



## **Based Standards**

JIS C8372 Japanese Industrial Standard

(New JIS C8201-2 is also supported)

IEC60947-2 International Electrotechnical Commission

EN60947-2 European Standard AS 3947-2 Australian Standard

NEMA PUB NO.SG3 National Electrical Manufacturers Association

ANSI C37.13 American National Standard Institute

## **Certification & Authorisation**

ASTA, UK ASTA Certification Services NK, Japan Nippon Kaiji Kyokai LR, UK Lloyd's Register of Shipping

ABS, USA American Bureau of Shipping GL, Germany Germanischer Lloyd

BV, France Bureau Veritas

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# **1** Features

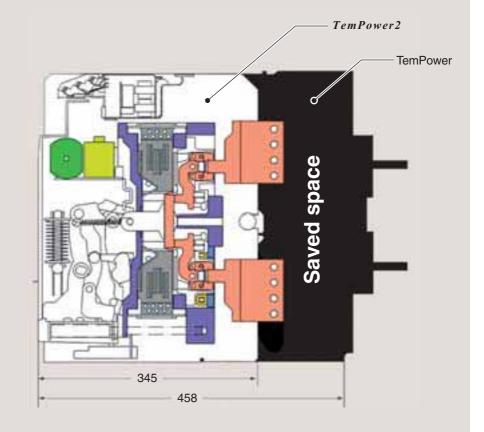
# The ultimate in compactness and operational capability



### Geared toward the smallest depth in the world

Direct connections of the isolating main contacts to the hinges of the fixed main contacts eliminate the need for intermediate conductors. Allowing the *TemPower2* ACBs having the world's smallest depth. Resulting in space saving in switchboards.

More than twenty design patents have been registered for the *TemPower2* ACB.

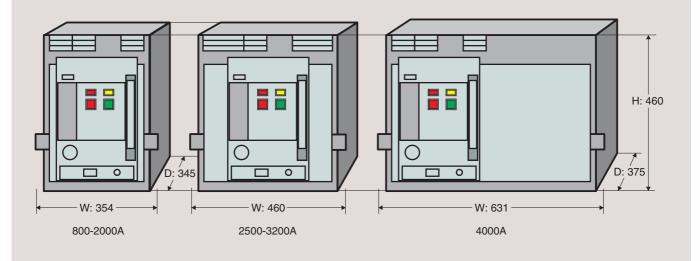


The height and depth dimensions are identical in all sizes to 3200A. There are two common widths or frame size, from 800-2000A and from 2500-3200A. The panel cutout size is the same for all types of *TemPower2*, which makes it easy to arrange the ACBs in switchboards.

Maximum power from minimum volume was central to the design specification. With a depth of 290mm for the fixed type and 345mm for draw-out, it is one of the smallest ACBs in the world.

ACBs with front connections are available off-the-shelf.

Front connections are especially suitable for smaller-depth switchboards.

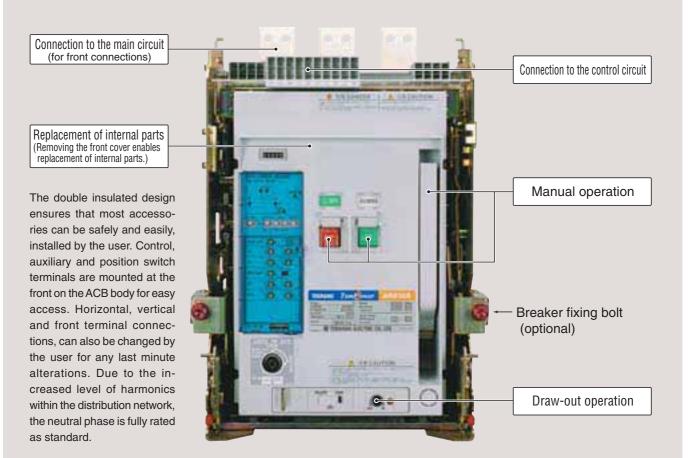






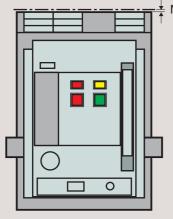
### Increased accessibility from the front

It enhances ease of installation, operation, and maintenance.





# No extra arc space required, vertical stacking permitted



No extra arc space required

All the arc energy is effectively dissipated within the "DoubleBreak" arc chamber, thus achieving the required clearance distance to earthed metal of zero. A stack-together arrangement of the ACBs will minimize the height of the switchboard.



# Replacement of the main contacts

If the main contacts are worn, they can be replaced as a unit; a long service life of the ACB is ensured.





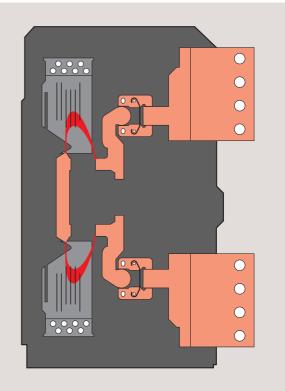
# A high performance and reliability



# Very fast interruption by "DoubleBreak" system

The unique "DoubleBreak" system ensures fast interruption of short circuit currents. The maximum clearing time is 30msec, less than half that of conventional ACBs. Sharing the arc energy also substantially reduces main contact wear.

The "DoubleBreak" system also improves safety in case of reverse connection.

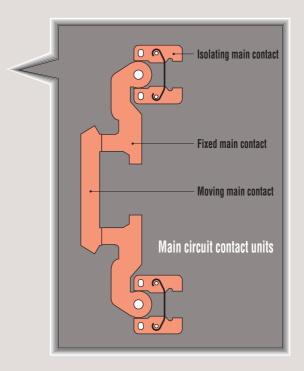




# No clamp screws used for the main circuit contact units

There are no clamp screws or flexible leads in the main circuit contact units.

This substantially enhances the durability of the main circuit contact units and improves the reliability in ON-OFF operation.





### Contactless closing/tripping operation circuitry using the AGR2.

When the AGR2 OCR is used, the closing/tripping operation circuits of the *TemPower2* series are contactless and free of the possibility of poor conduction or contact, thereby remarkably increasing the reliability in operation.





### **Enhanced selectivity**

- L Long time delay
- S Short time delay
- I Instantaneous

At Terasaki we are so concerned about selectivity that all our protection relays have 'LSI' characteristics as standard.

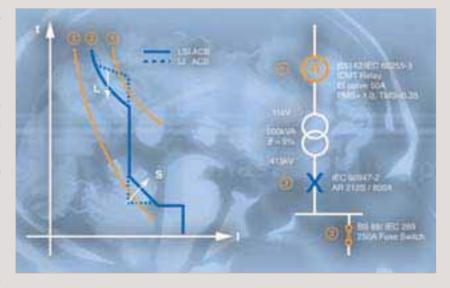
This provides an adjustable time delay on overload (L) and also the I<sup>2</sup>t ramp characteristic (S).

As shown, these are essential to provide selectivity when grading with other protective devices such as downstream fuses and upstream relays.

The standard 'LSI' curve provides

more than five million combinations of unique time current characteristics.

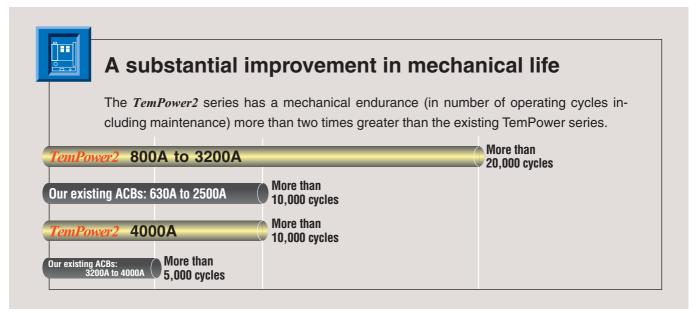
Zone selective interlocking is available to provide zero time delay selectivity.



The rated breaking capacity, the rated short-time withstand current, and the rated latching current are identical.

As the breaking capacity is not lowered even if the ACB is furnished with the short time-delay trip function only, full selectivity is achieved.

Performance	Type and rated current	AR208S AR212S AR216S AR220S	800A 1250A 1600A 2000A	AR325S AR332S	2500A 3200A	AR440S	4000A
Rated breaking current (at AC440V)	65k	¢Α	85kA		100kA		
Rated short-time (for 1 sec.)			001		100		
Rated latching c	urrent						





# **TemPower2** provides positive protection for electric power systems.



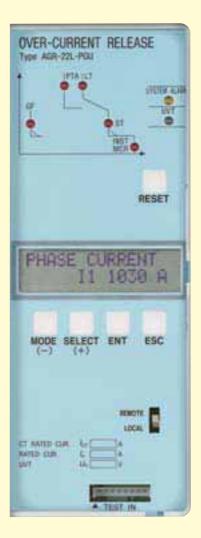
The *TemPower2* series is equipped with an RMS sensing over-current release (OCR) having a wide range of protection functions and capabilities.



Standard OCR with adjustment dial Type AGR-11.



Enhanced OCR with adjustment dial Type AGR-21.



Enhanced OCR with L.C.D. display Type AGR-22.



### **Overload protection**

Adjustable from 40–100% of rated current incorporating true r.m.s. detection. Microprocessor controlled devices eliminate "nuisance" tripping by responding to the true r.m.s. value of the waveform. Neutral protection for all those Triple-N harmonics, such as 3rd, 9th and 15th. Also in case we forgot to mention, a "thermal memory" as standard!



## Reverse power trip function

(S-characteristic) ※1

#### (The first-ever feature for ACBs)

The OCR for generator protection has a reverse power trip function, negating the need for installation and wiring work for external reverse power relays.

This provides protection when parallelling generators.



For general feeder circuits (L-characteristic)

For general feeder circuits (R-characteristic)

For generator protection (S-characteristic)



# Two channel pre-trip alarm function (S-characteristic) \*1

This function can be used to adjust feeding to loads according to how essential they are. For example, you can set the function so that, when it generates a pre-trip alarm, an emergency generator starts to ensure constant feeding to essential loads.



# N-phase protection function (optional)

In a 3-phase, 4-wire system with some harmonic distortion, the 3rd harmonic may cause a large current to flow through the neutral conductor. The N-phase protection function prevents the neutral conductor from sustaining damage or burnout due to a large N-phase 3rd harmonic current.



### **Ground fault protection**

Restricted and unrestricted ground fault protection is available on the same relay as a special specification. There is no need to use a separate relay with *TemPower2*, thus saving panel space and cost. Furthermore, fewer CT's and busbar connections are required which reduces heat and power consumption.



# Earth leakage trip function (L/R-characteristic) \*\*1

In conjunction with an external Zero phase Current Transformer (ZCT), this function provides protection against earth leakage. Trip or alarm indication is available to enhance system protection.



# Adjustable undervoltage trip function \*1

With adjustable voltage pick up and an adjustable time delay. This provides fine tuning of all the voltage requirements. Phase failure protection is also available.



# Data measuring and output function (optional) \*1

In some cases it may not be cost effective to upgrade to a digital network so the traditional analogue 4mA – 20mA signal is supported.

This function measures phase currents, line voltages (or phase voltages), electric power, and electric energy.



# Monitoring various data on L.C.D. display

Type AGR-22 OCR can monitor phase currents, line voltages (or phase voltages), electric power, electric energy, power factor, frequency, etc. on the L.C.D. display. See page 25 for details



### **Communication function**

(optional) %1

This function supports the LonTalk protocol and enables transmission of various data via LonWorks® networks.

#### **Energy Measurement**

I, V, kW, MWh, kvar, cosø, frequency

#### **Intelligent Fault Analysis**

Status, fault type, fault size, tripping time, fault history

#### **Maintenance Information**

Trip circuit supervision, protection relay supervision, contact wear indication, contact temperature measurement.

The communication system uses LONWORKS® network of Echelon Corporation, however other protocols can be supported. %2



# Contact temperature monitoring function (optional) \*1

This function monitors the temperature of the ACB main contacts, and gives an alarm when the temperature exceeds 155°C. Continuous monitoring of the contact temperature provides valuable input for preventative and predictive maintenance programs.

%1: Not available for standard OCRs, type AGR-11.

※2: LonWorks® is registered trademarks of Echelon Corporation

# **1** Features



# Optimum protective coordination

Why use a separate panel mounted protection relay when you can have all the benefits of I.D.M.T. protection integral to the ACB?

*TemPower2* is available with a choice of flexible protection curves to assist in selectivity applications.

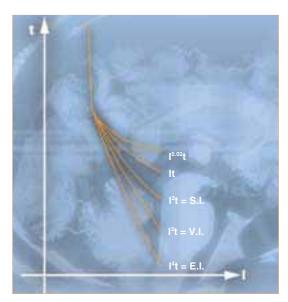
- S.I. Standard Inverse
- V.I. Very Inverse
- E.I. Extremely Inverse

All these curves are user definable and comply with IEC 60255-3. Standard transformer and generator protection characteristics are also available.

AGR-L Industrial & transformer protection

AGR-S Generator protection

AGR-R Characteristics to IEC 60255-3



Inverse Definite Minimum Time (I.D.M.T.)





# Operation panel available for centralized indication and control

The *TemPower2* operation panel provides a lower cost alternative to the P.C. based system.

Incorporating a dual LED display, the information gathered by the AGR2 intelligent protection relay can be displayed.

The operation panel can also provide the option of remote closing and opening ACB operation.

Up to eight *TemPower2* ACBs can be connected to one operation panel.

(See page 36 for details).





# Meeting customer requirements

TemPower2 provides solutions to satisfy customer needs.

