Derwent
Top 100
Global
Innovator
2020

# EMPR Series

Electronic Motor Protection Relays



LS ELECTRIC

*The new standard of next-generation motor protection relay*

# EMPR Series

*With smart protection and safe control,*
*We provide the cutting-edge digital total solution.*






# Electronic Motor Protection Relays

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# A list of standard models

| Functions | | GMP22/40 | | | GMP60 | | | | GMP80 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2P/ 2PD/ 2PA 2T/2S | 3P/3T/3S | 3PR/3TR /3SR | T/TE/TA | TD/TDa | 3T/3TR, 3S/3SR | 3TZ/3TZR, 3TN/3TNR, 3SZ/3SZR, 3SN/3SNR | 2S/2SA | 3S/3SR |
| Control power | AC | 110/220 100~260V | 100~260V | 100~260V | 24/48/110/ 220/380 180~480V 110/220V | 110/220V | 100~260V | 100~260V | 100~260V | 100~260V |
| | DC | - | - | - | - | - | - | - | - | - |
| | Frequency | 50/60Hz | 50/60Hz | 50/60Hz | 50/60Hz | 50/60Hz | 50/60Hz | 50/60Hz | 50/60Hz | 50/60Hz |
| | Single phase | - | - | - | - | - | - | - | - | - |
| | Three-phase | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| CT connection | External tunnel type | - | - | - | - | - | - | - | - | - |
| | Internal tunnel type | ●(T) | ●(T) | ●(T) | ●(T) | ●(T) | ●(T) | ●(T) | - | - |
| | Screw type | ●(S) | ●(S) | ●(S) | - | - | ●(S) | ●(S) | ●(S) | ●(S) |
| | Pin type | ●(P) | ●(P) | ●(P) | - | - | - | - | - | - |
| Protection functions (Current) | Overcurrent | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | Undercurrent | - | - | - | - | ●(a) | - | - | - | - |
| | Stall | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | Jam | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | Current phase failure | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | Current reverse phase | - | - | ●(R) | - | - | ●(R) | ●(R) | - | ●(R) |
| | Current phase unbalance | - | ●(3) | ●(3) | - | - | ●(3) | ●(3) | - | ●(3) |
| | Ground fault(zero phase current) | - | - | - | - | - | - | ●(Z) | - | - |
| | Instant short circuit | - | - | - | - | - | - | - | - | - |
| | Heat accumulation inverse time | ● | ● | ● | - | - | - | - | ● | ● |
| | Definite time | ●(D) | - | - | ● | ●(D) | ● | ● | - | - |
| | Ground fault (residual current) | - | - | - | - | - | | ●(N) | - | - |
| | Selective ground fault | - | - | - | - | - | - | - | - | - |
| Protection functions (Voltage) | Overvoltage | - | - | - | - | - | - | - | - | - |
| | Undervoltage | - | - | - | - | - | - | - | - | - |
| | Voltage phase failure | - | - | - | - | - | - | - | - | - |
| | Voltage phase unbalance | - | - | - | - | - | - | - | - | - |
| | Overvoltage reverse phase | - | - | - | - | - | - | - | - | - |
| | Overvoltage ground fault | - | - | - | - | - | - | - | - | - |
| Protection functions (Power) | Overpower | - | - | - | - | - | - | - | - | - |
| | Underpower | - | - | - | - | - | - | - | - | - |
| | Over power factor | - | - | - | - | - | - | - | - | - |
| | Under power factor | - | - | - | - | - | - | - | - | - |
| Additional Function | Insulation Resistance | - | - | - | - | - | - | - | - | - |
| | Motor Temperature | - | - | - | - | - | - | - | - | - |

# Electronic Motor Protection Relays

| | DMPi | | | | IMP | MMP | | | | IMC-III |
|---|---|---|---|---|---|---|---|---|---|---|
| | S/T | SZ/TZ SB/TB | SI/TI | SM/TM SA/TA | | C | S | P | IR | |
| | AC/DC 85~260V | AC/DC 85~260V | AC/DC 85~260V | AC/DC 85~260V | AC/DC 85~245V | 100~260V | 100~260V | 100~260V | 100V | 110/220V |
| | | | | | | - | - | - | - | - |
| | 50/60Hz | 50/60Hz | 50/60Hz | 50/60Hz | 50/60Hz | 50/60Hz | 50/60Hz | 50/60Hz | 60Hz | 50/60Hz |
| | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | - | - | - | - | - | - | - | - | - | ● |
| | ●(T) | ●(T) | ●(T) | ●(T) | ● | ● | ● | ● | ● | - |
| | ●(S) | ●(S) | ●(S) | ●(S) | - | - | - | - | - | - |
| | - | - | - | - | - | - | - | - | - | - |
| | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | - | ●(Z/B) | - | - | ● | ● | ● | ● | ● | - |
| | - | - | ●(I) | - | ● | ● | ● | ● | ● | - |
| | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | - | - | - | - | - | ● | ● | ● | ● | ● |
| | ● | ● | ● | ● | - | ● | ● | ● | ● | - |
| | - | - | - | - | - | - | ● | - | - | - |
| | - | - | - | - | - | - | - | ● | - | - |
| | - | - | - | - | - | - | - | ● | - | - |
| | - | - | - | - | - | - | - | ● | - | - |
| | - | - | - | - | - | - | - | ● | - | - |
| | - | - | - | - | - | - | - | ● | - | - |
| | - | - | - | - | - | - | ● | - | - | - |
| | - | - | - | - | - | - | - | ●(Alarm) | - | - |
| | - | - | - | - | - | - | - | ●(Alarm) | - | - |
| | - | - | - | - | - | - | - | ● | - | - |
| | - | - | - | - | - | - | - | ● | - | - |
| | - | - | - | - | - | - | - | - | ● | - |
| | - | - | - | - | - | - | - | - | ● | - |

