

DC Air Circuit Breakers Moulded Case Circuit Breakers

TemPower & TemBreak



TERASAKI ELECTRIC CO., LTD.

www.terasaki.co.jp

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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.

AR220S

DC

Air Circuit Breakers

Rated current 2000A
Rated breaking capacity DC600V 40kA



PVS400-NDL

DC

Moulded Case Circuit Breakers

Rated current 400A
Rated breaking capacity DC750V 10kA



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

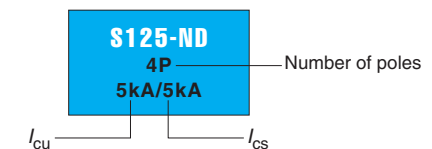
Photovoltaic (or Solar) power generation, which is attracting attention as clean energy, ranges from simple generation of up to several kilowatts for home use, to larger systems of 100 kilowatts or greater for industrial use. In the "School New Deal" program, one of the governmental measures during the 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.

Selection Chart

Voltage		Frame size (A)														
		50	125	160	250	400	800		1000	1250	1600	2000	2500	3200	4000	
Air Circuit Breakers	800V												AR325-NDH 4P 30kA/30kA			
	600V												AR216S 3P 40kA/40kA	AR220S 3P 40kA/40kA	AR325S 3P 40kA/40kA	AR332S 3P 40kA/40kA
Moulded Case Circuit Breakers	1000V					PVS400-NDH 4P 5kA/5kA	PVS800-NDH 4P 5kA/5kA									
	750V					PVS400-NDL 4P 10kA/10kA	PVS800-NDL 4P 10kA/10kA									
	600V	S50-GD 4P 5kA/5kA	S125-ND 4P 5kA/5kA	S160-ND 4P 5kA/5kA	S250-ND 4P 5kA/5kA	S400-ND 3P 15kA/15kA	S800-ND 3P 20kA/10kA	S1000-ND 3P 20kA/10kA	S1250-ND 3P 20kA/15kA	S1600-ND 3P 20kA/15kA	XS2000ND 3P 20kA/15kA	XS2500ND 3P 20kA/15kA	XS3200ND 3P 20kA/15kA			
	500V	S50-GD 4P 7.5kA/7.5kA	S125-ND 4P 7.5kA/7.5kA	S160-ND 4P 7.5kA/7.5kA	S250-ND 4P 7.5kA/7.5kA	S400-ND 3P 15kA/15kA	S800-ND 3P 20kA/10kA	S1000-ND 3P 20kA/10kA	S1250-ND 3P 50kA/25kA	S1600-ND 3P 50kA/25kA	XS2000ND 3P 50kA/25kA	XS2500ND 3P 50kA/25kA	XS3200ND 3P 50kA/25kA			
	350V	S50-GD 3P 10kA/10kA	S125-ND 3P 10kA/10kA	S160-ND 3P 10kA/10kA	S250-ND 3P 10kA/10kA	S400-ND 3P 20kA/20kA	S800-ND 3P 30kA/15kA	S1000-ND 3P 30kA/15kA	S1250-ND 3P 50kA/25kA	S1600-ND 3P 50kA/25kA	XS2000ND 3P 50kA/25kA	XS2500ND 3P 50kA/25kA	XS3200ND 3P 50kA/25kA			
	250V							S1000-ND 2P 50kA/20kA	S1250-ND 2P 50kA/30kA	S1600-ND 2P 50kA/30kA	XS2000ND 2P 50kA/30kA	XS2500ND 2P 50kA/30kA	XS3200ND 2P 50kA/30kA			
Switch-disconnectors	1000V					PVS400-NNH 4P	PVS800-NNH 4P									
	800V				PVS160-NNL 4P	PVS400-NNL 4P	PVS800-NNL 4P									



2

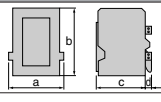
Ratings and Specifications

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Switch-disconnectors for DC800V-1000V	2-6

Air Circuit Breakers for DC350V-800V

Frame size (A)	1600	2000	2500	2500	3200	4000	4000
Type	AR216S	AR220S	AR325S	AR325-NDH	AR332S	AR440SB	AR440S
Rated current (max.) [I_n] A	1600	2000	2500	2500	3200	4000	4000
Number of poles	3	3	3	4	3	3	3
Rated insulation voltage [U_i] V	AC 1000	1000	1000	1000	1000	1000	1000
Rated operational voltage [U_e] V	DC 600	600	600	800	600	600	600
Rated impulse withstand voltage [U_{imp}] kV	12	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	40/40
	350V	40/40	40/40	40/40	—	40/40	40/40
Rated short time withstand current [I_{cw}] kA	1s	65	65	85	85	85	100
	3s	50	50	65	65	65	75
Latching current kA	65	65	85	85	85	85	100
Total breaking time (s)	0.04	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	10
Close time (s) max.	0.08	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 1000	1000	500	500	500	500
	DC 600V	1000	1000	500	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	140
Weight kg	76	79	105	125	105	126	139
Reverse connection	Yes	Yes	Yes	Yes	Yes	Yes	Yes

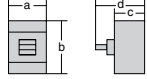
Sale shortly



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

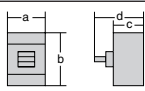
Moulded Case Circuit Breakers for DC350V-600V

Frame size (A)	50		125		160		250		400		800		1000									
Type	S50-GD		S125-ND		S160-ND		S250-ND		S400-ND		S800-ND		S1000-ND									
Number of poles	3	4	3	4	3	4	3	4	3	4	3		3									
■ Ratings																						
Rated current, A	15	40	20 (12.5-20)		20 (12.5-20)		160 (100-160)		250 (160-250)		630 (400-630)		1000									
Calibrated at 45°C	20	50	32 (20-32)		32 (20-32)		250 (160-250)		400 (250-400)		800 (500-800)											
	30		50 (32-50)		50 (32-50)																	
	(40°C only)		63 (40-63)		63 (40-63)																	
			100 (63-100)		100 (63-100)																	
			125 (80-125)		125 (80-125)																	
					160 (100-160)																	
* 2 poles breaker is same outline dimensions as 3 poles breaker.																						
Rated insulation voltage [U _i] V	AC 690		690		690		690		690		690		690									
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 600V		—		5/5		—		5/5		15/15		20/10									
IEC 60947-2	500V		—		7.5/7.5		—		7.5/7.5		15/15		20/10									
I _{cu} /I _{cs} (4) (5)	350V		10/10		—		10/10		—		20/20		30/15									
	250V		—		—		—		—		—		50/20									
■ External dimensions, mm																						
			a 90 120		b 155		c 68		d 92		90 120		105 140		105 140		140		210		210	
Weight (● marked standard type) kg	1.1 1.4		1.1 1.4		1.5 1.9		1.5 1.9		4.2		8.5		9.8 10.8									
■ 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 ●		A X ●		A X ●		A X ●		A X ●		A X ●									
	Alarm switch		A L ●		A L ●		A L ●		A L ●		A L ●		A L ●									
	Shunt trips		S H ●		S H ●		S H ●		S H ●		S H ●		S H ●									
	Undervoltage trips		U V ●		U V ●		U V ●		U V ●		U V ●		U V ●									
	Motor operator		M C ●		M C ●		M C ●		M C ●		M C ●		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 ●							
	Toggle holder		H H ●		Toggle lock H L ●		Terminal cover For front-connected C F ● (8)		For rear-connected and plug-in C R ● (8)		Interpole barrier B A ● (3)		Terminal block for lead T F ●		Door flange D F ●							
	Terminal cover		For front-connected C F ● (8)		For rear-connected and plug-in C R ● (8)		Interpole barrier B A ● (3)		Terminal block for lead T F ●		Door flange D F ●											
	Interpole barrier		B A ● (3)		Terminal block for lead T F ●		Door flange D F ●															
	Terminal block for lead		T F ●		Door flange D F ●																	
Door flange		D F ●																				
■ Standard specifications																						
Overcurrent trip mechanism	Fixed thermal, fixed magnetic		Grey		Adj. thermal, fixed magnetic		Grey		Adj. thermal, fixed magnetic		Grey		Adj. thermal, fixed magnetic		Grey							
Colour of cover	Yes (Red)		Yes (Red)		Yes (Red)		Yes (Red)		Yes (Red)		Yes (Red)		Yes (Red)		Yes (Red)							
Trip button (Colour)	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes							
Handle position indication (ON: Red, OFF: Green)	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes							
Suitability for isolation	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes							
Reverse connection	Yes		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".
- ① : Instantaneous trip only.
- 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
- ⑧ : Line side terminal cover is supplied as standard when over DC350V.

Moulded Case Circuit Breakers for DC350V-600V

Frame size (A)	1250		1600		2000		2500		3200			
Type	S1250-ND		S1600-ND		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				
	b	370	370	450	450	450	450	450				
	c	140	140	185	185	185	185	185				
	d	191	191	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	H B	●	●	—	—	—	—	—	—		
	Door-mounted (variable depth)	H P	●	●	● ⑦	● 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.

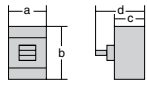
⑤ : The time constant (L/R) of the circuit should be,

- 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)	400	400	800	800				
Type	PVS400-NDL	PVS400-NDH	PVS800-NDL	PVS800-NDH				
Number of poles	4	4	4	4				
■ Ratings								
Rated current, A	250 (160-250)	250 (160-250)	630 (400-630)	630 (400-630)				
Calibrated at 45°C	400 (250-400)	400 (250-400)	800 (500-800)	800 (500-800)				
* 2 poles breaker is same outline dimensions as 3 poles breaker.								
Rated insulation voltage [U _i] V AC	1150	1150	1150	1150				
Rated impulse withstand voltage [U _{imp}] kV	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	10/10	—	10/10	—				
■ 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 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	●	●	●	●			
		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								
Overcurrent trip mechanism	Adj. thermal, fixed magnetic	Adj. thermal, fixed magnetic	Adj. thermal, fixed magnetic	Adj. thermal, fixed magnetic				
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".

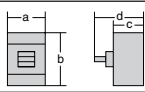
① : Connect 4poles in series.

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

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.

Switch-disconnectors for DC800V-1000V

Frame size (A)	160	400	400	800	800			
Type	PVS160-NNL	PVS400-NNL	PVS400-NNH	PVS800-NNL	PVS800-NNH			
Number of poles	4	4	4	4	4			
■ Ratings								
Rated current, A	160	400	400	630 800	630 800			
Rated insulation voltage [U_i] V	AC 800	1150	1150	1150	1150			
Rated operational voltage V	DC 800	800	1000	800	1000			
Rated short circuit making capacity, kA peak	6	9	9	17	17			
Rated short time withstand current, kA	2 (0.3sec.)	5 (0.3sec.)	5 (0.3sec.)	10 (0.3sec.)	10 (0.3sec.)			
Rated impulse withstand voltage [U_{imp}] kV	8	8	8	8	8			
■ Performance								
Utilization category ①②	DC	DC-22B	DC-22A	DC-22A	DC-22A			
JIS C 8201-3 IEC 60947-3								
■ External dimensions, mm								
	a	140	185	185	280	280		
	b	165	260	260	273	273		
	c	68	103	103	103	103		
	d	92	145	145	145	145		
Weight (● marked standard type) kg	1.9	5.6	5.6	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	●	●	●	●		
Exterior	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	—	—	—	—	
	Toggle holder	Link type	M L	●	●	●	●	
		Wire type	M W	●	●	●	●	
	Toggle lock	H L	●	●	●	●		
	Terminal cover	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	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 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 $\leq 10\text{KA}$
 - less than 10ms for short circuit $\leq 20\text{KA}$
 - less than 15ms for short circuit $> 20\text{KA}$
 - 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.

