

Energy

Technical characteristics



MSX AIR

Air circuit breakers for power distribution

GEWISS

Technical data - Air circuit breakers MSX AIR

		MA208S	MA212S	MA212H	MA216S
					
Rated current (IN) ⁽¹⁾ :	(A)	800	1250	1250	1600
Number of poles ⁽²⁾ :		3, 4	3, 4	3, 4	3, 4
Rated insulation voltage (Ui):	(V)	1000	1000	1000	1000
Rated operational voltage (Ue):	(V)	690	690	690	690
Rated impulse withstand voltage (Uimp):	(kV)	12	12	12	12
Rated short time withstand current 1s (Icw):	(kA)	65	65	80	65
Total breaking time:	(s)	0.03	0.03	0.03	0.03
Spring charging time:	(s)	10	10	10	10
Close time:	(s)	0.08	0.08	0.08	0.08
Mechanical life:	(No. cycles)	30000	30000	30000	30000
Electrical life (440Vac):	(No. cycles)	12000	12000	12000	12000
Breaking capacity (Icu)					
Alternating current:	440V (kA)	65	65	80	65
	690V (kA)	50	50	55	50
Direct current ⁽⁴⁾ :	250V (kA)	40	40	40	40
Rated short-circuit making capacity (Icm)					
Alternating current:	440V (kA peak)	143	143	176	143
	690V (kA peak)	105 ⁽³⁾	105 ⁽³⁾	121	105 ⁽³⁾
Direct current ⁽⁴⁾ :	250V (kA peak)	40	40	40	40
Outline dimension					
Fixed type:	Base (3P/4P)	(mm)	360 / 445	360 / 445	360 / 445
	Height	(mm)	460	460	460
	Body depth	(mm)	290	290	290
	Terminals depth	(mm)	75	75	75
Draw-out type:	Base (3P/4P)	(mm)	354 / 439	354 / 439	354 / 439
	Height	(mm)	460	460	460
	Body depth	(mm)	345	345	345
	Terminals depth	(mm)	40	40	40
Weights					
Fixed type:	(3P/4P)	(kg)	53 / 59	53 / 59	54 / 60
	Body (3P/4P)	(kg)	45 / 51	45 / 51	46 / 52
Draw-out type:	Chassis (3P/4P)	(kg)	28 / 35	28 / 35	33 / 42
	Total (3P/4P)	(kg)	73 / 86	73 / 86	79 / 94
Environmental characteristics					
Operating temperature:	(°C)	-5...+40	-5...+40	-5...+40	-5...+40
24-hour average temperature:	(°C)	35	35	35	35
Relative humidity:		< 80%	< 80%	< 80%	< 80%
Altitude:	(m)	< 2000	< 2000	< 2000	< 2000

⁽¹⁾ Values in open air at 40°C

⁽²⁾ For 2 pole MSX Air use outside poles of 3 pole MSX Air

⁽³⁾ Cannot apply IT earthing system

⁽⁴⁾ Standard protection relays cannot be used for DC, please contact Gewiss

MA216H

MA220S

MA220H

MA325S

MA325H

MA332S

MA332H

MA440SB



1600	2000	2000	2500	2500	3200	3200	4000
3, 4	3, 4	3, 4	3, 4	3, 4	3, 4	3, 4	3, 4
1000	1000	1000	1000	1000	1000	1000	1000
690	690	690	690	690	690	690	690
12	12	12	12	12	12	12	12
80	65	80	85	100	85	100	100
0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
10	10	10	10	10	10	10	10
0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
30000	25000	30000	20000	20000	20000	20000	15000
12000	10000	12000	7000	7000	7000	7000	3000
80	65	80	85	100	85	100	100
55	50	55	65	85	65	85	85
40	40	40	40	40	40	40	40
176	143	176	187	220	187	220	220
121	105 ⁽³⁾	121	143 ⁽³⁾	187	143 ⁽³⁾	187	187
40	40	40	40	40	40	40	40
360 / 445	360 / 445	360 / 445	466 / 586	466 / 586	466 / 586	466 / 586	-
460	460	460	460	460	460	460	-
290	290	290	290	290	290	290	-
75	75	75	75	75	75	75	-
354 / 439	354 / 439	354 / 439	460 / 580	460 / 580	460 / 580	460 / 580	460 / 580
460	460	460	460	460	460	460	460
345	345	345	345	345	345	345	345
40	40	40	40	40	40	40	140
54 / 60	54 / 60	54 / 60	80 / 92	80 / 92	80 / 92	80 / 92	-
46 / 52	46 / 52	46 / 52	56 / 68	56 / 68	56 / 68	56 / 68	58 / 71
33 / 42	33 / 42	33 / 42	49 / 57	49 / 57	49 / 57	49 / 57	68 / 87
79 / 94	79 / 94	79 / 94	105 / 125	105 / 125	105 / 125	105 / 125	126 / 158
-5...+40	-5...+40	-5...+40	-5...+40	-5...+40	-5...+40	-5...+40	-5...+40
35	35	35	35	35	35	35	35
< 80%	< 80%	< 80%	< 80%	< 80%	< 80%	< 80%	< 80%
< 2000	< 2000	< 2000	< 2000	< 2000	< 2000	< 2000	< 2000

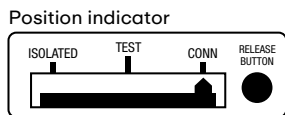
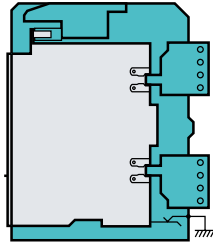
Type of mounting

Draw-out type

This model consists of a breaker body and a draw-out cradle. The breaker body can be moved within or removed from the draw-out cradle that is fixed in the switchboard.

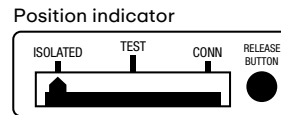
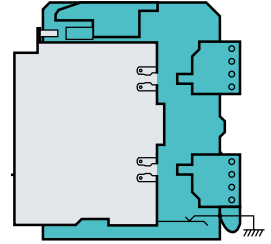
There are four breaker body positions: CONNECTED, TEST, ISOLATED and WITHDRAWN. The switchboard panel door can be kept closed in the CONNECTED, TEST and ISOLATED positions.

① CONNECTED position



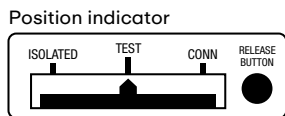
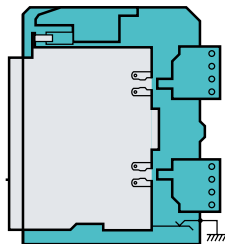
Both the main and control circuits are connected for normal service.

③ ISOLATED position



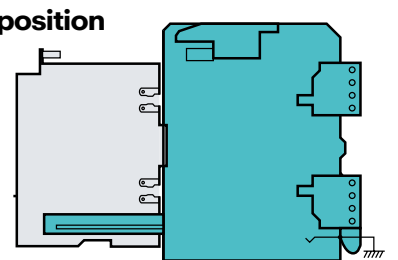
Both the main and control circuits are isolated.
The switchboard panel door does not need to be opened.

② TEST position



The main circuit is isolated and the control circuits are connected.
This position permits operation tests without the need for opening the switchboard panel door.

④ WITHDRAWN position



The breaker body is fully withdrawn from the draw-out cradle.

Fixed type

This model has no draw-out cradle and is designed to be directly mounted in the switchboard.

Terminal arrangements

Main circuit terminals

Three types of main circuit terminal arrangements are available: vertical terminals, horizontal terminals and front connections. Different types of terminal arrangements can be specified for the line and load sides.

NOTE: The max. rated current [In] may be reduced depending on the main circuit terminal arrangement.

TYPE	Vertical terminals	Horizontal terminals	Front connection
MA208S - MA212S - MA216S	●	■	●
MA220S - MA325S - MA332S	■	●	●
MA212H - MA216H - MA220H MA325H - MA332H	■	●	-
MA440SB	■	-	-

■ : Standard
● : Optional
- : Not available

Control circuit terminals

Control circuit terminals are front located to allow easy wiring/access.

The terminal blocks (for auxiliary switches, position switches and control circuits) are positioned on the top of the breaker front panel and can be accessed from the front for wiring.

MSX AIR

Accessories for draw-out type

Main circuit safety shutters

The main circuit safety shutters automatically conceal the main circuit contacts on the draw-out cradle when the breaker is drawn out. The top and bottom shutters operate independently and can be separately padlocked in the closed position. Up to three padlocks (with $\varnothing 6$ hasp) can be installed on each side using padlocking unit (padlock not supplied). In the closed position, the shutters be easily unlocked by hand. They can be unlocked and held open if required for the purpose of inspection or maintenance.



Control circuit safety shutters

The control circuit safety shutter covers the control circuit contacts, ensuring safety.



Test jumper

The test jumper is a plug-in type, and allows ON-OFF tests on all the MSX AIR series with the breaker body drawn out from the draw-out cradle. The standard jumper cable is 5 m long.



Breaker fixing bolts

The breaker fixing bolts hold the breaker body securely to the draw-out cradle in position. Use them if the breaker is subject to strong vibration.



Position padlock lever*

Using the position padlock lever prevents the breaker body from inadvertently being drawn out. The position padlock lever in the pulled-out position locks the breaker body in the CONNECTED, TEST or ISOLATED position. Up to 3 padlocks (with $\varnothing 6$ hasp) can be installed.



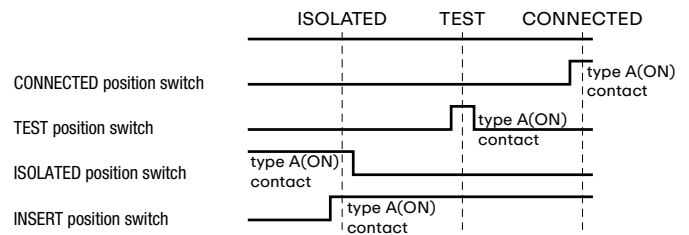
* Supplied as standard

Position switches

The position switch operates to give an indication of the breaker position: CONNECTED, TEST, ISOLATED and INSERT.
There are two contact arrangements: 2c and 4c. Connections to the switches are made via screw type terminals.
The following table lists the available types of the switches.

Number of contacts	Contact arrangement			
	INSERT	ISOLATED	TEST	CONN
2c	-	1	1	-
	-	1	-	1
	-	-	1	1
	-	2	-	-
	-	-	2	-
	-	-	-	2
4c	1	1	1	1
	1	2	1	-
	1	2	-	1
	-	2	1	1
	1	1	2	-
	1	-	2	1
	-	1	2	1
	1	1	-	2
	1	-	1	2
	-	1	1	2
	-	2	2	-
	-	2	-	2
	-	-	2	2
	1	-	3	-
	-	1	3	-
	-	-	3	1
	1	-	-	3
	-	1	-	3
	-	-	1	3
	-	-	4	-
	-	-	-	4

Operating sequence of the position contact



INSERT position means the breaker body is in any position between ISOLATED and CONNECTED.

Rated values of the position contacts

Voltage	Resistive load (A)	Inductive load (A) ($\cos\phi = 0.6 - L/R = 0.07$)
100-125V ac	11	6
250V dc	0.3	0.3
125V dc	0.6	0.6
30V dc	6	5
8V dc	10	6

Spring charged operation

Manual charging type

For this type of device, the closing springs are charged by means of the spring charging handle. ON/OFF operation of the breaker is performed by means of the ON /OFF buttons on the breaker.

Charging the closing springs

Pumping the spring charging handle by hand charges the closing springs.

Closing the breaker

Pressing the ON button on the device closes the breaker.

Opening the breaker

Pressing the OFF button on the device opens the breaker. The breaker cannot be closed as long as the OFF button is pressed.

Motor charging type

For this type of device, the closing springs are charged by means of a motor. ON/OFF operation of the breaker can be performed remotely. A manual charging mechanism is also fitted to facilitate inspection or maintenance work.

Charging the closing springs

A motor is used to charge the closing springs. When the closing springs are released to close the breaker, they are automatically charged again by the motor for the next ON operation.

Closing the breaker

Turning on "remote" ON switch enables the breaker to be remotely closed.

Anti pumping mechanism

Even if the ON switch is kept on, breaker closing operation is performed only once. To close the breaker again, remove the ON signal to reset the anti-pumping mechanism and then reapply the ON signal.

If ON and OFF signals are simultaneously given to the breaker, the ON signal is ignored.

ON signal should be given to the breaker on an over 200ms after OFF signal.

Opening the breaker

For opening the breaker remotely specify the shunt trip device or the undervoltage trip.

Operation power supply

Rated voltage (V)	Applicable voltage range (V)	Operation power supply ratings		
	CHARGE/ ON operation	Motor inrush current (peak) (A)	Motor steady-state current (A)	Closing command current (peak) (A)
100 ac	85-110	7	1.1	0.29
110 ac	94-121	7	1.1	0.25
120 ac	102-132	7	1.1	0.22
200 ac	170-220	4	0.7	0.15
220 ac	187-242	4	0.7	0.13
240 ac	204-264	4	0.7	0.11
24 dc	21-26	14	4	1.04
48 dc	41-53	10	1.6	0.51
100 dc	85-110	6	0.8	0.25
110 dc	94-121	6	0.8	0.22
125 dc	107-138	6	0.8	0.21
200 dc	170-220	4	0.5	0.13
220 dc	187-242	4	0.5	0.12

Accessories for spring charged operation

Automatic closing spring release

For draw-out type breakers. This device allows the charged closing springs to be automatically released when the breaker is drawn out.

Spring charge indicator

This switch can be used to indicate that the closing springs have been fully charged.

Normal contacts for general service

Rated control voltage (V)		Switch contact ratings (A)	
		Resistive load	Inductive load
ac	250	3	3
	250	0.1	0.1
dc	125	0.5	0.5
	30	3	2

Minimum applicable load: 24V dc, 10mA

Gold contacts for microload

Rated control voltage (V)		Switch contact ratings (A)	
		Resistive load	Inductive load
ac	250	0.1	0.1
dc	30	0.1	0.1

Minimum applicable load: 24V dc, 10mA

Trip devices

Continuously-rated shunt trip device

The continuous rated shunt trip device allows the breaker to be opened when an external protection relay against overcurrent or reverse power is activated.

Because of its continuous rating, the device can also be used to provide an electrical interlock to the breaker.

Continuously rated shunt trip and undervoltage trip can not be fitted to the same breaker. However by fitting a special continuously rated shunt trip to the side plate of a breaker chassis will allow an undervoltage trip to be used in conjunction with a continuously rated shunt trip. A mechanical interlock cannot be fitted with this combination.

Instantaneously rated shunt trip also available with special specification. This shunt trip can be fitted with undervoltage trip to the same breaker. Special double opening and closing coils are available.

Capacitor trip device

In conjunction with the continuously-rated shunt trip device, the capacitor trip device can be used to trip the breaker within a limited period of 30 sec if a large voltage drop occurs due to an ac power failure or short-circuit.

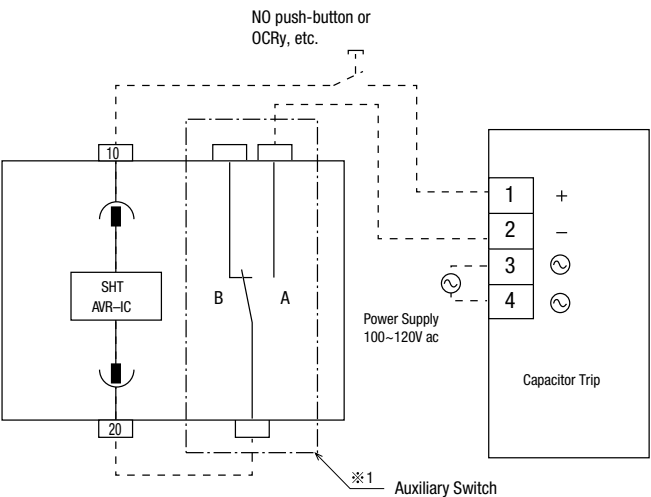
When the continuously-rated shunt trip is used with a capacitor trip device, “a” contact of auxiliary switch of ACB should be inserted in series, otherwise internal damage may occur.

Rated values of the trip device

Rated voltage (V)	Operational voltage (V)	Max excitation current (A)	Opening time (max.) (ms)
100 ac	70-110 ac	0.29	50
110 ac	77-121 ac	0.25	
120 ac	84-132 ac	0.22	
200 ac	140-220 ac	0.15	
220 ac	154-242 ac	0.13	
240 ac	168-264 ac	0.11	
24 dc	16.8-26.4 dc	1.04	
30 dc	21-33 dc	0.85	
48 dc	33.6-52.8 dc	0.51	
100 dc	70-110 dc	0.25	
110 dc	77-121 dc	0.22	
125 dc	87.5-137.5 dc	0.21	
200 dc	140-220 dc	0.13	
220 dc	154-242 dc	0.12	

Rated voltage	ac 100-120V
Operational voltage	70 to 110% rated voltage
Rated frequency	50/60Hz
Rated voltage of shunt trip used	48V dc
Power consumption	100VA

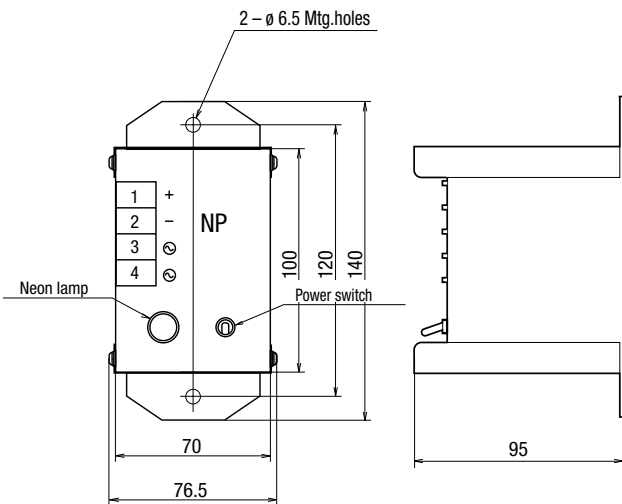
Control circuit



--- user wiring

※ 1: Use auxiliary switch for capacitor trip

Outline dimensions



Undervoltage trip device (UVT)

The undervoltage trip device (UVT) trips the breaker when the control voltage drops below the opening voltage. When the control voltage is restored to the pick-up voltage, the breaker can be closed. The pick-up voltage is fixed to 85% of the rated voltage.

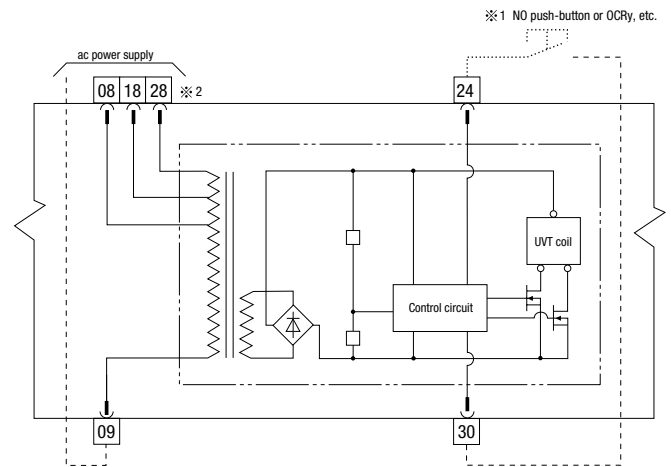
The UVT consists of a tripping mechanism and an undervoltage trip control device.

The trip control device is available in two types:

- instantaneous trip
- delayed trip (at least 500ms)

Adding a push-button switch (with normally opened contacts) between terminals [24] and [30] allows the breaker to be tripped remotely.

Undervoltage trip control circuit (for ac)



※ 1 Tripping signal is 48V dc/5mA. Apply tripping signal for at least 80 ms.

※ 2 For dc type use [09] as the negative terminal and [08] as the positive terminal.

It takes max. 1.5 sec. for UVT coil to be absorbed after the rated voltage is applied to the undervoltage trip device. Therefore, for the closing command, the closing signal should be applied on and over 1.5 sec. after the rated voltage is applied.

Rated values

Rated voltage (V) 50/60Hz	Opening voltage (V)	Pick-up voltage (V)	Coil excitation current (A)	Power consumption (VA)	
				Normal	Reset
100 ac	35 - 70	85	0.1	8	10
110 ac	38.5 - 77	93.5			
120 ac	42 - 84	102			
200 ac	70 - 140	170			
220 ac	77 - 154	187			
240 ac	84 - 168	204			
380 ac	133 - 266	323			
415 ac	145 - 290	352			
440 ac	154 - 308	374			

Protection relays

The AGR series of protection relays featuring high reliability and multiple protection capabilities is available for MSX AIR. Controlled by an internal 16-bit microprocessor, the protection relay provides reliable protection against overcurrent. The protection relay range is divided into three groups: L-characteristic, R-characteristic (both for general feeder) and S-characteristic (for generator protection).

Each group consists of:

Type AGR-11B: standard protection relay with adjustment dial

Type AGR-21B, 22B: standard protection relay with LCD

Type AGR-31B: enhanced protection relay with backlit LCD

Optional protection functions of the protection relay include those against ground fault, earth leakage, undervoltage and reverse power. Pretrip alarm function can also be installed.

Protective functions

1 Adjustable long time-delay function LT

RMS sensing is used to accurately read through distorted wave forms. In addition to the standard L and S-characteristics, the R-characteristic is available in five types for long time-delay trip. The R-characteristic can be used to give selectivity with e.g. fuses.

HOT start mode (applicable to L-characteristic of AGR-21B, 31B)

HOT or COLD start mode is user-selectable.

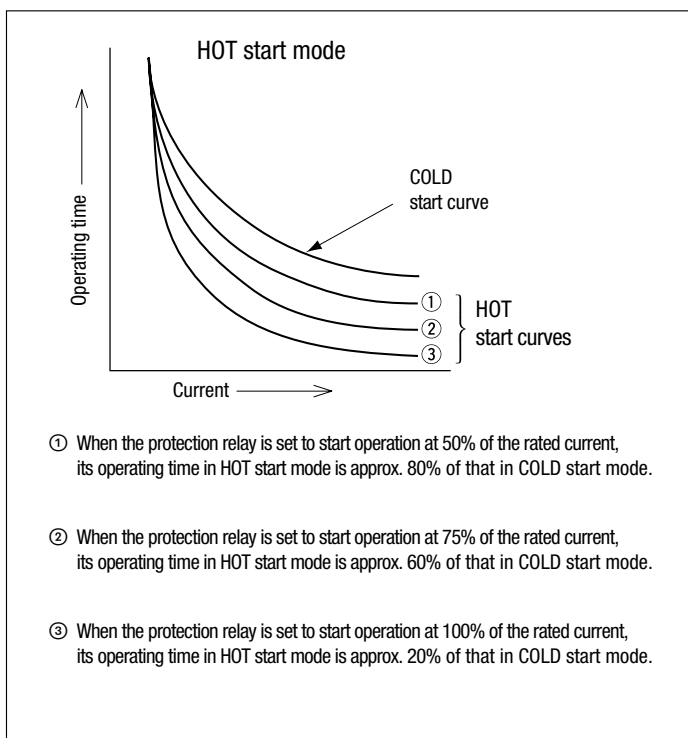
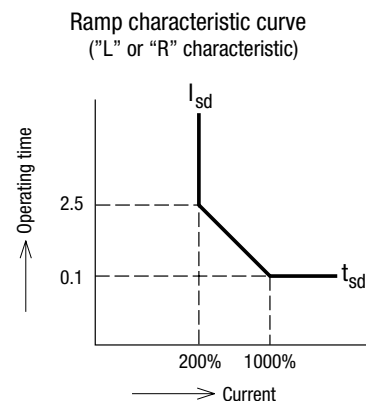
In HOT start mode, the protection relay operates faster than in COLD start mode in response to an overload. The HOT start mode gives protection, taking account of the behaviour of loads under heat stress.

