Building a better future
Global Leader

U-Series

# Air Circuit Breaker


LV & MV Circuit Breakers

HYUNDAI
HEAVY INDUSTRIES CO.,LTD.

# Leader of Technology

Hyundai Heavy Industries' state-of-the-art technologies
have created circuit breakers and contactors
for electrical systems that are genuine masterpieces.

## CONTENTS

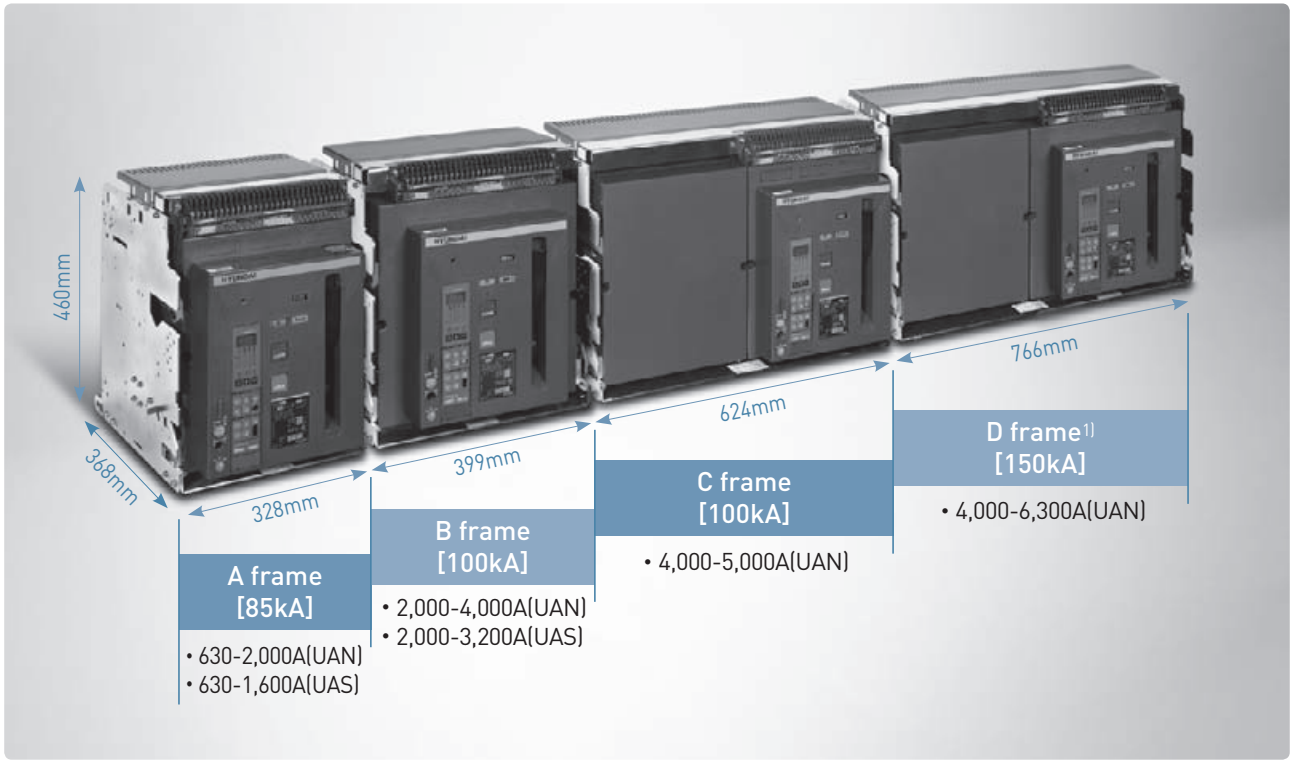
# U-Series
# Air Circuit Breaker

HYUNDAI ACB meets your demands for high breaking capacity, full line-up, and optimized panel size. Various accessories and connection methods realize user-friendly handling.


# Features

## | Full line-up |

• U-Series ACB maximize your choice and satisfaction with compact size and dual (UAN/UAS) model.




※ - Breaking capacity is at AC500V.
1) D frame will be available from October 2013.

## | Applications |

• U-Series ACB offering high breaking capacity and advanced protection trip relay is suitable to cover various applications including buildings, data centers, industrials and so on. U-Series ACB protects these facilities from harmonic frequency by 100% capacity of N phase.

**Buildings**
- Multipurpose buildings
- Hospitals
- Commercial buildings
- Hotels

**Data centers & Networks**
- Broadcasting stations
- IT/Telecommunications

**Industrials**
- Steel/Metal
- Gas/Chemical
- Pulp/Paper

**Electric power facilities**
- Electric power stations
- Electric power substations
- Dispersed power generators
- Renewable energy facilities

## | Compliance with standards |

### ■ Standard

- IEC 60947-1,2 International Electrotechnical Commission
- EN 60947-2 European Standard
- GB China National Standard (Guojia Biaozhun)
- GOST R 50030.2-99 9 Government Standard of Russia
- GOST R 50030.1-2000 Government Standard of Russia
- KS C 4620 Korean Standards Association

### ■ Approval

- ISO 18001, 14001, 9001
- KS/KOREA Korea Quality Certificate Standard Association
- CE Community European
- GOST-R/RUSSIA Government Standard of Russia
- CCC/CHINA China Compulsory Certification
- KR/KOREA Korean Register of Shipping
- GL/GERMANY Germanischer Lloyd
- LR/U.K Lloyd's Register of Shipping
- ABS/U.S.A American Bureau of Shipping
- BV/FRANCE Bureau Veritas
- NK/JAPAN Nippon Kaiji Kyokai

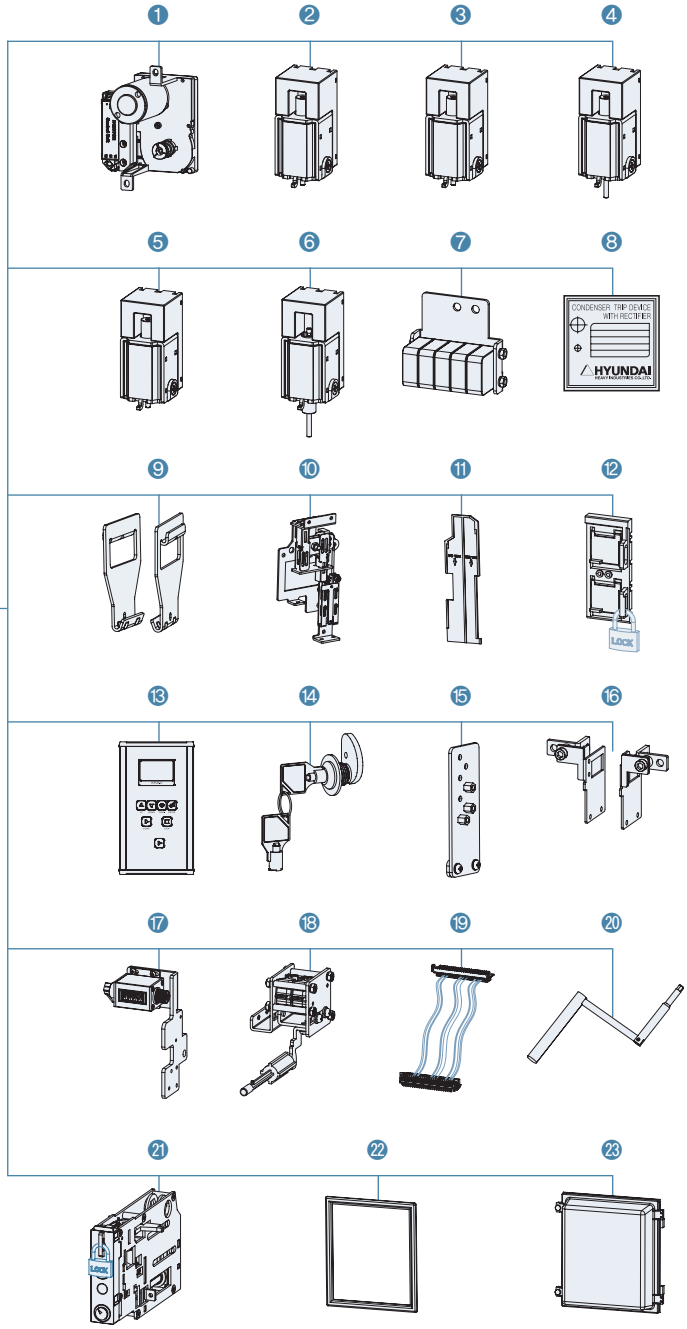
### ■ CB type test

- DEKRA Formerly KEMA Quality Registered
- KERI Korea Electrotechnology Research Institute

# Features

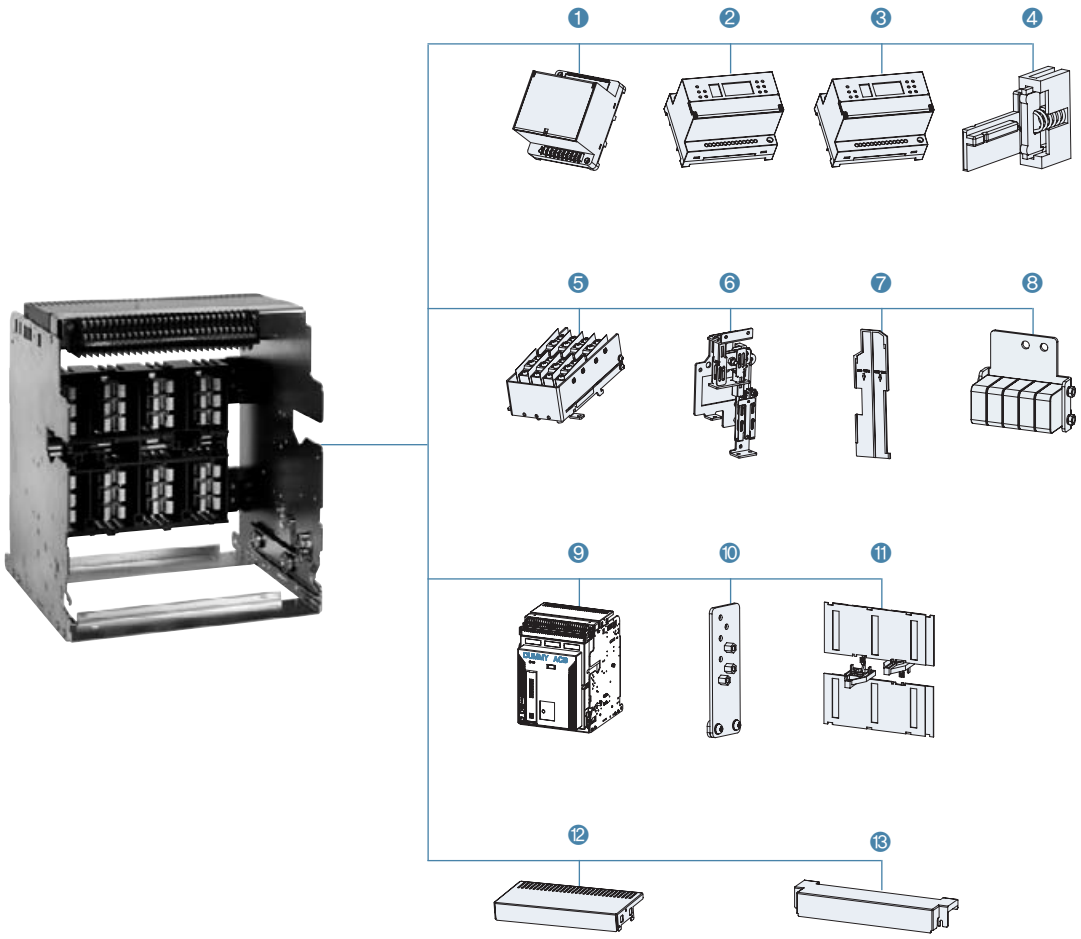
## | Various accessories |

[ Body side ]