3

Characteristics

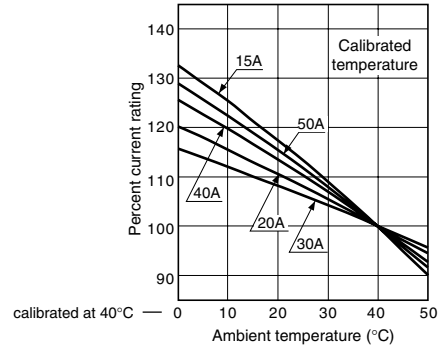
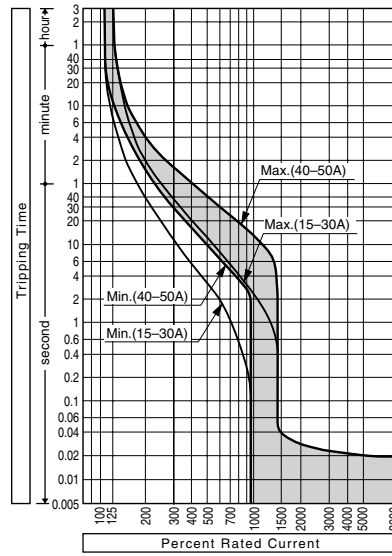
Time/Current characteristic curves, Ambient Compensating Curves

S50-GD, S125-ND	3-2
S160-ND, S250-ND, S400-ND	3-3
S800-ND, S1000-ND, S1250-ND	3-4
S1600-ND, XS2000ND, XS2500ND	3-5
XS3200ND, PVS400-NDL, PVS400-NDH	3-6
PVS800-NDL, PVS800-NDH	3-7

Time/Current characteristic curves, Ambient Compensating Curves

Type Time/Current characteristic curves, Ambient Compensating Curves

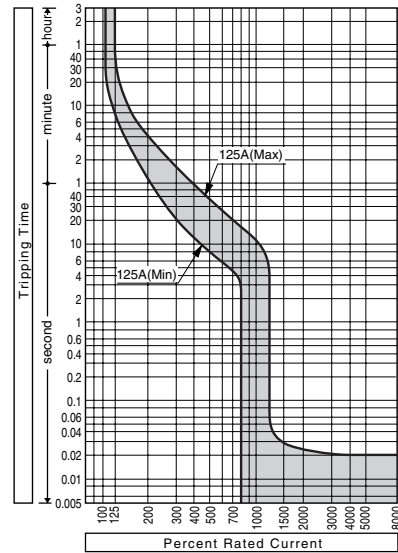
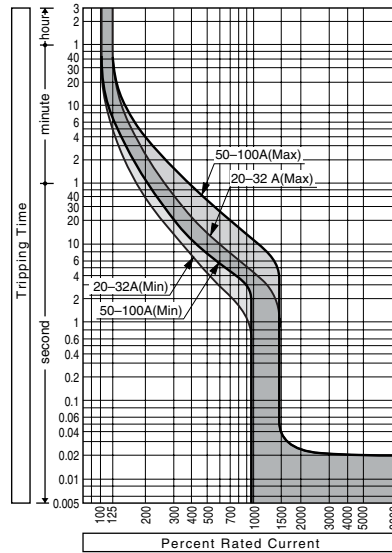
S50-GD



Rated current (A)	Magnetic trip current (A)
15	180
20	240
30	360
40	480
50	600

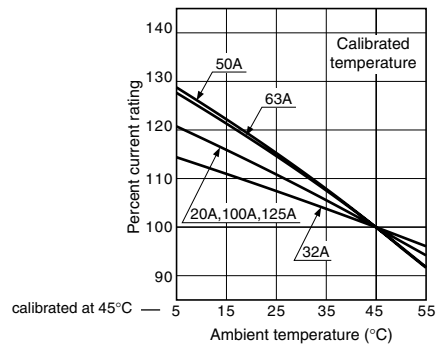
Notes : Setting tolerance $\pm 20\%$

S125-ND

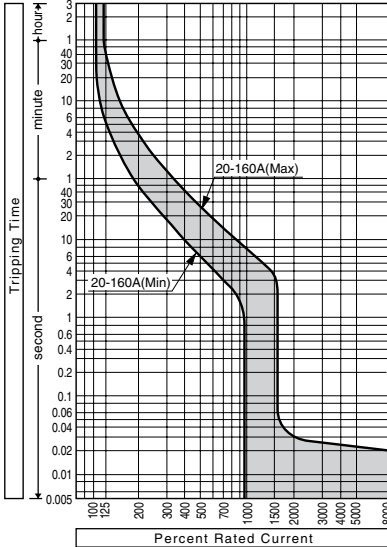
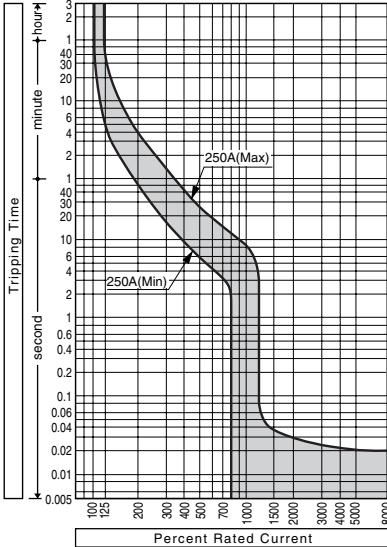
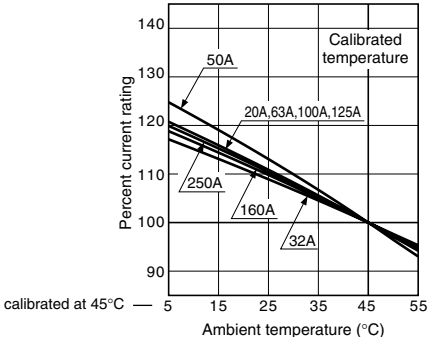
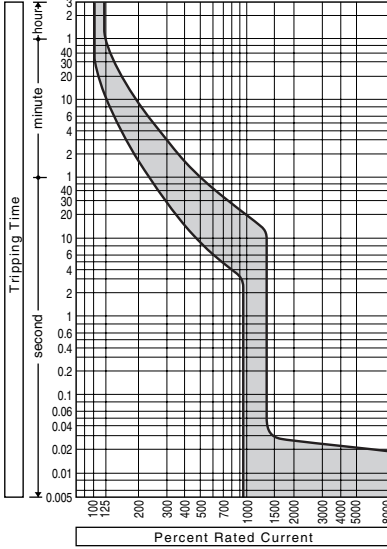
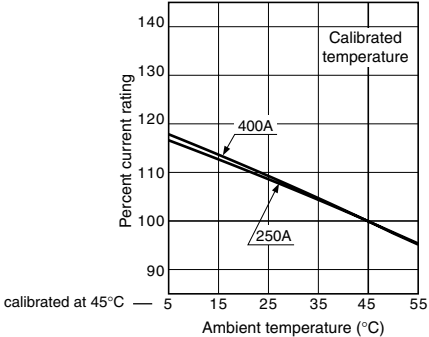


Rated current (A)	Magnetic trip current (A)
20	240
32	384
50	600
63	756
100	1200
125	1250

Notes : Setting tolerance $\pm 20\%$



Time/Current characteristic curves, Ambient Compensating Curves

Type	Time/Current characteristic curves, Ambient Compensating Curves																		
<p>S160-ND S250-ND</p>	<div style="display: flex; justify-content: space-around;">   </div> <table border="1" data-bbox="507 1146 890 1326"> <thead> <tr> <th>Rated current (A)</th> <th>Magnetic trip current (A)</th> </tr> </thead> <tbody> <tr><td>20</td><td>240</td></tr> <tr><td>32</td><td>384</td></tr> <tr><td>50</td><td>600</td></tr> <tr><td>63</td><td>756</td></tr> <tr><td>100</td><td>1200</td></tr> <tr><td>125</td><td>1500</td></tr> <tr><td>160</td><td>2080</td></tr> <tr><td>250</td><td>2500</td></tr> </tbody> </table> <p>Notes : Setting tolerance ±20%</p>  <p>calibrated at 45°C</p>	Rated current (A)	Magnetic trip current (A)	20	240	32	384	50	600	63	756	100	1200	125	1500	160	2080	250	2500
Rated current (A)	Magnetic trip current (A)																		
20	240																		
32	384																		
50	600																		
63	756																		
100	1200																		
125	1500																		
160	2080																		
250	2500																		
<p>S400-ND</p>	  <p>calibrated at 45°C</p> <table border="1" data-bbox="1066 1953 1449 2020"> <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 ±20%</p>	Rated current (A)	Magnetic trip current (A)	250	3000	400	4800												
Rated current (A)	Magnetic trip current (A)																		
250	3000																		
400	4800																		

Time/Current characteristic curves, Ambient Compensating Curves

Type	Time/Current characteristic curves, Ambient Compensating Curves																	
S800-ND		<table border="1" data-bbox="1013 795 1396 862"> <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 data-bbox="1013 862 1228 884">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		<table border="1" data-bbox="1013 1422 1396 1467"> <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 data-bbox="1013 1467 1228 1489">Notes : Setting tolerance $\pm 20\%$</p>	Rated current (A)	Magnetic trip current (A)	1000	8000												
Rated current (A)	Magnetic trip current (A)																	
1000	8000																	
S1250-ND		<table border="1" data-bbox="829 1948 1412 2016"> <thead> <tr> <th>Rated current (A)</th> <th>Scale</th> <th>Magnetic trip current (A)</th> <th>8</th> <th>7.1</th> <th>6.3</th> <th>5</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>1250</td> <td></td> <td>8000</td> <td>7100</td> <td>6300</td> <td>5000</td> <td>4000</td> <td></td> </tr> </tbody> </table> <p data-bbox="829 2016 1300 2038">Notes : Setting tolerance $\pm 10\%$ at 8000A and $\pm 25\%$ for other settings.</p> <p data-bbox="829 2094 1292 2116">Note: Magnetic trip only. Use the external over-current relay.</p>	Rated current (A)	Scale	Magnetic trip current (A)	8	7.1	6.3	5	4	1250		8000	7100	6300	5000	4000	
Rated current (A)	Scale	Magnetic trip current (A)	8	7.1	6.3	5	4											
1250		8000	7100	6300	5000	4000												

Time/Current characteristic curves, Ambient Compensating Curves

Type	Time/Current characteristic curves, Ambient Compensating Curves													
<p>S1600-ND</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>1600</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	1600	8000	7100	6300	5000	4000
Rated current (A) Scale	8	7.1	6.3	5	4									
1600	8000	7100	6300	5000	4000									
<p>XS2000ND</p>		<table border="1" data-bbox="874 1348 1460 1408"> <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>2000</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	2000	8000	7100	6300	5000	4000
Rated current (A) Scale	8	7.1	6.3	5	4									
2000	8000	7100	6300	5000	4000									
<p>XS2500ND</p>		<table border="1" data-bbox="874 1962 1460 2022"> <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									

