Low Voltage Air Circuit Breakers

World Super AE

630AF~6300AF

World Super WS Series
Mitsubishi Presents the WS Series, Satisfied with the High Demands of the 21st Century Global Market.

**World Super Series**

**Best-Solution**
- Various line-up and high flexibility

**High-Performance**
- One-rank higher breaking performance

**High-Reliability**
- Safety and reliability provided

**Customer Friendly**
- Easy handling and retrofitted solution

**Global...**
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High-Reliability Customer Friendly

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Safety and reliability provided Easy handling and retrofitted solution

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Line up (630 to 6300A)

<table>
<thead>
<tr>
<th>Rated current (A)</th>
<th>630</th>
<th>1000</th>
<th>1250</th>
<th>1600</th>
<th>2000</th>
<th>2500</th>
<th>3200</th>
<th>4000</th>
<th>5000</th>
<th>6300</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW series</td>
<td>AE630-SW</td>
<td>AE1000-SW</td>
<td>AE1250-SW</td>
<td>AE1600-SW</td>
<td>AE2000-SWA</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>AE2000-SW</td>
<td>AE2500-SW</td>
<td>AE3200-SW</td>
<td>AE4000-SWA</td>
<td>—</td>
<td>—</td>
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<td></td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>AE4000-SW</td>
<td>AE5000-SW</td>
<td>AE6300-SW</td>
</tr>
</tbody>
</table>
■ **Best Solution**

Through Flexible and Various Options, To be Built up the Suitable Functions.

**Electronic Trip Relay**

With interchangeable & add-on modules, flexible functions built up.

<table>
<thead>
<tr>
<th>WS1</th>
<th>WS2</th>
<th>WS3</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTD+STD+INST / MCR</td>
<td>LTD+STD+INST / MCR</td>
<td>LTD+STD+INST / MCR</td>
</tr>
</tbody>
</table>

**Optional setting module**

With optional setting modules, GFR, ER etc are added easily.

<table>
<thead>
<tr>
<th>G1</th>
<th>E1</th>
<th>AP</th>
<th>N5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground fault protection (GFR)</td>
<td>Earth leakage (ER)</td>
<td>2nd Additional Pre-alarm</td>
<td>Neutral pole 50% protection</td>
</tr>
</tbody>
</table>

Note (1) : Combination with ZCT
(2) : With “N5” optional module, Neutral pole protection will be changed from 100% (standard) to 50%.

**Power supply**

It is necessary for Display and LEDs. (see page 19, 20.)

<table>
<thead>
<tr>
<th>P1</th>
<th>P2</th>
<th>P3</th>
<th>P4</th>
<th>P5</th>
</tr>
</thead>
<tbody>
<tr>
<td>100-240V AC-DC</td>
<td>24-60V DC</td>
<td>100-240V AC / 100-125V DC with output contact</td>
<td>24-60V DC with output contact</td>
<td>100-240V DC with output contact (SSR)</td>
</tr>
</tbody>
</table>

Note (1) : Solid State Relay

**Additional function**

<table>
<thead>
<tr>
<th>EX1</th>
<th>DP1</th>
<th>TAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extension module</td>
<td>Display</td>
<td>Temperature alarm</td>
</tr>
<tr>
<td>Module for display and communication</td>
<td>Current, Voltage, Power, Harmonics, Trip current, etc.</td>
<td>The TAL is operated by an unusual temperature of the breaker contacts. (see page 34)</td>
</tr>
</tbody>
</table>

**WS relay with ampere meter and fault memory (DP3)**

Displays Current, Harmonic, Trip current, Trip cause, etc. Note : Refer to page 23 on details.
By using various application software for PLC, users can also connect to the network SCADA system (CC-Link®, MODBUS®).

**Network**

**Interface unit**

- CC-Link®
- PROFIBUS-DP
- MODBUS®(RS-485)

**I/O unit**

- ON, OFF, Spring charge, Digital input
- Option to interface unit
  - I/O unit enables to turn ON/OFF the breaker and the spring charge via network.
  - And by addition of the drawout position switch, it is possible to transmit the breaker drawout position.

**Display unit for Panel board**

- DP2
  - It has the same function as the breaker display unit (DP1).
  - In the case where the breaker is installed in the panel, it becomes possible to view the measurement information from the outside of the panel board.
  - Note: The VT unit is required to display the measured data except for the load current.

**VT unit**

- VT unit enables to measure voltages, electric powers, harmonics and etc.

**Electronic Trip Relay type code**

- Main setting module
  - AE300-1600-SW, AE200-3200-SW, AE400-SW: Protective coordination use
  - AE100-240V AC, AE200-3200-SW, AE400-SW: Protective coordination use
  - WS, WM: Generator protection use
  - WB: INST only
  - WF: Protective coordination use

- Optional setting module
  - G1: Ground fault protection
  - N5: Neutral pole 50% protection
  - E1: Earth leakage protection
  - AP: 2nd Additional Pre-alarm
  - NA: Without optional setting

- ETR Auxiliary Equipment
  - Temperature alarm (TAL)
  - MCR switch (MCR-SW)

- Power supply
  - P1: 100-240V AC-DC
  - P2: 24-60V DC
  - P3: 100-240V AC / 100-125V DC
  - P4: 24-60V DC with output contact
  - P5: 100-240V DC with output contact

- Additional function
  - Extension module(EX1)
  - Display(DP1)
  - Display panel (DP3)
  - VT unit (VT)

**Wire system (when EX1 is specified)**

- 3x³SW
- 3x³4W
- Normal connection
- Reverse connection

Note: For DP3, refer to page 23 on details.
Product Features

High-Performance High-Reliability
The safety of valuable circuits can be securely maintained.

Higher short circuit protection performance by improving breaking capacity
In case of 690V AC, Icu = Ics improved
from 50 kA to 65 kA for AE630-SW~AE2000-SWA
from 50 kA to 75 kA for AE2000-SW~AE4000-SWA
from 50 kA to 85 kA for AE4000-SW~AE6300-SWA

Wide coordination range by improving rated short-time withstand current
Icw (1s) improved
from 65 kA to 75 kA for AE2000-SW~AE4000-SWA
from 85 kA to 100 kA for AE4000-SW~AE6300-SWA

Higher safety by improving insulation performance
Rated impulse withstand voltage (Uimp) for the main circuit is improved from 8 kV to 12 kV.

Higher reliability by High operating durability

Mechanical
AE-SW series are sharply improved in mechanical durability compared to the former model.
Customer Friendly
Convenience for Customer

3 sizes

<table>
<thead>
<tr>
<th>Size1</th>
<th>Size2</th>
<th>Size3</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE530-SW</td>
<td>AE1000-SW</td>
<td>AE1250-SW</td>
</tr>
<tr>
<td>AE1500-SW</td>
<td>AE1600-SW</td>
<td>AE2000-SWA</td>
</tr>
<tr>
<td>AE2000-SW</td>
<td>AE2500-SW</td>
<td>AE3200-SW</td>
</tr>
<tr>
<td>AE4000-SW</td>
<td>AE5000-SW</td>
<td>AE6300-SW</td>
</tr>
</tbody>
</table>

Compact size AE2000-SWA!

- The compact AE2000-SWA can reduce the panel size.

Replacement from the former model (AE-SS)

- Due to the same installation dimension and outline dimension, the former model (AE-SS) can be replaced with AE-SW series.
- For the replacement of Drawout type, the Drawout frames (Cradle) for AE-SS have to be replaced with one for AE-SW.
- AE-SW can be installed to the existing connection bus bar without any special connection kit.
  (Except for AE2000-SWA and AE4000-SWA)

Replacement from the old model (AE-S)

For the replacement from the old model (AE-S), the special adapter for AE-SW is prepared. (It is available for Drawout type only.) For details, please contact us.

Zero arc space

Arc exhaust to the outside of the breaker is drastically reduced for safer operation.
(For AE630-SW~AE4000-SWA models, 600V AC or less)
(Refer to page 58 : Insulation distance)
Appearance and Product structure

**Fixed type**

AE-SW Series

1. Arc extinguishing chamber
2. Control circuit terminal block
3. Electronic trip relay
4. OFF button
5. ON button
6. Padlock hook
7. Charging indicator
8. ON/OFF indicator
9. Manual reset button (Optional)

For the fixed type, Lifting hooks (HP) are attached.

**Drawout type**

AE-SW Series

1. Cradle
2. Control circuit terminal block
3. Lifting hole
4. Charging handle
5. Drawout position indicator
6. Extension rail
7. Position lock
8. Aperture for the drawout handle
9. Drawout handle

For the drawout type, Drawout handle is attached.
Skeleton

Product configuration

1. Type
   - AE630-SW
   - AE1000-SW
   - AE1250-SW
   - AE1600-SW
   - AE2000-SW
   - AE2500-SW
   - AE3200-SW
   - AE4000-SW
   - AE5000-SW
   - AE6300-SW

2. Standard
   - IEC 60947-2
   - EN 60947-2(CE)
   - JIS C 8201-2-1
   - GB/T 14048.2
   - Marine Approvals
     - LR
     - BV
     - DNV GL
     - ABS
     - CCS*
     - NK

3. Connection
   - Drawout type
     - Horizontal terminal
     - Vertical terminal
     - Front terminal
   - Fixed type

4. Drawout type accessories
   - Cell switch
   - Shorting b-contact
   - Lifting hooks
   - Safety shutter
   - Safety shutter lock
   - Mis-insertion preventor
   - Test jumper

5. Electrical accessories
   - Auxiliary switch
   - Motor charging device
   - Closing coil
   - Shunt trip device
   - Under voltage trip device

6. Mechanical accessories
   - Push button cover
   - Counter
   - Cylinder lock
   - Terminal cover
   - Door frame
   - Dust cover
   - Interphase barrier
   - Mechanical interlock
   - Door interlock

7. Electronic trip relay
   - General use
     - WS type
   - Generator protection use
     - WM type
   - Special use
     - WB type
   - Protective coordination use
     - WF type
   - Optional
     - G1: Ground fault protection
     - E1: Earth leakage protection
     - AP: 2nd Additional Pre-alarm
     - NS: Neutral pole 50% protection

8. Relay accessories
   - Extension module
   - Display
   - Temperature alarm
   - MCR switch
   - Neutral CT
   - External ZCT
   - VT unit

9. Network
   - CC-Link® Interface unit
   - PROFINET®-DP Interface unit
   - MODBUS® Interface unit
   - I/O unit

*Except for AE4000-SW~AE6300-SW
### Specification

<table>
<thead>
<tr>
<th>Type</th>
<th>AE630-SW</th>
<th>AE1000-SW</th>
<th>AE1250-SW</th>
<th>AE1600-SW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame size (A)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated insulation voltage (UL) (50/60Hz)(AC V)</td>
<td>630</td>
<td>1000</td>
<td>1250</td>
<td>1600</td>
</tr>
<tr>
<td>Rated operational voltage (Ue) (50/60Hz)(AC V)</td>
<td>690</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated impulse withstand voltage (Uimp) (kV)</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pollution degree</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of poles</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated current In (CT rating)</td>
<td>630 (Note 5)</td>
<td>1000</td>
<td>1250</td>
<td>1600</td>
</tr>
<tr>
<td>Current setting Ir (A) (40°C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ultimate breaking capacity Icu (kA rms)</td>
<td>690V AC</td>
<td>600V AC</td>
<td>240-500V AC</td>
<td>65</td>
</tr>
<tr>
<td>with MCR</td>
<td>690V AC</td>
<td>600V AC</td>
<td>240-500V AC</td>
<td>65</td>
</tr>
<tr>
<td>Bare + External relay</td>
<td>690V AC</td>
<td>100%</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>Rated service breaking capacity Isc (kA rms) 3%Icu</td>
<td>690V AC</td>
<td>143</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>Rated making capacity Ism (kA peak)</td>
<td>690V AC</td>
<td>143</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>with MCR</td>
<td>690V AC</td>
<td>143</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>Bare or Bare + External relay</td>
<td>690V AC</td>
<td>52.5</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>Rated short time withstand current Icw (kA rms)</td>
<td>1s</td>
<td>65</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2s</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3s</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum total breaking time (ms)</td>
<td>40 (Note 6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum closing time (ms)</td>
<td>80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of operating cycles</td>
<td>With rated current</td>
<td>500V AC In</td>
<td>5,000</td>
<td>5,000</td>
</tr>
<tr>
<td></td>
<td>Without rated current</td>
<td>690V AC In</td>
<td>25,000 (Note 4)</td>
<td></td>
</tr>
<tr>
<td>Connecting terminal</td>
<td>Horizontal terminal</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vertical terminal</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Front terminal</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outline dimension (mm) H×W×D</td>
<td>Fixed type</td>
<td>3-pole</td>
<td>410×340×290</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4-pole</td>
<td>410×425×290</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drawout type</td>
<td>3-pole</td>
<td>430×300×375</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4-pole</td>
<td>430×385×375</td>
<td></td>
</tr>
<tr>
<td>Weight (kg) (without Accessory)</td>
<td>Fixed type</td>
<td>3-pole</td>
<td>40</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>4-pole</td>
<td>50</td>
<td>51</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drawout type (including cradle)</td>
<td>3-pole</td>
<td>63</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>4-pole</td>
<td>77</td>
<td>78</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cradle only</td>
<td>3-pole</td>
<td>26</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>4-pole</td>
<td>75</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>Marine approval</td>
<td>3-pole</td>
<td>(LR, BV, DNV GL, ABS, NK, CCS)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Note 1) This is the Icu value when the bare main body and the external relay are combined.

(Note 2) The number of operating cycles without rated current also includes the number of operating cycles with rated current.

(Note 3) AE2000-SWA, AE4000-SWA and AE4000-SW-AE6300-SW apply for only vertical terminal of connecting terminal.

(Note 4) This value is max. operating cycle for just ACB body without any accessories.

(Note 5) Products with low rating types are available. For AE630-SW low rating types (250A, 315A, 500A), DP3 is not available.

AE630-SW | 3 kinds of products with low rating types are available.
AE2000-SW | 2 kinds of products with low rating types are available.
<table>
<thead>
<tr>
<th>Frame size</th>
<th>Rated impulse withstand voltage (Uimp) (kV)</th>
<th>Rated operational voltage (Ue) (50/60Hz)(AC.V)</th>
<th>Rated insulation voltage (Ui) (50/60Hz)(AC.V)</th>
<th>Rated current In (CT rating) (A)</th>
<th>Pollution degree</th>
<th>Icu (kA rms)</th>
<th>Ultimate breaking capacity (Icm) (kA peak)</th>
<th>Rated making capacity (INM) (A)</th>
<th>Operating cycles without rated current</th>
<th>External relay</th>
<th>With rated</th>
<th>Bare + MCR</th>
<th>Fixing way</th>
<th>Type</th>
<th>Contact terminal</th>
<th>Connecting terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>5670</td>
<td>690</td>
<td>690</td>
<td>1000</td>
<td>1260</td>
<td>3</td>
<td>3.4 (HN, FN) (Note 7)</td>
<td>4 (HN)</td>
<td>1600 ≤ Ir ≤ 2500</td>
<td>2000 ≤ Ir ≤ 3200</td>
<td>2500 ≤ Ir ≤ 4000</td>
<td>3150 ≤ Ir ≤ 5000</td>
<td>4000 ≤ Ir ≤ 6300</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>2000 (Note 5)</td>
<td>2500</td>
<td>3200</td>
<td>4000</td>
<td>2000</td>
<td>3</td>
<td>3.4 (HN, FN) (Note 7)</td>
<td>4 (HN)</td>
<td>1600 ≤ Ir ≤ 2500</td>
<td>2000 ≤ Ir ≤ 3200</td>
<td>2500 ≤ Ir ≤ 4000</td>
<td>3150 ≤ Ir ≤ 5000</td>
<td>4000 ≤ Ir ≤ 6300</td>
<td></td>
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<tr>
<td>1000-1100</td>
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<td>2880-3040</td>
<td>2880-3040</td>
<td>2880-3040</td>
<td>2880-3040</td>
</tr>
<tr>
<td>4500-4750</td>
<td>4500-4750</td>
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<td>4500-4750</td>
<td>4500-4750</td>
<td>4500-4750</td>
<td>4500-4750</td>
</tr>
</tbody>
</table>

(Note 6) This value means the instantaneous breaking time at shortcircuit interruption. (Remark) All models conforms to the interrupting function according to IEC 60947-2. Reverse connection is possible.

