TERASAKI
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NHP

TemBreak PRO

P Model Moulded Case Circuit Breaker

Basic Electronic Trip Unit from 160A up to 630A

USER MANUAL

Version
1.9.0

Using this manual

Safety Precautions

Authorised Personnel Only
The product or system described in this documentation must be installed, operated and maintained by qualified personnel only. NHP or Terasaki accept no responsibility for the consequences of the use of this equipment by unqualified personnel.
A qualified person is one with the necessary skills and knowledge of the construction and operation of the installation of electrical equipment and has been trained to identify and avoid risks.

Appropriate use of NHP / Terasaki products
NHP / Terasaki products are intended to be used only for the applications described in the catalogue and technical documentation, which is dedicated to them. If products and components from other manufacturers are used, they must be recommended or approved by NHP or Terasaki.
Appropriate use of NHP / Terasaki products during transport, storage, installation, assembly, commissioning, operation and maintenance is necessary to ensure safe operation and without any problems.
The permissible ambient conditions must be met. The information contained in the technical documentation must be observed.

Publication of responsibility
The contents of this document have been reviewed to ensure that the reliability of the information is correct at time of publication.
NHP or Terasaki are not responsible for printing or damage resulting from errors. NHP or Terasaki reserve the right to make corrections and changes needed in subsequent edition.

Warnings and notes
This documentation contains safety instructions that you must follow for your personal safety and to prevent damage to property.
Safety instructions, referring to your personal safety are reported in the literature by a safety alert symbol.

Safety warning symbols and the words below are classified according to the degree of risk.

WARNING: Indicates an imminently hazardous situation which, if it cannot be avoided, will result in death or serious injury.

WARNING: Indicates a potentially hazardous situation which, if it cannot be avoided, can result serious injury or death.

WARNING: Indicates a potentially hazardous situation which, if it cannot be avoided, may cause minor or moderate injury.

Notice: Indicates a warning of property damage and can also indicate important operating and especially useful information on the product, that it should pay particular attention to efficient and safe operation.

Summary of Changes

This section highlights the details of changes made since the previous issue of this document.

The versioning convention used to track changes in this document follows the structure V**x.y.z** where:

x: Major revision, where extensive changes are made which is generally incompatible with the previous version. Such changes may include new products and/or features, or removal of information which is no longer relevant or applicable to the previous version

y: Minor revision, where changes made do not change the overall scope of the previous version, but may include additional information which complements or corrects the previous version, or provides additional clarity on an existing topic.

z: Patch version, where small changes are made to correct minor errors or adjust existing text, charts, figures and/or images, and which do not add or remove information from the previous version. Example changes may include spelling corrections, image re-sizing and adjustments, updated images, etc.

Version	Publication date	Changes	By
V 1.0.0	19-Apr-2021	Initial release	D.NAT
V 1.1.0	26-Apr-2021	Product information corrections	D.NAT
V 1.2.0	29-Apr-2021	Neutral Protection information correction	D.NAT
V 1.3.0	13-May-2021	Clearance distance corrections	N.ALEX
V 1.4.0	24-May-2021	Temperature corrections and fixed typo on Part Number Break Down	N.ALEX
V 1.5.0	28-May-2021	Label Identification section added, Temperature Rating tables aligned headings with TD-001-EN, I^2t Curves updated in image quality, added references and links to, TD-001-EN, TD-002-EN, TD-003-EN, & Type2_TBpro_MotorStartTables-TD-001-EN	N.ALEX
V 1.5.1	10-May-2021	Fixed typo on P250 Let-through scale	N.ALEX
V 1.6.0	20-August-2021	Fixed typo on Part Number Break Down, Correction to P160 Information table data, added resistance watts loss, rewording in Clearance section links to Installation Manuals added	N.ALEX
V 1.7.0	20-Jan-2022	Changed watts loss and temperature tables to match TD-001-EN	N.ALEX
V 1.8.0	10-Feb-2022	Added LTD Equation	N.ALEX
V 1.9.0	22-Jan-2025	Added link to MCCB Catalogue, edited format of product information tables, added internal links to other sections, corrections made to descriptions of Shunt and UVT terminals, additional Shunt and UVT data, added additional data for Shunt and UVT wiring, description changes to the clearances section layout, added Pressure Trip section, improved dimensions, added handle dimensions, document naming convention changed, NZ website address updated, added Installation Manuals to Accessories	N.ALEX

Table of Contents

Introduction

This user manual describes the TemBreak *PRO* Basic Electronic (**P_BE**) MCCB features and instructions for use, and provides information for commissioning and configuring.

Some additional features may require the use of additional products and accessories to achieve full utilization of that feature. Refer the respective User Manual in the TemBreak *PRO* series for additional information on the respective product.

Notice: Not all OCRs in the TemBreak *PRO* series are identical. This document specifically covers the P_BE OCRs only. Refer to the respective OCR User Manual (e.g. B_SE, P_SE, etc.) for information and instructions on other OCRs in the TemBreak *PRO* series.

Who Should Use This Manual?

This manual aims to provide users, electricians, panel builders and maintenance personnel, with the technical information required for commissioning and operation of the NHP / Terasaki TemBreak *PRO* P_BE MCCB.

Users of this document must have at minimum a basic understanding of electrical circuit protection topics including (but not limited to):

- Power distribution and reticulation
- Circuit protection devices
- Fault currents
- Arc faults
- Temperature rise and thermal derating of switchgear

Additional resources

The following resources contain additional information which should be read in conjunction with this document.

Resource	Description
NHP/Terasaki TemBreak *PRO* P_BE Installation Instructions TemBreak-Pro-Moulded-Case-Circuit-Breakers-P160-3-Pole-Basic-Electronic-Installation-Manual TemBreak-Pro-Moulded-Case-Circuit-Breakers-P160-4-Pole-Basic-Electronic-Installation-Manual TemBreak-Pro-Moulded-Case-Circuit-Breakers-P250-3-Pole-Basic-Electronic-Installation-Manual TemBreak-Pro-Moulded-Case-Circuit-Breakers-P250-4-Pole-Basic-Electronic-Installation-Manual TemBreak-Pro-Moulded-Case-Circuit-Breakers-P400-3-Pole-Basic-Electronic-Installation-Manual TemBreak-Pro-Moulded-Case-Circuit-Breakers-P400-4-Pole-Basic-Electronic-Installation-Manual TemBreak-Pro-Moulded-Case-Circuit-Breakers-P630-3-Pole-Basic-Electronic-Installation-Manual TemBreak-Pro-Moulded-Case-Circuit-Breakers-P630-4-Pole-Basic-Electronic-Installation-Manual	Information on installing, mounting, and wiring the TemBreak *PRO* Basic Electronic MCCB.
NHP/Terasaki Mechanical Interlock Installation Instructions TemBreak-PRO-Mechanical-Link-Interlock-Installation-User-Manual TemBreak-PRO-Mechanical-Cable-Interlock-P160-P250-P400-P630-User-Manual	Information on installing and mounting the mechanical link and cable interlocks.
NHP/Terasaki External Mount Handle Installation Instructions TemBreak-PRO-HS-External-Handle-For-P160-P250-P400-P630-User-Manual TemBreak-PRO-HP-External-Handle-Installation-For-P160-P250-User-Manual TemBreak-PRO-HP-External-Handle-Installation-For-P400-P630-User-Manual	Information on installing and mounting the HS and HP external mount handles.

Introduction

Additional resources

Resource	Description
NHP/Terasaki HB Direct Mount Handle Installation Instructions TemBreak-PRO-HB-External-Handle-Installation-For-P160-P250-User-Manual TemBreak-PRO-HB-External-Handle-Installation-For-P400-P630-User-Manual	Information on installing and mounting the HB direct mount handles.
NHP/Terasaki Motor Operator MCCB Installation Instructions TemBreak-PRO-Motor-Operator-Installation-P160-P250-User-Manual TemBreak-PRO-Motor-Operator-Installation-P400-P630-User-Manual	Information on installing, mounting, and wiring to a MCCB motor operator.
NHP Terasaki Rear Connection Tags Installation Instructions TemBreak-PRO-Rear-Tags-ZS125-ZS250-A250-P250-B160-B250-Installation-Manual	Information on installing and terminating to rear connection tags.
NHP Terasaki Plug-in Base Installation Instructions TemBreak-PRO-Plug-in-Base-Installation-P160-P400-P630-User-Manual	Information on installing and terminating to Plug-in base.
Technical Catalogue NHP-Moulded-Case-Circuit-Breaker-Technical-Catalogue	TemBreak PRO Catalogue, containing part numbers, product data, dimensions, and more to assist with product selection.
Technical Data – Temperature and Watts Loss TemBreak-PRO-Moulded-Case-Circuit-Breaker-Temperature-and-Watts-Loss-Technical-Catalogue	Temperature and Watts Loss tables for TemBreak *PRO* Moulded Case Circuit Breakers.
Technical Data – Cascading and Selectivity TemBreak-PRO-Moulded-Case-Circuit-Breaker-Cascading-and-Selectivity-Technical-Catalogue	Cascading and Selectivity tables for TemBreak *PRO* Moulded Case Circuit Breakers with Din-T, Din-Safe, & MOD6 MCBs/RCBOs
Technical Data – Coordination TemBreak-PRO-Moulded-Case-Circuit-Breaker-and-Socomec-Component-Ordering-Technical-Catalogue	Socomec Backup Tables with TemBreak *PRO* Moulded Case Circuit Breakers
Technical Data – Type 2 Coordination Type-2-Coordination-for-TemBreak-Pro-Technical-Catalogue	Type 2 Coordination for Premium Efficiency Motor Starters with TemBreak *PRO* Moulded Case Circuit Breakers

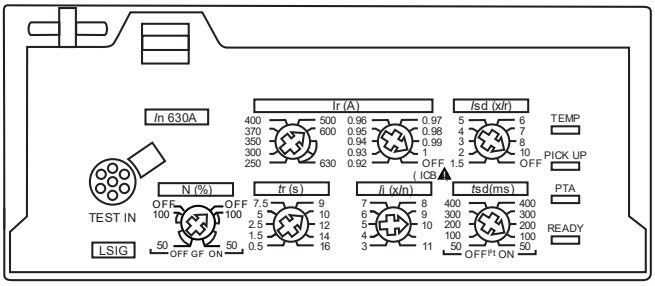
Introduction

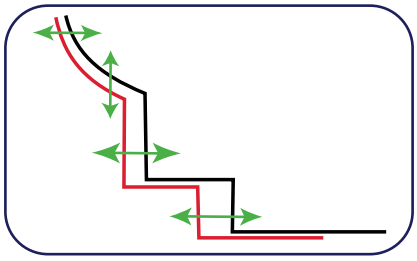
Terminology and Abbreviations

Abbreviation	Description	Abbreviation	Description
ACP	Auxiliary Communications port: Plug for Smart auxiliary / alarm contact block	**MIP**	Maintenance Interface Port: Plug for temporary connection to OCR testing, servicing, and maintenance tools
AL	Alarm: An auxiliary contact indicating trip status	**N**	Neutral
ASCII	American Standard Code for Information Interchange	**NP**	Neutral Protection
AX or AUX	Auxiliary: Auxiliary contact indicating open / closed	**OAC**	Optional Alarm Contact: Connection connector optional alarm output contact
BE	Basic Electronic Trip Unit (dial type, **LSI** and **LSIG**)	**OCR**	Over Current Relay
CCW	Connected Components Workbench software	**P or PTA**	Pre-trip Alarm
CIP [1] [2]	[1] Communication Interface Port: Plug for control power and data for use with the TPED remote display and TPCM communication module [2] Common Industrial Protocol	**PDU**	Protocol Data Unit
CRC	Cyclic Redundancy Check – error-detecting code used at the end of each Modbus message	**PELV**	Protected Extra Low Voltage (earthed system)
dec	Decimal (base-10) numbering system	**PTA**	Pre-Trip Alarm: is a programmable output contact to advise when a trip may be imminent.
DINT	Signed Double Integer datatype (4 bytes or 32 bits in length)	**RTU**	Remote Terminal Unit
EIPM	TemBreak *PRO* Ethernet/IP Module	**S or STD**	Short Time Delay Protection
FF	Fixed Thermal and Fixed Magnetic	**SE**	Smart Energy Trip Unit
FM	Fixed Thermal and Adjustable Magnetic	**SELV**	Separated Extra Low Voltage
G or GF	Ground Fault Protection	**SN**	Solid Neutral
hex	Hexadecimal (base-16) numbering system	**SSID**	Service Set Identifier (name of the Wi-Fi wireless network)
I or INST	Instantaneous Protection	**STR**	String datatype
IEC	International Electrotechnical Commission	**TCP**	Transmission Control Protocol
IEEE	Institute of Electrical and Electronics Engineers	**TF**	Adjustable Thermal and Fixed Magnetic
I_g	Ground Fault Protection Current	**THD**	Total Harmonic Distortion
I_i	Instantaneous Protection Current	**TM**	Adjustable Thermal Magnetic
I_n	Rated Current	**TPCM**	TemCom *PRO* Communication Module
I_N	Neutral Protection Current	**TPED**	TemView *PRO* External Display
INT	Signed Integer datatype (2 bytes or 16 bits in length)	t_r	LTD Time delay
IP	International Protection (Ingress Protection)	t_{sd}	STD Time delay
I_r	LTD Protection Current	t_{tsp}	Thermal Self-Protection Time delay
I_{sd}	STD Protection Current	**UDINT**	Unsigned Integer (2 bytes or 16-bits in length)
I_{tsp}	Thermal Self-Protection Current	**UINT**	Unsigned Integer (2 bytes or 16 bits in length)
L or LTD	Long Time Delay Protection	**ULINT**	Unsigned Long Integer datatype (8 bytes or 64 bits in length)
LCD	Liquid Crystal Display (LCD)	**URLs**	Uniform Resource Locator (address of an Internet website)
LED	Light Emitting Diode	**WORD**	2 bytes or 16-bits of data
LINT	Signed Long Integer datatype (8 bytes or 64 bits in length)	**ZSI**	Zone Selective Interlocking (zone selectivity)
LSI	Long Time, Short Time and Instantaneous Protection	θ	Thermal imaging value
LSIG	Long Time, Short Time, Instantaneous and Ground Fault Protection	θ_C	Cold start mode thermal imaging value
MCCB	Moulded Case Circuit Breaker	θ_H	Hot start mode thermal imaging value
microSD	Micro Secure Digital	θ_{trip}	Thermal imaging value tripping threshold

Product Information

The TemBreak *PRO* P model Basic Electronic MCCB with trip unit type P_BE, in addition to protecting against overloads and short circuits, offers flexibility via provide fully adjustable LSI(G) (long time, short time, instantaneous, ground fault) protection settings via preset rotary switches as well as a host of other standard or optional features. This allows for improved selectivity combinations between MCCBs or other circuit breaker types.





Features

- LSI or LSIG
- Setting by rotary dial
- Over temperature alarm LED
- Signalling the OCR LED status (Ready)
- Signalling PTA overload pre-warning LED
- LED signalling overload alarm (>I_r)
- Possible adjustment of thresholds and time delays for LSIG 6)
- Possible adjustment of the protection of neutral pole on 4-pole versions (neutral pole positioned to the right)

Frame Sizes

- P160
- P250
- P400
- P630

Protection Functions

- Long Time Delay
- Short Time Delay
- Instantaneous
- Ground Fault (LSIG model)
- Neutral Protection (LSIG 4P model)

Additional Certificates

Product Information

Part Number Break Down

P	160	F	2	4	160	BE	G
a)	b)	c)	d)	e)	f)	g)	h)

a) Model Type

A	Basic applications (160…250 A)
P	Mid to advanced applications (160…630 A)
B	High current, high kA applications (160…1600 A)
ZS	Earth Leakage applications (125…250 A)
XS	Highest current applications (2000…3200 A)

b) Ampere Frame

125 A
160 A
250 A
400 A
630 A
800 A
1000 A
1250 A
1600 A
2000 A
2500 A
3200 A

c) Short Circuit Break Capacity I_{cu} (kA)

R	200 kA
L	150 kA
P	125 kA
S	110 kA
G	100 kA
HL	85 kA
H	70 kA
M	65 kA
N	50 kA
F	36 kA
E	25 kA
D	Switch

d) Pole Pitch Size (mm) 1)

1	25
2	30
3	35

e) No. of Poles

1	7)
2	8)
3	
4	

f) Trip Unit Rating (I_n)

I_n	x A

g) Trip Unit Type

TF	Adj Thermal Fix Magnetic 4)
FF	Fix Thermal Fix Magnetic
TM	Adj Thermal Adj Magnetic
SX	Smart Ammeter 5) 6)
BE	Basic Electronic 6)
SE	Smart Energy 6)
NN	Non-Auto Switch

h) Trip Unit Option

G	Ground Fault 2)
N	Neutral 2)
P	Pre-Trip Alarm 3)
SN	Solid Neutral 9)

Notice: Not all combinations are possible. Confirm part number combination with NHP for availability.

1. 160AF only
2. For P_SE versions these features are standard and therefore are not added to the end of the part number.
3. PTA is standard with P electronic models and therefore P is not added to the end of the part number.
4. Only available in A & ZS models
5. Only available in B models
6. Not available in A and ZS models
7. Only available in A and B models (FF Only Trip Unit)
8. Not available in A and B models (FF Only Trip Unit)
9. ZS Models

Product Information

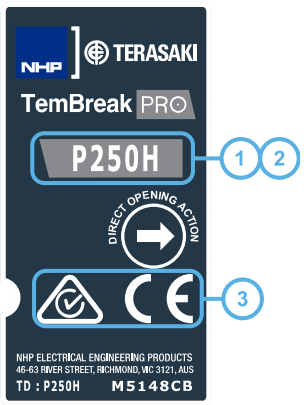
Available MCCBs in the TemBreak *PRO* range:

Rating Short Circuit Break Capacity (kA)		Frame Size										
		160	250	400	630	800	1000	1250	1600	2000	2500	3200
E	*25*	A160E – TF A160E – FF B160E – FF	A250E – TM	P400E-TM	P630E – TM							
F	*36*	A160F – TF P160F – FF P160F – TM P160F – BE P160F – BEG P160F – SE	A250F – TM P250F – TM P250F – BE P250F – BEG P250F – SE	P400F – TM P400F – BE P400F – BEG P400F – SE	P630F – TM P630F – BE P630F – BEG P630F – SE	B800F – TM						
N	*50*	P160N – TM P160N – BE P160N – BEG P160N – SE	P250N – TM P250N – BE P250N – BEG P250N – SE	P400N – TM P400N – BE P400N – BEG P400N – SE	P630N – TM P630N – BE P630N – BEG P630N – SE	B800N – TM B800N – BE B800N – SX B800N – SE	B1000N – BE B1000N – BEG B1000N – SX B1000N – SE	B1250N – BE B1250N – BEG	B1600N – BE B1600N – BEG			
H	*70*	P160H – TM P160H – BE P160H – BEG P160H – SE	P250H – TM P250H – BE P250H – BEG P250H – SE	P400H – TM P400H – BE P400H – BEG P400H – SE	P630H – TM P630H – BE P630H – BEG P630H – SE	B800H – TM B800H – BE B800H – BEG B800H – SX B800H – SE	B1000H – BE B1000H – BEG B1000H – SX B1000H – SE	B1250H – BE B1250H – BEG				
HL	*85*							B1250HL – BE B1250HL – BEG	B1600HL – BE B1600HL – BEG	XS2000HL – BE XS2000HL – BEG	XS2500HL – BE XS2500HL – BEG	XS3200HL – BE
G	*100*					B800G – TM B800G – BE B800G – BEG B800G – SX B800G – SE						
S	*110*			P400S – TM P400S – BE P400S – BEG P400S – SE	P630S – TM P630S – BE P630S – BEG P630S – SE							
P	*125*	B160P – TM	B250P – TM B250P – BE B250P – SE	B400P – BE B400P – BEG		B800P – BE B800P – BEG B800P – SX B800P – SE						
R	*200*	B160R – TM	B250R – TM	B400P – BE B400P – BEG		B800R – BE B800R – BEG B800R – SX B800R – SE						
D	*Switch*	A160D – NN P160D – NN	A250D – NN P250D – NN	P400D – NN	P630D – NN	B800D – NN	B1000D – NN	B1250D – NN	B1600D – NN	XS2000D – NN	XS2500D – NN	

Product Information

Label Identification

The label on the MCCB features information to aid in product identification.



	Description	Notes
1	Circuit Break Identifier	Identifies the model type, ampere frame, and I_{cu} rating.
2	Trip unit type	The trip unit type is indicated by the colour of the label.
3	Certifications	Identifies the additional localised certifications of the product, in addition to the international product standard, IEC 60947-2 / AS/NZS IEC 60947-2. For additional certifications please contact NHP.

White label – Thermal-magnetic type trip unit

Trip Units	FF, TF, FM, TM
Models	A, P, B, ZS
Ampere Frame	125 – 800

Grey label – electronic or non-auto type trip unit. To distinguish between the two, electronic trip units will have the "I_{cu}" letter and non-auto will use the letter "D", Switch.

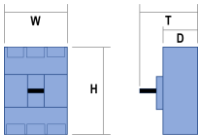
Trip Units	BE, BEG, BEGN , NN
Models	A, P, B, XS
Ampere Frame	160 – 3200

Blue Label – SMART electronic type trip unit

Trip Units	SX, SE
Models	P, B
Ampere Frame	160 – 1000

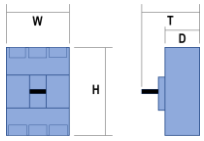
Product Information

P160_BE and P250_BE Information

Frame / Model	Attribute	Unit	Condition	P160F	P160N	P160H	P250F	P250N	P250H
Number of Poles				3, 4	3, 4	3, 4	3, 4	3, 4	3, 4
Nominal current ratings	I_{CT}	(A)	@ 50°C	40 A	40 A	40 A	40 A	40 A	40 A
Trip unit ratings				100 A	100 A	100 A	100 A	100 A	100 A
				160 A	160 A	160 A	160 A	160 A	160 A
				—	—	—	250 A	250 A	250 A
Electrical characteristics									
Rated maximum operational voltage	U_e	(V)	AC 50/60 Hz	690	690	690	690	690	690
		(V)	DC	—	—	—	—	—	—
Rated insulation voltage	U_i	(V)		800	800	800	800	800	800
Rated impulse withstand voltage	U_{imp}	(kV)		8	8	8	8	8	8
Selectivity category				A	A	A	A	A	A
Rated short time withstand current	I_{cw}	(kA)	0.4 sec	—	—	—	—	—	—
Ultimate breaking capacity	I_{cu}	(kA)	690 Vac	6	6	6	6	6	6
(IEC, JIS, AS/NZS)			400 /415 Vac	36	50	70	36	50	70
			240 Vac	50	85	85	50	85	85
Service breaking capacity	I_{cs}	(kA)	690 Vac	6	6	6	6	6	6
(IEC, JIS, AS/NZS)			400 /415 Vac	36	50	50	36	50	50
			220 /240 Vac	50	85	85	50	85	85
Protection - Over Current Release types									
BE 6 dial Adjustable LSI	Std = Standard			Std	Std	Std	Std	Std	Std
BE-G 7 dial Adjustable LSIG (Ground Fault)	Opt = Optional			Std	Std	Std	Std	Std	Std
BE Instantaneous only setting (ICB) [1]	— = Not Available			Std	Std	Std	Std	Std	Std
LT Adjustable 40% to 100% in 1% increments	M Req = Module Required			Std	Std	Std	Std	Std	Std
Instantaneous setting independently adjustable				Std	Std	Std	Std	Std	Std
Installation (Std / Opt / —)									
Front connection (FC)				Std	Std	Std	Std	Std	Std
Extension bar (FB)	Std = Standard			Opt	Opt	Opt	Opt	Opt	Opt
Cable tunnel clamp (FW)	Opt = Optional			Opt	Opt	Opt	Opt	Opt	Opt
Rear Connection (RC)	— = Not Available			Opt	Opt	Opt	Opt	Opt	Opt
DIN rail adaptor				Opt	Opt	Opt	Opt	Opt	Opt
Withdrawable mechanism				Opt	Opt	Opt	Opt	Opt	Opt
Plug-in				Opt	Opt	Opt	Opt	Opt	Opt
Reverse supply connection possible to 440V				Yes	Yes	Yes	Yes	Yes	Yes
Dimensions 	H	(mm)		130	130	130	165	165	165
	W	(mm)	1 pole	—	—	—	—	—	—
			2 pole	—	—	—	—	—	—
			3 pole	90	90	90	105	105	105
			4 pole	120	120	120	140	140	140
	D	(mm)		68	68	68	68	68	68
	T	(mm)		95.5	95.5	95.5	95.5	95.5	95.5
Weight	W	(kg)	3 pole	1.0	1.0	1.0	1.5	1.5	1.5
			4 pole	1.3	1.3	1.3	2	2	2
Operation options (Std / Opt / —)									
Toggle operation	Std = Standard			Std	Std	Std	Std	Std	Std
Extension handle TP-HS/HP or Direct mount T2HB	Opt = Optional			Opt	Opt	Opt	Opt	Opt	Opt
Motor operation TP-MC	— = Not Available			Opt	Opt	Opt	Opt	Opt	Opt
Endurance	Electrical	Cycles	415 Vac	30000	30000	30000	10000	10000	10000
	Mechanical	Cycles		50000	50000	50000	30000	30000	30000

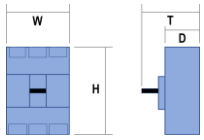
Product Information

P400_BE Information

Frame / Model	Attribute	Unit	Condition	P400F	P400N	P400H	P400S
Number of Poles				3, 4	3, 4	3, 4	3, 4
Nominal current ratings	I_{CT}	(A)	@ 50°C	250 A	250 A	250 A	250 A
Trip unit ratings				400 A	400 A	400 A	400 A
Electrical characteristics							
Rated maximum operational voltage	U_e	(V)	AC 50/60 Hz	690	690	690	690
		(V)	DC	—	—	—	—
Rated insulation voltage	U_i	(V)		800	800	800	800
Rated impulse withstand voltage	U_{imp}	(kV)		8	8	8	8
Selectivity category				B	B	B	B
Rated short time withstand current	I_{cw}	(kA)	0.4 sec	5	5	5	5
Ultimate breaking capacity	I_{cu}	(kA)	690 Vac	7	12	12	12
(IEC, JIS, AS/NZS)			400 /415 Vac	36	50	70	110
			240 Vac	50	85	100	125
Service breaking capacity	I_{cs}	(kA)	690 Vac	7	12	12	12
(IEC, JIS, AS/NZS)			400 /415 Vac	36	50	70	110
			220 /240 Vac	50	85	100	125
Protection - Over Current Release types							
BE 6 dial Adjustable LSI	Std Standard			Std	Std	Std	Std
BE-G 7 dial Adjustable LSIG (Ground Fault)	Opt Optional			Std	Std	Std	Std
BE Instantaneous only setting (ICB) [1)]	— Not Available			Std	Std	Std	Std
LT Adjustable 40% to 100% in 1% increments	M Req Module Required			Std	Std	Std	Std
Instantaneous setting independently adjustable				Std	Std	Std	Std
Installation (Std / Opt / —)							
Front connection (FC)				Std	Std	Std	Std
Extension bar (FB)	Std Standard			Std	Std	Std	Std
Cable tunnel clamp (FW)	Opt Optional			Opt	Opt	Opt	Opt
Rear connection (RC)	— Not Available			Opt	Opt	Opt	Opt
DIN rail adaptor				—	—	—	—
Withdrawable mechanism				Opt	Opt	Opt	Opt
Plug-in				Opt	Opt	Opt	Opt
Reverse supply connection possible to 440V				Yes	Yes	Yes	Yes
Dimensions 	H	(mm)		260	260	260	260
	W	(mm)	1 pole	—	—	—	—
			2 pole	—	—	—	—
			3 pole	140	140	140	140
			4 pole	185	185	185	185
	D	(mm)		103	103	103	103
	T	(mm)		145	145	145	145
Weight	W	(kg)	3 pole	4.3	4.3	4.3	4.3
			4 pole	5.7	5.7	5.7	5.7
Operation options (Std / Opt / —)							
Toggle operation	Std Standard			Std	Std	Std	Std
Extension handle TP-HS/HP or Direct mount T2HB	Opt Optional			Opt	Opt	Opt	Opt
Motor operation TP-MC	— Not Available			Opt	Opt	Opt	Opt
Endurance	Electrical	Cycles	415 Vac	6000	6000	6000	6000
	Mechanical	Cycles		15000	15000	15000	15000

Product Information

P630_BE Information

Frame / Model	Attribute	Unit	Condition	P630F	P630N	P630H	P630S
Number of Poles				3, 4	3, 4	3, 4	3, 4
Nominal current ratings Trip unit ratings	I_{CT}	(A)	50°C	630A	630A	630A	630A
Electrical characteristics							
Rated maximum operational voltage	U_e	(V)	AC 50/60 Hz	690	690	690	690
		(V)	DC	—	—	—	—
Rated insulation voltage	U_i	(V)		800	800	800	800
Rated impulse withstand voltage	U_{imp}	(kV)		8	8	8	8
Selectivity category				A	A	A	A
Rated short time withstand current	I_{cw}	(kA)	0.4 sec	—	—	—	—
Ultimate breaking capacity (IEC, JIS, AS/NZS)	I_{cu}	(kA)	690 Vac	7	12	12	12
			400 /415 Vac	36	50	70	110
			240 Vac	50	85	100	125
Service breaking capacity (IEC, JIS, AS/NZS)	I_{cs}	(kA)	690 Vac	7	12	12	12
			400 /415 Vac	36	50	70	110
			220 /240 Vac	50	85	100	125
Protection - Over Current Release types							
BE 6 dial Adjustable LSI	Std Standard			Std	Std	Std	Std
BE-G 7 dial Adjustable LSIG (Ground Fault)	Opt Optional			Std	Std	Std	Std
BE Instantaneous only setting (ICB) [1]	— Not Available			Std	Std	Std	Std
LT Adjustable 40% to 100% in 1% increments	M Req Module Required			Std	Std	Std	Std
Instantaneous setting independently adjustable				Std	Std	Std	Std
Installation (Std / Opt / —)							
Front connection (FC)				Std	Std	Std	Std
Extension bar (FB)				Std	Std	Std	Std
Cable tunnel clamp (FW)	Std Standard			Opt	Opt	Opt	Opt
Rear connection (RC)	Opt Optional			Opt	Opt	Opt	Opt
DIN rail adaptor	— Not Available			—	—	—	—
Withdrawable mechanism				Opt	Opt	Opt	Opt
Plug-in				Opt	Opt	Opt	Opt
Reverse supply connection possible to 440V				Yes	Yes	Yes	Yes
Dimensions 	H	(mm)		260	260	260	260
	W	(mm)	1 pole	—	—	—	—
			2 pole	—	—	—	—
			3 pole	140	140	140	140
			4 pole	185	185	185	185
	D	(mm)		103	103	103	103
	T	(mm)		145	145	145	145
Weight	W	(kg)	3 pole	5.0	5.0	5.0	5.0
			4 pole	6.6	6.6	6.6	6.6
Operation options (Std / Opt / —)							
Toggle operation	Std Standard			Std	Std	Std	Std
Extension handle TP-HS/HP or Direct mount T2HB	Opt Optional			Opt	Opt	Opt	Opt
Motor operation TP-MC	— Not Available			Opt	Opt	Opt	Opt
Endurance	Electrical	Cycles	415 Vac	4000	4000	4000	4000
	Mechanical	Cycles		15000	15000	15000	15000

Internal Accessories

Internal accessories include Auxiliary and Alarm contacts, Shunt Trip and Undervoltage Trip (UVT) modules, which may be installed under the front cover of the MCCB in various combinations to provide additional functionality and connection with external control circuits.

