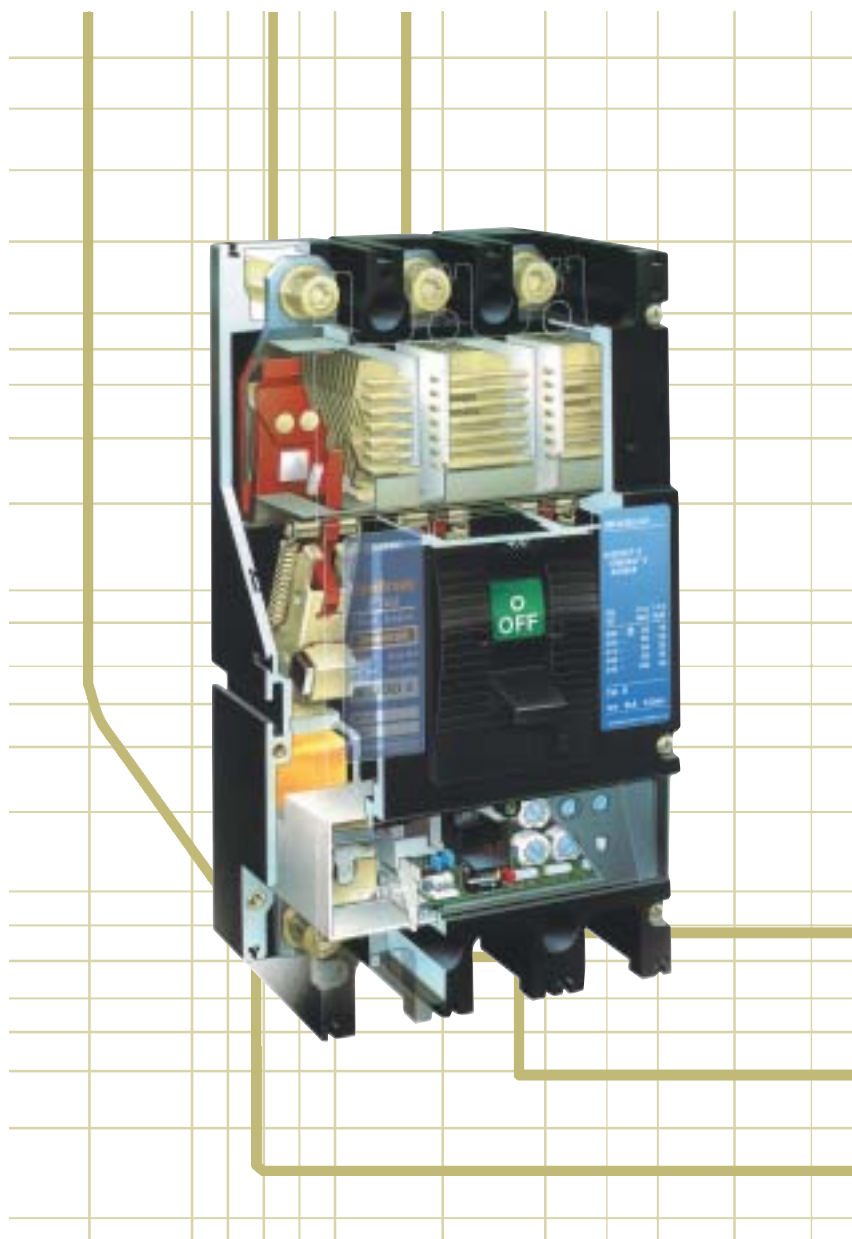


MCCB OPERATIONAL CHARACTERISTICS & DIMENSIONS

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Thermal Magnetic MCCBs

Thermal-Magnetic MCCBs are available from 125AF to 800AF. Depending on the type of MCCB thermal and/or magnetic trip setting may be adjustable.

MCCB type	Fixed thermal	Adjustable thermal	Fixed magnetic	Adjustable magnetic
XS125CS, XS125NS	●	-	●	-
XS125CJ, XS125NJ	-	●	●	-
XH125NJ, XH125PJ	-	●	●	-
XH160PJ	-	●	●	-
XE225NC	●	-	●	-
XS250NJ, XH250NJ	-	●	●	-
XH250PJ	-	●	-	●
XS400CJ, XS400NJ, XH400PJ	-	●	-	●
XS630CJ, XS630NJ, XH630PJ	-	●	-	●
XS800NJ	-	●	-	●
XH800PJ	-	●	-	●

- Yes
- No

Access to setting dials

From 125AF to 250AF the thermal adjustment is visible from the front of the MCCB. At 400AF and above a protective cover must be removed to gain access to the settings. To achieve access to the settings the cover screw under the 'sealed' label must be removed.

To adjust the individual trip settings turn the setting dial with a flat bladed screwdriver.

Once set secure the cover and apply a new sealing label.

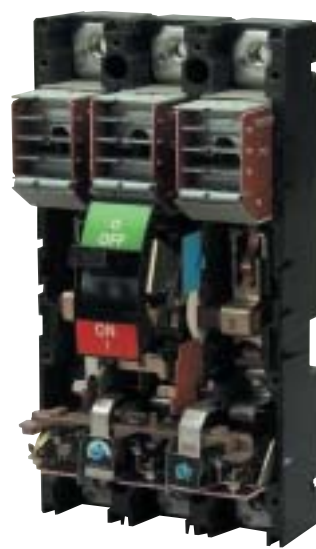
7



XH250NJ



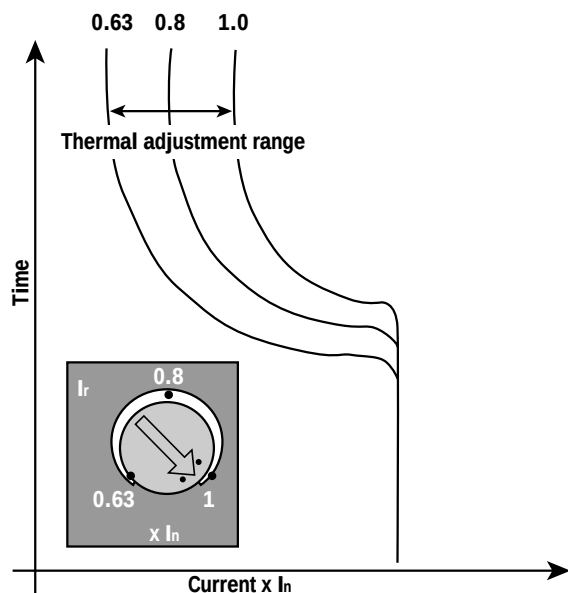
XS400NJ



XS400NJ (cover removed)

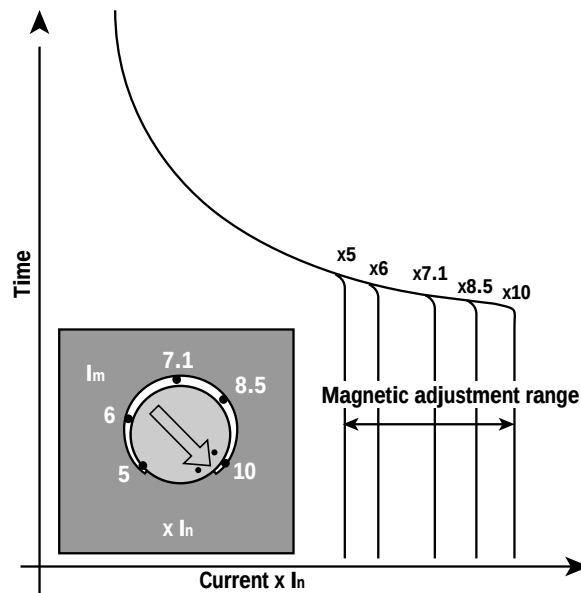
Thermal Adjustment

TemBreak MCCBs have a wide thermal adjustment range, one of the largest on the market. 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 400AF and above. 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, & 10. These are shown in the diagram below.



Examples

1. XS125NJ/125A MCCB set at I_r = 0.8, the rated current is calculated as 125 x 0.8 = 100A
2. XS400NJ/400A MCCB set at I_m = 6, the magnetic setting is calculated as 400 x 6 = 2400A
3. XS630NJ/630A MCCB set at I_r = 0.8 & I_m = 5.0

The rated current is calculated as 630 x 0.8 = 504A

The magnetic setting is calculated as 630 x 5 = 3150A

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 r.m.s. values.

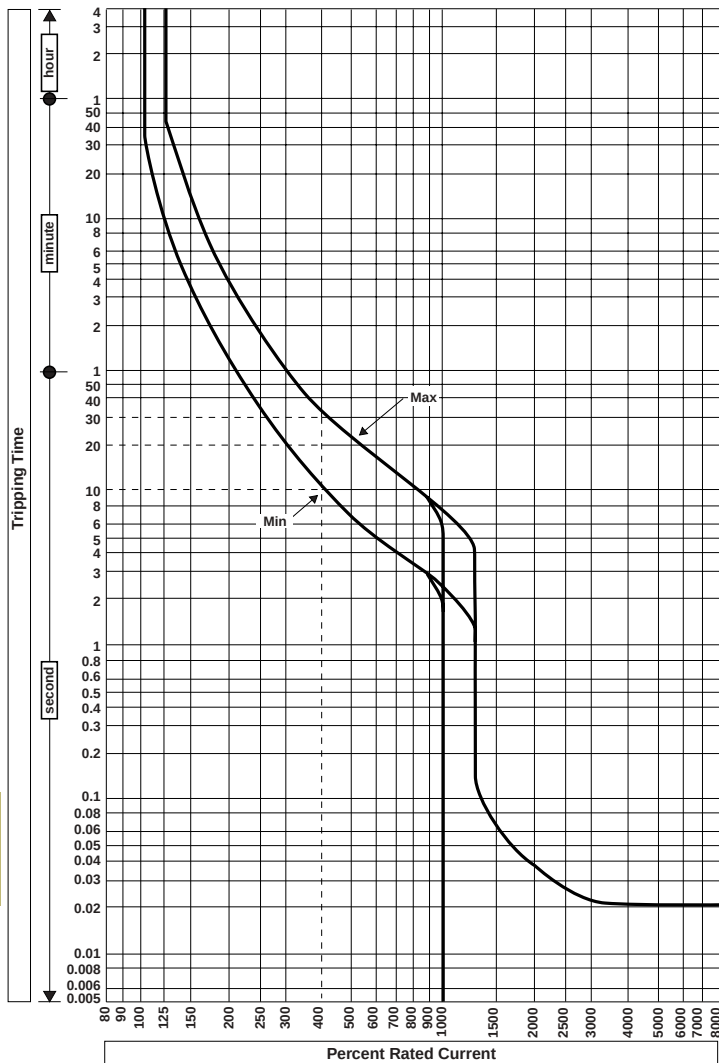
All MCCBs are calibrated at 45°C unless otherwise specified.

Breakers with adjustable magnetic trip

Breaker	Rated current (A)	Magnetic trip current (A)				
		Scale 10	8.5	7.1	6	5
XS400CJ	250	2500	2125	1775	1500	1250
XS400NJ	400	4000	3400	2840	2400	2000
XH400PJ	400	4000	3400	2840	2400	2000
XS630CJ	400	4000	3400	2840	2400	2000
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

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

Time/current characteristic curves



Example 1

The XS250NJ set at its maximum thermal setting of 250A experiences an overload of 1000A. What would be the tripping time?

Solution

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

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

The maximum and minimum on the curve are the tolerance bands. Therefore at 400% overload the tripping time would be as follows:

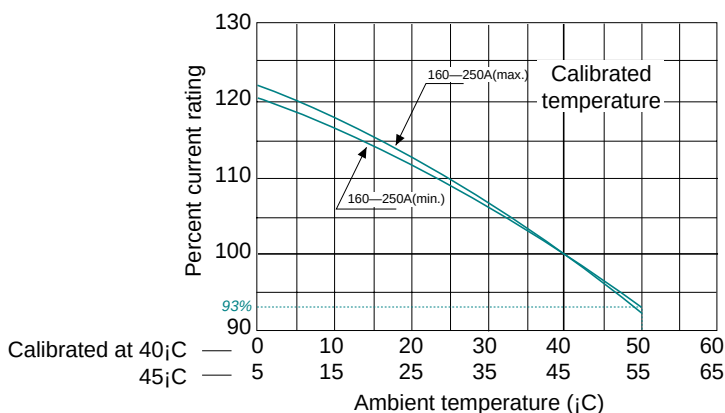
Maximum trip time $\approx$ 30 seconds

Minimum trip time $\approx$ 10 seconds

Average trip time $\approx$ 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 XS250NJ is calibrated at 250A for 45°C ambient. If the temperature rose to 55°C what effect would this have?

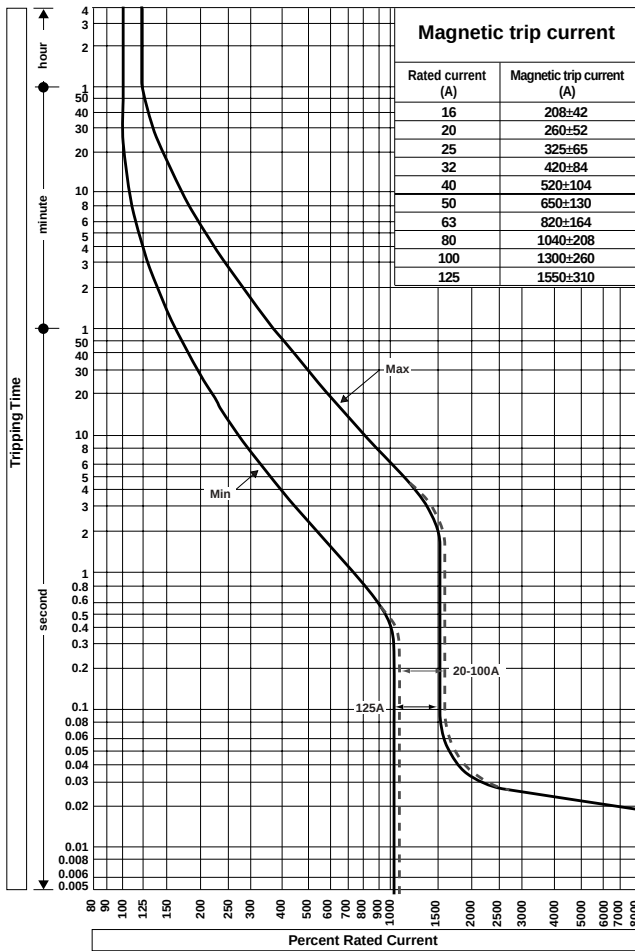
Solution

At 55°C the ambient compensating factor is 93%, i.e. $250 \times 0.93 = 232.5A$.

In other words the XS160NJ would act as an MCCB set at 232.5A, in 55°C.