2 Adjustable short time-delay trip function ST

The ST delay trip function has a “definite time delay characteristic” and a “ramp characteristic”. These characteristics are selectable. The ramp characteristic provides close selectivity with downstream circuit breakers or fuses.

The group AGR-xxL and AGR-xxR protection relays come in operation with the definite time characteristic when the load current reaches 1000% or more of the rated current [I_n] (500% or more of the rated current [I_n] for AGR-xxS).

The ST trip function is factory set to the definite time characteristic.



3 Adjustable instantaneous trip function INST/MCR

(For AGR-21B, 22B and 31B MCR only)

The INST trip function trips the breaker when the short circuit current exceeds the pickup current setting, irrespective of the state of the breaker.

The making current release (MCR) trips the breaker when the short circuit current exceeds the pickup current setting during closing operation. After the breaker is closed, the MCR is locked and kept inoperative.

NOTE: The MCR needs the control power. If the control power is lost, the MCR provides the INST trip function only.

4 Adjustable pre-trip alarm function PTA

The pre-trip alarm function provides an alarm signal via the alarm contact (1a-contact) when the load current exceeding a predetermined value lasts for a predetermined time. A 2-channel pre-trip alarm function is available for S-characteristic. This function can be used to adjust feeding to loads according to their priority.

The pre-trip alarm is automatically reset when the load current drops to the predetermined value.

Note that this function needs the control power.

5 Ground fault trip function GF

The peak value sensing is used (the residual current of each phase is detected). The GF pickup current can be set between 10% and 100% of the CT rated primary current [I_{CT}] and with an adjustable definite-time delay threshold.

Ramp characteristic is added

The ramp and definite time characteristics are selectable. The GF trip function comes into operation with the definite time characteristic when the load current reaches 100% or more of the CT rated primary current [I_{CT}]. The GF trip function is factory set to the definite time characteristic.

When using a 3-pole breaker in a 3-phase, 4-wire system, be sure to use an optional CT for neutral line.

NOTE 1: The GF trip function usually comes with operation indications. If you need nothing but ground fault indication without a ground fault tripping operation, specify at the time of ordering.

NOTE 2: Restricted and unrestricted ground fault protection REF is available as option. Please, contact GEWISS for more details.

6 N-phase protection function NP

This NP function is available on 4-pole ACBs and prevents the neutral conductor from suffering damage or burnout due to overcurrent.

The NP trip pickup current can be set between 40% and 100% of the Protection relay rated primary current for L and R-characteristics. For AGR-11B, it is factory set to a value specified at the time of ordering.

NOTE 1: The NP trip function comes usually with operation indications (LED and auxiliary contact). The NP time-delay setting is shared by the LT trip function.

NOTE 2: The HOT start mode is available for AGR-21B and 31B. The operating time for the NP trip function is linked to that for the LT trip function.

7 Earth leakage trip function ELT

(For AGR-31B only)

In conjunction with Zero phase Current Transformer (ZCT), the ELT function provides protection against earth leakage.

The ELT pick up current can be set at 0.2, 0.3 and 0.5A (medium sensitivity) or 1, 2, 3, 5 and 10A (low sensitivity).

This function needs the control power.

NOTE 1: For details on specifications of the external ZCT, contact GEWISS.

NOTE 2: The ELT function usually comes with operation indications. If you need nothing but earth leakage indications without earth leakage tripping operation, specify at the time of ordering.

8 Reverse power trip function RPT

(For AGR-22BS and AGR-31BS only)

The RPT function protects 3-phase generators running in parallel against reverse power. The RPT pickup current can be set in seven levels: 4% thru 10% of the generator rated power.

The maximum rated main circuit voltage is 250V ac.

9 Contact temperature monitoring function OH

(For AGR-22B and AGR-31B only).

It monitors the temperature of the breaker main contacts and gives an alarm on the LCD and an output signal via the alarm contact (1a-contact) when the temperature exceeds 155°C.

The HEAT function prevents the breaker from suffering damage due to overheat.

The alarm can be manually reset when the temperature drops to a normal temperature.

This function needs control power.

NOTE 1: The function can be selected in "Alarm only" mode without trip.

10 Negative Sequence Current Protection Function NS

(For AGR-21B and AGR-31B only)

This function detects the negative-phase current occurring due to reverse phase or phase loss and prevents burnout of a motor or damage to equipment. The protection setpoint ranges from 20% to 100% of the main circuit rated current [I_n].

11 Undervoltage alarm function UVA

(For AGR-22B and AGR-31B only)

This function monitors the main circuit voltage and gives an alarm on the LCD and an output signal via an alarm contact when the voltage drops below the setting voltage. The alarm is activated when the main circuit voltage drops below the setting voltage (selectable from 40%, 60% or 80% of the rated main circuit voltage [Vn]). The alarm is deactivated when the main circuit voltage rises above the setting voltage (selectable from 80%, 85%, 90%, 95% of the rated main circuit voltage [Vn]). If the rated main circuit voltage exceeds 250 Vac, a step-down power transformer is needed. When ordering the breaker, state the step-down ratio of the transformer you will use.

NOTE 1: The undervoltage alarm function is disabled once the main circuit voltage has risen to the recovery setting voltage or higher.

NOTE 2: If the undervoltage alarm function is used in conjunction with the undervoltage trip device (see page 11), an alarm may occur after the breaker trips open depending on the alarm setting voltage.

12 Zone interlock Z

(For AGR-22B and AGR-31B)

The zone-selective interlock capability permits tripping of the ACB upstream of and nearest to a fault point in the shortest operating time, irrespective of the short time delay trip time setting, and minimises thermal and mechanical damage to the power distribution line.

13 Mechanical reset facility

(For AGR-11B only)

When the circuit breaker is tripped by the protection relay a reset button engages on the AGR. To release the breaker after a trip event the reset button will require activation (pressed).

NON setting and fail-safe feature

1 NON setting

Setting a trip pickup current function to NON allows you to render the corresponding protection function inoperative. Functions having the NON option include LT, ST, INST/MCR and GF. Appropriate NON setting will be a useful means for optimum selectivity.

2 Fail-safe feature

The Protection relay has a fail-safe mechanism in case protection functions are improperly set to NON.

- **For AGR-11B relays**

If the ST and INST trip pickup current functions are both set to NON, the fail-safe mechanism will activate the INST trip function to trip the breaker when a fault current equal to or more than 16 times the rated current [In] flows through the breaker.

- **For AGR-21B, 22B, 31B relays**

If the ST trip pickup current function is set to NON, INST trip pickup current function cannot be set to NON and MCR cannot be selected. If the INST trip pickup current function is set to NON or if MCR is selected, ST trip pickup current function cannot be set to NON.

Operation indication function

1 Indication via single contact (AGR-11B)

When the LT, ST, INST/MCR or GF trip function is activated, an output is generated via 1a-contact. The 1a-contact will turn off after 40ms or more. A self-hold circuit is needed.

2 Indication via individual contacts (AGR-21B, 22B, 31B)

When the LT trip, ST trip, INST/MCR trip, GF trip, ELT, RPT, NS, REF, UVT, pre-trip alarm, or contact temperature monitoring function is activated, LCD will indicate their operation individually and output is generated via the corresponding contact. The Protection relay also has a self-diagnostic feature that monitors the internal tripping circuits. If detecting any fault in the circuits, this feature turns on the system alarm indicator. The control power is needed.

3 Contact ratings for operation indication

Voltage (V)		Current (A)			
		Single contact		Individual contacts	
		Resistive load	Inductive load	Resistive load	Inductive load
ac	250	8	3	0.5	0.2
dc	250	0.3	0.15	0.27	0.04
	125	0.5	0.25	0.5	0.2
	30	5	3	2	0.7

NOTE: See page 25 for "Trip release indication" values.
See page 9 for "Spring charge indication" values.

Operation indications

Protective characteristic	L/R-characteristic		S-characteristic	
	LCD	Contact	LCD	Contact
LT	● ⁽¹⁾	● ⁽¹⁾	● ⁽¹⁾	■ ⁽²⁾
NP	● ⁽¹⁾	● ⁽¹⁾	● ⁽¹⁾	■ ⁽²⁾
ST	● ⁽¹⁾	● ⁽¹⁾	● ⁽¹⁾	■ ⁽²⁾
INST / MCR	● ⁽¹⁾	● ⁽¹⁾	● ⁽¹⁾	■ ⁽²⁾
GF (Ground fault)	● ⁽¹⁾	● ⁽¹⁾	-	-
ELT (Earth leakage)	● ⁽¹⁾	● ⁽¹⁾	-	-
OH ⁽³⁾ (Contact temperature)	● ⁽¹⁾	● ⁽¹⁾	● ⁽¹⁾	● ⁽¹⁾
NS ⁽³⁾ (Reverse phase)	● ⁽¹⁾	● ⁽¹⁾	-	-
REF ⁽³⁾ (Line side GF)	● ⁽¹⁾	● ⁽¹⁾	-	-
Trip indication ⁽³⁾	×	×	×	×
RPT (Reverse power trip)	-	-	● ⁽¹⁾	■ ⁽²⁾
PTA (Pretrip alarm)	■	■	■	■
UV ⁽⁴⁾ (Undervoltage alarm)	● ⁽¹⁾	×	● ⁽¹⁾	×
Spring charge indication ⁽⁴⁾	×	×	×	×
System alarm	● ⁽¹⁾	● ⁽¹⁾	● ⁽¹⁾	● ⁽¹⁾

● : Self-hold

■ : Auto-reset

× : Status indication

- : Not applicable

⁽¹⁾ : To reset the motion indication, press the Reset push-button

⁽²⁾ : The contact will turn off after 500ms

⁽³⁾ : Only one function can be selected from OH, NS, REF or trip indication

⁽⁴⁾ : Only one function can be selected from UV or spring charge indication

Measure and data transmission type AGR-31B

1 Monitoring various data on LCD

Protection relay can monitor:

- Phase current (A): I_1 , I_2 , I_3 and their max. peak current
- Neutral and ground fault I_n and I_g
- Line voltage (V) V_{12} , V_{23} , V_{31} and their max. peak voltage or Phase voltage V_{1n} , V_{2n} , V_{3n} and their peak voltage
- Active power (W/kW)
- Active power demand (W/kW)
- Power factor (cos ϕ)
- Energy (Wh/kWh/MWh/GWh)
- Frequency (Hz)
- Trip history

Fault current is monitored and the operation cause is indicated on LCD and via individual contacts.

NOTE 1: The supply voltage to the protection relay for indicating the main circuit voltage or power must not exceed 250V ac, otherwise a step-down power transformer is needed.

2 Abnormal function system alarm

Any anomalies are indicated on the LCD display in the following cases:

- Trip function fail
- MHT circuit break

MSX AIR Protection relay selection table

TYPE	APPLICATION	PROTECTION RELAY	PROTECTION			
			STANDARD PROTECTION			
			Long time	Short time	Instantaneous / MCR	
			LT	ST	INST	MCR
STANDARD PROTECTION RELAYS						
DIAL TYPE	FOR GENERAL FEEDER CIRCUITS	AGR-11BL-AL	●	●	●	-
		AGR-11BL-GL	●	●	●	-
LCD DISPLAY	FOR GENERAL FEEDER CIRCUITS	AGR-21BL-PS	●	●	●	●
		AGR-21BL-PG	●	●	●	●
SPECIALISED PROTECTION RELAYS						
LCD DISPLAY	FOR GENERATOR PROTECTION	AGR-21BS-PS	●	●	●	●
		AGR-22BS-PR	●	●	●	●
LCD DISPLAY	FOR GENERAL FEEDER CIRCUITS	AGR-31BL-PS	●	●	●	●
		AGR-31BL-PG	●	●	●	●
LCD DISPLAY	FOR GENERATOR PROTECTION	AGR-31BS-PS	-	-	-	-
		AGR-31BS-PR	-	-	-	-

TYPE	APPLICATION	PROTECTION RELAY	SPECIAL APPLICATIONS			
			Contact temperature monitoring	Zone interlock	Earth leakage protection	Reverse power protection
			OH ⁽¹⁾	Z	ELT ⁽⁴⁾	RPT ⁽⁵⁾
STANDARD PROTECTION RELAYS						
DIAL TYPE	FOR GENERAL FEEDER CIRCUITS	AGR-11BL-AL	-	-	-	-
		AGR-11BL-GL	-	-	-	-
LCD DISPLAY	FOR GENERAL FEEDER CIRCUITS	AGR-21BL-PS	-	-	-	-
		AGR-21BL-PG	-	-	-	-
SPECIALISED PROTECTION RELAYS						
LCD DISPLAY	FOR GENERATOR PROTECTION	AGR-21BS-PS	-	-	-	-
		AGR-22BS-PR	■	■	-	●
LCD DISPLAY	FOR GENERAL FEEDER CIRCUITS	AGR-31BL-PS	■	■	■	-
		AGR-31BL-PG	■	■	-	-
LCD DISPLAY	FOR GENERATOR PROTECTION	AGR-31BS-PS	■	■	-	-
		AGR-31BS-PR	■	■	-	●

● : Available as standard

■ : Available as option

- : Not available

⁽¹⁾ : Only one function can be selected from REF, OH, NS or Trip indication

⁽²⁾ : Only one function can be selected from UVA or Spring charge indicator

⁽³⁾ : Not available if CT rated primary current [I_{cr}] is 200A or less.

⁽⁴⁾ : Available up to 3200A rated current

⁽⁵⁾ : Over 250Vac, a step down VT is required

OTHER FUNCTIONS						
GROUND FAULT ⁽³⁾		N-PHASE	INDICATION AND MONITORING			
Unrestricted	Restricted	N-phase protection	Indication		Monitoring	
UREF	REF ⁽¹⁾	NP	Single contact	Individual contacts	Ammeter	Energy analyser
-	-	■	●	-	-	-
●	-	■	●	-	-	-
-	-	■	-	●	●	-
●	■	■	-	●	●	-
-	-	-	-	●	●	-
-	-	-	-	●	●	-
-	-	■	-	●	-	●
●	■	■	-	●	-	●
-	-	-	-	●	-	●
-	-	-	-	●	-	●

SPECIAL APPLICATIONS						
Phase rotation protection	Under voltage alarm	Pre-trip alarm	Spring charge indication ⁽²⁾	Trip indication ⁽¹⁾	Communication	Field test
NS ⁽¹⁾	UVA ⁽²⁾	PTA			C	
-	-	-	■	■	-	-
-	-	-	■	■	-	-
■	-	●	■	■	■	●
■	-	●	■	■	■	●
-	-	●	■	■	■	●
-	■	●	■	■	■	●
■	■	●	■	■	■	●
■	■	●	■	■	■	●
-	■	●	■	■	■	●
-	■	●	■	■	■	●

L-characteristic for general feeder circuits (Type AGR-11BL, 21BL, 31BL)

Setting of the protection functions

Protection functions			Setting range						
Adjustable long time-delay trip characteristics									
LT	Pick-up current [I_n]	(A)	[I_n] x (0.8 - 0.85 - 0.9 - 0.95 - 1.0 - NON); 6 graduations • Non tripping when load current $I \leq ([I_n] \times 1.05)$. • Tripping when ($[I_n] \times 1.05$) < load current $\leq ([I_n] \times 1.2)$						
	Time-delay [t_n]	(s)	(0.5 - 1.25 - 2.5 - 5 - 10 - 15 - 20 - 25 - 30) at 600% of [I_n]; 9 graduations						
	Time-delay setting tolerance	(%)	$\pm 15\%$ +150ms - 0ms						
Adjustable short time-delay trip characteristics									
ST	Pick-up current [I_{sd}]	(A)	[I_n] x (1 - 1.5 - 2 - 2.5 - 3 - 4 - 6 - 8 - 10 - NON); 10 graduations						
	Current setting tolerance	(%)	$\pm 15\%$						
	Time-delay [t_{sd}] Relay time	(ms)	50	100	200	400	600	800	; 6 graduations
	Resettable time	(ms)	25	75	175	375	575	775	
	Max. total clearing time	(ms)	120	170	270	470	670	870	
Adjustable instantaneous trip characteristics									
INST or MCR (for AGR-11B only INST)									
Pick-up current [I_i]		(A)	[I_n] x (2 - 4 - 6 - 8 - 10 - 12 - 14 - 16 - NON); 9 graduations						
Current setting tolerance		(%)	$\pm 20\%$						
Adjustable pre-trip alarm characteristics									
PTA	Pick-up current [I_{p1}]	(A)	[I_n] x (0.75 - 0.8 - 0.85 - 0.9 - 0.95 - 1.0); 6 graduations						
	Current setting tolerance	(%)	$\pm 7.5\%$						
	Time-delay [t_{p1}]	(s)	(5 - 10 - 15 - 20 - 40 - 60 - 80 - 120 - 160 - 200) at [I_{p1}] or more; 10 graduations						
	Time-delay setting tolerance	(%)	$\pm 15\%$ +100ms - 0ms						
Adjustable ground fault trip characteristics			NOTE: Set [I_g] to 1200A or less						
GF	Pick-up current [I_g]	(A)	[I_{ct}] x (0.1 - 0.2 - 0.3 - 0.4 - 0.6 - 0.8 - 1.0 - NON); 8 graduations						
	Current setting tolerance	(%)	$\pm 20\%$						
	Time-delay [t_g] Relay time	(ms)	100	200	300	500	1000	2000	; 6 graduations
	Resettable time	(ms)	75	175	275	475	975	1975	
	Max. total clearing time	(ms)	170	270	370	570	1070	2070	
Ground fault trip characteristics on line side									
REF (for AGR-21B, 31B only)									
Pick-up current [I_{REF}]		(A)	[I_{ct}] x (0.1 - 0.2 - 0.3 - 0.4 - 0.6 - 0.8 - 1.0 - NON); 8 graduations						
Current setting tolerance		(%)	$\pm 20\%$						
Time-delay		(s)	Inst						
N-phase protection characteristics									
NP	Pick-up current [I_n]	(A)	[I_{ct}] x (0.4 - 0.5 - 0.63 - 0.8 - 1.0); Factory set to a user-specified value for AGR-11BL • Non tripping when load current $\leq ([I_n] \times 1.05)$. • Tripping when ($[I_n] \times 1.05$) < load current $\leq ([I_n] \times 1.2)$						
	Time-delay [t_n]	(s)	Tripping at 600% of [I_n] with LT time-delay [t_n]						
	Time-delay setting tolerance	(%)	$\pm 15\%$ +150ms - 0ms						
Phase rotation protection characteristics									
NS (for AGR-21B, 31B only)									
Pick-up current [I_{ns}]		(A)	[I_n] x (0.2 - 0.3 - 0.4 - 0.5 - 0.6 - 0.7 - 0.8 - 0.9 - 1.0); 9 graduations						
Current setting tolerance		(%)	$\pm 10\%$						
Time-delay [t_{ns}]		(s)	0.4 - 0.8 - 1.2 - 1.6 - 2 - 2.4 - 2.8 - 3.2 - 3.6 - 4) at 150% of [I_{ns}]; 10 graduations						
Time-delay setting tolerance		(%)	$\pm 20\%$ +150ms - 0ms						
Adjustable earth leakage trip characteristics									
ELT (for AGR-31B only)									
Pick-up current [$I_{\Delta n}$]		(A)	0.2 - 0.3 - 0.5 - (medium sensitivity) or 1 - 2 - 3 - 5 - 10 (low sensitivity)						
Current setting tolerance		(%)	Non operate below 70% of [$I_{\Delta n}$], operate between 70% and 100% of [$I_{\Delta n}$]						
Time-delay [$t_{\Delta n}$] Relay time		(ms)	100	150	300	500	800	1500	3000 ; 7 graduations
Resettable time		(ms)	50	100	250	450	750	1450	2950
Max. total clearing time		(ms)	250	300	450	650	950	1650	3150
Undervoltage alarm characteristics									
UV (for AGR-31B only)									
Recovery setting voltage		(V)	[V_n] x (0.8 - 0.85 - 0.9 - 0.95); 4 graduations						
Recovery voltage setting tolerance		(%)	$\pm 5\%$						
Setting voltage		(V)	[V_n] x (0.4 - 0.6 - 0.8); 3 graduations						
Voltage setting tolerance		(%)	$\pm 5\%$						
Time-delay		(s)	0.1 - 0.5 - 1 - 2 - 5 - 10 - 15 - 20 - 30 - 36; 10 graduations						
Time-delay setting tolerance		(%)	$\pm 15\%$ +100ms - 0ms						
Control power (for REF, NP, NS, ELT, UV functions)			100-120V ac 200-240V ac) common	100-125V dc 200-250V dc) common	24V dc 48V dc) common				
			Power consumption: 5 VA						

The highlighted parameters represent default setting values

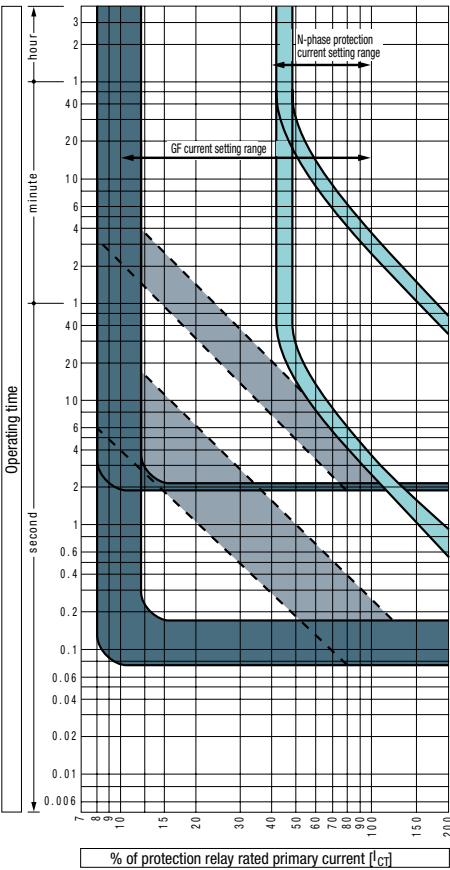
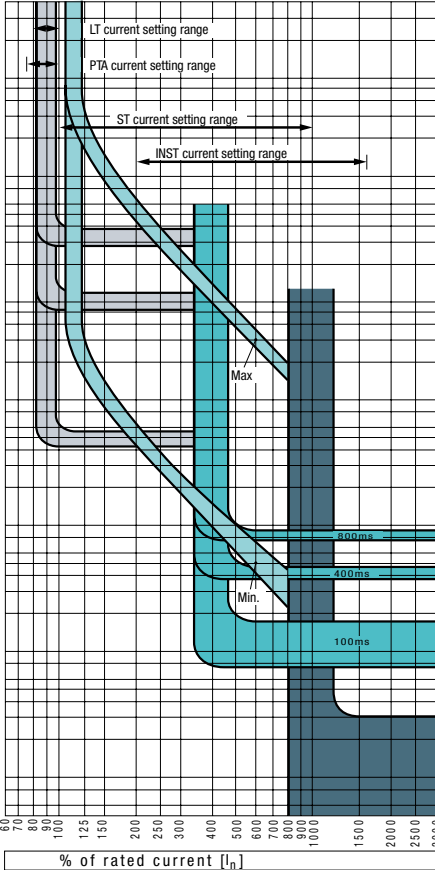
Values of I_{cr} and I_n

Type	Appli cable	Rated current I_n (A)				
		I_{cr} (A)	$I_{cr} \times 0.5$	$I_{cr} \times 0.63$	$I_{cr} \times 0.8$	$I_{cr} \times 1.0$
MA208S	200	100	125	160	200	
	400	200	250	320	400	
	800	400	500	630	800	
MA212S	400	200	250	320	400	
	800	400	500	630	800	
	1250	630	800	1000	1250	
MA216S	400	200	250	320	400	
	800	400	500	630	800	
	1250	630	800	1000	1250	
	1600	800	1000	1250	1600	

Type	Appli cable	Rated current I_n (A)				
		I_{cr} (A)	$I_{cr} \times 0.5$	$I_{cr} \times 0.63$	$I_{cr} \times 0.8$	$I_{cr} \times 1.0$
MA220S	400	200	250	320	400	
	800	400	500	630	800	
	1250	630	800	1000	1250	
	1600	800	1000	1250	1600	
	2000	1000	1250	1600	2000	
MA325S	2500	1250	1600	2000	2500	
MA332S	3200	1600	2000	2500	3200	
MA440SB	4000	2000	2500	3200	4000	

Type	Appli cable	Rated current I_n (A)				
		I_{cr} (A)	$I_{cr} \times 0.5$	$I_{cr} \times 0.63$	$I_{cr} \times 0.8$	$I_{cr} \times 1.0$
MA212H	200	100	125	160	200	
	800	400	500	630	800	
	400	200	250	320	400	
	1600	800	1000	1250	1600	
	800	400	500	630	800	
	2500	1250	1600	2000	2500	
	1250	630	800	1000	1250	
MA216H	1600	800	1000	1250	1600	
MA220H	2000	1000	1250	1600	2000	
MA325H	2500	1250	1600	2000	2500	
MA332H	3200	1600	2000	2500	3200	

Protection characteristics



The ST trip characteristic shown in the figure applies when the ramp characteristic select switch is in the OFF position.