❶ Motor
❷ Closing coil
❸ Trip coil
❹ Double trip coil
❺ Trip supervision coil
❻ Under voltage trip coil
❼ Auxiliary switch
❽ Condenser trip device
❾ Lifting lug
❿ Mechanical interlock kit
⓫ Phase insulation barrier
⓬ ON/OFF button cover
⓭ OCR portable checker
⓮ Key lock device
⓯ Wrong insertion preventer
⓰ Fixing block
⓱ Counter
⓲ OCR & Alarm switch reset device
⓳ Test jumper
⓴ Draw-in/out handle
㉑ Draw-in/out and position lock device
㉒ Door flange
㉓ Dust cover

[ Cradle side ]



❶ UVT time delay controller
❷ Remote operation module
❸ Temperature detection module
❹ Short "b"contact
❺ Position switch
❻ Mechanical interlock kit
❼ Phase insulation barrier
❽ Mechanical operated cell (MOC) switch
❾ Dummy ACB
❿ Wrong insertion preventer
⓫ Safety shutter
⓬ Arc shield
⓭ Control terminal protection cover

# Features

## | High performance protection trip relay (OCR) |

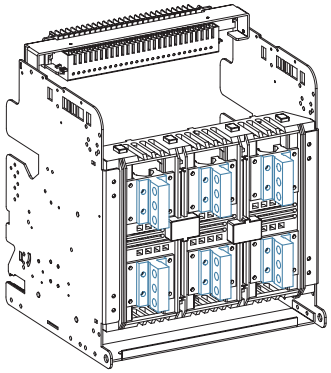
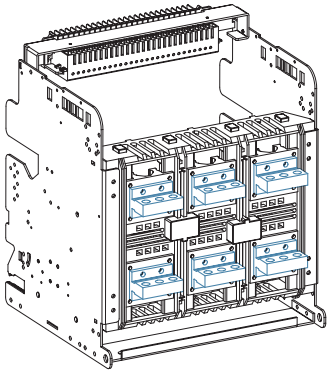
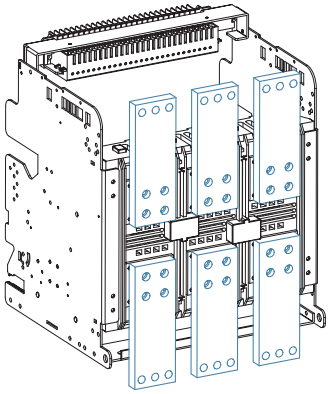
• The protection trip relay (OCR) of U-Series ACB supports stable power supply with temperature alarm, fault recording, and others in addition to main protection functions.

| Type | | UPR-1L-GL | UPR-2L-GS | UPR-1D-GT | UPR-2L-GM |
|---|---|---|---|---|---|
| Ordering code | 50Hz | 33 | 35 | 36 | 37 |
| | 60Hz | 43 | 45 | 46 | 47 |
| Externals | |  |  |  |  |
| Main function | | • L/S/I/G<br>• Self-power<br>• Failsafe<br>• Pre-trip alarm<br>• Integrated instantaneous output contact | • L/S/I/G<br>• Self-power<br>• AC, DC100-250V<br>• Failsafe<br>• Pre-trip alarm<br>• Individual continuous output contact<br>• Fault event<br>• Temperature alarm | • L/S/I/G<br>• Self-power<br>• AC, DC100-250V<br>• Failsafe<br>• Pre-trip alarm<br>• Individual output contact<br>• Fault event<br>• Temperature alarm<br>• Earth leakage trip<br>• Communication (Modbus) | • L/S/I/G<br>• Self-power<br>• AC, DC100-250V<br>• Failsafe<br>• Pre-trip alarm<br>• Individual output contact<br>• Fault event<br>• Temperature alarm |

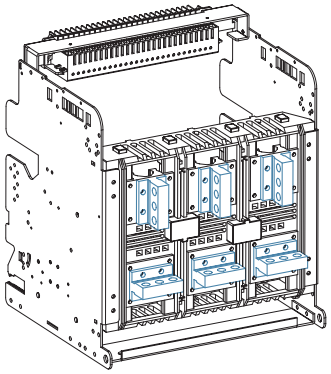
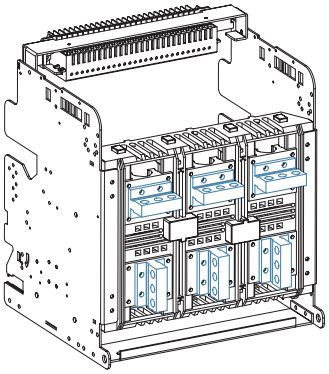
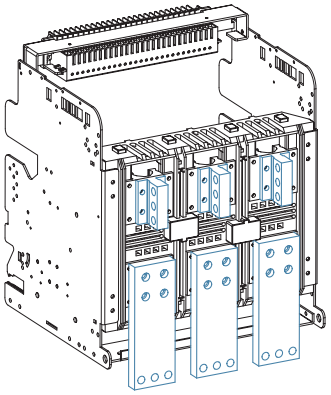
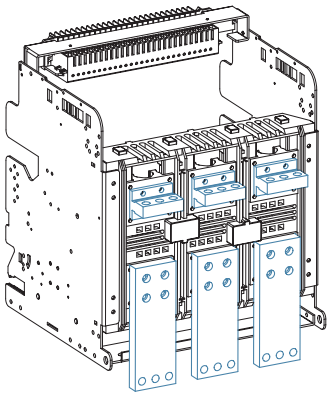
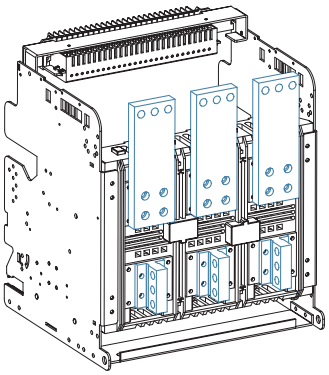
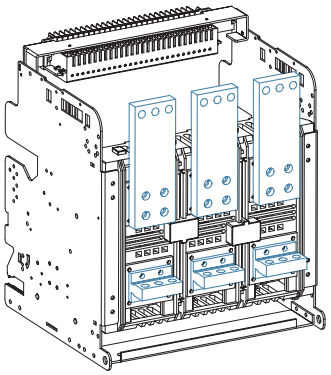
## | Multiple terminal busbar connections |

- Increases the user's convenience by diversified terminal connection methods according to busbar's type.
- Simply turn a horizontal connector 90˚ to make it a vertical connector (The opposite case is same).

### ■ Standard connection

| Vertical | Horizontal | Front |
|---|---|---|
|  |  |  |

### ■ Mixed connection (Top/Bottom)

| Vertical/Horizontal | Horizontal/Vertical | Vertical/Front |
|---|---|---|
|  |  |  |
| **Horizontal/Front** | **Front/Vertical** | **Front/Horizontal** |
|  |  |  |

※ - Changing connector is available only for UAN/UAS A frame 630-1,600A, UAN/UAS B frame 2,000-3,200A.
- Front connection type is suitable the panel requirement for limited installation space.
- Changing connection above 4,000A needs additional component, please contact us.

# Features

## | Easy-to-install |

### ■ Fixed type

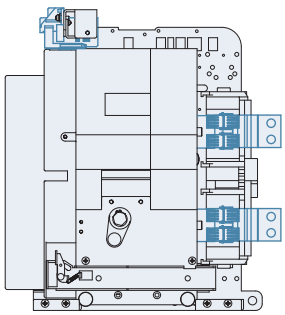
• Installed in a switchboard directly.

### ■ Draw-out type

• Consists of ACB and cradle.
• Cradle is fixed to a switchboard.
• ACB may be in the position of CONNECTED, TEST, ISOLATED, and REMOVED.
• Switchboard door may be closed in ISOLATED position.

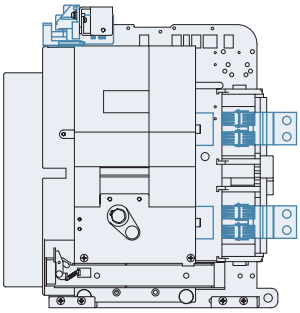
[ Draw-in/out guide rail ]

**Connected position**



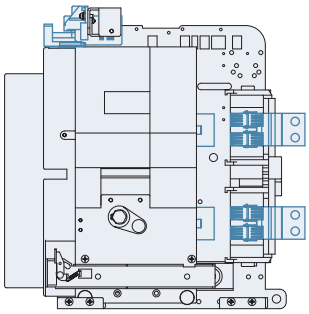
- Main and control circuit are all connected.
- Normal condition of use

**Test position**



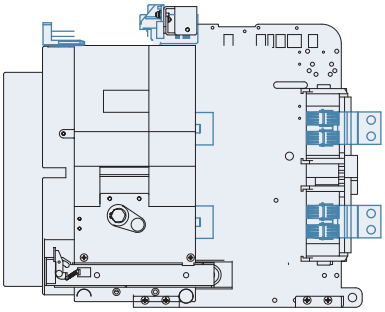
- Main circuit is isolated, control circuit is connected.
- Control test is possible when switchboard's door is closed.

**Isolated position**



- Main and control circuit are all isolated.
- Switchboard door may be closed in isolated position.

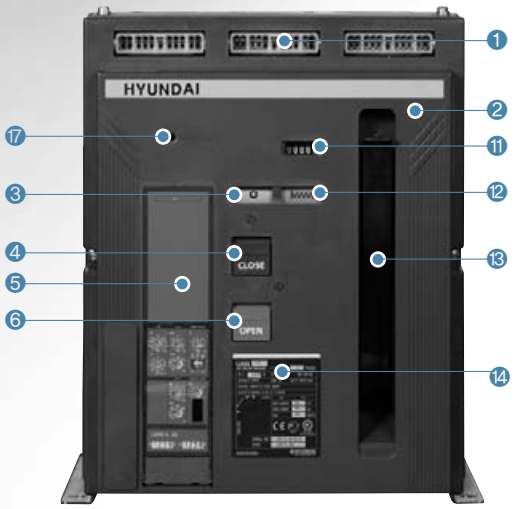
**Removed position**



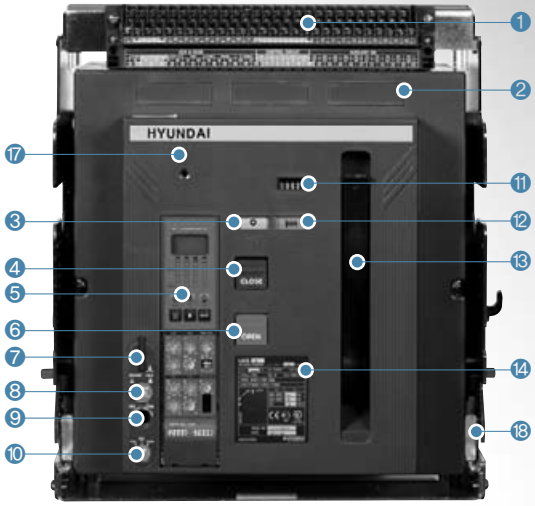
- ACB is totally drawn out from the cradle.

