e-Front runners

# FUJI Air Circuit Breakers

## DH series　New OCR providing Higher Reliability

Fuji Electric FA Components & Systems Co., Ltd.

EEH604b

## ■Variation

| Rated current [A] | | 800A | 1250A | 1600A | 2000A | 2500A | 3200A | 4000A |
|---|---|---|---|---|---|---|---|---|
| Rated Breaking capacity(kA sym.)/ Rated making current(kA peak) IEC EN AS [Ics=Icu] | Rated Voltage 690VAC | 50/105 | | | | 65/143 | | 75/165 |
| | | | 55/121 | | | | | |
| | | | | 85/187 | | | | |
| | Rated Voltage 440VAC | 65/143 | | | | 85/187 | | 100/220 |
| | | | 80/176 | | | | | |
| | | | | 100/220 | | | | |

: DH series : DH-H series : DH-P series

DH-H,DH-P series : Refer to D&C catalog.

## ■Based Standards

IEC60947-2..... International Electrotechnical Commission
EN60947-2..... European Standard
AS 3947-2..... Australian Standard
NEMA PUB NO.SG3..... National Electrical Manufactures Association
ANSI C37.13..... American National Standard Institute
JIS C8372..... Japanese Industrial Standards

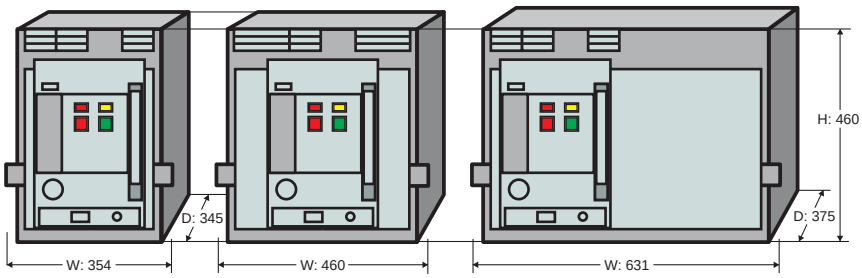
## CONTENTS

# Features

## The ultimate in compactness and operational capability

### Standardized basic dimenstions

The height and depth dimensions are identical in all sizes to 3200A. There are two common widths or frame size, from 800-2000A and from 2500-3200A for the standard series. The panel cutout size is the same for all types of DH series ACB, which makes it easy to arrange the ACBs in switchboards.
Maximum power from minimum volume was central to the design specification. With a depth of 290mm for the fixed type and 345mm for draw-out, it is one of the smallest ACBs in the world.
ACBs with front connections are available off-the-shelf.
Front connections are especially suitable for smaller-depth switchboards




Standard type
800~2000A

2500~3200A

4000A

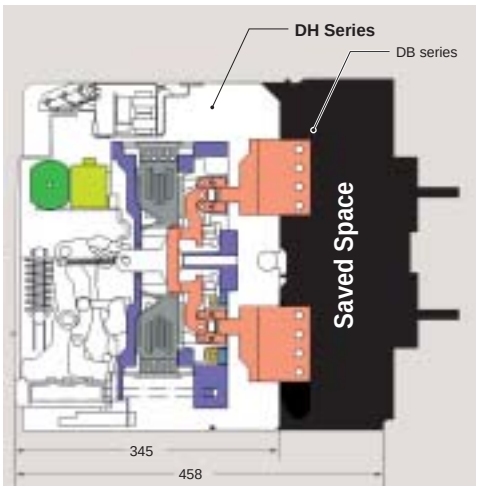
High breaking type
1250~2000A

1600~3200A

### Geared toward the smallest depth in the world

Direct connection of the isolating main contacts to the hinges of the fixed main contacts eliminates the need for intermediate conductors. Allowing the DH series ACBs have the world's smallest depth resulting in space saving in switchboards.

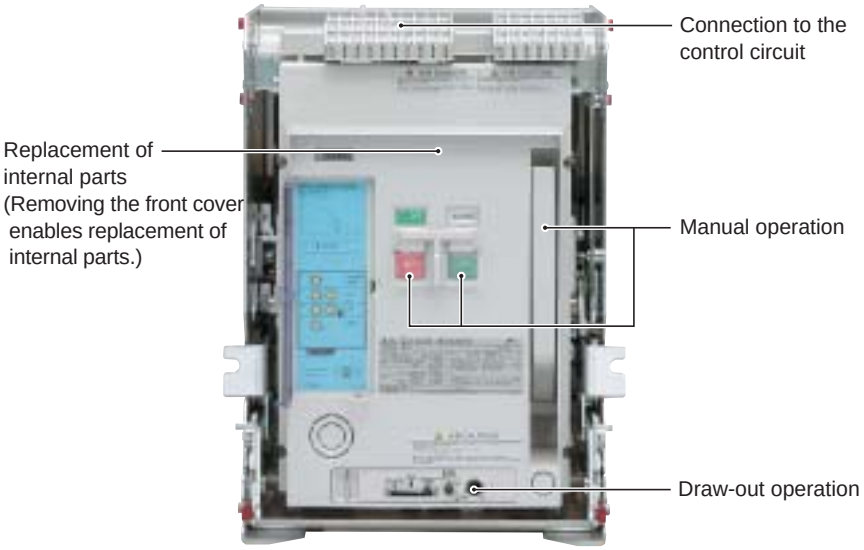
More than twenty design patents have been registered for the **DH series ACB.**




### Increased accessibility from the front

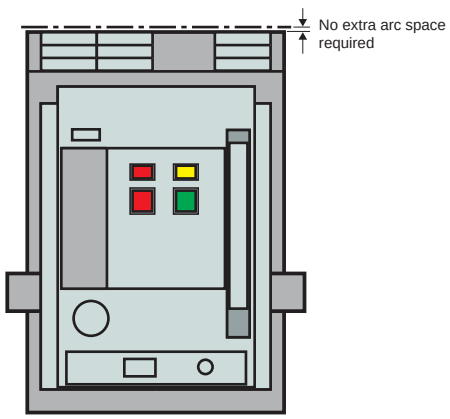
It enhances ease of installation, operation, and maintenance.

The double insulated design ensures that most accessories can be safely and easily, installed by the user. Control, auxiliary and position switch terminals are mounted at the front on the ACB body for easy access. Due to the increased level of harmonics within the distribution network, the neutral phase is fully rated as standard.




### No extra arc space required, vertical stacking permitted

The **DH series ACB** dissipates all arc energy within its unique **"Double Break"** arc chamber. The internal energy dissipation within the ACB allows the clearance distance of the ACB to nearby earthed metal to be zero. This will assist in minimizing switchboard height and costs.

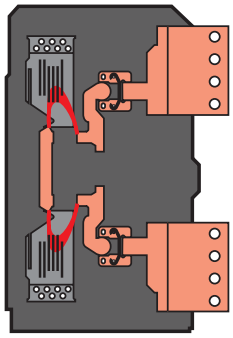


# Features

## A high performance and reliability

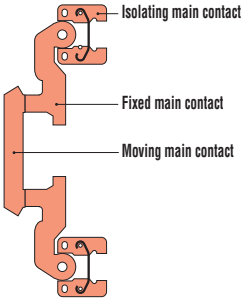
### Very fast interruption by "Double Break" system

The unique **"Double Break"** main contact system ensures extremely fast interruption of short-circuit currents and substantially reduces main contact wear. The internally symmetrical **"Double Break"** structure allows reverse power connection.



### No clamp screws used for the main circuit contact units

There are no clamp screws or flexible leads in the main circuit contact units.
This substantially enhances the durability of the main circuit contact units and improves the reliability in ON-OFF operation.

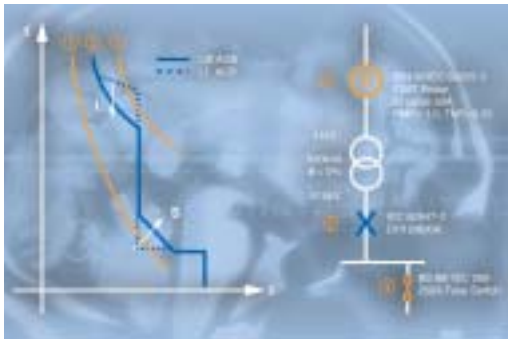



### Enhanced selectivity

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

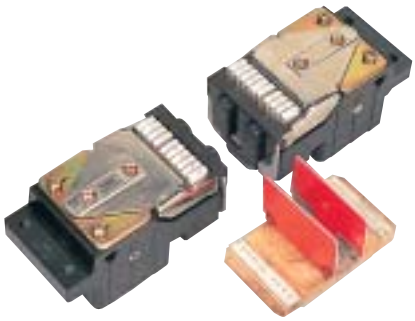
This provides an adjustable time delay on overload (L) and also the $I^2t$ ramp characteristic (S).
As shown, these are essential to provide selectivity when grading with other protective devices such as downstream fuses and upstream relays.
The standard 'LSI' curve provides more than five million combinations of unique time current characteristics.
Zone selective interlocking is available to provide zero time delay selectivity.
As the rated breaking capacity is identical to the rated short-time withstand current full selectivity can be achieved.