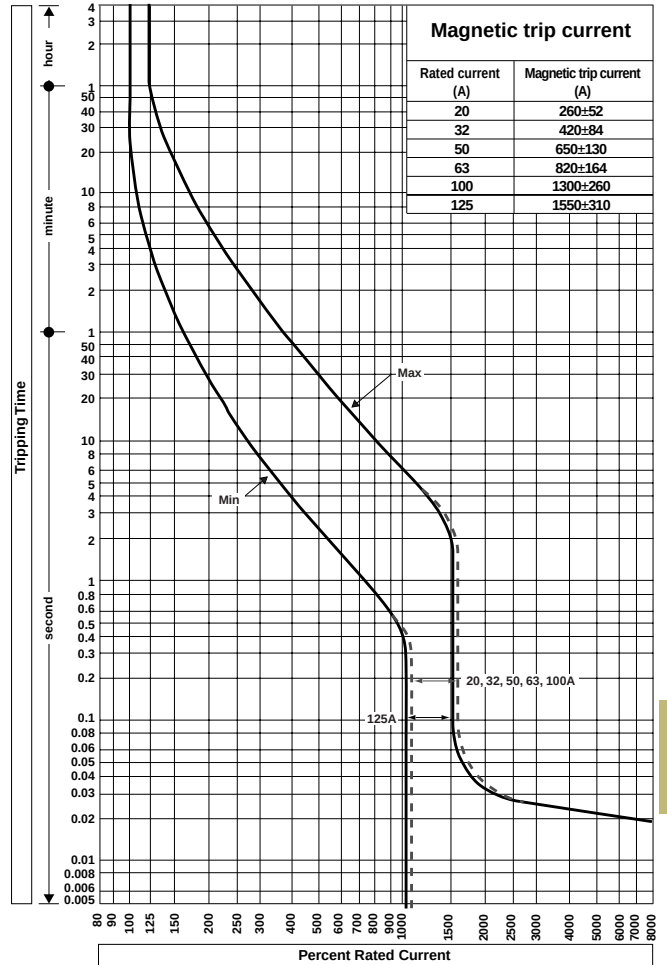
XS125CS, XS125NS

Time/current characteristic curves



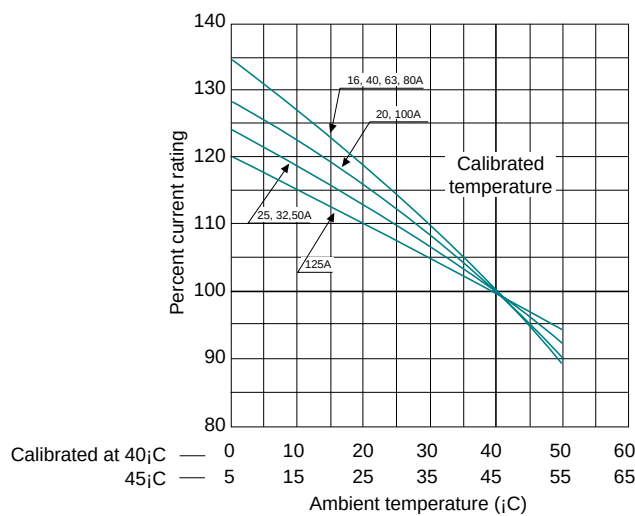
XS125CJ, XS125NJ, XH125NJ, XH125NJ

Time/current characteristic curves

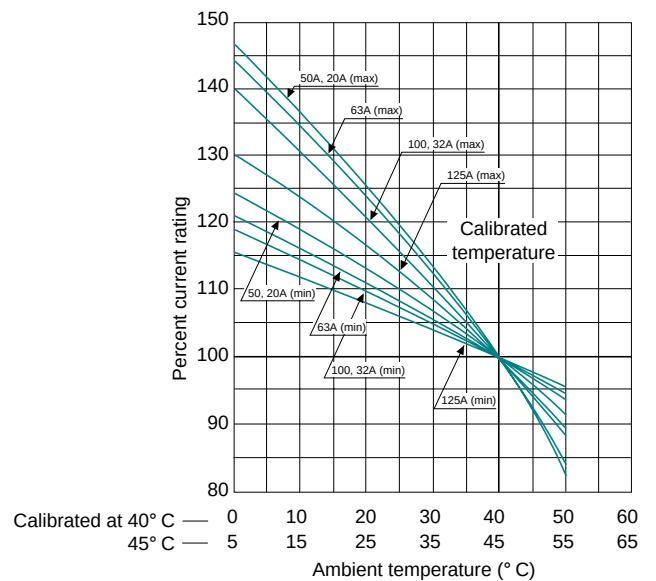


7

Ambient compensating curves

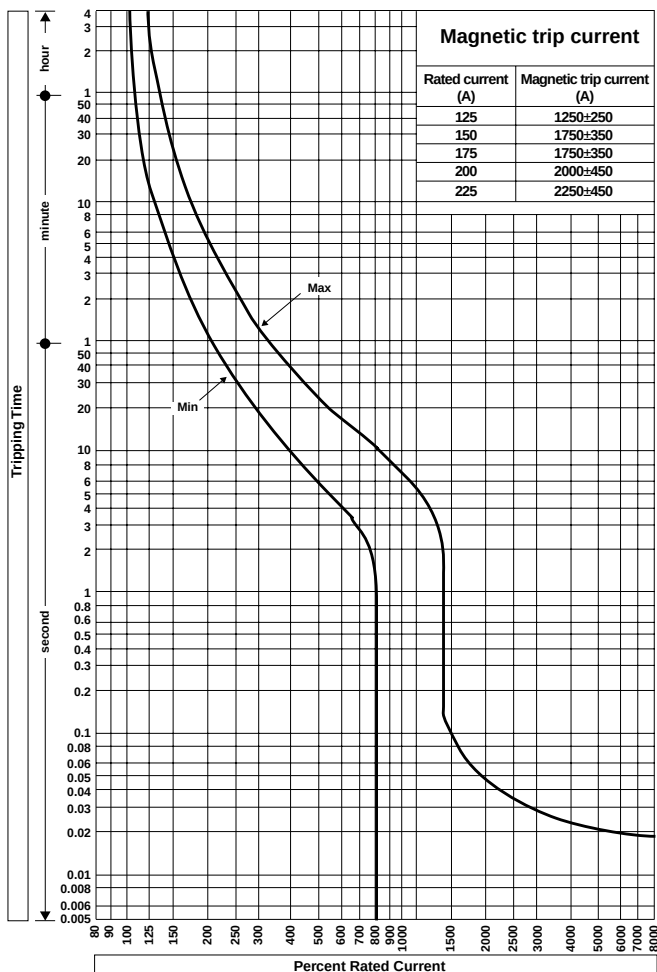


Ambient compensating curves



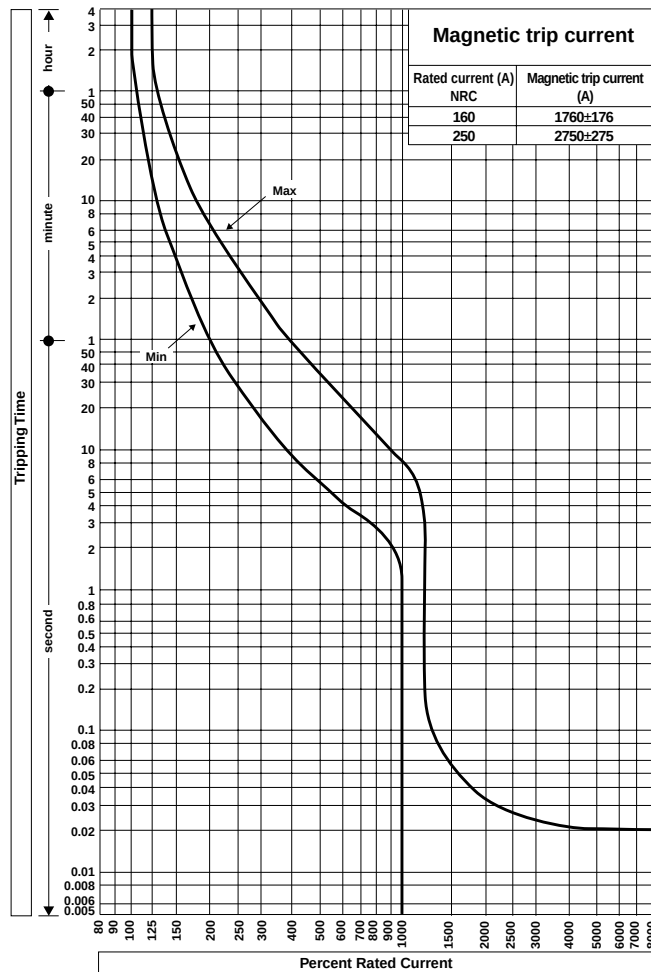
XE225NC

Time/current characteristic curves

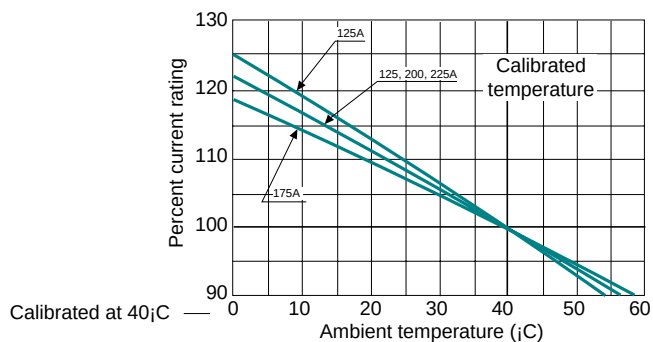


XH160PJ, XS250NJ, XH250NJ

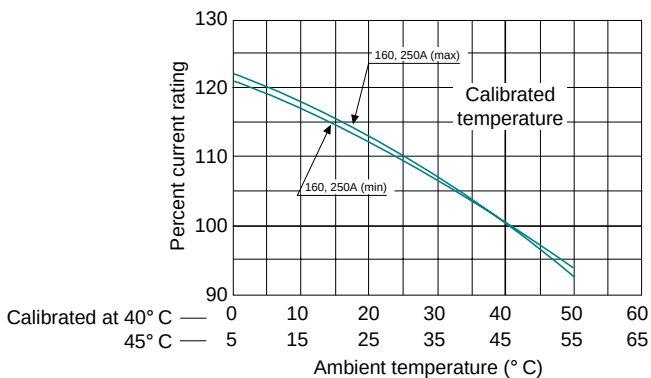
Time/current characteristic curves



Ambient compensating curves

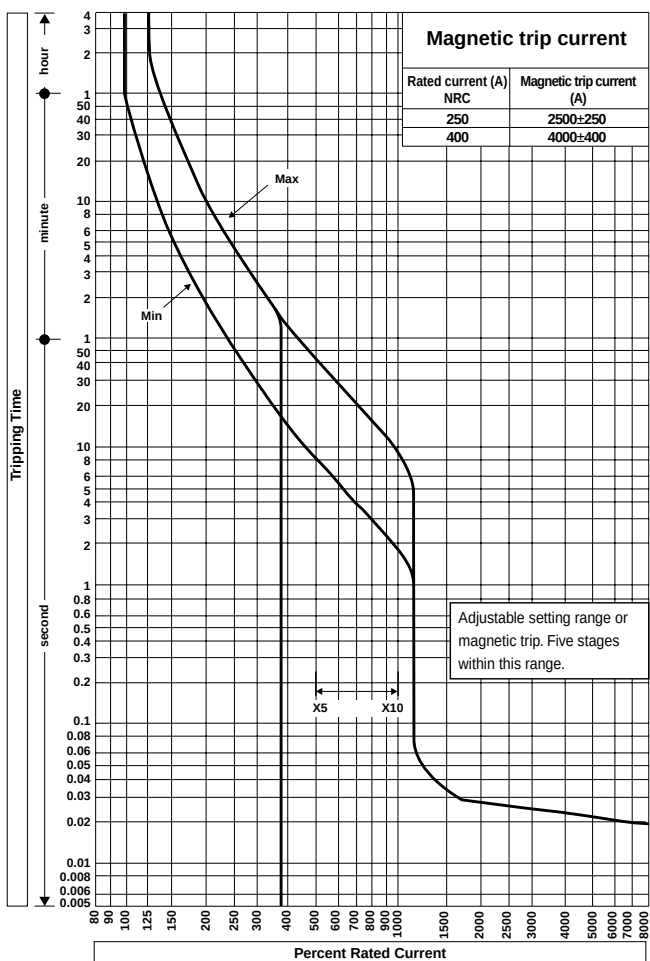


Ambient compensating curves



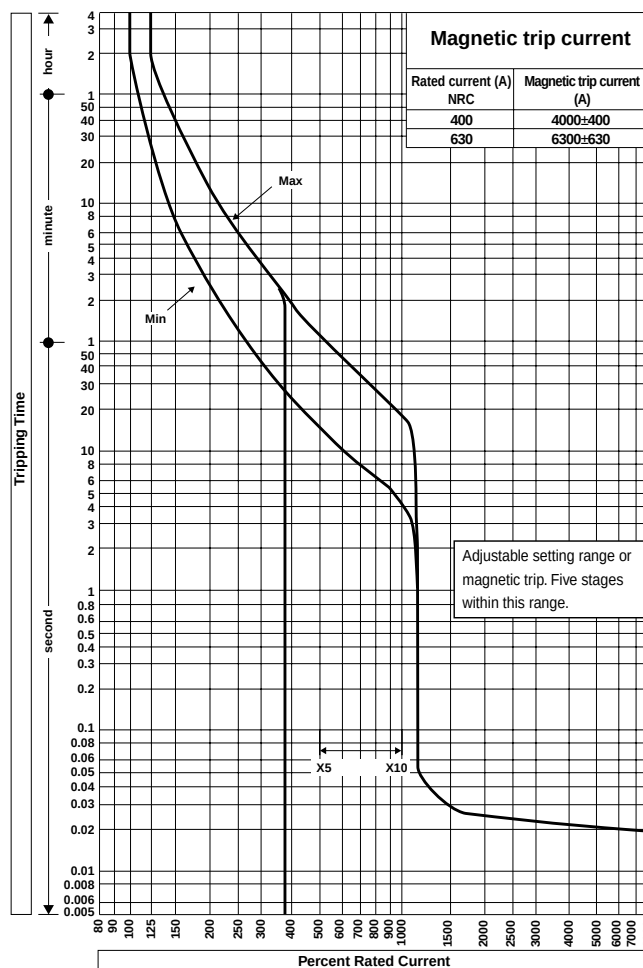
XH250PJ, XS400CJ, XS400NJ, XH400PJ

Time/current characteristic curves

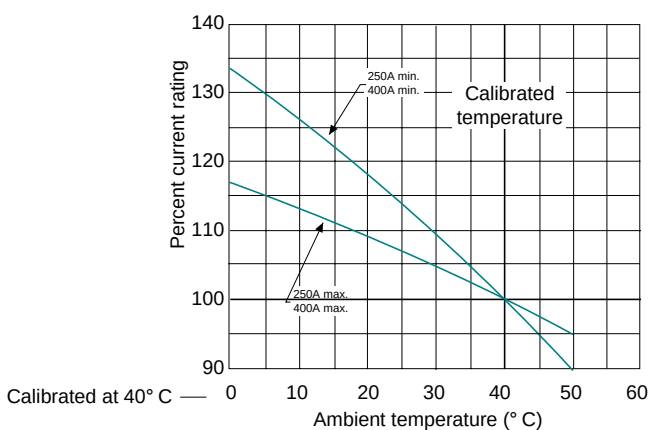


XS630CJ, XS630NJ, XH630PJ

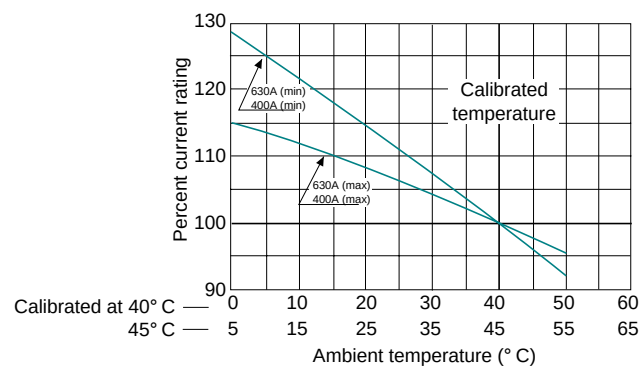
Time/current characteristic curves



Ambient compensating curves

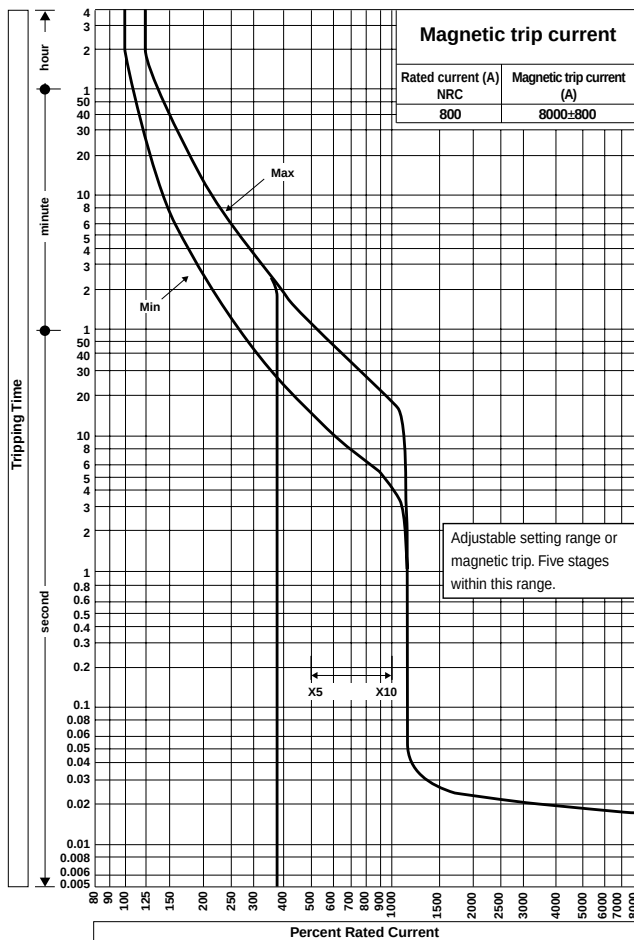


Ambient compensating curves



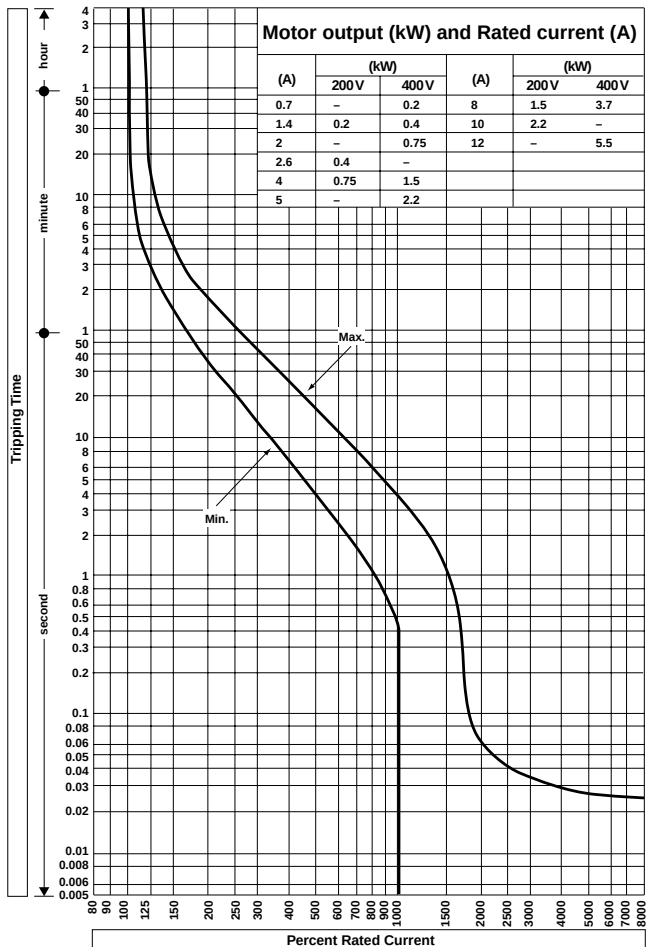
XS800NJ, XH800PJ

Time/current characteristic curves

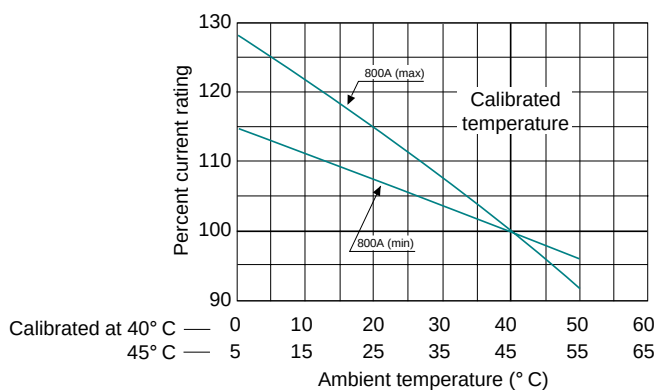


XM30PB

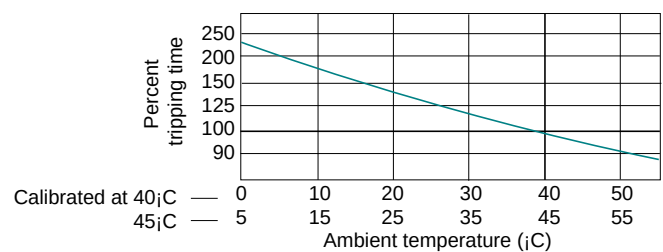
Time/current characteristic curves



Ambient compensating curves

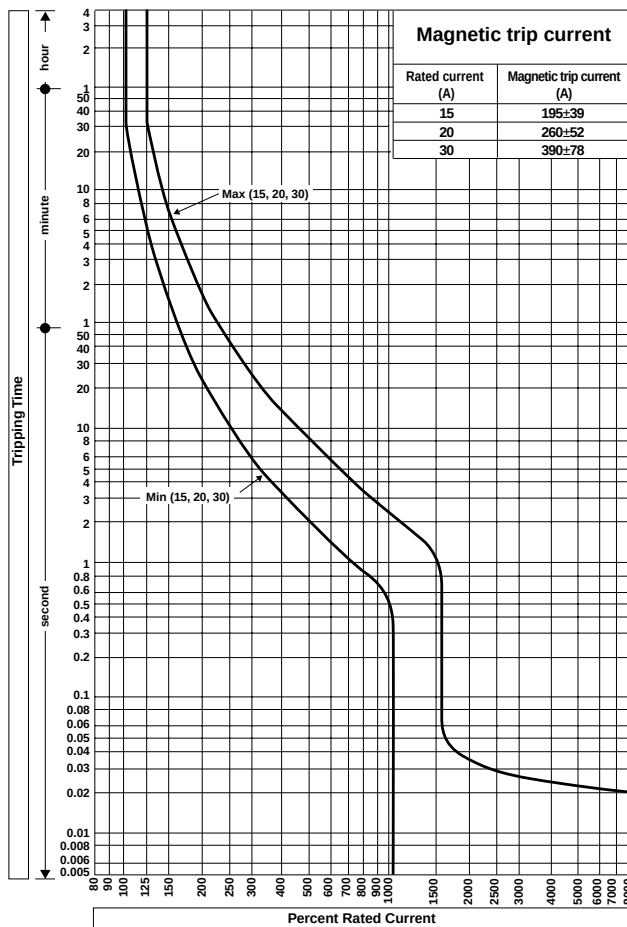


Ambient compensating curves



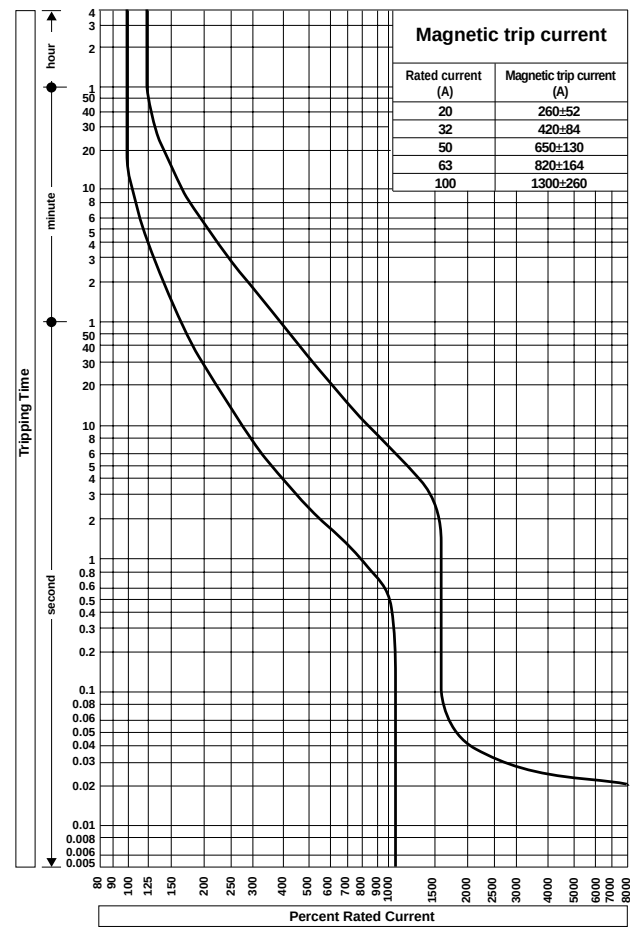
TL30F

Time/current characteristic curves



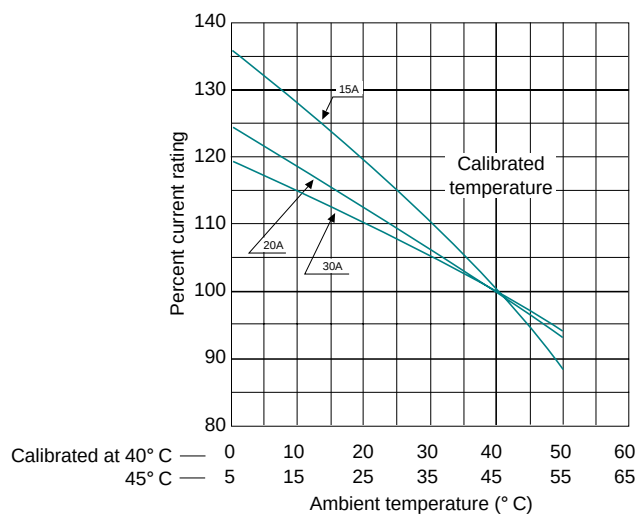
TL100NJ

Time/current characteristic curves

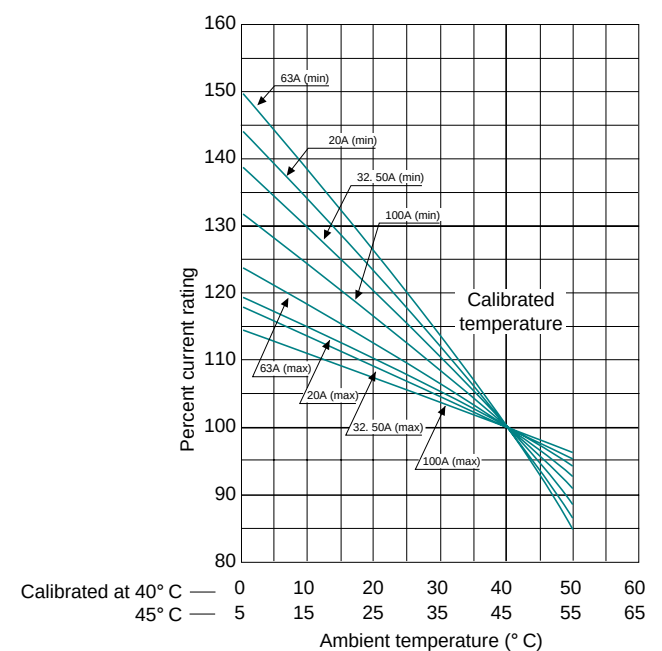


7

Ambient compensating curves

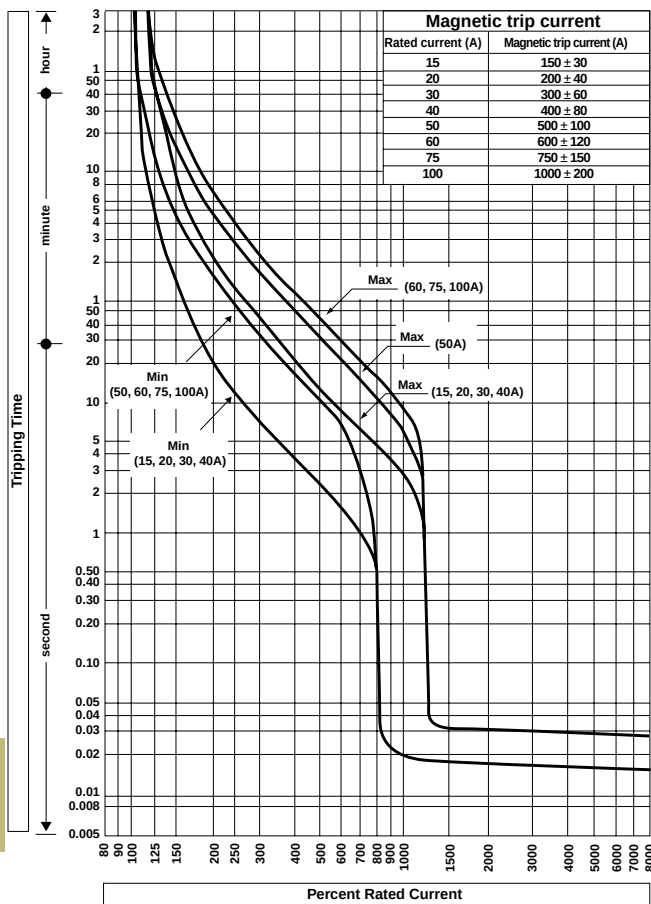


Ambient compensating curves



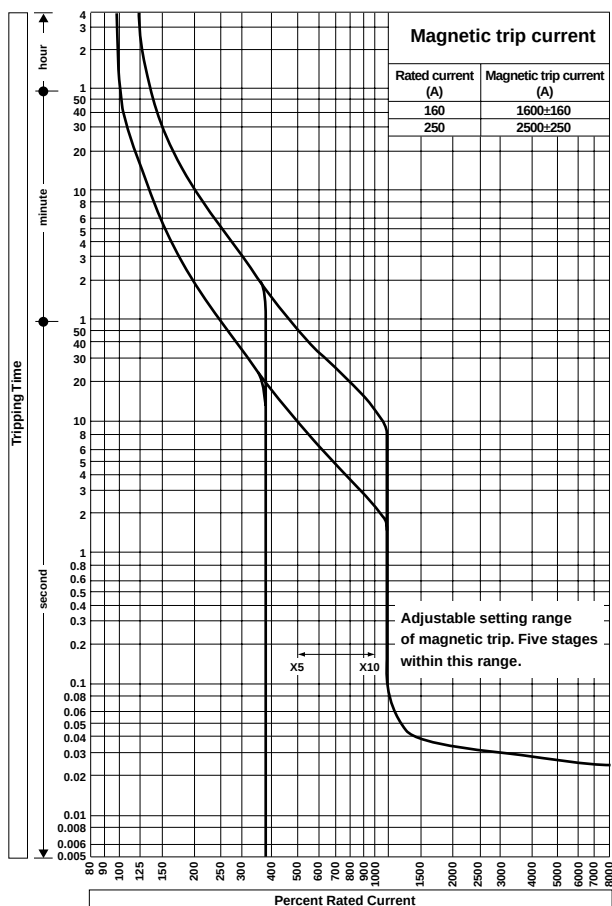
TL100EM

Time/current characteristic curves

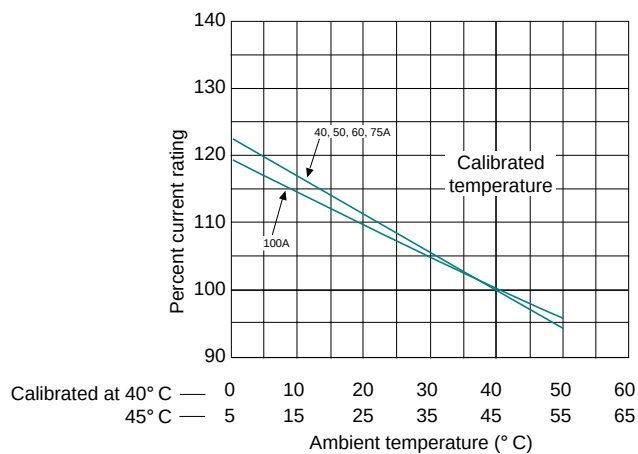


TL250NJ

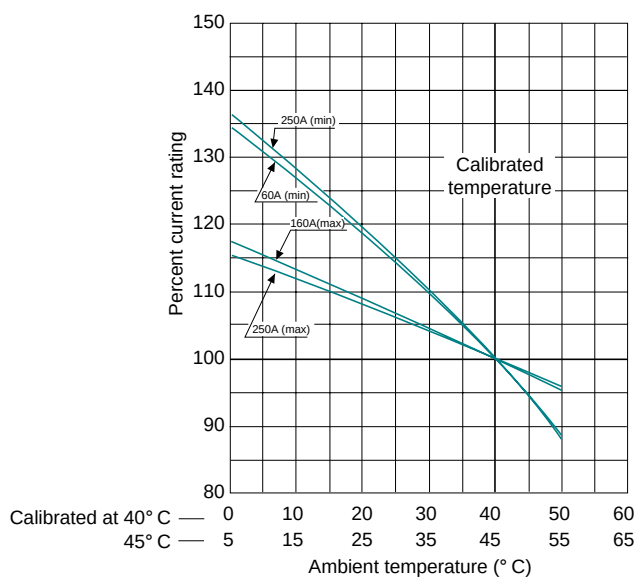
Time/current characteristic curves



Ambient compensating curves



Ambient compensating curves



Microprocessor based characteristics and adjustments

Characteristics

The standard microprocessor based MCCB from Terasaki has the most flexible characteristics on the European market. In addition to the standard overload and short circuit protection, there are a number of options available to meet specific applications.

MCCB type	LTD	STD	INST	I ² T Ramp	Pick-up LED	Test Port	PTA	GFT	internal LEDs	external LEDs
XS400, XH400	●	●	●	●	●	●	◆	-	-	◆
XS630, XH630	●	●	●	●	●	●	◆	◆	-	◆
XS800, XH800	●	●	●	●	●	●	◆	◆	-	◆
XS1250SE	●	●	●	●	●	●	◆	◆	◆	-
XS1600SE	●	●	●	●	●	●	◆	◆	◆	-
XS2000NE	●	●	●	●	●	●	◆	◆	◆	-
XS2500NE	●	●	●	●	●	●	◆	◆	◆	-

Standard on all TemBreak Microprocessor MCCBs

● Standard

◆ Optional

- Not available

MCCB types include XV mining MCCBs.

Legend

Application

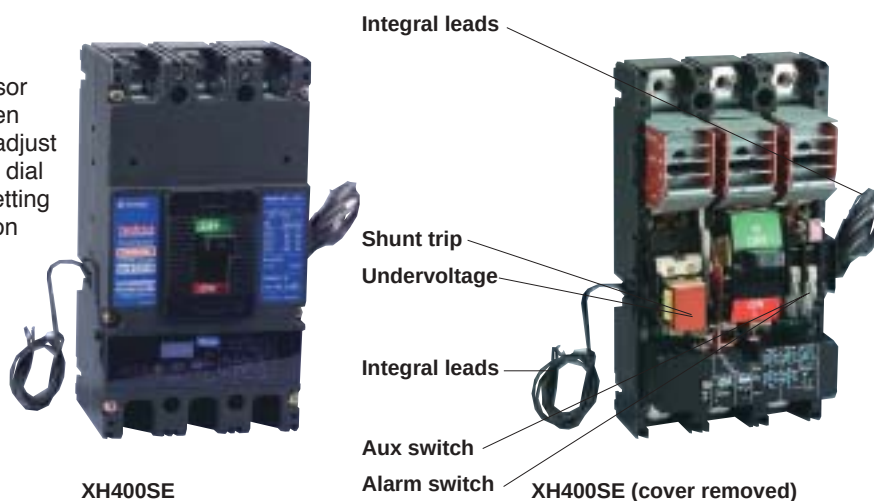
LTD	Long Time Delay	Overload protection, True R.M.S.
STD	Short Time Delay	Short circuit protection and selectivity
INST	Instantaneous	Short circuit protection, fast acting
I²t RAMP		Provides easier grading with downstream fuses
Pick-up LED		Lights on LTD overload, flashes on PTA pick-up
Test Port		Facility for TNS-1 OCR checker for calibration checking
PTA	Pre-Trip Alarm	Useful for loadshedding application
GFT	Ground Fault Trip	Protection against ground faults
LEDs	Light Emitting Diodes	Indication of fault for faster diagnosis
HI-INST	High Instantaneous	High inrush applications, increased selectivity

Standard for all
TemBreak
Microprocessor
MCCBs

7

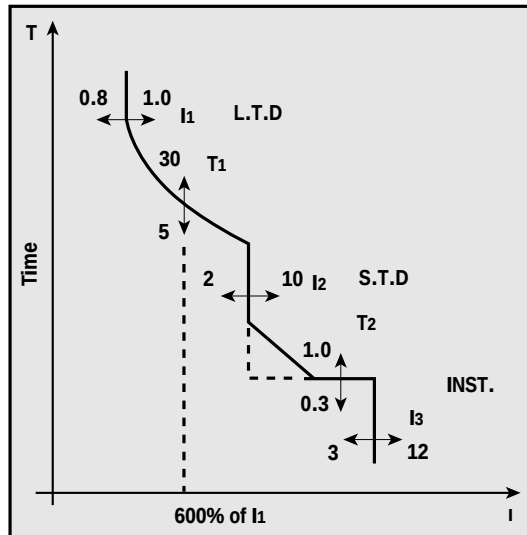
Access to setting dials

To adjust the settings on the microprocessor TemBreak, the sealed label 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.



Microprocessor based characteristics and adjustments operation settings

Standard time current curves

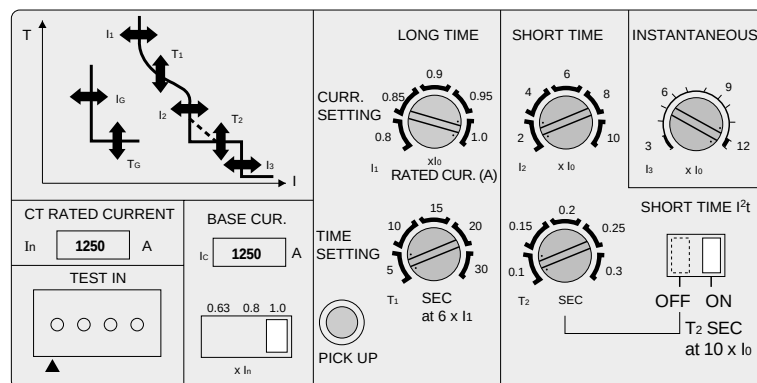


Each part of the characteristic curve can be independently adjusted. This unique adjustability of LTD, STD and INST enables the standard microprocessor MCCB to achieve more than 200,000 permutations of its time/current characteristic.

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

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

Standard microprocessor adjustments



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

With the switch off, the STD operates with a definite time characteristic: $\square$ with the switch on, the characteristic alters to a ramp: $\triangle$, cutting off the corner which poses a potential selectivity problem.

Setting Dial

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.

Adjustment of TemBreak (electronic type) tripping characteristics

Electronic models of TemBreak come standard with an 8-bit microprocessor Over Current 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 tripping time of the breaker.

