

DC Air Circuit Breakers Moulded Case Circuit Breakers

TemPower & TemBreak



TERASAKI ELECTRIC CO., LTD.

www.terasaki.co.jp

CAT REF. '15-I73E

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General

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Introduction

In recent years, as part of the drive to reduce greenhouse gas emissions, significant attention is now being directed towards the energy produced by large-scale photovoltaic (solar), wind, and biomass energy power generation.

The total power generation capacity of facilities for these new energy sources is expected to exceed that produced by nuclear energy by approximately 2030. To aid and support these new technologies, Terasaki now offer a new, broad range of dedicated DC air circuit breakers and moulded case circuit breakers. The new range of Terasaki DC circuit breakers are ideally suited for all types of industries, buildings, as well as the information technology and communications sectors where highly reliable sources of electric power are required.

DC Air Circuit Breakers



AR220S

Rated current 2000A
Rated breaking capacity DC600V 40kA

Possible reverse connection

DC Moulded Case Circuit Breakers



PVE160-SDL

Rated current 160A
Rated breaking capacity DC750V 3kA

Possible reverse connection



PVS160-SDL

Rated current 160A
Rated breaking capacity DC750V 5kA

Possible reverse connection



PVS250-SDH

Rated current 250A
Rated breaking capacity DC1000V 5kA

Possible reverse connection

DC power sources for the Uninterruptible Power Supply (UPS) market

Electrical and electronic equipment used in the advanced information and communications sectors requires a highly reliable power source. Should a power failure occur, and to assist with continuity of electrical power, it is standard practice to install an Uninterruptible Power Supply (UPS).

A data centre is where Internet servers and other systems for data communications, such as fixed, mobile, and IP telephones are installed. At the data centre, AC power from the main system power source is sent to the UPS, and is temporarily converted to DC power. A storage battery is then charged with this DC power, which is re-converted back into AC power and then sent to the information equipment.

Building and Industrial power back-up

A UPS is typically required for critical power systems in department stores, hotels, hospitals, theaters, and office buildings. For example, in semiconductor manufacturing plants that feature advanced automation as a part of their production processes, UPS systems with large battery capacities are used to take measures against any large-scale power outage affecting critical manufacturing facilities.

Photovoltaic power generation

Photovoltaic (or Solar) power generation, which is attracting attention as clean energy, ranges from simple generation of up to several kilowatts for home use, to larger systems of 100 kilowatts or greater for industrial use. In the "School New Deal" program, one of the governmental measures during the economic crisis, were for eco-friendly modifications which advocated the use of photovoltaic power generation at schools. One example is a power distribution system linked to a source of photovoltaic power generation. The current produced from the photovoltaic solar cells is sent to a power conditioner via a diode with a DC circuit breaker in a junction box and then converted into AC, which can then be supplied to a load via a distribution board.

Rationalization of use of electric power via large-capacity storage battery

Energy from new power sources such as wind and photovoltaic power generation do not have a stable output. A lithium ion battery and a sodium-sulfur (NAS) battery can suppress such fluctuations by load leveling. The battery is charged at night using a lower electrical power rate at night and discharged at daytime when the electrical power usage rate is higher, and in addition, any new electrical power generated can also be saved. For this purpose, large-capacity storage battery systems are used at wind and photovoltaic power generation facilities. The use of these types of systems is expected to grow across all user sectors requiring large amounts of power, plus as an additional measure against possible power outages.

All Air Circuit Breakers and Switch-disconnectors are possible to reverse the connection.
 Moulded Case Circuit Breakers up to 1000A frame are possible to reverse the connection.

Selection Chart

Voltage		Frame size (A)						
		160	250	400	800			
Air Circuit Breakers	800V							
	600V							
Moulded Case Circuit Breakers	1000V		PVS160-SDH 4P 5kA/5kA		PVS250-SDH 4P 5kA/5kA	PVS400-NDH 4P 5kA/5kA	PVS800-NDH 4P 5kA/5kA	
	750V		PVE160-SDL 3P 3kA/3kA	PVS160-SDL 3P 5kA/5kA		PVS250-SDL 3P 5kA/5kA	PVS400-NDL 3P 10kA/5kA	PVS800-NDL 3P 10kA/10kA
				PVS160-SDL 4P 10kA/5kA		PVS250-SDL 4P 10kA/5kA	PVS400-NDL 4P 10kA/10kA	PVS800-NDL 4P 10kA/10kA
	600V	S160-SD 3P 5kA/5kA	S160-GD 3P 10kA/5kA	S250-SD 3P 5kA/5kA	S250-GD 3P 10kA/5kA	S400-ND 3P 15kA/15kA	S800-ND 3P 20kA/10kA	
	500V	S160-SD 3P 7.5kA/7.5kA	S160-GD 3P 15kA/7.5kA	S250-SD 3P 7.5kA/7.5kA	S250-GD 3P 15kA/7.5kA			
	350V	S160-SD 3P 10kA/10kA		S250-SD 3P 10kA/10kA		S400-ND 3P 20kA/20kA	S800-ND 3P 30kA/15kA	
	250V							
	Switch-disconnectors	1000V		PVS160-SNH 4P		PVS250-SNH 4P	PVS400-NNH 4P	PVS800-NNH 4P
		800V		PVS160-SNL 4P		PVS250-SNL 4P	PVS400-NNL 4P	PVS800-NNL 4P
		600V	S160-SDN 3P		S250-SDN 3P			



... Reverse connection Possible



... Reverse connection Not possible

1000 1250 1600 2000 2500 3200 4000

AR325-NDH
4P
30kA/30kA

AR216S
3P
40kA/40kA

AR220S
3P
40kA/40kA

AR325S
3P
40kA/40kA

AR332S
3P
40kA/40kA

AR440S
3P
40kA/40kA

S1000-ND
3P
20kA/10kA

XS1250ND
3P
20kA/15kA

XS1600ND
3P
20kA/15kA

XS2000ND
3P
20kA/15kA

XS2500ND
3P
20kA/15kA

XS3200ND
3P
20kA/15kA

S1000-ND
3P
30kA/15kA

XS1250ND
3P
50kA/25kA

XS1600ND
3P
50kA/25kA

XS2000ND
3P
50kA/25kA

XS2500ND
3P
50kA/25kA

XS3200ND
3P
50kA/25kA

S1000-ND
2P
50kA/20kA

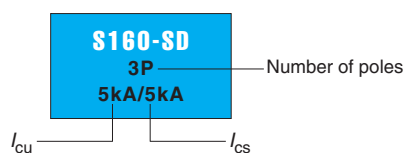
XS1250ND
2P
50kA/30kA

XS1600ND
2P
50kA/30kA

XS2000ND
2P
50kA/30kA

XS2500ND
2P
50kA/30kA

XS3200ND
2P
50kA/30kA



2

Ratings and Specifications

Air Circuit Breakers for DC350V-800V	2-2
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Air Circuit Breakers for DC350V-800V

Frame size (A)	1600	2000	2500	2500	3200	4000	
Type	AR216S	AR220S	AR325S	AR325-NDH	AR332S	AR440S	
Rated current (max.) [I_n] A	1600	2000	2500	2500	3200	4000	
Number of poles	3	3	3	4	3	3	
Rated insulation voltage [U_i] V	AC 1000	1000	1000	1000	1000	1000	
Rated operational voltage [U_e] V	DC 600	600	600	800	600	600	
Rated impulse withstand voltage [U_{imp}] kV	12	12	12	12	12	12	
■ Rated breaking cap, kA							
JIS C 8201-2-1 Ann.1 Ann.2	DC	800V	—	—	30/30	—	—
IEC 60947-2	600V	40/40	40/40	40/40	—	40/40	40/40
I_{cu}/I_{cs} ①②	500V	40/40	40/40	40/40	—	40/40	40/40
	350V	40/40	40/40	40/40	—	40/40	40/40
Rated short time withstand current [I_{cw}] kA	1s	40	40	40	30	40	40
Latching current kA		65	65	85	85	85	100
Total breaking time (s)		0.04	0.04	0.04	0.04	0.04	0.04
■ Closing operation time							
Spring charging time (s) max.		10	10	10	10	10	10
Close time (s) max.		0.08	0.08	0.08	0.08	0.08	0.08
■ No. of operating cycles							
Mechanical life	with maintenance	30000	25000	20000	20000	20000	15000
	without maintenance	15000	12000	10000	10000	10000	8000
Electrical life	without maintenance	DC 600V	1000	1000	500	500	500
■ Outline dimension mm							
Draw-out type	a	354	354	460	580	460	631
	b	460	460	460	460	460	460
	c	345	345	345	345	345	375
	d	40	40	40	40	40	53
Weight kg		76	79	105	125	105	139
Reverse connection		Yes	Yes	Yes	Yes	Yes	Yes

Notes:

— : "no" or "not available".

① : AGR over-current release can not be used for DC. Please prepare DC over-current relay and connect with shunt trip device.

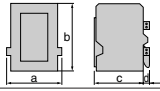
② : The time constant (L/R) of the circuit should be,
less than 2.0ms nearby rated current
less than 15ms for short circuit

(1) Shunt trip device is Instantaneously rated type. Continuously rated shunt trip device is not applicable.

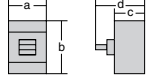
(2) Undervoltage trip device is not applicable.

(3) Test jumper is not applicable.

For further details please contact TERASAKI.



Moulded Case Circuit Breakers for DC350V-600V

Frame size (A)	160	160	250	250	400	800	1000	
Type	\$160-SD	\$160-GD	\$250-SD	\$250-GD	\$400-ND	\$800-ND	\$1000-ND	
Number of poles	3	3	3	3	3	3	2* 3	
■ Ratings								
Rated current, A	25 (16-25) 32 (20-32) 40 (25-40) 63 (40-63) 80 (50-80) 100 (63-100) 125 (80-125) 160 (100-160)	25 (16-25) 32 (20-32) 40 (25-40) 63 (40-63) 80 (50-80) 100 (63-100) 125 (80-125) 160 (100-160)	100 (63-100) 125 (80-125) 160 (100-160) 200 (125-200) 250 (160-250)	100 (63-100) 125 (80-125) 160 (100-160) 200 (125-200) 250 (160-250)	250 (160-250) 400 (250-400)	630 (400-630) 800 (500-800)	1000	
Calibrated at 45°C								
* 2 poles breaker is same outline dimensions as 3 poles breaker.								
Rated insulation voltage [U _i] V	690	690	800	800	800	800	800	
Rated impulse withstand voltage [U _{imp}] kV	8	8	8	8	8	8	8	
■ Rated breaking capacity, kA								
JIS C 8201-2-1 Ann.1 Ann.2 DC	5/5	10/5	5/5	10/5	15/15	20/10	— 20/10	
IEC 60947-2	7.5/7.5	15/7.5	7.5/7.5	15/7.5	15/15	20/10	— 20/10	
I _{cu} /I _{cs} (4) (5)	10/10	—	10/10	—	20/20	30/15	— 30/15	
	—	—	—	—	—	—	50/20 —	
■ External dimensions, mm								
	a	75	75	105	105	140	210	
	b	130+50 (17)	130+50 (17)	165+55 (17)	165+55 (17)	260	273	
	c	68	68	68	68	103	103	
	d	95	95	95	95	145	145	
Weight (● marked standard type) kg	0.8	0.8	1.5	1.5	4.2	8.5	9.8 10.8	
■ Connections and Mountings								
Front-connected (FC)	Terminal screws With extension bars	● ○ (BAR)	● ○ (BAR)	● ○ (BAR)	● ○ (BAR)	— ●	— ●	
Rear-connected (RC)	Flat bar studs	○	○	○	○	○	○	
Plug-in (PM)	For switchboards For distribution boards	— —	— —	— —	— —	— —	— —	
Draw-out type (DR)	—	—	—	—	—	—	—	
TemPlug70 (PG)	—	—	—	—	—	—	—	
TemPlug45B (PG4)	—	—	—	—	—	—	—	
DIN rail mount	○ (1)	○ (1)	—	—	—	—	—	
Clip-in chassis mount	—	—	—	—	—	—	—	
■ Accessories (optional)								
	Symbol							
Interior	Auxiliary switch	A X	●	●	●	●	●	
	Alarm switch	A L	●	●	●	●	●	
	Shunt trips	S H	●	●	●	●	●	
	Undervoltage trips	U V	●	●	●	●	●	
	Motor operator	M C	—	—	●	●	●	
	External operating handle	Breaker-mounted	H B	●	●	●	●	●
		Door-mounted (variable depth)	H P	●	●	●	●	●
		Toggle extension	H A	—	—	—	—	●
	Mechanical interlock	Slide type	M S	—	—	—	—	—
		Rear-connected type	M B	—	—	—	—	—
Link type		M L	—	—	—	—	—	
Wire type		M W	—	—	—	—	—	
Exterior	Toggle holder	H H	●	●	●	●	●	
	Toggle lock	H L	●	●	●	●	●	
	Terminal cover	For front-connected	C F	● (12)	● (12)	● (12)	●	●
		For rear-connected and plug-in	C R	● (12)	● (12)	● (12)	● (12)	● (3)
	Interpole barrier	B A	● (13)	● (13)	● (13)	● (13)	● (3)	
	Terminal block for lead	T F	●	●	●	●	●	
	Door flange	D F	●	●	●	●	●	
■ Standard specifications								
Overcurrent trip mechanism	Adj. thermal, fixed magnetic	Adj. thermal, fixed magnetic	Adj. thermal, fixed magnetic	Adj. thermal, fixed magnetic	Adj. thermal, fixed magnetic	Adj. thermal, fixed magnetic	Fixed thermal, fixed magnetic	
Colour of cover	Grey	Grey	Grey	Grey	Grey	Grey	Grey	
Trip button (Colour)	Yes (Red)	Yes (Red)	Yes (Red)	Yes (Red)	Yes (Red)	Yes (Red)	Yes (Red)	
Handle position indication (ON: Red, OFF: Green)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Suitability for isolation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Reverse connection	Yes	Yes	Yes	Yes	Yes	Yes	Yes	

Notes:

● : Standard. This configuration used unless otherwise specified. ○ : Optional standard. Specify when ordering. ● : "yes" or "available". — : "no" or "not available".

③ : Line side interpole barriers are supplied as standard. (Front connection only)

④ : Connect 3pole or 4pole in series when over DC250V.

⑤ : The time constant (L/R) of the circuit should be,

- less than 2.0ms nearby rated current
- less than 5ms for short circuit ≤ 10KA
- less than 10ms for short circuit ≤ 20KA
- less than 15ms for short circuit > 20KA

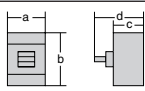
① : Provided with DIN rail adaptor.

② : Be sure to install the terminal covers on Line side (ON side) that is supplied as standard.

③ : Possible to fit on load side (option).

④ : + means the dimension of the terminal cover. See outline dimensions for details.

Moulded Case Circuit Breakers for DC350V-600V

Frame size (A)	1250		1600		2000		2500		3200			
Type	XS1250ND		XS1600ND		XS2000ND		XS2500ND		XS3200ND			
Number of poles	2*	3	2*	3	2*	3	2*	3	2*	3		
Rated current, A	1250 ①		1600 ①		2000 ①		2500 ①		3200 ①			
Calibrated at 45°C												
* 2 poles breaker is same outline dimensions as 3 poles breaker.												
Rated insulation voltage [U _i] V	690		690		690		690		690			
Rated impulse withstand voltage [U _{imp}] kV	8		8		8		8		8			
Rated breaking capacity, kA												
JIS C 8201-2-1 Ann.1 Ann.2	DC	600V	—	20/15	—	20/15	—	20/15	—	20/15		
IEC 60947-2		500V	—	50/25	—	50/25	—	50/25	—	50/25		
i _{cu} /i _{cs} ④⑤		350V	—	50/25	—	50/25	—	50/25	—	50/25		
		250V	50/30	—	50/30	—	50/30	—	50/30	—		
External dimensions, mm												
	a	210	210	320	320	320	320	320	320			
	b	370	370	450	450	450	450	450	450			
	c	140	140	185	185	185	185	185	185			
	d	191	191	245	245	245	245	245	245			
Weight (● marked standard type) kg	23.8	26.0	24.0	27.0	50.0	54.0	55.7	62.5	55.7	62.5		
Connections and Mountings												
Front-connected (FC)	Terminal screws	—	—	—	—	—	—	—	—	—		
	With extension bars	●	○	○	○	○	○	○	○	○		
Rear-connected (RC)	Flat bar studs	○	●	●	●	●	●	●	●	●		
Plug-in (PM)	For switchboards	—	—	—	—	—	—	—	—	—		
	For distribution boards	—	—	—	—	—	—	—	—	—		
Draw-out type (DR)	—	—	○	—	○	—	—	—	—	—		
TemPlug70 (PG)	—	—	—	—	—	—	—	—	—	—		
TemPlug45B (PG4)	—	—	—	—	—	—	—	—	—	—		
DIN rail mount	—	—	—	—	—	—	—	—	—	—		
Clip-in chassis mount	—	—	—	—	—	—	—	—	—	—		
Accessories (optional)	Symbol											
Interior	Auxiliary switch	A X	●	●	●	●	●	●	●	●		
	Alarm switch	A L	●	●	●	●	●	●	●	●		
	Shunt trips	S H	●	●	●	●	●	●	●	●		
	Undervoltage trips	U V	—	—	—	—	—	—	—	—		
	Motor operator	M C	●	●	●	●	●	●	●	●		
	External operating handle	Breaker-mounted	H B	●	●	—	—	—	—	—		
		Door-mounted (variable depth)	H P	●	●	● ⑦	● ⑦	● ⑦	● ⑦	● ⑦		
	Toggle extension	H A	● ⑥	● ⑥	● ②	● ②	● ②	● ②	● ②	● ②		
	Mechanical interlock	Slide type	M S	—	—	—	—	—	—	—		
		Rear-connected type	M B	—	—	—	—	—	—	—		
		Link type	M L	—	—	—	—	—	—	—		
		Wire type	M W	—	—	—	—	—	—	—		
Exterior	Toggle holder	H H	●	●	●	●	●	●	●	●		
	Toggle lock	H L	—	—	—	—	—	—	—	—		
	Terminal cover	For front-connected	C F	—	—	—	—	—	—	—		
		For rear-connected and plug-in	C R	—	—	—	—	—	—	—		
	Interpole barrier	B A	● ③	● ③	—	—	—	—	—	—		
	Terminal block for lead	T F	●	●	●	●	●	●	●	●		
	Door flange	D F	●	●	●	●	●	●	●	●		
Standard specifications												
Overcurrent trip mechanism	Magnetic(adjustable) ①		Magnetic(adjustable) ①		Magnetic(adjustable) ①		Magnetic(adjustable) ①		Magnetic(adjustable) ①			
Colour of cover	Grey		Grey		Grey		Grey		Grey			
Trip button (Colour)	Yes (Red)		Yes (Red)		Yes (Red)		Yes (Red)		Yes (Red)			
Handle position indication (ON: Red, OFF: Green)	Yes		Yes		Yes		Yes		Yes			
Suitability for isolation	Yes		Yes		Non		Non		Non			
Reverse connection	Non		Non		Non		Non		Non			

Notes:

● : Standard. This configuration used unless otherwise specified. ○ : Optional standard. Specify when ordering. ● : "yes" or "available". — : "no" or "not available".

① : Instantaneous trip only.

② : Supplied as standard.

③ : Line side interpole barriers are supplied as standard. (Front connection only)

④ : Connect 3pole in series when over DC250V.

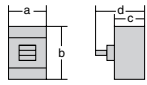
⑤ : The time constant (L/R) of the circuit should be,

- less than 2.0ms nearby rated current
- less than 5ms for short circuit ≤ 10KA
- less than 10ms for short circuit ≤ 20KA
- less than 15ms for short circuit > 20KA

⑥ : One is supplied with every five breakers. Please specify if more are required.