### SWITCHBOARD BUILDER

- Compact size for high packing density
- No extra arc space required for clearance
- · Low temperature dissipation
- Built in trip supervision circuit
- · Fully rated neutral as standard
- Terminal connections and accessories are field changeable
- Uniform panel cut out size



#### **CONSULTANT**

- Time Current Characteristics to IEC 60255-3
- Standard, Very and Extremely Inverse curves available
- Restricted and Unrestricted ground fault protection in one relay
- · LSI characteristic curves as standard
- True r.m.s. protection
- Sophisticated undervoltage/phase failure protection
- Integral reverse power protection and load shedding relay



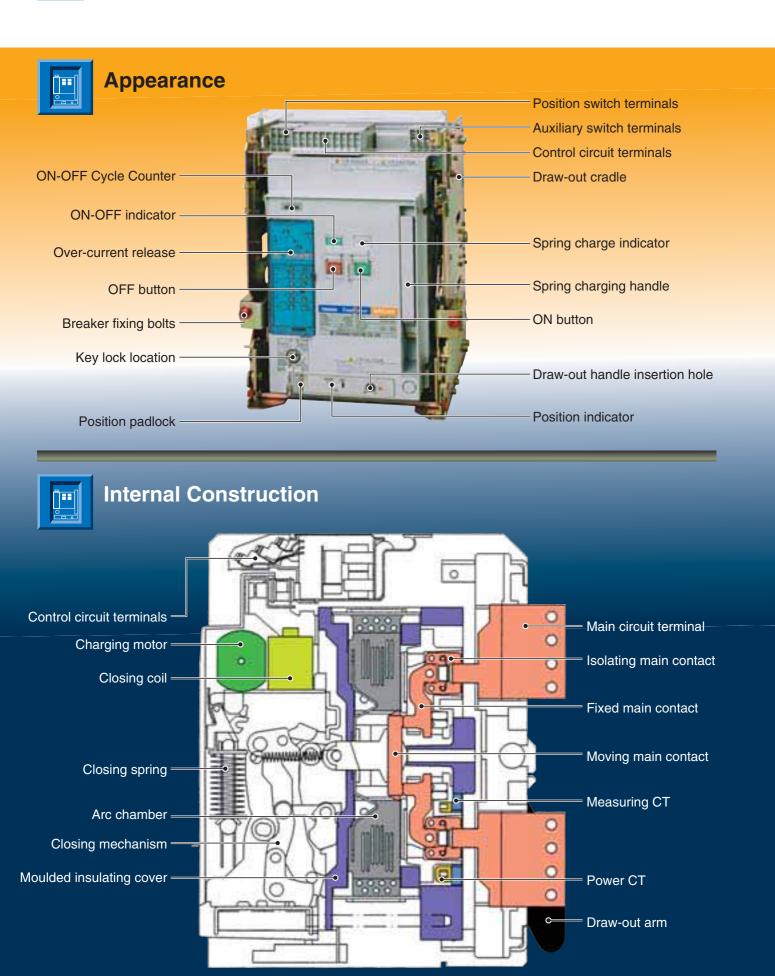
#### **END USER**

- · Self checking protection relay and tripping coil
- Built in relay tester can check on line without tripping ACB
- Percentage contact wear indicator
- · Contact temperature monitoring
- Fault diagnosis type of fault, magnitude, tripping time & trip history
- · High making capacity for operator safety
- · Communication via B.M.S. or S.C.A.D.A. system
- Main contacts can be changed within around 15 minutes per pole





# 2 Appearance and Internal Construction







### **Standard Range**

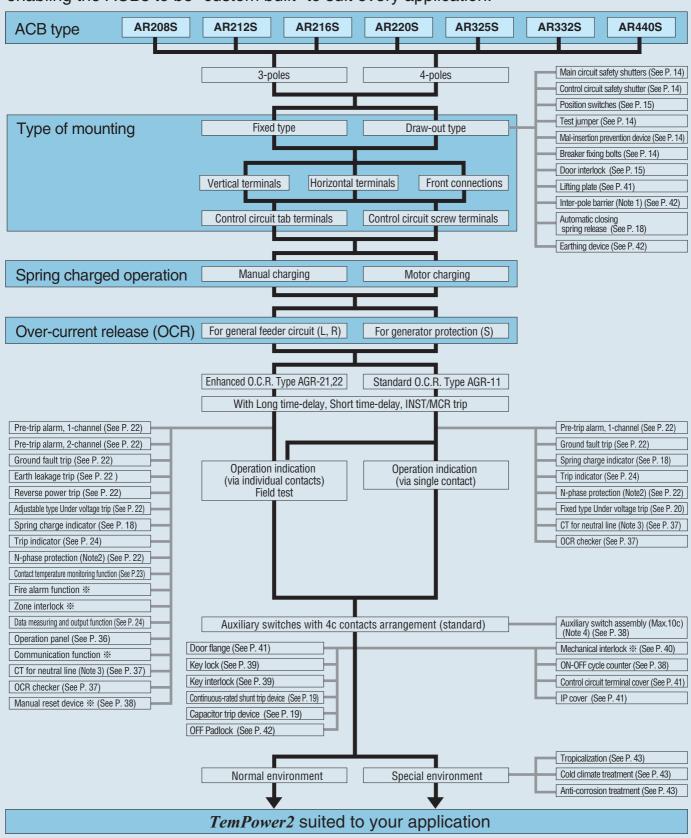
AMPERE RATING(A)			800		1250		1600		2000		2500		3200		4000	
TYPE			AR208	S	AR212S		AR216	S	AR220	S	AR325	iS	AR332	2S	AR440	)S
RATED CURRENT (max) [4](A)	IEC,	EN, AS	800		1250		1600		2000	•	2500		3200		4000	
1 2	JIS		800		1250		1600		2000		2500		3200		3700	
	NEM	IA, ANSI	800		1250		1540		2000		2500		3200		3700	
	Mari	ne	800		1250		1600		2000		2500		3200		4000	
NEUTRAL POLE AMPERES FRAME	(A)		800		1250		1600		2000		2500		3200		4000	
NUMBER OF POLES		3 4	3	4	3	4	3	4	3	4	3	4	3	4	3	4
RATED PRIMARY CURRENT OF OVE	ER-CU	RRENT	200		400		400		400		2500		3200		4000	
RELEASE [/ <sub>CT</sub> ](A)			400		800		800		800							
for general feeder circuit use			800		1250		1250		1250							
							1600		1600							
									2000							
RATED CURRENT OF OVER-CURRI	ENT RI	ELEASE(A)	100≦/ <sub>n</sub>	≦200	200≦/ <sub>n</sub> ≦	400	200≦/ <sub>n</sub> :	<u>≤</u> 400	200≦/ <sub>n</sub>	<b>≦</b> 400	1250≦/	′n≦2500	1600≦/	′n≦3200	2000≦	<u>/n≦4000</u>
<ul> <li>for generator protection use</li> </ul>			200 <td>≦400</td> <td>400&lt; /<sub>n</sub>≤</td> <td></td> <td>400 &lt; /<sub>n</sub></td> <td>≦800</td> <td>400<td>≦800</td><td></td><td></td><td></td><td></td><td></td><td></td></td>	≦400	400< / <sub>n</sub> ≤		400 < / <sub>n</sub>	≦800	400 <td>≦800</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	≦800						
$[/_n]$ is generator rated current.			400 < / <sub>n</sub>	≦800	630< / <sub>n</sub> ≤	1250	630 < / <sub>n</sub>	≦1250	630 <td>≦1250</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	≦1250						
					•		800 <td>≦1600</td> <td>800<td></td><td></td><td></td><td></td><td></td><td></td><td></td></td>	≦1600	800 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							
									1000 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							
AC RATED INSULATION VOLTAGE [	/¡(V. 50	/60Hz) ⑤	1000		1000		1000		1000		1000		1000		1000	
RATED OPERATIONAL VOLTAGE [ $U_{\epsilon}$	](V. 50	/60Hz) ⑥	690		690		690		690		690		690		690	
AC RATED BREAKING CAP [kA sym rms]/M.	AKING (	CAP [kA peak]														
IEC,EN,AS	AC	690V ⑦	50/105		50/105		50/105		50/105		65/143	}	65/143	3	75/165	5
$[\prime_{cs} = \prime_{cu}]$		440V	65/143	8	65/143 (8	3)	65/143	8	65/143	8	85/187	8	85/187	7 (8)	100/22	20
NEMA	AC	600V	42/96.6	3	42/96.6		42/96.6	6	42/96.6	3	50/115	;	50/115	5	65/149	9.5
ANSI		480V	50/115		50/115		50/115		50/115		65/149	).5	65/149	9.5	75/172	2.5
		240V	65/149	.5	65/149.5	;	65/149	.5	65/149	.5	85/195	5.5	85/195	5.5	100/23	30
JIS	AC	550V	50/105		50/105		50/105		50/105		65/143	3	65/143	3	75/165	5
		460V	65/143		65/143		65/143		65/143		85/195	.5	85/195	5.5	100/23	30
		220V	65/143		65/143		65/143		65/143		85/195	5.5	85/195	5.5	100/23	30
9	DC	600V 10	40/40		40/40		40/40		40/40		40/40		40/40		40/40	
		250V	40/40		40/40		40/40		40/40		40/40		40/40		40/40	
NK ①	AC	690V	50/115		50/115		50/115		50/115		65/153	3	65/153	3	11)	
		450V	65/153	8	65/153 (	3)	65/153	8	65/153	8	85/201	8	85/201	8	11)	
LR, AB, ①	AC	690V	50/115		50/115		50/115		50/115		65/153	3	65/153	3	11)	
GL, BV		450V	65/153	8	65/153 (	3)	65/153	8	65/153	8	85/201	8	85/201	8	11)	
RATED IMPULSE WITHSTAND VOLTA	AGE[		12		12		12		12		12		12		12	
RATED SHORT TIME WITHSTAND		<u>1s</u>	65		65		65		65		85		85		100	
CURRENT[/ <sub>cw</sub> ][kA rms]		3s	50		50		50		50		65		65		75	
LATCHING CURRENT (kA)			65		65		65		65		85		85		100	
TOTAL BREAKING TIME (s)			0.03		0.03		0.03		0.03		0.03		0.03		0.03	
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		80.0		0.08		0.08		0.08	
WEIGHT (kg) draw-out type			73	86	73	86	76	90	79	94	105	125	105	125	139	176
OUTLINE DIMENSION (mm)																
FIXED TYPE	a		360	445		445	360	445	360	445	466	586	466	586		
b	b		460		460		460		460		460		460			
	C		290		290		290		290		290		290			
a   c  d	d		75		75		75		75		75		75			T
DRAW-OUT	<u>a</u>		354	439		439	354	439	354	439	460	580	460	580	631	801
TYPE (3)	b		460		460		460		460		460		460		460	
	C .		345		345		345		345		345		345		375	
<u>a</u>    <u>c</u>  d	d		40		40		40		40		40		40		53	

- ① : Values in open air at 40°C (45°C for marine applications).
- 2 : Values of AR208S  $\sim$  216S for draw-out type with horizontal terminals, Values of AR220S  $\sim$  440S for draw-out type with vertical terminals.
- ③: For 2poles use both opposite ends poles of 3poles ACBs.
- ④ : 4poles ACBs without Neutral phase protection can not be applied to IT earthing systems.
- ⑤ : Rated insulation voltage depends on applied standard: 1000V AC according to IEC 60947-2 and JIS C8201-2.
- ①: Cannot apply IT earthing system, ie, insulated from earth.
- ® : For 500V AC.
- 9: Please contact TERASAKI for DC application.

- 10: 3poles in series should be applied for 600V DC.
- $\ensuremath{\textcircled{\scriptsize{1}}}\xspace$  : Contact TERASAKI for details.
- 12: Applicable to only 3poles ACBs.
- (3): For vertical terminals or horizontal terminals.

# 4 Specifications

*TemPower2* series ACBs have an extensive range of accessories available, enabling the ACBs to be "custom built" to suit every application.



Note 1: Not applicable to ACBs equipped with front connections or reverse power trip device.

Note 2: Applicable to 4-pole ACBs.

- Note 3: Required for ground fault protection for 3-poles ACB on 3-phase, 4-wire systems.
- Note 4: Microload switch assembly with 3c arrangement available.
  - \*: Contact Terasaki for details.

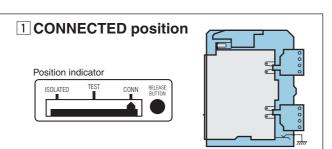


### Types of Mounting

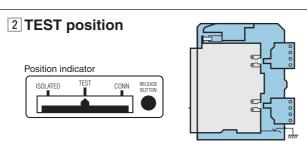
#### **Draw-out type**

This type of ACB 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.

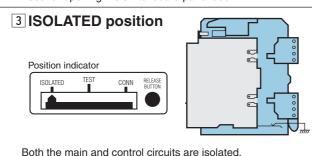
There are four breaker body positions: CONNECTED, TEST, ISOLATED, and WITHDRAWN. The switchboard panel door can be kept closed in the CONNECTED, TEST, and ISOLATED positions ("shut-in three positions").



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

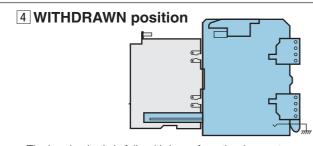


The main circuit is isolated and the control circuits are connected. This position permits operation tests without the need for opening the switchboard panel door.



Both the main and control circuits are isolated.

The switchboard panel door does not need to be opened.



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

#### **Fixed type**

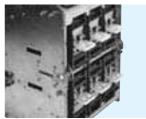
This type of ACB has no draw-out cradle and is designed to be directly mounted in the switchboard.

#### **Connection methods**

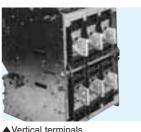
#### ■ Main circuit terminals

Three(3) 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. Unless otherwise specified by the user, horizontal terminals are given to types AR208S, AR212S and AR216S ACBs on both the line and load sides, and vertical terminals to AR220S, AR235S, AR332S and AR 440S.

For AR440S, only vertical terminals available.



▲Horizontal terminals



▲Front connections



#### **■**Control circuit terminals

Control circuit terminals are front located to allow easy wiring/

- The terminal blocks (for auxiliary switches, position switches, and control circuits) are positioned on the top of the ACB front panel and can be accessed from the front for wiring.
- 0.5 mm-thick tab terminals (#187) are used. Receptacle terminals fully insulated with #187 insulation sleeve are required.
   M4 screw terminals are also available on request.



▲Tab terminals (standard)



▲Screw terminals (optional)

### Accessories for Draw-out Type

X: Standard equipment

#### Main circuit safety shutters

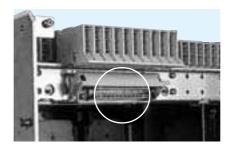
The main circuit safety shutters automatically conceal the main circuit contacts on the draw-out cradle when the ACB is drawn out.

- The top and bottom shutters operate independently and can be separately padlocked in the closed position.
- Up to three padlocks (with ø6 hasp) can be installed on each side using padlocking unit. (Padlock not supplied)
- In the closed position, the shutters are locked to the extent that they cannot be easily unlocked by hand. They can be unlocked and held open if required for the purpose of inspection or maintenance.



#### **Control circuit safety shutter**

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



#### Test jumper

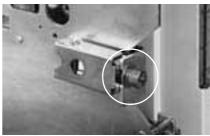
The test jumper is a plug-in type, and allows ON-OFF tests on all the *TemPower2* series ACBs with the breaker body drawn out from the draw-out cradle.

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 ACB is subject to strong vibration.



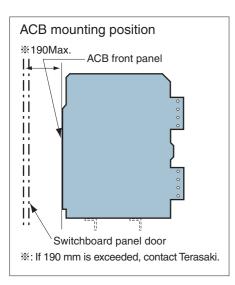
#### Position padlock lever \*

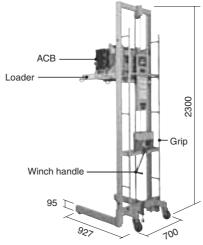
Using the position padlock lever prevents the breaker body from inadvertently being drawn out. The position padlock lever in the pulled-out position locks the breaker body in the CONNECTED, TEST, or ISOLATED position. Up to three padlocks (with ø6 hasp) can be installed.



#### Lifter

A special lifter is available to allow easy and safe transportation or installation of the ACB. A drop prevention mechanism is standard.





Weight: 110 kg
Contact Terasaki for products with CE marking.

#### Mal-insertion prevention device

Interchangeability exists within the *TemPower2* series of ACBs. Because of this feature, there is a possibility for an ACB of a different specification being placed into the draw-out cradle. Using the mal-insertion prevention device eliminates such a possibility.

This device is capable of distinguishing nine different breaker bodies.





#### **Position switches**

The position switches operate to give indication of breaker positions: CONNECTED, TEST, ISOLATED, and INSERT.