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

Front view

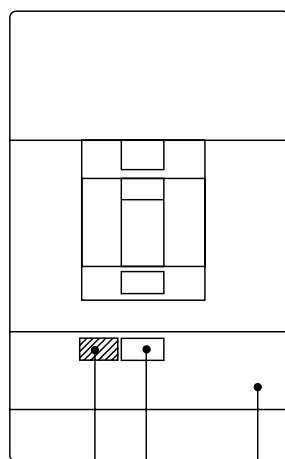
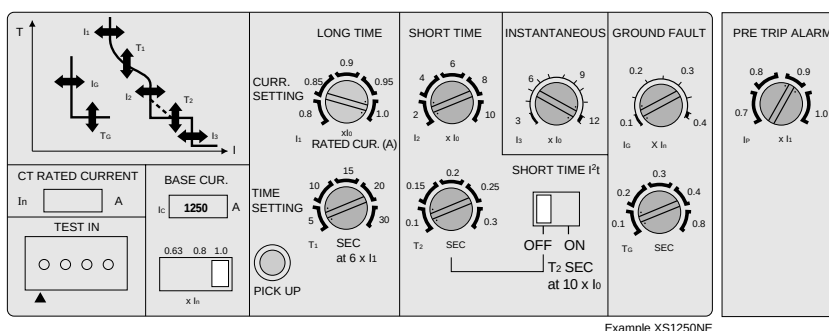


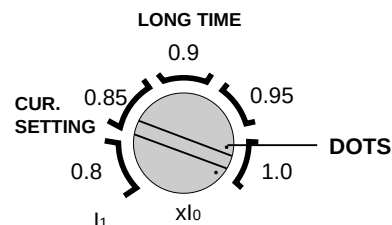
Figure 1. Electronic OCR adjustment possible (with label removed).



Adjustment method

Remove the sealing label, 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.

Note: Align the groove (end marked with dots) between the bands for the required setting.
For example, the diagram right shows $I_0 = 1.0$.
The INST. and GFT pick-up currents are continuously adjustable.



Secure the cover and apply the sealing label.

Microprocessor based characteristics and adjustments operation and examples

Overload adjustment

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

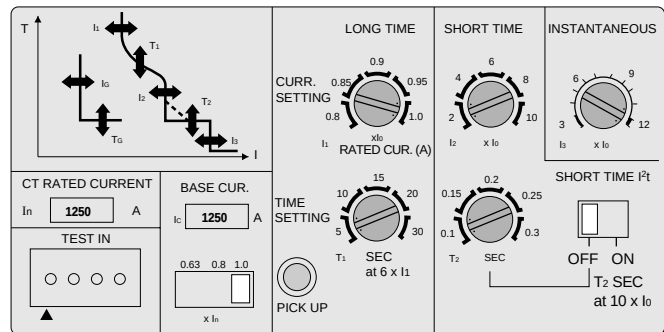
The rated current (LTD pick-up) is achieved as follows:

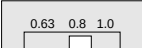
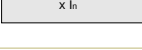
$$I_{\text{RATED}} = I_n \times I_0 \times I_1$$

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

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

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



Base current		63					80					100				
Current dial		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 the example shown on the right what are all the settings in Amps?

Solution

$$I_{\text{RATING}} \text{ LTD pickup} = I_n \times I_0 \times I_1$$

$$1250 \times 0.8 \times 0.9 = 900\text{A}$$

$$\text{STD pickup} = I_n \times I_0 \times I_2$$

$$1250 \times 0.8 \times 4 = 4000\text{A}$$

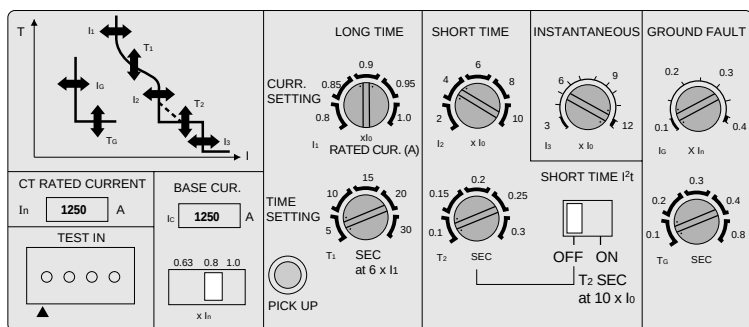
$$\text{INST pickup} = I_n \times I_0 \times I_3$$

$$1250 \times 0.8 \times 12 = 12,000\text{A}$$

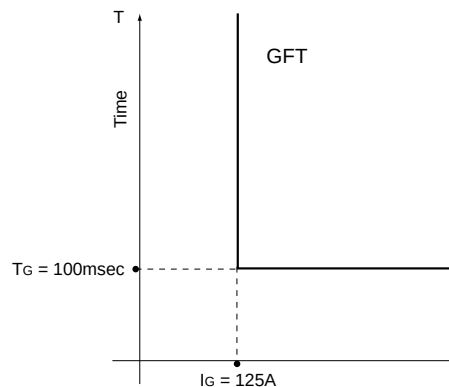
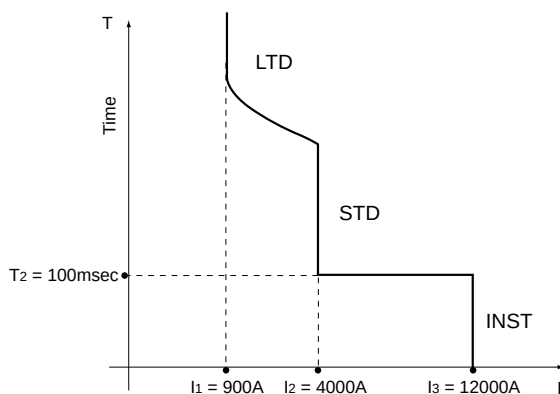
$$\text{GFT pickup} = I_n \times I_0$$

$$1250 \times 0.1 = 125\text{A}$$

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



Example - Time/Current Curves



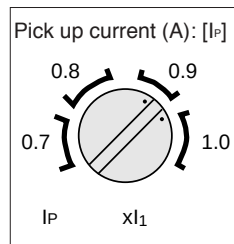
Options (electronic type) TemBreak

Pre-trip alarm (PTA)

The PTA continuously monitors the true r.m.s. value of the load current. When the load current exceeds the pre-set current (I_p) an LED gives local alarm that the MCCB is approaching an overload situation.

Should the current I_p be exceeded for 40 secs a (1a) contact will close to provide remote indication and/or load shedding.

PTA specifications

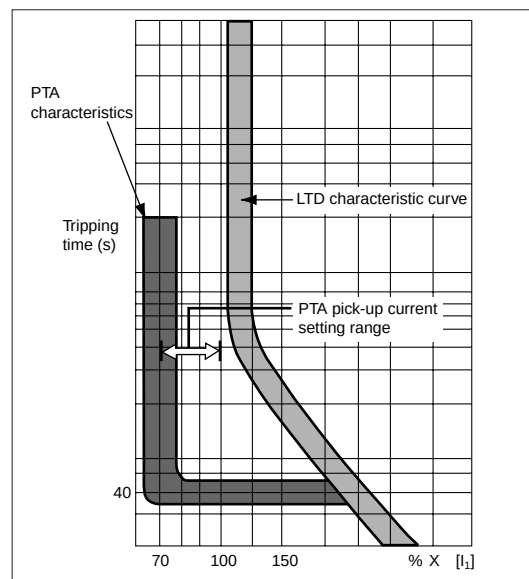


Adjustable steps of 70, 80, 90, 100% of the selected rated current [I_1].

Setting tolerance $\pm 10\%$

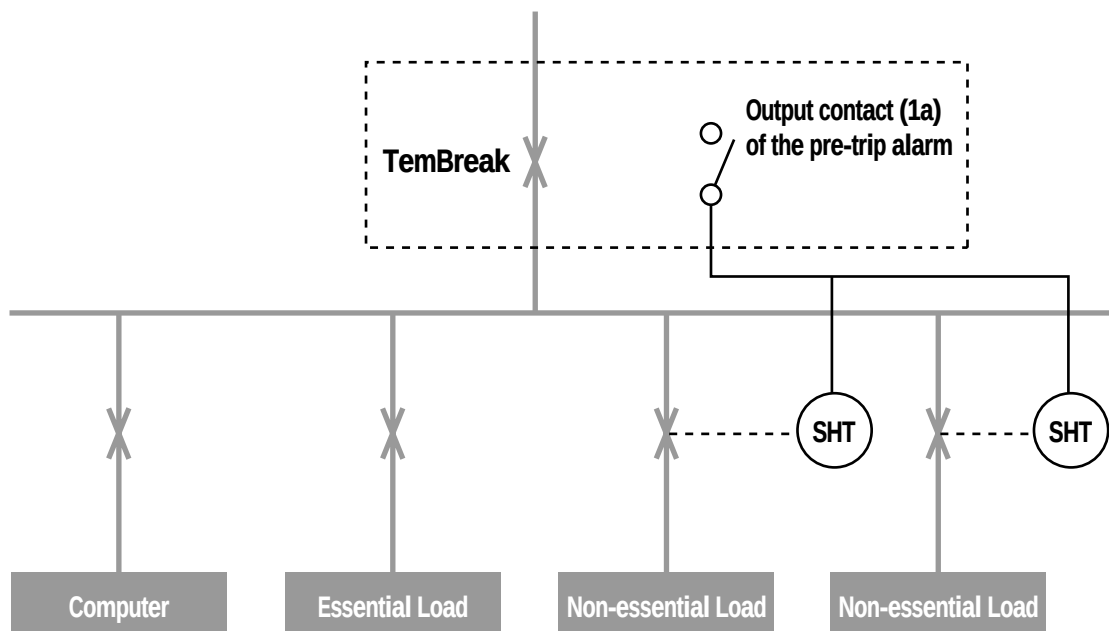
Note: The long time-delay trip does not operate 'first' when the pick-up current is adjusted to 100% of the rated current [I_1].

PTA characteristics



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

7



Adjustment of TemBreak electronic type OCR with ground fault

Ground fault trip

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

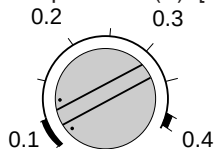
Notes: The ground fault trip and pre-trip alarm cannot be used simultaneously in a single breaker.

XS400NE, XH400NE are not available with ground fault function.

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

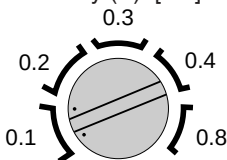
Pick-up current (A): [IG]



$I_G \times I_{CT}$

Continuously adjustable from 10 to 40% of the rated CT current (I_{CT}) setting tolerance is $\pm 15\%$

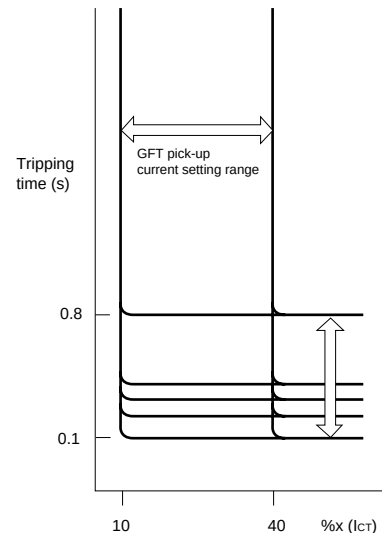
Time-delay (S): [TG]



T_G SEC

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

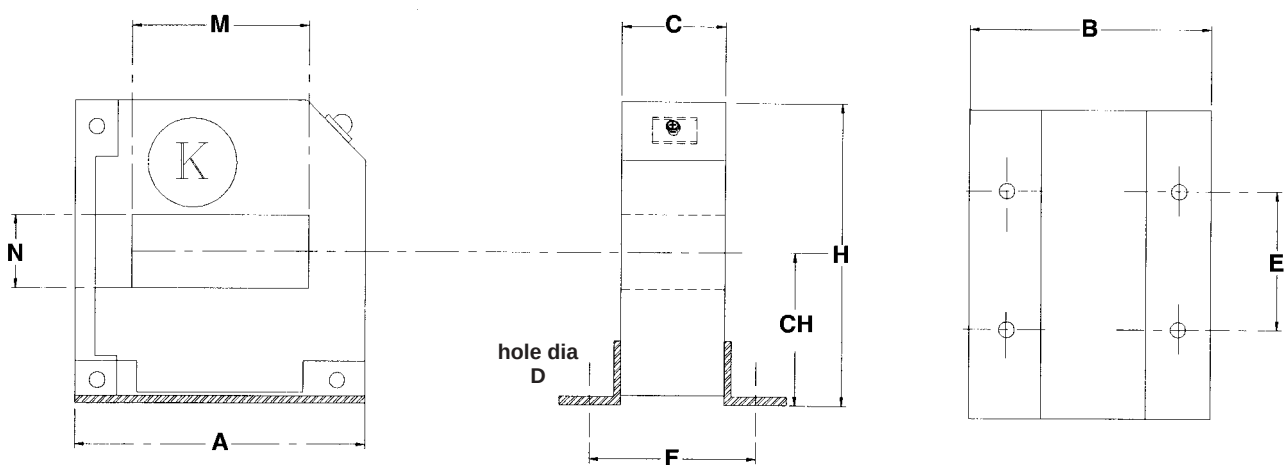
GFT characteristics



4th CT for GFT

7

Rating (A)	Type
2500	UXOY0007A
2000	UXOY0006A
1600	UXOY0005A
1250	UXOY0004A
1000	UXOY0003A
800	UXOY0002A
630	UXOY0001A



Dimensions (mm)

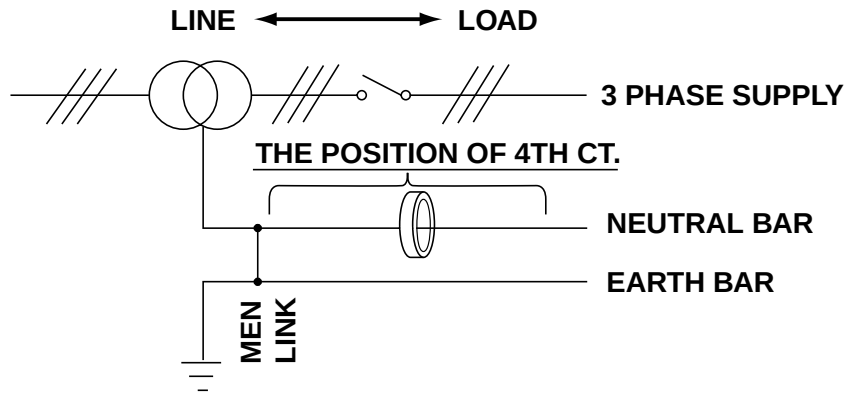
Rating (A)	A	B	C	D	E	F	H	CH	M	N
2500-1000	140	110	50	10	80	85	145	75	85	35
800-630	105	100	40	8	50	75	110	57	50	20

TemBreak electronic type with ground fault

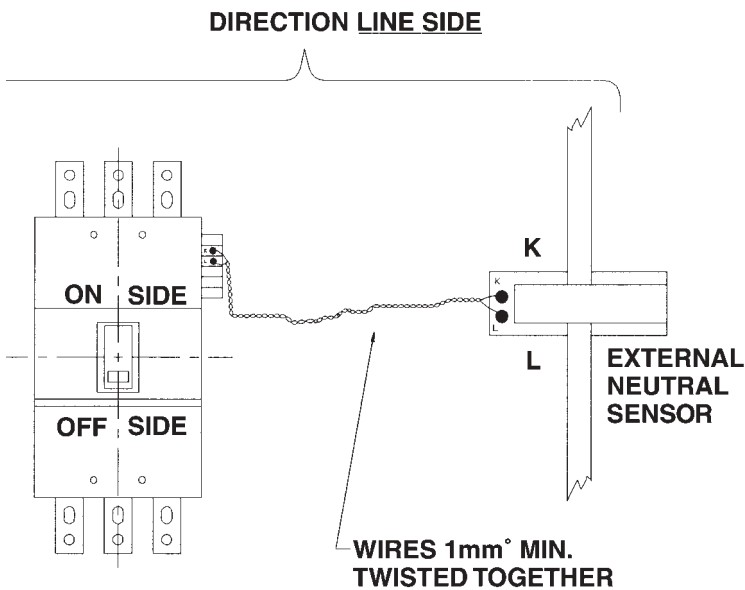
External neutral sensor (4th CT)

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

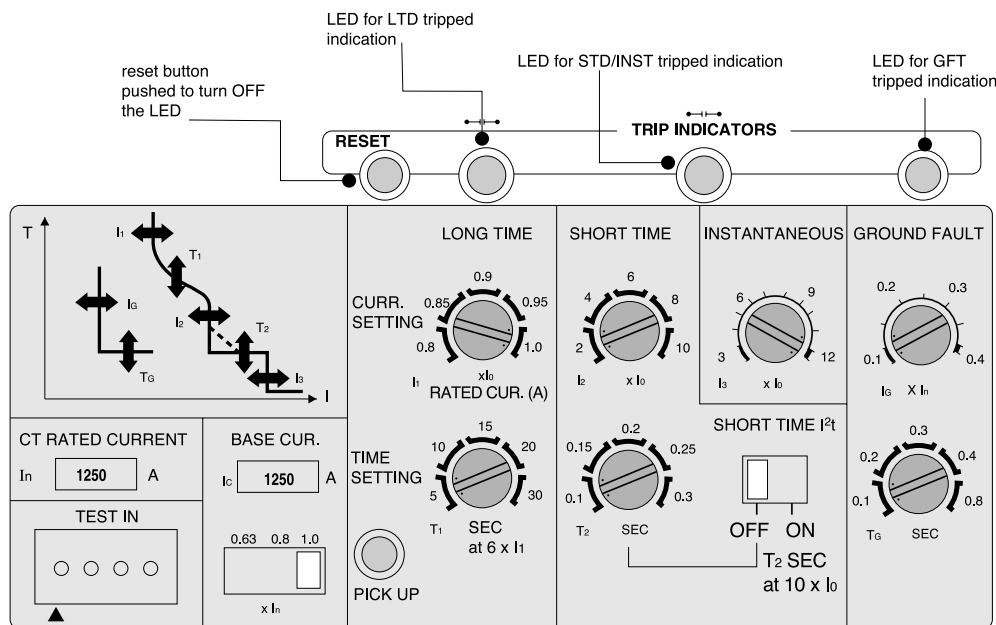


Trip indicators

The LEDs when lit, indicate which trip function tripped the breaker, 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 (1250AF and above)



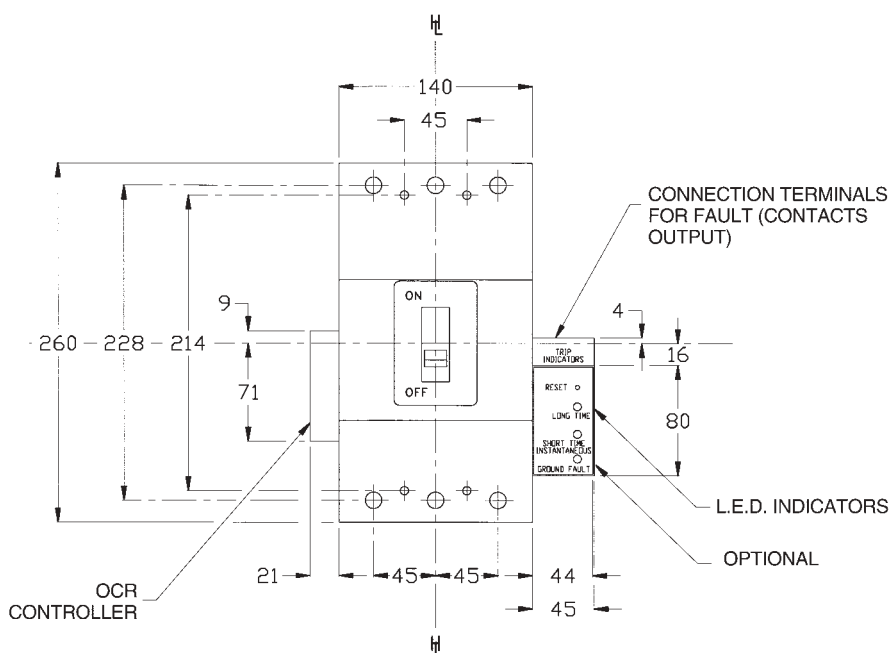
PICK UP
LED turns on when LTD function picks up.
In case PTA is fitted, this LED flickers when PTA function picks up. (separate control power required).

Example XS1250NE

Trip indicator display (400AF to 800AF) and OCR controller example: XS, XH, 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 trip (long time, STD/INST).

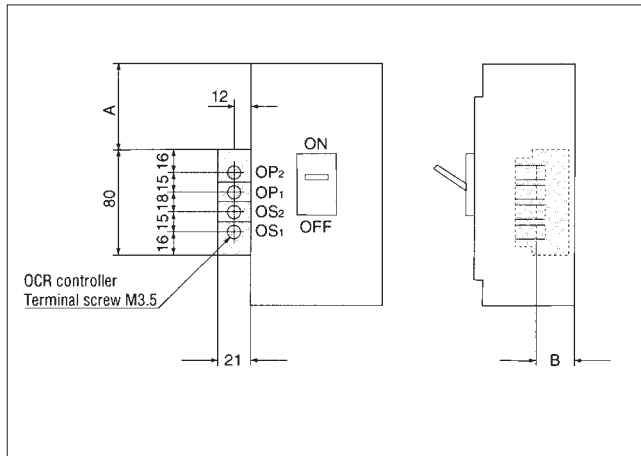
An external trip indicator box is required with 400AF models.



Notes: For dimensions of XS/XH800SE, PE and XV630/800PE refer to pages 7-39 and 7-40, add dimensions of OCR CONTROLLER and TRIP INDICATION box (above).

OCR controller (PTA and trip indication)

OCR controller mounting position



Dimension table (mm)

Ampere frame	Type of MCCB	A		B
		With UVT controller	Without UVT controller	
400	XS400	34	97	48
	XH400	34	97	48
630	XS630	64	151	60
	XH630	64	151	60
800	XS800	64	151	60
	XH800	64	151	60
1250	XS1250SE	51	114	72
1600	XS1600SE	51	114	92
2000	XS2000NE	54	180	115
2500	XS2500NE	54	180	115

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

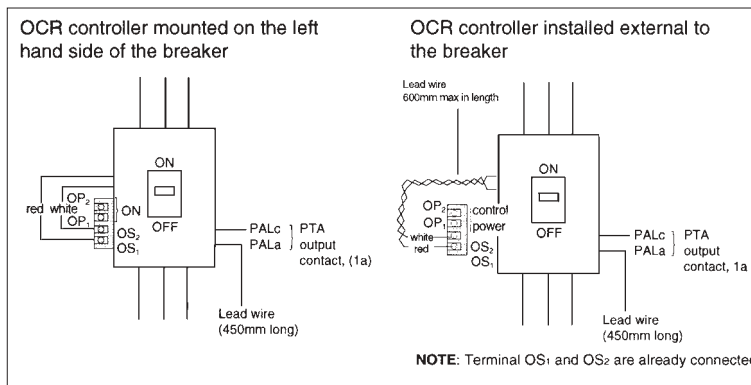
Control power source

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.

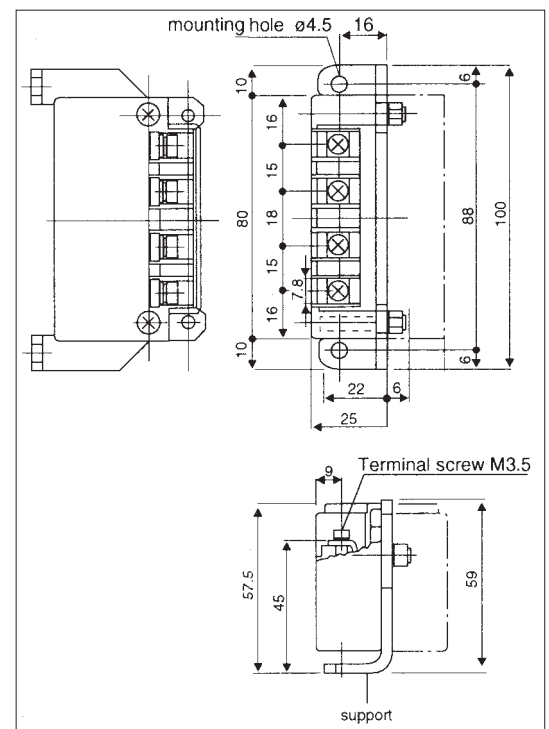
OCR controller connection diagram ^{1) 2)}



Notes: ¹⁾ Standard torque for the terminal screws M3.5 – 0.88~1.18 Nm (9~12 Kgf.cm)

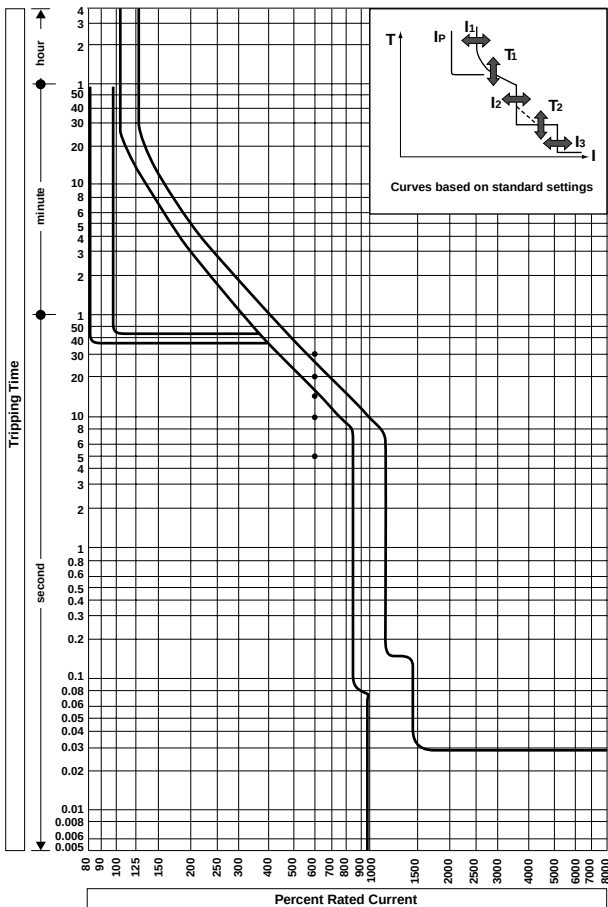
²⁾ Connected cable size – Max 2.0 mm²

OCR controller dimensions (Installed external to the breaker)



