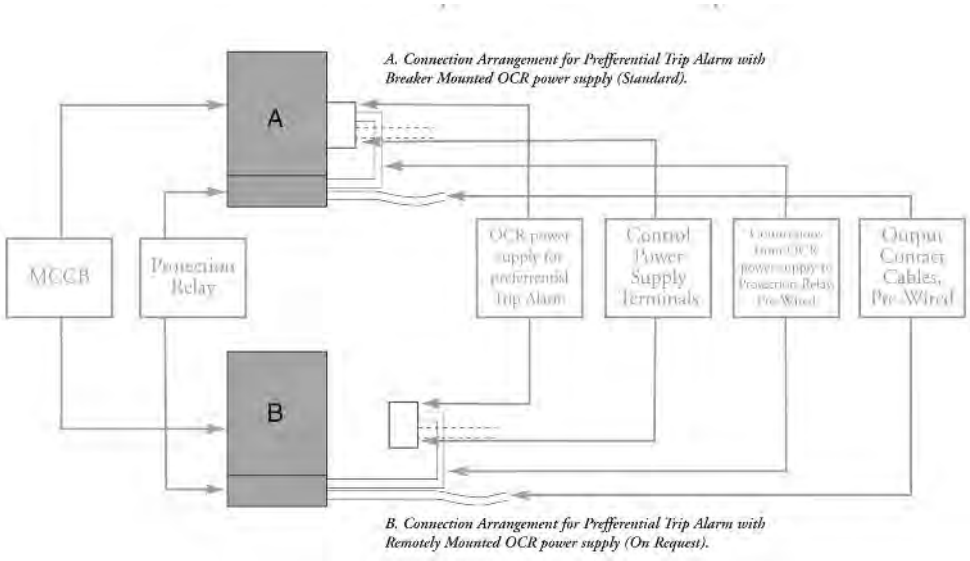
An OCR power supply is required for operation of the preferential trip alarm. This is mounted as shown below, either on the side of the breaker (250 A, 400 A, 630 A – standard), or remotely (400 A, 630 A only – on request). Ratings, specifications and wiring arrangements are shown below.

Control power supply specifications

Frame (A)	250	400/630
Voltage	200-240 V AC	200-240 V AC
Rated Power	2 VA	2 VA

Rated current of output contact

Frame (A)	250	400/630
125 V AC, resistive load	3 A	3 A
125 V AC, inductive load	2 A	2 A
250 V AC, resistive load	3 A	3 A
250 V AC, inductive load	2 A	2 A
30 V DC, resistive load	2 A	2 A
30 V DC, inductive load	2 A	2 A



A. Connection Arrangement for Prefferential Trip Alarm with Breaker Mounted OCR power supply (Standard).

B. Connection Arrangement for Prefferential Trip Alarm with Remotely Mounted OCR power supply (On Request).

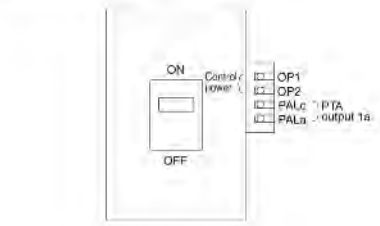
TemBreak 2 MCCB Technical data
Optional functions for TemBreak 2 electronic MCBs

Function features
Pre-trip alarm (P)

MCCB type

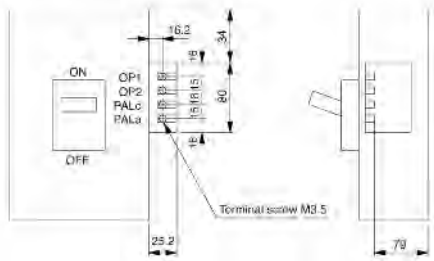
S250-NE, S250-GE,
8250-PE, H250-NE

Connection diagram



Notes: Separate installation of the OCR power supply is not available.

Mounting dimensions



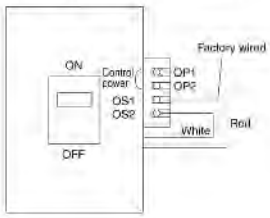
Notes: 1. Tightening torque of terminal screws: 0.9 – 1.2 N·m
2. Applicable wire size: 2.0 mm² max

MCCB type

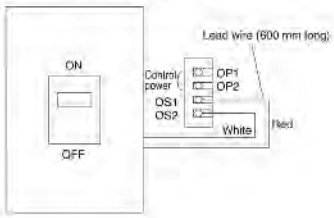
	A	B	C	D
S400-NE, S400-GE, S400-PE, E630-NE, S630-CE, S630-GE	71	74	25.2	16.2
H400-NE-L400-NE	71	111	25.2	16.2

Connection diagram

OCR power supply installed on the breaker

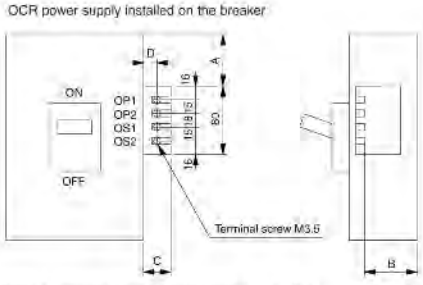


OCR power supply installed separately to the breaker



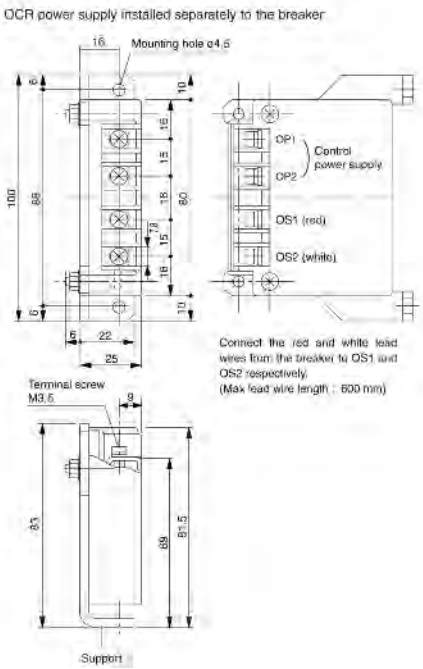
Mounting dimensions

OCR power supply installed on the breaker



Notes: 1. Tightening torque of terminal screws: 0.9 – 1.2 N·m
2. Applicable lead wire size: 2.0 mm² max

OCR power supply installed separately to the breaker

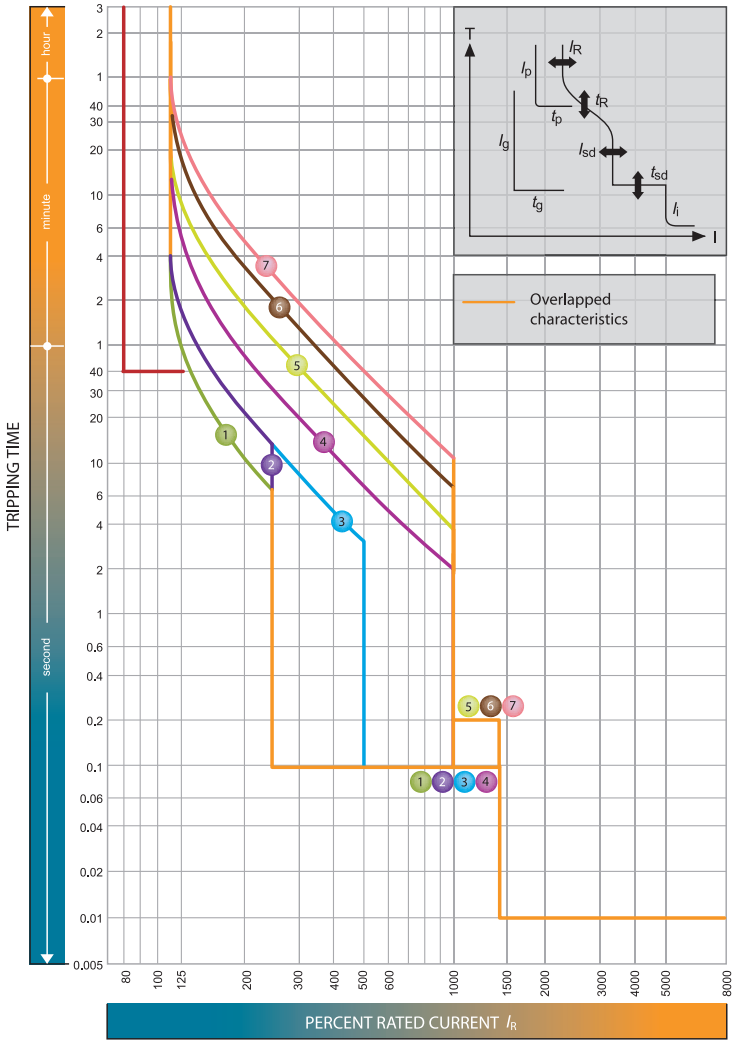


Connect the red and white lead wires from the breaker to OS1 and OS2 respectively.
(Max lead wire length : 600 mm)

TemBreak 2 MCCB Technical data
Time/current characteristics

Electronic characteristics

S250PE, H250NE



In = 250 A; 125 A; 40 A
Tabular representation

Curve Selection Dial ONLY				
Characteristic curve selection dial position	LTD (sec)		STD Characteristics	
	200% overload	600% overload	I_n	Delay (sec)
1	11	–	2.5 x I_R	0.1
2	21	–	2.5 x I_R	0.1
3	21	–	5 x I_R	0.1
4	53	5	10 x I_R	0.1
5	108	10	10 x I_R	0.2
6	200	19	10 x I_R	0.2
7	308	29	10 x I_R	0.2

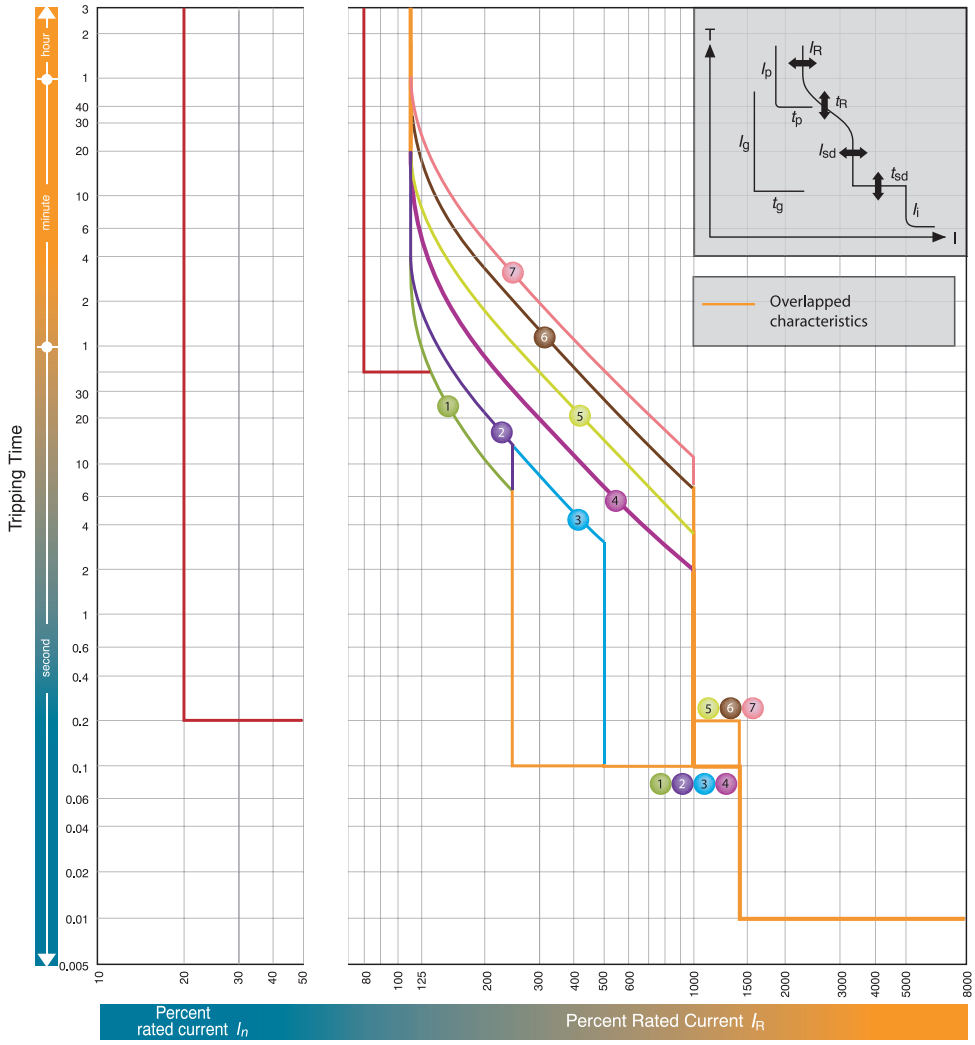
I_R Selection Dial ONLY		OPTIONAL FEATURES		
I_R Selection dial position	INST (A) I_n			
0.40	14 x I_R	**PTA** Pre-trip alarm	I_p x I_R	0.8
			t_P (sec)	40
0.50	14 x I_R		–	–
0.63	14 x I_R		–	–
0.80	14 x I_R	**NP** Neutral protection	I_N x I_n	1
0.85	–		t_N (sec)	$t_N = t_R$ [1])[2])
0.90	14 x I_R			
0.95	13 x I_R			
1.00	13 x I_R			

Notes:
[1]) The standard setting of I_n is 100% of I_n. For any other setting, specify when ordering.
[2]) When Neutral pole protection is installed the breaker must be set at 100% of its I_n rating for the Neutral protection to function. For other settings contact NHP.

TemBreak 2 MCCB Technical data
Time/current characteristics

Electronic characteristics

S400NE, S400GE, H400NE, L400NE



In = 400 A; 250 A
Tabular representation

Curve Selection Dial ONLY				
Characteristic curve selection dial position	LTD (sec)		STD Characteristics	
	200% overload	600% overload	I_n	Delay (sec)
1	11	–	2.5 x I_R	0.1
2	21	–	2.5 x I_R	0.1
3	21	–	5 x I_R	0.1
4	53	5	10 x I_R	0.1
5	108	10	10 x I_R	0.2
6	200	19	10 x I_R	0.2
7	308	29	10 x I_R	0.2

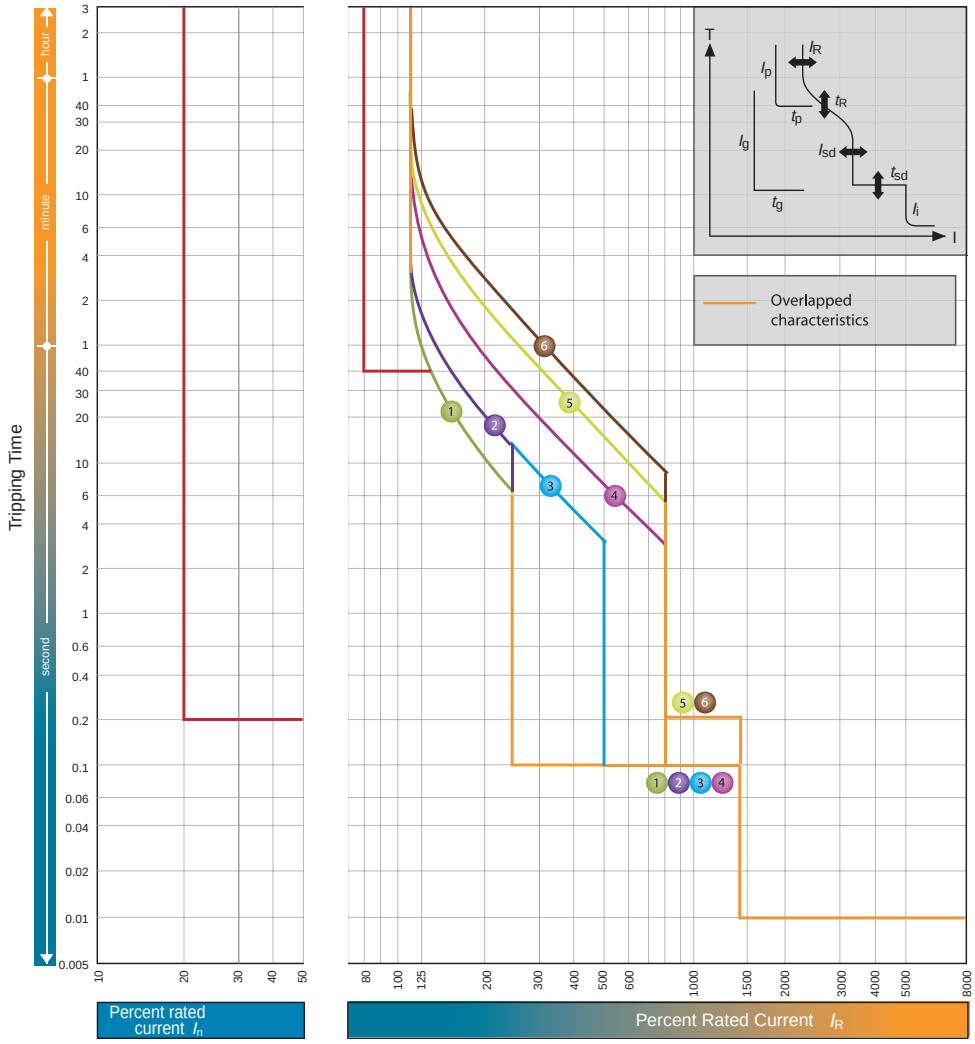
I_R Selection Dial ONLY		OPTIONAL FEATURES		
I_R	INST (A)			
Selection dial position	I_n	**PTA** Pre-trip alarm	I_p x I_R	0.8
0.40	14 x I_R		t_P (sec)	40
0.50	14 x I_R	**GFT** Ground fault trip	I_g x I_n	0.2
0.63	14 x I_R		t_g (sec)	0.2
0.80	14 x I_R	**NP** Neutral protection	I_N x I_n	1
0.85	–		t_N (sec)	$t_N = t_R$ [1])[2])
0.90	14 x I_R			
0.95	13 x I_R			
1.00	13 x I_R			

Notes: [1]) The standard setting of I_n is 100% of I_n. For any other setting, specify when ordering.
[2]) When Neutral pole protection is installed the breaker must be set at 100% of its I_n rating for the Neutral protection to function. For other settings contact NHP.

TemBreak 2 MCCB Technical data
Time/current characteristics

Electronic characteristics

E630NE, S630CE, S630GE



In = 630 A
Tabular representation

Curve Selection Dial ONLY				
Characteristic curve selection dial position	LTD (sec)		STD Characteristics	
	200% overload	600% overload	I_n 630 A	Delay (sec)
1	11	–	2.5 x I_R	0.1
2	21	–	2.5 x I_R	0.1
3	21	–	5 x I_R	0.1
4	53	5	8 x I_R	0.1
5	108	10	8 x I_R	0.2
6	200	19	8 x I_R	0.2

I_R Selection Dial ONLY		OPTIONAL FEATURES		
I_R Selection dial position	INST (A) I_n 630 A			
0.40	14 x I_R	**PTA** Pre-trip alarm	I_p x I_R	0.8
			t_P (sec)	40
0.50	14 x I_R	**GFT** Ground fault trip	I_g x I_n	0.2
0.63	14 x I_R		t_g (sec)	0.2
0.80	10 x I_R	**NP** Neutral protection	I_N x I_n	1
0.85	10 x I_R		t_N (sec)	$t_N = t_R$ [1])[2])
0.90	10 x I_R			
0.95	10 x I_R			
1.00	10 x I_R			

Notes: [1]) The standard setting of I_n is 100% of I_n. For any other setting, specify when ordering.
[2]) When Neutral pole protection is installed the breaker must be set at 100% of its I_n rating for the Neutral protection to function. For other settings contact NHP.

MCCB Technical data

Time/current characteristic curves – TemBreak 2 electronic

Example 1:

Generator protection, CURVE 1

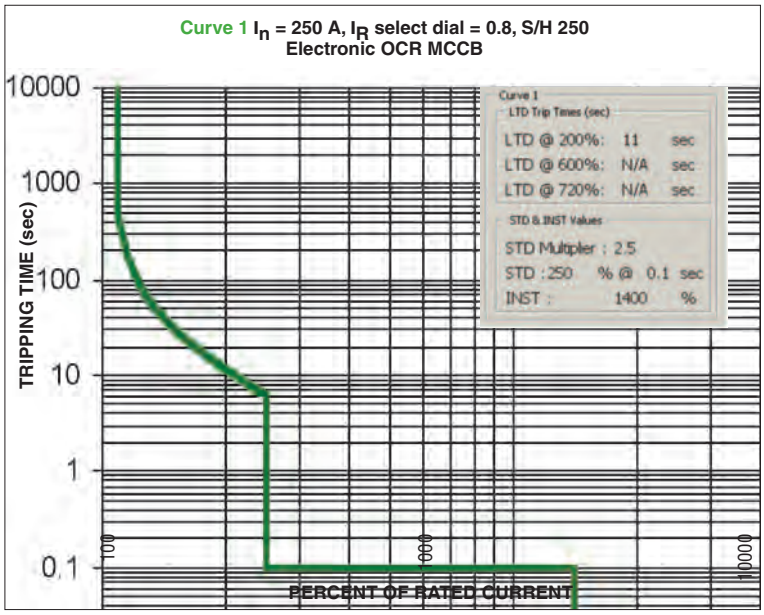
Compared to a transformer, a generator has a limited short circuit capacity (say 4 times the full load rating). Therefore to avoid possible damage to the generator it is desirable to select a tripping characteristic curve that accommodates a generator's limitations.

When configured for use in a generator application the characteristic curve features faster tripping times during overload situations and low level short circuit faults.

In Curve 1, an S250 TemBreak 2 MCCB with a rated current of I_n (250 A) x I_R (0.8) = 200 A features:

- Approximate trip time of 11 seconds during a 200% of rated current (400 A) overload
- Approximate trip time of 0.1 seconds during a 250% of rated current (500 A) low level short circuit
- Instantaneous (no intentional delay) threshold of 1400% of rated current (2800 A).

Generator protection – LOW short circuit protection



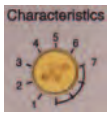
Example 2:

General feeder low SCP [1]), CURVE 2

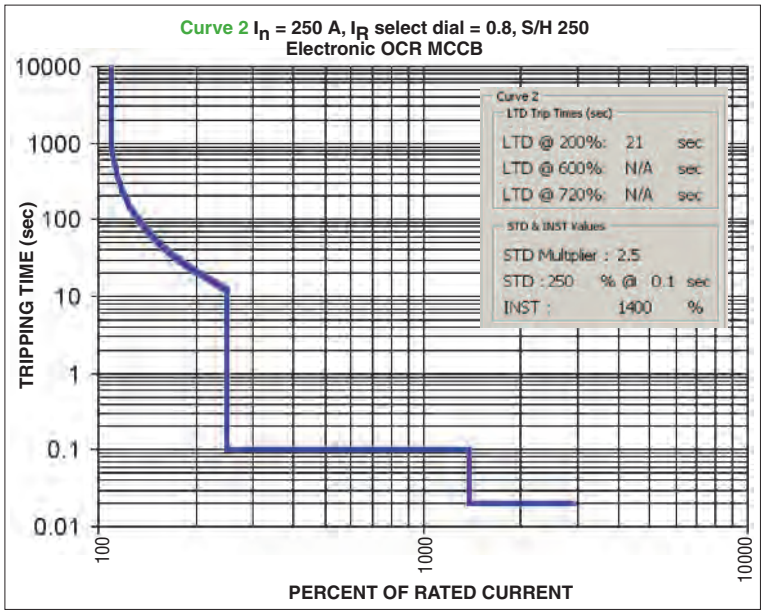
Sharing the same short circuit tripping time characteristics as the generator protection curve, the general feeder LOW SCP curve 2 has greater tolerance to allow for overloads caused by small inrush currents.

In Curve 2, an S250 TemBreak 2 MCCB with a rated current of I_N (250 A) x I_R (0.8) = 200 A features:

- Approximate trip time of 21 seconds during a 200% of rated current (400 A) overload
- Approximate trip time of 0.1 seconds during a 250% of rated current (500 A) low level short circuit
- Instantaneous (no intentional delay) threshold of 1400% of rated current (2800 A).



General feeder – LOW short circuit protection



Note: [1]) SCP = Short circuit protection.

Note: The above curves are worked examples for an electronic MCCB with a 250 A rated overcurrent relay (OCR). The same curve and setting data will also apply to TemBreak 2 MCCBs with other ampere ratings.

MCCB Technical data

Time/current characteristic curves – TemBreak 2 electronic

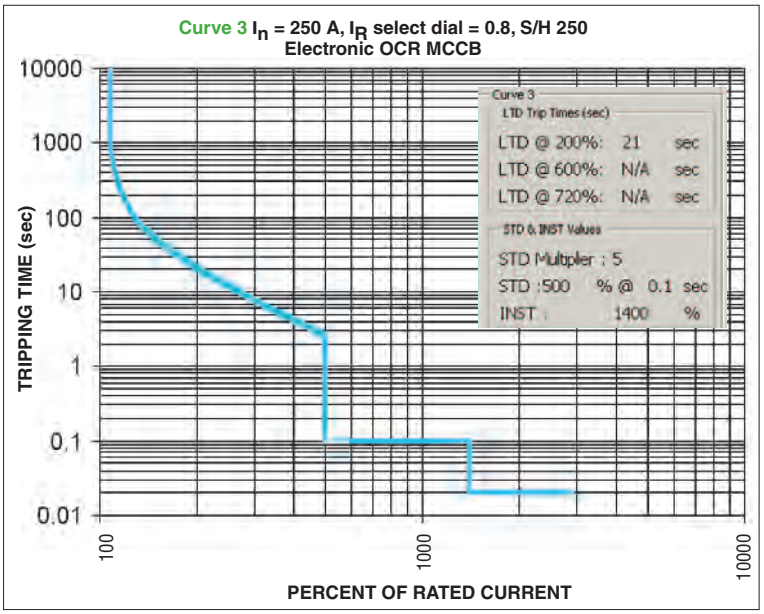
Example 3:

General feeder medium SCP [1]), CURVE 3

Featuring a shallower overload time-trip curve and higher short circuit current protection characteristics than curve 2, curve 3 allows greater tolerance during overload and short circuit conditions.
In Curve 3, an S250 TemBreak 2 MCCB with a rated current of I_n (250 A) x I_R (0.8) = 200 A features:

- Approximate trip time of 21 seconds during a 200% of rated current (400 A) overload
- Approximate trip time of 0.1 seconds during a 500% of rated current (1000 A) low level short circuit
- Instantaneous (no intentional delay) threshold of 1400% of rated current (2800 A).

General feeder – MEDIUM short circuit protection



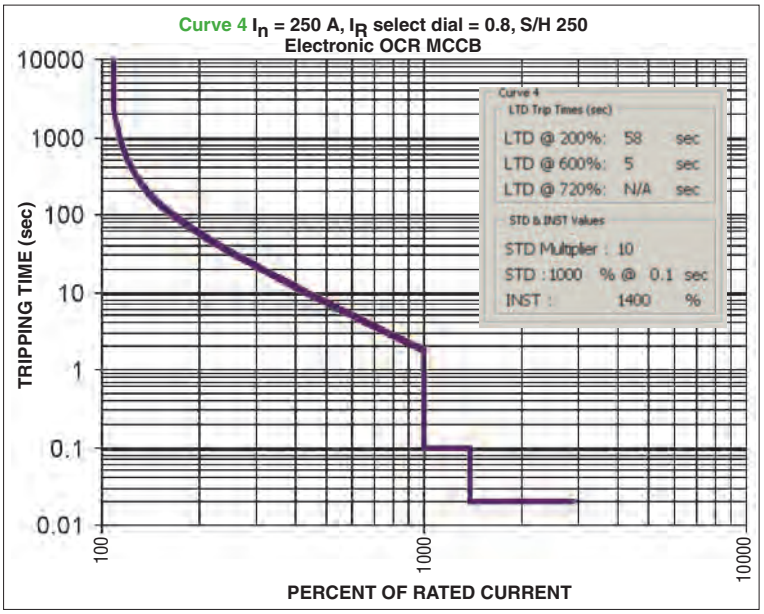
Example 4:

General feeder high SCP [1]), CURVE 4

This curve contains a shallower overload time-trip curve and a higher short circuit current protection characteristic, compared to curve 3.
In Curve 4, an S250 TemBreak 2 MCCB with a rated current of I_n (250 A) x I_R (0.8) = 200 A features:

- Approximate trip time of 58 seconds during a 200% of rated current (400 A) overload
- Approximate trip time of 5 seconds during a 600% of rated current (1200 A) overload
- Approximate trip time of 0.1 seconds during a 1000% of rated current (2000 A) low level short ciruit
- Instantaneous (no intentional delay) threshold of 1400% of rated current (2800 A).

General feeder – HIGH short circuit protection



Note: [1]) SCP = Short circuit protection.

Note: The above curves are worked examples for an electronic MCCB with a 250 A rated overcurrent relay (OCR). The same curve and setting data will also apply to TemBreak 2 MCCBs with other ampere ratings.

MCCB Technical data

Time/current characteristic curves – TemBreak 2 electronic

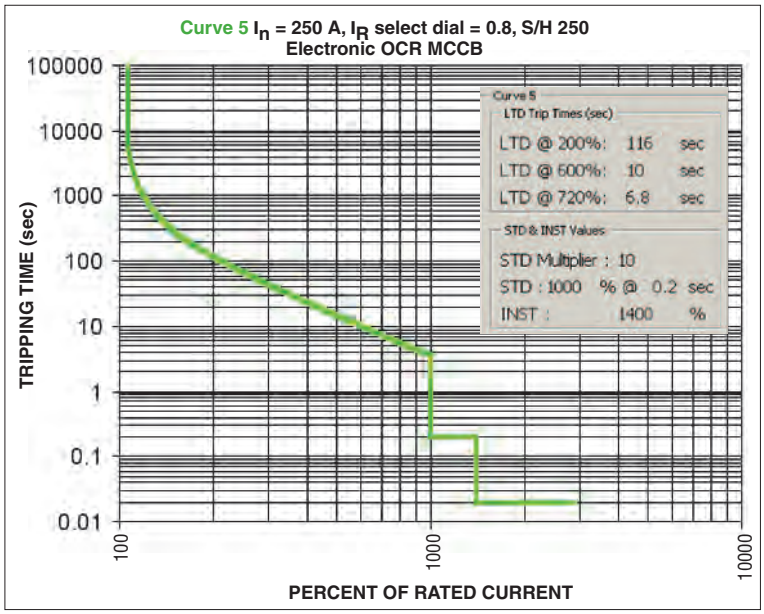
Example 5:

Motor protection Class 10, CURVE 5

Class 10 protection requires the overload detection element to trip the breaker in 10 seconds or less when a current of 600% of its rated current is experienced. Class 10 protection is commonly used for general purpose motor applications, hermetic motors and submersible pumps.
In Curve 5, an S250 TemBreak 2 MCCB with a rated current of I_n (250 A) x II_R (0.8) = 200 A features:

- Approximate trip time of 116 seconds during a 200% of rated current (400 A) overload
- Approximate trip time of 10 seconds during a 600% of rated current (1200 A) overload
- Approximate trip time of 6.8 seconds during a 720% of rated current (1440 A) overload
- Approximate trip time of 0.2 seconds during a 1000% of rated current (2000 A) low level short circuit
- Instantaneous (no intentional delay) threshold of 1400% of rated current (2800 A).

Motor protection Class 10



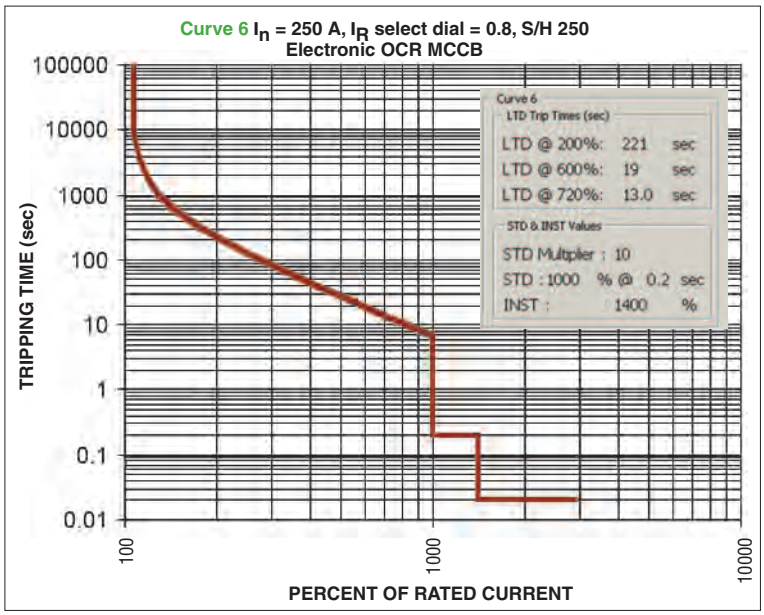
Example 6:

Motor protection Class 20, CURVE 6

Class 20 protection requires the overload detection element to trip the breaker in 20 seconds or less when a current of 600% of its rated current is experienced. Class 20 protection is typically reserved for motors with difficult starting conditions.
In Curve 6, an S250 TemBreak 2 MCCB with a rated current of I_n (250 A) x I_R (0.8) = 200 A features:

- Approximate trip time of 221 seconds during a 200% of rated current (400 A) overload
- Approximate trip time of 19 seconds during a 600% of rated current (1200 A) overload
- Approximate trip time of 13 seconds during a 720% of rated current (1440 A) overload
- Approximate trip time of 0.2 seconds during a 1000% of rated current (2000 A) low level short circuit
- Instantaneous (no intentional delay) threshold of 1400% of rated current (2800 A).

Motor protection Class 20



Note: **The above curves are worked examples for an electronic MCCB with a 250 A rated overcurrent relay (OCR). The same curve and setting data will also apply to TemBreak 2 MCCBs with other ampere ratings.**

MCCB Technical data

Time/current characteristic curves – TemBreak 2 electronic

Example 7:

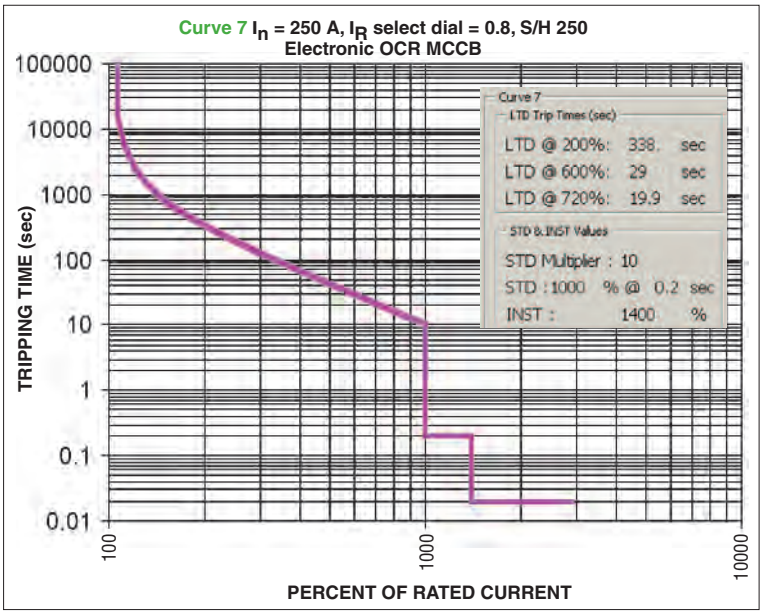
Motor protection Class 30, CURVE 7

Class 30 protection requires the overload detection element to trip the breaker in 30 seconds or less when a current of 600% of its rated current is experienced. Class 30 protection is typically reserved for motors with difficult starting conditions that are driving high inertia loads.