## | Externals |

[ Front ]




[ Fixed type ]




[ Draw-out type ]

[ Cradle ]

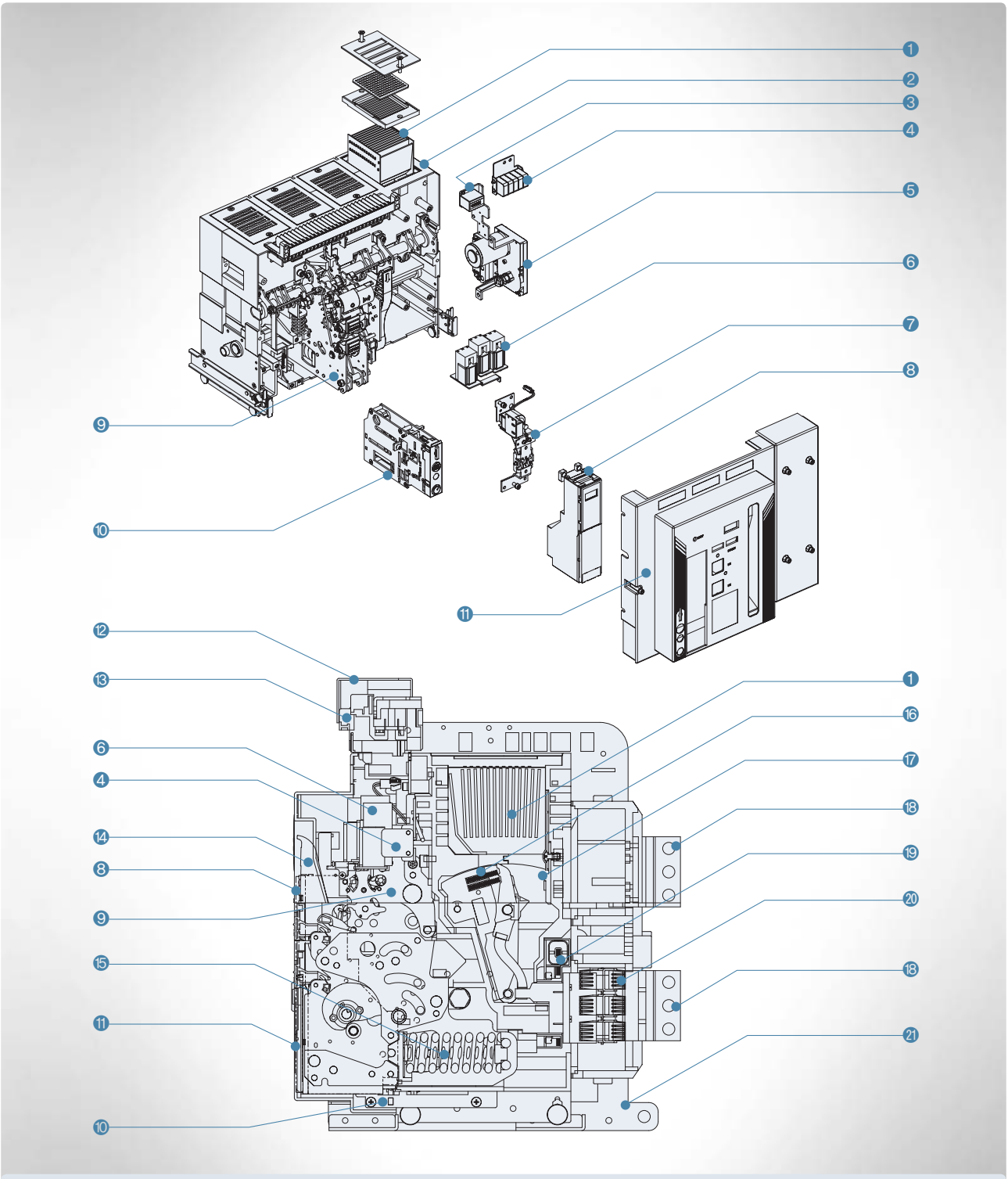
[ Inside ]


[ Rear ]

❶ Control terminal
❷ Front cover
❸ Close/Open indicator
❹ Close button
❺ Protection trip relay (OCR)
❻ Open button
❼ Position lock device
❽ Position lock release button
❾ Draw-in/out handle insertion hole
❿ Position indicator
⓫ Counter
⓬ Charged/Discharged indicator
⓭ Manual charging handle
⓮ Name plate
⓯ Arc shield
⓰ Terminal busbar
⓱ OCR & Alarm switch reset button
⓲ Draw-in/out guide rail

# Structure

## | Internals |

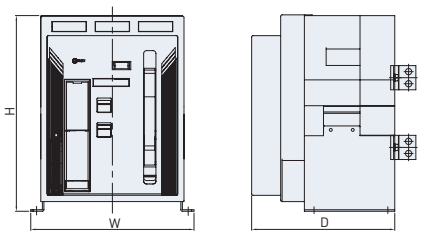


❶ Arc chamber
❷ Frame
❸ Counter
❹ Auxiliary switch
❺ Motor
❻ Closing/Trip/UVT coil
❼ MHT device
❽ Protection trip telay (OCR)
❾ Mechanism
❿ Draw-in/out device
⓫ Front cover
⓬ Control terminal protection cover
⓭ Control terminal
⓮ Manual charging handle
⓯ Closing spring
⓰ Moving contact
⓱ Fixed contact
⓲ Terminal busbar
⓳ Current transformer
⓴ Terminal clip
㉑ Cradle

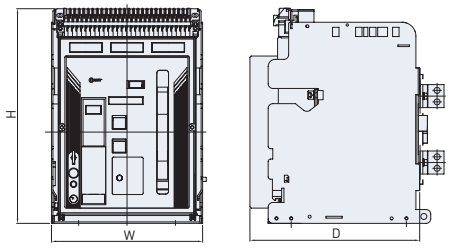
# Ratings

| Frame | | | A frame | B frame | C frame | A frame | B frame |
|---|---|---|---|---|---|---|---|
| Model | | | UAN | | | UAS | |
| Recognition order code:<br>Rated current (In max at 40℃) (A) | | | 06 : 630<br>08 : 800<br>10 : 1,000<br>12 : 1,250<br>16 : 1,600<br>20 : 2,000 | 06 : 630<br>08 : 800<br>10 : 1,000<br>12 : 1,250<br>16 : 1,600<br>20 : 2,000<br>25 : 2,500<br>32 : 3,200<br>40 : 4,000 | 32 : 3,200<br>40 : 4,000<br>50 : 5,000 | 06 : 630<br>08 : 800<br>10 : 1,000<br>12 : 1,250<br>16 : 1,600 | 20 : 2,000<br>25 : 2,500<br>32 : 3,200 |
| Rated operating voltage (Ue) (V) | | | AC 690 | | | AC 690 | |
| Rated insulation voltage (Ui) (V) | | | AC 1,000 | | | AC 1,000 | |
| Frequency (Hz) | | | 50/60 | | | 50/60 | |
| Number of poles | | | 3, 4 | | | 3, 4 | |
| Current setting range (..... x In max) | | | 0.4-1.0 | | | 0.4-1.0 | |
| Rated current of neutral pole (.....% x In) | | | 100% | | | 100% | |
| Rated breaking capacity (Icu) (kA sym) | IEC 60947-2 category "B" KS C 4620 | AC 690/600/550V | 65 | 85 | 85 | 55 | 70 |
| | | AC 500/480/460V | 85 | 100 | 100 | 65 | 85 |
| | | AC 415/380/230/220V | 85 | 100 | 100 | 65 | 85 |
| Rated service breaking capacity (.....% x Icu) | | | 100% | | | 100% | |
| Rated making capacity (Icm) (kA peak) | IEC 60947-2 category "B" KS C 4620 | AC 690/600/550V | 143 | 187 | 187 | 121 | 154 |
| | | AC 500/480/460V | 187 | 220 | 220 | 143 | 187 |
| | | AC 415/380/230/220V | 187 | 220 | 220 | 143 | 187 |
| Rated short-time capacity (Icw) (kA, without Inst.) | | 1 sec | 65 | 85 | 85 | 55 | 70 |
| | | 2 sec | 60 | 75 | 75 | 45 | 65 |
| | | 3 sec | 50 | 65 | 65 | 36 | 55 |
| Rated impulse withstand voltage (Uimp) (kV) | | | 12 | | | 12 | |
| Maximum total breaking time (ms) | | | 40 | | | 40 | |
| Closing operating time | Motor charging time (sec) max. | | 10 | | | 10 | |
| | Closing time (ms) max. | | 40 | | | 40 | |
| Life cycle (times) | Mechanical | Without maintenance | 20,000 | 15,000 | 10,000 | 20,000 | 15,000 |
| | | With maintenance | 30,000 | 2,000 | 2,000 | 30,000 | 20,000 |
| | Electrical | Without maintenance | 5,000 | 06-20 : 10,000<br>25-40 : 5,000 | 2,000 | 5,000 | 5,000 |
| | | With maintenance | 10,000 | 06-20 : 15,000<br>25-40 : 10,000 | 5,000 | 10,000 | 10,000 |
| Weight (kg) | 3 pole | Draw-out type | 63 | 06-32 : 87<br>40 : 107 | 145 | 63 | 87 |
| | | Fixed type | 34 | 06-32 : 44<br>40 : 61 | 76 | 34 | 44 |
| | 4 pole | Draw-out type | 280 | 06-32 : 130<br>40 : 61 | 173 | 74 | 103 |
| | | Fixed type | 44 | 06-32 : 55<br>40 : 81 | 81 | 44 | 55 |
| External dimension (mm) (WxHxD, except busbar) | 3 pole | Draw-out type | 328 x 460 x 368 | 399 x 460 x 368 | 624 x 460 x 368 | 328 x 460 x 368 | 399 x 460 x 368 |
| | | Fixed type | 337 x 404 x 296 | 408 x 404 x 296 | 633 x 404 x 296 | 337 x 404 x 296 | 408 x 404 x 296 |
| | 4 pole | Draw-out type | 413 x 460 x 368 | 514 x 460 x 368 | 794 x 460 x 368 | 413 x 460 x 368 | 514 x 460 x 368 |
| | | Fixed type | 422 x 404 x 296 | 523 x 404 x 296 | 803 x 404 x 296 | 422 x 404 x 296 | 523 x 404 x 296 |

**Fixed type**

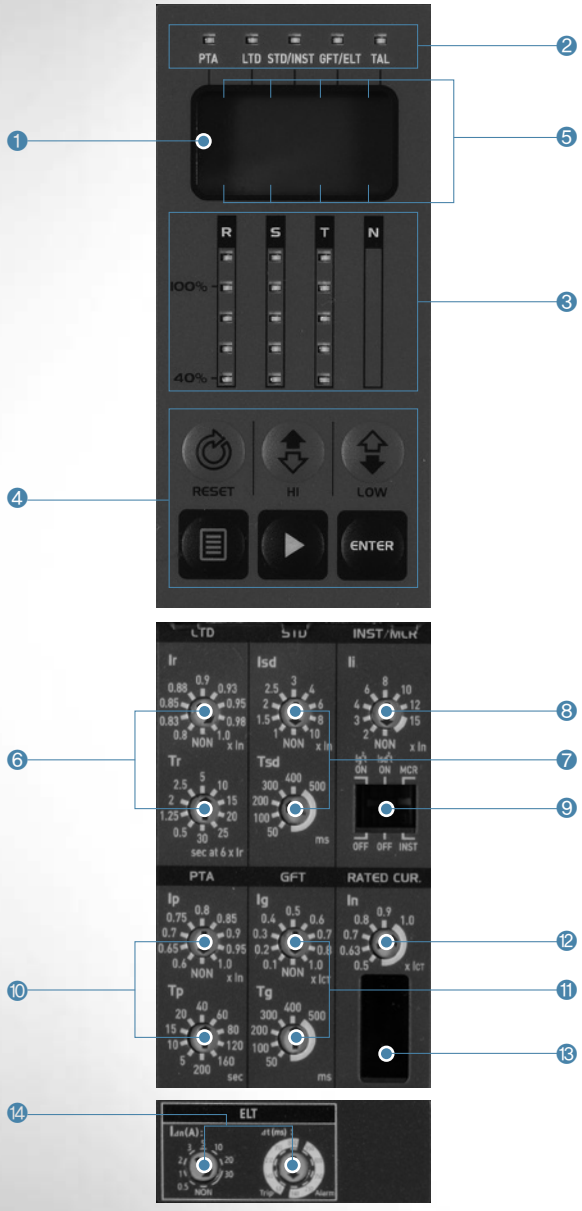



**Draw-out type**

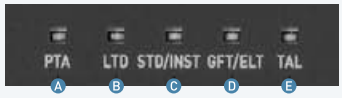


# Protection Trip Relay (OCR)

## | Overview |

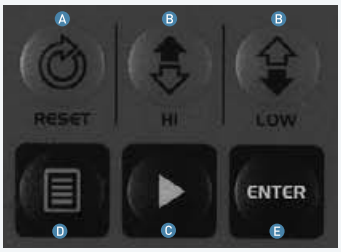



❶ LCD display window
❷ Fault indication LED




Ⓐ PTA: Pre-trip alarm
Ⓑ LTD: Long time delay
Ⓒ STD/INST: Short time or instantaneous tripping
Ⓓ GFT/ELT: Ground fault trip or earth-leakage trip
Ⓔ TAL: Temperature alarm