# A list of standard models

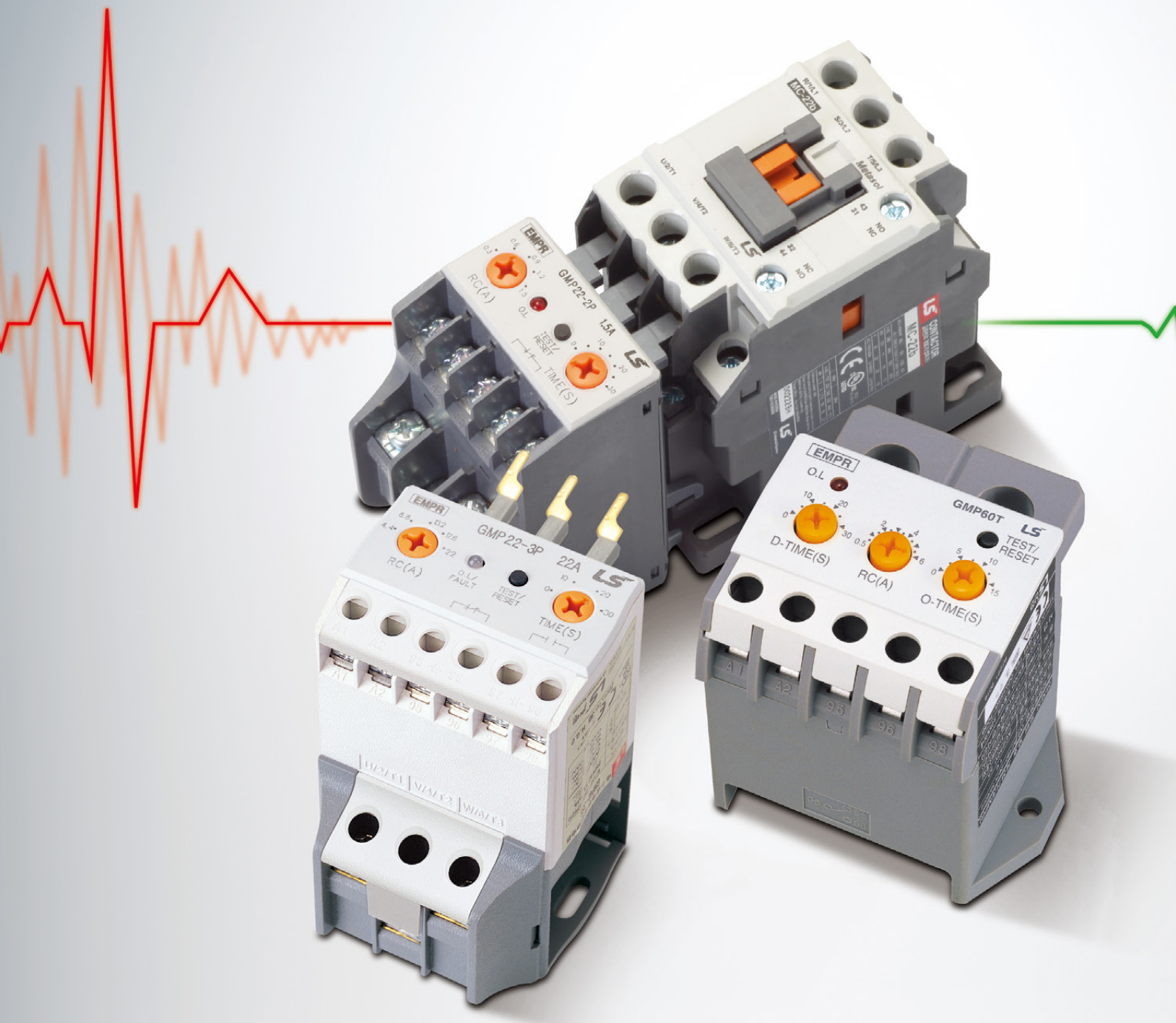
| Functions | | GMP22/40 | | | GMP60 | | | | GMP80 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2P/ 2PD/ 2PA 2T/2S | 3P/3T/3S | 3PR/3TR /3SR | T/TE/TA | TD/TDa | 3T/3TR, 3S/3SR | 3TZ/3TZR, 3TN/3TNR, 3SZ/3SZR, 3SN/3SNR | 2S/2SA | 3S/3SR |
| Display | Phase current | - | - | - | - | - | - | - | - | - |
| | Ground current | - | - | - | - | - | - | - | - | - |
| | Active/Reactive Power | - | - | - | - | - | - | - | - | - |
| | Electric energy | - | - | - | - | - | - | - | - | - |
| | Insulation Resistance | - | - | - | - | - | - | - | - | - |
| | Motor Temperature | - | - | - | - | - | - | - | - | - |
| | Total running time | - | - | - | - | - | - | - | - | - |
| | Display failure cause | - | - | - | - | ●(a) | - | - | - | - |
| | Save failure cause | - | - | - | - | ●(a) | ● | ● | - | - |
| | Display load factor | - | - | - | - | - | - | - | - | - |
| | Display | - | - | - | - | 4 digit 7-segment | - | - | - | - |
| Auxiliary function | Save failure cause | - | - | - | - | - | ●(3T) | - | - | - |
| | Display alert | - | - | - | - | ● | - | - | - | - |
| | Set return method | ●(A) | - | - | ●(A) | ●(a) | - | - | ●(A) | - |
| | Set date/Time information | - | - | - | - | - | - | - | - | - |
| | Set password | - | - | - | - | - | - | - | - | - |
| | Set/Save total running time | - | - | - | ● | ●(a) | - | - | - | - |
| | Set operating characteristics | - | - | - | - | - | - | - | - | - |
| | Save fault wave | - | - | - | - | - | - | - | - | - |
| | Self-test | - | - | - | - | - | - | - | - | - |
| | Restart limit | - | - | - | - | - | - | - | - | - |
| | Select starting method | - | - | - | - | - | - | - | - | - |
| | Built-in ZCT | - | - | - | - | - | - | - | - | - |
| | Selective ground protection setting | - | - | - | - | - | - | - | - | - |
| | On/Off switch | - | - | - | - | - | - | - | - | - |
| | Electric energy pulse output(4~20mA) | - | - | - | - | - | - | - | - | - |
| Communication function | 4~20mA output | - | - | - | - | - | - | - | - | - |
| | MODBUS RS-485 | - | - | - | - | - | - | - | - | - |

# Electronic Motor Protection Relays

| | DMPi | | | | IMP | MMP | | | | IMC-III |
|---|---|---|---|---|---|---|---|---|---|---|
| | S/T | SZ/TZ<br>SB/TB | SI/TI | SM/TM<br>SA/TA | | C | S | P | IR | |
| | ● | ● | ● | ● | - | ● | ● | ● | ● | ● |
| | - | - | - | - | - | ● | ● | ● | ● | ● |
| | - | - | - | - | - | ● | ● | ● | - | - |
| | - | - | - | - | - | ● | ● | ● | - | - |
| | - | - | - | - | - | - | - | - | ● | - |
| | - | - | - | - | - | - | - | - | ● | - |
| | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | ● | ● | ● | ● | - | ● | ● | ● | ● | ● |
| | ● | ● | ● | ● | - | ● | ● | ● | ● | ● |
| | ● | ● | ● | ● | - | - | - | - | ● | ● |
| | 4 digit<br>7-segment | 4 digit<br>7-segment | 4 digit<br>7-segment | 4 digit<br>7-segment | 4 digit<br>7-segment | 4 digit<br>7-segment | 4 digit<br>7-segment | 4 digit<br>7-segment | 4 digit<br>7-segment | 4 digit<br>7-segment |
| | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | ● | ● | ● | ● | ● | ● | ● | ● | ● | - |
| | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | ● | ● | ● | ● | ● | ● | ● | ● | ● | - |
| | ● | ● | ● | ● | ● | ● | ● | ● | ● | - |
| | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | - | - | - | - | - | ● | ● | ● | ● | - |
| | - | - | - | - | - | ● | ● | ● | ● | ● |
| | - | - | - | - | - | ● | ● | ● | - | ● |
| | - | - | - | - | - | ● | ● | ● | - | - |
| | - | ●(B) | - | - | - | - | ● | - | ● | - |
| | - | - | - | - | - | ● | ● | ● | - | - |
| | - | - | - | - | - | ● | ● | ● | - | ● |
| | - | - | - | ●(A) | - | ● | ● | ● | - | - |
| | - | - | - | ●(A) | ● | ●(M) | ●(M) | ●(M) | ● | ●(A420) |
| | - | - | - | ●(M) | ● | ●(M) | ●(M) | ●(M) | ● | ●(M485) |

# *The new standard of next-generation motor protection relay!*

*With smart protection and safe control, we provide the cutting-edge digital total solution.*



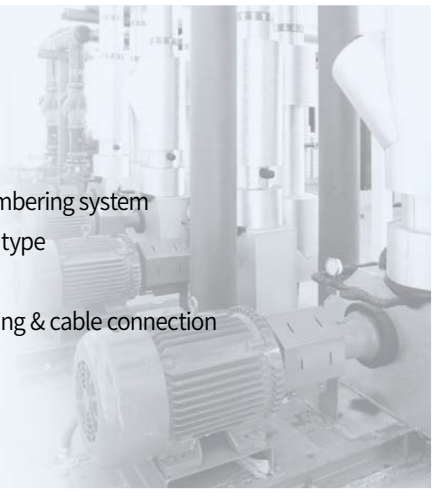
# GMP Series

Electronic Motor Protection Relays

- Definite/inverse time protection of a variety of rating
- Ground fault protection model
- LED based display of failure cause
- MC direct coupling, penetration, and terminal types sharing

## Contents


10 A list of standard models
11 Product characteristics
12 Motor selection & model numbering system
13 Rated specifications & order type
22 Operation & setting method
27 Terminal configuration / Wiring & cable connection
30 Dimensions