Time/Current characteristic curves, Ambient Compensating Curves

Type	Time/Current characteristic curves, Ambient Compensating Curves													
XS3200ND		<table border="1" data-bbox="836 734 1412 792"> <thead> <tr> <th>Rated current (A) Scale</th> <th colspan="5">Magnetic trip current (A)</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 data-bbox="836 797 1308 819">Notes : Setting tolerance $\pm 10\%$ at 12000A and $\pm 25\%$ for other settings.</p> <p data-bbox="836 873 1292 896">Note: Magnetic trip only. Use the external over-current relay.</p>	Rated current (A) Scale	Magnetic trip current (A)					3200	12000	11000	10000	8000	6000
Rated current (A) Scale	Magnetic trip current (A)													
3200	12000	11000	10000	8000	6000									
PVS400-NDL		<table border="1" data-bbox="1015 1415 1398 1473"> <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="1015 1476 1228 1498">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		<table border="1" data-bbox="1015 2027 1398 2085"> <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="1015 2087 1228 2110">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													

Time/Current characteristic curves, Ambient Compensating Curves

Type	Time/Current characteristic curves, Ambient Compensating Curves						
PVS800-NDL PVS800-NDH	<div style="display: flex; justify-content: space-around;"> <div data-bbox="507 331 901 878"> <p>The graph shows tripping time on a logarithmic scale from 0.005 to 3 hours against percent rated current from 100 to 8000. Two curves are shown: one for 800A (left) and one for 630A (right). Both curves show a sharp drop in tripping time as current increases, reaching a minimum between 500% and 700% of rated current.</p> </div> <div data-bbox="970 331 1401 689"> <p>This graph shows the percent current rating (90-140) versus ambient temperature (5-55°C). Two lines represent the 800A and 630A models. The 800A line starts at approximately 118% at 5°C and ends at 95% at 55°C. The 630A line starts at approximately 112% at 5°C and ends at 90% at 55°C. The device is calibrated at 45°C.</p> </div> </div> <div style="margin-top: 10px;"> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Rated current (A)</th> <th style="text-align: left;">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>Notes : Setting tolerance $\pm 20\%$</p> </div>	Rated current (A)	Magnetic trip current (A)	630	3500	800	3500
Rated current (A)	Magnetic trip current (A)						
630	3500						
800	3500						

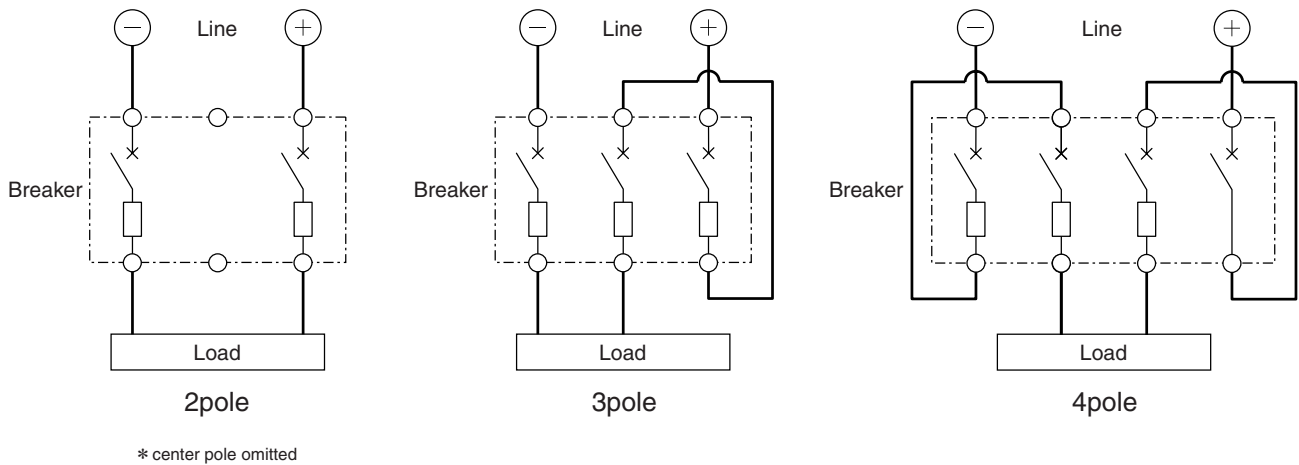
4 Mounting and Connection

Connection of conductors to DC circuit breakers	4-2
Insulation distance DC600V or less	4-3
Insulation distance DC750V-1000V	
PVS400-NDL, PVS400-NDH	4-4
PVS400-NNL, PVS400-NNH	4-5
PVS800-NDL, PVS800-NDH	4-6
PVS800-NNL, PVS800-NNH	4-7

Connection of conductors to DC circuit breakers

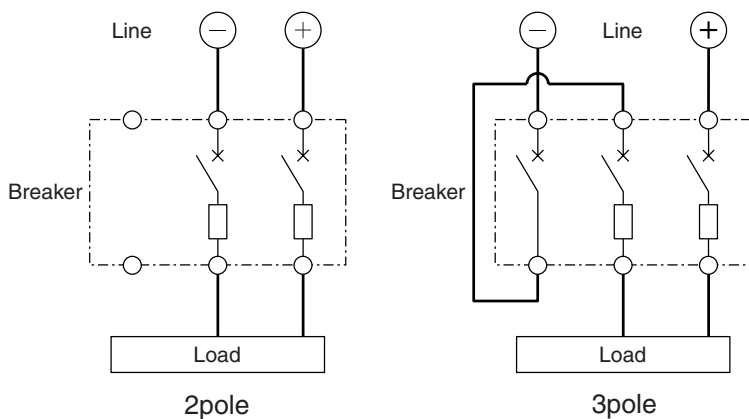
It is more difficult to interrupt DC current than AC current because DC current does not have a zero point. Therefore for high DC voltages, 3-pole or 4-pole circuit breaker main contacts are connected in series to ensure breaking performance. As illustrated below, the main power conductors for DC-use 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.

(except S1250-ND, S1600-ND)



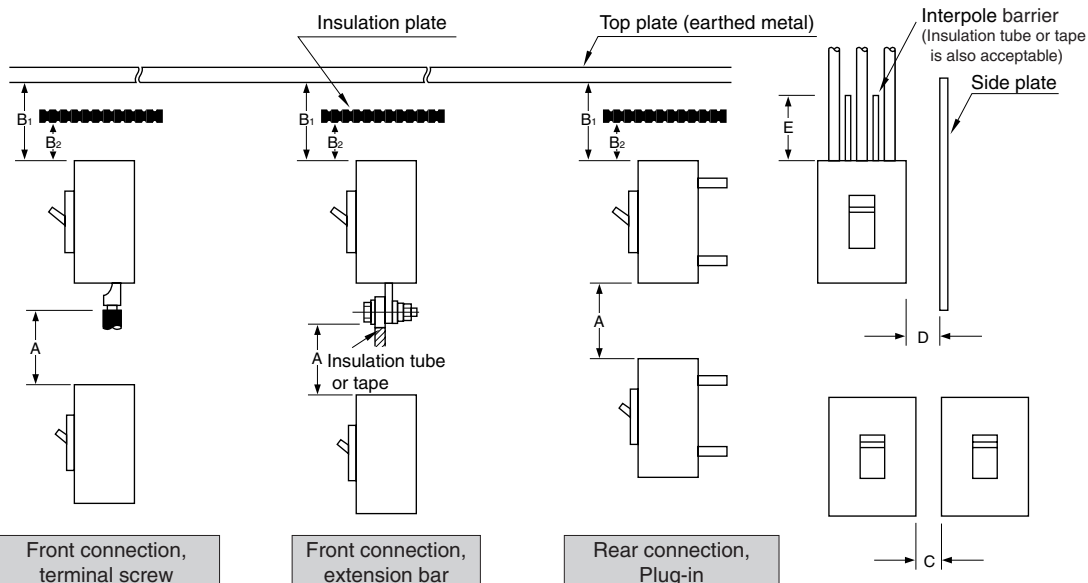
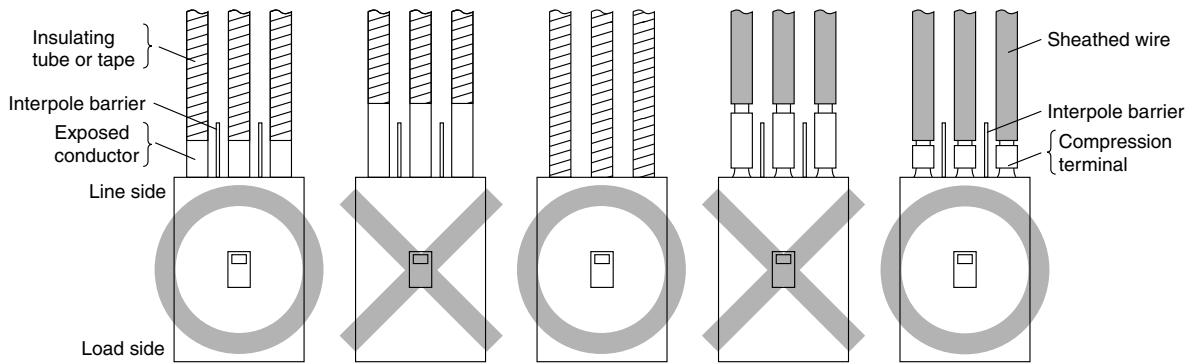
NOTE For S1250-ND, S1600-ND

S1250-ND and S1600-ND do not have the tripping element on the left pole. These breakers shall be connected as shown below.



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	B1	B2	C	D	E	
				Note ②						
S50-GD	S125-ND			50	50 Note ⑤	50 Note ⑤	*	Possible to set close Note ③	25	Not less than the length of the bare live part Note ④
S160-ND	S250-ND			65	65 Note ⑤	65 Note ⑤	*	∕	50	∕
S400-ND	S800-ND	S1000-ND		150	120	80	∕	∕	80	∕
S1250-ND	S1600-ND	XS2000ND	XS2500ND	150	150	100	∕	∕	100	∕

Notes:

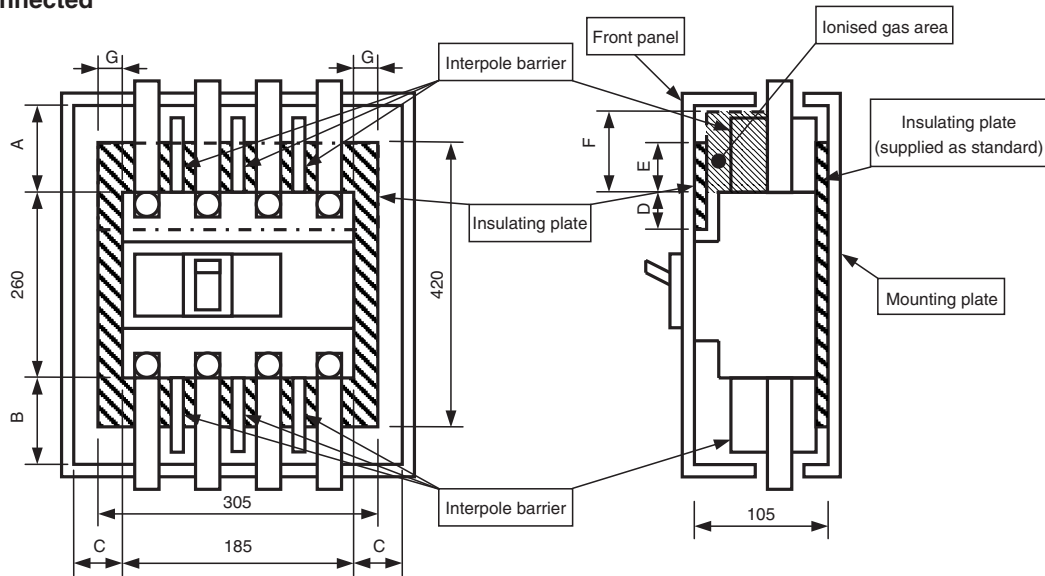
- ①. Required to allow free and uninterrupted flow of arc gases. Ensure additional clearance or insulation distance if required to perform wiring, barrier installation or electrical work or to meet the need for more insulation distance between bare live parts and grounded metal members in a switchboard 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. If the rated voltage is more than 350V DC, be sure to install the terminal covers (supplied as standard) on the line side of the 4poles breakers.
- *. If using extension bars (optional), ensure the insulation distance specified for the application.