❸ Overload indication LED
❹ Function key




Ⓐ Reset: Fault reset
Ⓑ Hi/Low: Field test function
(Hi: STD/INST, Low: LTD)
Ⓒ Move
Ⓓ List: Secondary menu
Ⓔ Enter: Setting input

❺ Phase indication line
❻ Ir: Long time current setting knob
Tr: Long time tripping delay setting knob
❼ Isd: Short time current setting knob
Tsd: Short time tripping delay setting knob
❽ Ii: Instantaneous current setting knob
❾ GFT/STD, MCR setting knob
❿ Ip: Pre-trip alarm current setting knob
Tp: Pre-trip alarm delay setting knob
⓫ Ig: Ground fault current setting knob
Tg: Ground fault tripping delay setting knob
⓬ Rated current setting knob
⓭ Test jack
⓮ Earth leakage pick-up and
tripping delay setting knob

| Application | | General feeder | | | | Generator | |
|---|---|---|---|---|---|---|---|
| | | UPR-1L-GL | UPR-2L-GS | UPR-1D-GT | UPR-2L-GM | UPR-1S-AL | UPR-2S-AS |
| Externals | |  |  |  |  |  |  |
| Power supply | Control power | – | ● | ● | ● | – | ● |
| | Self power | ● | ● | ● | ● | ● | ● |
| Protection | Long time delay (LTD) | ● | ● | ● | ● | ● | ● |
| | Short time delay (STD) | ● | ● | ● | ● | ● | ● |
| | Instantaneous trip (INST) | ● | ● | ● | ● | ● | ● |
| | Pre trip alarm | – | ● | ● | ● | – | ● |
| | Ground fault trip | ● | ● | ● | ● | – | – |
| | Field test | – | ● | ● | ● | – | ● |
| | Failsafe | ● | ● | ● | ● | ● | ● |
| Indication | True RMS detection | ● | ● | ● | ● | ● | ● |
| | Fault indication LED | – | ● | ● | ● | – | ● |
| | Overload indication LED | – | ● | ● | ● | – | ● |
| | Display window | – | ● | ● | ● | – | ● |
| Output contact | Integrated instantaneous contact (1a) | ● | – | – | ● PTA: 1a L/S/I/G: 2a | ● | – |
| | Individual continuous contact (4a) | – | ● | ● | ● PTA: 1a L/S/I/G: 2a | – | ● LTD: 1a S/I: 1a PTA:1a |
| Optional function | MCR | ○ | ○ | ○ | ○ | ○ | ○ |
| | Temperature detection | – | – | ○ | – | – | ○ |
| | Event/Fault recording | – | ● | ● | ● | – | ● |
| | Earth leakage trip (ELT) | – | – | ● | – | – | – |
| | Communication | – | – | ● | – | – | – |

※ ●: Standard ○: Option

## ■ Ordering codes

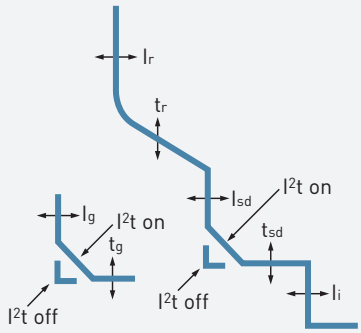
| Model | Frequency | Ordering codes | | Specifications | Application | | Mounting position |
|---|---|---|---|---|---|---|---|
| | | Complete parts of ACB/Cradle | Spare part | | UAN | UAS | |
| UPR-1L-GL | 50Hz | 33 | UANS **OCR33A/33J** | for auto connection/manual connection type | ○ | ○ | Inside of ACB body |
| UPR-2L-GS | | 35 | UANS **OCR35A/35J** | for auto connection/manual connection type | ○ | ○ | |
| UPR-1D-GT | | 36 | UANS **OCR36A/36J** | for auto connection/manual connection type | ○ | | |
| UPR-2L-GM | | 37 | UANS **OCR37A/37J** | for auto connection/manual connection type | ○ | ○ | |
| UPR-1S-AL | | 38 | UANS **OCR38A/38J** | for auto connection/manual connection type | ○ | ○ | |
| UPR-2S-AS | | 39 | UANS **OCR39A/39J** | for auto connection/manual connection type | ○ | ○ | |
| UPR-1L-GL | 60Hz | 43 | UANS **OCR43A/43J** | for auto connection/manual connection type | ○ | ○ | |
| UPR-2L-GS | | 45 | UANS **OCR45A/45J** | for auto connection/manual connection type | ○ | ○ | |
| UPR-1D-GT | | 46 | UANS **OCR46A/46J** | for auto connection/manual connection type | ○ | | |
| UPR-2L-GM | | 47 | UANS **OCR47A/47J** | for auto connection/manual connection type | ○ | ○ | |
| UPR-1S-AL | | 48 | UANS **OCR48A/48J** | for auto connection/manual connection type | ○ | ○ | |
| UPR-2S-AS | | 49 | UANS **OCR49A/49J** | for auto connection/manual connection type | ○ | ○ | |

# Protection Trip Relay (OCR)

## | UPR-1L-GL |

- Overload protection
  - Long time delay
- Short circuit protection
  - Short time delay, instantaneous trip
  - $I^2t$ on/off optional (for STD)
- Ground fault protection
  - $I^2t$ on/off optional
- Self power
- 1a DO (Digital output)

### Characteristic




Ir: Long time current setting
tr: Long time tripping delay setting
Isd: Short time current setting
tsd: Short time tripping delay setting
Ii: Instantaneous current setting
tg: Ground fault tripping delay setting
Ig: Ground fault current setting

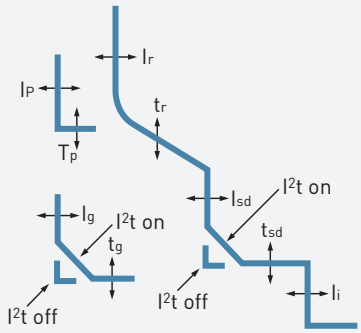
## ■ Protection

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Long time | Current setting (Ir) | In = Ict×··· | | (A) | 0.5 | 0.63 | 0.7 | 0.8 | 0.9 | 1 | | | | |
| | | Ir = In×··· | | (A) | 0.8 | 0.83 | 0.85 | 0.88 | 0.9 | 0.93 | 0.95 | 0.98 | 1 | Non |
| | Time delay (tr) Accuracy: ±15% or below 100ms | tr at (1.5×Ir) | | (sec) | 10.4 | 26.1 | 41.7 | 52 | 104 | 208 | 312 | 417 | 521 | 626 |
| | | tr at (6.0×Ir) | | (sec) | 0.5 | 1.25 | 2 | 2.5 | 5 | 10 | 15 | 20 | 25 | 30 |
| | | tr at (7.2×Ir) | | (sec) | 0.35 | 0.86 | 1.38 | 1.73 | 3.45 | 6.9 | 10.4 | 13.8 | 17.3 | 20.7 |
| Short time | Current setting (Isd) | Isd = In×··· | | (A) | 1 | 1.5 | 2 | 2.5 | 3 | 4 | 6 | 8 | 10 | Non |
| | Time delay (tsd) at 10×Ir Accuracy: ±20% | tsd | $I^2t$ off | (sec) | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | | | | |
| | | | $I^2t$ on | (sec) | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | | | | |
| | | ($I^2t$ off) | Min. trip time | (msec) | 20 | 80 | 160 | 260 | 360 | 460 | | | | |
| | | | Max. trip time | (msec) | 80 | 140 | 240 | 340 | 440 | 540 | | | | |
| Instantaneous | Current setting (Ii) | Ii = In×··· | | (A) | 2 | 3 | 4 | 6 | 8 | 10 | 12 | 15 | Non | |
| | Trip time | | | | below 50ms | | | | | | | | | |
| Ground fault | Pick-up (Ig) Accuracy: ±15% (Ig>0.4In) ±20% (Ig≤0.4In) | Ig = Ict×··· | | (A) | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 1 | Non |
| | Time delay (tg) at 1×In Accuracy: ±20% | tg | $I^2t$ off | (sec) | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | | | | |
| | | | $I^2t$ on | (sec) | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | | | | |
| | | ($I^2t$ off) | Min. trip time | (msec) | 20 | 80 | 160 | 260 | 360 | 460 | | | | |
| | | | Max. trip time | (msec) | 80 | 140 | 240 | 340 | 440 | 540 | | | | |

## | UPR-2L-GS, UPR-2L-GM |

- Overload protection
  - Long time delay
- Short circuit protection
  - Short time delay, instantaneous trip
  - $I^2t$ on/off optional (for STD)
- Ground fault protection
  - $I^2t$ on/off optional
- Realization of protective coordination by ZSI (Zone selective interlocking)
- Fault recording
  - Records max. up to 10 fault information about fault type, fault phase, fault valve, occurrence time of fault
- Event recording
  - Short time delay, instantaneous trip
  - $I^2t$ on/off optional (for STD)
- Pre-trip alarm
  - Prevent unnecessary over load trip according to rated current (In)
- Field test
  - Simulation of long time, short time, instantaneous delay
- 4a(3a) DO (Digital output)
  - 4a (UPR-2L-GS)
  - 3a (UPR-2L-GM)

### Characteristic




Ir: Long time current setting
tr: Long time tripping delay setting
Isd: Short time current setting
tsd: Short time tripping delay setting
Ii: Instantaneous current setting
tg: Ground fault tripping delay setting
Ig: Ground fault current setting
tp: Pre-trip alarm delay setting
Ip: Pre-trip alarm current setting