# A list of standard models









| Rated current | Connection method | Type name | over-current | Locked rotor | Phase failure | Phase unbalance | Reverse phase | low current | Ground Fault | Characteristic |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.3~1.5<br>1~5<br>4.4~22A | Pin type note 1) | GMP22-2P Sol | ● | ● | ● | - | - | - | - | Inverse time |
| | | GMP22-2PD Sol | ● | ● | ● | - | - | - | - | Definite time |
| | | GMP22-2P Sol | ● | ● | ● | - | - | - | - | Inverse time |
| | | GMP22-2PA Sol | ● | ● | ● | - | - | - | - | Definite time/ Automatic return |
| | | GMP22-3P Sol | ● | ● | ● | ● | - | - | - | Inverse time |
| | | GMP22-3PR Sol | ● | ● | ● | ● | ● | - | - | Inverse time |
| | Screw type | GMP22-2S | ● | ● | ● | - | - | - | - | Inverse time |
| | | GMP22-3S | ● | ● | ● | ● | - | - | - | Inverse time |
| | | GMP22-3SR | ● | ● | ● | ● | ● | - | - | Inverse time |
| | Tunnel types | GMP22-2T | ● | ● | ● | - | - | - | - | Inverse time |
| | | GMP22-3T | ● | ● | ● | ● | - | - | - | Inverse time |
| | | GMP22-3TR | ● | ● | ● | ● | ● | - | - | Inverse time |
| 4~20<br>8~40A | Pin type note 1) | GMP40-2PD Sol | ● | ● | ● | - | - | - | - | Definite time |
| | | GMP40-2P Sol | ● | ● | ● | - | - | - | - | Inverse time |
| | | GMP40-2PA Sol | ● | ● | ● | - | - | - | - | Inverse time/ Automatic return |
| | | GMP40-3P Sol | ● | ● | ● | ● | - | - | - | Inverse time |
| | | GMP40-3PR Sol | ● | ● | ● | ● | ● | - | - | Inverse time |
| | Screw type | GMP40-2S | ● | ● | ● | - | - | - | - | Inverse time |
| | | GMP40-3S | ● | ● | ● | ● | - | - | - | Inverse time |
| | | GMP40-3SR | ● | ● | ● | ● | ● | - | - | Inverse time |
| | Tunnel types | GMP40-2T | ● | ● | ● | - | - | - | - | Inverse time |
| | | GMP40-3T | ● | ● | ● | ● | - | - | - | Inverse time |
| | | GMP40-3TR | ● | ● | ● | ● | ● | - | - | Inverse time |
| 0.5~6<br>3~30<br>5~60A | Tunnel types | GMP60T | ● | ● | ● | - | - | - | - | Inverse time |
| | | GMP60TE | ● | ● | ● | - | - | - | - | Inverse time |
| | | GMP60TA | ● | ● | ● | - | - | - | - | Definite time/ Automatic return |
| 0.5~60A | | GMP60TD | ● | ● | ● | - | - | - | - | Definite time |
| | | GMP60TDa | ● | ● | ● | - | - | ● | - | Definite time/ Automatic return |
| 0.5~60A | Tunnel types | GMP60-3T | ● | ● | ● | ● | - | - | - | Definite time |
| | | GMP60-3TR | ● | ● | ● | ● | ● | - | - | Definite time |
| | | GMP60-3TZ note 2) | ● | ● | ● | ● | - | - | ● | Definite time |
| | | GMP60-3TN | ● | ● | ● | ● | - | - | ● | Definite time |
| | | GMP60-3TZR | ● | ● | ● | ● | ● | - | ● | Definite time |
| | | GMP60-3TNR | ● | ● | ● | ● | ● | - | ● | Definite time |
| 0.5~60A note 3) | Screw type | GMP60-3S | ● | ● | ● | ● | - | - | - | Definite time |
| | | GMP60-3SR | ● | ● | ● | ● | ● | - | - | Definite time |
| | | GMP60-3SZ | ● | ● | ● | ● | - | - | ● | Definite time |
| | | GMP60-3SN | ● | ● | ● | ● | - | - | ● | Definite time |
| | | GMP60-3SZR | ● | ● | ● | ● | ● | - | ● | Definite time |
| | | GMP60-3SNR | ● | ● | ● | ● | ● | - | ● | Definite time |
| 16~80A | | GMP80-2S | ● | ● | ● | - | - | - | - | Inverse time |
| | | GMP80-2SA | ● | ● | ● | - | - | - | - | Inverse time/ Automatic return |
| | | GMP80-3S | ● | ● | ● | ● | - | - | - | Inverse time |
| | | GMP80-3SR | ● | ● | ● | ● | ● | - | - | Inverse time |

Note) 1. Direct coupling type (Pin) supports direct coupling of Metasol MC. With your order, it is required to describe "Sol".
2. For GMP60-3TZ/3TZR, use ZCT (100mA/40~55mV) for EMPR only.
3. In case of GMP60-3S Series, it is required to purchase a terminal block separately.
4. This product is designed for protecting a low-voltage motor with 1,000V or less. Therefore, it should not be used in high voltage lines.

## Convenience

**Integrated Digital Motor Protection Relay using MCU(Microprocessor Control Unit)**
It offers real time data processing and high precision.

**Applicable to invertor circuits**
It may be applied to the secondary inverter control circuit with its outstanding resistance to harmonic noise.
(Usable frequency range: 20~200Hz, except for phase reversal model)

**Save the last fault cause**
At the time of power recover after power failure, it is possible to check the final operation cause.
(Test/Reset Key 2-time operation) Some models only. (Check specifications table by model)

**Sharing of terminal contact type and penetration type**
It is possible to detach and attach a terminal block and conveniently apply the product to a variety of installation conditions.

**Perfect connection with LS Digital Contactor Metasol MC**

| EMPR | Contactor model |
|---|---|
| GMP22-2P/3P/3PR | MC-9b, MC-12b, MC-18b, MC-22 |
| GMP40-2P/3P/3PR | MC-32a, MC-40a |

*In case of Metasol MC direct coupling type, it is required to describe "Sol" with your order.
*GMP80-Model is unable to direct-couple to Metasol MC.



**Various Installation Ways**
With the uses of screws and brackets for DIN-Rail, it is possible to install 35mm DIN-Rail.

**Wide Current Control Range**
Since this product has a wide current control range, it is more convenient than thermal overload relays.

## Reliability

**Acquired S-Mark (safety certification) first in the industry**
**What is S-Mark (safety)?**
S-Mark is used to approve a product's safety, reliability, and safe design manufacturing in the way of reviewing the quality management system of its manufacturer. If a product complies with safety certification standards, it has safety certification (S-Mark). 'S-Mark (see Mark)' is applied to a product, a product package, or a product advertisement in order to show its safety.



**Remarkable improvement in the characteristics of Nois**
- This product solves the malfunction made by electromagnetic waves and surges which are the biggest problem of digital motor protection relays.
- With the application of highly-reliable Toroidal CT, the product safely protects digital contactors, radio devices, lightning surges, impulses, etc. against external influence.

**Inverse time characteristic good for motor protection**
Thanks to the inverse time characteristic in which a running time is determined by a size of overcurrent, the product is excellent at motor protection.

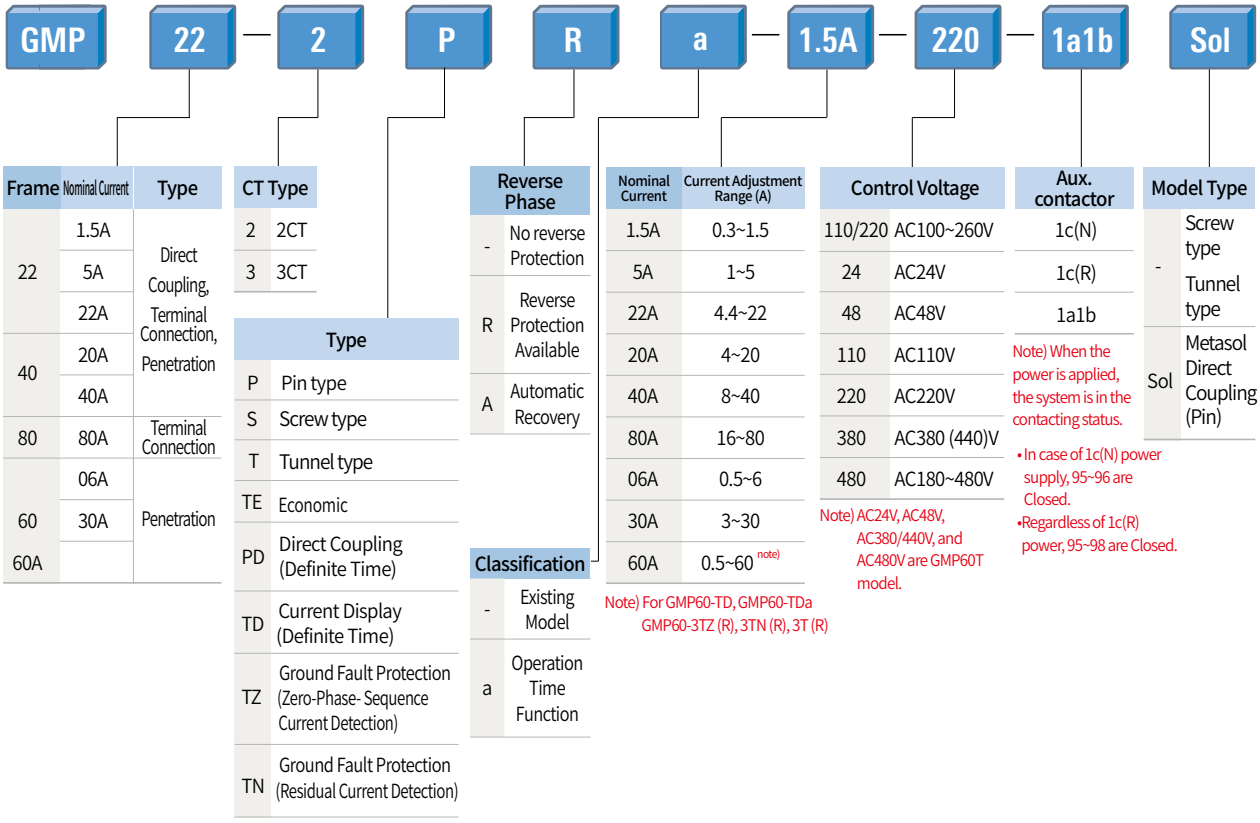
# Motor selection & model numbering system