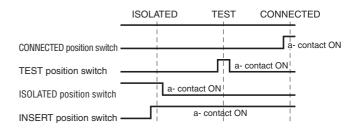
There are two contact arrangements: 2c and 4c.

Connections to the switches are made via tab terminals. Screw terminal type is available as an option.

The following table lists the available types of the switches.

Type	Number of	Со	ntact arr	angen	nent
туре	contacts	INSERT	ISOLATED	TEST	CONN
ALR-0110P		0	1	1	0
ALR-0101P		0	1	0	1
ALR-0011P	0.0	0	0	1	1
ALR-0200P	2 c	0	2	0	0
ALR-0020P		0	0	2	0
ALR-0002P		0	0	0	2
ALR-1111P		1	1	1	1
ALR-1210P		1	2	1	0
ALR-1201P	_	1	2	0	1
ALR-0211P		0	2	1	1
ALR-1120P		1	1	2	0
ALR-1021P		1	0	2	1
ALR-0121P		0	1	2	1
ALR-1102P	_	1	1	0	2
ALR-1012P		1	0	1	2
ALR-0112P	_	0	1	1	2
ALR-0220P	4 c	0	2	2	0
ALR-0202P		0	2	0	2
ALR-0022P	_	0	0	2	2
ALR-1030P		1	0	3	0
ALR-0130P	_	0	1	3	0
ALR-0031P	-	0	0	3	1
ALR-1003P	_	1	0	0	3
ALR-0103P		0	1	0	3
ALR-0013P	_	0	0	1	3
ALR-0040P	=	0	0	4	0
ALR-0004P	-	0	0	0	4

#### Position switch operation sequence



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

#### Position switch ratings

Voltage	Resistive load (A)	Inductive load (A) (COS Ø = 0.6, L/R = 0.07)
AC 100-250V	11	6
DC 250V	0.3	0.3
DC 125V	0.6	0.6
DC 30V	6	5
DC 8V	10	6

#### **Door interlock**

The door interlock prevents the switchboard door from being opened unless the breaker body is in the ISOLATED position.

When the draw-out handle \*\* is removed while the ACB is in the ISOLATED position, the interlock is released and the switchboard door can be opened.

The breaker body cannot be inserted unless the switchboard door is closed.

Contact Terasaki for details.

When a Door interlock is specified, a storage draw-out handle is supplied.



### 3 Spring Charged Operation

#### Manual charging type

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

#### ■Charging the closing springs

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

#### ■Closing the ACB

Pressing the ON button on the ACB closes the ACB.

#### ■Opening the ACB

Pressing the OFF button on the ACB opens the ACB.

The ACB cannot be closed as long as the OFF button is pressed.

#### Motor charging type

For this type of ACB, the closing springs are charged by means of a motor. ON/OFF operation of the ACB can be performed remotely.

The control circuits provide optimum control to the spring charging and ACB ON/OFF operation.

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 ACB, they are automatically charged again by the motor for the next ON operation.

#### ■Closing the ACB

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

· Anti-pumping mechanism

Even if the ON switch is kept on, ACB closing operation is performed only once.

To close the ACB again, turn off the ON switch to charge the closing springs and then turn on the ON switch.

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

#### ■Opening the ACB

(1) With AGR-11 OCR or without OCR.

For opening the ACB remotely, specify the shunt trip device (See P. 19) or the undervoltage trip (See P. 20).

(2) With AGR-21 or AGR-22 OCR.

Turning on an external OFF switch excites the tripping coil TC, thus enabling the ACB to be remotely opened.

The tripping coil TC is equipped as standard.



#### ■Operation power supply

#### (1) With AGR-11 OCR or without OCR.

Rated voltage	Applicable volt	age range (V)	Opera	ation power supply ra	atings
(V)	CHARGE/	OFF operation	Motor inrush	Motor steady-state	Closing command
(*)	ON operation	(Note1)	current (peak) (A)	current (A)	current (peak) (A)
AC 100	85-110		6	0.8	0.48
AC 110	94-121		6	8.0	0.39
AC 120	102-132		6	0.8	0.37
AC 200	170-220		8	0.7	0.24
AC 220	187-242		8	0.7	0.19
AC 240	204-264		8	0.7	0.18
DC 24	20-26		12	3.5	1.65
DC 48	41-53		9	1.4	0.86
DC 100	85-110		5	0.7	0.39
DC 110	94-121		5	0.7	0.37
DC 125	106-138		5	0.7	0.31
DC 200	170-220		6	0.5	0.19
DC 220	187-242		6	0.5	0.18

Note 1: For the ratings refer to the shunt trip device of page 19.

#### (2) With AGR-21 or AGR-22 OCR

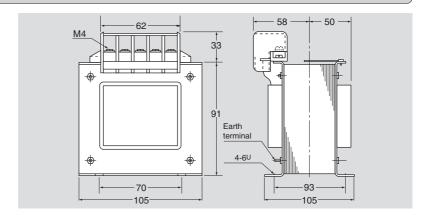
Rated voltage	Applicable voltage	range (V) (Note 2)	Operation power supply ratings				
(V)	CHARGE/ ON operation	OFF operation	Motor inrush current (peak) (A)	Motor steady-state current (A)	Closing command current (peak) (A)		
AC 100-120	85-132	70-132	6	0.8	3.0		
AC 200-240	170-264	140-264	8	0.7	3.5		
DC 24	18-26	17-26	12	3.5	7		
DC 48	36-53	34-53	15	3	9		
DC 100-125	75-138	70-138	5	0.7	2.5		
DC 200-250	150-275	140-275	6	0.5	3		

Note 2: To charge the closing spring, to close the ACB or to open the ACB, two separate power supply (the control power supply and the operation power supply) are required.

#### **Step-down transformer (external)**

The maximum rated control voltage applicable to the operation power supply is AC240V. If far higher voltages, a step-down transformer is needed. The following step-down transformers are available as options.

Rated control	Transformer						
voltage	Туре	Capacity	Voltage ratio				
AC410-470V	TSE-30M	300VA	450/220V				
AC350-395V	TSE-30M	300VA	380/220V				





## 4 Accessories for Spring Charged Operation

#### **Automatic closing spring release**

This device allows the charged closing springs to be automatically released when the ACB is drawn out from the ISOLATED position to the REMOVED position.

ANSI or NEMA-compliant ACBs require this option.

#### **Spring charge indicator**

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

#### (1) With AGR-11 OCR or without OCR

Voltage		Switch contact ratings (A)				
(V)		Resistive load	Inductive load			
AC	250	6	3			
	250	0.1	0.1			
DC	125	0.5	0.5			
	30	3	2			

#### (2) With AGR-21 or AGR-22 OCR

Volt	tage	Switch contact ratings (A)				
(V)		Resistive load	Inductive load			
AC	250	0.5	0.2			
	250	0.27	0.04			
DC	125	0.5	0.2			
	30	2	0.7			



### 5 Trip Devices

#### Continuously-rated shunt trip device

The continuous-rated shunt trip device allows the ACB 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 ACB.

When an AGR-11 OCR is fitted or no OCR is fitted continuously rated shunt trip and fixed type undervoltage trip can not be fitted to the same ACB.

Shunt Trip Rating (Continuously rated type)

Туре	Rated voltage (V)	Operational voltage (V)	Peak excitation current (A)	Steady-state current (A)	Opening time (max.) (ms)
	AC100	AC70-110	0.48	0.32	
	AC110	AC77-121	0.39	0.26	
	AC120	AC84-132	0.37	0.24	
	AC200	AC140-220	0.24	0.16	
	AC220	AC154-242	0.19	0.13	
	AC240	AC168-264	0.18	0.12	
AVR-1C	DC24	DC16.8-26.4	1.65	1.1	40
	DC48	DC33.6-52.8	0.86	0.57	
	DC100	DC70-110	0.39	0.26	
	DC110	DC77-121	0.37	0.25	
	DC125	DC87.5-137.5	0.31	0.21	
	DC200	DC140-220	0.19	0.13	
	DC220	DC154-242	0.18	0.12	

#### **Capacitor trip device**

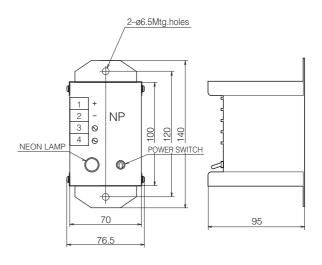
In conjunction with the continuously-rated shunt trip device, the capacitor trip device can be used to trip the ACB within a limited period of 30 sec if large voltage drop occurs due to an ac power failure or short-circuit.

When the continuously-rated shunt trip device is used with capacitor trip device, "a" contact of auxiliary switch of ACB should be inserted in series. Otherwise, the internal resistor may be damaged.

AQR-1
AC100-120V
Rated Voltage X 70 to 110%
50/60Hz
DC48V
100VA

### PB (OPEN) or Control Circuit OCRy\_etc. 1 2 3 $\odot$ $\odot$ SHT В 4 AVR-IC POWER SUPPLY AC100V~120V CAPACITOR TRIP 20 \*1 Auxiliary Switch

#### • Outline Dimensions



\*1: Use Auxiliary Switch for capacitor trip

---- User Wiring

# 4 Specifications

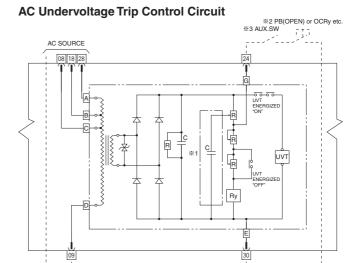
#### Fixed type Undervoltage Trip (UVT) (With AGR-11 or Without OCR)

The undervoltage trip (UVT) automatically trips the ACB when the control power voltage drops below a pre-determined value. When the control voltage is restored to a value equal to or greater than the pick-up value, the ACB can be closed.

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

Two types of UVT are available. AUR-1BS (instantaneous trip type) and AUR-1BD (500ms time delay type).

Remote opening of the circuit breaker by the UVT is possible by connection of a normally open push button across terminals 24 and 30.



- **%1** For AUR-1BD only
- %2 For tripping command apply minimum 50ms
- \*3 "a" contact of auxiliary switch of ACB to be used.

#### Rating

Type of UVT	Rated	l Control	Opening	Pick-up	Coil Excitation	ion Power Consumption (VA)		
Control Device	Voltag	ge (V), 50/60Hz	Voltage (V)	Voltage (V)	Current (A)	Normal	Reset	
AUR-1BS	AC	100	35 – 70	85				
AUR-1BD		110	38.5 – 77	93.5				
		120	42 – 84	102	0.3	30 5		
		200	70 – 140	170				
		220	77 – 154	187			50	
		240	84 – 168	204				
		380	133 – 266	323				
		415	145 – 290	352				
		440	154 – 308	374				



## **Over-current Releases (OCRs)**

The AGR series of over-current releases (OCRs) featuring high reliability and multiple protection capabilities is available for TemPower2. Controlled by an internal 8-bit microprocessor, the OCR provides reliable protection against overcurrent.

The OCR 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-11: Standard OCR with adjusiment dial Type AGR-21: Enhanced OCR with adjustment dial Type AGR-22: Enhanced OCR with L.C.D. display

Optional protection functions of the OCR include those against ground fault, earth leakage, undervoltage and reverse power.

Pre-trip alarm function can also be installed.

#### **Protective functions**

1) Adjustable long time-delay trip function LT

RMS sensing is used to accurately read through distorted waveforms.

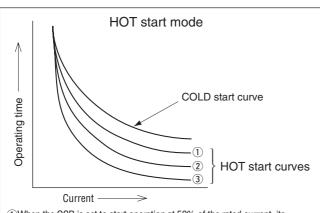
In addition to the standard L and S-characteristics, the R-characteristic is available in five types for long time-delay trip.

The R-characteristic can be used to give selectivity with e.g., fuses. (See P. 8).

■HOT start mode (applicable to L-characteristic)

HOT or COLD start mode is user-selectable.

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



- ①When the OCR is set to start operation at 50% of the rated current, its operating time in HOT start mode is approx. 80% of that in COLD start mode.
- (2) When the OCR is set to start operation at 75% of the rated current, its operating time in HOT start mode is approx. 60% of that in COLD start mode.
- ③When the OCR is set to start operation at 100% of the rated current, its operating time in HOT start mode is approx. 20% of that in COLD start mode.

②Adjustable short time-delay trip function ST

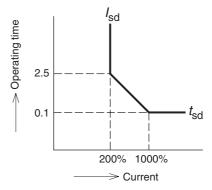
The ST delay trip function has a "definite time delay characteristic" and a "ramp characteristic". These characteristics are switch-selectable.

The ramp characteristic provides close selectivity with downstream circuit breakers or fuses.

The group AGR-21L and AGR-21R OCRs come in operation with the definite time characteristic when the load current reaches 1000% or more of the rated current [/n] (500% or more of the rated current  $[\frac{1}{n}]$  for AGR-21S).

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

> Ramp characteristic curve ("L" or "R" characteristic)



3 Adjustable instantaneous trip function INST/MCR

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

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

The INST and MCR are switch-selectable.

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.

#### ⑤Ground 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 [ $I_{CT}$ ].

#### <Ramp characteristic is added>

The ramp and definite time characteristics are switch selectable. The GF trip function comes in operation with the definite time characteristic when the load current reaches 100% or more of the CT rated primary current  $[\mbox{$\ell_{\rm CT}$}]$ .

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

When using a 3-pole ACB in a 3-phase, 4-wire system, be sure to use an optional CT for neutral line (see P. 37).

Note 1: The GF trip function comes usually with operation indications (LED and contact output). 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 is available on the same relay as a special specification.

Contact TERASAKI for details.

#### ⑥ Earth leakage trip function ELT (For AGR-21 and AGR-22 only.)

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

The ELT pickup current can be set at 0.2, 0.3, 0.5 and 1A (Medium sensitivity) or 3 and 5A (Low sensitivity).

This function needs the control power.

Note 1: For details on specifications of the external ZCT, contact Terasaki.

Note 2: The ELT function comes usually with operation indications (LED and contact output). If you need nothing but earth leakage indications without earth leakage tripping operation, specify at the time of ordering.

Note 3: The ELT function is available up to 3200A rated current  $[ / _n ]$ 

Reverse power trip function RPT (For AGR-21 and AGR-22 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 applicable rated voltages are AC100 - 120V, AC200 - 240V, and AC380 - 460V.

The RPT function comes usually with operation indications (LED and contact output).

Note 1: CT for RPT is not provided in the case of AR440S.

#### 8N-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 OCR rated primary current for L and R-characteristics.

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 contact output). The NP trip pickup current setting is shared by the LT trip function.

Note 2: The HOT start mode is available. The operating time for the NP trip function is linked to that for the LT trip function.

The applicable rated voltages are AC100 - 120V, AC200 - 240V, and AC380 - 460V.

The UVT function trips the ACB when the UVT control voltage drops to a value equal to 65% of the rated value.

The operating time can be set in ten levels: "instantaneous" thru 1 sec.

The ACB can be closed 2 sec. after the UVT control voltage has returned to the pick-up voltage.

Phase failure protection is available by connecting R,S and T-phase.

Note 1: The UVT control power is shared by the reverse power trip function (if fitted).

Note 2: The UVT function comes usually with operation indications (LED and contact output).