## ■ Protection

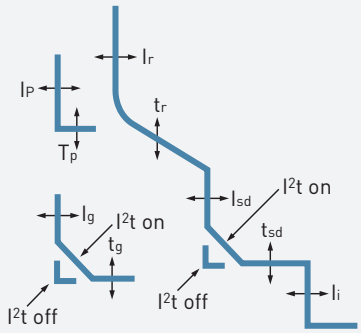
| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Long time | Current setting (Ir) | In = Ict×··· | | (A) | 0.5 | 0.63 | 0.7 | 0.8 | 0.9 | 1 | | | | |
| | | Ir = In×··· | | (A) | 0.8 | 0.83 | 0.85 | 0.88 | 0.9 | 0.93 | 0.95 | 0.98 | 1 | Non |
| | Time delay (tr)<br>Accuracy: ±15%<br>or below 100ms | tr at (1.5×Ir) | | (sec) | 10.4 | 26.1 | 41.7 | 52 | 104 | 208 | 312 | 417 | 521 | 626 |
| | | tr at (6.0×Ir) | | (sec) | 0.5 | 1.25 | 2 | 2.5 | 5 | 10 | 15 | 20 | 25 | 30 |
| | | tr at (7.2×Ir) | | (sec) | 0.35 | 0.86 | 1.38 | 1.73 | 3.45 | 6.9 | 10.4 | 13.8 | 17.3 | 20.7 |
| Short time | Current setting (Isd) | Isd = In×··· | | (A) | 1 | 1.5 | 2 | 2.5 | 3 | 4 | 6 | 8 | 10 | Non |
| | Time delay (tsd)<br>at 10×Ir<br>Accuracy: ±15% | tsd | $I^2t$ off | (sec) | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | | | | |
| | | | $I^2t$ on | (sec) | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | | | | |
| | | ($I^2t$ off) | Min. trip time | (msec) | 20 | 80 | 160 | 260 | 360 | 460 | | | | |
| | | | Max. trip time | (msec) | 80 | 140 | 240 | 340 | 440 | 540 | | | | |
| Instantaneous | Current setting (Ii) | Ii = In×··· | | (A) | 2 | 3 | 4 | 6 | 8 | 10 | 12 | 15 | Non | |
| | Trip time | | | | below 50ms | | | | | | | | | |
| Ground fault | Pick-up (Ig) | In = Ict×··· | | | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 1 | Non |
| | Time delay (tg)<br>at 1×In<br>Accuracy: ±15% (Ig>0.4In)<br>±20% (Ig≤0.4In) | tg | $I^2t$ off | (sec) | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | | | | |
| | | | $I^2t$ on | (sec) | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | | | | |
| | | ($I^2t$ off) | Min. trip time | (msec) | 20 | 80 | 160 | 260 | 360 | 460 | | | | |
| | | | Max. trip time | (msec) | 80 | 140 | 240 | 340 | 440 | 540 | | | | |
| Pre trip alarm | Current setting (Ip)<br>Accuracy: ±15% | Ip = In×··· | | (A) | 0.6 | 0.65 | 0.7 | 0.75 | 0.8 | 0.85 | 0.9 | 0.95 | 1 | Non |
| | Time delay (tp) | tp | | (sec) | 5 | 10 | 15 | 20 | 40 | 60 | 80 | 120 | 160 | |

# Protection Trip Relay (OCR)

## | UPR-1D-GT |

- Overload protection
  - Long time delay
- Short circuit protection
  - Short time delay, instantaneous trip
  - $I^2t$ on/off optional (for STD)
- Ground fault protection
  - $I^2t$ on/off optional
- Realization of protective coordination by ZSI (Zone selective interlocking)
- Fault recording
  - Records max. up to 10 fault information about fault type, fault phase, fault valve, occurrence time of fault
- Event recording
  - Records events of device related to setting change, operation and state change (Max. up to 10)
- Pre trip alarm
  - Prevent unnecessary over load trip according to rated current (In)
- Field test
  - Simulation of long time, short time, instantaneous delay
- 4a DO (Digital output)
- Communication: Modbus-RTU/RS-485
- Earth leakage trip (Optional)

### Characteristic




$I_r$: Long time current setting
$t_r$: Long time tripping delay setting
$I_{sd}$: Short time current setting
$t_{sd}$: Short time tripping delay setting
$I_i$: Instantaneous current setting
$t_g$: Ground fault tripping delay setting
$I_g$: Ground fault current setting
$t_p$: Pre-trip alarm delay setting
$I_p$: Pre-trip alarm current setting

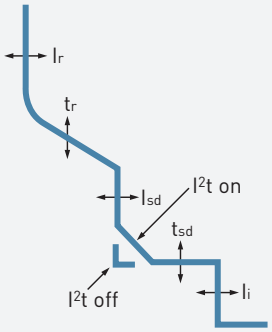
## ■ Protection

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Long time | Current setting (Ir) | In = Ict×··· | | (A) | 0.5 | 0.63 | 0.7 | 0.8 | 0.9 | 1 | | | | |
| | | Ir = In×··· | | (A) | 0.8 | 0.83 | 0.85 | 0.88 | 0.9 | 0.93 | 0.95 | 0.98 | 1 | Non |
| | Time delay (tr) Accuracy: ±15% or below 100ms | tr at (1.5×Ir) | | (sec) | 10.4 | 26.1 | 41.7 | 52 | 104 | 208 | 312 | 417 | 521 | 626 |
| | | tr at (6.0×Ir) | | (sec) | 0.5 | 1.25 | 2 | 2.5 | 5 | 10 | 15 | 20 | 25 | 30 |
| | | tr at (7.2×Ir) | | (sec) | 0.35 | 0.86 | 1.38 | 1.73 | 3.45 | 6.9 | 10.4 | 13.8 | 17.3 | 20.7 |
| Short time | Current setting (Isd) | Isd = In×··· | | (A) | 1 | 1.5 | 2 | 2.5 | 3 | 4 | 6 | 8 | 10 | Non |
| | Time delay (tsd) at 10×Ir Accuracy: ±15% | tsd | $I^2t$ off | (sec) | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | | | | |
| | | | $I^2t$ on | (sec) | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | | | | |
| | | ($I^2t$ off) | Min. trip time | (msec) | 20 | 80 | 160 | 260 | 360 | 460 | | | | |
| | | | Max. trip time | (msec) | 80 | 140 | 240 | 340 | 440 | 540 | | | | |
| Instantaneous | Current setting (Ii) | Ii = In×··· | | (A) | 2 | 3 | 4 | 6 | 8 | 10 | 12 | 15 | Non | |
| | Trip time | | | | below 50ms | | | | | | | | | |
| Ground fault | Pick-up (Ig) | Ig = Ict×··· | | | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 1 | Non |
| | Time delay (tg) at 1×In Accuracy: ±15%(Ig>0.4In) ±20%(Ig≤0.4In) | tg | $I^2t$ off | (sec) | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | | | | |
| | | | $I^2t$ on | (sec) | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | | | | |
| | | ($I^2t$ off) | Min. trip time | (msec) | 20 | 80 | 160 | 260 | 360 | 460 | | | | |
| | | | Max. trip time | (msec) | 80 | 140 | 240 | 340 | 440 | 540 | | | | |
| Pre trip alarm | Current setting (Ip) | Ip = In×··· | | (A) | 0.6 | 0.65 | 0.7 | 0.75 | 0.8 | 0.85 | 0.9 | 0.95 | 1 | Non |
| | Time delay (Tp) Accuracy: ±15% | tp | | (sec) | 5 | 10 | 15 | 20 | 40 | 60 | 80 | 120 | 160 | |
| Earth leakage (optional) | Current setting (IΔn) | IΔn | | (A) | 0.5 | 1 | 2 | 3 | 5 | 10 | 20 | 30 | Non | |
| | Time delay (Δt) Accuracy: ±15% or below 40ms | Δt | Alarm time | (msec) | 140 | 230 | 350 | 800 | 950 | 80 | 120 | 160 | | |
| | | | Trip time | (msec) | 60 | 140 | 230 | 350 | 800 | | | | | |

## | UPR-1S-AL |

- Overload protection
  - Long time delay
- Short circuit protection
  - Short time delay, instantaneous trip
  - $I^2t$ on/off optional (for STD)
- Ground fault protection
  - $I^2t$ on/off optional (for STD)
- Self power
- 1a DO (Digital output)

### Characteristic




Ir: Long time current setting
tr: Long time tripping delay setting
Isd: Short time current setting
tsd: Short time tripping delay setting
Ii: Instantaneous current setting

## ■ Protection

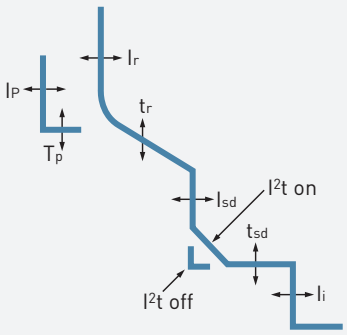
| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Long time | Current setting (Ir) | In = Ict×··· | | (A) | (0.5-1.0) x1% unit, or 1A unit | | | | | | | | |
| | | Ir = In×··· | | (A) | 0.7 | 0.8 | 0.9 | 1 | 1.05 | 1.1 | 1.15 | 1.2 | 1.25 | Non |
| | Time delay (tr)<br>Accuracy: ±15%<br>or below 100ms | tr at (1.05×Ir) | | (sec) | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 100 | 120 | |
| | | tr at (1.2×Ir) | | (sec) | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 50 | 60 | |
| | | tr at (3×Ir) | | (sec) | 0.99 | 1.49 | 1.99 | 2.48 | 2.98 | 3.48 | 3.97 | 4.97 | 5.96 | |
| Short time | Current setting (Isd) | Isd = In×··· | | (A) | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | Non |
| | Time delay (tsd)<br>at 10×Ir<br>Accuracy: ±15% | tsd | $I^2t$ off | (sec) | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | | | | |
| | | | $I^2t$ on | (sec) | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | | | | |
| | | ($I^2t$ off) | Min. trip time | (msec) | 20 | 80 | 160 | 260 | 360 | 460 | | | | |
| | | | Max. trip time | (msec) | 80 | 140 | 240 | 340 | 440 | 540 | | | | |
| Instantaneous | Current setting (Ii) | Ii = In×··· | | (A) | 2 | 3 | 4 | 6 | 8 | 10 | 12 | 15 | Non | |
| | Trip time | | | | below 50ms | | | | | | | | | |

# Protection Trip Relay (OCR)

## | UPR-2S-AS |

- Overload protection
  - Long time delay
- Short circuit protection
  - Short time delay, instantaneous trip
  - $I^2t$ on/off optional (for STD)
- Realization of protective coordination by ZSI (Zone selective interlocking)
- Fault recording
  - Records max. up to 10 fault information about fault type, fault phase, fault valve, occurrence time of fault
- Event recording
  - Records events of device related to setting change, operation and state change (Max. up to 10)
- Pre trip alarm
  - Prevent unnecessary over load trip according to rated current (In)
- Field test
  - Simulation of long time, short time, instantaneous delay
- 3a DO (Digital output)

### Characteristic



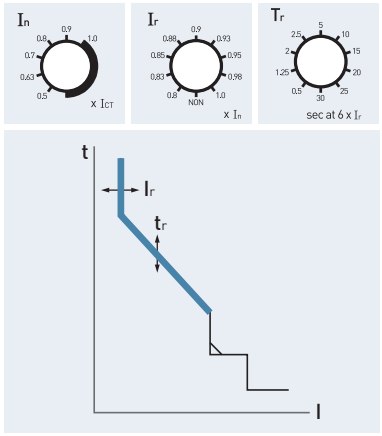

$I_r$: Long time current setting
$t_r$: Long time tripping delay setting
$I_{sd}$: Short time current setting
$t_{sd}$: Short time tripping delay setting
$I_i$: Instantaneous current setting
$t_p$: Pre-trip alarm delay setting
$I_p$: Pre-trip alarm current setting