## Motor selection

| Current | Current setting range (A) | 220~240VAC | | | 380~440VAC | | |
|---|---|---|---|---|---|---|---|
| | | 3-phase motor rating kW (Hp) | | Full Load Current for the Motor(A) | 3-phase motor rating kW (Hp) | | Full Load Current for the Motor(A) |
| 1.5 | 0.3-1.5 | ~0.18 | (~0.25) | 1.5 | 0.12~0.55 | (~0.75) | 1.6 |
| 5 | 1-5 | 0.18~0.75 | (0.25~1) | 4.8 | 0.25~1.5 | (0.33~2) | 4 |
| 22 | 4.4-22 | 1.1~4 | (1.5~5.5) | 18.8 | 3~7.5 | (4~10) | 17 |
| 20 | 4-20 | 0.75~3.7 | (1~5) | 17.4 | 2.2~7.5 | (3~10) | 17 |
| 40 | 8-40 | 2.2~7.5 | (3~10) | 34 | 4~15 | (5.5~20) | 32.5 |
| 80 | 16-80 | 4~18.5 | (5.5~25) | 79 | 7.5~37 | (10~50) | 74 |
| 06 | 0.5-6 | 0.09~0.75 | (0.13~1) | 4.8 | 0.12~2.2 | (0.13~3) | 5.5 |
| 30 | 3-30 | 0.37~5.5 | (0.5~7.5) | 26 | 1.1~11 | (1.5~15) | 24 |
| 60 | 0.5-60 | 1.1~11 | (1~15) | 48 | 3~22 | (4~30) | 46.5 |

Note) The above data can be different depending on a motor degree and a manufacturer. They are the reference values of AC Degree 3 Standard Squirrel Cage Motor.

## Model numbering system



# GMP22-2P, 2PD 1c



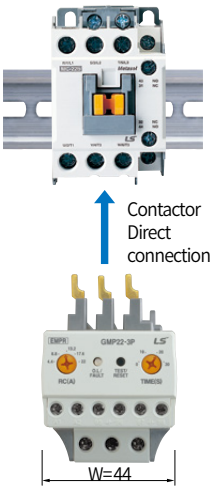
GMP22-2P(1c)
GMP22-2PD(1c)

## Specification (Direct type EMPR)

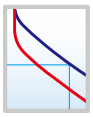
| | |
|---|---|
| Connection: Accessible electronic contactors | Minimum direct connection with width 44mm : MC-9b, 12b, 18b, 22b |
| Auxiliary contact | 1SPDT 1c (N type) note1) |
| Current setting range | 0.3~1.5/1~5/4.4~22A |
| Operating time characteristics | Inverse time, Definite time (PD) |
| Number of built-in CT (deflector) | 2 (R, T phase) |
| Operating power | AC 110/220V (±10%) |
| Return (reset) method/time | Manual/Electrical return |
| Using Inverter Secondary | Available |

| Type | | GMP22-2P (1c) Sol | GMP22-2PD (1c) Sol |
|---|---|---|---|
| Protection | Overcurrent | ✓ | ✓ |
| | Lock/Stall | ✓ | ✓ |
| | Phase failure | ✓ note 2) | ✓ note 2) |
| Certification | UL, CE | ✓ | |

Contactor
MC-9b, 12b, 18b, 22b




## Order type

| Type | Model/CT | Operating characteristics | Current setting range | Order type |
|---|---|---|---|---|
| Pin type | GMP22-2P(1c) - 2CT type | Inverse time (0~30sec)  | 0.3 - 1.5A | GMP22-2P(1c) 1.5A Sol |
| | | | 1 - 5A | GMP22-2P(1c) 5A Sol |
| | | | 4.4 - 22A | GMP22-2P(1c) 22A Sol |
| | | | 0.3 - 1.5A | GMP22-2P(1c) 1.5A [N] |
| | | | 1 - 5A | GMP22-2P(1c) 5A [N] |
| | | | 4.4 - 22A | GMP22-2P(1c) 22A [N] |
| | | | 0.3 - 1.5A | GMP22-2P(1c) 1.5A [R] |
| | | | 1 - 5A | GMP22-2P(1c) 5A [R] |
| | | | 4.4 - 22A | GMP22-2P(1c) 22A [R] |
| | GMP22-2PD(1c) - 2CT type | Definite time<br>D-Time : 0~60sec<br>O-Time : 5sec(Fixed)  | 0.3 - 1.5A | GMP22-2PD(1c) 1.5A Sol |
| | | | 1 - 5A | GMP22-2PD(1c) 5A Sol |
| | | | 4.4 - 22A | GMP22-2PD(1c) 22A Sol |
| | | | 0.3 - 1.5A | GMP22-2PD(1c) 1.5A [N] |
| | | | 1 - 5A | GMP22-2PD(1c) 5A [N] |
| | | | 4.4 - 22A | GMP22-2PD(1c) 22A [N] |
| | | | 0.3 - 1.5A | GMP22-2PD(1c) 1.5A [R] |
| | | | 1 - 5A | GMP22-2PD(1c) 5A [R] |
| | | | 4.4 - 22A | GMP22-2PD(1c) 22A [R] |

Note) 1. 1c contacts have two types of products: N-type (Fail Safe/Normal Energyed) and R-type(Non Fail Safe / Normal De-Energyed). In terms of product reliability, N-type (Fail Safe) product is recommended to be used.
2. The product detects phase failure of the phase (R, T) connected with two CTs in order for protection.



## Technical information

| | |
|---|---|
| Installation | Direct connection to contactors (not alone) |
| Tolerance | Current : ±5%<br>Time : ±5% (or±0.5sec) |
| Frequency | 50/60Hz |
| Aux. contact Ratings | 5A/250VAC Resistive load |
| Insulation resistance | Min 100MΩ at 500Vdc |
| Lightning impulse voltage | 1.2×50μs 5kV With standard waveform (IEC1000-4-5) |
| Fast Transient Burst | 2kV/5min (IEC1000-4-4) |
| Environment | Operation : -25~70°C<br>Storage : -30~80°C<br>Relative humidity : within 80% RH, no condensation |
| Trip indicator | Red LED |
| Application specification | UL508, IEC60947-1 |

# Rated specifications & order type

## GMP22-□



Pin type
GMP22-□P, PR



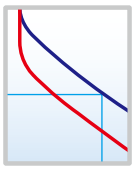
Screw type
GMP22-□S, SR



Tunnel type
GMP22-□T, TR

### Specification

| | |
|---|---|
| Various connection methods : Electronic contactors applied | Pin, Screw, Tunnel type : MC-9b, 12b, 18b, 22b |
| Auxiliary contact | 2SPST (1a1b at energization) |
| Current setting range | 0.3~1.5/1~5/4.4~22A |
| Operating time characteristics | Inverse time |
| Number of built-in CT (deflector) | 2 (R, Tphase) or 3 |
| Operating power | AC 100~260V |
| Return (reset) method/time | Manual/Electrical return (Standard)<br>Manual/Auto/Electrical return (2PA) |
| Using Inverter Secondary | Available (Exclude GMP22-3PR, 3TR, 3SR) |