R-characteristic for general feeder circuits (Type AGR-21BR, 31BR)

Setting of the protection functions

Protection functions			Setting range							
Adjustable long time-delay trip characteristics			Select one from among $I^{0.02}t$, I_t , I^2t , I^3t , I^4t on LCD							
LT	Pick-up current [I_n]	(A)	[I_n] x (0.8 - 0.85 - 0.9 - 0.95 - 1.0 - NON); 6 graduations							
	Current setting tolerance	(%)	±5%							
	Time-delay [t_n]	(s)	(1 - 2 - 3 - 4 - 5 - 6 - 6.3 - 6.8 - 10) at 300% of [I_n]; 8 graduations							
	Time-delay setting tolerance	(%)	±20% +150ms - 0ms							
Adjustable short time-delay trip characteristics										
ST	Pick-up current [I_{sd}]	(A)	[I_n] x (1 - 1.5 - 2 - 2.5 - 3 - 4 - 6 - 8 - 10 - NON); 10 graduations							
	Current setting tolerance	(%)	±15%							
	Time-delay [t_{sd}] Relay time	(ms)	50	100	200	400	600	800	; 6 graduations	
	Resettable time	(ms)	25	75	175	375	575	775		
	Max. total clearing time	(ms)	120	170	270	470	670	870		
Adjustable instantaneous trip characteristics										
INST or MCR										
Pick-up current [I_i]			(A)	[I_n] x (2 - 4 - 6 - 8 - 10 - 12 - 14 - 16 - NON); 9 graduations						
Current setting tolerance			(%)	±20%						
Adjustable pre-trip alarm characteristics										
PTA	Pick-up current [I_{p1}]	(A)	[I_n] x (0.75 - 0.8 - 0.85 - 0.9 - 0.95 - 1.0); 6 graduations							
	Current setting tolerance	(%)	±7.5%							
	Time-delay [t_{p1}]	(s)	(5 - 10 - 15 - 20 - 40 - 60 - 80 - 120 - 160 - 200) at [I_{p1}] or more; 10 graduations							
	Time-delay setting tolerance	(%)	±15% +100ms - 0ms							
Adjustable ground fault trip characteristics			NOTE: Set [I_g] to 1200A or less							
GF	Pick-up current [I_g]	(A)	[I_{CT}] x (0.1 - 0.2 - 0.3 - 0.4 - 0.6 - 0.8 - 1.0 - NON); 8 graduations							
	Current setting tolerance	(%)	±20%							
	Time-delay [t_g] Relay time	(ms)	100	200	300	500	1000	2000	; 6 graduations	
	Resettable time	(ms)	75	175	275	475	975	1975		
	Max. total clearing time	(ms)	170	270	370	570	1070	2070		
Ground fault trip characteristics on line side										
REF	Pick-up current [I_{REF}]	(A)	[I_{CT}] x (0.1 - 0.2 - 0.3 - 0.4 - 0.6 - 0.8 - NON); 8 graduations							
	Current setting tolerance	(%)	±20%							
	Time-delay	(s)	Inst							
N-phase protection characteristics										
NP	Pick-up current [I_n]	(A)	[I_{CT}] x (0.4 - 0.5 - 0.63 - 0.8 - 1.0)							
	Current setting tolerance	(%)	±5%							
	Time-delay [t_n]	(s)	Tripping at 300% of [I_n] with LT time-delay [t_n]							
	Time-delay setting tolerance	(%)	±20% +150ms - 0ms							
Phase rotation protection characteristics										
NS	Pick-up current [I_{ns}]	(A)	[I_n] x (0.2 - 0.3 - 0.4 - 0.5 - 0.6 - 0.7 - 0.8 - 0.9 - 1.0); 9 graduations							
	Current setting tolerance	(%)	±10%							
	Time-delay [t_{ns}]	(s)	0.4 - 0.8 - 1.2 - 1.6 - 2 - 2.4 - 2.8 - 3.2 - 3.6 - 4) at 150% of [I_{ns}]; 10 graduations							
	Time-delay setting tolerance	(%)	±20% +150ms - 0ms							
Adjustable earth leakage trip characteristics										
ELT	(for AGR-31B only)									
	Pick-up current [$I_{\Delta R}$]	(A)	0.2 - 0.3 - 0.5 - (medium sensitivity) or 1 - 2 - 3 - 5 - 10 (low sensitivity)							
	Current setting tolerance	(%)	Non operate below 70% of [$I_{\Delta R}$], operate between 70% and 100% of [$I_{\Delta R}$]							
	Time-delay [$t_{\Delta R}$] Relay time	(ms)	100	150	300	500	800	1500	3000 ; 7 graduations	
	Resettable time	(ms)	50	100	250	450	750	1450	2950	
	Max. total clearing time	(ms)	250	300	450	650	950	1650	3150	
Undervoltage alarm characteristics										
UV	(for AGR-31B only)									
	Recovery setting voltage	(V)	[V_n] x (0.8 - 0.85 - 0.9 - 0.95); 4 graduations							
	Recovery voltage setting tolerance	(%)	±5%							
	Setting voltage	(V)	[V_n] x (0.4 - 0.6 - 08); 3 graduations							
	Voltage setting tolerance	(%)	±5%							
	Time-delay	(s)	0.1 - 0.5 - 1 - 2 - 5 - 10 - 15 - 20 - 30 - 36; 10 graduations							
	Time-delay setting tolerance	(%)	±15% +100ms - 0ms							
Control power (for REF, NP, NS, ELT, UV functions)			100-120V ac 200-240V ac	) common	100-125V dc 200-250V dc	) common	24V dc 48V dc	) common		
			Power consumption: 5 VA							

The highlighted parameters represent default setting values

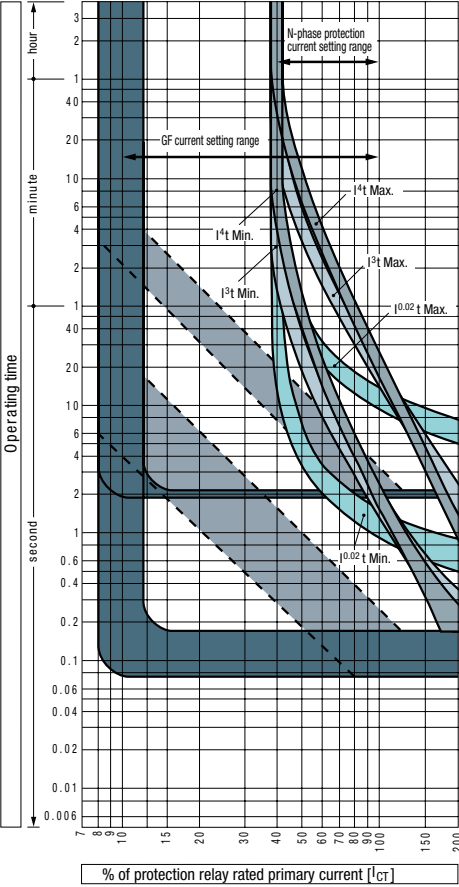
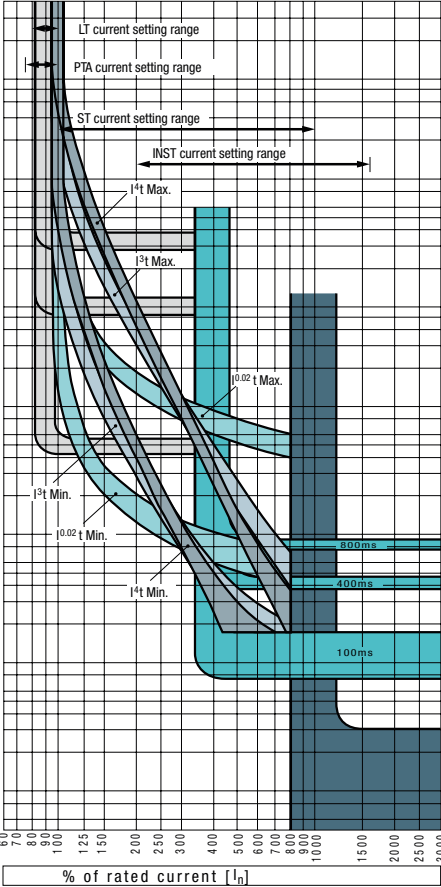
Values of [I_{cr}] and [I_n]

Type	Appli cable	Rated current [I _n](A)				
		[I _{cr}] (A)	[I _{cr}] x 0.5	[I _{cr}] x 0.63	[I _{cr}] x 0.8	[I _{cr}] x 1.0
MA208S	200	100	125	160	200	
	400	200	250	320	400	
	800	400	500	630	800	
MA212S	400	200	250	320	400	
	800	400	500	630	800	
	1250	630	800	1000	1250	
MA216S	400	200	250	320	400	
	800	400	500	630	800	
	1250	630	800	1000	1250	
	1600	800	1000	1250	1600	

Type	Appli cable	Rated current [I _n](A)				
		[I _{cr}] (A)	[I _{cr}] x 0.5	[I _{cr}] x 0.63	[I _{cr}] x 0.8	[I _{cr}] x 1.0
MA220S	400	200	250	320	400	
	800	400	500	630	800	
	1250	630	800	1000	1250	
	1600	800	1000	1250	1600	
	2000	1000	1250	1600	2000	
MA325S	2500	1250	1600	2000	2500	
MA332S	3200	1600	2000	2500	3200	
MA440SB	4000	2000	2500	3200	4000	

Type	Appli cable	Rated current [I _n](A)				
		[I _{cr}] (A)	[I _{cr}] x 0.5	[I _{cr}] x 0.63	[I _{cr}] x 0.8	[I _{cr}] x 1.0
MA212H	200	100	125	160	200	
	800	400	500	630	800	
	400	200	250	320	400	
	1250	630	800	1000	1250	
MA216H	1600	800	1000	1250	1600	
MA220H	2000	1000	1250	1600	2000	
MA325H	2500	1250	1600	2000	2500	
MA332H	3200	1600	2000	2500	3200	

Protection characteristics



The ST trip characteristic shown in the figure applies when the ramp characteristic select switch is in the OFF position.

S-characteristic for general feeder circuits (Type AGR-21BS, 22BS, 31BS)

Setting of the protection functions

Protection functions			Setting range						
Adjustable long time-delay trip characteristics									
LT	Pick-up current [I _n]	(A)	[I _n] x (0.8 - 1.0 - 1.05 - 1.1 - 1.15 - NON); 6 graduations						
	Current setting tolerance	(%)	±5%						
	Time-delay [t _n]	(s)	(15 - 20 - 25 - 30 - 40 - 50 - 60) at 120% of [I _n]; 7 graduations						
	Time-delay setting tolerance	(%)	±15% +150ms - 0ms						
Adjustable short time-delay trip characteristics									
ST	Pick-up current [I _{sd}]	(A)	[I _n] x (2 - 2.5 - 2.7 - 3 - 3.5 - 4 - 4.5 - 5 - NON); 9 graduations						
	Current setting tolerance	(%)	±10%						
	Time-delay [t _{sd}] Relay time	(ms)	100	200	300	400	600	800	; 6 graduations
	Resettable time	(ms)	75	175	275	375	575	775	
	Max. total clearing time	(ms)	170	270	370	470	670	870	
Adjustable instantaneous trip characteristics									
INST or MCR									
	Pick-up current [I _i]	(A)	[I _n] x (2 - 4 - 6 - 8 - 10 - 12 - 14 - 16 - NON); 9 graduations						
	Current setting tolerance	(%)	±20%						
Adjustable pre-trip alarm characteristics									
PTA	Pick-up current [I _{p1}]	(A)	[I _n] x (0.75 - 0.8 - 0.85 - 0.9 - 0.95 - 1.0 - 1.05); 7 graduations						
	Current setting tolerance	(%)	±5%						
	Time-delay [t _{p1}]	(s)	(10 - 15 - 20 - 25 - 30) at 120% of [I _{p1}]; 5 graduations						
	Time-delay setting tolerance	(%)	±15% +100ms - 0ms						
PTA 2	(for AGR-22B, 31B only)								
	Pick-up current [I _{p2}]	(A)	[I _n] x (0.75 - 0.8 - 0.85 - 0.9 - 0.95 - 1.0 - 1.05); 7 graduations						
	Current setting tolerance	(%)	±5%						
	Time-delay [t _{p2}]	(s)	1.5 [t _{p1}] at 120% of [I _{p2}]						
	Time-delay setting tolerance	(%)	±15% +100ms - 0ms						
Adjustable reverse power trip characteristics									
RPT	(for AGR-22B, 31B only)								
	Pick-up power [P _n]	(kW)	Rated power [P _n] x (0.04 - 0.05 - 0.06 - 0.07 - 0.08 - 0.09 - 0.1 - NON); 8 graduations						
	Power setting tolerance	(%)	+0 - 20%						
	Time-delay [time]	(s)	(2.5 - 5 - 7.5 - 10 - 12.5 - 15 - 17.5 - 20) at 100% of [P _n]; 8 graduations						
	Time-delay setting tolerance	(%)	±20%						
Undervoltage alarm characteristics									
UV	(for AGR-22B, 31B only)								
	Recovery setting voltage	(V)	[V _n] x (0.8 - 0.85 - 0.9 - 0.95); 4 graduations						
	Recovery voltage setting tolerance	(%)	±5%						
	Setting voltage	(V)	[V _n] x (0.4 - 0.6 - 0.8); 3 graduations						
	Voltage setting tolerance	(%)	±5%						
	Time-delay	(s)	0.1 - 0.5 - 1 - 2 - 5 - 10 - 15 - 20 - 30 - 36; 10 graduations						
	Time-delay setting tolerance	(%)	±15% +100ms - 0ms						
Control power (for REF, NP, NS, ELT, UV functions)			100-120V ac 200-240V ac) common		100-125V dc 200-250V dc) common		24V dc 48V dc) common		
			Power consumption: 5 VA						

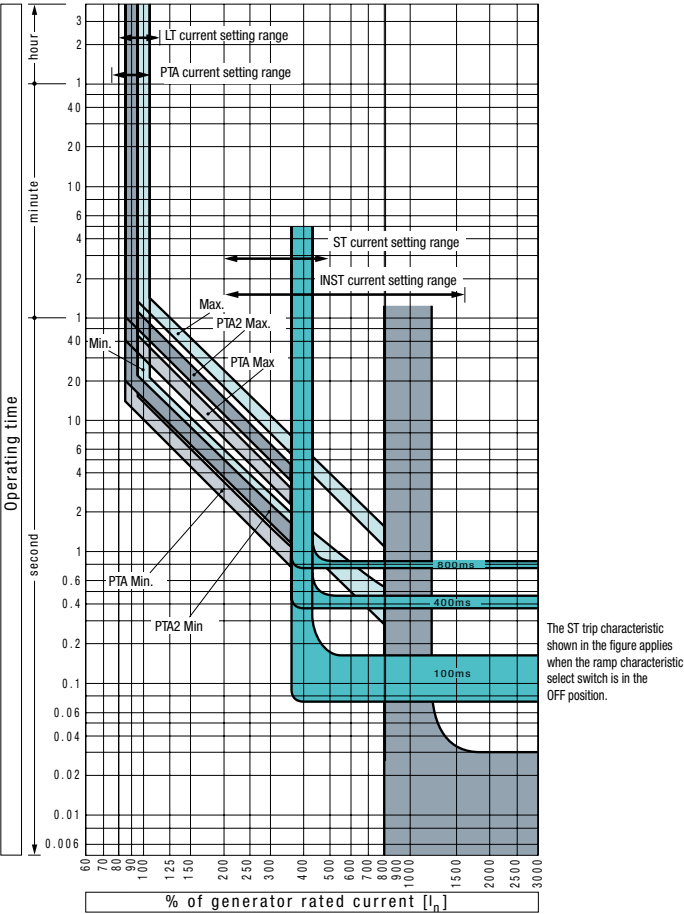
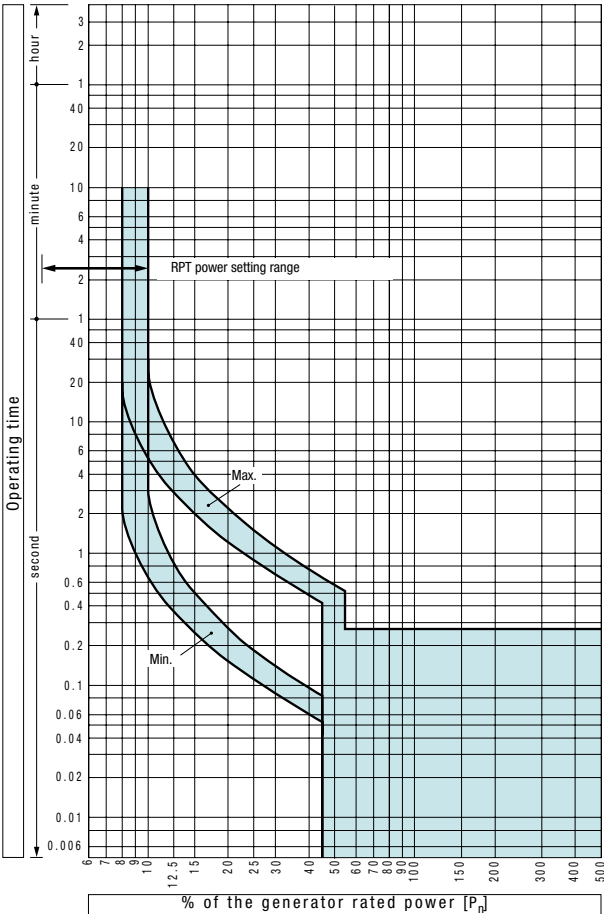
The highlighted parameters represent default setting values

Applicable range of generator rated current [In]

Type	Protection relay rated primary current [Icr](A)	Applicable range of generator rated current [In] (A)
MA208S	200	$100 \leq [In] \leq 200$
	400	$200 < [In] \leq 400$
	800	$400 < [In] \leq 800$
MA212S	400	$200 \leq [In] \leq 400$
	800	$400 < [In] \leq 800$
	1250	$630 < [In] \leq 1250$
MA216S	400	$200 \leq [In] \leq 400$
	800	$400 < [In] \leq 800$
	1250	$630 < [In] \leq 1250$
	1600	$800 \leq [In] \leq 1600$
MA220S	400	$200 \leq [In] \leq 400$
	800	$400 < [In] \leq 800$
	1250	$630 < [In] \leq 1250$
	1600	$800 \leq [In] \leq 1600$
	2000	$1250 \leq [In] \leq 2000$
MA325S	2500	$1250 \leq [In] \leq 2500$
MA332S	3200	$1600 \leq [In] \leq 3200$
MA440SB	4000	$2000 \leq [In] \leq 4000$

Type	Protection relay rated primary current [Icr](A)	Applicable range of generator rated current [In] (A)
MA212H	200	$100 \leq [In] \leq 200$
	400	$200 < [In] \leq 400$
	800	$400 < [In] \leq 800$
	1250	$630 < [In] \leq 1250$
	1600	$800 \leq [In] \leq 1600$
MA220H	2000	$1000 \leq [In] \leq 2000$
MA325H	2500	$1250 \leq [In] \leq 2500$
MA332H	3200	$1600 \leq [In] \leq 3200$

Protection characteristics



ON-OFF cycle counter

The ON-OFF cycle counter is a mechanical 5-digit readout that shows the number of ON-OFF cycles of the breaker. Counter readings serve as a guide for maintenance or inspection.



Auxiliary switches

The auxiliary switches operate during the breaker ON/OFF operation. Connections to the switches are made via screw terminals. The auxiliary switches for draw-out type breakers operate in the CONNECTED and TEST positions. If required, the auxiliary switches for breakers can operate in the CONNECTED position only. The auxiliary switches have change-over contacts and are available for general service and for microload.