In Curve 7, an S250 TemBreak 2 MCCB with a rated current of I_n (250 A) x I_R (0.8) = 200 A features:

- Approximate trip time of 338 seconds during a 200% of rated current (400 A) overload
- Approximate trip time of 29 seconds during a 600% of rated current (1200 A) overload
- Approximate trip time of 19.9 seconds during a 720% of rated current (1440 A) overload
- Approximate trip time of 0.2 seconds during a 1000% of rated current (2000 A) low level short circuit
- Instantaneous (no intentional delay) threshold of 1400% of rated current (2800 A).

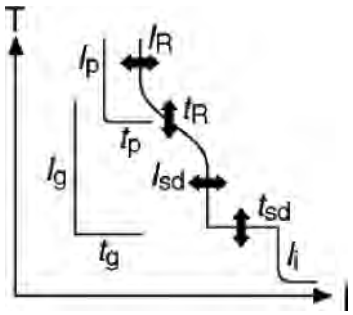
Motor protection Class 30



5

Curve comparison

As previously described, the predetermined curve characteristic switch enables easy OCR configuration to match the electrical characteristics of the load.



Tabular representation

Curve Selection Dial ONLY					
Characteristic curve selection dial position	LTD (sec)		STD Characteristics		
	200% overload	600% overload	I_n < 630 A	I_n ≥ 630 A	Delay (sec)
1	11	–	2.5 x I_R	2.5 x I_R	0.1
2	21	–	2.5 x I_R	2.5 x I_R	0.1
3	21	–	5 x I_R	5 x I_R	0.1
4	53	5	10 x I_R	8 x I_R	0.1
5	108	10	10 x I_R	8 x I_R	0.2
6	200	19	10 x I_R	8 x I_R	0.2
7	308	29 (Not applicable for 630 A)	10 x I_R	8 x I_R	0.2

I_R Selection Dial ONLY			OPTIONAL FEATURES		
I_R Selection dial position	INST (A)				
	I_n < 630 A	I_n > 630 A			
0.40	14 x I_R	14 x I_R	**PTA** Pre-trip alarm	I_p x I_R	0.8
				t_P (sec)	40
0.50	14 x I_R	14 x I_R	**GFT** Ground fault trip	I_g x I_n	0.2
0.63	14 x I_R	14 x I_R		t_g (sec)	0.2
0.80	14 x I_R	10 x I_R	**NP** Neutral protection	I_N x I_n	1
0.85	–	10 x I_R		t_N (sec)	$t_N = t_R$ [1])[2])
0.90	14 x I_R	10 x I_R			
0.95	13 x I_R	10 x I_R			
1.00	13 x I_R	10 x I_R			

Notes: [1]) The standard setting of I_n is 100% of I_n. For any other setting, specify when ordering.

[2]) When Neutral pole protection is installed the breaker must be set at 100% of its I_n rating for the Neutral protection to function. For other settings contact NHP.

Note: The above curves are worked examples for an electronic MCCB with a 250 A rated overcurrent relay (OCR). The same curve and setting data will also apply to TemBreak 2 MCCBs with other ampere ratings.

MCCB Technical data

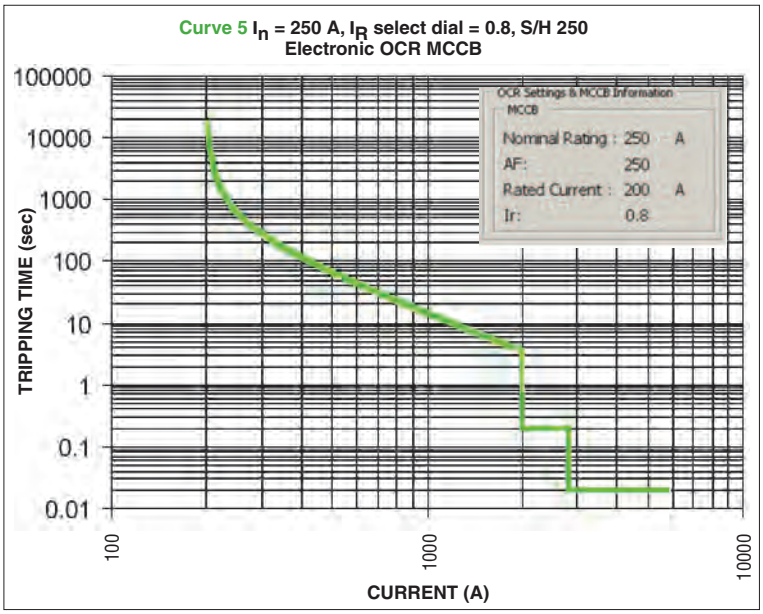
Time/current characteristic curves – TemBreak 2 electronic

Example 8:

Setting the rated current I_R (A) adjustment

The rated current value of the breaker can be adjusted from 40% to 100% of its nominal value. In this example an S250 TemBreak 2 MCCB OCR is initially set with a rated current of I_n (250 A) x I_n (0.8) = 200 A. (See also example below).

Rated current I_R



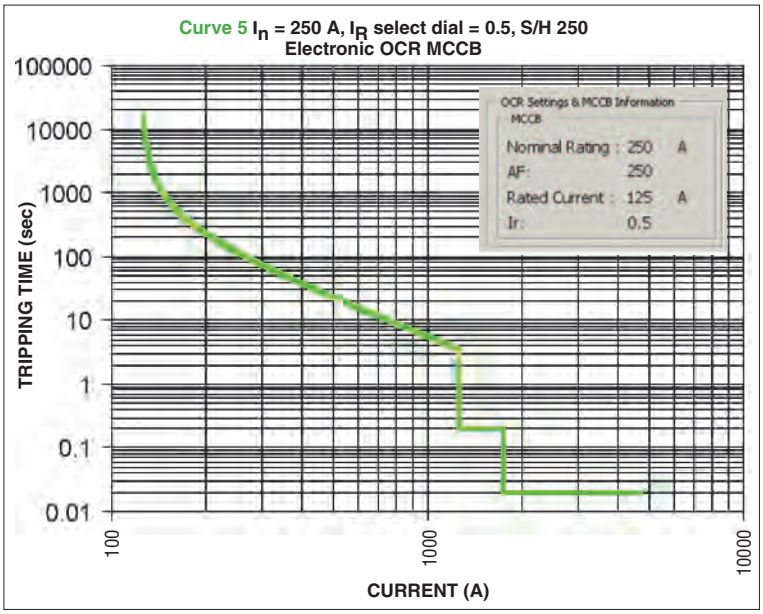
Example 9:

Setting the rated current I_R (A) adjustment

This example shows the OCR being set at '0.5' of I_R (A). This has the effect of changing the rated current of the breaker to I_n (250 A) x I_R (0.5) = 125 A.

This change can be clearly seen in the curve movement.

Rated current I_R

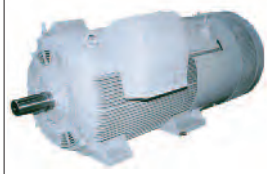
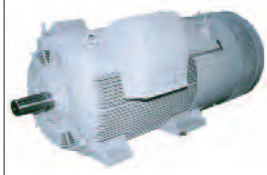
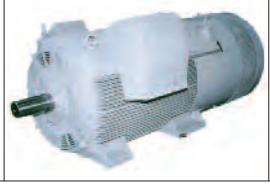


Note: The above curves are worked examples for an electronic MCCB with a 250 A rated overcurrent relay (OCR). The same curve and setting data will also apply to TemBreak 2 MCCBs with other ampere ratings.

MCCB Technical data

Optional applications/functions – TemBreak 2 electronic

TemBreak2

CURVE	Application	Description	LTD	STD
1	Generator/ heating/ resistive loads (LOW short circuit level) 	The characteristic curve features faster tripping times during overload situations and low level short circuit faults.	Fastest tripping time during an overload	Fastest tripping during a low level short circuit
2	General distribution (LOW short circuit level) 	Sharing the same short circuit tripping time characteristics as curve 1, curve 2 has greater tolerance to allow for overloads caused by small inrush currents.	Intermediate tripping time during an overload	Fastest tripping during a low level short circuit
3	General distribution (MEDIUM short circuit level) 	Featuring a shallower overload time trip curve and higher short circuit current protection characteristics than curve 2, curve 3 allows greater tolerance during overload and short circuit conditions.	Intermediate tripping time during an overload	Intermediate tripping time during a low level short circuit
4	General distribution (HIGH short circuit level) 	Featuring a shallower overload time trip curve and a higher short circuit current protection characteristic than curve 3.	Slow tripping time during an overload	Slow tripping (high tolerance) time during a low level short circuit
5	Motor Protection Class 10 	Class 10 protection requires the overload detection element to trip the breaker in 10 seconds or less when a current of 600% of its rated current is experienced. Use -general purpose motor applications, hermetic motors and submersible pumps	Slow tripping time during an overload	Slow tripping time (high tolerance) during a low level short circuit
6	Motor Protection Class 20 	Class 20 protection requires the overload detection element to trip the breaker in 20 seconds or less when a current of 600% of its rated current is experienced. Use- Motors with difficult starting conditions.	Slow tripping time during an overload	Slow tripping time (high tolerance) during a low level short circuit
7	Motor Protection Class 30 	Class 30 protection requires the overload detection element to trip the breaker in 30 seconds or less when a current of 600% of its rated current is experienced. Use- motors with difficult starting conditions that are driving high inertia loads.	Slowest tripping time during an overload	Slowest tripping time (high tolerance) during a low level short circuit

5

TemBreak 1 MCCB Technical data
Electronic based characteristics and adjustments

Characteristics

The standard electronic based MCCB from Terasaki features a fully adjustable LSI over current relay. In addition to the standard overload and short circuit protection, there are a number of options available to suit specific applications.

MCCB type	LTD	STD	INST	I²T Ramp	Pick-up LED	Test port	PTA	GFT	internal LEDs	external LEDs
XV400	●	●	●	●	●	●	◆	-	-	◆
XS630, XH630, XV630	●	●	●	●	●	●	◆	◆	-	◆
XS800, XH800, XV800	●	●	●	●	●	●	◆	◆	-	◆
XS1250SE, XV1250	●	●	●	●	●	●	◆	◆	◆	-
XS1600SE [1])	●	●	●	●	●	●	◆	◆	◆	-
XS2000NE	●	●	●	●	●	●	◆	◆	◆	-
XS2500NE	●	●	●	●	●	●	◆	◆	◆	-

Standard on all TemBreak MCCBs

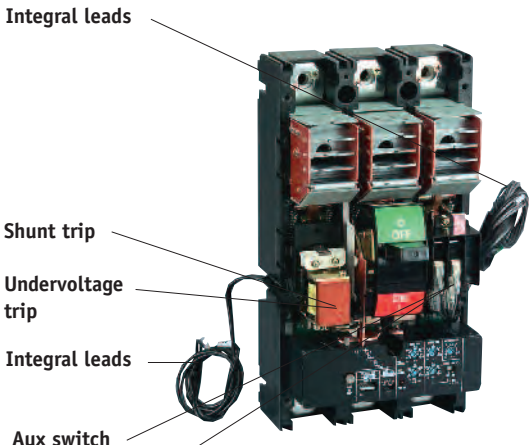
Legend		Application
LTD	Long time delay	Overload protection, True RMS
STD	Short time delay	Short circuit protection and selectivity
INST	Instantaneous	Short circuit protection, fast acting
I²t RAMP		Provides easier grading with downstream fuses
Pick-up LED		Illuminates on LTD overload, flashes on PTA pick-up
Test Port		Facility for TNS-2 OCR checker for calibration checking
PTA	Pre-trip alarm	Useful for loadshedding applications
GFT	Ground fault trip	Protection against ground faults
LEDs	Light emitting diodes	Indication of fault for faster diagnosis

Standard for all TemBreak 1 Electronic MCCBs

Access to setting dials

To adjust the settings on the electronic TemBreak, the protective cover seal on the front of the breaker must be broken, and the cover fixing screws removed. To adjust the individual trip settings, turn the setting dial with a flat bladed screwdriver. Align the setting required between the black dots marked on the dial. (Replacement seals are provided.) Refer diagrams on following pages.

XS1600SE



XV400 (cover removed)

Notes: [1]) Includes TL630NE to TL1250NE
● Standard
◆ Optional
- Not available

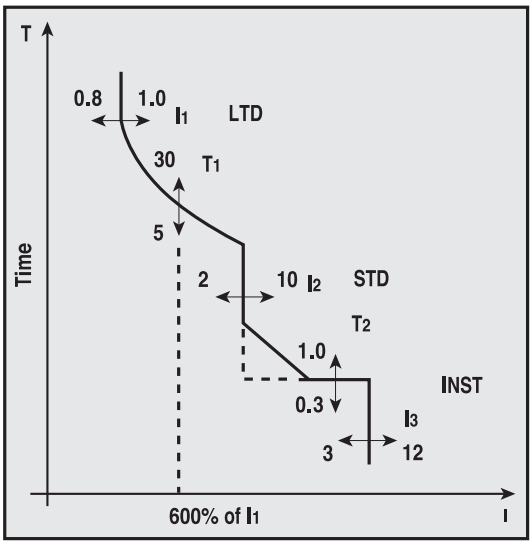
MCCB Technical data

Electronic based characteristics – adjustments, operation and setting – TemBreak 1

Standard time / current curves

Each part of the characteristic curve can be independently adjusted. This unique adjustability of LTD, STD and INST enables the standard electronic MCCB to achieve more than 200,000 permutations of its time/current characteristic.

This makes the TemBreak electronic range one of the most flexible on the market.



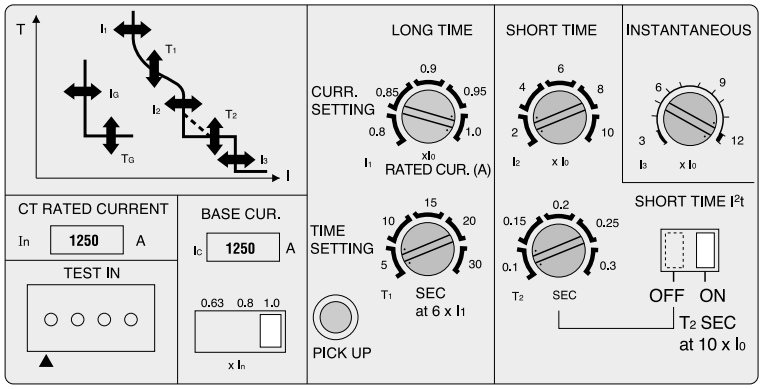
TemCurve

To complement this range, NHP have developed TemCurve, a circuit breaker selectivity applications software package, which contains the full range of TemBreak MCCBs on database. This software programme highlights the full benefit of having highly adjustable electronic MCCBs when involved with difficult selectivity problems.

Standard electronic adjustments

The I^2t ramp switch, which is provided as standard, assists in discrimination with downstream fuses or breakers.

With the switch off, the STD operates with a definite time characteristic, e.g. ⌊ . With the switch on, the characteristic alters to a ramp, ⌞ , cutting off the corner which poses a potential selectivity problem.



Dial setting		Available adjustments	
Base current setting	I_0	0.63 - 0.8 - 1.0 x I_n	Amps
LTD pick-up	I_1	0.8 - 0.85 - 0.9 - 0.95 - 1.0 x I_0	Amps
LTD setting	T_1	5 - 10 - 15 - 20 - 25 - 30 (at I_1 x 600 %)	Secs
STD pick-up	I_2	2 - 4 - 6 - 8 -10 x I_0	Amps
STD setting	T_2	0.1 - 0.15 - 0.2 - 0.25 - 0.3	Secs
INST pick-up	I_3	3 - 12 - x I_0 (continuously adjustable)	Amps

Note: A special generator T_1 setting adjustment of 1-5 sec (at I_1 x 600 %), is also available. Please contact NHP for details.

MCCB Technical data

Adjustment of tripping characteristics

TemBreak 1 (electronic type)

Electronic models of TemBreak come standard with an 8-bit microprocessor overcurrent relay (OCR). It is the OCR which provides the functions necessary for protection, while maintaining a high level of reliability.

The wide OCR adjustment range allows the circuit breaker to be set-up in order to trip under certain conditions. Adjustments can be made to the tripping current as well as the tripping time of the breaker.

Front view of breaker

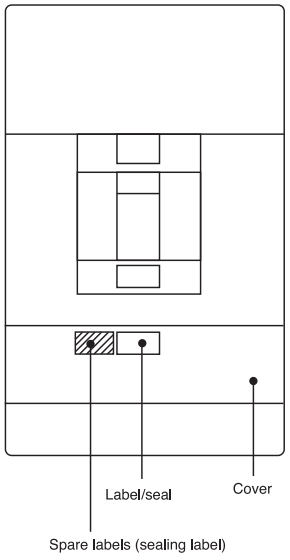
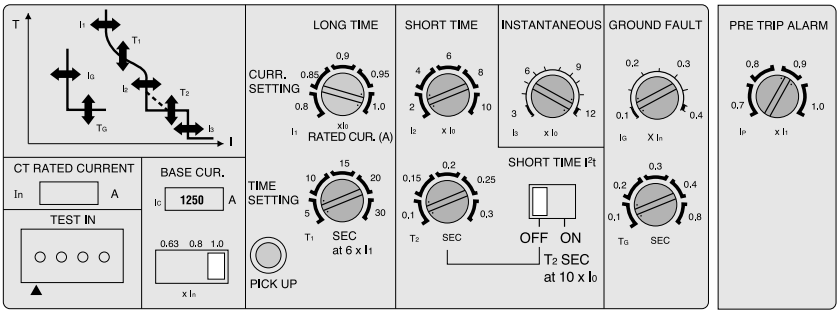


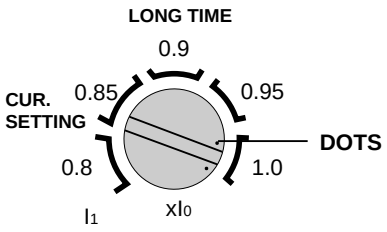
Figure 1. Electronic OCR adjustments possible (after removing protective cover and seal).



Example XS1250NE

Adjustment method

Remove the seal from the OCR adjustment cover, loosen and remove the cover fixing screws and remove the cover. To adjust the individual trip settings, turn the setting dial with a flat bladed screwdriver.



Secure the cover and apply a new seal.

Notes: Align the groove (end marked with dots) between the bands for the required setting.

For example, the diagram above shows I_o = 1.0.

The INST and GFT pick-up currents are continuously adjustable.

The ground fault trip and pre-trip alarm cannot be used simultaneously in a single breaker.

MCCB Technical data

Electronic based characteristics – adjustments, operation and examples – TemBreak 1

Overload adjustment

The rated current of the electronic based TemBreak is adjusted using two current multipliers. This process achieves high accuracy adjustment from 50 % to 100 %. These are the LTD pick-up dial (I_1) and the Base current (I_0) selector switch.

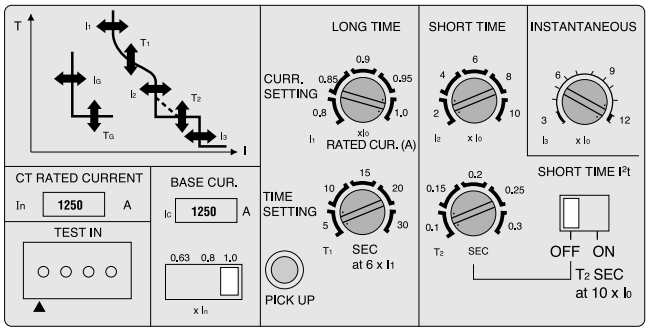
The rated current (LTD pick-up) is achieved as follows:

$I_{RATED} = I_n \times I_0 \times I_1$

In the example shown on the right the rating would be:

$I_{RATED} = 1250 \times 1.0 \times 1.0 = 1250$ A

In total there are 15 possible increments of adjustment between 50 and 100 %, as shown below.



Base current	0.63 0.8 1.0 x In	63					80					100			
Current dial	0.9 0.85 0.95 0.8 1.0	80	85	90	95	100	80	85	90	95	100	80	85	90	95	100
Breaker rated current	72% in this example	50	54	57	60	63	64	68	72	76	80	80	85	90	95	100

Example - Settings

In this example, what are all the settings in Amps?

Solution

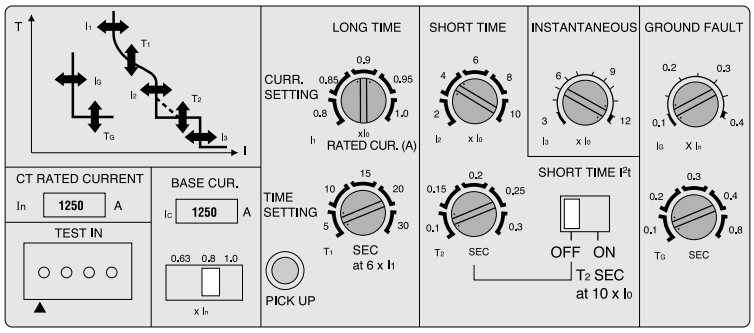
I_{RATING} LTD pick-up = $I_n \times I_0 \times I_1$
1250 x 0.8 x 0.9 = 900 A

STD pick-up = $I_n \times I_0 \times I_2$
1250 x 0.8 x 4 = 4000 A

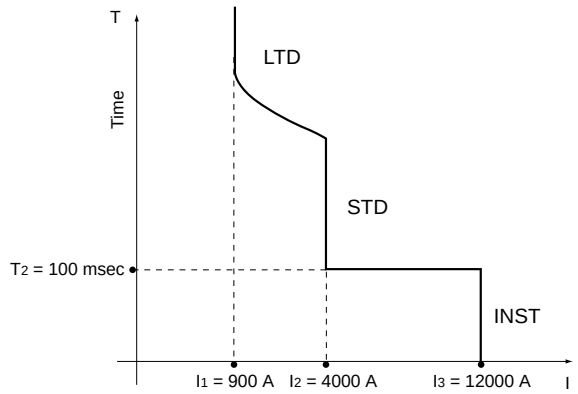
INST pick-up = $I_n \times I_0 \times I_3$
1250 x 0.8 x 12 = 12,000 A

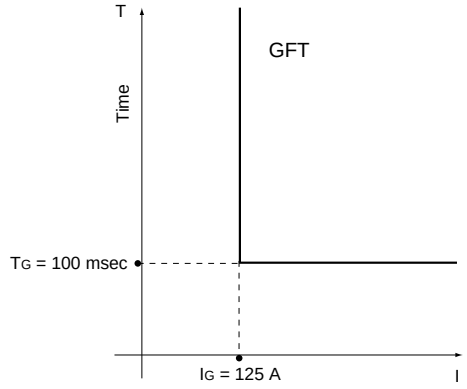
GFT pick-up = $I_n \times I_G$
1250 x 0.1 = 125 A

(Note that GFT is a function of I_n and not I_0)



Example - Time/Current curves



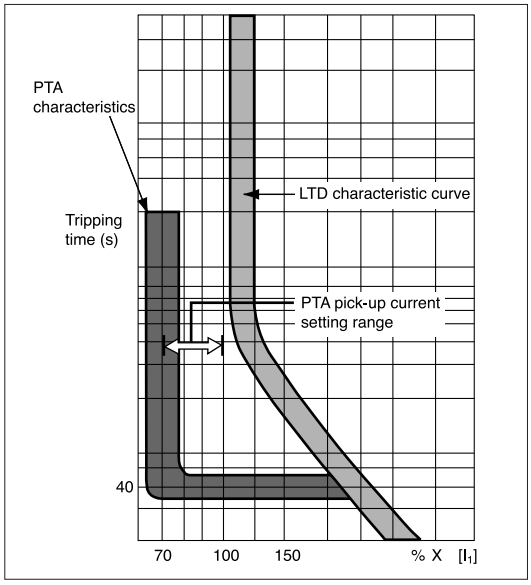


MCCB Technical data
Options (electronic type) TemBreak 1

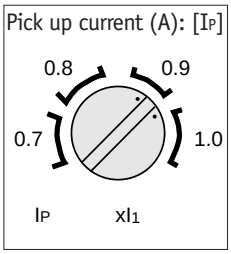
Pre-trip alarm (PTA)

The PTA continuously monitors the true RMS value of the load current. When the load current exceeds the pre-set current (Ip) an LED gives local alarm that the MCCB is approaching an overload situation.
Should the current Ip be exceeded for 40 secs a (N/O) contact will close to provide remote indication and/or load shedding.

PTA characteristics



PTA specifications

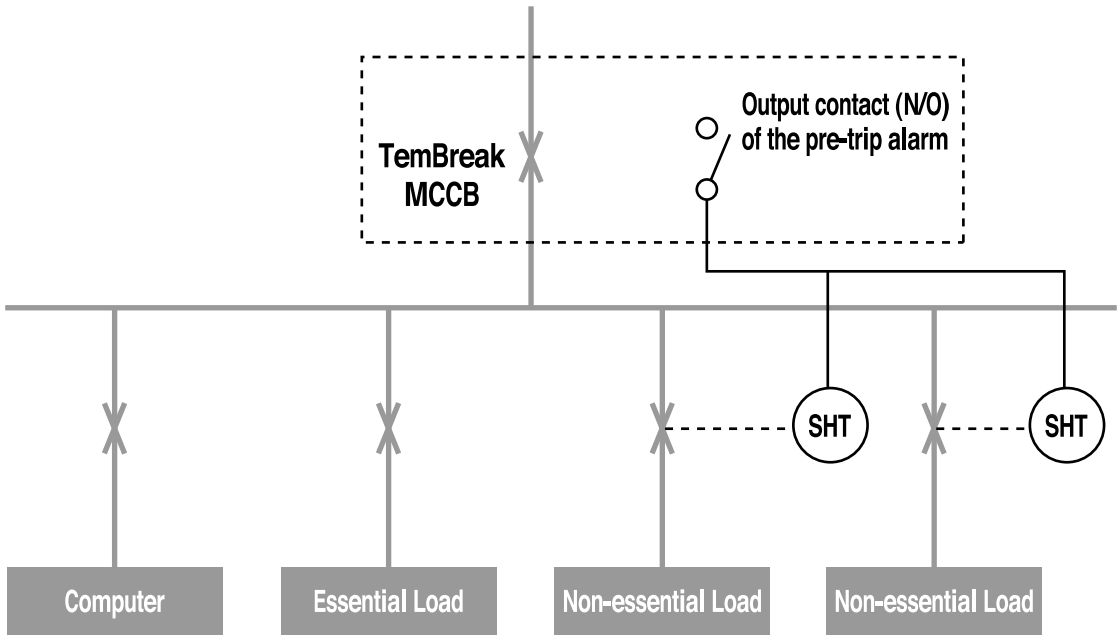


Adjustable steps of 70, 80, 90, 100 % of the selected rated current [I_1].

Setting tolerance ±10 %

Note: The long time-delay trip does not operate 'first' when the pick-up current is adjusted to 100 % of the rated current [I_1].

Operating time (s) [Ip]		40 secs (fixed definite time-delay) setting tolerance is ±10 %		
Output contact		Normally open contact, (1a) Integral lead is standard length (450 mm)		
			Resistive load	**Inductive load**
	Rating of contact	250 V AC	125 VA (2 A max)	20 VA (2 A max)
		220 V DC	60 W (2 A max)	10 W (2 A max)
PTA indication		Pick-up LED flickers		



MCCB Technical data

Adjustment of TemBreak electronic OCR with ground fault – TemBreak 1

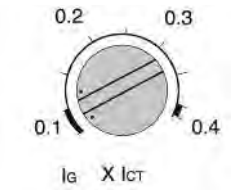
Ground fault trip

The GFT pick-up current is continuously adjustable from 10 % to 40 % of the rated CT current.

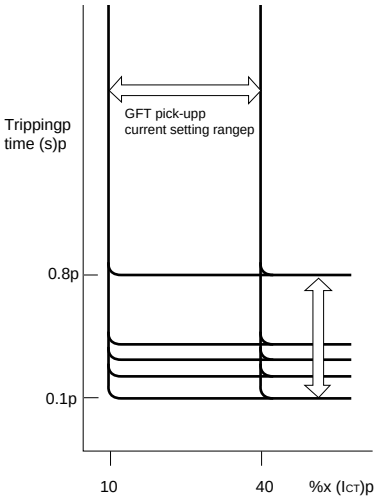
Notes: The ground fault trip and pre-trip alarm cannot be used simultaneously in a single breaker.
400 AF TemBreak 1 MCCBs are not available with ground fault function. (Refer TemBreak 2 400 AF which is.)
When a three pole breaker is used in a 3 phase, 4 wire system, a separate CT is required for the neutral line. (refer NHP).

GFT specifications

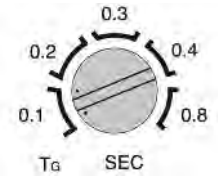
Pick-up current (A): [IG]



Continuously adjustable from 10 to 40 % of the rated CT current (Ict) setting tolerance is ± 15 %



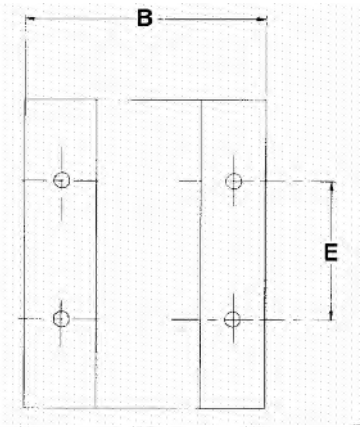
Time-delay (S): [TG]

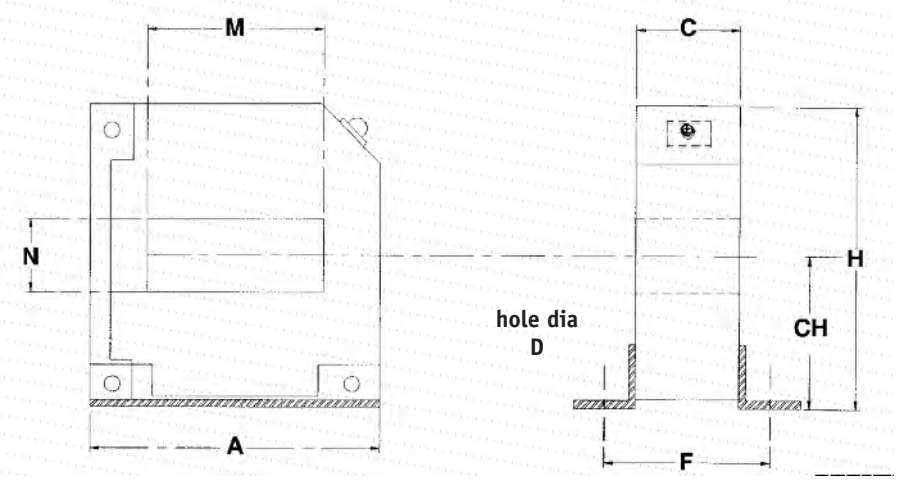


The GFT has a definite time-delay characteristic and is adjustable in steps of 0.1, 0.2, 0.3, 0.4, 0.8 s.
Total clearing time is +50 ms and resettable time is –20 ms for the preset time delay.

4th CT for GFT

Rating (A)	Type
2500	UX0Y0007A
2000	UX0Y0006A
1600	UX0Y0005A
1250	UX0Y0004A
1000	UX0Y0003A
800	UX0Y0002A
630	UX0Y0001A





Dimensions (mm)

Rating (A)	A	B	C	D	E	F	H	CH	M	N
2500-1000	140	110	50	10	80	85	145	75	85	35
800-630	105	100	40	8	50	75	110	57	50	20

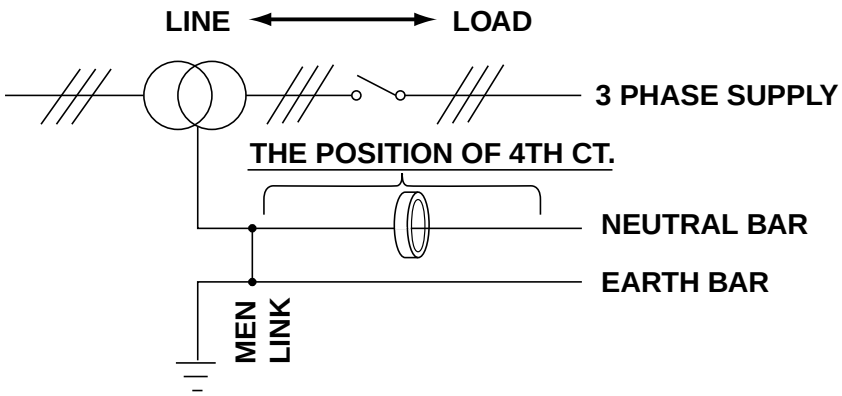
MCCB Technical data

TemBreak electronic type with ground fault – TemBreak 1

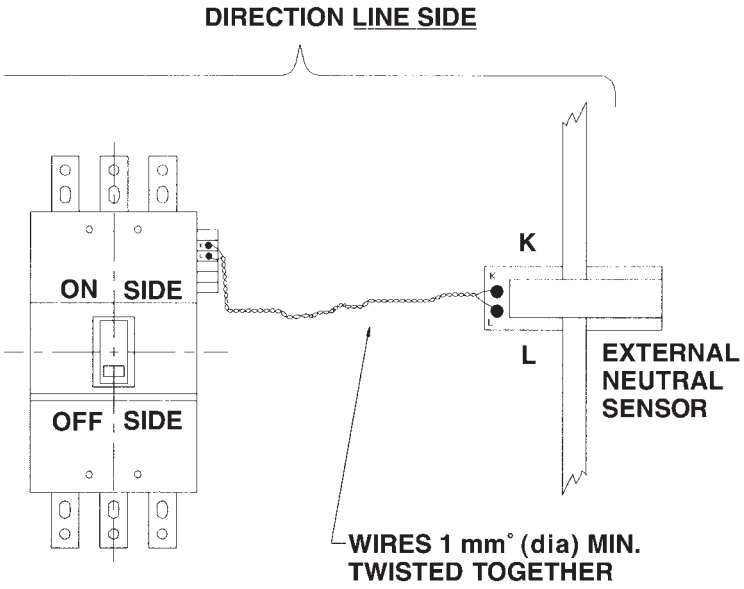
External neutral sensor (4th CT)

External neutral sensors are required whenever optional earth fault is used on 3 phase 4 wire systems

The position and direction of 4th CT



The direction of 4th CT

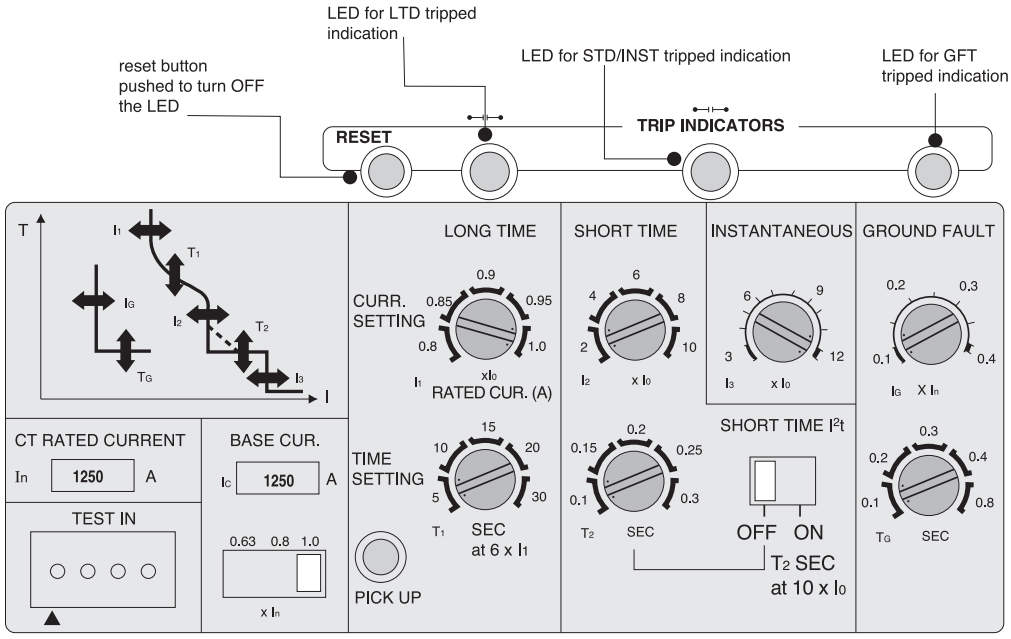


MCCB Technical data
Trip indicators – TemBreak 1

The LEDs when lit, indicate which trip function tripped the breaker eg, long-time-delay (LTD), short-time delay/ instantaneous (STD/INST) or ground fault (GFT) (control power required).