⑦ : Fixed depth. (not adjustable)

Moulded Case Circuit Breakers for DC750V-1000V

Frame size (A)	160	160	160	250	250	
Type	PVE160-SDL	PVS160-SDL	PVS160-SDH	PVS250-SDL	PVS250-SDH	
Number of poles	3	3 4	4	3 4	4	
■ Ratings						
Rated current, A	25 (16-25) 32 (20-32) 40 (25-40) 63 (40-63) 80 (50-80) 100 (63-100) 125 (80-125) 160 (100-160)	50 (32-50) 63 (40-63) 100 (63-100) 125 (80-125) 160 (100-160)	50 (32-50) 63 (40-63) 100 (63-100) 125 (80-125) 160 (100-160)	50 (32-50) 63 (40-63) 100 (63-100) 125 (80-125) 160 (100-160) 200 (125-200) 250 (160-250)	100 (63-100) 125 (80-125) 160 (100-160) 200 (125-200) 250 (160-250)	100 (63-100) 125 (80-125) 160 (100-160) 200 (125-200) 250 (160-250)
Calibrated at 45°C						
* 2 poles breaker is same outline dimensions as 3 poles breaker.						
Rated insulation voltage [U _i] V AC	800	800	800	1000	1000	
Rated impulse withstand voltage [U _{imp}] kV	8	8	8	8	8	
■ Rated breaking capacity, kA						
JIS C 8201-2-1 Ann.1 Ann.2 DC 1000V	—	—	—	5/5	—	
IEC 60947-2 I _{cu} /I _{cs} ①② 750V	3/3	5/5	10/5	—	5/5	
■ External dimensions, mm						
	a 75 b 130+50×2 ⑰ c 68 d 95	a 105 b 165+55×2 ⑰ c 68 d 95	a 140 b 165+55×2 ⑰ c 68 d 95	a 140 b 165+55×2 ⑰ c 68 d 95	a 140 b 165+55×2 ⑰ c 68 d 95	
Weight (● marked standard type) kg	0.8	1.5	1.9	1.9	1.9	
■ Connections and Mountings						
Front-connected (FC) Terminal screws	●	●	●	●	●	
With extension bars	○ (BAR)	○ (BAR)	○ (BAR)	○ (BAR)	○ (BAR)	
Rear-connected (RC) Flat bar studs	○	○	○	○	○	
Plug-in (PM) For switchboards	—	—	—	—	—	
For distribution boards	—	—	—	—	—	
Draw-out type (DR)	—	—	—	—	—	
TemPlug70 (PG)	—	—	—	—	—	
TemPlug45B (PG4)	—	—	—	—	—	
DIN rail mount	—	—	—	—	—	
Clip-in chassis mount	—	—	—	—	—	
■ Accessories (optional) Symbol						
Interior						
Auxiliary switch A X	●	●	●	●	●	
Alarm switch A L	●	●	●	●	●	
Shunt trips S H	●	●	●	●	●	
Undervoltage trips U V	●	●	●	●	●	
Motor operator M C	—	●	●	●	●	
External operating Breaker-mounted H B	●	●	●	●	●	
handle Door-mounted (variable depth) H P	●	●	●	●	●	
Toggle extension H A	—	—	—	—	—	
Mechanical interlock Slide type M S	—	—	—	—	—	
Rear-connected type M B	—	—	—	—	—	
Link type M L	—	—	—	—	—	
Wire type M W	—	—	—	—	—	
Exterior						
Toggle holder H H	●	●	●	●	●	
Toggle lock H L	●	●	●	●	●	
Terminal cover For front-connected C F	● ⑧	● ⑧	● ⑧	● ⑧	● ⑧	
For rear-connected and plug-in C R	● ⑧	● ⑧	● ⑧	● ⑧	● ⑧	
Interpole barrier B A	—	—	—	—	—	
Terminal block for lead T F	●	●	●	●	●	
Door flange D F	●	●	●	●	●	
■ Standard specifications						
Overcurrent trip mechanism	Adj. thermal, fixed magnetic	Adj. thermal, fixed magnetic	Adj. thermal, fixed magnetic	Adj. thermal, fixed magnetic	Adj. thermal, fixed magnetic	
Colour of cover	Grey	Grey	Grey	Grey	Grey	
Trip button (Colour)	Yes (Red)	Yes (Red)	Yes (Red)	Yes (Red)	Yes (Red)	
Handle position indication (ON: Red, OFF: Green)	Yes	Yes	Yes	Yes	Yes	
Suitability for isolation	Yes	Yes	Yes	Yes	Yes	
Reverse connection	Yes	Yes	Yes	Yes	Yes	

Notes:

● : Standard. This configuration used unless otherwise specified. ○ : Optional standard. Specify when ordering. ● : "yes" or "available". — : "no" or "not available".

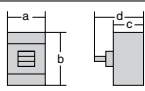
① : Connect 3poles or 4poles in series.

② : The time constant (L/R) of the circuit should be,
 less than 2.0ms nearby rated current
 less than 5ms for short circuit ≤ 10KA
 less than 10ms for short circuit ≤ 20KA
 less than 15ms for short circuit > 20KA

⑧ : Two terminal covers are supplied as standard. Be sure to install the terminal covers on Line side (ON side) and Load side (OFF side).

⑰ : + means the dimension of the terminal cover. See outline dimensions for details.

Moulded Case Circuit Breakers for DC750V-1000V

Frame size (A)	400		400	800		800		
Type	PVS400-NDL		PVS400-NDH	PVS800-NDL		PVS800-NDH		
Number of poles	3	4	4	3	4	4		
■ Ratings								
Rated current, A	250 (160-250)	250 (160-250)	250 (160-250)	630 (400-630)	630 (400-630)	630 (400-630)		
Calibrated at 45°C	400 (250-400)	400 (250-400)	400 (250-400)	800 (500-800)	800 (500-800)	800 (500-800)		
* 2 poles breaker is same outline dimensions as 3 poles breaker.								
Rated insulation voltage $[U_i]$ V	800	1150	1150	800	1150	1150		
Rated impulse withstand voltage $[U_{imp}]$ kV	8	8	8	8	8	8		
■ Rated breaking capacity, kA								
JIS C 8201-2-1 Ann.1 Ann.2 DC 1000V	—	—	5/5	—	—	5/5		
IEC 60947-2 I_{cu}/I_{cs} ①② 750V	10/5	10/10	—	10/10	10/10	—		
■ External dimensions, mm								
	a	140	185	185	210	280	280	
	b	260	260	260	273	273	273	
	c	103	103	103	103	103	103	
	d	145	145	145	145	145	145	
Weight (● marked standard type) kg	4.2	5.6	5.6	8.5	11.5	11.5		
■ Connections and Mountings								
Front-connected (FC) Terminal screws	●	●	●	—	—	—		
With extension bars	○ (BAR)	○ (BAR)	○ (BAR)	●	●	●		
Rear-connected (RC) Flat bar studs	○	○	○	○	○	○		
Plug-in (PM) For switchboards	—	—	—	—	—	—		
For distribution boards	—	—	—	—	—	—		
Draw-out type (DR)	—	—	—	—	—	—		
TemPlug70 (PG)	—	—	—	—	—	—		
TemPlug45B (PG4)	—	—	—	—	—	—		
DIN rail mount	—	—	—	—	—	—		
Clip-in chassis mount	—	—	—	—	—	—		
■ Accessories (optional)	Symbol							
Interior	Auxiliary switch A X	●	●	●	●	●		
	Alarm switch A L	●	●	●	●	●		
	Shunt trips S H	●	●	●	●	●		
	Undervoltage trips U V	●	●	●	●	●		
	Motor operator M C	●	●	●	●	●		
	External operating handle Breaker-mounted H B	●	●	●	●	●		
	Door-mounted (variable depth) H P	●	●	●	●	●		
	Toggle extension H A	—	—	—	●	●	●	
	Mechanical interlock	Slide type M S	—	—	—	—	—	
		Rear-connected type M B	—	—	—	—	—	
Link type M L		—	—	—	—	—		
Wire type M W		—	—	—	—	—		
Exterior	Toggle holder H H	●	●	●	●	●		
	Toggle lock H L	●	●	●	●	●		
	Terminal cover	For front-connected C F	●	●	●	●	●	
		For rear-connected and plug-in C R	●	●	●	●	●	
	Interpole barrier B A	● 16	● 9	● 9	● 16	● 10	● 10	
	Terminal block for lead T F	●	●	●	●	●	●	
	Door flange D F	—	—	—	—	—	—	
■ Standard specifications								
Overcurrent trip mechanism	Adj. thermal, fixed magnetic	Adj. thermal, fixed magnetic	Adj. thermal, fixed magnetic	Adj. thermal, fixed magnetic	Adj. thermal, fixed magnetic	Adj. thermal, fixed magnetic		
Colour of cover	Grey	Grey	Grey	Grey	Grey	Grey		
Trip button (Colour)	Yes (Red)	Yes (Red)	Yes (Red)	Yes (Red)	Yes (Red)	Yes (Red)		
Handle position indication (ON: Red, OFF: Green)	Yes	Yes	Yes	Yes	Yes	Yes		
Suitability for isolation	Yes	Yes	Yes	Yes	Yes	Yes		
Reverse connection	Yes	Yes	Yes	Yes	Yes	Yes		

Notes:

● : Standard. This configuration used unless otherwise specified. ○ : Optional standard. Specify when ordering. ● : "yes" or "available". — : "no" or "not available".

① : Connect 3poles or 4poles in series.

② : The time constant (L/R) of the circuit should be, less than 2.0ms nearby rated current
less than 5ms for short circuit $\leq 10KA$
less than 10ms for short circuit $\leq 20KA$
less than 15ms for short circuit $> 20KA$

⑨ : For front connection, both line and load side interpole barriers are supplied as standard.

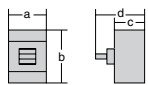
For rear connection, line side interpole barriers are supplied as standard.

⑩ : For front connection, 5pcs line side interpole barriers and 3pcs load side interpole barriers are supplied as standard.

For rear connection, 5pcs line side interpole barriers are supplied as standard.

16 : For front connection and rear connection, 2pcs line side interpole barriers are supplied as standard.

Switch-disconnectors for DC600V-1000V

Frame size (A)	160	160	160	250	250	250		
Type	S160-SDN	PVS160-SNL	PVS160-SNH	S250-SDN	PVS250-SNL	PVS250-SNH		
Number of poles	3	4	4	3	4	4		
■ Ratings								
Rated current, A	160	160	160	250	250	250		
Rated insulation voltage [U_i] V	690	800	1000	800	800	1000		
Rated operational voltage V	600	800	1000	600	800	1000		
Rated short time withstand current, kA	2 (0.3sec.)	3 (0.3sec.)	3 (0.3sec.)	3 (0.3sec.)	3 (0.3sec.)	3 (0.3sec.)		
Rated impulse withstand voltage [U_{imp}] kV	8	8	8	8	8	8		
■ Performance								
Utilization category ①⑱	DC	DC-22A	DC-22A	DC-22A	DC-22A	DC-22A		
JIS C 8201-3 IEC 60947-3								
■ External dimensions, mm								
	a	75	140	140	105	140		
	b	130+50 ⑰	165+55×2 ⑰	165+55×2 ⑰	165+55 ⑰	165+55×2 ⑰	165+55×2 ⑰	
	c	68	68	68	68	68		
	d	95	95	95	95	95		
Weight (● marked standard type) kg	0.8	1.9	1.9	1.5	1.9	1.9		
■ Connections and Mountings								
Front-connected (FC)	Terminal screws With extension bars	● ○ (BAR)	● ○ (BAR)	● ○ (BAR)	● ○ (BAR)	● ○ (BAR)		
Rear-connected (RC)	Flat bar studs	○	○	○	○	○		
Plug-in (PM)	For switchboards For distribution boards	—	—	—	—	—		
Draw-out type (DR)		—	—	—	—	—		
TemPlug70 (PG)		—	—	—	—	—		
TemPlug45B (PG4)		—	—	—	—	—		
DIN rail mount		○ ⑪	—	—	—	—		
Clip-in chassis mount		—	—	—	—	—		
■ Accessories (optional)	Symbol							
Interior	Auxiliary switch	A X	●	●	●	●		
	Alarm switch	A L	●	●	●	●		
	Shunt trips	S H	●	●	●	●		
	Undervoltage trips	U V	●	●	●	●		
	Motor operator	M C	—	●	●	●		
	External operating handle	Breaker-mounted Door-mounted (variable depth)	H B H P	● ●	● ●	● ●	● ●	
	Toggle extension	H A	—	—	—	—		
	Exterior	Mechanical interlock	Slide type Rear-connected type	M S M B	— —	— —	— —	— —
		Link type	M L	—	—	—	—	
		Wire type	M W	—	—	—	—	
Toggle holder		H H	●	●	●	●		
Toggle lock	H L	●	●	●	●			
Terminal cover	For front-connected	C F	● ⑫	● ⑧	● ⑫	● ⑧		
	For rear-connected and plug-in	C R	● ⑫	● ⑧	● ⑫	● ⑧		
Interpole barrier	B A	● ⑬	—	● ⑬	—			
Terminal block for lead	T F	●	●	●	●			
Door flange	D F	●	●	●	●			
■ Standard specifications								
Colour of cover	Grey	Grey	Grey	Grey	Grey	Grey		
Trip button (Colour)	Yes (Red)	Yes (Red)	Yes (Red)	Yes (Red)	Yes (Red)	Yes (Red)		
Handle position indication (ON: Red, OFF: Green)	Yes	Yes	Yes	Yes	Yes	Yes		
Suitability for isolation	Yes	Yes	Yes	Yes	Yes	Yes		
Reverse connection	Yes	Yes	Yes	Yes	Yes	Yes		

Notes:

● : Standard. This configuration used unless otherwise specified. ○ : Optional standard. Specify when ordering. ● : "yes" or "available". — : "no" or "not available".

① : Connect 3poles or 4poles in series.

⑧ : Two terminal covers are supplied as standard. Be sure to install the terminal covers on Line side (ON side) and Load side (OFF side).

⑪ : Provided with DIN rail adaptor.

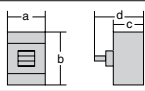
⑫ : Be sure to install the terminal covers on Line side (ON side) that is supplied as standard.

⑬ : Possible to fit on load side (option).

⑰ : + means the dimension of the terminal cover. See outline dimensions for details.

⑱ : The time constant (L/R) of the circuit should be less than 2.0ms nearby rated current.

Switch-disconnectors for DC600V-1000V

Frame size (A)	400	400	800	800				
Type	PVS400-NNL	PVS400-NNH	PVS800-NNL	PVS800-NNH				
Number of poles	4	4	4	4				
■ Ratings								
Rated current, A	400	400	630 800	630 800				
Rated insulation voltage [U_i] V	1150	1150	1150	1150				
Rated operational voltage V	800	1000	800	1000				
Rated short time withstand current, kA	5 (0.3sec.)	5 (0.3sec.)	10 (0.3sec.)	10 (0.3sec.)				
Rated impulse withstand voltage [U_{imp}] kV	8	8	8	8				
■ Performance								
Utilization category ①⑱	DC	DC-22A	DC-22A	DC-22A				
JIS C 8201-3 IEC 60947-3								
■ External dimensions, mm								
	a	185	185	280	280			
	b	260	260	273	273			
	c	103	103	103	103			
	d	145	145	145	145			
Weight (● marked standard type) kg	5.6	5.6	11.5	11.5				
■ Connections and Mountings								
Front-connected (FC)	Terminal screws	●	●	—	—	—	—	
	With extension bars	○ (BAR)	○ (BAR)	●	●	—	—	
Rear-connected (RC)	Flat bar studs	○	○	○	○	—	—	
Plug-in (PM)	For switchboards	—	—	—	—	—	—	
	For distribution boards	—	—	—	—	—	—	
Draw-out type (DR)		—	—	—	—	—	—	
TemPlug70 (PG)		—	—	—	—	—	—	
TemPlug45B (PG4)		—	—	—	—	—	—	
DIN rail mount		—	—	—	—	—	—	
Clip-in chassis mount		—	—	—	—	—	—	
■ Accessories (optional)	Symbol							
Interior	Auxiliary switch	A X	●	●	●	●	—	
	Alarm switch	A L	●	●	●	●	—	
	Shunt trips	S H	●	●	●	●	—	
	Undervoltage trips	U V	●	●	●	●	—	
	Motor operator	M C	●	●	●	●	—	
	External operating handle	Breaker-mounted Door-mounted (variable depth)	H B H P	● ●	● ●	● ●	● ●	— —
	Toggle extension	H A	—	—	●	●	—	
	Exterior	Mechanical interlock	Slide type	M S	—	—	—	—
			Rear-connected type	M B	—	—	—	—
		Toggle holder	Link type	M L	—	—	—	—
Wire type			M W	—	—	—	—	
Toggle lock			H H	●	●	●	●	—
Terminal cover	Toggle lock	H L	—	—	—	—		
	For front-connected	C F	●	●	●	●	—	
	For rear-connected and plug-in	C R	●	●	●	●	—	
Interpole barrier	B A	●⑨	●⑨	●⑩	●⑩	—		
Terminal block for lead	T F	●	●	●	●	—		
Door flange	D F	—	—	—	—	—		
■ Standard specifications								
Colour of cover	Grey	Grey	Grey	Grey				
Trip button (Colour)	Yes (Red)	Yes (Red)	Yes (Red)	Yes (Red)				
Handle position indication (ON: Red, OFF: Green)	Yes	Yes	Yes	Yes				
Suitability for isolation	Yes	Yes	Yes	Yes				
Reverse connection	Yes	Yes	Yes	Yes				

- Notes:**
 ● : Standard. This configuration used unless otherwise specified. ○ : Optional standard. Specify when ordering. ● : "yes" or "available". — : "no" or "not available".
 ① : Connect 4poles in series.
 ⑨ : For front connection, both line and load side interpole barriers are supplied as standard. For rear connection, line side interpole barriers are supplied as standard.
 ⑩ : For front connection, 5pcs line side interpole barriers and 3pcs load side interpole barriers are supplied as standard. For rear connection, 5pcs line side interpole barriers are supplied as standard.
 ⑱ : The time constant (L/R) of the circuit should be less than 2.0ms nearby rated current.

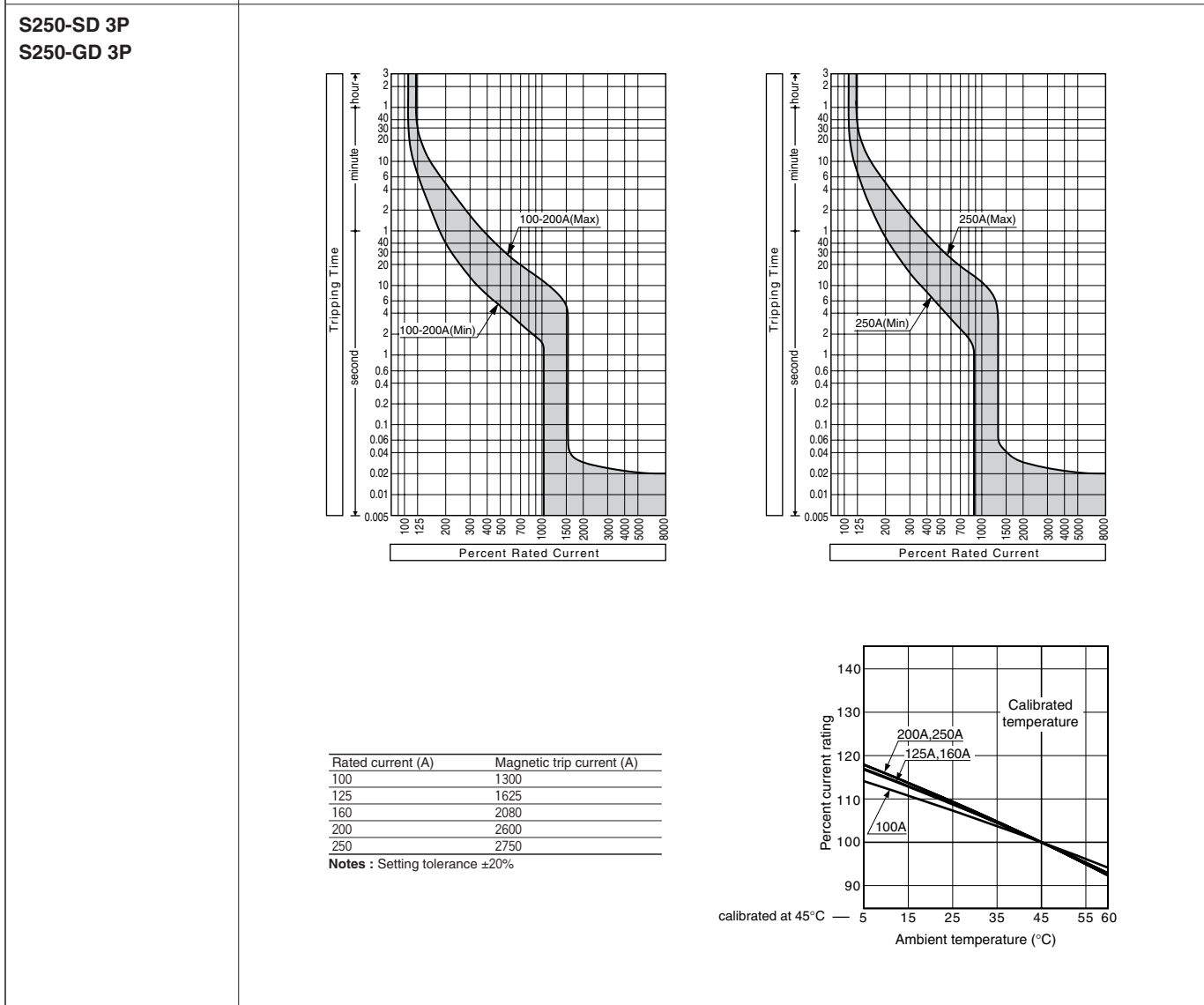
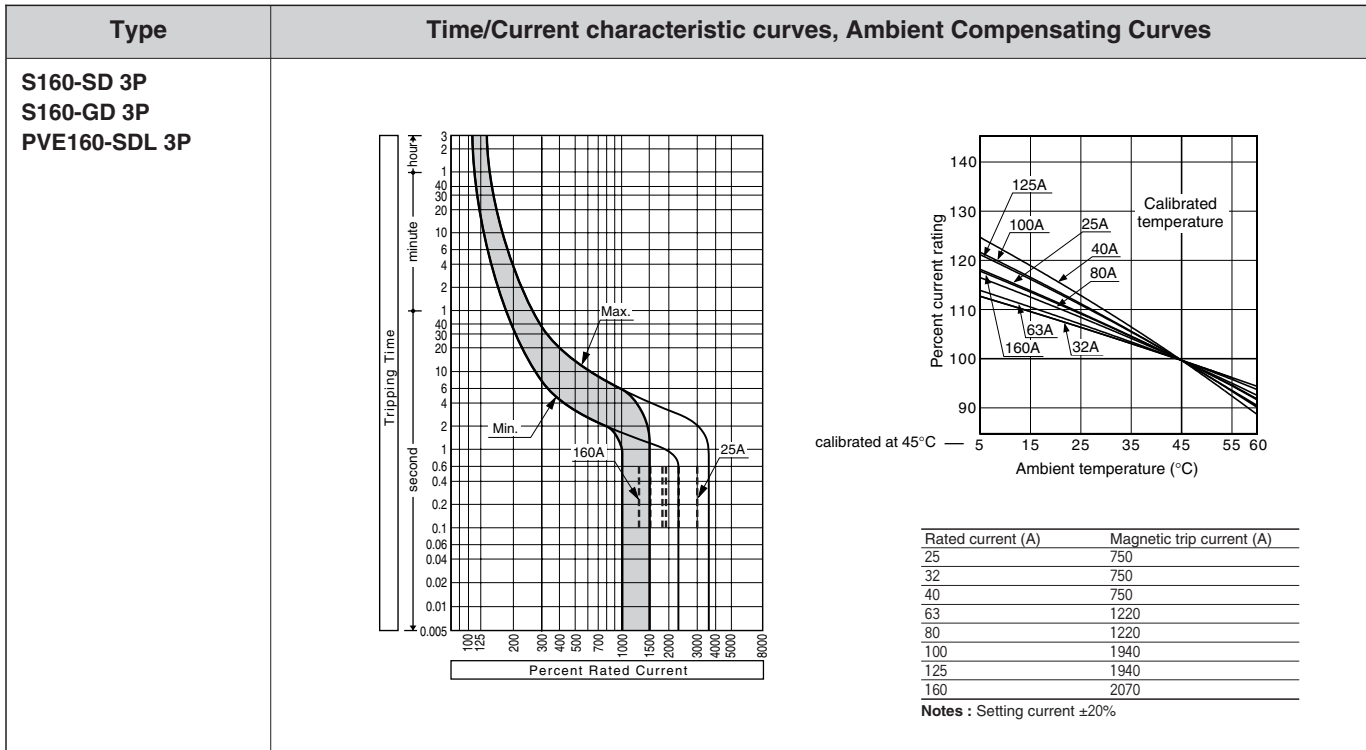
3