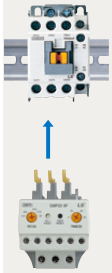
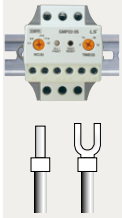
Inverse time

*GMP22-2PA automatically returns within 60 seconds in case of overcurrent.

| Type (GMP22-□) | | 2P, 2PA, 2T, 2S | 3P, 3T, 3S | 3PR, 3TR, 3SR |
|---|---|---|---|---|
| Protection | Overcurrent | ✓ | ✓ | ✓ |
| | Lock/Stall | ✓ note) | ✓ | ✓ |
| | Phase failure | ✓ | ✓ | ✓ |
| | Phase unbalance | - | ✓ | ✓ |
| | Reverse phase | - | - | ✓ |
| Certification | UL, CE | ✓ (Exclude 2PD) | ✓ | ✓ |

Note) The product detects phase failure of the phase (R, T) connected with two CTs in order for protection.

### Order type

| Mounting type | Model/CT | Current setting range | Order type |
|---|---|---|---|
| Direct mount onto a Metasol MC<br><br>Electronic contactor MC-9b, 12b, 18b, 22b | GMP22-2P (1a1b)<br>- 2CT type | 0.3 - 1.5A | GMP22-2P(1a1b) 1.5A Sol |
| | | 1 - 5A | GMP22-2P(1a1b) 5A Sol |
| | | 4.4 - 22A | GMP22-2P(1a1b) 22A Sol |
| | GMP22-2PA (1a1b)<br>- 2CT type<br>- Automatic return | 0.3 - 1.5A | GMP22-2PA(1a1b) 1.5A Sol |
| | | 1-5A | GMP22-2PA(1a1b) 5A Sol |
| | | 4.4-22A | GMP22-2PA(1a1b) 22A Sol |
| | GMP22-3P<br>- 3CT type | 0.3 - 1.5A | GMP22-3P 1.5A Sol |
| | | 1 - 5A | GMP22-3P 5A Sol |
| | | 4.4 - 22A | GMP22-3P 22A Sol |
| | GMP22-3PR<br>- 3CT type<br>- Reverse phase protection | 0.3 - 1.5A | GMP22-3PR 1.5A Sol |
| | | 1 - 5A | GMP22-3PR 5A Sol |
| | | 4.4 - 22A | GMP22-3PR 22A Sol |
| Screw type<br><br>Install Screw/Rail | GMP22-2S<br>- 2CT type | 0.3 - 1.5A | GMP22-2S 1.5A |
| | | 1 - 5A | GMP22-2S 5A |
| | | 4.4 - 22A | GMP22-2S 22A |
| | GMP22-3S<br>- 3CT type | 0.3 - 1.5A | GMP22-3S 1.5A |
| | | 1-5A | GMP22-3S 5A |
| | | 4.4-22A | GMP22-3S 22A |
| | GMP22-3SR<br>- 3CT type<br>- Reverse phase protection | 0.3 - 1.5A | GMP22-3SR 1.5A |
| | | 1 - 5A | GMP22-3SR 5A |
| | | 4.4 - 22A | GMP22-3SR 22A |
| Tunnel type<br><br>Install Screw/Rail | GMP22-2T<br>- 2CT type | 0.3 - 1.5A | GMP22-2T 1.5A |
| | | 1 - 5A | GMP22-2T 5A |
| | | 4.4 - 22A | GMP22-2T 22A |
| | GMP22-3T<br>- 3CT type | 0.3 - 1.5A | GMP22-3T 1.5A |
| | | 1-5A | GMP22-3T 5A |
| | | 4.4-22A | GMP22-3T 22A |
| | GMP22-3TR<br>- 3CT type<br>- Reverse phase protection | 0.3 - 1.5A | GMP22-3TR 1.5A |
| | | 1 - 5A | GMP22-3TR 5A |
| | | 4.4 - 22A | GMP22-3TR 22A |

# GMP40-□



Pin type
GMP40-□P, PR



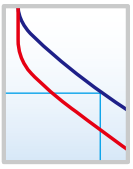
Screw type
GMP40-□S, SR



Tunnel type
GMP40-□T, TR

## Specification

| | |
|---|---|
| Various connection methods : Electronic contactors applied | Pin, Screw, Tunnel type : MC-32a, 40a |
| Auxiliary contact | 2SPST (1a1b at energization) |
| Current setting range | 4~20/8~40A |
| Operating time characteristics | Inverse time, Definite time (2PD) |
| Number of built-in CT (deflector) | 2 (R, T phase) or 3 |
| Operating power | AC 100~260V |
| Return (reset) method/time | Manual/Electrical return (Standard)<br>Manual/Auto/Electrical return (2PA) |
| Using Inverter Secondary | Available (Exclude GMP40-3PR, 3TR, 3SR) |



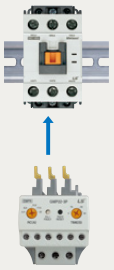
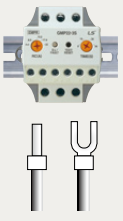
Inverse time

*GMP40-2PA automatically returns within 60 seconds in case of overcurrent.

| Type (GMP22-□) | | 2P, 2PD, 2PA, 2T, 2S | 3P, 3T, 3S | 3PR, 3TR, 3SR |
|---|---|---|---|---|
| Protection | Overcurrent | ✓ | ✓ | ✓ |
| | Lock/Stall | ✓ | ✓ | ✓ |
| | Phase failure | ✓ note) | ✓ | ✓ |
| | Phase unbalance | - | ✓ | ✓ |
| | Reverse phase | - | - | ✓ |
| Certification | UL, CE | ✓ (Exclude PD, PA) | ✓ | ✓ |

Note) The product detects phase failure of the phase (R, T) connected with two CTs in order for protection.

## Order type

| Mounting type | Model/CT | Current setting range | Order type |
|---|---|---|---|
| Direct mount onto a Metasol MC<br> Electronic contactor MC-32a, 40a | GMP40-2P - 2CT type | 4 - 20A | GMP40-2P 20A Sol |
| | | 8 - 40A | GMP40-2P 40A Sol |
| | GMP40-2PA - 2CT type - Automatic return | 4-20A | GMP40-2PA 20A Sol |
| | | 8-40A | GMP40-2PA 40A Sol |
| | GMP40-2PD - 2CT type - Defined Time characteristics | 4-20A | GMP40-2PD 20A Sol |
| | | 8-40A | GMP40-2PD 40A Sol |
| | GMP40-3P - 3CT type | 4 - 20A | GMP40-3P 20A Sol |
| | | 8 - 40A | GMP40-3P 40A Sol |
| | GMP40-3PR - 3CT type - Reverse phase protection | 4 - 20A | GMP40-3PR 20A Sol |
| | | 8 - 40A | GMP40-3PR 40A Sol |
| Screw type<br> Install Screw/Rail | GMP40-2S - 2CT type | 4 - 20A | GMP40-2S 20A |
| | | 8 - 40A | GMP40-2S 40A |
| | GMP40-3S - 3CT type | 4 - 20A | GMP40-3S 20A |
| | | 8 - 40A | GMP40-3S 40A |
| | GMP40-3SR - 3CT type - Reverse phase protection | 4 - 20A | GMP40-3SR 20A |
| | | 8 - 40A | GMP40-3SR 40A |
| Tunnel type<br> Install Screw/Rail | GMP40-2T - 2CT type | 4 - 20A | GMP40-2T 20A |
| | | 8 - 40A | GMP40-2T 40A |
| | GMP40-3T - 3CT type | 4 - 20A | GMP40-3T 20A |
| | | 8 - 40A | GMP40-3T 40A |
| | GMP40-3TR - 3CT type - Reverse phase protection | 4 - 20A | GMP40-3TR 20A |
| | | 8 - 40A | GMP40-3TR 40A |