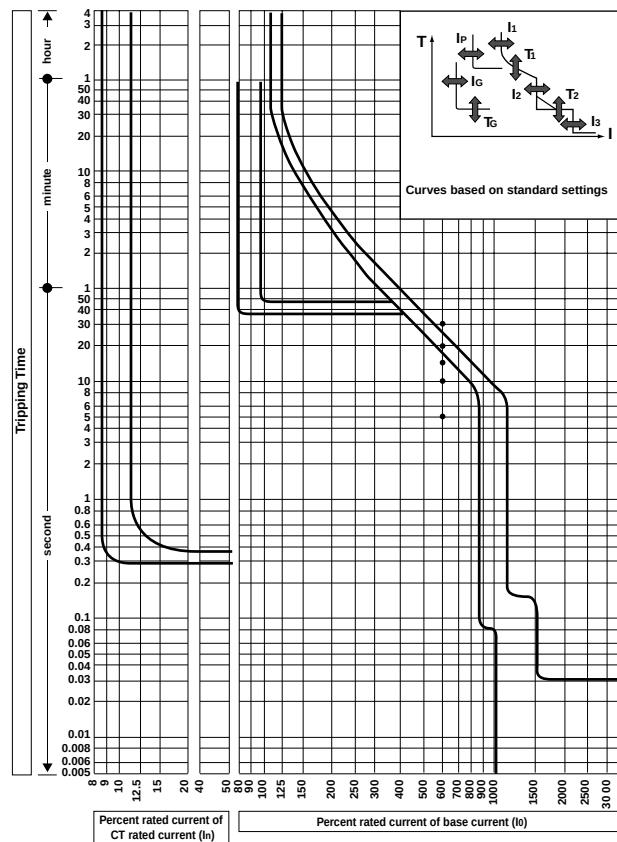
Time/Current curves XS400, XH400, XV400

Time/current characteristic curves



XS630, XH630, XV630, XS800, XH800, XV800

Time/current characteristic curves



Overcurrent tripping characteristics

CT rated current (A) (I_n)	250, 400
Base current setting (A) (I_b)	$(I_n) \times (0.63-0.8-1.0)$
Long time-delay pick-up current (A): (I_1)	$(I_b) \times (0.8-0.85-0.9-0.95-1.0)$ Non-tripping at (I_1) setting $\times 105\%$ and below. Tripping at 125% and above.
Long time-delay time settings (S) (T_1)	(5-10-15-20-30) at (I_1) $\times 600\%$ current. Setting tolerance $\pm 20\%$
Short time-delay pick-up current (A): (I_2)	$(I_b) \times (2-4-6-8-10)$ Setting tolerance $\pm 15\%$
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_b) $\times (3$ to <u>12</u>) Setting tolerance $\pm 20\%$
• Pre-trip alarm pick-up current (A) (I_p)	$(I_b) \times (0.7, 0.8, \underline{0.9}, 1.0)$ Setting tolerance $\pm 10\%$
• Pre-trip alarm time setting (S) (T_p)	40 fixed definite time-delay. Setting tolerance $\pm 10\%$

Note: • Optional

Underlined values will be applied as standard ratings unless otherwise specified when ordering

Overcurrent tripping characteristics

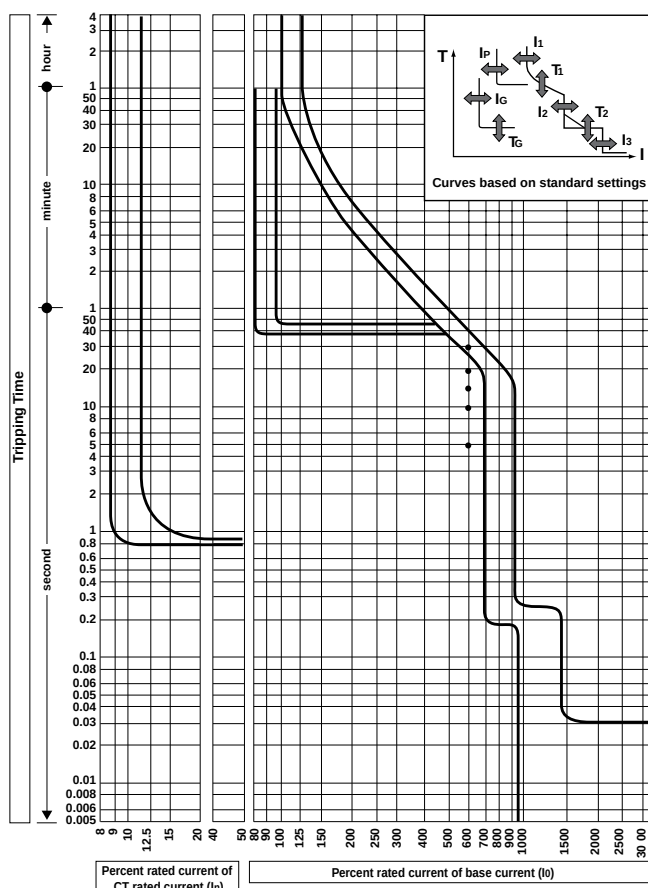
CT rated current (A) (I_n)	630, 800
Base current setting (A) (I_b)	$(I_n) \times (0.63-0.8-1.0)$
Long time-delay pick-up current (A): (I_1)	$(I_b) \times (0.8-0.85-0.9-0.95-1.0)$ Non-tripping at (I_1) setting $\times 105\%$ and below. Tripping at 125% and above.
Long time-delay time settings (S) (T_1)	(5-10-15-20-30) at (I_1) $\times 600\%$ current. Setting tolerance $\pm 20\%$
Short time-delay pick-up current (A): (I_2)	$(I_b) \times (2-4-6-8-10)$ Setting tolerance $\pm 15\%$
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_b) $\times (3$ to <u>12</u>) Setting tolerance $\pm 20\%$
• Pre-trip alarm pick-up current (A) (I_p)	$(I_b) \times (0.7, 0.8, \underline{0.9}, 1.0)$ Setting tolerance $\pm 10\%$
• Pre-trip alarm time setting (S) (T_p)	40 fixed definite time-delay. Setting tolerance $\pm 10\%$
• Ground fault trip pick-up current (A) (I_g)	Continuously adjustable from (I_b) $\times (\underline{0.1}$ to 0.4) Setting tolerance $\pm 15\%$
• Ground fault trip time setting (S) (T_g)	Opening time (0.1-0.2- <u>0.3</u> -0.4-0.8) in the definite time-delay. Total clearing time is +50mS and resettable time is - 20mS for the time-delay settings

Note: • Optional

Underlined values will be applied as standard ratings unless otherwise specified when ordering

Microprocessor based characteristics and adjustments XS1250SE, XV1250NE, XS1600SE, XS2000NE, XS2500NE

Time/current characteristic curves



7

Overcurrent tripping characteristics

CT rated current (A) (I_n)	1000, 1250, 1600, 2000, 2500
Base current setting (A) (I_o)	$(I_n) \times (0.63-0.8-1.0)$
Long time-delay pick-up current (A): (I_1)	$(I_o) \times (0.8-0.85-0.9-0.95-1.0)$ Non-tripping at (I_1) setting $\times 105\%$ and below. Tripping at 125% and above.
Long time-delay time settings (S) (T_1)	(5-10-15-20-30) at (I_1) $\times 600\%$ current. Setting tolerance $\pm 20\%$
Short time-delay pick-up current (A): (I_2)	$(I_o) \times (2-4-6-8-10)$ Setting tolerance $\pm 15\%$
Short time-delay time settings (S) (T_2)	Opening time (0.1, 0.15, <u>0.2</u> , 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_o) $\times (3$ to <u>12</u>) Setting tolerance $\pm 20\%$
• Pre-trip alarm pick-up current (A) (I_p)	$(I_o) \times (0.7, 0.8, 0.9, 1.0)$ Setting tolerance $\pm 10\%$
• Pre-trip alarm time setting (S) (T_p)	40 fixed definite time-delay. Setting tolerance $\pm 10\%$
• Ground fault trip pick-up current (A) (I_G)	Continuously adjustable from (I_n) $\times (0.1 to 0.4)$ Setting tolerance $\pm 15\%$
• Ground fault trip time setting (S) (T_G)	Opening time (0.1-0.2-0.3-0.4- <u>0.8</u>) in the definite time-delay. Total clearing time is +50mS and resettable time is - 20mS for the time-delay settings

Note: • Optional

Underlined values will be applied as standard ratings unless otherwise specified when ordering

Time/Current curves Mathematical analysis

MCCB curves

A microprocessor 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 Analysis Software is available for computerised generation of curves (refer to page 7-24).

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:

$$(I^2 - 1) \cdot t = k$$

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 - 947 - 2 states that a breaker must not trip below 105% of its rated current, and always trip at 130% of its rated current. Terasaki microprocessor 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.

7

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

$I_3 = 12$ (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:

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

giving the characteristic equation:

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

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 $1250 \times 1.0 \times 0.8 \times 4 = 400A$).

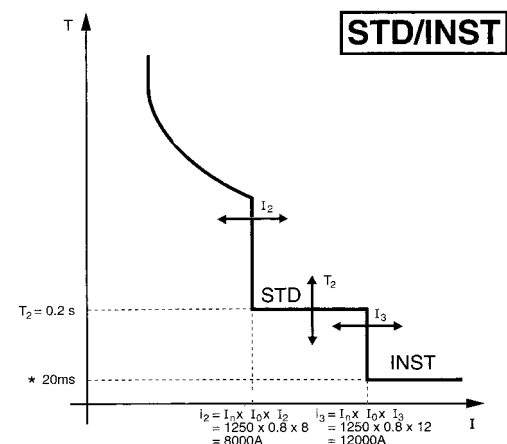
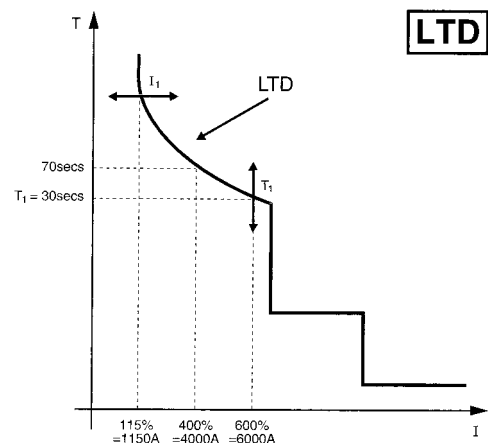
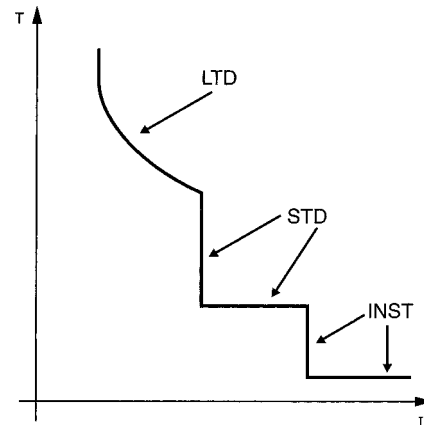
$$t = \frac{1050}{(I^2 - 1)} = \frac{1050}{(4^2 - 1)} = 70 \text{ secs}$$

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.



OCR checker, inspection and maintenance



The TemBreak (Electronic) OCR checker, Type TNS-1, 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.

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	200 mm (W) x 84 mm (H) x 130 mm (D)
Weight	2.7 kg

NEW
AR ACB included
NT compatible

TemCurve

Version 4

Selectivity Analysis Software

TemCurve, is an exciting new generation of selectivity software now available from NHP.

Our objective is to provide you with the tools necessary to ensure your time is managed as effectively and efficiently as possible.

TemCurve has been developed wholly by NHP for the Australian market, but will also be used within the Terasaki organisation throughout the world.

TemCurve, version 4.0 takes all the features presently available in version 3.0 and adds to them.

This ensures that **TemCurve** 4.0 will remain one of the most versatile design tools available on the market today.

Circuit breaker selection and set-up can be a laborious and time-consuming task. NHP has ensured that **TemCurve** 4.0, for "Windows™ 98, 2000, NT is now even simpler to operate.

Hence, accurate results can be gained in a matter of minutes.



The database within **TemCurve** holds the characteristic curves for all Terasaki devices presently available from NHP. In addition to this, the extensive database of non-Terasaki devices allows you to produce accurate grading from the transformer primary side to the point of final distribution.

High quality prints can be output, including the characteristic curves for each chosen device, as well as a complete list of device settings.

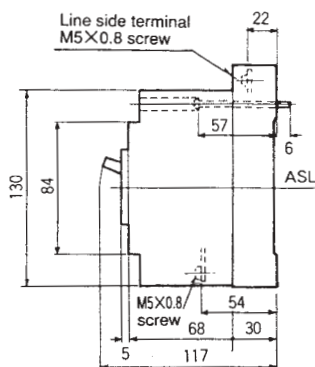
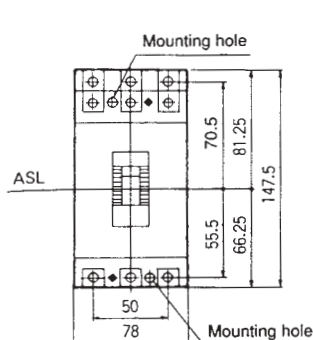
TemBreak XM30PB

Outline dimensions (mm)

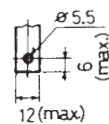
ASL: Arrangement standard line

HL: Handle frame centre line

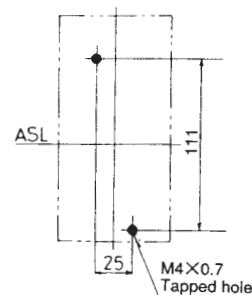
Front connected (standard)



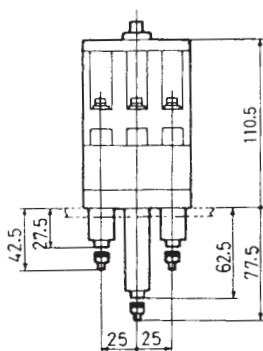
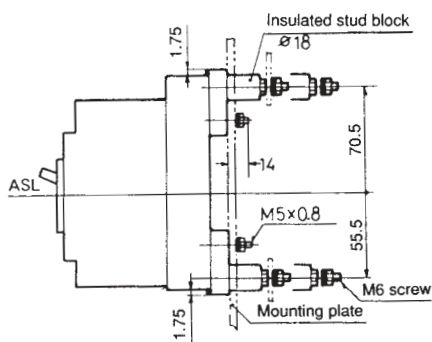
Preparation of conductor



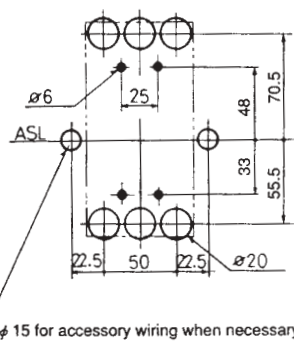
Drilling plan



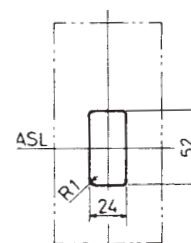
Rear connected (optional)



Drilling plan

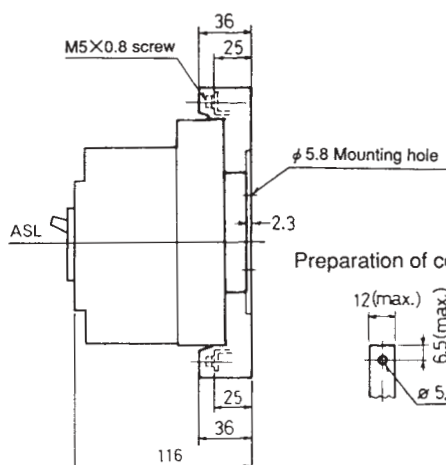
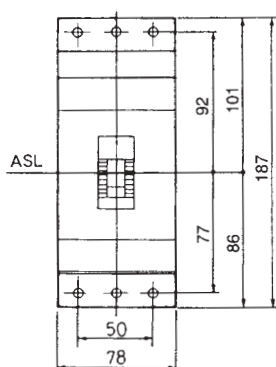


Panel cut-out

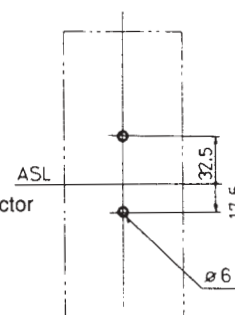


Panel cut-out dimensions shown give an allowance of 1.0 mm around the handle escutcheon.

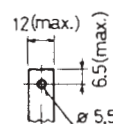
Plug-in (optional)



Drilling plan



Preparation of conductor



TemBreak XS125CS, CJ, NS, NJ, XH125NJ, PJ and TL30F MCCBs

ASL: Arrangement standard line

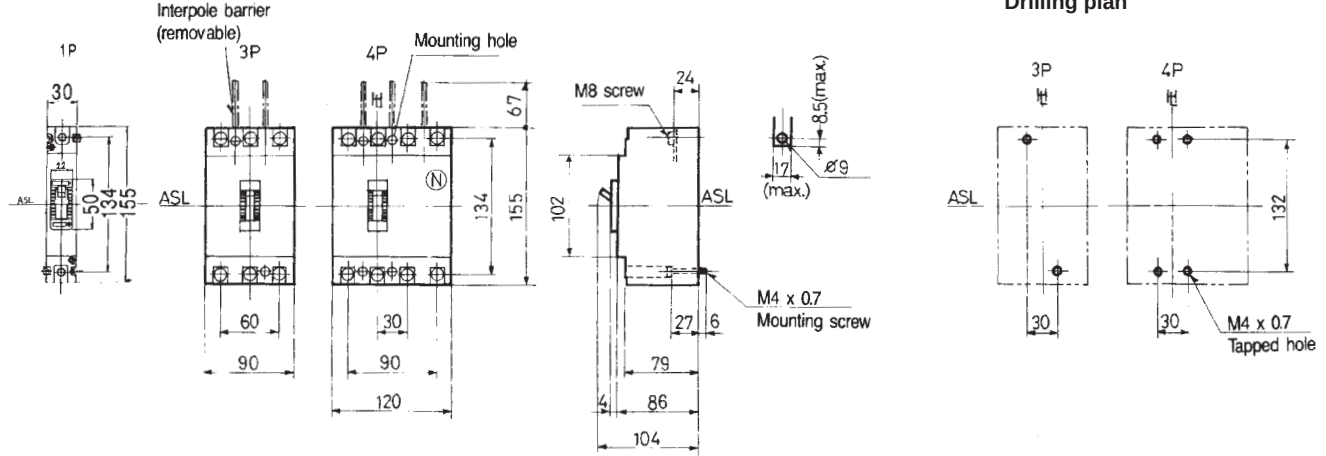
H: Handle frame centre line

Outline dimensions (mm)

Front connected (standard)

Note: XS125NS 1 pole only

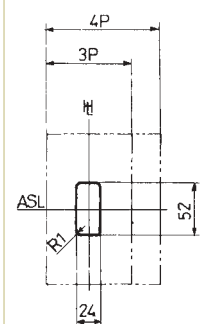
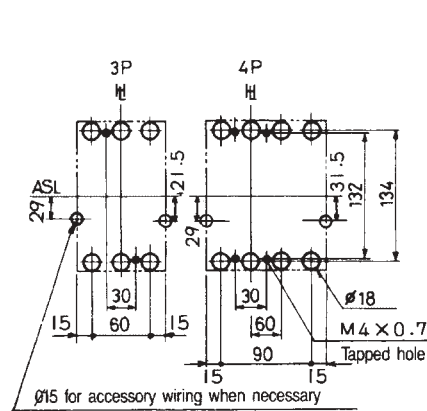
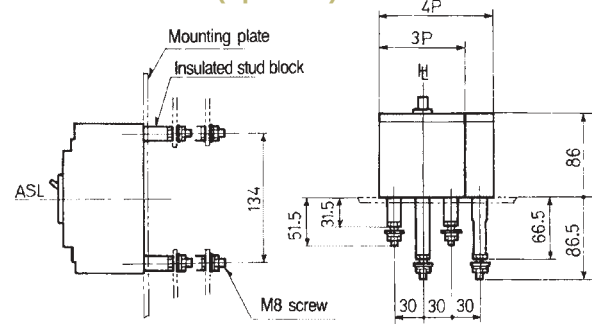
Drilling plan



Rear connected (optional)

Drilling plan

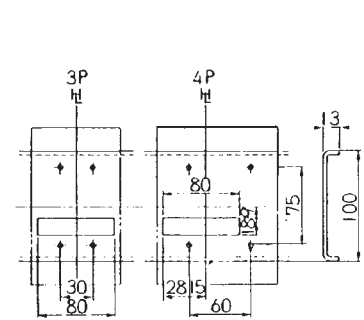
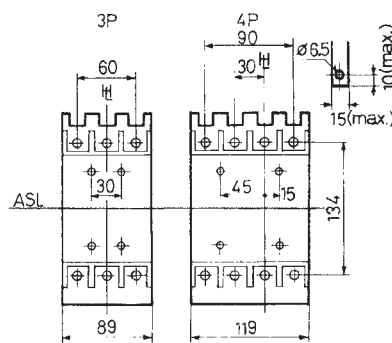
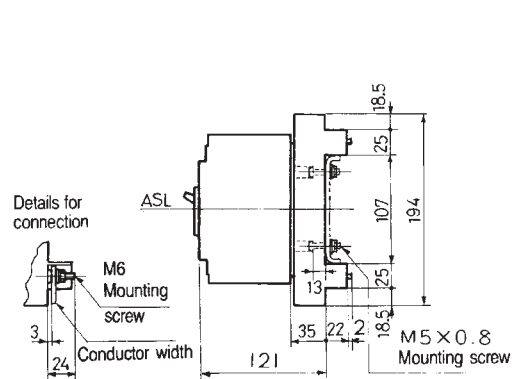
Panel cut-out



Plug-in (optional)

Mounting block

Drilling plan



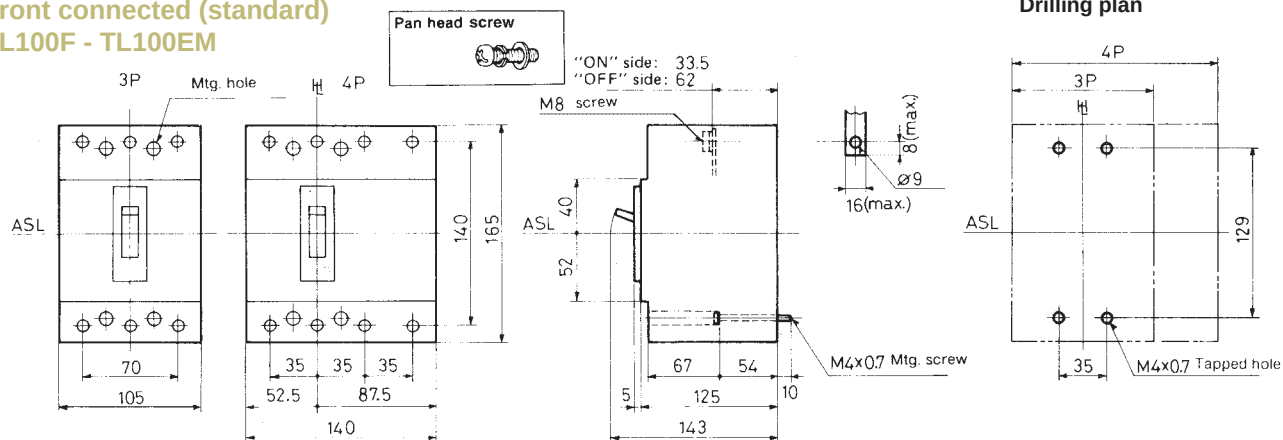
TemBreak TL100F – TL100EM – TL100NJ

Outline dimensions (mm)

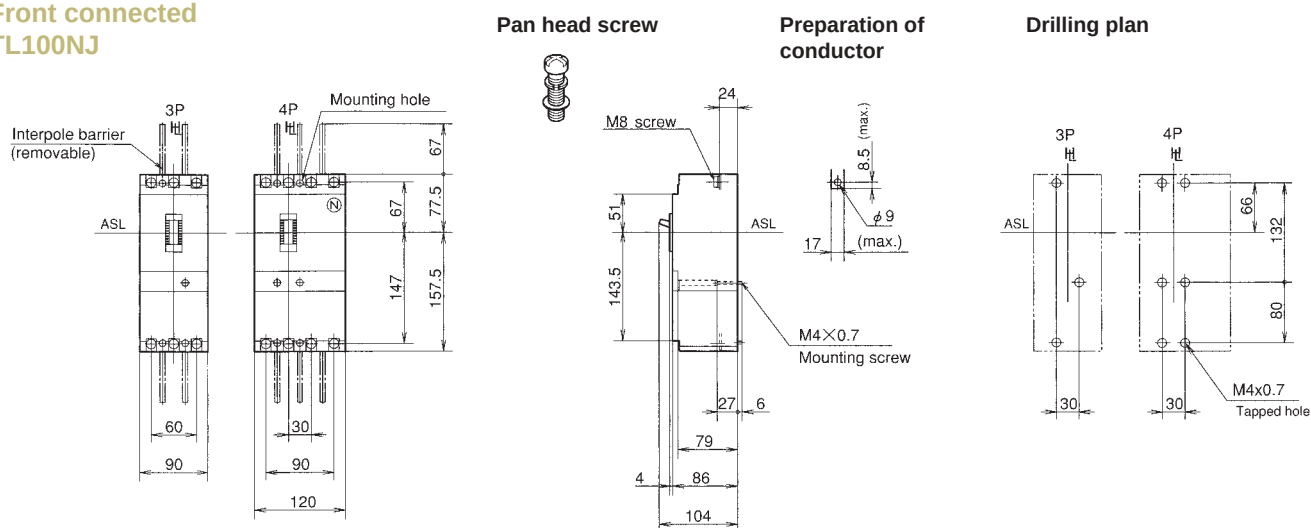
ASL: Arrangement standard line

HL: Handle frame centre line

Front connected (standard) TL100F - TL100EM

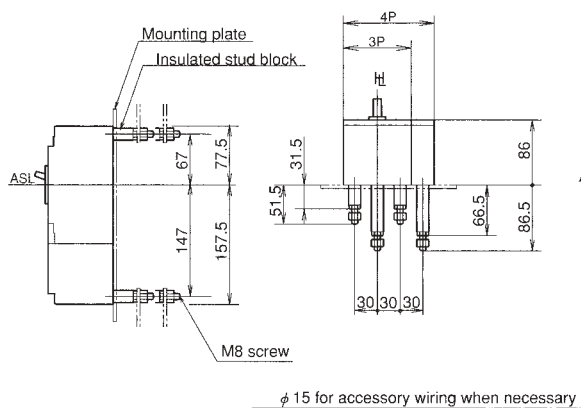


Front connected TL100NJ

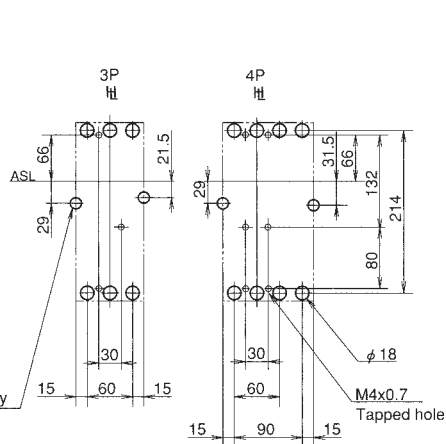


Rear connected

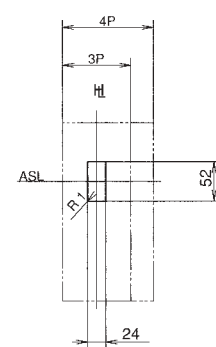
Bold stud type



Drilling plan



Panel cut-out



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

Note: Interpole barriers standard on TL100EM and TL100NJ.