※ The standard contact arrangement of the auxiliary switches is 4c.
(Form c: Change-over, single gap, three terminals).

※※ Suited to electronic circuits.

NOTE: 4c is the maximum arrangement when any one of the ground fault protection on the line side, zone interlock, or communication function is incorporated or in the case of type AGR-31B protection relay with the ground fault trip function incorporated.

Type	Normal contacts for general service	Gold contacts for microload ※※
※ AXR-004	4c	-
AXR-007	7c	-
AXR-304	4c	3c
AXR-010	10c	-
AXR-307	7c	3c

Auxiliary switch ratings

Category	For general service			For microload ※※			Min. applicable load
Voltage	Resistive load (A)	Inductive load (A)	ac: $\cos\phi \geq 0.3$ dc: $L/R \leq 0.01$	Resistive load (A)	Inductive load (A)	ac: $\cos\phi \geq 0.6$ dc: $L/R \leq 0.07$	
100-250V ac	5	5		0.1	0.1		5V dc 1mA
251-500V ac	5	5		-	-		
30V dc	1	1		0.1	0.1		
125-250V dc	1	1		-	-		

NOTE 1: The chattering of b-contacts due to ON-OFF operation of the breaker lasts for less than 20 ms.

NOTE 2: Do not supply different voltages to contacts of a switch.

Momentary trip indicator

It can indicate a trip by overcurrent release, shunt trip, undervoltage trip or manual push-button trip.
Operation is according to the table. Use a relay holding circuit if continuous indication is required under these conditions.

Cause of trip	Indication type	
	Spring charged	Spring discharged
Protection relay	Switch is ON for 40 ms, then reset to OFF	Switch remains ON until closing springs are charged
Shunt trip		
Remote opening	Switch is ON until undervoltage condition is restored to normal	Switch remains ON until springs are charged after undervoltage condition is restored to normal
Undervoltage trip		
Manual opening by push-button	Switch remains ON until push-button is released	Switch remains ON until springs are charged after push-button is released

Normal contacts for general service

Voltage (V)		Load (A)	
		Resistive	Inductive
ac	250	3	3
	250	0.1	0.1
dc	125	0.5	0.5
	30	3	2

Minimum applicable load: 24V dc, 10mA

Gold contacts for microload

Voltage (V)		Load (A)	
		Resistive	Inductive
ac	250	0.1	0.1
dc	30	0.1	0.1

Minimum applicable load is 24V dc, 10mA

“Ready to close” contact

It indicates that the breaker is in a ready to close status.
This contact operates when the following are valid:

- ON-OFF indicator shows “OFF”.
- Spring charge indicator shows “charged”.
- Undervoltage trip is energised.
- Shunt trip is not energised.
- Breaker is in the connected or test position.
- Key lock and Key interlock are off.
- Mechanical interlock is off.

Normal contacts for general service

Voltage (V)		Load (A)	
		Resistive	Inductive
ac	250	3	3
	250	0.1	0.1
dc	125	0.5	0.5
	30	3	2

Minimum applicable load: 24V dc, 10mA

Gold contacts for microload

Voltage (V)		Load (A)	
		Resistive	Inductive
ac	250	0.1	0.1
dc	30	0.1	0.1

Minimum applicable load: 24V dc, 10mA

Key lock

The key lock is available in two types: the lock-in ON type that locks the breaker in the closed position, and the lock-in OFF type that locks the breaker in the open position. When the breaker is fitted with a key lock, the operator cannot operate the breaker unless using a matched key.



Key interlock

The key interlock is a system of interlocking between breakers, each fitted with a key lock of lock-in OFF type.

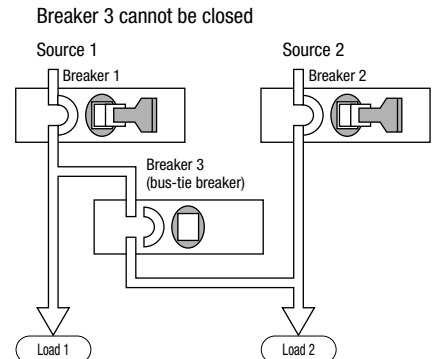
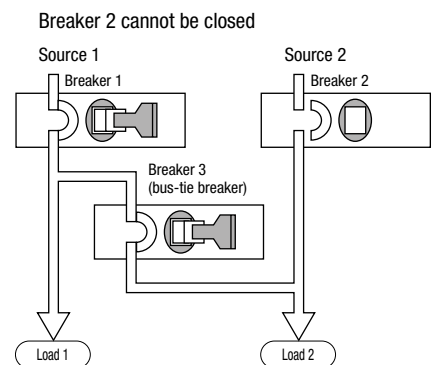
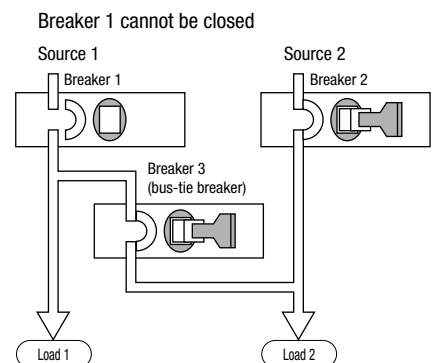
- A key must be inserted to release the lock before the breaker can be closed.
- The breaker must be opened and locked in the OFF position before the key can be removed.

By utilising the lock-in OFF type key lock feature, and then a limited number of keys by default provides an effective and reliable interlock system.

Using the same keys also allows interlocking between a breaker and other devices (such as switchboard door).

Breakers can be supplied with a cylinder lock or type FS-2 Castell lock (with an angular movement 90° clockwise to trap key). The Castell lock is not included.

Example: interlock for prevention of parallel feeding from two sources



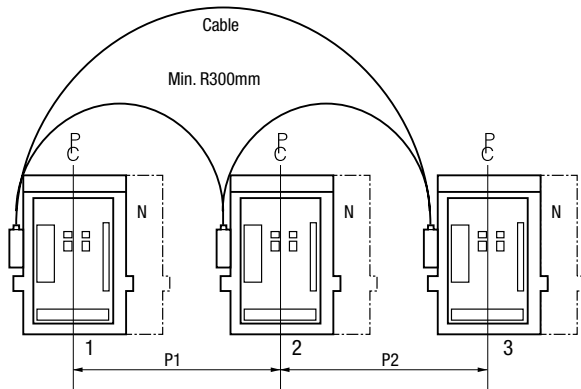
Mechanical interlock

Cable type interlocks for 2 or 3 breakers in either horizontal or vertical arrangements are available. Rod type mechanical interlocks are available for vertical interlocking of breakers. In conjunction with an electrical interlock, it will enhance safety and reliability of power distribution systems. Interlocking is possible between 2 or 3 breakers of any frame size within the MSX AIR range.

1 Horizontal type

The table shows the center-to-center distance between Breaker 1 on the left and Breaker 2 on the right, or between Breaker 2 on the left and Breaker 3 on the right.

		Center-to-center distance between breakers P (mm)	
		MA220S MA212H~AR220H	MA325S~MA332S MA332H MA440SB
Left breaker	Right breaker	3P, 4P	3P, 4P
MA220S MA212H~MA220H	3P	600, 700, 800	600, 700, 800
	4P	600, 700, 800, 900	700, 800, 900
MA325S~MA332S MA332H MA440SB	3P	600, 700, 800, 900	700, 800, 900
	4P	700, 800, 900, 1000	800, 900, 1000



To order, select the required pitch for P1 and P2 from the above table and specify the type and number of poles for each breaker and the type of interlock (A,B,C or D).

Example:

P1: 700 mm

P2: 800 mm

Breaker 1: MA212H 3 poles

Breaker 2: MA332H 3 poles

Breaker 3: MA216H 3 poles

Type of interlock: B

2 Vertical type

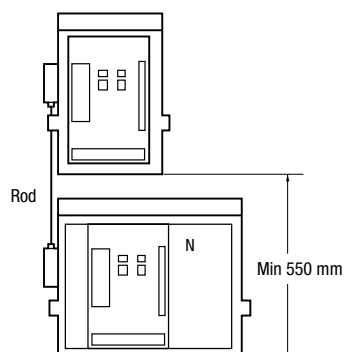
Minimum pitch (550mm) is possible.

Maximum is 1200mm.

Specify the required pitch when ordering.

The interlock between three breakers is available.

Please, contact us for more details.



Types and operations

Type	Operation			Remark
	Br1	Br2	Br3	
Type C 1 	ON	OFF	-	One or two breakers can be turned on.
	OFF	ON	-	
	OFF	OFF	-	
Type B 2 	ON	ON	OFF	One or two of the three breakers can be turned on.
	ON	OFF	ON	
	OFF	ON	ON	
	OFF	ON	OFF	
	OFF	OFF	ON	
Type D 3 	ON	OFF	OFF	One of three breakers can be turned on.
	OFF	ON	OFF	
	OFF	OFF	ON	
	OFF	OFF	OFF	
Type A 4 	ON	OFF	ON	Br2 is interlocked with both Br1 and Br3.
	OFF	ON	OFF	
	OFF	OFF	ON	
	OFF	OFF	OFF	

- Interlock is enabled in the CONNECTED position. When the breaker body is in the TEST, ISOLATED or DRAW-OUT position, interlock is disabled.
- If all of two or three breakers receive a closing (on) signal, they all will turn off. This case however involves a momentary continuity between the main circuit and the auxiliary switch a-contact in all the breakers.
- The body of a draw-out type breakers, as long as it is off (open), can be drawn out or inserted, irrespective of the state of other breakers. (Do not draw out or insert a breaker body during cable installation, adjustment or operation check).

MSX AIR

Lifting plates

Lifting plates are detachable tools that can be used to lift a breaker body out of a draw-out cradle.



Control circuit terminal cover

A control circuit terminal cover protects the terminal blocks for auxiliary switches, position switches and control circuits from being accidentally touched, thus enhancing safety.



Door flange

A door flange can be used as a decoration panel that covers the cutout on the switchboard panel and provides IP20 protection. For IP31 protection please specify the door flange with a gasket.

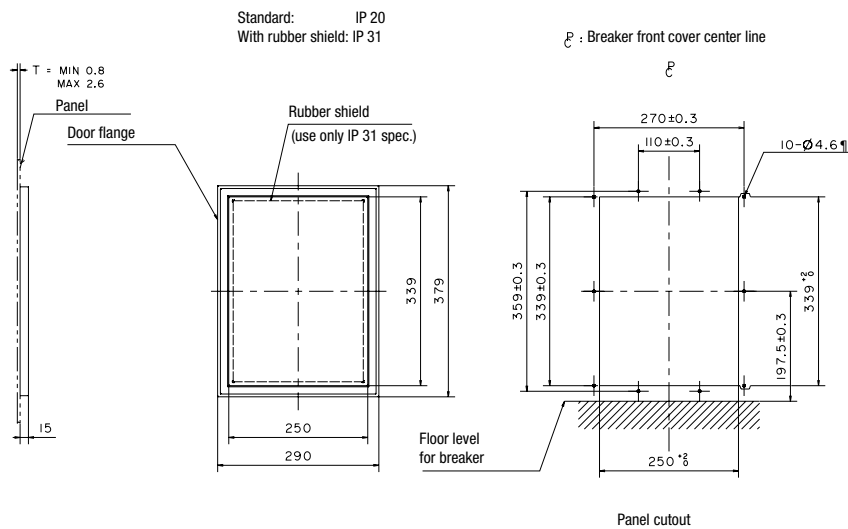
NOTE: door flange cannot be fitted with IP55 cover.



ON-OFF button cover ※

※ Standard accessories

An ON-OFF button cover prevents inadvertent or unauthorised operation of the ON or OFF button. It can be locked with up to three padlocks with $\phi 6$ hasp. Padlocks are not supplied.



OFF padlock

Permits the breaker to be padlocked in the OFF position. Max. three padlocks with ø6 hasp can be fitted. Padlocking is possible only when ON-OFF indicator shows OFF. When the breaker is padlocked in the OFF position both manual and electrical closing become inoperative, but the charging of the closing spring by manual or motor is still possible.

Note 1: OFF padlock facility cannot be fitted with key lock or key interlock.

Earthing device

There is growing demand in L.V. distribution for greater protection against electric shock particularly during periods when maintenance work is being carried out on the main busbars or cables. A safe and economical way to meet this requirement is to apply system earthing via the normal service breaker. Earthing devices MSX AIR comprises: permanent parts which are factory fitted by Gewiss and are mounted on the breaker chassis and body to enable the breaker to receive the portable parts. Portable parts are supplied in loose kit form and are fitted on to the breaker body by the customer's engineer. This converts the breaker from a normal service device to an earthing device.

When the breaker is converted to the earthing device mode, the over-current release and the other electrical tripping devices are automatically disabled to prevent the remote opening of the breaker.

It is recommended that the ON-OFF operating buttons be padlocked to prevent manual opening of the breaker when used in the earthing mode. UVT function cannot be applied to the earthing device.

For further information contact Gewiss for details.

Inter-pole barrier

An inter-pole barrier prevents a possible short circuit due to foreign objects entering between the poles of the main circuit terminals or between the line and load ends, thus enhancing operation reliability of the breaker. This barrier can be applied to the drawout type breakers with vertical terminals or horizontal terminals.



MSX AIR

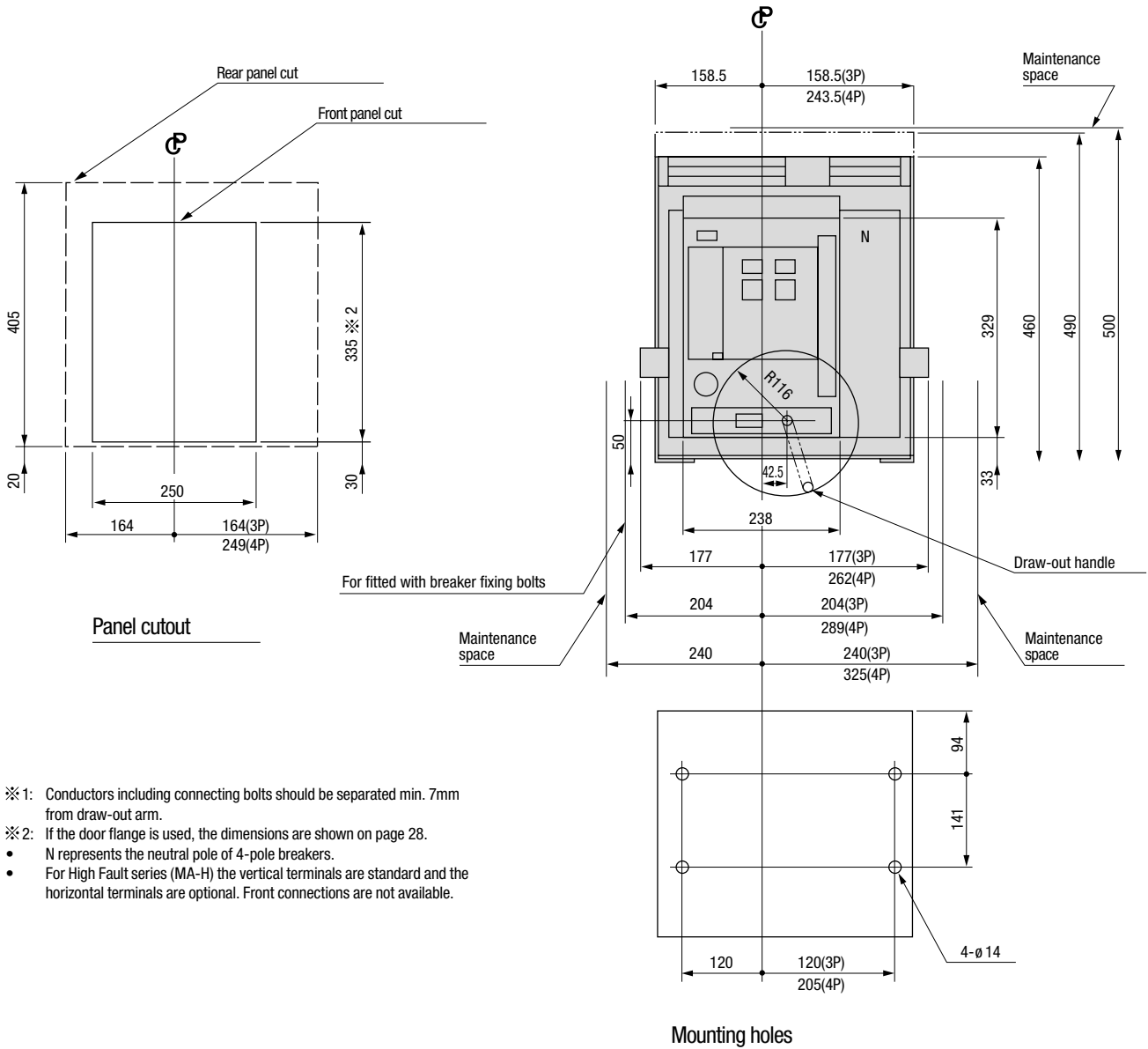
Dimensions

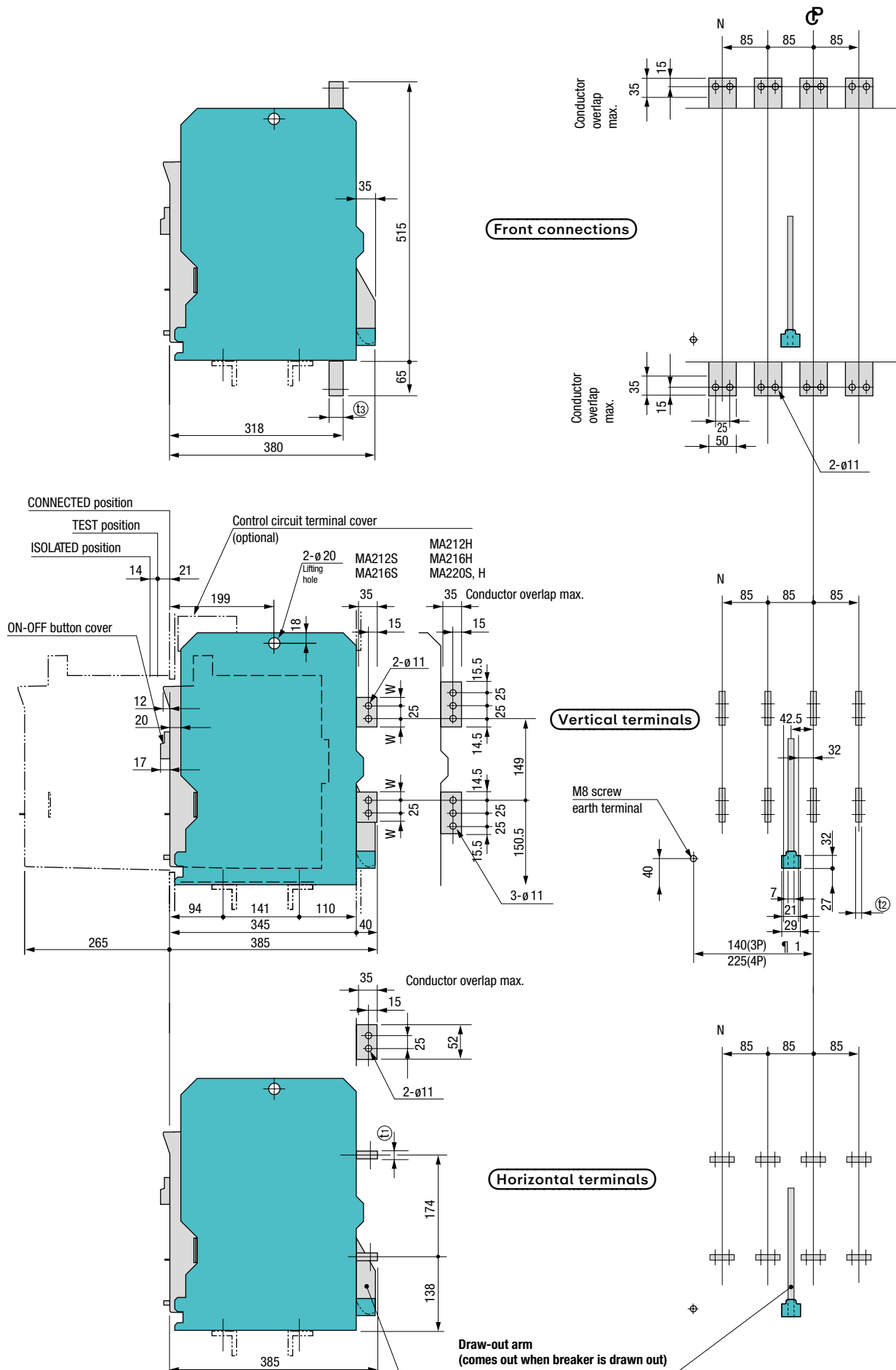
MA208S, MA212S, MA212H, MA216S, MA216H, MA220S, MA220H
Draw-out type

Ⓟ : Breaker front cover center line

Terminal size

TYPE	t1	t2	t3	W
MA208S	10	10	15	17.5
MA212S	10	10	15	17.5
MA216S	20	15	25	22.5
MA220S	20	15	25	-
MA212H	20	15	-	-
MA216H	20	15	-	-
MA220H	20	15	-	-