For information regarding installation of the internal accessories, see Internal Accessory Mounting Locations

Auxiliary & Alarm Switches

Auxiliary Contacts

An auxiliary contact can be installed to indicate whether an MCCB is Open (both OFF and Tripped positions) or Closed (ON). Auxiliary contacts come in either general purpose or micro-switch type, with some combinations pre-wired or with terminals. Each contact type is provided as a single change-over switching arrangement (1x C/O).

Part Number	Description	Contact Type	Connection Type	Conductor			
				Minimum	Maximum	Size	Length
T2AX00LML3SWA	Auxiliary	General purpose	Pre-wired	N/A		0.5mm²	700mm
T2AX00LML3STA	Auxiliary	General purpose	Terminal	0.5mm²	1.25mm²	N/A	
T2AX00LML3RWA	Auxiliary	Micro-switch	Pre-wired	N/A		0.5mm²	700mm

Alarm Contacts

An alarm contact can be installed to indicate whether an MCCB is in the Tripped or Not Tripped position (ON, OFF). Alarm contacts come in either general purpose or micro-switch type, with some combinations pre-wired or with terminals. Each contact type is provided as a single change-over switching arrangement (1x C/O).

Part Number	Description	Contact Type	Connection Type	Conductor			
				Minimum	Maximum	Size	Length
T2AL00LML3SWA	Alarm; left side only	General purpose	Pre-wired	N/A		0.5mm²	700mm
T2AL00LML3STA	Alarm; left side only	General purpose	Terminal	0.5mm²	1.25mm²	N/A	
T2AL00LML3RWA	Alarm; left side only	Micro-switch	Pre-wired	N/A		0.5mm²	700mm

Auxiliary and Alarm Data

The below information applies to both auxiliary and alarm accessories.

General purpose contact						
AC (V)			DC (V)			Minimum Load
Volts (V)	Amperes (A)		Volts (V)	Amperes (A)		
	Resistive Load	Inductive Load		Resistive Load	Inductive Load	
480	—	—	250	—	—	100 mA @ 15 Vdc
250	3	2	125	0.4	0.05	
125	3	2	30	3	2	

Micro-switch contact		
DC (V)		Minimum Load
Volts (V)	Amperes (A) Resistive Load	
30	0.1	1 mA @ 5 Vdc

For information regarding wiring and terminal designations, see Annex G

Internal Accessories

Shunt Trip

A shunt (normally de-energized) can be installed to trip the MCCB by applying voltage to the shunt coil.

Part Number	Rated voltage		Connection Type	Conductors	
	AC (V)	DC (V)		Minimum	Maximum
T2SH00LA10T	110	—	Cage Clamp	0.5mm²	1.25mm²
T2SH00LA20T	200…240	—	Cage Clamp		
T2SH00LA40T	380…450	—	Cage Clamp		
T2SH00LD01T	—	12	Cage Clamp		
T2SH00LD02T	—	24	Cage Clamp		
T2SH00LD04T	—	48	Cage Clamp		
T2SH00LD10T	—	100…120	Cage Clamp		
T2SH00LD20T	—	200…240	Cage Clamp		
				Size	Length
T2SH00LA10WA	110	—	Pre-wired cage clamp	0.5mm²	500mm
T2SH00LA20WA	200…240	—	Pre-wired cage clamp		
T2SH00LA40WA	380…450	—	Pre-wired cage clamp		
T2SH00LD01WA	—	12	Pre-wired cage clamp		
T2SH00LD02WA	—	24	Pre-wired cage clamp		
T2SH00LD04WA	—	48	Pre-wired cage clamp		
T2SH00LD10WA	—	100…120	Pre-wired cage clamp		
T2SH00LD20WA	—	200…240	Pre-wired cage clamp		

Rated voltage	AC (V)			DC (V)				
	100…120	200…240	380...450	12	24	48	100…120	200…240
Excitation current (mA)	16.0	16.0	6.8	160.0	124.0	32.0	14.0	12.0
Rated voltage range	85% to 110% of the rated voltage			75 % to 125 % of the rated voltage				
Actuation Time	<30ms			<30ms				

Notice: The rated voltage range is from 85% to 110% of the rated voltage for AC and 75 % to 125 % for DC. Ensure that the voltage does not drop or exceed the voltage range when shunt is actuated.

Internal Accessories

Under Voltage Trips

A UVT (normally energized) can be installed to trip the MCCB removing voltage from the UVT coil.

Part Number	Rated voltage		Compatible MCCB		Connection Type	Notes	Conductors	
	AC (V)	DC (V)	3P	4P			Minimum	Maximum
T2UV00LA10NT	100…120	—	All	All	Cage Clamp	Instantaneous	0.5mm²	1.25mm²
T2UV00LA20NT	200…240	—	All	All	Cage Clamp	Instantaneous		
T2UV00LA40NT	380…450	—	All	All	Cage Clamp	Instantaneous		
T2UV00LD02NT	—	24	All	All	Cage Clamp	Instantaneous		
T2UV00LD10NT	—	100…120	All	All	Cage Clamp	Instantaneous		
T2UV00LD20NT	—	200…240	All	All	Cage Clamp	Instantaneous		
							Size	Length
T2UV00LA10NWA	100…120	—	All	All	Pre-wired cage clamp	Instantaneous	0.5mm²	500mm
T2UV00LA20NWA	200…240	—	All	All	Pre-wired cage clamp	Instantaneous		
T2UV00LA40NWA	380…450	—	All	All	Pre-wired cage clamp	Instantaneous		
T2UV00LD02NWA	—	24	All	All	Pre-wired cage clamp	Instantaneous		
T2UV00LD10NWA	—	100…120	All	All	Pre-wired cage clamp	Instantaneous		
T2UV00LD20NWA	—	200…240	All	All	Pre-wired cage clamp	Instantaneous		

Rated Voltage	AC (V)			DC (V)		
	100…120	200…240	380…450	24	100…120	200…240
Power supply requirement (VA)	1.3	1.1	2.0			
Excitation current (mA)				22.0	9.0	3.7
Actuation Time	<50ms			<50ms		

For information regarding wiring and terminal designations, see Annex G

Under Voltage Trips (With Time Delay)

A UVT (normally energized) can be installed to trip the MCCB removing voltage from the UVT coil

Part Number	Rated voltage		Compatible MCCB		Connection Type	Notes	Conductors	
	AC (V)	DC (V)	3P	4P			Minimum	Maximum
T2UV00LA10DS	100…110	—	All	P160 / 250	Cage Clamp	Time Delay 500ms	0.5mm²	1.25mm²
T2UV00LA24DS	230…240	—	All	P160 / 250	Cage Clamp	Time Delay 500ms		
T2UV00LA40DS	380…415	—	All	P160 / 250	Cage Clamp	Time Delay 500ms		
T2UV00LA45DS	440…450	—	All	P160 / 250	Cage Clamp	Time Delay 500ms		
T2UV00LD02DS	—	24	All	P160 / 250	Cage Clamp	Time Delay 500ms		
T2UV00LD10DS	—	100…110	All	P160 / 250	Cage Clamp	Time Delay 500ms		
T2UV00LD24DS	—	230…240	All	P160 / 250	Cage Clamp	Time Delay 500ms		
							Minimum	Maximum
T2UV00LA10DL	110	—	Not Compatible	P400 / 630	Cage Clamp	Time Delay 500ms	0.5mm²	1.25mm²
T2UV00LA24DL	230…240	—		P400 / 630	Cage Clamp	Time Delay 500ms		
T2UV00LA40DL	380…415	—		P400 / 630	Cage Clamp	Time Delay 500ms		
T2UV00LA45DL	440…450	—		P400 / 630	Cage Clamp	Time Delay 500ms		
T2UV00LD02DL		24		P400 / 630	Cage Clamp	Time Delay 500ms		
T2UV00LD10DL		110		P400 / 630	Cage Clamp	Time Delay 500ms		
T2UV00LD24DL		230		P400 / 630	Cage Clamp	Time Delay 500ms		

Rated Voltage	AC (V)				DC (V)		
	100…110	230…240	380…415	440…450	24	100…110	230…240
Power supply requirement (VA)	1.3	1.1	1.7	2.0			
Excitation current (mA)					22.0	8.1	3.7
Actuation Time	500 ± 300ms				500 ± 300ms		

For information regarding wiring and terminal designations, see Annex G

Plugs & Ports

The P_BE circuit breaker is equipped with specific connectors for connecting interfacing devices and accessories.

Port		Description
PTA		Used to connect the PTA output contact to send the pre-trip alarm over a local signalling circuit. Located on the outside left-hand side of the MCCB.
MIP		Maintenance Interface Port – for temporary connection to OCR testing, servicing, and maintenance tools. Located to the right of the embedded display front cover.

Notice: Port images are representative only. Locations differ slightly for the various ampere frame sizes

Installation

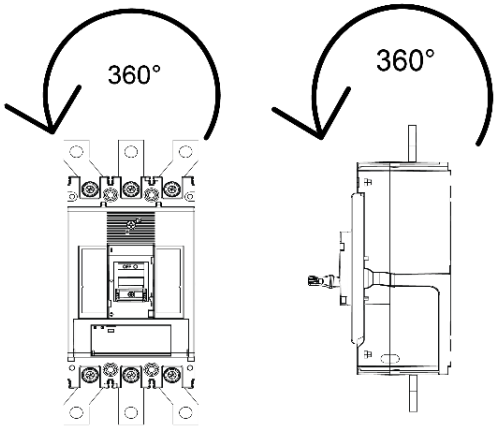
Precautions

WARNING: To prevent electrical shock and damage to equipment, disconnect and isolate power source upstream of the MCCB before installing or servicing the MCCB including its connected accessories.

Notice: To ensure correct performance, and integrity of equipment, the installation instructions and recommendations provided herein shall be respected. Refer to the respective user manual and installation instructions provided with the MCCB and associated accessories.

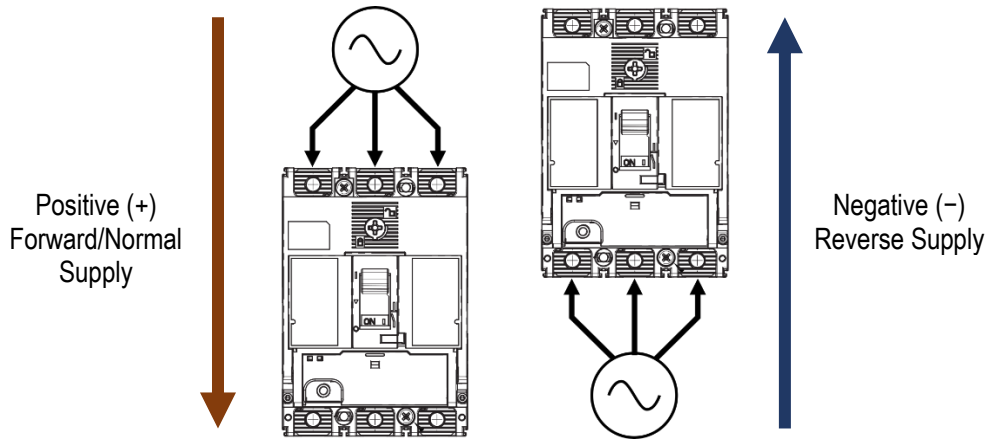
Mounting Angles

TemBreak *PRO* MCCBs may be mounted at any angle without affecting performance.



Direction of Power Supply

Power supply may be fed in either direction with respect to the MCCB without affecting performance.



Installation

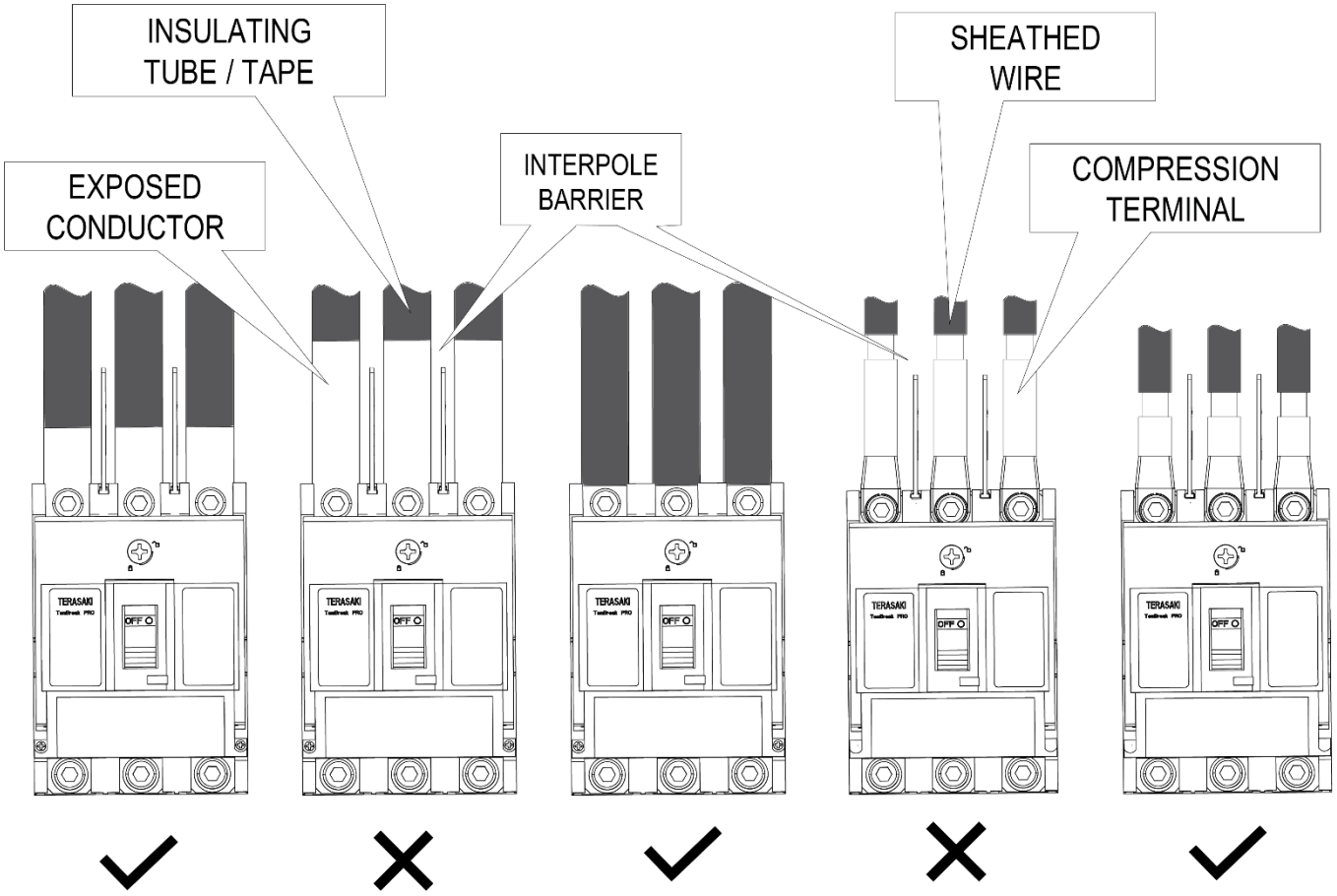
Clearances

WARNING: Exposed conductors including terminals at attached busbars must be insulated to avoid possible short-circuit or earth faults due any foreign matter coming into contact with the conductors.

Phase to Phase and Earth

Interruption of large currents during fault or normal switching operation produces ionised gases and arcing materials which expelled from the vents at the top of the MCCB for P160/P250, and top and bottom for P400/P630. These ionised gases are highly conductive, concentrated, and at an elevated temperature when it exits the MCCB via the arc vents. Care must be taken to avoid an arcing fault from occurring due to the presence of concentrated ionised gases creating a conductive path between exposed conductors. Incoming conductors must therefore be insulated the full length up to the terminal opening of the MCCB, ensuring bare conductors are not exposed directly to concentrated ionised gases. This also applies to the attached busbars supplied as part of the MCCB.

Interpole barriers or terminal covers may be used to achieve creepage and clearance requirements. Conductors must not impede the flow of ionised gas and allow it to clear and disperse safety. Interpole barriers are supplied as standard with Terasaki MCCBs for the line side only. 2 barriers with 3P MCCBs and 3 with 4P MCCBs. In cases where two different MCCB types are installed one above the other, the insulation distance between the two models should be as for the lower model.



Installation

Insulating Distance

When earth metal is installed within proximity of the breakers, the correct insulating distance must be maintained, (refer to Minimum Clearance). This distance is necessary to allow the exhausted arc gases to disperse. This could include the mounting plate or side panel within a switchboard.

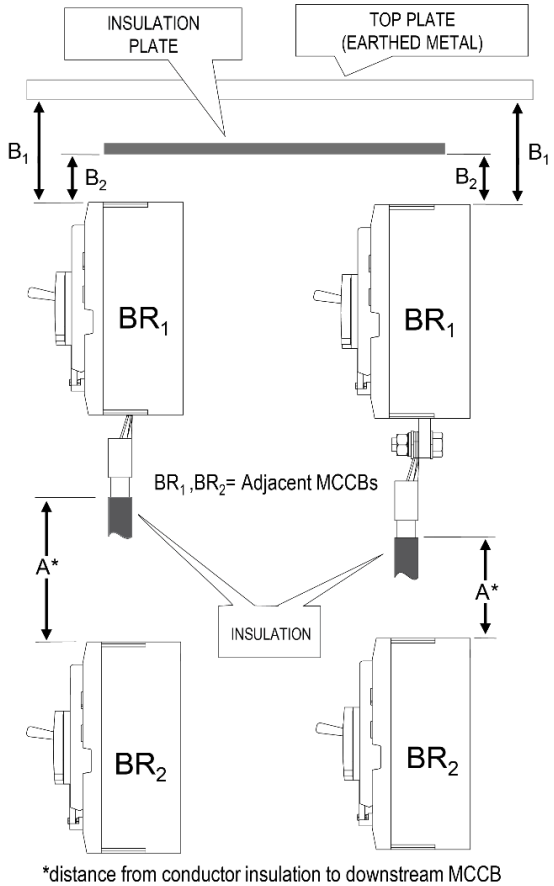
Minimum Clearance

Below illustrates the minimum clearance that must be maintained.

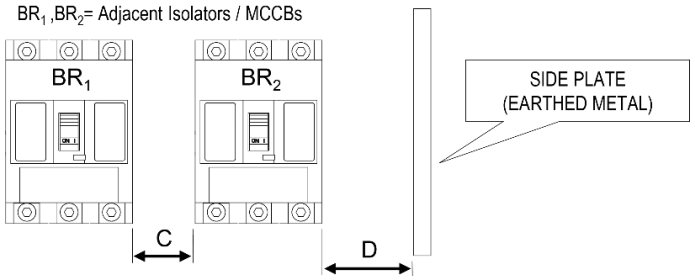
WARNING: Ensure that the exposed conductors are insulated until it overlaps the moulded case breaker at the terminal, or the terminal cover.

Dim.	Description
A	Distance from lower breaker to open charging part of terminal on upper breaker (front connection) or the distance from lower breaker to upper breaker end (rear connection and plug-in type)
B_1	Distance from breaker end to ceiling (earthed metal)
B_2	Distance from breaker end to insulator
C	Clearance between breakers
D	Distance from breaker side to side plate (earthed metal)
E	Length of insulation over exposed conductors.

MCCB Cat. No.	Distances (mm)				
	A	B_1	B_2	C	D
P160F	50	10	10	0	25
P160N / H / D	75	45	25	0	25
P250F	50	40	30	0	25
P250N / H / D	80	80	30	0	25
P400F / N / H / D	100	80	60	0	80
P400S	120	120	80	0	80
P630F / N / H / D	100	80	60	0	80
P630S	120	120	80	0	80



*distance from conductor insulation to downstream MCCB



Installation

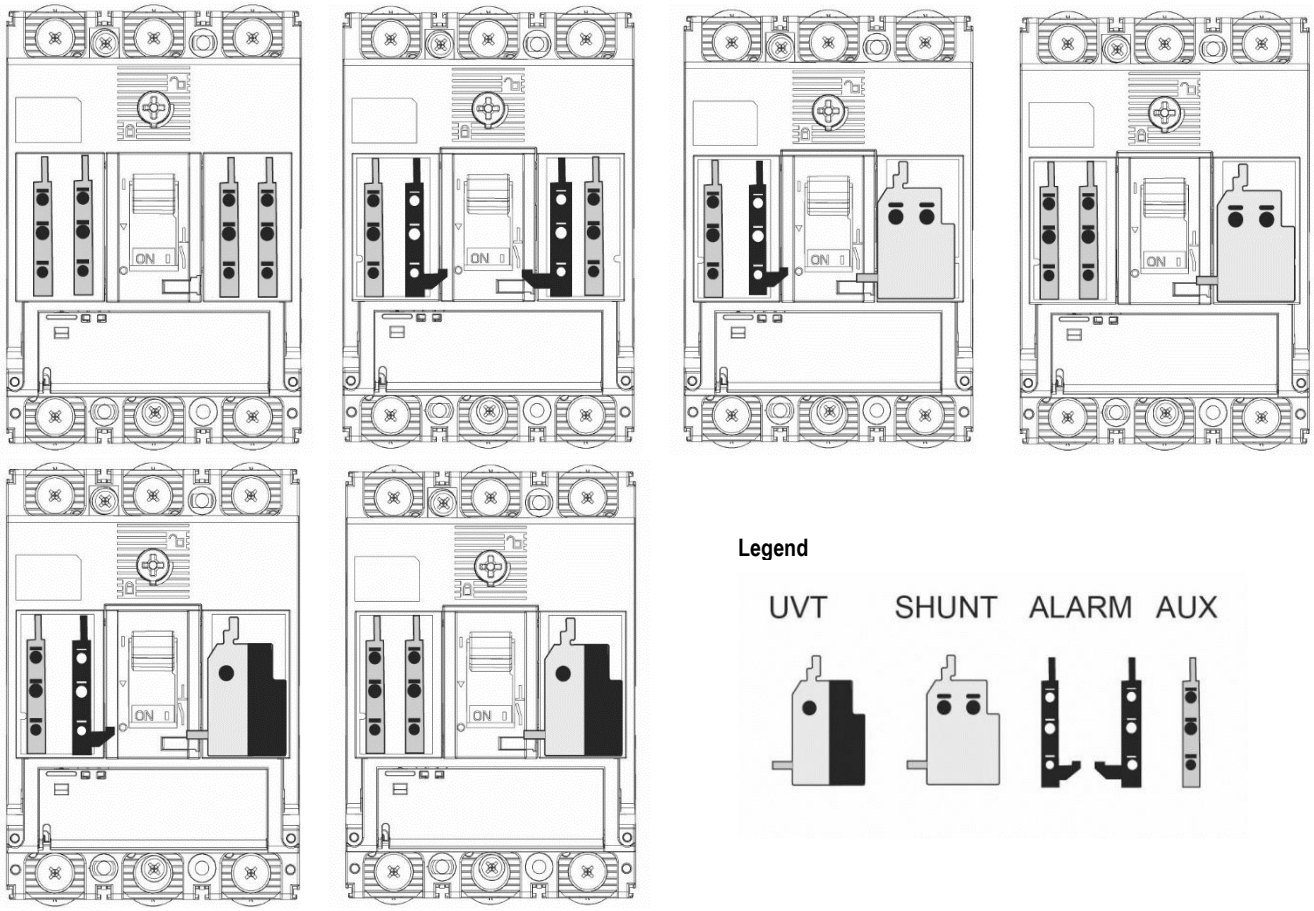
Internal Accessory Mounting Locations

P160, P250 and P400/630 frame sizes have different internal mounting locations for auxiliary contacts, alarm contacts, shunts and, UVTs.

Left-side and right-side mounting locations are independent and accept unique combinations. For example, shunts and UVTs may only be mounted on the right side, whereas auxiliary and alarm contacts may be mounted on either left or right side.

Refer to the following illustrations for each frame size listing the various possible internal accessories combinations.

P160 internal accessories combination

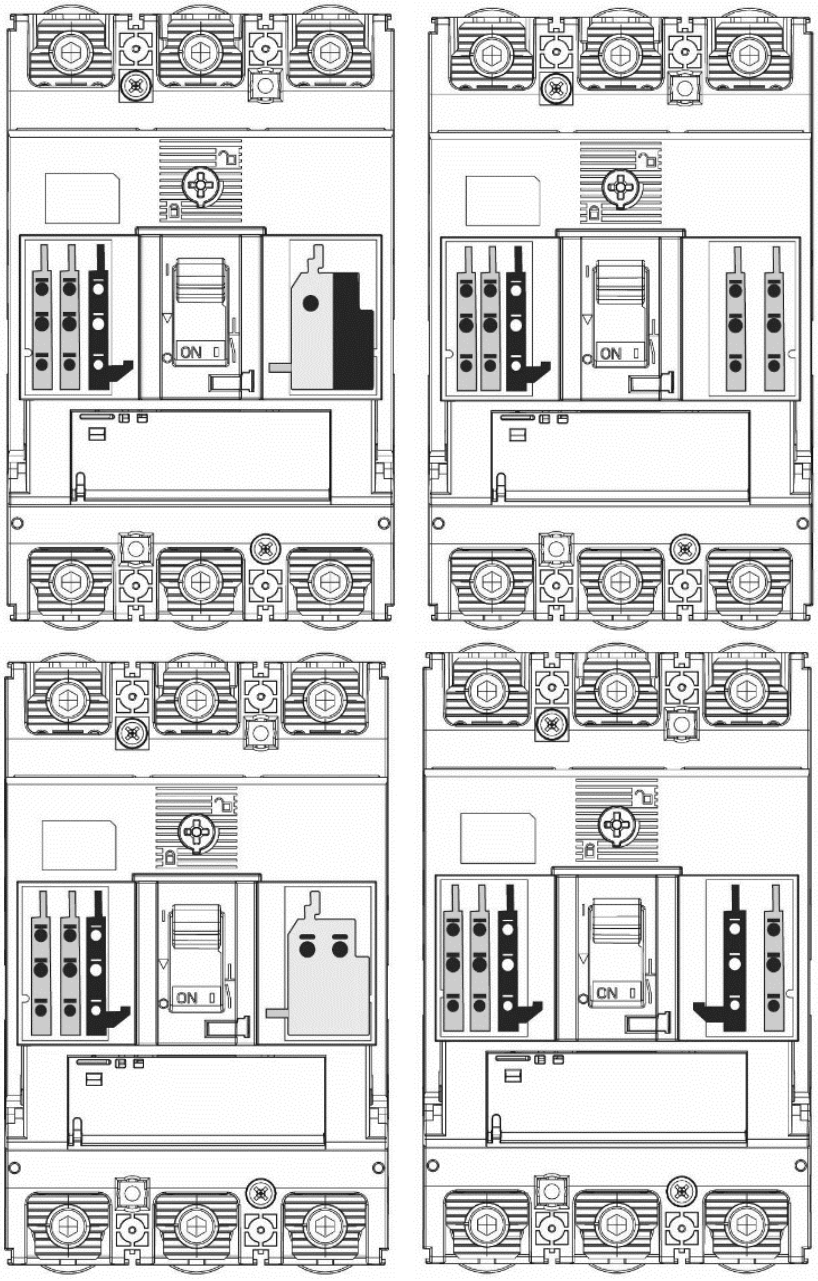


Legend

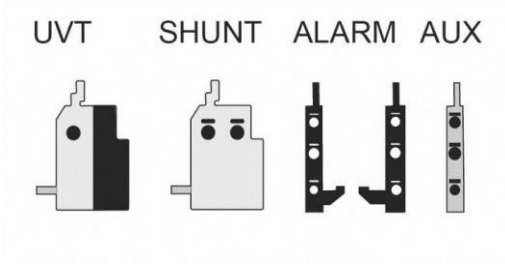
Installation

Internal Accessory Mounting Locations

P250 internal accessories combination



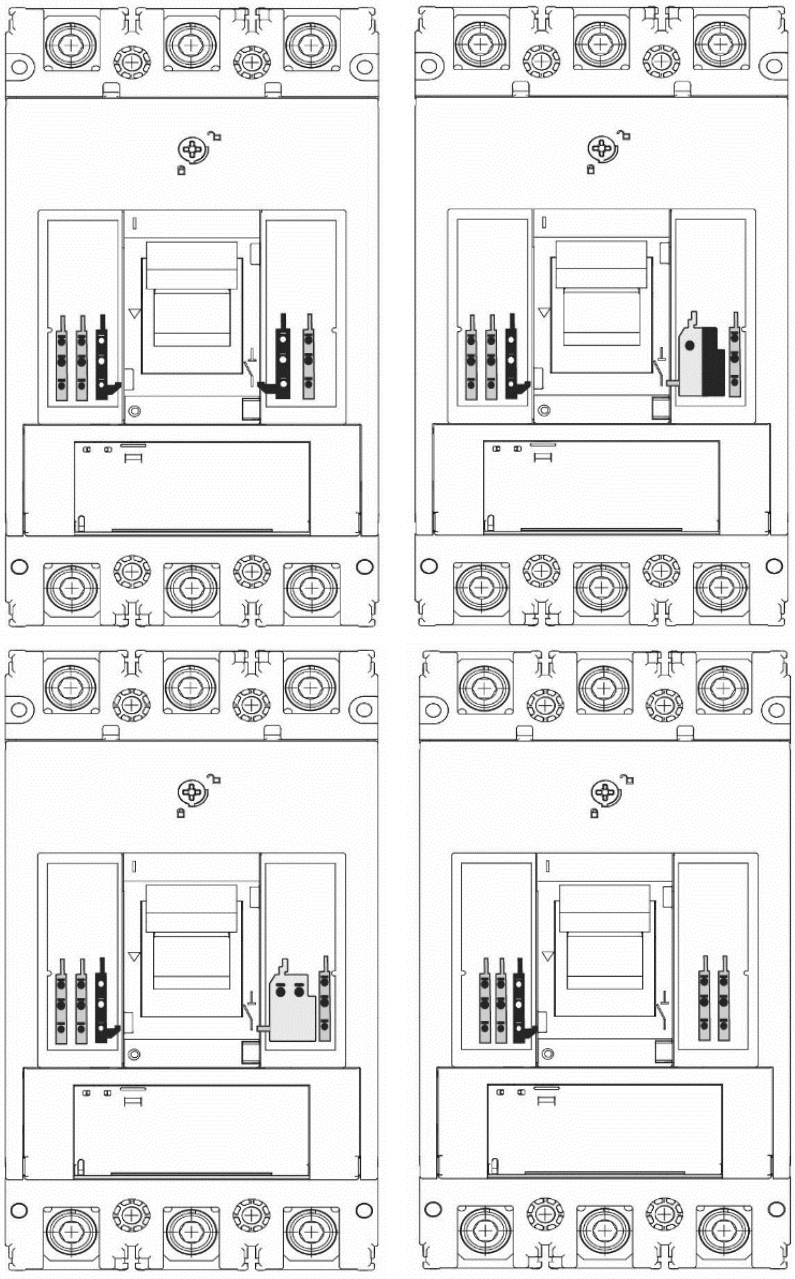
Legend



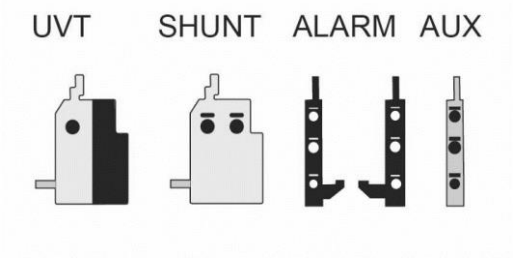
Installation

Internal Accessory Mounting Locations

P400/630 internal accessories combination



Legend



Notice: Only 2 internal accessories can be mounted on the right-hand side of a P400 and P630 MCCB. Under no circumstances can 3 or more be installed.
Examples:

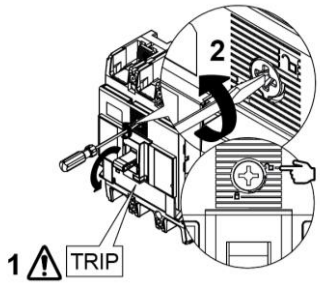
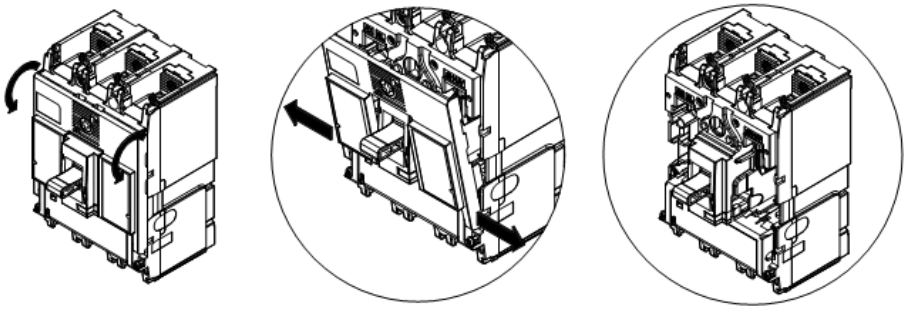
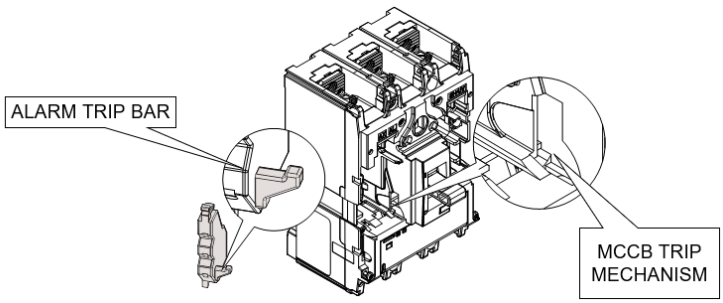
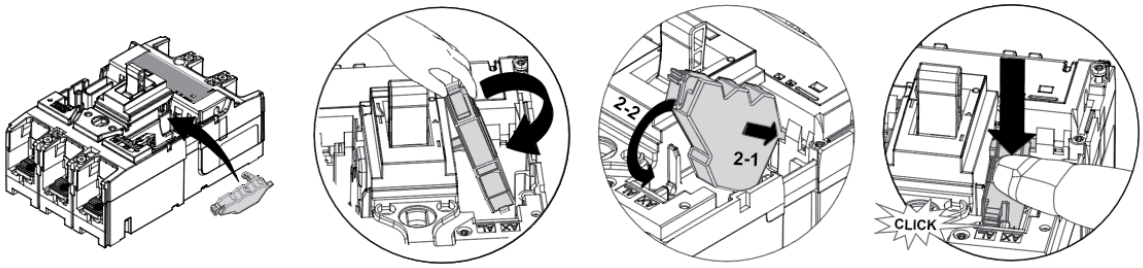
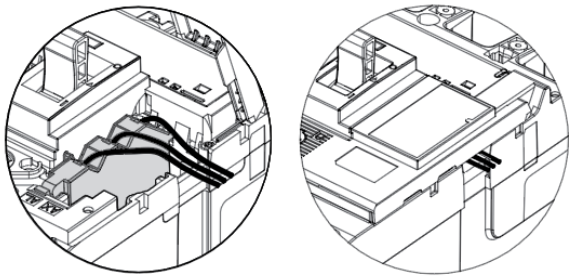
- 2 AUX
- 1 Alarm and 1 AUX
- 1 Shunt and 1 AUX
- 1 UVT and 1 AUX

Installation

Alarm, Shunt & UVT Installation

The alarm, shunt and UVT have a trip bar that needs to interact with the MCCBs trip mechanism. As such they must be installed in a specific way. Refer to the supplied Installation Instructions for the respective accessories for further detail.