## ■ Protection

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Long time | Current setting (Ir) | In = Ict×··· | | (A) | (0.5-1.0) x1% unit, or 1A unit | | | | | | | | |
| | | Ir = In×··· | | (A) | 0.7 | 0.8 | 0.9 | 1 | 1.05 | 1.1 | 1.15 | 1.2 | 1.25 | Non |
| | Time delay (tr) Accuracy: ±15% or below 100ms | tr at (1.05×Ir) | | (sec) | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 100 | 120 | |
| | | tr at (1.2×Ir) | | (sec) | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 50 | 60 | |
| | | tr at (3×Ir) | | (sec) | 0.99 | 1.49 | 1.99 | 2.48 | 2.98 | 3.48 | 3.97 | 4.97 | 5.96 | |
| Short time | Current setting (Isd) | Isd = In×··· | | (A) | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | Non |
| | Time delay (tsd) at 10×Ir Accuracy: ±20% | tsd | $I^2t$ off | (sec) | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | | | | |
| | | | $I^2t$ on | (sec) | 0.05 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | | | | |
| | | ($I^2t$ off) | Min. trip time | (msec) | 20 | 80 | 160 | 260 | 360 | 460 | | | | |
| | | | Max. trip time | (msec) | 80 | 140 | 240 | 340 | 440 | 540 | | | | |
| Instantaneous | Current setting (Ii) | Ii = In×··· | | (A) | 2 | 3 | 4 | 6 | 8 | 10 | 12 | 15 | Non | |
| | Trip time | | | | below 50ms | | | | | | | | | |
| Ground fault | Current setting (Ip) | Ip = In×··· | | (A) | 0.7 | 0.75 | 0.8 | 0.85 | 0.9 | 0.95 | 1 | 1.05 | 1.1 | Non |
| | Time delay (Tp) Accuracy: ±15% | tp | | (sec) | 1 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | |

## | Operation characteristics |

### Long time delay (LTD)



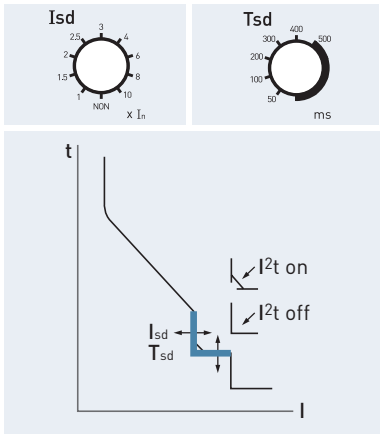

#### ■ Standard current setting

- **L type**
  - The scale is marked as magnification of [In].
  - Setting range: (Non, 0.8, 0.83, 0.85, 0.88, 0.9, 0.93, 0.95, 0.98, 1.0)×In (10 modes)
  - No protection in case of non setting of [Ir].
  - The breaker is not tripped below 105% of [Ir], and tripped at 120%.
- **S type**
  - Setting range: (Non, 0.7, 0.8, 0.9, 1.0, 1.05, 1.1, 1.15, 1.2, 1.25 )×In (8 modes)
  - The breaker is tripped above 100% of [Ir].

#### ■ Time delay setting

- **L type**
  - Standard operating time (sec) is based on the time of 600%×[Ir] with inverse time operation.
  - Setting range: 0.5, 1.25, 2, 2.5, 5, 10, 15, 20, 25, 30sec (10 modes)
  - The breaker is tripped at ±15% of setting time.
- **S type**
  - Standard operating time (sec) is based on the time of 120%×[Ir] with inverse time operation.
  - Setting range: 10, 15, 20, 25, 30, 35, 40, 50, 60sec (9 modes)
  - The breaker is tripped at ±15% of setting time.

### Short time delay (STD)



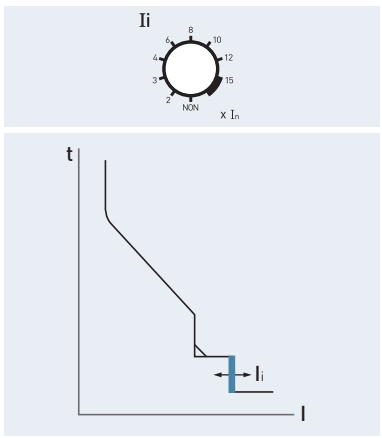

#### ■ Standard current setting

- **L type**
  - The scale is marked as magnification of [In].
  - Setting range: (Non, 1, 1.5, 2, 2.5, 3, 4, 6, 8, 10)×In (10 modes)
- **S type**
  - The scale is marked as magnification of [In].
  - Setting range: (Non, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5)×In (10 modes)

#### ■ Time delay setting

- **L type**
  - Standard operating time (msec) is based on the time of 120%×[Isd] with definite time operation.
  - Setting range: 50, 100, 200, 300, 400, 500msec (6 modes)
  - 1000% of inverse time curve applied in case of inverse time ($I^2t$ on) setting.
- **S type**
  - Standard operating time (msec) is based on the time of 120%×[Isd] with definite time operation.
  - The range of set time is 50, 100, 200, 300, 400, 500msec (6 step).
  - 500% of inverse time curve applied in case of inverse time ($I^2t$ on) setting.

### Instantaneous trip (INST)




#### ■ Standard current setting

- The scale is marked as magnification of [In].
- Setting range: (Non, 2, 3, 4, 6, 8, 10, 12, 15)×In (9 modes)
- No protection in case of non setting of [Ii].

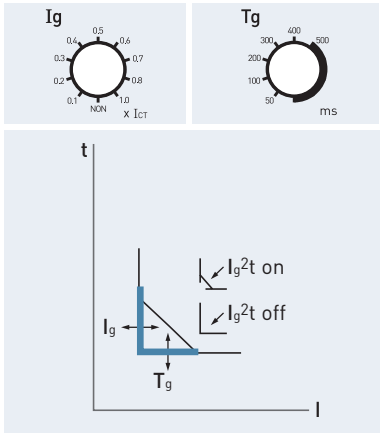
#### ■ Time delay setting

- Total breaking time is below 50ms.

# Protection Trip Relay (OCR)

## | Operation characteristics |

### Ground fault trip (GFT)



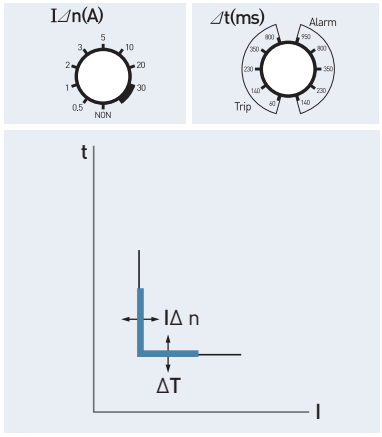

■ **Standard current setting**

- **L type**
  - The scale is marked as magnification of OCR rated primary current [ICT].
  - Setting range: (Non, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 1.0)×[ICT] (10 modes)

■ **Time delay setting**

- **L type**
  - Standard operating time (msec) is based on the time of 120%×[Ig] with definite time operation.
  - Setting range: 50, 100, 200, 300, 400, 500msec (6 modes)
  - Inverse time operated with 100% of [Ict] standard in case of [$I^2t$ on] setting.
  - The breaker is tripped at ±15% of setting time.

### Earth leakage trip (ELT)



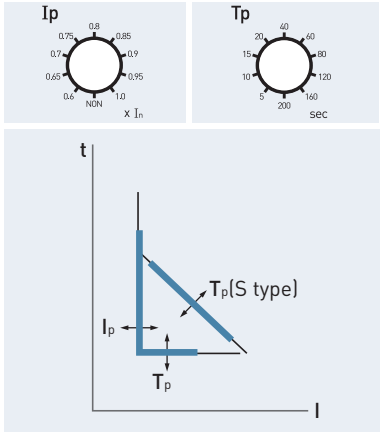

■ **Standard current setting**

- **L type**
  - The scale is marked as magnification of OCR rated primary current [ZCT].
  - Setting range: (Non, 0.5, 1, 2, 3, 5, 10, 20, 30[A]) (9 modes)

■ **Time delay setting**

- **L type**
  - Settings within its alarm range will prevent its breaker from tripping but activating its alarm.
  - Trip time: 60, 140, 230, 350, 800msec (5 modes)
  - Alarm time: 140, 230, 350, 800, 950msec (5 modes)

### Pre-trip alarm (PTA)




■ **Standard current setting**

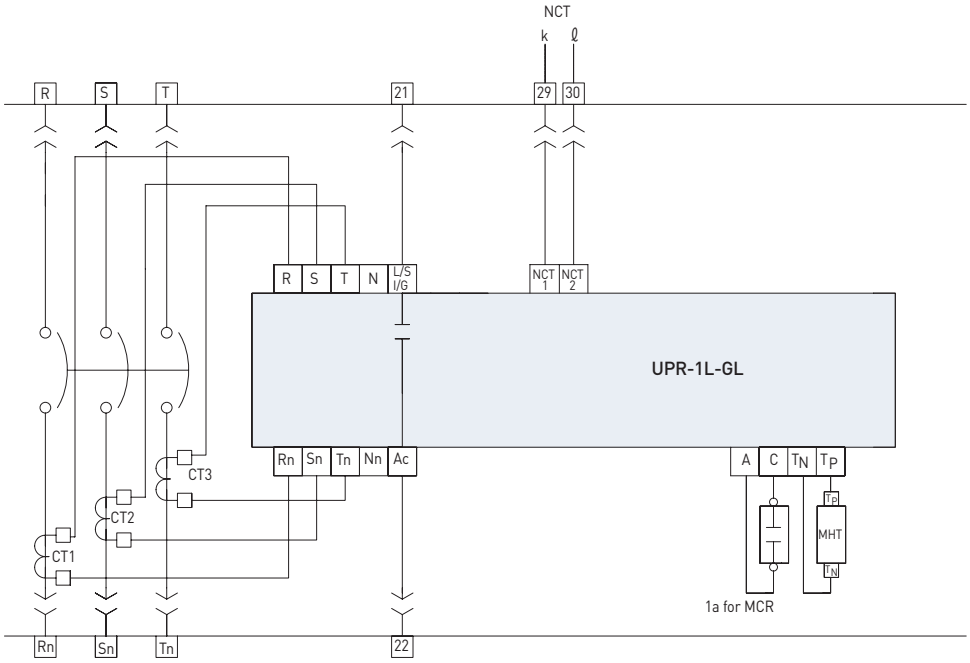
- **L type**
  - The scale is marked as magnification of [In] with definite time operation.
  - Setting range: (Non, 0.6, 0.65, 0.7, 0.75, 0.8, 0.85, 0.9, 0.95, 1.0)×In (10 modes)
- **S type**
  - The scale is marked as magnification of [In] with inverse time operation.
  - Setting range: (Non, 0.7, 0.75, 0.8, 0.85, 0.9, 0.95, 1.0, 1.05, 1.1)×In (10 modes)

■ **Time delay setting**

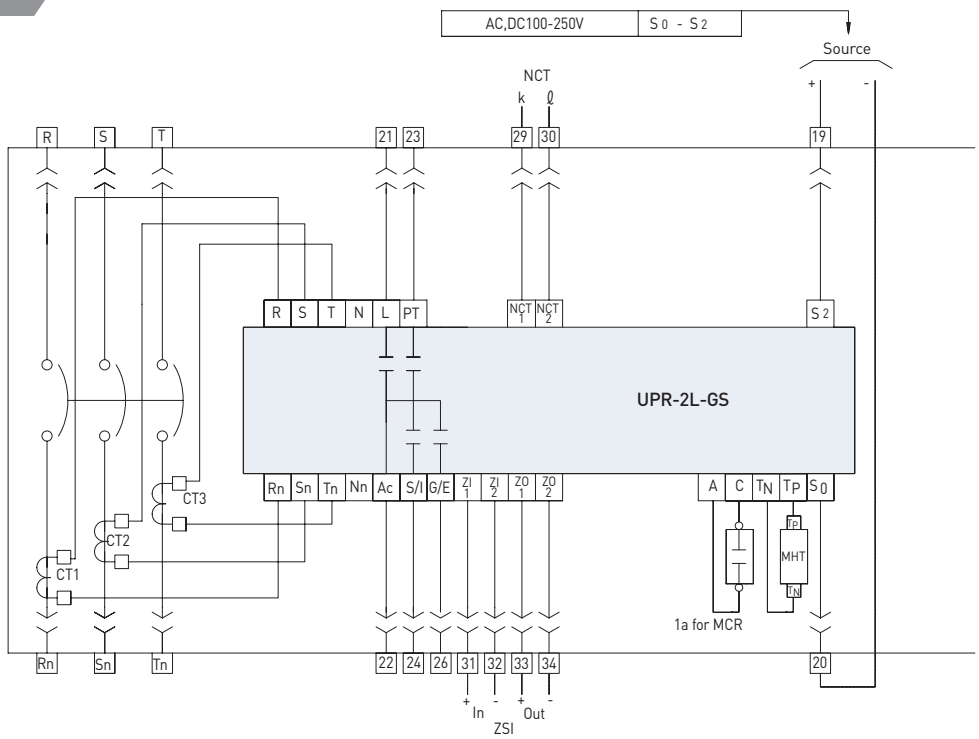
- **L type**
  - Standard operating time (sec) is based on the time of 100%×[Ip].
  - Setting range: 5, 10, 15, 20, 40, 60, 80, 120, 160, 200sec (10 modes)
- **S Type**
  - Standard operating time (sec) is based on the time of 120%×[Ip].
  - Setting range: 1, 5, 10, 15, 20, 25, 30, 35, 40sec (9 modes)