Note: If a pre-trip alarm (PTA) is fitted, the LED control power can be used (common).

Trip indicator display (1250 AF and above)

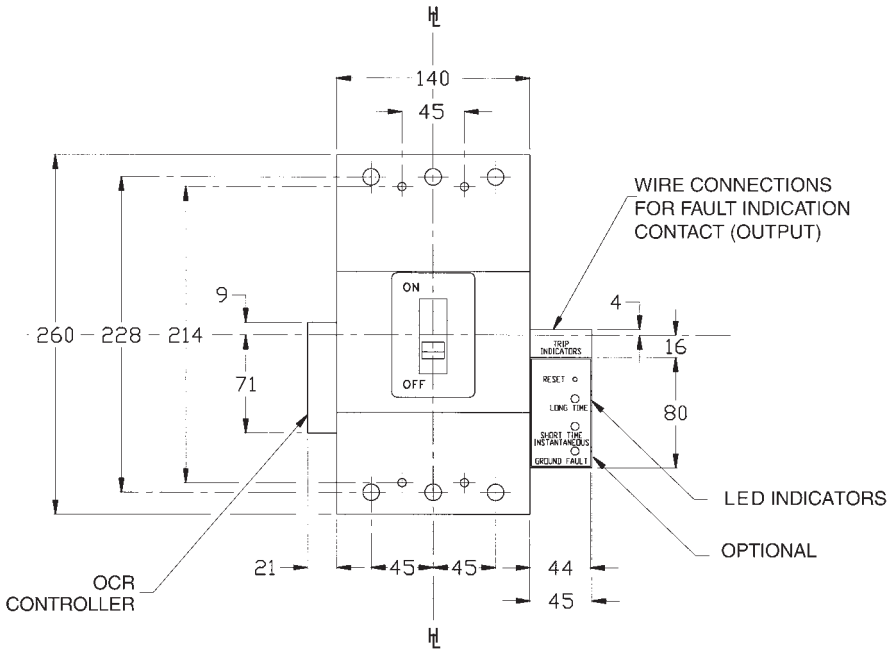


Example XS1250SE

PICK UP
LED turns ON when LTD function picks up.
In case PTA is fitted, this LED flickers when PTA function picks up. (separate control power required).

Trip indicator display (400 AF to 800 AF) and OCR controller example: XV400

An optional feature available with TemBreak electronic type are fault indication contacts - these are voltage free and provide a signal of the cause of a trip (long time, STD/INST).
An external trip indicator box is required with 400 AF models.

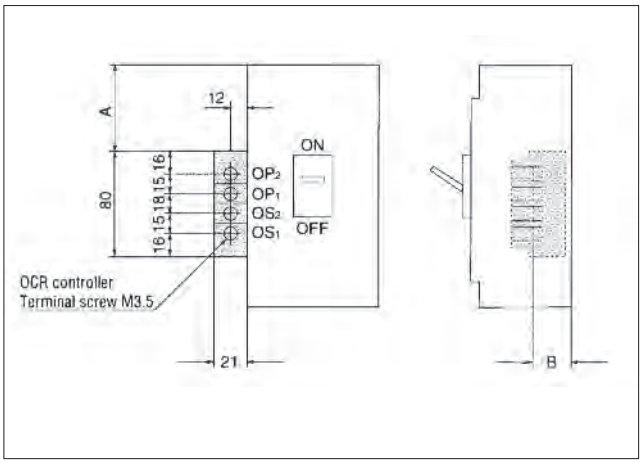


Notes: For dimensions of XS/XH800SE and PE refer to pages 6 - 68 and 6 - 69, add dimensions of OCR controller and trip indication box (above).

MCCB Technical data

OCR controller (PTA and trip indication) TemBreak 1

OCR controller mounting position



Dimensions (mm)

Ampere frame	Type of MCCB	A		B
		With UVT controller	Without UVT controller	
400	XV400	34	97	48
630	XS630/XV	64	151	60
	XH630	64	151	60
800	XS800/XV	64	151	60
	XH800	64	151	60
1250	XS1250SE/XV	51	114	72
1600	XS1600SE/TL-NE	51	114	92
2000	XS2000NE	54	180	115
2500	XS2500NE	54	180	115

5

OCR controller (PTA and trip indication)

The OCR controller is installed in the left hand side of the breaker (standard). This can also be installed externally to the breaker (please specify when ordering).

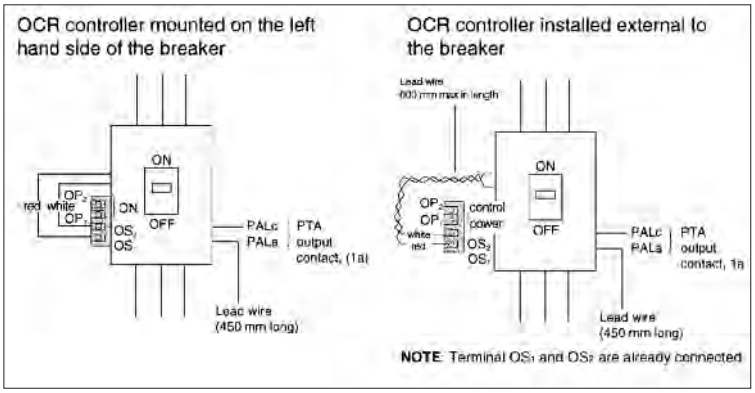
OCR controller specifications

Control power source:

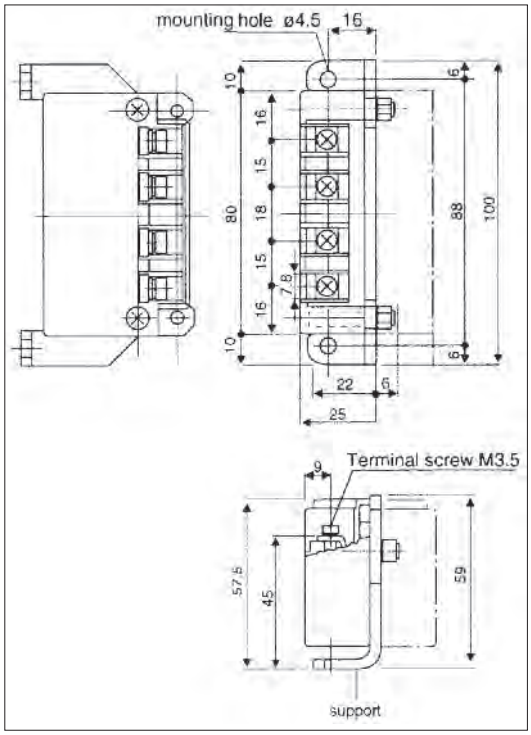
Rated voltage 100-120 V AC or 200-240 V AC
Consumption 2 VA

Note: The permissible range of control power is 85-110 % of the rated voltage.

OCR controller connection diagram [1] [2]



OCR controller dimensions (Installed external to the breaker)

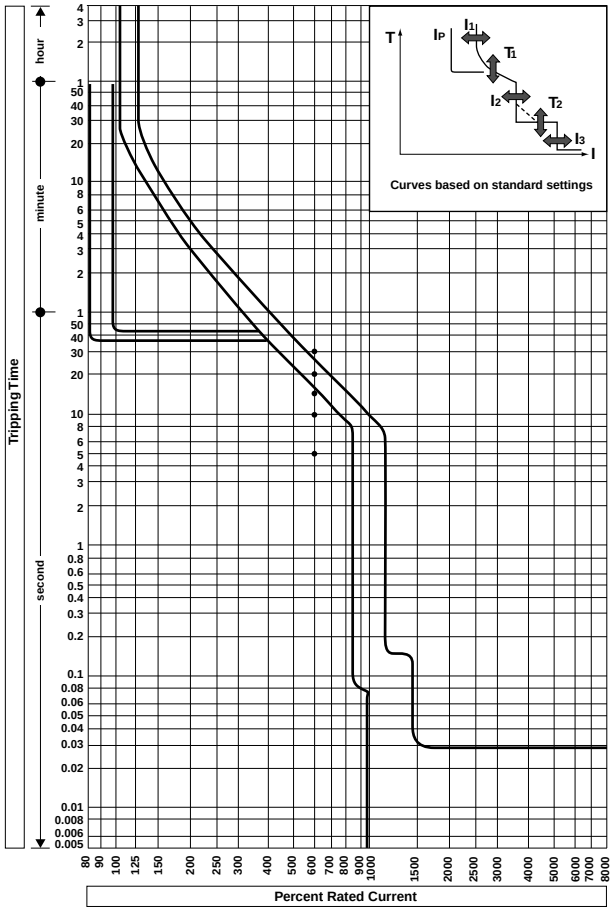


Notes: [1]) Standard torque for the terminal screws M3.5 – 0.88~1.18 Nm (9~12 Kgf.cm).
[2]) Connected cable size – Max 2.0 mm².

MCCB Technical data
Time/Current curves – TemBreak 1

XV400

Time/current characteristic curves



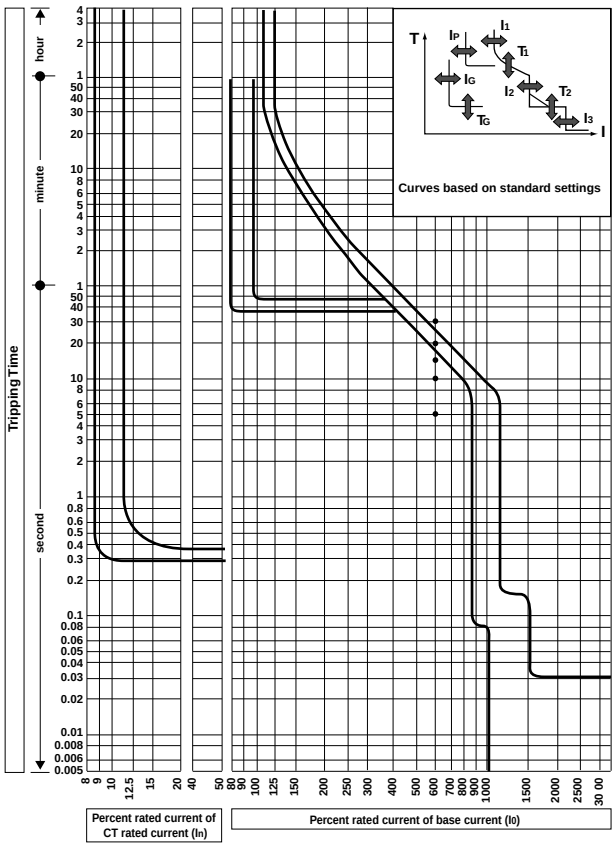
Overcurrent tripping characteristics

CT rated current (A) (I_n)	250, 400
Base current setting (A) (I_0)	(I_n) x (0.63-0.8-1.0)
Long time-delay pick-up current (A): (I_1)	(I_0) x (0.8-0.85-0.9-0.95-1.0) Non-tripping at (I_1) setting x 105 % and below. Tripping at 125 % and above.
Long time-delay time settings (S) (T_1)	(5-10-15-20-30) at (I_1) x 600 % current. Setting tolerance ± 20 %
Short time-delay pick-up current (A): (I_2)	(I_0) x (2-4-6-8-10) Setting tolerance ± 15 %
Short time-delay time settings (S) (T_2)	Opening time (0.1, 0.15, 0.2, 0.25, 0.3) in the definite time-delay. Total clearing time is +50 ms and resettable time - 20 ms for the time-delay setting
Instantaneous trip pick-up current (A) (I_3)	Continuously adjustable from (I_0) x (3 to 12) Setting tolerance ± 20 %
• Pre-trip alarm pick-up current (A) (I_P)	(I_1) x (0.7, 0.8, 0.9, 1.0) Setting tolerance ± 10 %
• Pre-trip alarm time setting (S) (T_P)	40 fixed definite time-delay. Setting tolerance ± 10 %

Notes: • Optional.
Underlined values will be applied as standard ratings unless otherwise specified when ordering.

XS630, XH630, XS800, XH800, XV630, XV800

Time/current characteristic curves



Overcurrent tripping characteristics

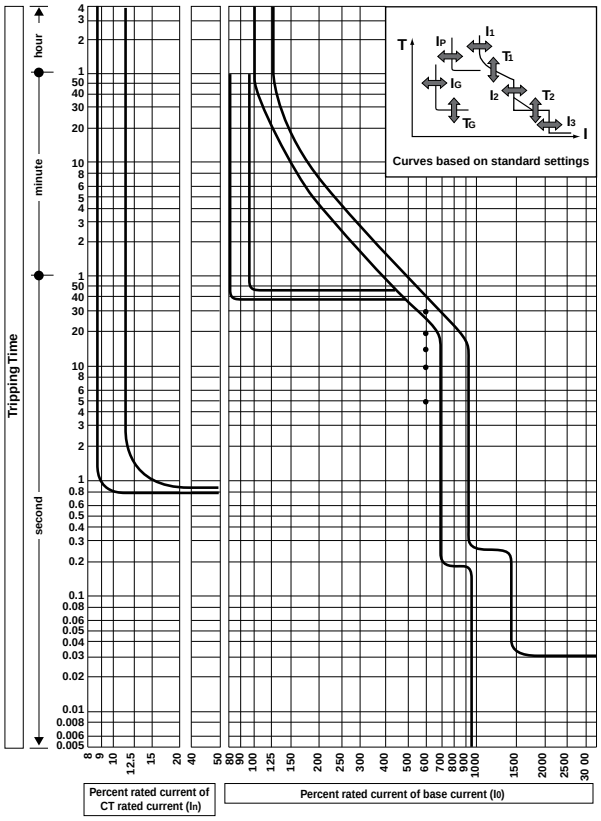
CT rated current (A) (I_n)	630, 800
Base current setting (A) (I_0)	(I_n) x (0.63-0.8-1.0)
Long time-delay pick-up current (A): (I_1)	(I_0) x (0.8-0.85-0.9-0.95-1.0) Non-tripping at (I_1) setting x 105 % and below. Tripping at 125 % and above.
Long time-delay time settings (S) (T_1)	(5-10-15-20-30) at (I_1) x 600 % current. Setting tolerance ± 20 %
Short time-delay pick-up current (A): (I_2)	(I_0) x (2-4-6-8-10) Setting tolerance ± 15%
Short time-delay time settings (S) (T_2)	Opening time (0.1, 0.15, 0.2, 0.25, 0.3) in the definite time-delay. Total clearing time is +50 ms and resettable time - 20 ms for the time-delay setting
Instantaneous trip pick-up current (A) (I_3)	Continuously adjustable from (I_0) x (3 to 12) Setting tolerance ± 20 %
• Pre-trip alarm pick-up current (A) (I_P)	(I_1) x (0.7, 0.8, 0.9, 1.0) Setting tolerance ± 10 %
• Pre-trip alarm time setting (S) (T_P)	40 fixed definite time-delay. Setting tolerance ± 10 %
• Ground fault trip pick-up current (A) (I_G)	Continuously adjustable from (I_n) x (0.1 to 0.4) Setting tolerance ± 15 %
• Ground fault trip time setting (S) (T_G)	Opening time (0.1-0.2-0.3-0.4-0.8) in the definite time-delay. Total clearing time is +50 ms and resettable time is - 20 ms for the time-delay settings

MCCB Technical data

Electronic based characteristics and adjustments

XS1250SE, XS1600SE, XS2000NE, XS2500NE, TL630NE, TL800NE, TL1250NE & XV1250 – TemBreak 1

Time/current characteristic curves



Overcurrent tripping characteristics

CT rated current (A) (I_n)	1000, 1250, 1600, 2000, 2500
Base current setting (A) (I_o)	(I_n) x (0.63-0.8-1.0)
Long time-delay pick-up current (A): (I_1)	(I_o) x (0.8-0.85-0.9-0.95-1.0) Non-tripping at (I_1) setting x 105 % and below. Tripping at 125 % and above.
Long time-delay time settings (S) (T_1)	(5-10-15-20-30) at (I_1) x 600 % current. Setting tolerance ± 20 %
Short time-delay pick-up current (A): (I_2)	(I_o) x (2-4-6-8-10) Setting tolerance ± 15 %
Short time-delay time settings (S) (T_2)	Opening time (0.1, 0.15, 0.2, 0.25, 0.3) in the definite time-delay. Total clearing time is +50 ms and resettable time - 20 ms for the time-delay setting
Instantaneous trip pick-up current (A) (I_3)	Continuously adjustable from (Io) x (3 to 12) Setting tolerance ± 20 %
• Pre-trip alarm pick-up current (A) (I_P)	(I_1) x (0.7, 0.8, 0.9, 1.0) Setting tolerance ±10 %
• Pre-trip alarm time setting (S) (T_P)	40 fixed definite time-delay. Setting tolerance ±10 %
• Ground fault trip pick-up current (A) (I_6)	Continuously adjustable from (I_N) x (0.1 to 0.4) Setting tolerance ± 15 %
• Ground fault trip time setting (S) (T_6)	Opening time (0.1-0.2-0.3-0.4-0.8) in the definite time-delay. Total clearing time is +50 ms and resettable time is - 20 ms for the time-delay settings

Notes: • Optional.
Underlined values will be applied as standard ratings unless otherwise specified when ordering.

MCCB Technical data

Time/Current curves – mathematical analysis – TemBreak 1

MCCB curves

An electronic MCCB has three major regions on its overcurrent tripping characteristic, namely Long time delay (LTD) for overload protection, Short time delay (STD) and Instantaneous (INST), both for short circuit protection.

The following is an insight into how these curves interact and could act as a guide for hand-drawing the curves. TemCurve selectivity application software is available for computerised generation of curves (refer page 6-9).

Firstly consider the following basic characteristic curve shown in figure 1.

The LTD takes the form of a curve and has the following characteristic equation:

$$(I^2\text{-}1).\ t = k$$

where 'k' is a constant. To determine k, the calibration point of the LTD should be used, i.e. $t = T_1$ at $I_1 = 6$ (600 %).

IEC 60947 - 2 states that a breaker must not trip below 105 % of its rated current, and always trip at 130 % of its rated current.
Terasaki electronic MCCBs however are calibrated to trip between 105 % and 125 %, giving them a higher degree of accuracy. If the middle point is taken then the pick-up of the MCCB is 115 % of its rated current.

The STD and INST parts of the curve can be drawn more easily as they are simply a series of horizontal and vertical lines determined by the I_2 and T_2 settings for the STD, and I_3 setting for the INST.

Example

If we assume that we have:

XS1250SE with 1250A CTs and

$I_0 = 1$, $I_1 = 0.8$, $T_1 = 30$ secs,

$I_2 = 8$, $T_2 = 0.2$ sec and

$I_3 = 1_2$ (dial setting on OCR),

then the characteristic curve can be constructed as follows.

To draw the LTD we firstly need to determine the constant k, as follows:

$k = (I^2 - 1)\ \ t = (6^2 - 1)\ \ 30 = 1050$

giving the characteristic equation:

$(I^2 - 1)\ \ t = 1050$

By simple arithmetic the tripping times for each level of overload can now be determined.

For 400 % overload (for the example this is equivalent to 1250 x 1.0 x 0.8 x 4 = 400 A).

$$t = \frac{1050}{(I^2 - 1)} = \frac{1050}{(4^2 - 1)} = 70 \text{ secs}$$

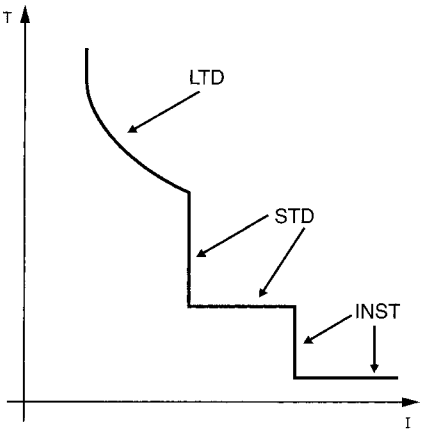
The STD and INST can be constructed as follows with

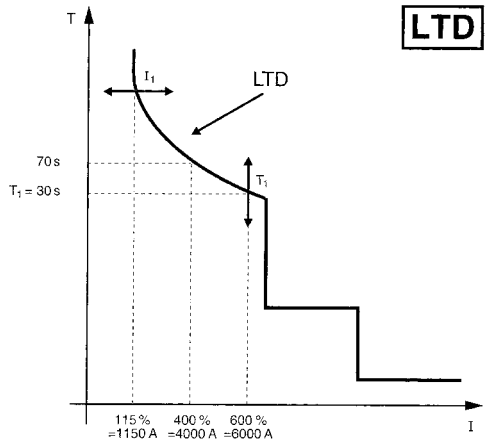
$I_2 = I_n \times I_0 \times I_2$

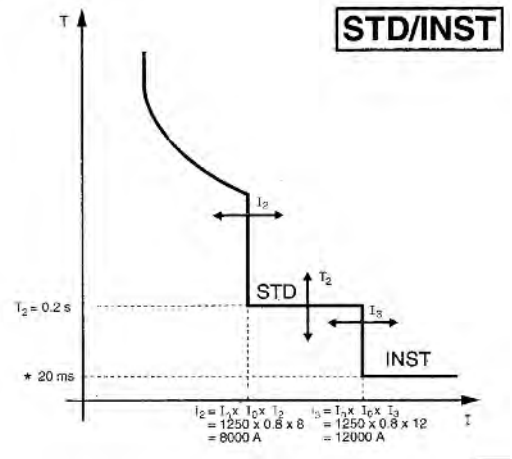
$I_3 = I_n \times I_0 \times I_3$

Please note that 20 ms is taken as an average time for the INST trip of the MCCB as it is the maximum time it will take the MCCB to trip. In practice the breaker will open much faster, particularly at high faults where the current limiting qualities of the MCCB become more effective.

Fig. 1







MCCB Technical data

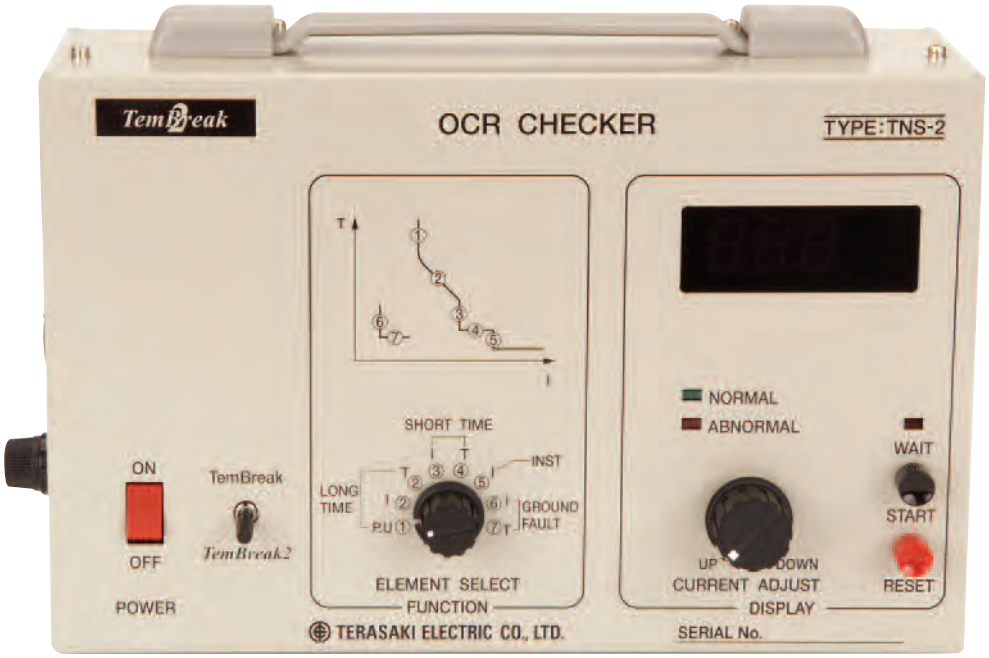
OCR checker, inspection and maintenance – TemBreak 1 & 2

OCR Checker TNS-2

The TemBreak (Electronic) OCR checker, Type TNS-2, is a portable easy-to-use instrument for field testing the trip functions.

It checks the pick-up current and tripping time value of the LTD, STD, INST and GFT functions.

The checker can be used with TemBreak 1 and 2 MCCBs.



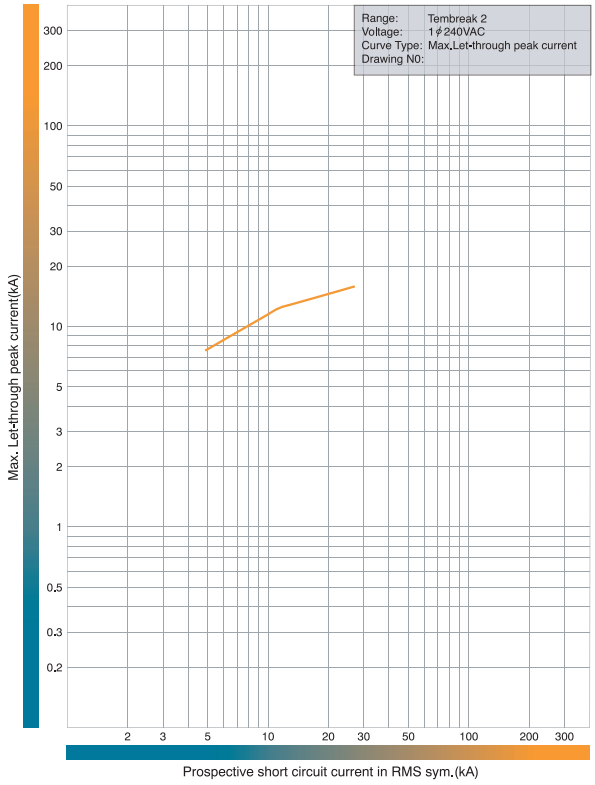
Ratings and specifications

Power source	100~110 V, 220~240 V AC single phase 50/60 Hz	
Power consumption	30 VA	
Application	LTD	function check (set current and trip time values)
	STD	function check (set current and trip time values)
	INST	function check (set current value)
	GFT	function check (set current and trip time values)
Measurement of set current values	Display	3-digit digital display
	Range	0-900 mA
Measurement of tripping time values	Range 0.00-99.9 seconds	
Outline dimensions (mm)	200 W x 84 H x 130 D	
Weight	2.7 kg	

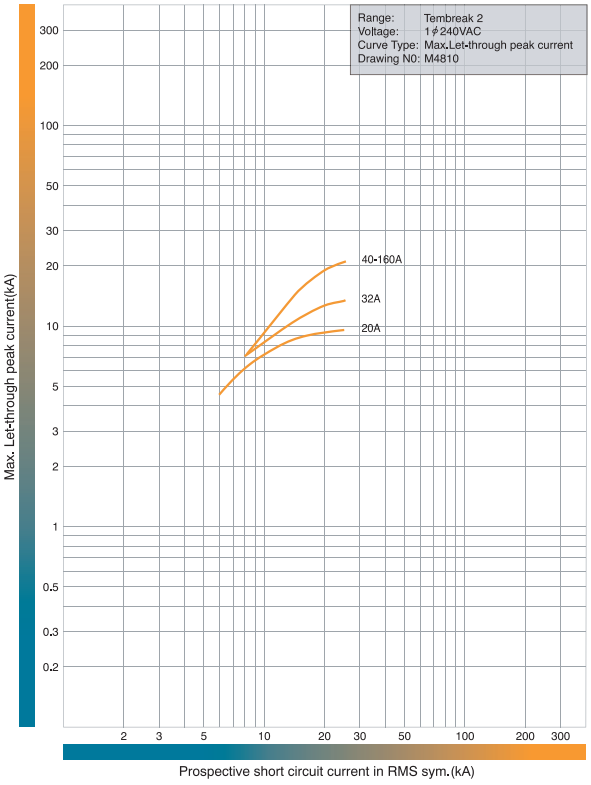
MCCB Technical data
Operating characteristics – TemBreak 2

Let-through Peak Current characteristics

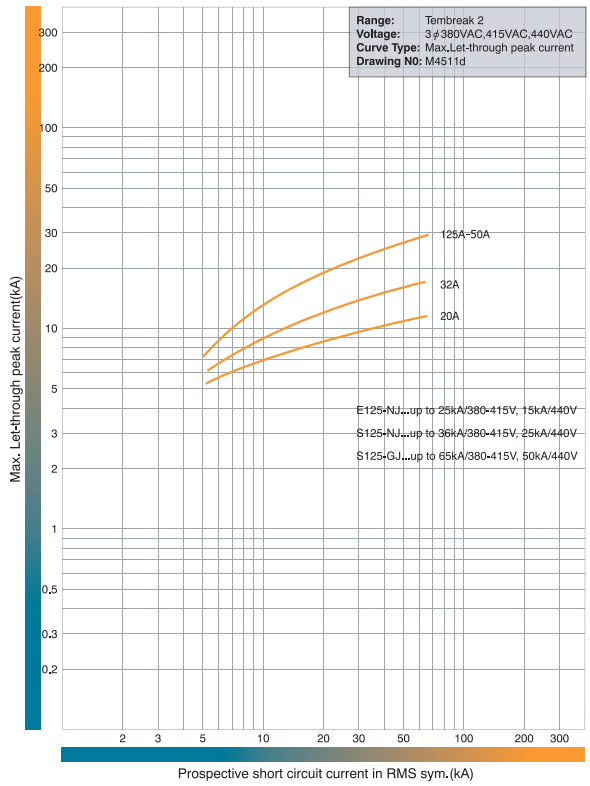
S125-NF 240 V AC



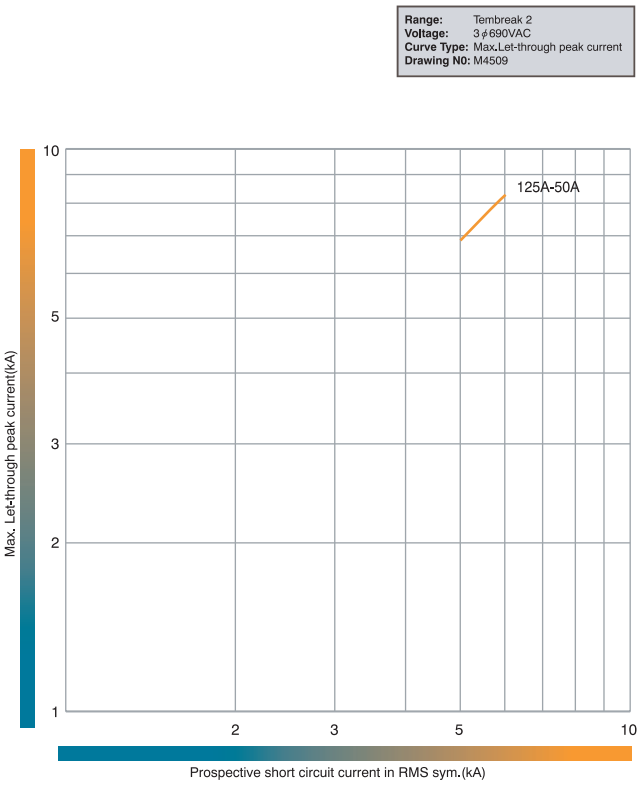
S160-NF 240 V AC



E125-NJ, S125-NJ/GJ 440 V AC



S125-NJ/GJ 690 V AC

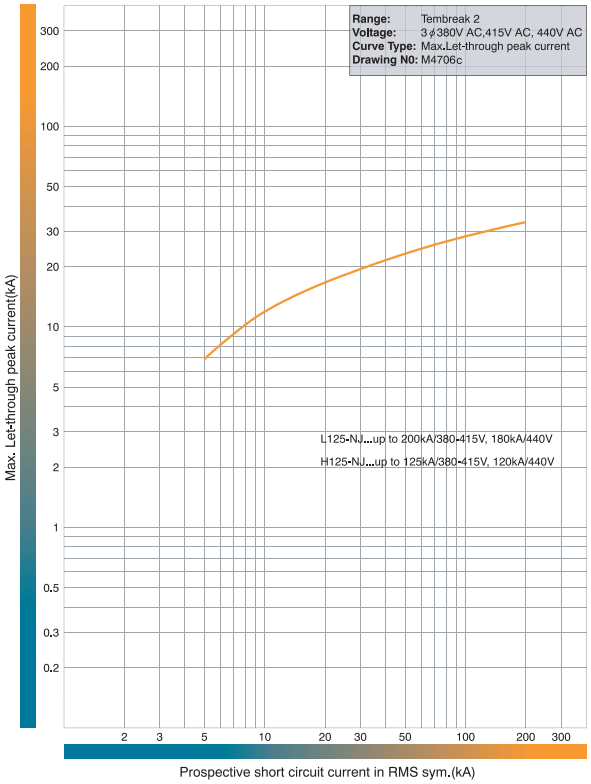


5

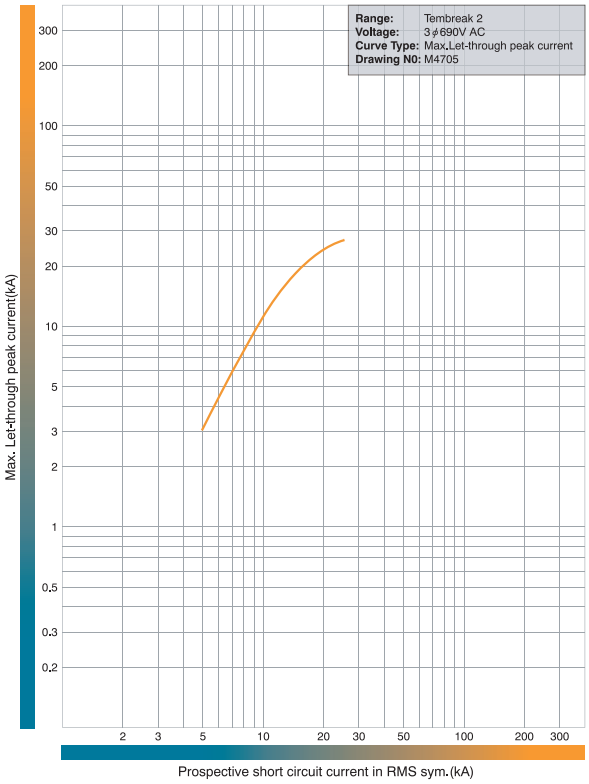
MCCB Technical data
Operating characteristics – TemBreak 2