Characteristics

Time/Current characteristic curves, Ambient Compensating Curves

S160-SD, S160-GD, PVE160-SDL, S250-SD, S250-GD 3P	3-2
S400-ND, S800-ND 3P	3-3
S1000-ND 2P, 3P	3-3
XS1250ND, XS1600ND, XS2000ND 2P, 3P	3-4
XS2500ND, XS3200ND 2P, 3P	3-5
PVS160-SDL, PVS250-SDL 3P, 4P	3-6
PVS160-SDH, PVS250-SDH 4P	3-6
PVS400-NDL 3P	3-6
PVS400-NDL, PVS400-NDH, PVS800-NDH 4P	3-7
PVS800-NDL 3P, 4P	3-7

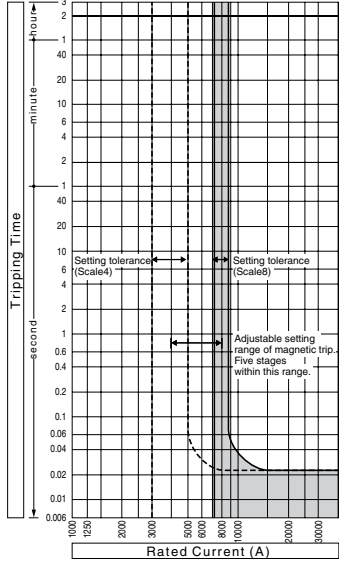
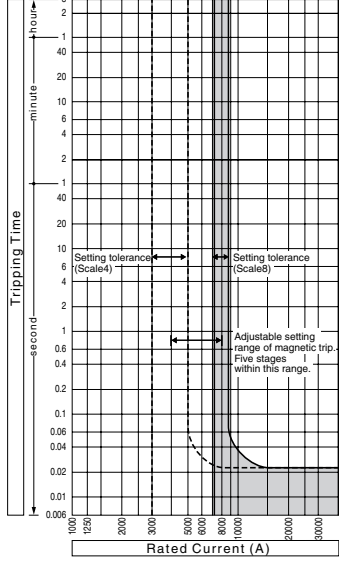
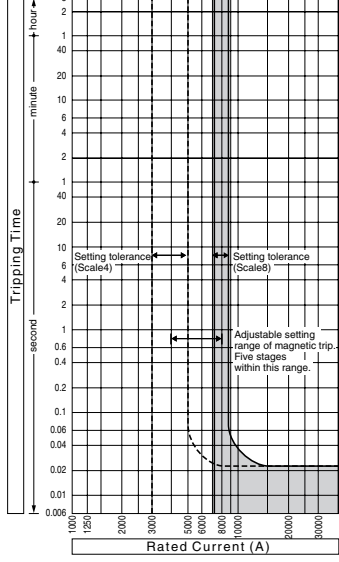
Time/Current characteristic curves, Ambient Compensating Curves



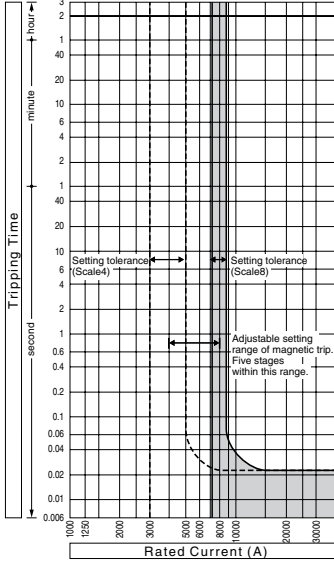
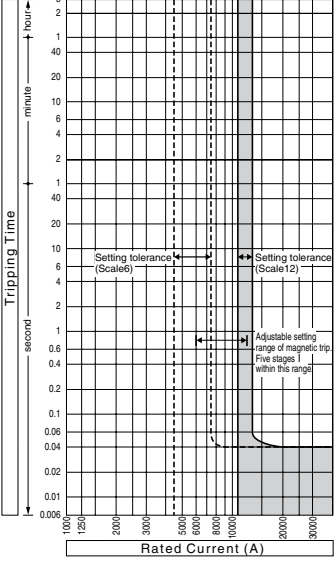
Time/Current characteristic curves, Ambient Compensating Curves

Type	Time/Current characteristic curves, Ambient Compensating Curves							
S400-ND 3P		<p>calibrated at 45°C</p> <table border="1"> <thead> <tr> <th>Rated current (A)</th> <th>Magnetic trip current (A)</th> </tr> </thead> <tbody> <tr> <td>250</td> <td>3000</td> </tr> <tr> <td>400</td> <td>4800</td> </tr> </tbody> </table> <p>Notes : Setting tolerance $\pm 20\%$</p>	Rated current (A)	Magnetic trip current (A)	250	3000	400	4800
Rated current (A)	Magnetic trip current (A)							
250	3000							
400	4800							
S800-ND 3P		<p>calibrated at 45°C</p> <table border="1"> <thead> <tr> <th>Rated current (A)</th> <th>Magnetic trip current (A)</th> </tr> </thead> <tbody> <tr> <td>630</td> <td>6300</td> </tr> <tr> <td>800</td> <td>8000</td> </tr> </tbody> </table> <p>Notes : Setting tolerance $\pm 20\%$</p>	Rated current (A)	Magnetic trip current (A)	630	6300	800	8000
Rated current (A)	Magnetic trip current (A)							
630	6300							
800	8000							
S1000-ND 2P, 3P		<p>calibrated at 45°C</p> <table border="1"> <thead> <tr> <th>Rated current (A)</th> <th>Magnetic trip current (A)</th> </tr> </thead> <tbody> <tr> <td>1000</td> <td>8000</td> </tr> </tbody> </table> <p>Notes : Setting tolerance $\pm 20\%$</p>	Rated current (A)	Magnetic trip current (A)	1000	8000		
Rated current (A)	Magnetic trip current (A)							
1000	8000							

Time/Current characteristic curves, Ambient Compensating Curves

Type	Time/Current characteristic curves, Ambient Compensating Curves												
XS1250ND 2P, 3P		<table border="1" data-bbox="831 734 1412 792"> <thead> <tr> <th>Rated current (A) Scale</th> <th colspan="4">Magnetic trip current (A)</th> </tr> </thead> <tbody> <tr> <td>1250</td> <td>8000</td> <td>7100</td> <td>6300</td> <td>5000</td> <td>4000</td> </tr> </tbody> </table> <p data-bbox="831 797 1300 819">Notes : Setting tolerance $\pm 10\%$ at 8000A and $\pm 25\%$ for other settings.</p> <p data-bbox="831 875 1292 898">Note: Magnetic trip only. Use the external over-current relay.</p>	Rated current (A) Scale	Magnetic trip current (A)				1250	8000	7100	6300	5000	4000
Rated current (A) Scale	Magnetic trip current (A)												
1250	8000	7100	6300	5000	4000								
XS1600ND 2P, 3P		<table border="1" data-bbox="831 1348 1412 1406"> <thead> <tr> <th>Rated current (A) Scale</th> <th colspan="4">Magnetic trip current (A)</th> </tr> </thead> <tbody> <tr> <td>1600</td> <td>8000</td> <td>7100</td> <td>6300</td> <td>5000</td> <td>4000</td> </tr> </tbody> </table> <p data-bbox="831 1411 1300 1433">Notes : Setting tolerance $\pm 10\%$ at 8000A and $\pm 25\%$ for other settings.</p> <p data-bbox="831 1489 1292 1512">Note: Magnetic trip only. Use the external over-current relay.</p>	Rated current (A) Scale	Magnetic trip current (A)				1600	8000	7100	6300	5000	4000
Rated current (A) Scale	Magnetic trip current (A)												
1600	8000	7100	6300	5000	4000								
XS2000ND 2P, 3P		<table border="1" data-bbox="831 1962 1412 2020"> <thead> <tr> <th>Rated current (A) Scale</th> <th colspan="4">Magnetic trip current (A)</th> </tr> </thead> <tbody> <tr> <td>2000</td> <td>8000</td> <td>7100</td> <td>6300</td> <td>5000</td> <td>4000</td> </tr> </tbody> </table> <p data-bbox="831 2024 1300 2047">Notes : Setting tolerance $\pm 10\%$ at 8000A and $\pm 25\%$ for other settings.</p> <p data-bbox="831 2103 1292 2125">Note: Magnetic trip only. Use the external over-current relay.</p>	Rated current (A) Scale	Magnetic trip current (A)				2000	8000	7100	6300	5000	4000
Rated current (A) Scale	Magnetic trip current (A)												
2000	8000	7100	6300	5000	4000								

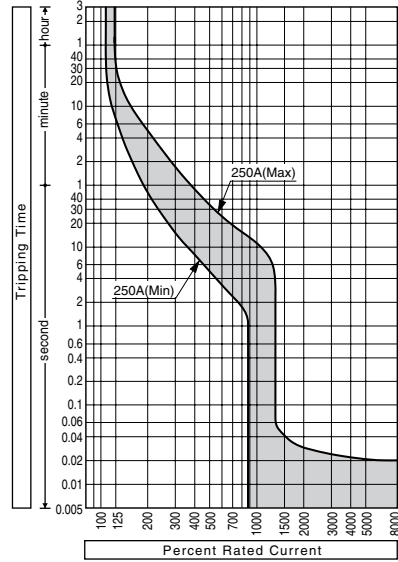
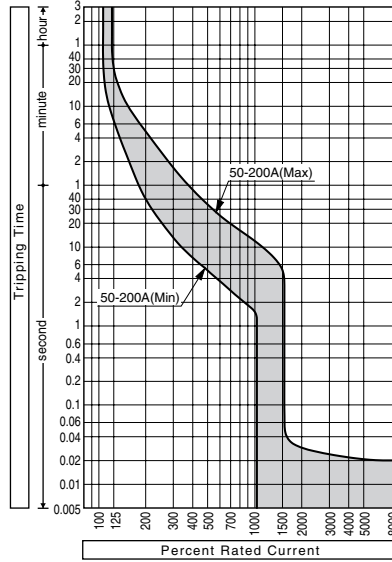
Time/Current characteristic curves, Ambient Compensating Curves

Type	Time/Current characteristic curves, Ambient Compensating Curves												
<p>XS2500ND 2P, 3P</p>	 <table border="1" data-bbox="874 734 1460 795"> <thead> <tr> <th>Rated current (A) Scale</th> <th>8</th> <th>7.1</th> <th>6.3</th> <th>5</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>2500</td> <td>8000</td> <td>7100</td> <td>6300</td> <td>5000</td> <td>4000</td> </tr> </tbody> </table> <p>Notes : Setting tolerance $\pm 10\%$ at 8000A and $\pm 25\%$ for other settings.</p> <p>Note: Magnetic trip only. Use the external over-current relay.</p>	Rated current (A) Scale	8	7.1	6.3	5	4	2500	8000	7100	6300	5000	4000
Rated current (A) Scale	8	7.1	6.3	5	4								
2500	8000	7100	6300	5000	4000								
<p>XS3200ND 2P, 3P</p>	 <table border="1" data-bbox="874 1348 1460 1408"> <thead> <tr> <th>Rated current (A) Scale</th> <th>12</th> <th>11</th> <th>10</th> <th>8</th> <th>6</th> </tr> </thead> <tbody> <tr> <td>3200</td> <td>12000</td> <td>11000</td> <td>10000</td> <td>8000</td> <td>6000</td> </tr> </tbody> </table> <p>Notes : Setting tolerance $\pm 10\%$ at 12000A and $\pm 25\%$ for other settings.</p> <p>Note: Magnetic trip only. Use the external over-current relay.</p>	Rated current (A) Scale	12	11	10	8	6	3200	12000	11000	10000	8000	6000
Rated current (A) Scale	12	11	10	8	6								
3200	12000	11000	10000	8000	6000								

Time/Current characteristic curves, Ambient Compensating Curves

Type Time/Current characteristic curves, Ambient Compensating Curves

PVS160-SDL 3P, 4P
 PVS160-SDH 4P
 PVS250-SDL 3P, 4P
 PVS250-SDH 4P



PVS160-SDL, PVS160-SDH

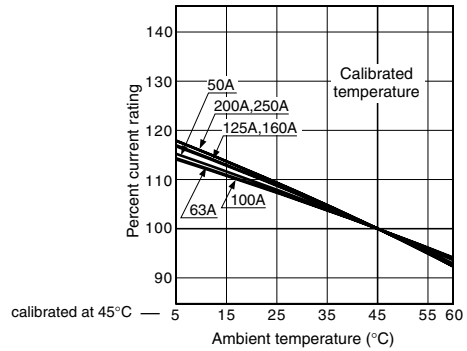
Rated current (A)	Magnetic trip current (A)
50	650
63	819
100	1300
125	1625
160	2080

Notes : Setting tolerance $\pm 20\%$

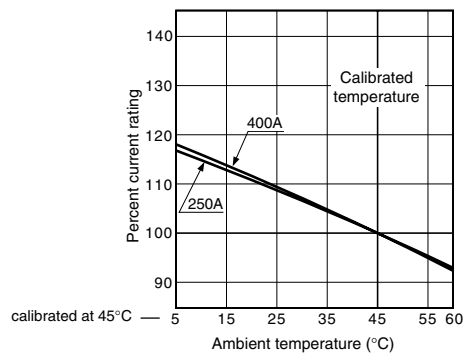
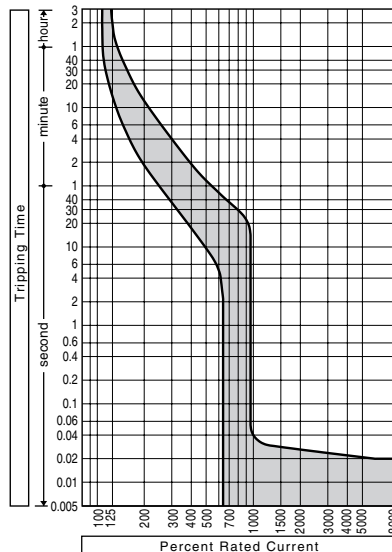
PVS250-SDL, PVS250-SDH

Rated current (A)	Magnetic trip current (A)
100	1300
125	1625
160	2080
200	2600
250	2750

Notes : Setting tolerance $\pm 20\%$



PVS400-NDL 3P



Rated current (A)	Magnetic trip current (A)
250	2000
400	3200

Notes : Setting tolerance $\pm 20\%$

Time/Current characteristic curves, Ambient Compensating Curves

Type	Time/Current characteristic curves, Ambient Compensating Curves							
PVS400-NDL 4P		<table border="1" data-bbox="1037 795 1436 862"> <thead> <tr> <th>Rated current (A)</th> <th>Magnetic trip current (A)</th> </tr> </thead> <tbody> <tr> <td>250</td> <td>3000</td> </tr> <tr> <td>400</td> <td>4800</td> </tr> </tbody> </table> <p data-bbox="1037 862 1260 884">Notes : Setting tolerance $\pm 20\%$</p>	Rated current (A)	Magnetic trip current (A)	250	3000	400	4800
Rated current (A)	Magnetic trip current (A)							
250	3000							
400	4800							
PVS400-NDH 4P		<table border="1" data-bbox="1037 1411 1436 1478"> <thead> <tr> <th>Rated current (A)</th> <th>Magnetic trip current (A)</th> </tr> </thead> <tbody> <tr> <td>250</td> <td>2000</td> </tr> <tr> <td>400</td> <td>3200</td> </tr> </tbody> </table> <p data-bbox="1037 1478 1260 1500">Notes : Setting tolerance $\pm 20\%$</p>	Rated current (A)	Magnetic trip current (A)	250	2000	400	3200
Rated current (A)	Magnetic trip current (A)							
250	2000							
400	3200							
PVS800-NDL 3P, 4P PVS800-NDH 4P		<table border="1" data-bbox="1037 2016 1436 2083"> <thead> <tr> <th>Rated current (A)</th> <th>Magnetic trip current (A)</th> </tr> </thead> <tbody> <tr> <td>630</td> <td>3500</td> </tr> <tr> <td>800</td> <td>3500</td> </tr> </tbody> </table> <p data-bbox="1037 2083 1260 2105">Notes : Setting tolerance $\pm 20\%$</p>	Rated current (A)	Magnetic trip current (A)	630	3500	800	3500
Rated current (A)	Magnetic trip current (A)							
630	3500							
800	3500							

4 Mounting and Connection

Connection of conductors to DC circuit breakers	4-2
Insulation distance DC600V or less	4-7
Insulation distance DC750V-1000V	
PVE160-SDL 3P	4-8
PVS160-SDL 3P, PVS250-SDL 3P	4-9
PVS160-SDL 4P, PVS250-SDL 4P, PVS160-SNL 4P, PVS250-SNL 4P	4-10
PVS160-SDH 4P, PVS250-SDH 4P	4-11
PVS160-SNH 4P, PVS250-SNH 4P	4-12
PVS400-NDL 3P	4-13
PVS400-NDL 4P, PVS400-NDH 4P	4-14
PVS400-NNL 4P, PVS400-NNH 4P	4-15
PVS800-NDL 3P	4-16
PVS800-NDL 4P, PVS800-NDH 4P	4-17
PVS800-NNL 4P, PVS800-NNH 4P	4-18

Connection of conductors to DC circuit breakers

It is more difficult to interrupt DC current than AC current because DC current does not have a zero point. Therefore for high DC voltages, 3-pole or 4-pole circuit breaker main contacts are connected in series to ensure breaking performance. As illustrated below, the main power conductors for DC-use air circuit breakers, moulded case circuit breakers, and switch disconnectors shall be connected generally as shown below but also depending on the type of breaker, the number of poles, and the DC operating voltage.

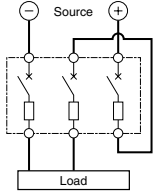
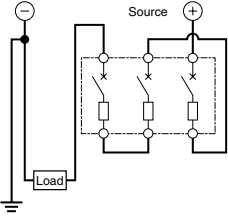
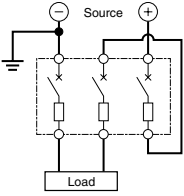
		Non-grounded system (Protection + Isolation function)		Grounded system (Protection)		Grounded system (Protection + Isolation function)	
		Ordinally connection					
		Reverse connection					
Type of breakers	No.s of poles	Applicable voltage (V)	Rated breaking capacity I_{cu}/I_{cs}	Applicable voltage (V)	Rated breaking capacity I_{cu}/I_{cs}	Applicable voltage (V)	Rated breaking capacity I_{cu}/I_{cs}
S1000-ND	2P	≤ 250	50kA/20kA	≤ 250	50kA/20kA	≤ 150	50kA/20kA

* : 2 poles breaker is a 3 pole breaker with the center pole omitted.