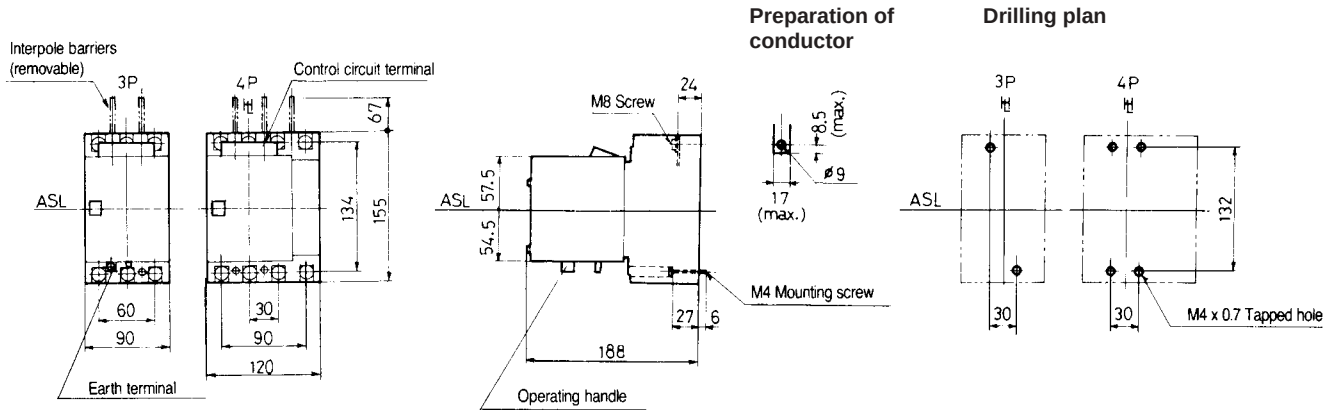
Motor operators for XS125, XH125, TL100NJ, TL30F ¹⁾ ²⁾

ASL: Arrangement standard line

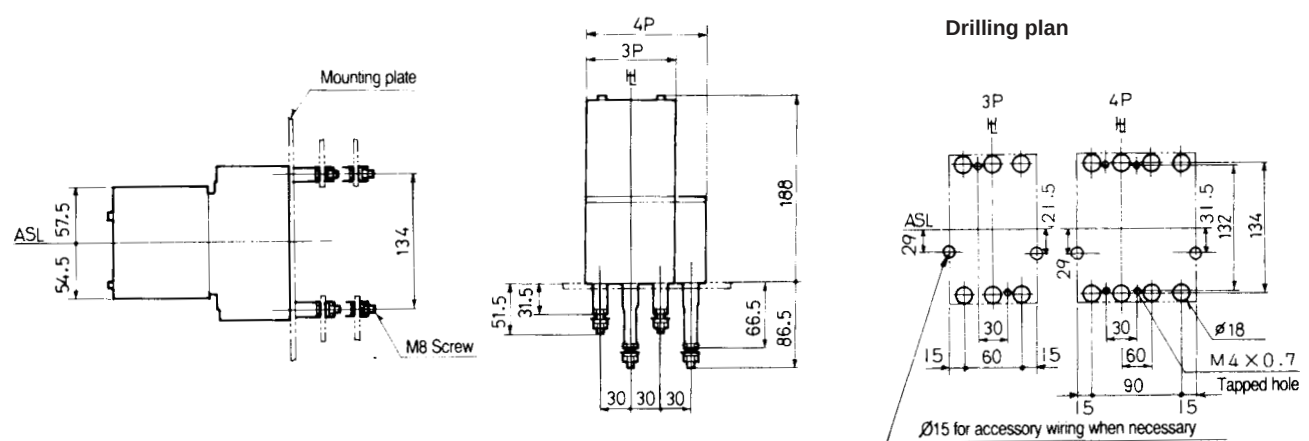
H: Handle frame centre line

Outline dimensions (mm)

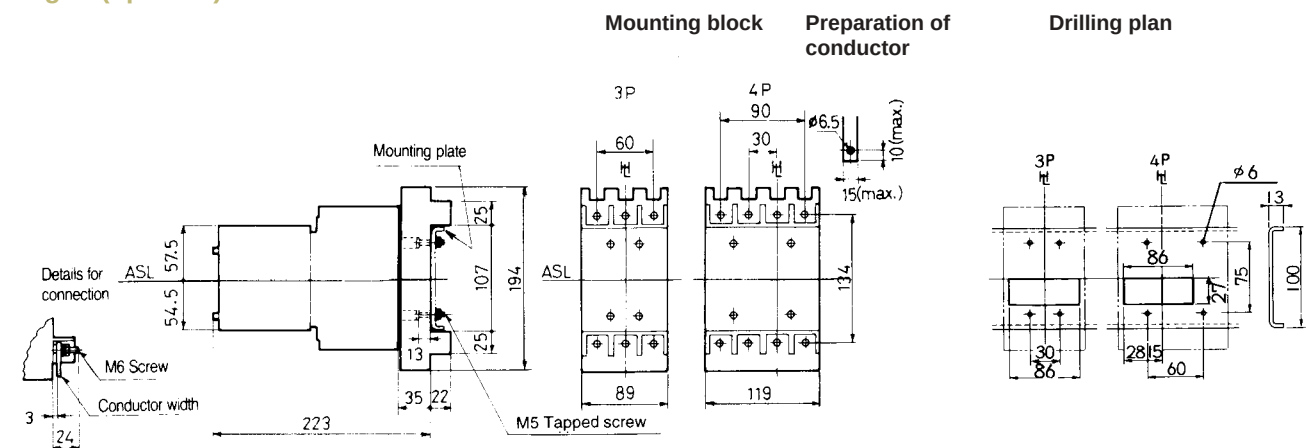
Front connected (standard)



Rear connected (optional)



Plug-in (optional)



Notes: ¹⁾ For dimensions of 7MB-3BA2 used for TL100EM TL100F refer to NHP.

²⁾ Dimensions for TL100NJ not showing length of MCCB. Refer page 7-27.

Above outline dimensions are for AC motors. Contact NHP for details for DC motors.

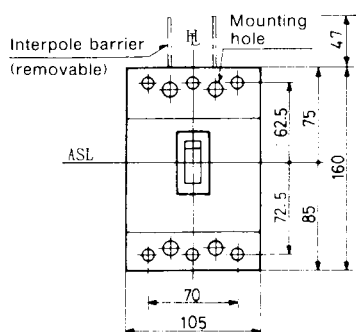
TemBreak XE225NC

Outline dimensions (mm)

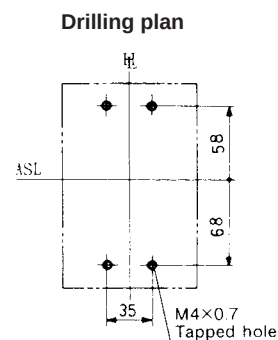
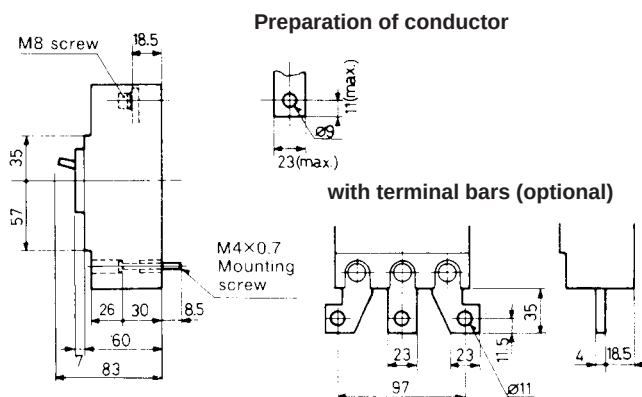
ASL: Arrangement standard line

H: Handle frame centre line

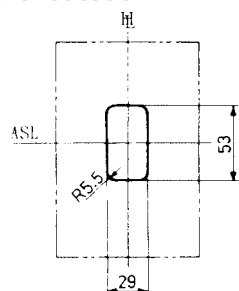
Front connected (standard)



Breakers with terminal bars
available on request

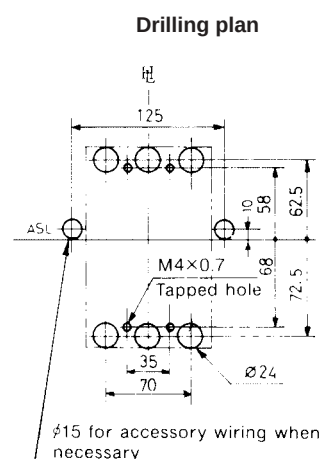
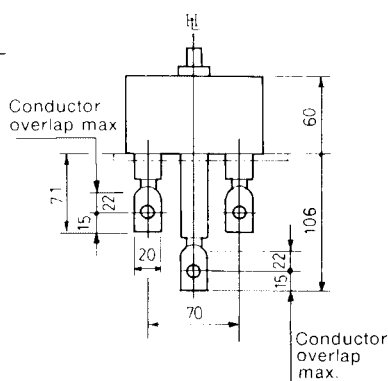
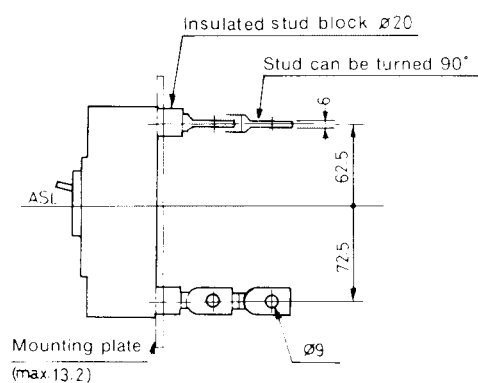


Panel cutout



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

Rear connected (optional)

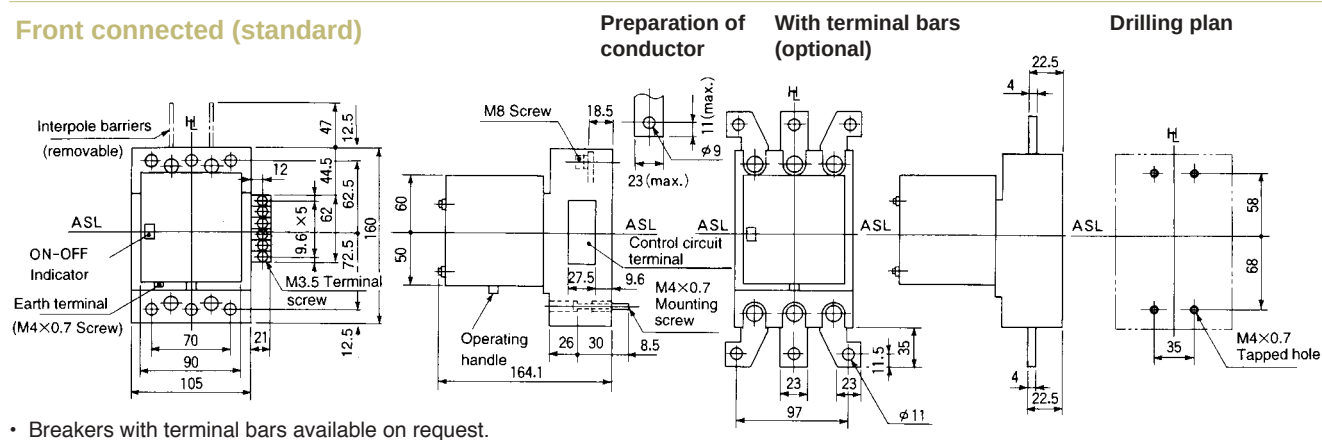


Note: In the standard shipment mode, both terminals on the line side and the load side are in a horizontal direction.

Motor operators for XE225NC

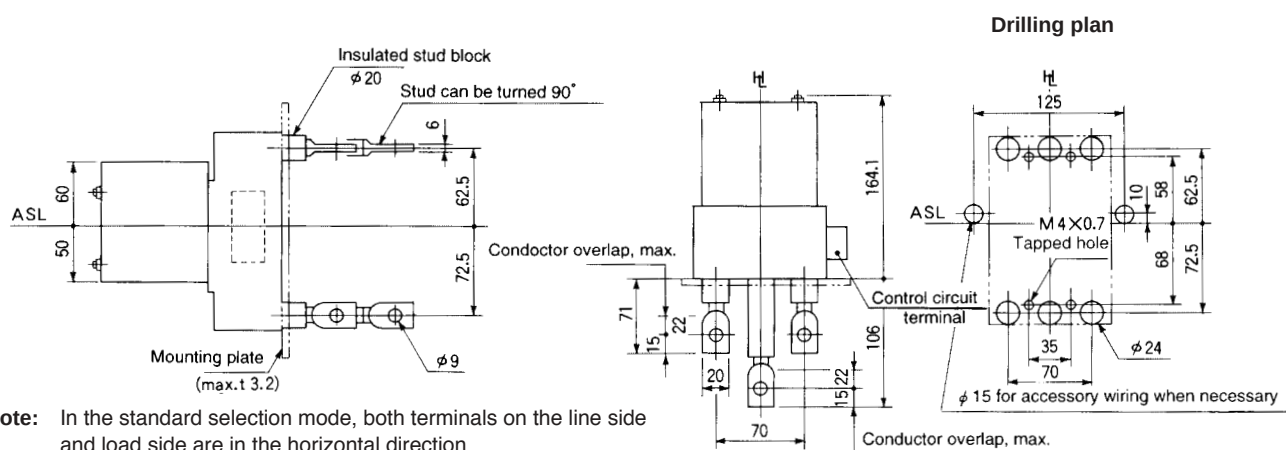
Outline dimensions (mm)

Front connected (standard)



- Breakers with terminal bars available on request.

Rear connected (optional)



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

ASL: Arrangement standard line
H: Handle frame centre line

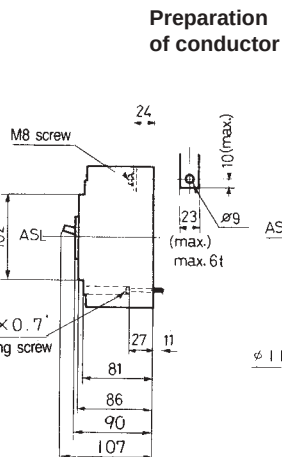
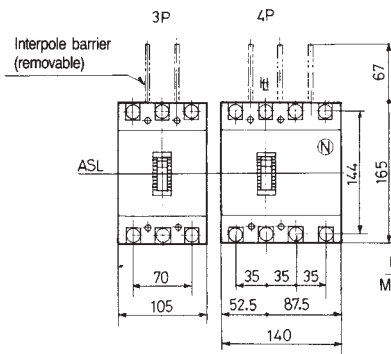
TemBreak XS250NJ

Outline dimensions (mm)

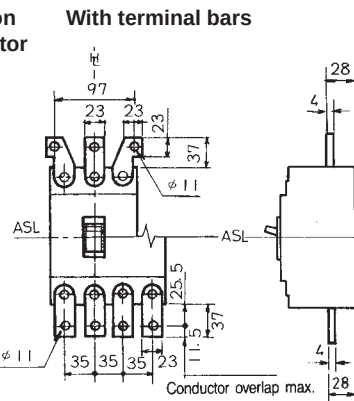
ASL: Arrangement standard line

H: Handle frame centre line

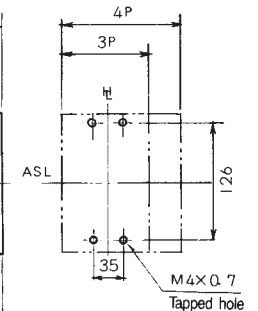
Front connected (standard)



(optional)

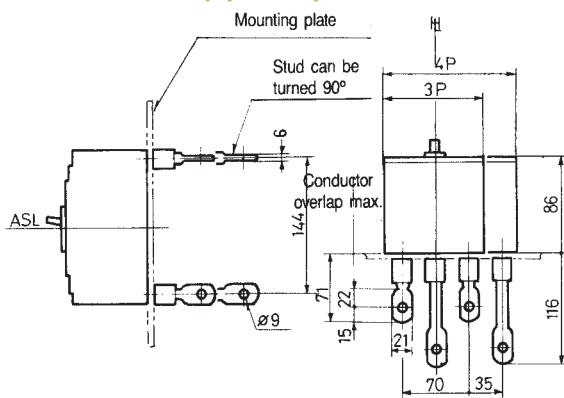


Drilling plan

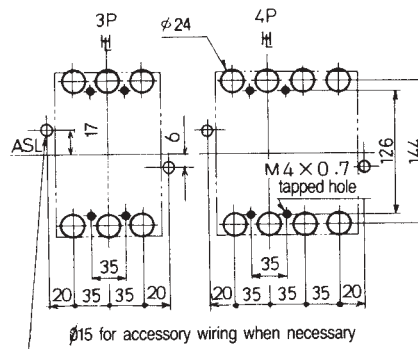


Breakers with terminal bars available on request.

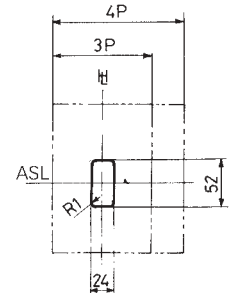
Rear connected (optional)



Drilling plan



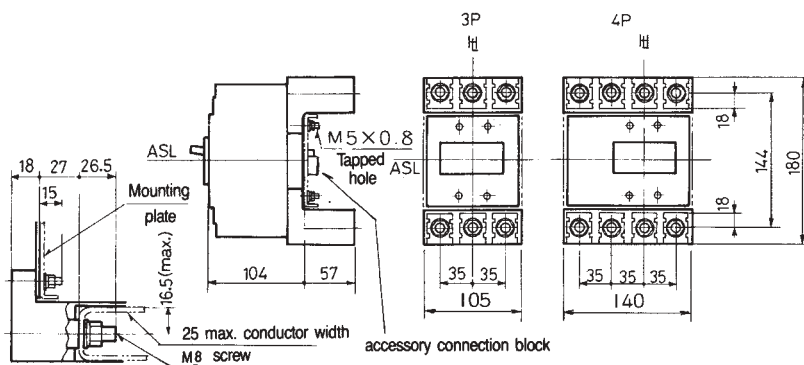
Panel cut-out



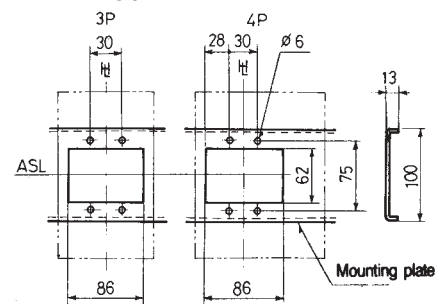
Note: In the standard shipment mode, both terminals on the line side and the load side are in a horizontal position.

Plug-in (optional)

Mounting block



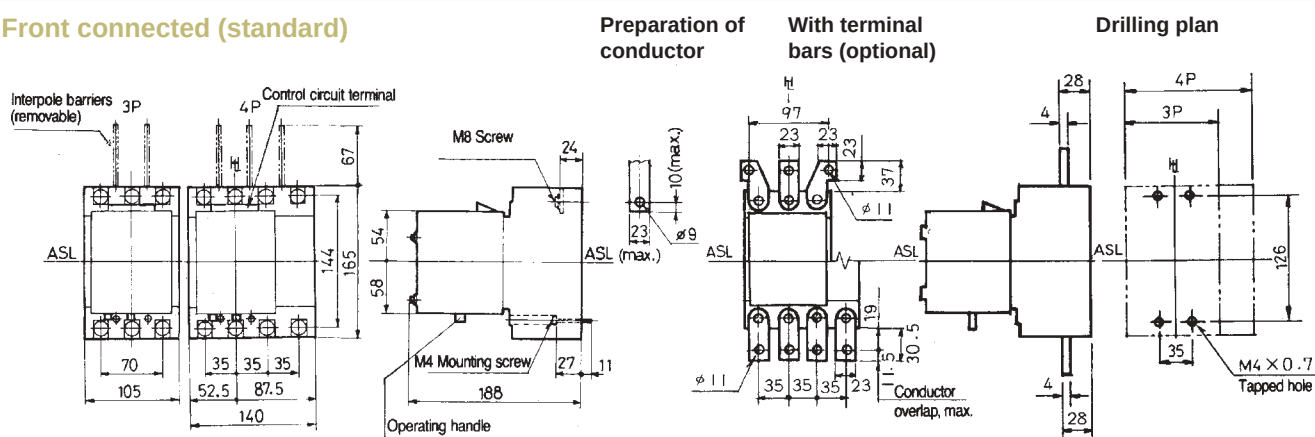
Drilling plan



Motor operators for XS250NJ

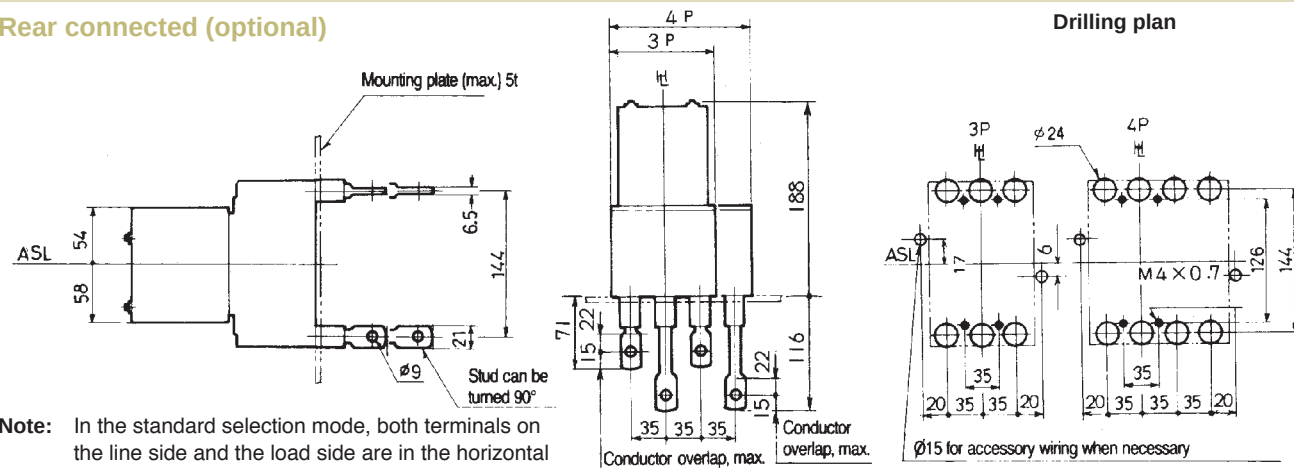
Outline dimensions (mm)

Front connected (standard)



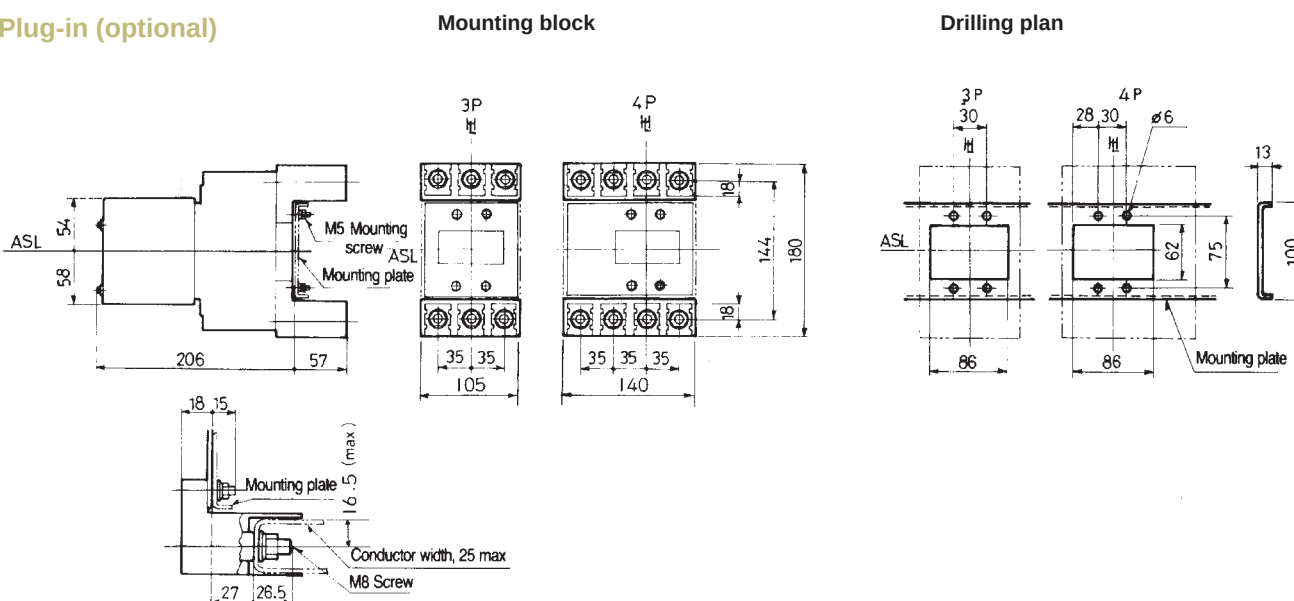
- Breakers with terminals bars available on request.

Rear connected (optional)



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

Plug-in (optional)



ASL: Arrangement standard line
H: Handle frame centre line

Note: For dimensions and selection of motors for TL225F refer to NHP.

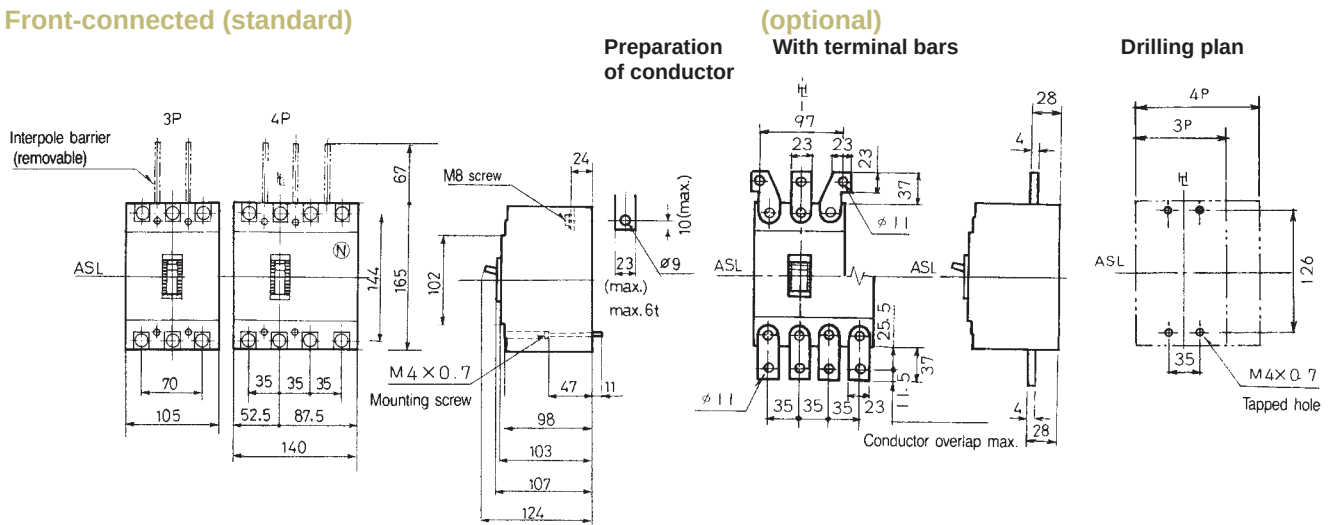
TemBreak XH160PJ and XH250NJ

ASL: Arrangement standard line

HL: Handle frame centre line

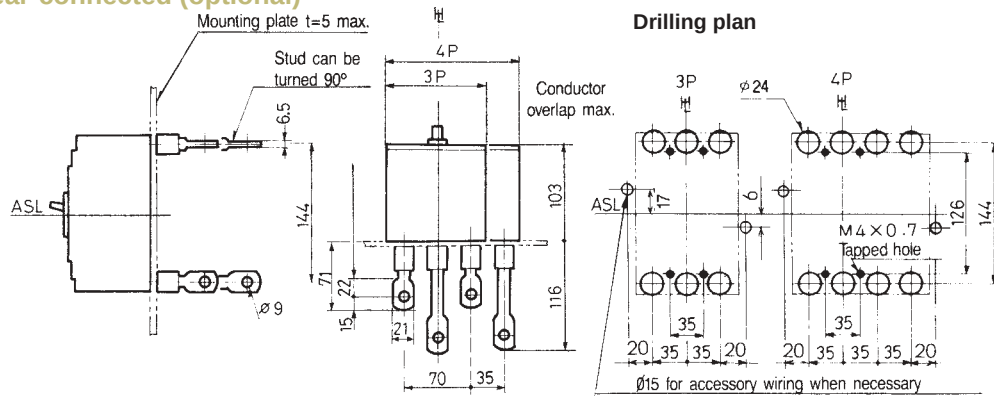
Outline dimensions (mm)

Front-connected (standard)



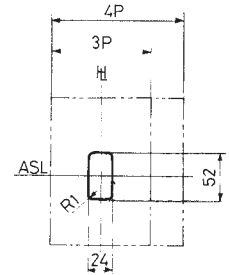
Note: Breakers with terminal bars available on request.