Let-through Peak Current characteristics

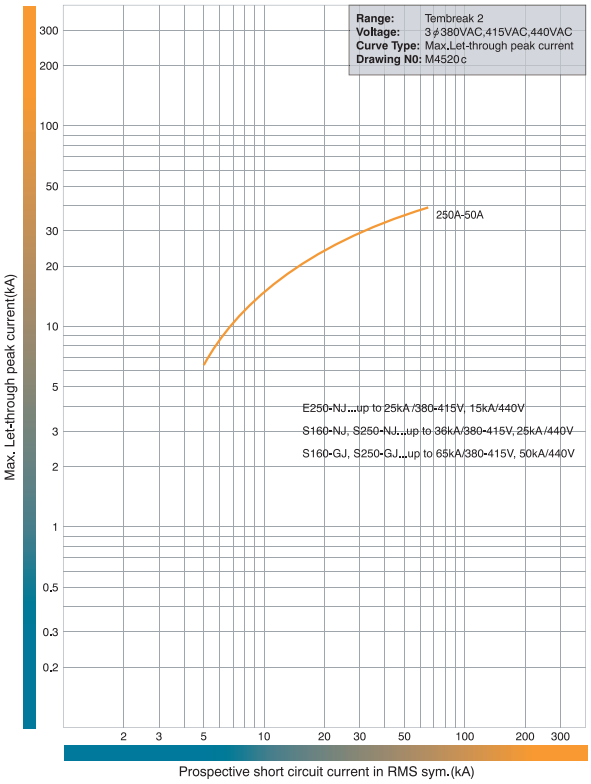
H125-NJ, L125-NJ 440 V AC



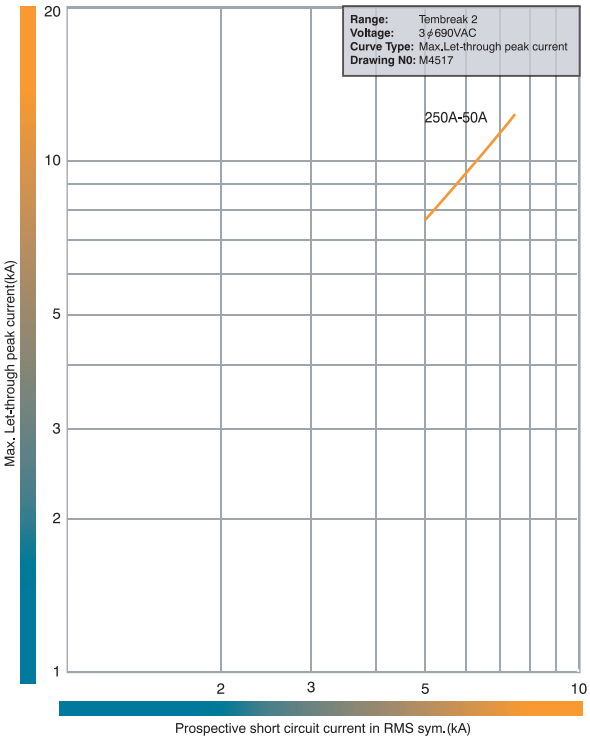
H125-NJ, L125-NJ 690 V AC



S160-NJ/GJ, E250-NJ, S250-NJ/GJ 440 V AC



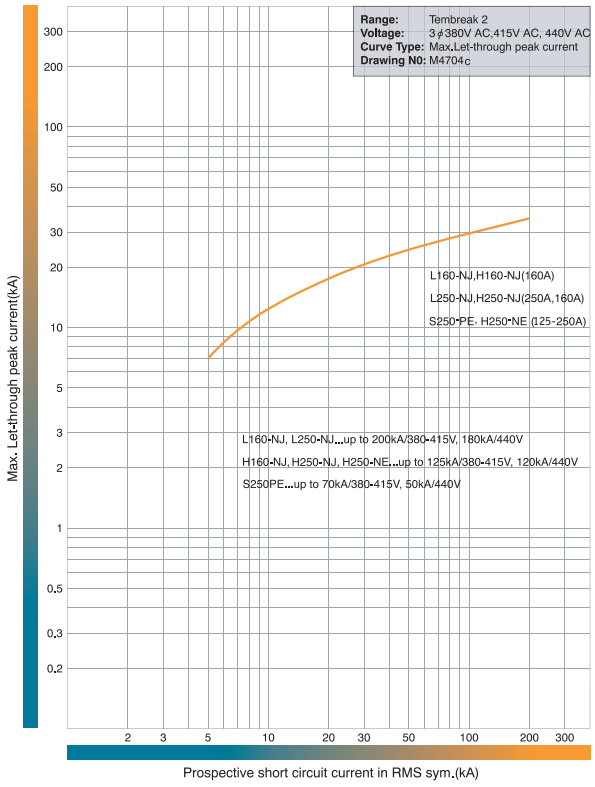
S160-NJ/GJ, S250-NJ/GJ 690 V AC



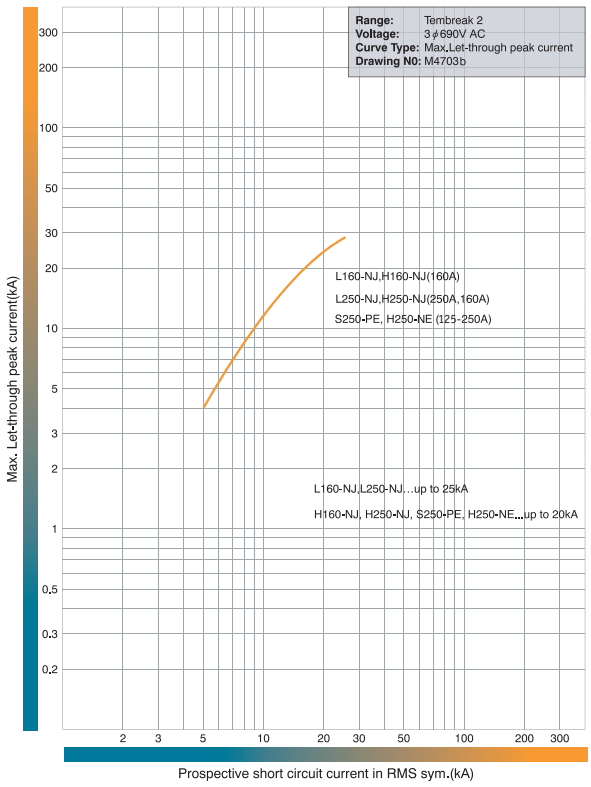
MCCB Technical data
Operating characteristics – TemBreak 2

Let-through Peak Current characteristics

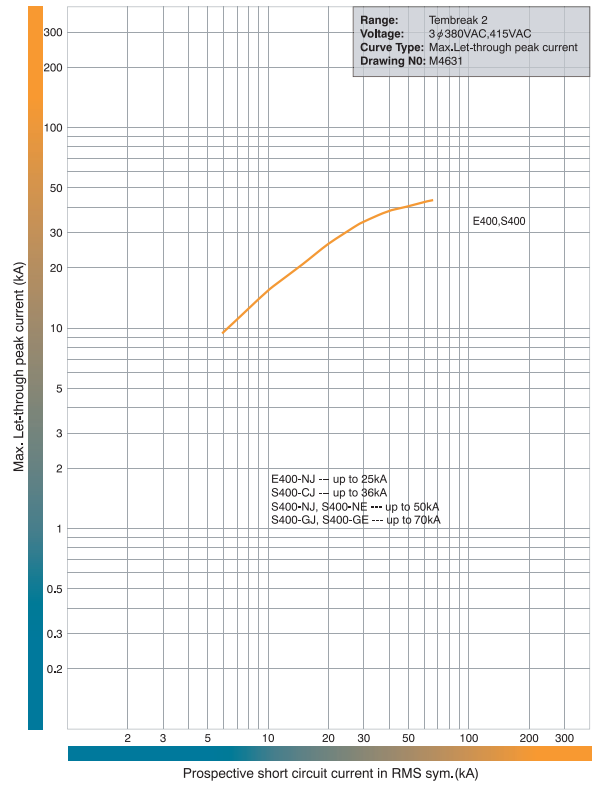
H160-NJ, L160-NJ, S250-PE, H250-NJ/NE, L250-NJ 440 V AC



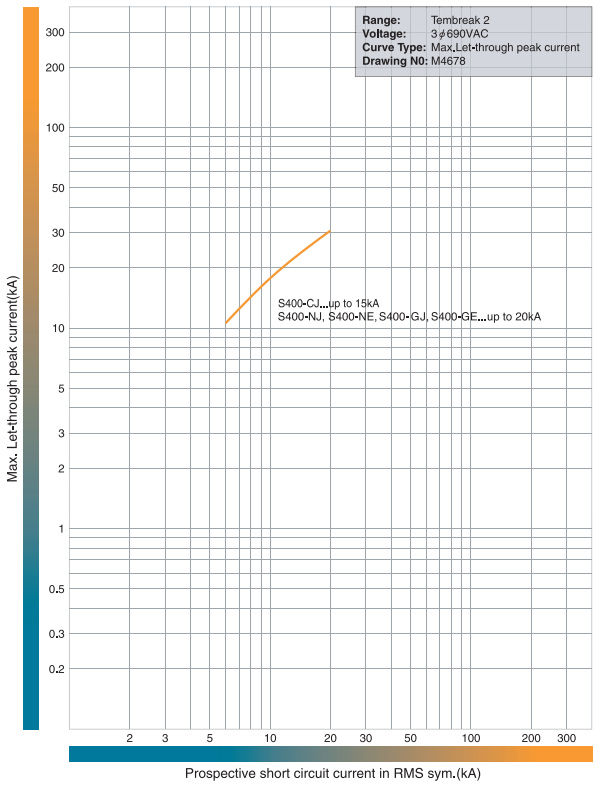
H160-NJ, L160-NJ, S250-PE, H250-NJ/NE, L250-NJ 690 V AC



E400-NJ, S400-CJ/NJ/NE/GJ/GE 415 V AC



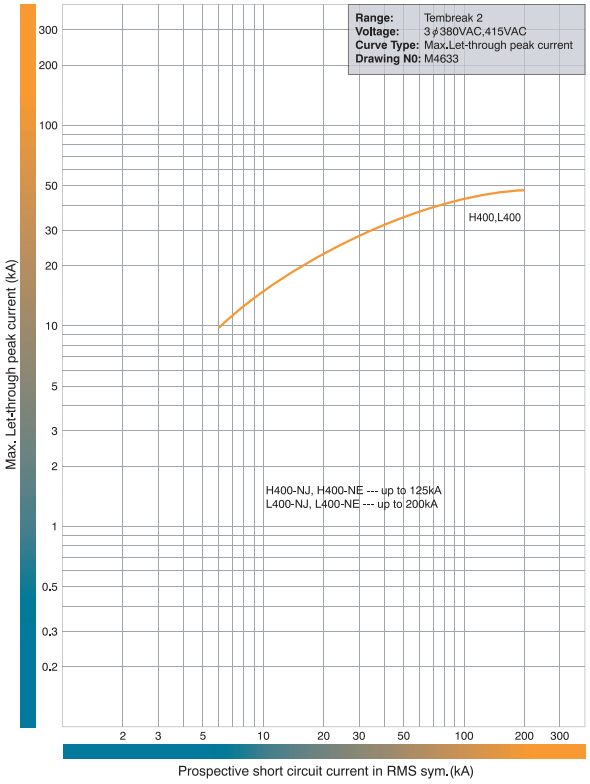
S400-CJ/NJ/NE/GJ/GE 690 V AC



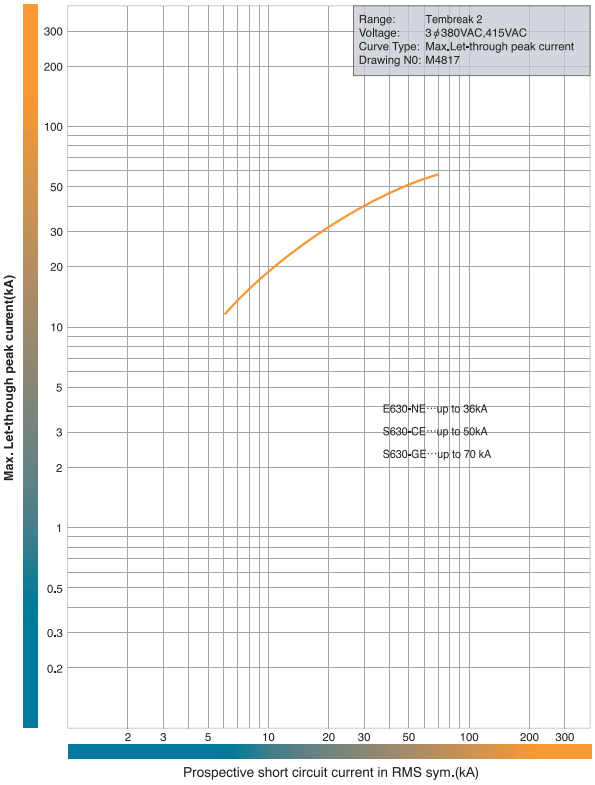
MCCB Technical data
Operating characteristics – TemBreak 2

Let-through Peak Current characteristics

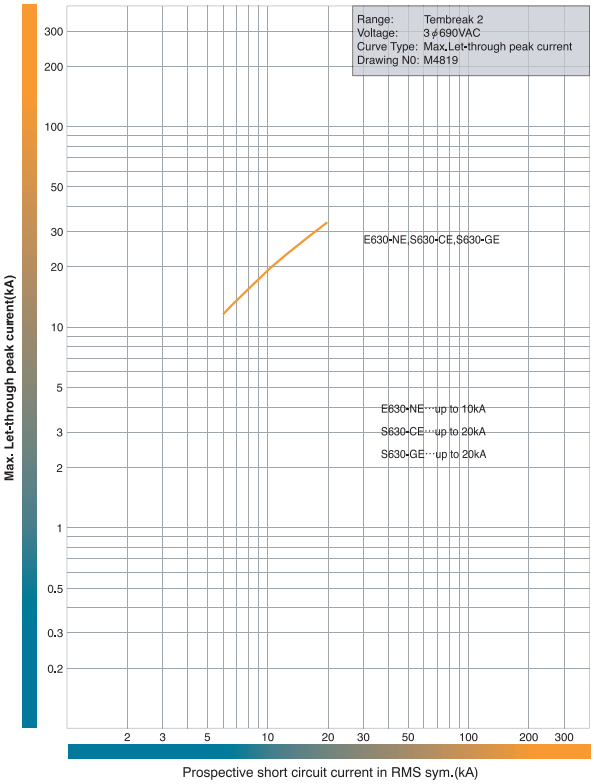
H400-NJ/NE, L400-NJ/NE 415 V AC



E630-NE/CE/GE 415 V AC



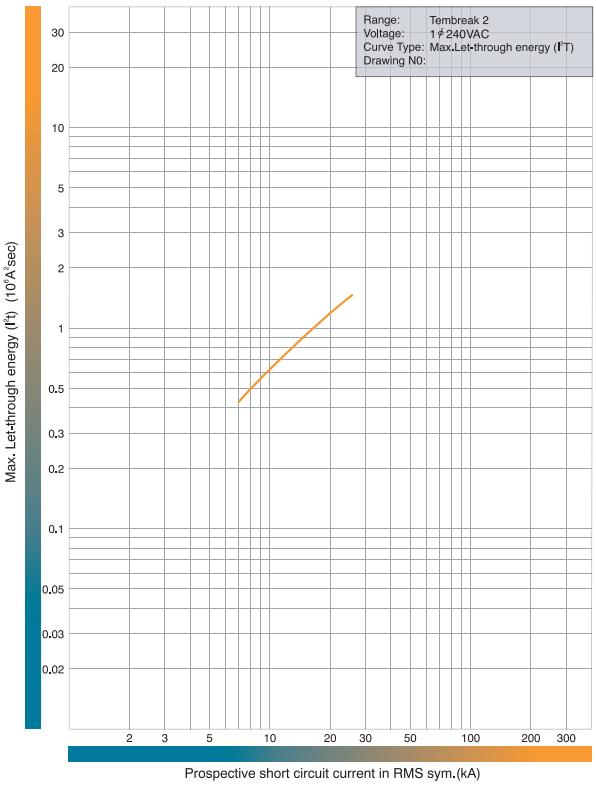
E630-NE/CE/GE 690 V AC



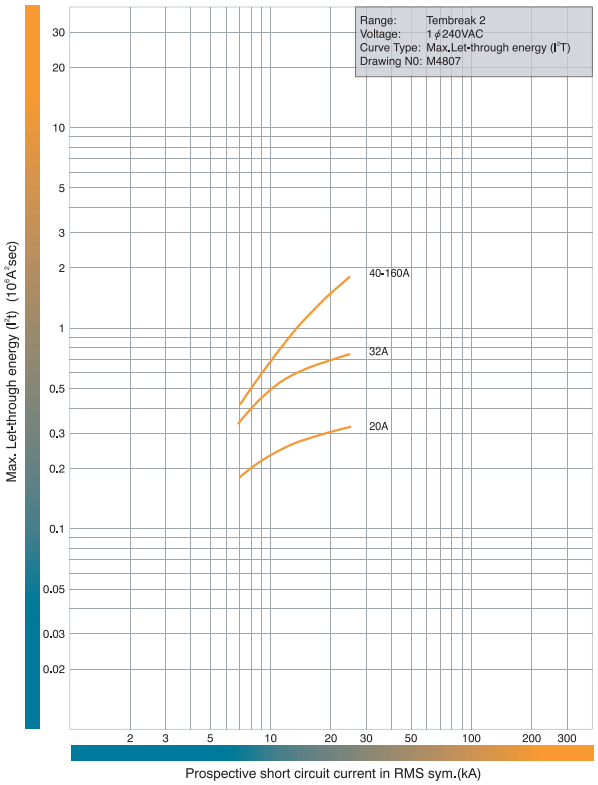
MCCB Technical data
Operating characteristics – TemBreak 2

Let-through Energy characteristics

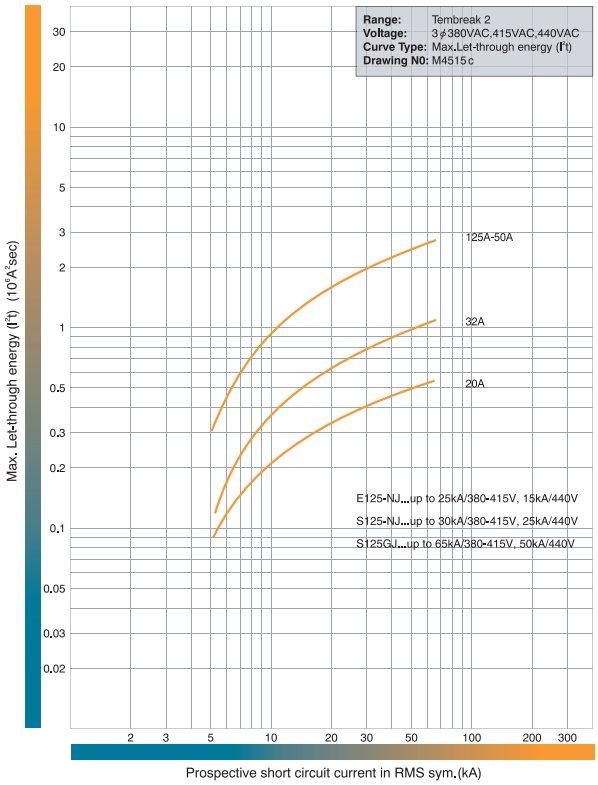
S125-NF 240 V AC



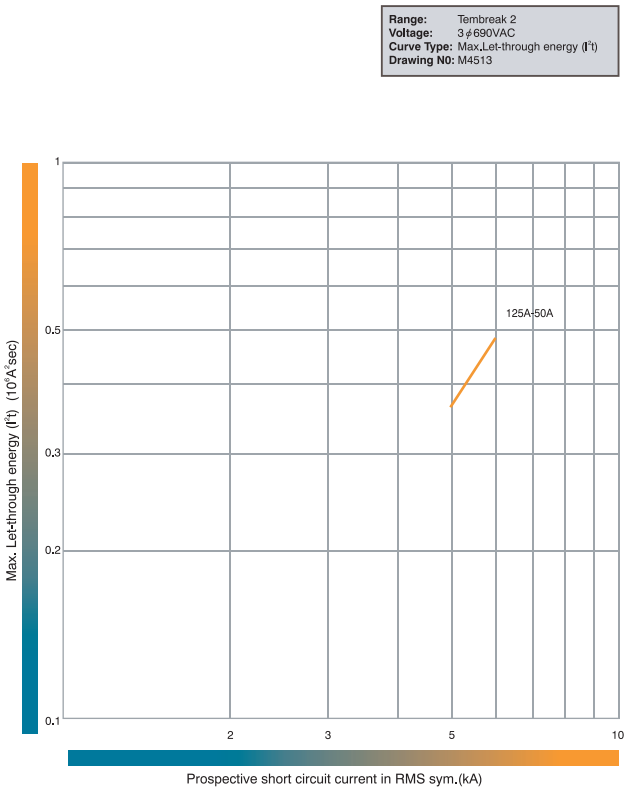
S160-NF 240 V AC



E125-NJ, S125-NJ/GJ 440 V AC



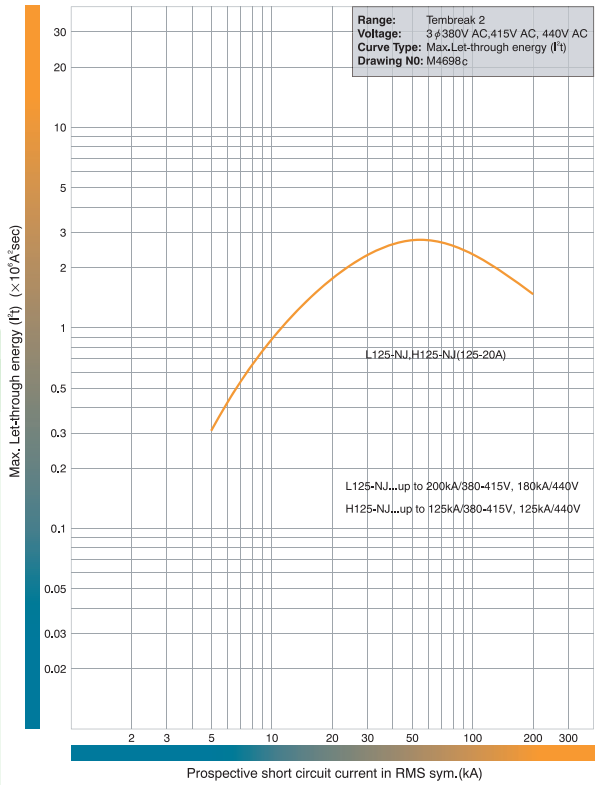
S125-NJ/GJ 690 V AC



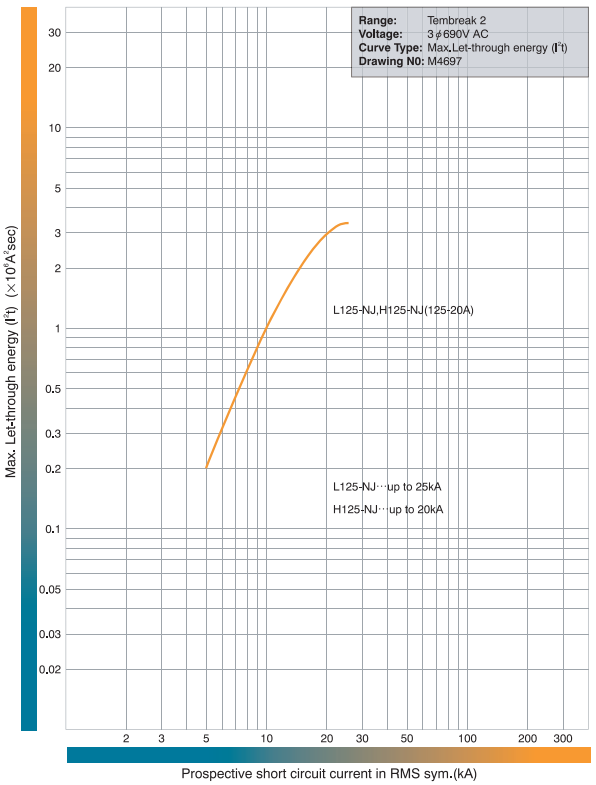
MCCB Technical data
Operating characteristics – TemBreak 2

Let-through Energy characteristics

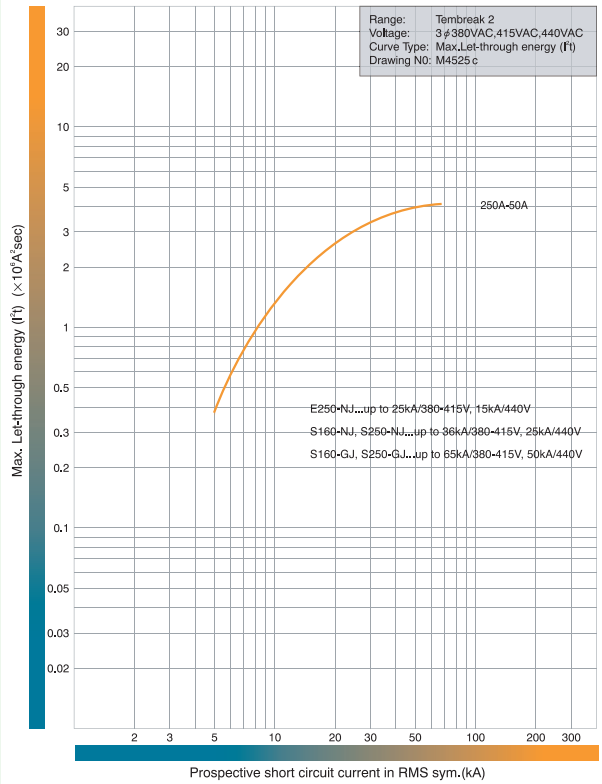
H125-NJ, L125-NJ 440 V AC



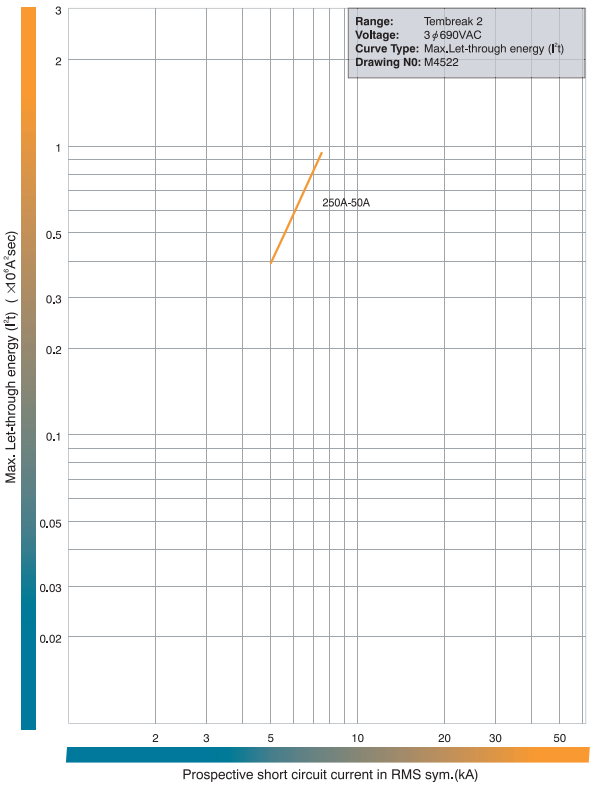
H125-NJ, L125-NJ 690 V AC



S160-NJ/GJ, E250-NJ, S250-NJ/GJ 440 V AC



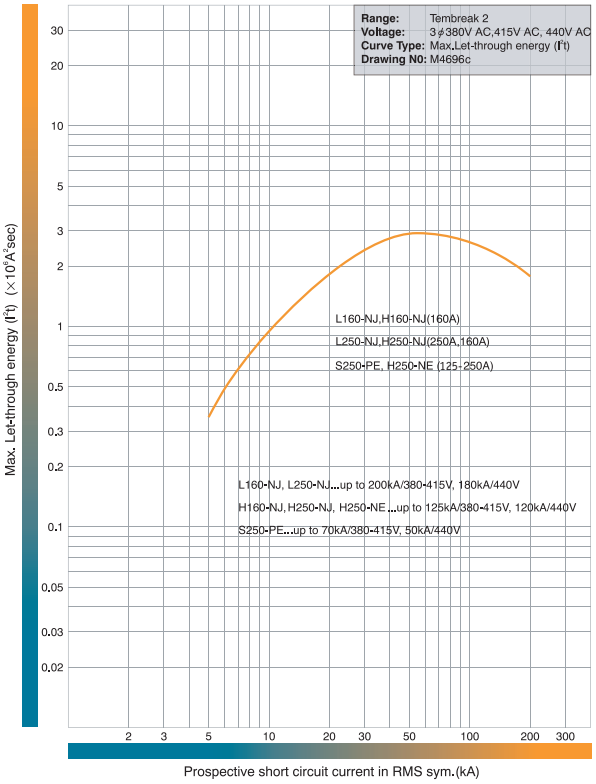
S160-NJ/GJ, S250-NJ/GJ 690 V AC



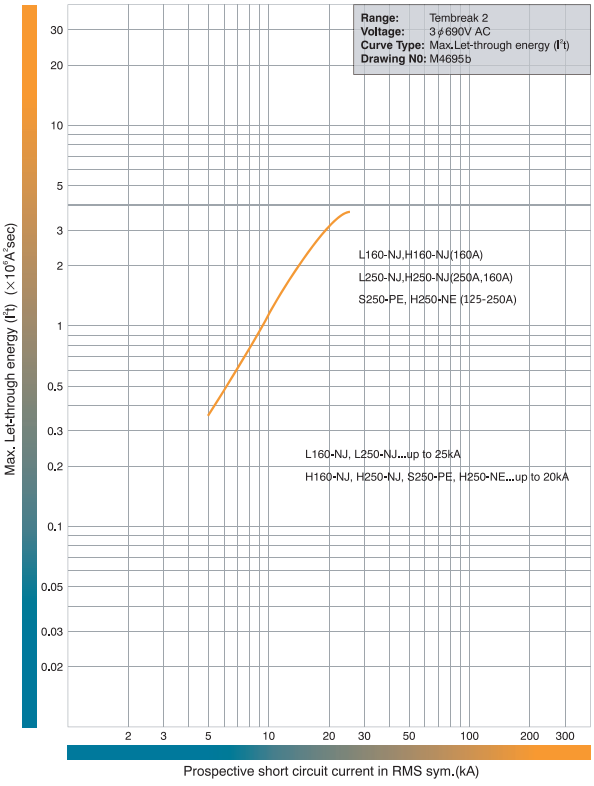
MCCB Technical data
Operating characteristics – TemBreak 2

Let-through Energy characteristics

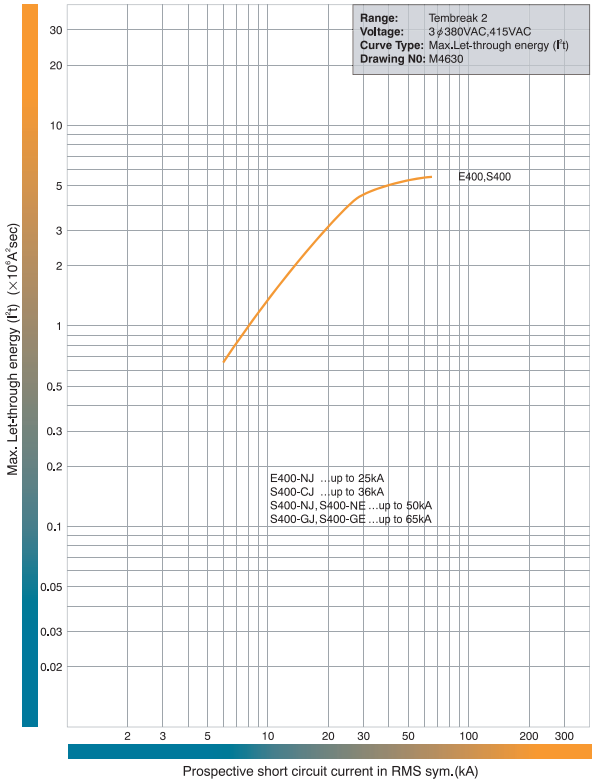
H160-NJ, L160-NJ, S250-PE, H250-NE/NJ, L250-NJ 440 V AC



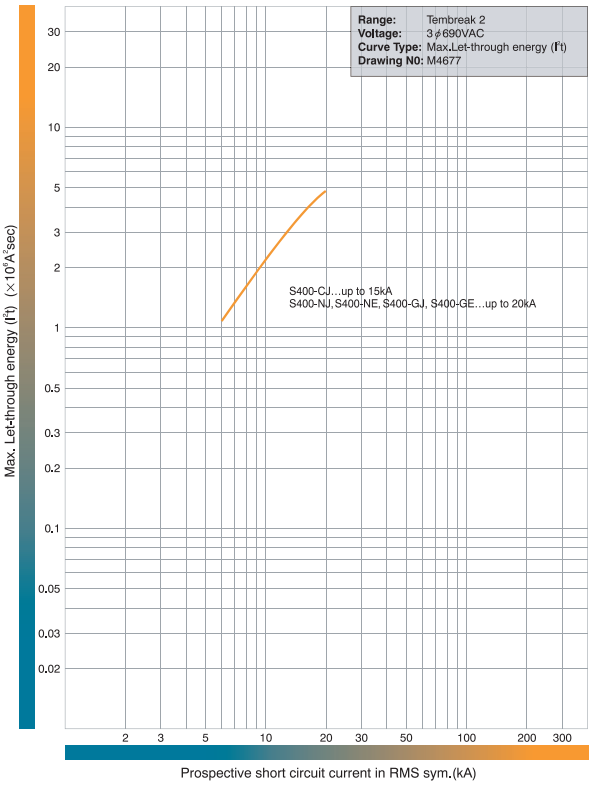
H160-NJ, L160-NJ, S250-PE, H250-NE/NJ, L250-NJ 690 V AC