Note 3: The UVT function trips the ACB when any phase is lost



in case 3 phases are detected.

Note 4: For the fixed type undervoltage trip device for AGR-11 or no OCR, See page 20.

①Contact temperature monitoring function (HEAT) (For AGR-21 and AGR-22 only.)

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

It monitors the temperature of the ACB main contacts, and gives an alarm via an LED indicator and an output signal via the alarm contact (1a-contact) when the temperature exceeds  $155^{\circ}$ C.

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

If you want to set the threshold temperature to a lower value, contact Terasaki.

This function needs the control power.

Note 1: For OCR type AGR-22, "alarm" or "trip" can be selected.

#### NON setting and fail-safe feature

#### 1 NON setting

Setting a trip pickup current setting dial to the NON position allows you to render the corresponding protection function inoperative.

Dials having the NON position include LT, ST, INST/MCR, and GF.

Appropriate NON setting will be a useful means for optimum selectivity.

#### <sup>2</sup> Fail-safe feature

The OCR has a fail-safe mechanism in case setting dials are improperly set to the NON position.

- If the ST and INST trip pickup current setting dials are both set to NON, the fail-safe mechanism will activate the INST trip function to trip the ACB when a fault current equal to or more than 16 times the rated current [/n] flows through the ACB.
- If the ST and MCR trip pickup current setting dials are both set to NON, the fail safe mechanism will activate the ST delay trip function to trip the ACB when a fault current equal to or more than 10 times (5 times for generator protection) the rated current [/<sub>n</sub>] flows through the ACB.

#### Data measuring and output function (Contact TERASAKI for details)

The data measuring and output function measures phase current, line voltage (or phase voltage), electric power, and electric energy (pulse output), and outputs them in the form of analog values ranging from 4 to 20 mA dc.

This function needs the control power.

• Output tolerance: 5%

#### Field test facility

The field test facility allows simple field testing on the LT, ST and INST trip functions.

This facility needs control power.



#### OCR with L.C.D. display, type AGR-22 (Contact TERASAKI for details)

#### 1 Monitoring various data on L.C.D.

OCR can monitor,

- Phase current (A) of I1, I2, I3, I<sub>N</sub>, I<sub>G</sub> and their max. peak current
- Line voltage (V) of V12, V23, V31 and their max. peak voltage (or, Phase voltage (V) of V1N, V2N, V3N and their peak voltage)
- Active power max. (kW)
- Reactive power max. (kVar)
- Power factor (cos ø)
- Electric energy (MWh)
- Frequency
- Trip history

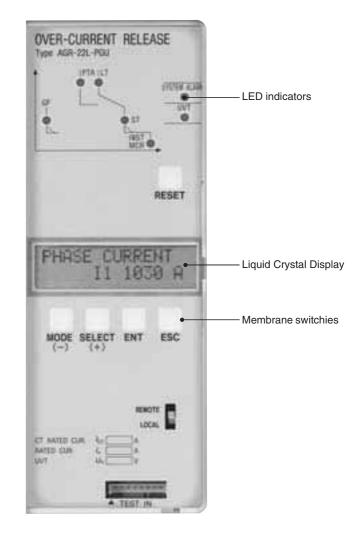
Fault current is monitored, and the operation cause is indicated via individual contacts and LED indicators.

- Contact temperature (See P. 23)
- Contact wear (Optional)

The contact wear is indicated by percentage calculating from interrupting current and interrupting times. This gives information about contact replacement.

# 2 Gives the system alarm with LED indication and output contact for the following abnormal function.

- · Abnormal analog circuit
- UVT reset fail
- Trip function fail
- MHT circuit break
- · Abnormal closing time
- · Abnormal opening time
- · Abnormal charging time



# **TemPower**

# 4 Specifications

# **Optional functions**

		0	.1				Protection function	n
Protection characteristic		Over-current r (OCR) Type	elease	N-phase protection	Restricted and Unrestricted Ground fault ®	Contact temperature monitoring	Fixed type Under Voltage Trip	
			Note 4	N	R	0		
		AGR-11L-AL		0	_	_	0	
		AGR-11L-GL		0	_	_	0	
	ts	AGR-11L-PS		0	_	_	0	
	cui	AGR-11L-PG		0	_	_	0	
	rcir	AGR-21L-PS		0	_	0	_	
	epe	AGR-21L-PG	U	0	0	0	_	
Dial adjustment type	For general feeder circuits	AGR-21L-PE	-L	0	_	0	_	
l t	əral	AGR-21L-PE	-M	0	_	0	_	
l me	ene	AGR-11R-AL		0	_	_	0	
just	or g	AGR-11R-GL		0	_	_	0	
ad	PG	AGR-11R-PS		0	_	_	0	
)ial		AGR-11R-PG	İ	0	_	_	0	
_		AGR-21R-PG	iU	0	0	0	_	
	r	AGR-11S-AL		_	_	_	0	
	For generator protection	AGR-11S-PS		_	_	_	0	
	jene	AGR-21S-PS	U	_	_	0	_	
	or g	AGR-21S-PR	U	_	_	0	_	
	Ш	AGR-21S-TR	U	_	_	0	_	
	ts	AGR-22L-PS		0	_	0	_	
	rcui	AGR-22L-PG		0	0	0	_	
	er ci	AGR-22L-PG	U	0	0	0	_	
/pe	eed	AGR-22L-PE	-L	0	_	0	_	
\   ₹	general feeder circuits	AGR-22L-PE		0	_	0	_	
- bla	ene	AGR-22R-PS		0	_	0	_	
iÿ	For g	AGR-22R-PG		0	0	0	_	
C.D. display type	ц	AGR-22R-PG		0	0	0	_	
0	ttor n	AGR-22S-PS		_	_	0	_	
	nera	AGR-22S-PS		<u> </u>	_	0	_	
	For generator protection	AGR-22S-PR	U	_	_	0	_	
	Fo	AGR-22S-TR	U	_	_	0	_	

_		
():	Available	as ontion

Note4: When optional functions are required please specify the OCR type designation by adding one or more of the abbreviated letters at the end of the code.

Ex. AGR-21L-PSNO

Contact temperature monitoring

N-phase protection

<sup>—:</sup> Not available

<sup>8 :</sup> Contact TERASAKI for details.



			Operation indication	
Fire alarm (8)	Zone interlock	Data measuring and output 8	Operation panel	Communication 8
F	Z	A	Р	С
_	_	_	_	_
_	_	_	_	_
_	_	_	_	_
_	_	_		_
_	_	_		_
0	0	$\circ$	0	0
0	0	$\circ$	$\circ$	0
0	0	0	0	0
_	_	_		_
_	_			_
_	_	_	_	_
_	_	_		_
$\circ$	0	0	0	0
_	_	_	_	_
_	_			_
0	0	0	0	0
0	0	0	0	0
$\circ$	0	0	0	0
_	_	_	_	_
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
_	_	_	_	_
0	0	0	0	0
0	0	0	0	0
_	_	_	_	_
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

### L-characteristic for general feeder circuits (Type AGR-11L, 21L, 22L)

#### **Setting range of protection functions**

#### **Protection functions**

■Adjustable long time-delay trip characteristics

Pick-up current [/R] (A)

Time-delay [t<sub>R</sub>] (s)

Time-delay setting tolerance (%)

■Adjustable short time-delay trip characteristics ST

Pick-up current [/sd] (A)

Current setting tolerance (%)

Time-delay  $[t_{sd}]$  (ms) Relay time

Resettable time (ms)

Max. total clearing time (ms)

■Adjustable instantaneous trip characteristics

INST or MCR

Pick-up current [/i] (A)

Current setting tolerance (%)

■Adjustable pre-trip alarm characteristics PTA

Pick-up current [/p1] (A)

Current setting tolerance (%)

Time-delay  $[t_{P1}]$  (s)

Time-delay setting tolerance (%)

Adjustable ground fault trip characteristics

Pick-up current [/g] (A)

Current setting tolerance (%)

Time-delay  $[t_g]$  (ms) Relay time

Resettable time (ms)

Max. total clearing time (ms)

■N-phase protection characteristics NP

Pick-up current [1/N] (A)

Time-delay  $[t_N]$  (s)

Current setting tolerance (%)

■Adjustable earth leakage trip characteristics

ELT (AGR-21,22 only)

Pick-up current [/AB] (A)

Current setting tolerance

Time-delay [ $t_{\Delta R}$ ] (ms) Relay time

Resettable time (ms)

Max. total clearing time (ms)

■Undervoltage trip characteristics UVT (AGR-21,22 only)

Pick-up voltage (V)

Time-delay [time] (s)

■Control power

#### Setting range

 $[\frac{1}{2}]\times(0.8 - 0.85 - 0.9 - 0.95 - 1.0 - NON)$ ; 6 graduations

• Non tripping when load current  $\leq$  ([/<sub>R</sub>]×1.05). • Tripping when ([/<sub>R</sub>]×1.05) < load current  $\leq$  ([/<sub>R</sub>]×1.2) (0.5 - 1.25 - 2.5 - 5 - 10 - 15 - 20 - 25 - 30) at 600% of [A]; 9 graduations

±15% +150ms - 0ms

170

 $[\frac{1}{2}]\times(1-1.5-2-2.5-3-4-\underline{6}-8-10-NON)$ ; 10 graduations 50 100 200 600 800 : 6 graduations <u>400</u> 75 25 575 775

870

670

 $[\frac{1}{4}]\times(2-4-6-8-10-12-14-\underline{16}-NON)$ ; 9 graduations

270

 $[\frac{1}{2}]\times(0.75-0.8-0.85-0.9-0.95-1.0)$ ; 6 graduations

120

 $(5-10-15-20-40-60-80-\underline{120}-160-200)$  at  $[I_{P1}]$  or more; 10 graduations

470

±15% +100ms - 0ms

Note: Set [/g] to 1200A or less.

 $[/_{CT}] \times (0.1 - 0.2 - 0.3 - 0.4 - 0.6 - 0.8 - 1.0 - NON)$ ; 8 graduations

±20 /0						
100	200	300	500	1000	2000	; 6 graduations
75	175	275	475	975	1975	
170	270	370	570	1070	2070	

 $[/_{CT}] \times (0.4 - 0.5 - 0.63 - 0.8 - 1.0)$ ; Factory set to a user-specified value.

• Non tripping when load current  $\leq$  ([ $\frac{1}{N}$ ]×1.05). • Tripping when ([ $\frac{1}{N}$ ]×1.05) < load current  $\leq$  ([ $\frac{1}{N}$ ]×1.2)

Tripping at 600% of  $[\mbox{$I$}_{N}]$  with LT time-delay  $[\mbox{$I$}_{R}]$ 

±15% +150ms - 0ms

0.2 - 0.3 - 0.5 - 1 (Medium sensitivity) or 3 - 5 (Low sensitivity)

Non operate below 50% of  $[/_{\rm R}]$ , Operate between 50% and 100% of  $[/_{\rm R}]$ .

100	200	300	500	1000	2000 ; 6 gra	aduations
50	150	250	450	950	1950	
250	350	450	600	1150	2150	

UVT rated supply voltage  $[U_c] \times (0.8 - \underline{0.85} - 0.9 - 0.95)$ ; 4 graduations

0 - 0.1 - 0.2 - 0.3 - 0.4 - 0.5 - 0.6 - 0.7 - 0.8 - 1.0; 10 graduations

AC100 - 120V DC100 - 125V AC200 – 240V ) Common DC48V Common Common DC200 - 250V

Power consumption: 5 VA

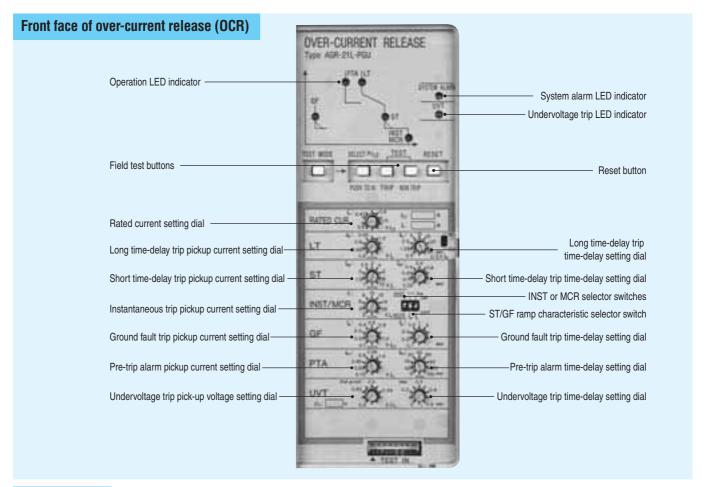
: Default setting

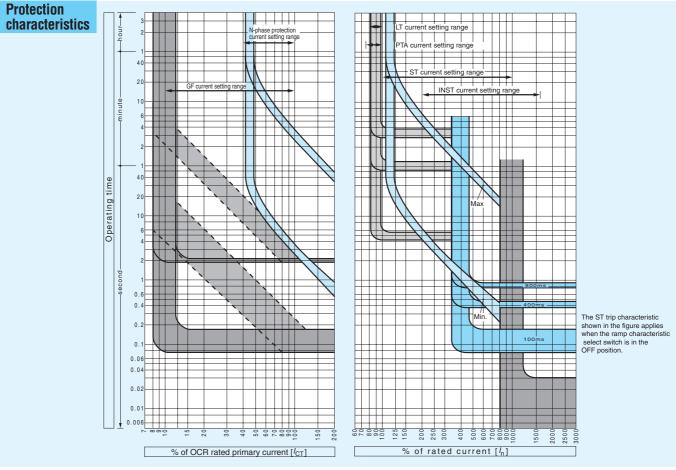
#### ■ Values of $[I_{CT}]$ and $[I_n]$

	- 0	- 11-			
Туре	Applicable	Ra	ted curre	nt [/ <sub>n</sub> ](A	.)
	[/ <sub>CT</sub> ] (A)	[/ <sub>CT</sub> ] ×0.5	[/ <sub>CT</sub> ] ×0.63	[/ <sub>CT</sub> ] ×0.8	[/ <sub>CT</sub> ] <u>×1.0</u>
AR2085	200	100	125	160	200
	400	200	250	320	400
	800	400	500	630	800
AR2125	400	200	250	320	400
	800	400	500	630	800
	1250	630	800	1000	1250
AR2165	400	200	250	320	400
	800	400	500	630	800
	1250	630	800	1000	1250
	1600	800	1000	1250	1600

Гуре	Applicable	Rat	ed curre	$nt [ \frac{1}{n} ](A)$	
	[/ <sub>CT</sub> ] (A)	[ <sub>亿T</sub> ] ×0.5	[/ <sub>CT</sub> ] ×0.63	[/ <sub>CT</sub> ] ×0.8	[/ <sub>CT</sub> ] <u>×1.0</u>
AR220S	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
AR325S	2500	1250	1600	2000	2500
AR332S	3200	1600	2000	2500	3200
AR440S	4000	2000	2500	3200	4000







### R-characteristic for general feeder circuits (Type AGR-11R, 21R, 22R)

#### **Setting range of protection functions**

#### **Protection functions**

Adjustable long time-delay trip characteristics

Pick-up current [/R] (A)

Time-delay [t<sub>R</sub>] (s)

Time-delay setting tolerance (%)

■Adjustable short time-delay trip characteristics

Pick-up current [/sd] (A)

Current setting tolerance (%)

Time-delay  $[t_{sd}]$  (ms) Relay time

Resettable time (ms)

Max. total clearing time (ms)

■Adjustable instantaneous trip characteristics

INST or MCR

Pick-up current [/i] (A)

Current setting tolerance (%)

■Adjustable pre-trip alarm characteristics

Pick-up current [/p1] (A)

Current setting tolerance (%)

Time-delay  $[t_{P1}]$  (s)

Time-delay setting tolerance (%)

Adjustable ground fault trip characteristics

Pick-up current [/g] (A)

Current setting tolerance (%)

Time-delay  $[t_g]$  (ms) Relay time

Resettable time (ms)

Max. total clearing time (ms)

■N-phase protection characteristics NP

Pick-up current [1/N] (A)

Time-delay  $[t_N]$  (s)

Current setting tolerance (%)

Undervoltage trip characteristics

UVT (AGR-21,22 only)

Pick-up voltage (V)

Time-delay [time] (s)

■Control power

#### **Setting range**

Select one from among I<sup>0.02</sup>t, It, I<sup>2</sup>t, I<sup>3</sup>t, and I<sup>4</sup>t by selector switch.