		Non-grounded system (Protection + Isolation function)		Grounded system (Protection)		Grounded system (Protection + Isolation function)	
		Ordinally connection					
		Reverse connection					
Type of breakers	No.s of poles	Applicable voltage (V)	Rated breaking capacity I_{cu}/I_{cs}	Applicable voltage (V)	Rated breaking capacity I_{cu}/I_{cs}	Applicable voltage (V)	Rated breaking capacity I_{cu}/I_{cs}
XS1250ND	2P	≤ 250	50kA/30kA	≤ 250	50kA/30kA	≤ 150	50kA/30kA
XS1600ND	2P	≤ 250	50kA/30kA	≤ 250	50kA/30kA	≤ 150	50kA/30kA
XS2000ND	2P	≤ 250	50kA/30kA	≤ 250	50kA/30kA	≤ 150	50kA/30kA
XS2500ND	2P	≤ 250	50kA/30kA	≤ 250	50kA/30kA	≤ 150	50kA/30kA
XS3200ND	2P	≤ 250	50kA/30kA	≤ 250	50kA/30kA	≤ 150	50kA/30kA

* : 2 poles breaker is a 3 pole breaker with the center pole omitted.

Connection of conductors to DC circuit breakers

		Non-grounded system (Protection + Isolation function)		Grounded system (Protection)		Grounded system (Protection + Isolation function)	
Ordinally connection							
Type of breakers	No.s of poles	Applicable voltage (V)	Rated breaking capacity I_{cu}/I_{cs}	Applicable voltage (V)	Rated breaking capacity I_{cu}/I_{cs}	Applicable voltage (V)	Rated breaking capacity I_{cu}/I_{cs}
XS1250ND	3P	≤ 600	20kA/15kA	≤ 600	20kA/15kA	≤ 400	20kA/15kA
XS1250ND	3P	≤ 500	50kA/25kA	≤ 500	50kA/25kA	≤ 350	50kA/25kA
XS1600ND	3P	≤ 600	20kA/15kA	≤ 600	20kA/15kA	≤ 400	20kA/15kA
XS1600ND	3P	≤ 500	50kA/25kA	≤ 500	50kA/25kA	≤ 350	50kA/25kA
XS2000ND	3P	≤ 600	20kA/15kA	≤ 600	20kA/15kA	≤ 400	20kA/15kA
XS2000ND	3P	≤ 500	50kA/25kA	≤ 500	50kA/25kA	≤ 350	50kA/25kA
XS2500ND	3P	≤ 600	20kA/15kA	≤ 600	20kA/15kA	≤ 400	20kA/15kA
XS2500ND	3P	≤ 500	50kA/25kA	≤ 500	50kA/25kA	≤ 350	50kA/25kA
XS3200ND	3P	≤ 600	20kA/15kA	≤ 600	20kA/15kA	≤ 400	20kA/15kA
XS3200ND	3P	≤ 500	50kA/25kA	≤ 500	50kA/25kA	≤ 350	50kA/25kA

		Non-grounded system (Protection + Isolation function)		Grounded system (Protection)		Grounded system (Protection + Isolation function)	
Type of breakers	Ordinally connection						
	Reverse connection						
No.s of poles	Applicable voltage (V)	Rated breaking capacity I_{cu}/I_{cs}	Applicable voltage (V)	Rated breaking capacity I_{cu}/I_{cs}	Applicable voltage (V)	Rated breaking capacity I_{cu}/I_{cs}	
PVS160-SDL	4P	≤ 750	10kA/5kA	≤ 750	10kA/5kA	≤ 550	10kA/5kA
PVS250-SDL	4P	≤ 750	10kA/5kA	≤ 750	10kA/5kA	≤ 550	10kA/5kA
PVS160-SDH	4P	≤ 1000	5kA/5kA	≤ 1000	5kA/5kA	≤ 750	5kA/5kA
PVS250-SDH	4P	≤ 1000	5kA/5kA	≤ 1000	5kA/5kA	≤ 750	5kA/5kA
PVS400-NDL	4P	≤ 750	10kA/10kA	≤ 750	10kA/10kA	≤ 750	10kA/10kA ②
PVS400-NDH	4P	≤ 1000	5kA/5kA	≤ 1000	5kA/5kA		
PVS800-NDL	4P	≤ 750	10kA/10kA	≤ 750	10kA/10kA	≤ 750	10kA/10kA
PVS800-NDH	4P	≤ 1000	5kA/5kA	≤ 1000	5kA/5kA	≤ 750	5kA/5kA
PVS160-SNL	4P	≤ 800	—	≤ 800	—	≤ 600	—
PVS250-SNL	4P	≤ 800	—	≤ 800	—	≤ 600	—
PVS160-SNH	4P	≤ 1000	—	≤ 1000	—	≤ 750	—
PVS250-SNH	4P	≤ 1000	—	≤ 1000	—	≤ 750	—
PVS400-NNL	4P	≤ 800	—	≤ 800	—	≤ 750	—
PVS400-NNH	4P	≤ 1000	—	≤ 1000	—		
PVS800-NNL	4P	≤ 800	—	≤ 800	—	≤ 750	—
PVS800-NNH	4P	≤ 1000	—	≤ 1000	—		

Note ② : The breaking capacity goes down to $I_{cu}10kA / I_{cs}5kA$ for ground fault protection.

Connection of conductors to DC circuit breakers

		Non-grounded system (Protection + Isolation function)		Grounded system (Protection)		Grounded system (Protection + Isolation function)	
		Ordinally connection					
		Reverse connection					
Type of breakers	No.s of poles	Applicable voltage (V)	Rated breaking capacity I_{cu}/I_{cs}	Applicable voltage (V)	Rated breaking capacity I_{cu}/I_{cs}	Applicable voltage (V)	Rated breaking capacity I_{cu}/I_{cs}
AR216S ③	3P	≤ 600	40kA/40kA	≤ 600	40kA/40kA	≤ 400	40kA/40kA
AR220S ③	3P	≤ 600	40kA/40kA	≤ 600	40kA/40kA	≤ 400	40kA/40kA
AR325S ③	3P	≤ 600	40kA/40kA	≤ 600	40kA/40kA	≤ 400	40kA/40kA
AR332S ③	3P	≤ 600	40kA/40kA	≤ 600	40kA/40kA	≤ 400	40kA/40kA
AR440S ③	3P	≤ 600	40kA/40kA	≤ 600	40kA/40kA	≤ 400	40kA/40kA

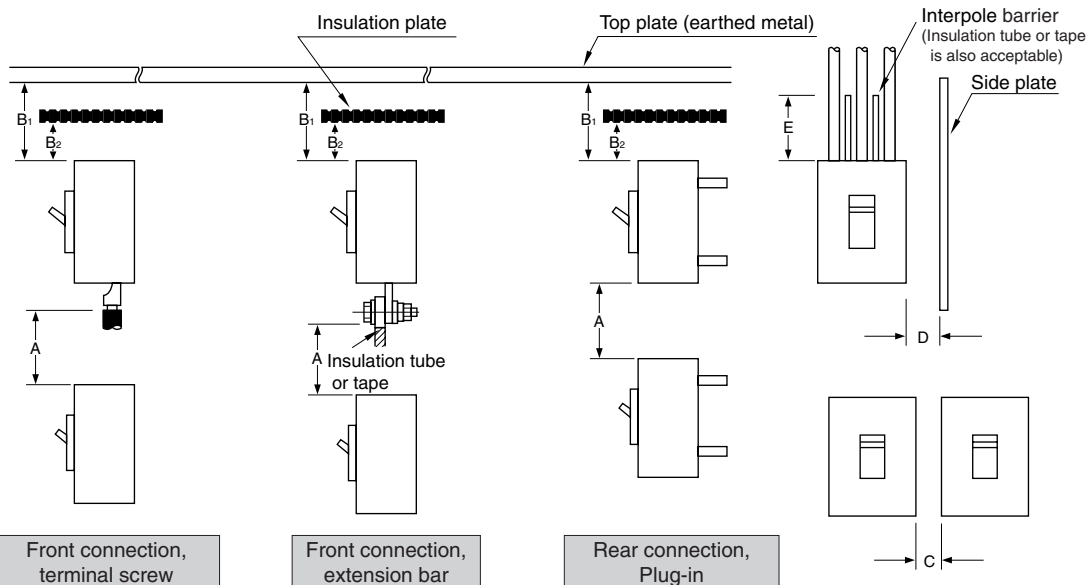
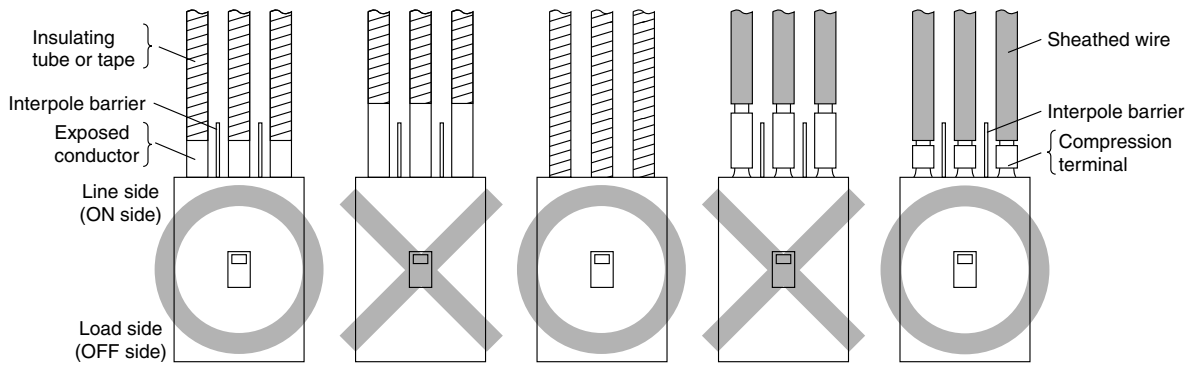
Note ③ : AGR over-current release can not be used for DC. Please prepare DC over-current relay and connect with shunt trip device.

		Non-grounded system (Protection + Isolation function)		Grounded system (Protection)		Grounded system (Protection + Isolation function)	
		Ordinally connection					
		Reverse connection					
Type of breakers	No.s of poles	Applicable voltage (V)	Rated breaking capacity I_{cu}/I_{cs}	Applicable voltage (V)	Rated breaking capacity I_{cu}/I_{cs}	Applicable voltage (V)	Rated breaking capacity I_{cu}/I_{cs}
AR325-NDH ③	4P	≤ 800	30kA/30kA	≤ 800	30kA/30kA	≤ 600	30kA/30kA

Note ③ : AGR over-current release can not be used for DC. Please prepare DC over-current relay and connect with shunt trip device.

Insulation distance DC600V or less

The insulation distances between the breaker and earthed metal parts and insulators shown in the table below must be maintained to prevent arcing faults occurring due to conductive ionised gas. In addition, any exposed line-side conductors must be completely covered, right up the breaker casing or to below the height protected by any interpole barriers. This can be done by using an insulation tube or tape, in order to provide positive protection against short circuit or ground fault due to metal chipping, surge voltage, dust particles or salt. If terminal covers are not being used, the interpole barriers supplied with the breaker as standard must be used.



- A . Distance from lower breaker to exposed live part of upper breaker terminal (front connection) or distance from lower breaker to end face of upper breaker (rear connection).
- B1. Distance from end face of breaker to top plate.
- B2. Distance from end face of breaker to insulation plate.
- C . Gap between breakers.
- D . Distance from side of breaker to side plate (earthed metal).
- E . Dimension of insulation over exposed conductors.

Insulation distance, mm (DC 600 V or less) Note ①

Moulded Case Circuit Breakers				A <small>Note ②</small>	B1	B2	C	D	E
S160-SD	S160-GD	S160-SDN	⑤	50	50	50	* Possible to set close <small>Note ③</small>	25	Not less than the length of the bare live part <small>Note ④</small>
S250-SD	S250-GD	S250-SDN	⑤	65	65	65	*	50	∕
S400-ND	S800-ND	S1000-ND		150	120	80	∕	80	∕
XS1250ND	XS1600ND	XS2000ND	XS2500ND	XS3200ND	150	100	∕	100	∕

Notes:

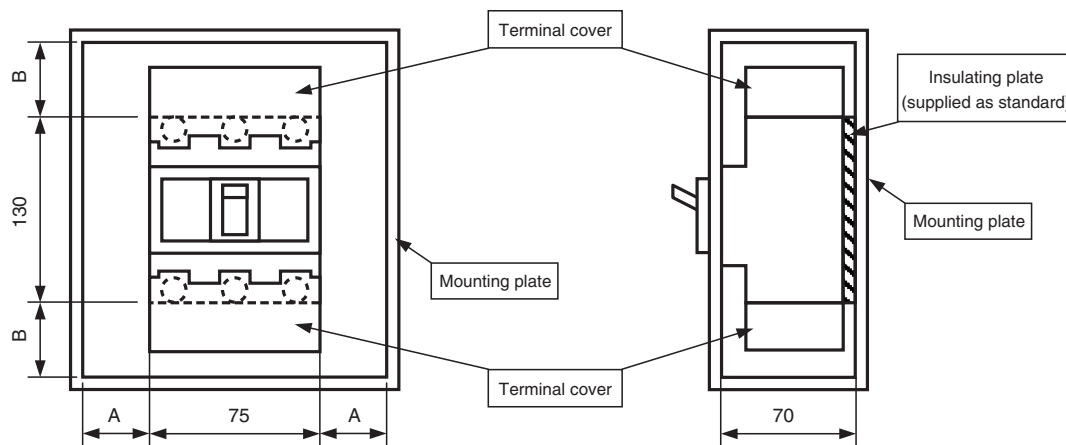
- ①. Required to allow free and uninterrupted flow of arc gases. Ensure additional clearance or insulation distance if required to perform wiring, barrier installation or electrical work or to meet the need for more insulation distance between bare live parts and grounded metal members in a switchboard or the like.
- ②. The figures are for lower breakers.
- ③. When the accessories are fitted it is not possible to set close.
- ④. For front connected breakers, insulate all exposed conductors of the line side until the breaker end. If interpole barriers are packed, be sure to use the barriers; more over, insulate all exposed conductors by insulating tape or the like so that the tape overlaps with the barriers.
- ⑤. Be sure to install the terminal covers (supplied as standard) on the line side of the breakers.
- *. If using extension bars (optional), ensure the insulation distance specified for the application.

Insulation distance DC750V-1000V

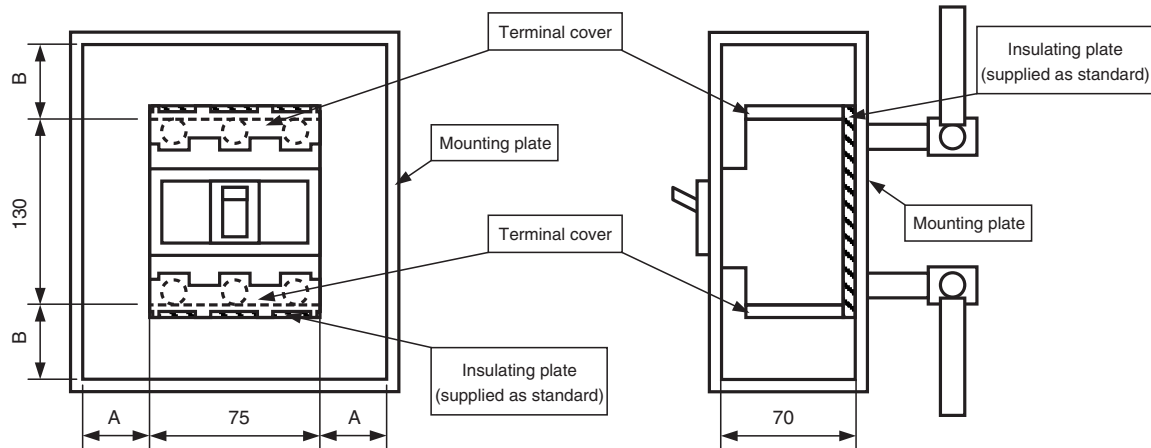
The insulation distances between the breaker and earthed metal parts and insulators shown in the table below must be maintained to prevent arcing faults occurring due to conductive ionised gas. In addition, any exposed line-side conductors must be completely covered, right up the breaker casing or to below the height protected by any terminal covers or interpole barriers. This can be done by using an insulation tube or tape, in order to provide positive protection against short circuit or ground fault due to metal chipping, surge voltage, dust particles or salt. The terminal covers or the interpole barriers supplied with the breaker as standard must be used. For DC750V-1000V breakers, the front and the rear insulating plates must also be installed.

PVE160-SDL 3P

Front-connected



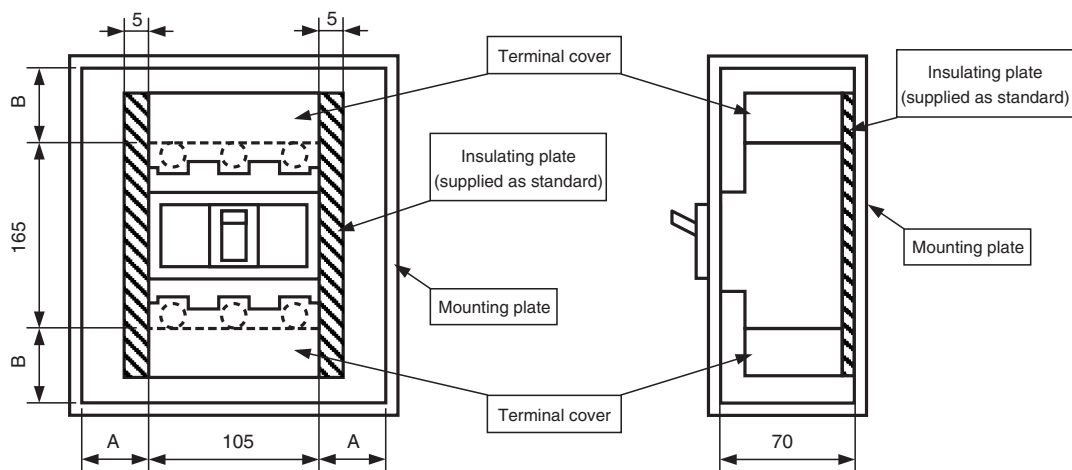
Rear-connected



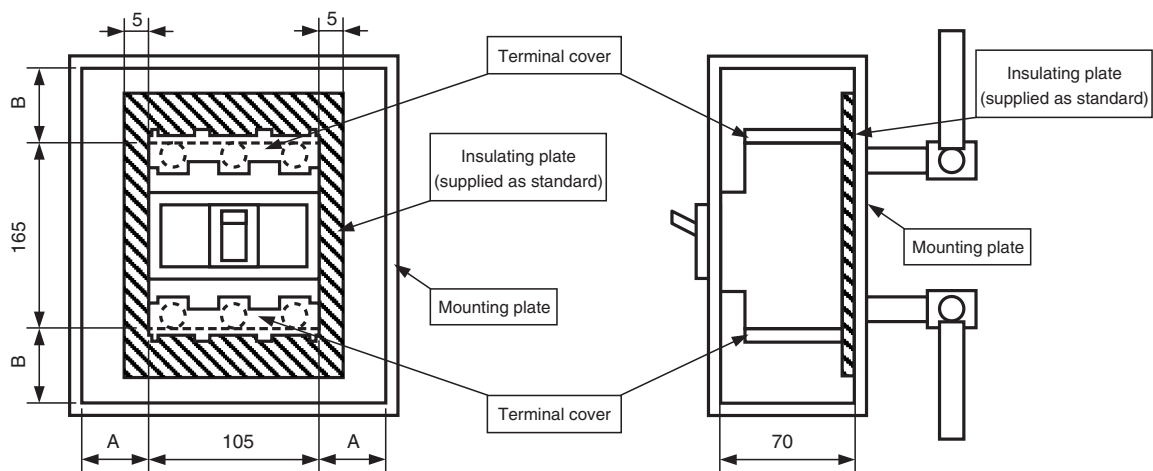
Type	Connection	Minimum insulation distance (mm)		Insulating plate	
		A	B	Terminal cover	Insulating plate
PVE160-SDL 3P	Front-connected Rear-connected	25	50	2pcs are supplied for line and load side as standard.	1pc of 130mm×75mm for F.C. or 140mm×75mm for R.C. is supplied as standard.

PVS160-SDL 3P, PVS250-SDL 3P

Front-connected



Rear-connected

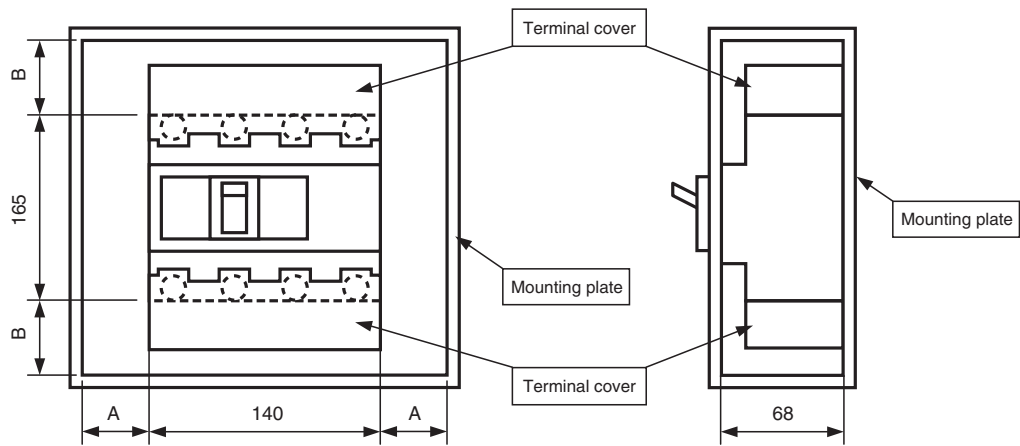


Type	Connection	Minimum insulation distance (mm)		Insulating plate	
		A	B	Terminal cover	Insulating plate
PVS160-SDL 3P PVS250-SDL 3P	Front-connected Rear-connected	50	65	2pcs are supplied for line and load side as standard.	2pcs of 115mm×137.5mm are supplied as standard.