Insulation distance DC750V-1000V

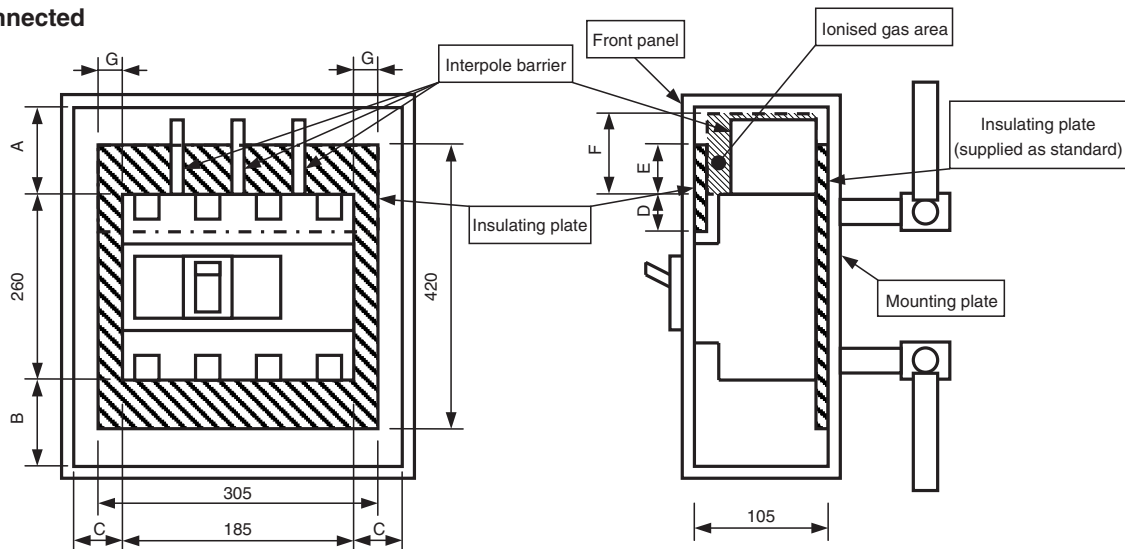
The insulation distances between the breaker and earthed metal parts and insulators shown in the table below must be maintained to prevent arcing faults occurring due to conductive ionised gas. In addition, any exposed line-side conductors must be completely covered, right up the breaker casing or to below the height protected by any 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, then 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.

PVS400-NDL, PVS400-NDH

Front-connected



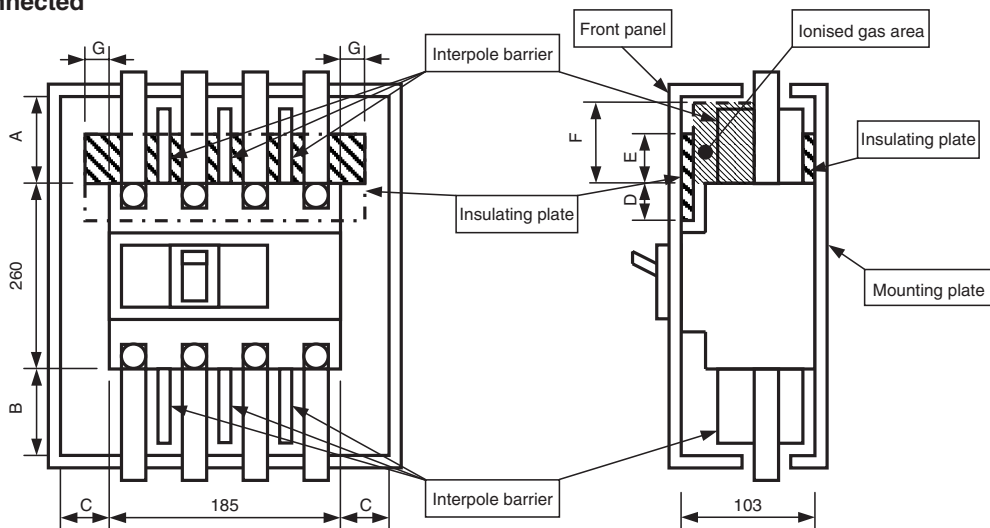
Rear-connected



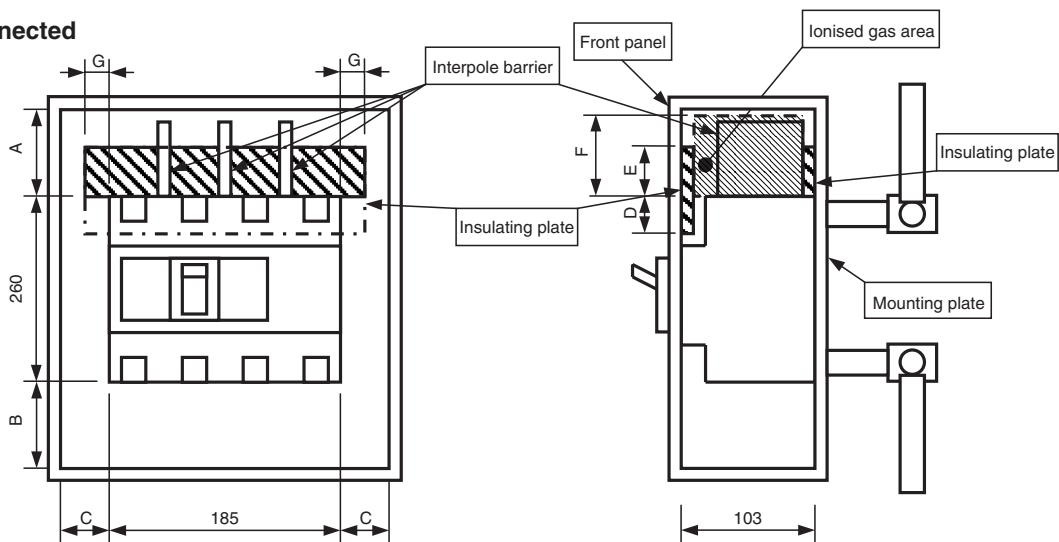
Type	Connection	Minimum insulation distance (mm)							Insulating plate	
		A	B	C	D	E	F	G	Front panel side	Mounting plate side
PVS400-NDL PVS400-NDH	Front-connected Rear-connected	160	80	80	30	140	160	60	Not supplied	Supplied as standard

PVS400-NNL, PVS400-NNH

Front-connected



Rear-connected

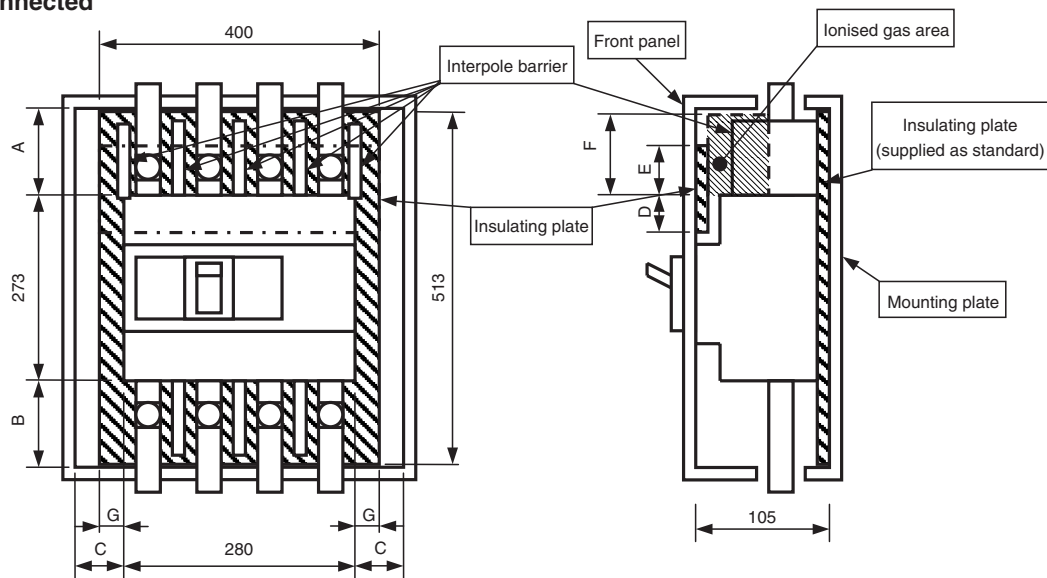


Type	Connection	Minimum insulation distance (mm)							Insulating plate	
		A	B	C	D	E	F	G	Front panel side	Mounting plate side
PVS400-NNL PVS400-NNH	Front-connected Rear-connected	120	80	80	30	80	80	40	Not supplied	Not supplied