E400-NJ, S400-CJ/NJ/NE/GJ/GE 415 V AC



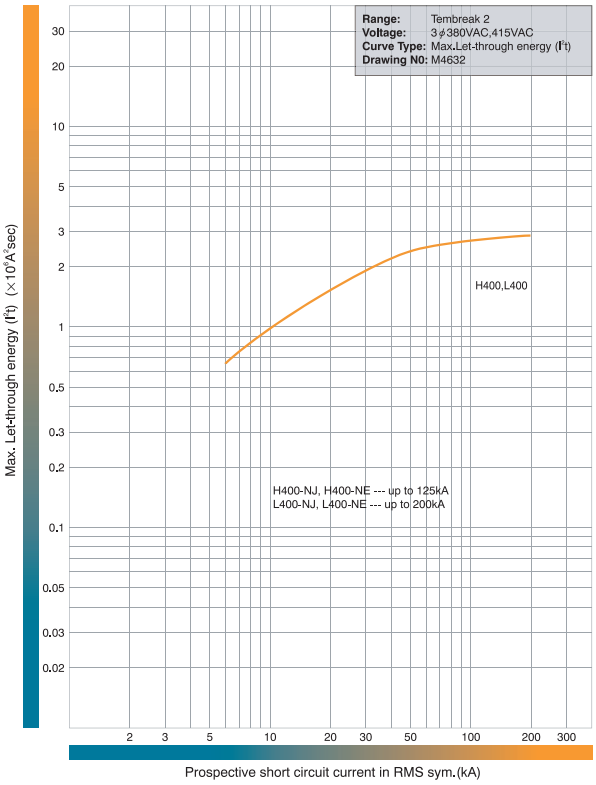
S400-CJ/NJ/NE/GJ/GE 690 V AC



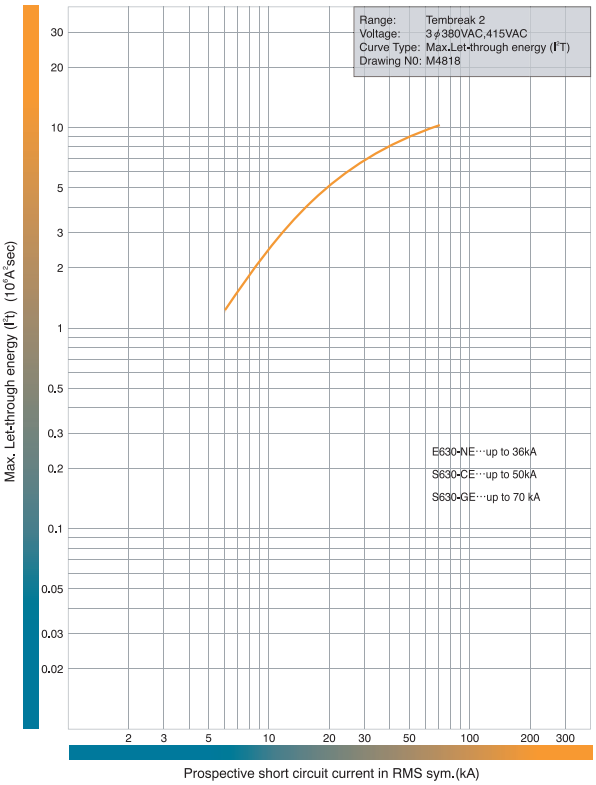
MCCB Technical data
Operating characteristics – TemBreak 2

Let-through Energy characteristics

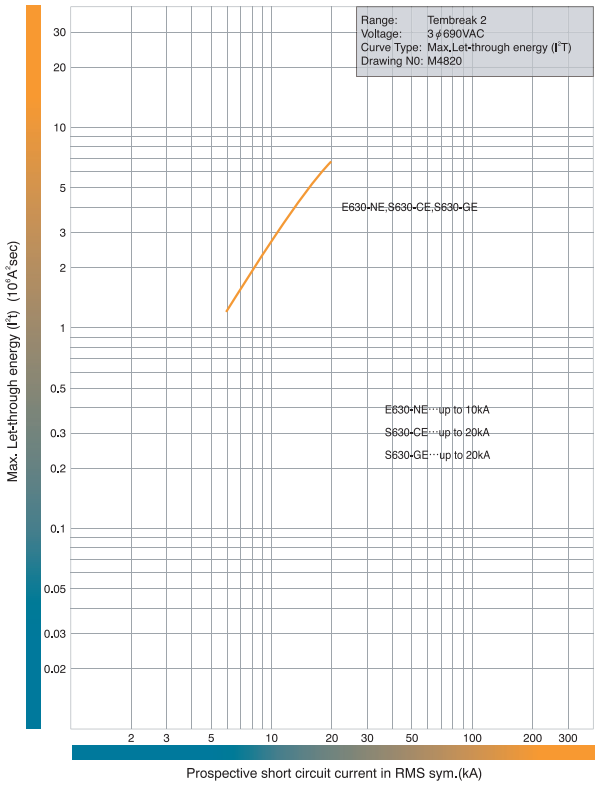
H400-NJ/NE, L400-NJ/NE 415 V AC



E630-NE, S630-CE/GE 415 V AC



E630-NE, S630-CE/GE 690 V AC



MCCB dimensions and mounting – TemBreak 1 and 2

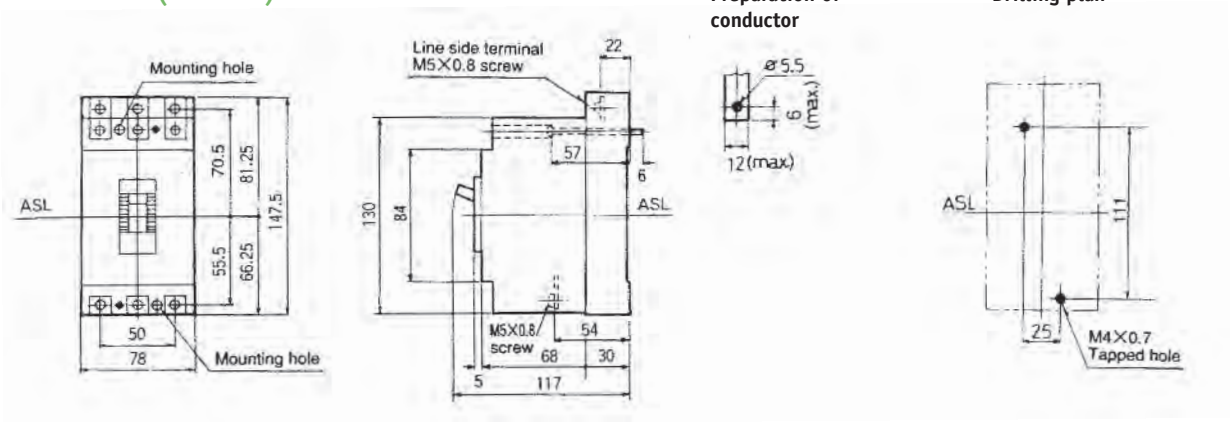
MCCB dimensions and mounting

MCCB Technical data
TemBreak 1 – XM30PB

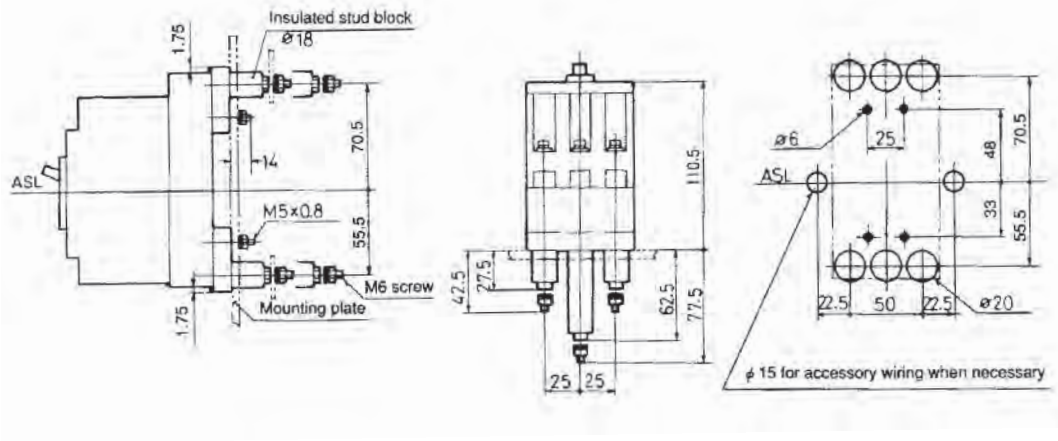
ASL: Arrangement Standard Line
℄: Handle Frame Centre Line

Outline dimensions (mm)

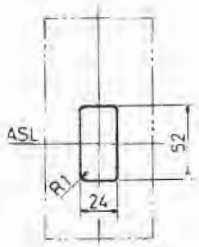
Front connected (standard)



Rear connected (optional)

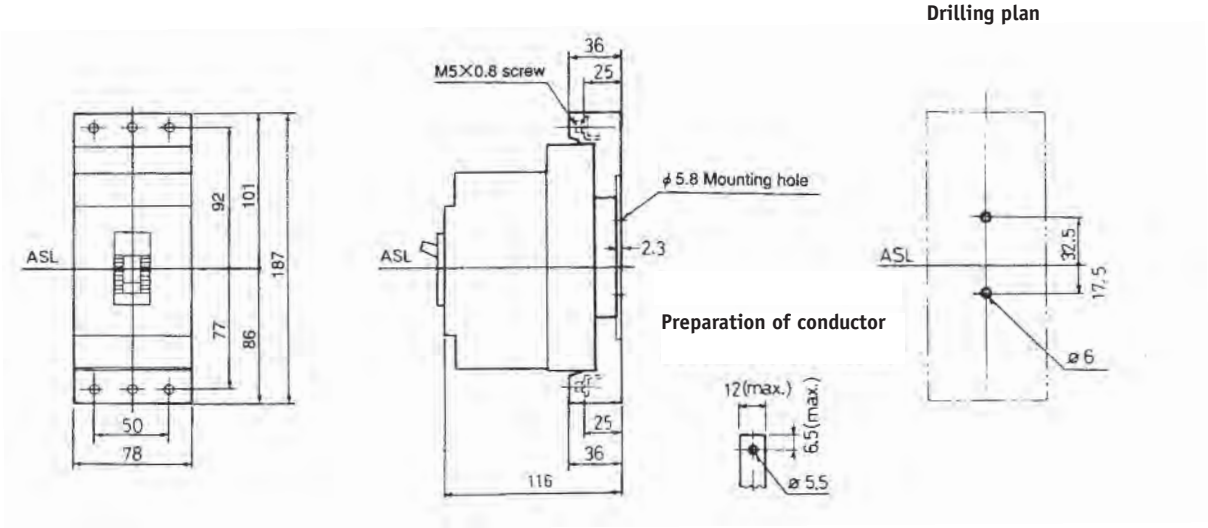


Panel cut-out



Panel cut-out dimensions shown give an allowance of 1.0 mm around the handle escutcheon.

Plug-in (optional)

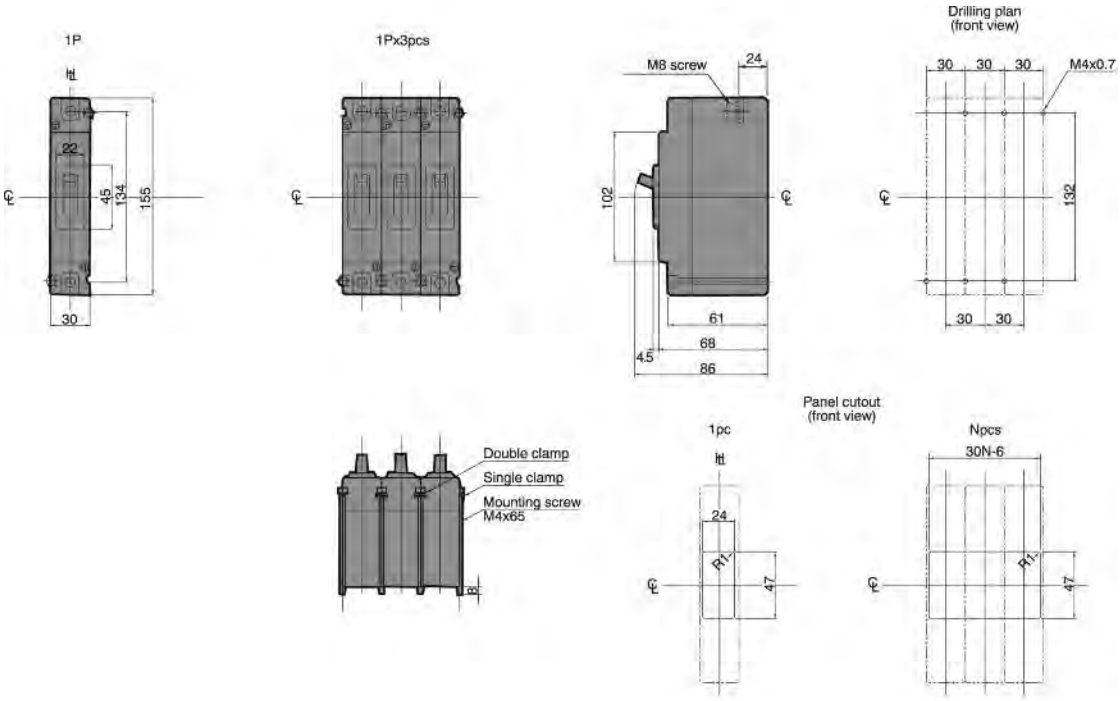


TemBreak 2 MCCB Dimensions
S125-NF, S160-NF

ASL: Arrangement Standard Line
HL: Handle Frame Centre Line

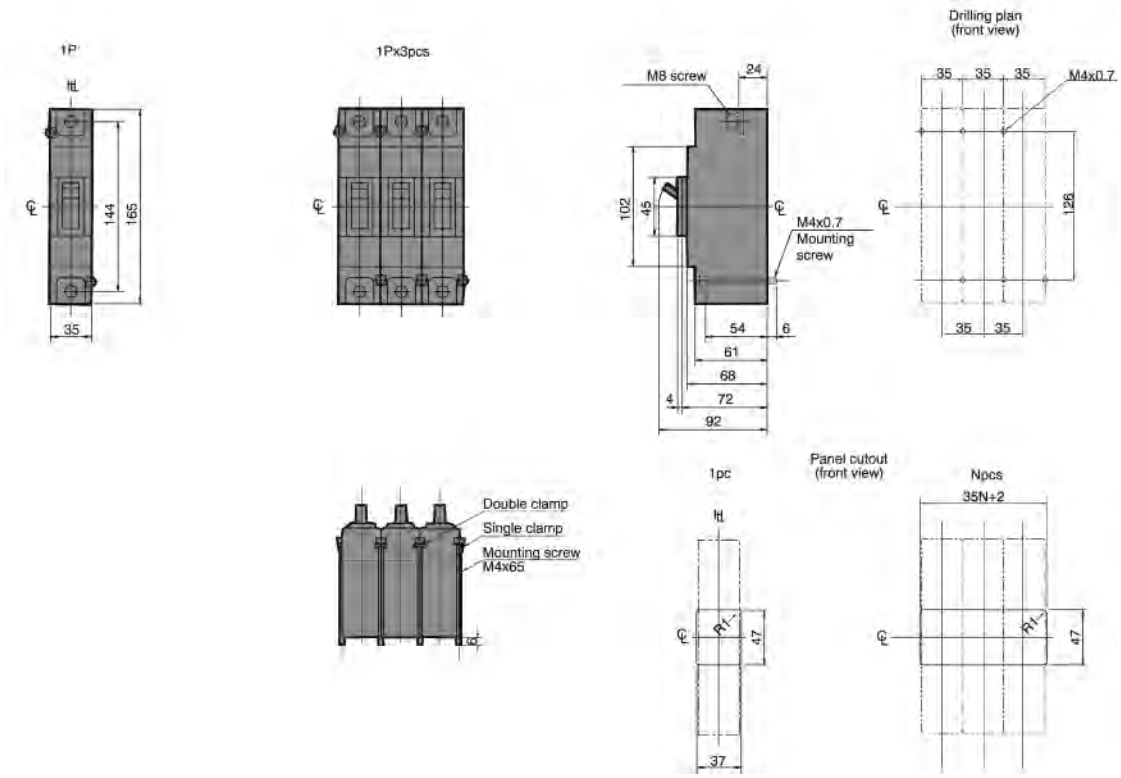
Outline dimensions (mm) S125-NF — 125 AF 1 Pole

Front connected



Outline dimensions (mm) S160-NF — 250 AF 1 Pole

Front connected



TemBreak 2 MCCB Dimensions
E125-NJ, S125-NJ, S125-GJ, S100GF, ZS125GJ

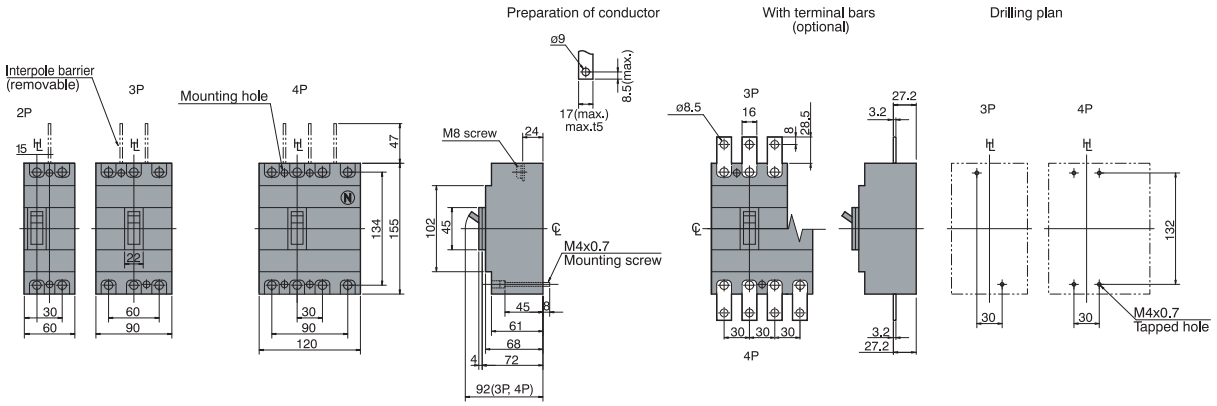
ASL: Arrangement Standard Line
: Handle Frame Centre Line

5

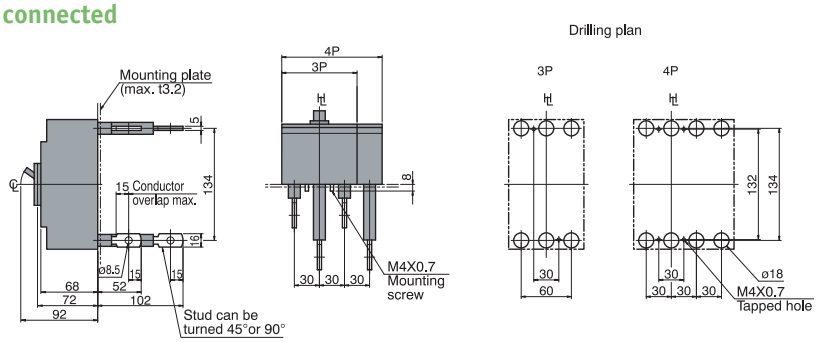
Outline dimensions (mm)

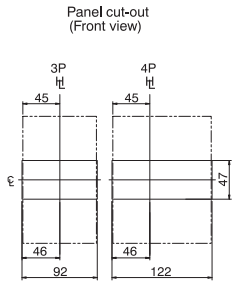
125 AF

Front connected



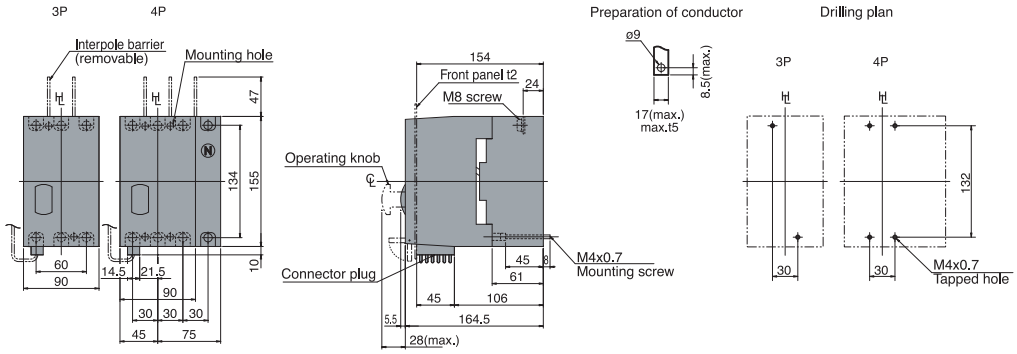
Rear connected

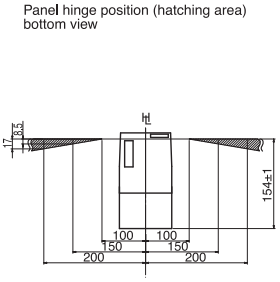




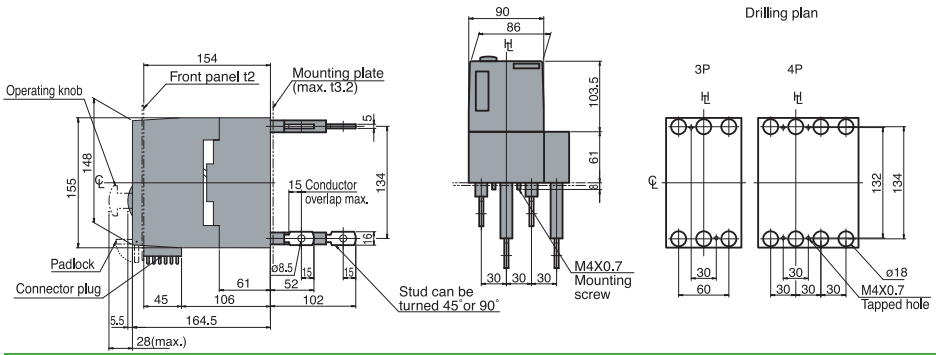
Panel cut-out dimensions shown give an allowance of 1.0mm around the handle escutcheon.

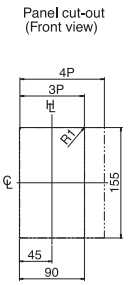
Front connected with Motor Operator





Rear connected with Motor Operator





Panel cut-out dimensions shown give an allowance of 1.5mm around the handle escutcheon.

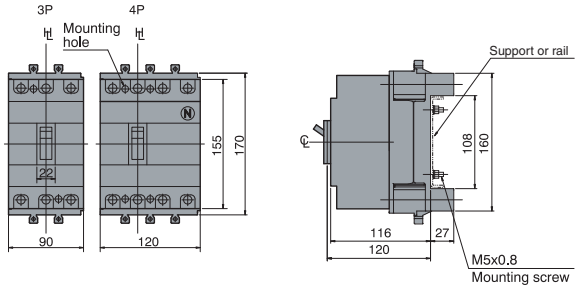
TemBreak 2 MCCB Dimensions
E125-NJ, S125-NJ, S125-GJ, ZS125GJ
Plug-in versions (T2 PM Plug-in base)

ASL: Arrangement Standard Line
H: Handle Frame Centre Line

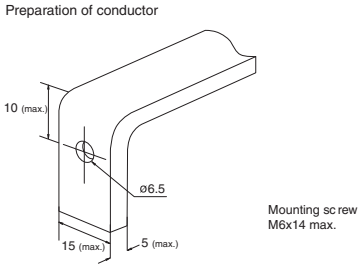
Outline dimensions (mm)

125 AF

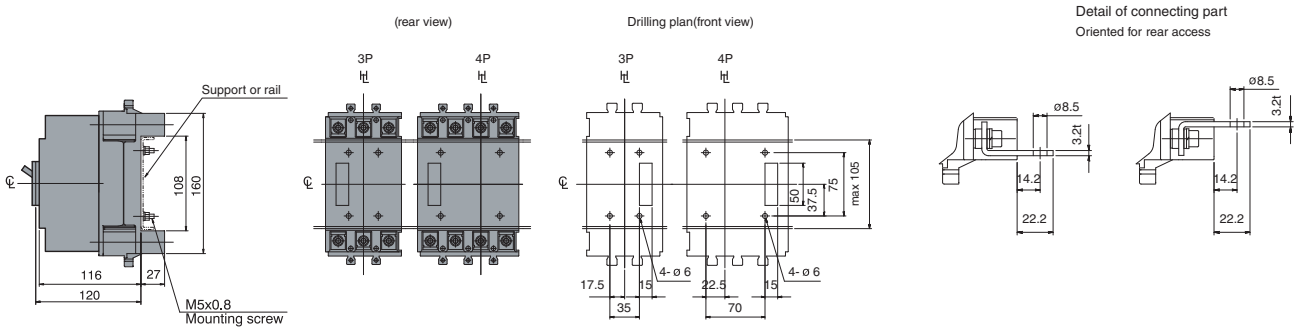
Plug-in



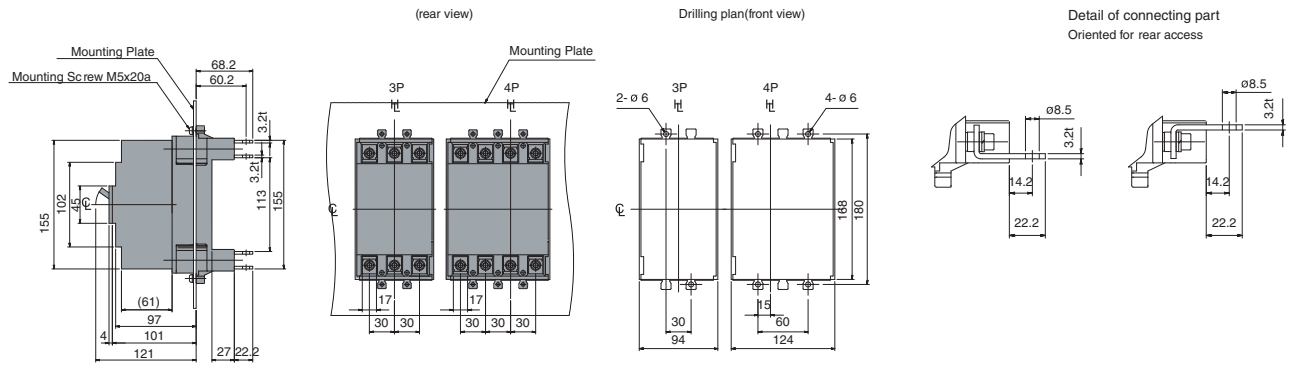
Termination of Busbar



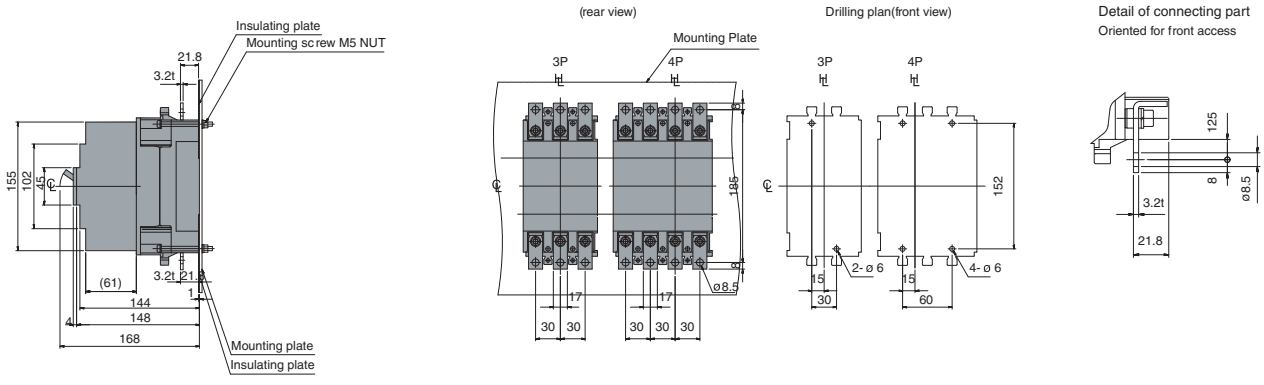
Mounting on a support or rails (shown with optional connection bars oriented for rear access)



Mounting through the backplate (shown with optional connection bars oriented for rear access)



Mounting on the backplate (optional connection bars **must** be oriented for front access)



Note that the insulation plate (supplied as standard) must be fitted between the base and the backplate.

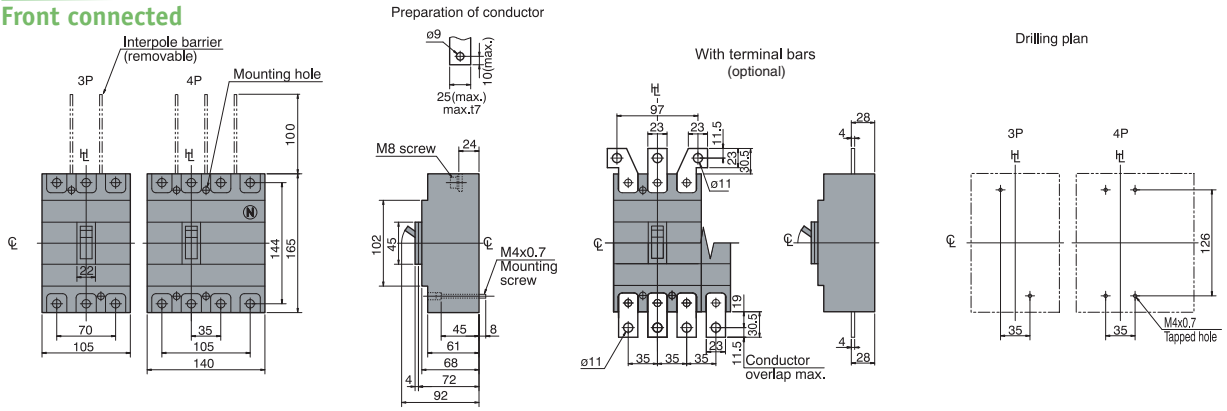
TemBreak 2 MCCB Dimensions
S160-NJ, S160-GJ, E250-NJ, S250-NJ, S250-GJ, ZS160GJ, ZS250GJ

ASL: Arrangement Standard Line
H: Handle Frame Centre Line

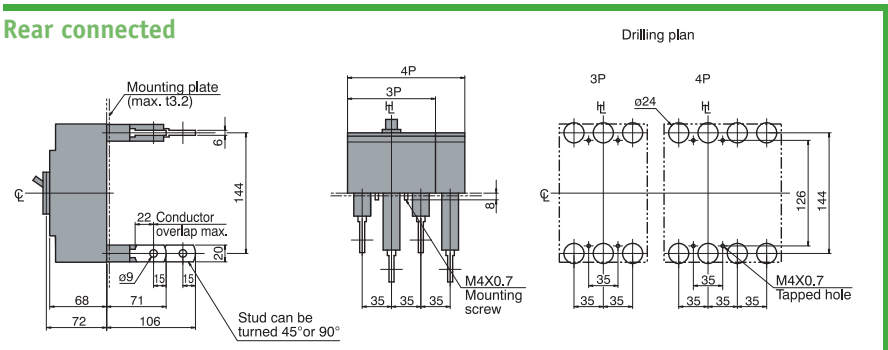
Outline dimensions (mm)

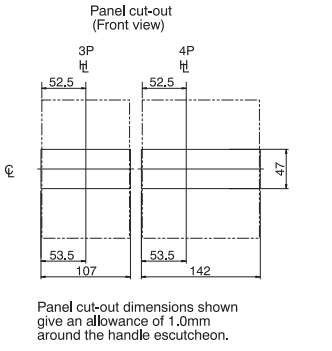
250 AF

Front connected

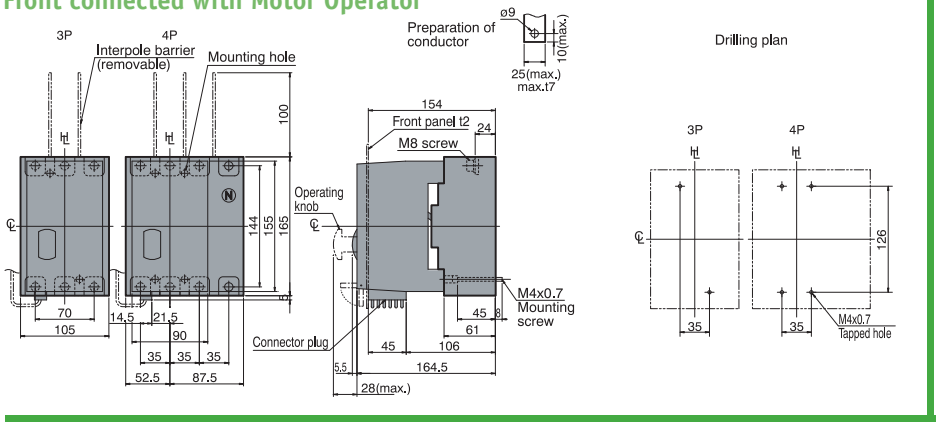


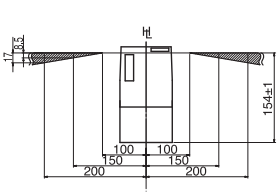
Rear connected



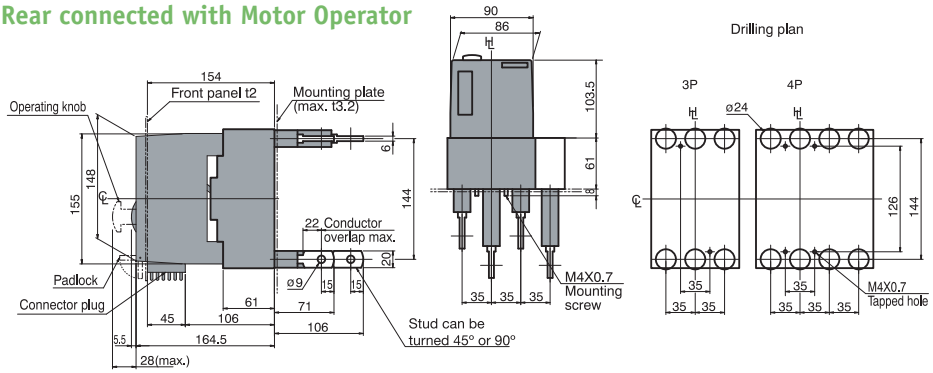


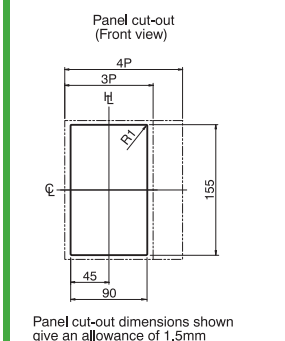
Front connected with Motor Operator





Rear connected with Motor Operator





TemBreak 2 MCCB Dimensions

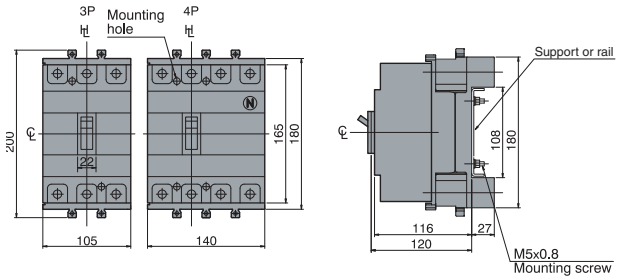
S160-NJ/GJ, E250-NJ, S250-NJ/GJ, ZS160GJ, ZS250GJ – Plug-in versions (T2 PM Plug-in-base)