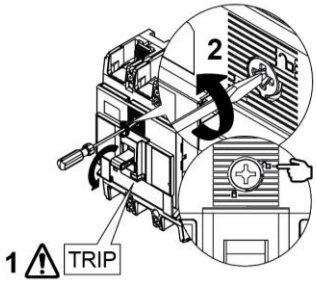
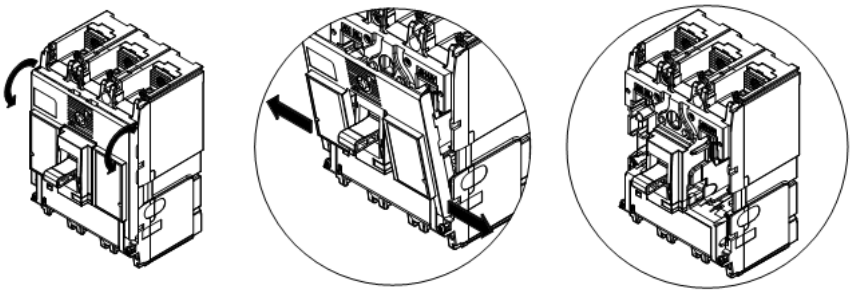
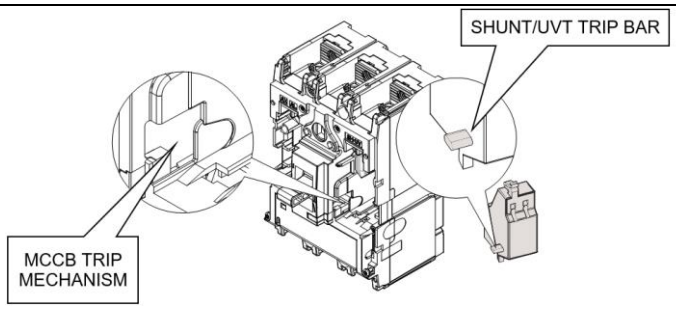
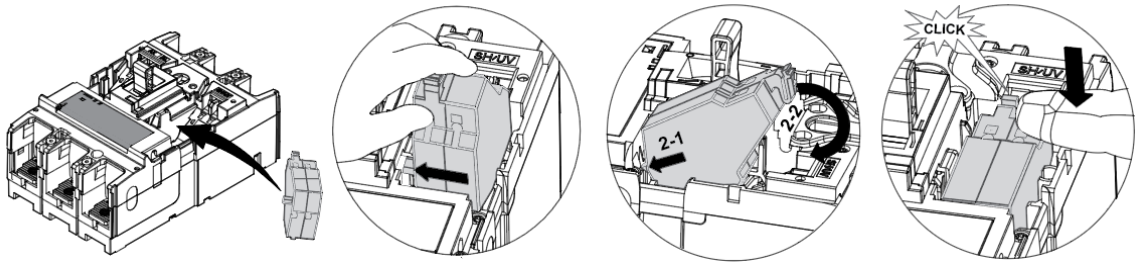
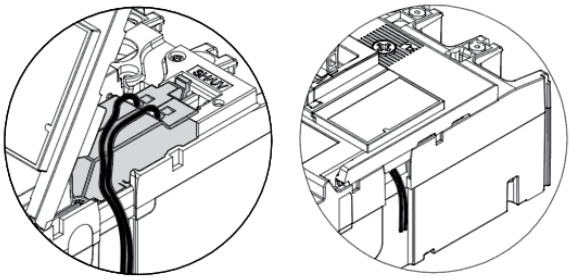
Standard Alarm & Auxiliary installation

	Action	Note
1	Switch the Smart MCCB to the Tripped Position.	
2	Open the front cover of the MCCB.	
3	Locate the alarm's trip bar into the MCCB trip mechanism slot.	
4	The alarm will need to be rolled into place, follow the images to the right.	
5	Run the wires out the left-hand side of the MCCB, through the allocated groves.	

Installation

Alarm, Shunt & UVT Installation

Shunt & UVT installation

	Action	Note
1	Switch the Smart MCCB to the Tripped Position.	
2	Open the front cover of the MCCB.	
3	Locate the shunt or UVT's trip bar into the MCCB trip mechanism slot.	
4	The shunt or UVT will need to be rolled into place, follow the images to the right.	
5	Run the wires out the right-hand side of the MCCB, through the allocated groves.	

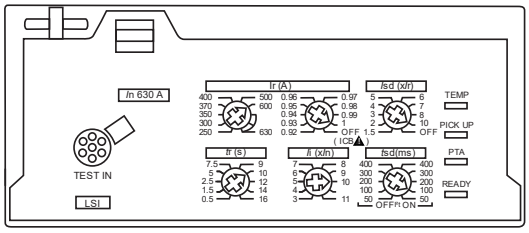
Protection Settings

Trip Curve

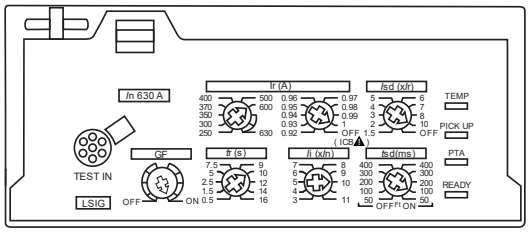
The TemBreak *PRO* P_BE electronic trip unit protects against overcurrent and short circuit faults for many types of electrical distribution systems. The P_BE OCR has protective characteristics according to the requirements of the standard AS/NZS IEC 60947-2.

All protection functions are based on the effective value (RMS) of power, to reduce the effects of current harmonics.
The wide range of protection curves adjustments assist in being able to achieve Selectivity combinations of upstream and downstream protection.

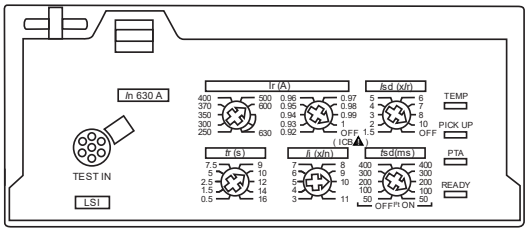
LSI 3 Pole



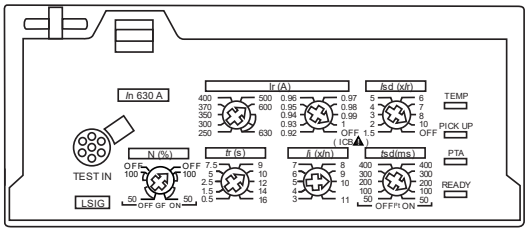
LSIG 3 Pole



LSI 4 Pole



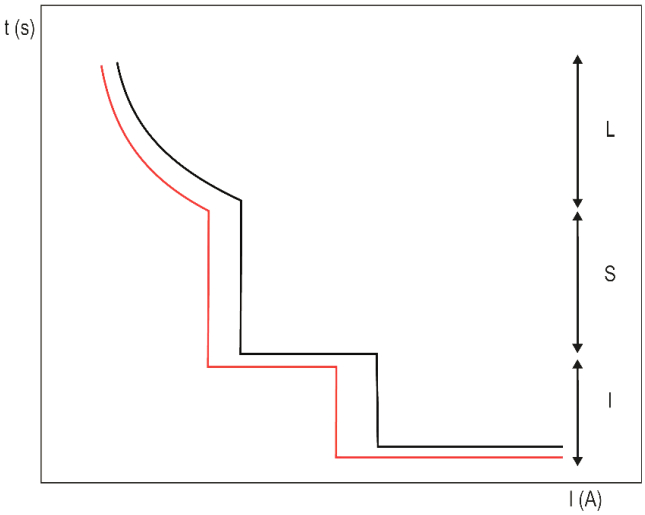
LSIG 4 Pole



List of Protection Functions

Abbreviation	Description	Protection against	Symbol	Definition
L	Long-time delay (LTD) protection	Low level current overload	I_r	Threshold long time protection
			t_r	Long Time Delay
S	Short-time delay (STD protection	Low level short-circuit	I_{sd}	Threshold short time protection
			t_{sd}	Short Time Delay
			I²t ON / OFF	I²t curve on Short delay protection activated or not
I	Instantaneous (INST) protection	Larger short-circuit	I_i	Instantaneous protection threshold
G	Ground/Earth protection	Ground / Earth fault	I_g	Earth Protection Threshold
			t_g	Delay protection Earth
			I²t ON / OFF	I²t curve on Earth protection or not activated

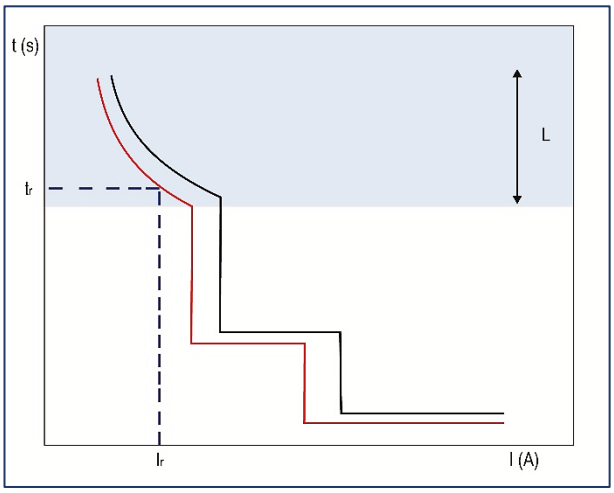
Time-current curve



Protection Settings

Long Time Delay (LTD) protection

The Long Time Delay protection protects against current overloads or surges in power distribution or motor control applications.
Long Time Delay protection is an inverse-time protection which includes a thermal image function.



	Long Time Delay Settings	Description
L	I_r	Long Time Delay protection threshold (current rating)
	t_r	Long Time Delay (time delay)

Equation

The tr time delay defines the trip time of the long-time delay protection at a 6 x I_r.
The time to trip at any given current is calculated using the below formula, where k is a constant specific to I_r and t_r settings.

The derivation of the constant k is given by the below formula, where t_r is equal to the t_r setting, I_r equal to the Ir setting and where I equals 6 x I_r.

P Model Long Time Equation	$k = \frac{-t_r}{\log_e\left(1-\left(\frac{1.125 \times I_r}{I}\right)^2\right)}$

Example

P250H3250SE with the below LTD settings
I_{r1} = 250A
I_{r2} = 1.0
t_r = 5s

k constant is calculated as below for this example.

$$k = \frac{-t_r}{\log_e\left(1-\left(\frac{1.125 \times I_r}{I}\right)^2\right)} = \frac{-5}{\log_e\left(1-\left(\frac{1.125 \times I_r}{6 \times I_r}\right)^2\right)} = \frac{-5}{\log_e\left(1-\left(\frac{1.125}{6}\right)^2\right)} = 139.71$$

$$I_r = I_{r1} \times I_{r2} = 250A \times 1.0 = 250A$$

Now the LTD curve for a P250_BE with the above LTD settings can be plotted using the below

$$t_r = -\left(139.71 \times \log_e\left(1-\left(\frac{1.125 \times 250}{I}\right)^2\right)\right), where\ t_r\ is\ the\ time\ delay\ for\ a\ given\ value\ of\ I$$

Protection Settings

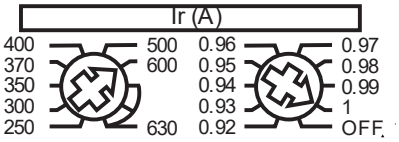
Long Time Delay (LTD) protection

Adjusting I_r (Current)

The LTD protection trip range is: 1.05...1.20 x I_r according to standard AS/NZS IEC 60947.2.
The trip threshold tolerance I_r for the long-time delay protection is +5% to +20%.

The I_r trip threshold is adjusted using two I_r dials on the front of the MCCB:

I_{r1} – maximum scale adjustment
I_{r2} – fine adjustment of the maximum scale in increments of 1%



The I_r threshold is firstly set using the I_{r1} dial to set the maximum current range, then, if necessary, from the I_{r2} dial further adjustments in fine increments of 1% can be made from OFF to 0.92 x I_{r1} dial. Refer to the Commissioning – LTD Adjustments (I_r, t_r) section for further information on using the I_{r1} and I_{r2} adjustment dials.

WARNING: Setting I_{r2} to OFF will disable both LTD and STD protection modes; therefore, the MCCB will provide instantaneous protection only.

Rating (I_n)	Dial position									
	1	2	3	4	5	6	7	8	9	10
40A	**I_{r1} max 16**	**I_{r1} max 18**	**I_{r1} max 20**	**I_{r1} max 22**	**I_{r1} max 25**	**I_{r1} max 28**	**I_{r1} max 32**	**I_{r1} max 34**	**I_{r1} max 37**	**I_{r1} max 40**
	14.72...16	16.56...18	18.4...20	20.24...22	23...25	25.76...28	29.44...32	31.28...34	34.04-37	36.8-40
100A	**I_{r1} max 40**	**I_{r1} max 45**	**I_{r1} max 50**	**I_{r1} max 57**	**I_{r1} max 63**	**I_{r1} max 72**	**I_{r1} max 80**	**I_{r1} max 87**	**I_{r1} max 93**	**I_{r1} max 100**
	36.8...40	41.4...45	46...50	52.44...57	57.96...63	66.24...72	73.6...80	80.04...87	85.56-93	92-100
160A	**I_{r1} max 63**	**I_{r1} max 70**	**I_{r1} max 80**	**I_{r1} max 90**	**I_{r1} max 100**	**I_{r1} max 110**	**I_{r1} max 125**	**I_{r1} max 135**	**I_{r1} max 150**	**I_{r1} max 160**
	58...63	64.4...70	73.6...80	82.8...90	92...100	101.2...110	115...125	124.2...135	138-150	147.2-160
250A	**I_{r1} max 100**	**I_{r1} max 110**	**I_{r1} max 125**	**I_{r1} max 140**	**I_{r1} max 160**	**I_{r1} max 180**	**I_{r1} max 200**	**I_{r1} max 225**	**I_{r1} max 250**	
	92...100	101.2...110	115...125	128.8...140	147.2...160	165.6...180	184...200	207...225	230-250	
400A	**I_{r1} max 160**	**I_{r1} max 180**	**I_{r1} max 200**	**I_{r1} max 225**	**I_{r1} max 250**	**I_{r1} max 300**	**I_{r1} max 350**	**I_{r1} max 370**	**I_{r1} max 400**	
	147.2...160	165.6...180	184...200	207...225	230...250	276...300	322...350	340.4...370	368-400	
630A	**I_{r1} max 250**	**I_{r1} max 300**	**I_{r1} max 350**	**I_{r1} max 370**	**I_{r1} max 400**	**I_{r1} max 500**	**I_{r1} max 600**	**I_{r1} max 630**		
	230...250	276...300	322...350	340.4...370	368...400	460...500	552...600	579.6...630		

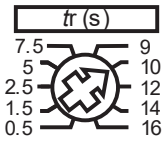
I_{r1} max scale setting (A)
I_{r2} fine adjustment range (A)

Protection Settings

Long Time Delay (LTD) protection

Adjusting t_r (Time Delay)

The t_r time delay defines the trip time of the long-time delay protection for a current of 6 x I_r. and adjustable via the t_r dial.



t_r Adjustment Range (seconds)									
0.5	1.5	2.5	5	7.5	9	10	12	14	16

Notice: For the following MCCBs the setting of I_r and t_r can limit the setting of I_{sd} for STD protection.

P160_BE I_n = 160A, P250_BE I_n = 250A

If: I_r > 0.9 x I_n and t_r = 16s I_{sd} is limited to 9 x I_r. even if the dial is set to 10x

Notice: The trip time tolerance for LTD protection is -20% + 20ms to 0% + 30ms.
Example:
For t_r = 5 s and I = 6 x I_r, the trip time for long time delay protection will be between 4.02 s and 5.03 s.

Protection Settings

Long Time Delay (LTD) protection

Thermal memory / Hot–Cold start mode

TemBreak *PRO* electronic OCRs have a thermal imaging function, which models the active heating and cooling of electrical conductors as current passes through them. The thermal imaging function calculates a thermal value (θ) for the conductors, which trips the MCCB when its thermal threshold (θ_{trip}) is reached. This allows the MCCB to simulate the true thermal state of the conductors more accurately, and better protect against overload conditions between successive operating cycles.

Thermal imaging cannot be disabled in the OCR, however, the P_BE model can be supplied with either a hot or cold start mode, which determines whether the calculated thermal value θ is retained if the current drops below the LTD pick-up current threshold (between 1.05…1.20 x I_r).

The standard P_BE OCR is supplied with Cold start mode only. If Hot start mode is required, a made-to-order P_BE can be supplied. Contact NHP for details on the Hot start mode option.

Alternatively, the P_SE model can be configured with either a hot or cold start mode using the embedded display, or TPCM or TPED accessories.

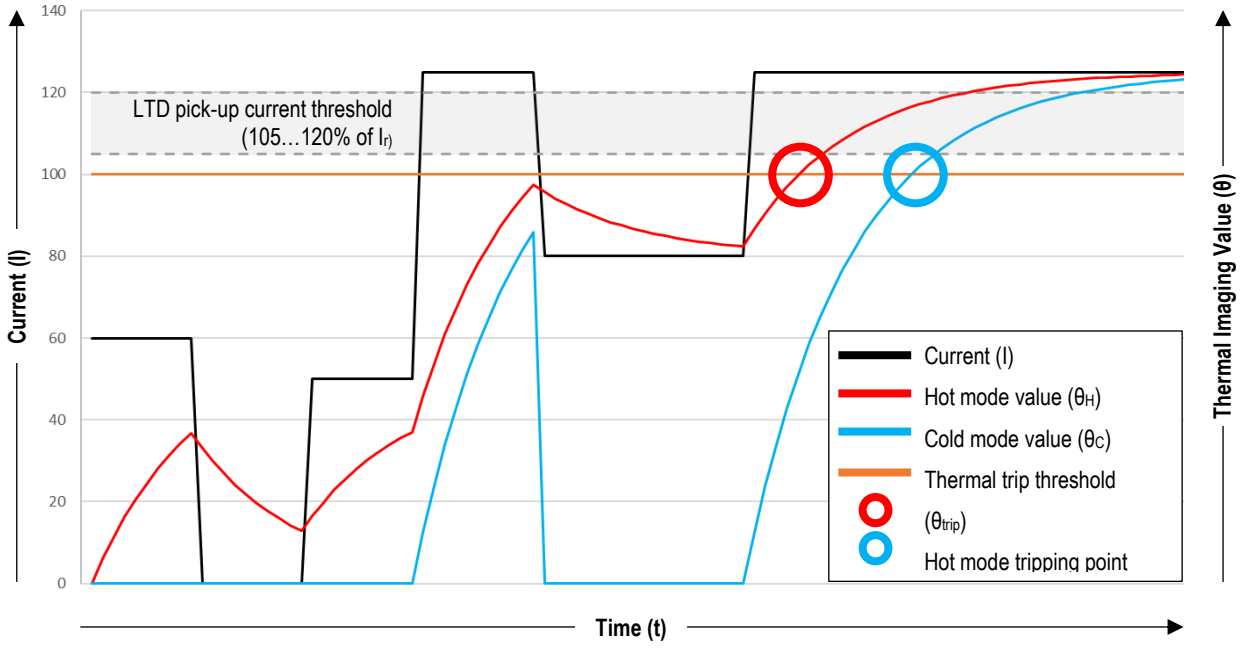
Hot start mode

In Hot start mode, the thermal imaging continues to calculate the thermal value (θ_H), even if the current is below the LTD pick-up threshold.
As long as the OCR is powered (self-supply or external backup power), the thermal imaging will continue to function. If power is removed from the OCR, thermal imaging will continue to operate for at least 20 minutes or until the calculated thermal value θ_H reaches 0.

Cold start mode

In Cold start mode, the thermal value (θ_C) is only calculated from when the current reaches and exceeds the LTD pick-up current threshold.
If the current drops below the LTD pick-up current threshold, then the thermal value θ_C resets to 0.

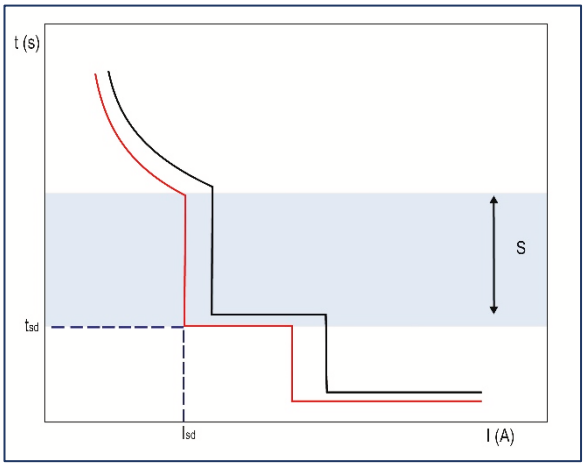
The below figure illustrates the OCR with thermal imaging in both hot and cold start modes. Where the current (I) drops below the LTD pick-up current threshold (region in grey between 105…120% of I_r), the Hot mode thermal value θ_H continues to be calculated, whereas the Cold mode thermal value θ_C resets to 0 each time. In either start mode, the MCCB trips when the respective thermal value threshold θ_{trip} is reached. The differences between start modes is made most apparent by the different tripping times after successive operations, where hot mode θ_H reaches the tripping threshold θ_{trip} earlier, providing added safety and optimum protection of the conductors.



Protection Settings

Short Time Delay Protection (STD)

The short time protection is designed to protect against low level short circuits.

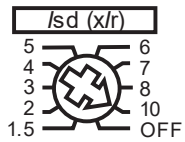


	Short Time Delay Settings	Description
S	I_{sd} (x I_r)	Short Time Delay protection threshold
	t_{sd} (ms)	Short Time Delay
	I^2t (ON / OFF)	Inverse I^2t time

Protection Settings

Adjusting I_{sd} (Current)

The I_{sd} trip threshold tolerance for STD protection is ±10%.
Adjustments to I_{sd} can be made via the I_{sd} adjustment dial, which is represented as a multiple of I_r.



For example: I_r is set to 120A, I_{sd} dial in position 5 sets I_{sd} to 5 x 120A = 600A (±10%).

I_{sd} Threshold Adjustment										
Dial Position	1	2	3	4	5	6	7	8	9	10
I_{sd}	1.5	2	3	4	5	6	7	8	10	OFF

Notice: For the following MCCBs the setting of I_r and t_r can limit the setting of I_{sd} for STD protection.

P160_BE I_n = 160A, P250_BE I_n = 250A

If: I_r > 0.9 x I_n and t_r = 16s I_{sd} is limited to 9 x I_r. even if the dial is set to 10x

Notice: In the case where STD protection is disabled (I_{sd} = OFF), thermal self-protection parameters I_{tsp} and t_{tsp} are automatically enabled on the following trip units:

P160_BE **I_n** = 160A, P250_BE **I_n** = 250A

In this case, a supplementary I^2t = K curve is added to the end of LTD tripping curve, starting from I_{tsp}, where constant K = Max(I_i)² x t_{tsp}.

Max(I_i) is the maximum I_i settable on the trip unit and is not adjustable.

Refer to Thermal Self-Protection section.

Protection Settings

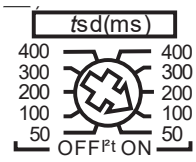
Short Time Delay Protection (STD)

Adjusting t_{sd} (Time Delay)

The t_{sd} time delay can be adjusted from the t_{sd} dial, where the tripping delay is given in milliseconds (ms).
An I^2t function for STD can be enabled by setting the t_{sd} dial to a value on the right side, or I^2t disabled by setting a value on the left side.

For example: The figure below displays t_{sd} set to 100ms with I^2t for STD as enabled.

See I^2t function for STD section for more information.



I_{sd} Time Delay Adjustment Settings (ms)				
50	100	200	300	400

The trip time tolerance for short time delay protection is as follows:

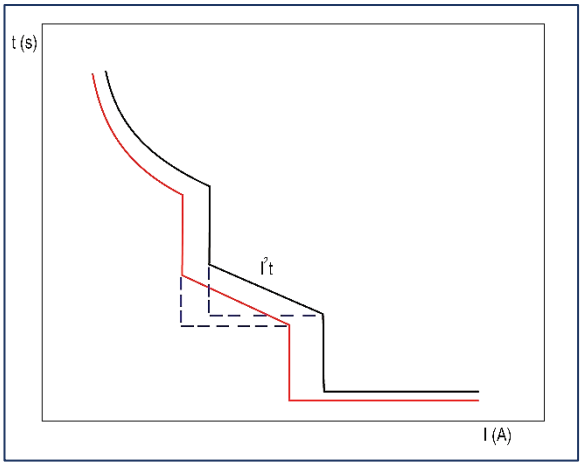
- For t_{sd} = 50 ms: ±30 ms
- For t_{sd} ≥ 100 ms: -20 ms / +50 ms

Protection Settings

Short Time Delay Protection (STD)

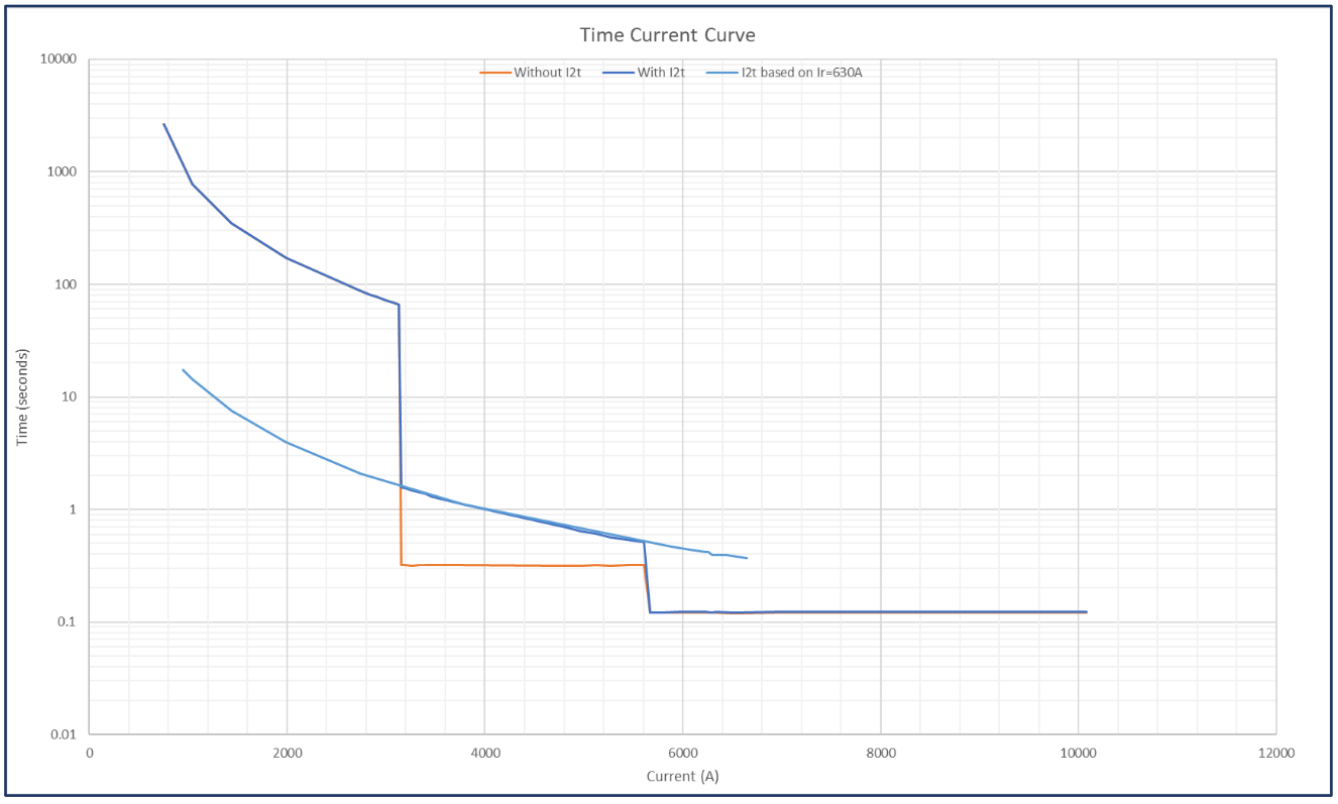
I^2t function for STD

When enabled, the I^2t function for STD may be used to improve selectivity with downstream devices by overlaying a supplementary $I^2t = K$ curve within the STD tripping section, starting from the I_{sd} threshold setting up to the I_i threshold setting.