(Note 7) 4(HN) means the neutral poles current capacity is 50% of the rated current, for 4 poles.

(Note 8) 3, 4 (HN, FN) (Note 7) 4(HN) means the neutral poles current capacity is 100% of the rated current, for 4 poles.

(Note 9) Marine approval value is 138kA.
The closing spring is charged by an electric motor. When the breaker is closed, the spring is charged automatically (ON-charge method). The closing coil (CC) is required to remotely close the breaker, and the shunt trip device is required to remotely open the breaker.

The closing spring is charged by the manual charging handle. The breaker is closed when the ON button is pressed, and opened when the OFF button is pressed. The breaker cannot be closed while the OFF button is being pressed. (Safety design)

OFF lock is enabled by padlock (See P7, P17) as standard.

The indicator shows the ON or OFF state of the main contacts.

When the closing spring is completely charged, the charging indicator will show "CHARGED".

Pumping prevention is assured both electrically and mechanically.

As the charging completion contact is separate from the electrical charging circuit, its function in the control scheme can be arranged as desired.

Manual charging operation is also possible.

OFF charging method is also available. The closing spring is charged automatically when the breaker is opened. This is available only by externally connecting b contact (AXb) of the auxiliary switch to the motor charging circuit in series.

In case of DC power supply, please use high capacity auxiliary switch (HAX).

Available connections

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>FIX-VT</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>○</td>
<td>−</td>
<td>○</td>
<td>−</td>
<td>−</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>FIX-VTA</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>−</td>
<td>○</td>
<td>○</td>
<td>−</td>
<td>−</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>FIX-FTA</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>−</td>
<td>−</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Available connections for 24V DC and 48V DC:

- For AE4000-SWA 4 pole and AE4000-SW ~ AE6300-SW, we cannot manufacture in 24V DC and 48V DC rating.

- Connection image : AE630~1600-SW, 3-pole type

- Connection image : AE2000-SWA, 3-pole type

- Connection image : AE630~1600-SW, 3-pole type
**Manual charging**

The closing spring is charged by the manual charging handle. The breaker is closed when the ON button is pressed, and opened when the OFF button is pressed.

- When the closing spring is completely charged, the charging indicator will show "CHARGED".
- The indicator shows the ON or OFF state of the main contacts.
- The breaker cannot be closed while the OFF button is being pressed. (Safety design)
- OFF lock is enabled by padlock (See P7, P17) as standard.

**Motor charging device (MD)**

The closing spring is charged by an electric motor. When the breaker is closed, the spring is charged automatically (ON-charge method). The closing coil (CC) is required to remotely close the breaker, and the shunt trip device is required to remotely open the breaker.

- Manual charging operation is also possible.
- Pumping prevention is assured both electrically and mechanically.
- As the charging completion contact is separate from the electrical charging circuit, its function in the control scheme can be arranged as desired.

**Motor charging rating**

<table>
<thead>
<tr>
<th>Rated voltage (V)</th>
<th>Applicable voltage range (V)</th>
<th>Applied voltage (V)</th>
<th>Inrush (Peak value) (A)</th>
<th>Steady current (A)</th>
<th>Charging time (s)</th>
<th>Criterion for power requirement (VA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>24DC</td>
<td>18 - 28.4</td>
<td>24</td>
<td>&lt; 0.4</td>
<td>6</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>48DC</td>
<td>36 - 52.8</td>
<td>48</td>
<td>&lt; 0.4</td>
<td>3</td>
<td>700</td>
<td></td>
</tr>
<tr>
<td>AC/DC 100-150</td>
<td>85 - 137.5</td>
<td>100</td>
<td>AC &lt; 0.45</td>
<td>3/6</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>AC/DC 200-250</td>
<td>170 - 275</td>
<td>200</td>
<td>AC &lt; 0.45</td>
<td>1/2</td>
<td>700</td>
<td></td>
</tr>
</tbody>
</table>

Values in parentheses show values for AE4000-SWA 4 pole and AE4000-SW ~ AE6300-SW.

We cannot manufacture AE4000-SWA 4 pole and AE4000-SW ~ AE6300-SW in 24V DC and 48V DC rating.

**Charging completion contact rating**

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Resistance load (A)</th>
<th>Inductive load (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>460</td>
<td>6</td>
<td>2.5</td>
</tr>
<tr>
<td>250</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>125</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>DC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>3</td>
<td>1.5</td>
</tr>
<tr>
<td>125</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>250</td>
<td>3</td>
<td>1.5</td>
</tr>
<tr>
<td>30</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>
Closing coil (CC)

The closing coil is a device to close the breaker by remote control.

- An interlock to prevent pumping is provided electrically.
- Closing coil means time from the initial energization of the closing coil up to the complete closing of the main contacts.
- An interlock to prevent pumping is provided electrically.
- As CC is one-pulse driven, it is not necessary to insert AXb for burning prevention purposes. Inserting AXb will cause

<table>
<thead>
<tr>
<th>Rated voltage (Applicable voltage range)</th>
<th>Operating voltage - Operating inrush current (VA)</th>
<th>Closing time (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>24-46V DC (18.5-5A)</td>
<td>AC 24V DC 3.8A (100W)</td>
<td>0.08 s or less</td>
</tr>
<tr>
<td></td>
<td>DC 48V DC 6.8A (200W)</td>
<td></td>
</tr>
<tr>
<td>100-250V AC - DC common (75-275)</td>
<td>100V AC 0.7A (100VA)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>250V AC 1.7A (250VA)</td>
<td></td>
</tr>
</tbody>
</table>

Note 1) In case of double rating of rated voltage, it is the value for the lower rating.

- Closing time means time from the initial energization of the closing coil up to the complete closing of the main contacts.
- As CC is one-pulse driven, it is not necessary to insert AXb for burning prevention purposes. Inserting AXb will cause

Shunt trip device (SHT)

The shunt trip device is a device to open the breaker by remote control. A cut-off switch is included.

<table>
<thead>
<tr>
<th>Rated voltage (Applicable voltage range)</th>
<th>Operating voltage - Operating inrush current (VA)</th>
<th>Operating time (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>24-46V DC (16.5-5A)</td>
<td>AC 24V DC 2.5A (100W)</td>
<td>0.04 s or less</td>
</tr>
<tr>
<td></td>
<td>DC 48V DC 6.8A (200W)</td>
<td></td>
</tr>
<tr>
<td>100-250V AC - DC common (75-275)</td>
<td>100V AC 0.6A (100VA)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>250V AC 1.4A (250VA)</td>
<td></td>
</tr>
<tr>
<td>380-500V AC (265-505)</td>
<td>380V AC 0.5A (250VA)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>500V AC 0.7A (350VA)</td>
<td></td>
</tr>
</tbody>
</table>

Note 1) In case of double rating of rated voltage, it is the value for the lower rating.

- Operating time for AE4006-SW~AE6300-SW is 0.05s or less.
Under voltage trip device (UVT)

This is the device that automatically trips the breaker when the circuit voltage drops below the nominal voltage, and comprises UVT coil and UVT controller. There are 3 kinds of tripping time, INST, 0.5s and 3.0s. A trip terminal for forced OFF function is included as standard equipment.

<table>
<thead>
<tr>
<th>Ruled voltage</th>
<th>Frequency</th>
<th>operating time (time delay)</th>
<th>Pick-up voltage</th>
<th>Drop-out voltage</th>
<th>Trip function</th>
<th>Power consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>105-120V AC</td>
<td>50/60Hz</td>
<td>50-600msec</td>
<td>65-85V</td>
<td>45-70V</td>
<td>With open circuit of DT1, DT2 terminals</td>
<td>Steady: 20VA (max: 25VA)</td>
</tr>
<tr>
<td>220-240V AC</td>
<td>50/60Hz</td>
<td>50-600msec</td>
<td>130-170V</td>
<td>90-140V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24V DC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48V DC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100-110V DC</td>
<td>50/60Hz</td>
<td>50-600msec</td>
<td>65-85V</td>
<td>45-70V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>150-125V DC</td>
<td>50/60Hz</td>
<td>50-600msec</td>
<td>76-100V</td>
<td>54-84V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note1) In case of 380-460V AC, the external unit is attached additionally.
Note2) The operating time is a guarantee value when it drops from 85% or more of rated voltage.
Note3) Time delay should be allowed for 1.5s between applying the voltage to the UVT and closing the breaker.
Note4) If a remote trip function is required, remove the shorting bar (DT1 DT2) and connect a normally closed switch, rated 0.5A at 150V DC across them.
Note5) If a forced OFF function is used, the shorting (signal input to DT1 and DT2) should be held for 0.2 sec or more.
Note6) When an ambient temperature is at 65°C, this device is installed outside of the ACB body.
Note7) The operating time in the above table does not include the operating time of the ACB.

OCR alarm (AL) [Automatic reset type: Short-time operation (30ms)]

OCR alarm (AL) is provided as standard if ETR is equipped. OCR alarm (AL) is the contact (1a) of short-time operation (30ms), being output when the breaker is tripped by the electronic trip relay. Two types of automatic reset type (standard) and manual reset type (optional) are available. When ordering, specify either automatic reset or Manual reset.

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Current (A)</th>
<th>Resistant load</th>
<th>Inductive load</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC 24V</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>DC 24V</td>
<td>0.2</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>0.4</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

Note1) Though the control power supply is unnecessary to activate OCR alarm (AL), the self-holding circuit is necessary since the contact output is activated for the short-time (30ms).
Note2) This works when tripping occurs in LTD, STD, INST, GFR or ER.
Note3) If any continuous output of OCR alarm (AL) is necessary, use the trip indication (TI) output contact of the electronic trip relay. Choose P3, P4 or P5 for power supply type.

OCR alarm (AL) [MRE : Manual reset type]

On the manual reset type (optional), the gray manual reset button on the front side of the breaker will stick out to continuously output OCR alarm (AL) if the breaker is tripped by the electronic trip relay. After tripping, the breaker can not be turned on unless the manual reset button is pressed for resetting.

Auxiliary switch

Standard (AX) • High capacity type (HAX)

This is the contact that remotely indicates the ON or OFF status of the breaker.

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Current (A)</th>
<th>Min. load range graph</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC 250</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>125</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>DC 250</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>125</td>
<td>0.6</td>
<td>10</td>
</tr>
<tr>
<td>30</td>
<td>10</td>
<td>6</td>
</tr>
</tbody>
</table>

Change-over sequence

- Breaker state
- a-contact (NO) b-contact (NC)
- ON OFF
- OFF ON

- The a and b contacts may turn simultaneously to ON instantaneously at the time of changing the contact;
  Pay attention to the contact state when designing circuits.
- The chattering time at the time of contact ON-OFF is below 0.025 s.
Accessories (for breaker unit)

**Push button cover (BC-L)**
- The cover prevents careless manual operation (ON, OFF) of the push buttons.
- BC-L can be locked by a padlock (The padlock should be supplied by the customer.)
- For the suitable size of a padlock, refer to Page 17.

**Cylinder lock (CYL)**
- The breaker is locked OFF with the cylinder lock.
- Since it is an interlock which only allows the key to be removed when the breaker is locked off, it can be used for interlocking two or more breakers.

**Counter (CNT)**
- The number of open/close operations of the breaker are shown by a 5 digit counter.

**Door frame (DF)**
- The door frame improves the appearance, after cutting out the panel door to install the breaker.
- As for panel cut-out dimensions, refer to page 53.

**Door interlock (DI)**
- The panel door cannot be opened unless the breaker is open position.
- A wire type mechanical interlock allows flexibility in positioning breakers in the switchboard.
- The parts of the Door panel should be supplied by the customer.
- DI can not be installed with “Mechanical interlock(MI)for 3 breakers.”

**Interphase Barrier (BA)**
- This enhances the interphase insulation between the terminal portions of the breaker, and prevents short-circuit due to conductive inclusion or dust. It can be attached and detached easily. As for its availability, refer to the following table.

<table>
<thead>
<tr>
<th>Type</th>
<th>Connections</th>
<th>AE630-SW/ AE1600-SW</th>
<th>AE2000-SWA</th>
<th>AE3200-SW/ AE3200-SW</th>
<th>AE4000-SWA</th>
<th>AE4000-SW/ AE6300-SW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed type (FIX)</td>
<td>Horizontal (FIX)</td>
<td>●</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vertical terminal (FIX-VT)</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Vertical terminal adapter (VTA)</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Front terminal adapter (FIX-FTA)</td>
<td>▲</td>
<td>▲</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Drawout type (DR)</td>
<td>Horizontal (DR)</td>
<td>●</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vertical terminal (DR-VT)</td>
<td>●</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
</tr>
<tr>
<td></td>
<td>Front terminal (DR-FT)</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
</tr>
<tr>
<td></td>
<td>Vertical terminal adapter (VTA)</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
<td>▲</td>
</tr>
<tr>
<td></td>
<td>Front terminal adapter (DR-FTA)</td>
<td>▲</td>
<td>▲</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

G: Available for the insulation  ▲: Available for separating terminals  L: Not existing type  –: Attachment is impossible

**Terminal Cover (TTC)**
- The transparent terminal cover prevents from careless touching to the live control terminals.
- Protection degree is IP20.
**Mechanical interlock (MI)**

This is the device to prevent parallel charge of 2 or 3 units of breakers, and it can interlock the breakers mechanically without fail. All combinations are available among any models from AE630-SW to AE6300-SW. Please make inquiries about installation to AE4000-SW–AE6300-SW. Further the interlock is possible among the different connection types or poles, such as fixed type or drawout type, 3 pole or 4 pole. In combination with electric interlock, the higher safety interlock system can be secured.

- For drawout type, the interlock works at “CONNECTED” position, and in another position the interlock is released, which assures easy maintenance and inspection of the breaker.
- When turning OFF one breaker and then turning ON another breakers, please take an interval 0.5 seconds or more.
- MI for 3 breakers can not be installed by combining with Door Interlock (DI).

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**Condenser trip device (COT)**

Please prepare by the customer. Refer to Page 13 for the specifications of combined SHT.

---

**Dust cover (DUC)**

Dust cover prevents the dust or water entering into the panel board from the breaker panel cut. Protection degree is IP54.
Drawout interlock (standard equipment)

This is the safety device that prevents insertion and drawout operation. When the breaker is ON, the drawout handle cannot be inserted, and insertion and drawout operation cannot be done unless the OFF button is pressed.

Position lock (standard equipment)

This is the device that locks automatically the drawout mechanism at “TEST” or “CONNECTED” positions during insertion and drawout operation. When the lock plate is pushed in, lock is released and operation can be continued.

Padlock

* This padlock should be supplied by customer.

A padlock can be arranged at the lock plate. Thereby, it is possible to prevent the connection position from being changed unnecessarily. As for outline dimensions of the padlock, please refer to the left figure.

Operating position of drawout type

CONNECTED position
- Both main and control circuits are connected.
- Normal in use condition.
- Lock plate is protruding

TEST position
- Main circuit is disconnected, but the control circuit is connected.
- The breaker operation can be tested with the door closed.
- Lock plate is protruding

DISCONNECTED position
- Both main and control circuits are disconnected.
- The door can be closed.

DRAOUT position
- This is the position for removing the breaker.
- The breaker is drawn out of the cradle on the extension rails.

Ground terminal is on right side of the cradle.

Cell switch (CL)

This is the switch to show the drawout position (CONNECTED, TEST, and DISCONNECTED) of the breaker. An arbitrary combination up to 4 pieces is available.