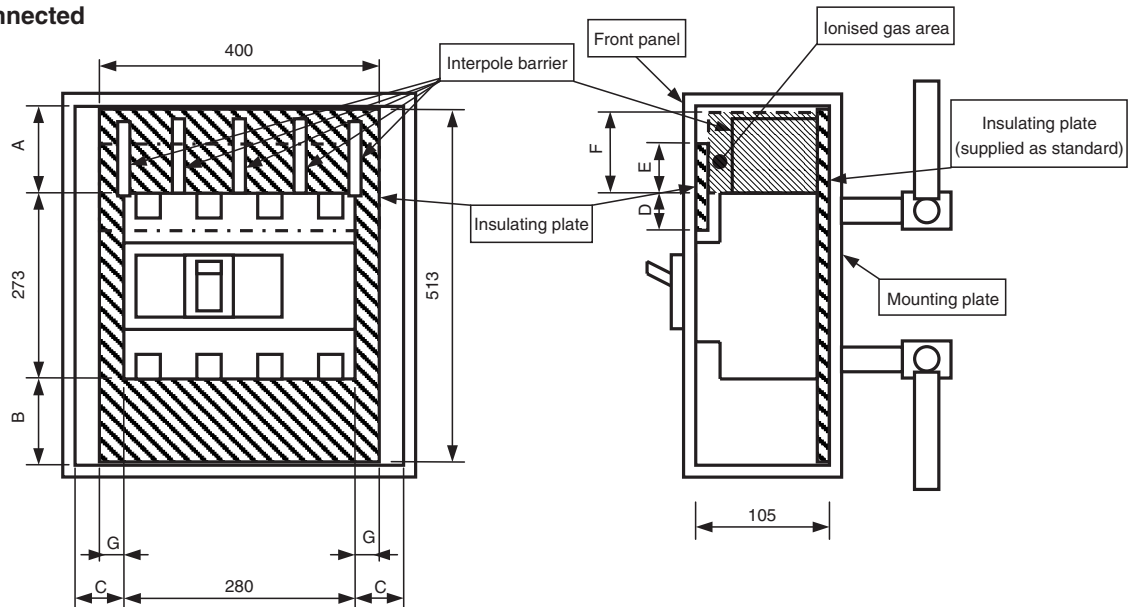
Insulation distance DC750V-1000V

PVS800-NDL, PVS800-NDH

Front-connected



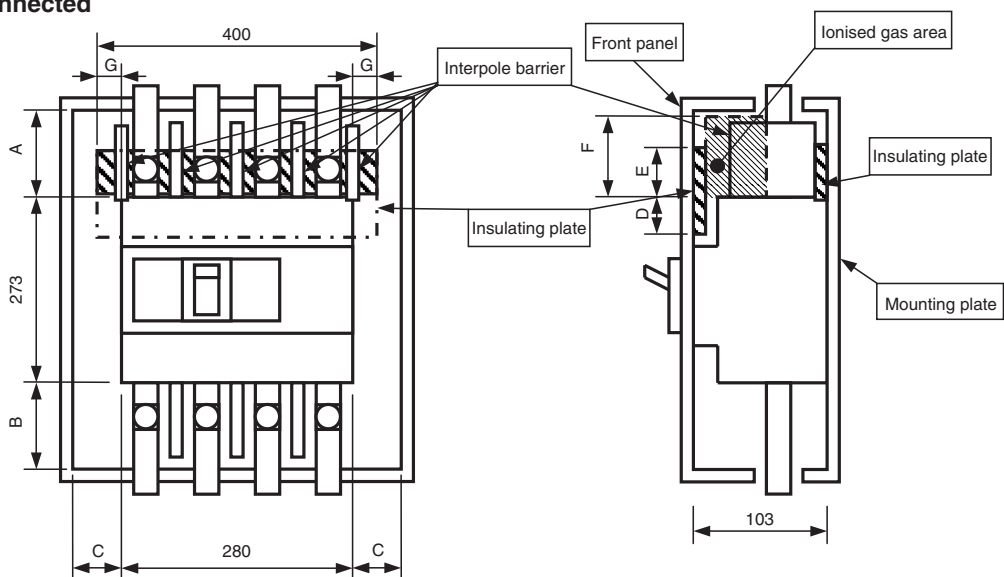
Rear-connected



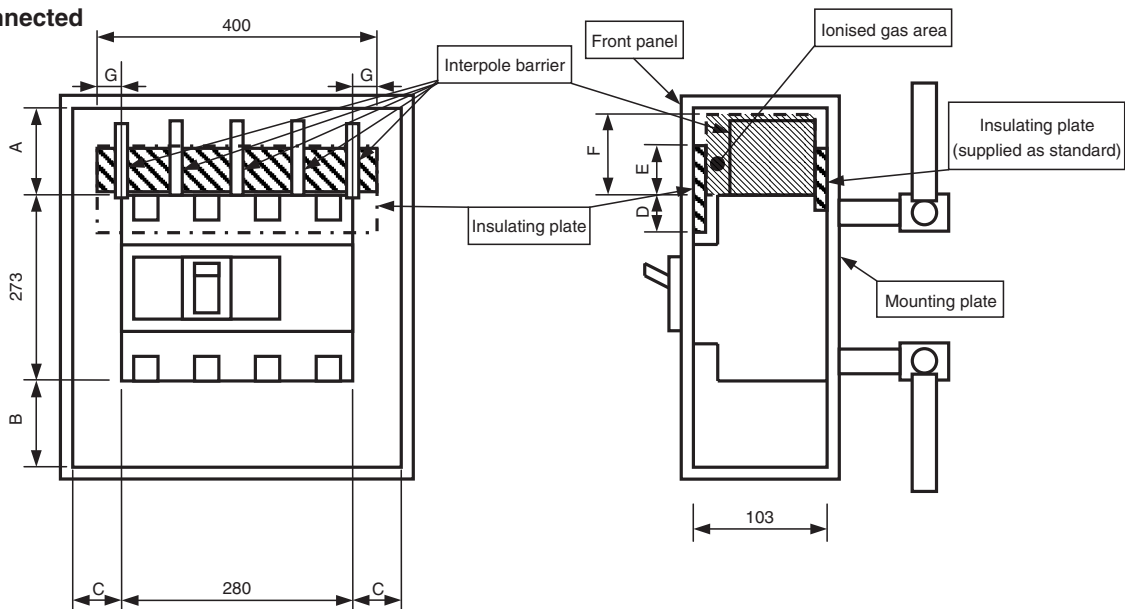
Type	Connection	Minimum insulation distance (mm)							Insulating plate	
		A	B	C	D	E	F	G	Front panel side	Mounting plate side
PVS800-NDL PVS800-NDH	Front-connected Rear-connected	160	80	80	80	140	160	60	Not supplied	Supplied as standard

PVS800-NNL, PVS800-NNH

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 PVS800-NNH	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	5-2
AR325S, AR332S	5-4
AR325-NDH	5-6
AR440SB	5-8
AR440S	5-10

DC Moulded Case Circuit Breakers Outline Dimensions

S50-GD, S125-ND	5-12
S160-ND, S250-ND	5-13
S400-ND	5-14
S800-ND	5-14
S1000-ND	5-15
S1250-ND	5-16
S1600-ND	5-17
XS2000ND	5-18
XS2500ND, XS3200ND	5-19
PVS160-NNL	5-20
PVS400-NDL, PVS400-NDH, PVS400-NNL, PVS400-NNH	5-20
PVS800-NDL, PVS800-NDH, PVS800-NNL, PVS800-NNH	5-21

DC Air Circuit Breakers

CP : ACB Front cover center line

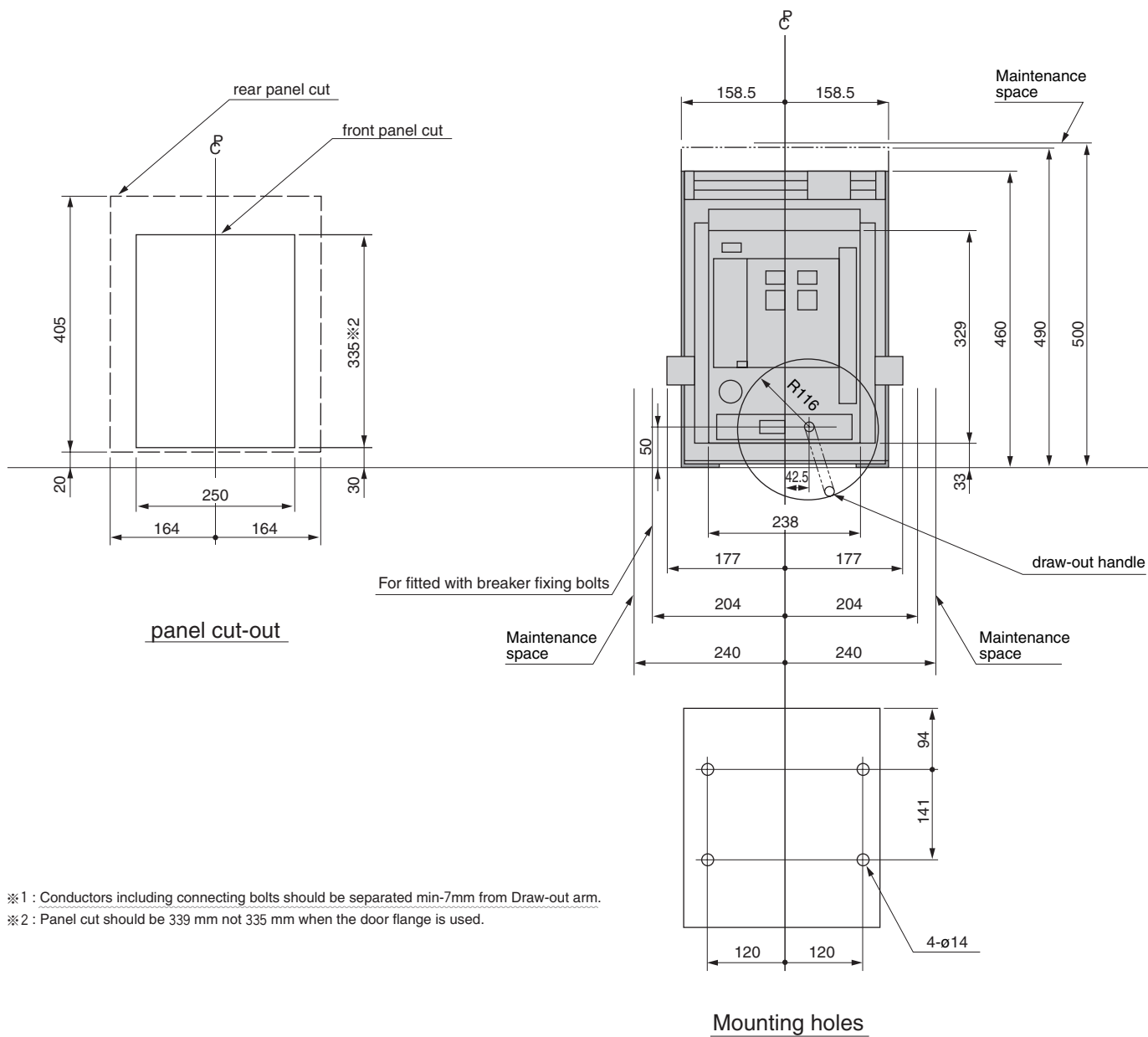
Outline dimensions (mm)