Rear-connected (optional)



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

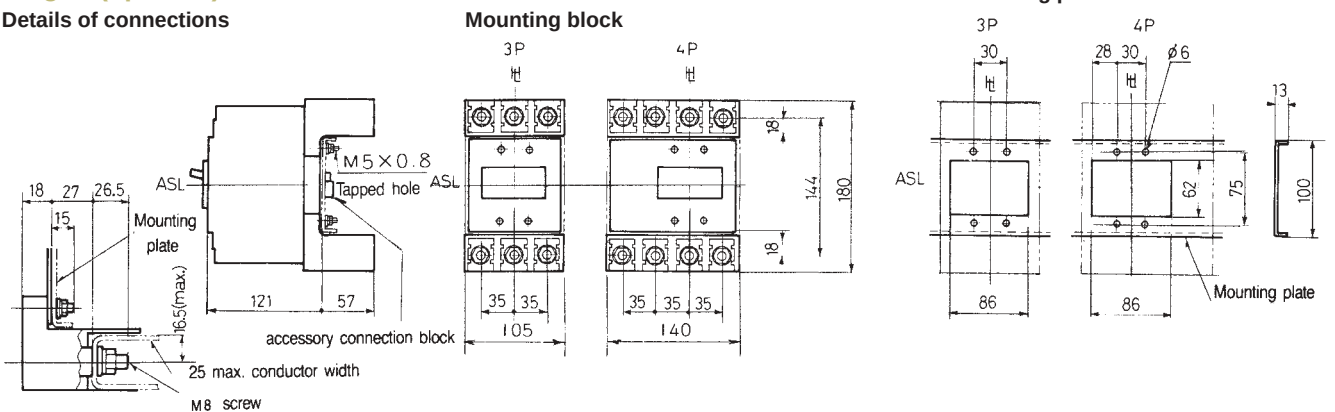
Panel cut-out



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

Plug-in (optional)

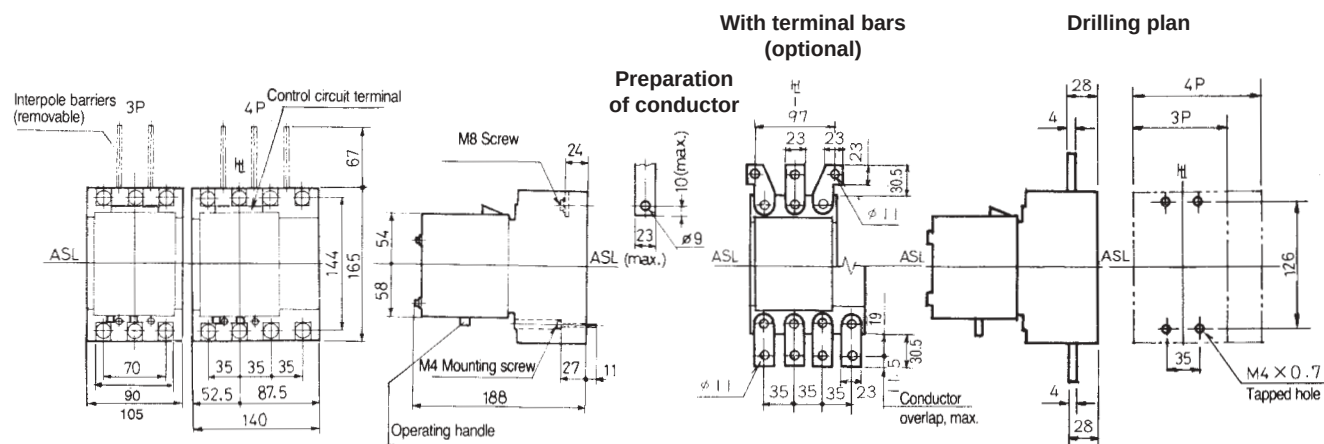
Details of connections



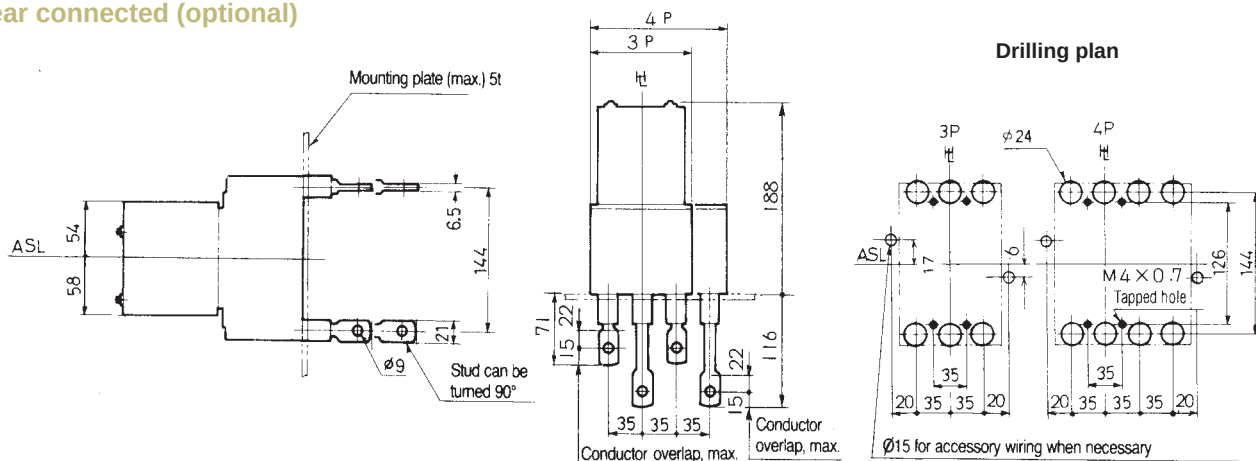
Motor operators for XH160PJ and XH250NJ

Outline dimensions (mm)

Front connected (standard)

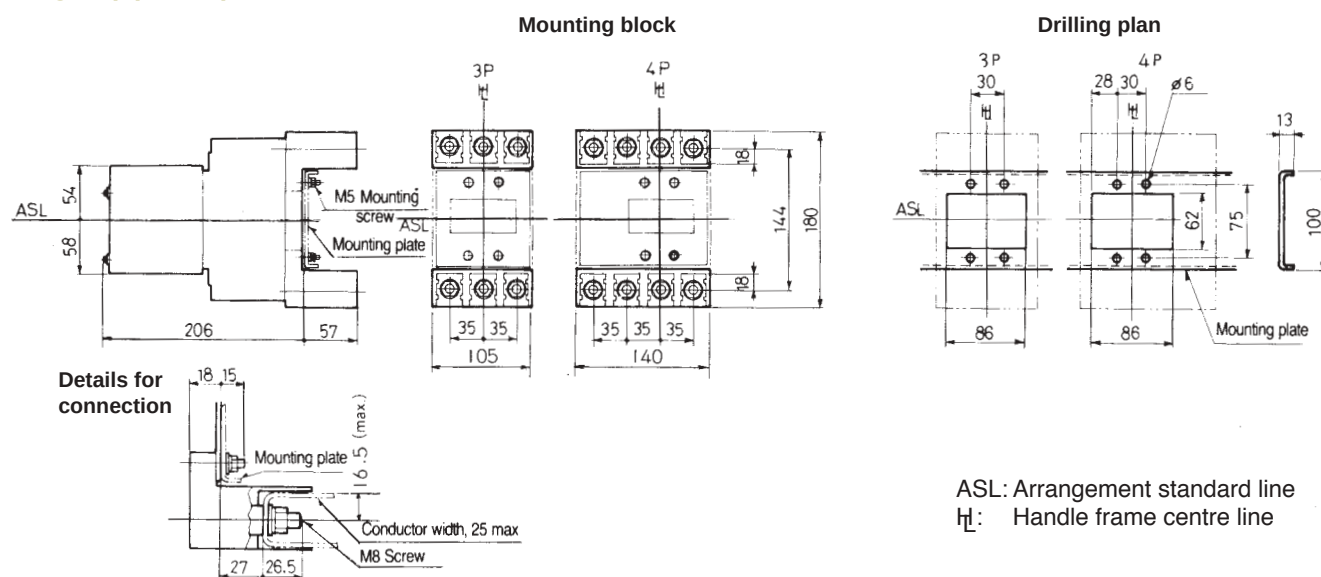


Rear connected (optional)



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

Plug-in (optional)



ASL: Arrangement standard line
H: Handle frame centre line

TemBreak TL225F, TL250NJ

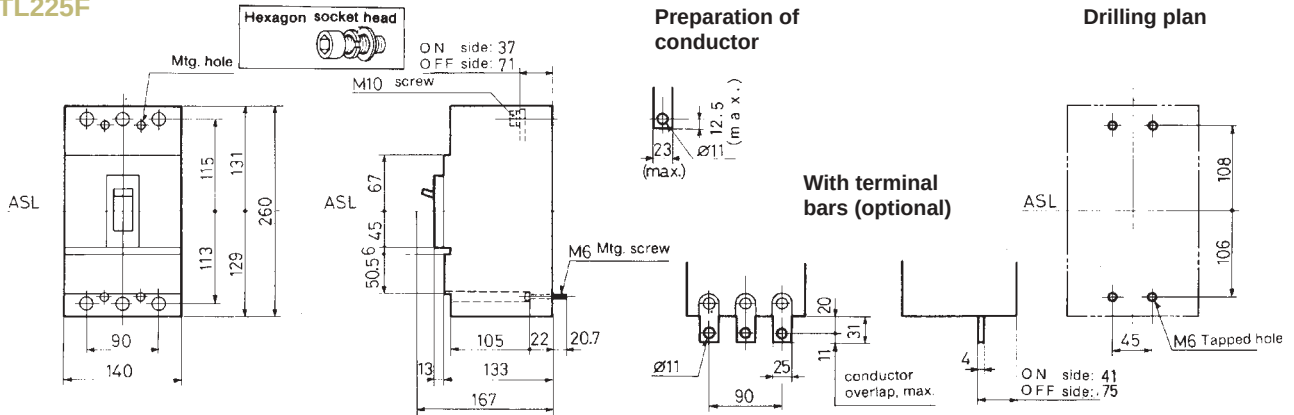
Outline dimensions (mm)

ASL: Arrangement standard line

H_L: Handle frame centre line

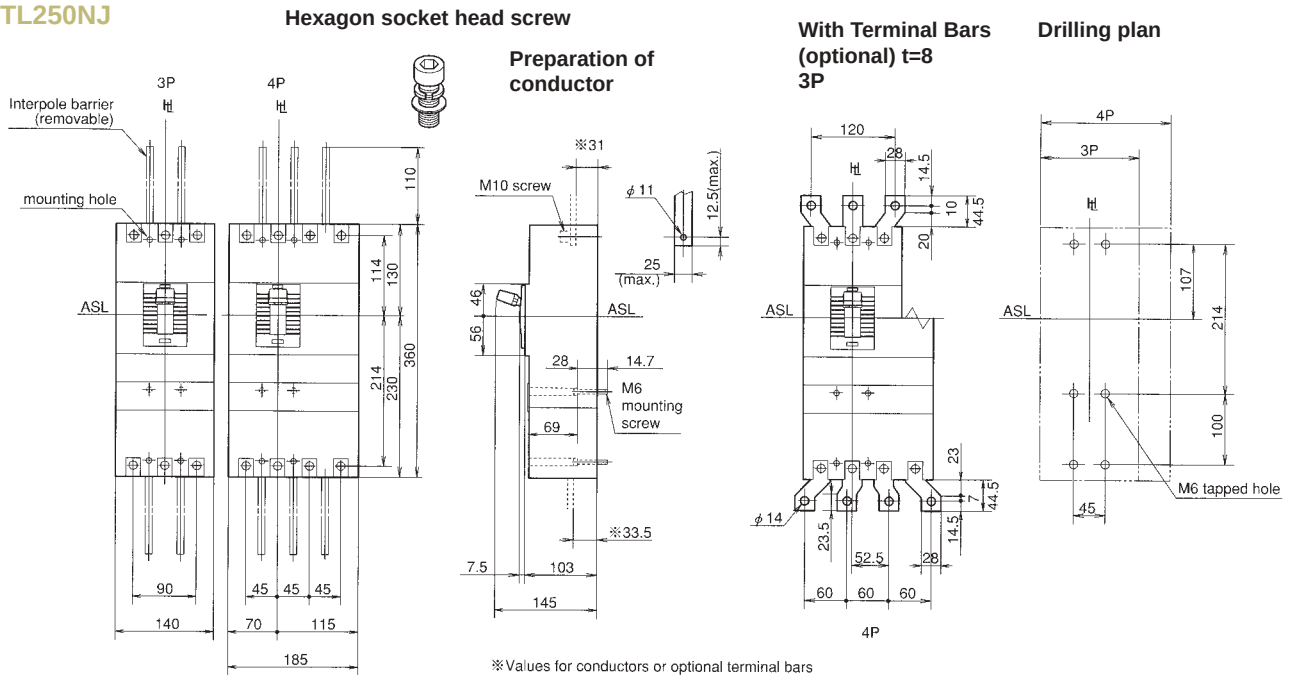
Front connected (standard)

TL225F



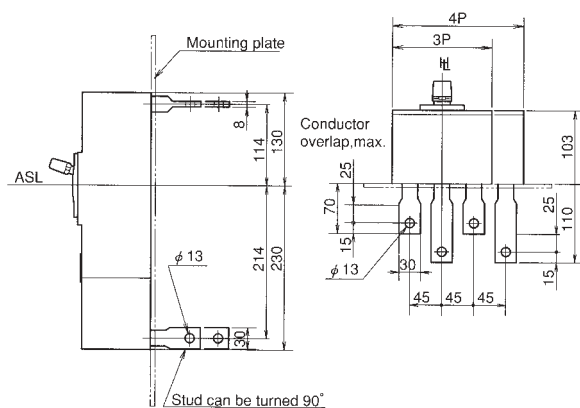
Front connected

TL250NJ



Rear connected

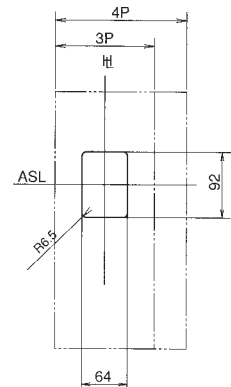
Flat bar stud



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

Drilling plan

Panel cut-out



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

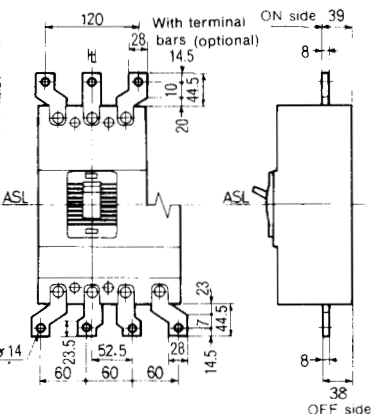
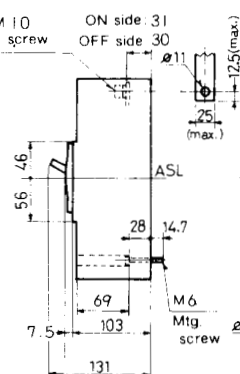
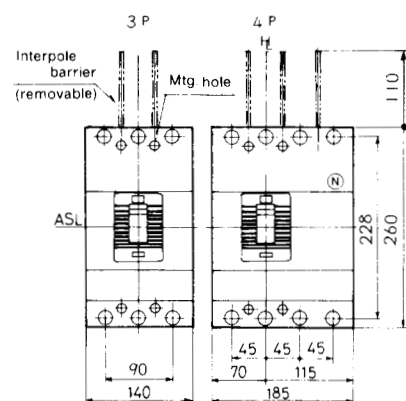
TemBreak XS400, XH400, XV400, XH250PJ

ASL: Arrangement standard line

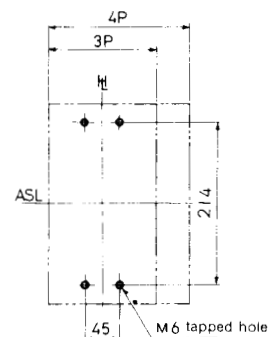
H: Handle frame centre line

Outline dimensions (mm)

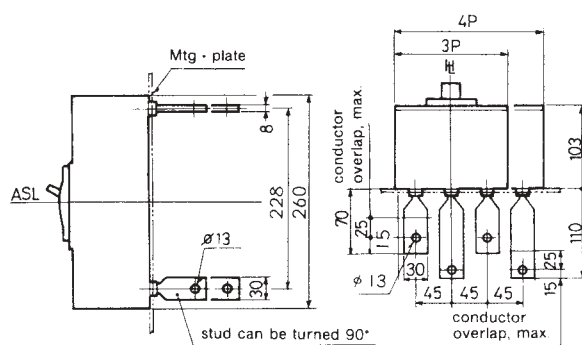
Front connected (standard)



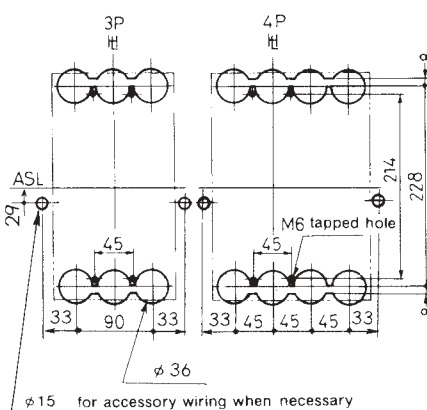
Drilling plan



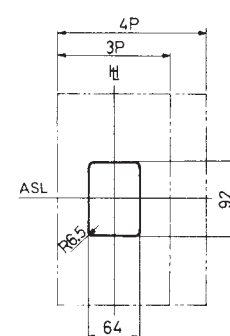
Rear connected (optional)



Drilling plan



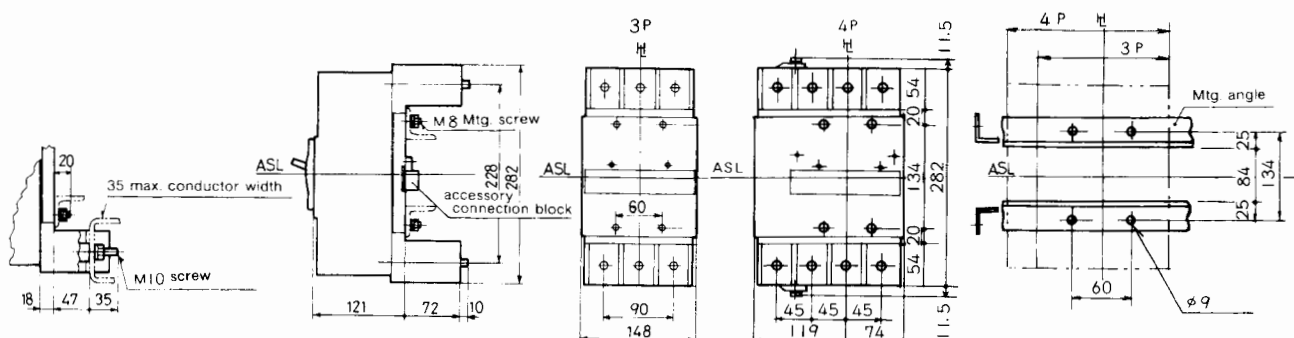
Panel cut-out



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

Note: In the standard shipment mode, both terminals on the line side or the load side are in horizontal direction.

Plug-in (optional)



TemBreak TL400NE

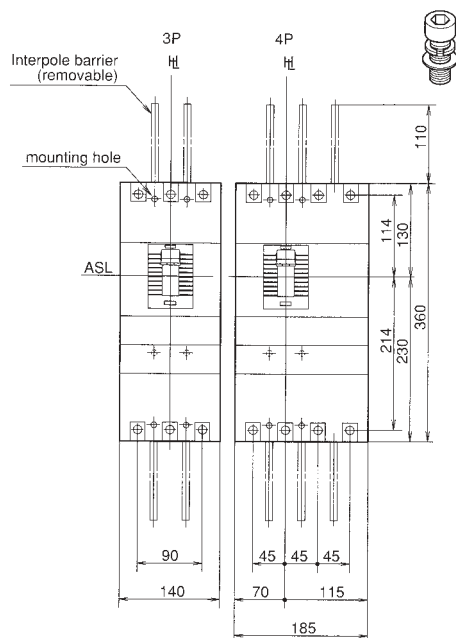
ASL: Arrangement standard line

H: Handle frame centre line

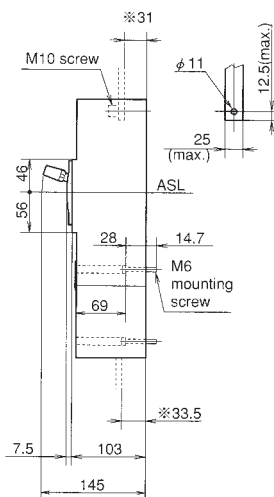
Outline dimensions (mm)

Front connected TL400NE

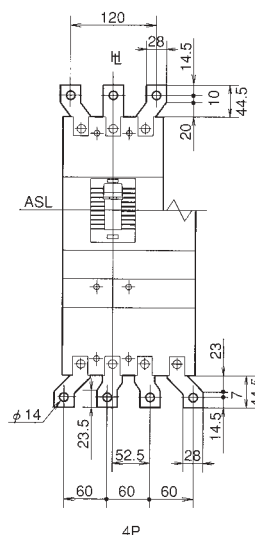
Hexagon socket head screw



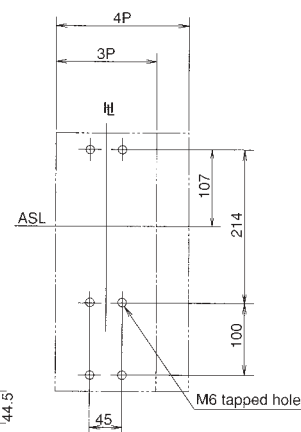
Preparation of conductor



With Terminal Bars
(optional) t=8
3P



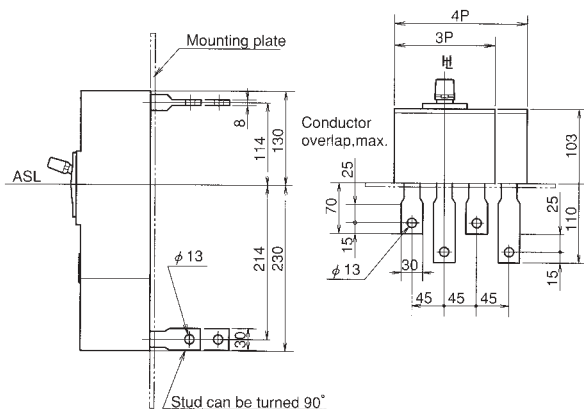
Drilling plan



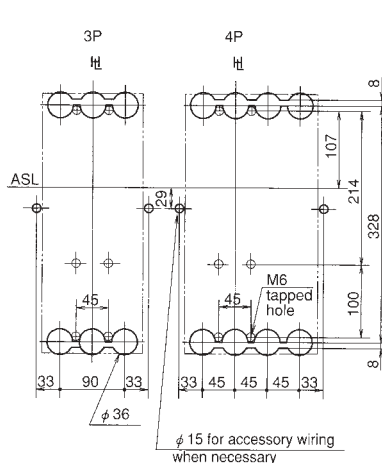
※Values for conductors or optional terminal bars

Rear connected

Flat bar stud

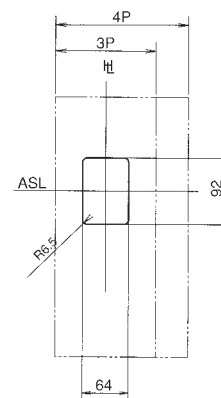


Drilling plan



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

Panel cut-out

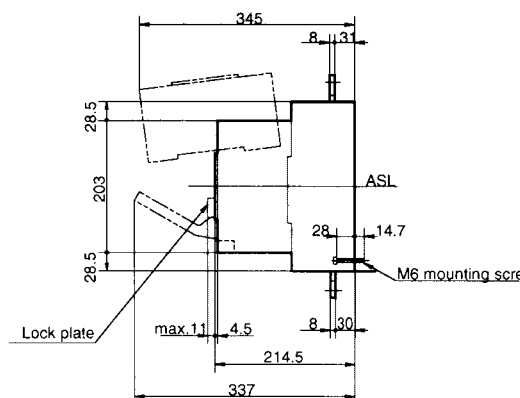
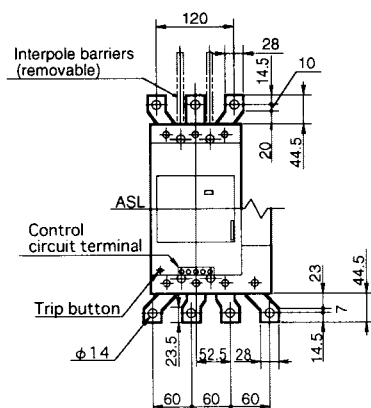


Panel cut-out dimensions should give an allowance of 1.0 mm around the handle escutcheon.

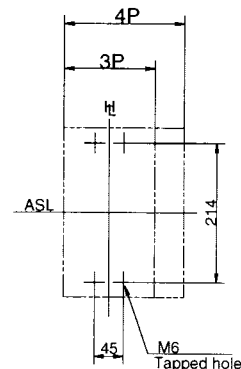
Motor operators for XS400, XH400, XV400, TL250NJ, TL400NE ¹⁾

Outline dimensions (mm)

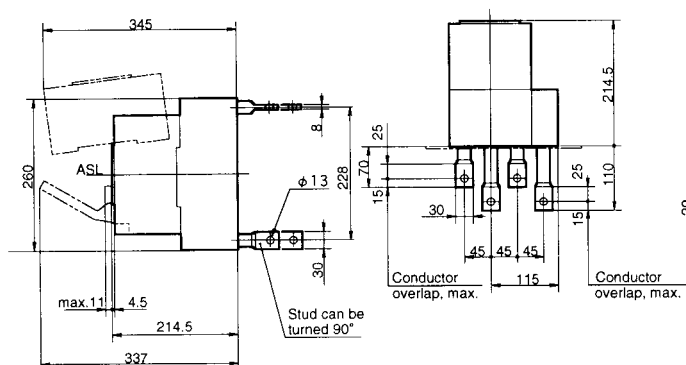
Front connected (standard)



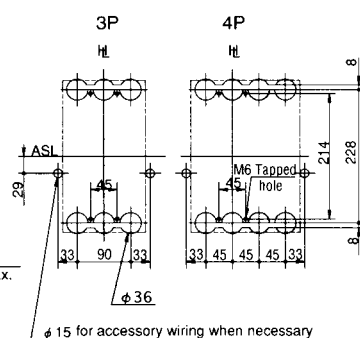
Drilling plan



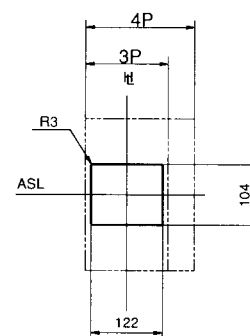
Rear connected (optional)



Drilling plan



Panel cut-out

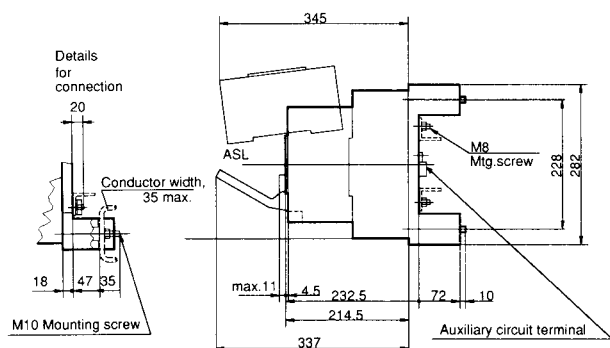


Panel cut-out dimensions should give an allowance of 1.0 mm around the handle escutcheon.