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



### Replacement of the main contacts

The fixed and moving main contacts can easily be replaced in the field, thus prolonging the life on the circuit breaker.
Changing each pole takes around 15 minutes.



| Performance | Type and rated current | DH08 800A<br>DH12 1250A<br>DH16 1600A<br>DH20 2000A | DH12H 1250A<br>DH16H 1600A<br>DH20H 2000A | DH25 2500A<br>DH30 3200A | DH16P 1600A<br>DH20P 2000A<br>DH25P 2500A<br>DH30P 3200A | DH40 4000A |
|---|---|---|---|---|---|---|
| Rated breaking current (at 440V AC) | With INST trip function | 65kA | 80kA | 85kA | 100kA | 100kA |
| | With ST delay trip function (Without INST trip/MCR functions) | | | | | |
| Rated short-time withstand current (for 1 sec.) | | | | | | |

Note: If the ACB is DH-H type or DH-P type without INST trip/MCR function, the rated breaking capacity will decrease down to the rated latching current.

# Features

For general feeder circuits (L-characteristic)
For general feeder circuits (R-characteristic)
For generator protection (S-characteristic)

## FUJI ACB provides positive protection for electric power systems.

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

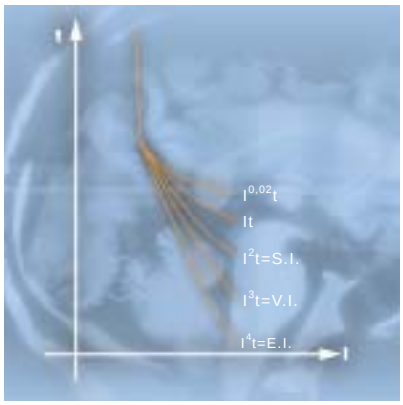
### Optimum protective coordination

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

Fuji ACB is available with a choice of flexible protection curves to assist in selectivity applications.

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

AGR-L Industrial & transformer protection
AGR-R Characteristics to IEC 60255-3
AGR-S Generator protection




Inverse Definite Minimum Time (I.D.M.T.)
(S.I. Standard Inverse
V.I. Very Inverse
E.I. Extremely Inverse)

**Standard OCR with adjustment dial Type AGR-11B**

**Standard OCR with LCD Type AGR-21B,22B**

**Enhanced OCR with LCD Type AGR-31B**

### Overload protection

Adjustable from 40–100% of rated current. True r.m.s detection up to the 19th harmonic, a distant vision for the competition who rarely see past the 7th. Neutral protection for all those Triple-N harmonics, such as 3rd, 9th and 15th. Also in case we forgot to mention, a "thermal memory" as standard!

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

This function can be used to monitor and switch on additional power backup to feed critical circuits. For example, the function can be set so that when a pre-trip alarm is activated, an emergency generator starts to ensure a constant supply. This feature is only available on some AGR21 OCR models with a generator "S" characteristic.

### N-phase protection function (optional)

In 3-phase, 4-wire systems that contain harmonic distortion, the 3rd harmonic may cause large currents to flow through the neutral conductor. The N-phase protection function prevents the neutral conductor from sustaining damage or burnout due to these large currents. Available in all OCRs except for generator "S" characteristic types.

### Reverse power trip function (S-characteristic) ✻1 (The first-ever feature for ACBs)

This feature provides additional protection when paralleling generators. The AGR21 OCR for generator protection with the reverse power trip function, negates the need for installation and wiring in an external reverse power relay. This feature is available using an AGR21 OCR with a generator "S" type characteristic only.

### Ground fault trip function

This function eliminates external relays to provide a ground fault protection to TN-C or TN-S power distribution systems on the load side. Ground faault protection on the line side is also available as an option.

### Reverse phase protection function

This function detects the negative-phase current occurring due to reverse phase or phase loss and precents burnout of a motor or damage to equipment.

### Contact temperature monitoring function (optional) ✻2

This function monitors the temperature of the ACBs main contacts. An alarm indicates when the temperature exceeds 155°C. Continuous monitoring of the contact temperature provides valuable input for preventative and predictive maintenance programs.

### Advanced L.C.D display, Over Current Relay

The AGR-31B OCR comes standard with an LCD display. It can monitor and indicate phase currents, voltages, power, energy, power factor, frequency, and more.

✻1: Available for type AGR-22BS, 31BS.
✻2: Available for type AGR-22B, 31B OCR.

# DH series
# Type number nomenclature

## ■ Type number nomenclature

**DH 08 3 X H - M 11BLAL F □**

**① Basic type**

**② Frame size**
- 08: 800A
- 12: 1250A
- 16: 1600A
- 20: 2000A
- 25: 2500A
- 30: 3200A
- 40: 4000A

**③ Number of poles**
- 3: 3-pole
- 4: 4-pole

**④ Installation**
- P: Fixed (Breaking capacity standard type only)
- X: Draw-out with cradle
- Q: Draw-out with cradle & shutter

**⑤ Interrupting capacity class**
- Blank: Standard
- H: High
- P: Super High

**⑥ Closing mechanism**
- T: Manual-spring
- M: Motor-spring ex.M = 100VDC

**⑦ Overcurrent release device**

11BLAL:Standard (LT, ST, INST/MCA)
11BLGL:Std. Plus GF
(For details, see page 8.)

**⑧ Tripping device**
- F: Shunt trip (AVR-1C) ex. F = 100VDC
- R1: Undervoltage trip/Instantaneous (AUR-1CS)
- R2: Undervoltage trip/500ms Time delay (AUR-1CD)

**⑨Detailed specifications**

Specify any additional requirements, such as overseas standards compliance, special environmental usage, or accessories, when ordering. Also clearly indicate the applicable standards, main circuit voltage, and breaking current. See the tables below.
ex. IEC 440VAC 65kA

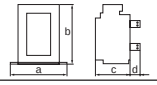
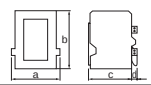
| Applied standard | Ordering code |
|---|---|
| IEC | IEC |
| EN | EN |
| AS | AS |
| NEMA | NEMA |
| ANSI | ANSI |

| Special environment specification | Ordering code |
|---|---|
| Tropical uses | Tropical |
| Extremely cold use<br>storage -40°C<br>operating -25°C | Extremely cold |
| Anti-corrosion treatment | Anti-corrosion |

| Optional accessories | Ordering code |
|---|---|
| Auxiliary switch (4PDT) | Auxiliary switch (4PDT) |
| Auxiliary switch (10PDT) | Auxiliary switch (10PDT) |
| Auxiliary switch (7PDT)<br>for general 4PDT, for low level circuits 3PDT | Auxiliary switch<br>4PDT + 3PDT |
| Auxiliary switch (10PDT)<br>for general 7PDT, for low level circuits 3PDT | Auxiliary switch<br>7PDT + 3PDT |
| OFF (Open) padlock | OFF (Open) padlock |
| Automatic closing spring release device | Automatic closing spring release device |
| Capacitor trip device | AQR-1 |
| Control circuit safety shutter | Control circuit safety shutter |
| Position switches | ALR-□P |
| Test jumper | Test jumper |
| Mis – insertion protection device<br>Breaker fixing bolts | Mis – insertion protection device<br>Breaker fixing bolts |
| Door interlock | Door interlock |
| Key lock | Key lock |
| Key interlock | Key interlock |
| Mechanical interlock | Mechanical interlock |
| Manual reset device | Manual reset device |
| IP55 cover | IP55 cover |
| Control circuit terminal cover | Control circuit terminal cover |
| Earthing device | Earthing device |
| Arc barrier | Arc barrier |
| Door flange | Door flange |
| Draw-out storage handle | Draw-out storage handle |
| Main circuit safety shutter | Main circuit safety shutter |
| Padlocling unit for main circuit safety shutter | Padlocling unit for main circuit safety shutter |
| Lifting plate | Lifting plate |

| External accessories | Ordering code |
|---|---|
| CT for neutral line 800 to 1600A frame | CW80-40LS |
| CT for neutral line 2000 to 4000A frame | EC160-40LS |
| Power transformer | TSE-30M |
| Lifter | AWR-1 (DH08 to DH30), AWR-2 (DH08 to DH40) |
| OCR checker | ANU-1 |