 $[\frac{1}{2}]\times(0.8 - 0.85 - 0.9 - 0.95 - 1.0 - NON)$ ; 6 graduations

 $\bullet \text{ Non tripping when load current} \leqq ([\rlap/{_R}] \times 1.05). \quad \bullet \text{ Tripping when } ([\rlap/{_R}] \times 1.05) < \text{ load current} \leqq ([\rlap/{_R}] \times 1.2)$ (1-2-3-4-5-6-7-8-10-13) at 300% of [/<sub>B</sub>]; 10 graduations

±20% +150ms - 0ms

[/ <sub>0</sub> ]×(1 -	$\lceil f_0 \rceil \times (1 - 1.5 - 2 - 2.5 - 3 - 4 - 6 - 8 - 10 - NON)$ ; 10 graduations								
±15%				,					
50	100	200	400	600	800 ; 6 graduations				
25	75	175	375	575	775				
120	170	270	470	670	870				

 $[\frac{1}{4}]\times(2-4-6-8-10-12-14-\underline{16}-NON)$ ; 9 graduations

 $[\frac{1}{2}]\times(0.75-0.8-0.85-0.9-0.95-1.0)$ ; 6 graduations

 $(5-10-15-20-40-60-80-\underline{120}-160-200)$  at  $[I_{P1}]$  or more; 10 graduations

±15% +100ms - 0ms

Note: Set [/g] to 1200A or less.

 $[/_{CT}] \times (0.1 - 0.2 - 0.3 - 0.4 - 0.6 - 0.8 - 1.0 - NON)$ ; 8 graduations

±20 /0						
100	200	300	500	1000	2000	; 6 graduations
75	175	275	475	975	1975	
170	270	370	570	1070	2070	

 $[/_{CT}] \times (0.4 - 0.5 - 0.63 - 0.8 - 1.0)$ ; Factory set to a user-specified value.

• Non tripping when load current  $\leq$  ([ $\sqrt[]{N}$ ]×1.05). • Tripping when ([ $\sqrt[]{N}$ ]×1.05) < load current  $\leq$  ([ $\sqrt[]{N}$ ]×1.2)

Tripping at 300% of  $[\mbox{$I$}_{N}]$  with LT time-delay  $[\mbox{$I$}_{R}]$ 

±20% +150ms - 0ms

UVT rated supply voltage  $[U_c] \times (0.8 - 0.85 - 0.9 - 0.95)$ ; 4 graduations

0 - 0.1 - 0.2 - 0.3 - 0.4 - 0.5 - 0.6 - 0.7 - 0.8 - 1.0; 10 graduations

AC100 – 120V AC200 – 240V Common DC24V DC48V Common DC100 - 125V)

Common DC200 - 250V

Power consumption: 5 VA

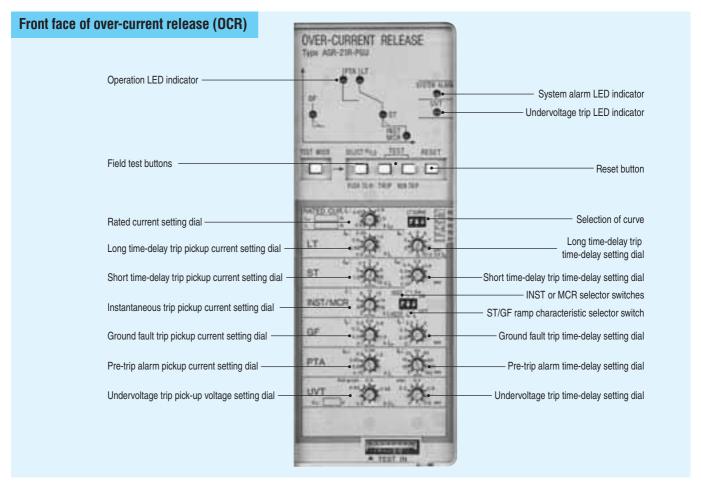
#### ■ Values of $[I_{CT}]$ and $[I_n]$

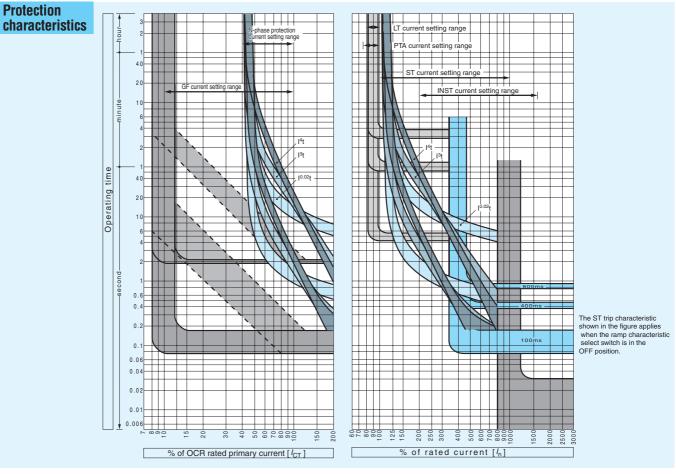
		*					
Туре	Applicable	Ra	.)				
	[∕ <sub>CT</sub> ] (A)	[化T] ×0.5	[∕ <sub>CT</sub> ] ×0.63	[∕ <sub>CT</sub> ] ×0.8	[/ <sub>CT</sub> ] <u>×1.0</u>		
AR2085	200	100	125	160	200		
	400	200	250	320	400		
	800	400	500	630	800		
AR2125	S 400	200	250	320	400		
	800	400	500	630	800		
	1250	630	800	1000	1250		
AR2169	S 400	200	250	320	400		
	800	400	500	630	800		
	1250	630	800	1000	1250		
	1600	800	1000	1250	1600		

Гуре	Applicable	Rat	ted curre	nt [/n](A)	
	[∕ <sub>CT</sub> ]	[/ <sub>CT</sub> ] ×0.5	[∕ <sub>CT</sub> ] ×0.63	[∕ <sub>CT</sub> ] ×0.8	[伦T] <u>×1.0</u>
AR220S	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
AR325S	2500	1250	1600	2000	2500
AR332S	3200	1600	2000	2500	3200
AR440S	4000	2000	2500	3200	4000

<sup>:</sup> Default setting







### S-characteristic for generator protection (Type AGR-11S, 21S, 22S)

#### **Setting range of protection functions**

#### **Protection functions**

Adjustable long time-delay trip characteristics

LT

Pick-up current [/R] (A)

Current setting tolerance (%)

Time-delay [t<sub>R</sub>] (s)

Time-delay setting tolerance (%)

■Adjustable short time-delay trip characteristics

ST

Pick-up current [/sd] (A)

Current setting tolerance (%)

Time-delay  $[t_{sd}]$  (ms) Relay time

Resettable time (ms)

Max. total clearing time (ms)

Adjustable instantaneous trip characteristics

INST or MCR

Pick-up current [/i] (A)

Current setting tolerance (%)

Adjustable pre-trip alarm characteristics

PTA

Pick-up current [/p1] (A)

Current setting tolerance (%)

Time-delay  $[t_{P1}]$  (s)

Time-delay setting tolerance (%)

PTA 2 (AGR-21,22 only)

Pick-up current [/<sub>P2</sub>] (A)

Current setting tolerance (%)

Time-delay [t<sub>P2</sub>] (s)

Time-delay setting tolerance (%)

■Adjustable reverse power trip characteristics

RPT (AGR-21,22 only)

Pick-up power  $[P_R]$  (kW)

Power setting tolerance (%)

Time-delay [time] (s)

Time-delay setting tolerance (%)

■Undervoltage trip characteristics

UVT (AGR-21,22 only) Pick-up voltage (V)

Time-delay [time] (s)

■Control power

Setting range

 $[\frac{1}{2}]\times(0.8-1.0-1.05-1.1-\frac{1.15}{2}-NON)$ ; 6 graduations

±5%

(15 - 20 - 25 - 30 - 40 - 50 - 60) at 120% of [A]; 7 graduations

±15% +150ms - 0ms

 $[\frac{1}{2}] \times (2 - 2.5 - 2.7 - 3 - 3.5 - 4 - 4.5 - 5 - NON)$ ; 9 graduations

±109

100 300 400 600 800 : 6 graduations 200 75 175 775 575 170 270 470 670 870 370

 $\overline{[\frac{1}{2}]} \times (2 - 4 - 6 - 8 - 10 - 12 - 14 - \underline{16} - NON)$ ; 9 graduations

±20%

 $[\frac{1}{1}] \times (0.75 - 0.8 - 0.85 - 0.9 - 0.95 - 1.0 - 1.05)$ ; 7 graduations

±5%

 $(10-15-20-25-\underline{30})$  at 120% of [/p<sub>1</sub>]; 5 graduations

±15% +100ms - 0ms

 $[\frac{1}{1}]\times(0.75-0.8-0.85-0.9-0.95-1.0-1.05)$ ; 7 graduations

±5%

1.5 [t<sub>P1</sub>] at 120% of [t<sub>P2</sub>]

±15% +100ms - 0ms

Rated power  $[P_n] \times (0.04 - 0.05 - 0.06 - 0.07 - 0.08 - 0.09 - 0.1 - NON)$ ; 8 graduations

+0 - 20%

 $(2.5 - \underline{5} - 7.5 - 10 - 12.5 - 15 - 17.5 - 20)$  at 100% of  $[P_R]$ ; 8 graduations

+20%

UVT and RPT rated supply voltage [ $U_c$ ] $\times$ (0.8 – 0.85 – 0.9 – 0.95) ; 4 graduations

0 - 0.1 - 0.2 - 0.3 - 0.4 - 0.5 - 0.6 - 0.7 - 0.8 - 1.0; 10 graduations

0 - 0.1 - 0.2 - 0.3 - <u>0.4</u> - 0.5 - 0.6 - 0.7 - 0.8 - 1.0; 10 graduations AC100 - 120V) \_ DC100 - 125V) \_ DC24V) \_

AC200 – 240V) Common DC200 – 250V Common DC24V DC48V Common

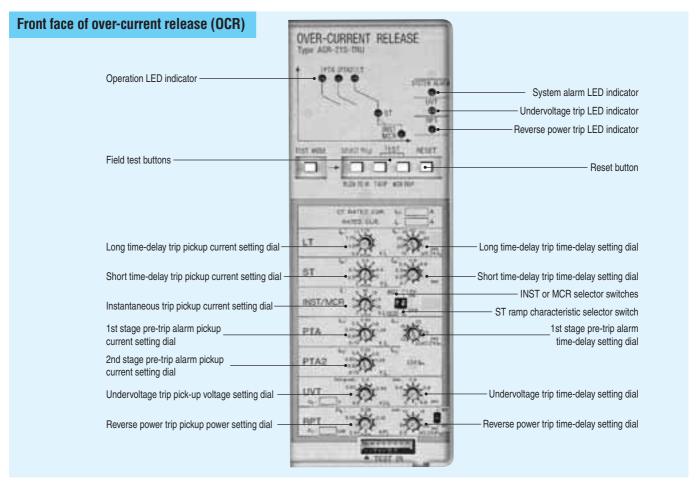
Power consumption: 5 VA

\_\_: Default setting

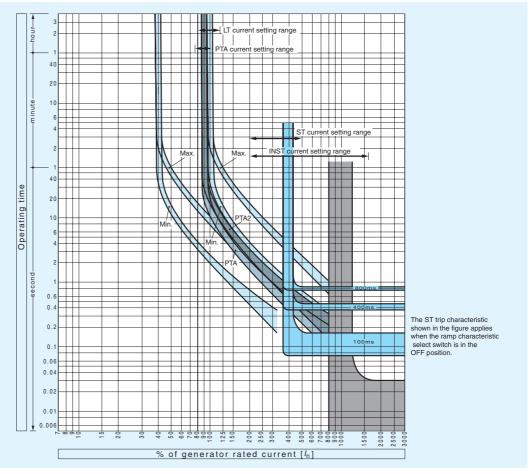
#### Applicable range of generator rated current $[I_n]$

1.1	3. 3	r IIa	
Туре	OCR rated primary current [/ <sub>CT</sub> ](A)	Applicable range of generator rated current $[-/n]$ (A)	
AR208S	200	100≦[/ <sub>n</sub> ]≦200	
	400	200<[/ <sub>n</sub> ]≦400	
	800	400<[/ <sub>n</sub> ]≦800	
AR212S	400	200≦[/ <sub>n</sub> ]≦400	
	800	400<[/ <sub>n</sub> ]≦800	
	1250	630<[/ <sub>n</sub> ]≦1250	
AR216S	400	200≦[/ <sub>n</sub> ]≦400	
	800	400<[/ <sub>n</sub> ]≦800	
	1250	630<[/ <sub>n</sub> ]≦1250	
	1600	800≦[/ <sub>n</sub> ]≦1600	
AR220S	400	200≦[/n]≦400	
	800	400<[/ <sub>n</sub> ]≦800	
	1250	630<[/ <sub>n</sub> ]≦1250	
	1600	800≦[/n]≦1600	
	2000	1250≦[亿]≦2000	
AR325S	2500	1250≦[/₀]≦2500	
AR332S	3200	1600≦[/₀]≦3200	
AR440S	4000	2000≦[/n]≦4000	





# Protection characteristics





#### 7 Other Accessories

#### Operation panel, type APR-1P



The operation panel, which is an integrated monitoring and control tool, has functions and capabilities of watt-hour meters, wattmeters, voltmeters, ammeters, switches, and indicators, allowing the operator to remotely monitor and control up to eight ACBs via serial communications.

Two large LED monitors on the panel can read two kinds of data simultaneously in real time.

The operation panel can be installed up to 50 m away from the ACBs.

#### **Specifications and functions**

- Power supply:
- DC12V (supplied from ACB)
- Dimensions (in mm):
  - 202 (H)  $\times$  237 (W)  $\times$  25 (D)
- Weight: 1.65 kg
- Operation:

Selecting an ACB, turning it ON/OFF, resetting OCR indications, etc. are allowed from a remote site.