<table>
<thead>
<tr>
<th>Operating sequence</th>
<th>Disconnected</th>
<th>Connected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display position of drawout operation</td>
<td>DISCON</td>
<td>TEST</td>
</tr>
<tr>
<td>Switch</td>
<td>CL-C (CONNECTED)</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td>CL-T (TEST)</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td>CL-D (DISCONNECTED)</td>
<td>OFF</td>
</tr>
</tbody>
</table>

Note 1: The setting can be changed by customer later.
A preliminary setting of CL at factory shipment is as follows.
CL1:1C CL2:1C1D CL3:1C1T1D CL4:2C1T1D

Switch rating

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Resistive load (A)</th>
<th>Inductive load (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC 250</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>125</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC 250</td>
<td>3</td>
<td>1.5</td>
</tr>
<tr>
<td>125</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>30</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

Maximum contacts: Total 4c max.

Standard pattern:
- CL-C
- CL-T
- CL-D
- CL1 1
- CL2 1
- CL3 1
- CL4 1

* This padlock should be supplied by customer.
Shorting b-contact (SBC)

When moving the breaker from the connected to the test positions, this contact is used to short circuit auxiliary switch (AXb), thus maintaining the correct sequence of operation of the external control circuit. When ordering, SBC with the same number of contacts as auxiliary switches (AXb) will be provided.

<table>
<thead>
<tr>
<th>Operating sequence</th>
<th>Main circuit</th>
<th>Display position of drawout operation</th>
<th>Change-over sequence of SBC (bCONTACT)</th>
<th>Switch rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Disconnected</td>
<td>DISCON</td>
<td>TEST</td>
<td>CONNECT</td>
</tr>
<tr>
<td></td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

Note 1: Refer to the Min. load range graph in Page 14.

Lifting hook (HP)

This is the metal fitting to suspend the main body when the breaker is removed from the drawout cradle. The fixed type breaker is equipped with HP as standard.

Safety shutter (SST)

The safety shutters cover the conductors (cradle side) and prevent contact with them when the breaker is drawn out.

Safety shutter lock (SST-Lock)

This kit is used to lock the safety shutters using 2 padlocks (the padlocks to be customer’s supply). The safety shutters close when the breakers are drawn out to prevent accidental contact with the main contacts.

Mis-insertion preventor (MIP)

This prevents other breakers unspecified from inserting into the cradle, and 5 patterns in maximum are available.

Not available for AE4000-SW~AE6300-SW

Test jumper (TJ)

With the breaker taken out of its cradle, this device enables the breaker to be electrically opened and closed, and the operating sequence to be checked. 3m cable is equipped as standard shipment.
Electronic trip relay (Feature)

1. Main setting module
   This module provides the characteristic setting function of Over current protection according to application. The modules for general use (WS) and for generator protection use (WM) have the setting dials for LTD, STD and INST operating characteristics. And the module for special use (WB) has setting dials for INST only.

2. Optional setting module (option)
   With each optional setting modules, the following functions can be added respectively.
   G1: Ground fault protection
   N5: Neutral pole 50% protection
   E1: Earth leakage protection in combination with ZCT
   AP: 2nd Additional Pre-alarm

3. Power supply module
   This module provides the control power source for Trip indicator LED and Additional function modules like EX1, DP1, etc.
   Please select a Power supply type from P1 to P5, which include Power supplies with output contact or with SSR output contact for 200V DC
   (The Over current protection and Ground fault protection (GFR)* can work with power from Internal CT, even if Control power source is off.)
   Note: For Ground fault protection, it works under the rated current (In) setting of 0.2-1.0 without Control power source.

4. Pre-alarm (PAL LED and Current setting dial) (standard)
   This indicator displays the Pre-Alarm situation when the setting current is exceeded. If output contact for this Pre-alarm is required, Power supply module should be selected from P3, P4 or P5. And by adding the Optional setting module "AP", 2nd Pre-alarm can be added.

5. RESET button (standard)
   With this Reset button, Trip indicator, Display data like fault cause and current Pre-alarm are reseted. When Power supply module P3, P4 or P5 is equipped, the resetting from Control circuit terminal becomes possible. Additionally, this Reset button provides a lock function of resetting from Control circuit terminal becomes possible. Additionally, this Reset button provides a lock function of resetting from Control circuit terminal becomes possible.

6. TEST terminal (standard)
   This Test terminal is used for the field testing of characteristics with Mitsubishi Tester "Y-2005". (refer to Page 34).

Neutral pole overcurrent protection (NP) (standard)
When Harmonics in load current become higher, the current on Neutral pole may exceed the rated current. This Neutral pole overcurrent protection prevents the troubles caused by higher Harmonics.

Electronic trip relay (ETR) Type designation breakdown

<table>
<thead>
<tr>
<th>Main setting module</th>
<th>Optional setting module</th>
<th>Power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>INST, W1, W1, W1, W1</td>
<td>G1: Ground fault protection</td>
<td>P1: 100-240V AC-DC</td>
</tr>
<tr>
<td>RS3, WB, WM, WM</td>
<td>N5: Neutral pole 50% protection</td>
<td>P2: 24-60V DC</td>
</tr>
<tr>
<td>RS3, WS, WM, WS</td>
<td>E1: Earth leakage protection</td>
<td>P3: 100-240V AC / 100-125V DC with output contact</td>
</tr>
<tr>
<td>WS: General use</td>
<td>AP: 2nd Additional Pre-alarm</td>
<td>P4: 24-60V DC with output contact</td>
</tr>
<tr>
<td>MW: Generator protection use</td>
<td>NA: Without optional setting</td>
<td>P5: 100-240V DC with output contact</td>
</tr>
<tr>
<td>WB: INST only</td>
<td>ETR Auxiliary Equipment</td>
<td></td>
</tr>
<tr>
<td>WF: Protective coordination use</td>
<td>□ Temperature alarm (TAL)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ MCR switch (MCR-SW)</td>
<td></td>
</tr>
</tbody>
</table>

Additional function
- Display module (EX1)
- Network (BIF-DC, BIF-PR, BIF-MD)
- Wire system (when EX1 is specified): 3x3W, 3x4W, Normal connection, Reverse connection
Electronic trip relay (ETR) for WS relay with Ampere Meter and Fault Memory (DP3)

- **With ETR**
  - **Type**
    - WS2: AE2000-SWA, AE4000-SWA, AE6300-SW
  - **Optional setting**
    - G1: Ground fault protection
    - NA: Without optional setting
  - **ETR Auxiliary Equipment**
    - MCR switch (MCR-SW)

- **Power supply**
  - P1: 100–240V AC-DC
  - P2: 24–60V DC
  - P3: 100–240V AC / 100–125V DC with output contact
  - P4: 24–60V DC with output contact
  - P5: 100–240V DC with output contact (SSR)

- **Connection**
  - □ Neutral CT (NCT)

Note: For DP3, refer to page 23 on details.
**Electronic trip relay (for general use: WS)**

The table and the figure include both optional display and MCR.

For WS relay, Pre-alarm current "OVER" setting is Iu x 1.15.

### Adjustable setting range

<table>
<thead>
<tr>
<th>No.</th>
<th>Setting item</th>
<th>Mark</th>
<th>Adjustable setting range</th>
<th>Accuracy</th>
<th>Factory default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>Current setting</td>
<td>Ir</td>
<td>0.5 – 1.0 (0.05step) x In (CT rating)</td>
<td>—</td>
<td>1.0</td>
</tr>
<tr>
<td>H</td>
<td>Uninterrupted current</td>
<td>Iu</td>
<td>0.8 – 1.0 x Iu (0.02step), Pick-up current : 1.15 x Iu</td>
<td>± 20%</td>
<td>150</td>
</tr>
<tr>
<td>I</td>
<td>LTD time</td>
<td>Tl</td>
<td>12–25–50–100–150s at Iu x 2</td>
<td>± 20%</td>
<td>12–25–50–100–150s</td>
</tr>
<tr>
<td>J</td>
<td>STD pick-up current</td>
<td>Isd</td>
<td>1.5–2–2.5–3–4–5–6–7–8–9–10 x Iu</td>
<td>± 15%</td>
<td>10</td>
</tr>
<tr>
<td>K</td>
<td>STD time</td>
<td>Tsd</td>
<td>0.5–0.4–0.3–0.2–0.1–0.06–0.06–0.1–0.2–0.3–0.4–0.5s at Isd x 1.5</td>
<td>± 20%</td>
<td>0.5 (ON)</td>
</tr>
<tr>
<td>L</td>
<td>INST/MCR pick-up current</td>
<td>Li</td>
<td>AE630-SW–AE1600-SW 16–12–10–8–6–4–2–2–4–6–8–10–12–16 x Iu</td>
<td>± 15%</td>
<td>WS1–16 (INST)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>AE4000-SW</td>
<td></td>
<td>WS3–10 (INST)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>AE6300-SW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>Pre-alarm current</td>
<td>Ip</td>
<td>Iu x 0.68 – 1.0 (0.04step) –OVER</td>
<td>± 10%</td>
<td>OVER</td>
</tr>
<tr>
<td>O</td>
<td>Pre-alarm time</td>
<td>Tp</td>
<td>1/2 Tl at Iu x 2 (after 1/2 Tl, PAL contact output turns on.)</td>
<td>± 20%</td>
<td>—</td>
</tr>
</tbody>
</table>

Note: The figure shows WS1 type with G1 module, Display (DP1) and MCR switch. G1, DP1 and MCR are optional equipments.
Operating characteristic curve (for general use : WS)

The figure shows WS1 type with G1 module, Display (DP1) and MCR switch. G1, DP1 and MCR are optional equipments.

Note:
- Pre-alarm current : Ip
  - Iu x 0.68–1.01 x 0.04 step ± 10%
- Uninterrupted current : Iu
  - 0.8–1.0 x Ir (0.02 step)
- LTD Pick-up
  - 1.05 x Iu – Non pick-up
  - 1.25 x Iu – Pick-up

Pre-alarm time : Tp
- TL/2 ± 20% (at Iu x 2)

STD pick-up current : Isd
- Ir x 1.5–2–2.5–3–4–5–6–7–8–9–10 ± 15%

STD time : Tsd
- 0.06–0.1–0.2–0.3–0.4–0.5 (s) ± 20%
  (at Isd x 1.5)

With MCR
- LTD Pick-up, Ip… % of Uninterrupted current Iu
- Iu, Isd, Ii……… % of Current setting Ir

INST/MCR pick-up current : Ii
- Max. breaking time
  - In case of AE4000-SW~AE6300-SW, it is 0.05s
  - 0.8~1.0 x Ir (0.02 step)

Note1 When Tsd=0.06 setting, operating time is 0.04–0.08s. Ii is selectable : ON or OFF.
Electronic trip relay (for general use: WS relay with Ampere Meter and Fault Memory "DP3")

A. Trip indicator LED
B. Pre-alarm LED
C. Frequency selector switch
D. Load current LED
E. RUN LED
F. ERR. LED
G. Current setting dial
H. Uninterrupted current setting dial
I. LTD time setting dial
J. STD pick-up setting dial
K. STD time setting dial
L. INST/MCR pick-up current setting dial
M. Optional setting (P.31)
N. Pre-alarm current setting dial
O. RESET button (TEST L/S LOCK button)
P. TEST terminal

Note: The figure shows WS1 type with DP3 that equipped with G1. For optional setting, only G1 and MCR are available for WS relay with DP3.

Relation of setting dial

Load current LED
Pre-alarm LED
Frequency selector switch
Load current LED
RUN LED
ERR. LED
Current setting dial
Uninterrupted current setting dial
LTD time setting dial
STD time setting dial
INST/MCR pick-up current setting dial
Optional setting (P.31)
Pre-alarm current setting dial
RESET button (TEST L/S LOCK button)
TEST terminal

Adjustable setting range

<table>
<thead>
<tr>
<th>No.</th>
<th>Setting item</th>
<th>Mark</th>
<th>Adjustable setting range</th>
<th>Accuracy</th>
<th>Factory default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>Current setting</td>
<td>Ir</td>
<td>0.5 – 1.0 (0.05step) x In (CT rating)</td>
<td>—</td>
<td>1.0</td>
</tr>
<tr>
<td>H</td>
<td>Uninterrupted current</td>
<td>Lu</td>
<td>0.8 – 1.0 x Ir (0.02step), Pick-up current : 1.15 x Lu</td>
<td>±20%</td>
<td>150</td>
</tr>
<tr>
<td>I</td>
<td>LTD time</td>
<td>Tl</td>
<td>12–25–50–100–150s at Lu x 2</td>
<td>±20%</td>
<td>150</td>
</tr>
<tr>
<td>J</td>
<td>STD pick-up current</td>
<td>Isd</td>
<td>1.5–2.5–3.4–5.6–7.8–9–10 x Ir</td>
<td>±15%</td>
<td>10</td>
</tr>
<tr>
<td>K</td>
<td>STD time</td>
<td>Tsd</td>
<td>0.5–0.4–0.3–0.2–0.1–0.06–0.06–0.1–0.2–0.3–0.4–0.5s at Isd x 1.5</td>
<td>±20%</td>
<td>0.5 (R4 ON)</td>
</tr>
<tr>
<td>L</td>
<td>INST/MCR pick-up current</td>
<td>Li</td>
<td>AE630-SW–AE1600-SW 16-12-10-8-6-4-2-2-2-6-4-8-10-12-16 x Ir</td>
<td>±15%</td>
<td>WS1–16 (INST)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>AE2000-SW—AE3200-SW 12-10-8-6-4-2-2-2-6-8-10-12-12 x Ir</td>
<td></td>
<td>WS2–12 (INST)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>AE4000-SW</td>
<td></td>
<td>WS3–10 (INST)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>AE4000-SWA, AE5000-SWA 10-8-6-4-2-2-2-2-6-8-10-12 x Ir</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>Pre-alarm current</td>
<td>Ip</td>
<td>Lu x 0.68 – 1.0 (0.04step) –OVER</td>
<td>±10%</td>
<td>OVER</td>
</tr>
<tr>
<td>O</td>
<td>Pre-alarm time</td>
<td>Tp</td>
<td>1/2 Tl at Lu x 2 (after 1/2 Tl, PAL contact output turns on.)</td>
<td>±20%</td>
<td>—</td>
</tr>
</tbody>
</table>

The table and the figure include both optional display and MCR.
For WS relay, Pre-alarm current "OVER" setting is Lu x 1.15.
Operating characteristic curve
(for general use: WS relay with Ampere Meter and Fault Memory "DP3")
Electronic trip relay (for generator protection use : WM)

This WM relay is mainly used for the protection of generator on ship. Current setting Ir (default value) is fixed at the value complying with the rating of generator, which should be indicated when placing an order.

For WM relay only, when Pre-alarm current Ip is set at “OVER”, the Ip value becomes equal to “Ii x 1.0.”