The below graphic illustrates the difference between I^2t enabled and disabled with a I^2t curve based on I_r = 630A for reference.

Settings	Full curve without I^2t enabled	Full curve with I^2t enabled	I^2t ONLY base on I_r=630A
I_r	630A	630A	630A
t_r	5s	5s	5s
I_{sd}	5	5	1.5
t_{sd}	50ms	50ms	50ms
I_i	9	9	11
I^2t	Disabled	Enabled	Enabled



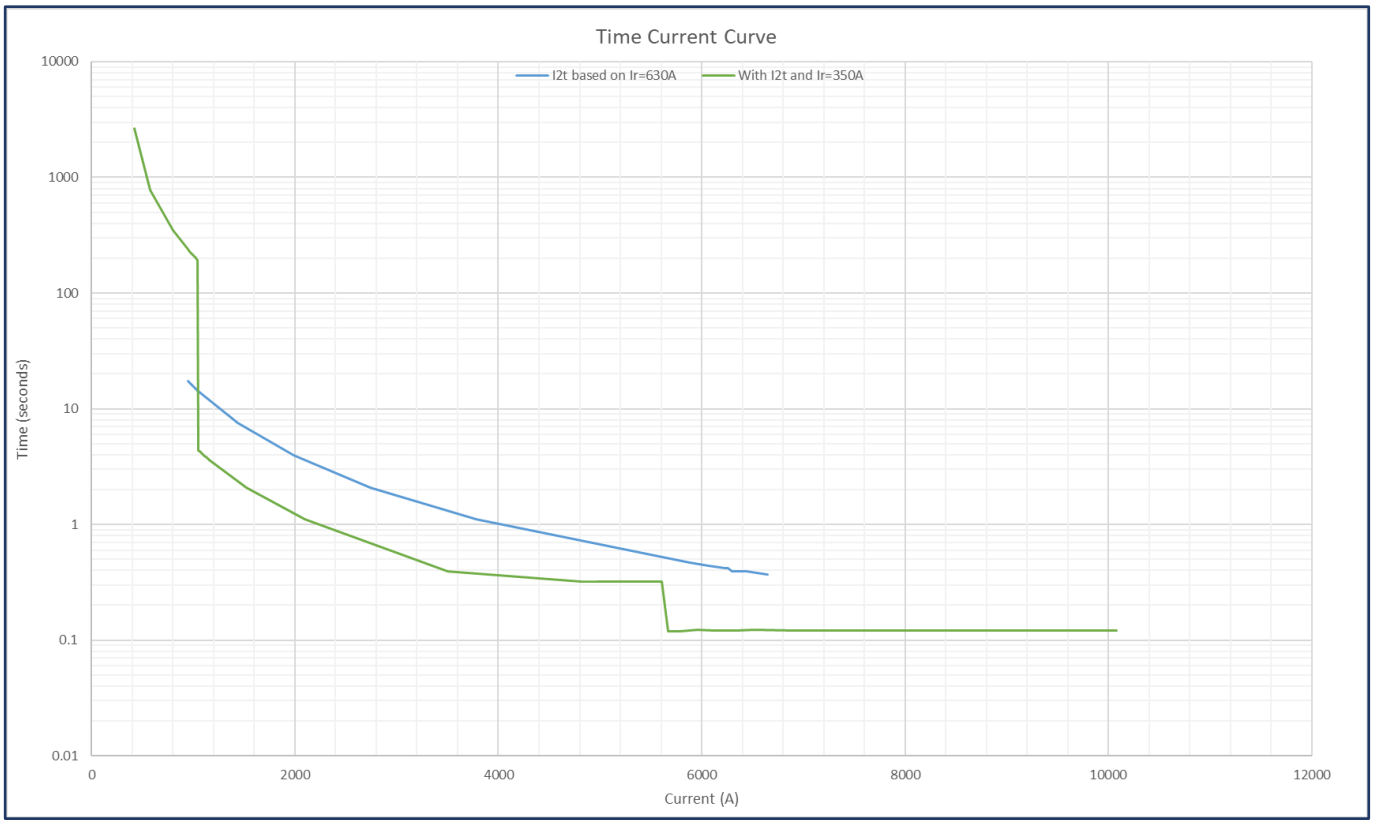
Protection Settings

Short Time Delay Protection (STD)

I^2t function for STD

The I^2t curve is based on the setting of I_r. The below time current graph illustrates the effect of the I^2t curves calculated for different I_r settings.

Settings	I^2t ONLY base on I_r=630A	Full curve with I^2t enabled
I_r	630A	350A
t_r	5s	5s
I_{sd}	1.5	3
t_{sd}	50ms	50ms
I_i	11	9
I^2t	Enabled	Enabled



Protection Settings

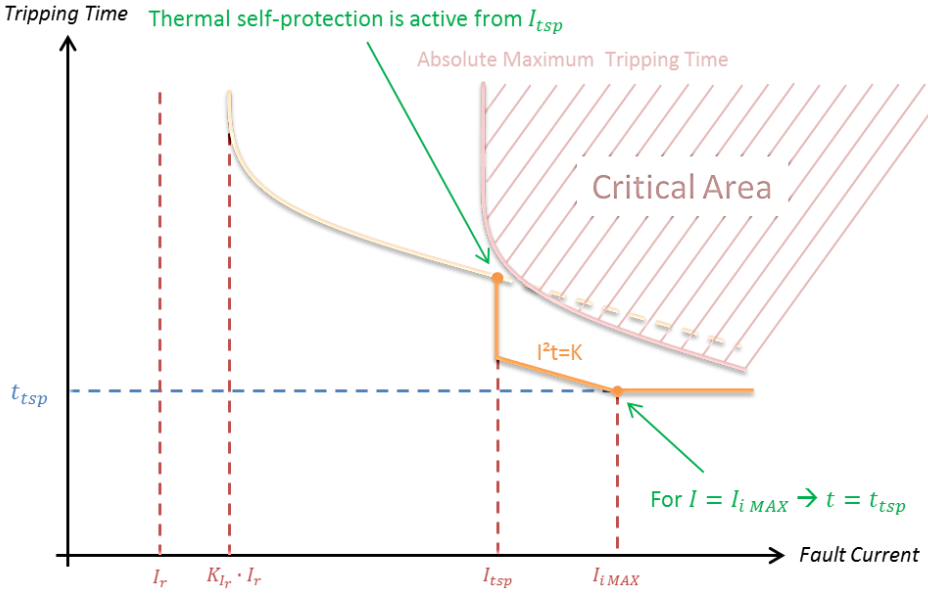
Short Time Delay Protection (STD)

I²t function for STD

Thermal Self Protection

Thermal self-protection is enabled automatically where STD is disabled. This is to ensure that the continuation of the LTD curve does not intersect with the Critical Area of the MCCB, which could create overheating stresses in the MCCB and cause irreparable damage and/or undesirable operation or failure of the trip-unit.

To achieve this, a supplementary I²t = K curve is added to the end of LTD tripping curve, starting from I_{tsp}, where constant K = Max(I_i)² x t_{tsp}. Max(I_i) is the maximum I_i settable on the trip unit and is not adjustable.



For the following MCCBs I_{tsp} and t_{tsp} values are specifications.

MCCB	I_{tsp} x I_r	t_{tsp} (seconds)
P160_BE I_n = 160A	8	2
P250_BE I_n = 250A	8	2

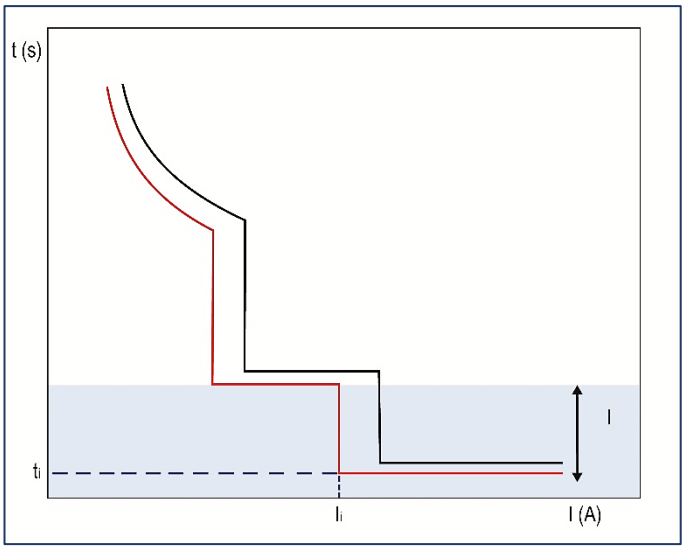
Notice: Thermal self-protection is applied to all phases where LTD protection is enabled.
In the case of 4P MCCBs, Thermal self-protection is also applied to the neutral pole (irrespective of the N Coefficient parameter) provided that Neutral Protection (NP) is enabled. Refer to Neutral Protection section.

Notice: LTD thermal image value θ is only affected during a trip event where it is temporarily forced to a value over 100%.

Protection Settings

Instantaneous Protection (INST)

Instantaneous protection is designed to protect against high current short circuits. This protection is independent of time and is set as a multiple of the rated current I_n.

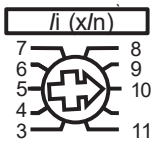


	Instantaneous Protection Settings	Description
I	I_i (x I_n)	Instantaneous protection threshold

Adjusting I_i (Current)

The I_i trip threshold tolerance for instantaneous protection is ±15%.
The instantaneous protection has no adjustable time delay.
The non-trip time is 10 ms with a maximum cut-out time is 50 ms.

The I_i trip threshold can be adjusted from the I_i dial, which is represented as a multiple of I_n.



Rated I_n	I_i Adjustment Settings (x I_n)									
	Dial Position									
	1	2	3	4	5	6	7	8	9	10
40	3	4	5	6	7	8	10	12	15	15
100										
160	3	4	5	6	7	8	9	10	11	11
250 (P250 Ampere Frame)										
250 (P400 Ampere Frame)	3	4	5	6	7	8	10	11	12	12
400										
630	3	4	5	7	7	8	9	10	11	11

Protection Settings

Tolerances

Instantaneous protection is provided by the trip unit up to the Ii settings. For current values greater than Ii, protection is instead offered through a Pressure Trip mechanism. The tolerances outlined below pertain to the Trip Unit and are not indicative of the circuit breaker's performance when the Pressure Trip mechanism overrides the Trip Unit's calculations. See Pressure Trip for further information.

Notice: The following tolerances for instantaneous protection reflect the Trip Unit calculations within the Ii setting range.

- The I_i trip threshold tolerance for instantaneous protection is ±15%.
- The non-trip time is 10 ms with a maximum cut-out time is 50 ms

Pressure Trip

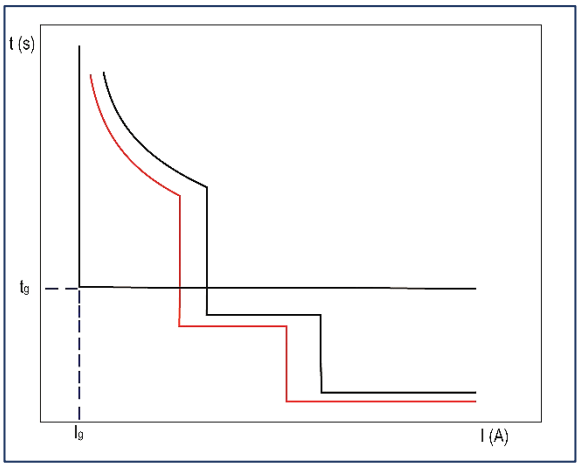
All TemBreak PRO P model electronic MCCBs have a built in 10ms delay in the trip unit to allow for improved selectivity with downstream protection devices. To ensure total clearing time is kept to a minimum at high fault levels, the TemBreak *PRO* P model electronic MCCBs have a built-in Pressure Trip feature. This Pressure Trip will act before the trip unit's delay in fault levels beyond the MCCB's maximum instantaneous settings.
Total clearing time of the MCCB beyond the instantaneous settings are vary based on the frame size and fault level, see table below.

MCCB	Trip Unit Ratings (I_n)	Total Clearance Time					
		15kA	25kA	36kA	50kA	70kA	110kA
P160_BE	40 100 160	Pressure Trip Data Not Available	<10ms				Not Applicable
P250_BE	40 100 160 250	<15ms	<10ms				
P400_SE	250 400	<12ms	<10ms				
P630_BE	630	<12ms	<10ms				

Protection Settings

Ground/Earth Fault Protection (GF)

Ground Fault (GF) protection is protection against high strength insulation / earth faults. An LSIG P_BE OCR is required for both 3P and 4P MCCBs to permit GF protection. P_BE OCRs with LIS only do not have GF protection.

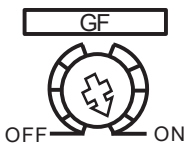


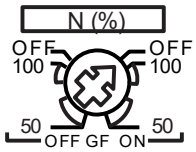
	Ground Fault Protection Settings	Description
G	I_g = 0.4 x I_n	Ground fault protection threshold
	t_g = 200 ms	Ground fault delay

GF pickup current I_g is fixed at I_g = 0.4 x I_n and is not adjustable.
The I_g trip threshold tolerance for ground protection is ±10%.

GF time delay t_g is also fixed at t_g = 200ms and is not adjustable.
The trip time tolerance for ground protection is -20 ms / +50 ms

GF protection can be turned ON or OFF using the GF dial on 3P MCCBs by setting the dial to the ON or OFF position respectively.
For 4P MCCBs, the N (%) dial is also used for turning GF protection ON or OFF by setting the dial to any position on the right for ON, or any position on the left for OFF. See Neutral Protection (NP) section for more information on the N (%) dial.





Notice: Enabling GF for 3 pole MCCBs on a 4-wire system may result in nuisance tripping in the case of imbalanced loads. It is recommended in this case that GF should be disabled.

Protection Settings

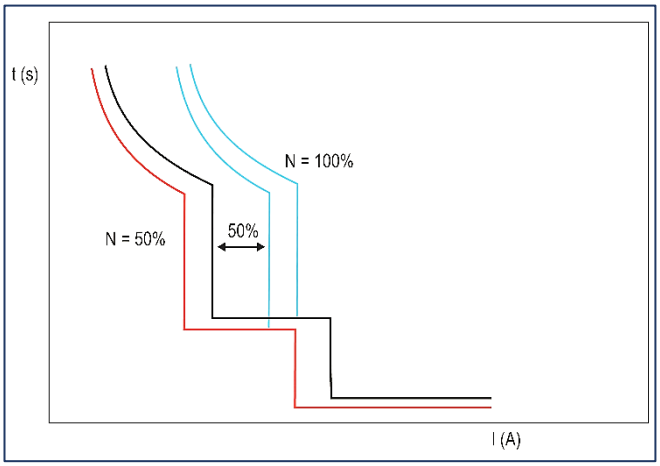
Neutral Protection (NP)

Neutral protection is available with 4P P_BE MCCBs with LSIG OCR. It is particularly useful when the cross-section of the neutral conductor is reduced in relation to the phase conductors.

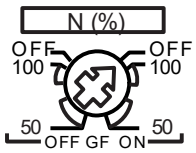
Neutral protection is based off the standard LTD and STD protection parameter of the main phases. The I_r and I_{sd} parameters for the Neutral pole are adjusted according to the set Neutral Coefficient percentage. For example, If the Neutral conductor is sized at 50% of the main phases, and the N Coefficient Adjustment parameter is set to 50%, then I_r and I_{sd} of the Neutral pole will be 50% of I_r and I_{sd} of main phase poles.

The time delays for the Neutral pole remain identical to the t_r and t_{sd} time delay adjustment values for the main phases and cannot be independently changed.

INST protection of the Neutral pole is not affected by the N Coefficient adjustment setting and is identical to the I_i trip threshold of the main phases.



The Neutral Coefficient percentage can be adjusted from the N (%) dial. GF protection is also turned ON or OFF by setting the dial to any position on the right for ON, or any position on the left for OFF. See Ground/Earth Fault Protection (GF) section for more information on the N (%) dial.



N Coefficient Adjustment Settings (%)	Parameters Impacted
50 – 100 – OFF	The coefficient is applied to the adjustment value of the phase I_r and I_{sd} thresholds

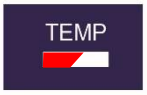
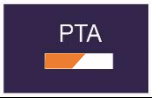
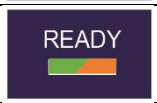
Notice: If the I^2t function for STD is enabled, I^2t will also be included in the Neutral Protection curve as calculated from the Neutral pole I_r parameter.

Alarms & Indication

The P_BE OCR provides alarming for various types of events based on system status and live monitoring of parameters. There are three types of alarms to indicate OCR health and trip status:

- **System alarm**: Correspond to predefined events internal to the OCR.
- **Trip alarm**: Provide warning about trip events.
- **Pre-Trip alarm (PTA):** Provides a warning about the imminent trip risk due to a current overload. It is associated with the PTA output contact.

Indicators in the form of LEDs on the front display various operational status changes and alarms for P_BE OCR.

Alarm/Status type	Indication	LED Status	Description
OCR Temperature Alarm		RED Solid	Internal OCR temperature > 105°C
LTD Pick-up Alarm		OFF	Current < 105% x Ir
		RED Flashing	Current ≥ 105% x Ir
		RED Solid	Current ≥ 112.5% x Ir
PTA (Pre-Trip Alarm)		OFF	Current < 80% x I_r
		ORANGE Flashing	Current ≥ 80% x I_r
		ORANGE Solid	PTA output activated
OCR Status		GREEN Solid	OCR operating normally
		ORANGE Flashing	Internal OCR fault detected

System Alarms

System alarms are produced as a result of either an internal OCR error, or overtemperature of the OCR itself.

OCR Temperature: The P_BE OCR constantly monitors its internal temperature. In the event that the temperature exceeds 105°C, the *OCR temperature alarm* is activated and the OCR Temperature Alarm LED illuminates solid red. The alarm features a lower hysteresis threshold, which keeps the alarm active until the internal temperature of the OCR drops below 100°C.

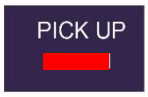
Internal OCR error: The P_BE OCR constantly monitors its protection function. In the event of an operating fault concerning the electronics of the OCR, the *Internal trip unit error* alarm is activated and the OCR Status LED flashes orange.

Alarm/Status type	LED Status	Description
OCR Temperature Alarm	OFF 	Internal OCR temperature < 105°C
	RED Solid 	Internal OCR temperature > 105°C
OCR Status	GREEN Solid 	OCR operating normally
	ORANGE Flashing 	Internal OCR fault detected

Alarms & Indication

Trip Alarm

The trip alarm on the P_OCR indicates the status of the LTD protection, which if flashing indicates that an LTD trip is imminent.

Alarm/Status type	LED Status	Description
LTD Pick-up Alarm	OFF 	Current < 105% x Ir
	RED Flashing 	Current ≥ 105% x Ir
	RED Solid 	Current ≥ 112.5% x Ir

Alarms & Indication

PTA (Pre-Trip Alarm)

The Pre-Trip Alarm permits monitoring and early warning of overload conditions prior to an actual LTD trip. The PTA setting is defined by two parameters which define the Pre-trip warning and Pre-trip Alarm zones and thus the behaviour of the PTA contact and status LED:

- PTA current threshold I_p: Threshold expressed as a percentage of I_r and is fixed at 80% x I_r.
- PTA time delay t_p : Expressed as a percentage of t_r and is fixed at 50% x t_r.

The I_p current threshold defines the lowest current that could be considered to be within the Pre-trip warning and Pre-trip alarm zones. The t_p time delay threshold defines the shortest time in which the Pre-trip alarm will activate. The time delay for PTA follows the LTD protection curve and varies with current as shown in the figure below. Lower currents in the Pre-trip zones will activate the alarm with a longer delay than higher currents.

The behaviour of the various pre-trip zones are illustrated in the figure and table below.

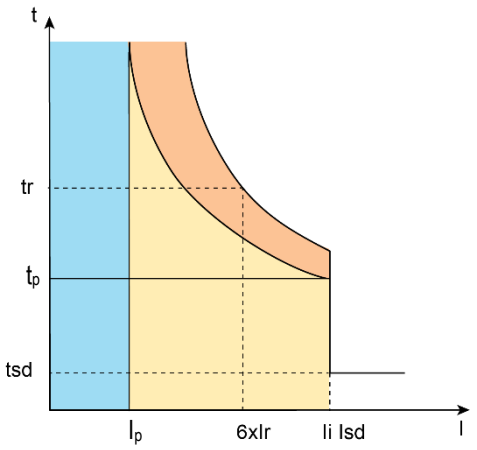
If the load current is less than the I_p current threshold, then this is considered the normal load zone, and the PTA LED and contact are unaffected and remain OFF and OPEN, respectively.

As the load current increases to at or above I_p, the Pre-trip warning zone is entered, and is indicated by the PTA LED illuminating FLASHING orange. Whilst in the pre-trip warning zone, the load current is monitored and characterised with thermal imaging by the OCR.

If the current remains above I_p for an extended period of time, the Pre-trip Alarm zone is entered, and is indicated by the PTA LED illuminating SOLID orange, and the PTA contact activating CLOSED. The time required for the Pre-trip Alarm to activate is dependent on the current value and the t_p parameter set, as this follows the LTD protection curve.

Notice: The use of the PTA contact requires the connection of the OAC/PTA cable to the PTA port located on the external left-hand side of the P_BE MCCB. Refer to the OAC and PTA cable section below for details

Pre-trip zone	Current I vs. I_p	PTA LED status	PTA Contact status
Normal load	$I < I_p$ (0.8x I_r)	OFF READY	OPEN
Pre-trip Warning	$I \geq I_p$ (0.8x I_r)	FLASHING READY	OPEN
Pre-trip Alarm	$I \geq I_p$ (0.8x I_r)	SOLID READY	CLOSED



OAC and PTA cable

The P_BE MCCB provides an on-board digital output for use with the Pre-Trip Alarm (PTA), which is used with the corresponding cable:

Connector	Accessories Reference	Length	Number of Wires	Switching rating
OAC or PTA	TPPHQTT130H – OAC and PTA	1.20m	2	Max. 100mA at 24V ac/dc

OCR Power Supply

Power to the P_BE OCR is self-powered whilst sufficient current is flowing through the MCCB, which provides a minimum power supply to operate and provide alarm and configured protection functions

Minimum conditions for energizing the trip unit without an external power supply:

- Circuit breaker closed
- Minimum current through the circuit breaker; below is a table per rating

Trip unit rating	1 Pole fed	2 Poles fed	3 Poles fed
40A	—	> 14A	> 10A
100A	> 25A	> 15A	> 15A
160A	> 32A	> 16A	> 16A
250A	> 50A	> 25A	> 25A
400A	> 80A	> 40A	> 40A
630A	> 126A	> 63A	> 63A

Notice: 40A trip unit with 1 Pole feed, will still provide INST protection for $I > 2x\ I_n$ (>80A).

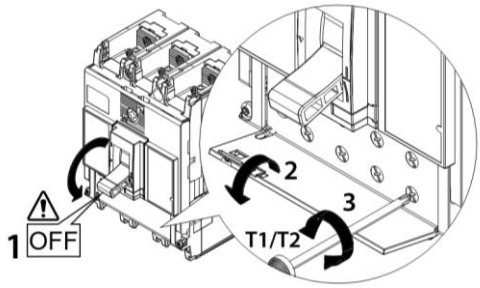
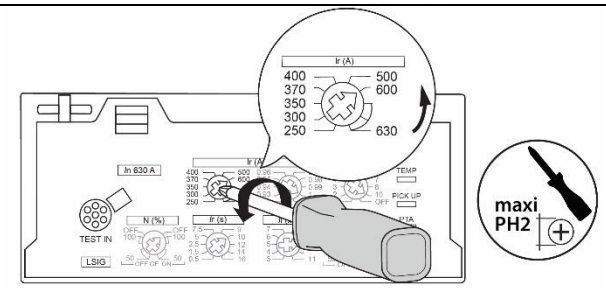
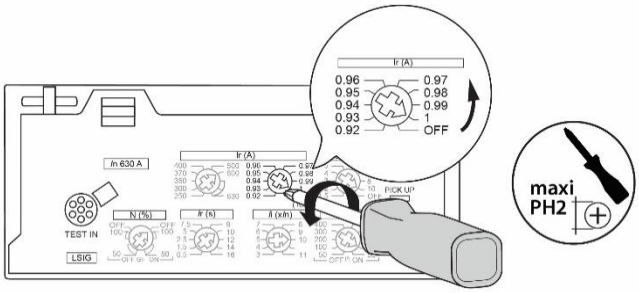
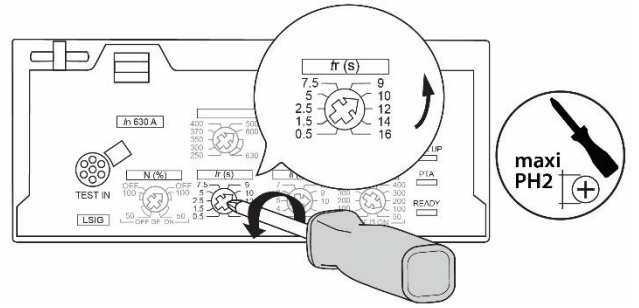
Commissioning

WARNING: Before applying power to the MCCB for the first time, an initial inspection must be performed.

WARNING: Risk of nuisance tripping.
Only qualified personnel are to set the protection levels. Failure to respect these instructions may cause death, serious injuries or equipment damage.

LTD Adjustments (I_r, t_r)

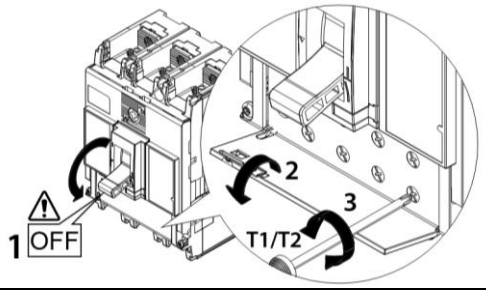
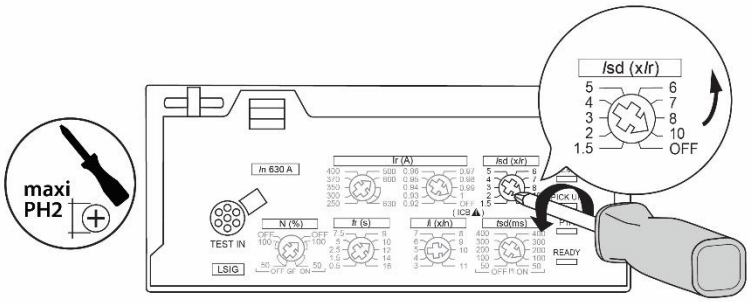
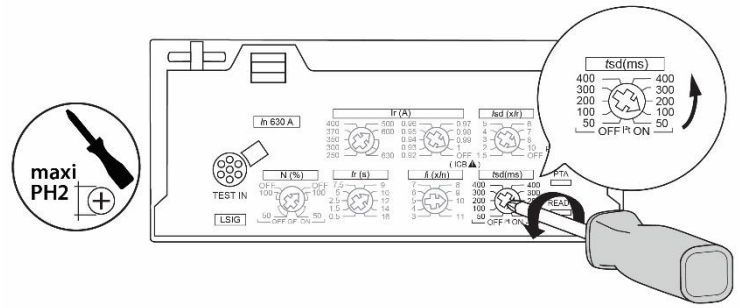
The LTD protection is configured by the I_r and t_r adjustment rotary dials, which is performed as follows. Refer to Protection Settings – Long Time Delay Protection (LTD) section for further detail on setting I_r and t_r

	Action	Note / Illustration
1	Turn the MCCB to the OFF Position Open the transparent flap to access the max I_r adjustment dials	
2	Using a PH1, PH2 or PZ2 size screwdriver, rotate the I_{r1} adjustment dial to the maximum scale value of I_r in Amperes.	
3	If required, turn the I_{r2} fine adjustment dial to the required percentage of the maximum scale I_{r1} as configured in the previous step. NOTE: To turn off LTD protection, set I_{r2} to the OFF position. This will also disable STD protection and the OCR will be set as INST protection only. See INST Protection Only Setting.	
4	Set the time delay by rotating the t_r dial to the required value in seconds.	

Commissioning

STD Adjustments (I_{sd}, t_{sd})

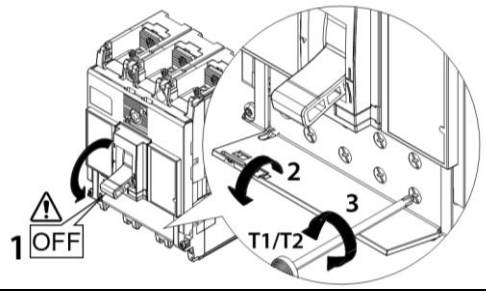
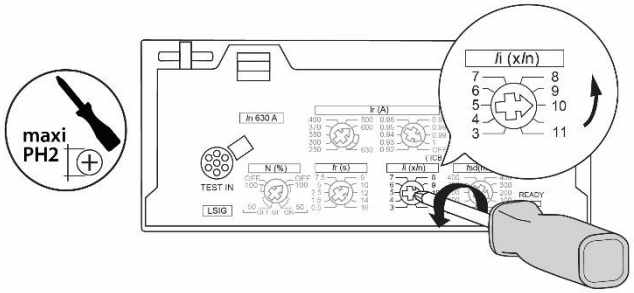
The STD protection is configured by the I_r and t_{sd} adjustment rotary dials, which is performed as follows. Refer to Protection Settings – Short Time Delay Protection (STD) section for further detail on setting I_{sd} and t_{sd}

	Action	Note / Illustration
1	Turn the MCCB to the OFF Position Open the transparent flap to access I_{sd} adjustment dials	
2	Using a PH1, PH2 or PZ2 size screwdriver, rotate the I_{sd} adjustment dial to the required multiple of I_r. NOTE: To turn off STD protection, set I_{r2} to the OFF position, this will	
3	Set the time delay by rotating the t_{sd} dial to the required value in seconds. NOTE: There are two sides to the t_{sd} dial to enable or disable the I^2t function for STD: Right side to enable, and left side to disable.	