• Monitoring:

Items monitored include the present or demand values of the following:

Line voltage (V12, V23, V31)

Active power (kW) and reactive power (kvar)

Power factor

Active electric energy (MWh)

Phase current (I1, I2, I3, IN) and ground fault current (IG)

Frequency

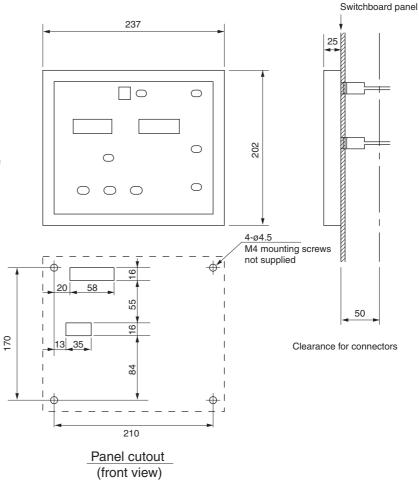
ACB main contact temperature (°C)

ACB main contact wear (%)

• Fault indication:

Fault trip current

System alarm





### OCR checker, type ANU-1

The OCR checker allows easy checking of the long time-delay trip, short time-delay trip, instantaneous trip, and ground fault trip functions and the pre-trip alarm function of the OCR in the field.

#### Ratings and specifications

Dawar aupply	AC100/110V, 50/60Hz or				
Power supply	$4 \times$ AA alkaline cells				
Power consumption	3 W				
Dimensions	101 (W) $ imes$ 195 (H) $ imes$ 44 (D) mm				
Weight	400 g				



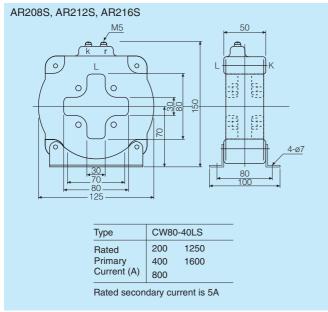
### **Current transformer for neutral line (separate type)**

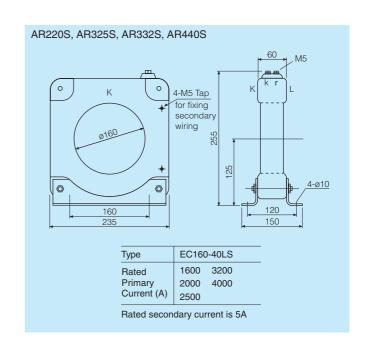
When using a 3-pole ACB with the ground fault protection function to protect a 3-phase, 4-wire system against ground fault, install an appropriate current transformer (CT) to the neutral line of the system.

TERASAKI can provide this neutral line CT as an option.

For the 4-pole ACB, a measuring CT instead of the neutral line CT is already built into the neutral phase of the ACB when the ground fault protection is fitted.

### • Outline dimension of CT for neutral line







### **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 ACB.

Counter readings serve as a guide for maintenance or inspection.



### **Auxiliary switches**

The auxiliary switches operate during the ACB ON/OFF operation.

Connections to the switches are made via tab terminals. Screw terminal type is available as an option.

The auxiliary switches for draw-out type ACBs operate in the CONNECTED and TEST positions.

The auxiliary switches for ACBs conforming to classification society's rules operate in the CONNECTED position only.

The auxiliary switches have change-over contacts and are available for general service and for microload.

Type	For general service	For microload ***
<b>%AXR-004</b>	4c	<u> </u>
AXR-007	7c	_
AXR-304	4c	3c
AXR-010	10c	_
AXR-307	7c	3c

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

### Auxiliary switch ratings

Category		For general service	For microload ※※			
Voltage	Resistive load (A)	Inductive AC: $\cos \emptyset \ge 0.3$ load (A) DC: L/R $\le 0.01$	Resistive load (A)	Inductive AC: $\cos \emptyset \ge 0.6$ load (A) DC: L/R $\le 0.007$	Min. applicable load	
AC100-250V	5	5	0.1	0.1		
AC251-500V	5	5	_	_	DC5V 1mA	
DC30V	1	1	0.1	0.1	DOSVIIIIA	
DC125-250V	1	1	_	_		

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

### Manual reset device (Contact TERASAKI for details)

The manual reset device holds the ACB open that was tripped by the OCR, and provides a mechanical indication that the ACB is in the tripped state.

To close the ACB again, the operator needs to manually reset the indication after making sure the cause of tripping has been removed.

- Note 1: The manual reset device is not applicable when AGR-11 OCR is equipped.
- Note 2: The manual reset device is not applicable when the OCR is equipped with the UVT function.
- Note 3: When the OCR is equipped with the manual reset device, a continuous-rated shunt trip device is necessary for remote OFF operation of the ACB.

**<sup>%</sup>** Suited to electronic circuits

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



### **Key lock**

The key lock is available in two types: the lock-in ON type that locks the ACB in the closed position, and the lock-in OFF type that locks the ACB in the open position.

When the ACB is fitted with a key lock, the operator cannot operate the ACB unless using a matched key.



### **Key interlock**

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

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

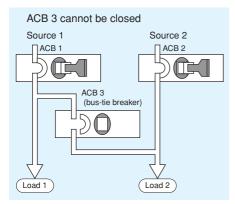
By utilizing the lock-in OFF type key lock feature, and then a limited number of keys by default provides an effective and reliable interlock system.

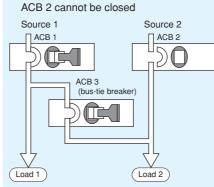
Using the same keys also allows interlocking between an ACB and other devices (such as a switchboard door).

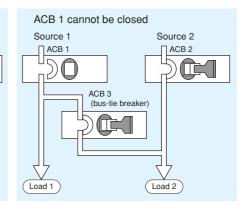
ACBs are supplied with a cylinder lock or with a provision for type FS-2 Castell lock (with angular movement 90° clockwise to trap key).

The Castell lock is not supplied.

### Example: Interlock for prevention of parallel feeding from two sources







### Mechanical interlock (Contact TERASAKI for details)

The mechanical interlock uses a cable system to provide a positive interlock between two or three ACBs. In conjunction with an electrical interlock, it will enhance safety and reliability of power distribution systems.

### 1 Horizontal type

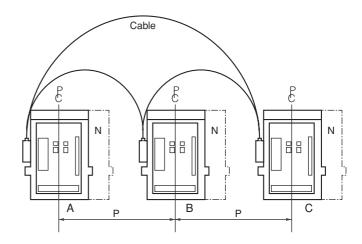
Interlocking is possible between any frame size within the TemPower2 range.

This table shows the standard pitch between left side ACB  ${\tt A}$  and right side ACB  ${\tt B}$ ,

or between left side ACB  $\ensuremath{\mathtt{B}}$  and right side ACB  $\ensuremath{\mathtt{c}}.$ 

Select the required pitch from the table below:

		Pitch of ACB P (mm) (PC line to PC line)				
Right ACB		AR208S ~ AR220S	AR325S ~ AR332S	AR440S		
Left ACB		3P, 4P	3P, 4P	3P, 4P		
AR208S ~ AR220S	3P	500, 600, 700	600, 700, 800	500, 600, 700		
	4P	600, 700, 800	700, 800, 900	600, 700, 800		
AR325S ~ AR332S	3P	600, 700, 800	700, 800, 900	600, 700, 800		
	4P	700, 800, 900	800, 900, 1000	700, 800, 900		
AR440S	3P	800, 900, 1000	900, 1000, 1100	800, 900, 1000		
	4P	1000, 1100, 1200	1000, 1100, 1200	1000, 1100, 1200		



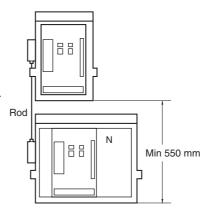
### **2** Vertical Type

Minimum pitch (550mm) is possible.

Specify the required pitch when order.

Maximum is 1200mm.

Contact TERASAKI for the details of vertical type with 3 ACBs.



### Lifting plate

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



### ON-OFF button cover \*

※: Standard equipment

An ON-OFF button cover prevents inadvertent or unauthorized operation of the ON or OFF button. It can be locked with up to three padlocks with ø6 hasp. Padlocks are not supplied.



### **IP** cover

An IP cover provides an IP55 grade of protection as defined in IEC 60529. Even if the breaker body is on the ISOLATED position, IP cover can still be fitted on the ACB.



### **Control circuit terminal cover**

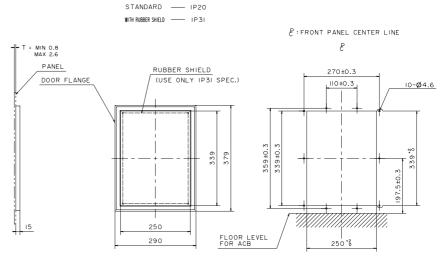
A control circuit terminal cover protects the terminal blocks for auxiliary switches, position switches, and control circuits from being accidentally touched, thus enhancing safety.



### **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.





PANEL CUTOUT

## 4 Specifications

### **OFF** padlock

Permits the ACB 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 ACB is padlocked in the OFF position both manual and electrial closing become inoperative, but the charging of the closing spring by manual or motor is still possible.

Note1: OFF padlock facility cannot be fitted with key lock or key interlock.

### 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 operational reliability of the ACB.

This barrier cannot be applied to ACBs that are supplied with front connections or a reverse power trip function.



### **Earthing device**

There is a 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 on *TemPower2* ACBs comprises; Permanent parts which are factory fitted by Terasaki and are mounted on the ACB chassis and body to enable the ACB to receive the portable parts. Portable parts are supplied in loose kit form and are fitted on to the ACB body by the customer's engineer.

This converts the ACB from a normal service device to an earthing device.

When the ACB 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 ACB.

It is recommended that the ON-OFF operating buttons be padlocked to prevent manual opening of the ACB when used in the earthing mode.

UVT function can not be applied to the earthing device. For further information contact Terasaki for details.



### Operation Environments

#### Standard environment

The standard environment for ACBs is as follows:

Ambient temperature -5°C to +40°C

The average temperature for 24

hours must not exceed 35°C.

Relative humidity 45% to 85%

Attitude Below 2000 m

Atmosphere Excessive water vapor, oil vapor,

smoke, dust, or corrosive gases must

not exist.

Sudden change in temperature, condensation, or icing must not occur.

### **Special environment**

### Tropicalization (Fungus and moisture treatment)

Specify this treatment when the ACB is used under high-temperature and high-humidity conditions.

Conditions: Max. permissible ambient temperature 60°C

Max. permissible humidity 95% rel.

No condensation

### Cold climate treatment

Specify this treatment when the ACB is used in cold areas. Conditions: Min. permissible storage temperature -40°C

Min. permissible operating temperature -25°C

No condensation

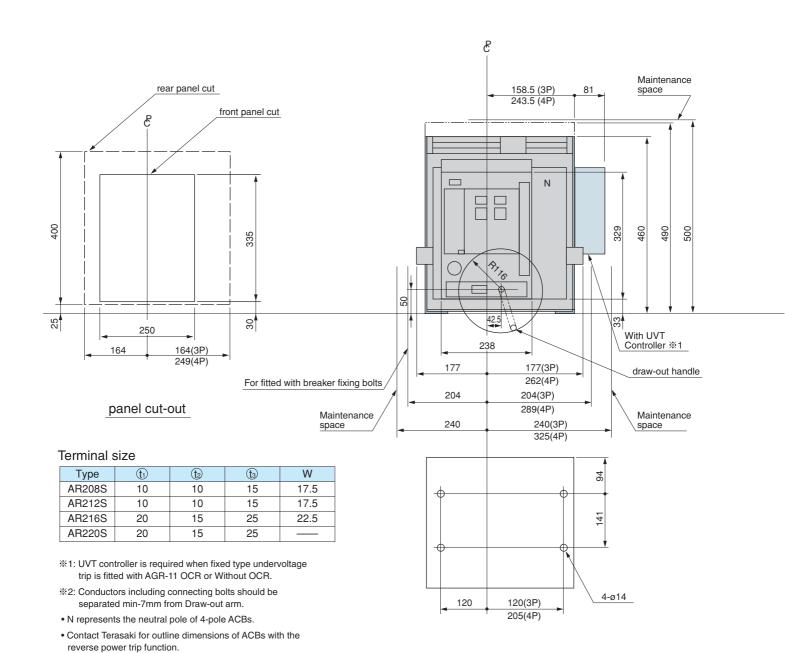
### Anti-corrosion treatment

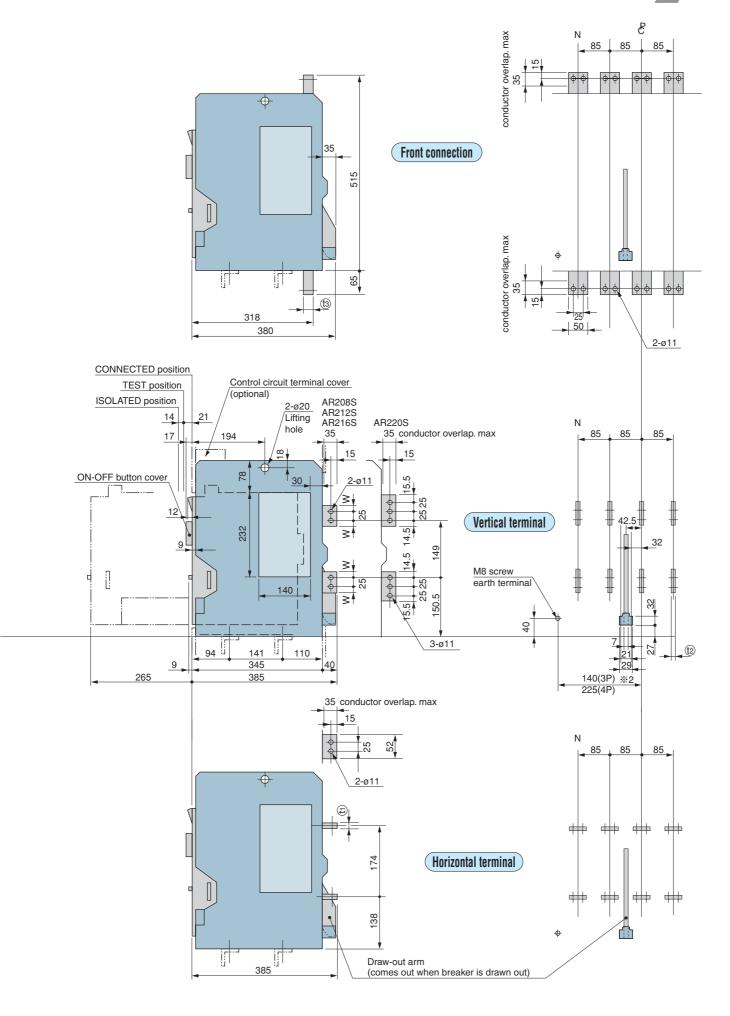
Specify this treatment when the ACB is used in a corrosive atmosphere.

Contact Terasaki for details.