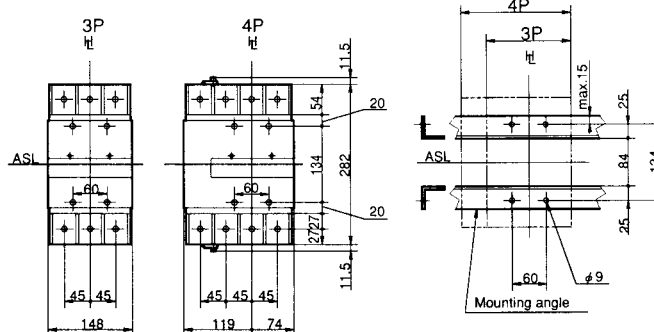
Note: In the standard selection mode, both terminals on the line side and the load side are in the horizontal direction

Plug-in (optional)

Mounting block



Drilling plan



ASL: Arrangement standard line
H: Handle frame centre line

Note: 1) TL250NJ and TL400NE length dimension not shown. Refer pages 7-35 and 7-37.

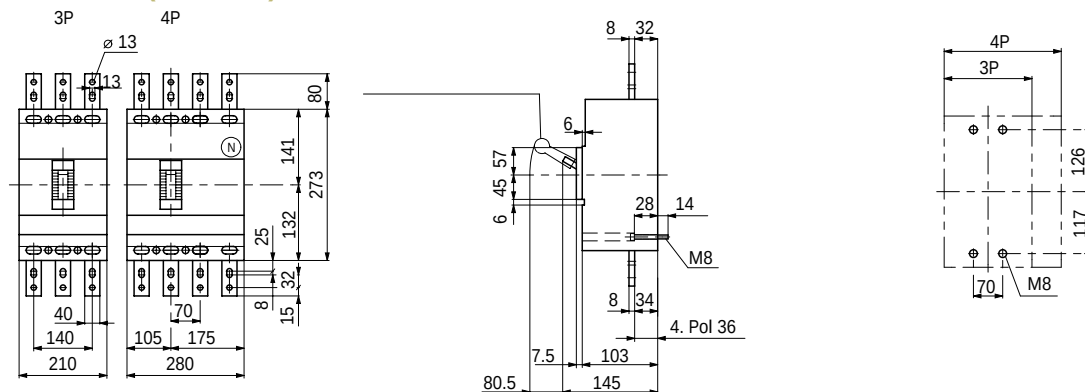
TemBreak 630A frames XS630, XH630, XV630

ASL: Arrangement standard line

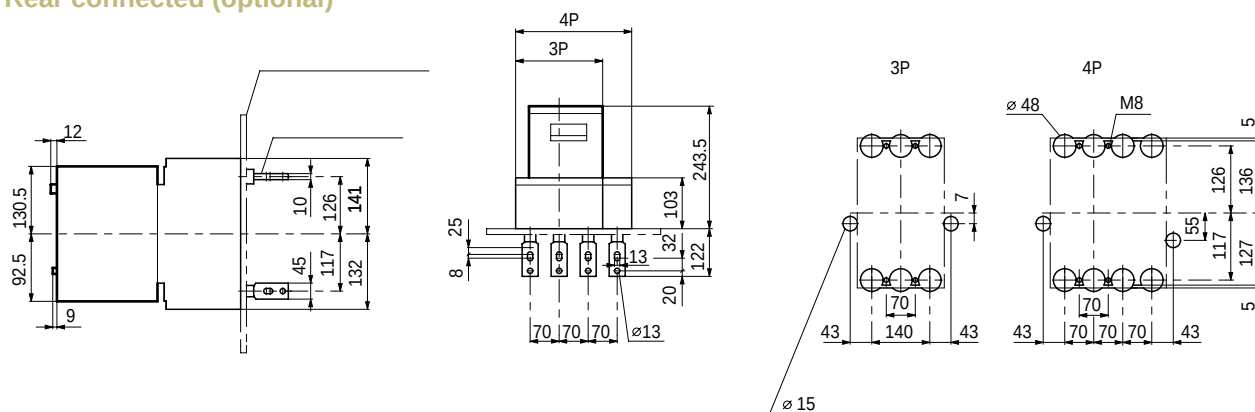
HL: Handle frame centre line

Outline dimensions (mm)

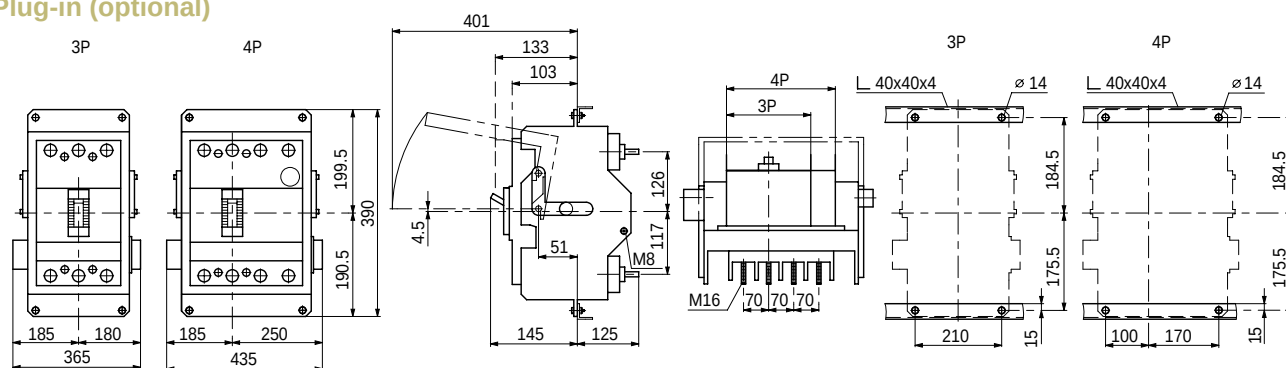
Front connected (standard)



Rear connected (optional)



Plug-in (optional)



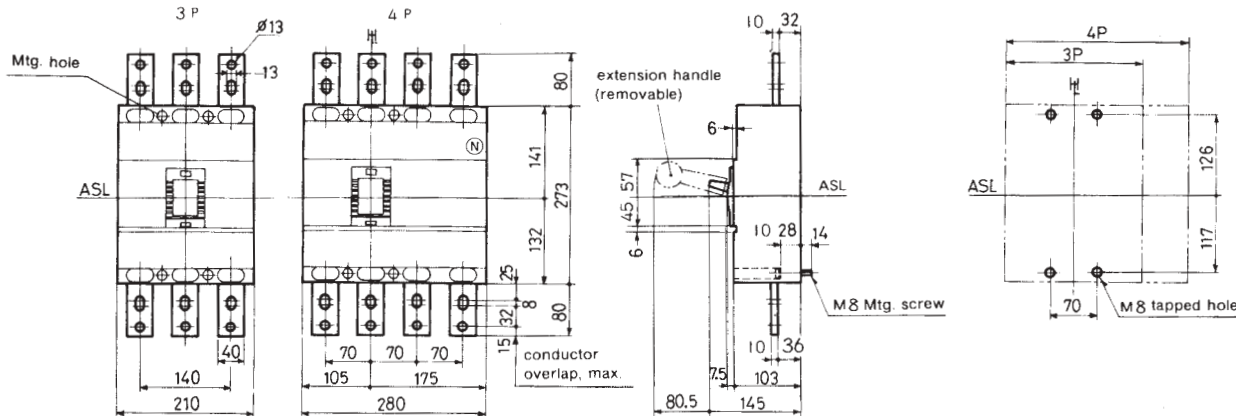
TemBreak 800A frames XS800, XH800, XV800

ASL: Arrangement standard line
H: Handle frame centre line

Outline dimensions (mm)

Front connected (standard)

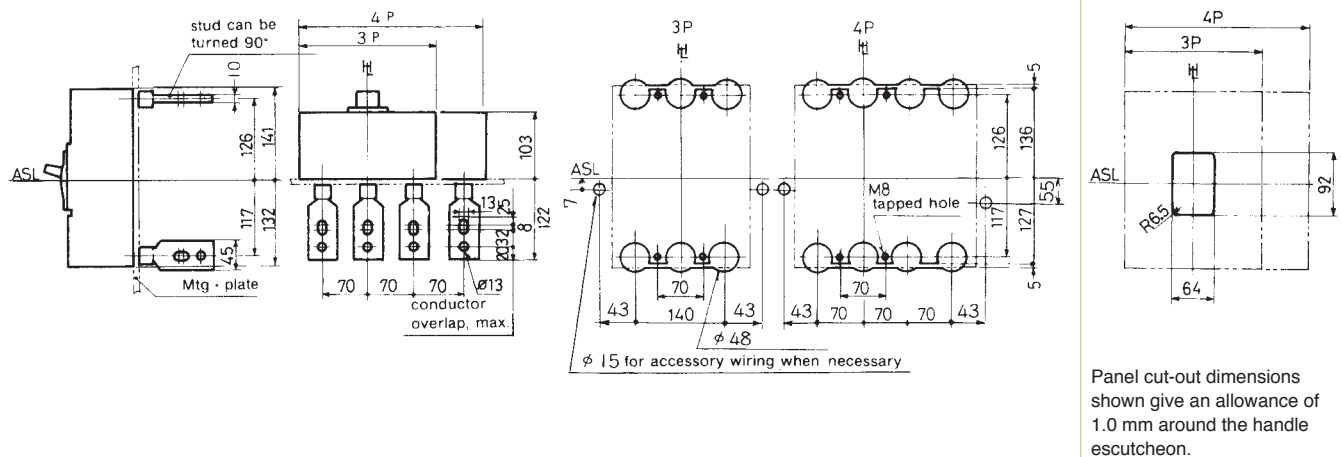
Drilling plan



Rear connected (optional)

Drilling plan

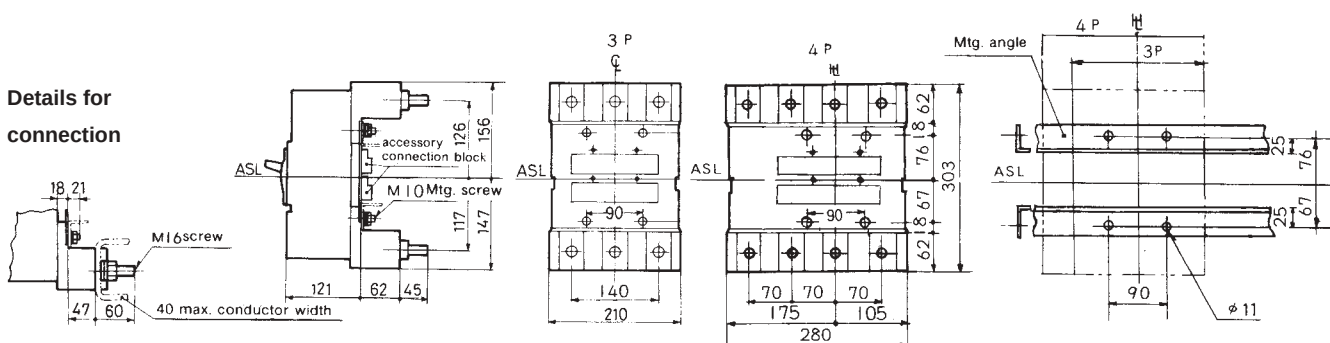
Panel cut-out



Plug-in (optional)

Mounting block

Drilling plan

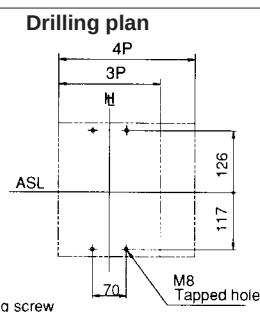
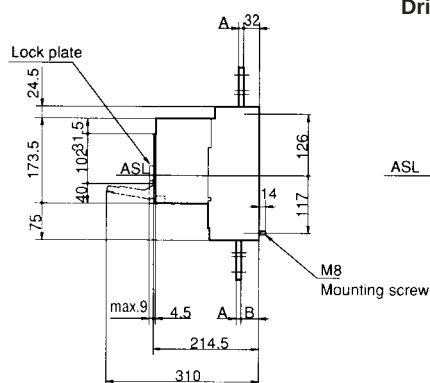
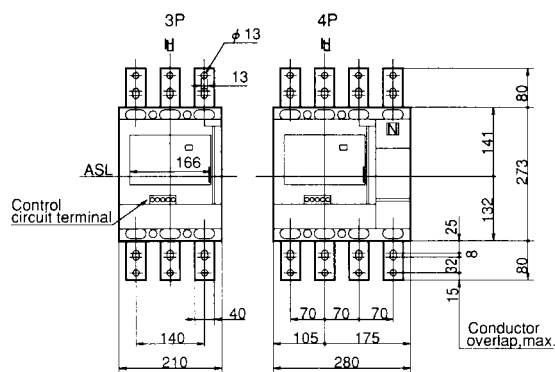


Motor operators for XS630, XH630, XV630PE, XS800, XH800, XV800PE

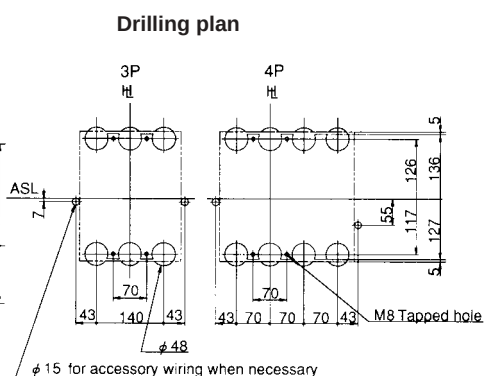
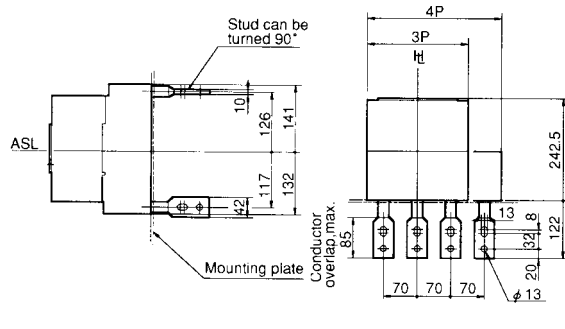
Outline dimensions (mm)

Front connected (standard)

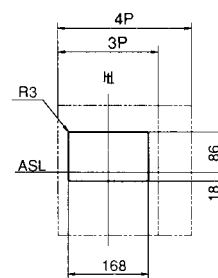
Types	A (mm)	B (mm)	
		3 pole	N pole
XH, XV, XS800NE	10	36	36
XH, XV, XS630NE	8	36	36



Rear connected (optional)



Panel cut-out

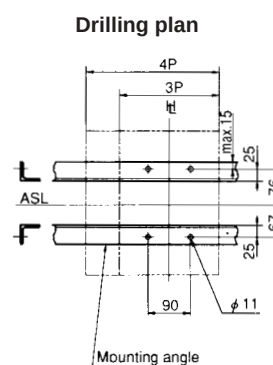
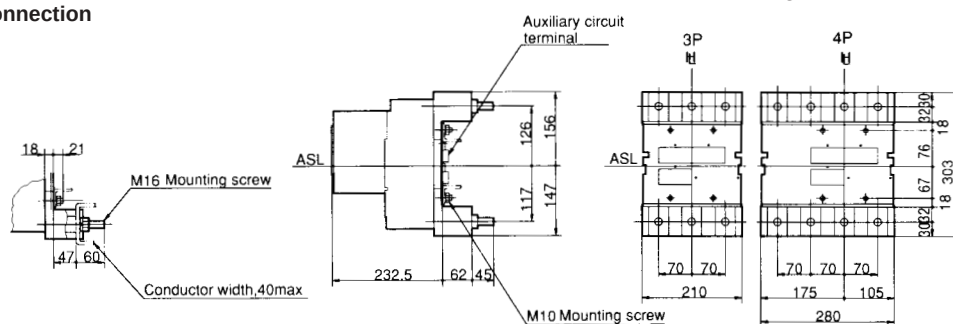


Panel cut-out dimensions shown give an allowance of 1.0 mm around the motor operator frame.

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

Plug-in (optional)

Details for connection



ASL: Arrangement standard line
H: Handle frame centre line

TemBreak XS/XV1250

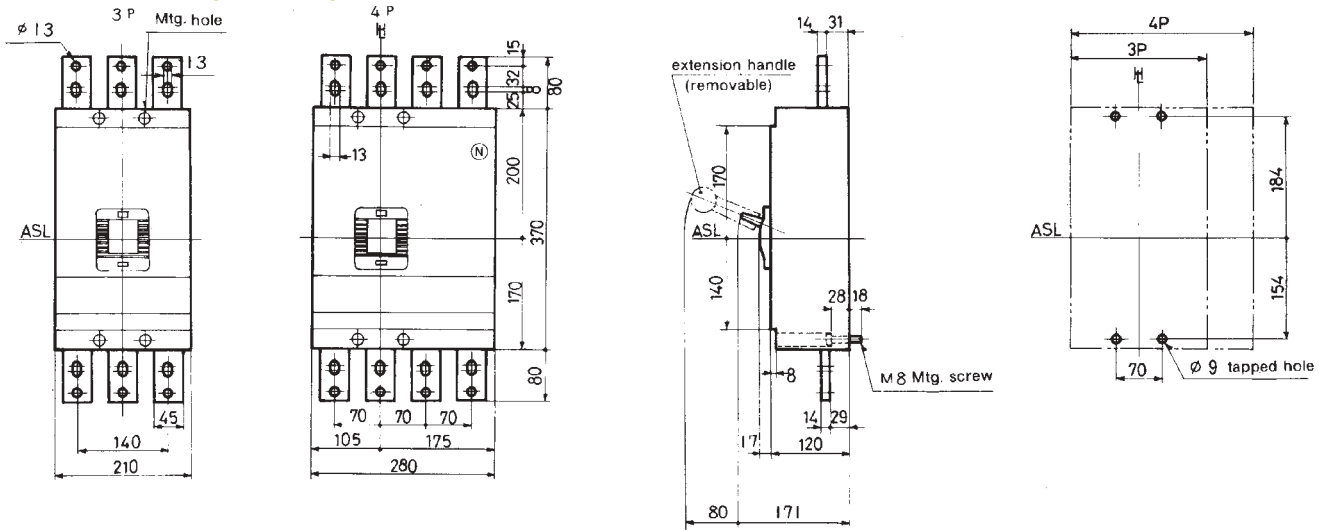
ASL: Arrangement standard line

H: Handle frame centre line

Outline dimensions (mm)

Front connected (standard)

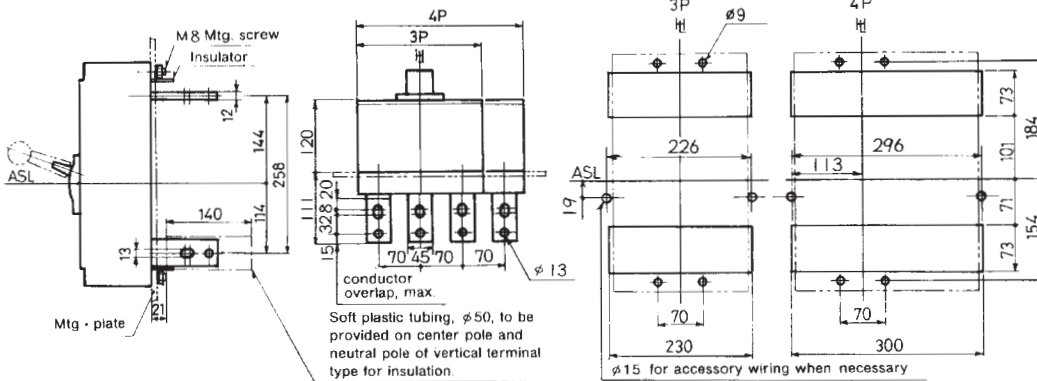
Drilling plan



Rear connected (optional)

Drilling plan

Panel cut-out



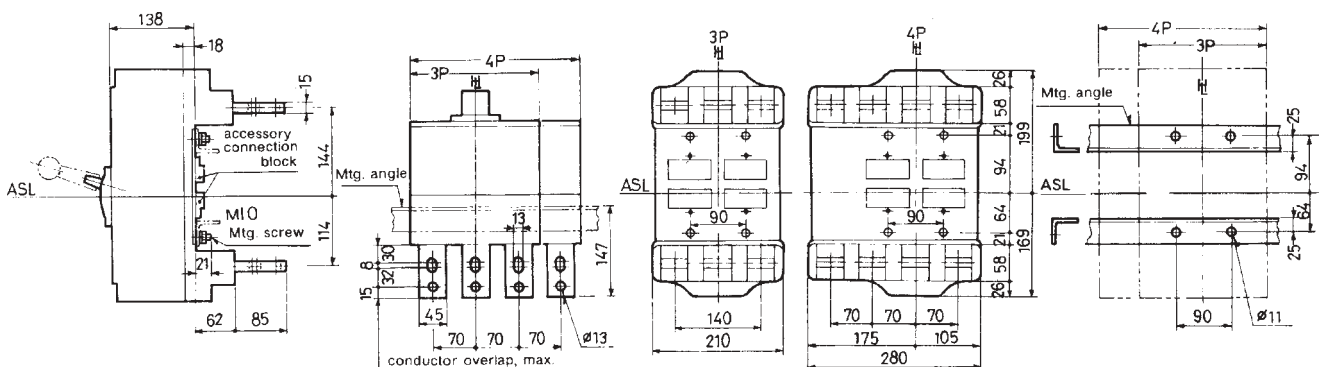
Panel cut-out dimensions shown give an allowance of 1.5 mm around the handle escutcheon.

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

Plug-in (optional)

Mounting block

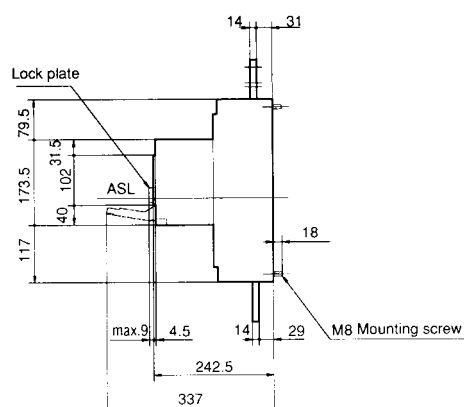
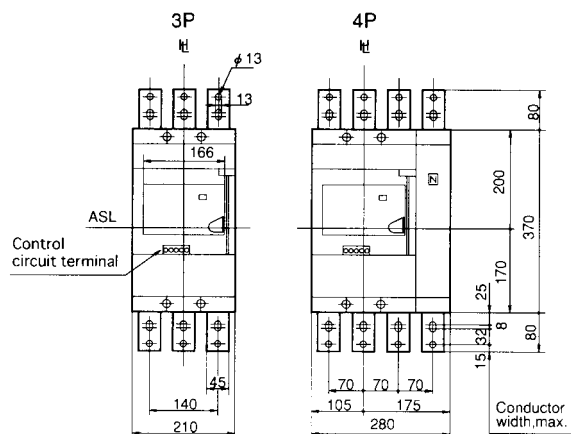
Drilling plan



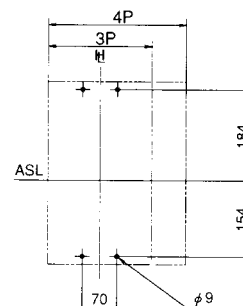
Motor operators for XS/XV1250, (1000A and 1250A) NE & SE types

Outline dimensions (mm)

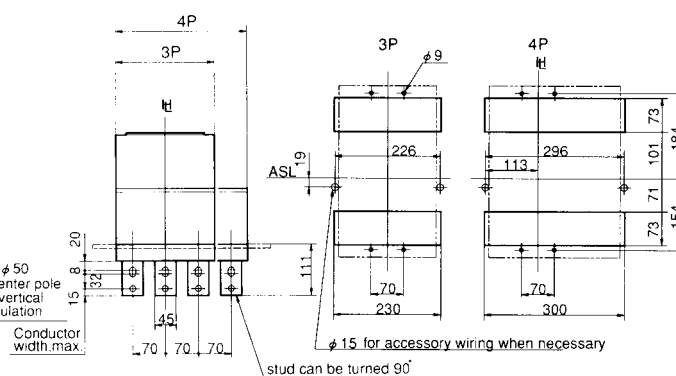
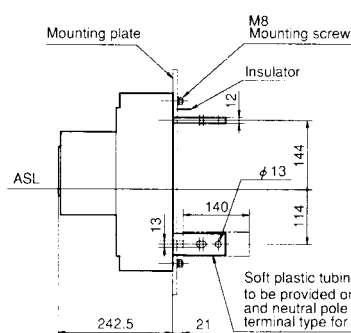
Front connected (standard)



Drilling plan

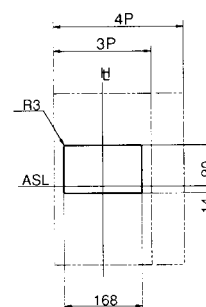


Rear connected (optional)



Drilling plan

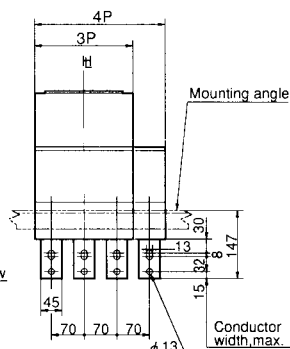
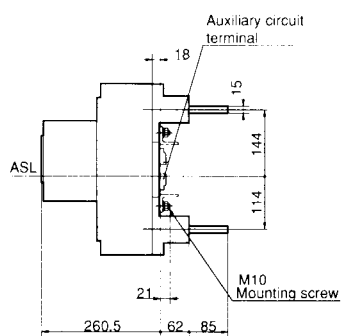
Panel cut-out



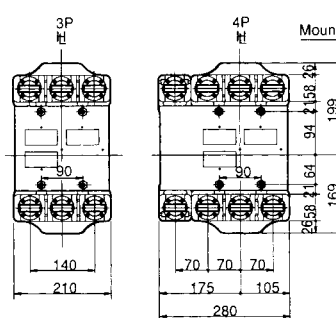
Panel cut-out dimensions shown give an allowance of 1.0 mm around the motor operator frame.