Adjustable setting range

<table>
<thead>
<tr>
<th>No.</th>
<th>Setting item</th>
<th>Mark</th>
<th>Adjustable setting range</th>
<th>Accuracy</th>
<th>Factory default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>—</td>
<td>Current setting</td>
<td>Ir</td>
<td>To be fixed at Factory default value in the available range, which shows in Page 9 and 10.</td>
<td>—</td>
<td>To be complied with ordering indication</td>
</tr>
<tr>
<td>G</td>
<td>LTD pick-up current</td>
<td>l</td>
<td>1.0–1.05–1.1–1.15–1.2 x Ir</td>
<td>± 5%</td>
<td>1.15</td>
</tr>
<tr>
<td>H</td>
<td>LTD time</td>
<td>Tl</td>
<td>15–20–25–30–40–60s at l x 1.2</td>
<td>± 20%</td>
<td>20</td>
</tr>
<tr>
<td>I</td>
<td>STD pick-up current</td>
<td>Isd</td>
<td>1.5–2–2.5–3–3.5–4–4.5–5 x Ir</td>
<td>± 15%</td>
<td>5</td>
</tr>
<tr>
<td>J</td>
<td>STD time</td>
<td>Tsd</td>
<td>0.5–0.4–0.3–0.2–0.1–0.06–0.06–0.1–0.2–0.3–0.4–0.5s (I2t ON)</td>
<td>± 20%</td>
<td>0.5 (I2t ON)</td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>K</td>
<td>INST/MCR pick-up current</td>
<td>li</td>
<td>AE630-SW~AE6300-SW 16–12–10–8–6–4–2–2–4–6–8–10–12–16 x Ir</td>
<td>± 15%</td>
<td>WM1…16 (INST)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>AE2000-SW~AE3200-SW</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>AE4000-SW</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>AE2000-SWA, AE4000-SWA 12–10–8–6–4–2–2–4–6–8–10–12 x Ir</td>
<td>± 15%</td>
<td>WM2…12 (INST)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>AE5000-SW</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>AE630-SW 10–8–6–4–2–2–4–6–8–10, x Ir</td>
<td>± 15%</td>
<td>WM3…10 (INST)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>Pre-alarm current</td>
<td>Ip</td>
<td>l x 0.68 – 1.0 (0.04step) –OVER</td>
<td>± 5%</td>
<td>OVER</td>
</tr>
<tr>
<td>—</td>
<td>Pre-alarm time</td>
<td>Tp</td>
<td>1/2 Tl at l x 1.2 (after 1/2 Tl, PAL contact output turns on.)</td>
<td>± 20%</td>
<td>—</td>
</tr>
</tbody>
</table>

The table and the figure include both optional display and MCR. For WM relay only, when Pre-alarm current Ip is set at “OVER”, the Ip value becomes equal to “Ii x 1.0.”
**Operating characteristic curve (for generator protection use: WM)**

- **Pre-alarm current:** \( I_p \)
  - \( I_p \times 0.68 \times 1.0(0.04\text{step}) \pm 5\% \)

- **LTD pick-up current:** \( I_l \)
  - \( 1.0-1.05-1.1-1.15-1.2 \pm 5\% \)
  - Factory setting position is 1.15

- **Pre-alarm time:** \( T_p \)
  - \( T_l/2 \pm 20\% \) (at \( I_l \times 1.2 \))

- **STD pick-up current:** \( I_{sd} \)
  - \( I_{sd} \times 1.5-2-2.5-3-3.5-4-4.5-5 \pm 15\% \)

- **STD time:** \( T_{sd} \)
  - \( I_{sd} \times 0.68-0.7-0.8-0.9-1 \pm 20\% \) (at \( I_{sd} \times 1.5 \))

- **LTD time:** \( T_L \)
  - \( I_{sd} \times 1.5 \pm 5\% \)

- **Max. breaking time**
  - \( I_p \times 2-4-6-8-10-12 \pm 15\% \) (WM3)
  - \( I_{sd} \times 2-4-6-8-10 \pm 15\% \) (WM3)

---

**Note 1:** When \( T_{sd} = 0.06\text{setting, operating time is 0.04} \sim 0.08\text{s}.\)

**Note 2:** \( I_p \) is selectable: ON or OFF.

---

**Table and Figure Include Both Optional Display and MCR**

### Adjustable Setting Range

<table>
<thead>
<tr>
<th>Current (%)</th>
<th>Inst/MCR Pick-up Current: ( I_i )</th>
<th>LTD Pick-up Current: ( I_l )</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-8-6-4-2-2-4-6-8-10</td>
<td>( I_{sd} \times 1.5-2-2.5-3-3.5-4-4.5-5 \pm 15% )</td>
<td>( I_{sd} \times 1.5 \pm 5% )</td>
</tr>
</tbody>
</table>

---

**Graph Details**

- Current: \( I_l, I_{sd}, I_i \) — % of Current setting \( I_r \)
- \( I_{sd} \) — % of LTD pick-up current \( I_l \)

---

**INFORMATION**

- Pre-alarm current: \( I_p \)
- LTD pick-up current: \( I_l \)
- Pre-alarm time: \( T_p \)
- STD pick-up current: \( I_{sd} \)
- STD time: \( T_{sd} \)
- LTD time: \( T_L \)
- INST/MCR pick-up current: \( I_i \)
- Max. breaking time
  - In case of AE6000-SW, it is 0.05s.
  - In case of AE4000-SW, it is 0.05s.
Electronic trip relay (for special use: WB)

This WB relay is effective for the combination with the external OCR without severely decreasing the breaking capacity.
Actually, if ACB is combined with the external OCR only without WB relay, its breaking capacity comes to be reduced drastically. (e.g. For AE1600-SW, it's reduced to 25kA.)

Adjustable setting range

<table>
<thead>
<tr>
<th>No.</th>
<th>Setting item</th>
<th>Mark</th>
<th>Adjustable setting range</th>
<th>Accuracy</th>
<th>Factory default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Current setting</td>
<td>Ir</td>
<td>0.5 ~ 1.0 (0.05step) x In (CT rating)</td>
<td>—</td>
<td>1.0</td>
</tr>
<tr>
<td>H</td>
<td>INST/MCR pick-up current</td>
<td>Li</td>
<td>AE830-SW–AE1600-SW; AE2000-SW–AE3200-SW; AE4000-SW; AE10000-SW; AE18000-SW; AE2000-SW; AE4000-SW; AE6300-SW; AE8300-SW</td>
<td>± 15%</td>
<td>WB1…16 (INST)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>16-12-10-8-6-4-2-2-2-2-2-2-2-2-2-2-12-16 x Ir</td>
<td></td>
<td>WB2…12 (INST)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(INST) (MCR)</td>
<td></td>
<td>WB3…10 (INST)</td>
</tr>
<tr>
<td>I</td>
<td>Pre-alarm current</td>
<td>Ip</td>
<td>Ir x 0.68 ~ 1.0 (0.04step) –OVER</td>
<td>± 10%</td>
<td>OVER</td>
</tr>
<tr>
<td></td>
<td>Pre-alarm time</td>
<td>Tp</td>
<td>75s at Ir x 2 (after 75s, PAL contact output turns on.)</td>
<td>± 20%</td>
<td>—</td>
</tr>
</tbody>
</table>

The table and the figure include both optional display and MCR.
For WB relay, when Pre-alarm current Ip is set at “OVER”, the Ip value is “Ir x 1.15.”
Operating characteristic curve (for special use: WB)

Pre-alarm current: Ip
Ir x 0.68 ~ 1.0 (0.04 step) - OVER ± 10%

Pre-alarm time: Tp
75 s ±20% at Ir x 2

Max. time of let-through current

Max. Setting of External OCR

INST/MCR pick-up current: Ii
Ir x 2-4-6-8-10-12 ±15% [WB1]
Ir x 2-4-6-8-10-12 ±15% [WB2]
Ir x 2-4-6-8-10-12 ±15% [WB3]

Max. breaking time
(In case of AE4000-SW~AE6300-SW, it is 0.05s)

Adjustable setting range
Current setting 0.5 ~ 1.0 (0.05 step) x In (CT rating)

Pre-alarm current Ip
Ir x 0.68 ~ 1.0 (0.04 step) - OVER ± 10%

Pre-alarm time Tp
75 s ±20% at Ir x 2

Max. time of let-through current

Max. Setting of External OCR

INST/MCR pick-up current Ii
Ir x 2-4-6-8-10-12 ±15% [WB1]
Ir x 2-4-6-8-10-12 ±15% [WB2]
Ir x 2-4-6-8-10-12 ±15% [WB3]

The figure shows WB1 type with MCR switch.
MCR is optional equipment.

Note:

The table and the figure include both optional display and MCR.
For WB relay, when Pre-alarm current Ip is set at "OVER", the Ip value is "Ir x 1.15".

This WB relay is effective for the combination with the external OCR without severely decreasing the breaking capacity.
Actually, if ACB is combined with the external OCR only without WB relay, its breaking capacity comes to be reduced drastically. (e.g. For AE1600-SW, it's reduced to 25kA.)
Electronic trip relay (for protective coordination use: WF)

WF relay incorporates five kinds of LTD characteristics. Protective coordination with upstream OCRs and/or Fuses can be more easily achieved.

The selectable characteristics are the following five curves.

- (f ⋅ 1)-f = const.
- (f ⋅ 1)-f = const.
- (f − 1)-f = const.
- (f + 1)-f = const.

LTD curve can be selected by the LTD curve setting dial.

### Adjustable setting range

<table>
<thead>
<tr>
<th>No.</th>
<th>Setting item</th>
<th>Mark</th>
<th>Adjustable setting range</th>
<th>Accuracy</th>
<th>Factory default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>Current setting</td>
<td>Ir</td>
<td>0.5 ~ 1.0 (0.05step) x ln (CT rating)</td>
<td>1.10 x Ir—Non pick-up</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>LTD pick-up current</td>
<td></td>
<td>LTD pick-up current : 1.15 x Ir</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>LTD time</td>
<td>Tt</td>
<td>1<del>2</del>3<del>4</del>5<del>6</del>8<del>10</del>12<del>15</del>18s at Ir x 4</td>
<td>± 30% (1.5Ir/load current)</td>
<td>18</td>
</tr>
<tr>
<td>I</td>
<td>STD pick-up current</td>
<td>Isd</td>
<td>0.02<del>1</del>2<del>3</del>4</td>
<td>± 15%</td>
<td>2</td>
</tr>
<tr>
<td>J</td>
<td>STD time</td>
<td>Tsd</td>
<td>0.05<del>0.4</del>0.9<del>0.3</del>0.0<del>0.6</del>0.06<del>0.06</del>0.1<del>0.2</del>0.3<del>0.4</del>0.5 (s)</td>
<td>± 20%</td>
<td>0.5 (P ON)</td>
</tr>
<tr>
<td>K</td>
<td>INST/MCR pick-up current</td>
<td>Li</td>
<td>AE630-SW-AE1600-SW AE2000-SW-AE3200-SW AE4000-SW</td>
<td>± 15%</td>
<td>WF1~16 (INST)</td>
</tr>
<tr>
<td></td>
<td>AE2000-SWA, AE4000-SWA AE5000-SW</td>
<td></td>
<td>16<del>12</del>10<del>8</del>6<del>4</del>2<del>2</del>4<del>6</del>8<del>10</del>12~16 ~Ir</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AE6300-SW</td>
<td></td>
<td>10<del>8</del>6<del>4</del>2<del>4</del>6<del>8</del>10~x Ir</td>
<td>± 20%</td>
<td>WF2~12 (INST)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(P ON)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(P OFF)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>Pre-alarm current</td>
<td>Ip</td>
<td>Ir x 0.68 ~ 1.0 (0.04step) —OVER</td>
<td>± 5%</td>
<td>OVER</td>
</tr>
<tr>
<td></td>
<td>Pre-alarm time</td>
<td>Tp</td>
<td>1/2 Tt at Ir x 4</td>
<td>± 5%</td>
<td>OVER</td>
</tr>
</tbody>
</table>

The table and the figure include both optional display and MCR. For WF relay, when Pre-alarm current Ip is set at "OVER", the Ip value is "Ir x 1.15".
Operating characteristic curve (for protective coordination use : WF)

[LTD curve setting "a=0.02"]

[LTD curve setting "a=1"]

[LTD curve setting "a=3"]

[LTD curve setting "a=4"]

Note 1: LTD operating time tLTD is calculated by the following equations.

\[ t_{LTD} = \frac{(a/1.115)x - T_0}{v} x T_0 \]  

a = LTD curve setting  
\( x = \) load current (A)  
\( v = 0.5 - 0.6 \times x \)  
\( T_0 = 1 - 18 \) (s)

The accuracy of operating time is ±30% (1.5Ic/load current) or ±20% (4Ir/load current).

LTD operating time is 0.6(I2t) when the operating time becomes 0.8s or less.

Note 2: PAL operating time tPAL is calculated by the following equations.

\[ t_{PAL} = \frac{(4/0.377) \times I_c - 1}{I_2} \]  

a = LTD curve setting  
\( x = \) load current (A)  
\( v = 0.6 - 1.1 x \)  
\( T_0 = 1 - 18 \) (s)

The accuracy of operating time is ±30% (1.5Ic/load current) or ±20% (4Ir/load current).

PAL operating time is 0.5(I2t) when the operating time becomes 0.8s or less.

Note 3: When Tsd = "0.08" setting, operating time is 0.04–0.08s.

IP is selectable : ON or OFF.
Electronic trip relay

### Accessories

#### Ground fault protection (GFR)

The ground fault protection (GFR) of several hundred amperes is possible. This function can be selected for trip and alarm (no trip). Power supply is necessary for this function, even if there is not power supply, it can function at 0.2xIn or higher.

<table>
<thead>
<tr>
<th>Setting item</th>
<th>Mark</th>
<th>Adjustable setting range</th>
<th>Accuracy</th>
<th>Factory default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>GFR pick-up current</td>
<td>Ig</td>
<td>0.1-0.2-0.3-0.4-0.5-0.6-0.7-0.8-0.9-1.0 x In</td>
<td>±20%</td>
<td>1.0</td>
</tr>
<tr>
<td>GFR time</td>
<td>Tg</td>
<td>3-1.5-0.8-0.5-0.3-0.15&lt;0.1 - &lt;0.1-0.15-0.3-0.5-0.8-1.5-3s (at 1.5 x Ig)</td>
<td>±20%</td>
<td>3s (TRIP)</td>
</tr>
<tr>
<td>alarm output</td>
<td>—</td>
<td>TRIP side : Self-holding/ALARM side : Automatic reset</td>
<td>—</td>
<td>TRIP side Self-holding</td>
</tr>
</tbody>
</table>

#### Neutral CT (NCT)  ※Only use for AE-SW

The Neutral CT is used for ground fault protection when the 3 pole breaker is used on a 3 phase 4 wires system and for over current protection on N phase. Please use this CT in combination with ground fault protection (GFR). As for outline dimensions, refer to page 54. The length of the cable (attached) for NCT is 2m.

---

Refer to Outline dimensions in page 54.
Earth leakage protection (ER)

By combining the ETR with earth leakage protection (ER) and External ZCT, earth leakage protection is possible. Earth leakage protection, earth leakage tripping, and earth leakage alarm can be selected. Control supply is necessary for this function.

<table>
<thead>
<tr>
<th>Setting item</th>
<th>Mark</th>
<th>Adjustable setting range</th>
<th>Accuracy</th>
<th>Factory default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ER pick-up current</td>
<td>λi/n</td>
<td>1A-2A-3A-5A-10A</td>
<td>±20%</td>
<td>10A</td>
</tr>
<tr>
<td>ER time</td>
<td>Te</td>
<td>3-1.5-0.8-0.5-0.3-0.15-&lt;0.1-0.1-0.15-0.3-0.5-0.8-1.5-3s (at 1.5 x i/n)</td>
<td>±20%</td>
<td>3s (TRIP)</td>
</tr>
<tr>
<td>Alarm output</td>
<td>TRIP side : Self-holding/ALARM side : Automatic reset</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
</tbody>
</table>

External ZCT

This option is used to detect several amperes of earth leakage when used in combination with an electronic trip relay that has the earth leakage tripping (ER) option. Two methods are available. The first is where the all load conductors pass through the ZCT. The other method uses a smaller ZCT through which the supply transformer's ground wire passes through to the earth.