## | Circuit diagrams |

### UPR-1L-GL



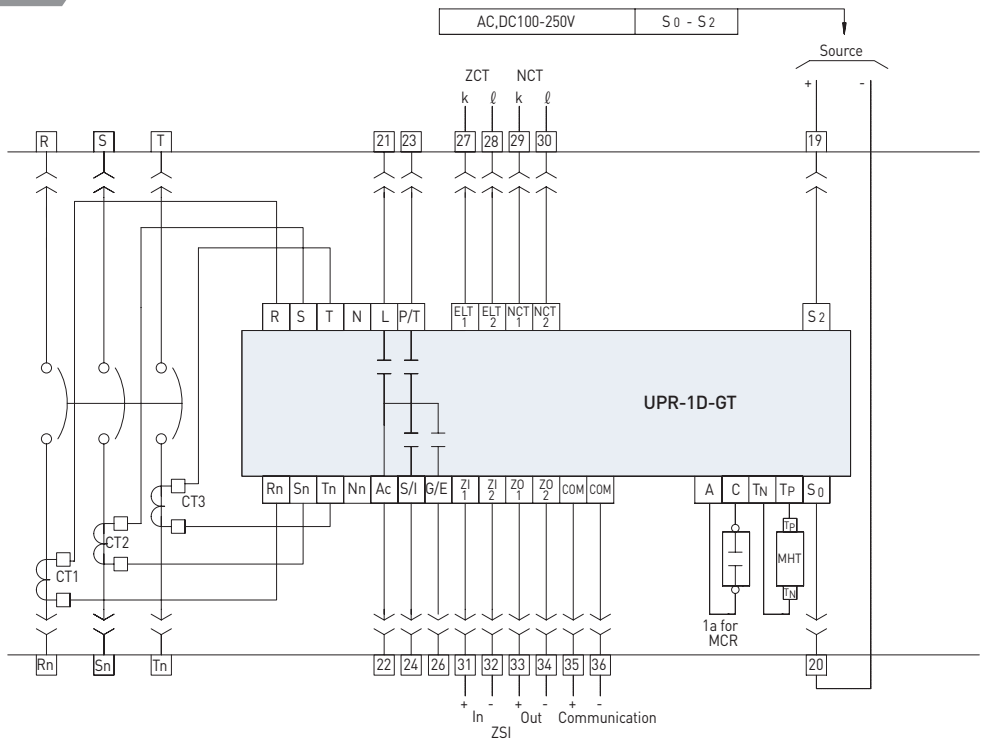

### UPR-2L-GS



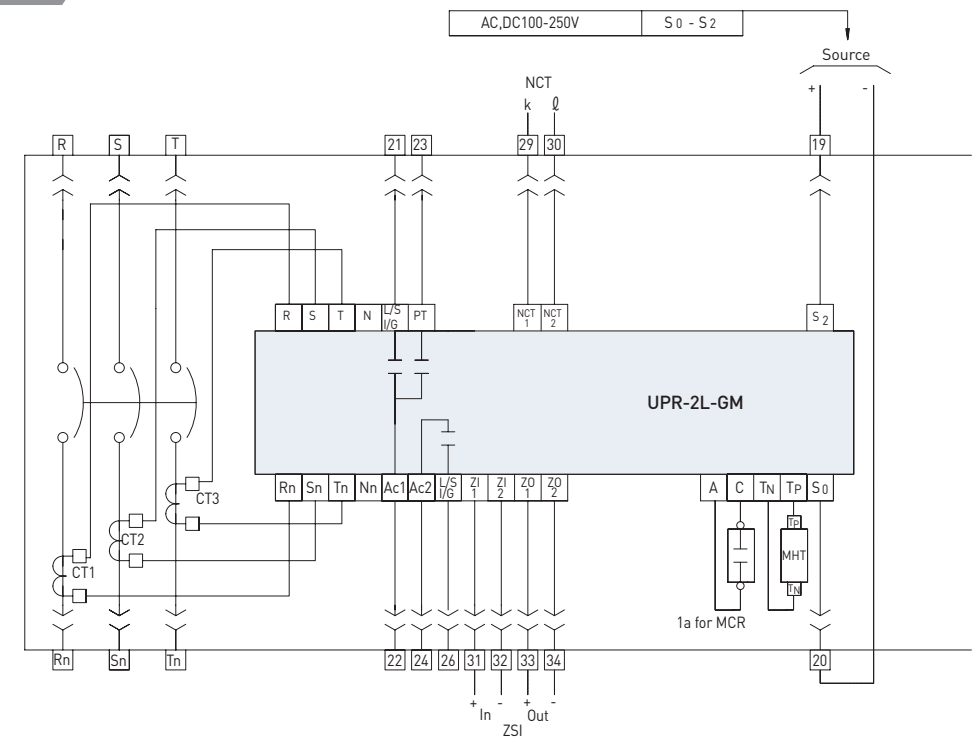
# Protection Trip Relay (OCR)