ASL: Arrangement Standard Line
⊬: Handle Frame Centre Line

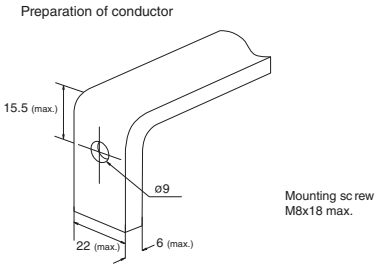
Outline dimensions (mm)

250 AF

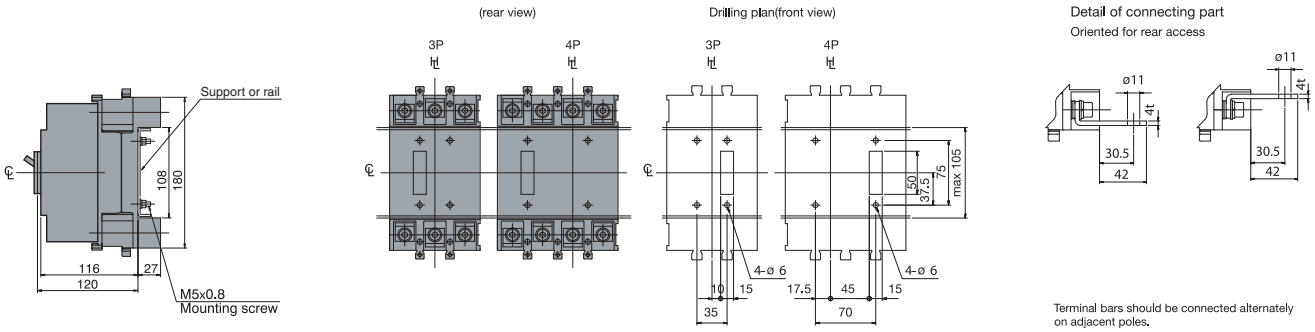
Plug-in



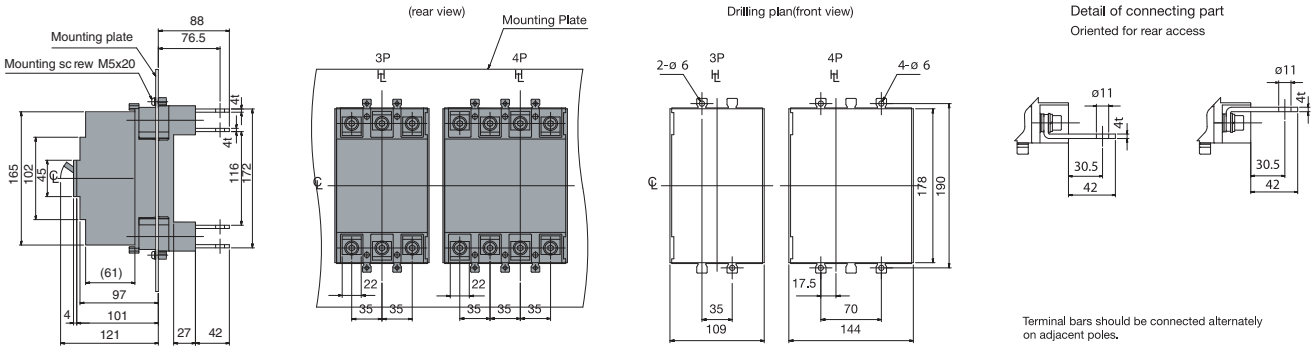
Termination of Busbar



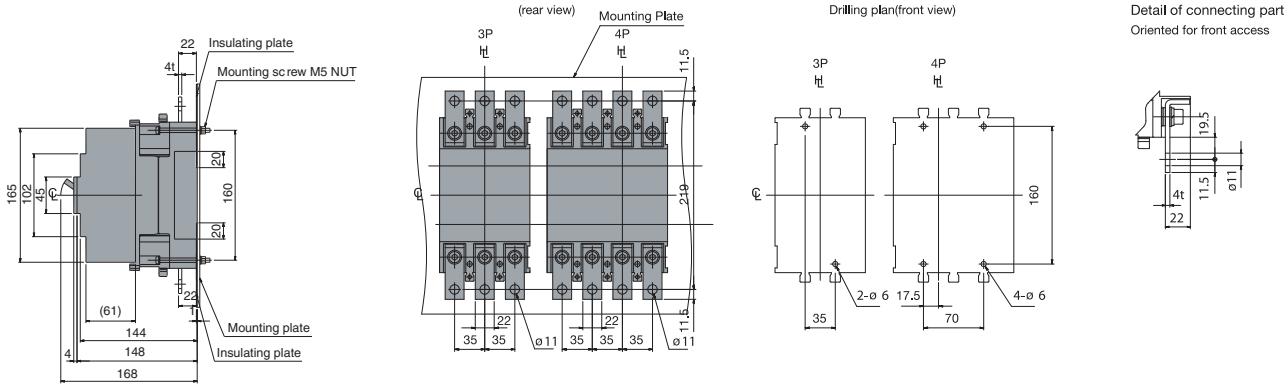
Mounting on a support or rails (shown with optional connection bars oriented for rear access)



Mounting through the backplate (shown with optional connection bars oriented for rear access)



Mounting on the backplate (optional connection bars **must** be oriented for front access)



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TemBreak 2 MCCB Dimensions

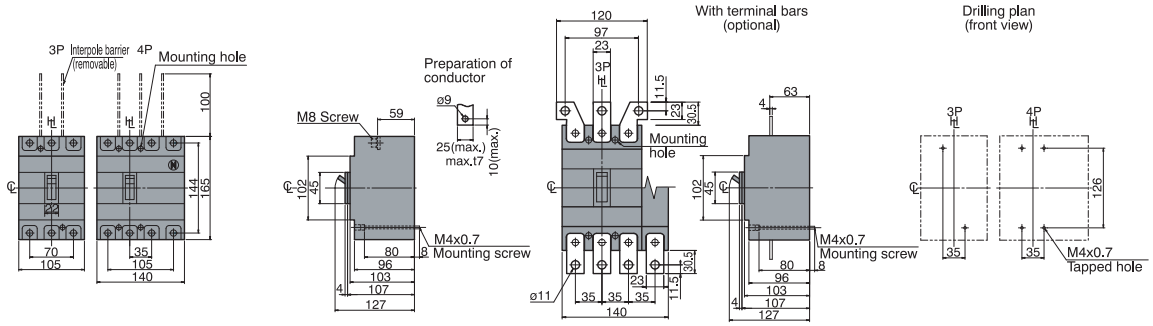
H125-NJ, L125-NJ, H160-NJ, L160-NJ, S250-NE, H250-NJ, H250-NE, L250-NJ

ASL: Arrangement Standard Line
H: Handle Frame Centre Line

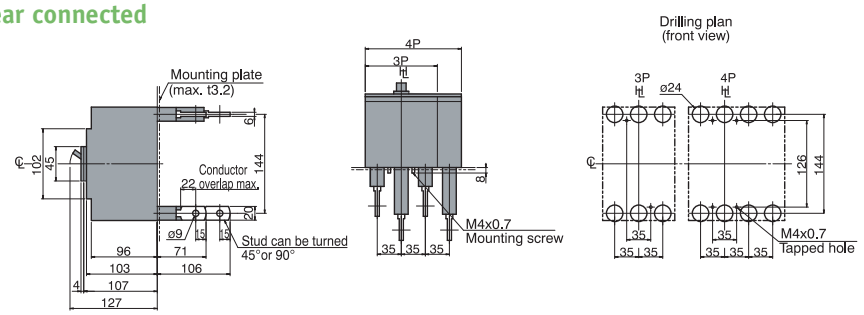
Outline dimensions (mm)

250 AF

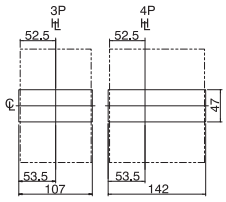
Front connected



Rear connected

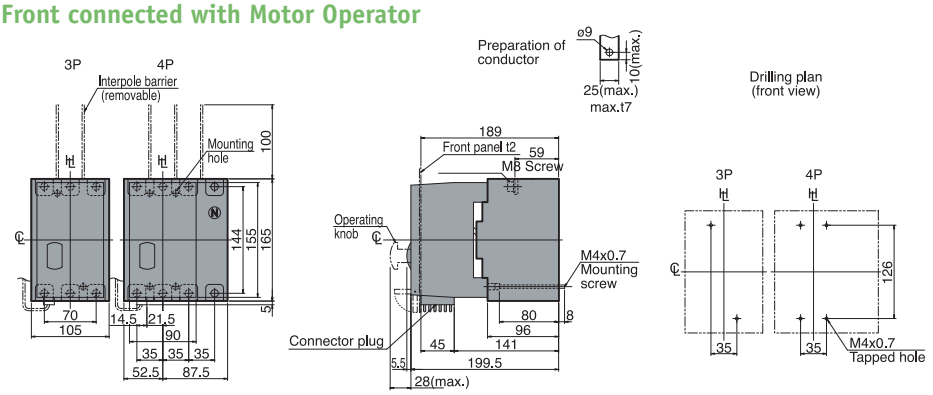


Panel cut-out (front view)

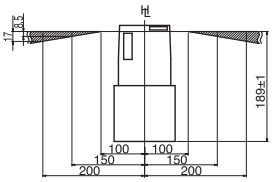


Panel cut-out dimensions shown give an allowance of 1.0mm around the handle escutcheon.

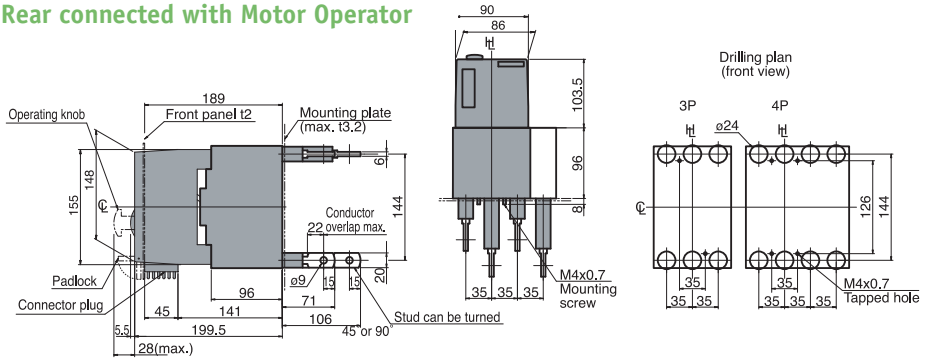
Front connected with Motor Operator



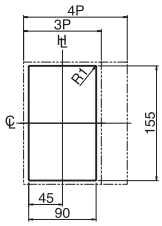
Panel hinge position (hatching area) bottom view



Rear connected with Motor Operator



Panel cut-out (front view)



Panel cut-out dimensions shown give an allowance of 1.5mm around the handle escutcheon.

ASL: Arrangement Standard Line
H: Handle Frame Centre Line

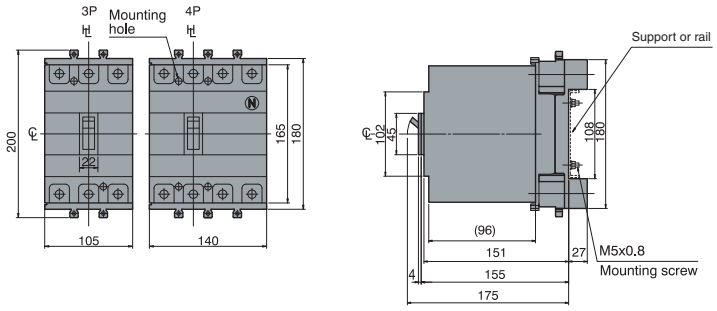
TemBreak 2 MCCB Dimensions

H125-NJ, L125-NJ, H160-NJ, L160-NJ, S250-PE, H250-NE/NJ, L250-NJ Plug-in versions (T2 PM Plug-in base)

Outline dimensions (mm)

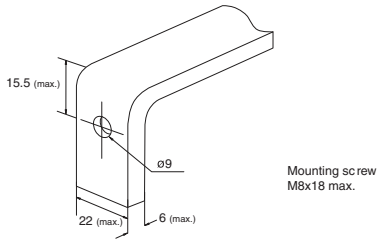
250 AF

Plug-in



Termination of Busbar

Preparation of conductor



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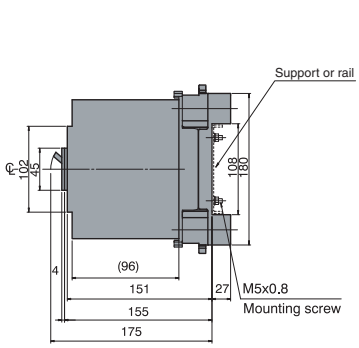
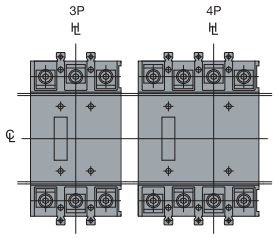
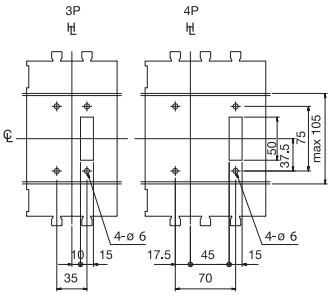
Mounting on a support or rails (shown with optional connection bars oriented for rear access)



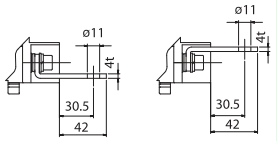
(rear view)



Drilling plan(front view)

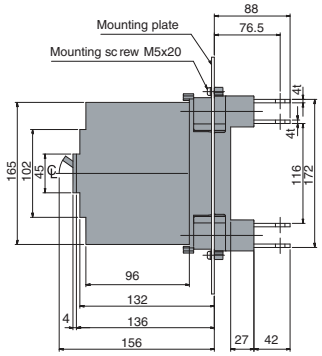


Detail of connecting part
Oriented for rear access

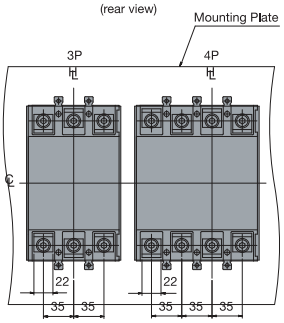


Terminal bars should be connected alternately on adjacent poles.

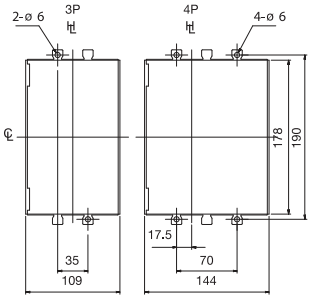
Mounting through the backplate (shown with optional connection bars oriented for rear access)



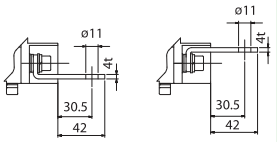
(rear view)



Drilling plan(front view)

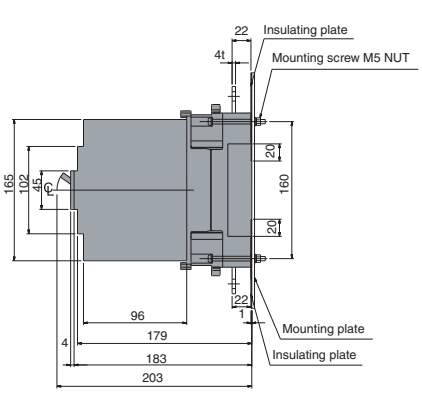


Detail of connecting part
Oriented for rear access

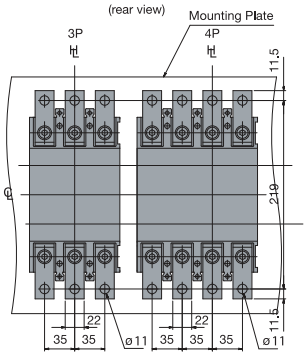


Terminal bars should be connected alternately on adjacent poles.

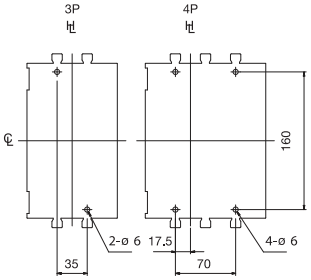
Mounting on the backplate (optional connection bars **must** be oriented for front access)



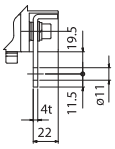
(rear view)



Drilling plan(front view)



Detail of connecting part
Oriented for front access



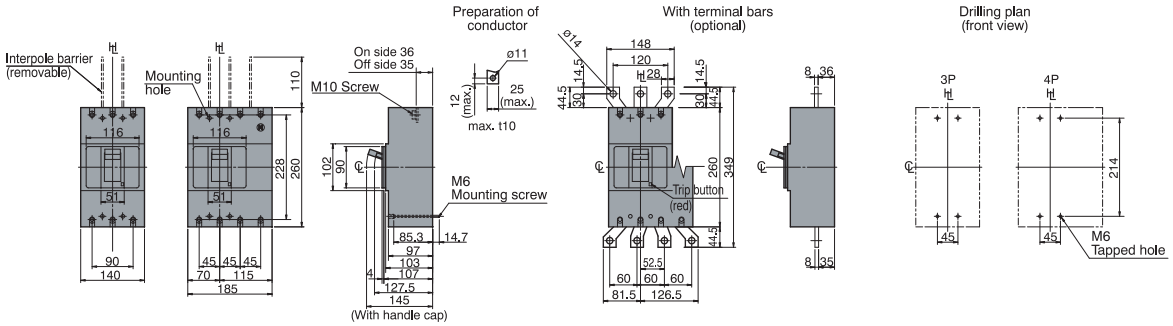
TemBreak 2 MCCB Dimensions
E400-NJ, S400-CJ, S400-NJ, S400-NE, S400-GJ, S400-GE, S400-PE

ASL: Arrangement Standard Line
H: Handle Frame Centre Line

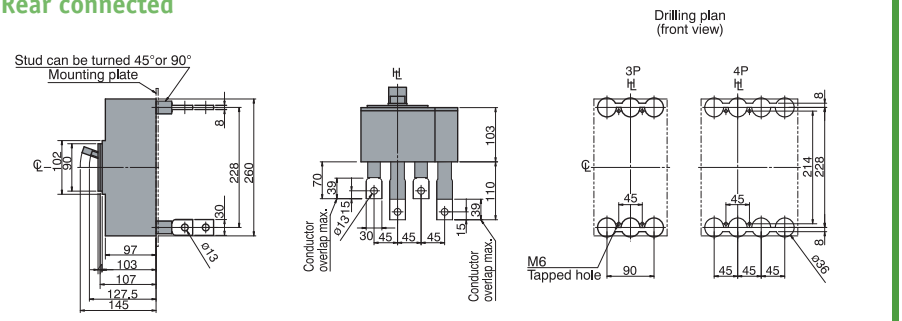
Outline dimensions (mm)

400/630 AF

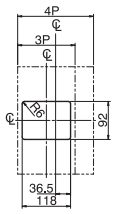
Front connected



Rear connected

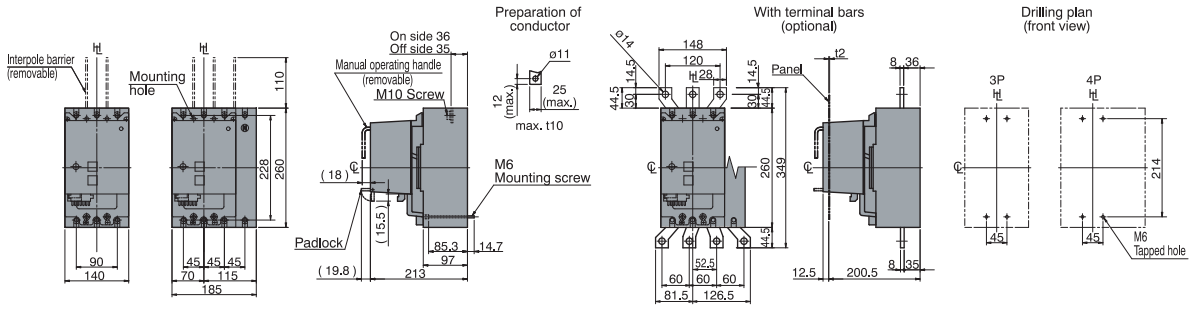


Panel cut-out (front view)

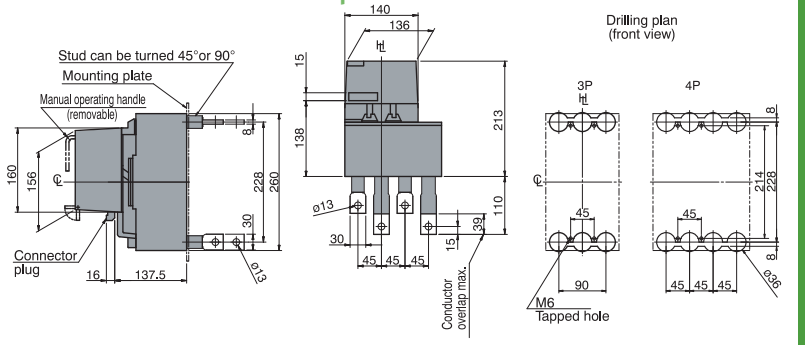


Panel cut-out dimensions shown give an allowance of 1.0mm around the handle escutcheon.

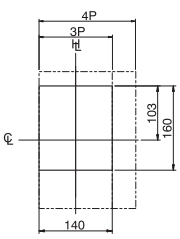
Front connected with Motor Operator



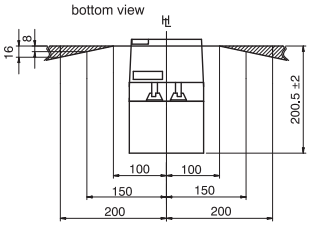
Rear connected with Motor Operator



Panel cut-out (front view)



Panel hinge position (hatching area)
bottom view



Panel cut-out dimensions shown give an allowance of 1.5mm around motor operator

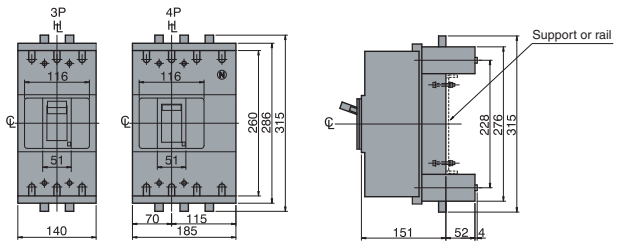
ASL: Arrangement Standard Line
H: Handle Frame Centre Line

TemBreak 2 MCCB Dimensions
E400-NJ, S400-CJ, S400-NJ, S400-NE, S400-GJ, S400-GE, S400-PE Plug-in versions

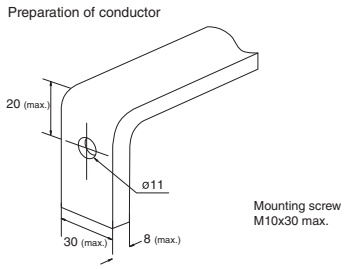
Outline dimensions (mm)

400/630 AF

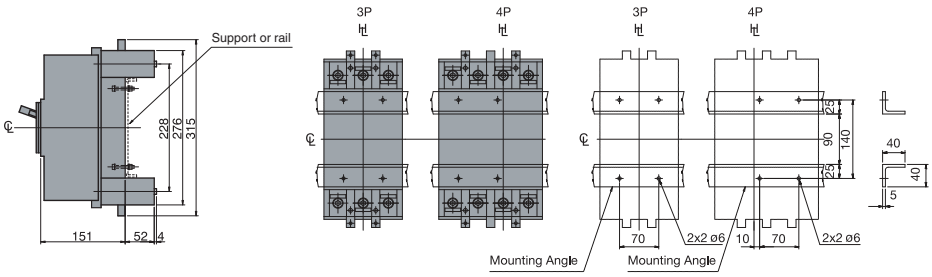
Plug-in



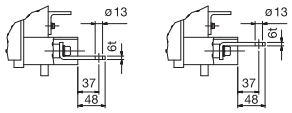
Termination of Busbar



Mounting on a support or rails (shown with optional connection bars oriented for rear access)

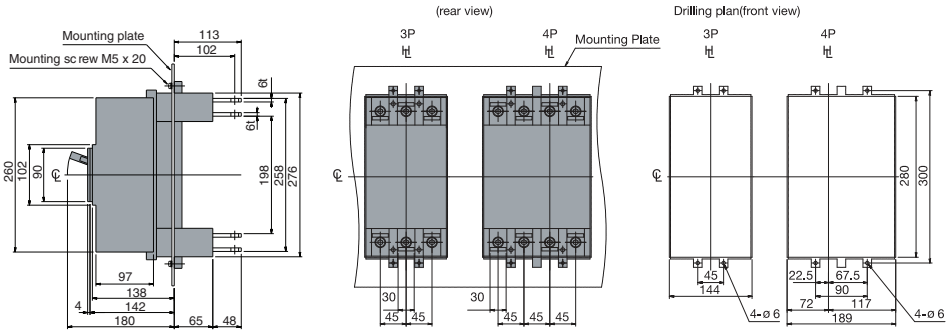


Detail of connecting part
Oriented for rear access

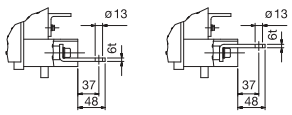


Terminal bars should be connected alternately on adjacent poles.

Mounting through the backplate (shown with optional connection bars oriented for rear access)

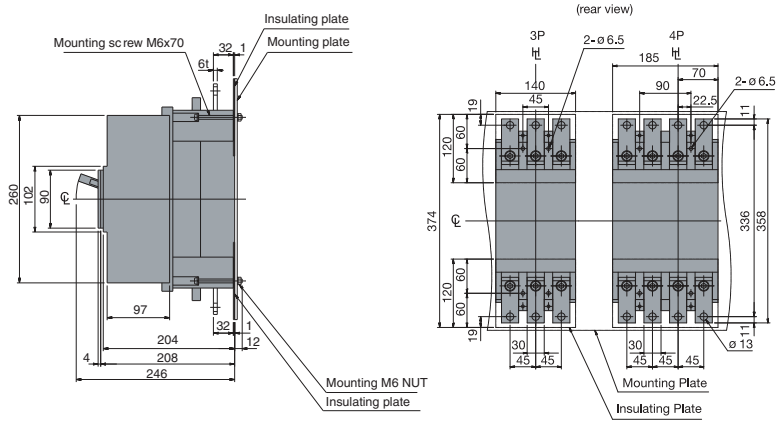


Detail of connecting part
Oriented for rear access

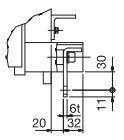


Terminal bars should be connected alternately on adjacent poles.

Mounting on the backplate (optional connection bars **must** be oriented for front access)



Detail of connecting part
Oriented for front access



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TemBreak 2 MCCB Dimensions
H400-NE, L400-NE

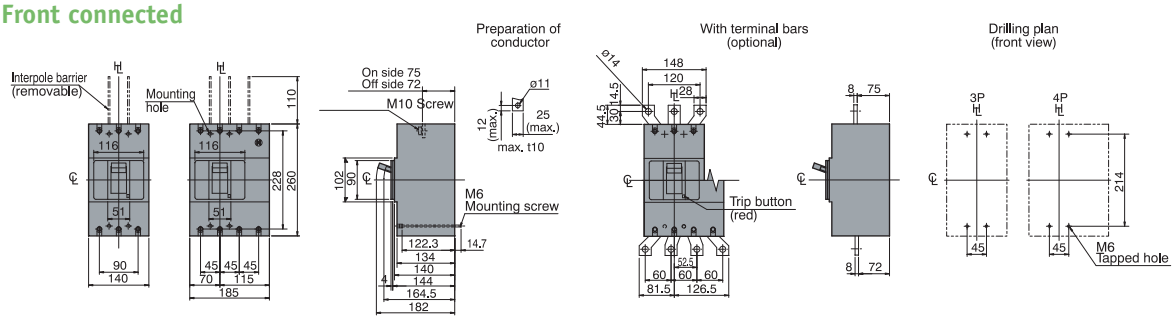
ASL: Arrangement Standard Line
: Handle Frame Centre Line

Outline dimensions (mm)

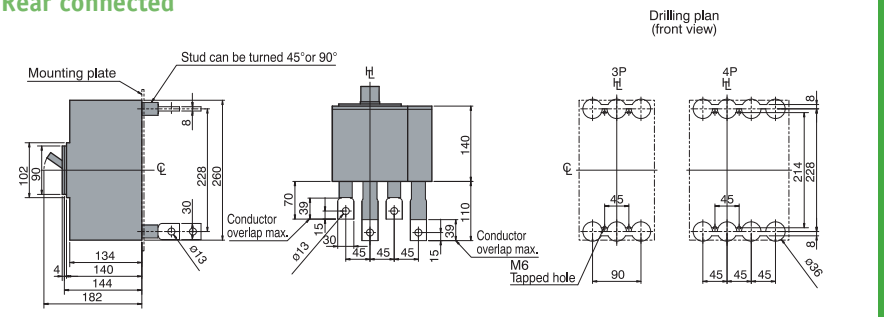
400/630 AF

5

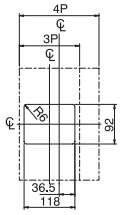
Front connected



Rear connected

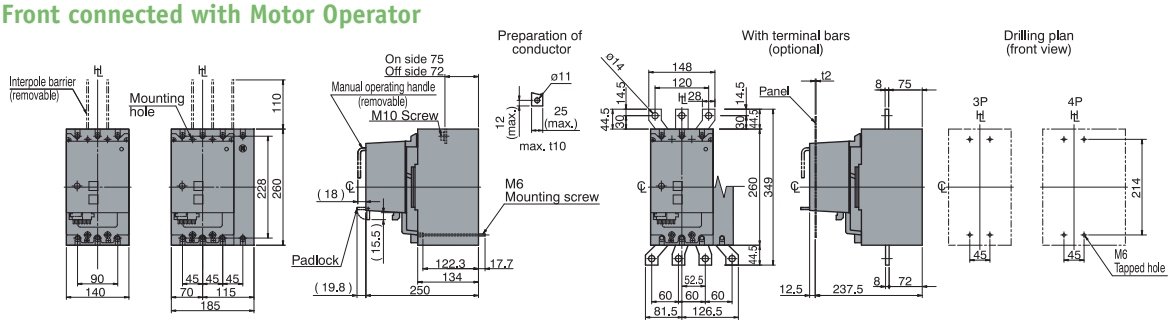


Panel cut-out (front view)

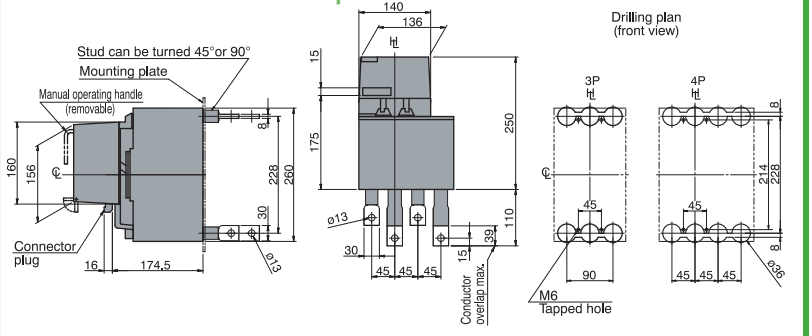


Panel cut-out dimensions shown give an allowance of 1.0mm around the handle escutcheon.

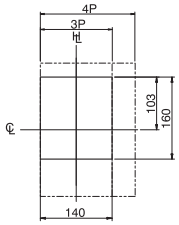
Front connected with Motor Operator



Rear connected with Motor Operator

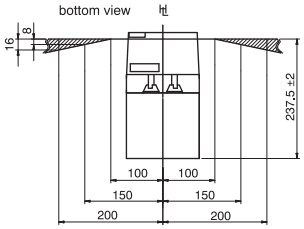


Panel cut-out (front view)



Panel cut-out dimensions shown give an allowance of 1.5mm around motor operator

Panel hinge position (hatching area)



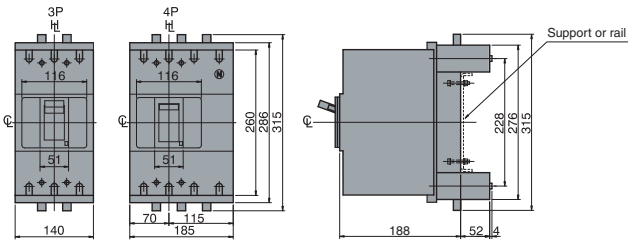
TemBreak 2 MCCB Dimensions
H400-NE, L400-NE
Plug-in versions (T2 PM plug-in base)

ASL: Arrangement Standard Line
℄: Handle Frame Centre Line

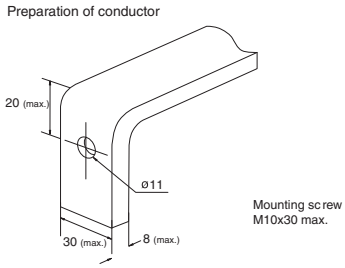
Outline dimensions (mm)

400/630 AF

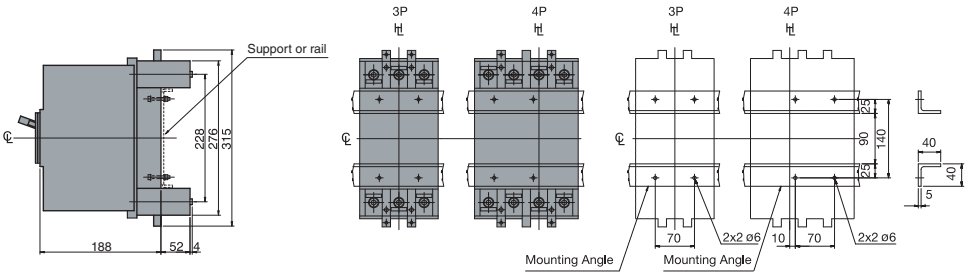
Plug-in



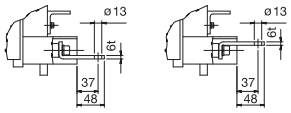
Termination of Busbar



Mounting on a support or rails (shown with optional connection bars oriented for rear access)

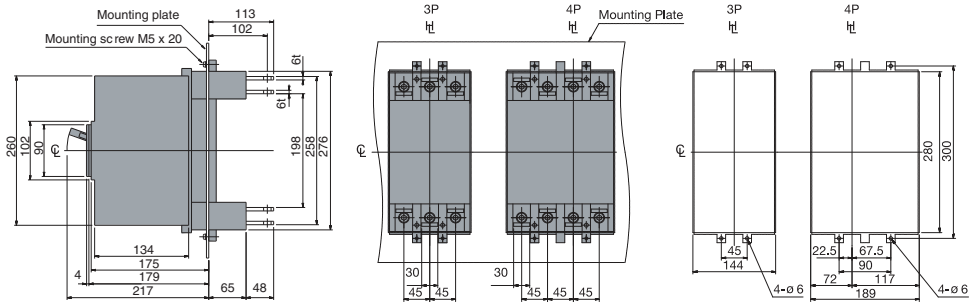


Detail of connecting part
Oriented for rear access

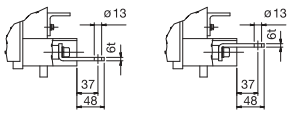


Terminal bars should be connected alternately on adjacent poles.