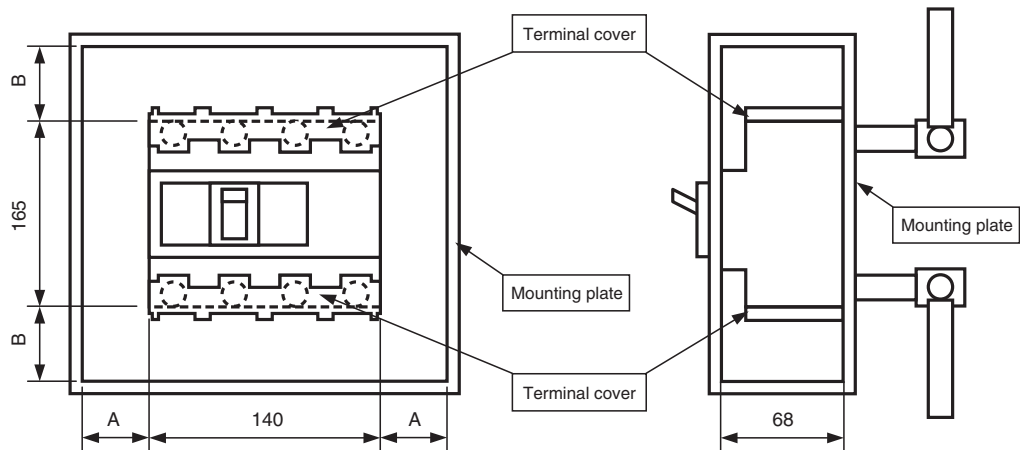
Insulation distance DC750V-1000V

PVS160-SDL 4P, PVS250-SDL 4P, PVS160-SNL 4P, PVS250-SNL 4P

Front-connected



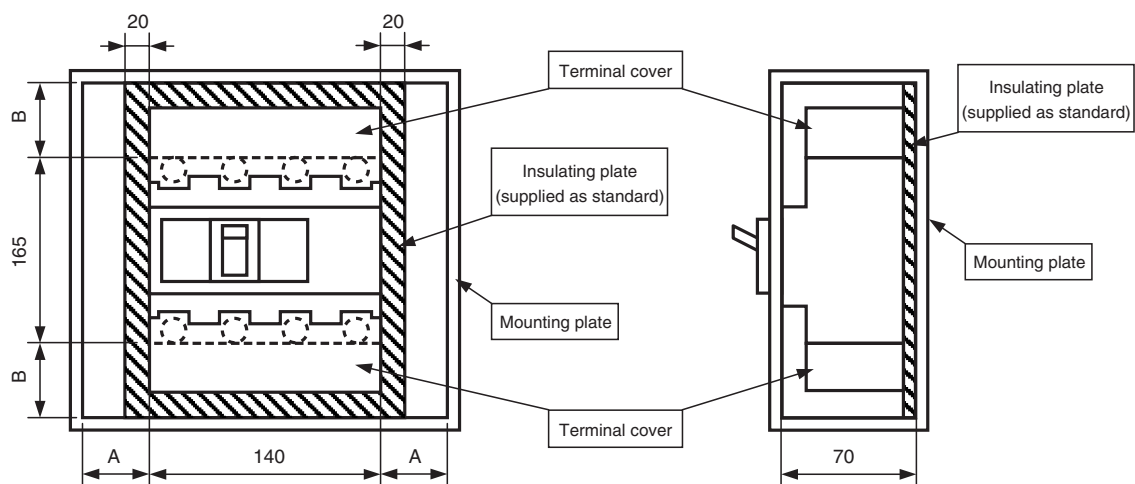
Rear-connected



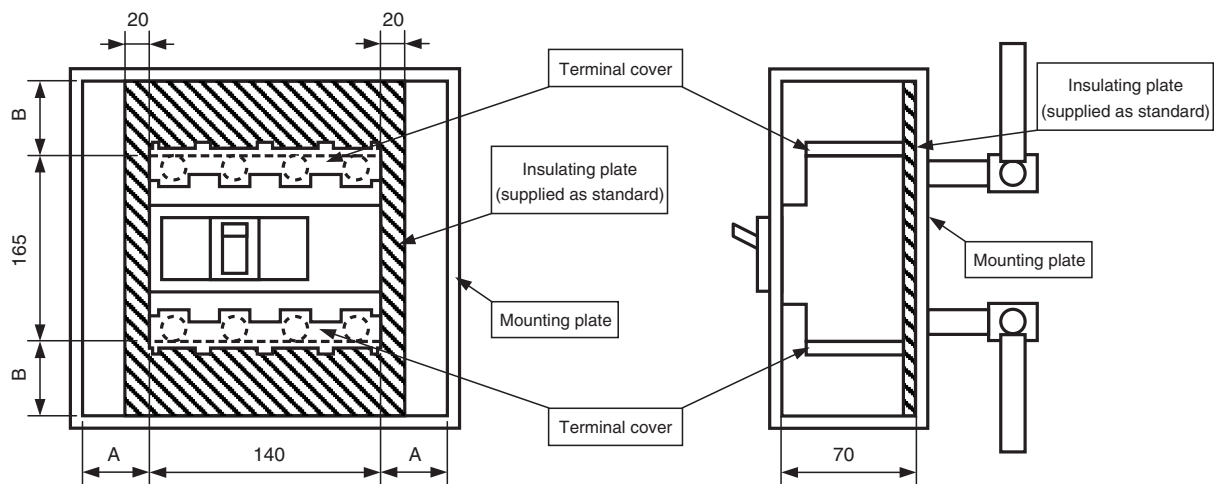
Type	Connection	Minimum insulation distance (mm)		Terminal cover
		A	B	
PVS160-SDL 4P	Front-connected Rear-connected	50	65	2pcs are supplied for line and load side as standard.
PVS250-SDL 4P				
PVS160-SNL 4P				
PVS250-SNL 4P				

PVS160-SDH 4P, PVS250-SDH 4P

Front-connected



Rear-connected

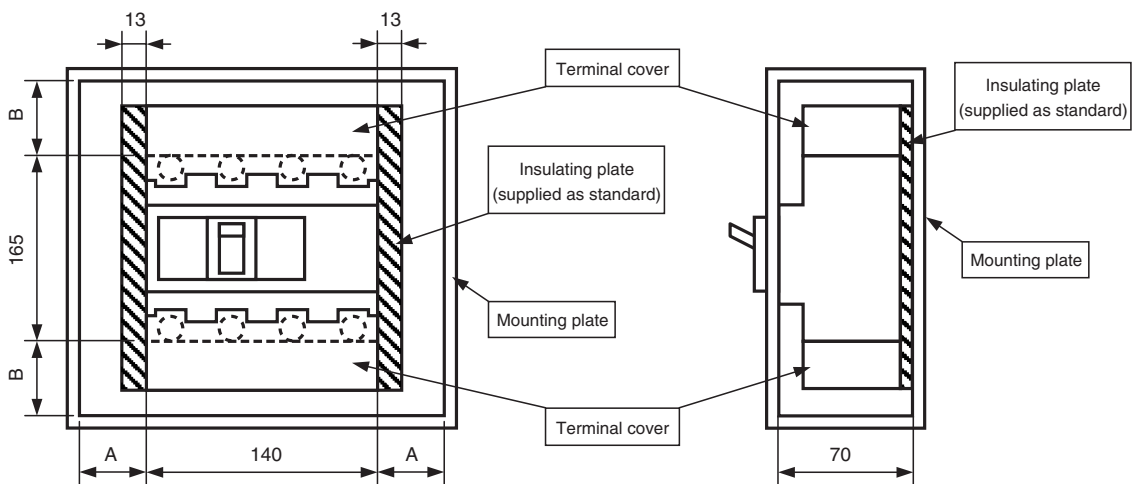


Type	Connection	Minimum insulation distance (mm)		Insulating plate	
		A	B	Terminal cover	Insulating plate
PVS160-SDH 4P PVS250-SDH 4P	Front-connected Rear-connected	50	65	2pcs are supplied for line and load side as standard.	2pcs of 180mm×147.5mm are supplied as standard.

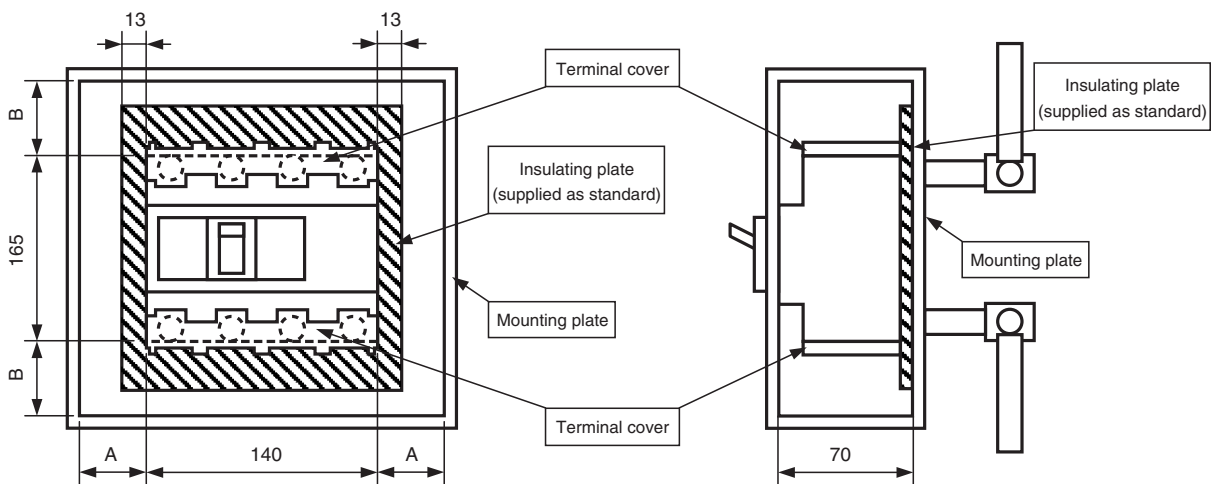
Insulation distance DC750V-1000V

PVS160-SNH 4P, PVS250-SNH 4P

Front-connected



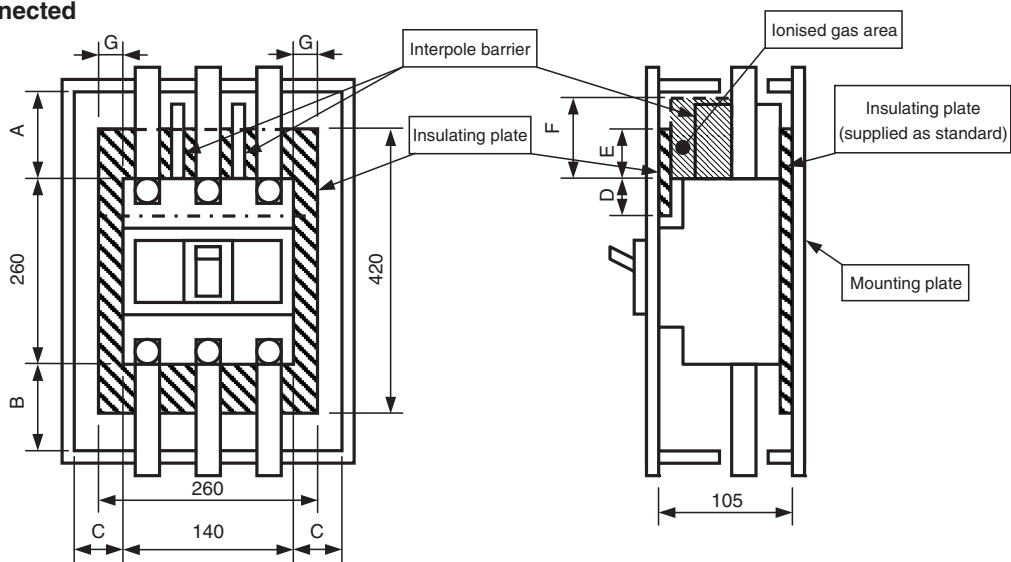
Rear-connected



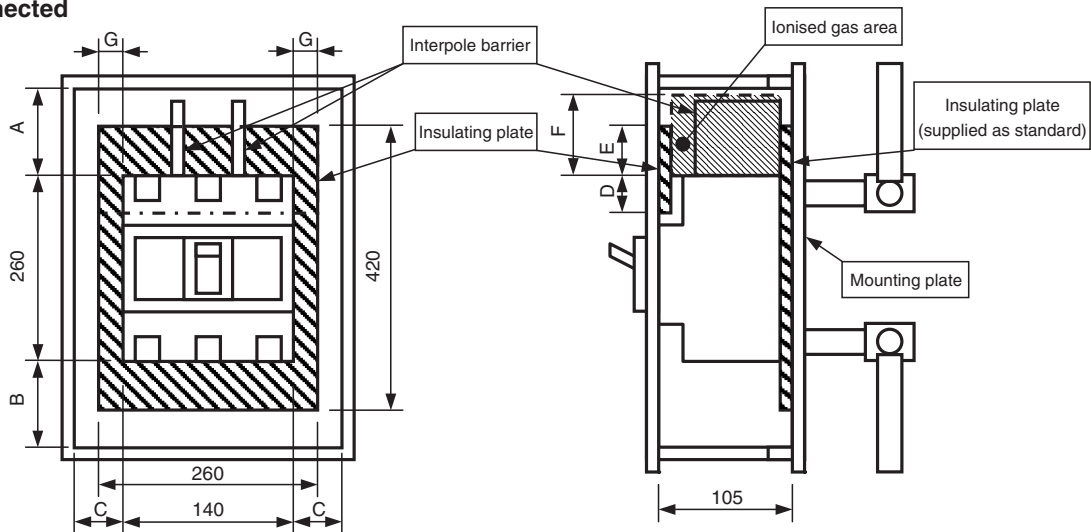
Type	Connection	Minimum insulation distance (mm)		Insulating plate	
		A	B	Terminal cover	Insulating plate
PVS160-SNH 4P PVS250-SNH 4P	Front-connected Rear-connected	30	65	2pcs are supplied for line and load side as standard.	2pcs of 166mm×137.5mm are supplied as standard.

PVS400-NDL 3P

Front-connected



Rear-connected

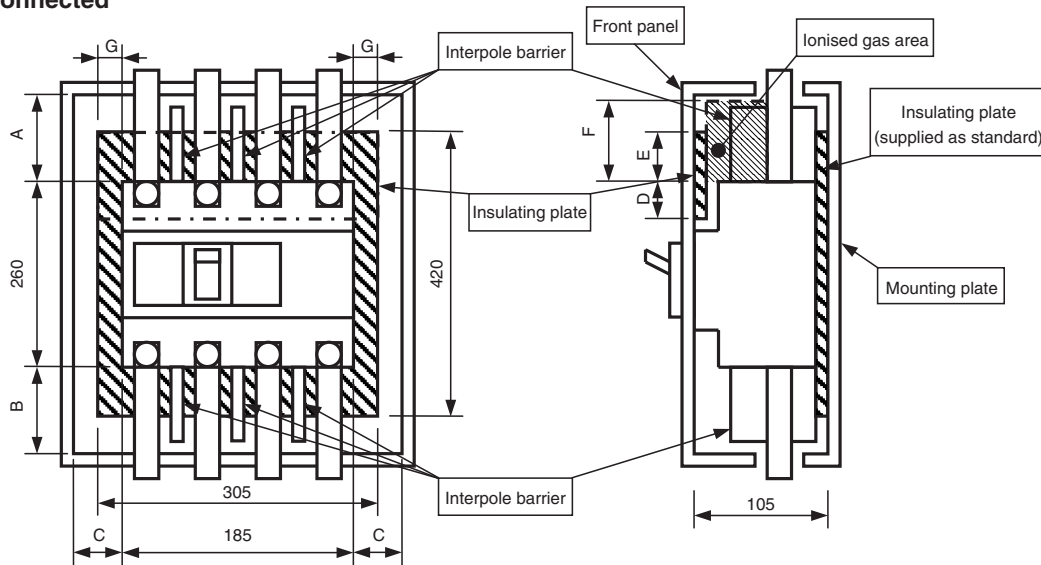


Type	Connection	Minimum insulation distance (mm)							Insulating plate	
		A	B	C	D	E	F	G	Front panel side	Mounting plate side
PVS400-NDL 3P	Front-connected Rear-connected	160	80	80	30	140	160	60	Not supplied	Supplied as standard

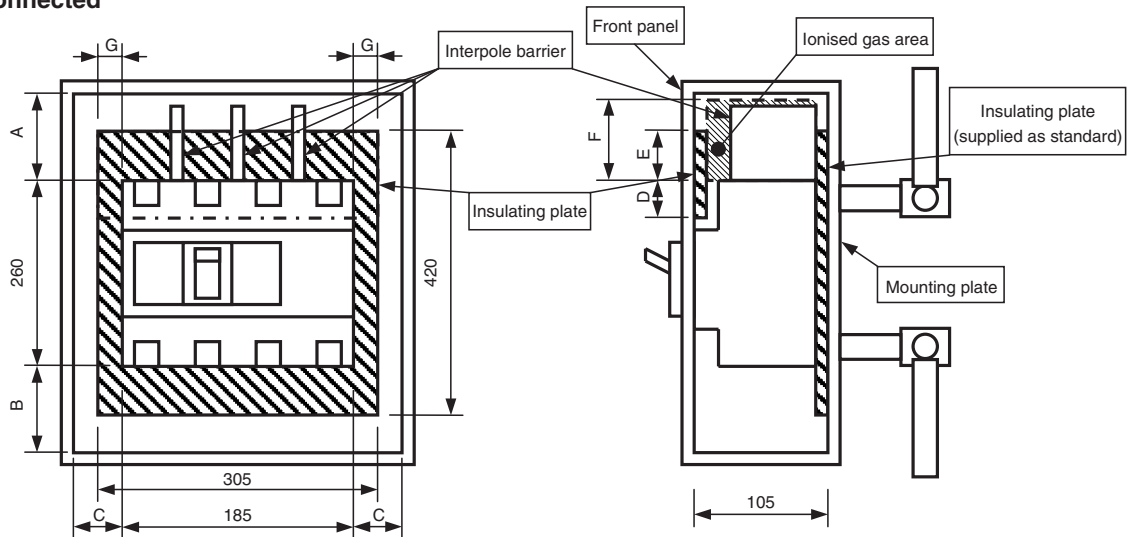
Insulation distance DC750V-1000V

PVS400-NDL 4P, PVS400-NDH 4P

Front-connected



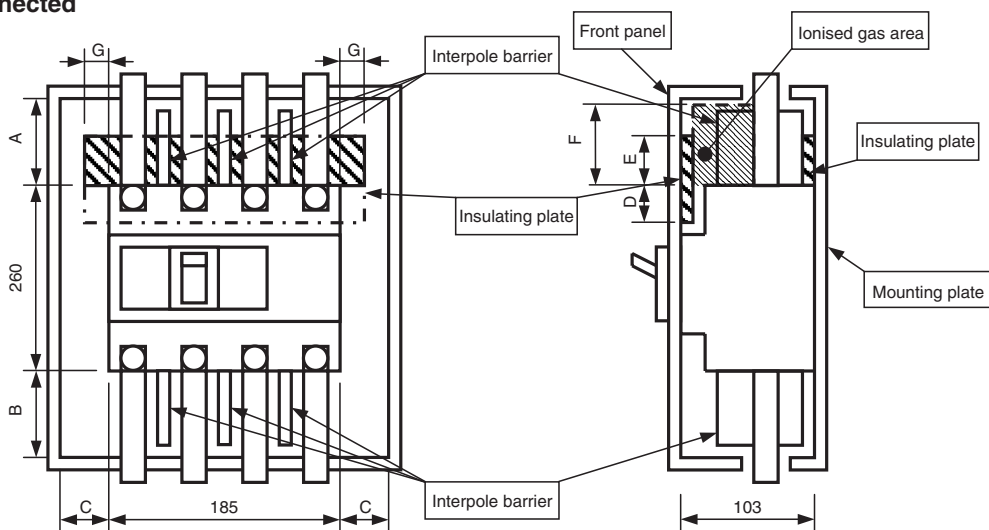
Rear-connected



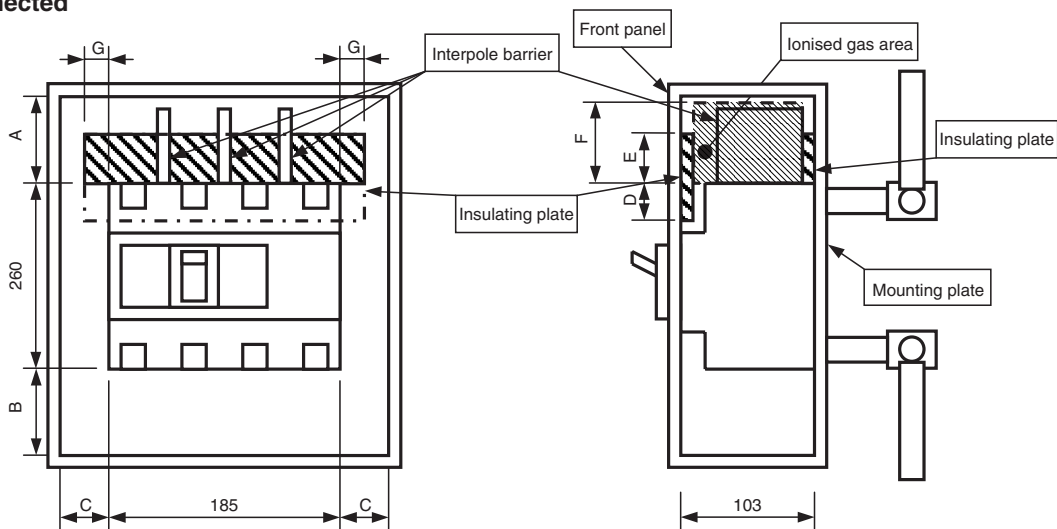
Type	Connection	Minimum insulation distance (mm)							Insulating plate	
		A	B	C	D	E	F	G	Front panel side	Mounting plate side
PVS400-NDL 4P PVS400-NDH 4P	Front-connected Rear-connected	160	80	80	30	140	160	60	Not supplied	Supplied as standard