## ■ Specifications, standard types

| Frame size | | 800A | | 1250A | | 1600A | | 2000A | | 2500A | | 3200A | | 4000A | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Basic type | | **DH08 □■** | | **DH12 □■** | | **DH16 □■** | | **DH20 □■** | | **DH25 □■** | | **DH30 □■** | | **DH40 □■** | |
| No. of poles *2 | | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 |
| Rated current (A) *1 (Max.) | IEC, EN, AS | 800 | | 1250 | | 1600 | | 2000 | | 2500 | | 3200 | | 4000 | |
| | NEMA, ANSI | 800 | | 1250 | | 1540 | | 2000 | | 2500 | | 3200 | | 3700 | |
| | JIS | 800 | | 1250 | | 1600 | | 2000 | | 2500 | | 3200 | | 3700 | |
| Rated current of the neutral pole (A) | | 800 | | 1250 | | 1600 | | 2000 | | 2500 | | 3200 | | 4000 | |
| Rated primary current of overcurrent tripping device ($I_{CT}$) (A) (For general feeder circuit use) | | 200<br>400<br>800 | | 400<br>800<br>1250 | | 400<br>800<br>1250<br>1600 | | 400<br>800<br>1250<br>1600<br>2000 | | 2500 | | 3200 | | 4000 | |
| Rated insulation voltage ($U_i$) (V, 50/60Hz) *3 | | 1000 | | | | | | | | | | | | | |
| Rated operational voltage ($U_e$)(V, 50/60Hz)*4 | | 690 | | | | | | | | | | | | | |
| Rated breaking capacity (kA, sym.)/ Rated making current (kA, peak) | | | | | | | | | | | | | | | |
| IEC, EN, AS [$I_{CS}$=$I_{CU}$] | 690V AC | 50/105 | | | | | | | | 65/143 | | | | 75/165 | |
| | 500V | 65/143 | | | | | | | | 85/187 | | | | 100/220 (440V) | |
| NEMA, ANSI | 600V AC | 42/96.6 | | | | | | | | 50/115 | | | | 65/149.5 | |
| | 480V | 50/115 | | | | | | | | 65/149.5 | | | | 75/172.5 | |
| | 240V | 65/149.5 | | | | | | | | 85/195.5 | | | | 100/230 | |
| JIS | 550V AC | 50/105 | | | | | | | | 65/143 | | | | 75/165 | |
| | 460V | 65/143 | | | | | | | | 85/195.5 | | | | 100/230 | |
| | 220V | 65/143 | | | | | | | | 85/195.5 | | | | 100/230 | |
| Installation | | | | | | | | | | | | | | | |
| Fixed type **P** | | ● | | ● | | ● | | ● | | ● | | ● | | – | |
| Draw-out type with cradle **X** | | ● | | ● | | ● | | ● | | ● | | ● | | ● | |
| Draw-out type with cradle and shutter **Q** | | ● | | ● | | ● | | ● | | ● | | ● | | ● | |
| Main circuit terminal connection | | | | | | | | | | | | | | | |
| Fixed type | Vertical terminal | ▲ | | ▲ | | ▲ | | ❍ | | ❍ | | ❍ | | – | |
| | Horizontal terminal | ❍ | | ❍ | | ❍ | | ▲ | | ▲ | | ▲ | | – | |
| | Front terminal | ▲ | | ▲ | | ▲ | | ▲ | | ▲ | | ▲ | | – | |
| Drow-out type | Vertical terminal | ▲ | | ▲ | | ▲ | | ❍ | | ❍ | | ❍ | | ❍ | |
| | Horizontal terminal | ❍ | | ❍ | | ❍ | | ▲ | | ▲ | | ▲ | | – | |
| | Front terminal | ▲ | | ▲ | | ▲ | | ▲ | | ▲ | | ▲ | | – | |
| Rated impulse withstand voltage ($U_{imp}$) (kV) | | 12 | | | | | | | | | | | | | |
| Rated short time withstand current ($I_{cw}$) (kA, rms ) | 1 sec. | 65 | | | | | | | | 85 | | | | 100 | |
| | 3 sec. | 50 | | | | | | | | 65 | | | | 85 | |
| Rated latching current (kA, rms ) | | 65 | | | | | | | | 85 | | | | 100 | |
| Total fault clearing time (s) | | 0.03 | | | | | | | | | | | | | |
| Closing time (s) max. | Spring charging time | 10 | | | | | | | | | | | | | |
| | Closing time | 0.08 | | | | | | | | | | | | | |
| Dimensions(mm) | | | | | | | | | | | | | | | |
| Fixed type  | a | 360 | 445 | 360 | 445 | 360 | 445 | 360 | 445 | 466 | 586 | 466 | 586 | – | |
| | b | 460 | | 460 | | 460 | | 460 | | 460 | | 460 | | – | |
| | c | 290 | | 290 | | 290 | | 290 | | 290 | | 290 | | – | |
| | d | 75 | | 75 | | 75 | | 75 | | 75 | | 75 | | – | |
| Drow-out type  | a | 354 | 439 | 354 | 439 | 354 | 439 | 345 | 439 | 460 | 580 | 460 | 580 | 631 | 801 |
| | b | 460 | | 460 | | 460 | | 460 | | 460 | | 460 | | 460 | |
| | c | 345 | | 345 | | 345 | | 345 | | 345 | | 345 | | 375 | |
| | d | 40 | | 40 | | 40 | | 40 | | 40 | | 40 | | 53 | |
| Mass (kg) For draw-out type X | | 73 | 86 | 73 | 86 | 76 | 90 | 79 | 94 | 105 | 125 | 105 | 125 | 139 | 176 |

Notes: ● Available – Not available
□ Replace the □ mark in the type number by the pole number code 3-pole: **3** 4-pole: **4**
■ Replace the ■ mark in the type number by the installation code Fixed: **P** Draw-out with cradle: **X** Draw-out with cradle and shutter: **Q**
❍ Standard ▲ Available on request

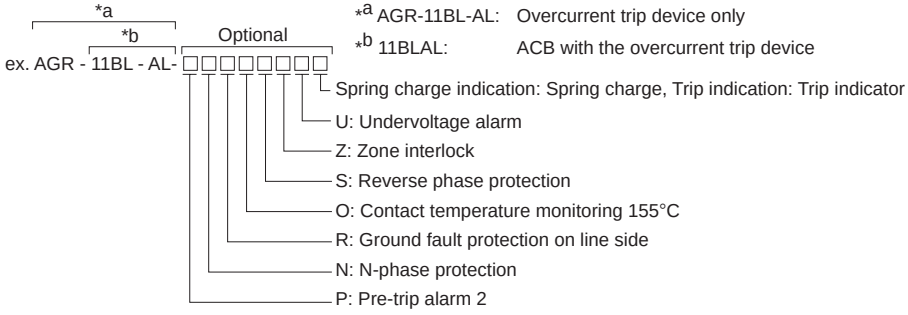
*1 At ambient temperature of 40°C. Rated current at standard terminal connection. Refer to D&C catalog for other terminal connection.
*2 The 2-pole ACBs are similar to 3-pole types except that the center pole contacts and conductors are omitted.
*3 1000V AC applies to IEC60947-2 and JIS C8201-2.
*4 690V AC applies to IEC60947-2 and JIS C8201-2.

# DH series
# Combination of overcurrent tripping device and indicator

## ■ Combination of overcurrent tripping device and indicator

| Division | Application | Type number *7 | LCD | | Protection function | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Multi indication *6 | Amperage indication only | Long time delay | Short time delay | Instantaneous or Making current release | | Pre-trip alarm | | Groumd fault | |
| | | | | | LT | ST | INST | MCR | PTA | PTA2 *1 | GF *2 | |
| Dial adjustment type | General feeder protection | 11BLAL | — | — | ● | | ● | — | — | — | — | |
| | | 11BLGL | — | — | ● | | ● | — | — | — | ● | |
| Standard LCD type | General feeder protection | 21BLPS | — | ● | ● | | ● | | ● | — | — | |
| | | 21BLPG | — | ● | ● | | ● | | ● | — | ● | |
| | | 21BRPS *5 | — | ● | ● | | ● | | ● | — | — | |
| | | 21BRPG *5 | — | ● | ● | | ● | | ● | — | ● | |
| | Generator protection | 21BSPS | — | ● | ● | | ● | | ● | — | — | |
| | | 22BSPR | — | ● | ● | | ● | | ● | ○ | — | |
| Enhanced LCD type | General feeder protection | 31BLPS | ● | — | ● | | ● | | ● | — | — | |
| | | 31BLPG | ● | — | ● | | ● | | ● | — | ● | |
| | | 31BRPS *5 | ● | — | ● | | ● | | ● | — | — | |
| | | 31BRPG *5 | ● | — | ● | | ● | | ● | — | ● | |
| | Generator protection | 31BSPS | ● | — | ● | | ● | | ● | ○ | — | |
| | | 31BSPR | ● | — | ● | | ● | | ● | ○ | — | |