## | Circuit diagrams |

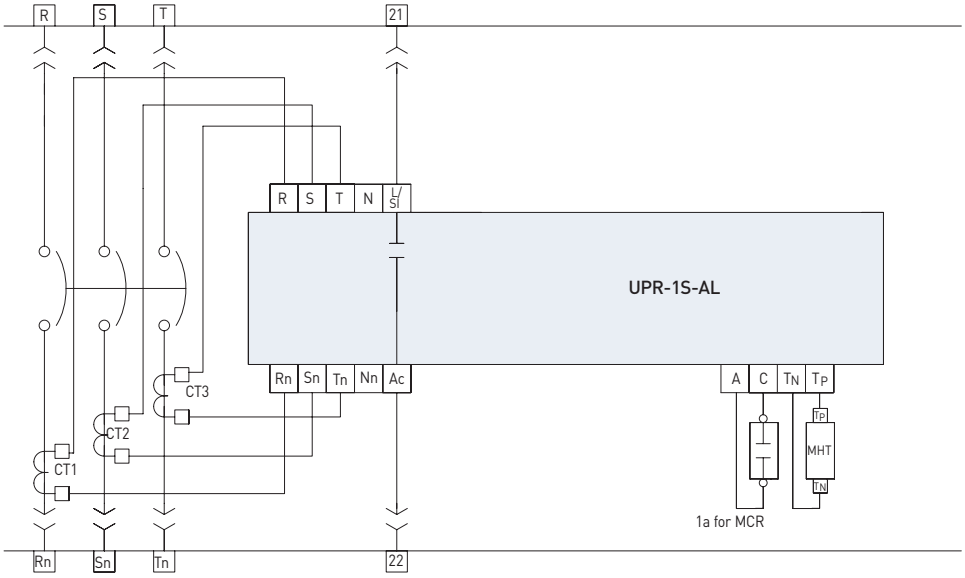
### UPR-1D-GT



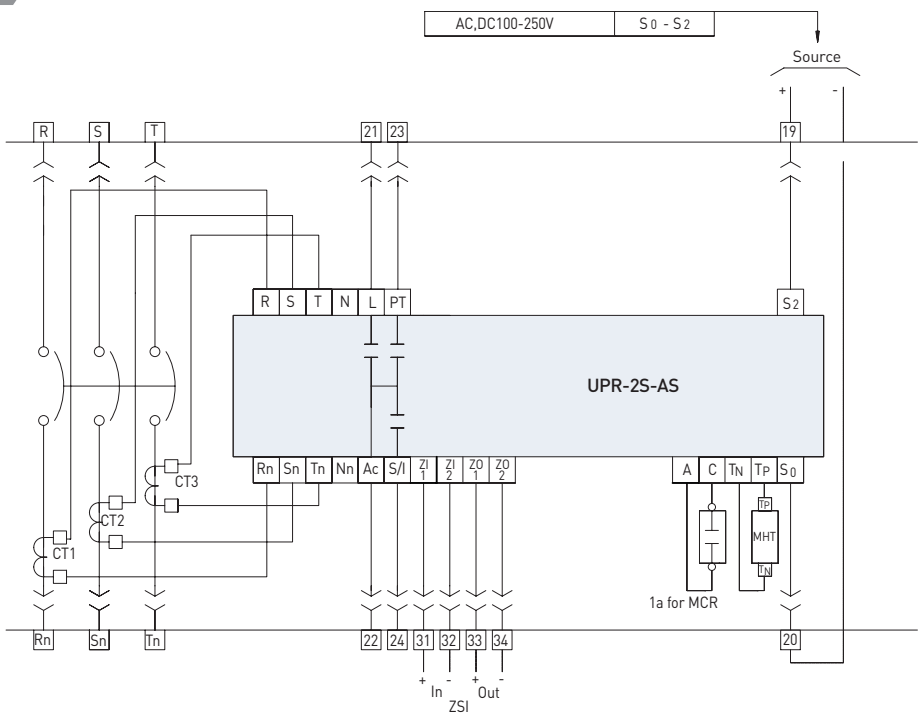

### UPR-2L-GM



## UPR-1S-AL



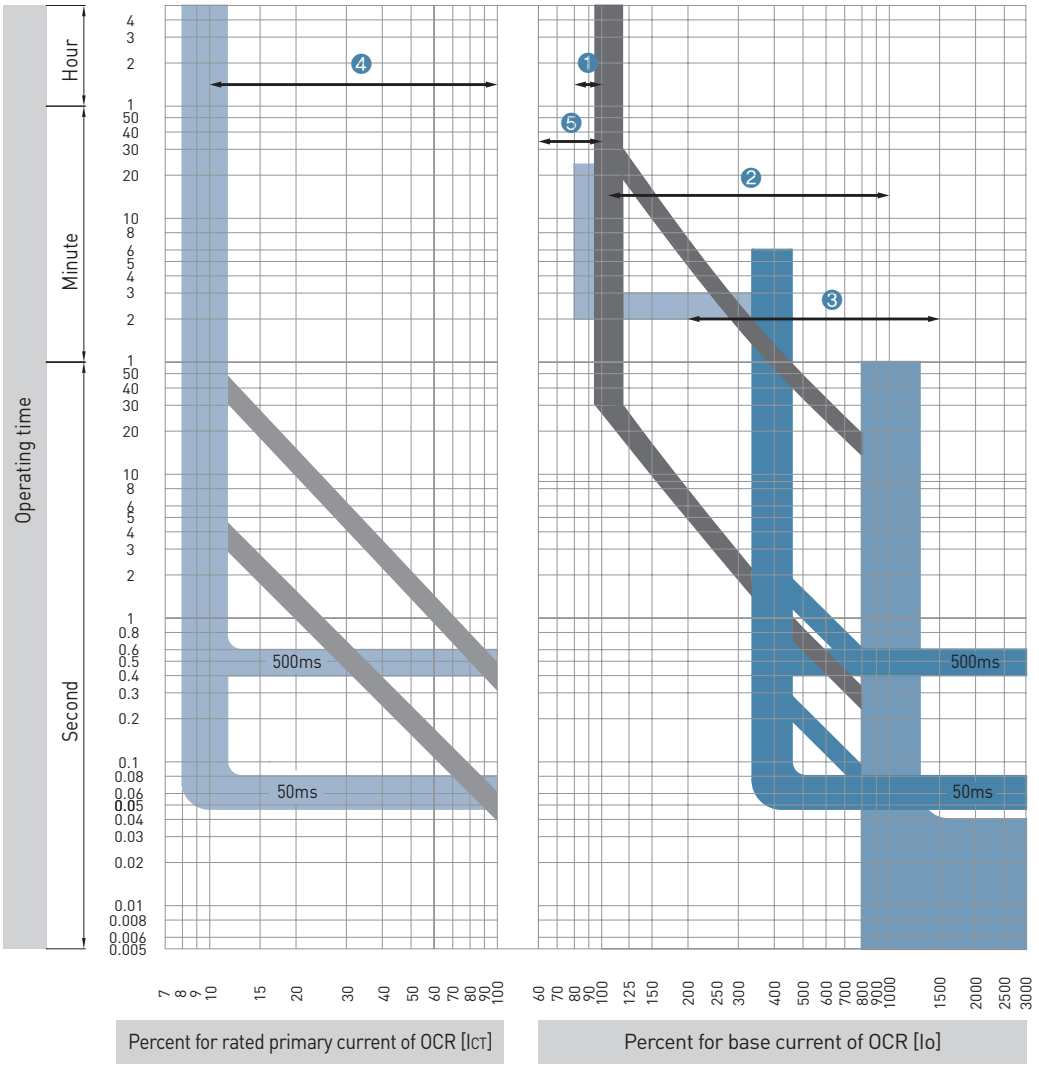

## UPR-2S-AS



# Protection Trip Relay (OCR)

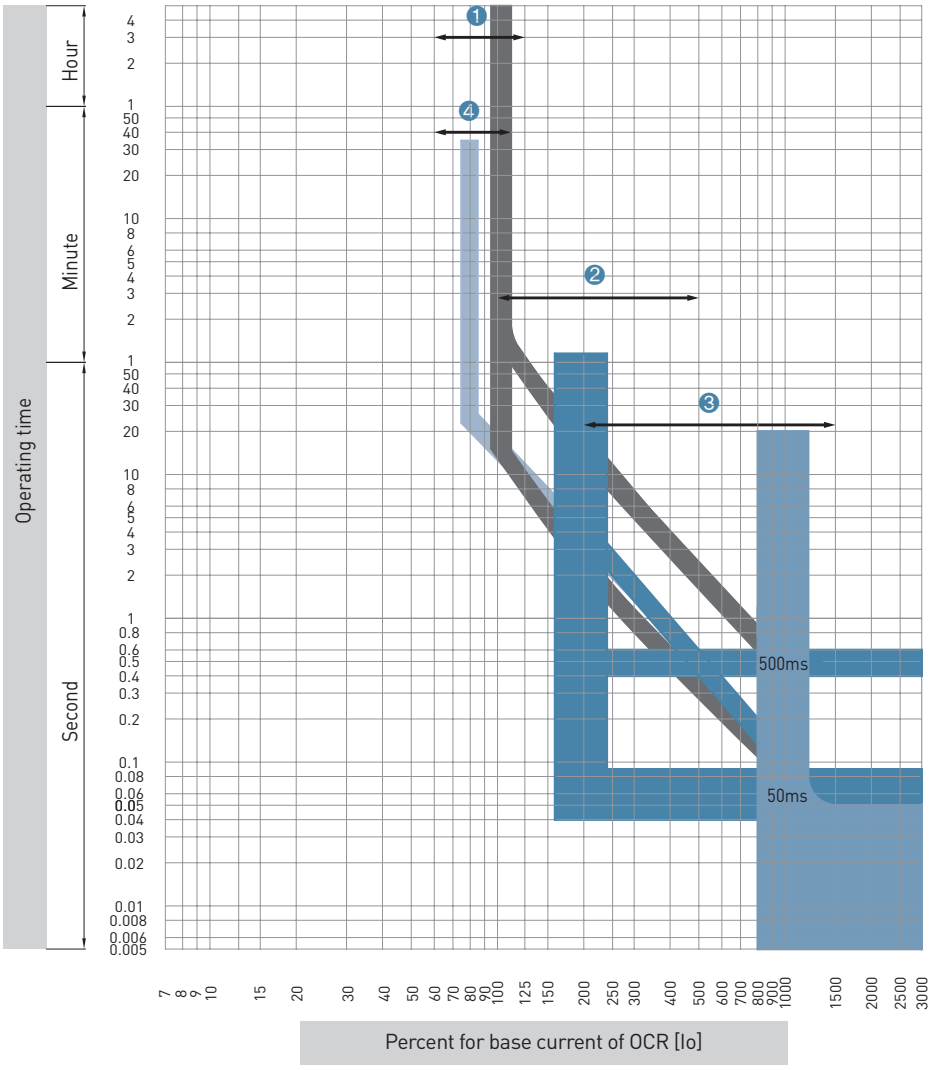
## | Characteristic curves |

**General feeder**




❶ Long time delay current setting range
❷ Short time delay current setting range
❸ Instantaneous tripping current setting range
❹ Ground fault trip current setting range
❺ Pre-trip alarm current setting range

## Generator




❶ Long time delay current setting range
❷ Short time delay current setting range
❸ Instantaneous tripping current setting range
❹ Pre-trip alarm current setting range

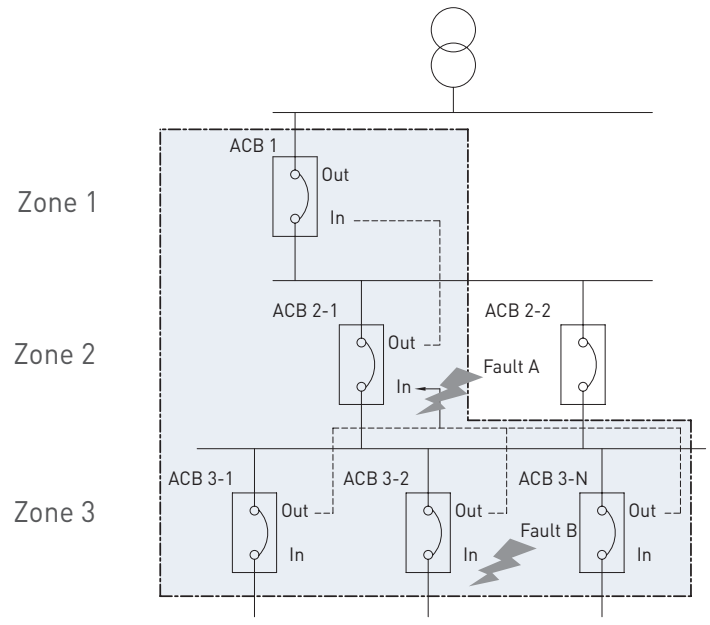
# Protection Trip Relay (OCR)

## | Zone selective interlock function |

Zone selective interlocking drops delay time that eliminates faults for breakers.
It minimizes the shock that all kinds of electric machinery get under fault conditions.

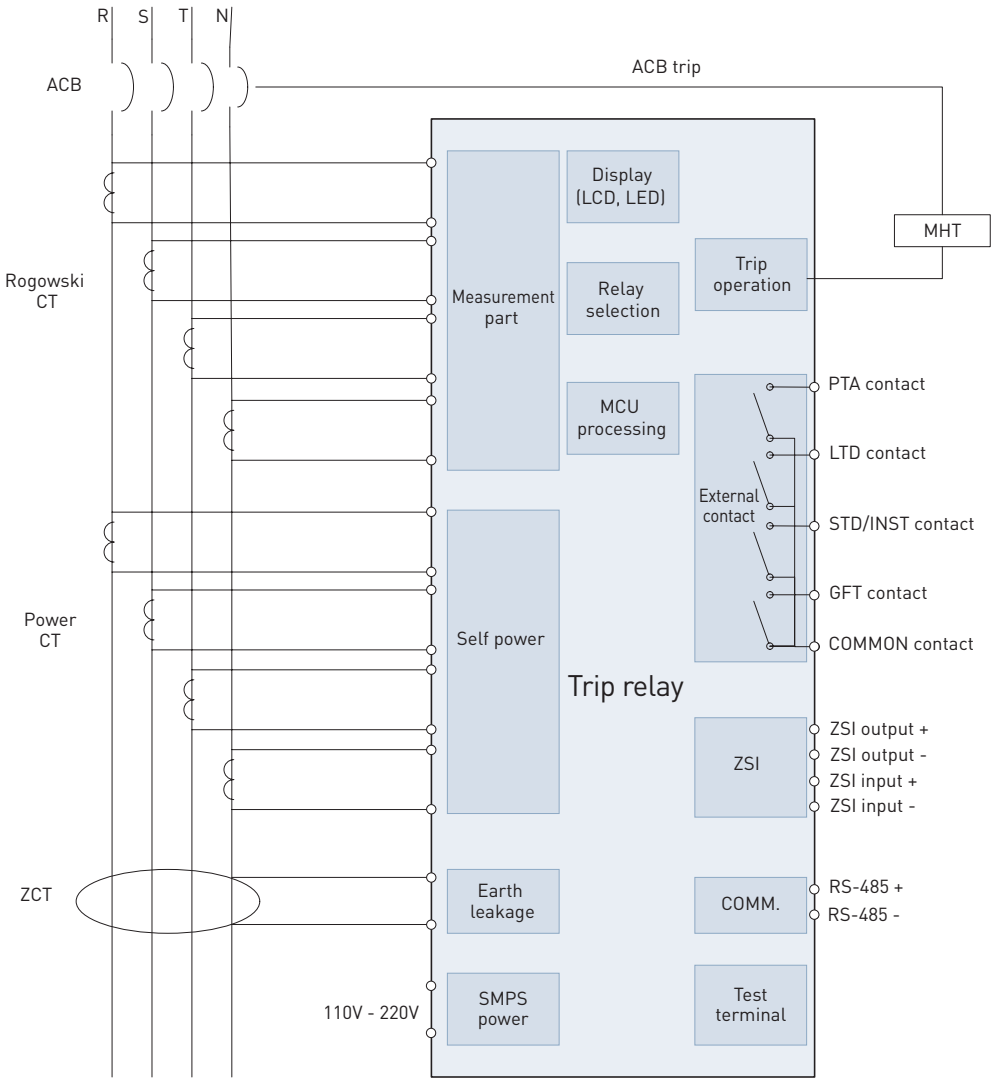
### ■ Example

1. In case of that short time-delay or ground fault accident occurs at ZSI built in system, the breaker at accident site sends ZSI signal to halt upstream breaker's operation.
2. To eliminate a breakdown, trip relay of ACB at accident site activates trip operation without time delay.
3. The upstream breaker that received ZSI signal adhere to pre-set short time-delay or ground fault time delay for protective coordination in the system. However upstream breaker that did not receive its signal will trip instantaneously.
4. For ordinary ZSI operation, it should arrange operation time accordingly so that downstream circuit breakers will react before upstream ones under overcurrent/short time delay/ground fault situations.
5. ZSI connecting line needs to be maximum 3m.




------- ZSI connecting

## | System diagram |




## | Communication function |

### ■ Modbus-RTU / RS-485

- Operation mode: Differential
- Distance: Max.1.2km
- Cable: RS-485 shielded twist 2-pair cable
- Baud rate: 9,600, 19,200, 38,400 bps
- Transmission method: Half-duplex
- Termination: 150Ω