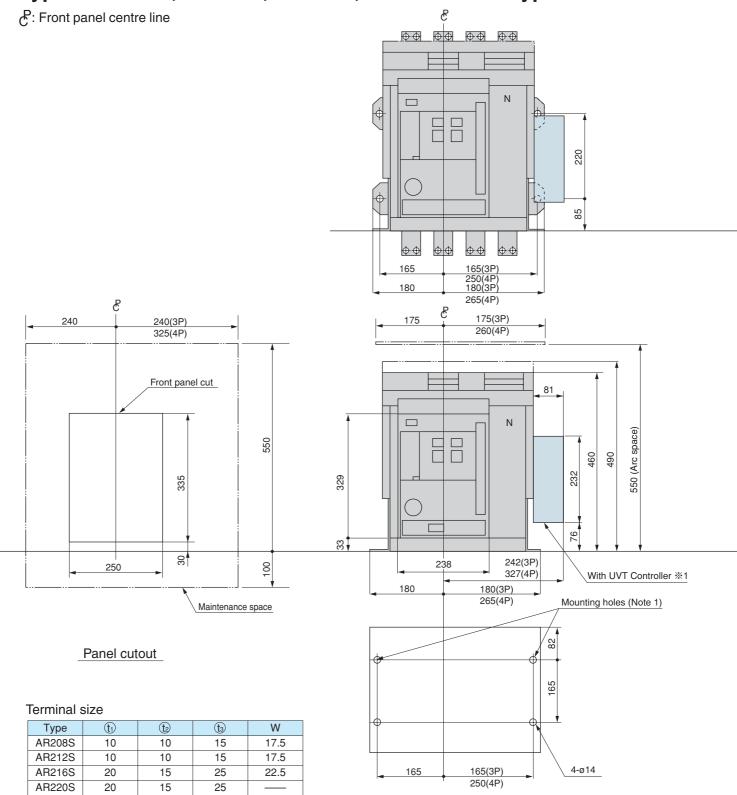
### • Type AR208S, AR212S, AR216S, AR220S Draw-out type

P: Front panel centre line





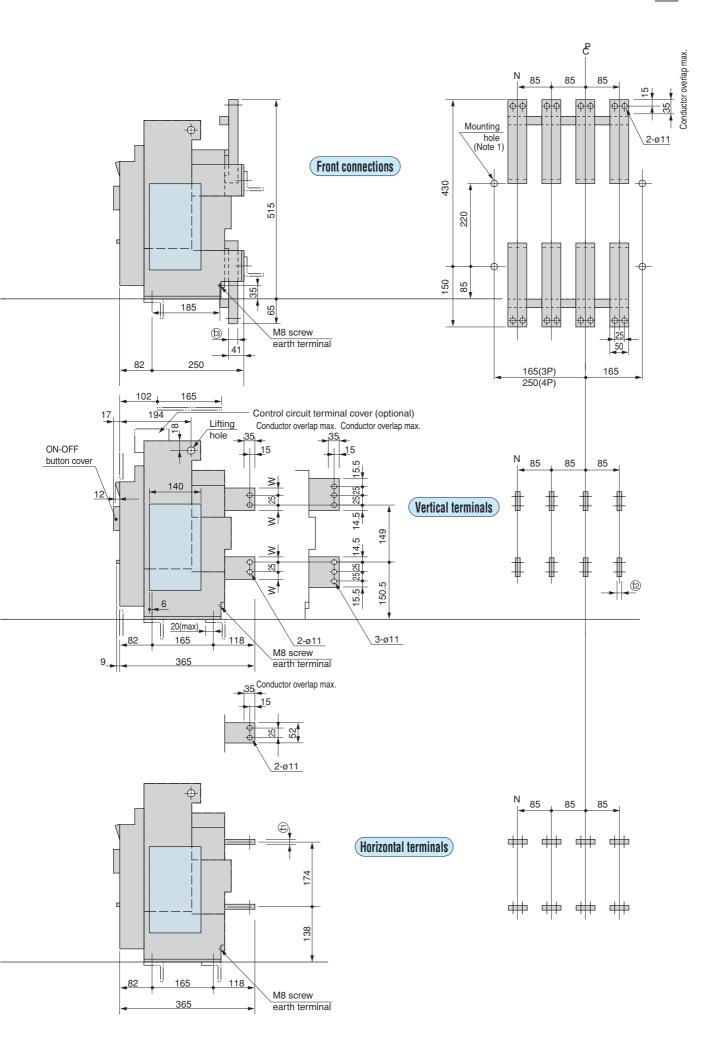
### • Types: AR208S, AR212S, AR216S, AR220S Fixed type



- #1: UVT controller is required when fixed type undervoltage trip is fitted with AGR-11 OCR or Without OCR.
- N represents the neutral pole of 4-pole ACBs.
- Contact Terasaki for outline dimensions of ACBs with the reverse power trip function.

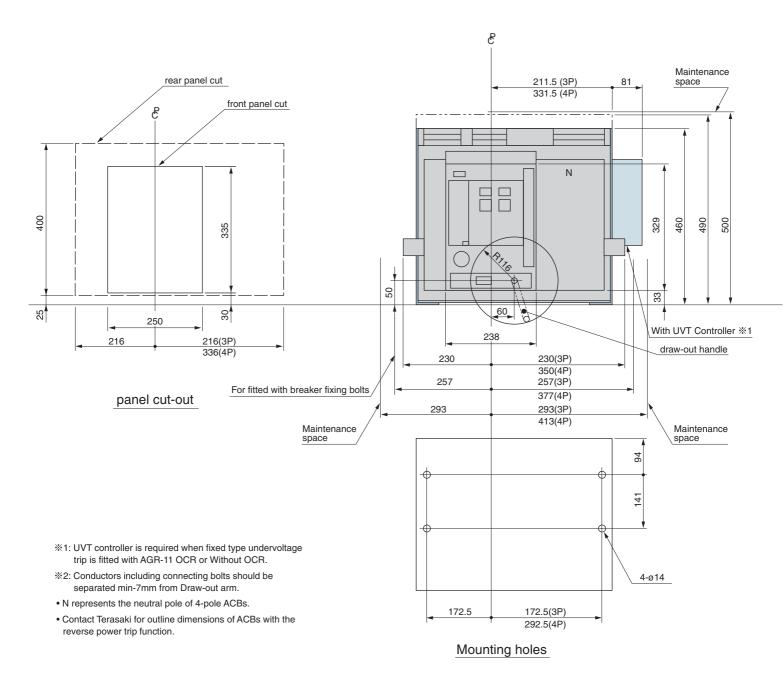
Mounting holes

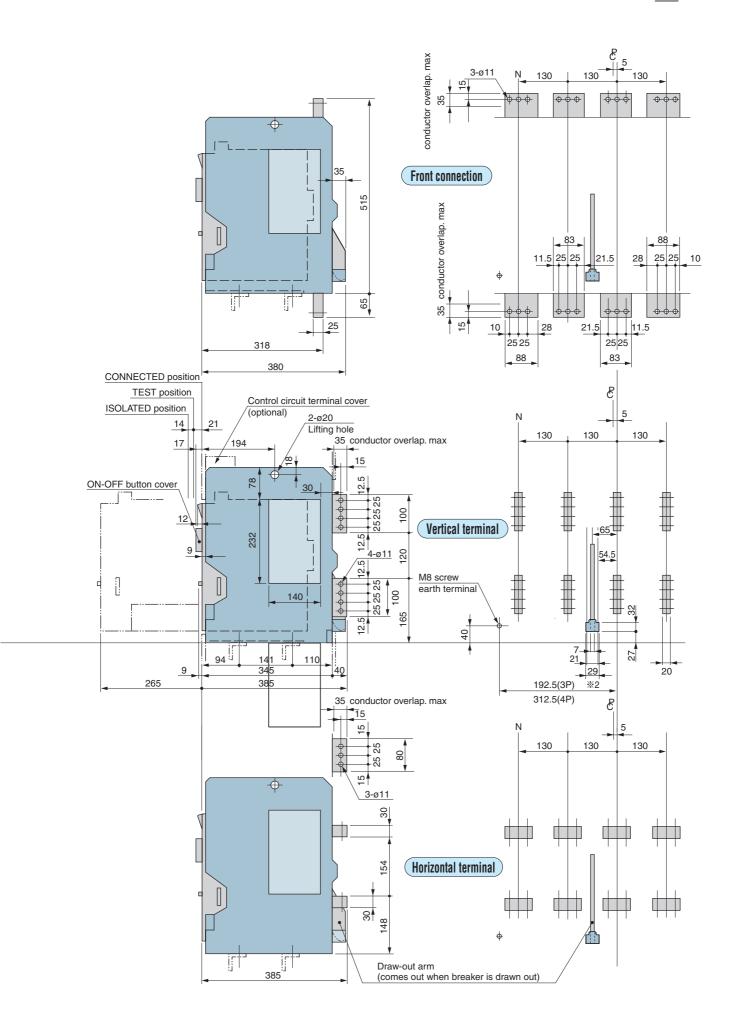
Note 1: Mount ACBs with front connections through 6 mounting holes.



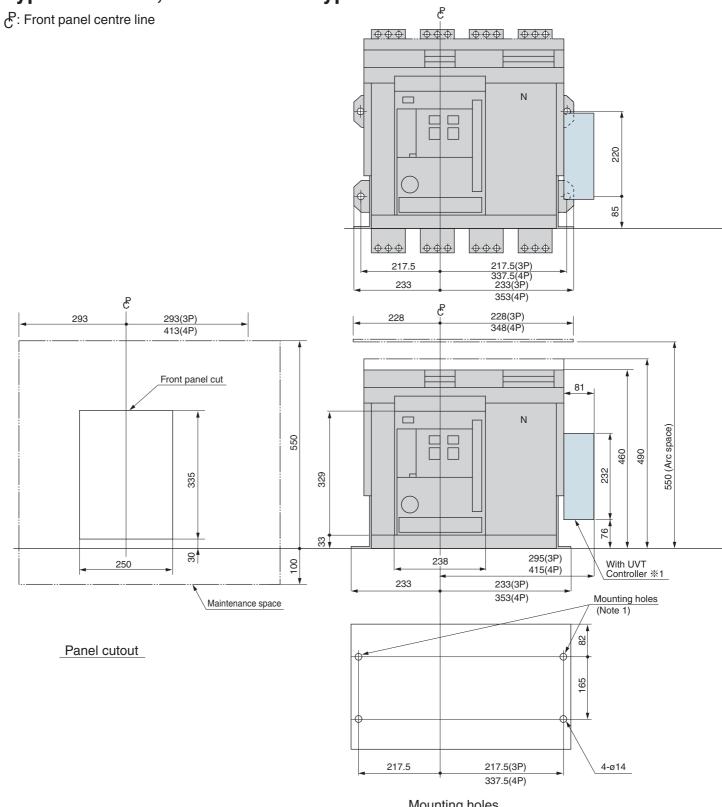
### ● Type AR325S, AR332S Draw-out type

P: Front panel centre line





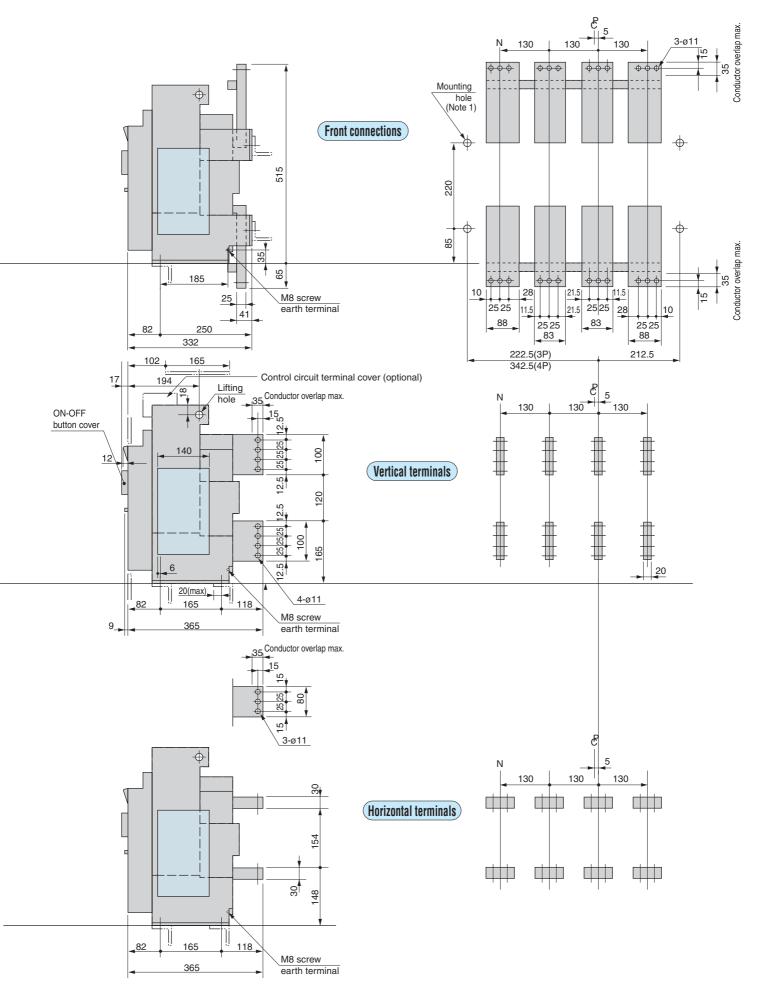
• Types: AR325S, AR332S Fixed type



- %1: UVT controller is required when fixed type undervoltage trip is fitted with AGR-11 OCR or Without OCR.
- N represents the neutral pole of 4-pole ACBs.
- Contact Terasaki for outline dimensions of ACBs with the reverse power trip function.

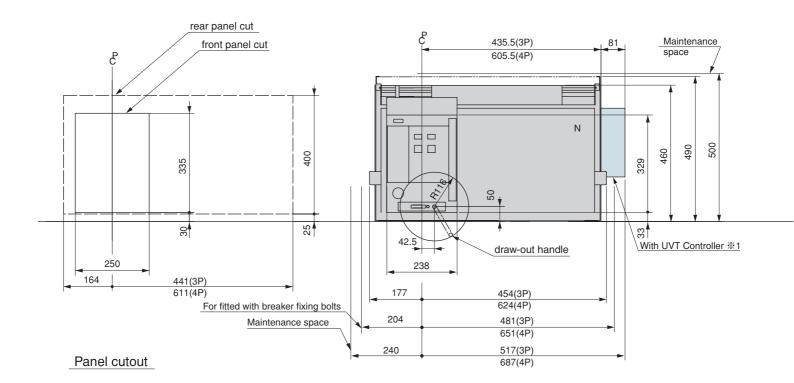
Mounting holes

Note 1: Mount ACBs with front connections through 6 mounting holes.