Note: *1 Only one function is selectable from PAT2, UV and spring charge indicator.
If you wish to select more than one function, the control circuit will be manually linked special model. Please contact FUJI.
*2 The GF function is not available when the CT rated primary current [$I_{CT}$] is 200A or less.
*3 When the main circuit voltage exceeds 250V, a step-down transformer is necessary.
*4 Only one function is selectable from REF, OH, NS, and trip indicator.
If you wish to select more than one function, the control circuit will be manually linked special model. Please contact FUJI.
*5 You can select an R characteristic from the following 5 protective characteristics.
$I^{0.02}T$ $IT$ $I^2T$ $I^3T$ $I^4T$
*6 Phase current, line voltage, and power can be indicated. See page 08/65 for details.
*7 Overcurrent trip device type




## ■ Ordering information

Specify the following:
1. Type number
2. Applied standard
3. Main circuit voltage and breaking capacity
4. Optional accessories for main device and OCR
5. Voltage of each device
6. External accessories

# Combination of overcurrent tripping device and indicator

●:Standard ○:Optional

| | | | | | | | Output indication | | | | Undervoltage alarm | Field test function | Control power |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Reverse power | N-phase protection | Gruond fault on line side | Contact temperature monitoring | Reverse phase protection | Zone interlock | Single contact | Individual contact | Spring charge indicator *1 | Trip indicator *4 | | | |
| | RPT *3 | NP | REF *4 | OH *4 | NS *4 | Z | | | | | UV *1*3 | | |
| | — | ○ | — | — | — | — | ● | — | ○ | ○ | — | — | Not required |
| | — | ○ | — | — | — | — | ● | — | ○ | ○ | — | — | Not required |
| | — | ○ | — | — | ○ | — | — | ● | ○ | ○ | — | ● | Required |
| | — | ○ | ○ | — | ○ | — | — | ● | ○ | ○ | — | ● | Required |
| | — | ○ | — | — | ○ | — | — | ● | ○ | ○ | — | ● | Required |
| | — | ○ | ○ | — | ○ | — | — | ● | ○ | ○ | — | ● | Required |
| | — | — | — | — | — | — | — | ● | ○ | ○ | — | ● | Required |
| | ● | — | — | ○ | — | ○ | — | ● | ○ | ○ | ○ | ● | Required |
| | — | ○ | — | ○ | ○ | ○ | — | ● | ○ | ○ | ○ | ● | Required |
| | — | ○ | ○ | ○ | ○ | ○ | — | ● | ○ | ○ | ○ | ● | Required |
| | — | ○ | — | ○ | ○ | ○ | — | ● | ○ | ○ | ○ | ● | Required |
| | — | ○ | ○ | ○ | ○ | ○ | — | ● | ○ | ○ | ○ | ● | Required |
| | — | — | — | ○ | — | ○ | — | ● | ○ | ○ | ○ | ● | Required |
| | ● | — | — | ○ | — | ○ | — | ● | ○ | ○ | ○ | ● | Required |

Note: • When AGR-11B OCR with single-contact indication is activated, the corresponding operation LED indicator is ON momentarily or OFF. But the LED indicator is kept ON when the protection function is checked with the optional OCR checker.

• If the control power is not supplied or is lost, each function operates as follows:

| | |
|---|---|
| LT, ST, INST, RPT | Operates normally. |
| GF | Operates normally<br>When the CT rated primary current [$I_{CT}$] is less than 800 A and the GF pick-up current is set to 10 %, the GF becomes inoperative. |
| MCR | Operates as INST. |
| PTA 1-channel<br>2-channel | Is inoperative. |
| LED indicator on OCRs with single-contact indication | Is on momentarily or off. |
| Contact output from OCRs with single-contact indication | Turns off after 40 ms or more. |
| Contact output from OCRs with individual contact indication | Is inoperative. |
| LCD | No display |
| Field test facility | Is inoperative. |

# DH series
# Characteristics overcurrent trip device

## ■ Characteristics of overcurrent trip device

For general feeder circuit/L-characteristic (Type AGR-11BL, 21BL, 31BL)

| Protection function | | Setting range |
|---|---|---|
| Adjustable long time delay trip LT | Pick-up current $I_R$ (A) | $I_n$X (0.8 — 0.85 — 0.9 — 0.95 — <u>1.0</u> — NON), 6 steps<br>• Non-tripping at $I_R$ X 1.05 or less • Tripping between over 1.05$I_R$ and 1.2$I_R$ or less |
| | Time delay $t_R$ (s)<br>Tolerance of $t_R$ (%) | (0.5 — 1.25 — 2.5 — 5 — <u>10</u> — 15 — 20 — 25 — 30) at 600% X $I_R$, 9 steps<br>±15% +150ms -0ms |
| Adjustable short time delay trip ST | Pick-up current $I_{sd}$ (A)<br>Tolerance of $I_{sd}$ (%) | $I_n$X (1 — 1.5 — 2 — 2.5 — 3 — 4 — <u>6</u> — 8 — 10 — NON), 10 steps<br>±15% |
| | Time delay $t_{sd}$ (ms)<br>Relay time (ms)<br>Resettable time (ms)<br>Total fault clearing time (ms) | <br>50 100 200 400 600 800, 6steps<br>25 75 175 375 575 775<br>120 170 270 470 670 870 |
| Adjustable instantaneous trip INST or MCR | Pick-up current $I_i$ (A)<br>Tolerance of $I_i$ (%) | $I_n$X (2 — 4 — 6 — 8 — 10 — 12 — 14 — <u>16</u> — NON), 9 steps<br>±20% |
| Adjustable pre-trip alarm PTA | Pick-up current $I_{P1}$ (A)<br>Tolerance of $I_{P1}$ (%)<br>Time delay $t_{P1}$ (s)<br>Tolerance of $t_{P1}$ (%) | $I_n$ X (0.75 — 0.8 — 0.85 — 0.9 — <u>0.95</u> — 1.0), 6 steps<br>±7.5%<br>(5 —10 — 15 — 20 — 40 — 60 — 80 — <u>120</u> — 160 — 200) at $I_{P1}$ or more, 10 steps<br>±15% +100ms -0ms |
| Adjustable ground fault trip GF | Pick-up current $I_g$ (A)<br>Tolerance of $I_g$ (%) | $I_{CT}$ X (0.1 — <u>0.2</u>— 0.3 — 0.4 — 0.6 — 0.8 — 1.0 — NON), 8 steps<br>±20% |
| | Time delay $t_g$ (ms)<br>Relay time (ms)<br>Resettable time (ms)<br>Total fault clearing time (ms) | <br>100 200 <u>300</u> 500 1000 2000, 6 steps<br>75 175 275 475 975 1975<br>170 270 370 570 1070 2070 |
| Ground fault trip on line side REF (AGR-21B, 31B only) | Pick-up current [$I_{REF}$] (A)<br>Current setting tolerance (%)<br>Time-delay (s) | [$I_{CT}$] x (0.1 — <u>0.2</u> — 0.3 — 0.4 — 0.6 — 0.8 — 1.0 — NON), 8 steps<br>±20%<br>Inst |
| Neutral phase protection function NP | Pick-up current $I_N$ (A) | $I_{CT}$ X (<u>0.4</u> — 0.5 — 0.63 — 0.8 — 1.0) Factory set to a user-specified value<br>• Non-tripping at 1.05 $I_N$ or less<br>• Tripping range: Between over 1.05$I_N$ and 1.2$I_N$ or less |
| | Time delay $t_N$ (s)<br>Tolerance of $t_N$ (%) | Long time delay (LT) trip at 600% of $I_N$<br>±15% +150ms -0ms |
| Reverse phase protection NS (AGR-21B, 31B only) | Pick-up current [$I_{NS}$] (A)<br>Current setting tolerance (%)<br>Time-delay [$t_{NS}$] (s)<br>Time-delay tolerance (%) | [$I_n$] x ( 0.2 — 0.3 — <u>0.4</u> — 0.5 — 0.6 — 0.7 — 0.8 — 0.9 — 1.0), 9 steps<br>±10%<br>At 150% current of [$I_{ns}$], 0.4 — 0.8 — 1.2 — 1.6 — 2 — 2.4 — 2.8 — 3.2 — 3.6 — <u>4</u> , 10 steps<br>±20% +150ms -0ms |
| Undervoltage alarm UV (AGR-31B only) | Recovery setting voltage (V)<br>Recovery voltage tolerance (%)<br>Setting voltage (V)<br>Setting voltage tolerance (%)<br>Time delay (s)<br>Time delay tolerance (%) | [$V_n$] x (0.8 — <u>0.85</u> — 0.9 — 0.95), 4 steps<br>±5%<br>[$V_n$] x (0.4 — <u>0.6</u> — 0.8), 3 steps<br>±5%<br>0.1 — 0.5 — <u>1</u> — 2 — 5 — 10 — 15 — 20 — 30 — 36, 10 steps<br>±5% +100ms -0ms |
| Control power | | 100 to 120V AC, 200 to 240V AC) common — 100 to 125V DC, 200 to 250V DC) common — 24V DC, 48V DC) common |
| | | Power consumption: 5VA |