AR216S, AR220S

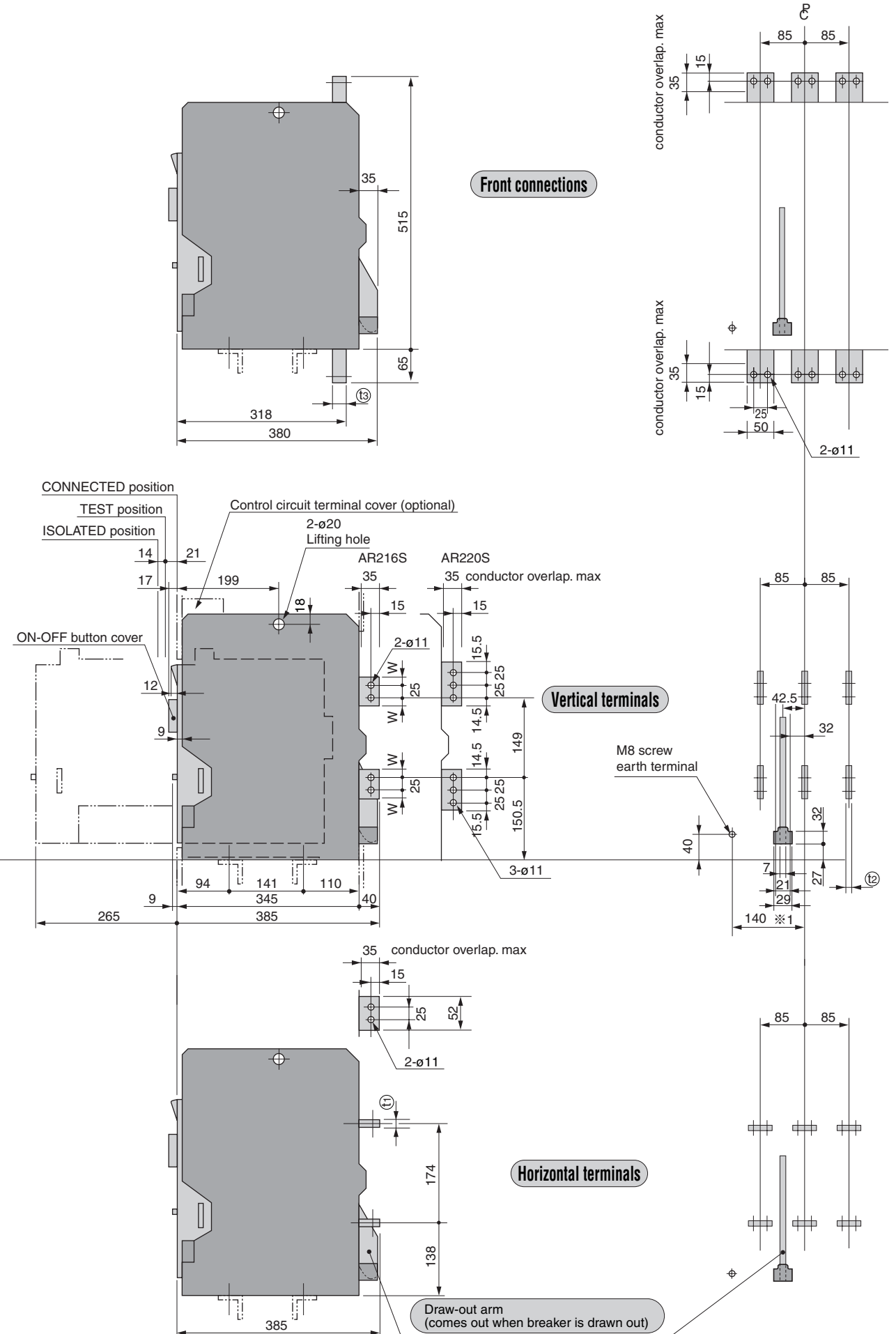
• Type AR216S, AR220S Draw-out type

Terminal size

Type	t1	t2	t3	W
AR216S	20	15	25	22.5
AR220S	20	15	25	—



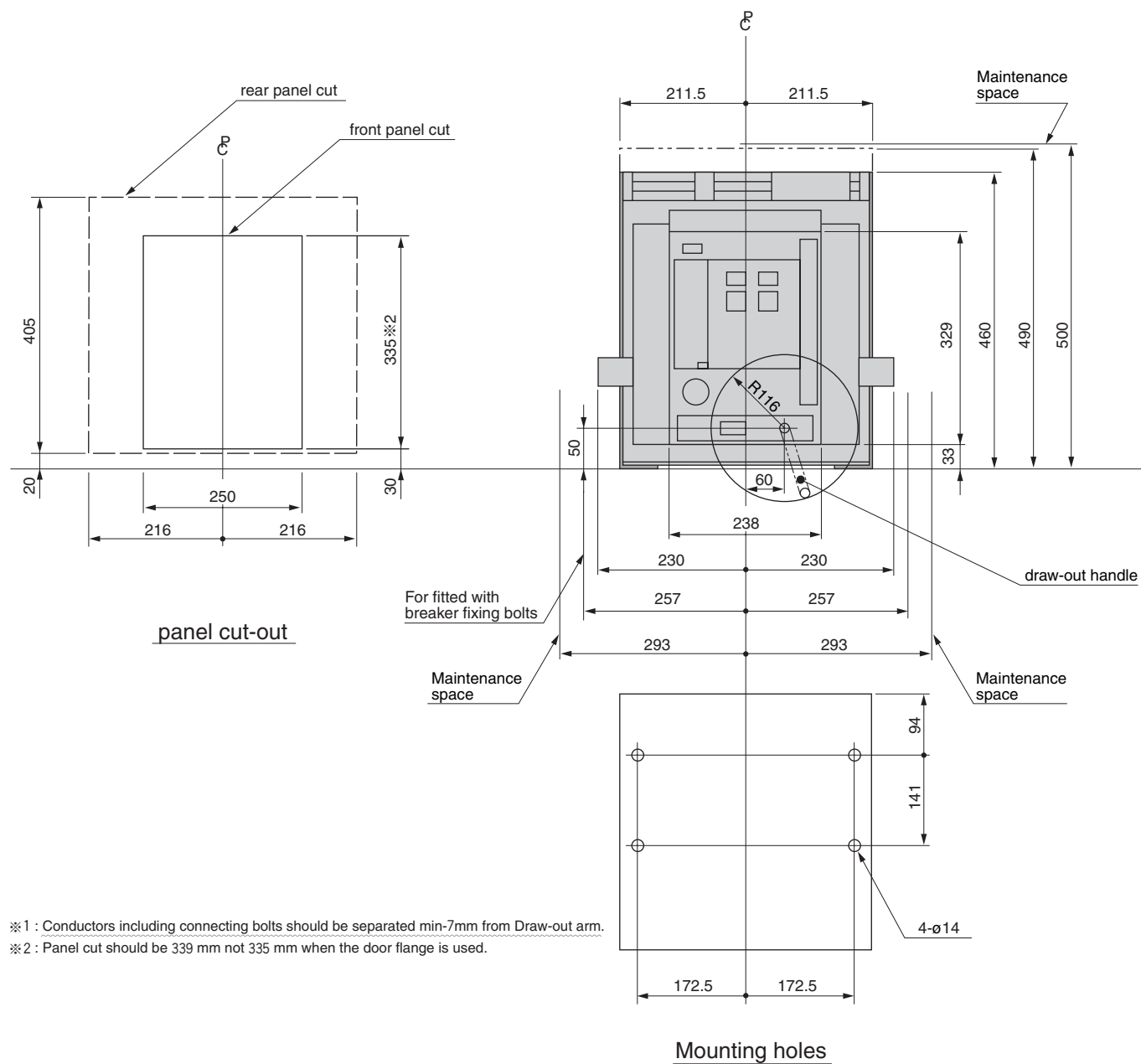
※1 : Conductors including connecting bolts should be separated min-7mm from Draw-out arm.
 ※2 : Panel cut should be 339 mm not 335 mm when the door flange is used.



DC Air Circuit Breakers

Outline dimensions (mm)

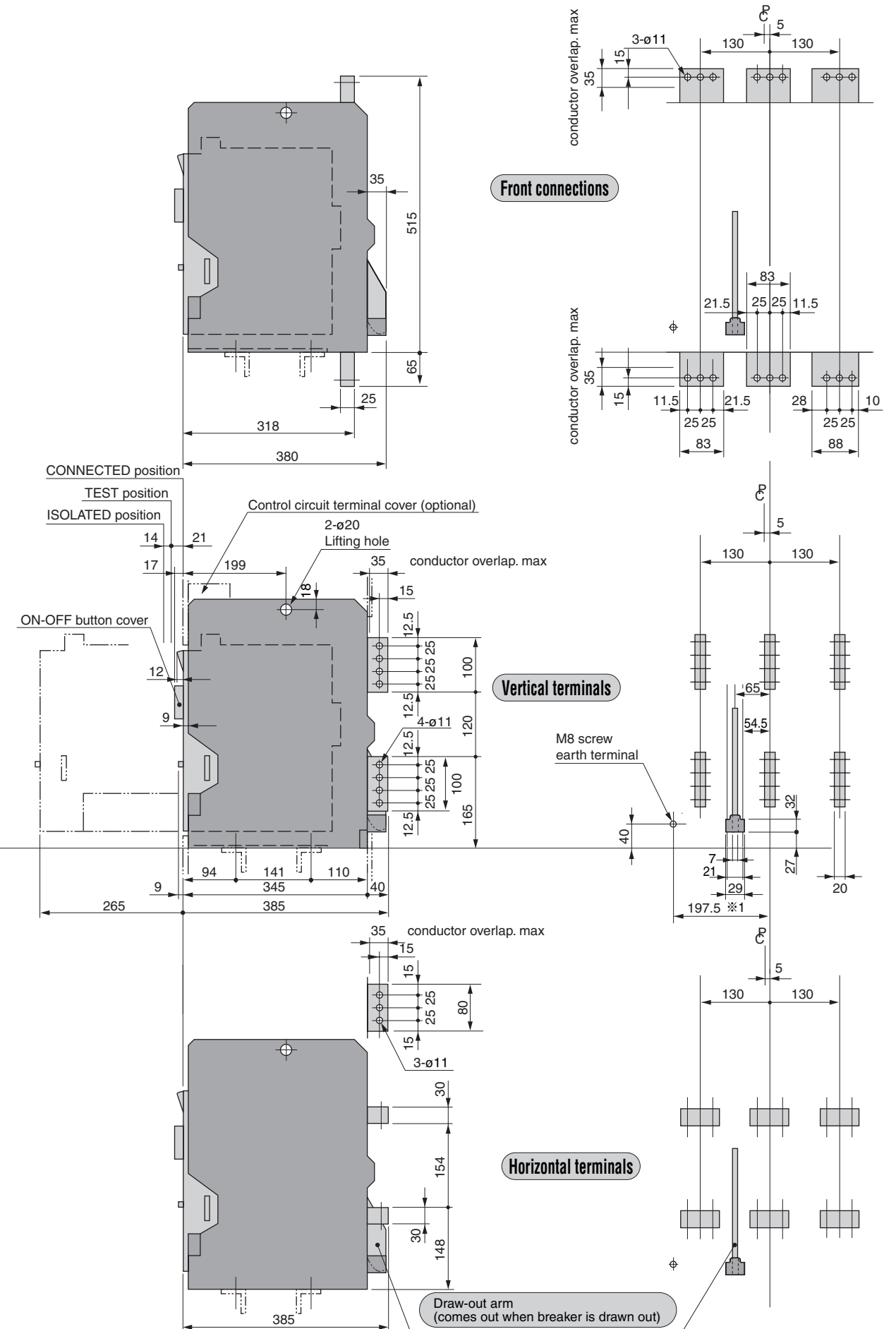
• Type AR325S, AR332S Draw-out type



※ 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.