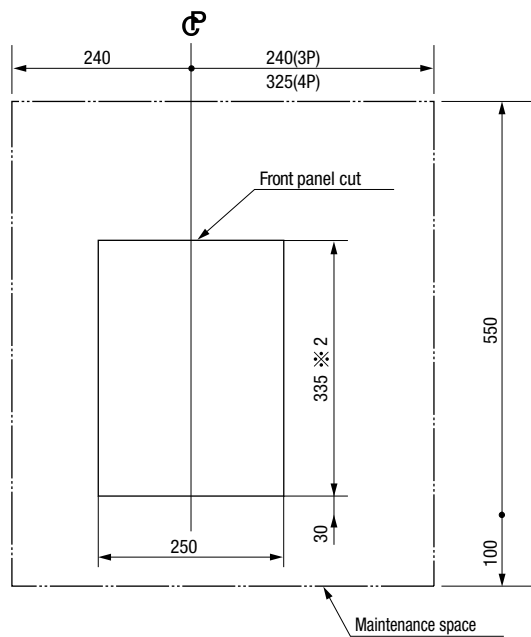
MSX AIR

MA208S, MA212S, MA216S, MA220S, MA212H, MA216H, MA220H Fixed type

☉ : Breaker front cover center line

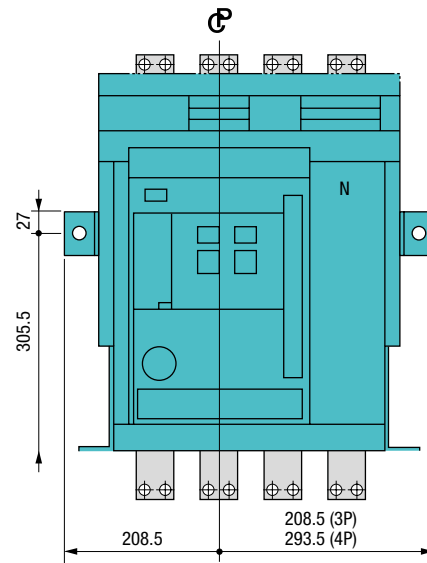
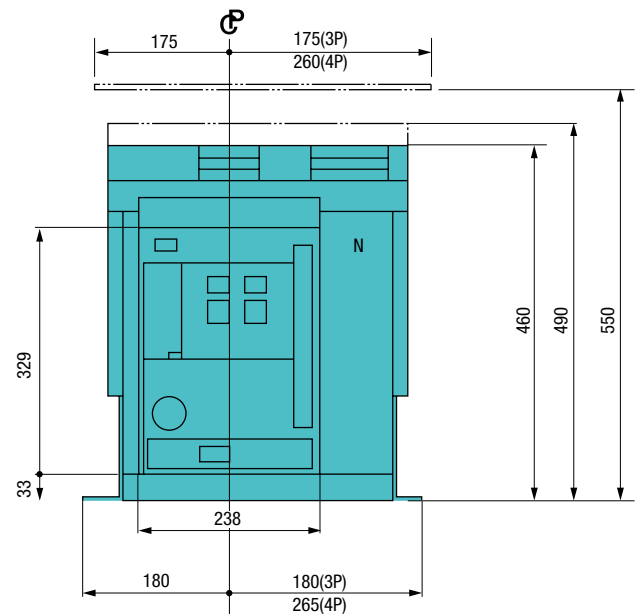
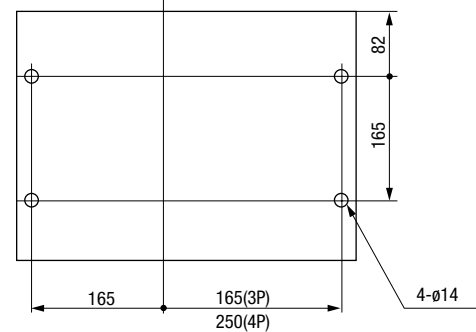
Terminal size

TYPE	t1	t2	t3	W
MA208S	10	10	15	17.5
MA212S	10	10	15	17.5
MA216S	20	15	25	22.5
MA220S	20	15	25	-
MA212H	20	15	-	-
MA216H	20	15	-	-
MA220H	20	15	-	-

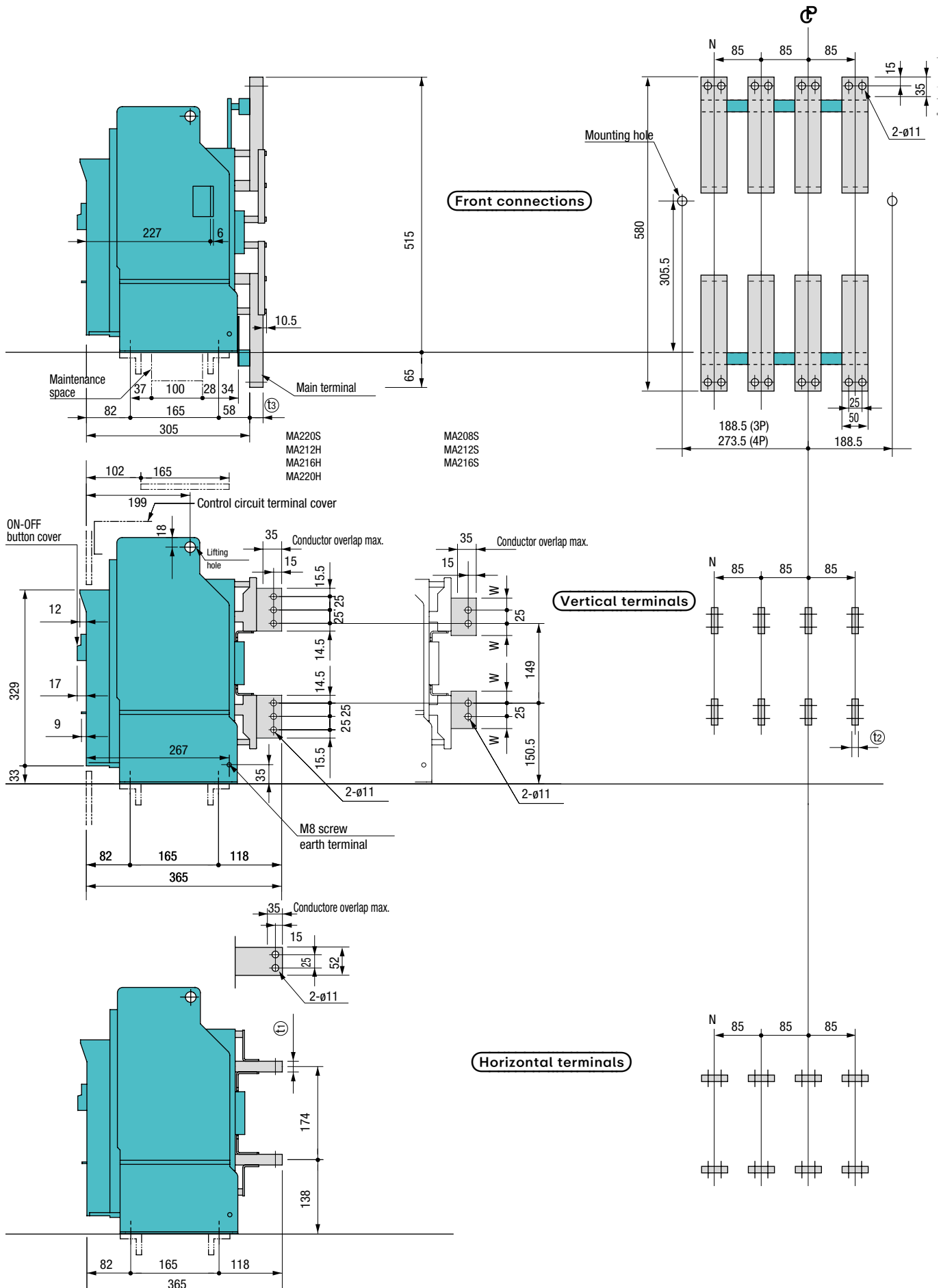


Panel cutout

- ※ 2: If the door flange is used, the dimensions are shown on page 28.
- N represents the neutral pole of 4-pole breakers.
 - For High Fault series (MA-H) the vertical terminals are standard and the horizontal terminals are optional. Front connections are not available.

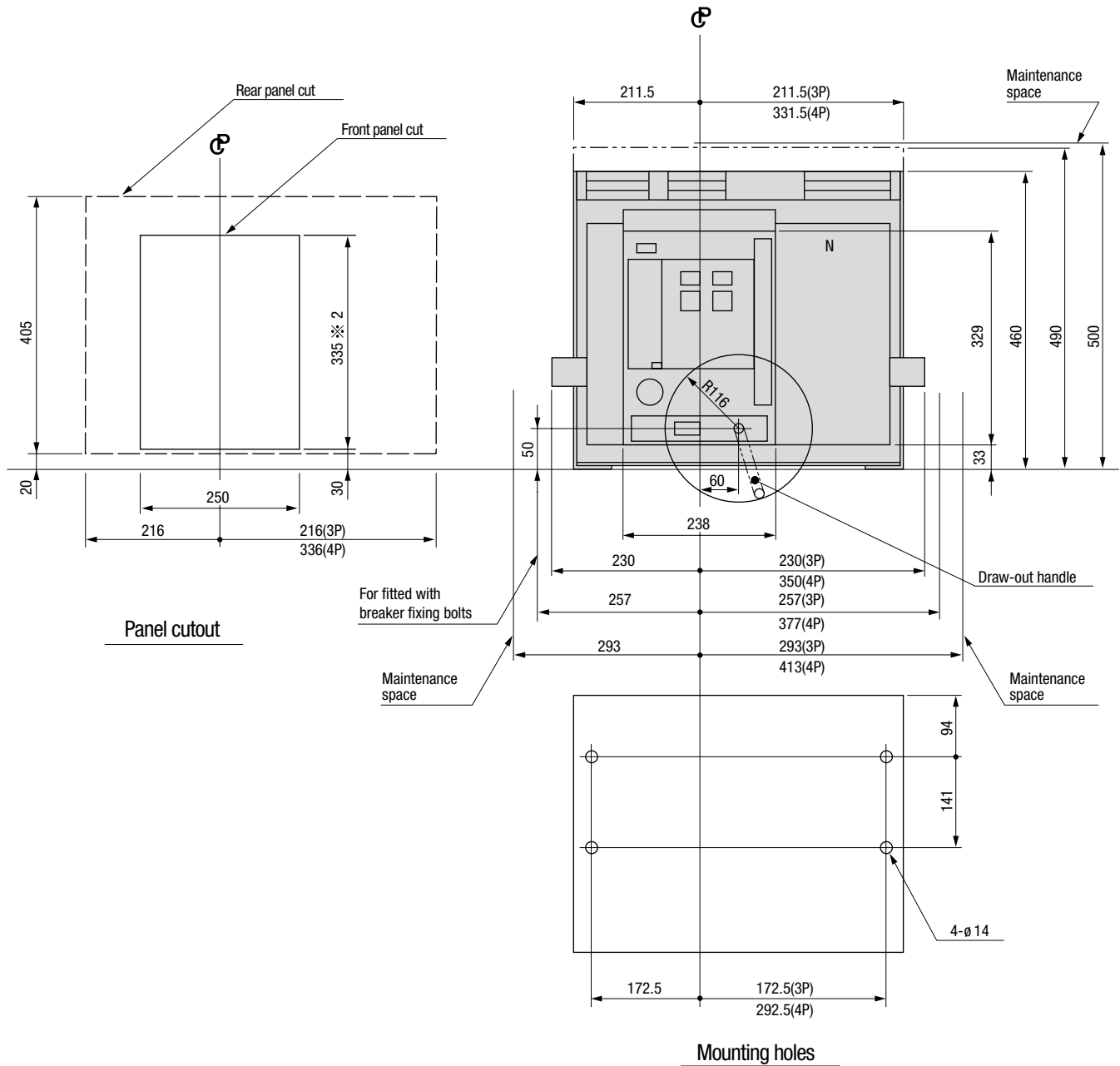


Mounting holes

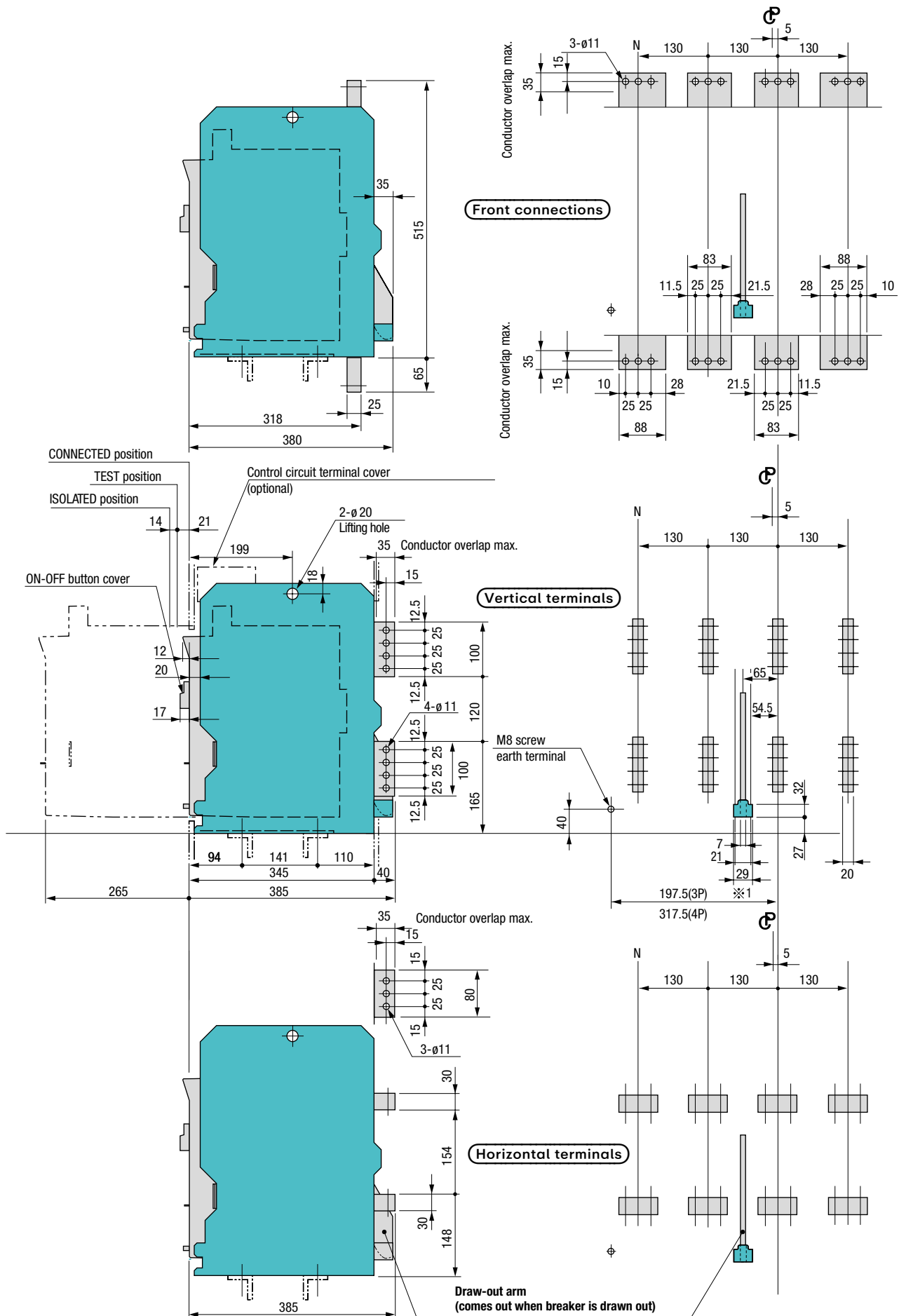


MA325S, MA325H, MA332S, MA332H Draw-out type

☉ : Breaker front cover center line



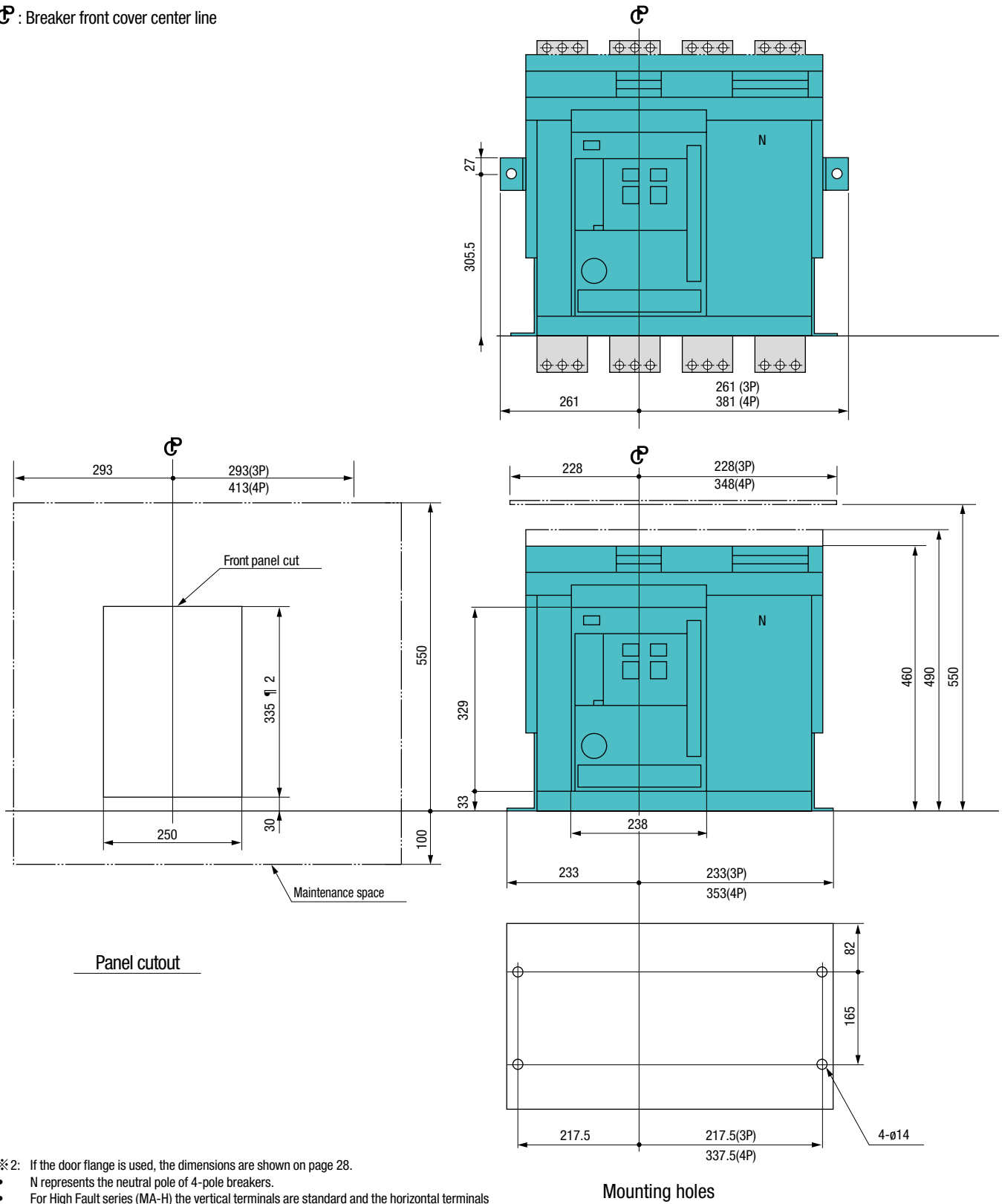
- ※ 1: Conductors including connecting bolts should be separated min. 7mm from draw-out arm.
- ※ 2: If the door flange is used, the dimensions are shown on page 28.
- N represents the neutral pole of 4-pole breakers.
- For High Fault series (MA-H) the vertical terminals are standard and the horizontal terminals are optional. Front connections are not available.



MSX AIR

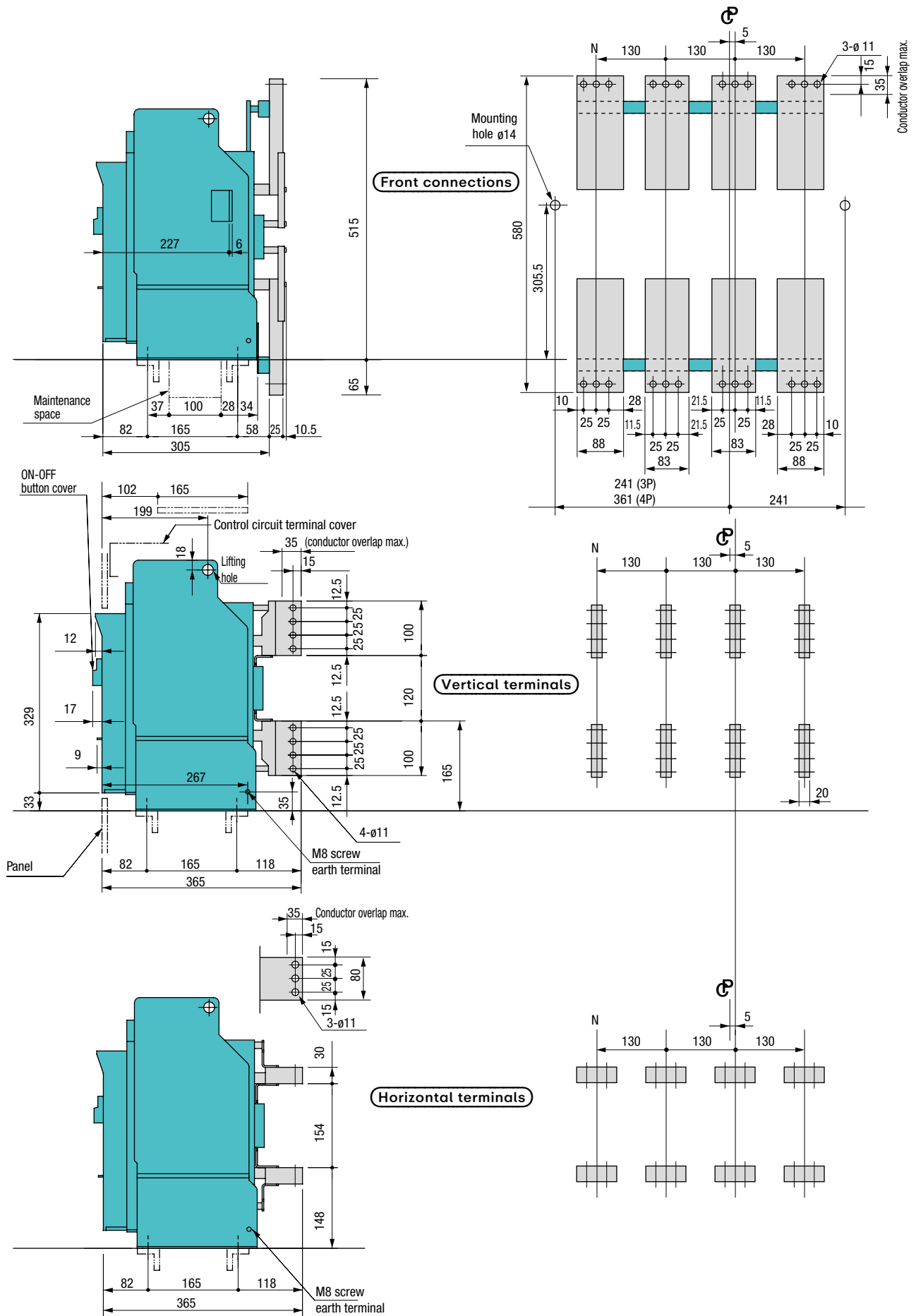
MA325S, MA332S, MA325H, MA332H Fixed type

Ⓢ : Breaker front cover center line



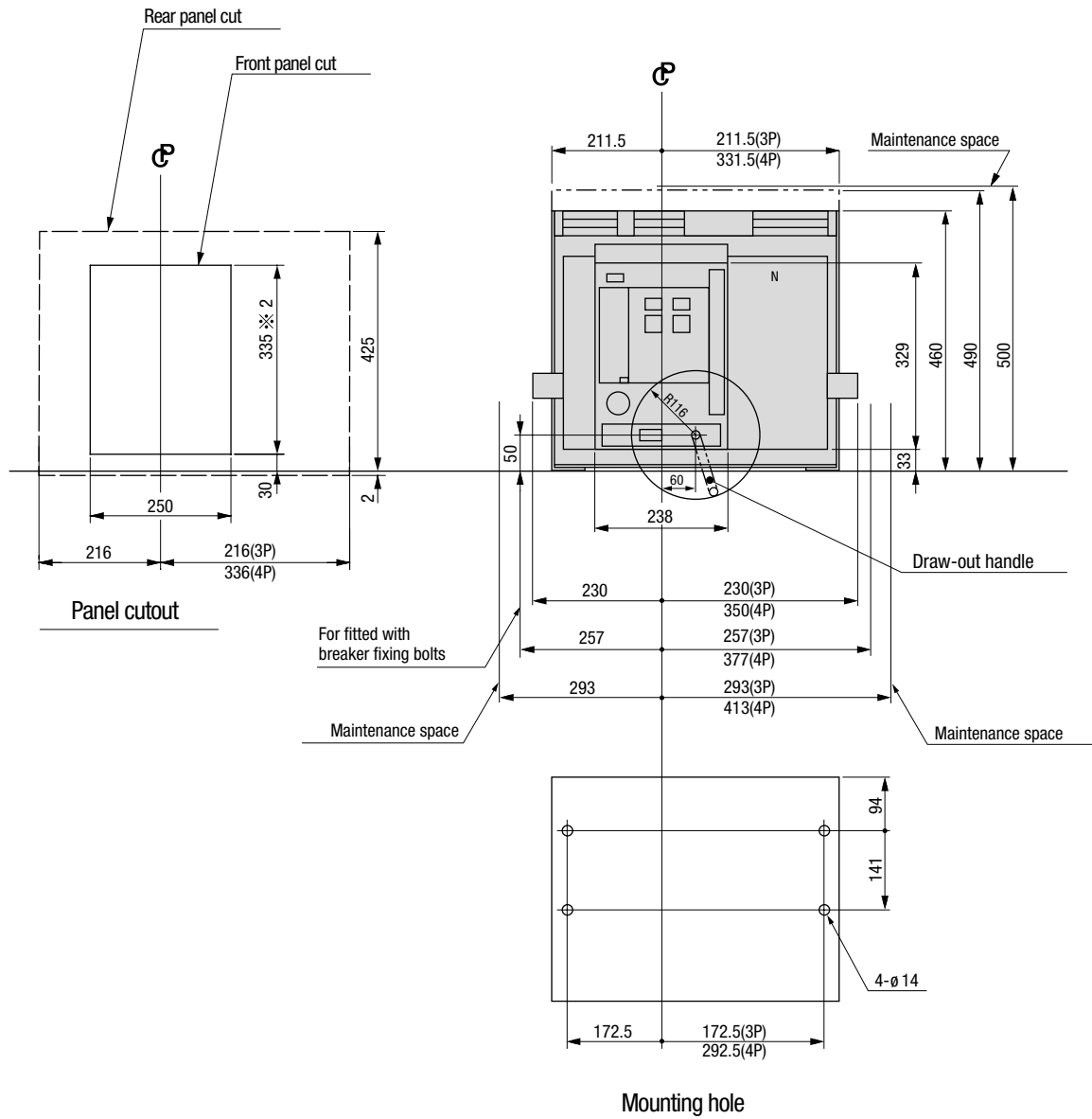
※2: If the door flange is used, the dimensions are shown on page 28.