PVS400-NNL 4P, PVS400-NNH 4P

Front-connected



Rear-connected

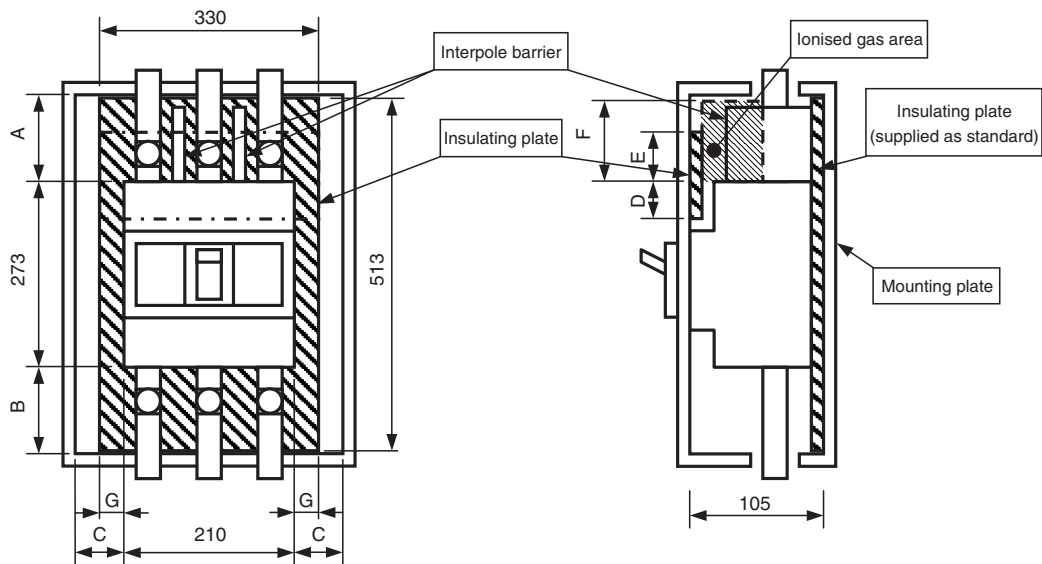


Type	Connection	Minimum insulation distance (mm)							Insulating plate	
		A	B	C	D	E	F	G	Front panel side	Mounting plate side
PVS400-NNL 4P PVS400-NNH 4P	Front-connected Rear-connected	120	80	80	30	80	80	40	Not supplied	Not supplied

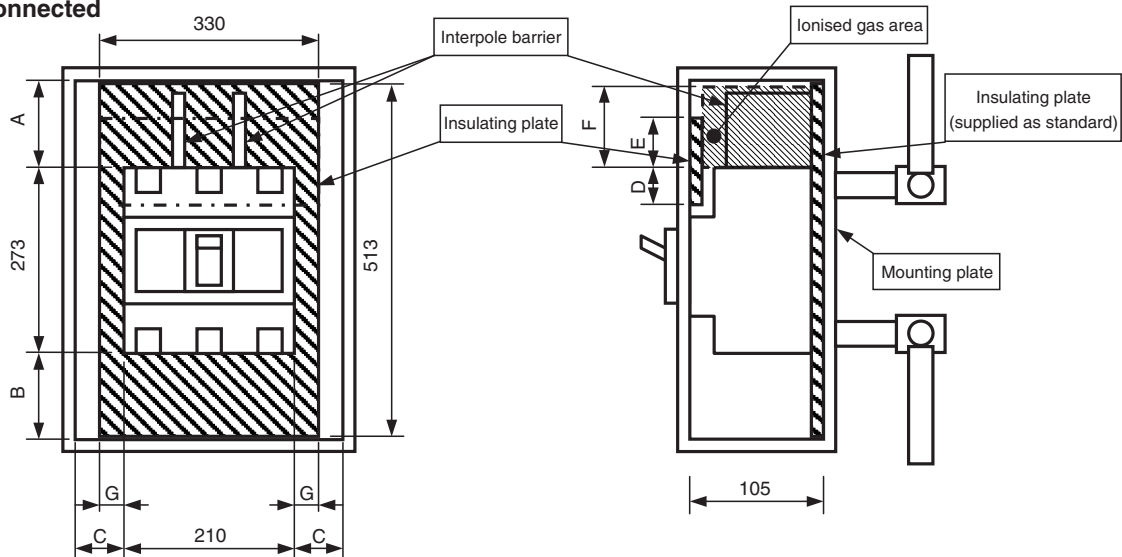
Insulation distance DC750V-1000V

PVS800-NDL 3P

Front-connected



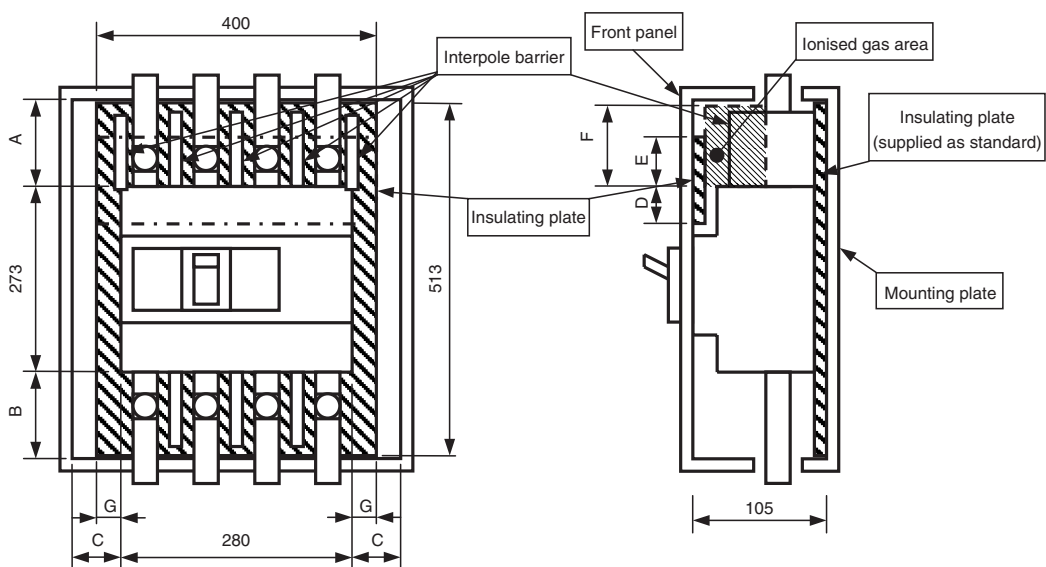
Rear-connected



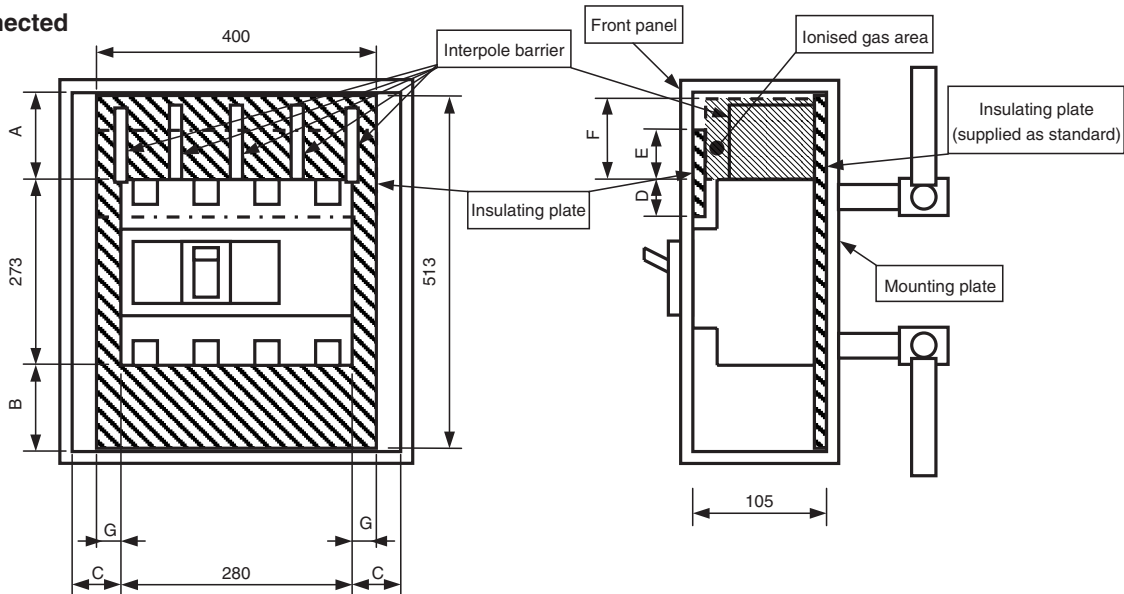
Type	Connection	Minimum insulation distance (mm)							Insulating plate	
		A	B	C	D	E	F	G	Front panel side	Mounting plate side
PVS800-NDL 3P	Front-connected Rear-connected	160	80	80	80	140	160	60	Not supplied	Supplied as standard

PVS800-NDL 4P, PVS800-NDH 4P

Front-connected



Rear-connected

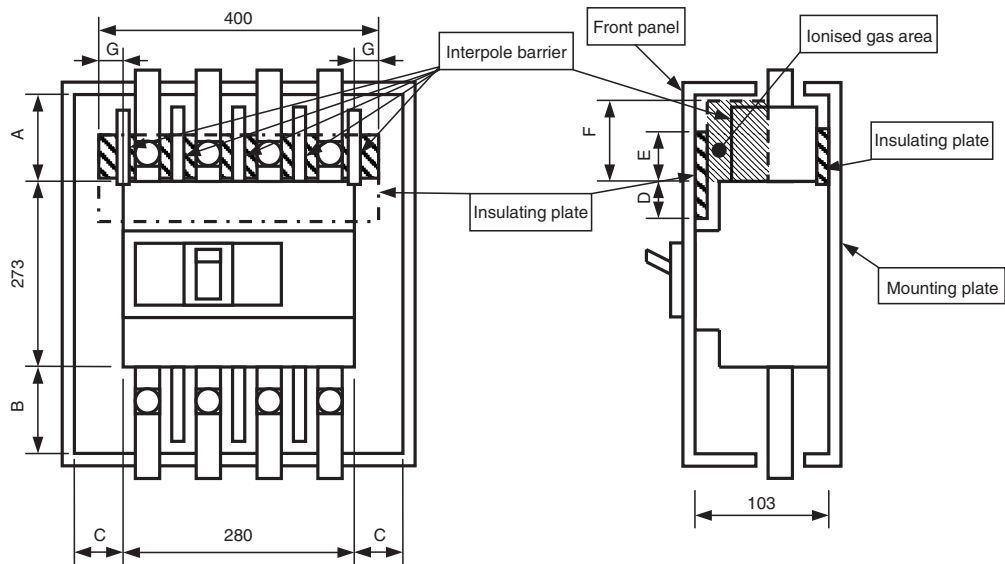


Type	Connection	Minimum insulation distance (mm)							Insulating plate	
		A	B	C	D	E	F	G	Front panel side	Mounting plate side
PVS800-NDL 4P PVS800-NDH 4P	Front-connected Rear-connected	160	80	80	80	140	160	60	Not supplied	Supplied as standard

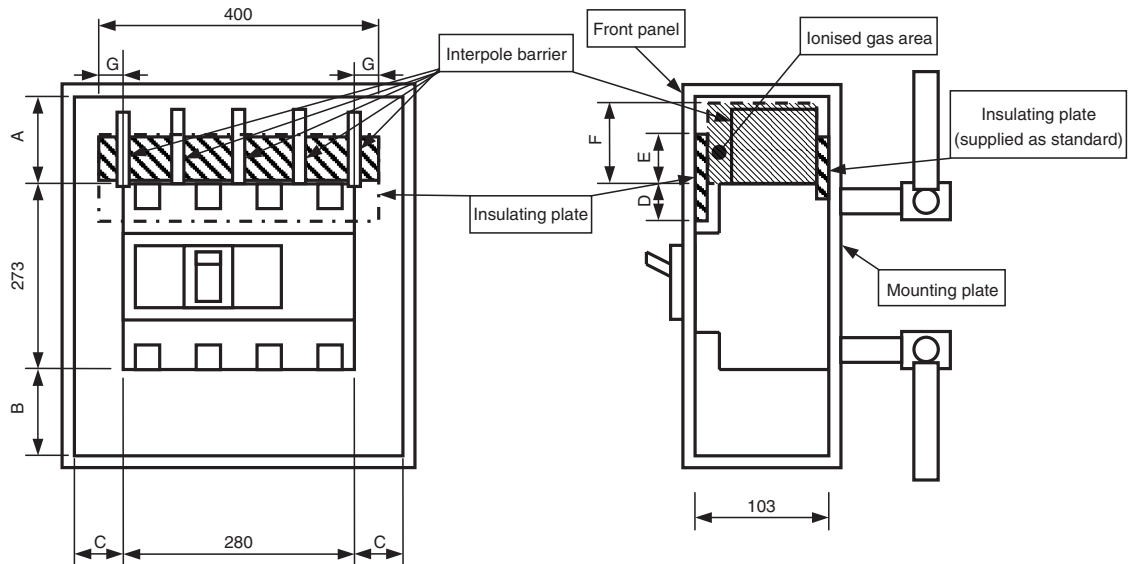
Insulation distance DC750V-1000V

PVS800-NNL 4P, PVS800-NNH 4P

Front-connected



Rear-connected



Type	Connection	Minimum insulation distance (mm)							Insulating plate	
		A	B	C	D	E	F	G	Front panel side	Mounting plate side
PVS800-NNL 4P PVS800-NNH 4P	Front-connected Rear-connected	120	80	80	80	80	80	60	Not supplied	Not supplied

5

Outline Dimensions

DC Air Circuit Breakers Outline Dimensions

AR216S, AR220S 3P	5-2
AR325S, AR332S 3P	5-4
AR325-NDH 4P.....	5-6
AR440S 3P	5-8

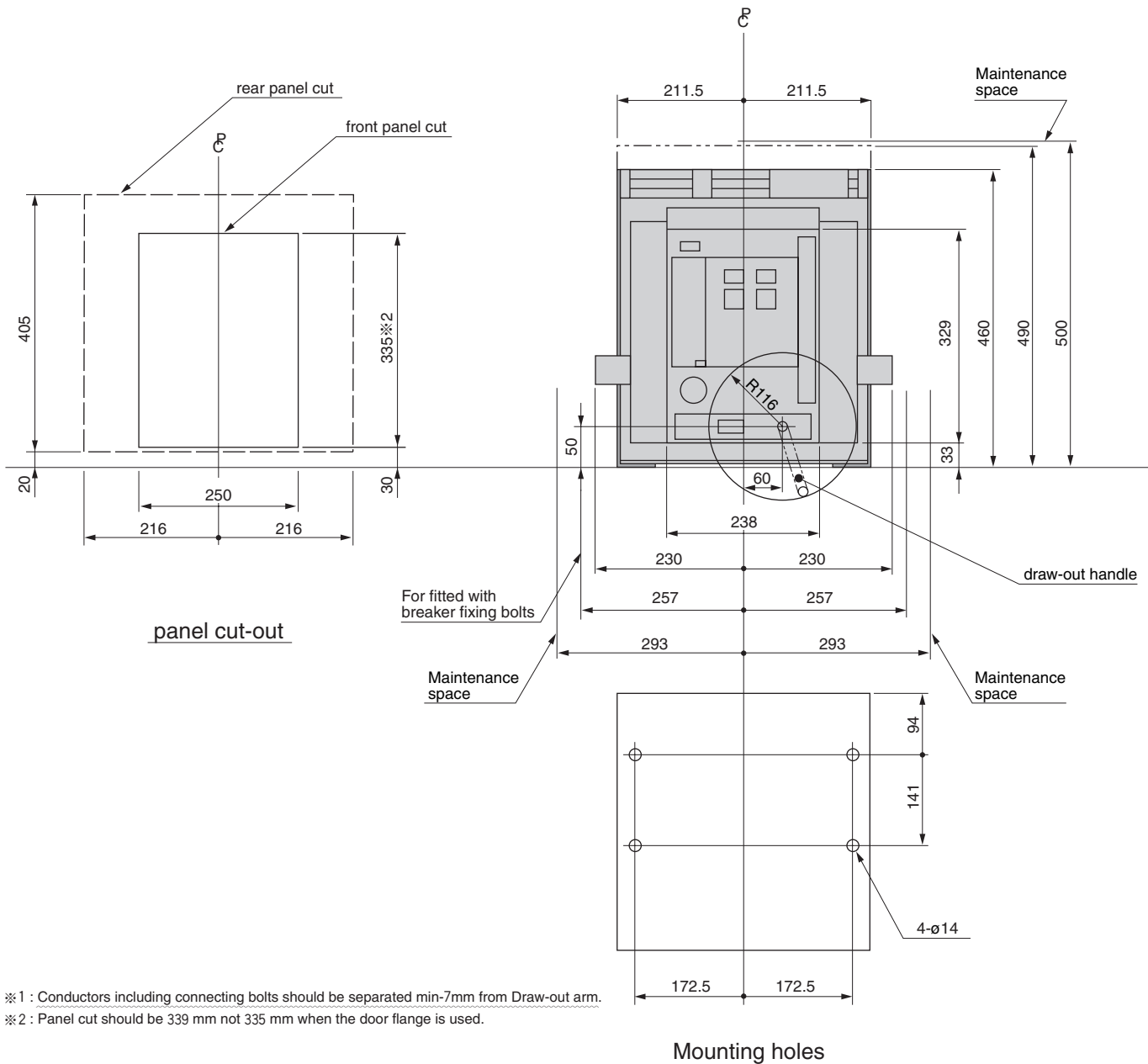
DC Moulded Case Circuit Breakers Outline Dimensions

S160-SD, S160-GD, S160-SDN, S250-SD, S250-GD, S250-SDN 3P ...	5-10
S400-ND 3P	5-11
S800-ND 3P	5-11
S1000-ND 2P, 3P	5-12
XS1250ND 2P, 3P	5-13
XS1600ND 2P, 3P	5-14
XS2000ND 2P, 3P	5-15
XS2500ND, XS3200ND 2P, 3P	5-16
PVE160-SDL 3P.....	5-17
PVS160-SDL, PVS250-SDL 3P	5-18
PVS160-SDL, PVS250-SDL, PVS160-SNL, PVS250-SNL 4P	5-18
PVS160-SDH, PVS250-SDH, PVS160-SNH, PVS250-SNH 4P	5-19
PVS400-NDL 3P.....	5-20
PVS400-NDL, PVS400-NDH 4P	5-21
PVS400-NNL, PVS400-NNH 4P	5-21
PVS800-NDL 3P.....	5-22
PVS800-NDL, PVS800-NDH 4P	5-23
PVS800-NNL, PVS800-NNH 4P	5-23