Commissioning

INST Protection Adjustments (I_i)

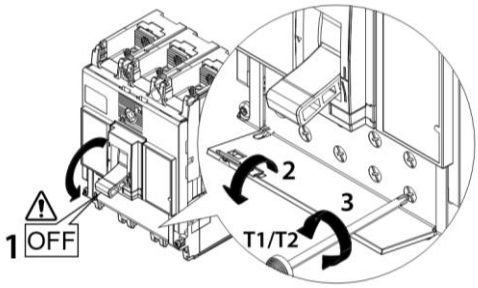
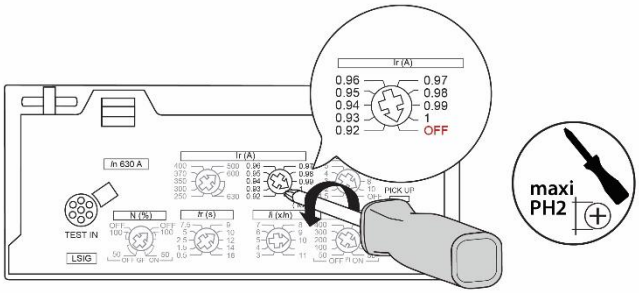
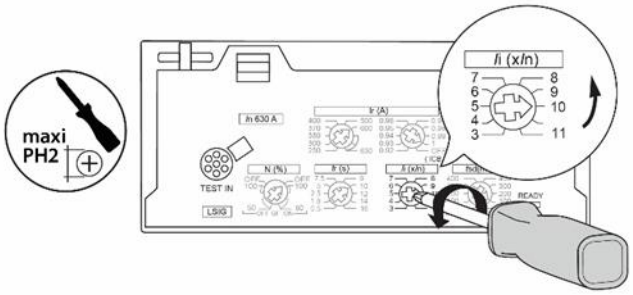
The INST protection is configured by the I_i adjustment rotary dial, which is performed as follows. Refer to Protection Settings – Instantaneous Protection (INST) section for further detail on setting I_i.

	Action	Note / Illustration
1	Turn the MCCB to the OFF Position Open the transparent flap to access Ii adjustment dials	
2	Using a PH1, PH2 or PZ2 size screwdriver, rotate the I_i adjustment dial to the required multiple of I_n.	

Commissioning

INST Protection Only Setting

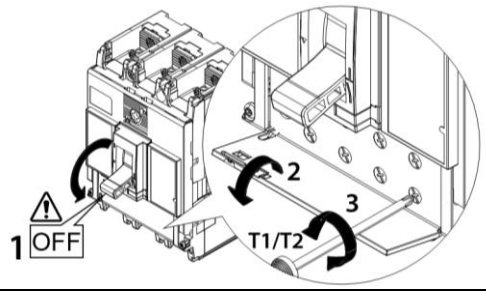
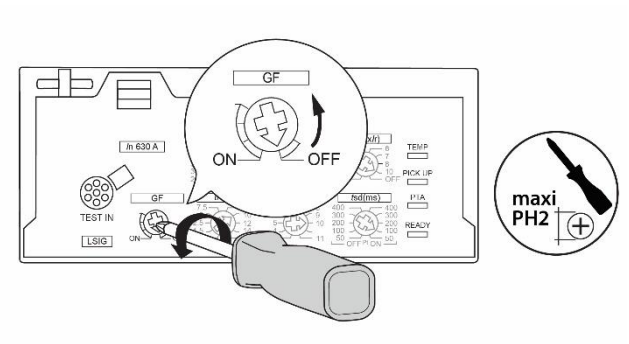
The P_BE OCR can be configured for INST protection only by disabling LTD (and STD) protection modes as follows: Refer to Protection Settings – Instantaneous Protection (INST) section for further detail on setting I_i.

	Action	Note / Illustration
1	Turn the MCCB to the OFF Position Open the transparent flap to access I_r adjustment dials	
2	Using a PH1, PH2 or PZ2 size screwdriver, rotate the I_{r2} adjustment dial to the OFF position.	
3	Rotate the Ii adjustment dial to the required multiple of In.	

Commissioning

LSIG 3P – GF Protection Adjustments (I_g)

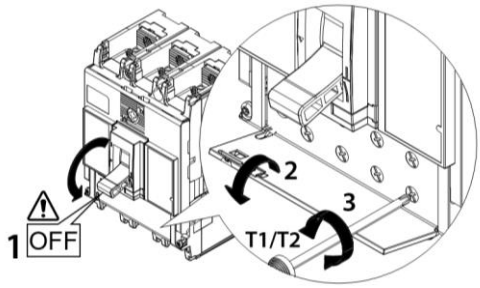
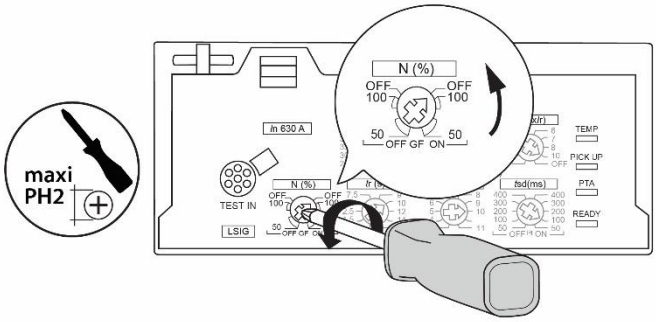
On the LSIG 3P variant P_BE MCCB, the GF protection is configured by the GF adjustment rotary dials, which is used to enable or disable GF protection, and is performed as follows. Refer to Protection Settings – Ground/Earth Fault Protection (GF) section for further detail on GF protection.

	Action	Note / Illustration
1	Turn the MCCB to the OFF Position Open the transparent flap to access GF adjustment dials	
2	Using a PH1, PH2 or PZ2 size screwdriver, rotate the GF adjustment dial to either ON or OFF position to enable or disable GF protection, respectively.	

Commissioning

LSIG 4P – NP and GF Protection Adjustments (I_N, I_g)

On the LSIG 4P variant P_BE MCCB, both NP and GF protection modes are configured by the N (%) adjustment rotary dials, which is performed as follows. Refer to Protection Settings – Ground/Earth Fault Protection (GF) and Neutral Protection (NP) sections for further detail on NP and GF protection.

	Action	Note / Illustration
1	Turn the MCCB to the OFF Position Open the transparent flap to access N(%) adjustment dial	
2	Using a PH1, PH2 or PZ2 size screwdriver, rotate the N(%) adjustment dial to the desired N Coefficient value. NOTE: There are two sides to the N(%) dial to enable or disable GF protection: Right side to enable, and left side to disable.	

Troubleshooting

In the event of a problem when using the TemBreak *PRO* system, this section provides advice on how to resolve issues.

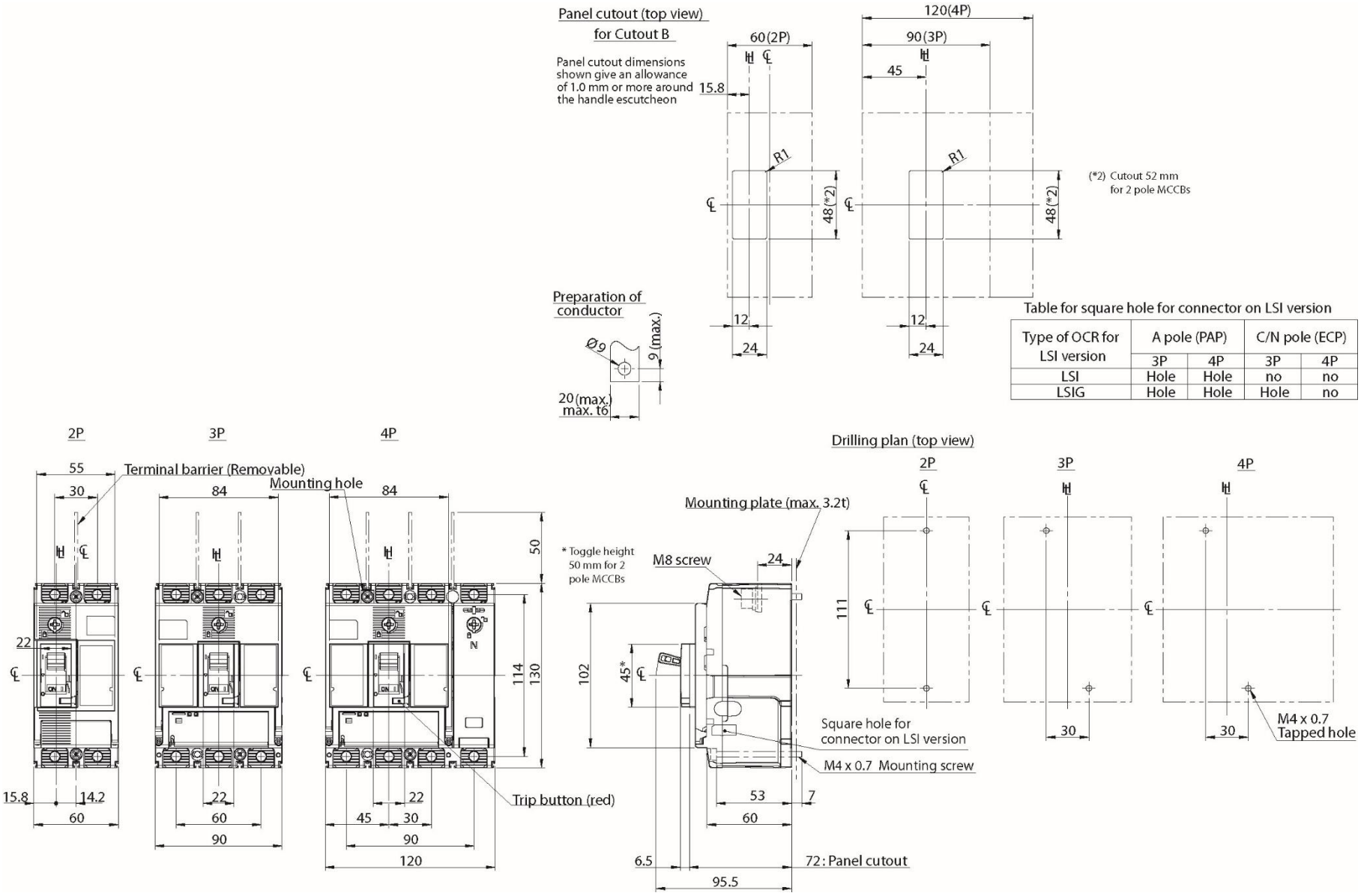
	Problem description	Possible cause	Remedial advice
1	Ready LED OFF	Insufficient or no power to the OCR	Verify power supply requirements. Refer to OCR Power Supply section. MCCB must be closed and load drawing sufficient current through main poles. Verify the current through the MCCB poles meets the minimum requirements.
		Incorrect or faulty wiring	Verify integrity of wiring and connections. Verify and correct any: - Loose connections to line and load terminals - Incorrect terminals / conductors / connector pins
2	Ready LED flashing orange	Incorrect settings	Verify adjustment dials are in correct defined positions
		OCR is faulty	Replace MCCB
3	OCR over temperature alarm (Internal OCR temperature > 105°C)	Excessive ambient temperature.	Verify ambient temperature surrounding the MCCB do not exceed the maximum rated ambient temperature range (-25°C...+70°C)
		Loose terminal screw or conductor connecting screw.	Verify and correct any loose connections to load and line terminals. Refer to torque and connection requirements in TemBreak *PRO* P_BE Installation Instructions supplied with MCCB
		Increased contact resistance, loose internal connection or contact failure.	Replace MCCB
		High proportion of high frequency distortion in load current.	Decrease distortion content of load circuit
4	Abnormal voltage on load side	Excessive wear of contacts	Replace MCCB.
		Foreign matter interfering with contacts or contact surfaces	
5	Failure in ON position	Reset operation not conducted after tripping operation.	Perform reset operation.
6	Failure in RESET position	UVT not energised	Apply voltage to UVT
		Circuit breaker service life ended due to large number of switching cycles using SHT or UVT	Replace MCCB
		Fault of tripping mechanism	
7	Nuisance tripping while rated current not reached	Vibration and/or shock	Dampen vibration of MCCB and review installation requirements
		High proportion of high frequency distortion in load current.	Decrease distortion content of load circuit
		Electromagnetic induced interference (from nearby conductors or external radio sources)	Review nearby sources of conducted and radiated emissions (e.g. radio sources, high-speed switching devices including variable frequency drives)
		Excessive surge	Isolate and mitigate surge source (e.g. surge protection devices)
		Erroneous connection of control circuit for SHT or UVT	Verify control wiring and supply to SHT and UVT

Troubleshooting

	Problem description	Possible cause	Remedial advice
8	Nuisance tripping due to starting current	Excessive inrush starting current due to load type	Review INST and STD protection settings for load type where applicable
		Switching operation of star-delta motor starter, incorrect wiring	Verify and correct any issues with star-delta starter wiring with respect to the motor windings and phase sequence. Refer to motor and/or starter manufacturer
		Short-circuit in motor (e.g. windings, starter circuit)	Verify and correct any issues with motor wiring. Inspect and verify motor winding insulation. Refer to motor manufacturer
		Erroneous connection of control circuit for SHT or UVT	Verify control wiring and supply to SHT and UVT
9	No trip at pickup current	Failure in selectivity/coordination with upstream circuit breaker or fuse	Review selectivity/coordination study and protection parameters of each device
		Incorrect protection settings	Review enabled protection settings ensuring correct pickup current and time-delay for load type. (e.g. LTD, STD, INST pickup currents and time delays)

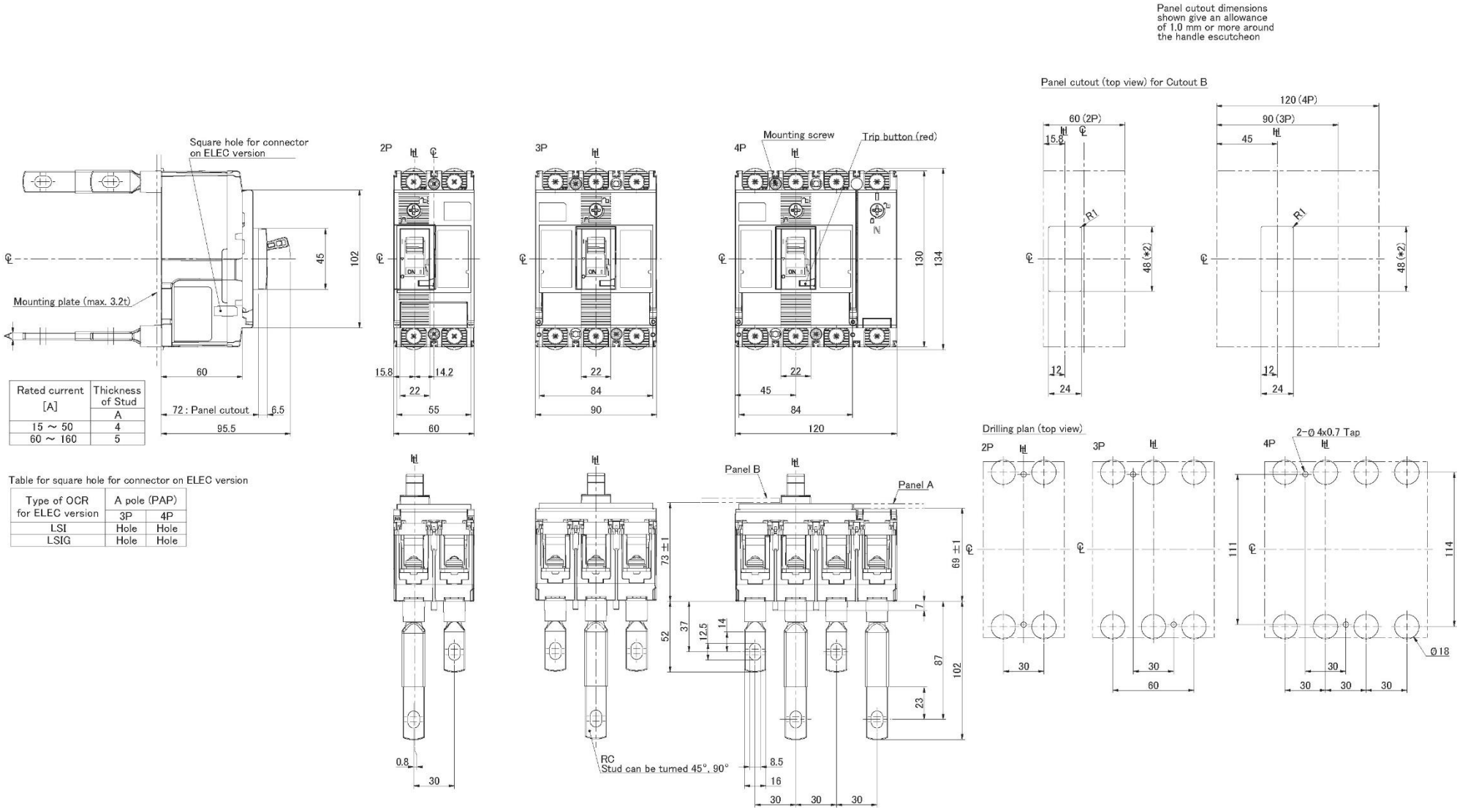
Annex A – Dimensions

P160 Dimensions



Annex A – Dimensions

P160 with Rear Connect



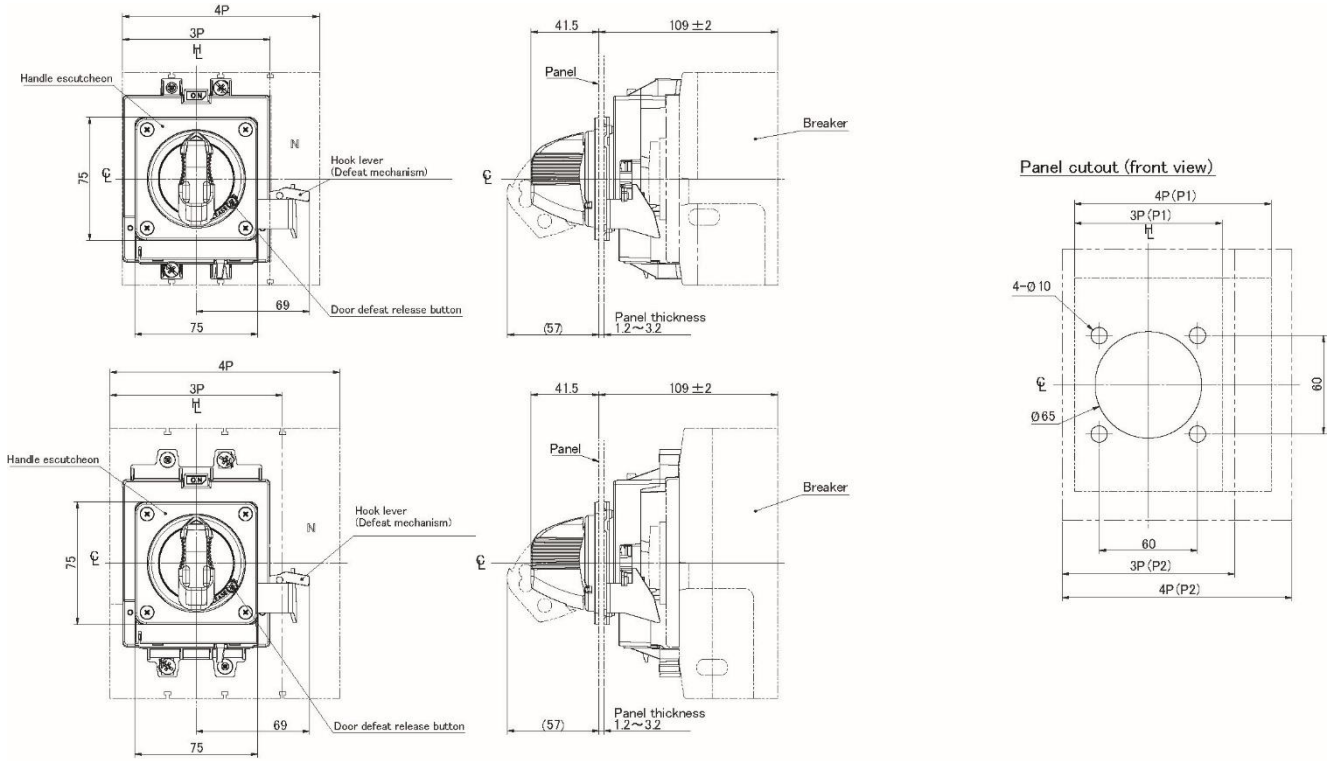
Rated current [A]	Thickness of Stud
	A
15 ~ 50	4
60 ~ 160	5

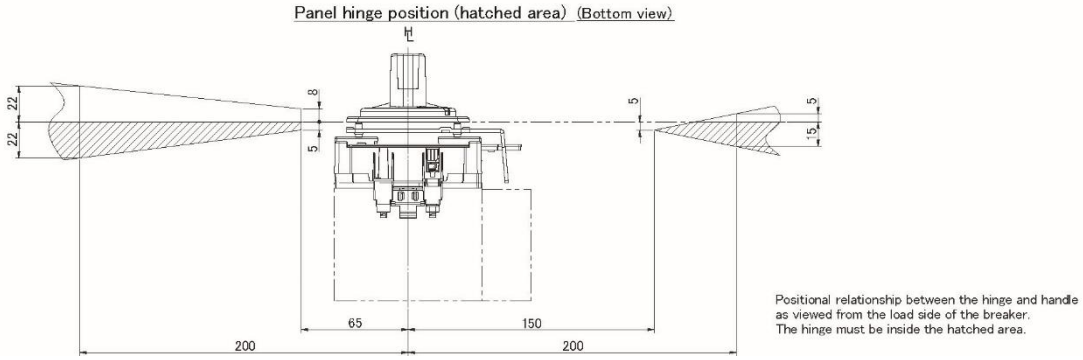
Table for square hole for connector on ELEC version

Type of OCR for ELEC version	A pole (PAP)	
	3P	4P
LSI	Hole	Hole
LSIG	Hole	Hole

Annex A – Dimensions

P160 with HB Handle

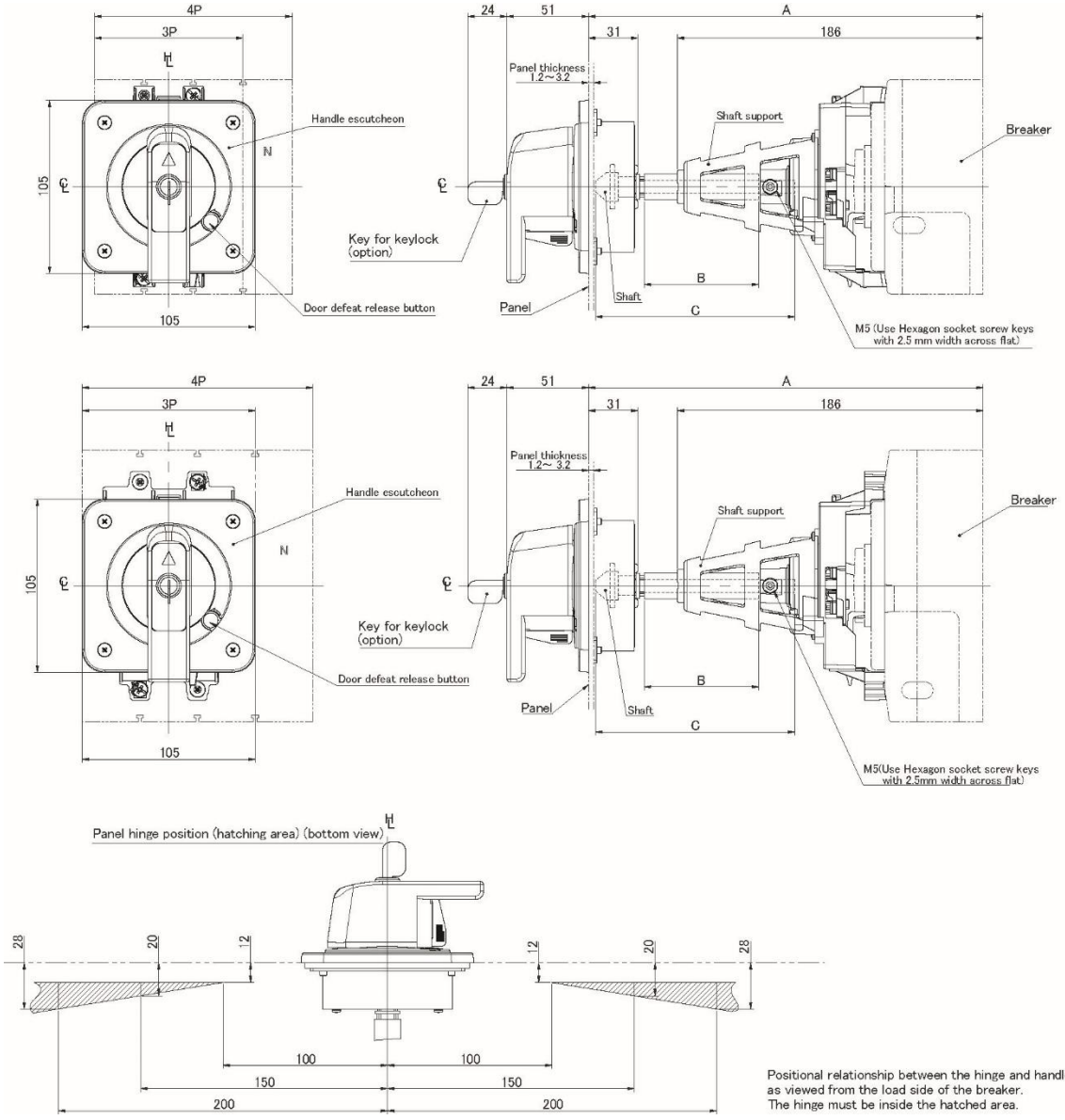




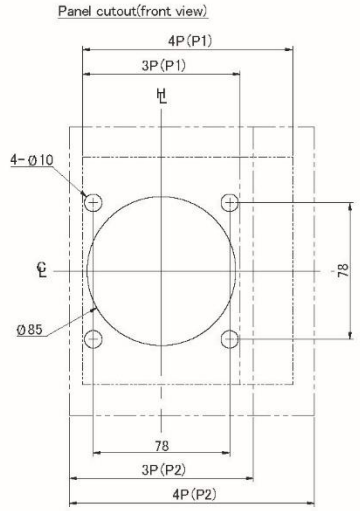
Positional relationship between the hinge and handle as viewed from the load side of the breaker.
The hinge must be inside the hatched area.

Annex A – Dimensions

P160 with HP Handle



Positional relationship between the hinge and handle as viewed from the load side of the breaker. The hinge must be inside the hatched area.

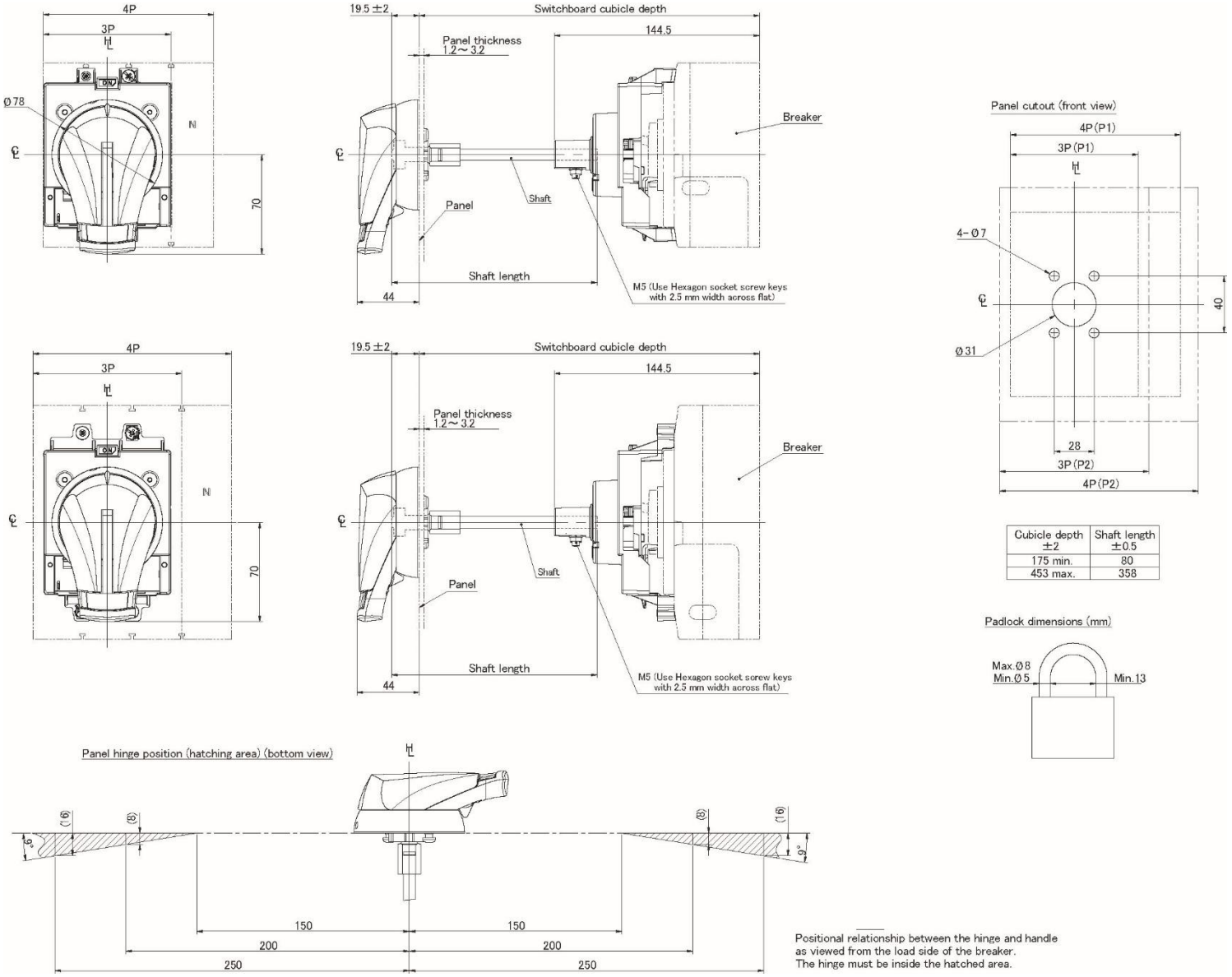


Cubicle depth A±2	Tube length B±1	Shaft length C±0.5	Shaft type
229 min.	56	107	T2PS251
243 max.	70	121	
343 max.	170	221	T2PS252
443 max.	270	321	T2PS253
543 max.	370	421	T2PS254

For other cubicle depth: Shaft length = Cubicle depth − 122
Tube depth = Cubicle depth − 173