# Rated specifications & order type

## GMP22/40-□

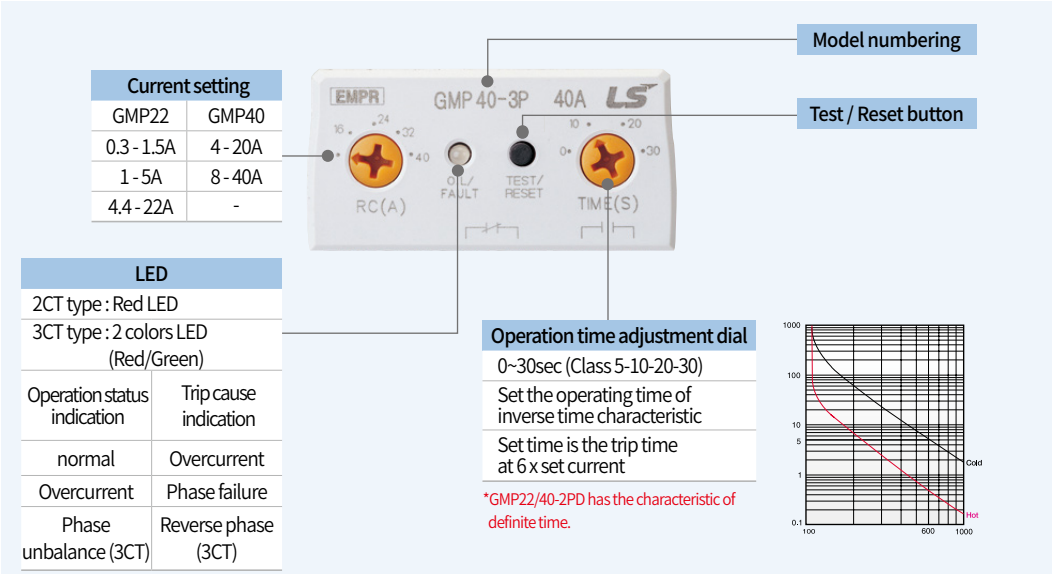


GMP22

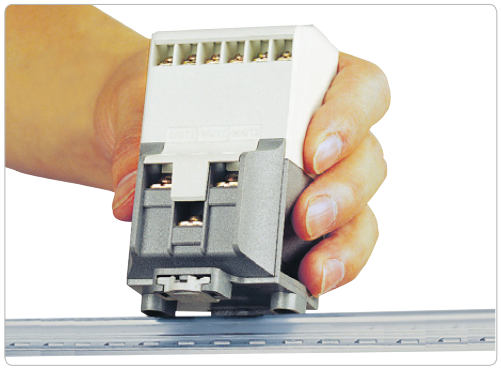


GMP40

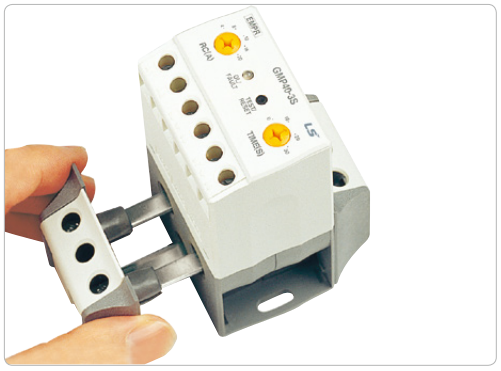
### Front face configuration




### Sharing of installation and contact



Screw installation ↔ Rail installation sharing
Terminal connection type and penetration type have the common use structure of DIN rail and screw installation.



Terminal connection type ↔ penetration type sharing
If the terminal block of terminal connection type is removed, it is possible to make a penetration type

### Technical information

| | |
|---|---|
| Tolerance | Current : ±5%<br>Time : ±5% (or ±0.5sec) |
| Frequency | 50/60Hz |
| Aux. contact Ratings | 5A/250VAC Resistive load |
| Insulation resistance | Minimum 100MΩ/500VDC |
| Lightning impulse voltage | 1.2×50μs 5kV With standard waveform (IEC60255-22-5) |
| Fast Transient Burst | 2kV/1min (IEC61000-4-4) |
| Environment | Operation : -25~70°C<br>Storage : -30~80°C<br>Relative humidity : within 80% RH, no condensation |
| Trip indicator | 2CT : Red LED, 3CT : Red/Green 2 colors LED |
| Application specification | IEC60947-1 |

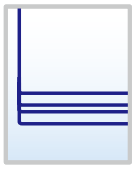
# GMP60T



GMP60T

## Specification (Tunnel type /Economic type EMPR)

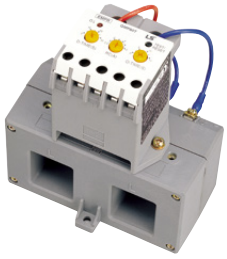
| | |
|---|---|
| Connection methods | Tunnel type |
| Auxiliary contact | 1SPDT 1c (N type) note 1) |
| Current setting range | 0.5~6/3~30/5~60A |
| Operating time characteristics | Definite time |
| Number of built-in CT (deflector) | 2 (R, T type) |
| Operating power | AC24V/48V/110V/220V/380V(440)<br>AC180~480V<br>AC110V/220V (GMP60TA) |
| Return (reset) method/time | Manual/Electrical return (Standard)<br>Manual/Auto/Electrical return (60TA) |
| Using Inverter Secondary | Available |



Definite time

| Type (GMP22-□) | | GMP60T | GMP60TE | GMP60TA |
|---|---|---|---|---|
| Protection | Overcurrent | ✓ | ✓ | ✓ |
| | Lock/Stall | ✓ | ✓ | ✓ |
| | Phase failure | ✓ note 2) | ✓ note 2) | ✓ note 2) |
| Operation time setting | | 0~30sec | 5sec (Fixed) | 5sec (Fixed) |
| Auto-return setting | | - | - | 0~120sec |
| Certification | UL, CE | ✓ | ✓ | - |

Note) 1. 1c contacts have two types of products: N-type (Fail Safe/Normal Energyed) and R-type(Non Fail Safe / Normal De-Energyed). In terms of product reliability, N-type (Fail Safe) product is recommended to be used
2. The product detects phase failure of the phase (R, T) connected with two CTs in order for protection.



If external CT (current transformer) is used, the product is applicable to a large current of 60A or more.

## Order type

| Mounting type | Model/CT | Operating characteristics | Current setting range | Order type |
|---|---|---|---|---|
| Pin type | GMP60T<br>- 2CT type | Defined Time characteristics<br>D-Time : 0~30sec<br>O-Time : 0~15sec | 0.5 - 6A | GMP60T 6A |
| | | | 3 - 30A | GMP60T 30A |
| | | | 5 - 60A | GMP60T 60A |
| | GMP60TE<br>- 2CT type<br>- Economic type | Defined Time characteristics<br>D-Time : 0~30sec<br>O-Time : 5sec (Fixed) | 0.5 - 6A | GMP60TE 6A |
| | | | 3 - 30A | GMP60TE 30A |
| | | | 5 - 60A | GMP60TE 60A |
| | GMP60TA<br>- 2CT type<br>- Auto-return | Defined Time characteristics<br>D-Time : 0~30sec<br>O-Time : 5sec (Fixed)<br>A-Time : 0~120sec | 0.5 - 6A | GMP60TA 6A |
| | | | 3 - 30A | GMP60TA 30A |
| | | | 5 - 60A | GMP60TA 60A |

*Auto Reset: applicable only at Overcurrent Trip

## Technical information

| | |
|---|---|
| Install | Screw / rail mounting |
| Tolerance | Current : ±5%<br>Time : ±5% (or ±0.5sec) |
| Frequency | 50/60Hz |
| Aux. contact Ratings | 5A/250VAC Resistive load |
| Insulation resistance | Minimum 100MΩ/500VDC |
| Lightning impulse voltage | 1.2×50μs 5kV With standard waveform (IEC60255-22-5) |
| Fast Transient Burst | 2kV/1min (IEC61000-4-4) |
| Environment | Operation : -25~70°C<br>Storage : -30~80°C<br>Relative humidity : within 80% RH, no condensation |
| Trip indicator | Red LED |
| Application specification | IEC60947-1 |