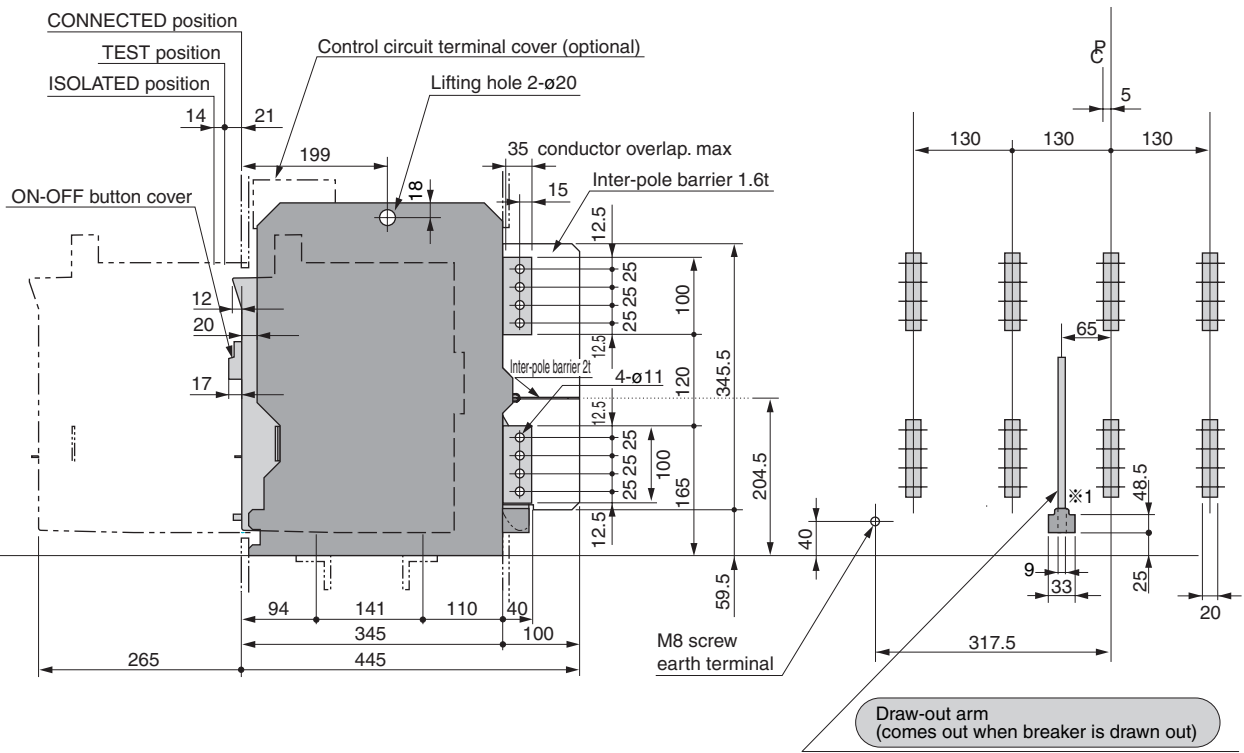
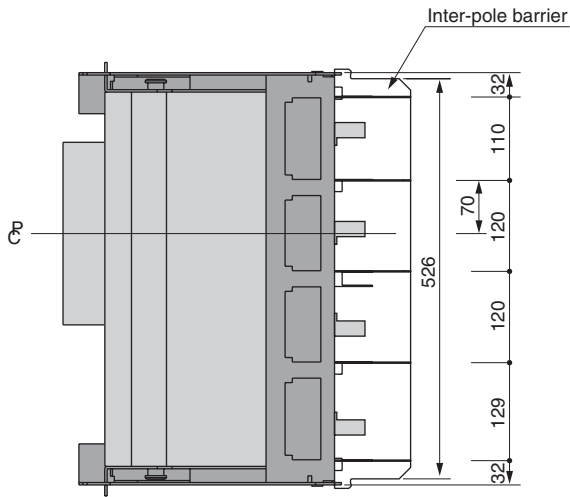
DC Air Circuit Breakers

Outline dimensions (mm)

- Type AR325S 3P, AR332S 3P Draw-out type



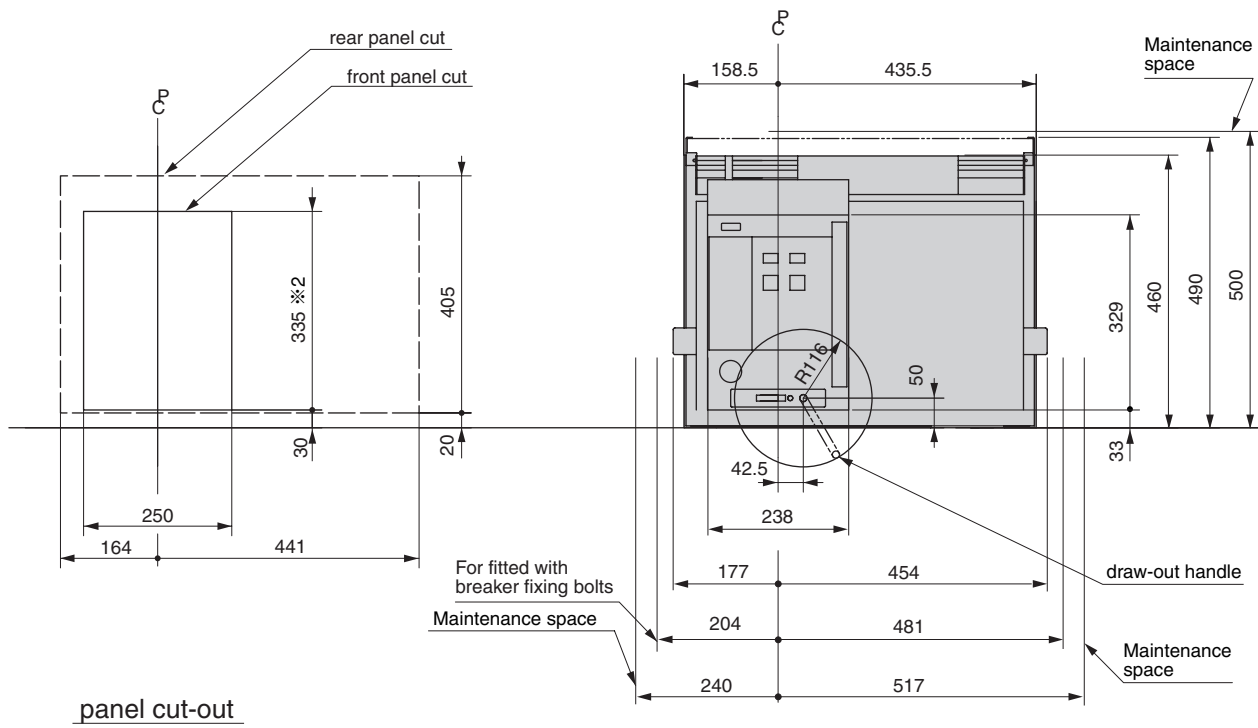
※1 : Conductors including connecting bolts should be separated min-7mm from Draw-out arm.
 ※2 : Panel cut should be 339 mm not 335 mm when the door flange is used.



DC Air Circuit Breakers

Outline dimensions (mm)

- Type AR440S 3P Draw-out type



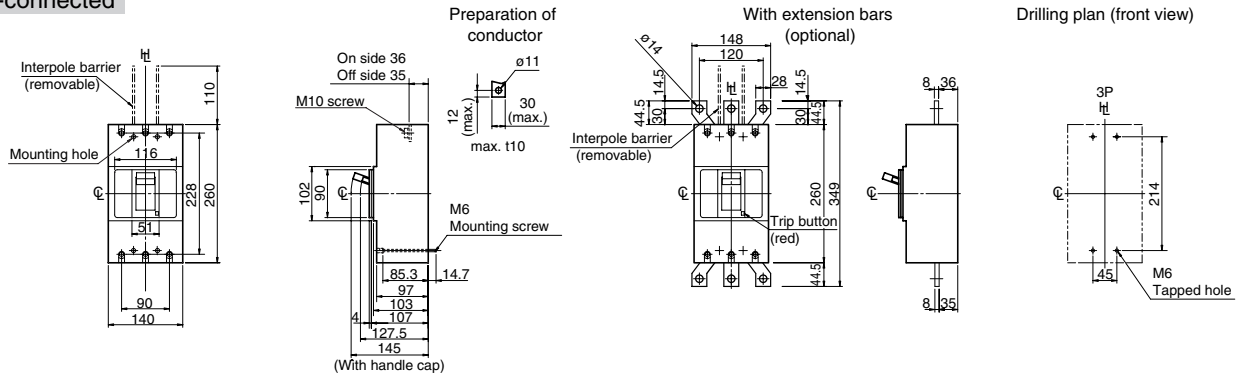
※1 : Conductors including connecting bolts should be separated min-7mm from Draw-out arm.

※2 : Panel cut should be 339 mm not 335 mm when the door flange is used.

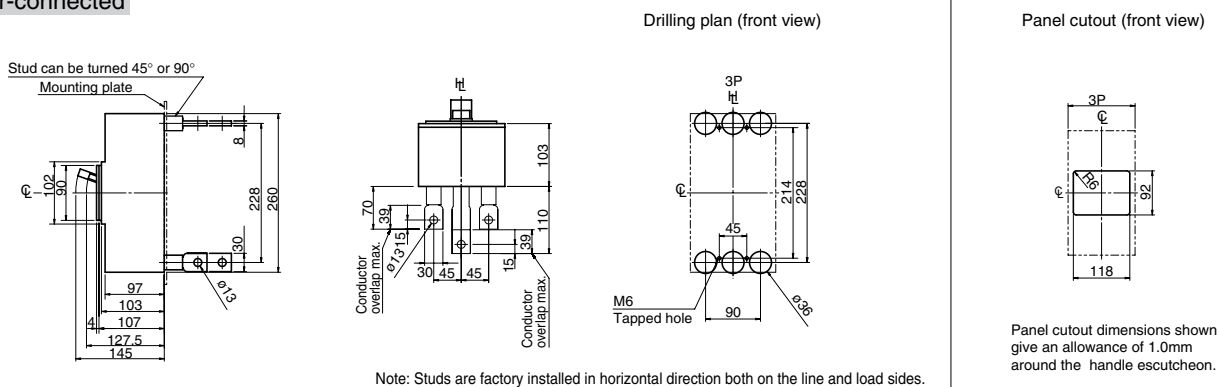
Outline dimensions (mm)

S400-ND 3P

Front-connected



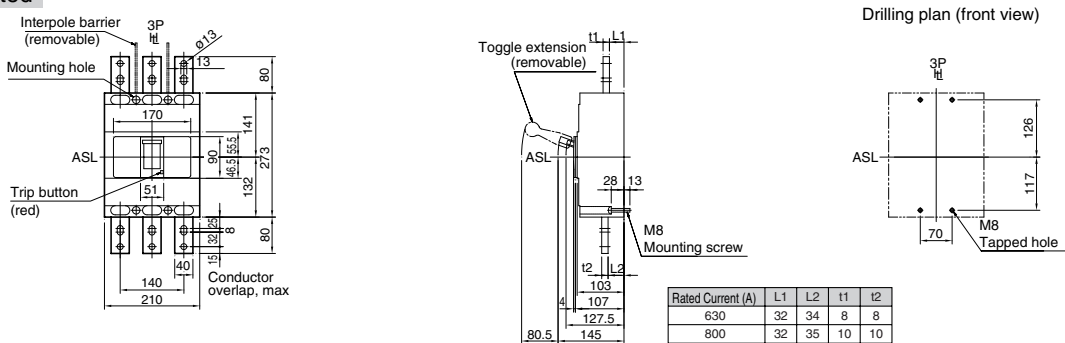
Rear-connected



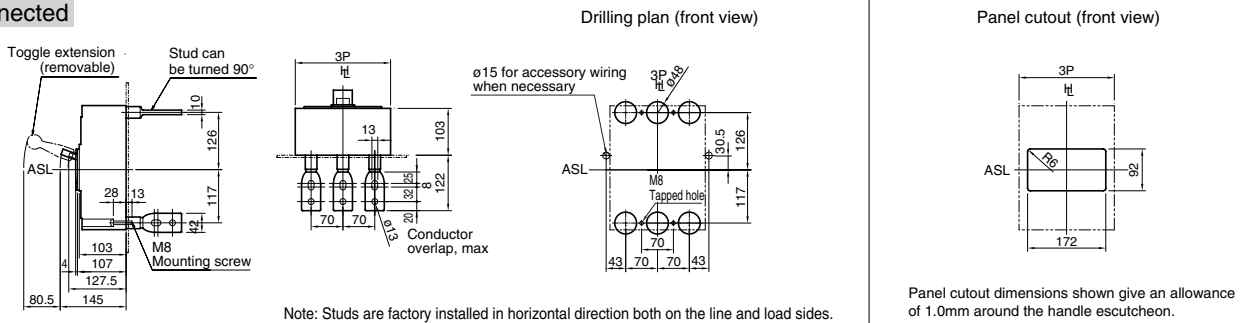
Outline dimensions (mm)

S800-ND 3P

Front-connected



Rear-connected

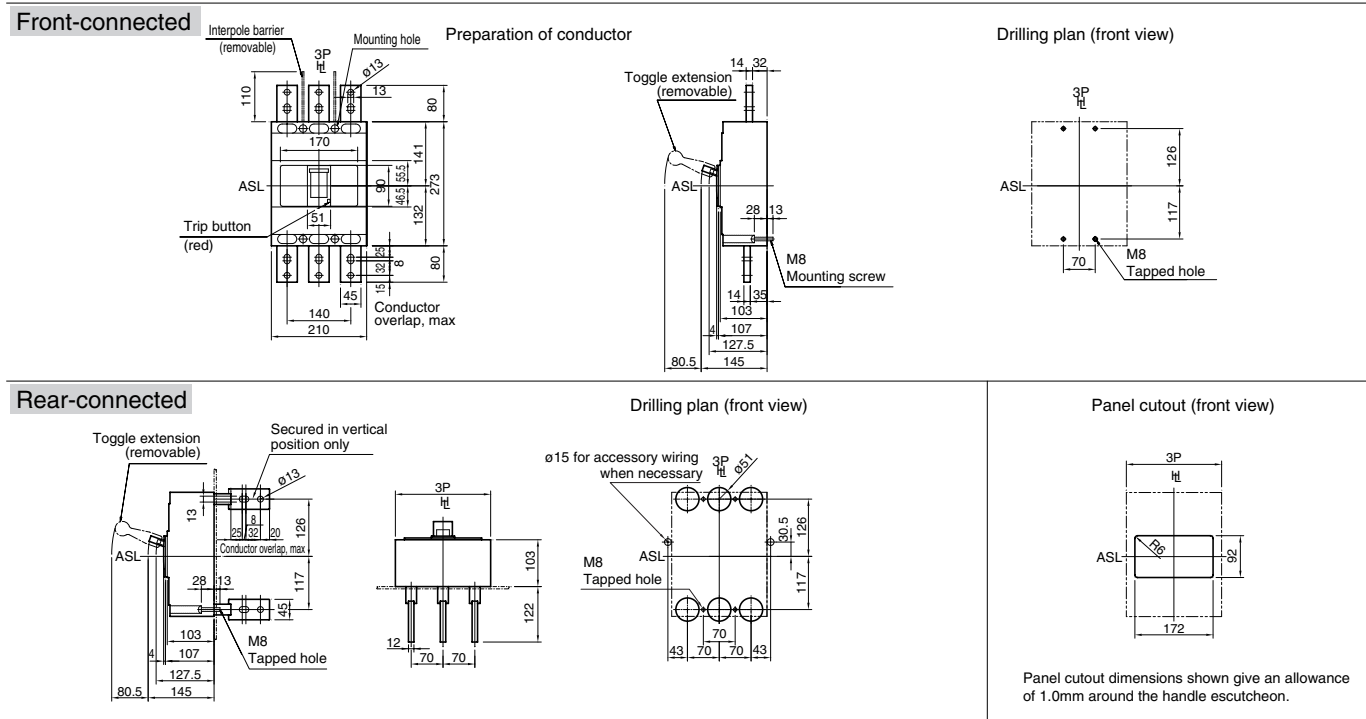


DC Moulded Case Circuit Breakers

ASL: Arrangement Standard Line

HL: Handle Frame Centre Line CL: Handle Centre Line

Outline dimensions (mm) S1000-ND 2P, 3P



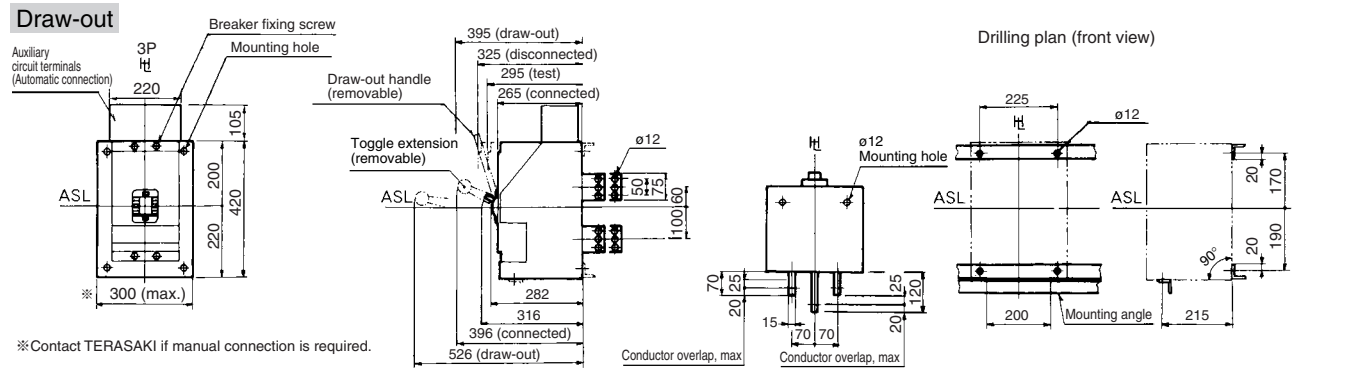
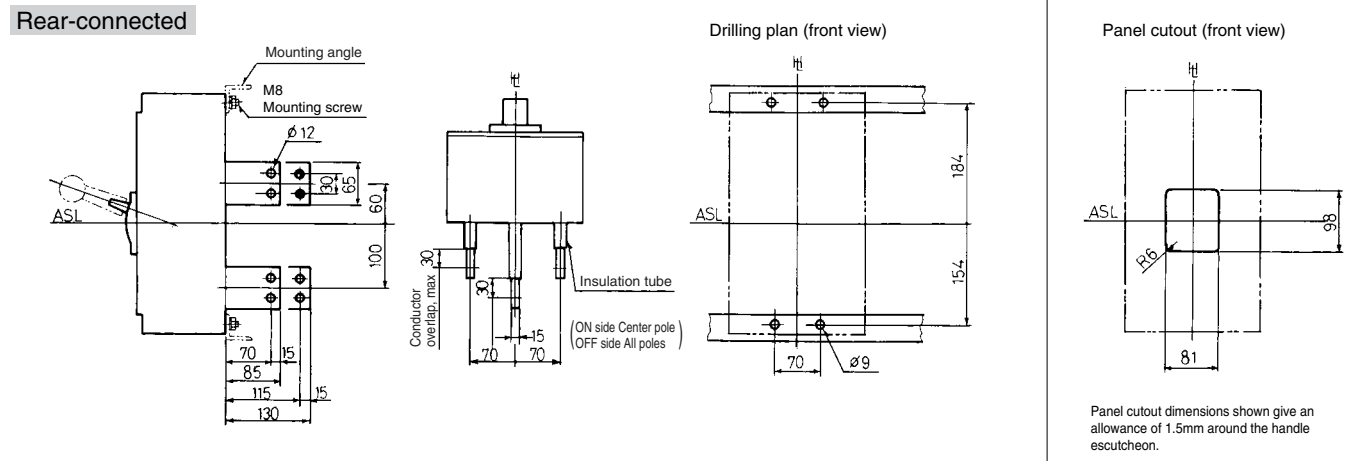
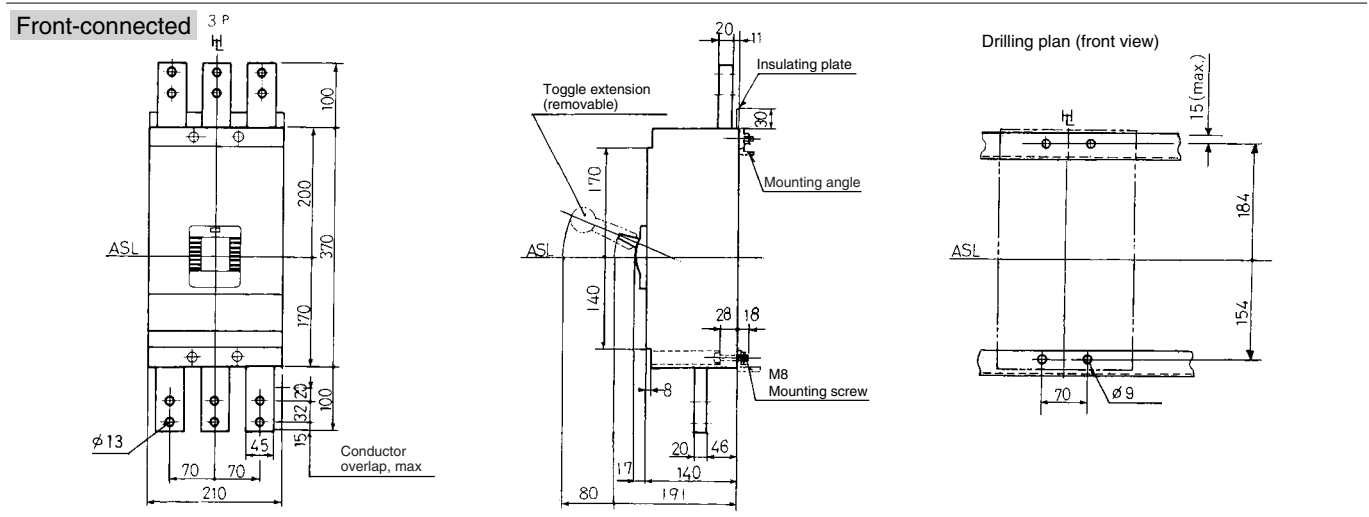
Note: 2 poles breaker is same outline dimensions as 3 poles breaker.