Annex A – Dimensions

P160 with HS Handle



Cubicle depth ±2	Shaft length ±0.5
175 min.	80
453 max.	358

Annex A – Dimensions

P250 Dimensions

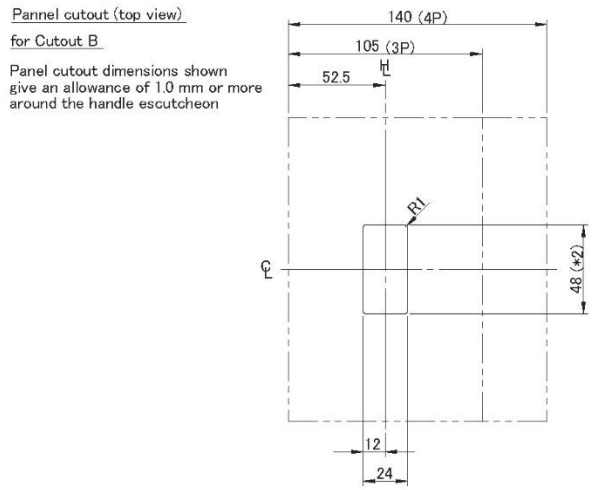
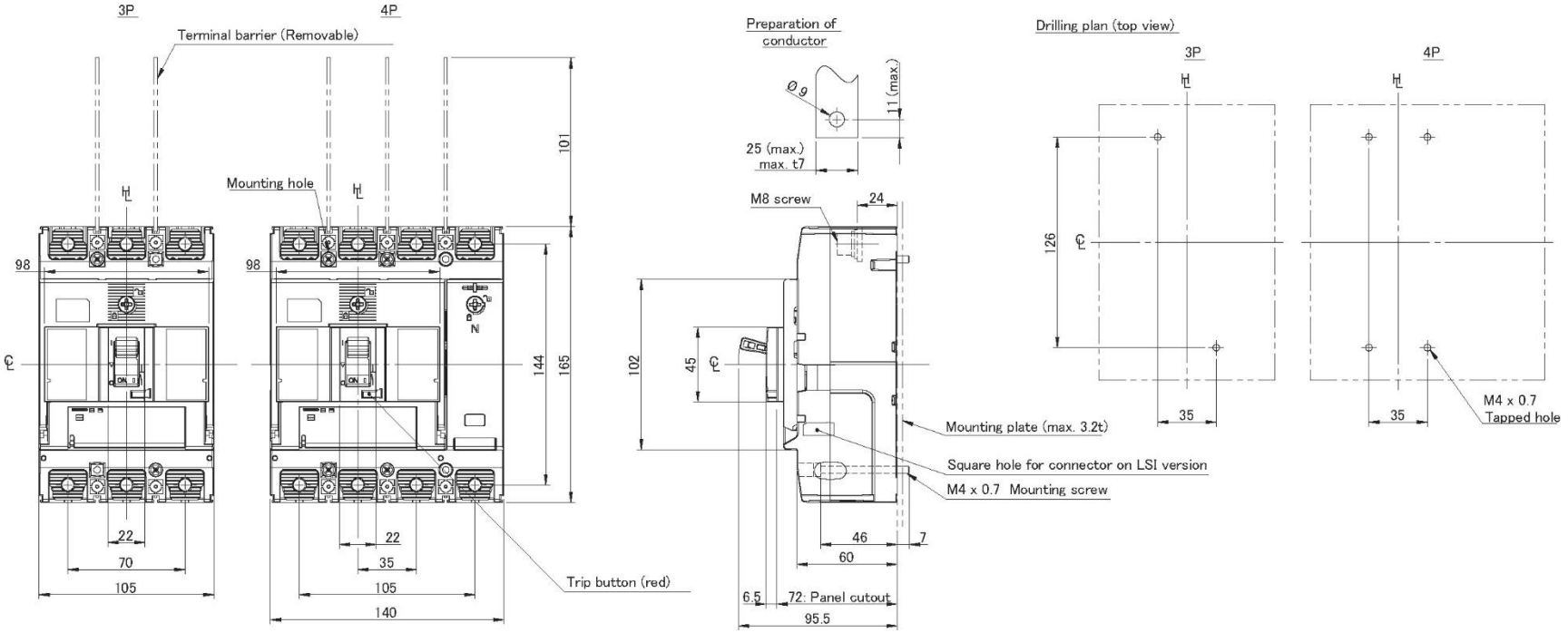


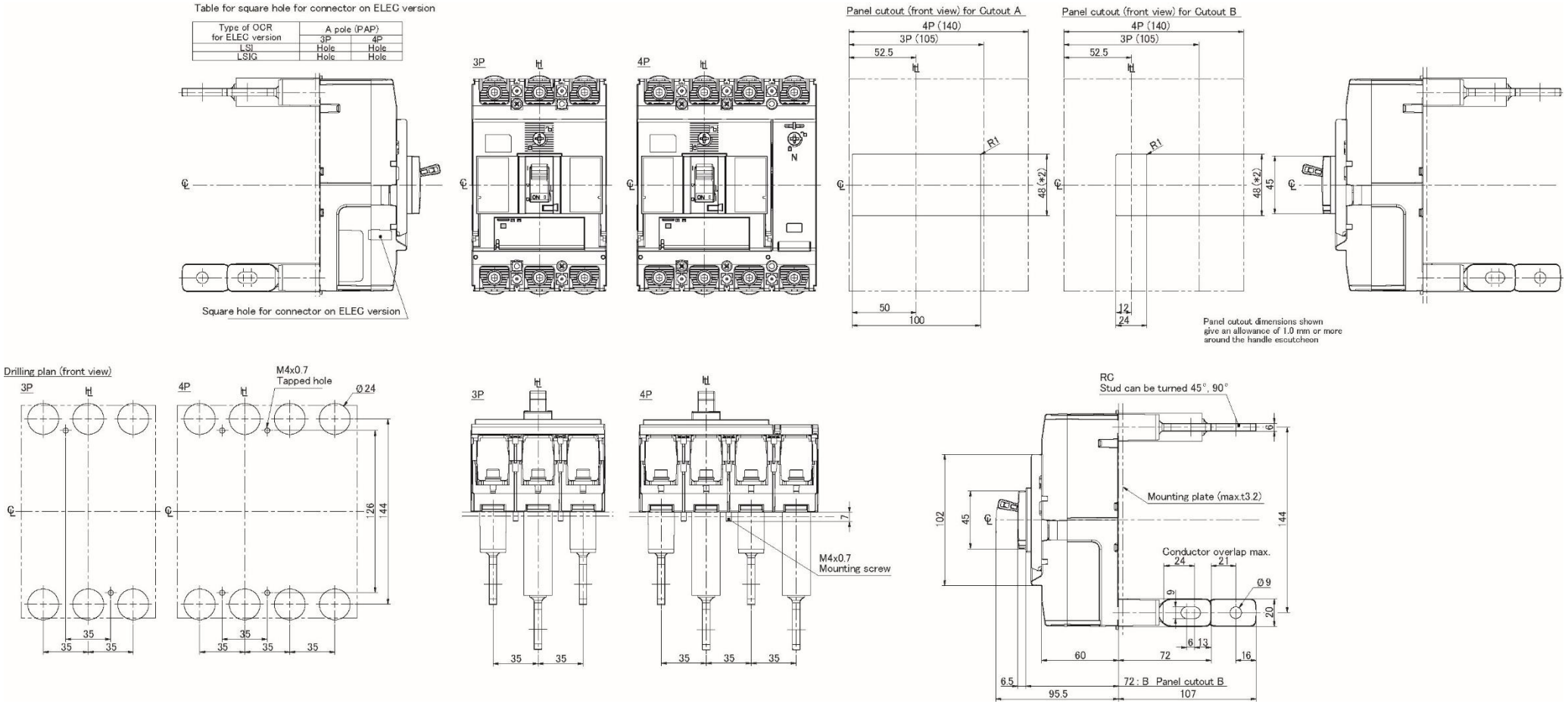
Table for square hole for connector on LSI version

Type of OCR for LSI version	A pole (PAP)		C/N pole (ECP)	
	3P	4P	3P	4P
LSI	Hole	Hole	no	no
LSIG	Hole	Hole	Hole	no



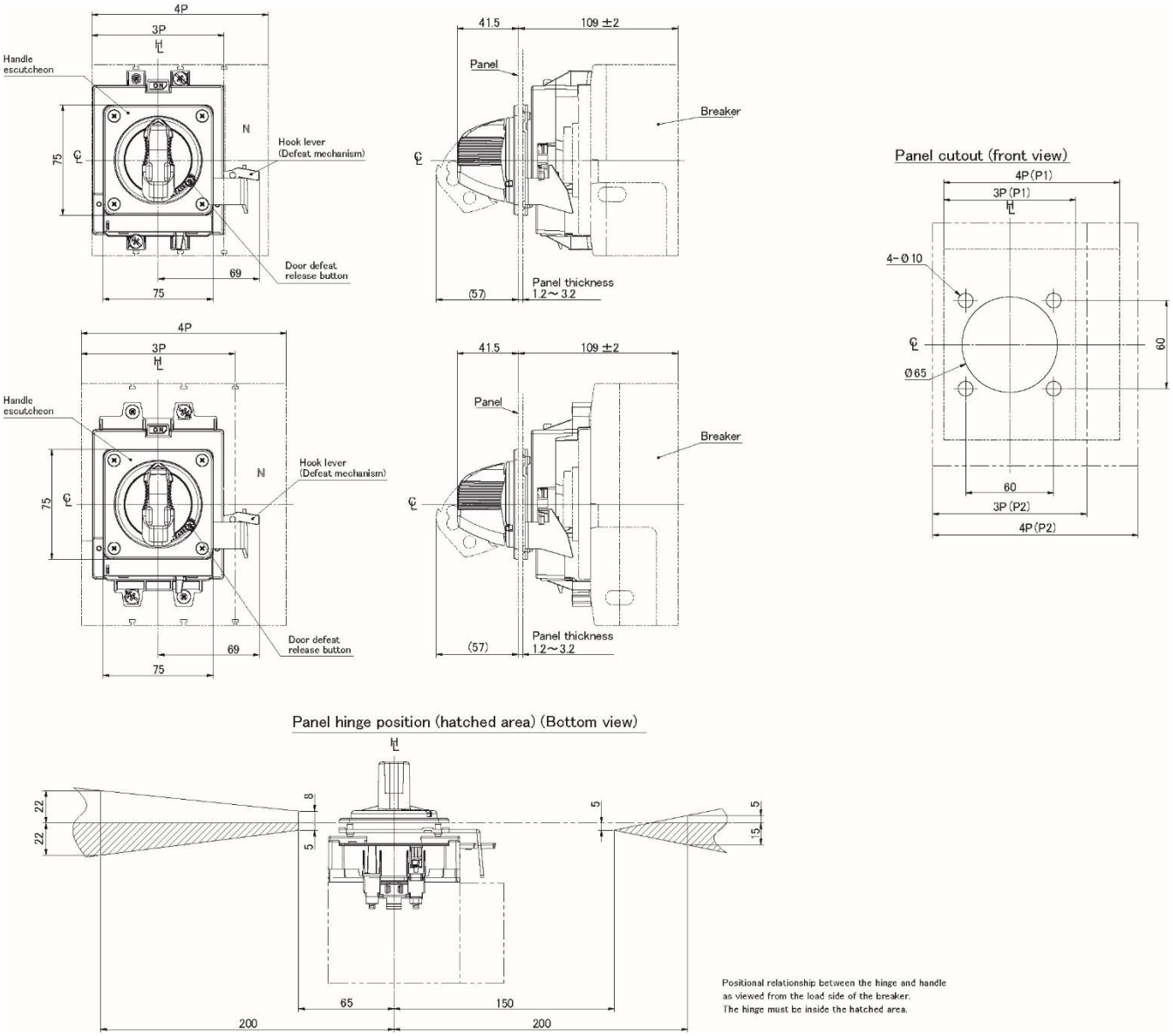
Annex A – Dimensions

P250 with Rear Connect



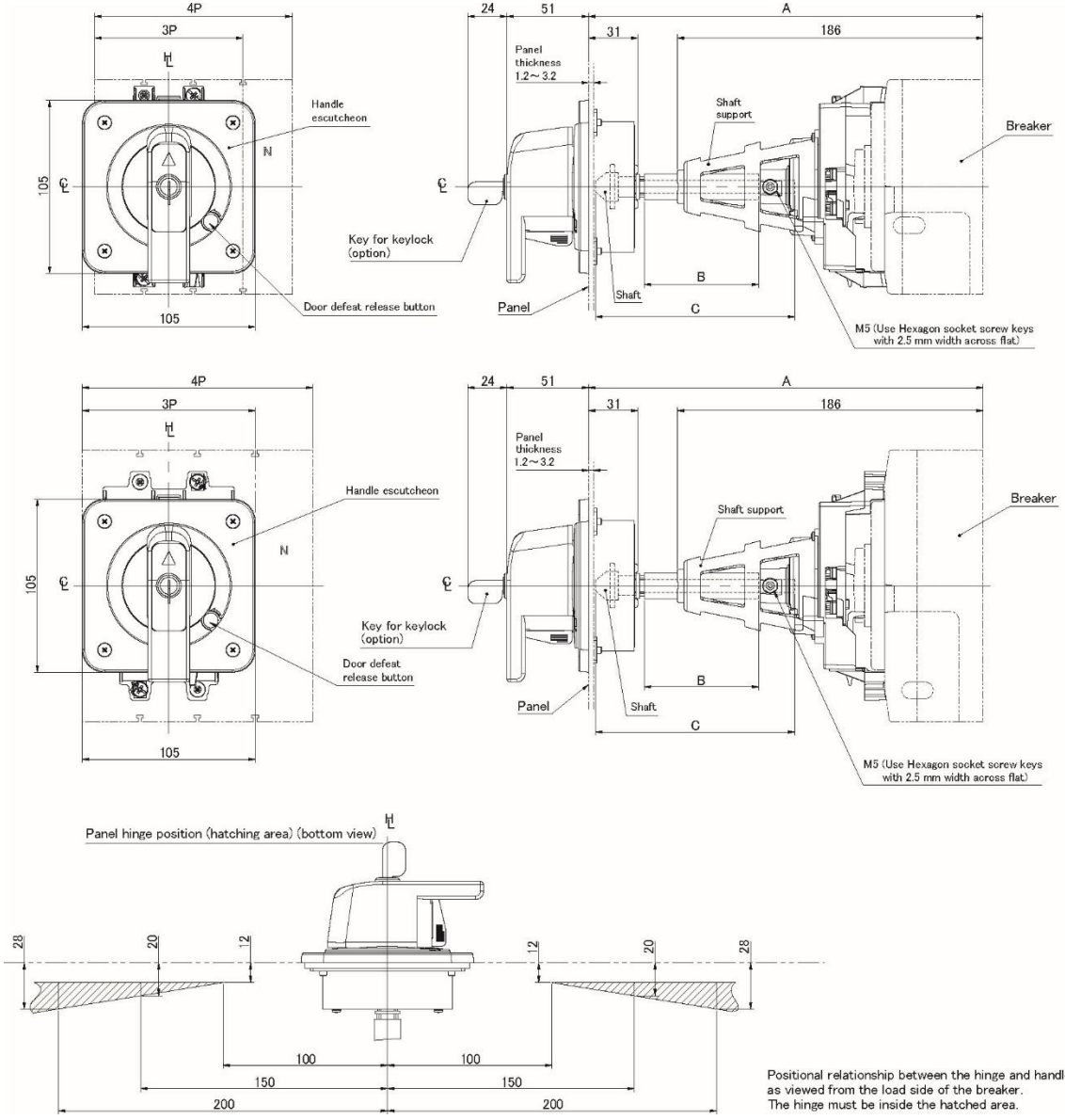
Annex A – Dimensions

P250 with HB Handle

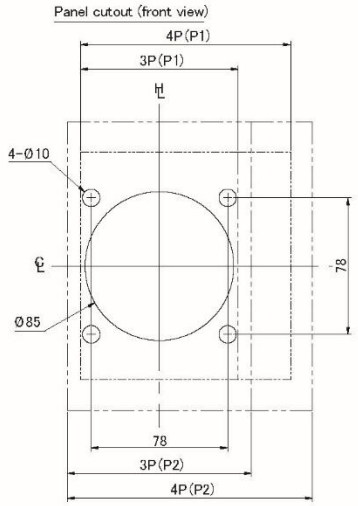


Annex A – Dimensions

P250 with HP Handle



Positional relationship between the hinge and handle as viewed from the load side of the breaker.
The hinge must be inside the hatched area.

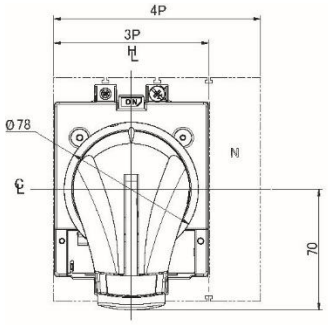


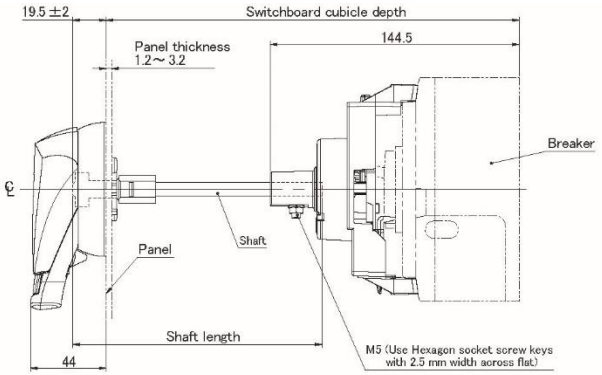
Cubicle depth A±2	Tube length B±1	Shaft length C±0.5	Shaft type
229 min.	56	107	T2PS251
243 max.	70	121	
343 max.	170	221	T2PS252
443 max.	270	321	T2PS253
543 max.	370	421	T2PS254

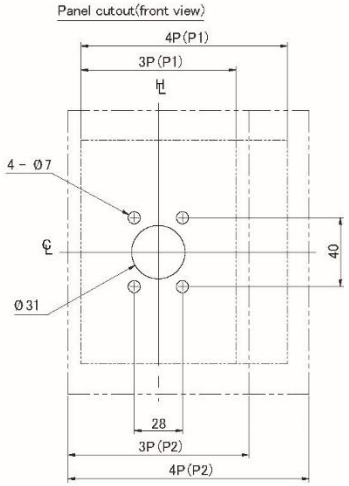
For other cubicle depth: Shaft length = Cubicle depth − 122
Tube depth = Cubicle depth − 173

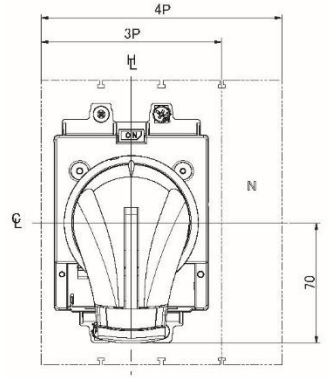
Annex A – Dimensions

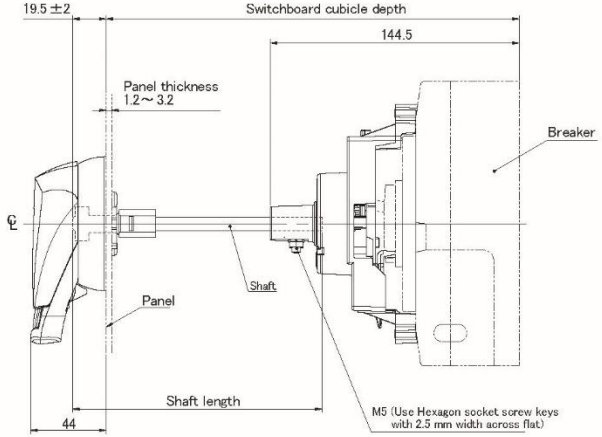
P250 with HS Handle



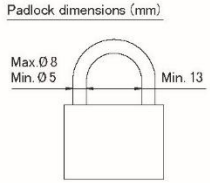


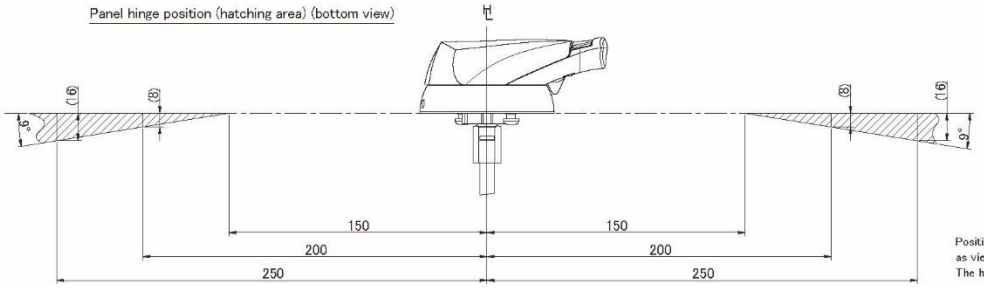






Cubicle depth ±2	Shaft length ±0.5
175 min.	80
453 max.	358

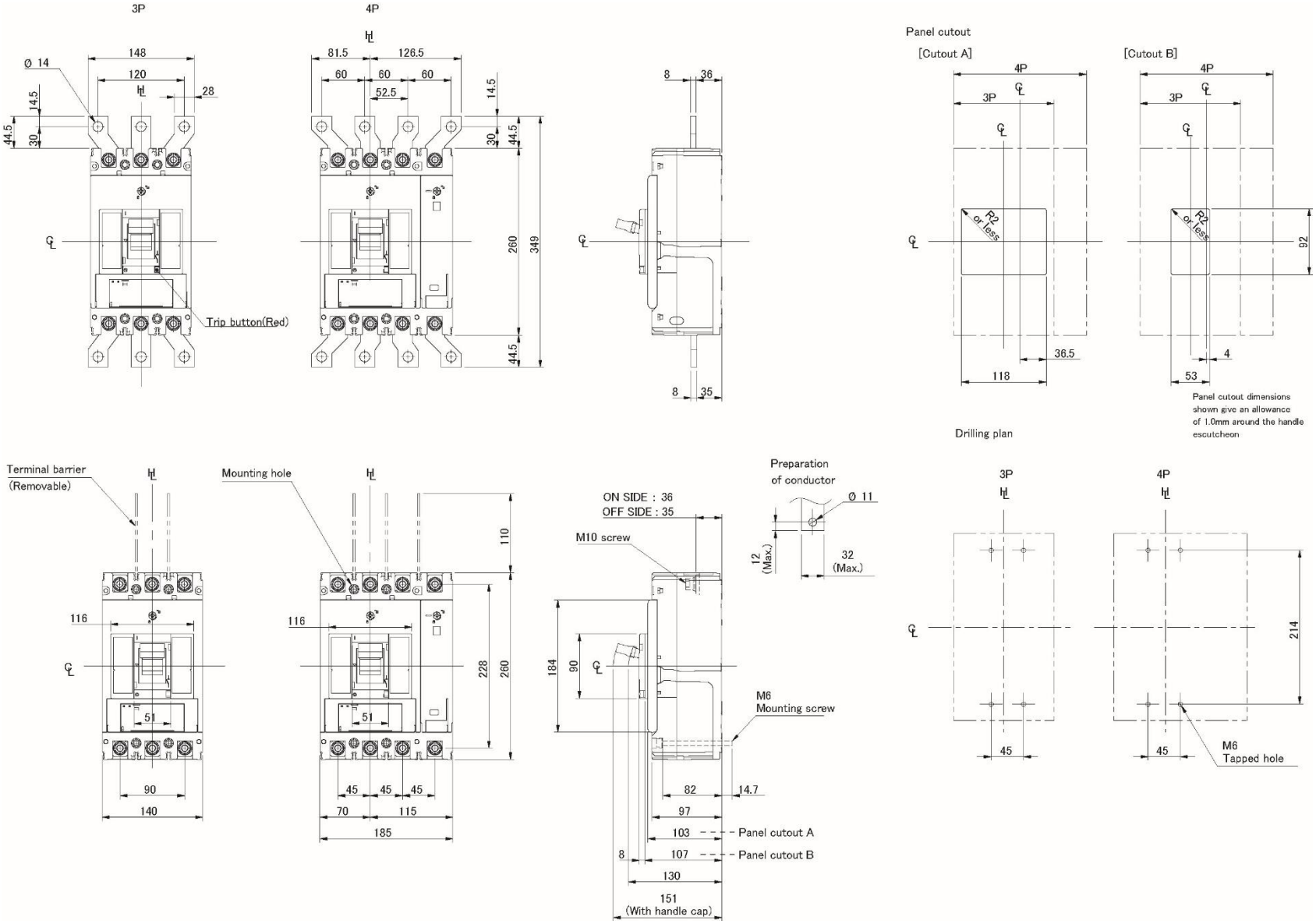




Positional relationship between the hinge and handle as viewed from the load side of the breaker.
The hinge must be inside the hatched area.