# Rated specifications & order type

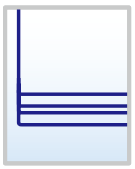
## GMP6-TD, TDa



GMP60-TD
GMP60-TDa

### Specification (Tunnel type/3-phase current indication type EMPR)

| | |
|---|---|
| Connection methods | Tunnel type |
| Auxiliary contact | 2SPST (1a1b at energization) |
| Current setting range | 0.5~60A |
| Current Ratio | 0.25, 0.5, 1~120 (0.125~600A) |
| Operating time characteristics | Definite time |
| Number of built-in CT (deflector) | 2 (R, T type) |
| Operating power | AC 110V/220V (Separate) |
| Return (reset) method/time | Manual (GMP60-TD)<br>Manual/Auto (GMP60-TDa) |
| Using Inverter Secondary | Available |



Definite time

| Type | | GMP60-TD | GMP60-TDa |
|---|---|---|---|
| Protection | Overcurrent | ✓ | ✓ |
| | Lock/Stall | ✓ | ✓ |
| | Phase failure | ✓ note) | ✓ note) |
| | Low current | - | ✓ |
| Auto-return setting | | - | ✓ |
| Operation time setting | | - | ✓ |
| Save the last fault cause | | - | ✓ |

Note) The product detects phase failure of the phase (R, T) connected with two CTs in order for protection.



Current control range by
Rated Current Setting DIP S/W:
0.5A~60A

### Order type

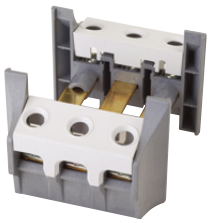
| Mounting type | Model/CT | Operating characteristics | Current setting range | Order type |
|---|---|---|---|---|
| Tunnel type<br>Screw / rail mounting | GMP60-TD<br>- 2CT type | Defined Time characteristics<br>D-Time : 1~60sec<br>O-Time : 0.5~30sec | 0.5 - 60A | GMP60-TD 6/60A |
| | GMP60-TDa<br>- 2CT type<br>- Low Current Protection<br>- Auto-return | Defined Time characteristics<br>D-Time : 1~60sec<br>O-Time : 0.5~30sec<br>A-Time : 1~20min | 0.5 - 60A | GMP60-TDa 6/60A |

### Technical information

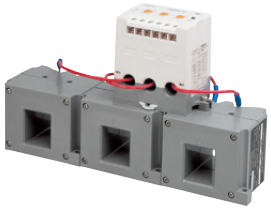
| | |
|---|---|
| Install | Screw / rail mounting |
| Tolerance | Current : ±5%<br>Time : ±5% (or ±0.5sec) |
| Frequency | 50/60Hz |
| Aux. contact Ratings | 5A/250VAC Resistive load |
| Insulation resistance | Minimum 100MΩ/500VDC |
| Lightning impulse voltage | 1.2×50μs 5kV With standard waveform |
| Fast Transient Burst | 2kV/1min |
| Environment | Operation : -25~70°C<br>Storage : -30~80°C<br>Relative humidity : within 80% RH, no condensation |
| Trip indicator | 7-Segment, 3-phase current value, trip cause |
| Application specification | IEC60947-1 |



GMP60-3T
GMP60-3TR



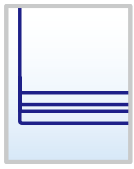
Terminal Block



If external CT (current transformer) is used, the product is applicable to a large current of 60A or more.

## Specification (Tunnel type / Screw type EMPR)

| | |
|---|---|
| Connection methods | Tunnel type / Screw type |
| Auxiliary contact | 2SPST (1a1b at energization) |
| Current setting range | 0.5~60A |
| Operating time characteristics | Definite time |
| Number of built-in CT (deflector) | 3 |
| Operating power | AC 100~260V |
| Return (reset) method/time | Manual/Electrical return |
| Using Inverter Secondary | Available (Exclude GMP60-3TR) |



Definite time

| Type | | GMP60-3T, 3S | GMP60-3TR, 3SR |
|---|---|---|---|
| Protection | Overcurrent | ✓ | ✓ |
| | Lock/Stall | ✓ | ✓ |
| | Phase failure | ✓ | ✓ |
| | Phase unbalance | ✓ | ✓ |
| | Reverse phase | - | ✓ |
| Save the last fault cause | | ✓ | ✓ |

* To use a terminal connection type (Screw Type), please purchase a terminal block separately.

## Order type

| Mounting type | Model/CT | Operating characteristics | Current setting range | Order type |
|---|---|---|---|---|
| Tunnel type<br>Screw / rail mounting | GMP60-3T<br>- 3CT type | Defined Time characteristics<br>D-Time : 0.2~60sec<br>O-Time : 0.2~15sec | 0.5~60A | GMP60-3T 6/60A |
| | GMP60-TR<br>- 3CT type<br>- Reverse phase protection | Defined Time characteristics<br>D-Time : 0.2~60sec<br>O-Time : 0.2~15sec | 0.5~60A | GMP60-3TR 6/60A |
| Screw type<br>Screw / rail mounting | GMP60-3S<br>- 3CT type | Defined Time characteristics<br>D-Time : 0.2~60sec<br>O-Time : 0.2~15sec | 0.5~60A | Please order a penetration type and a terminal block separately and assemble them before use. |
| | GMP60-3SR<br>- 3CT type<br>- Reverse phase protection | Defined Time characteristics<br>D-Time : 0.2~60sec<br>O-Time : 0.2~15sec | 0.5~60A | |

## Technical information

| | |
|---|---|
| Install | Screw / rail mounting |
| Tolerance | Current : ±5%<br>Time : ±5% (or ±0.5sec) |
| Frequency | 50/60Hz |
| Aux. contact Ratings | 5A/250VAC Resistive load |
| Insulation resistance | Minimum 100MΩ/500VDC |
| Lightning impulse voltage | 1.2×50μs 5kV With standard waveform (IEC60255-22-5) |
| Fast Transient Burst | 2kV/1min (IEC61000-4-4) |
| Environment | Operation : -25~70°C<br>Storage : -30~80°C<br>Relative humidity : within 80% RH, no condensation |
| Trip indicator | Red / Green 2 colors LED, Red LED |
| Application specification | IEC60947-1 |

# Rated specifications & order type

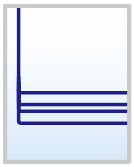
## GMP60-3TZ/3TZR, 3TN/3TNR, 3SZ/3SZR, 3SN/3SNR



GMP60-3TZ, 3TZR
GMP60-3TN, 3TNR

### Specification (Ground fault protection EMPR)

| | |
|---|---|
| Connection methods | Tunnel type / Screw type |
| Auxiliary contact | 2SPST (1a1b at energization) |
| Current setting range | 0.5~60A |
| Operating time characteristics | Definite time |
| Number of built-in CT (deflector) | 3 |
| Operating power | AC 100~260V |
| Return (reset) method/time | Manual/Electrical return |
| Definite time characteristics | D-Time : 0.2~60sec<br>O-Time : 3sec |
| Using Inverter Secondary | Available (Exclude GMP60-3TZR, 3TNR) note) |



Definite time

Note) If inverter load has an error, turn OFF ground fault function.

| Type | | GMP60-3TZ, 3TN | GMP60-3TZR, 3TNR |
|---|---|---|---|
| Protection | Overcurrent | ✓ | ✓ |
| | Lock/Stall | ✓ | ✓ |
| | Phase failure | ✓ | ✓ |
| | Phase unbalance | ✓ | ✓ |
| | Ground Fault | ✓ | ✓ |
| | Reverse phase | - | ✓ |
| Save the last fault cause | | ✓ | ✓ |

### Order type

| Mounting type | Model/CT | Operating characteristics | Current setting range | Order type |
|---|---|---|---|---|
| Tunnel type<br>Screw / rail mounting | Zero phase current detection (0.1~2.5A) (Separate ZCT required) | GMP60-3TZ | 0.5 - 60A | GMP60-3TZ 6/60A |
| | | GMP60-3TZR - Reverse phase protection | 0.5 - 60A | GMP60-3TZR 6/60A |
| | Residual current detection (0.5~6A) | GMP60-3TN | 0.5 - 60A | GMP60-3TN 6/60A |
| | | GMP60-3TNR - Reverse phase protection | 0.5 - 60A | GMP60-3TNR 6/60A |
| Tunnel type<br>Screw / rail mounting | Zero phase current detection(0.1~2.5A) (Separate ZCT required) | GMP60-3SZ | 0.5 - 60A | GMP60-3SZ 6/60A |
| | | GMP60-3SZR - Reverse phase protection | 0.5 - 60A | GMP60-3SZR 6/60A |
| | Residual current detection(0.5~6A) | GMP60-3SN | 0.5 - 60A | GMP60-3SN 6/60A |
| | | GMP60-3SNR - Reverse phase protection | 0.5 - 60A | GMP60-3SNR 6/60A |

Note) 1. In case of terminal connection type, please order a penetration type and a terminal block separately and assemble them before use.
2. In case of ZCT, use ZCT (100mA/40~55mV) for EMPR only.