ZCT for load circuit

<table>
<thead>
<tr>
<th>ZCT type name</th>
<th>ACB type name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZCT163</td>
<td>AE630-SW ~ AE1600-SW 3-pole</td>
</tr>
<tr>
<td>ZCT323</td>
<td>AE630-SW ~ AE1600-SW 4-pole</td>
</tr>
<tr>
<td>ZCT324</td>
<td>AE2000-SW ~ AE3200-SW 3-pole</td>
</tr>
</tbody>
</table>

ZCT for transformer ground wire

<table>
<thead>
<tr>
<th>ZCT type name</th>
<th>ACB type name / Pole</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZT15B</td>
<td>ZT30B</td>
</tr>
<tr>
<td>ZT40B</td>
<td>ZT60B</td>
</tr>
<tr>
<td>ZT80B</td>
<td>ZT100B</td>
</tr>
</tbody>
</table>

ZCT with primary conductors

<table>
<thead>
<tr>
<th>ZCT type name</th>
<th>ACB type name / Pole</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZTA1200A</td>
<td>AE630-SW / 3P, AE1000-SW / 3P</td>
</tr>
<tr>
<td>ZTA2000A</td>
<td>AE1250-SW / 3P, AE1600-SW / 3P</td>
</tr>
</tbody>
</table>

As for outline dimensions refer to page 54. Make a choice of suitable ZCT in conformity to the BUSBAR size.

---

![ER function block diagram (load circuit method)](image1)

![ER function block diagram (transformer ground wire method)](image2)
When used OA equipment or DC power source that brings the third higher harmonic in 3 phases 4 wires circuit, is sometimes it electrically damages the other peripheral equipments due to the superposition of the third higher harmonic on Neutral pole. This Neutral Pole 50% Protection (N5) is useful to protect the other peripheral equipments from such an electrical damage and also to prevent some troubles with the Pre-Alarm function (AP). Neutral pole overcurrent protection (operating at 100% of rated current) is already equipped with ETR as standard features. But, if the operation at 50% of rated current is required on Neutral pole, it becomes available with this optional module unit.

### Accessories

#### 2nd Additional Pre-alarm (AP)

The Pre-Alarm (1st) function is already installed in standard breaker, the 2nd additional Pre-Alarm function can be installed as option, thereby it is possible to monitor (observer) electric circuit in more detail by 2nd additional Pre-Alarm function.

<table>
<thead>
<tr>
<th>Setting item</th>
<th>Mark</th>
<th>Adjustable setting range</th>
<th>Accuracy</th>
<th>Factory default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd Additional Pre-alarm</td>
<td>Ip2</td>
<td>0.5-0.6-0.7-0.8-0.84-0.88-0.92-0.96-1.0 x Iu</td>
<td>±10% WM</td>
<td>1.0</td>
</tr>
<tr>
<td>pick-up current</td>
<td></td>
<td>0.5-0.6-0.7-0.8-0.84-0.88-0.92-0.96-1.0 x Iu</td>
<td>±5% WM</td>
<td>0.9 (x TL)</td>
</tr>
<tr>
<td>2nd Additional Pre-alarm</td>
<td>Tp2</td>
<td>0.8-0.8-0.8-0.8-0.8-0.8-0.8-0.8-0.3 x TL</td>
<td>±20%</td>
<td></td>
</tr>
<tr>
<td>time</td>
<td></td>
<td>5-10-15-20-30-40-60s</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**<Pre-alarm timing chart>**

PAL LED starts to blink at time when the actual current exceeds the setting current. Then after it passes a half of LTD time (TL), it starts to light and simultaneously the contact output starts. As for its operating time, refer to the Operating characteristic curves in Page 22, 24, 26 and 28.

### Neutral pole 50% protection (N5)

When used OA equipment or DC power source that brings the third higher harmonic in 3 phases 4 wires circuit, is sometimes it electrically damages the other peripheral equipments due to the superposition of the third higher harmonic on Neutral pole. This Neutral Pole 50% Protection (N5) is useful to protect the other peripheral equipments from such an electrical damage and also to prevent some troubles with the Pre-Alarm function (AP). Neutral pole overcurrent protection (operating at 100% of rated current) is already equipped with ETR as standard features. But, if the operation at 50% of rated current is required on Neutral pole, it becomes available with this optional module unit.
When used OA equipment or DC power source that brings the third higher harmonic in 3 phases 4 wires circuit, is sometimes it electrically damages the other peripheral equipments due to the superposition of the third higher harmonic on Neutral pole. This Neutral Pole 50% Protection (N5) is useful to protect the other peripheral equipments from such an electrical damage and also to prevent some troubles with the Pre-Alarm function (AP).

Neutral pole overcurrent protection (operating at 100% of rated current) is already equipped with ETR as standard features. But, if the operation at 50% of rated current is required on Neutral pole, it becomes available with this optional module unit.

Neutral pole 50% protection (N5)

The Pre-Alarm (1st) function is already installed in standard breaker, the 2nd additional Pre-Alarm function can be installed as option, thereby it is possible to monitor (observer) electric circuit in more detail by 2nd additional Pre-Alarm function.

2nd Additional Pre-alarm (AP)

2nd Additional Pre-alarm pick-up current

| Ip2’n | 1.0 | 0.9 (x TL) ± 20%T
|       |     | ± 10%Tp2 |

Setting item Mark Adjustable setting range Factory default value Accuracy

Temperature alarm (TAL)

When TAL sensor is installed in the breaker, temperature alarm is operative. When the temperature of main contact exceeds normal level, temperature alarm is indicated by LED on main setting module and also the output contact is made energize if power supply with output contact is installed. It is possible to know temperature rising which is caused by wear of main contact because TAL sensor is installed near main contact. When the temperature of main contact goes down to the normal level, temperature alarm turns off automatically.

Field test device (Y-2005)

The electronic trip relay can be checked by this field test device when the breaker is at the test position or the disconnect position. The breaker will trip when tested with this device.

Y-2005 specification

<table>
<thead>
<tr>
<th>Test items</th>
<th>LTD, STD, INST, GFR, PAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range of signal output</td>
<td>Voltage signal equivalent to 1%–2500% of Rated current In (CT rating)</td>
</tr>
<tr>
<td>Dimensions</td>
<td>220mm(W) x 150mm(H) x 340mm(D)</td>
</tr>
<tr>
<td>Time counter</td>
<td>0.000 – 999.999s</td>
</tr>
<tr>
<td>Input voltage</td>
<td>100-240V AC 50/60Hz</td>
</tr>
<tr>
<td>Weight</td>
<td>4.5kg</td>
</tr>
</tbody>
</table>
Electronic trip relay

**Additional functions**

By adding the extension module unit in ETR, additional functions like measuring, display and communication become available.

**List of extension unit (Option)**

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extension module</td>
<td>EX1</td>
<td>Base module for display and interface function (indispensable)</td>
</tr>
<tr>
<td>Display module (relay attachment)</td>
<td>DP1</td>
<td>Display module for ETR</td>
</tr>
<tr>
<td>Display module (panel attachment)</td>
<td>DP2</td>
<td>Display module for panel board</td>
</tr>
<tr>
<td>VT unit</td>
<td>VT</td>
<td>Module for measuring voltage, active power and active energy</td>
</tr>
<tr>
<td>CC-Link® interface unit</td>
<td>BIF-CC</td>
<td>Interface unit for CC-Link®</td>
</tr>
<tr>
<td>PROFIBUS-DP interface unit</td>
<td>BIF-PR</td>
<td>Interface unit for PROFIBUS-DP</td>
</tr>
<tr>
<td>MODBUS® (RS-485) interface unit</td>
<td>BIF-MD</td>
<td>Interface unit for MODBUS® (RS-485)</td>
</tr>
<tr>
<td>I/O unit</td>
<td>BIF-CON</td>
<td>Module for breaker remote control (Interface unit is required)</td>
</tr>
<tr>
<td>Drawout position switch</td>
<td>BIF-CL</td>
<td>Switch for detecting the drawout position of the breaker</td>
</tr>
</tbody>
</table>

Note: The above extension units are not available for WS relay with DP3.

**Selection samples of additional function modules**

(☐: required optional modules)

<table>
<thead>
<tr>
<th>Additional function</th>
<th>Name</th>
<th>Extension module</th>
<th>Display</th>
<th>VT unit</th>
<th>Interface unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load current</td>
<td></td>
<td>☐</td>
<td>DP1 or/and DP2</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td></td>
<td>☐</td>
<td>VT</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
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<td>☐</td>
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<td></td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Voltage, Power, Energy etc.</td>
<td></td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<td></td>
<td></td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

**Electronic trip relay (ETR) Type designation breakdown**

- **Main setting module**: G1: Ground fault protection, N6: Neutral pole 50% protection, E1: Earth leakage protection, AP: 2nd Additional Pre-alarm, NA: Without optional setting
- **ETR Auxiliary Equipment**: P1: 100-240V AC, P2: 24-60V DC, N5: Neutral pole 50% protection, E1: Earth leakage protection, AP: 2nd Additional Pre-alarm, NA: Without optional setting
- **Power supply**: P1: 100-240V AC, P2: 24-60V DC, P3: 100-240V AC / 100-125V DC with output contact, P4: 24-60V DC with output contact, P5: 100-240V DC with output contact
- **Temperature alarm (TAL)**, **MCR switch (MCR-SW)**, **Neutral CT (NCT)**, **External ZCT**

**Additional function**: Extension module (EX1), Network: PROFIBUS-DP, CC-Link®

**Wire system (when EX1 is specified)**: external, 3p6W, 3p4W, normal connection, reverse connection
Selection samples of additional function modules

**List of extension unit (Option)**

Additional functions

Note: The above extension units are not available for WS relay with DP3.

**Additional function**

- Current
- Harmonics
- Energy
- Power
- Voltage

**Load current**

**MODBUS® (RS-485) interface unit**

**PROFIBUS-DP interface unit**

**Drawout position switch**

**I/O unit**

**CC-Link® interface unit**

**VT unit**

**Display module (relay attachment)**

**Extension module**

- **G**
  - WS3, WB3, WM3, WF3
  - WS2, WB2, WM2, WF2
  - WS : General use
  - WB : INST only
  - WF : Protective coordination use

**Electronic trip relay (ETR) Type designation breakdown**

**Main setting module**

**Optional setting module**

**Communication**

**Display**

**Communication**

**Display & Communication**

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODBUS®</td>
<td></td>
<td>Interface unit for MODBUS® (RS-485)</td>
</tr>
<tr>
<td>PROFIBUS-DP</td>
<td></td>
<td>Interface unit for PROFIBUS-DP</td>
</tr>
<tr>
<td>MODBUS®</td>
<td></td>
<td>Interface unit for MODBUS® (RS-485)</td>
</tr>
<tr>
<td>PROFIBUS-DP</td>
<td></td>
<td>Interface unit for PROFIBUS-DP</td>
</tr>
<tr>
<td>CC-Link®</td>
<td></td>
<td>Interface unit for CC-Link®</td>
</tr>
<tr>
<td>MODBUS®</td>
<td></td>
<td>Interface unit for MODBUS® (RS-485)</td>
</tr>
<tr>
<td>CC-Link®</td>
<td></td>
<td>Interface unit for CC-Link®</td>
</tr>
<tr>
<td>MODBUS®</td>
<td></td>
<td>Interface unit for MODBUS® (RS-485)</td>
</tr>
<tr>
<td>PROFIBUS-DP</td>
<td></td>
<td>Interface unit for PROFIBUS-DP</td>
</tr>
</tbody>
</table>

**Name**

**Type**

**Description**

**G**

- Power supply
- NA: Without optional setting
- G1: Ground fault protection
- N5: Neutral pole 50% protection
- E1: Earth leakage protection

**ETR Auxiliary Equipment**

- MCR switch (MCR-SW)
- Temperature alarm (TAL)

**Module**

- Display (DP1)
- VT unit (VT)
- Display onto panel board (DP2)

**Reverse connection**

- 3φ 4W
- 3φ 3W

**Graphical display**

- Two-color back light
- Under trip or alarm, back light color changes from green to red automatically, which visually shows an abnormal situation.

**3 Graphical display**

- By adopting dot matrix type LCD, graphical display such as bar graph display of load current, harmonic currents and characteristic curve are available.

**There are 2 types of display module. One is the ETR attachment type (DP1). The other is the panel attachment type (DP2), which can be connected to extension terminals of control circuit with 2m cable. 2 units of display modules (DP1 and DP2) can be attached on one breaker.**

(As for outline dimensions of DP2, refer to page 55.)

**Note:**

- Extension module (EX1) is required.
- VT unit (VT) is required to display the measured data except load current.

**VT unit (VT)**

VT unit enables to measure voltages, powers, energies, harmonic currents and etc. by connecting the ETR with Extension module (EX1).

(Outline dimensions are shown in page 56.)

**Note:**

- The length of the cable attached for VT unit is 2m.
Network

Interface unit (BIF-CC/BIF-PR/BIF-MD)

These Interface units can expand the future possibility in various communication and Intelligent control.

1. Applicable to various open networks.
   These units are applicable to various open network systems such as CC-Link®, PROFIBUS-DP, and MODBUS® (RS-485), which can be built in easily.

2. Intelligent control by Multi-data communication
   It can be the Intelligent control by Multi-data communication from PLC/SCADA to these interface units. These interface units receive the measurement information, setting values, error information and trip and alarm information from PLC/SCADA.

The length of the cable for interface unit is 2m.

Note:
- Extension module (EX1) is required.
- VT unit (VT) is required to transmit the measured data except load current.

I/O unit (BIF-CON)

The Input & Output Controlling Unit (BIF-CON) is available for the remote controlling and the remote monitoring of the breaker condition through the various network systems. With this BIF-CON unit in addition to the Interface Unit, it becomes possible to control the breaker remotely, like a ON or OFF operations or Spring-charging.

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Breaker ON operation</td>
<td>1a contact for Closing coil (CC)</td>
</tr>
<tr>
<td></td>
<td>Breaker OFF operation</td>
<td>1a contact for Shunt trip device (SHT) (not applicable for 380-500V AC rating)</td>
</tr>
<tr>
<td></td>
<td>Spring charge</td>
<td>1a contact for Motor charging (MD)</td>
</tr>
<tr>
<td>Monitor</td>
<td>Digital Input (DI) monitoring</td>
<td>For BIF-CC and BIF-MD, Max. 3 contacts monitoring are available. For BIF-PR, 1 contact monitoring is available.</td>
</tr>
</tbody>
</table>

Drawout position switch (BIF-CL)

With this Drawout position switch (BIF-CL) in addition to Interface unit and I/O unit (BIF-CON), the remote monitoring of draw-out position becomes available for the breaker draw-out type.

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitor</td>
<td>Breaker Drawout position</td>
<td>Position : Connect or Test or Disconnect</td>
</tr>
</tbody>
</table>
remote monitoring of draw-out position becomes available for the breaker draw-out type. With this Drawout position switch (BIF-CL) in addition to Interface unit and I/O unit (BIF-CON), the Drawout position switch (BIF-CL) remotely, like a ON or OFF operations or Spring-charging.

With this BIF-CON unit in addition to the Interface Unit, it becomes possible to control the breaker monitoring of the breaker condition through the various network systems. The Input & Output Controlling Unit (BIF-CON) is available for the remote controlling and the remote I/O unit (BIF-CON).

These Interface units can expand the future possibility in various communication and Intelligent control.