- N represents the neutral pole of 4-pole breakers.
- For High Fault series (MA-H) the vertical terminals are standard and the horizontal terminals are optional. Front connections are not available.



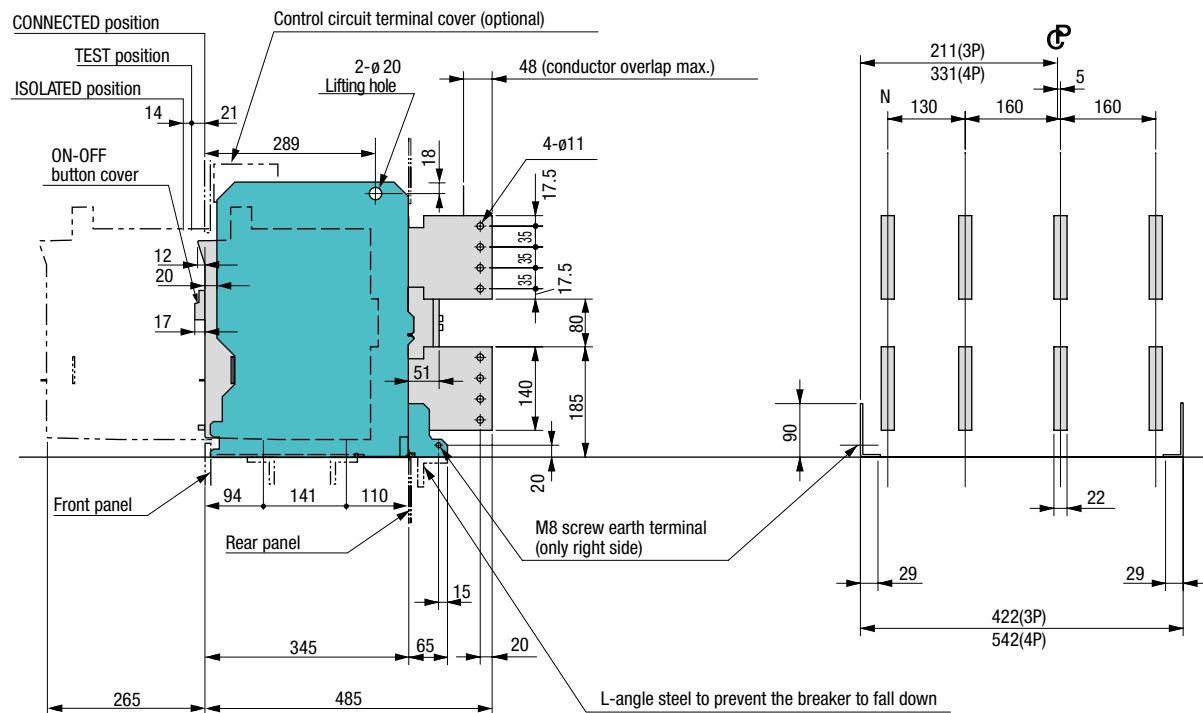
MA440SB Draw-out type

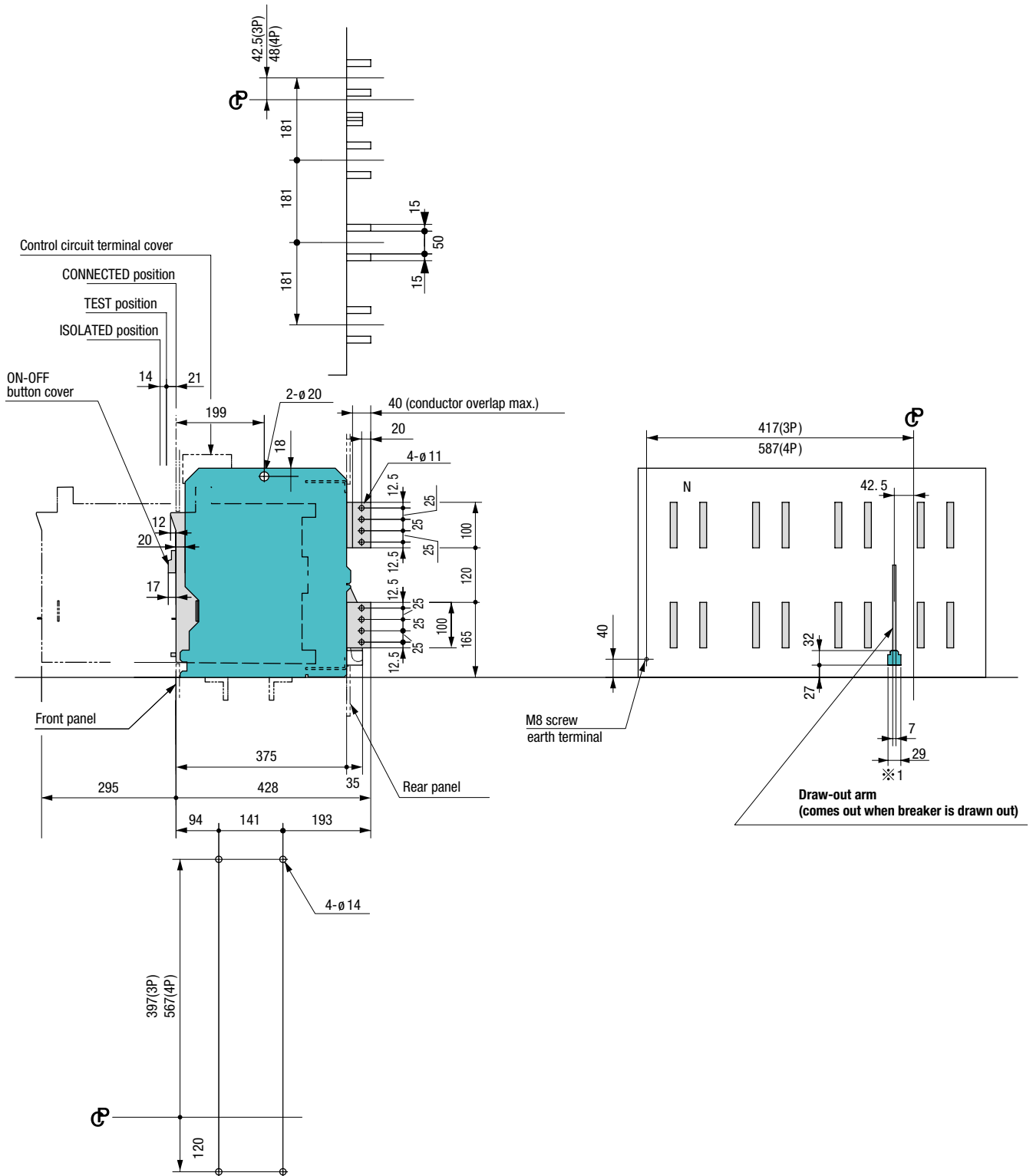
☉ : Breaker front cover center line

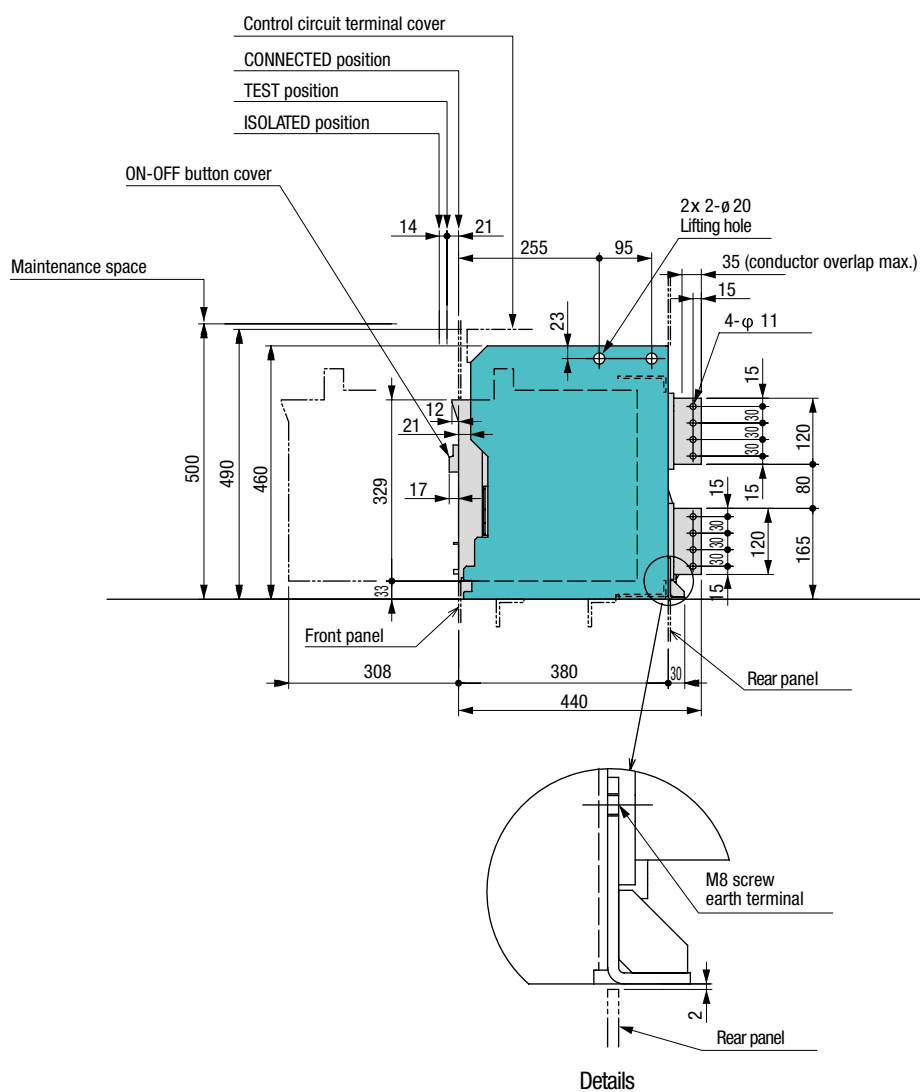


※ 2: If the door flange is used, the dimensions are shown on page 28.

- N represents the neutral pole of 4-pole breakers.





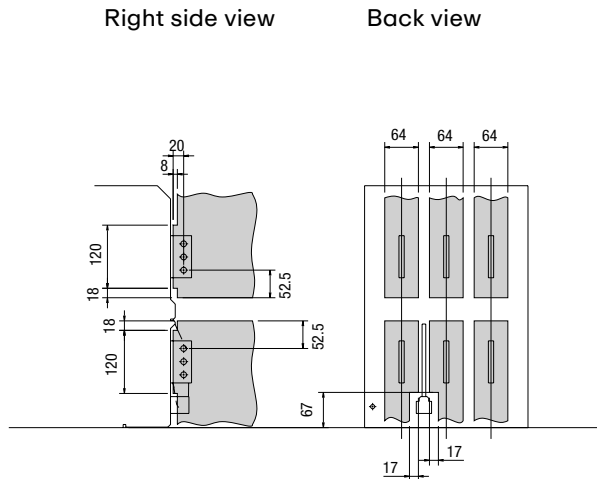


Connections

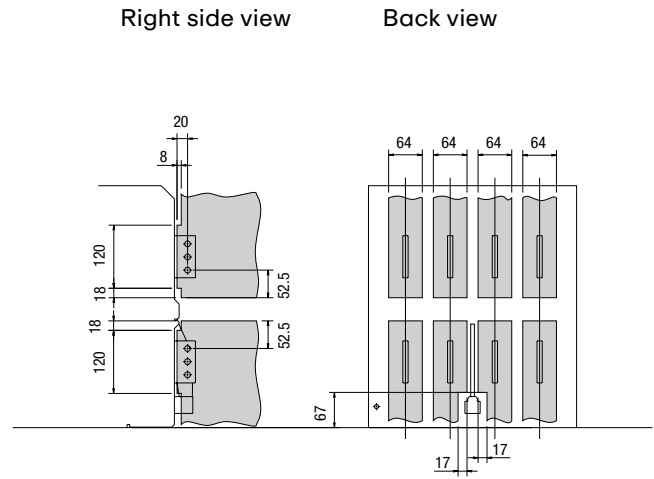
MA208S, MA212S, MA216S, MA220S, MA212H, MA220H

Connect conductors to the main circuit terminals in the conductor connection.
Insulation distance of conductor connection area and earth metal is more than 12.5mm.