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

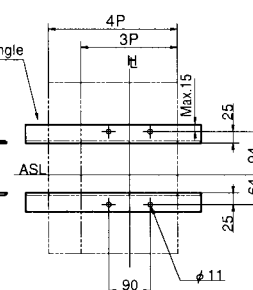
Plug-in (optional)



Mounting block



Drilling plan



ASL: Arrangement standard line
H: Handle frame centre line

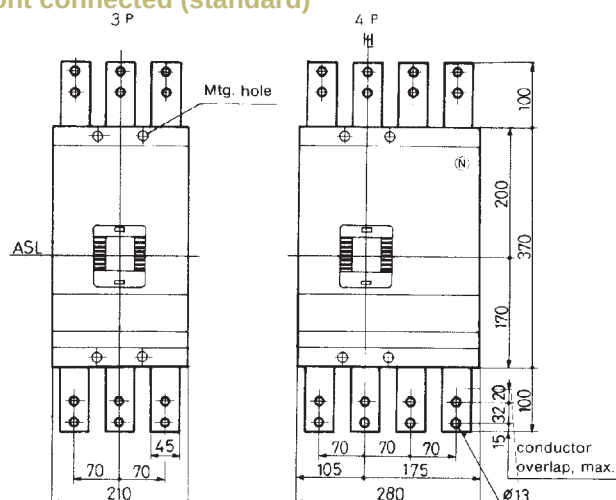
TemBreak XS1600SE, TL630, TL800, TL1250NE

ASL: Arrangement standard line

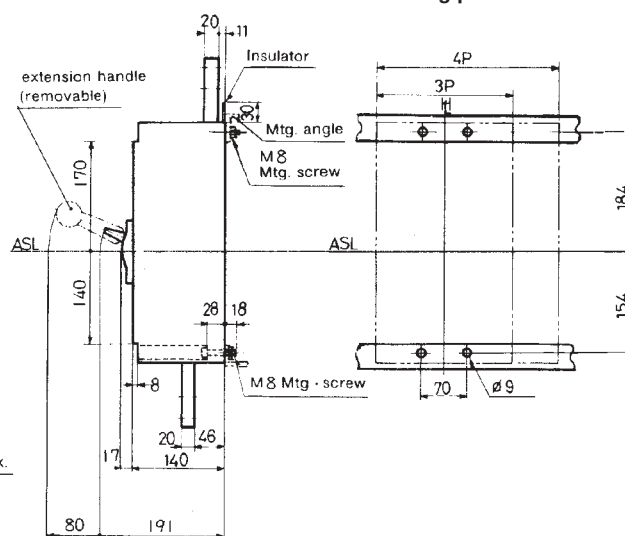
H: Handle frame centre line

Outline dimensions (mm)

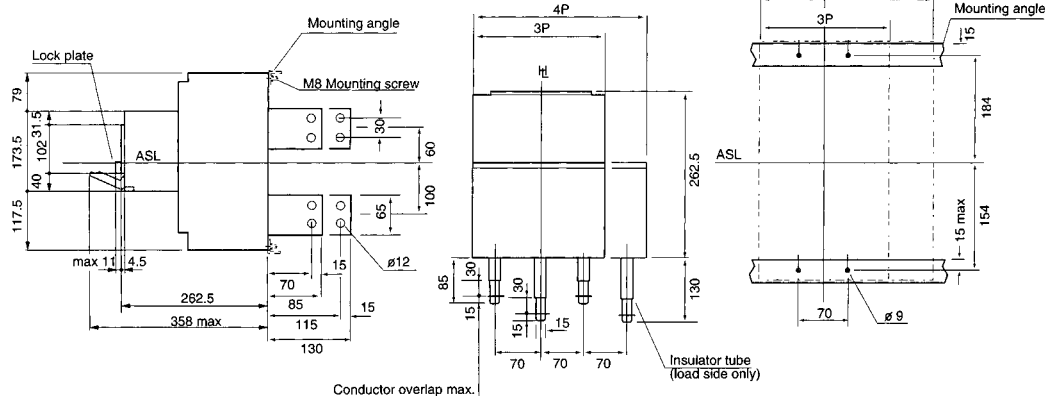
Front connected (standard)



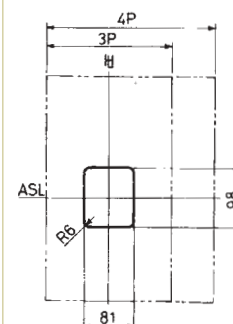
Drilling plan



Rear connected with motor operator

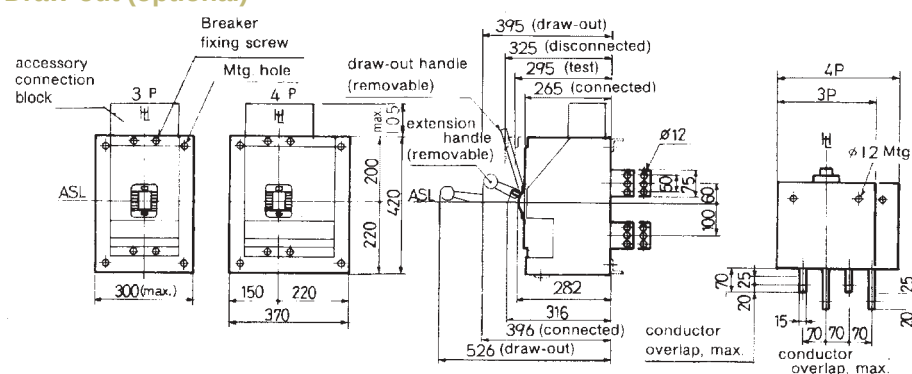


Panel cut-out

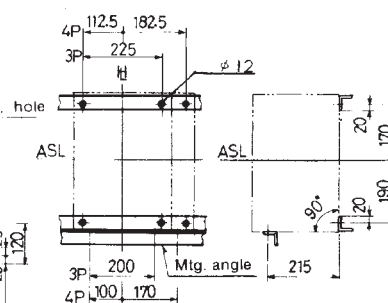


Panel cut-out dimensions shown give an allowance of 1.5 mm around the handle escutcheon.

Draw-out (optional)



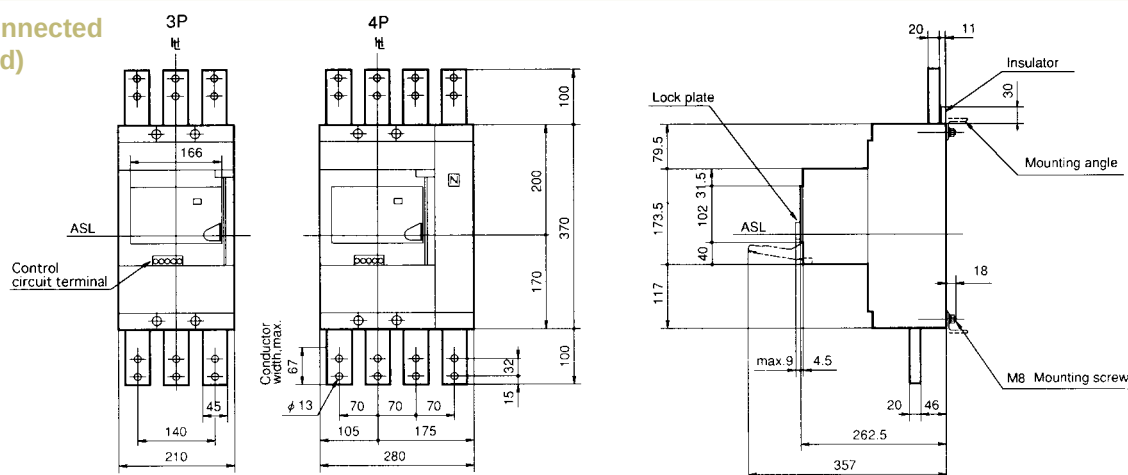
Drilling plan



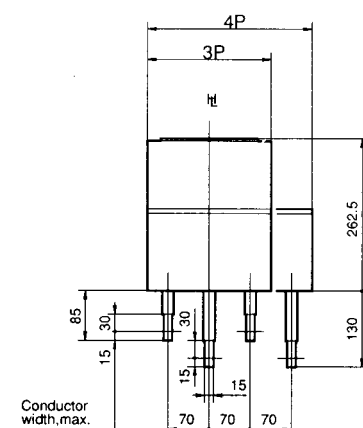
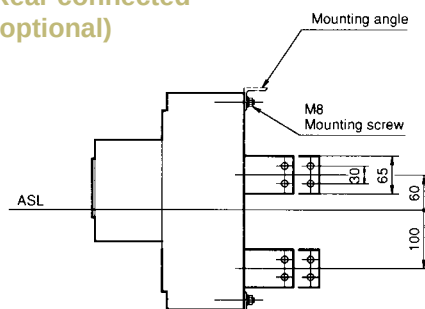
Motor operators for XS1600 SE types, TL630NE, TL800NE, TL1250NE

Outline dimensions (mm)

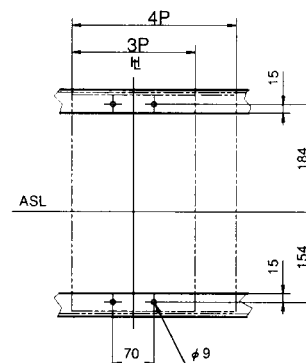
Front connected (standard)



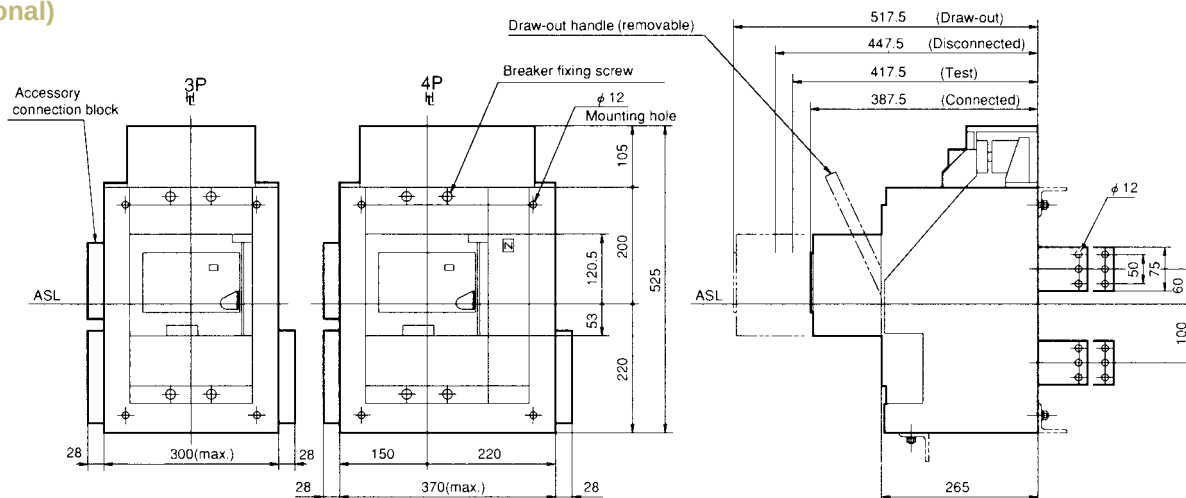
**Rear connected
(optional)**



Drilling plan



Draw out (optional)



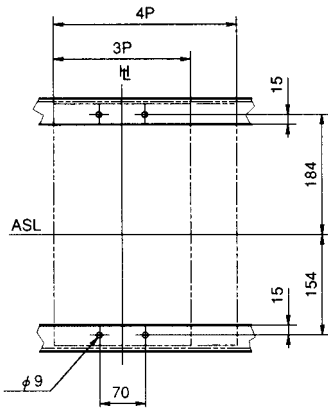
ASL: Arrangement standard line
H: Handle frame centre line

Motor operators for XS1600 TL630NE, TL800NE, TL1250NE

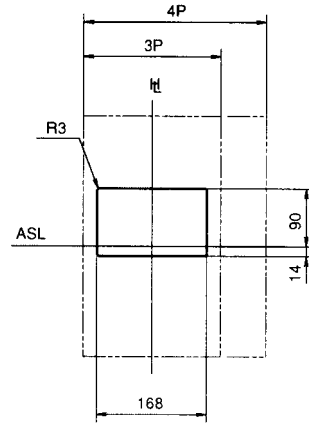
Outline dimensions (mm)

Front connected (standard)

Drilling plan



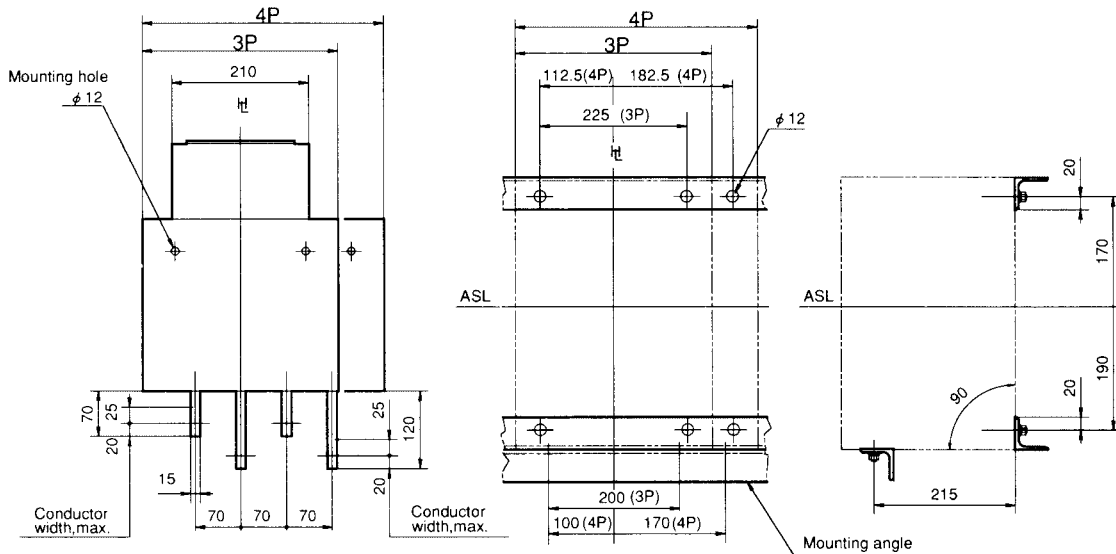
Panel cut-out



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

Draw out

Drilling plan



ASL: Arrangement standard line
H: Handle frame centre line

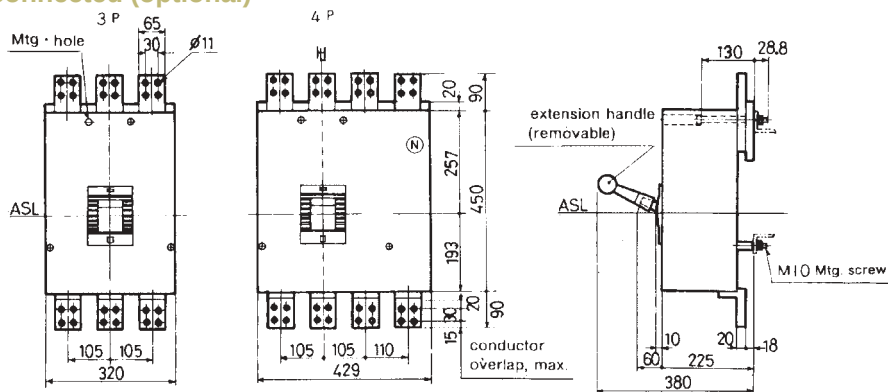
TemBreak XS2000NE

Outline dimensions (mm)

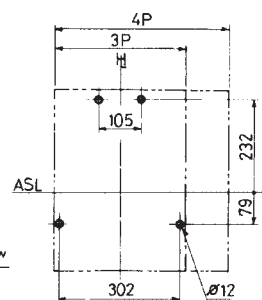
ASL: Arrangement standard line

H: Handle frame centre line

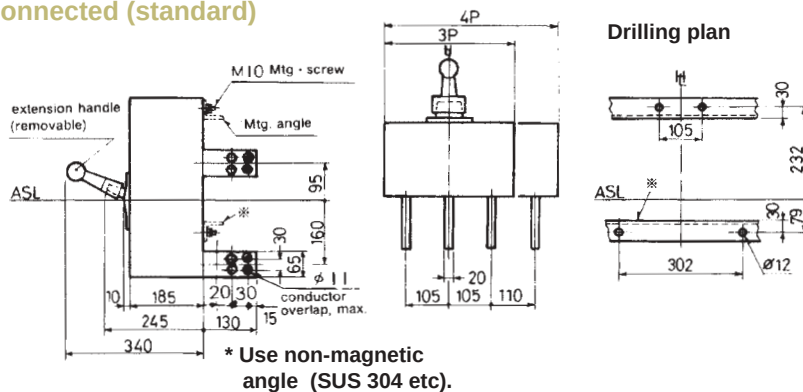
Front-connected (optional)



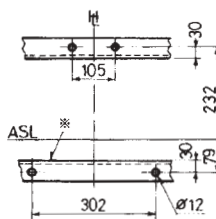
Drilling plan



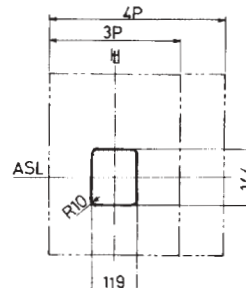
Rear-connected (standard)



Drilling plan

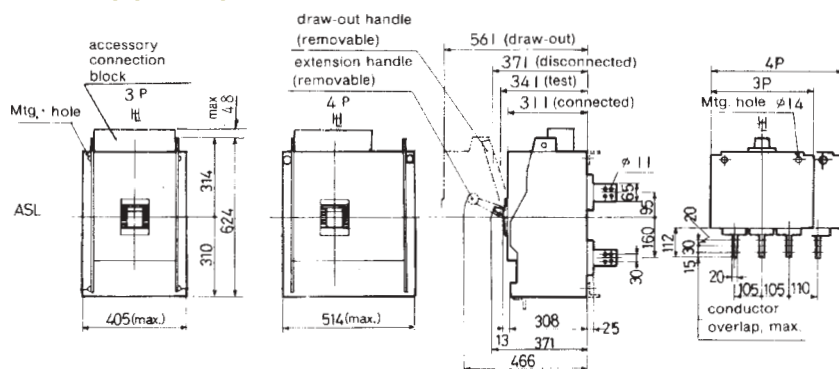


Panel cut-out

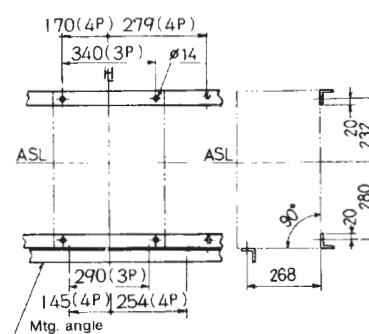


Panel cut-out dimensions shown give an allowance of 2 mm around the handle escutcheon.

Draw-out (optional)



Drilling plan



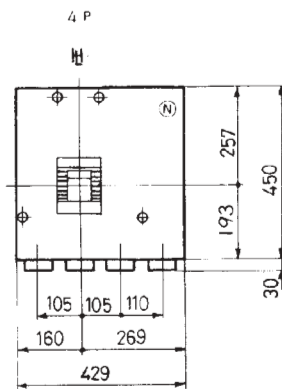
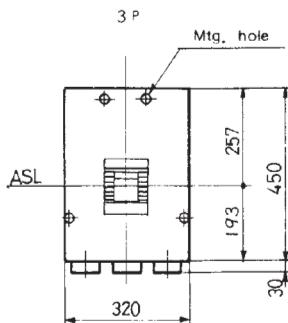
TemBreak XS2500NE

ASL: Arrangement standard line

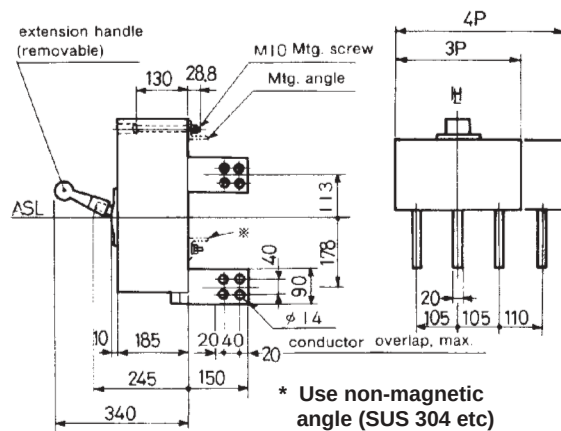
H: Handle frame centre line

Outline dimensions (mm)

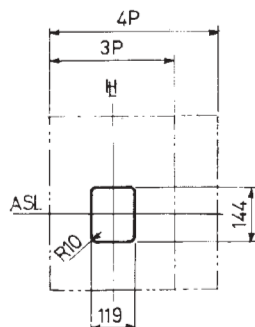
Rear-connected (RC standard, no FC version)



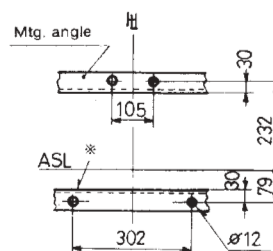
Panel cutout



Drilling plan



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



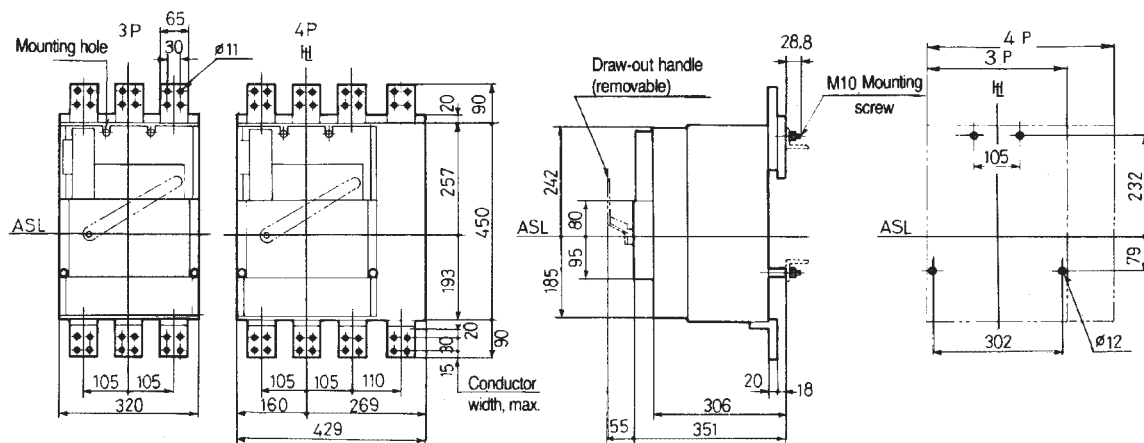
- * Use non-magnetic angle (SUS 304 etc)

Motor operators XMB types for XS2000NE & XS2500NE

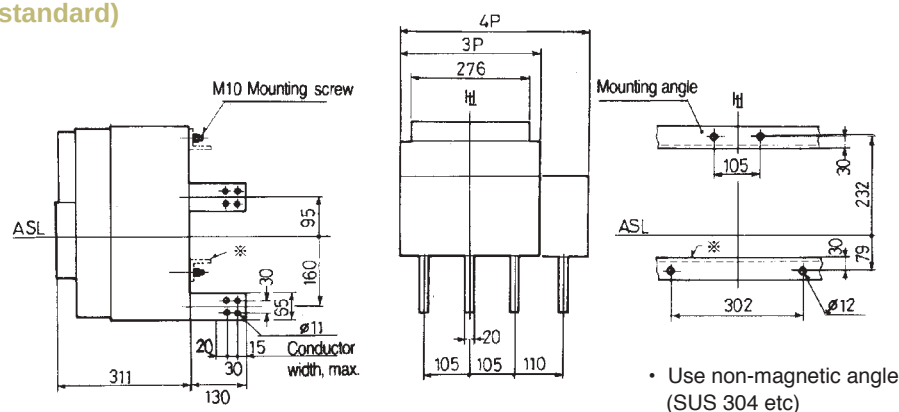
MCCB accessories

Outline dimensions (mm)

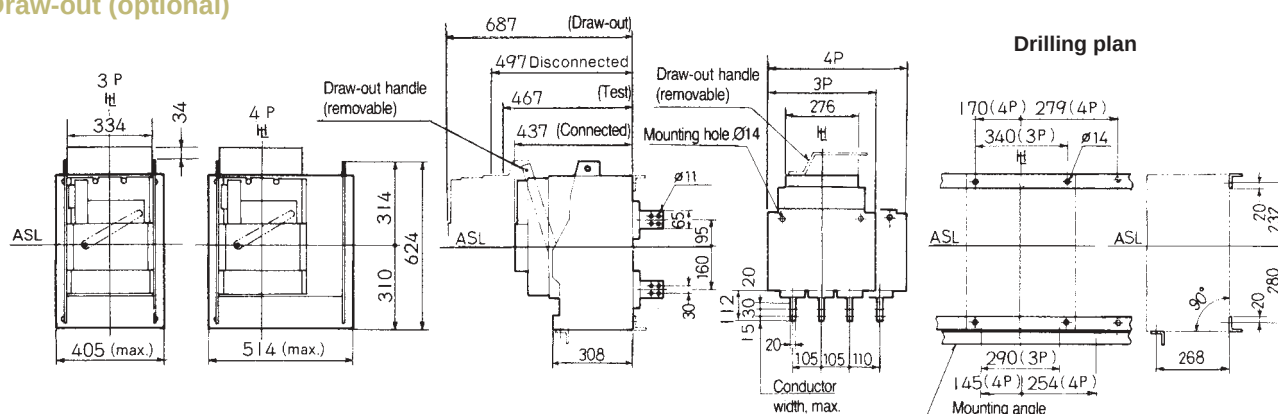
Front connected (optional)



Rear connected (standard)



Draw-out (optional)



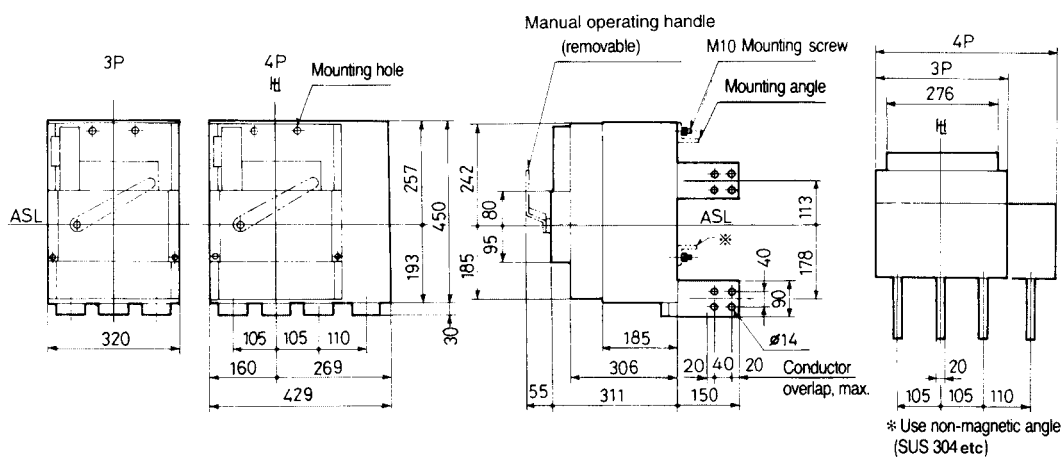
ASL: Arrangement standard line
HL: Handle frame centre line

Motor operators XMB types for XS2000NE & XS2500NE

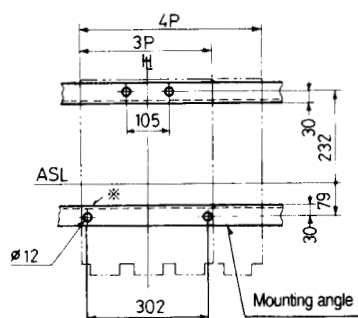
MCCB accessories

Outline dimensions (mm)

Front connected (standard)



Drilling plan



ASL: Arrangement standard line
H_L: Handle frame centre line