\mathcal{P} : ACB Front cover center line

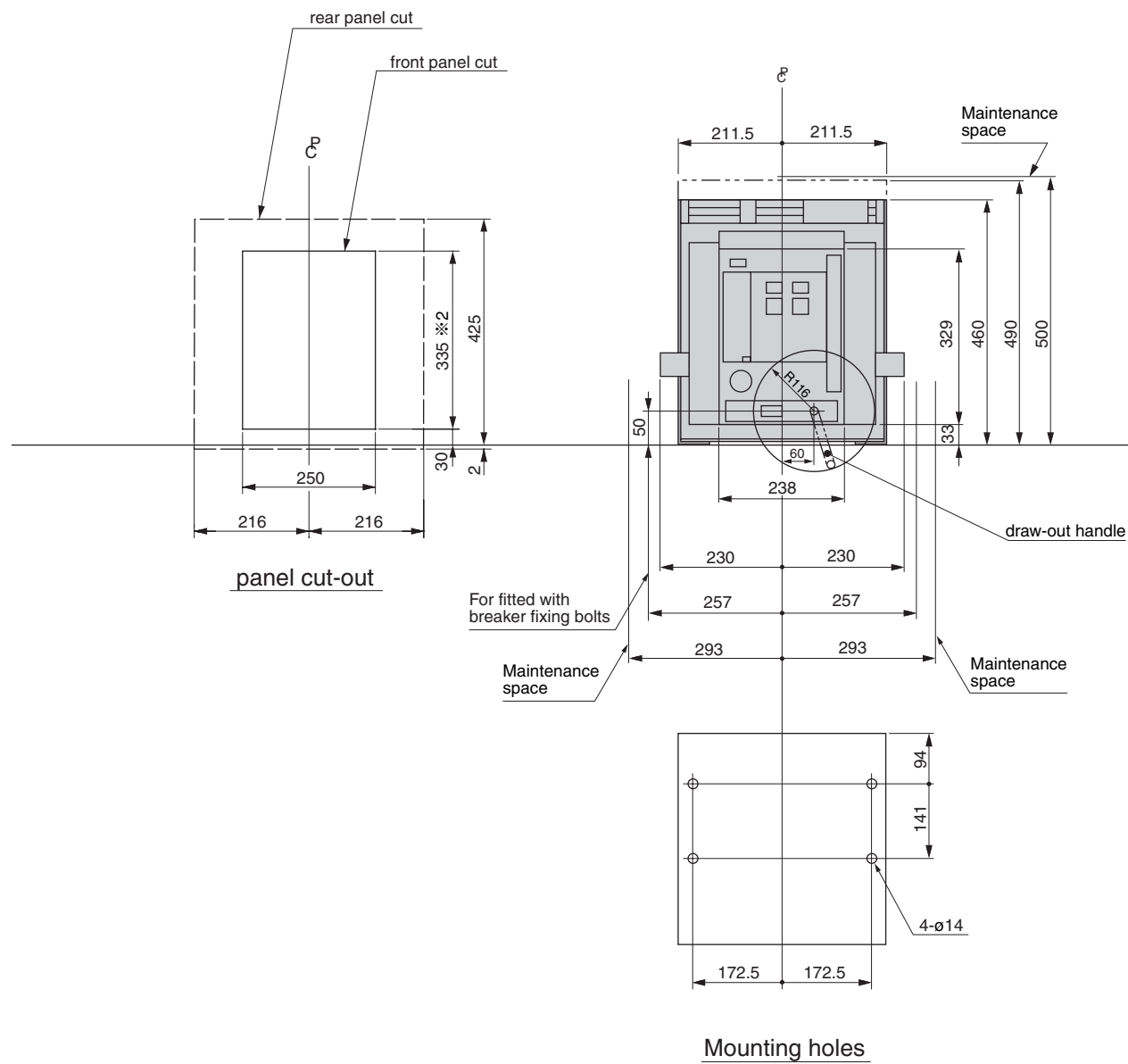
AR325S, AR332S



DC Air Circuit Breakers

Outline dimensions (mm)

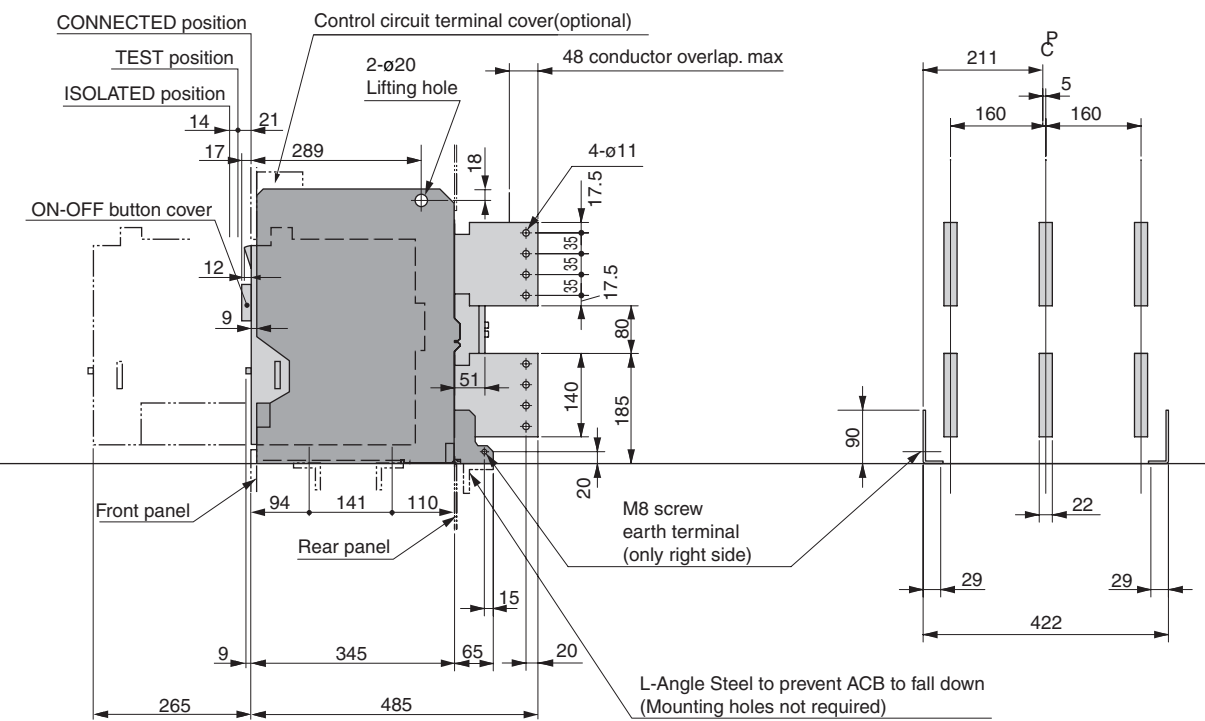
• Type AR440SB Draw-out type



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

P : ACB Front cover center line

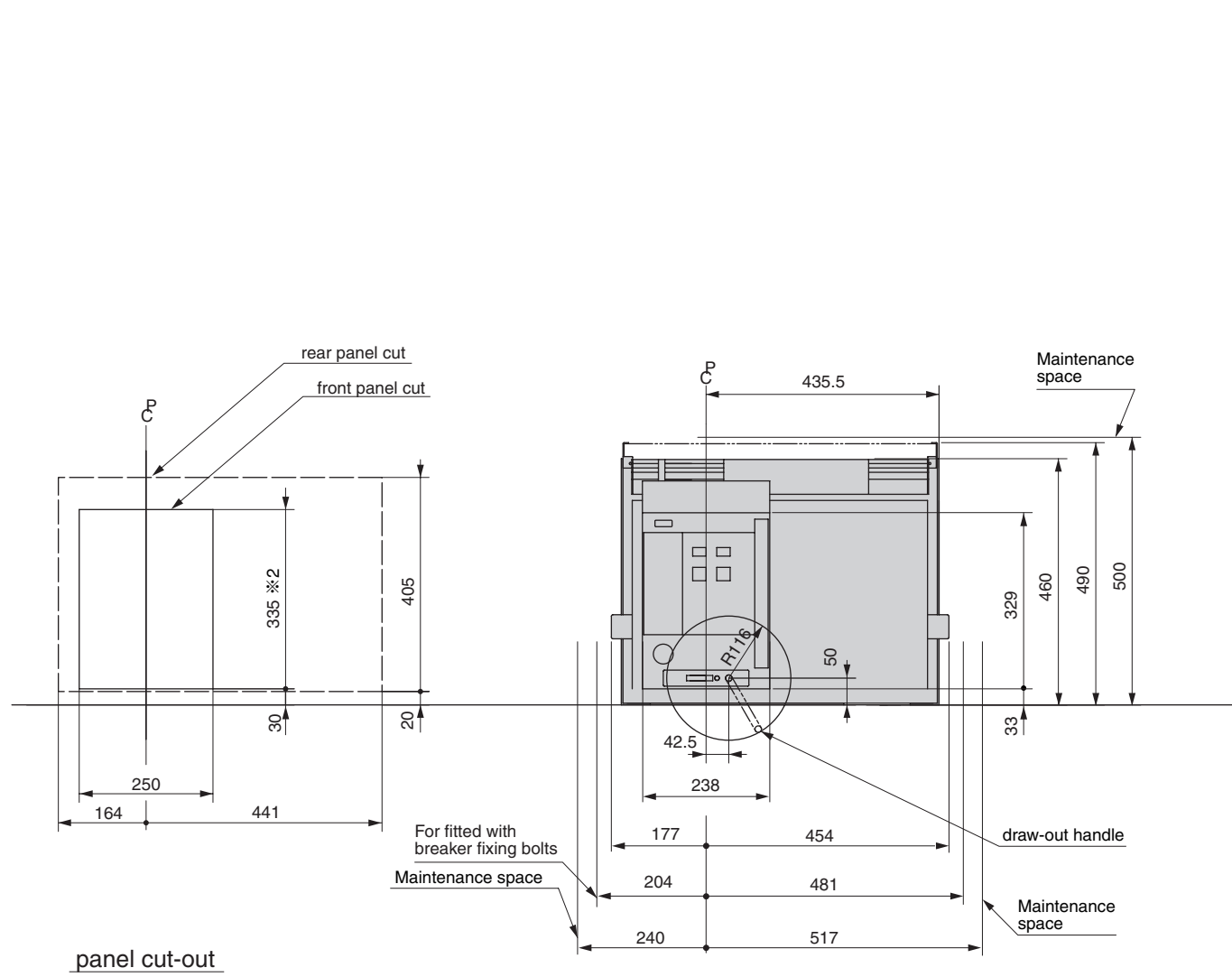
AR440SB



DC Air Circuit Breakers

Outline dimensions (mm)

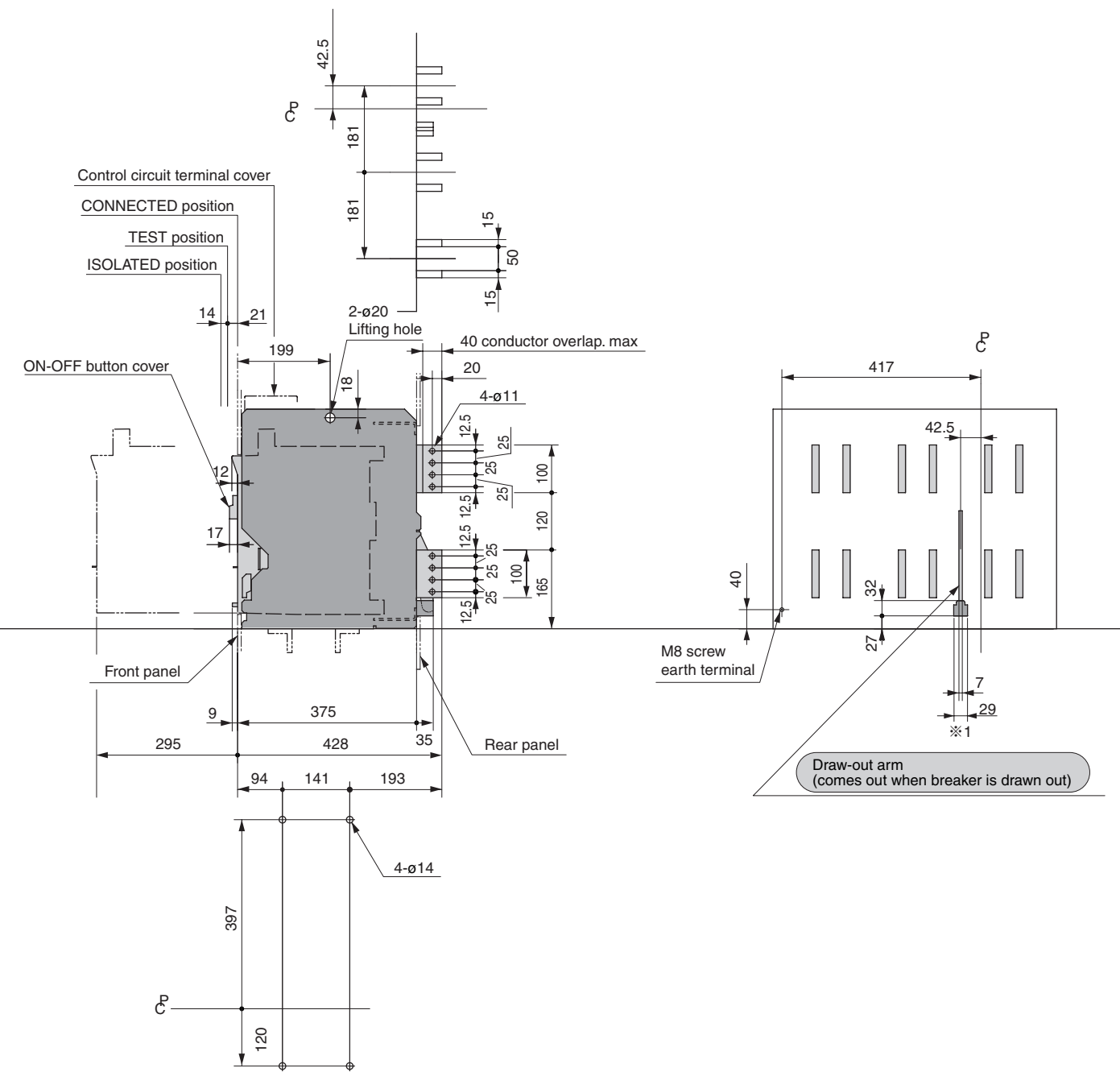
• Type AR440S Draw-out type



※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.