___ : Default setting

## ■ Values of [$I_{CT}$] and [$I_n$] (for standard connention)

| Type | Applicable [$I_{CT}$] (A) | Rated current [$I_n$](A) [$I_{CT}$] X 0.5 | [$I_{CT}$] X 0.63 | [$I_{CT}$] X 0.8 | [$I_{CT}$] <u>X 1.0</u> |
|---|---|---|---|---|---|
| DH08 | **200** | 100 | 125 | 160 | 200 |
| | **400** | 200 | 250 | 320 | 400 |
| | **800** | 400 | 500 | 630 | 800 |
| DH12 | **400** | 200 | 250 | 320 | 400 |
| | **800** | 400 | 500 | 630 | 800 |
| | **1250** | 630 | 800 | 1000 | 1250 |
| DH16 | **400** | 200 | 250 | 320 | 400 |
| | **800** | 400 | 500 | 630 | 800 |
| | **1250** | 630 | 800 | 1000 | 1250 |
| | **1600** | 800 | 1000 | 1250 | 1600* |

* NEMA, ANSi : Not available.

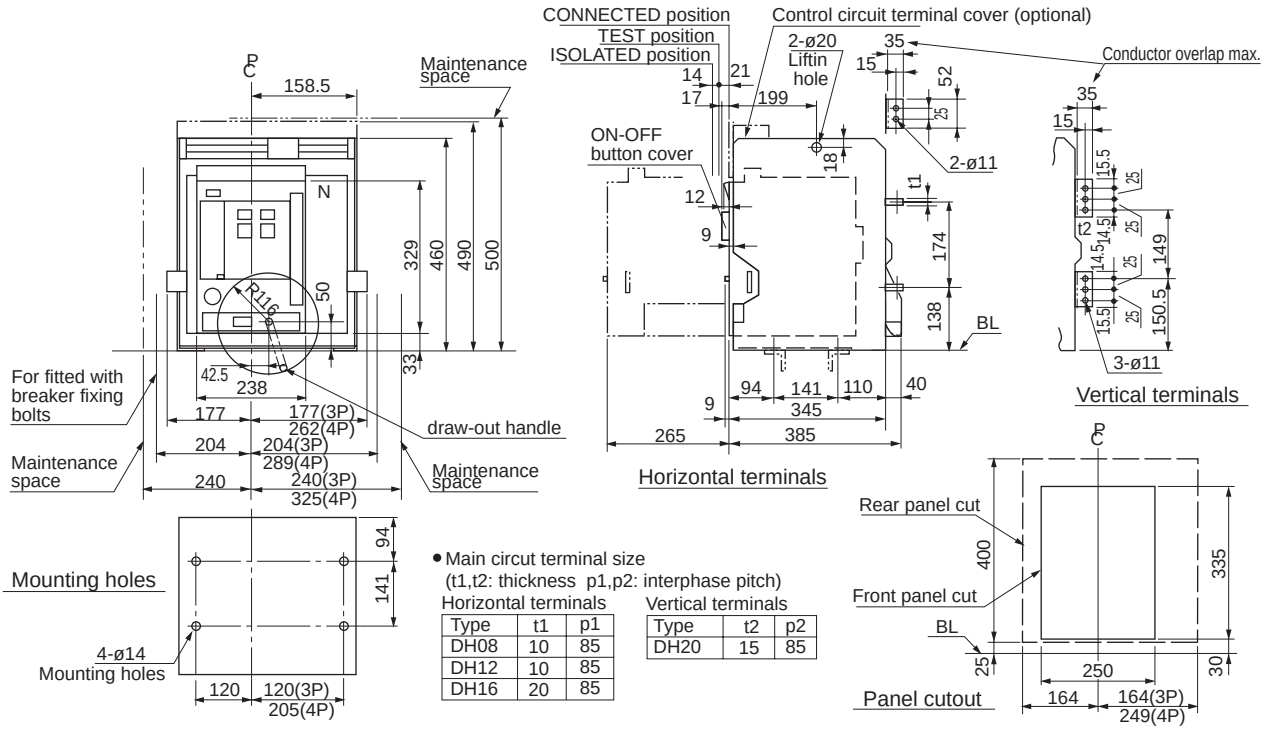
| Type | Applicable [$I_{CT}$] (A) | Rated current [$I_n$](A) [$I_{CT}$] X 0.5 | [$I_{CT}$] X 0.63 | [$I_{CT}$] X 0.8 | [$I_{CT}$] <u>X 1.0</u> |
|---|---|---|---|---|---|
| DH20 | **400** | 200 | 250 | 320 | 400 |
| | **800** | 400 | 500 | 630 | 800 |
| | **1250** | 630 | 800 | 1000 | 1250 |
| | **1600** | 800 | 1000 | 1250 | 1600 |
| | **2000** | 1000 | 1250 | 1600 | 2000 |
| DH25 | **2500** | 1250 | 1600 | 2000 | 2500 |
| DH30 | **3200** | 1600 | 2000 | 2500 | 3200 |
| DH40 | **4000** | 2000 | 2500 | 3200 | 4000 * |

* NEMA, ANSi, JIS : Not available.

___ : Default setting

## ■ Dimensions, mm

### • Draw-out types
**DH08, DH12, DH16, DH20**




- Main circut terminal size
  (t1,t2: thickness p1,p2: interphase pitch)

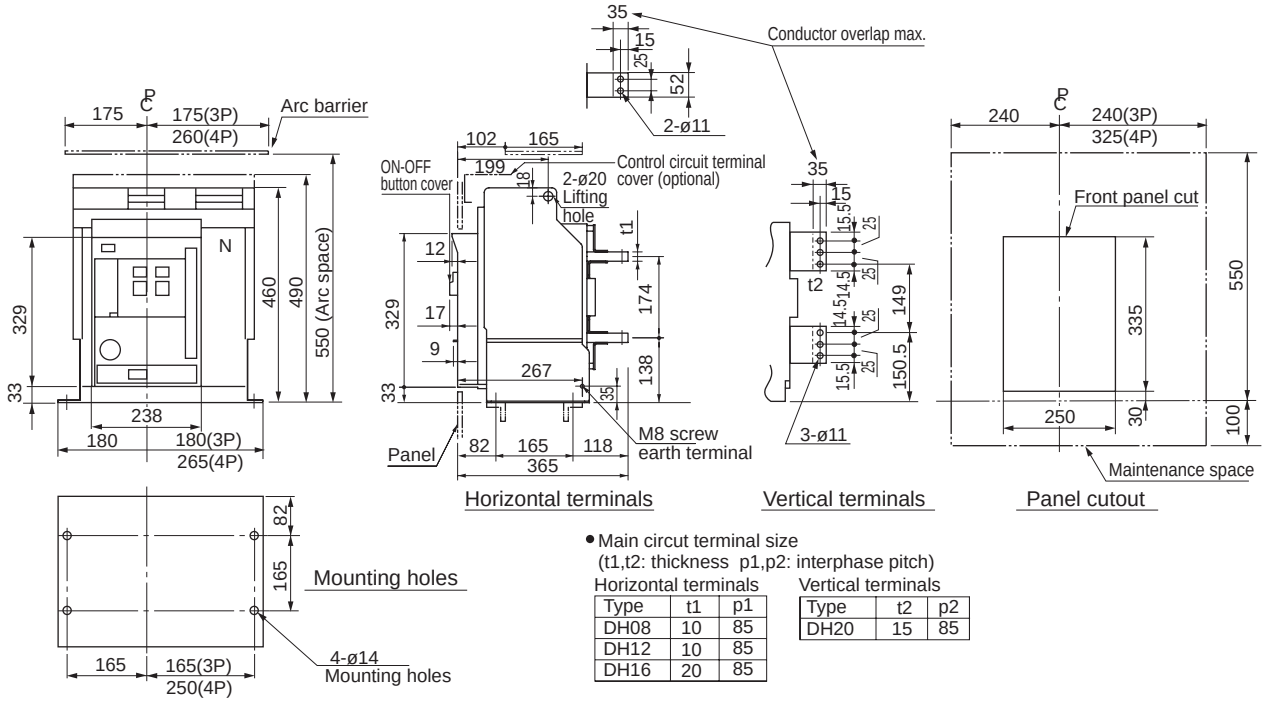
Horizontal terminals

| Type | t1 | p1 |
|---|---|---|
| DH08 | 10 | 85 |
| DH12 | 10 | 85 |
| DH16 | 20 | 85 |