Mounting through the backplate (shown with optional connection bars oriented for rear access)

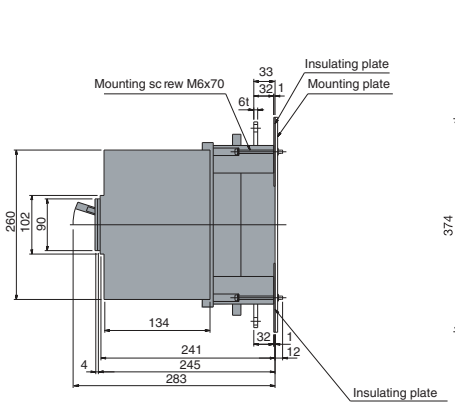


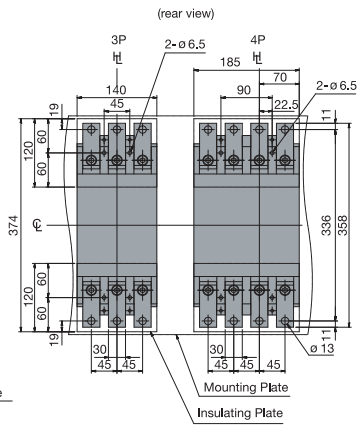
Detail of connecting part
Oriented for rear access

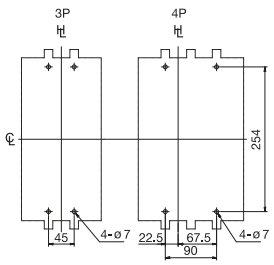


Terminal bars should be connected alternately on adjacent poles.

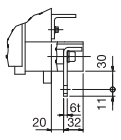
Mounting on the backplate (optional connection bars **must** be oriented for front access)







Detail of connecting part
Oriented for front access



TemBreak 2 MCCB Dimensions

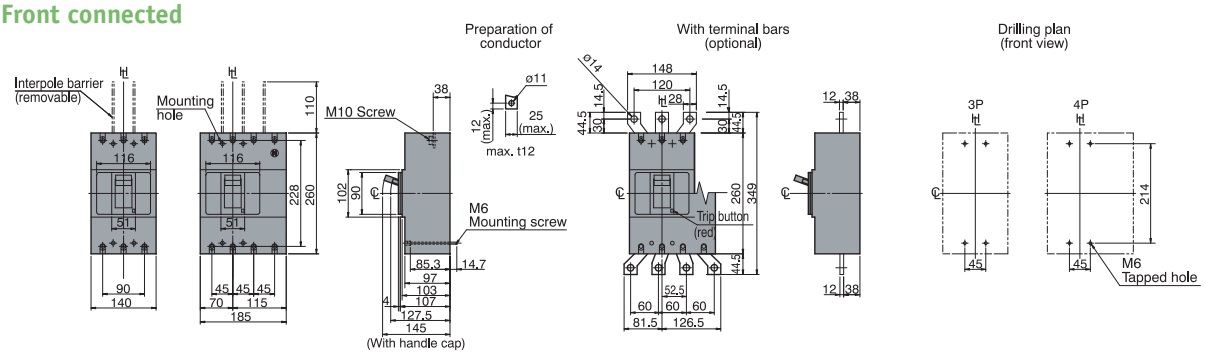
E630-NE, S630-CE, S630-GE

ASL: Arrangement Standard Line
H: Handle Frame Centre Line

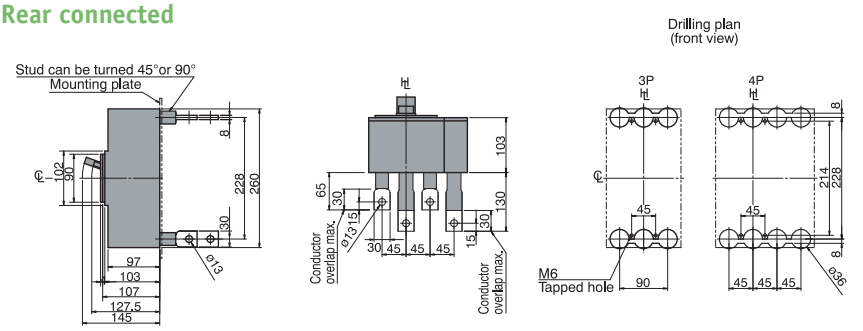
Outline dimensions (mm)

400/630 AF

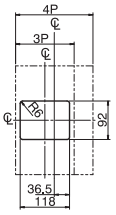
Front connected



Rear connected



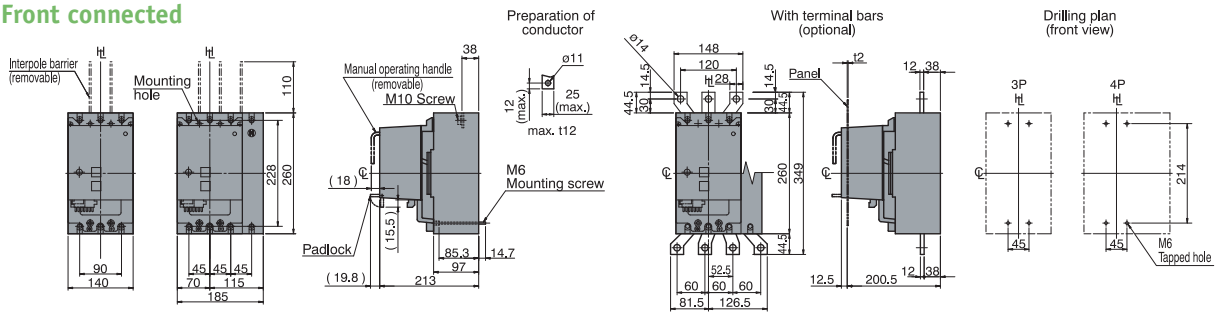
Panel cut-out (front view)



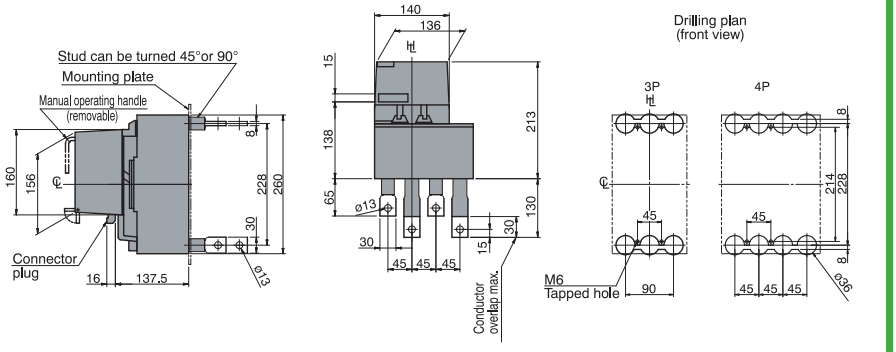
Panel cut-out dimensions shown give an allowance of 1.0mm around the handle escutcheon.

E630-NE, S630-CE, S630-GE with Motor Operator

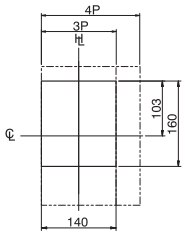
Front connected



Rear connected with Motor Operator



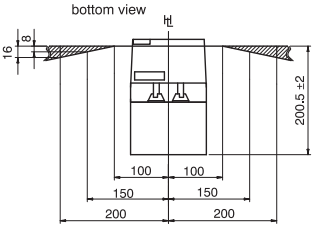
Panel cut-out (front view)



Panel cut-out dimensions shown give an allowance of 1.5mm around motor operator

Panel hinge position (hatching area)

bottom view

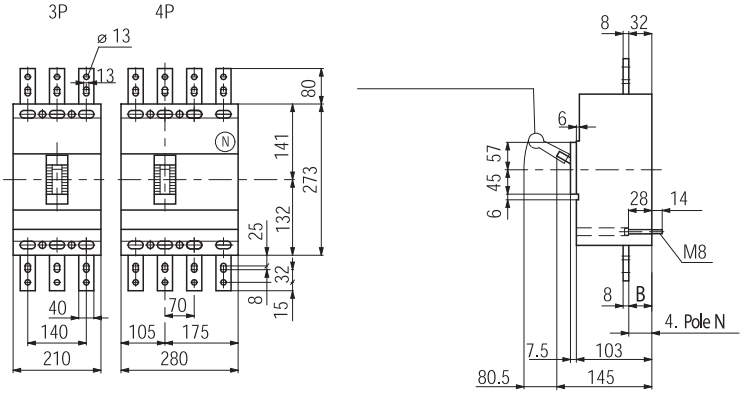


MCCB Technical data
TemBreak 1 – (630 AF) XS630, XH630

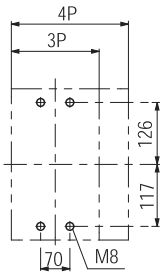
ASL: Arrangement Standard Line
H: Handle Frame Centre Line

Outline dimensions (mm)

Front connected (standard)

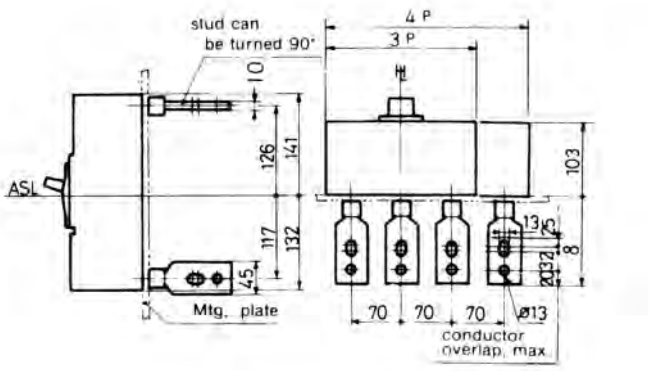


Drilling plan

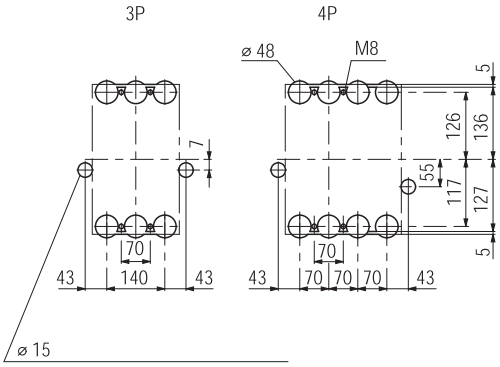


MCCB	B	N
XS630CJ, XS630NJ	34	36
XS630SE, XH630SE	36	36

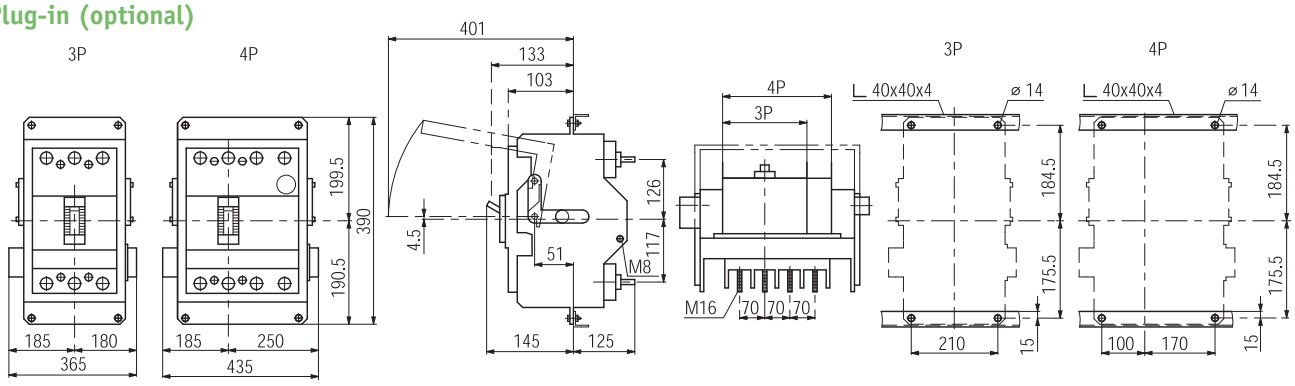
Rear connected (optional)



Drilling plan



Plug-in (optional)

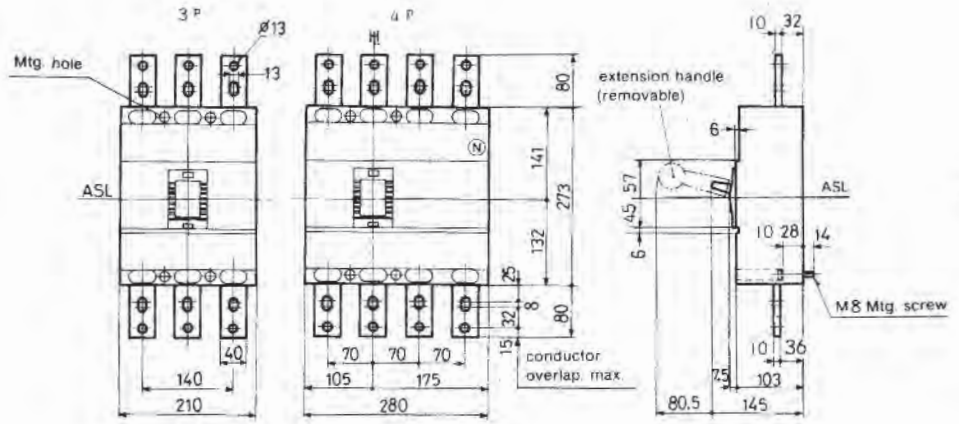


MCCB Technical data
TemBreak 1 – (800 AF) XS800, XH800

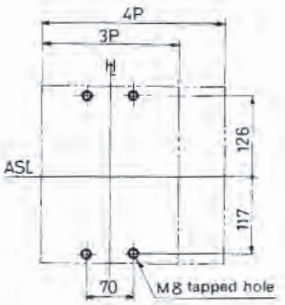
ASL: Arrangement Standard Line
H: Handle Frame Centre Line

Outline dimensions (mm)

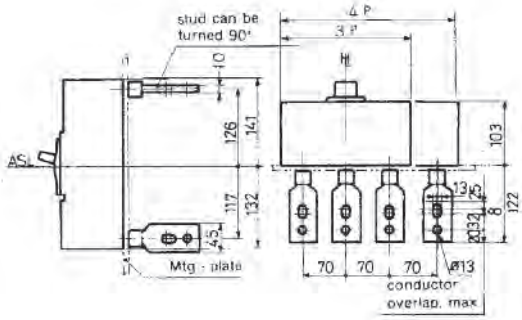
Front connected (standard)



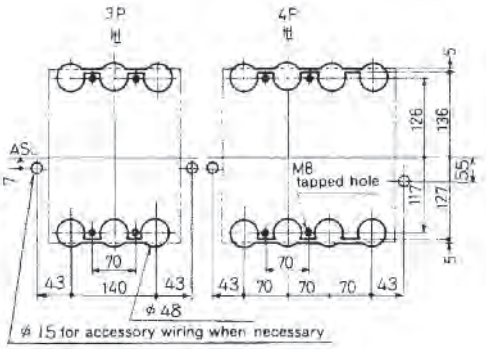
Drilling plan



Rear connected (optional)



Drilling plan

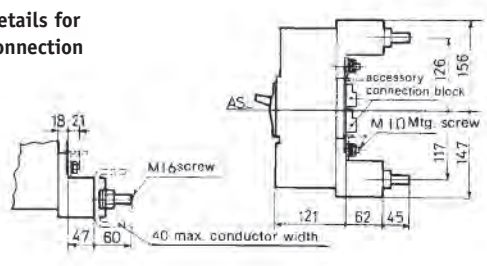


Panel cut-out

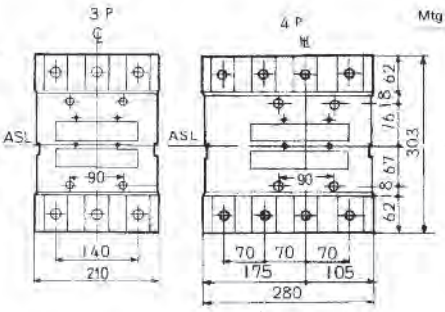
Panel cut-out dimensions shown give an allowance of 1.0 mm around the handle escutcheon.

Plug-in (optional)

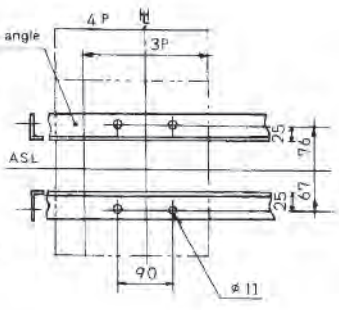
Details for connection



Mounting block



Drilling plan



MCCB Technical data

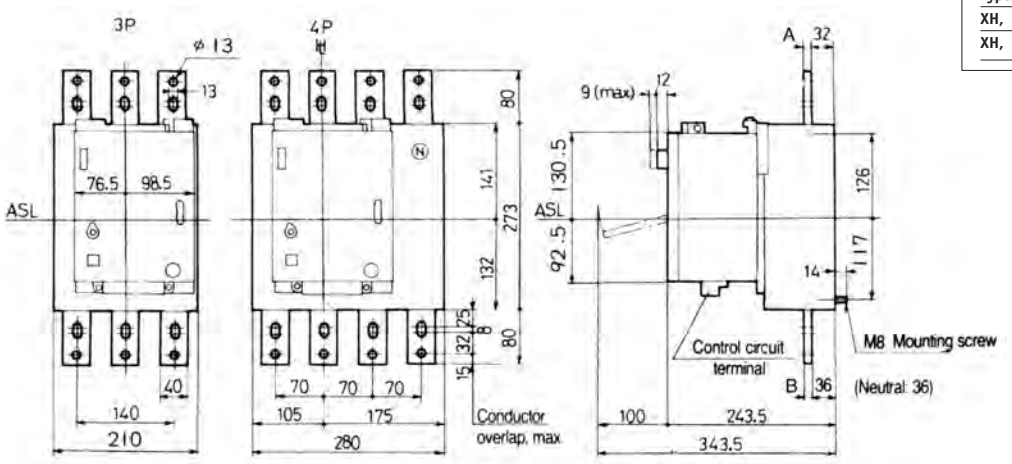
Motor operators (XMC type) for TemBreak 1
XS630, XH630, XS800, XH800

ASL: Arrangement Standard Line
: Handle Frame Centre Line

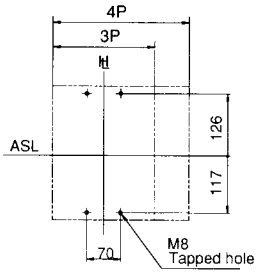
Outline dimensions (mm)

Front connected (standard)

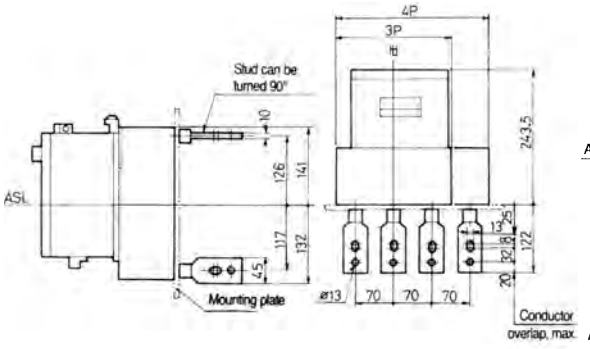
Types	A (mm)	N pole
XH, XV, XS800SE	10	36
XH, XV, XS630SE	8	36



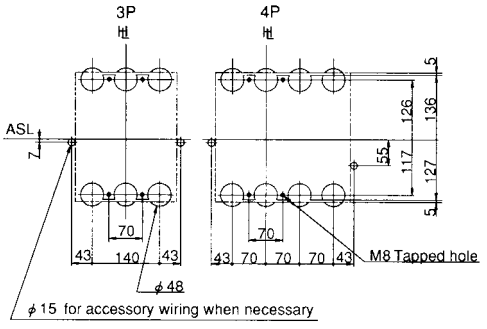
Drilling plan



Rear connected (optional)

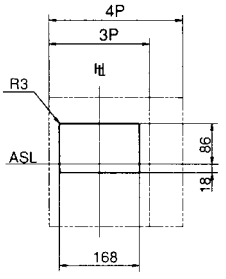


Drilling plan



Note: In the standard selection mode, terminals on both the line side and the load side are in a horizontal orientation.

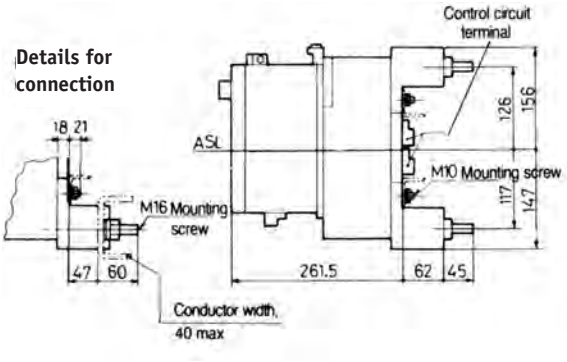
Panel cut-out



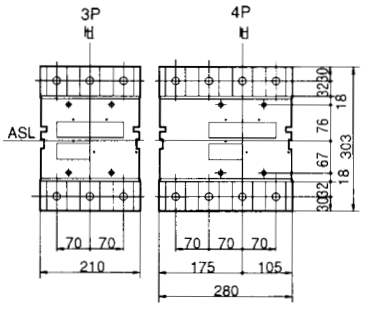
Panel cut-out dimensions shown give an allowance of 1.0 mm around the motor operator frame.

Plug-in (optional)

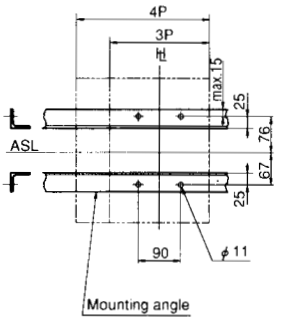
Details for connection



Mounting block



Drilling plan

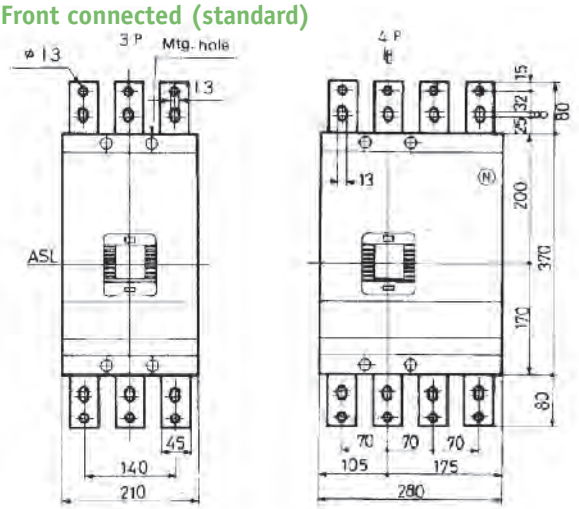


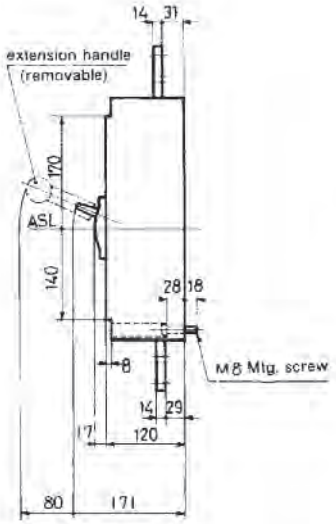
MCCB Technical data
TemBreak 1 – XS1250, XV1250

ASL: Arrangement Standard Line
⊬: Handle Frame Centre Line

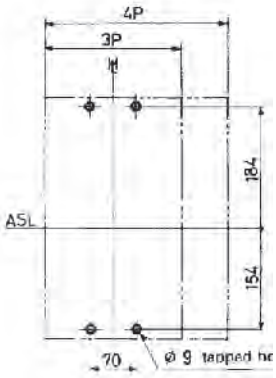
Outline dimensions (mm)

Front connected (standard)

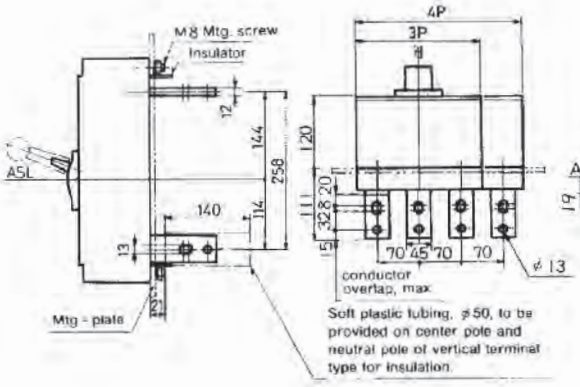




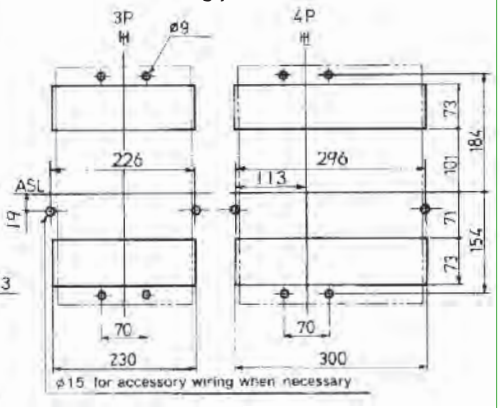
Drilling plan



Rear connected (optional)

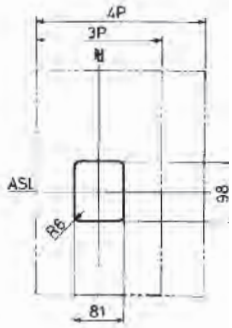


Drilling plan



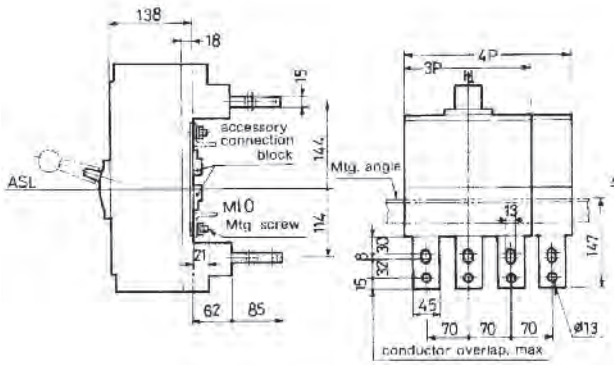
Note: In the standard shipment mode, terminals on both the line side and the load side are in a horizontal orientation.

Panel cut-out

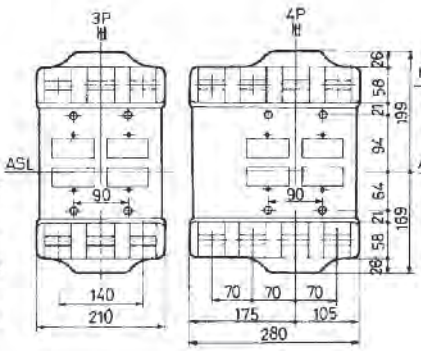


Panel cut-out dimensions shown give an allowance of 1.5 mm around the handle escutcheon.

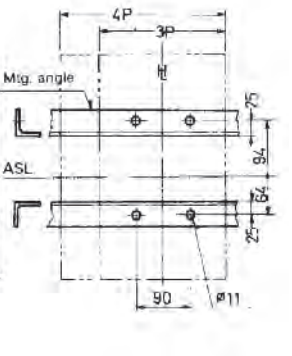
Plug-in (optional)



Mounting block



Drilling plan



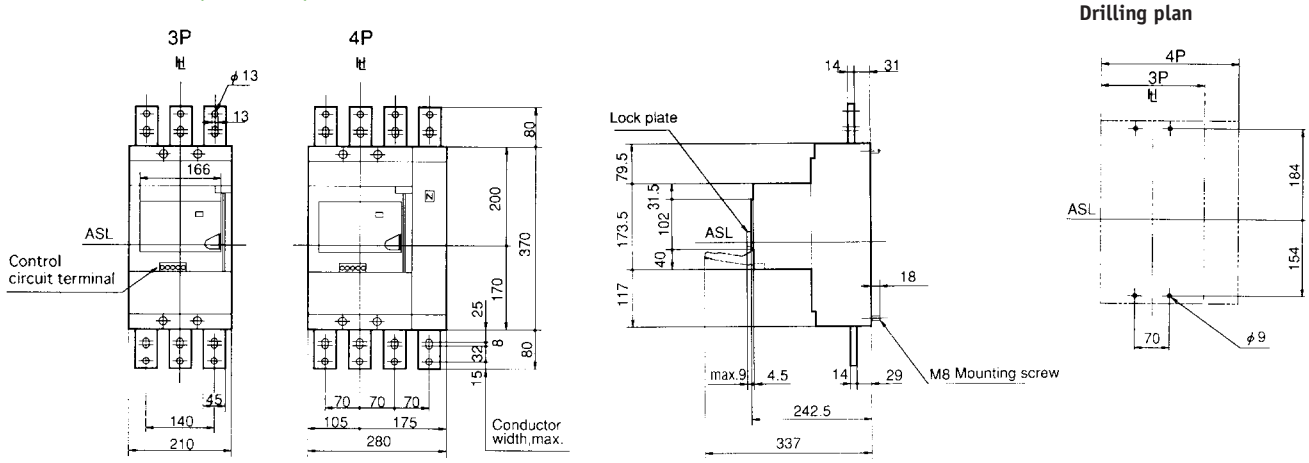
MCCB Technical data

Motor operators (XMD type) for TemBreak 1
XS1250, XV1250

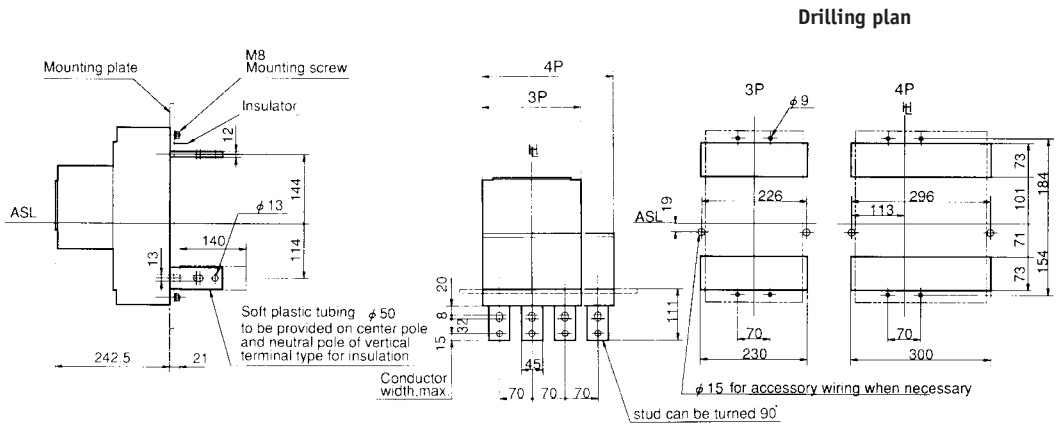
ASL: Arrangement Standard Line
: Handle Frame Centre Line

Outline dimensions (mm)

Front connected (standard)

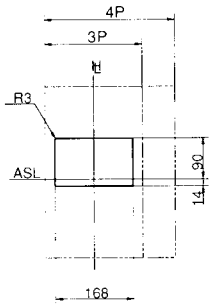


Rear connected (optional)



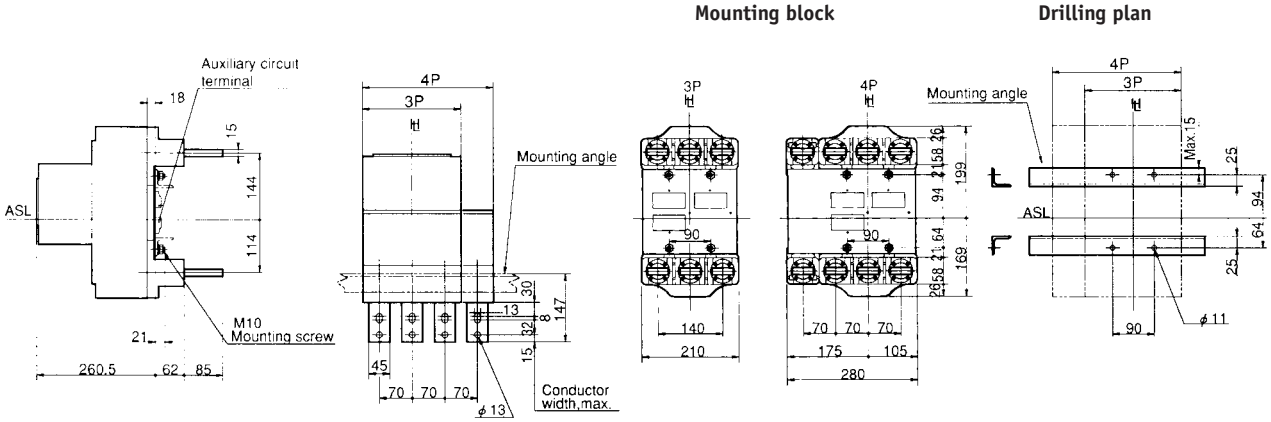
Note: In the standard selection mode, terminals on both the line side and the load side are in a horizontal orientation.

Panel cut-out



Panel cut-out dimensions shown give an allowance of 1.0 mm around the motor operator frame.