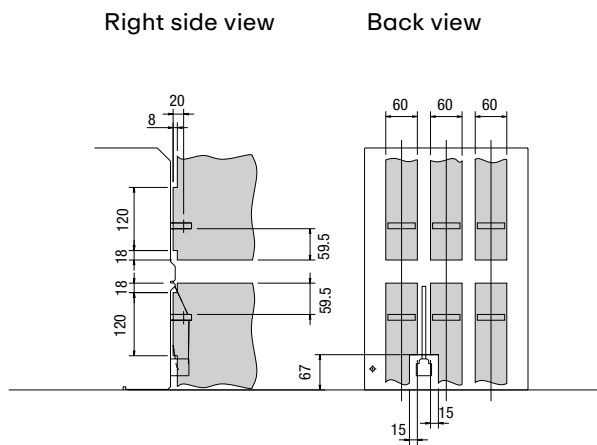
Vertical terminals 3P



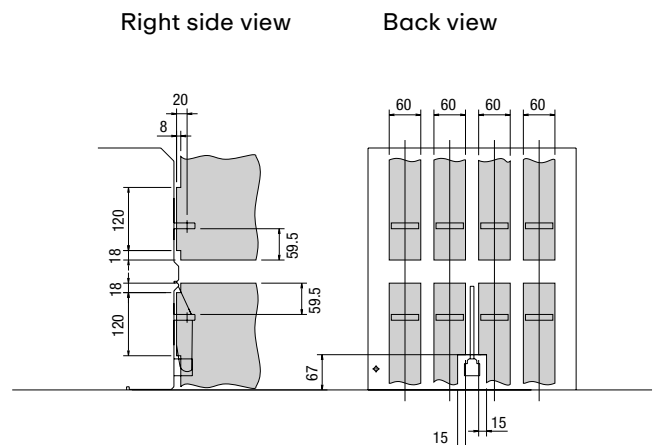
Vertical terminals 4P



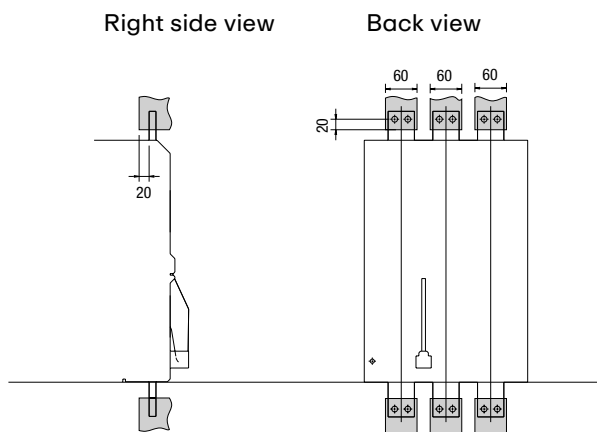
Horizontal terminals 3P



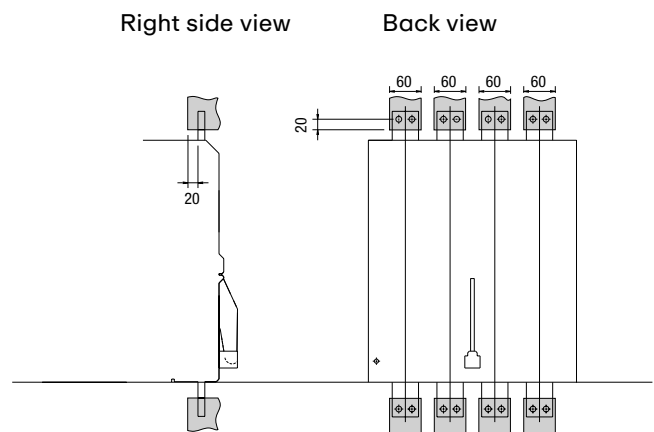
Horizontal terminals 4P



Front connections 3P

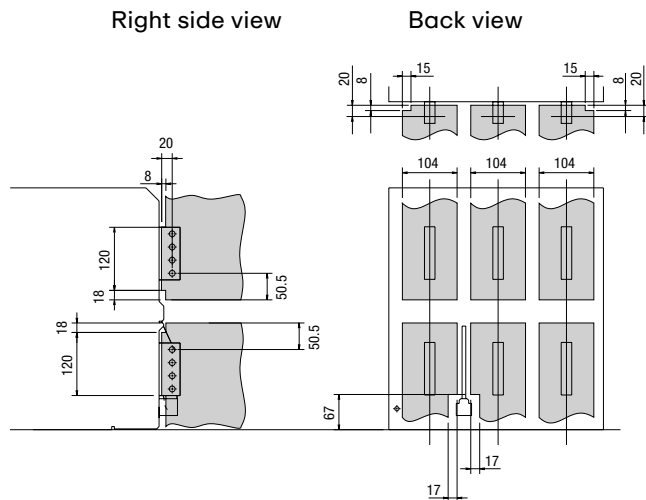


Front connections 4P

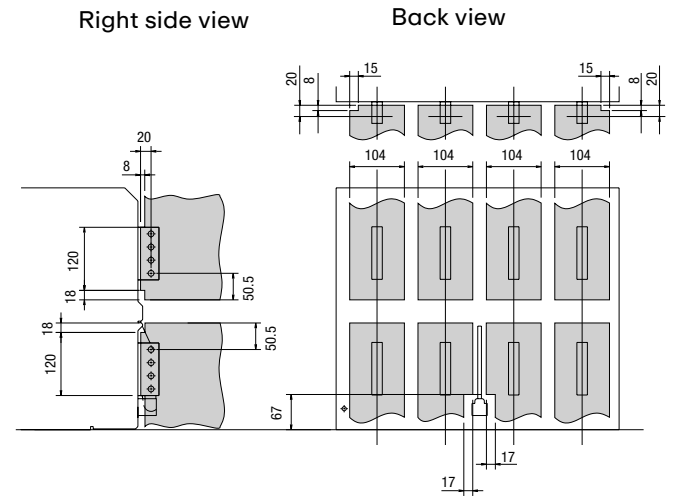


MA325S, MA332S, MA325H, MA332H

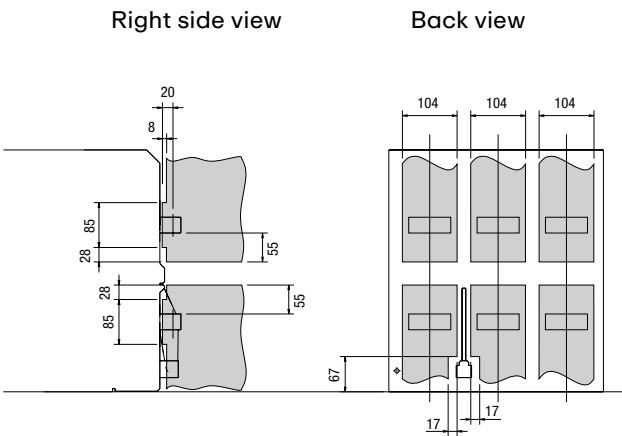
Vertical terminals 3P



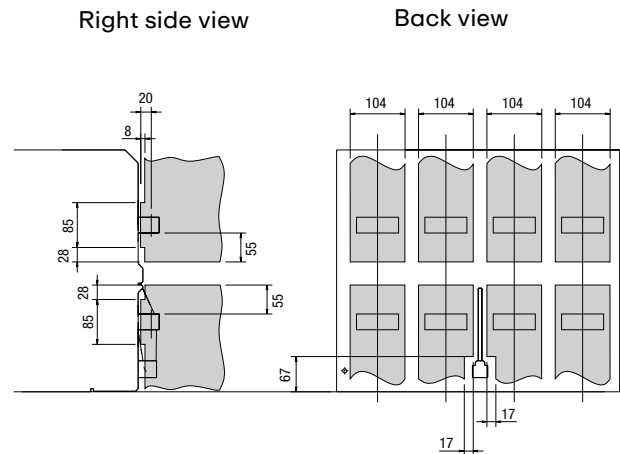
Vertical terminals 4P



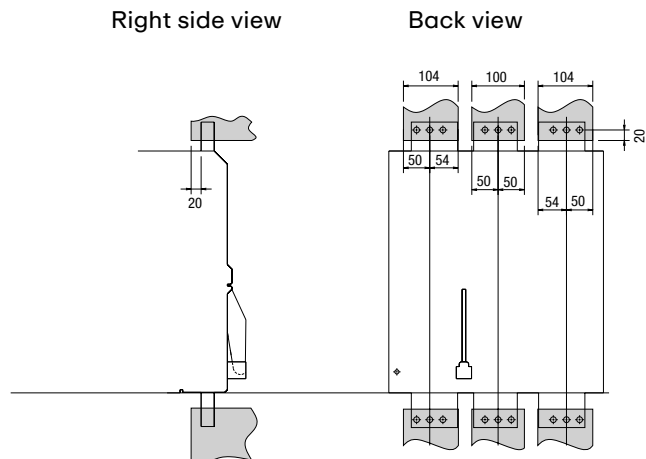
Horizontal terminals 3P



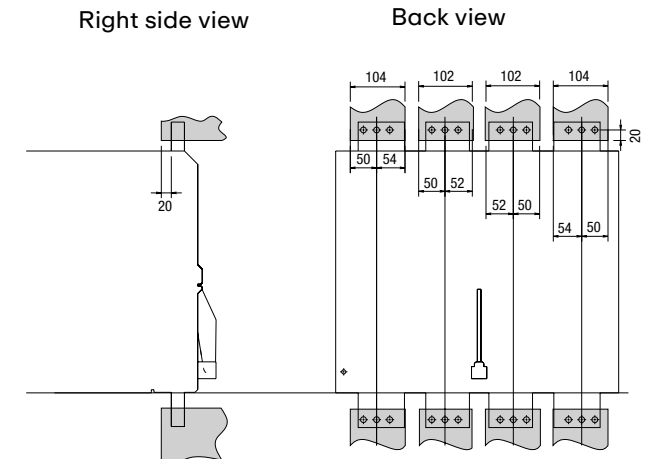
Horizontal terminals 4P



Front connections 3P

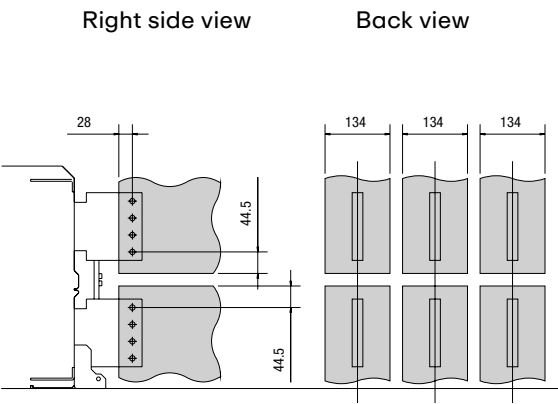


Front connections 4P

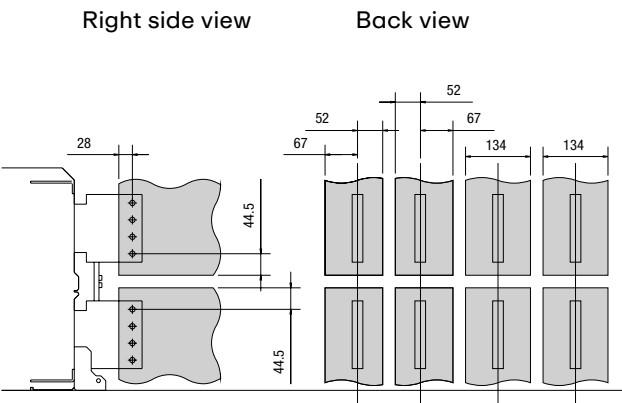


MA440SB

Vertical terminals 3P



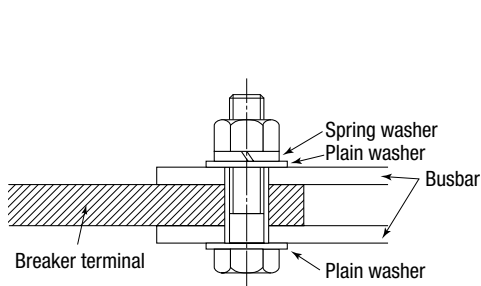
Vertical terminals 4P



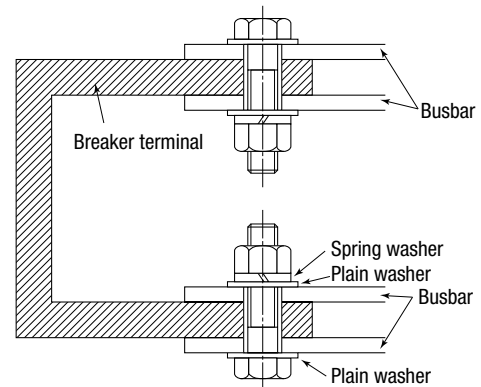
Busbars

When two busbars are connected to a terminal stud of the breaker, sandwich the terminal stud between the two busbars to utilise both surfaces of the terminal.

A spring and plain washer must be used in conjunction with the busbar bolt and nut as below.



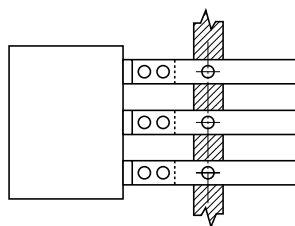
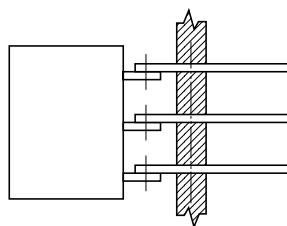
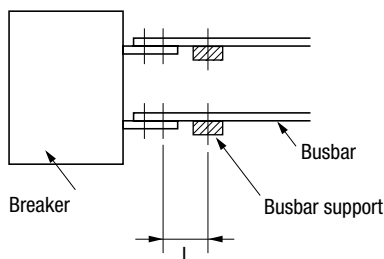
In case of 1 terminal per pole



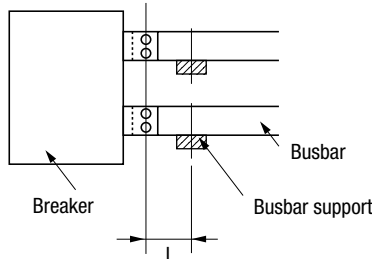
In case of 2 terminals per pole

Recommendation for busbars connection

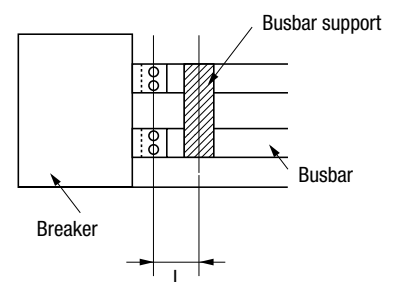
The busbars to the breaker should be firmly supported near the breaker terminal. Fault currents flow through the busbars developing a large electromagnetic force between the busbars. The support must be strong enough to withstand such forces and ensure enough insulating distance. The breaker should not be relied on as a single support.



Horizontal terminals



Vertical terminals



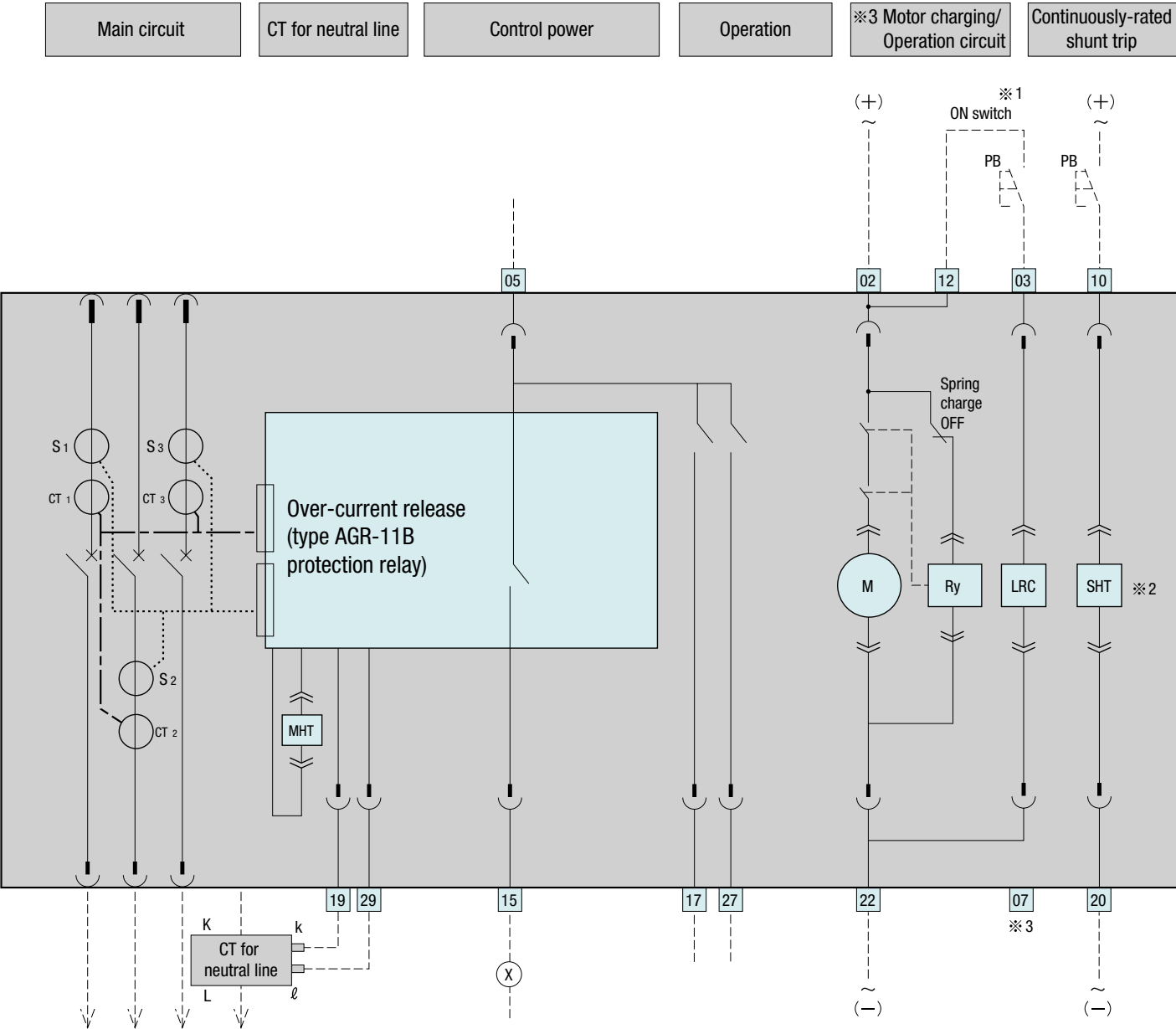
Vertical terminals

Maximum distance between the connection to the breaker and the closest busbar support

Short-circuit current (kA)		30	50	65	80	100	120	135
Distance L (mm)	MA2	300	250	150	150	-	-	-
	MA3	350	300	250	150	150	-	-
	MA440SB	350	300	250	150	100	-	-

Circuit diagram

with AGR-11B protection relay or without relay



Terminal description

- Check protection relay voltage before connecting.
- 02 22 Control power supply
100-240 V ac, 100-250V dc, 24V dc, 48V dc
 - 12 Operation switch, common
 - 03 ON switch
 - 05 Operation indication terminal, common
 - 15 Protection relay trip indication
 - 17 Trip indication
 - 27 Spring charge indicator
 - 10 20 Continuously-rated shunt trip
 - 19 Separate CT for neutral line (k)
 - 29 Separate CT for neutral line (l)
 - 08 18 UVT power supply
 - 09 UVT power supply, common

Symbols for accessories

- CT1 - CT3 : Power CTs
- S1 - S3 : Current sensors
- M : Charging motor
- LRC : Latch release coil
- MHT : Magnetic hold trigger
- Isolating terminal connector (for draw-out type)
- Manual connector
- User wiring
- Relay or indicator lamp

UVT power supply
(do not exceed spcified voltages)

Term.No.	100V ac unit	200V ac unit	400V ac unit	450V ac unit
08 - 09	100V	200V	380V	450V
18 - 09	110V	220V	415V	480V
28 - 09	120V	240V	440V	400V

- ※1: Do not connect "b" contact of auxiliary switch to ON switch in series, otherwise, pumping may occur.
- ※2: See page 22 for the circuit diagram of the continuously-rated shunt trip device with capacitor trip device.
- ※3: For motor split circuit, terminals (02), (22) and (03), (07) are used for charging and closing operation respectively (please, specify when ordering). See page 23 (activation by impulse only).
- ※4: Only one of terminals (08), (18), (28) must be used as this is a single phase UVT
- ※5: Do not use these terminals for other circuits when both instantaneously rated shunt trip and UVT are fitted. These terminals are used as the anti-burnout SW for the instantaneously rated shunt trip.
- ※6: Do not use these terminals for other circuits when both instantaneously rated shunt trip and UVT are fitted. These terminals are used as the anti-burnout SW for the instantaneously rated shunt trip.

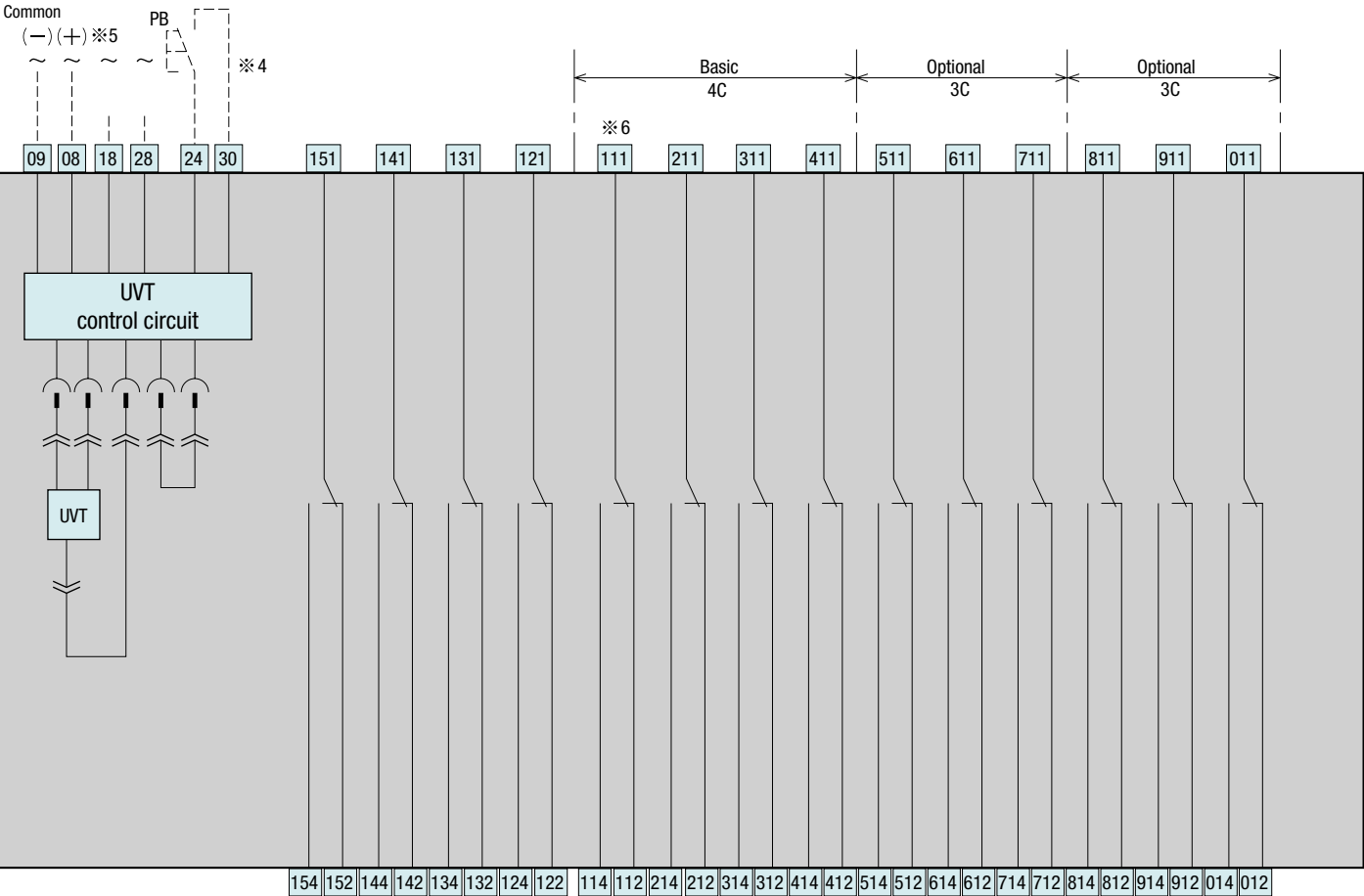
NOTE: In case of a UVT and a shunt fitted together or double opening or closing coil, use an auxiliary switch to prevent burnout. Contact Gewiss for wiring.

Term.No.	24V dc unit	48V dc unit	100V dc unit	110V dc unit
08 - 09	24V	48V	100V	110V

Undervoltage trip

Position switches

Auxiliary switches



Designation of terminals for auxiliary and position switches

- * 1: Common
- * 2: b-contact
- * 4: a-contact
- 1: Auxiliary switch
- 2: Position switch (for CONNECTED)
- 3: Position switch (for TEST)
- 4: Position switch (for ISOLATED)
- 5: Position switch (for INSERT)
- 1 – 0: Switch numbers
- A, B, C: Auxiliary switches for microload

CONNECTED position: 121–124 ON
121–122 OFF

TEST position: 131–134 ON
131–132 OFF

ISOLATED position: 141–144 ON
141–142 OFF

INSERT position: 151–154 ON
151–152 OFF

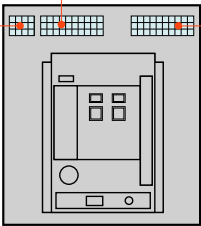
Position switches

Top	151	141	131	121
Middle	154	144	134	124
Bottom	152	142	132	122

Top	131	121
Middle	134	124
Bottom	132	122

Operation/control circuits

01	02	03	04	05	06	07	08	09	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30



Auxiliary switches

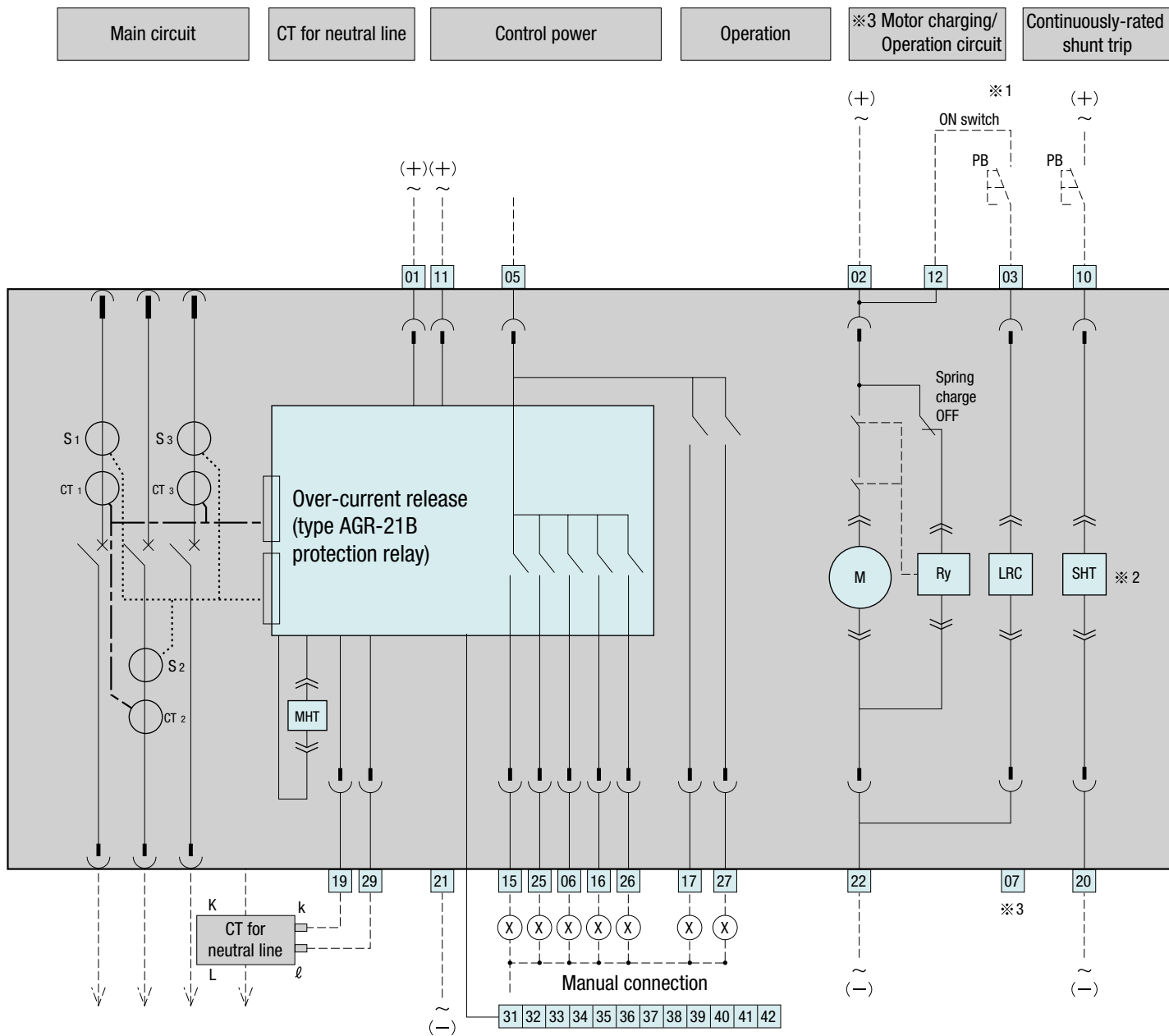
(4c + optional 6c arrangement)

111	211	311	411	511	611	711	811	911	011
114	214	314	414	514	614	714	814	914	014
112	212	312	412	512	612	712	812	912	012

(4c arrangement)

111	211	311	411
114	214	314	414
112	212	312	412

AGR-21B protection relay



Terminal description

Check protection relay voltage before connecting.