<table>
<thead>
<tr>
<th>Type</th>
<th>①</th>
<th>②</th>
<th>③</th>
<th>Note 1</th>
<th>①</th>
<th>②</th>
<th>③</th>
<th>Note 1</th>
<th>①</th>
<th>②</th>
<th>③</th>
<th>Note 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main setting</td>
<td>WS</td>
<td>WS</td>
<td>WM</td>
<td>Note 2</td>
<td>WB</td>
<td>WB</td>
<td>WS</td>
<td>Note 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optional setting</td>
<td>NA</td>
<td>AP</td>
<td>G1</td>
<td></td>
<td>NA</td>
<td>AP</td>
<td>G1</td>
<td></td>
<td>NA</td>
<td>AP</td>
<td>G1</td>
<td></td>
</tr>
<tr>
<td>Power supply</td>
<td>P1-P5</td>
<td>P1-P5</td>
<td>P1-P5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Measurement

<table>
<thead>
<tr>
<th>Load current (Accuracy)</th>
<th>(±2.5%)</th>
<th>(±2.5%)</th>
<th>(±1.5%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leakage current (±15%)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Voltage (±2.5%)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Power (active,reactive,apparent) (±2.5%)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Power factor (±5%)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Energy (active,reactive) (±2.5%)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Harmonics current (Accuracy)</td>
<td>-</td>
<td>(±2.5%, 3.5...19th)</td>
<td>(±2%)</td>
</tr>
</tbody>
</table>

### Trip history

<table>
<thead>
<tr>
<th>LTD</th>
<th>STD</th>
<th>INST</th>
<th>GFR</th>
<th>ER</th>
<th>UVT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(±)</td>
<td>(±)</td>
<td>(±)</td>
<td>(±)</td>
<td>(±)</td>
<td>(±)</td>
</tr>
</tbody>
</table>

### Alarm history

<table>
<thead>
<tr>
<th>PAL1</th>
<th>PAL2</th>
<th>OVER</th>
<th>GFR</th>
<th>EPAL</th>
<th>ER</th>
<th>TAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>(±)</td>
<td>(±)</td>
<td>(±)</td>
<td>(±)</td>
<td>(±)</td>
<td>(±)</td>
<td>(±)</td>
</tr>
</tbody>
</table>

### Characteristic setting (panel attachment product [DP2] only)

<table>
<thead>
<tr>
<th>LTD</th>
<th>STD</th>
<th>INST</th>
<th>PAL1</th>
<th>PAL2</th>
<th>GFR</th>
<th>EPAL</th>
<th>ER</th>
<th>TAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>(±)</td>
<td>(±)</td>
<td>(±)</td>
<td>(±)</td>
<td>(±)</td>
<td>(±)</td>
<td>(±)</td>
<td>(±)</td>
<td>(±)</td>
</tr>
</tbody>
</table>

### Setting

<table>
<thead>
<tr>
<th>Contact outputs setting change</th>
<th>Date &amp; Time</th>
<th>Demand time</th>
<th>Alarm holding method</th>
</tr>
</thead>
<tbody>
<tr>
<td>(±)</td>
<td>(±)</td>
<td>(±)</td>
<td>(±)</td>
</tr>
</tbody>
</table>

### Reset

<table>
<thead>
<tr>
<th>Trip and alarm information</th>
<th>Measurement information (min. and max. values)</th>
<th>ETR information</th>
</tr>
</thead>
<tbody>
<tr>
<td>(±)</td>
<td>(±)</td>
<td>(±)</td>
</tr>
</tbody>
</table>

### Transmission

<table>
<thead>
<tr>
<th>Communication</th>
<th>CC-Link® PROFIBUS-DP</th>
<th>CC-Link® PROFIBUS-DP</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODBUS®</td>
<td>MODBUS®</td>
<td></td>
</tr>
</tbody>
</table>

Note 1: 2 units of display modules can be attached.
Note 2: 1 contact monitoring is available.
Note 3: Max. 3 contacts for Motor charging (MD) (not applicable for 380-500V AC rating)
Note 4: Include the accuracy of ZCT.
Note 5: This is the accuracy value when WS relay with DP3 is assembled to ACB before factory shipment.
Note 6: Interface unit is required for communication function.
Prepare a small flat tipped screwdriver.

Insert the flat tipped screwdriver into the opening of the ETR cover.

Then, lightly turn the screwdriver to the upside as shown in the left figure, and the ETR cover will open.

There are two kinds of switches for characteristics setting and for trip indicator reset. They should be used as follows.

When the characteristic is set up, use a device like a field tester, etc to make sure that the required characteristic has been set.

For WS relay with DP3, there is a slide type switch (Frequency selector switch) as the left side picture shows.

At sealing, seal the ETR cover by using the sealing hole at the top of the ETR cover.

Adjustable in steps

Rotary code switch is used. Do not set the switch at points between steps. The setting value is the same when the switch is positioned at the thick line. (Set the switch with a torque of 0.02N•m or below.)

Note) If the switch is set at points between steps, the characteristics setting value will be decided at either end of steps.

Frequency selector switch

Do not set the switch at points between the slide. When operating the switch, use a flat tipped screwdriver of the following size.

Push-button

This is for temporary operation, and press it with force of 3N or less.

Energy is supplied for the operation of the overcurrent tripping and ground fault tripping (GFR) function of the electronic trip relay.

The current in each phase flowing through the breaker is detected. An air core coil which has good linearity is adopted.

This part converts power supply CT energy to constant voltage for respective circuits in the ETR.

This ASIC amplifies the signal detected by the current sensor coil and the detected signal of ground fault current which is vector composed of the detected signals of each phase.

The microprocessor integrates each phase current waveform from the ASIC and performs processing for overcurrent protection and others.

This module for the characteristic setting of the ETR.

The load current LED gives a figure of current in percent by CT energy.
Trip indicator and pre-alarm are indicated by control power supply.
RUN and ERR. LED indicate breaker’s condition by control power supply or ten-odd percent of CT energy.

This outputs contact signals of fault cause (including pre-alarm) and an other alarms.
A control supply is necessary for this function.
Setting procedure

1. Prepare a small flat tipped screwdriver.

2. Insert the flat tipped screwdriver into the opening of the ETR cover. Then, lightly turn the screwdriver to the upside as shown in the left figure, and the ETR cover will open.

3. There are two kinds of switches for characteristics setting and for trip indicator reset. They should be used as follows.

   ① Adjustable in steps
   Rotary code switch is used. Do not set the switch at points between steps. The setting value is the same when the switch is positioned at the thick line. (Set the switch with a torque of 0.02N·m or below.)
   Note) If the switch is set at points between steps, the characteristics setting value will be decided at either end of steps.

   ② Push-button
   This is for temporary operation, and press it with force of 3N or less.

4. For WS relay with DP3, there is a slide type switch (Frequency selector switch) as the left side picture shows.

   ① Frequency selector switch
   Do not set the switch at points between the slide. When operating the switch, use a flat tipped screwdriver of the following size.

5. When the characteristic is set up, use a device like a field tester, etc to make sure that the required characteristic has been set.

6. At sealing, seal the ETR cover by using the sealing hole at the top of the ETR cover.
The following diagram shows the case that accessories are fully equipped.

**Terminal description**

- **13 14 ~ 53 54**: Auxiliary switch "a"
- **11 12 ~ 51 52**: Auxiliary switch "b"
- **U1 U2**: Motor charging
- **413 414**: Charged signal (Normal open)
- **D1 D2**: Voltage Input terminal of UVT
- **DT1 DT2**: Trip terminal of UVT (Remote trip)
- **A1 A2**: Closing coil
- **C1 C2**: Shunt trip
- **97 98**: OCR alarm
- **P1 P2**: Power supply for ETR
- **P4**: FG of power supply (FG:Frame Ground)
- **RS1 RS2**: Alarm reset (Trip cause LED, alarm contact)
- **513 524**: Alarm contact for LTD Trip
- **513 534**: Alarm contact for STD or INST Trips
- **513 544**: Alarm contact for Ground fault, Earth leakage trips or 2nd Pre-alarm contact
- **513 554**: Pre-alarm contact
- **513 564**: Temperature alarm contact
- **513 574**: Error alarm contact
- **Z1 Z2**: For external ZCT
- **N1 N2**: For Neutral CT (Note)

**Accessory Symbols**

- **SHT**: Shunt tripping device
- **CC**: Closing coil
- **M**: Motor (Motor charging device)
- **UVT**: UVT coil
- **AX**: Auxiliary switch
- **AL**: OCR alarm switch
- **CLS**: Charge limit switch
- **SBC**: Shorting b-contact
- **CL**: Cell switch

**Wiring diagram**

- **Internal wiring**
- **External wiring (user's wiring)**
- **Control circuit connector (drawout type)**
The following diagram shows the case that accessories are fully equipped.

**Terminal description**

- RS1
- RS2
- DT1
- DT2
- L1
- L2
- L3
- N
- 513
- 554
- 544
- 574
- 564
- 413
- 414
- D1
- D2
- N1
- N2
- C1
- C2
- P4
- A1
- A2
- P1
- P2
- Z1
- Z2
- 11
- 12
- 13
- 14
- 97
- 98

**Main circuit**

- Electronic trip relay
- Electrical operation circuit

**Extension terminals**

- Voltage forbid to be applied
- Dielectric test forbidden
- Relay (ETR)

**For VT unit**

- For Interface unit

**For Neutral CT**

- For external ZCT

- Error alarm contact
- Pre-alarm contact
- Alarm contact for Ground fault, Earth leakage trips or 2nd Pre-alarm contact
- Alarm contact for STD or INST Trips
- Alarm reset (Trip cause LED, alarm contact)
- FG of power supply (FG: Frame Ground)
- Power supply for ETR
- OCR alarm
- Shunt trip
- Voltage Input terminal of UVT
- Motor charging
- Auxiliary switch “b”
- Auxiliary switch “a”

**Control circuit**

- Control circuit terminal block
- Terminal placement
- Power circuit
- Alarm contacts
- G1/E1/AP

**Accessory Symbols**

- Control circuit connecter (drawout type)
- External wiring (user's wiring)
- Internal wiring
- Cell switch
- Shorting b-contact
- Charge limit switch
- Auxiliary switch
- UVT coil
- Motor (Motor charging device)
- Closing coil
- Shunt tripping device
- Cut-off switch

**Note:**

- For the drawout type, the cables should have the length which allow the control circuit terminal block to be moved to the left or right by 5mm.
- When a coil load is connected in the same control circuit as the ETR, surge absorbers are required to absorb the surge voltage.
- OCR alarm (AL)
  - The contact output of the OCR alarm (Standard type AL) is the one-pulse output and the output time is 30–50ms.
  - For this reason, this output needs self-holding circuit.
- For Power supply type P3 and P4, the high sensitive relay used in contact output may cause the chattering noise (wrong output of ±1ms level) during ON and OFF operation, depending on the Panel placing condition. When it is used in the quick responsive sequence, the filter circuit of a few milli-second (ms) should be provided or the double reading sampling should be implemented.
- Closing coil (CC)
  - As CC is one-pulse driven, it is not necessary to insert AXb for burning prevention purposes. Inserting AXb will cause anti-pumping function to be ineffective.
- Under voltage trip device (UVT)
  - Use the switch that can open and close 150V DC, 0.5A for remote trip.
  - Remote trip terminal has short bar at shipment, so remove it before using this function.
  - Disconnect the voltage input wires during dielectric testing of main circuit.
- Since some terminals are polarized, the wiring should be done correctly as the polarity shown in the wiring diagram when the control voltage is DC. Auxiliary switch (AX) Standard type has no polarity.
- Alarm reset (Terminal: RS1 and RS2) is available only for Power supply type P3, P4 and P5. For Power supply type P1 and P2, it can not be reset from the Control circuit terminal block (RS1 and RS2).
- Alarm contacts (Terminal [513, 574] are available only for power supply type [P3, P4] and [P5]. For output contacts, refer to page 20 Note2.

**Fig.1**

**UVT controller wiring**

<table>
<thead>
<tr>
<th>100-120V AC type</th>
<th>200-240V AC type</th>
<th>380-460V AC type</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC types</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Input**

- IN2
- IN1
- external unit

**Output**

- OUT4
- OUT3
- D2
- D1

**Note:**

- For the drawout type, the cables should have the length which allow the control circuit terminal block to be moved to the left or right by 5mm.
- When a coil load is connected in the same control circuit as the ETR, surge absorbers are required to absorb the surge voltage.
- OCR alarm (AL)
  - The contact output of the OCR alarm (Standard type AL) is the one-pulse output and the output time is 30–50ms.
  - For this reason, this output needs self-holding circuit.
- For Power supply type P3 and P4, the high sensitive relay used in contact output may cause the chattering noise (wrong output of ±1ms level) during ON and OFF operation, depending on the Panel placing condition. When it is used in the quick responsive sequence, the filter circuit of a few milli-second (ms) should be provided or the double reading sampling should be implemented.
- Closing coil (CC)
  - As CC is one-pulse driven, it is not necessary to insert AXb for burning prevention purposes. Inserting AXb will cause anti-pumping function to be ineffective.
- Under voltage trip device (UVT)
  - Use the switch that can open and close 150V DC, 0.5A for remote trip.
  - Remote trip terminal has short bar at shipment, so remove it before using this function.
  - Disconnect the voltage input wires during dielectric testing of main circuit.
- Since some terminals are polarized, the wiring should be done correctly as the polarity shown in the wiring diagram when the control voltage is DC. Auxiliary switch (AX) Standard type has no polarity.
- Alarm reset (Terminal: RS1 and RS2) is available only for Power supply type P3, P4 and P5. For Power supply type P1 and P2, it can not be reset from the Control circuit terminal block (RS1 and RS2).
- Alarm contacts (Terminal [513, 574] are available only for power supply type [P3, P4] and [P5]. For output contacts, refer to page 20 Note2.
Outline dimensions

Drawout type AE630-SW, AE1000-SW, AE1250-SW, AE1600-SW

Front view

Side view

Rear view

Main circuit terminal dimension

* : Mounting pitch
The numerals shown in parentheses are for 3 poles.
Drawout type AE2000-SWA

Front view

Side view

Rear view

Main circuit terminal dimension

* : Mounting pitch
The numerals shown in parentheses are for 3 poles.
Outline dimensions

Drawout type AE2000-SW, AE2500-SW, AE3200-SW

Front view

Side view

Rear view

Main circuit terminal dimensions
Drawout type AE4000-SWA

**Main circuit terminal dimension**

*Note: Spacers are not required when fastening connecting conductors (T10). The necessary contact area can be obtained with ACB terminal bent by tightening the screw.*
Outline dimensions

Drawout type AE4000-SW, AE5000-SW, AE6300-SW

Front view

- Operating panel center
- Control terminals (M3.5 screw)
- Neutral pole
- Drawout handle
- Fixing bolts
- Aperture for the drawout handle

Side view

- Front face of control terminal
- Connecting 54
- Lifting hook hole
- Earth terminal
- M8 screw
- Insulation block

Rear view

- Operating panel center
- Control terminals (M3.5 screw)
- Neutral pole
- Drawout handle radius 100
- Aperture for the drawout handle
- Fixing bolts

Main circuit terminal dimension

- Outline of breaker
- Connecting area

4P FN type

The mounting angle should be prepared by the customer.

4P FN type

- Operating panel center
- Control terminals (M3.5 screw)
- Neutral pole
- Drawout handle radius 100
- Aperture for the drawout handle
- Fixing bolts

Side view dimensions are the same as 3 pole.
Fixed type AE630-SW, AE1000-SW, AE1250-SW, AE1600-SW

Front view

Operating panel center

Control terminal (M3.5 screw)

Neutral pole

Earth terminal M8 screw (Left side)

4P 3P

Operating panel center

Control terminal (M3.5 screw)

Neutral pole

Earth terminal M8 screw (Left side)

4P 3P

Main circuit terminal dimension

Connecting area

Lifting hooks (HP)
HP is supplied with ACB Fixed type.
Outline dimensions

Fixed type AE2000-SWA

Front view

Side view

Rear view

Main circuit terminal dimension

Lifting hooks (HP) HP is supplied with ACB Fixed type.
Fixed type AE2000-SW, AE2500-SW, AE3200-SW

Main circuit terminal dimension

Lifting hooks (HP)
HP is supplied with ACB Fixed type.

* : Mounting pitch
The numerals shown in parentheses are for 3 poles.

Connecting area

38
17
10
10
10
4-φ13
Fixed type AE4000-SWA

Front view

- Operating panel center
- Control terminal (M3.5 screw)
- Neutral pole
- Earth terminal (M8 screw)
- Connecting busbar size: All poles: T10xW150x3BUS/pole
- Inside of the panel (thickness 1.6~3.2)

Side view

- Connecting area
- Lifting hooks (HP)
- HP is supplied with ACB Fixed type.

Rear view

- Operating panel center
- Outline of breaker
- Neutral pole

Main circuit terminal dimension

- Note: Spacers are not required when fastening connecting conductors (T10). The necessary contact area can be obtained with ACB terminal bent by tightening the screw.