Vertical terminals

| Type | t2 | p2 |
|---|---|---|
| DH20 | 15 | 85 |

### • Fixed types
**DH08, DH12, DH16, DH20**




- Main circut terminal size
  (t1,t2: thickness p1,p2: interphase pitch)

Horizontal terminals

| Type | t1 | p1 |
|---|---|---|
| DH08 | 10 | 85 |
| DH12 | 10 | 85 |
| DH16 | 20 | 85 |

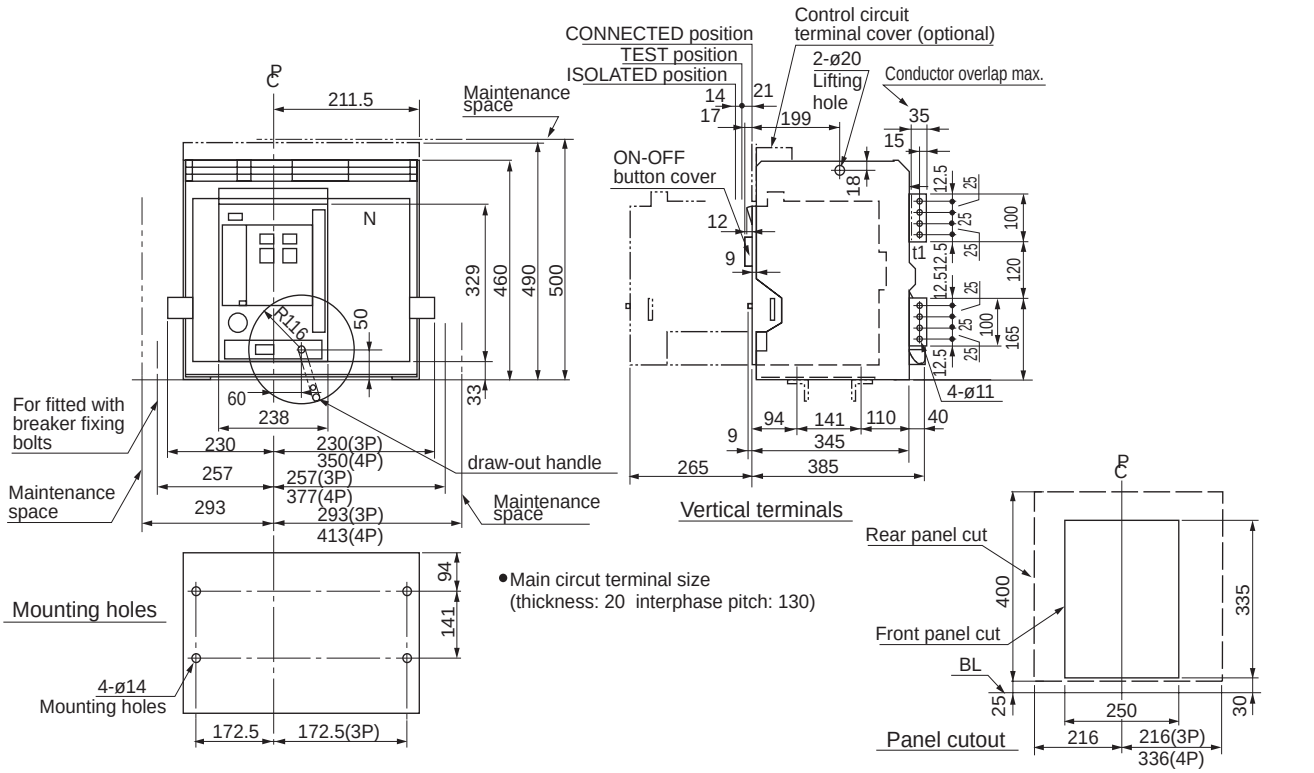
Vertical terminals

| Type | t2 | p2 |
|---|---|---|
| DH20 | 15 | 85 |

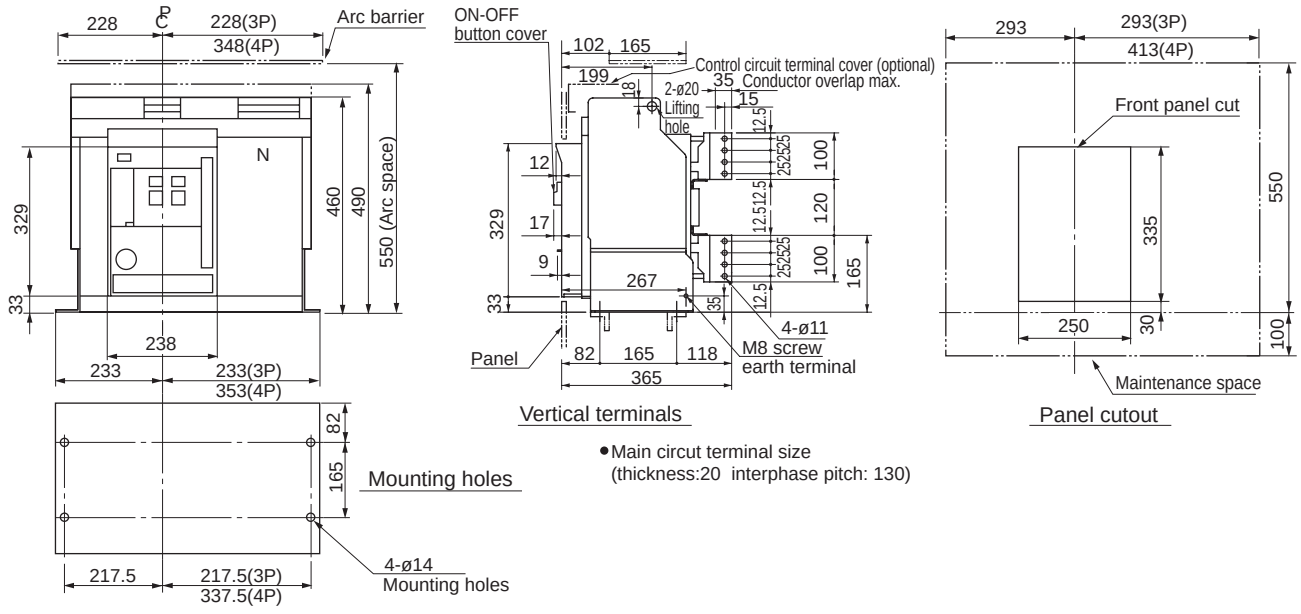
# DH series
# Dimensions

■ **Dimensions, mm**

• **Draw-out types**
**DH25, DH30**



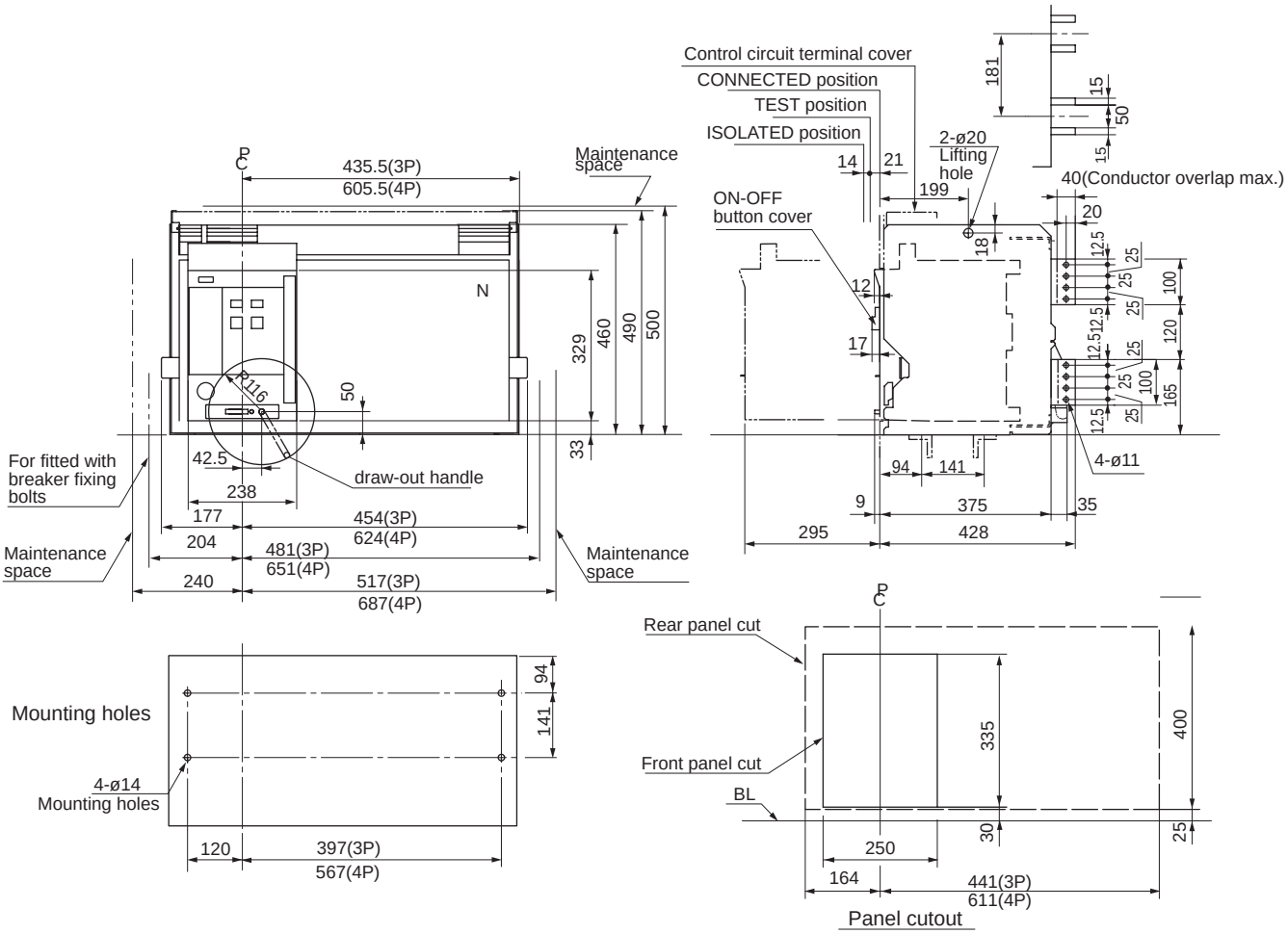

• **Fixed types**