DC Moulded Case Circuit Breakers

ASL: Arrangement Standard Line

H: Handle Frame Centre Line C: Handle Centre Line

Outline dimensions (mm) XS1600ND 2P, 3P

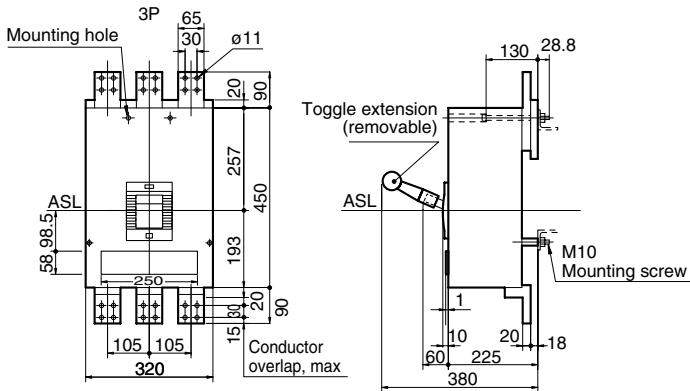


Note: 2 poles breaker is same outline dimensions as 3 poles breaker.

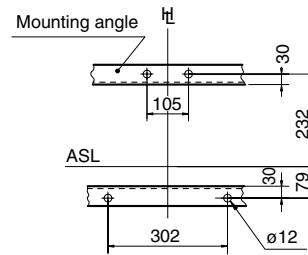
Outline dimensions (mm)

XS2000ND 2P, 3P

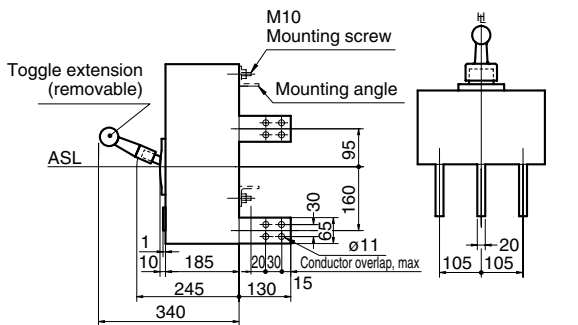
Front-connected



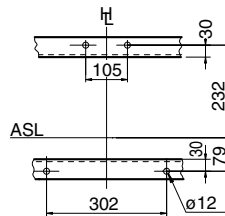
Drilling plan (front view)



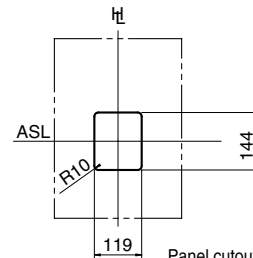
Rear-connected



Drilling plan (front view)

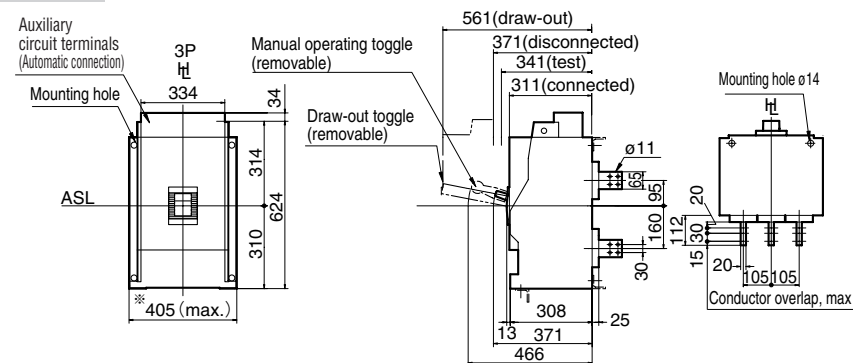


Panel cutout (front view)

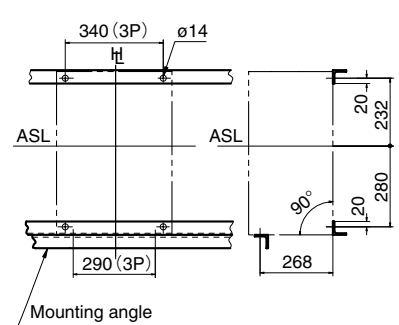


Panel cutout dimensions shown give an allowance of 2mm around the handle escutcheon.

Draw-out



Drilling plan (front view)



※Contact TERASAKI if manual connection is required.

Note: 2 poles breaker is same outline dimensions as 3 poles breaker.

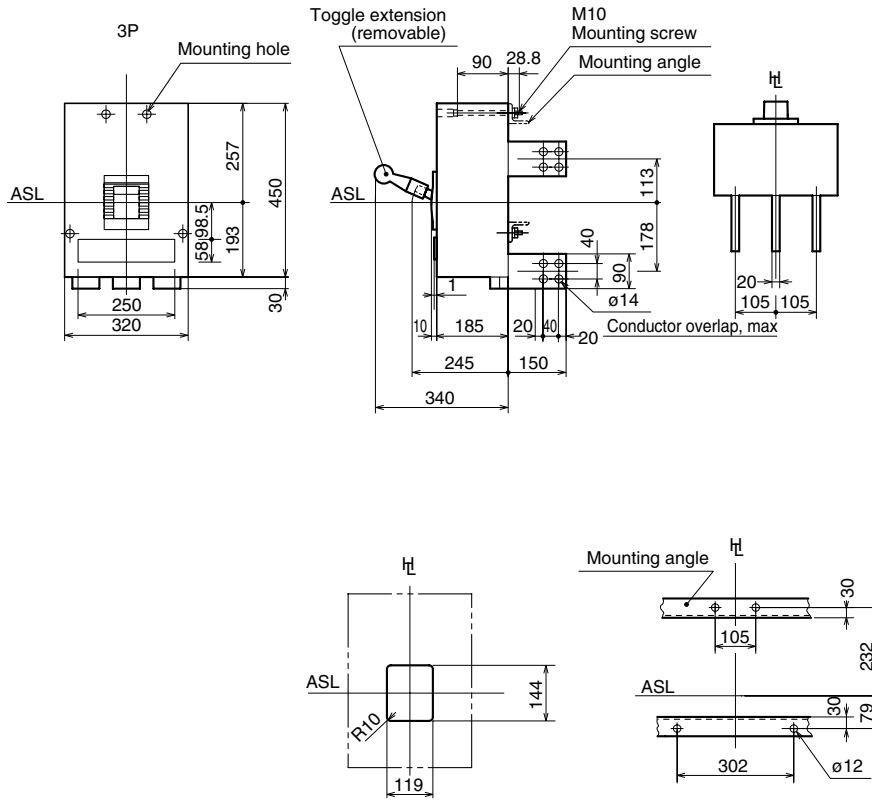
DC Moulded Case Circuit Breakers

ASL: Arrangement Standard Line

HL: Handle Frame Centre Line CL: Handle Centre Line

Outline dimensions (mm) XS2500ND 2P, 3P, XS3200ND 2P, 3P

Rear-connected



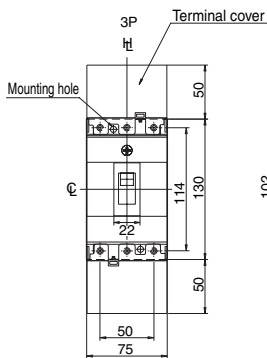
Panel cutout dimensions shown give an allowance of 2mm around the handle escutcheon.

Note: 2 poles breaker is same outline dimensions as 3 poles breaker.

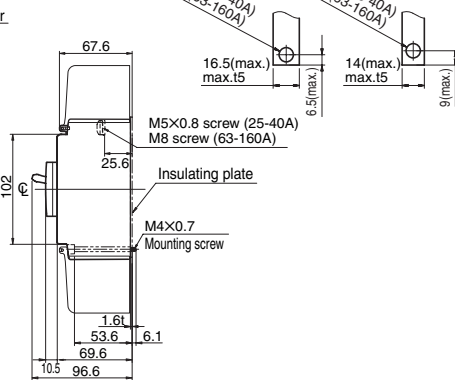
Outline dimensions (mm)

PVE160-SDL 3P

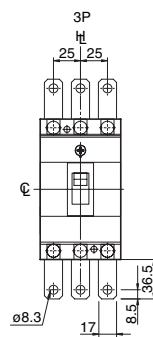
Front-connected



Preparation of conductor

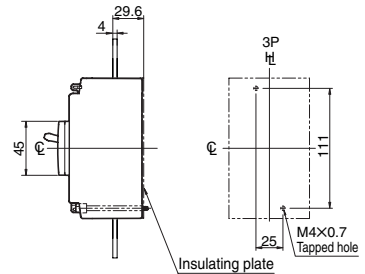


With extension bars * (optional)

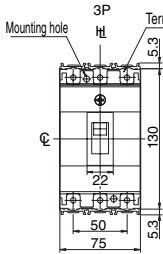


* Straight bars only.
 For line and load side, use with the terminal covers.

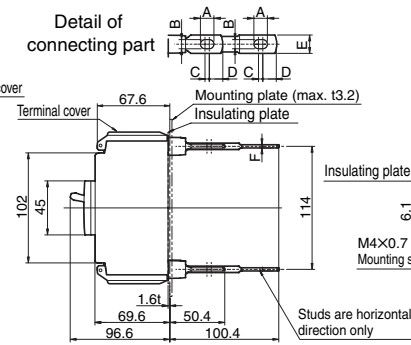
Drilling plan (front view)



Rear-connected

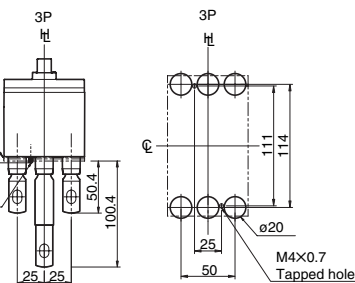


Detail of connecting part

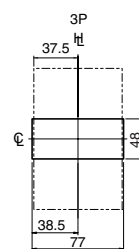


Rated current (A)	A	B	C	D	E	F
25-40	10.5	6.5	4	13	16	4
63-160	12.5	8.5	4	13	16	5

Drilling plan (front view)



Panel cutout (front view)



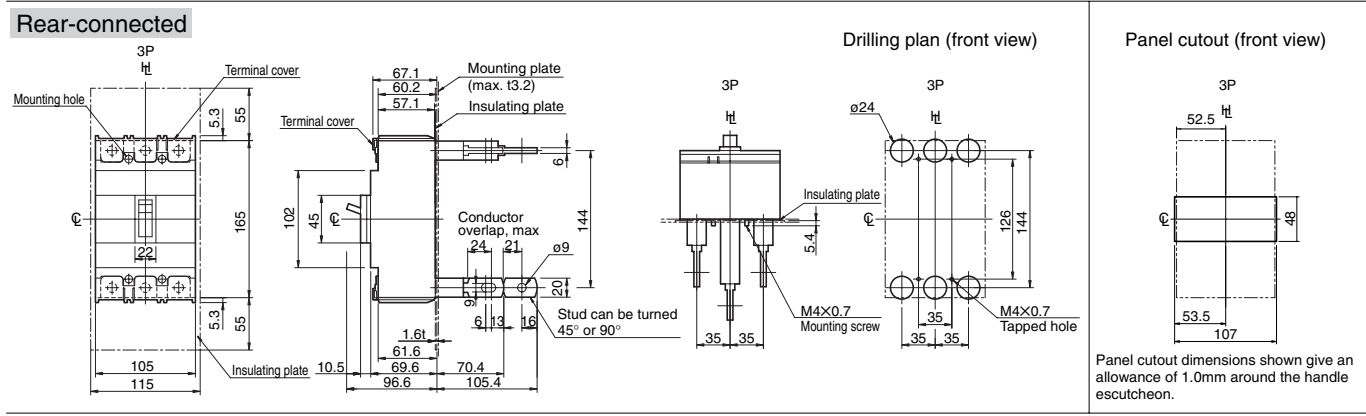
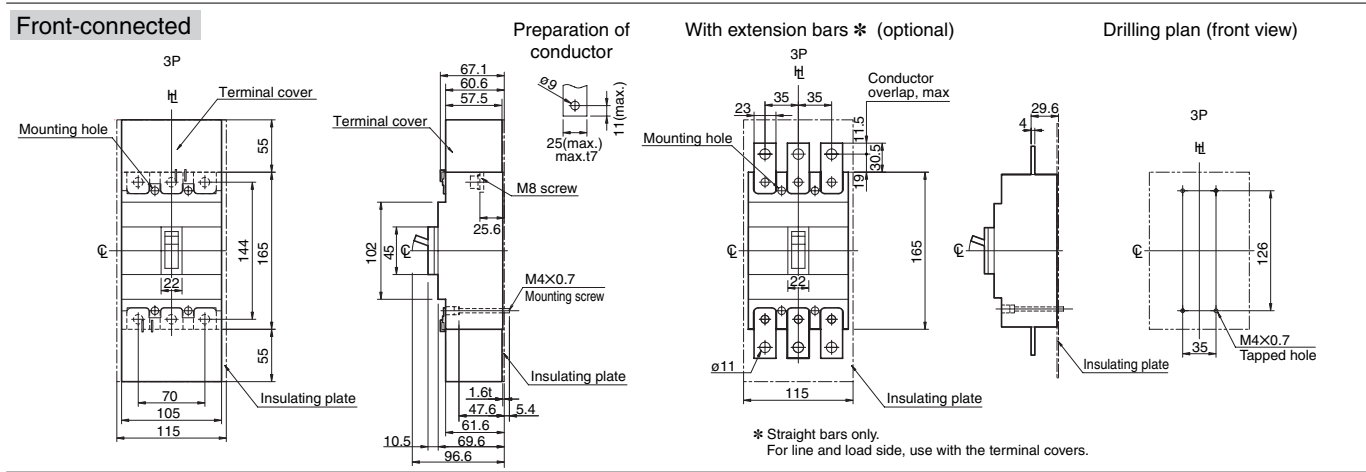
Panel cutout dimensions shown give an allowance of 1.0mm or more around the handle escutcheon.

DC Moulded Case Circuit Breakers

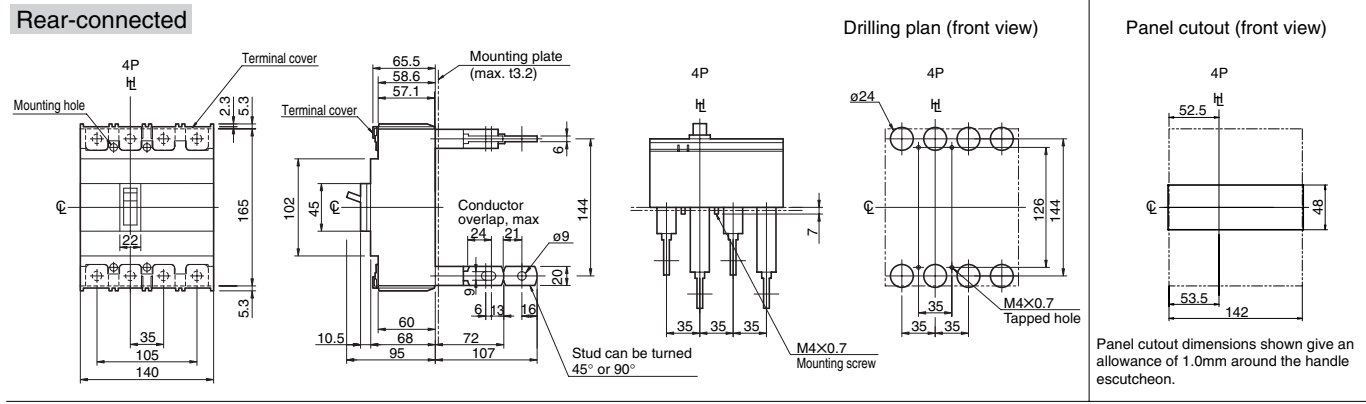
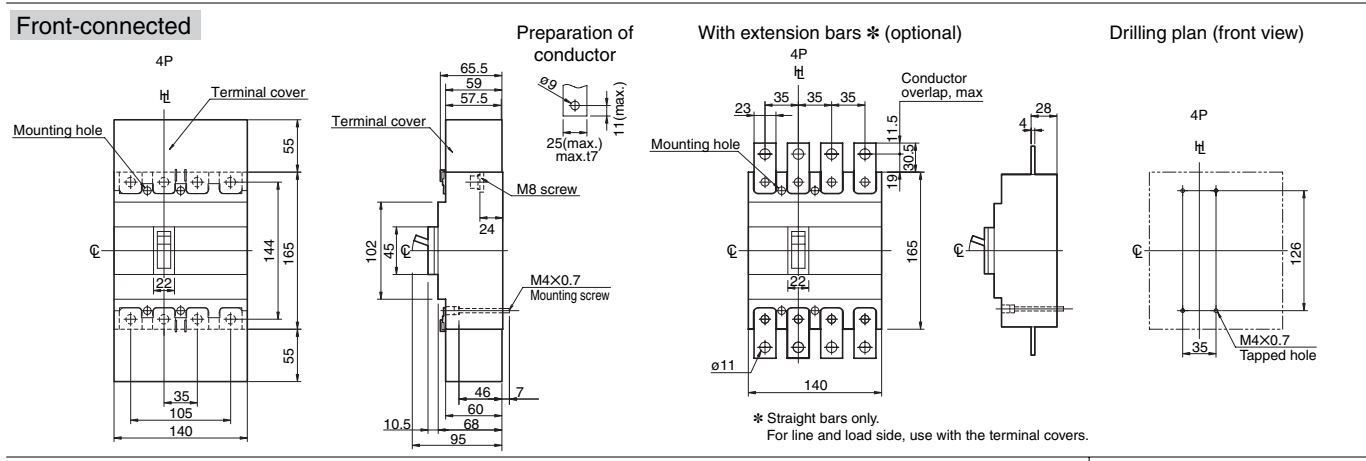
ASL: Arrangement Standard Line

HL: Handle Frame Centre Line CL: Handle Centre Line

Outline dimensions (mm) PVS160-SDL 3P, PVS250-SDL 3P



Outline dimensions (mm) PVS160-SDL 4P, PVS250-SDL 4P, PVS160-SNL 4P, PVS250-SNL 4P



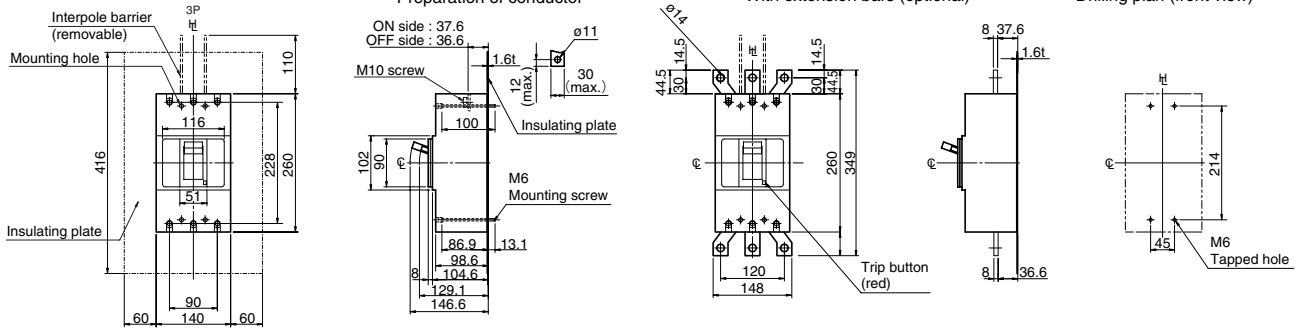
DC Moulded Case Circuit Breakers

ASL: Arrangement Standard Line

HL: Handle Frame Centre Line CL: Handle Centre Line

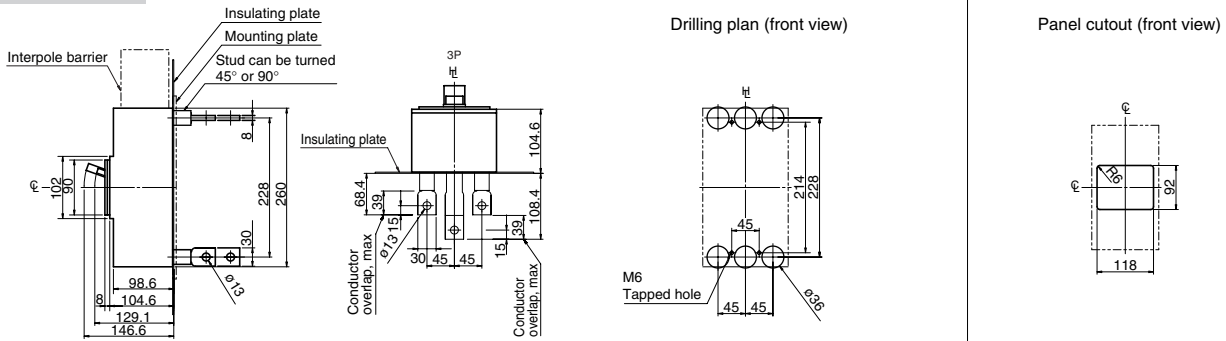
Outline dimensions (mm) PVS400-NDL 3P

Front-connected



Note: See section 4 for the installation of the insulating plate.

Rear-connected



Note: Studs are factory installed in horizontal direction both on the line and load sides. See section 4 for the installation of the insulating plate.

Panel cutout dimensions shown give an allowance of 1.0mm around the handle escutcheon.



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