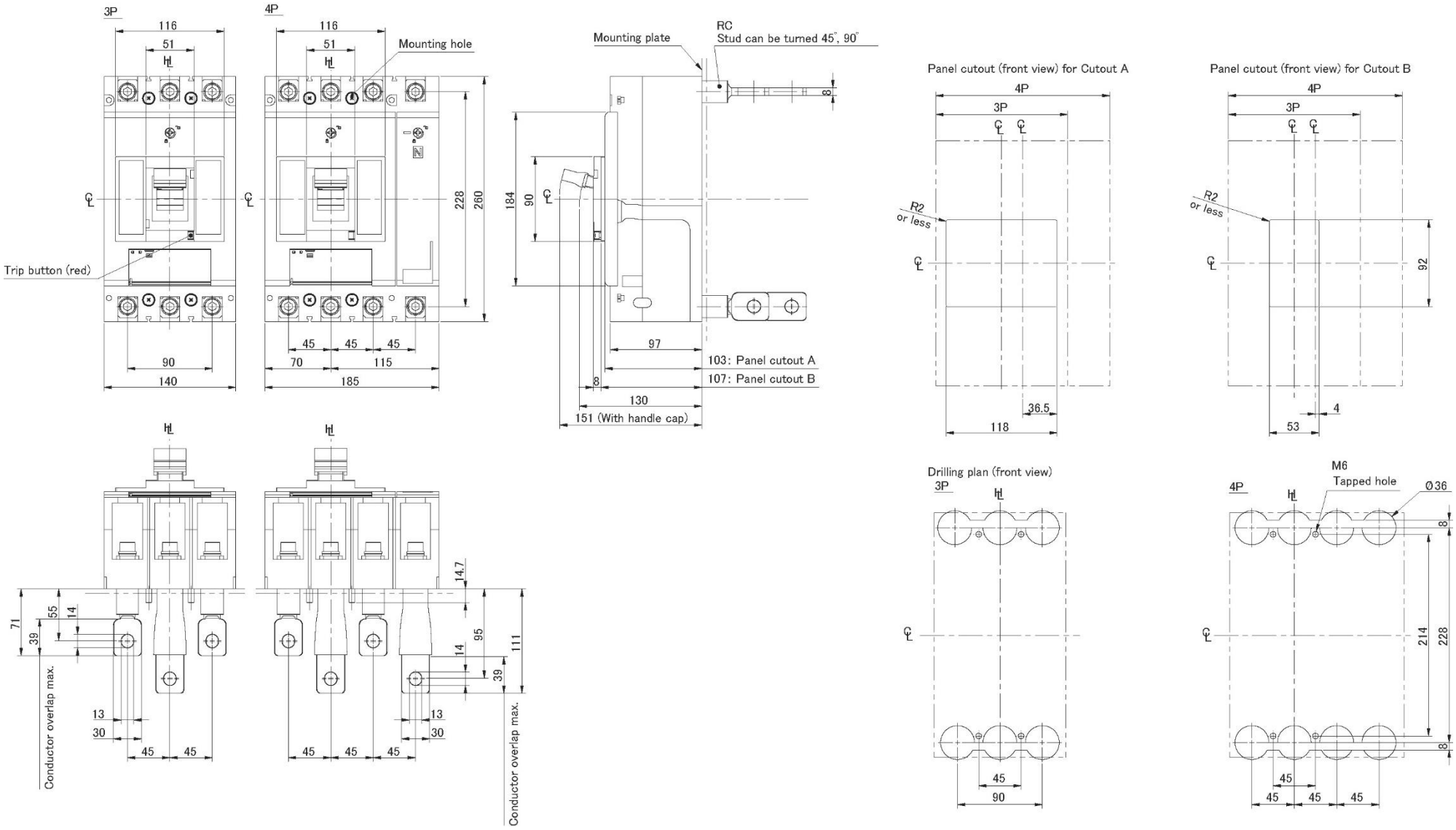
Annex A – Dimensions

P400 Dimensions



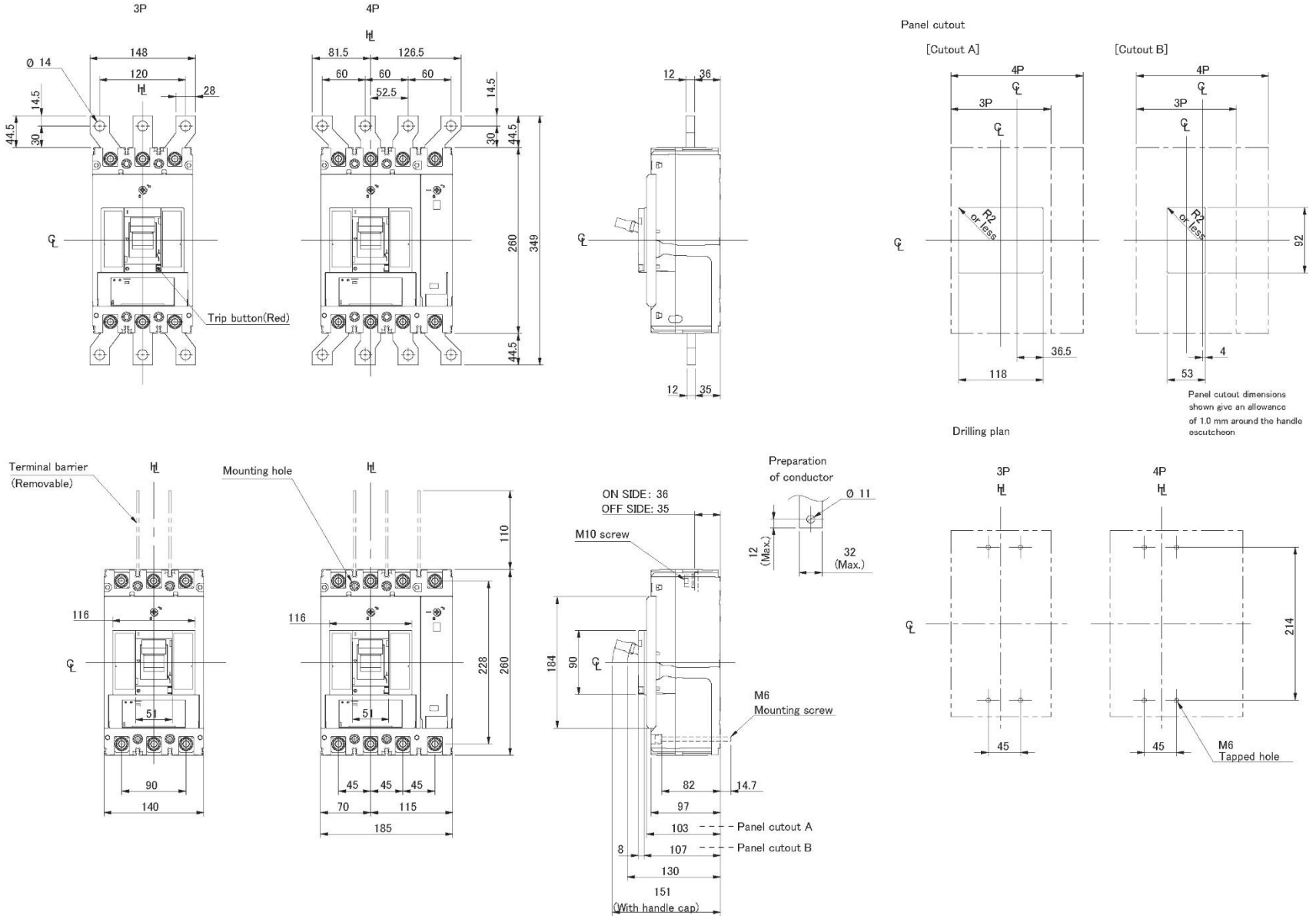
Annex A – Dimensions

P400 with Rear Connect



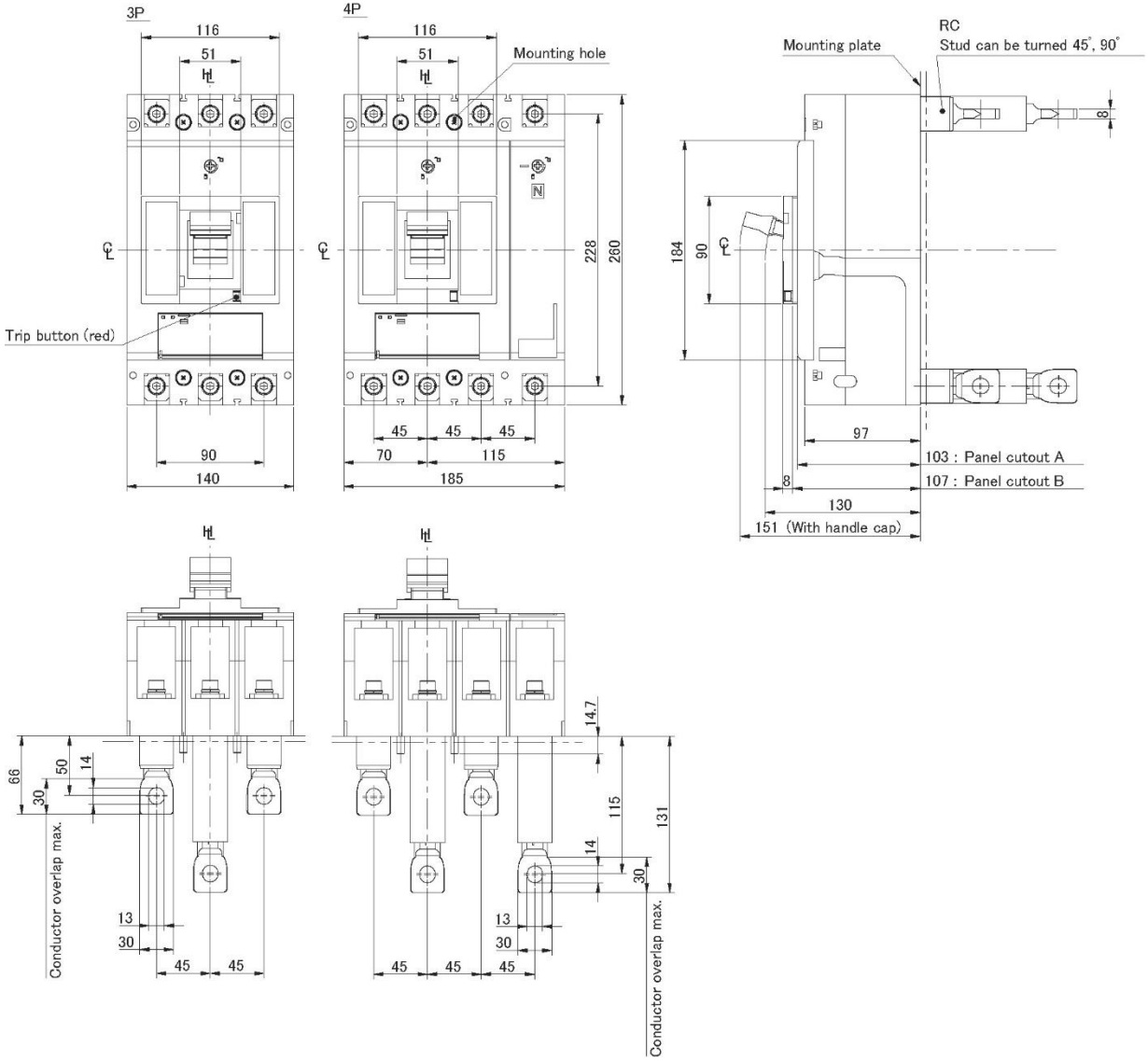
Annex A – Dimensions

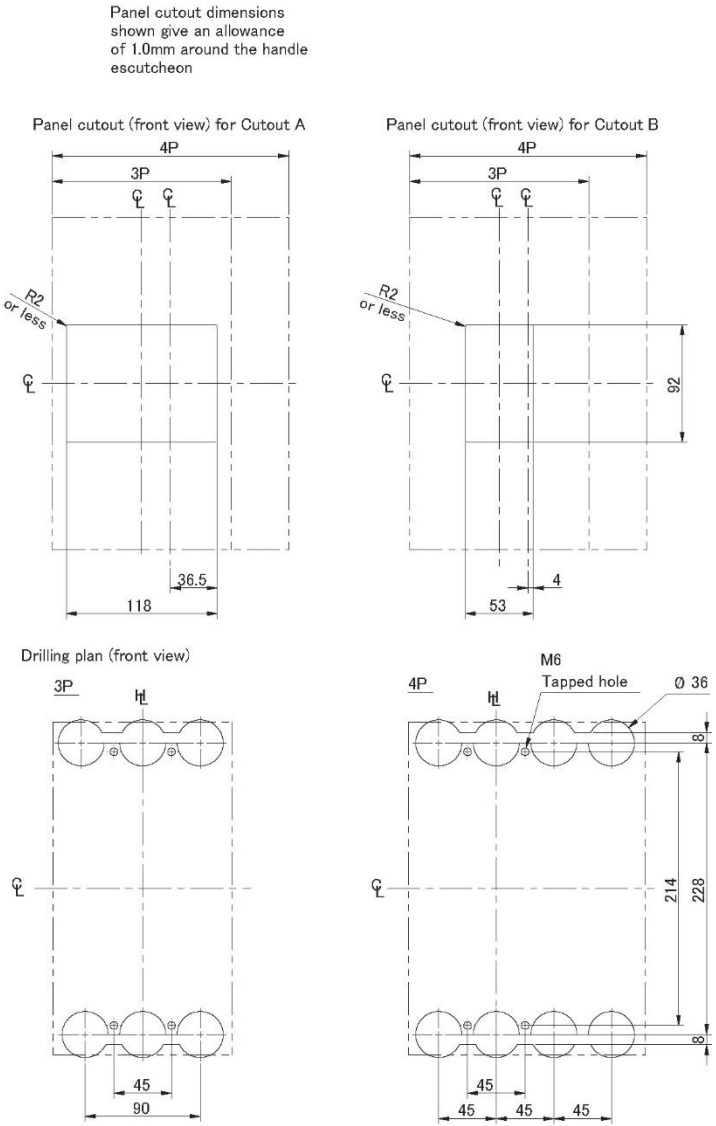
P630 Dimensions



Annex A – Dimensions

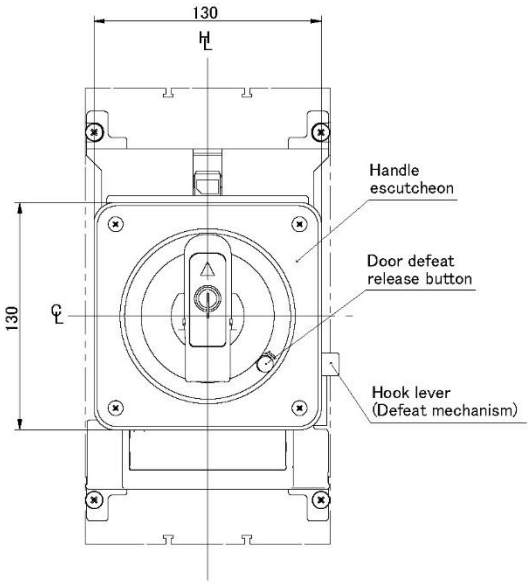
P630 with Rear Connect

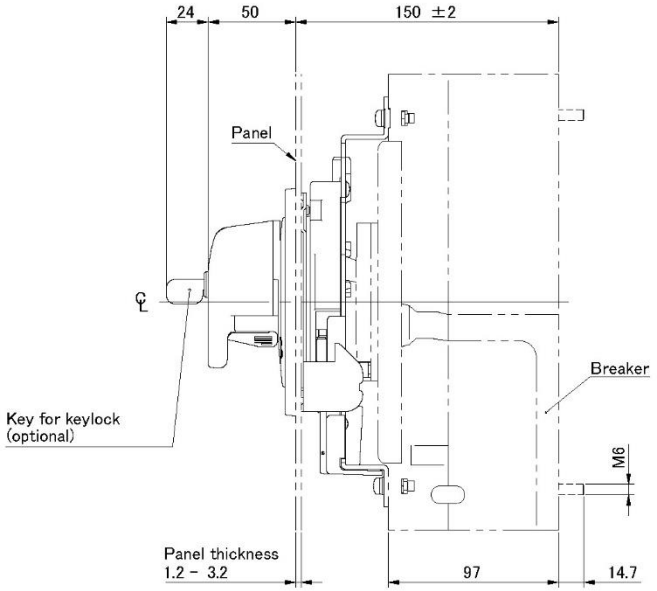


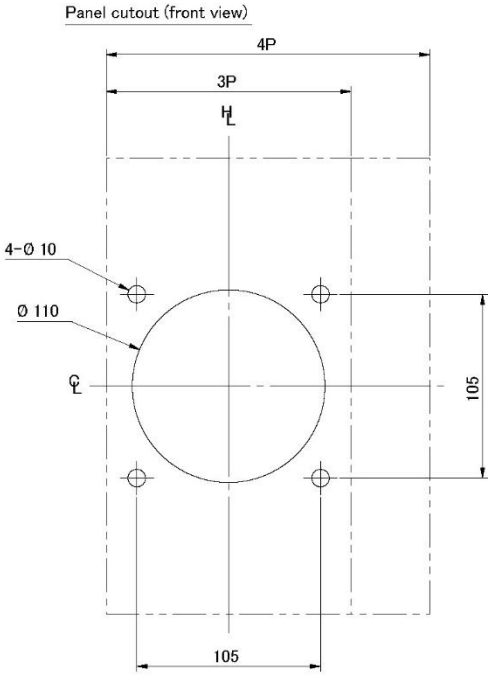


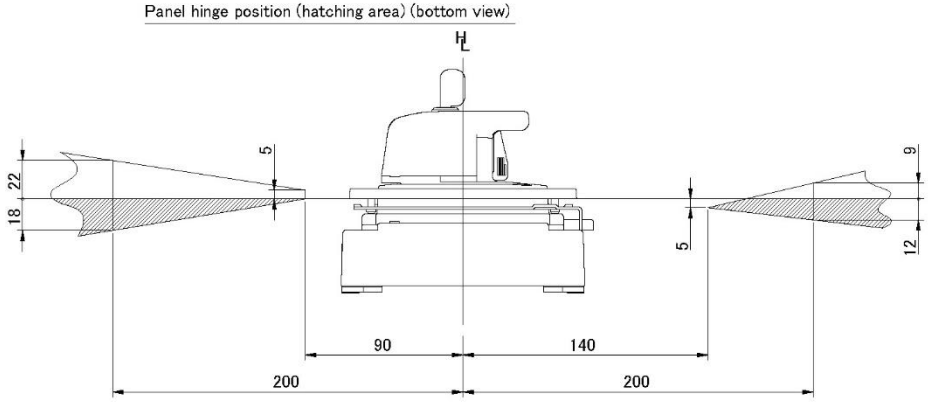
Annex A – Dimensions

P400 / P630 with HB Handle





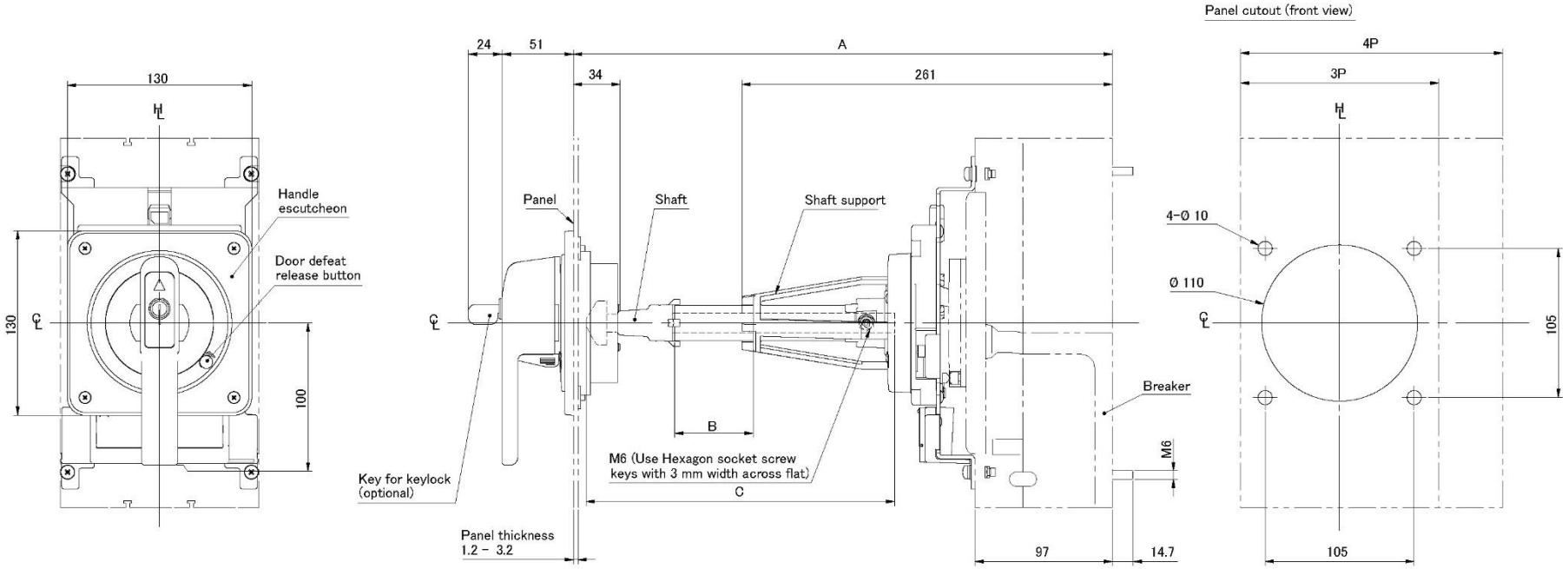


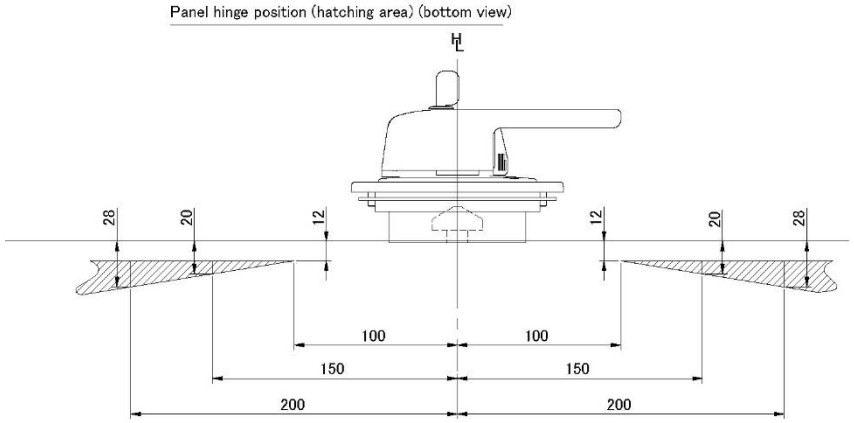


Positional relationship between the hinge and handle as viewed from the load side of the breaker.
The hinge must be inside the hatched area.

Annex A – Dimensions

P400 / P630 with HP Handle





With shaft support

A	B	C	Shaft type
340 min.	10	177.5	T2PS402A
410 max.	80	247.5	T2PS402A
510 max.	180	347.5	T2PS403A
610 max.	280	447.5	T2PS404A

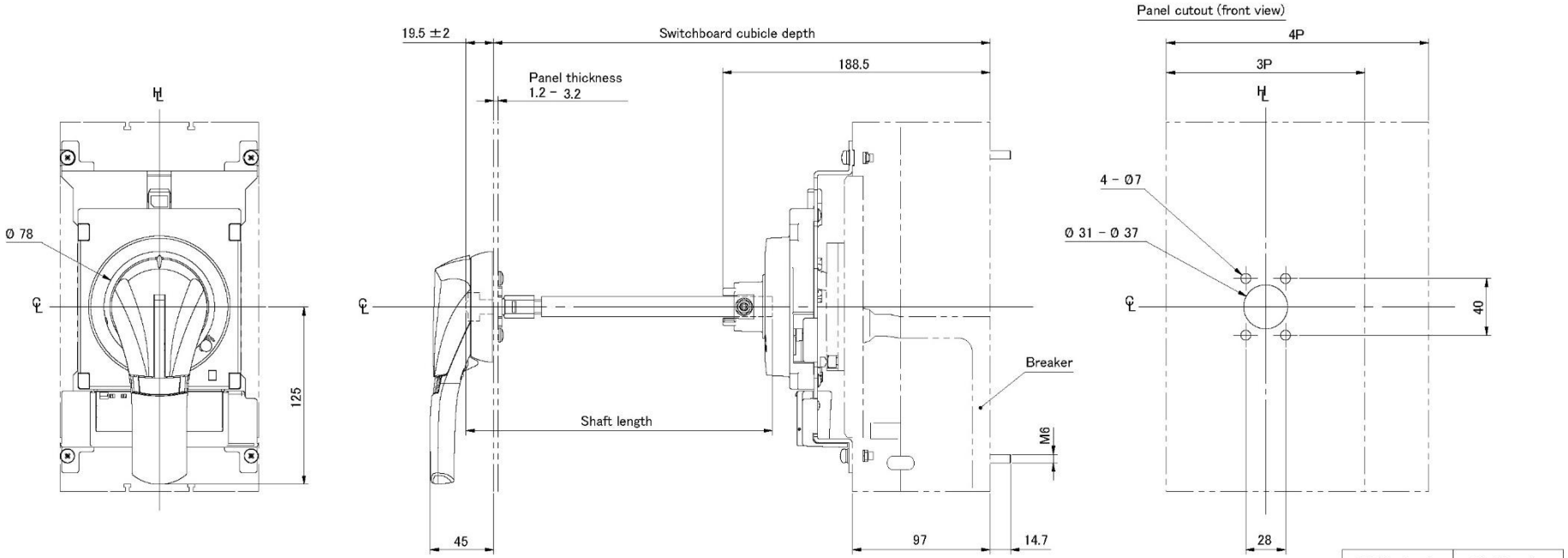
Without shaft support

A	B	C	Shaft type
270 min.	12	107.5	T2PS401A
310 max.	52	147.5	T2PS401A

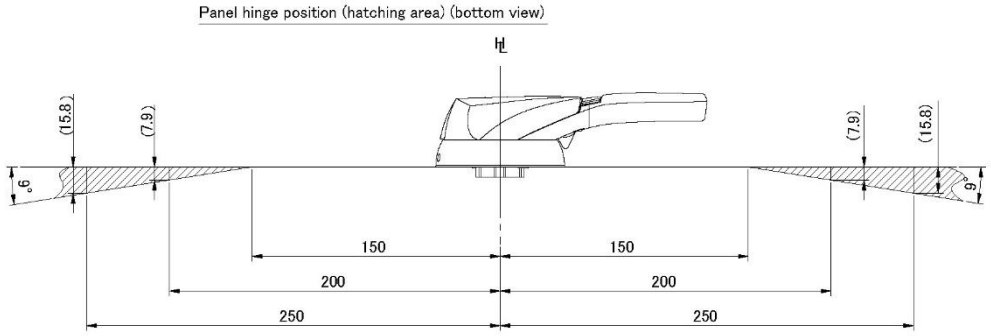
Positional relationship between the hinge and handle as viewed from the load side of the breaker.
The hinge must be inside the hatched area.

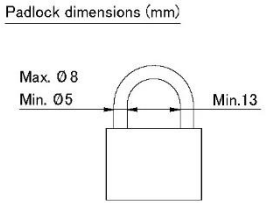
Annex A – Dimensions

P400 / P630 with HS Handle



Cubicle depth	Shaf length
220 min.	86
456 max.	322

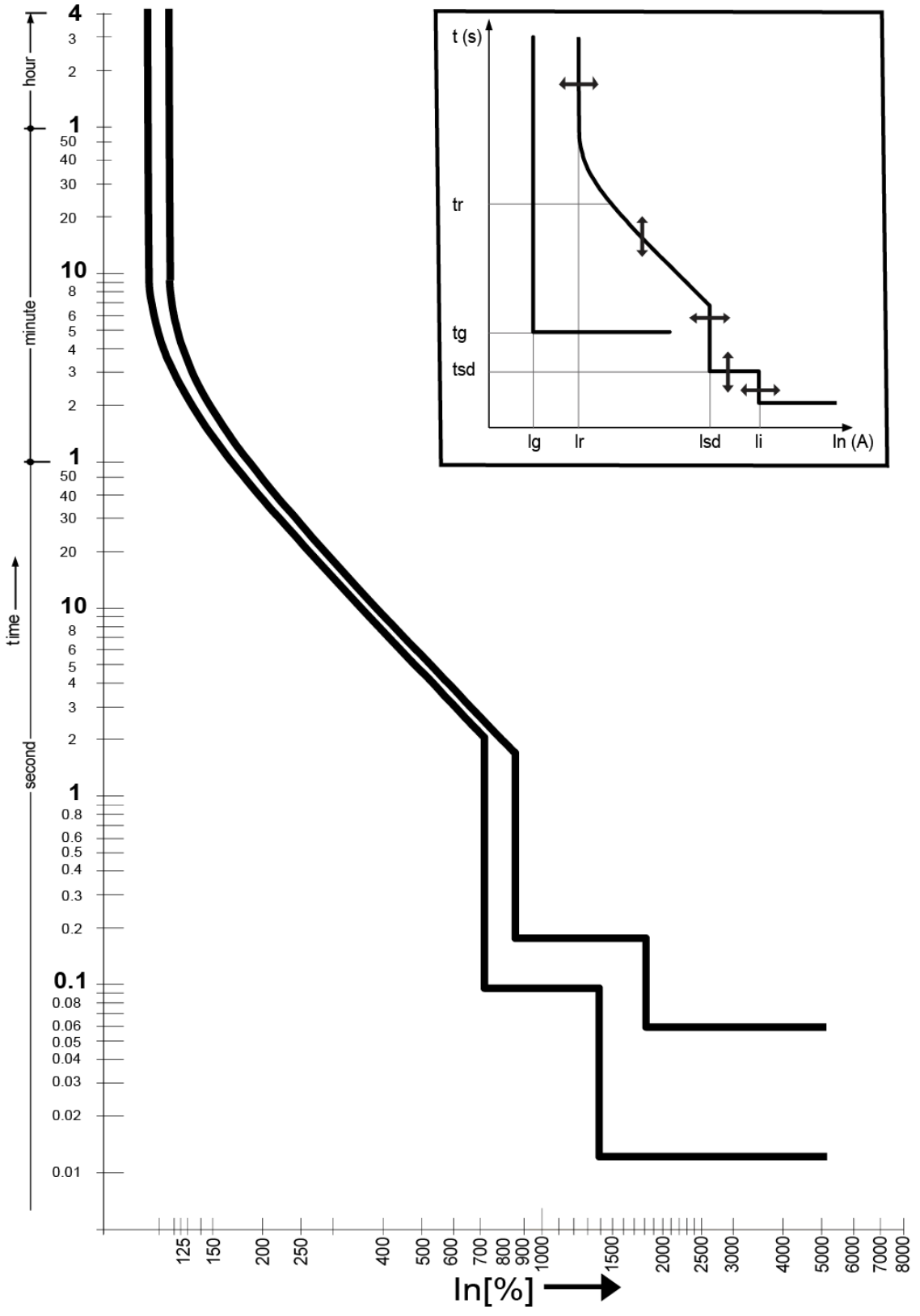




Positional relationship between the hinge and handle as viewed from the load side of the breaker.
The hinge must be inside the hatched area.

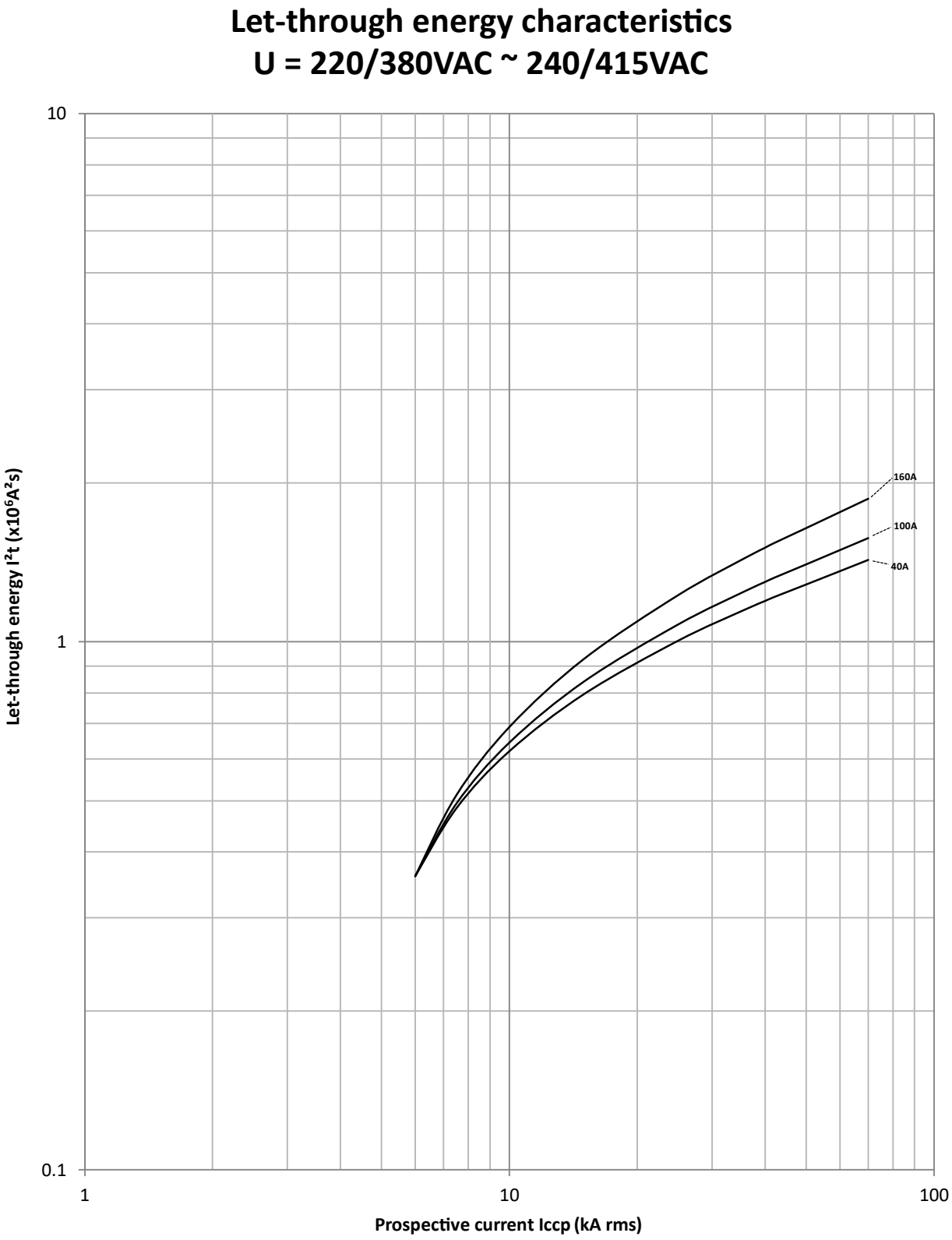
Annex B – Trip Curves

Notice: The below trip curve is representative only. The P_BE OCR features fully configurable protection settings with fine adjustment to pick-up current and time delay for the various respective trip curves, which can change depending on the application. To aide in selectivity studies, a trip curve based on the actual settings used can be generated using the software package TemCurve. Contact NHP for details on TemCurve and Selectivity.