Lifting hooks (HP)

- HP is supplied with ACB Fixed type.
Fixed type AE4000-SW, AE5000-SW, AE6300-SW

Front view

- Operating panel center
- Control terminals (M3.5 screw)
- Neutral pole

- Earth terminal M8 screw (Left side)

- Main circuit terminal dimension

4P FN type

- Earth terminal M8 screw (Left side)
- Control terminals (M3.5 screw)

Side view dimensions are the same as 3 pole.
**Outline dimensions**

**Panel cut-out, Terminal adapter, Drawout handle, Terminal cover**

### Panel cut-out dimensions

#### Operating panel center

![Diagram showing operating panel center dimensions](image)

- **Dimensions (mm)**:
  - 235 x 300

### Door frame panel cut-out dimensions

#### Operating panel center

![Diagram showing door frame panel cut-out dimensions](image)

- **Dimensions (mm)**:
  - 304 x 390

### Vertical terminal adapter

#### AE630~1600-SW

- **Top view**
- **Side view**

<table>
<thead>
<tr>
<th>Dimensions (mm)</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE2000-SW, 2500-SW</td>
<td>20</td>
</tr>
<tr>
<td>AE3200-SW</td>
<td>25</td>
</tr>
</tbody>
</table>

#### AE2000~3200-SW

- **Top view**
- **Side view**

<table>
<thead>
<tr>
<th>Dimensions (mm)</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE630~1600-SW</td>
<td>15</td>
</tr>
<tr>
<td>AE2000~3200-SW</td>
<td>15</td>
</tr>
<tr>
<td>AE3200-SW</td>
<td>15</td>
</tr>
<tr>
<td>AE630~1600-SW</td>
<td>25</td>
</tr>
<tr>
<td>AE2000~3200-SW</td>
<td>25</td>
</tr>
<tr>
<td>AE3200-SW</td>
<td>25</td>
</tr>
</tbody>
</table>

### Front terminal adapter

#### AE630~1600-SW

- **Side view**

<table>
<thead>
<tr>
<th>Dimensions (mm)</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE630-SW~1600-SW</td>
<td>15</td>
</tr>
<tr>
<td>AE2000-SW, 2500-SW</td>
<td>15</td>
</tr>
<tr>
<td>AE2000-SW, 3200-SW</td>
<td>15</td>
</tr>
</tbody>
</table>

### Drawout handle dimensions

- **Dimensions (mm)**:
  - 200 x 254

### Terminal cover (TTC)

- **Dimensions (mm)**:
  - 203 x 430

### Summary

- The document provides detailed specifications for various components of a circuit breaker, including panel cut-out dimensions, terminal adapters, and terminal covers. Each section includes diagrams and tables with precise measurements in millimeters (mm) for different types of circuit breakers. The specifications are designed to ensure compatibility and proper installation in electrical systems.
Neutral CT (NCT), External ZCT

Neutral CT (NCT)

630–2000A

2500–4000A

5000, 6300A

External ZCT for transformer ground wire

External ZCT for load circuits

ZCT with primary conductors

ZTA1200A (1200A)

ZTA2000A (2000A)
Outline dimensions

UVT external unit

UVT external unit (380 ~ 460V AC)

Use the attached mounting bracket. (IEC35mm rail is not applicable)

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Applicable wire</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN1</td>
<td></td>
</tr>
<tr>
<td>IN2</td>
<td></td>
</tr>
<tr>
<td>OUT3</td>
<td>1.25 ~ 2.0mm²</td>
</tr>
<tr>
<td>OUT4</td>
<td></td>
</tr>
</tbody>
</table>

ETR external units

Display onto panel board (DP2)

Note: Use the panel of thickness 1mm ~ 3.2mm.

CC-Link®, MODBUS® interface unit (BIF-CC, BIF-MD)

Outline dimensions

Installation dimensions

The available crimp-type terminal is the same as I/O unit (BIF-CON) (See page 56).
I/O unit (BIF-CON)

Outline dimensions

<table>
<thead>
<tr>
<th>Width</th>
<th>Height</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>102</td>
<td>71.5</td>
<td>65</td>
</tr>
</tbody>
</table>

Installation dimensions

<table>
<thead>
<tr>
<th>Mounting bracket Height</th>
<th>Mounting bracket Width</th>
<th>Mounting bracket Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>117</td>
<td>177</td>
<td>30</td>
</tr>
</tbody>
</table>

Crimp-type terminal

These terminals should be connected with wire using crimp-type terminal. The available crimp-type terminal is shown in figure 3.4.

PROFIBUS-DP interface unit (BIF-PR)

Outline dimensions

<table>
<thead>
<tr>
<th>Width</th>
<th>Height</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>110</td>
<td>77.5</td>
<td>65</td>
</tr>
</tbody>
</table>

Installation dimensions

<table>
<thead>
<tr>
<th>Mounting bracket Height</th>
<th>Mounting bracket Width</th>
<th>Mounting bracket Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>117</td>
<td>177</td>
<td>30</td>
</tr>
</tbody>
</table>

VT unit (VT)

Outline dimensions

<table>
<thead>
<tr>
<th>Width</th>
<th>Height</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>67.5</td>
<td>50</td>
</tr>
</tbody>
</table>

Installation dimensions

<table>
<thead>
<tr>
<th>Mounting bracket Height</th>
<th>Mounting bracket Width</th>
<th>Mounting bracket Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>117</td>
<td>177</td>
<td>30</td>
</tr>
</tbody>
</table>

Connecting wire

- V1, V2, V3, VN: 0.2~4.0mm² (AWG24~10)
- Tool: Minus head screw driver (Bit size Thickness 0.6mm, Width 3.5mm)
When selecting conductors to be connected to AE breakers, ensure that the bus bar should be less than 200mm. The terminal which is applicable to connect the conductor is different depending on the shape of the terminal. Refer to the outline dimensions of P43 to P52.

Standard tightening torque

<table>
<thead>
<tr>
<th>Screw size</th>
<th>Tightening torque (N･m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M12</td>
<td>45±5</td>
</tr>
</tbody>
</table>

Since fault current flowing through the conductors causes large electromagnetic forces, the conductors should be secured firmly, using the values in the below table as a reference. Max. distance between fixing support and ACB bus bar should be less than 200mm.

Electromagnetic force in N per 1m conductor (in the case of three phase short circuit)

When selecting conductors to be connected to AE breakers, ensure that they have a sufficient current capacity. Refer to the right table.

Conductor Size (IEC 60947-1; Ambient Temp. 40°C, Open air)

The left table shows the suitable connecting conductor size based on IEC 60947-1, which is assured from the test under Ambient temp. 40°C. Open air and testing configuration as shown in the following drawing.
When a short-circuit current is interrupted, discharged hot gas blows out from the exhaust port of the arc extinguishing chamber, so provide a clearance as shown in the following table.

Note 1: On the fixed type, maintenance is possible with following clearance.

### Dimensions

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>AE630-SW - AE3200-SW</th>
<th>AE2000-SWA</th>
<th>AE4000-SW - AE6300-SW</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed type</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applicable voltage</td>
<td>600V AC or less</td>
<td>660V AC, 690V AC</td>
<td>690V AC or less</td>
</tr>
<tr>
<td>Type</td>
<td>A (Note 1) 0</td>
<td>(Note 1) 50</td>
<td>(Note 1) 100</td>
</tr>
<tr>
<td></td>
<td>B (Note 3) 62</td>
<td>(Note 3) 50</td>
<td>(Note 3) 50</td>
</tr>
<tr>
<td></td>
<td>C 162</td>
<td>162</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>D (Note 2) 50</td>
<td>(Note 2) 50</td>
<td>200</td>
</tr>
<tr>
<td><strong>Drawout type</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>A 0</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>B (Note 3) 62</td>
<td>(Note 2) 50</td>
<td>(Note 3) 50</td>
</tr>
<tr>
<td></td>
<td>C 240</td>
<td>240</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>D (Note 3) 50</td>
<td>(Note 2) 50</td>
<td>200</td>
</tr>
</tbody>
</table>

Note 1: 300mm or more clearance is necessary to inspect the arc-extinguishing chamber and contacts.

Note 2: The wiring space required for the control terminal block.

Note 3: When using mechanical interlock, door interlock, etc., dimension B becomes larger.

### Service conditions

1. **Normal service condition**

   Under ordinary conditions the following normal working conditions are all satisfied, the AE Series air circuit breaker may be used unless otherwise specified.

   1. Ambient temperature
      - A range of max. +40°C to min. -5°C is recommended.
      - And the average over 24 hours must not exceed +35°C.
   2. Altitude
      - 2,000m (6,600 feet) or less
   3. Environmental conditions
      - The air must be clean, and the relative humidity must be 85% or less at max. temp. +40°C. Do not use and store in atmospheres with sulfide gas and ammonia gas etc. (H₂S ≤ 0.1 ppm, SO₂ ≤ 0.1 ppm, NH₃ < a few ppm.)
   4. Installation conditions
      - When installing the AE Series air circuit breaker, refer to the installation instructions in the catalogue and instruction manual.
   5. Storage temperature
      - A range of max. +80°C to min. -20°C is recommended to be stored.
      - And the average over 24 hours must not exceed +35°C.

2. **Special service conditions**

   In case of special service condition, service life may become shorter in some cases.

   1. Special environmental conditions
      - High temperature and/or high humidity corrosive gas
   2. High ambient temperature
      - If the ambient temperature exceeds +40°C, the uninterrupted current rating will be reduced. Since the derating value is different depending on the applicable standard, refer to P60.
   3. High altitude
      - Since the heat radiation rate is reduced for use at the 2,000m or higher, accordingly the operating voltage, continuous current capacity and breaking capacity are derated. Moreover the insulation durability is also decreased owing to the atmospheric pressure.
      - Please inquire us for further detail.

### Guarantee

1. **Free guarantee period**

   The free guarantee period of the product is one year from the day of purchase.

2. **Scope of guarantee**

   (1) We will repair the product free of charge within the guarantee period on condition that it has been used under the standard working conditions in conformity with the operating conditions, operating procedures, environmental conditions and instructions specified in the catalogs, manuals and caution labels on the product body.

   (2) In the following cases, the product will be repaired at your expense even within the free guarantee period.
      - Failure caused by your improper storage or handling, carelessness or negligence
      - Failure caused by inadequacies of installation
      - Failure caused by mis-operation or improper modification
      - Failure caused by external factors due to acts of God, such as fire and abnormal voltage, and natural disasters, such as earthquake, windstorm and flood
      - Failure caused by reasons that could not be foreseen on the level of science and technology at the time of delivery

   The term “guarantee” used in this section refers to the guarantee only of the delivered product. We are not liable to compensate for any damage induced by the failure of the delivered product.

3. **Repair parts supplying period**

   The supply of the repair parts is warranted for 5 years after discontinuation of the production. The supply is terminated as soon as the repair parts run out after the 5 years.
## Internal resistance, reactance and power consumption (per pole)

<table>
<thead>
<tr>
<th>Type</th>
<th>Connection</th>
<th>Internal resistance (mΩ)</th>
<th>Reactance (mΩ)</th>
<th>Power consumption (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE630-SW</td>
<td>Fixed type</td>
<td>0.020</td>
<td>0.099</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Drawout</td>
<td>0.031</td>
<td>0.147</td>
<td>12</td>
</tr>
<tr>
<td>AE1000-SW</td>
<td>Fixed type</td>
<td>0.020</td>
<td>0.095</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Drawout</td>
<td>0.031</td>
<td>0.136</td>
<td>31</td>
</tr>
<tr>
<td>AE1250-SW</td>
<td>Fixed type</td>
<td>0.020</td>
<td>0.088</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Drawout</td>
<td>0.031</td>
<td>0.135</td>
<td>48</td>
</tr>
<tr>
<td>AE1600-SW</td>
<td>Fixed type</td>
<td>0.020</td>
<td>0.099</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>Drawout</td>
<td>0.031</td>
<td>0.129</td>
<td>79</td>
</tr>
<tr>
<td>AE2000-SWA</td>
<td>Fixed type</td>
<td>0.020</td>
<td>0.120</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>Drawout</td>
<td>0.030</td>
<td>0.161</td>
<td>120</td>
</tr>
<tr>
<td>AE2000-SW</td>
<td>Fixed type</td>
<td>0.010</td>
<td>0.076</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>Drawout</td>
<td>0.018</td>
<td>0.122</td>
<td>72</td>
</tr>
<tr>
<td>AE2500-SW</td>
<td>Fixed type</td>
<td>0.010</td>
<td>0.084</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td>Drawout</td>
<td>0.018</td>
<td>0.128</td>
<td>113</td>
</tr>
<tr>
<td>AE3200-SW</td>
<td>Fixed type</td>
<td>0.009</td>
<td>0.068</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>Drawout</td>
<td>0.015</td>
<td>0.096</td>
<td>154</td>
</tr>
<tr>
<td>AE4000-SWA</td>
<td>Fixed type</td>
<td>0.011</td>
<td>0.111</td>
<td>176</td>
</tr>
<tr>
<td></td>
<td>Drawout</td>
<td>0.015</td>
<td>0.106</td>
<td>240</td>
</tr>
<tr>
<td>AE4000-SW</td>
<td>Fixed type</td>
<td>0.009</td>
<td>0.070</td>
<td>144</td>
</tr>
<tr>
<td></td>
<td>Drawout</td>
<td>0.011</td>
<td>0.084</td>
<td>176</td>
</tr>
<tr>
<td>AE5000-SW</td>
<td>Fixed type</td>
<td>0.009</td>
<td>0.061</td>
<td>225</td>
</tr>
<tr>
<td></td>
<td>Drawout</td>
<td>0.011</td>
<td>0.081</td>
<td>275</td>
</tr>
<tr>
<td>AE6300-SW</td>
<td>Fixed type</td>
<td>0.008</td>
<td>0.059</td>
<td>318</td>
</tr>
<tr>
<td></td>
<td>Drawout</td>
<td>0.009</td>
<td>0.080</td>
<td>357</td>
</tr>
</tbody>
</table>

(Note) The above values are applicable for one pole. The above values are measured values and can be used only for reference.
### Deratigs by ambient temperature

#### (Table 1) Deratigs of Max. rated current by ambient temperature

<table>
<thead>
<tr>
<th>Standard</th>
<th>Ambient Temperature</th>
<th>40°C</th>
<th>45°C</th>
<th>50°C</th>
<th>55°C</th>
<th>60°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE630-SW</td>
<td>630</td>
<td>630</td>
<td>630</td>
<td>630</td>
<td>630</td>
<td></td>
</tr>
<tr>
<td>AE1000-SW</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>AE1250-SW</td>
<td>1250</td>
<td>1250</td>
<td>1250</td>
<td>1250</td>
<td>1200</td>
<td></td>
</tr>
<tr>
<td>AE1600-SW</td>
<td>1600</td>
<td>1600</td>
<td>1550</td>
<td>1550</td>
<td>1500</td>
<td></td>
</tr>
<tr>
<td>AE2000-SWA</td>
<td>2000</td>
<td>1900</td>
<td>1800</td>
<td>1700</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AE2500-SW</td>
<td>2500</td>
<td>2500</td>
<td>2450</td>
<td>2350</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AE3200-SW</td>
<td>3200</td>
<td>3200</td>
<td>3000</td>
<td>2900</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AE4000-SWA</td>
<td>4000</td>
<td>4000</td>
<td>3800</td>
<td>3600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AE4000-SW</td>
<td>4000</td>
<td>4000</td>
<td>3900</td>
<td>3750</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AE5000-SW</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
<td>4750</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AE6300-SW</td>
<td>6300</td>
<td>5750</td>
<td>5500</td>
<td>5200</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### (Table 2) Deratigs of Max. rated current by ambient temperature with Extension module, Display and Network

In case extension module (EX1), display (DP1) and network are attached, the following derating values shown in this table are applied.