- 01 21 Control power supply 200-240V ac, 200-250V dc, 48V dc
- 01 11 Control power supply 100 - 120V ac
- 11 21 Control power supply 100 - 125V dc, 24V dc
- 02 22 Control power supply 100 - 240V ac, 100 - 250V dc, 24V dc, 48V dc
- 12 Operation switch, common
- 03 ON switch
- 05 Operation indication terminal, common
- 15 LT trip indication
- 25 ST/INST trip indication
- 06 PTA indication
- 16 GF trip indication
- 26 System alarm indication
- 17 REF, NS or trip indication

- 27 Spring charge indication
- 10 20 Continuously-rated shunt trip
- 19 Separate CT for neutral line (k)
- 29 Separate CT for neutral line (l)
- 08 18 28 UVT power supply
- 09 UVT power supply, common
- 35 Separate CT for REF (k)
- 36 Separate CT for REF (l)
- 41 Communication line (-)
- 42 Communication line (+)
- 32 Communication line (common)

UVT power supply (do not exceed specified voltages)

Term.No.	100V ac unit	200V ac unit	400V ac unit	450V ac unit
08 - 09	100V	200V	380V	450V
18 - 09	110V	220V	415V	480V
28 - 09	120V	240V	440V	400V

Term.No.	24V dc unit	48V dc unit	100V dc unit	110V dc unit
08 - 09	24V	48V	100V	110V

Symbols for accessories

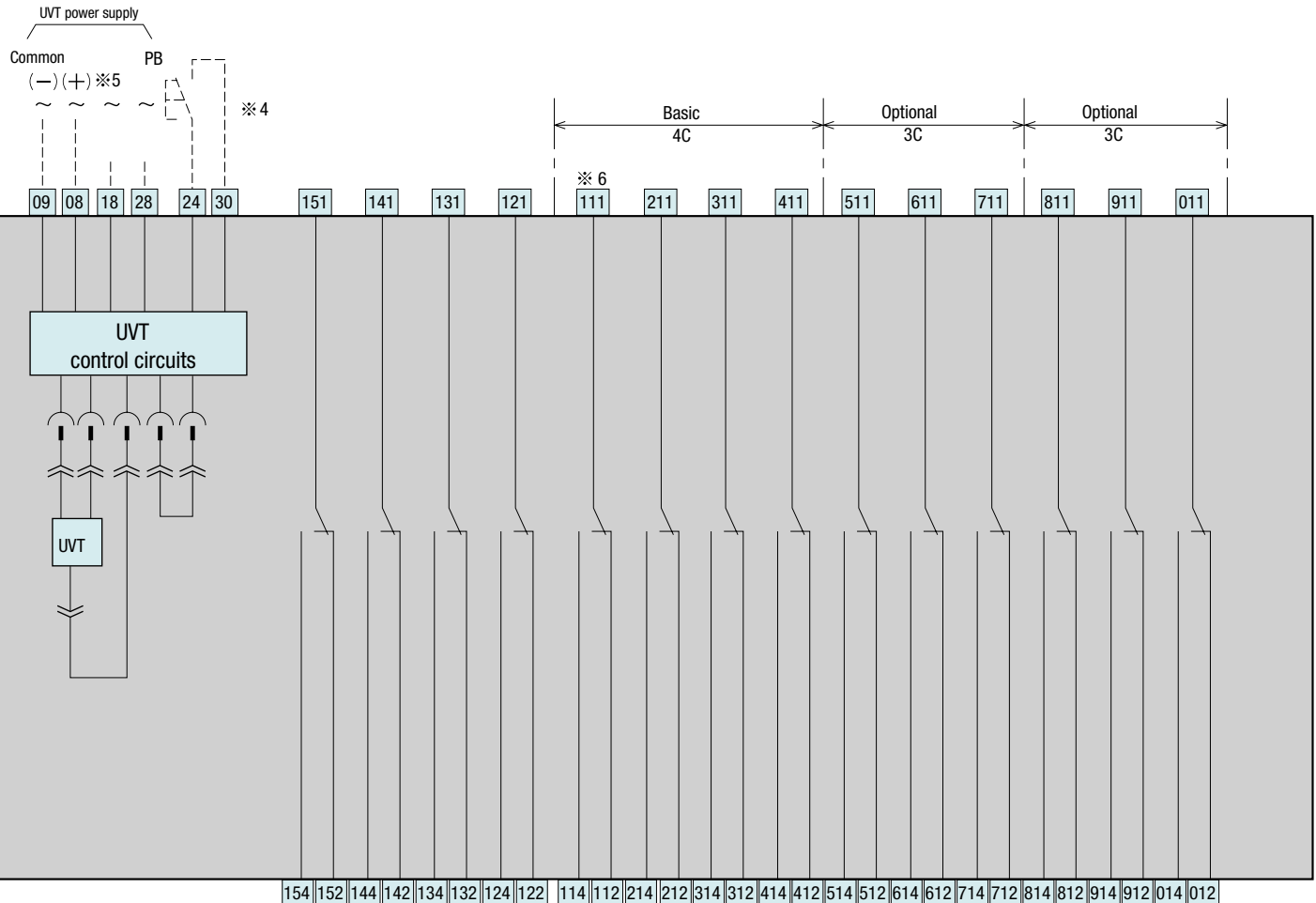
- CT1 - CT3 : Power CTs
- S1 - S3 : Current sensors
- M : Charging motor
- LRC : Latch release coil
- MHT : Magnetic hold trigger
- Isolating terminal connector (for draw-out type)
- Manual connector
- User wiring
- Relay or indicator lamp

- ※1: Do not connect "b" contact of auxiliary switch to ON switch in series, otherwise, pumping may occur.
- ※2: See page 22 for the circuit diagram of the continuously-rated shunt trip device with capacitor trip device.
- ※3: For motor split circuit, terminals (02), (22) and (03), (07) are used for charging and closing operation respectively (please, specify when ordering).
- ※4: See page 23 (activation by impulse only).
- ※5: Only one of terminals (08), (18), (28) must be used as this is a single phase UVT.
- ※6: Do not use these terminals for other circuits when both instantaneously rated shunt trip and UVT are fitted. These terminals are used as the anti-burnout SW for the instantaneously rated shunt trip.

Undervoltage trip

Position switches

Auxiliary switches



Designation of terminals for auxiliary and position switches

- * * *
- 1: Common
- 2: b-contact
- 4: a-contact
- 1: Auxiliary switch
- 2: Position switch (for CONNECTED)
- 3: Position switch (for TEST)
- 4: Position switch (for ISOLATED)
- 5: Position switch (for INSERT)
- 1 - 0: Switch numbers
- A, B, C: Auxiliary switches for microload

CONNECTED position: 121-124 ON
121-122 OFF

TEST position: 131-134 ON
131-132 OFF

ISOLATED position: 141-144 ON
141-142 OFF

INSERT position: 151-154 ON
151-152 OFF

Position switches

Top	151	141	131	121
Middle	154	144	134	124
Bottom	152	142	132	122

Top	131	121
Middle	134	124
Bottom	132	122

Option/control circuits

01	02	03	04	05	06	07	08	09	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30

Auxiliary switches

(4c + optional 6c arrangement)

111	211	311	411	511	611	711	811	911	011
114	214	314	414	514	614	714	814	914	014
112	212	312	412	512	612	712	812	912	012

(4c arrangement)

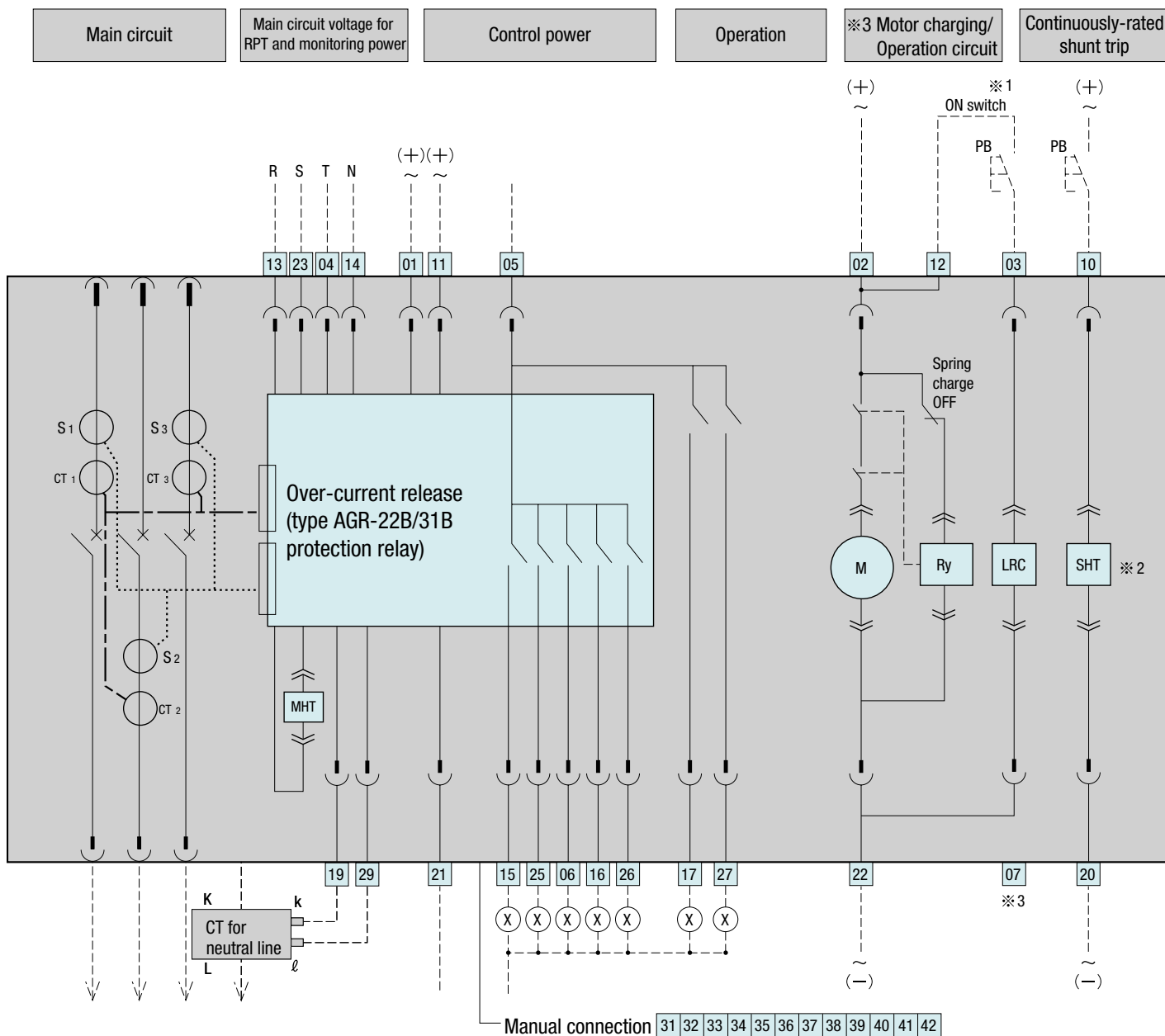
111	211	311	411
114	214	314	414
112	212	312	412

Manual connection

If the ground fault protection on the line side or communication function is incorporated, control circuit terminals are of manual connection type.

NOTE: In case of a UVT and a shunt fitted together or double opening or closing coil, use an auxiliary switch to prevent burnout. Contact Gewiss for wiring.

AGR-22B, 31B protection relay



Terminal description

Check protection relay voltage before connecting.

- 01 21 Control power supply 200-240V ac, 200-250V dc, 48V dc
- 01 11 Control power supply 100 - 120V ac
- 11 21 Control power supply 100 - 125V dc, 24V dc
- 02 22 Control power supply 100 - 240V ac, 100 - 250V dc, 24V dc, 48V dc
- 12 Operation switch, common
- 03 ON switch
- 05 Operation indication terminal, common
- 15 LT trip indication
- 25 ST/INST trip indication
- 06 PTA indication
- 16 GF trip indication
- 26 System alarm indication
- 17 REF, NS or trip indication
- 27 Spring charge indication
- 10 20 Continuously-rated shunt trip

- 19 Separate CT for neutral line (k)
- 29 Separate CT for neutral line (l)
- 08 18 28 UVT power supply
- 09 UVT power supply, common
- 35 Separate CT for REF (k)
- 36 Separate CT for REF (l)
- 41 Communication line (-)
- 42 Communication line (+)
- 32 Communication line (common)

UVT power supply (do not exceed specified voltages)

Term.No.	100V ac unit	200V ac unit	400V ac unit	450V ac unit
08 - 09	100V	200V	380V	450V
18 - 09	110V	220V	415V	480V
28 - 09	120V	240V	440V	400V

Term.No.	24V dc unit	48V dc unit	100V dc unit	110V dc unit
08 - 09	24V	48V	100V	110V

Symbols for accessories

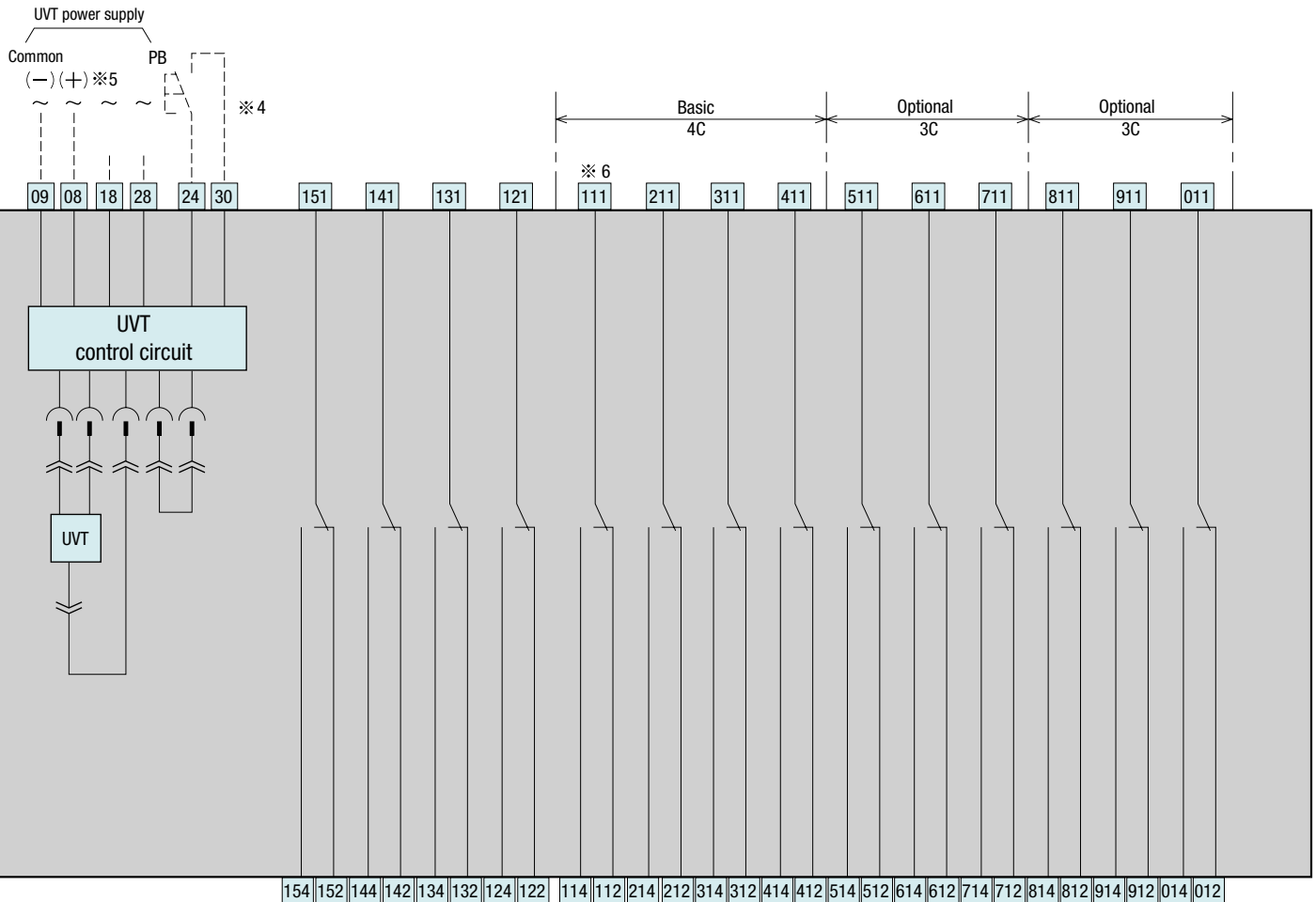
- CT1 - CT3 : Power CTs
- S1 - S3 : Current sensors
- M : Charging motor
- LRC : Latch release coil
- MHT : Magnetic hold trigger
- Isolating terminal connector (for draw-out type)
- Manual connector
- User wiring
- Relay or indicator lamp

- ※1: Do not connect "b" contact of auxiliary switch to ON switch in series, otherwise, pumping may occur.
- ※2: See page 22 for the circuit diagram of the continuously-rated shunt trip device with capacitor trip device.
- ※3: For motor split circuit, terminals (02), (22) and (03), (07) are used for charging and closing operation respectively (please, specify when ordering).
- ※4: See page 23 (activation by impulse only).
- ※5: Only one of terminals (08), (18), (28) must be used as this is a single phase UVT.
- ※6: Do not use these terminals for other circuits when both instantaneously rated shunt trip and UVT are fitted. These terminals are used as the anti-burnout SW for the instantaneously rated shunt trip.

Undervoltage trip

Position switches

Auxiliary switches



Designation of terminals for auxiliary and position switches

- * 1: Common
- * 2: b-contact
- * 4: a-contact
- 1: Auxiliary switch
- 2: Position switch (for CONNECTED)
- 3: Position switch (for TEST)
- 4: Position switch (for ISOLATED)
- 5: Position switch (for INSERT)
- 1 - 0: Switch numbers
- A, B, C: Auxiliary switches for microload

CONNECTED position: 121-124 ON
121-122 OFF

TEST position: 131-134 ON
131-132 OFF

ISOLATED position: 141-144 ON
141-142 OFF

INSERT position: 151-154 ON
151-152 OFF

Position switches

Top	151	141	131	121
Middle	154	144	134	124
Bottom	152	142	132	122

Top	131	121
Middle	134	124
Bottom	132	122

Operation/control circuits

01	02	03	04	05	06	07	08	09	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30

Auxiliary switches

(4c + optional 6c arrangement)

111	211	311	411	511	611	711	811	911	011
114	214	314	414	514	614	714	814	914	014
112	212	312	412	512	612	712	812	912	012

(4c arrangement)

111	211	311	411
114	214	314	414
112	212	312	412

Manual connection

31	32	33	34	35	36	37	38	39	40	41	42
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Manual connection

If the ground fault protection is incorporated and a separate current transformer for neutral line is used, or any one of ground fault protection on the line side, zone interlock or communication function is incorporated, control circuit terminals are of manual connection type.

NOTE: In case of a UVT and a shunt fitted together or double opening or closing coil, use an auxiliary switch to prevent burnout. Contact Gewiss for wiring.

Dielectric strength

Circuit	Withstand voltage (at 50/60 Hz) between		Rated impulse withstand voltage U _{imp}
Main circuit	Terminals, terminal group to earth	3500V for 1 minute	12kV
Control circuits	Auxiliary switches For general service	Terminal group to earth	2500V for 1 minute
	For microload	Terminal group to earth	2000V for 1 minute
	Position switches	Terminal group to earth	2000V for 1 minute
	Over-current release (OCR)	Terminal group to earth	2000V for 1 minute
	Alarm for undervoltage/2500V for 1 minute 6kV reverse power	Terminal group to earth	2500V for 1 minute
Other accessories	Terminal group to earth	2000V for 1 minute	4kV

NOTE: The values shown above are those measured on phase connections and cannot be applied to control terminals on the breaker.

Internal resistance and power consumption

Standard series

Type	MA208S	MA212S	MA216S	MA220S	MA325S	MA332S	MA440SB
Rated current (A)	800	1250	1600	2000	2500	3200	4000
Internal resistance per pole (mΩ dc)	0.033	0.033	0.028	0.024	0.014	0.014	0.017
Power consumption for 3 poles (W)	64	155	215	288	263	430	816

Haigh fault series

Type	MA212H	MA216H	MA220H	MA325H	MA332H
Rated current (A)	1250	1600	2000	2500	3200
Internal resistance per pole (mΩ dc)	0.024	0.024	0.024	0.014	0.014
Power consumption for 3 poles (W)	113	184	288	263	430

NOTE: Above figures are based on the calculation of 3I²R. For more information, please contact us.

Maximum rated current [I_n] depending on the terminal arrangement

Ambient temperature 40 °C

Based standard	IEC60947-2, EN60947-2		
Type	Terminals arrangement		
	Horizontal terminals	Vertical terminals	Front connections
MA208S	800	800	800
MA212S	1250	1250	1250
MA216S	1600	1600	1600
MA220S	2000	2000	2000
MA325S	2430	2500	2500
MA332S	2790	3200	3150
MA440SB	-	4000	-
MA212H	1250	1250	-
MA216H	1600	1600	-
MA220H	2000	2000	-
MA325H	2430	2500	-
MA332H	2790	3200	-

NOTE 1: If different type of terminal arrangement are used for line and load sides refer to the ratings for the horizontal terminals.

NOTE 2: Front connection can not be specified with the different types of terminal arrangement for line and load sides.

Derating

Standard series

Based standards	Ambient temperature (°C)	Type	MA208S	MA212S	MA216S	MA220S	MA325S	MA332S	MA440SB
		Connecting bar sizes	2x50x5t	2x80x5t	2x100x5t	3x100x5t	2x100x10t	3x100x10t	4x150x10t
IEC60947-2 EN 60947-2	40 (standard ambient temperature)		800	1250	1600	2000	2500	3200	4000
	45		800	1250	1600	2000	2500	3200	4000
	50		800	1250	1600	2000	2500	3200	3940
	55		800	1200	1540	1820	2500	2990	3820
	60		800	1150	1460	1740	2400	2850	3690

NOTE: The values are applicable for both draw-out type and fixed type.
The values for MA208S, MA212S and MA216S are for horizontal terminals on both line and load side.
For the other modes, the values are for vertical terminals on both line and load side.
Above figures are subject to the design of the enclosure and rating of busbar.

High Fault series

Based standards	Ambient temperature (°C)	Type	MA212H	MA216H	MA220H	MA325H	MA332H
		Connecting bar sizes	2x100x5t	3x100x5t	2x100x5t	3x100x10t	3x100x5t
IEC60947-2 EN 60947-2	40 (standard ambient temperature)		1250	1600	2000	2500	3200
	45		1250	1600	2000	2500	3200
	50		1250	1600	2000	2500	3200
	55		1250	1600	1820	2500	2990
	60		1250	1550	1740	2400	2850

NOTE: The values are applicable for both draw-out type and fixed type.
The values are for vertical terminals on both line and load side.
Above figures are subject to the design of the enclosure and rating of busbar.

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Company subject to the management and coordination of Polifin S.p.A.