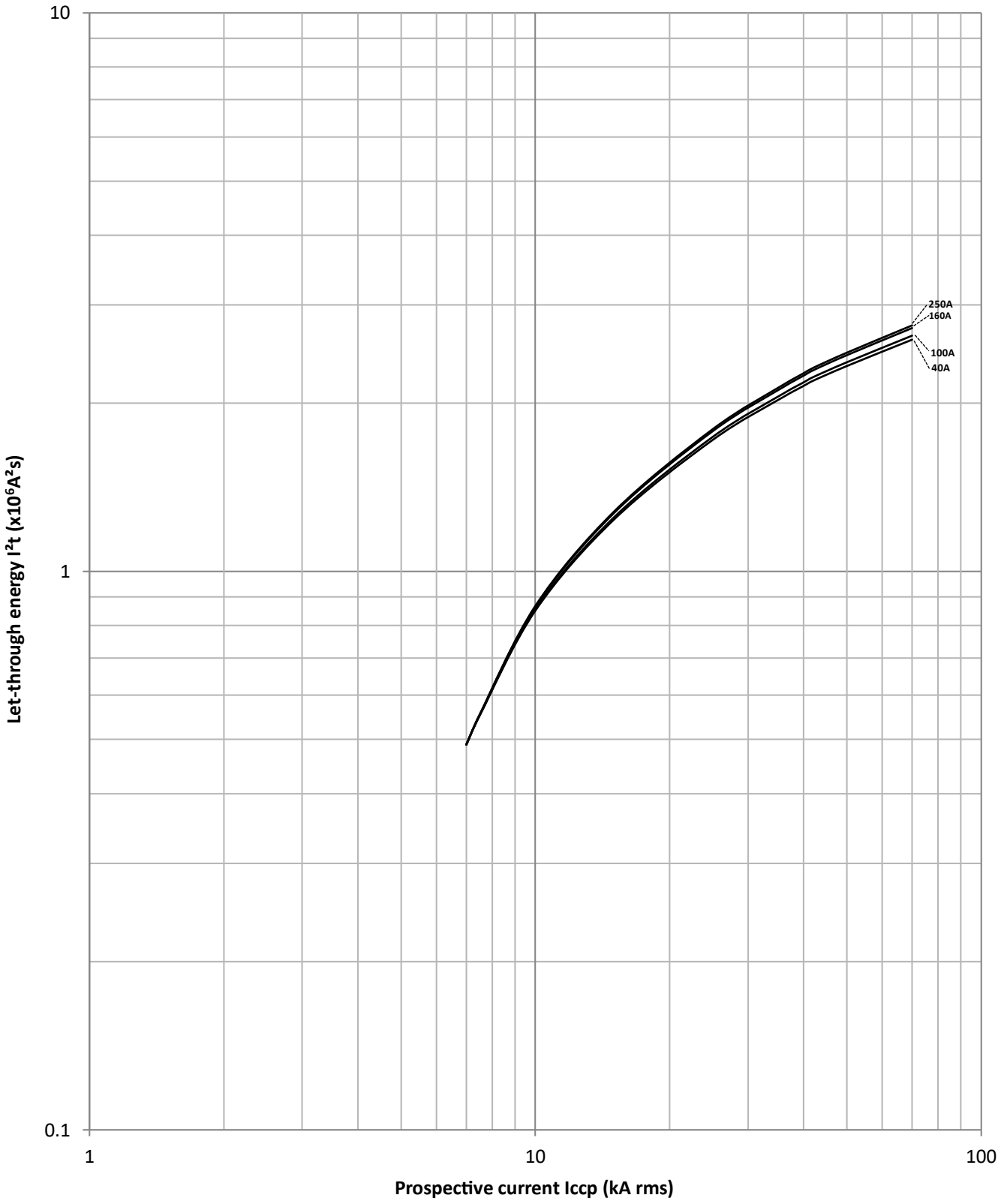
Annex C – I²t Let-Through Curves

P160_BE



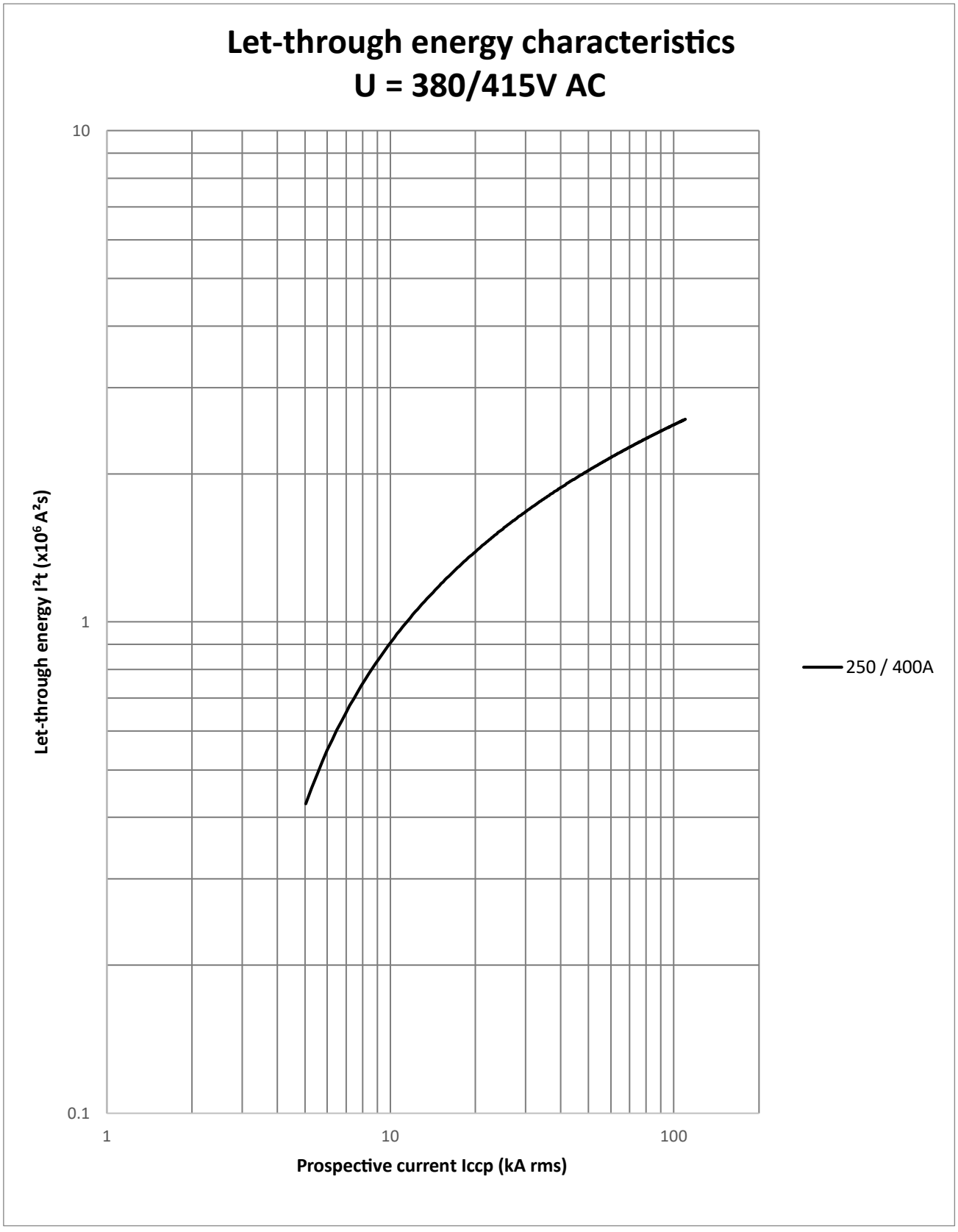
Annex C – I²t Let-Through Curves

P250_BE



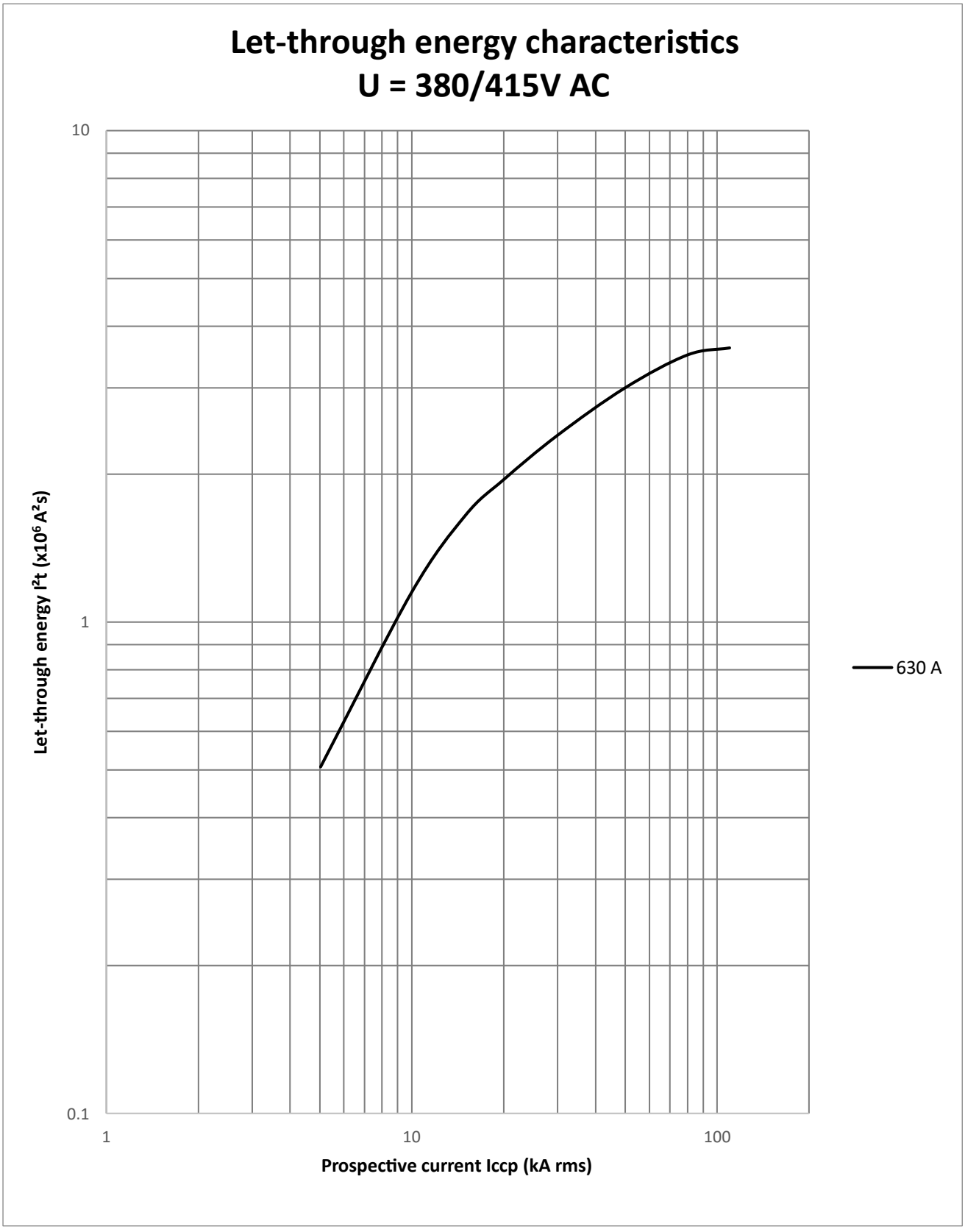
Annex C – I²t Let-Through Curves

P400_BE



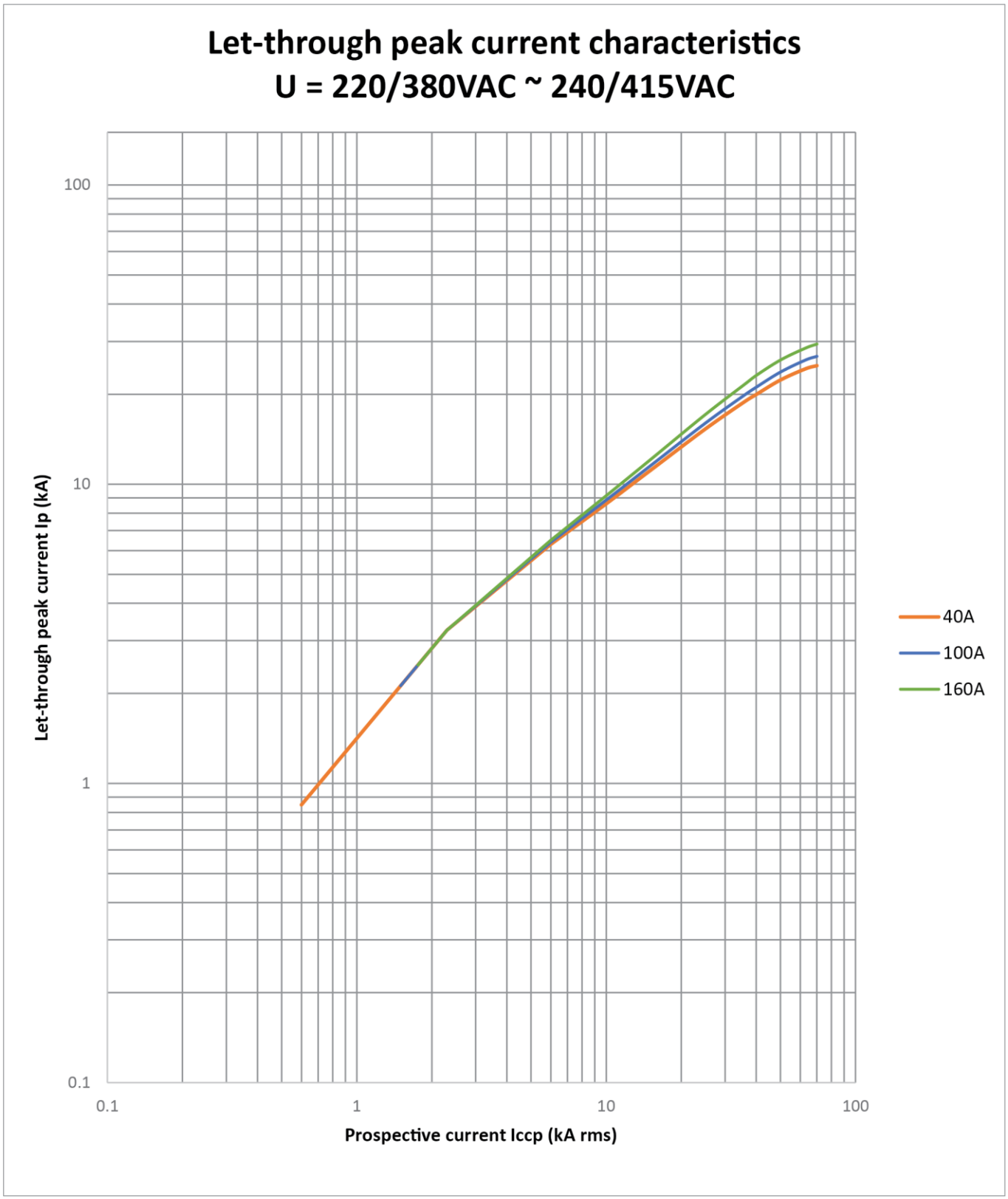
Annex C – I²t Let-Through Curves

P630_BE



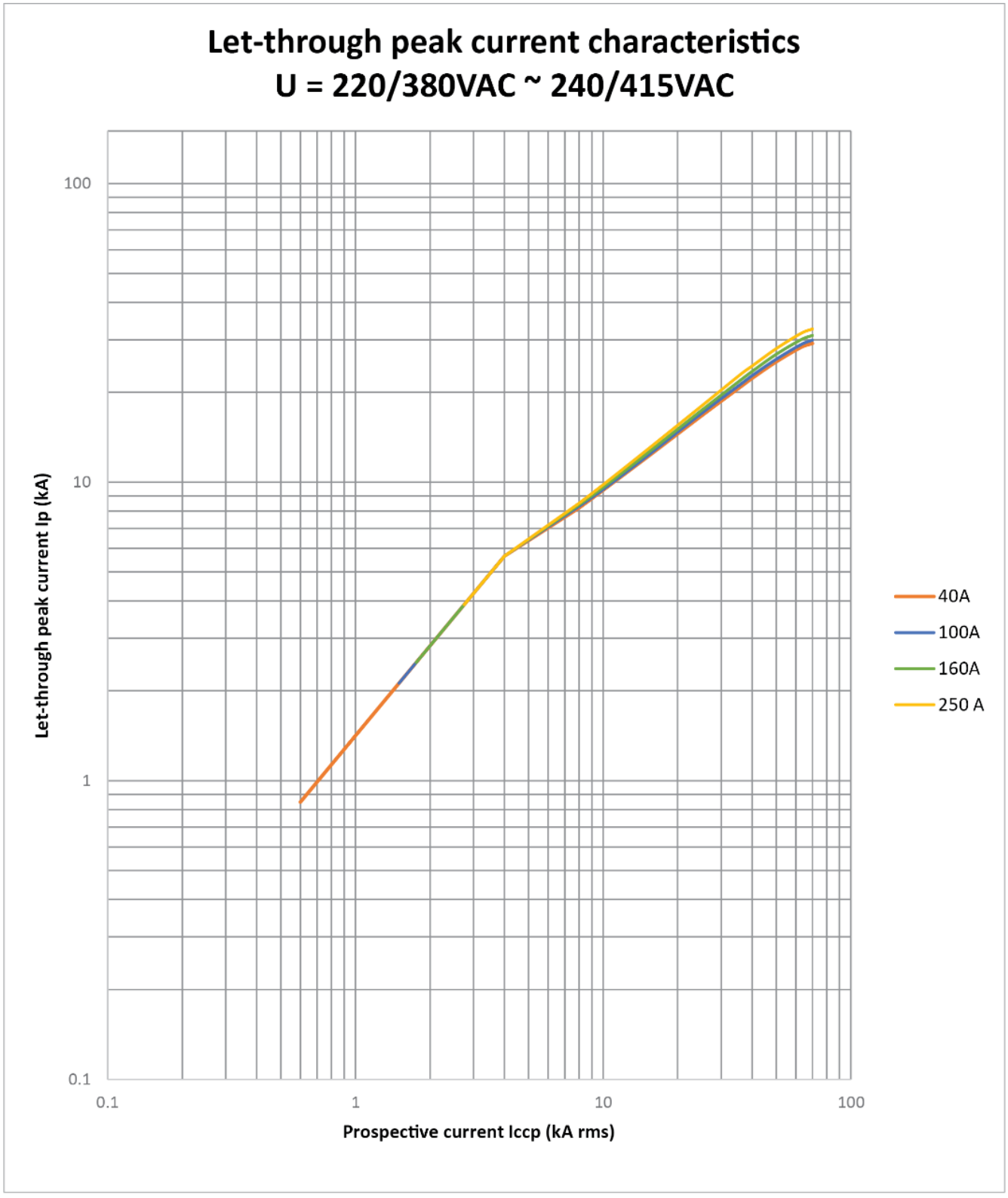
Annex D – Peak Let Through Curves

P160_BE



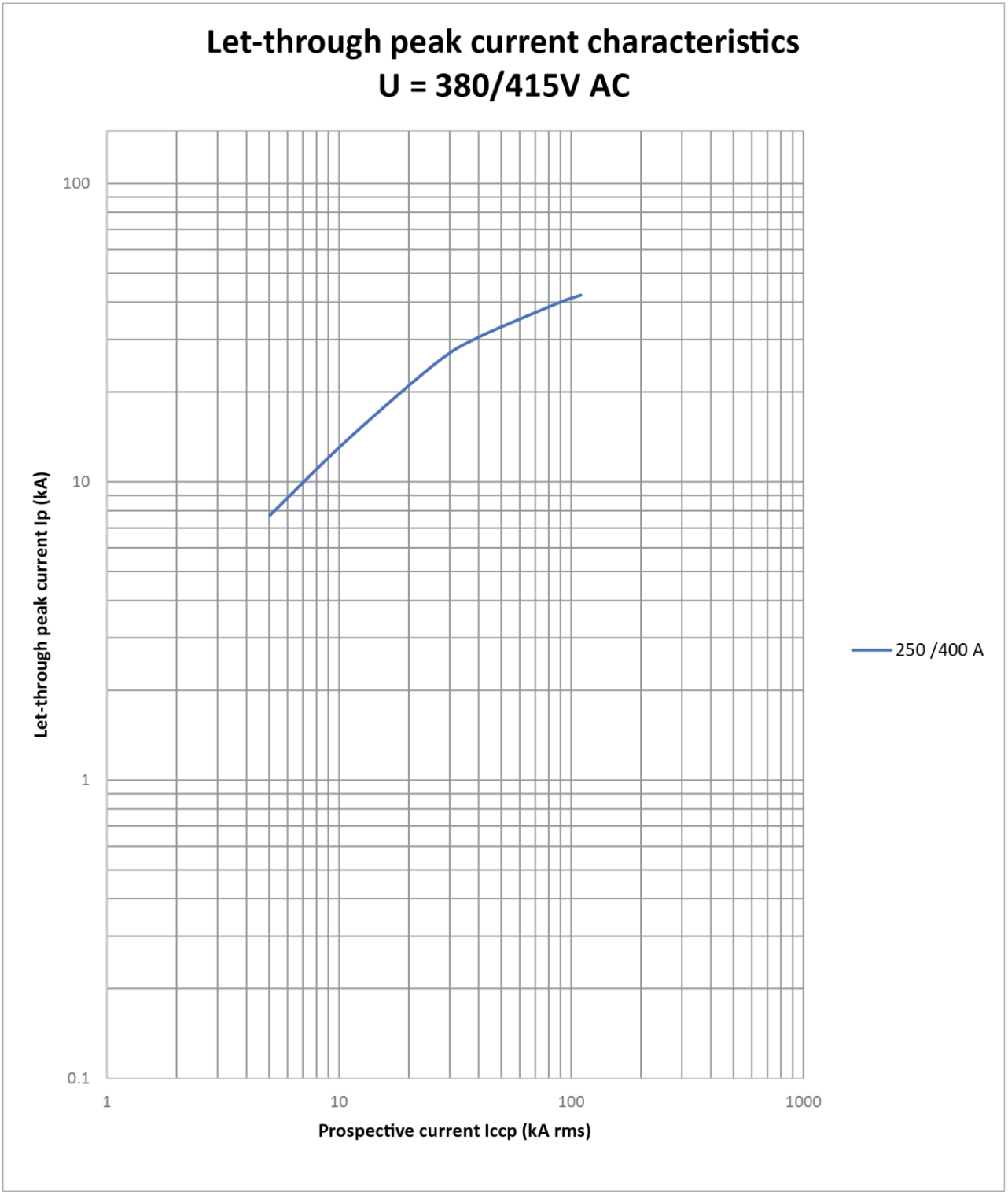
Annex D – Peak Let Through Curves

P250_BE



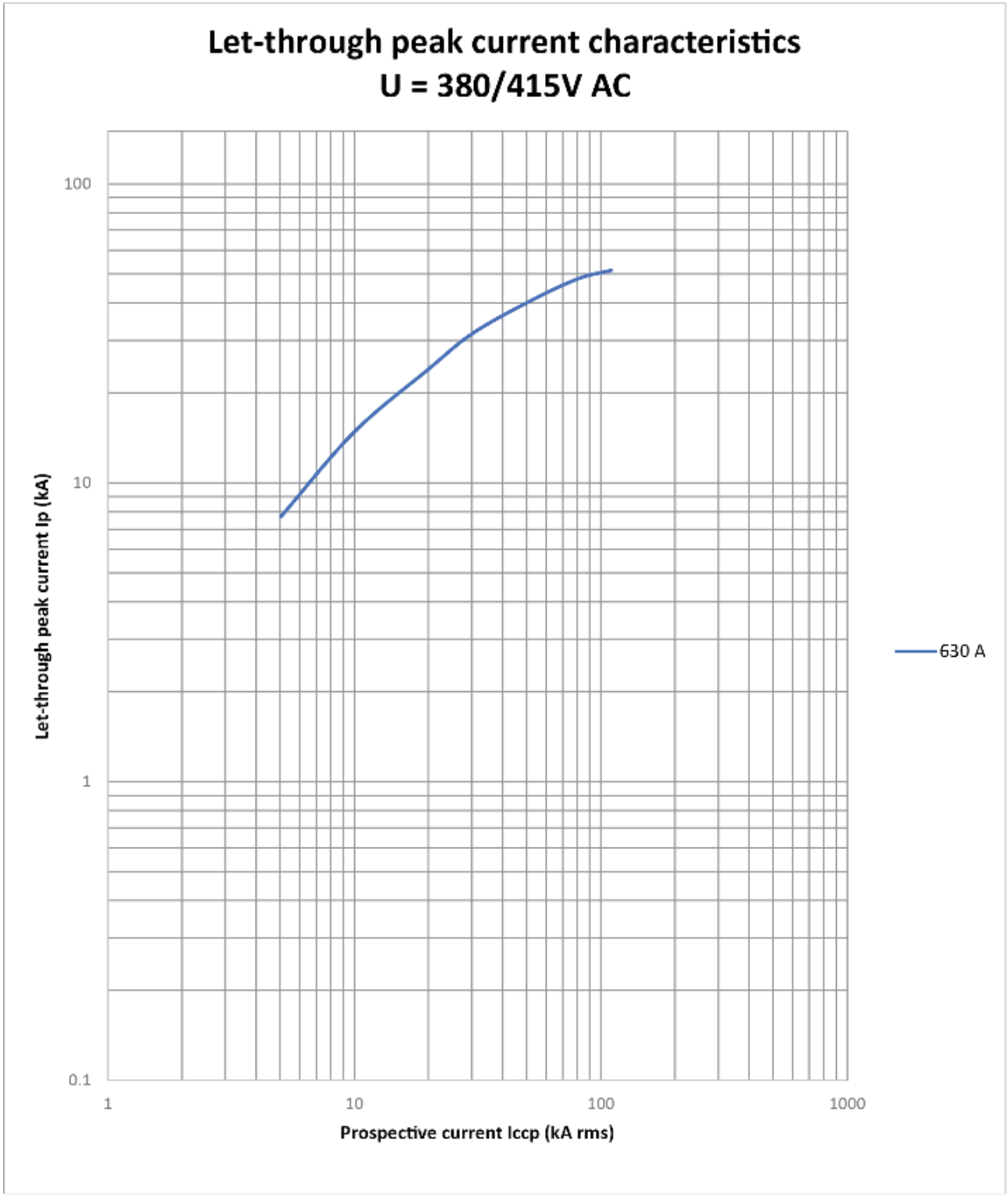
Annex D – Peak Let Through Curves

P400_BE



Annex D – Peak Let Through Curves

P630_BE



Annex E – Watts Loss

Impedance Watts Loss

Frame	Rating In (A)	Impedance per pole (mΩ)	Watts Loss per pole Based from Impedance (W)	Pole numbers	Watts Loss per product Based from Impedance (W)
P160_BE/G	40	0.35	0.6	3/4P	1.8
	100	0.35	3.5		10.5
	160	0.35	9.0		27
P250_BE/G	40	0.24	0.4	3/4P	1.2
	100	0.24	2.4		7.2
	160	0.24	6.1		18.3
	250	0.24	15.0		45
P400_BE/G	250	0.18	11.1	3/4P	33.3
	400	0.18	28.4		85.2
P630_BE/G	630	0.13	52.0	3/4P	156

Resistance Watts Loss

Frame	Rating In (A)	Resistance per pole (mΩ)	Watts Loss per pole Based from Resistance (W)	Pole numbers	Watts Loss per product Based from Resistance (W)
P160_BE/G	40	0.144	0.23	3/4P	0.69
	100	0.144	1.44		4.32
	160	0.144	3.69		11.07
P250_BE/G	40	0.127	0.2032	3/4P	0.6096
	100	0.127	1.27		3.81
	160	0.127	3.2512		9.7536
	250	0.127	7.9375		23.8125
P400_BE/G	250	0.128	8.0	3/4P	24
	400	0.128	20.5		61.5
P630_BE/G	630	0.064	25.4	3/4P	76.2

Annex F – Rated Temperature Tables

Maximum setting of the Ir at the nominated current at the specified ambient.
Values in bold are the maximum value for I_r, different combinations of I_{r1} and I_{r2} can be set if the combined settings are not greater than the I_r value advised.

P160 Electronic

MCCB Type	Connection Type	OCR Type	OCR Rating	Setting	Rated Current (A)						
					40°C	45°C	50°C	55°C	60°C	65°C	70°C
P160	Front Conn. Rear Conn. Plug-in Conn.	BE BEG	40A	**I_r (A)**	**40**	**40**	**40**	**40**	**40**	**40**	**40**
				I_{r1} (A)	40	40	40	40	40	40	40
				I_{r2}	1	1	1	1	1	1	1
		BE BEG	100A	**I_r (A)**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
				I_{r1} (A)	100	100	100	100	100	100	100
				I_{r2}	1	1	1	1	1	1	1
	Front Conn. Rear Conn.	BE BEG	160A	**I_r (A)**	**160**	**160**	**160**	**160**	**160**	**156.8**	**145.5**
				I_{r1} (A)	160	160	160	160	160	160	160
				I_{r2}	1	1	1	1	1	0.98	0.97
	Plug-in Conn.	BE BEG		**I_r (A)**	**125**	**125**	**125**	**125**	**125**	**120**	**110**
				I_{r1} (A)	125	125	125	125	125	125	110
				I_{r2}	1	1	1	1	1	0.96	1

P250 Electronic

MCCB Type	Connection Type	OCR Type	OCR Rating	Setting	Rated Current (A)						
					40°C	45°C	50°C	55°C	60°C	65°C	70°C
P250	Front Conn. Rear Conn. Plug-in Conn.	BE BEG	40A	**I_r (A)**	**40**	**40**	**40**	**40**	**40**	**40**	**40**
				I_{r1} (A)	40	40	40	40	40	40	40
				I_{r2}	1	1	1	1	1	1	1
		BE BEG	100A	**I_r (A)**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
				I_{r1} (A)	100	100	100	100	100	100	100
				I_{r2}	1	1	1	1	1	1	1
	Front Conn. Rear Conn.	BE BEG	160A	**I_r (A)**	**160**	**160**	**160**	**160**	**160**	**160**	**155.2**
				I_{r1} (A)	160	160	160	160	160	160	160
				I_{r2}	1	1	1	1	1	1	0.97
	Plug-in Conn.	BE BEG		**I_r (A)**	**160**	**160**	**160**	**160**	**160**	**160**	**148.5**
				I_{r1} (A)	160	160	160	160	160	160	150
				I_{r2}	1	1	1	1	1	1	0.99
	Front Conn. Rear Conn.	BE BEG	250A	**I_r (A)**	**250**	**250**	**250**	**250**	**242.5**	**225**	**209.25**
				I_{r1} (A)	250	250	250	250	250	225	225
				I_{r2}	1	1	1	1	0.97	1	0.93
	Plug-in Conn.	BE BEG		**I_r (A)**	**250**	**250**	**250**	**242.5**	**225**	**213.75**	**198**
				I_{r1} (A)	250	250	250	250	225	225	200
				I_{r2}	1	1	1	0.97	1.0	0.95	0.99

Annex F – Rated Temperature Tables

Maximum setting of the Ir at the nominated current at the specified ambient.
Values in bold are the maximum value for I_r, different combinations of I_{r1} and I_{r2} can be set if the combined settings are not greater than the I_r value advised.

P400 Electronic

MCCB Type	Connection Type	OCR Type	OCR Rating	Setting	Rated Current (A)						
					40°C	45°C	50°C	55°C	60°C	65°C	70°C
P400	Front Conn. Rear Conn. Plug-in Conn.	BE BEG	250A	**I_r (A)**	**250**	**250**	**250**	**250**	**250**	**250**	**250**
				I_{r1} (A)	250	250	250	250	250	250	250
				I_{r2}	1	1	1	1	1	1	1
		BE BEG	400A	**I_r (A)**	**400**	**400**	**400**	**400**	**400**	**358.9**	**300**
				I_{r1} (A)	400	400	400	400	400	370	300
				I_{r2}	1	1	1	1	1	0.97	1

P630 Electronic

MCCB Type	Connection Type	OCR Type	OCR Rating	Setting	Rated Current (A)								
					30°C	35°C	40°C	45°C	50°C	55°C	60°C	65°C	70°C
P630	Front Conn. Rear Conn.	BE BEG	630A	**I_r (A)**	**630**	**630**	**630**	**630**	**630**	**611**	**558**	**500**	**400**
				I_{r1} (A)	630	630	630	630	630	630	600	500	400
				I_{r2}	1	1	1	1	1	0.97	0.93	1	1
	Plug-in Conn.	BE BEG		**I_r (A)**	**570**	**570**	**570**	**570**	**500**	**500**	**400**	**400**	**372**
				I_{r1} (A)	600	600	600	600	500	500	400	400	400
				I_{r2}	0.95	0.95	0.95	0.95	1	1	1	1	0.93

Example setting

MCCB – P400H3400BE
Temperature – 65°C

MCCB Type	Connection Type	OCR Type	OCR Rating	Setting	Rated Current (A)						
					40°C	45°C	50°C	55°C	60°C	65°C	70°C
P400	Front Conn. Rear Conn. Plug-in Conn.	BE BEG	250A	**I_r (A)**	**250**	**250**	**250**	**250**	**250**	**250**	**250**
				I_{r1} (A)	250	250	250	250	250	250	250
				I_{r2}	1	1	1	1	1	1	1
		BE BEG	400A	**I_r (A)**	**400**	**400**	**400**	**400**	**400**	**358.9**	**300**
				I_{r1} (A)	400	400	400	400	400	370	300
				I_{r2}	1	1	1	1	1	0.97	1

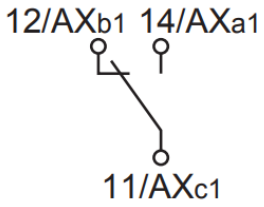
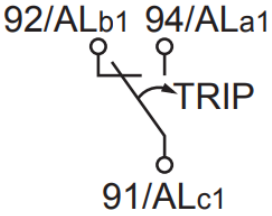
I_{r1} dial set to 370A
I_{r2} dial set to 0.97

Therefore, the maximum at 65°C is I_r = 370A x 0.97 = 358.9A

Other combinations of Ir1 and Ir2 in this case can be set as along as they don't exceed 358.9A.
Example: $I_r = I_{r1} \times I_{r2}$ = 350A x 1.0 = 350A

Annex G – Wiring Diagrams & Terminal Designations

Internal Accessories

Accessory	Terminal Designations	Notes		
		MCCB Status "Closed"	MCCB Status "Open"	MCCB Status "TRIP"
Auxiliary		11/AXc-14/AXa "Closed" 11/AXc-12/AXb "Open"	11/AXc-14/AXa "Open" 11/AXc-12/AXb "Closed"	11/AXc-14/AXa "Open" 11/AXc-12/AXb "Closed"
Alarm		MCCB Status "Closed"	MCCB Status "Open"	MCCB Status "TRIP"
		91/ALc-94/ALa "Open" 91/ALc-92/ALb "Closed"	91/ALc-94/ALa "Open" 91/ALc-92/ALb "Closed"	91/ALc-94/ALa "Closed" 91/ALc-92/ALb "Open"
Shunt		Shunt trips are continuous rated and do not make use of an anti-burn out switch. Terminals are not polarity sensitive.		
UVT (AC)		Terminals are not polarity sensitive.		
UVT (DC)		Terminals are not polarity sensitive.		

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