Plug-in (optional)



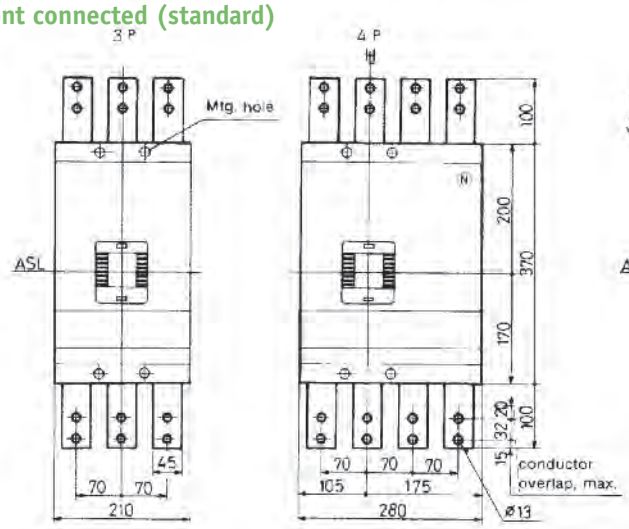
MCCB Technical data

TemBreak 1 – 1600 AF, XS1600SE, TL630, TL800, TL1250NE

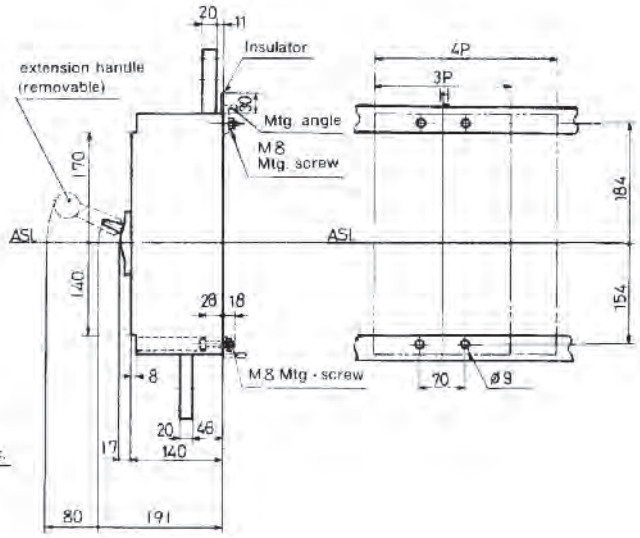
ASL: Arrangement Standard Line
H: Handle Frame Centre Line

Outline dimensions (mm)

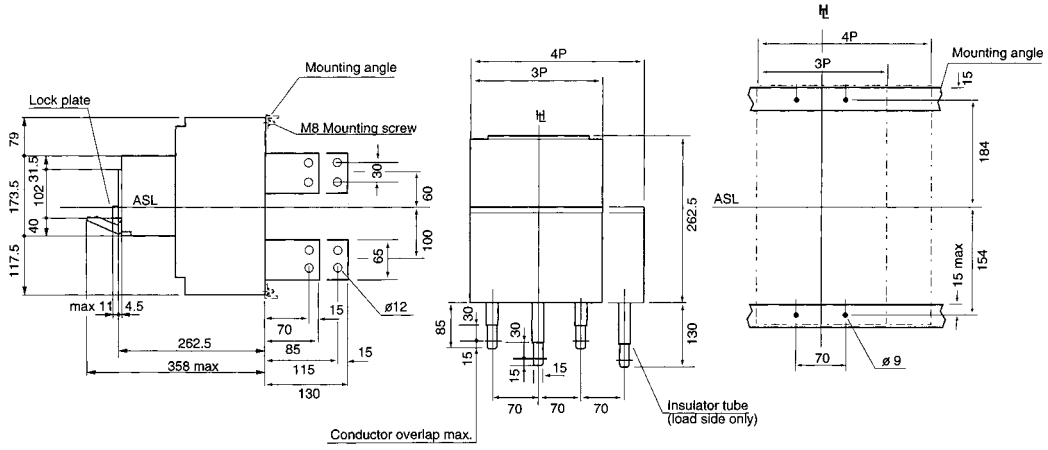
Front connected (standard)



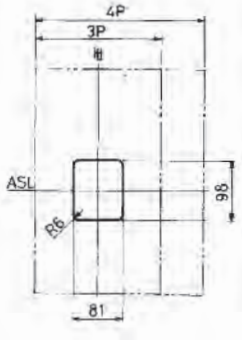
Drilling plan



Rear connected with motor operator

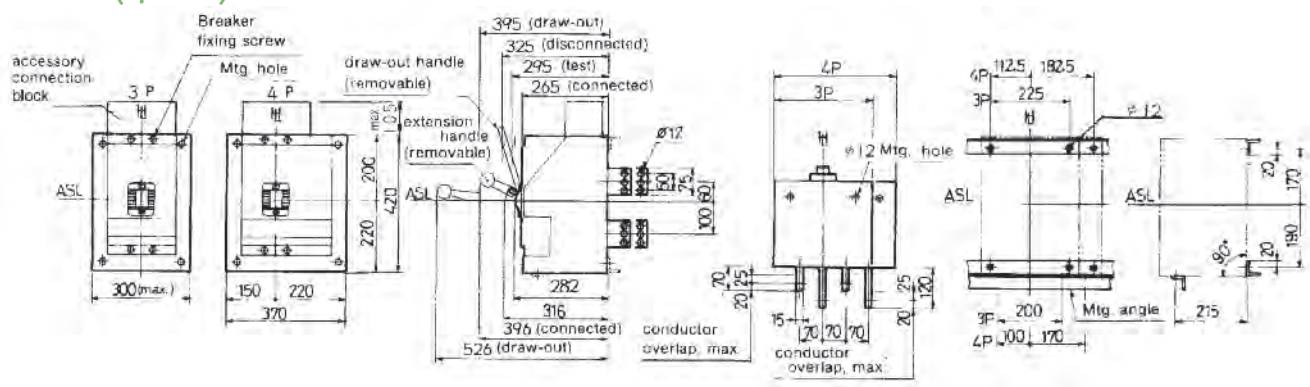


Panel cut-out



Panel cut-out dimensions shown give an allowance of 1.5 mm around the handle escutcheon.

Draw-out (optional)



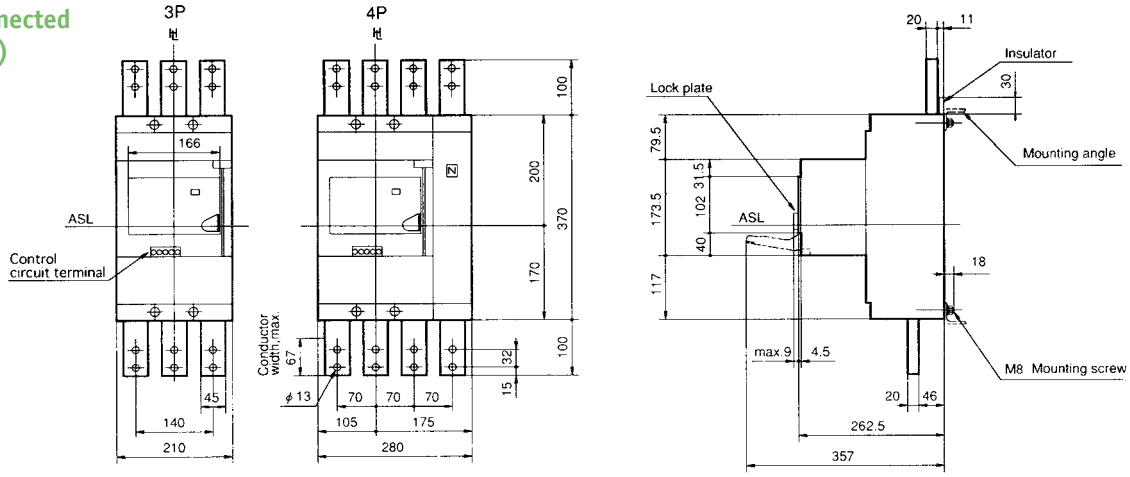
MCCB Technical data

ASL: Arrangement Standard Line
: Handle Frame Centre Line

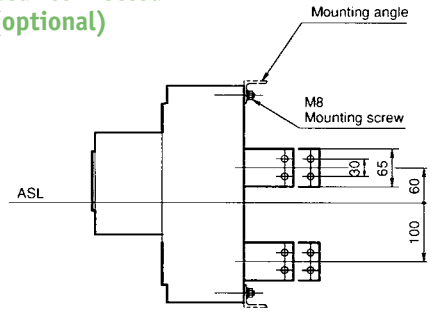
Motor operators (XMD type) for TemBreak 1
1600 AF, XS1600SE, TL630NE, TL800NE, TL1250NE

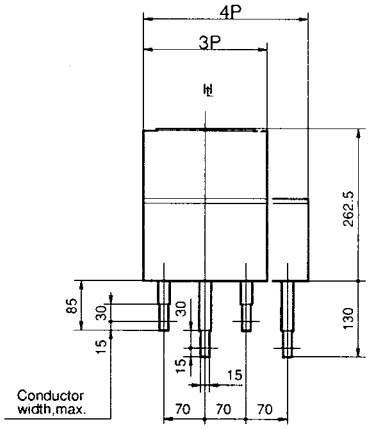
Outline dimensions (mm)

Front connected (standard)

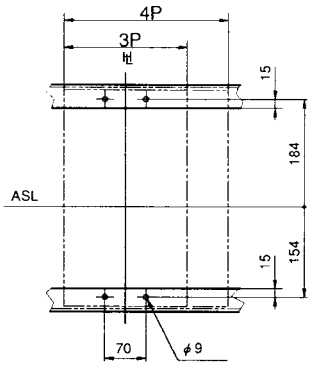


Rear connected (optional)

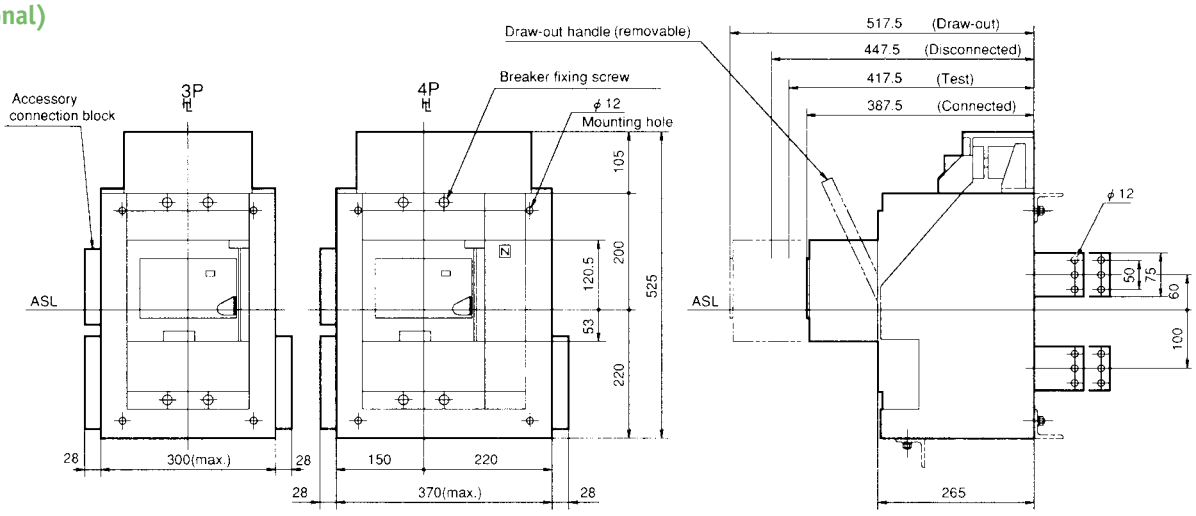




Drilling plan



Draw out (optional)



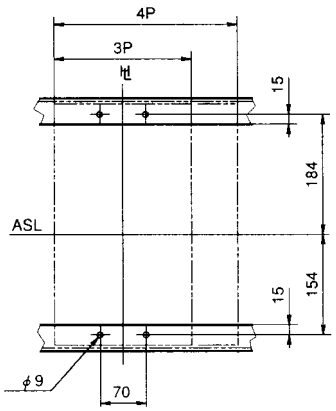
Motor operators (XMD type) for TemBreak 1 (Cont'd)
1600 AF, XS1600SE, TL630NE, TL800NE, TL1250NE

ASL: Arrangement Standard Line
: Handle Frame Centre Line

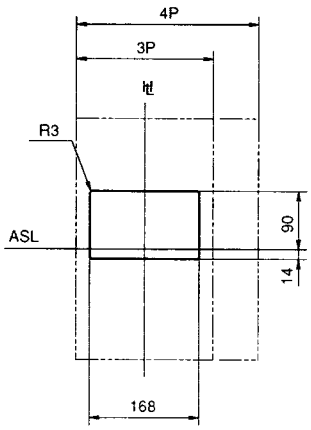
Outline dimensions (mm)

Front connected (standard)

Drilling plan



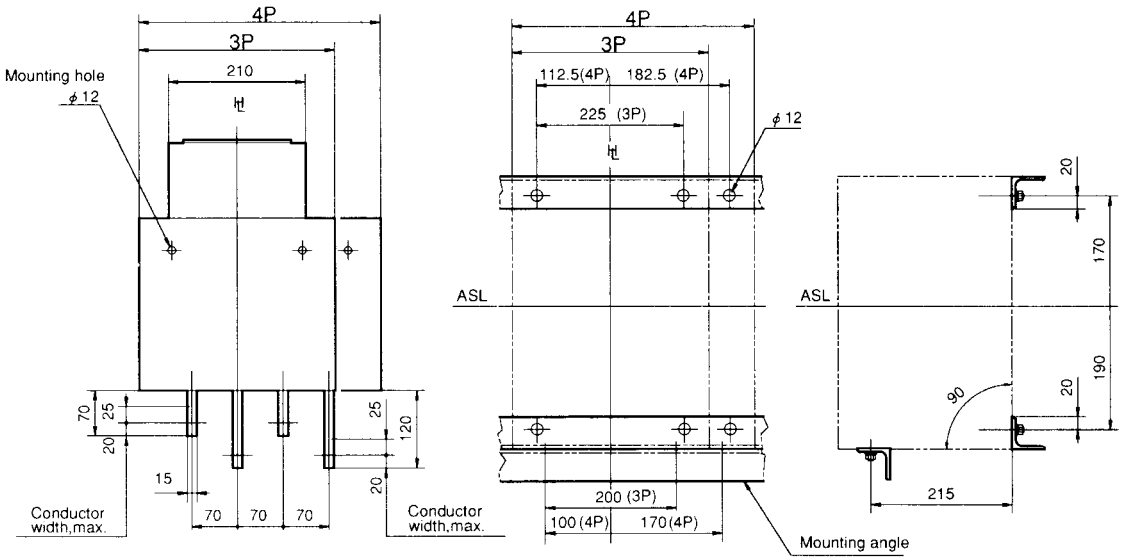
Panel cut-out



Panel cut-out dimensions shown give an allowance of 1.0 mm around the motor operator frame.

Draw out (optional)

Drilling plan

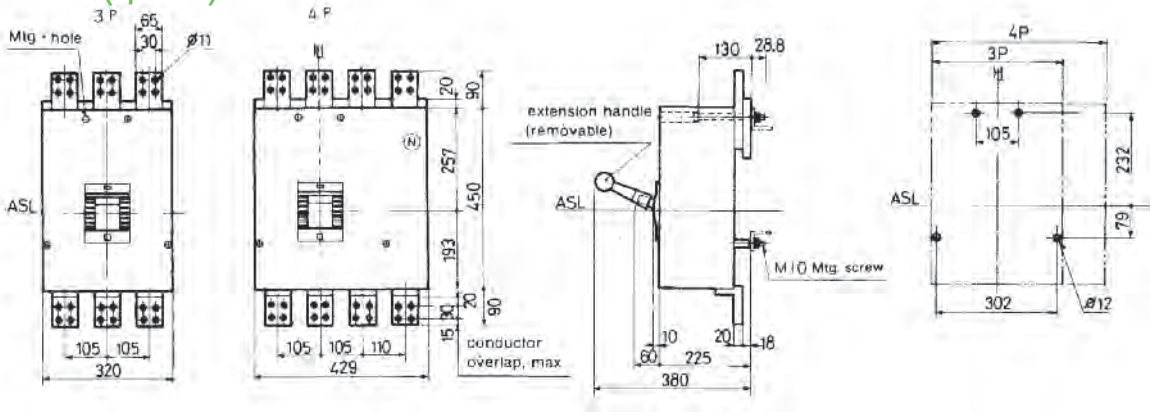


MCCB Technical data
TemBreak 1 – XS2000NE

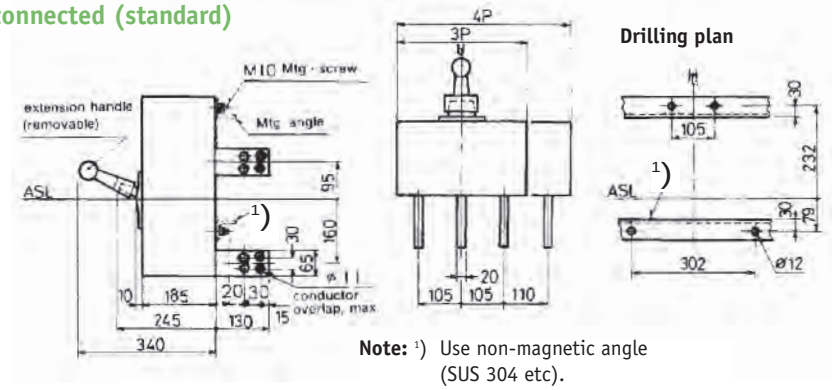
ASL: Arrangement Standard Line
: Handle Frame Centre Line

Outline dimensions (mm)

Front-connected (optional)

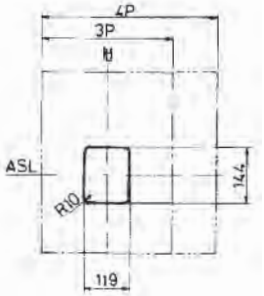


Rear-connected (standard)



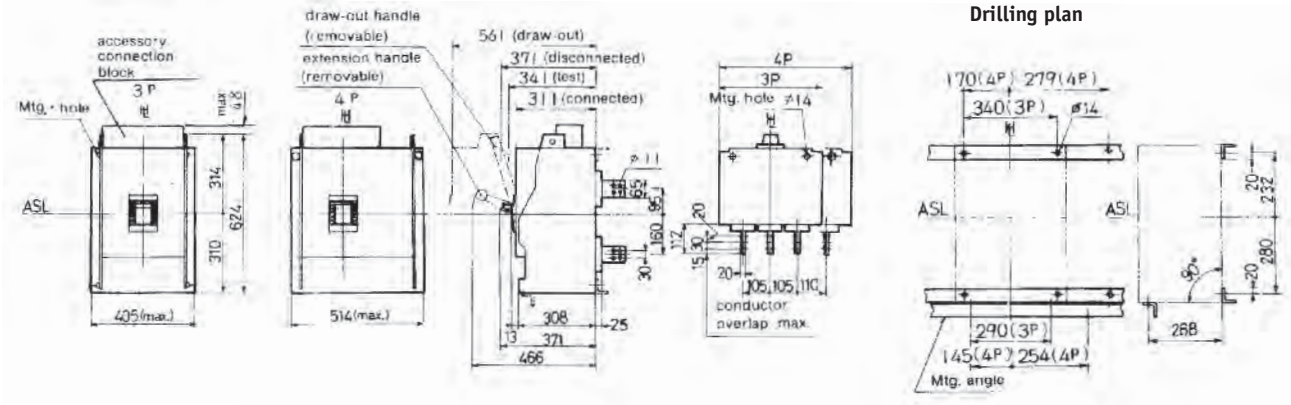
Note: 1) Use non-magnetic angle (SUS 304 etc).

Panel cut-out



Panel cut-out dimensions shown give an allowance of 2 mm around the handle escutcheon.

Draw-out (optional)

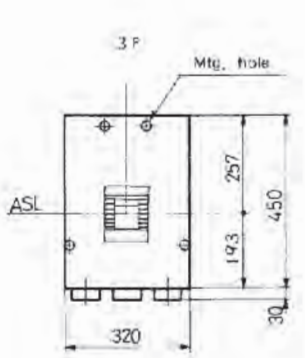


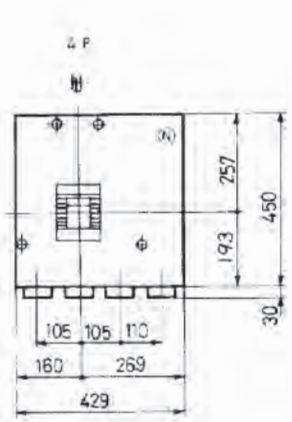
MCCB Technical data
TemBreak 1 – XS2500NE/ XS3200NE

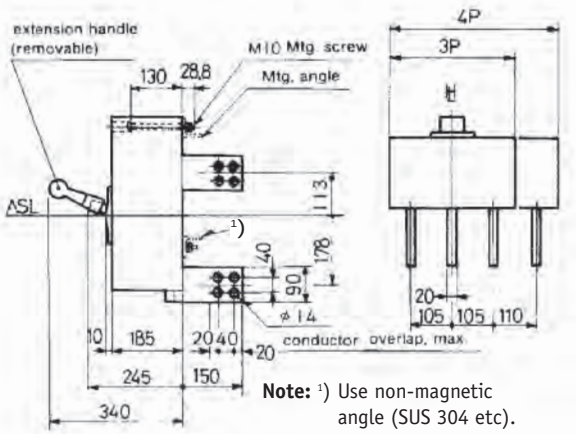
ASL: Arrangement Standard Line
H: Handle Frame Centre Line

Outline dimensions (mm)

Rear-connected (RC) standard. No FC version.

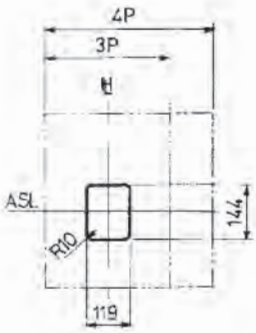






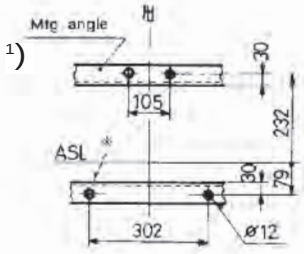
Note: 1) Use non-magnetic angle (SUS 304 etc).

Panel cut-out



- **Panel cut-out dimensions shown give an allowance of 2 mm around the handle escutcheon.**

Drilling plan



Note: 1) Use non-magnetic angle (SUS 304 etc).

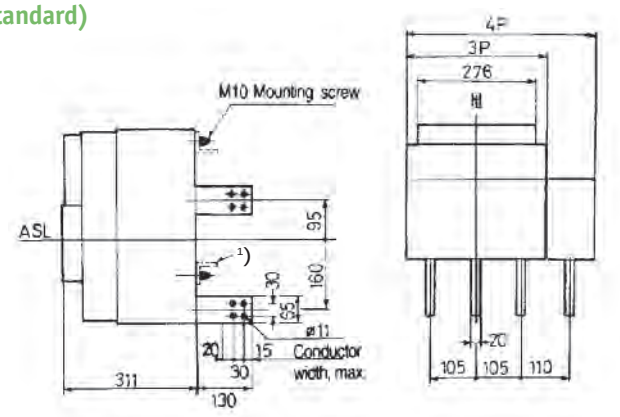
MCCB Technical data

Motor operators (XMB type) for TemBreak 1
XS2000NE, XS2500NE & XS3200NE

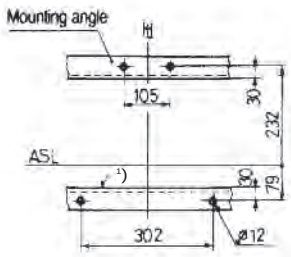
ASL: Arrangement Standard Line
: Handle Frame Centre Line

Outline dimensions (mm)

Rear connected (standard)

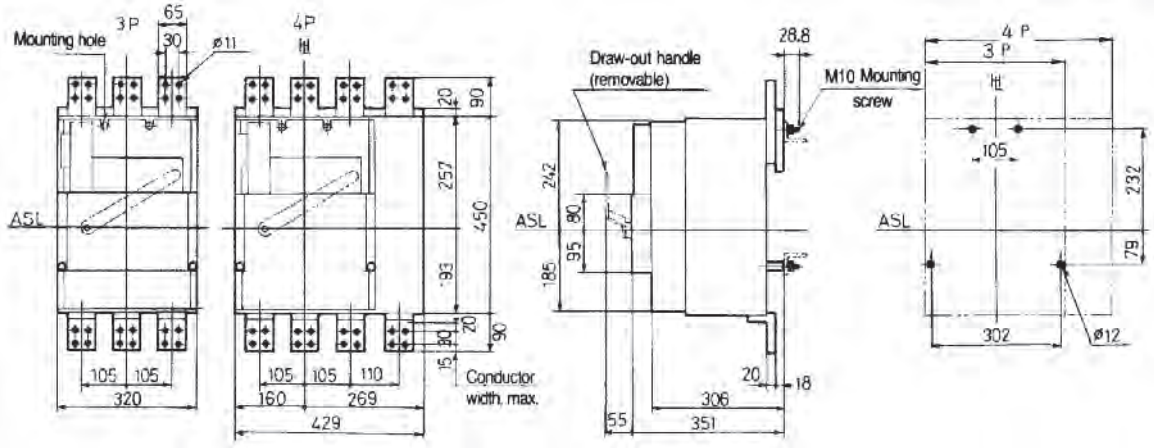


Drilling plan



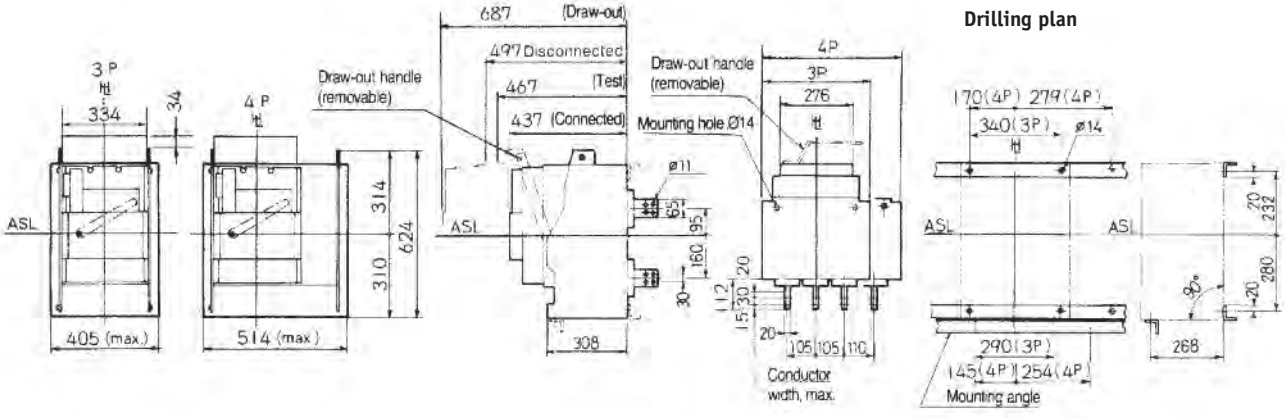
Note: 1) Use non-magnetic angle (SUS 304 etc).

Front connected (optional)



Drilling plan

Draw-out (optional)



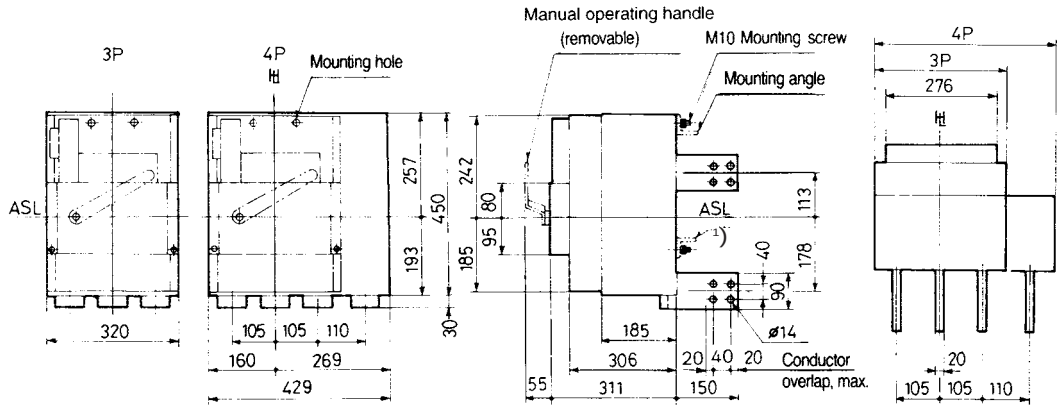
Drilling plan

Motor operators (XMB type) for TemBreak 1 (Cont'd)
XS2000NE, XS2500NE & XS3200NE

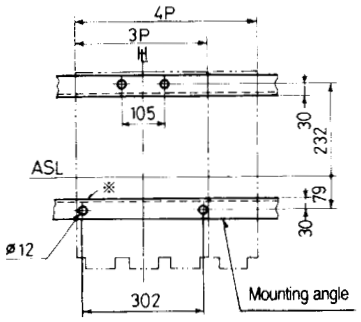
ASL: Arrangement Standard Line
⊬: Handle Frame Centre Line

Outline dimensions (mm)

Rear connected (standard)



Drilling plan

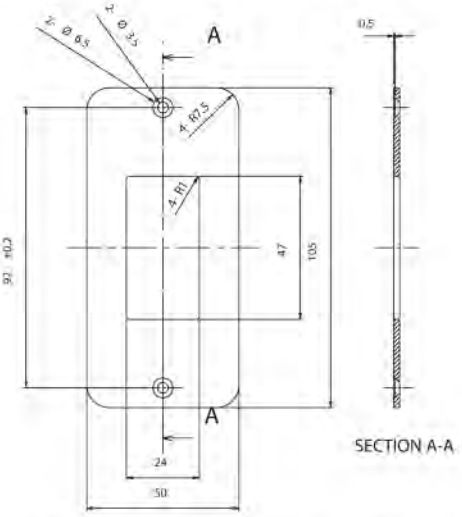


Note: 1) Use non-magnetic angle (SUS 304 etc).

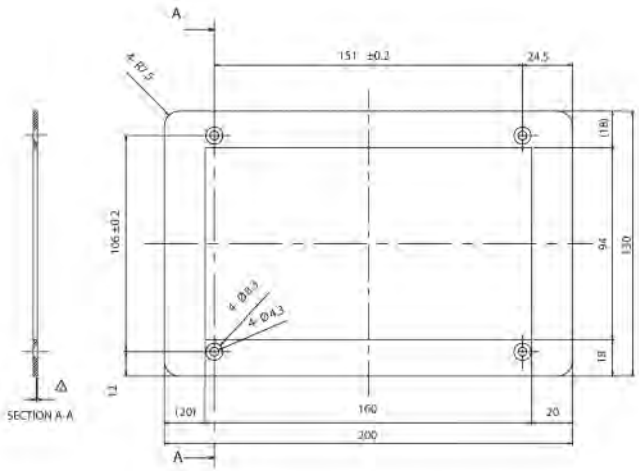
Door flanges for TemBreak 2 MCCBs

125 A - 630 A, suitable for MCCB toggles and motor operators

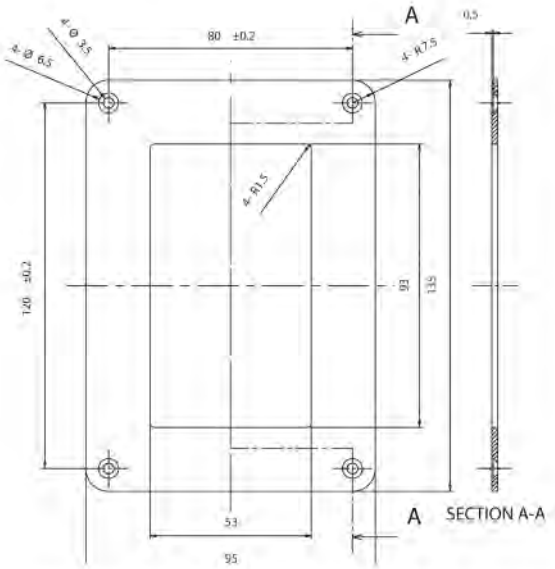
Door Flanges



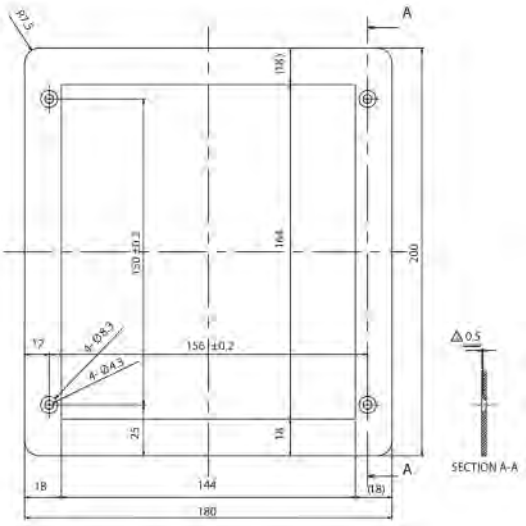
Door Flange for toggle-operated 125 A and 250 A frame



Door Flange for motor-operated 125 A and 250 A frame

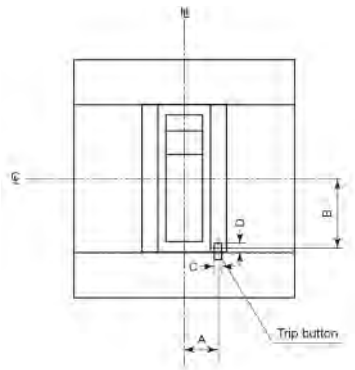


Door Flange for toggle-operated 400 A and 630 A frame



Door Flange for motor-operated 400 A and 630 A frame

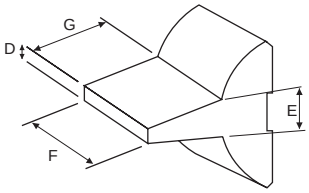
Position of trip button

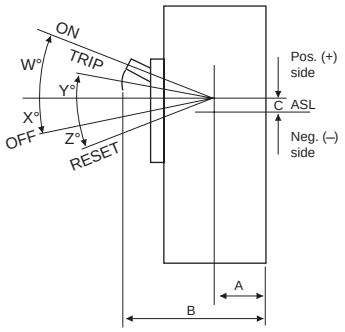


MCCB types	Poles	A	B	C	D
E125, S125, ZS125	3, 4	13.8	20.4	3.3	4.3
S160, E250, ZS250, S250-NJ, S250-GJ, S250-NN	3, 4	17.2	20.4	3.3	4.3
H125, L125, H160, L160, S250-PE, H250, L250	3, 4	17.2	20.4	3.3	4.3
E400, S400, H400, L400, E630, S630	3, 4	21.6	37.2	5.3	6.6

TemBreak 1 and 2 MCCB Technical data

Toggle operation, angles and dimensions (mm)





Frame (A)	Breaker	Operation angle				Toggle Dimensions (mm)							Operation effort (kgf)			
		On	Off	Trip	Reset								Off	On	Trip	Radius
		W°	X°	Y°	Z°	A	B	C	D	E	F	G	On	Off	Reset	(mm)
125	E125	22	15	4	17.5	57	84	9.5	5	5	12	19	15.6	20.1	33.1	26.9
													21.9	26.0	59.5	26.9
	S125, ZS125	19.2	16.5	4.1	19	26	92	0	6.8	9.3	13	20.4	22.0	28.0	68.0	66.0
	H125, L125	19.2	16.5	4.1	19	26	92	0	6.8	9.3	13	20.4	25.0	36.0	76.0	66.0
250	E250, S250, ZS250	19.2	16.5	4.1	19	26	92	0	6.8	9.3	13	20.4	25.0	36.0	76.0	66.0
400	E400, S400	19.8	19.3	-3.5	22.5	53.6	145	2.8	14	9	34	39.5	110	115	125	91.4
	H400, L400	19.8	19.3	-3.5	22.5	90.6	182	2.8	14	9	34	39.5	110	115	125	91.4
400	XV400	20.2	11	10.5	17.4	48	145	-3	14	12.5	24.5	41.5	8.8	12	10.2	97
600/630	XS/XH630	20	8.5	11	10.5	43.2	144	-6.8	11	12.5	40	33	12.3	15	24	100.8
800	XS/XH800	20	8.5	11	10.5	43.2	144	-6.8	11	12.5	40	33	12.3	15	24	100.8
1250	XS1250NE	22	4	12	9	73.5	171.8	-2.8	11	12.5	40	30	16	30	35	98.3
1600	XS1600NE	22	4	12	9	93.5	191.8	-2.8	11	12.5	40	30	16	30	35	98.3
2000	XS2000NE	18.3	10	7.7	15.3	100	245	+2	20.5	24	60	42.5	39	32.9	57	146
2500	XS2500NE	18.3	10	7.7	15.3	100	245	+2	20.5	24	60	42.5	39	32.9	57	146
3200	XS3200NE	18.3	10	7.7	15.3	100	245	+2	20.5	24	60	42.5	39	32.9	57	146