CP : ACB Front cover center line

AR440S

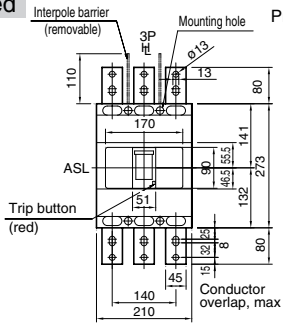


5 Outline Dimensions

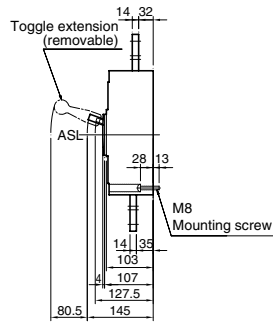
Outline dimensions (mm)

S1000-ND

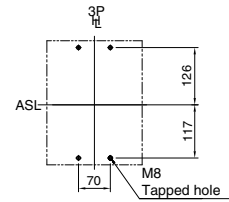
Front-connected



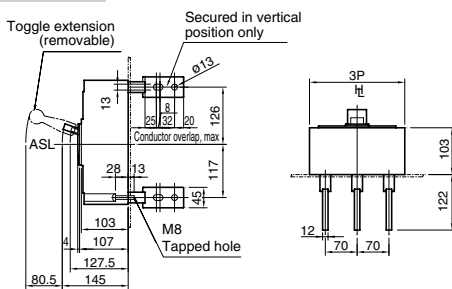
Preparation of conductor



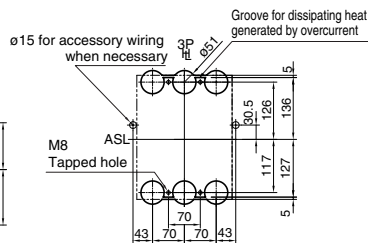
Drilling plan (front view)



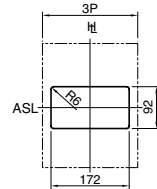
Rear-connected



Drilling plan (front view)



Panel cutout (front view)



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

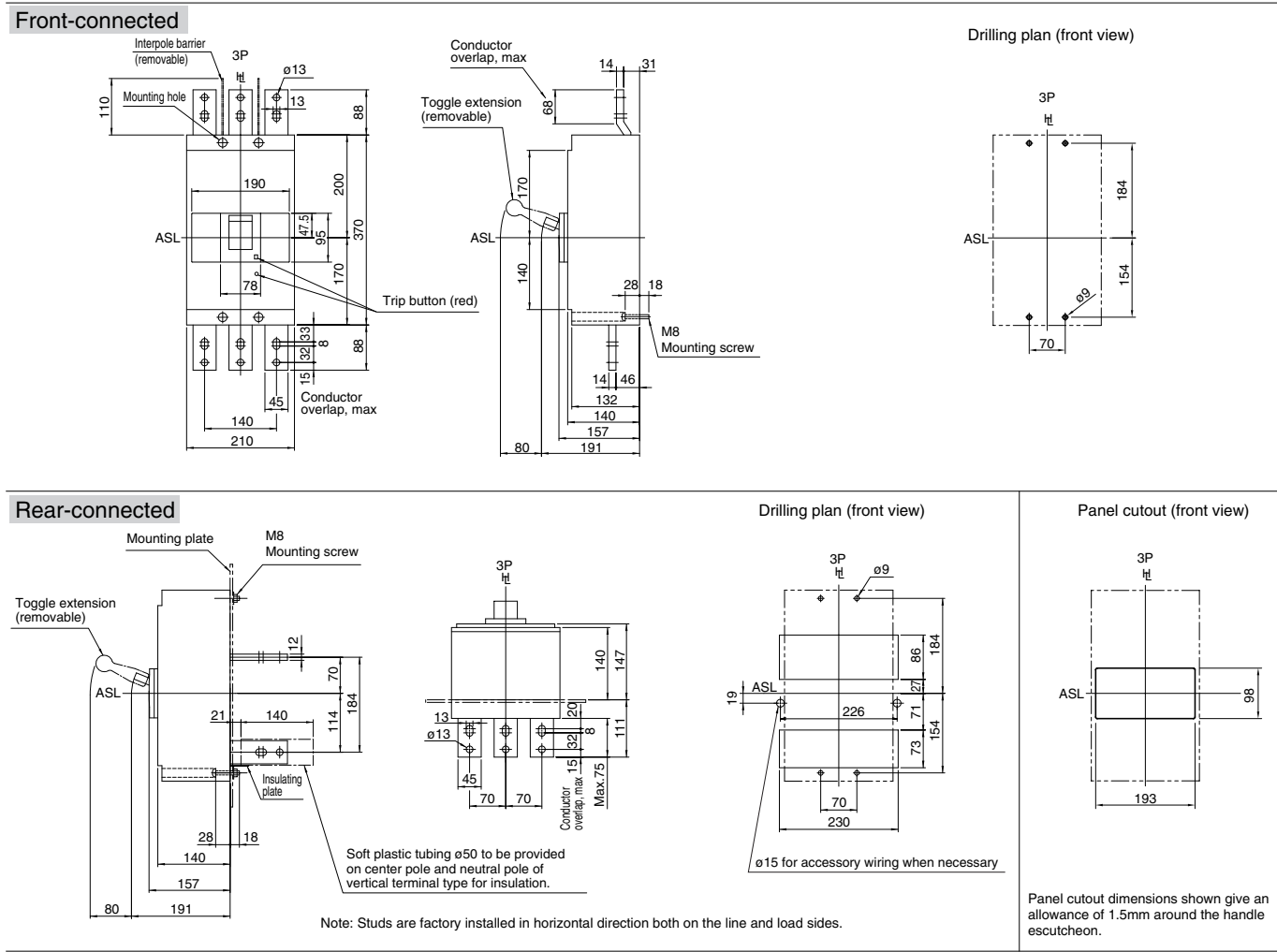
Note: 2 poles breaker is same outline dimensions as 3 poles breaker.

DC Moulded Case Circuit Breakers

ASL: Arrangement Standard Line

HL: Handle Frame Centre Line CL: Handle Centre Line

Outline dimensions (mm) S1250-ND

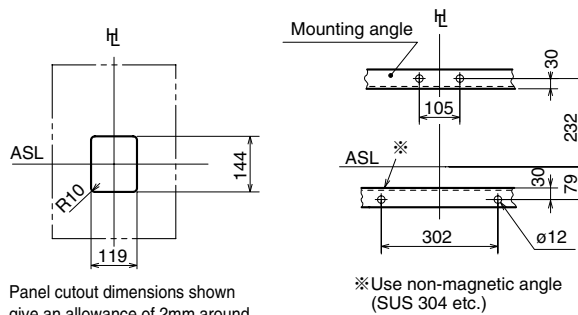
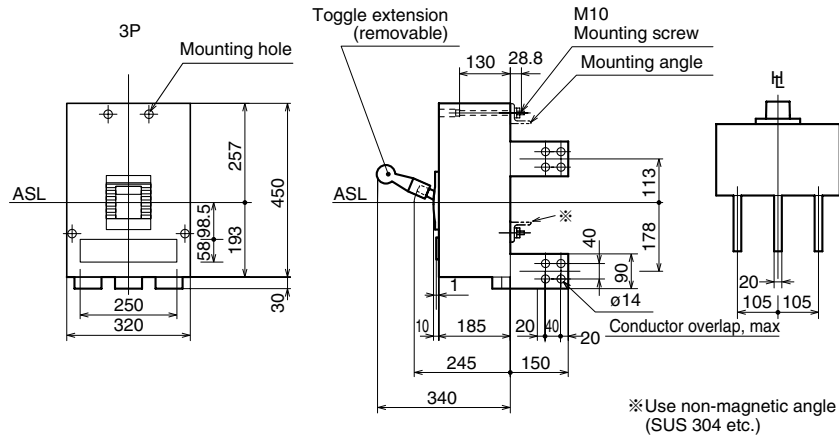


Note: 2 poles breaker is same outline dimensions as 3 poles breaker.

Outline dimensions (mm)

XS2500ND, XS3200ND

Front-connected



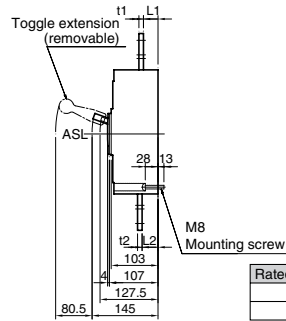
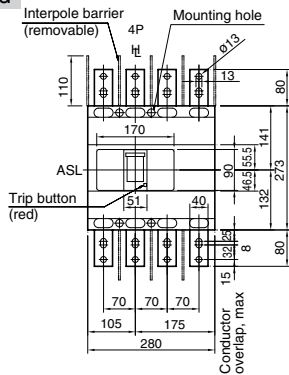
Panel cutout dimensions shown give an allowance of 2mm around the handle escutcheon.

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

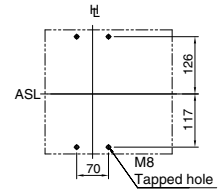
Outline dimensions (mm)

PVS800-NDL, PVS800-NDH, PVS800-NNL, PVS800-NNH

Front-connected

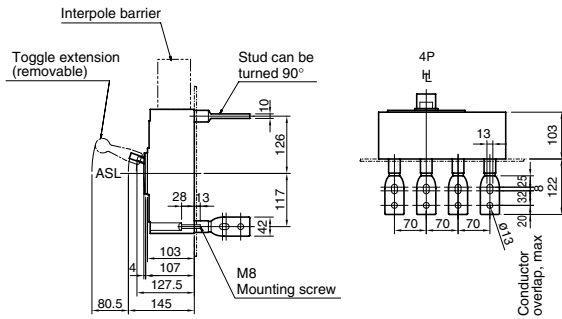


Drilling plan (front view)

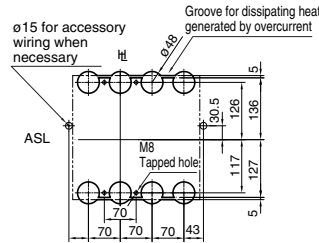


Rated Current (A)	L1	L2	t1	t2
630	32	34	8	8
800	32	35	10	10

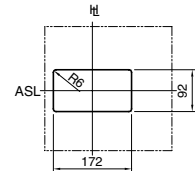
Rear-connected



Drilling plan (front view)



Panel cutout (front view)



Note: Studs are factory installed in horizontal direction both on the line and load sides.

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



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