**DH25, DH30**



■ **Dimensions, mm**

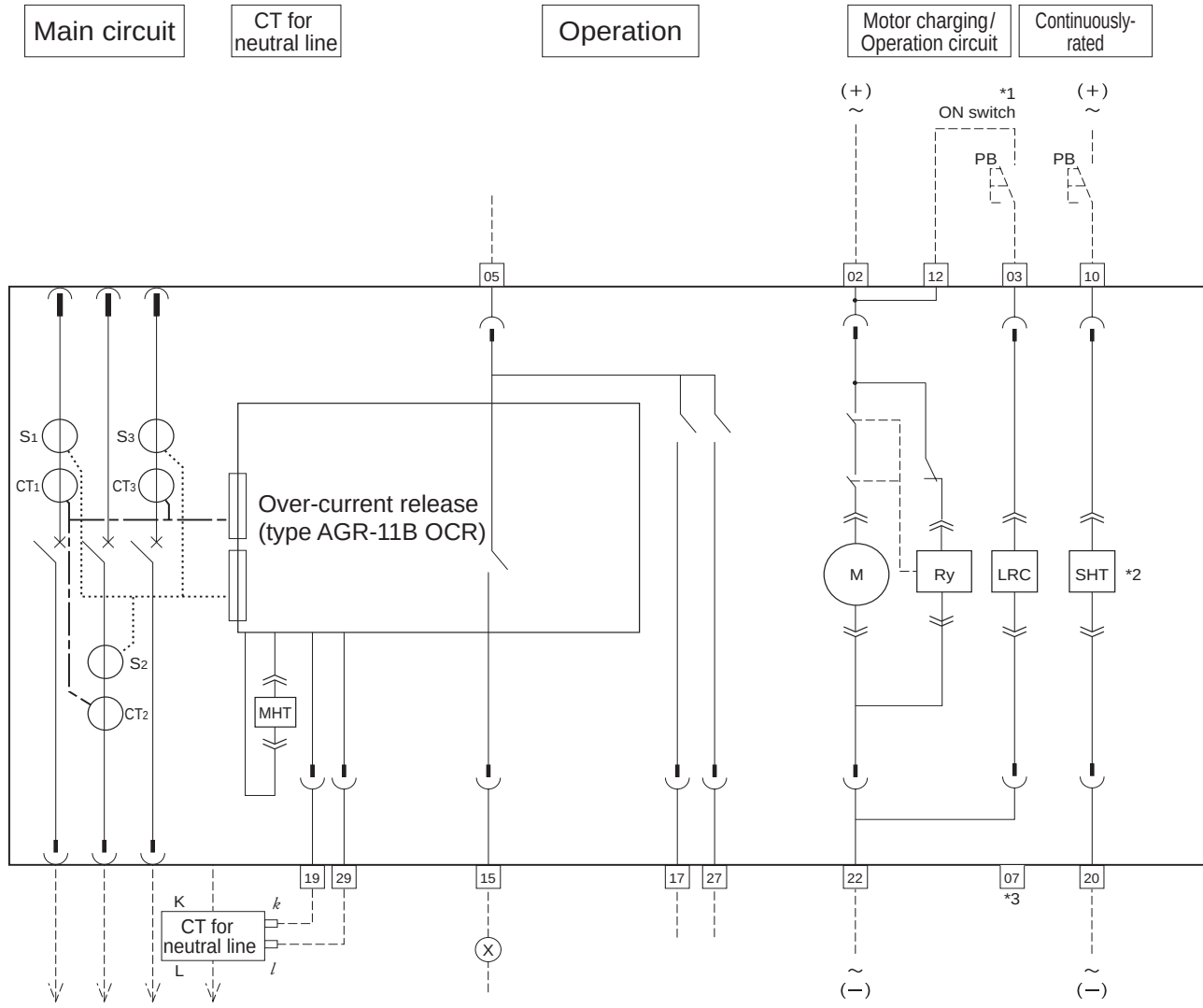
• **Draw-out types**

**DH40**



# DH series
# Wiring diagrams

## ■ Wiring diagrams(with AGR-11B OCR)




### Terminal description

Check OCR voltage before connecting.
02 22 Control power supply AC100 - 240V, DC100 - 250V, DC24V, DC48V
12 Operation switch, common
03 ON switch
05 Operation indication terminal, common
15 Single-contact indication
17 Trip indication
27 Spring charge indicator
10 20 Continuously-rated shunt trip
19 Separate CT for neutral line (*k*)
29 Separate CT for neutral line (*l*)
08 18 28 UVT power supply
09 UVT power supply common