<table>
<thead>
<tr>
<th>Standard</th>
<th>Ambient Temperature</th>
<th>40°C</th>
<th>45°C</th>
<th>50°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE630-SW</td>
<td>630</td>
<td>630</td>
<td>630</td>
<td></td>
</tr>
<tr>
<td>AE1000-SW</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>AE1250-SW</td>
<td>1250</td>
<td>1250</td>
<td>1250</td>
<td></td>
</tr>
<tr>
<td>AE1600-SW</td>
<td>1600</td>
<td>1600</td>
<td>1440</td>
<td></td>
</tr>
<tr>
<td>AE2000-SWA</td>
<td>2000</td>
<td>1900</td>
<td>1700</td>
<td></td>
</tr>
<tr>
<td>AE2500-SW</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
<td></td>
</tr>
<tr>
<td>AE3200-SW</td>
<td>3200</td>
<td>3200</td>
<td>2880</td>
<td></td>
</tr>
<tr>
<td>AE4000-SWA</td>
<td>4000</td>
<td>3800</td>
<td>3600</td>
<td></td>
</tr>
<tr>
<td>AE4000-SW</td>
<td>4000</td>
<td>4000</td>
<td>3750</td>
<td></td>
</tr>
<tr>
<td>AE5000-SW</td>
<td>5000</td>
<td>5000</td>
<td>4750</td>
<td></td>
</tr>
<tr>
<td>AE6300-SW</td>
<td>6300</td>
<td>5750</td>
<td>5200</td>
<td></td>
</tr>
</tbody>
</table>

The above table shows the maximum rated current per each ambient temperature for drawout type breaker with vertical connection (at brandnew product), when breaker and bus bar are installed in open air. Connection bus bar is according to IEC60947-1. For AE3200-SW, AE4000-SWA, AE4000-SW, AE5000-SW and AE6300-SW, it is required to follow the manufacturer recommended size shown in Page 57.

As for ambient temperature exceeding 60°C, please inquire us.
### Technical Information

#### AE-SW Series air circuit breakers provide easy selective co-ordination with branch circuit breakers.

For selective co-ordinations, refer to the following table.

### 230V AC sym kA

<table>
<thead>
<tr>
<th>Branch circuit breaker</th>
<th>Main circuit breaker</th>
<th>AE-SW30-SW</th>
<th>AE-SW100-SW</th>
<th>AE-SW125-SW</th>
<th>AE-SW160-SW</th>
<th>AE-SW200-SW</th>
<th>AE-SW250-SW</th>
<th>AE-SW320-SW</th>
<th>AE-SW400-SW</th>
<th>AE-SW500-SW</th>
<th>AE-SW630-SW</th>
</tr>
</thead>
<tbody>
<tr>
<td>NF30-SW</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
</tr>
<tr>
<td>NF30-SV</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>NF30-HV</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>NF30-HV</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>NF30-HV</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>NF30-HV</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>NF30-HV</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>NF30-HV</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
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*The values in the table represent the max. rated current for both Series AE-SW air circuit breakers and branch breakers, and the selective co-ordination applies when the AE-SW series air circuit breakers instantaneous pick up is set to maximum.*

*The numerals shown in parentheses are for AE-SW with MCR. (When set MCR).*
### 440V AC sym kA

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### 230V AC sym kA

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<th>AE1600-SW</th>
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<th>AE3200-SW</th>
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### Notes
- The values in the table represent the max rated current for both Series AE-SW air circuit breakers and branch breakers and the selective co-ordination applies when the AE-SW series air circuit breakers instantaneous trip is set to maximum.
- The numerals shown in parentheses are for AE-SW with MCR. (When set MCR).
### Ordering information

**Ordering information for Mitsubishi AE-SW series air circuit breaker**

(General use...WS Type, Special use...WB Type, Protective coordination use...WF Type)

<table>
<thead>
<tr>
<th>Customer(name)</th>
<th>Order No.</th>
<th>Number of units</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE series</td>
<td>AE 1600-SW</td>
<td>AE 1600-SWA</td>
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</tbody>
</table>

#### Type
- **Type**: AE
- **Order No.**: AE 1600-SW
- **Number of units**: AE 1600-SWA

#### Drawout type accessories
- **Cell switch (CL):** 1 or 2 or 3 or 4
- **Shorting b-contact (SBC):** 1 or 2 or 3 or 4 or 5
- **Lifting hooks (HP):**
- **Safety shutter (SST):**
- **Shutter lock (SST-LOCK):**
- **Mis-insertion preventor (MIP):**
- **Test jumper (TJ):**

#### Connection
- **Connection**: Fixed type
- **Connection**: Drawout type

#### Main circuit terminal
- **Main setting module**
- **Optional setting module**
- **EOT Auxiliary Equipment**
- **Electrical interlock (EL):**
- **Mechanical interlock (MI):**

#### Electronic trip relay (ETR)
- **Type**: With ETR
- **Reset type**: Automatic Reset (Standard)
- **Network**: 3Pole, 4Pole
- **Wire system (when EX1 is specified)**

#### Electrical accessories
- **Auxiliary switch (AX):** Standard, High-capacity
- **Motor charging (MD):** 100-125V AC, 200-250V AC, 24V DC, 48V DC
- **Closing coil (CC):** 100-250V AC, 24-48V DC
- **Shunt trip device (SHT):** 100-250V AC, 380-500V AC, 24-48V DC
- **Under voltage trip device (UVT):** 1200-240V AC, 380-460V AC, 24V DC, 48V DC, 110-120V DC

#### Mechanical accessories
- **Push button cover (BC):**
- **Cylinder lock (CYL):**
- **Door interlock (DI):**
- **Terminal cover (TTC):**
- **Door frame (DF):**
- **Dust cover (DUC):**
- **Interphase barrier (BA):** for 2 units (MI2)
- **Mechanical interlock (MI):** for 3 units (MI3)

#### Additional function
- **Extension module (EX1):**
- **External ZCT:**
- **Network:**
- **Wire system (when EX1 is specified):**

#### Remark
- **Order Issuer:**

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**Note:**
- For AE630-SW and AE2000-SW Low rating type, please specify CT rating. Refer to Page 9 and Page 20.
- There is a case to be derated by ambient temperature. Refer to Page 60.
- As for the terminal for AE2000-SWA, AE4000-SWA and AE4000-SW~AE6300-SW, vertical terminal type only is available. (FIX-VT or DR-VT)
- Refer to Page 11 and Page 43-45.
- This setting is available for change by customer later. A preliminary setting of CL at factory shipment is as follows.
- Neutral CT/NCT is used for 3 phase 4 wires system. (4Pole breaker or 3pole breaker with Neutral CT)
- Neutral CT is required for Ground fault or Neutral pole protection, when 3 Pole breaker is used for 3 phase 4 wires system.
- For Earth leakage protection, it is required External ZCT.
- 10V DC and 48V DC are not available for AE4000-SWA 4P and AE4000-SW~AE6300-SW.
- Some module types are not provided BA. Refer to Page 15.
- Power Supply comes from the top terminals.
- Power Supply comes from the bottom terminals.
- Current capacity of the neutral poles
- FN: 50% of the rated current
- FN: 100% of the rated current (See page 47, 52 for the outline and dimensions.)
### Ordering information for Mitsubishi AE-SW series air circuit breaker

**Type**
- WA-SW
- AE-SW

**Number of poles**
- 3P
- 4P
- 6P

**Ordering information**

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<td>4P HN Note 15</td>
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**Current setting**
- A

**CT rating**
- A

**Applicable standard**
- IEC 60947-2 CCC

**Ambient temperature**
- 40°C (Standard)

**Connection**
- Fixed type

**Main circuit terminal**
- Horizontal terminal (FIX)
- Vertical terminal (DR)
- Vertical terminal (VF)
- Front terminal (FT)

**Drawout type accessories**
- Cell switch (CL)
- Shorting b-contact (SB)
- Lifting hook (HP)
- Safety shutter (SST)
- Shutter lock (SST-LOCK)
- Mis-insertion preventor (MIP)
- Test jumper (TJ)
- Vertical terminal adapter (VTA)
- Front terminal adapter (FTA)

**Electronic trip relay (ETR)**
- **Type**
  - Web ETR

**Reset type**
- Automatic Reset (Standard)
- Manual Reset (MRE)

**Additional function**
- Display (DP1)
- Display into panel board (DP2)
- VT unit (VT)

**Network**
- External ZCT
- BIF-CC
- BIF-MD
- BIF-CON
- BIF-CL

**Power supply**
- P1: 100-240V AC/DC
- P2: 24-60V DC
- P3: 100-240V AC / 100-125V DC
- P4: 24-60V DC with output contact
- P5: 100-240V DC with output contact (SSR)

**Neutral CT (NCT)**
- BARE without ETR

**Electrical accessories**
- Auxiliary switch (AX)
- Motor charging (MD)
- Closing coil (CC)
- Shunt trip device (SHT)
- Under voltage trip device (UVT)

**Mechanical accessories**
- Push button cover (BC-L)
- Cylinder lock (CYL)
- Door interlock (DI)
- Terminal cover (TTC)
- Dust cover (DUC)
- Interphase barrier (BA)

**Order Issuer**

---

**Note:**
- For AE630-SW and AE2000-SW: Low rating type, please specify CT rating. Refer to Page 9 and Page 20.
- There is a case to be derated by ambient temperature. Refer to Page 66.
- As for the terminal for AE2000-SWA, AE4000-SWA and AE4000-SW~AE6300-SW, Vertical terminal type only is available. (FIX-VT or DR-VT)
- Refer to Page 11 and Page 43-45.
- This setting is available for change by customer later. A preliminary setting of CL at factory shipment is as follows.
- CL1: 1C CL2: 1C1D CL3: 1C1T1D CL4: 2C1T1D
- Neutral CT is required for Ground fault or Neutral pole protection, when 3 Pole breaker is used for 3 phase 4 wires system. (4 Pole breaker or 3 Pole breaker with Neutral CT).
- For Earth leakage protection, it is required External ZCT.
- Power Supply comes from the top terminals.
- Some module types are not provided. Refer to Page 15.
- Power Supply comes from the bottom terminals.
- Current capacity of the neutral pole: HN: 50% of the rated current FN: 100% of the rated current (See page 47, 52 for the outline and dimensions.)
Ordering information for Mitsubishi AE-SW series air circuit breaker (Generator protection use—WM Type)

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<td>100–125V AC</td>
<td>200–240V AC</td>
<td>380–460V AC</td>
</tr>
<tr>
<td>Time delay</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inst (INST)</td>
<td>9.5s(05)</td>
<td>3s(00)</td>
<td></td>
</tr>
</tbody>
</table>
| Note1: Please specify current setting (Ir) from the specification table. Refer to Page 9 and 10. Note2: There is a case to be derated by ambient temperature. Refer to Page 60. Note3: For the terminal for AE2000-SWA, AE4000-SWA and AE4000-SW~AE6300-SW, Vertical terminal type only is available. (FIX-VT or DR-VT) Note4: Refer to Page 11 and Page 43-46. Note5: This setting is available for change by customer later. A preliminary setting of CL at factory shipment is as follows. CL1: 1C CL2: 1C1D CL3: 1C1T1D CL4: 2C1T1D Note6: Not available for AE630-SW with CT rating: 250A or 315A or 500A. Note7: Neutral CT is optional setting module is used for 3 phase 4 wires system (4 Pole breaker or 3 pole breaker with Neutral CT) Note8: Neutral CT is required for Ground fault or Neutral pole protection, when 3 Pole breaker is used for 3 phase 4 wires system. Note9: For Earth leakage protection, it is required External ZCT. Note10: 24V DC and 48V DC are not available for AE4000-SWA 4P and AE4000-SWA~AE6300-SW. Note11: The combined installation of DI and MI is not available. Note12: Some module types are not provided BA. Refer to Page 15. Note13: Power Supply comes from the top terminals. Note14: Power Supply comes from the bottom terminals. Note15: Current capacity of the neutral poles.
## Ordering information for MITSUBISHI AE-SW series air circuit breaker

(General use— WS relay with Ampere Meter and Fault Memory "DP3")

<table>
<thead>
<tr>
<th>Customer(name)</th>
<th>Order No.</th>
<th>Number of units</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Type

<table>
<thead>
<tr>
<th>Type</th>
<th>AE______-SW</th>
<th>AE______-SWA</th>
</tr>
</thead>
</table>

### Number of poles

<table>
<thead>
<tr>
<th>3P</th>
<th>4P</th>
</tr>
</thead>
</table>

### Current setting Ir

<table>
<thead>
<tr>
<th>CT rating</th>
<th>A</th>
</tr>
</thead>
</table>

### Applicable standard

| IEC60947-2 | CCC |

### Ambient temperature

| 40°C (Standard) |

### Connection

| Fixed type | Drawout type |

### Main circuit terminal

| Horizontal terminal(FIX-VT) | Vertical terminal(DR-VT) | Front terminal(DR-FT) |

### Electronic trip relay (ETR)

<table>
<thead>
<tr>
<th>With ETR</th>
<th>Note1</th>
</tr>
</thead>
</table>

### Reset type

| Automatic Reset (Standard) | Manual Reset (MRE) |

### Power supply

| P1: 100-240V AC-DC |
| P2: 24-60V DC |
| P3: 100-240V AC / 100-125V DC with output contact |
| P4: 24-60V DC with output contact |
| P5: 100-240V DC with output contact (SSR) |

### Connection

| 3x3W | 3x4W |

### Electrical accessories

<table>
<thead>
<tr>
<th>Auxiliary switch</th>
<th>Standard (AX) 2 or 4 or 6 or 8 or 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor charging</td>
<td>100-125V AC-DC 200-250V AC-DC 24V DC 48V DC</td>
</tr>
<tr>
<td>Closing coil</td>
<td>24-48V DC</td>
</tr>
<tr>
<td>Shunt trip device</td>
<td>100-250V AC-DC 380-500V AC 24-48V DC</td>
</tr>
</tbody>
</table>

### Under voltage trip device (UVT)

| 100-120V AC | 200-240V AC-DC | 380-500V AC-DC | 24V DC |

### Mechanical accessories

| Push button cover (BC-L) |

### Note1:

For AE2000-SW, low rating current types are available.

For AE630-SW, types 1, 2, 3, 4 or 6 are available.

### Note2:

There is a case to be derated by ambient temperature. Refer to Page 60.

### Note3:

As for the terminal for AE2000-SWA, AE4000-SWA and AE4000-SW—AE6300-SW, vertical terminal type only is available. (P3-VT or DR-VT)

### Note4:

This setting is available for change by customer later. A preliminary setting of CL at factory shipment is as follows.

| CL1: 1C | CL2: 1C1D | CL3: 1C1T1D | CL4: 2C1T1D |

### Note5:

Neutral CT is required for Ground fault or Neutral pole protection, when 3-pole breaker is used for 3phase 4wire system.

### Note6:

24V DC and 48V DC are not available for AE4000-SWA 4P or AE4000-SW to 6300-SW.

### Note7:

The combined installation of DI and M0 is not available.

### Note8:

Some module types are not provided BA. Refer to Page 15.

### Note9:

Current capacity of the neutral poles

| 50% of the rated current |

### Note10:

If MCR switch is ordered, INST/MCR characteristic will be installed.

INST/MCR characteristics can be switched using a setting dial.

### Note11:

For WS relay with Ampere meter and Fault memory "DP3", ETR including optional setting such as "G1" has integrated structure.

So, optional setting such as G1 for WS relay with DP3 should be specified before ordering as those parts cannot be installed with ETR after factory shipment.
For Safety: Please read the instruction manual carefully before using the products in this catalog. Wiring and connection must be done by the person has a specialized knowledge of electric construction and wiring.

FA Global Site

Eco Changes is the Mitsubishi Electric Group’s environmental statement, and expresses the Group’s stance on environmental management. Through a wide range of businesses, we are helping contribute to the realization of a sustainable society.

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