### • Types: AR440S Draw-out type

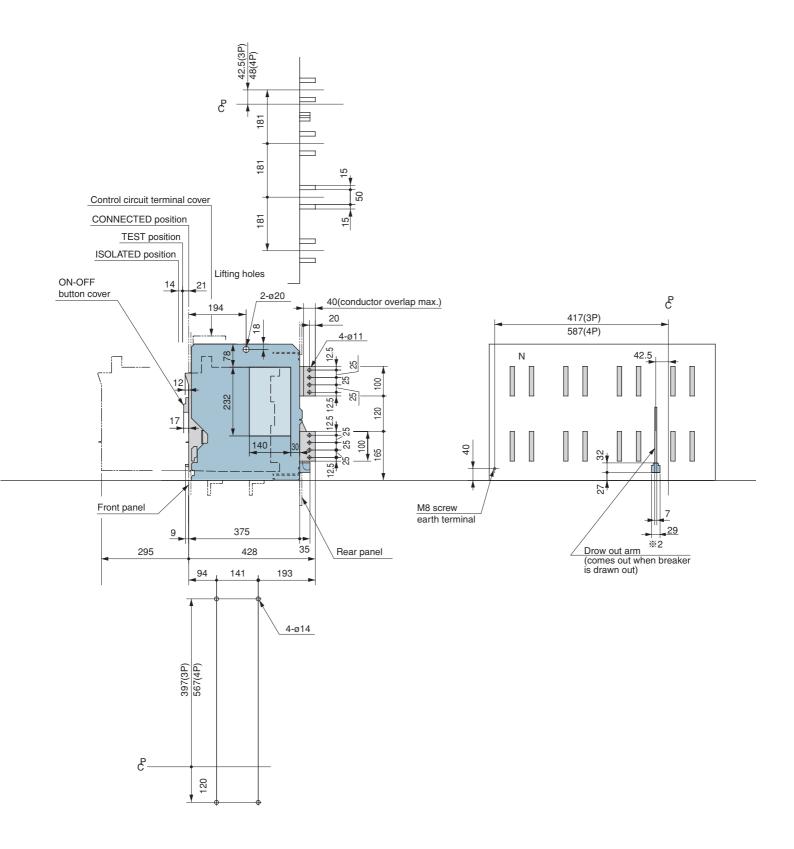
P: Front panel centre line



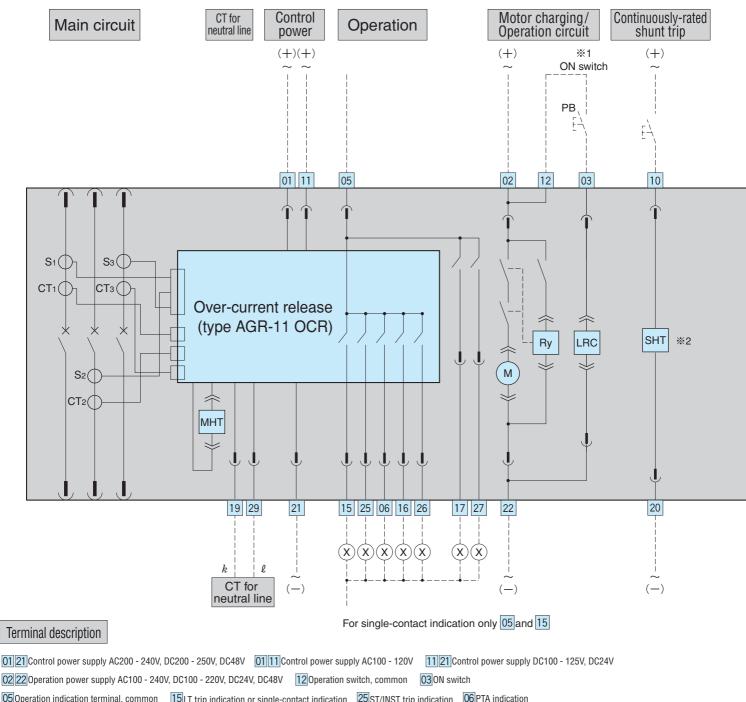
<sup>※1:</sup> UVT controller is required when fixed type undervoltage trip is fitted with AGR-11 OCR or Without OCR.

<sup>※2:</sup> Conductors including connecting bolts should be separated min-7mm from Draw-out arm.

<sup>•</sup> N represents the neutral pole of 4-pole ACBs.



### **Circuit Diagram** (with AGR-11 OCR or without OCR)



05 Operation indication terminal, common 15 LT trip indication or single-contact indication 25 ST/INST trip indication 06 PTA indication

16 GF trip indication 26 System alarm 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  $(\ell)$  08, 18, 28 UVT power supply 09 UVT power supply common

### Symbols for accessories

CT1 - CT3 : Power CTs S1 - S3 : Current sensors

: Charging motor LRC : Latch release coil MHT

: Magnetic Hold Trigger Isolating terminal connector (for draw-out type)
Manual connector

User wiring

---X-- Relay or indicator lamp

#### 08 09 100V 415V 18 - 09110V 220V 120V 240V

**UVT** power supply Term.

※1: Do not connect "b" contact of auxiliary switch to ON switch in series, otherwise, pumping may occur.

AC 100V

AC 200V

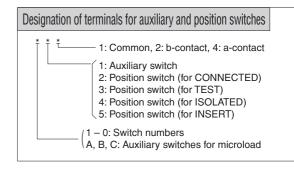
coil

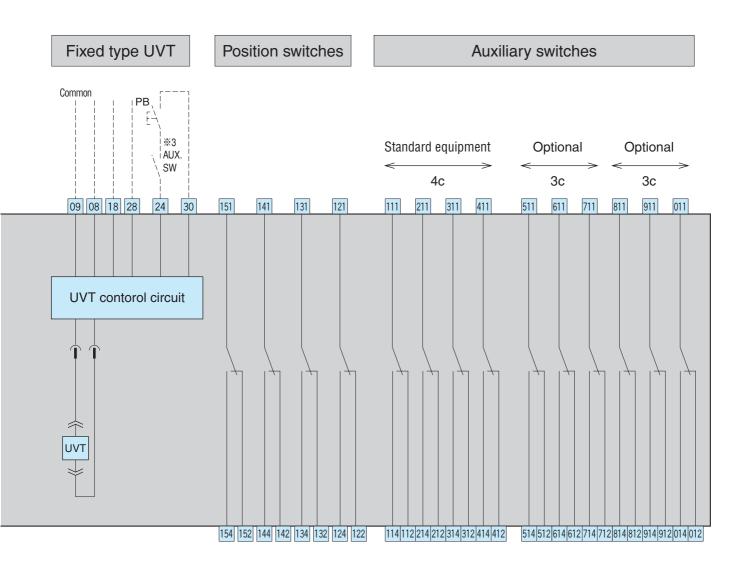
200V

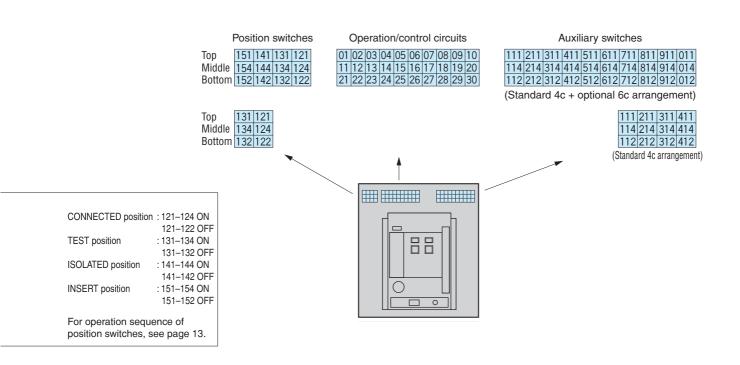
AC 400V

380V

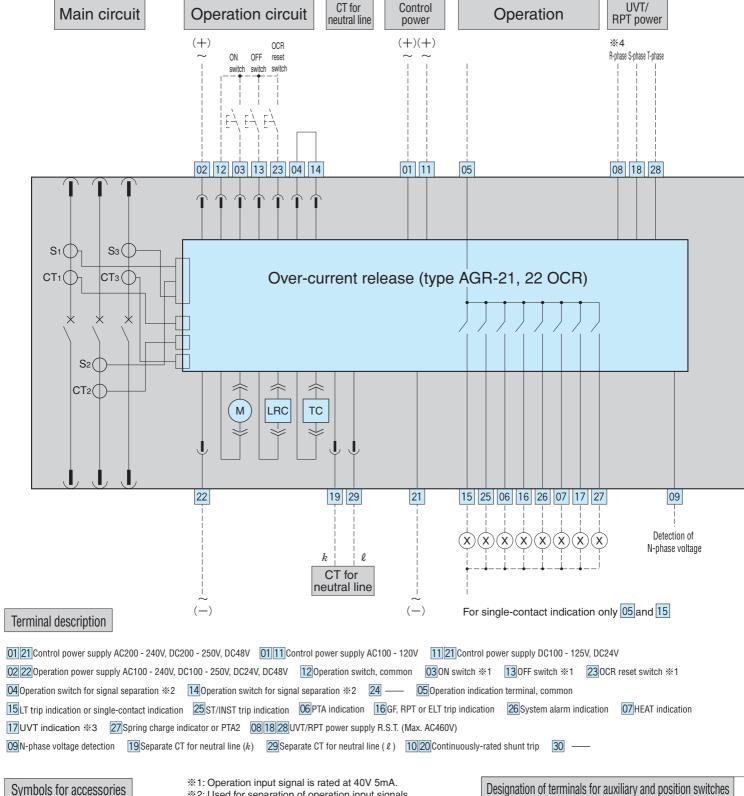
- ※2: See P. 19 for the circuit diagram of the continuously-rated shunt trip device with capacitor trip device.
- 3: Use "a" contact of auxiliary switch of ACB







### Circuit Diagram (with AGR-21, 22 OCR)



CT1 - CT3: Power CTs S1 - S3 : Current sensors Μ : Charging motor LRC : Latch release coil : Tripping coil TC

Isolating terminal connector (for draw-out type)
Manual connector

User wiring

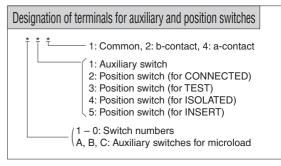
---X-- Relay or indicator lamp

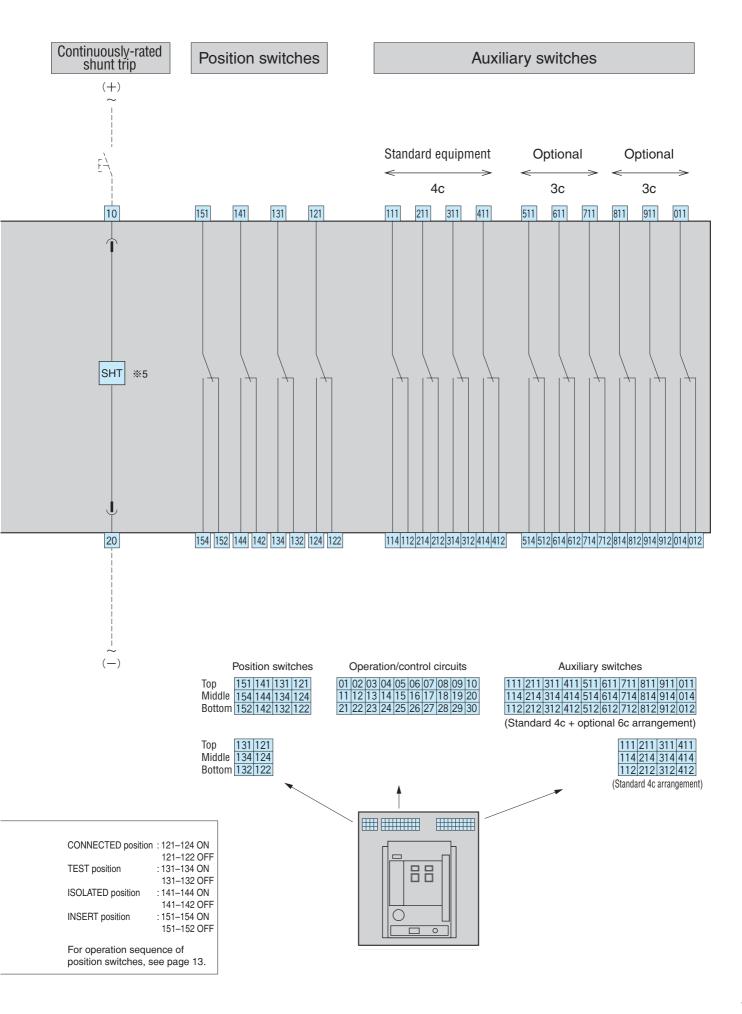
- ※2: Used for separation of operation input signals.
- \*3: Can be used for trip indicator in place of UVT indication.
- ¾4: For AGR-22 OCR connect the measured power source to the terminals, 08, 18, 28. In case of no reverse R-phase S-phase power trip function with AGR-21 OCR, UVT can

be used with single 80 18 phase power supply as right.

\*5: See P. 19 for the circuit diagram of the continuously-rated shunt trip device with capacitor trip device.

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### **Dielectric strength**

Circuit			Withstand voltage (at 50/60	O Hz)	Rated Impulse withstand voltage $U_{\mathrm{imp}}$	
Main circuit			Between terminals, terminal group to earth	AC3500V for 1 minute	12kV	
- S	Auxiliary switches	For general service	Terminal group to earth	AC2500V for 1 minute	6kV	
trol circuits		For microload	Terminal group to earth	AC2000V for 1 minute	4kV	
	Position switches		Terminal group to earth	AC2000V for 1 minute	4kV	
	Over-current release (OCR)		Terminal group to earth	AC2000V for 1 minute	4kV	
Control	Power supply for ur reverse power trip f		Terminal group to earth	AC2500V for 1 minute	6kV	
Other a	Other accessories		Terminal group to earth AC2000V for 1 minute		4kV	

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

### Internal resistance and power consumption

Туре	AR208S	AR212S	AR216S	AR220S	AR325S	AR332S	AR440S
Rated current (A)	800	1250	1600	2000	2500	3200	4000
DC internal resistance per pole (mΩ)	0.030	0.030	0.028	0.024	0.014	0.014	0.014
AC power consumption for 3 poles (W)	170	310	350	490	600	780	1060

### **Derating**

Based	Ambient	Type	AR208S	AR212S	AR216S	AR220S	AR325S	AR332S	AR440S
Standards	temperature (°C)	Connecting bar sizes	2×50×5t	2×80×5t	2×100×5t	3×100×5t	2×100×10t	3×100×10t	4×150×6t
IEC60947-2 EN 60947-2			800	1250	1600	2000	2500	3200	4000
AS3947.2 JIS C8201-2	45		800	1250	1600	2000	2500	3200	4000
JIS C0201-2	50		800	1250	1600	2000	2500	3200	4000
	55		800	1250	1600	1820	2500	2990	4000
	60		800	1250	1460	1740	2400	2850	3760
NEMA, SG-3 ANSI C37.13			800	1250	1540	2000	2500	3200	3700
	45		800	1240	1470	1960	2500	3010	3580
	50		800	1180	1390	1860	2440	2860	3470
	55		800	1110	1310	1750	2300	2690	3350
	60		800	1040	1230	1640	2150	2520	3150
JIS C8372	40 (Standar tempera	rd ambient ture)	800	1250	1600	2000	2500	3200	3700
	45		800	1250	1600	1900	2470	2900	3580
	50		800	1250	1540	1820	2400	2800	3470
	55		800	1250	1460	1740	2310	2710	3350
	60		800	1230	1390	1650	2230	2610	3230

Note: The values of AR208S, AR212S and AR216S are for horizontal terminals on both line and load side.

The values of AR220S, AR325S, AR332S and AR440S are for vertical terminals on both line and load side.

Above figures are subject to the design of the enclosure and rating of busbar.