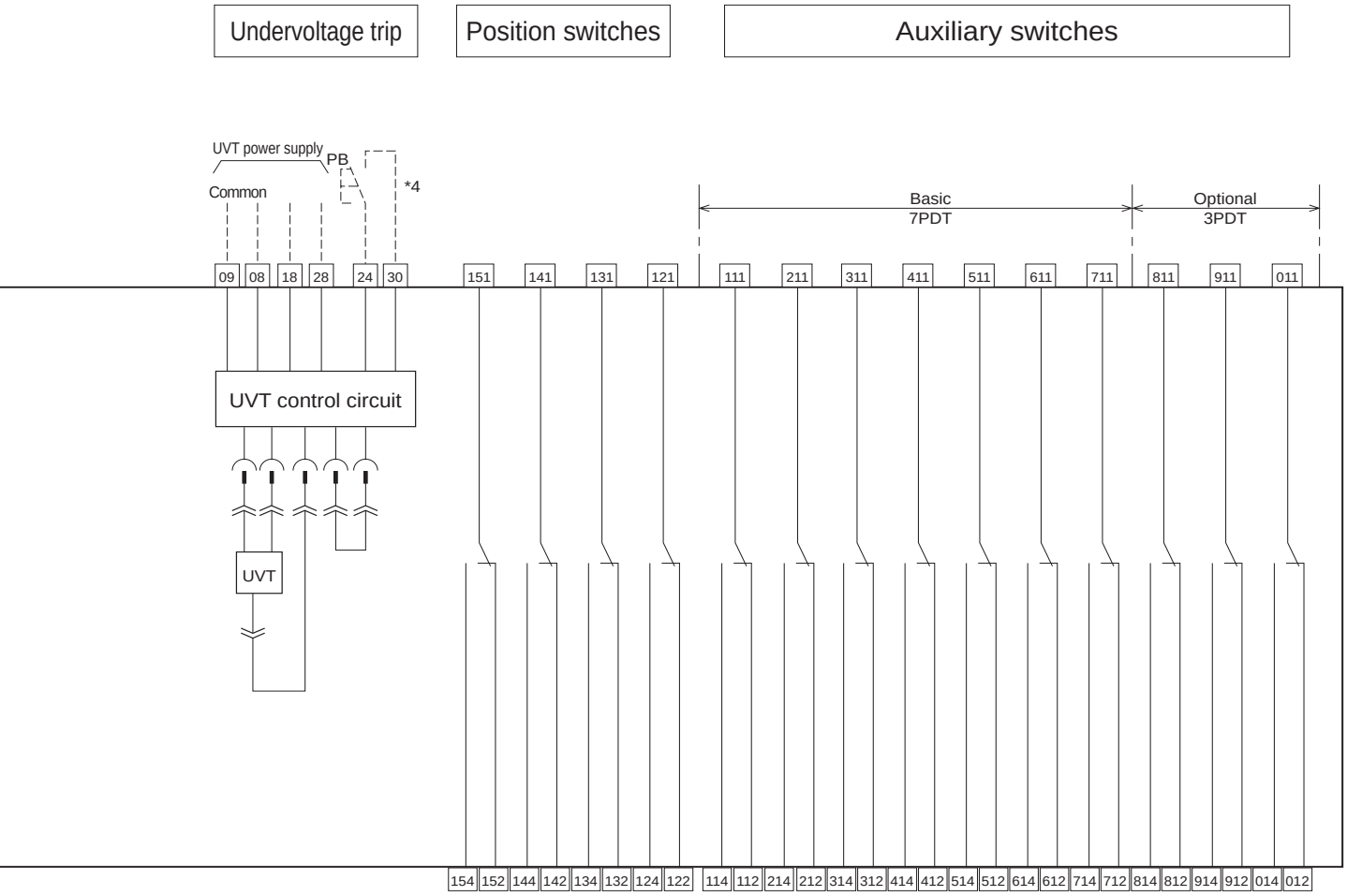
**UVT power supply**

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

### Symbols for accessories

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

*1: Do not connect “b”contact of auxiliary switch to ON switch in series, otherwise, pumping may occur.
*2: See 08/57 for the circuit diagram of the continuously-rated shunt trip device with capacitor trip device.
*3: For motor split circuit, terminals 02 , 22 and 03 , 07 are used for charging and closing operation respectively. (Please specify when ordering)
*4: Refer to D&C catalog (short pulse only)




**Designation of terminals for auxiliary and position switches**

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

CONNECTED position : 121–124 ON
121–122 OFF
TEST position : 131–134 ON
131–132 OFF
ISOLATED position : 141–144 ON
141–142 OFF
INSERT position : 151–154 ON
151–152 OFF

For operation sequence of position switches, see page 16.

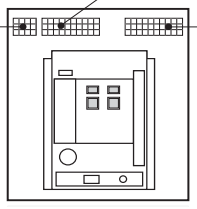
**Position switches**

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

| | | |
|---|---|---|
| Top | 131 | 121 |
| Middle | 134 | 124 |
| Bottom | 132 | 122 |

**Operation/control circuits**

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



**Auxiliary switches**

(Standard 7PDT + optional 3PDT arrangement)

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

(Standard 7PDT arrangement)

| | | | | | | |
|---|---|---|---|---|---|---|
| 111 | 211 | 311 | 411 | 511 | 611 | 711 |
| 114 | 214 | 314 | 414 | 514 | 614 | 714 |
| 112 | 212 | 312 | 412 | 512 | 612 | 712 |

## ■ Accessories

### Supplied accessories

| |
|---|
| Auxiliary switch (7PDT) |
| ON - OFF operation counter |
| ON - OFF button cover |
| Position padlock lever |
| Lifting hole (Draw-out type) |
| Draw-out handle (Draw-out type) |

### Optional accessories

### • Auxiliary switch (Ratings)

| Category | For general use | | For microload | | |
|---|---|---|---|---|---|
| Voltage | Resistive load (A) | Inductive load (A) AC: cos ø ≥ 0.3 DC: L/R ≤ 0.01 | Resistive load (A) | Inductive load (A) AC: cos ø ≥ 0.6 DC: L/R ≤ 0.007 | Min. applicable load |
| 100 to 250VAC | 5 | 5 | 0.1 | 0.1 | 5VDC |
| 251 to 500VAC | 5 | 5 | – | – | 1mA |
| 30VDC | 1 | 1 | 0.1 | 0.1 | |
| 125 to 250VDC | 1 | 1 | – | – | |

Notes: The chattering of NC-contacts due to ON - OFF operation of the ACB lasts for less than 20ms.
Do not supply different voltages to contacts of switch.

### • Auxiliary switch arrangement

| For general use | For microload |
|---|---|
| 4PDT | – |
| 4PDT | 3PDT |
| 10PDT | – |
| 7PDT | 3PDT |

### • Capacitor trip device

| Item | Specifications |
|---|---|
| Type | AQR-1 |
| Rated voltage | 100 to 120VAC |
| Operational voltage | Rated voltage X 70 to 110% |
| Rated frequency | 50/60Hz |
| Rated voltage of shunt trip used | 48VDC |
| Power consumption | 100VA |

### ■ Contact ratings of Trip indicator and Spring change indicator

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

### ■ Contact ratings other contacts

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

### Position switch

### • Position switch ratings

| Voltage | Resistive load (A) | Inductive load (A) (cos ø ≥ 0.6, L/R ≤ 0.007) |
|---|---|---|
| 100-250V AC | 11 | 6 |
| 250V DC | 0.3 | 0.3 |
| 125V DC | 0.6 | 0.6 |
| 30V DC | 6 | 5 |
| 8V DC | 10 | 6 |

| Type | Number of contacts | Contact arrangement | | | |
|---|---|---|---|---|---|
| | | INSERT | ISOLATED | TEST | CONN |
| ALR-0110P | 2PDT | 0 | 1 | 1 | 0 |
| ALR-0101P | | 0 | 1 | 0 | 1 |
| ALR-0011P | | 0 | 0 | 1 | 1 |
| ALR-0200P | | 0 | 2 | 0 | 0 |
| ALR-0020P | | 0 | 0 | 2 | 0 |
| ALR-0002P | | 0 | 0 | 0 | 2 |
| ALR-1111P | 4PDT | 1 | 1 | 1 | 1 |
| ALR-1210P | | 1 | 2 | 1 | 0 |
| ALR-1201P | | 1 | 2 | 0 | 1 |
| ALR-0211P | | 0 | 2 | 1 | 1 |
| ALR-1120P | | 1 | 1 | 2 | 0 |
| ALR-1021P | | 1 | 0 | 2 | 1 |
| ALR-0121P | | 0 | 1 | 2 | 1 |
| ALR-1102P | | 1 | 1 | 0 | 2 |
| ALR-1012P | | 1 | 0 | 1 | 2 |
| ALR-0112P | | 0 | 1 | 1 | 2 |
| ALR-0220P | | 0 | 2 | 2 | 0 |
| ALR-0202P | | 0 | 2 | 0 | 2 |
| ALR-0022P | | 0 | 0 | 2 | 2 |
| ALR-1030P | | 1 | 0 | 3 | 0 |
| ALR-0130P | | 0 | 1 | 3 | 0 |
| ALR-0031P | | 0 | 0 | 3 | 1 |
| ALR-1003P | | 1 | 0 | 0 | 3 |
| ALR-0103P | | 0 | 1 | 0 | 3 |
| ALR-0013P | | 0 | 0 | 1 | 3 |
| ALR-0040P | | 0 | 0 | 4 | 0 |
| ALR-0004P | | 0 | 0 | 0 | 4 |

## ⚠ Safety Considerations

- For safe operation, before using the product read the instruction manual or user manual that comes with the product carefully or consult the Fuji sales representative from which you purchased the product.
- Products introduced in this catalog have not been designed or manufactured for such applications in a system or equipment that will affect human bodies or lives.
- Customers, who want to use the products introduced in this catalog for special systems or devices such as for atomic-energy control, aerospace use, medical use, passenger vehicle, and traffic control, are requested to consult the Fuji sales division.
- Customers are requested to prepare safety measures when they apply the products introduced in this catalog to such systems or facilities that will affect human lives or cause severe damage to property if the products become faulty.
- For safe operation, wiring should be conducted only by qualified engineers who have sufficient technical knowledge about electrical work or wiring.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