### Technical information

| | |
|---|---|
| Install | Screw / rail mounting |
| Tolerance | Current : ±5%<br>Time : ±5% (or ±0.5sec) |
| Frequency | 50/60Hz |
| Aux. contact Ratings | 5A/250VAC Resistive load |
| Insulation resistance | Minimum 100MΩ/500VDC |
| Lightning impulse voltage | 1.2×50μs 5kV With standard waveform (IEC60255-22-5) |
| Fast Transient Burst | 2kV/1min (IEC61000-4-4) |
| Environment | Operation : -25~70°C<br>Storage : -30~80°C<br>Relative humidity : within 80% RH, no condensation |
| Trip indicator | Red / Green 2 colors LED, Red LED |
| Application specification | IEC 61000, IEC60947-1 |

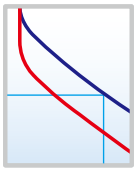
# GMP80



GMP80

## Specification

| | |
|---|---|
| Connection methods | Screw type (No direct connection with Metasol MC) |
| Auxiliary contact | 2SPST (1a1b at energization) |
| Current setting range | 16~80A |
| Operating time characteristics | Inverse-time |
| Number of built-in CT (deflector) | 2 (R, T type) or 3 |
| Operating power | AC 100~260V |
| Return (reset) method/time | Manual/Electrical return (Standard)<br>Manual/Auto/Electrical return (GMP80-2SA) |
| Using Inverter Secondary | Available (Exclude GMP80-3SR) |



Inverse-time

| Model numbering | | GMP80-2S | GMP80-2SA | GMP80-3S | GMP80-3SR |
|---|---|---|---|---|---|
| Functions | Overcurrent | ✓ | ✓ | ✓ | ✓ |
| | Locked rotor | ✓ | ✓ | ✓ | ✓ |
| | Phase loss | ✓ note) | ✓ note) | ✓ | ✓ |
| | Phase unbalance | - | - | ✓ | ✓ |
| | Reverse phase | - | - | - | ✓ |
| Certification | UL, CE | ✓ | - | ✓ | ✓ |

Note) The product detects phase failure of the phase (R, T) connected with two CTs in order for protection.



## Order type

| Mount/Connection | Model numbering system / CT | Setting range | Catalog No. |
|---|---|---|---|
| Screw type<br>Screw / rail mounting | GMP80-2S<br>- 2CT | 16 - 80A | GMP80-2S 80A |
| | GMP80-2SA<br>- 2CT<br>- Automatic return | 16 - 80A | GMP80-2SA 80A |
| | GMP80-3S<br>- 3CT | 16 - 80A | GMP80-3S 80A |
| | GMP80-3SR<br>- 3CT<br>- Reverse phase protection | 16 - 80A | GMP80-3SR 80A |

## Rated specifications

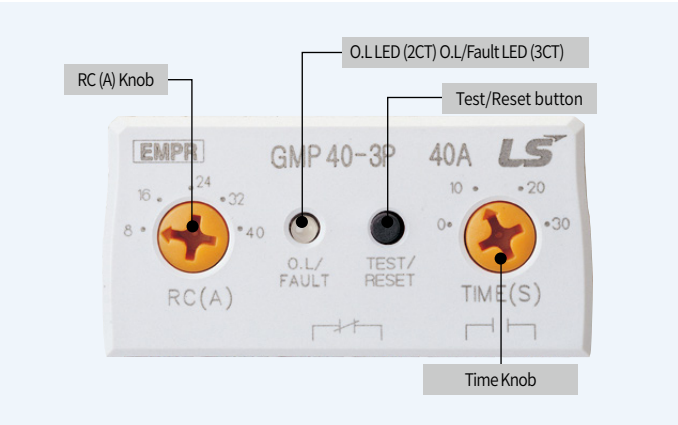
| | |
|---|---|
| Tolerance | Current : ±5%<br>Time : ±5% (or ±0.5sec) |
| Frequency | 50/60Hz |
| Aux. contact Ratings | 5A/250VAC Resistive load |
| Insulation resistance | Min 100MΩ at 500V DC |
| Lightning impulse voltage | 1.2×50μs 5kV With standard waveform (IEC60255-22-5) |
| Fast Transient Burst | 2kV/1min (IEC61000-4-4) |
| Environment | Operation : -25~70°C<br>Storage : -30~80°C<br>Relative humidity : within 80% RH, no condensation |
| Trip indicator | Red LED (2CT : 1, 3CT : 2) |
| Application specification | UL508, IEC60947-1 |

# Operation & setting method

## Inverse time characteristic

### 1. Check the rated voltage and apply the control power to A1 and A2 terminal

If 220V power is supplied to a model for AC110V, overvoltage occurs and thereby EMPR has a failure.




### 2. With Test/Reset button, check that output contact works normally.

1) If Test/Reset button is clicked once, O.L (display lamp) representing Trip is turned on. If EMPR is Tripped, output contact works.
2) If Test/Reset button is clicked again at the time of EMPR Trip, the display lamp is turned off and the equipment resets to its original state.
3) Auto reset function (Auto Reset)
• In case of overcurrent Trip, the equipment automatically returns after one minute (GMP22-2PA/GMP40-2PA),
• In case of overcurrent Trip, the equipment automatically returns after 0~120 seconds (variable setting) (GMP60T-A).

Note) To prevent a Trip accident, Test/Reset button is designed not to work while a motor is running.

### 3. Set the operating time

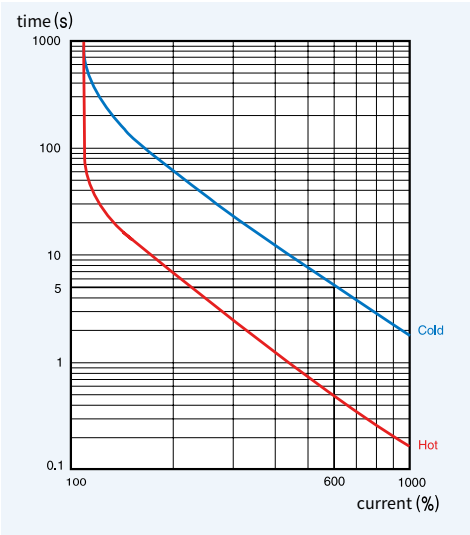
An operating time is based on 600% of rated current in the characteristic curve.

1) Set up the position of operating time control knob (Time Knob) in consideration of a staring time and starting current.
(E.g., on the assumption that a starting current accounts for 600%of normal operating current and a staring time is 10 seconds, set Time Knob to about 11~12 seconds with 10-20% margin.)
2) An available operating time ranges from 0 to 30 seconds.
3) In case that Time Knob is set to 10 seconds, if the starting current or 600% of rated current is supplied for 10 seconds, immediate Trip occurs.

Note) For a motor with frequent forward/reverse starting, such as a motor of crane or hoist, an EMPR with the characteristic of definite time is recommended

### 4. Set up a rated current.

Setting is based on the rated current of a motor (normal operating current).
1) Check that a motor's rated current is within the current control range of EMPR.
2) Set RC (Rating Current) Knob up to the maximum and run the motor.
3) In normal operation state, slowly turn RC Knob counter clockwise and stop at the point that overcurrent display lamp (O.L) flickers. At this point, the actual load current value (100%) of the motor is displayed.
4) From the point, turn RC Knob clockwise. Set up the knob at this point that O.L lamp is turned off (less than motor full load current).
(e.g., when overcurrent display lamp is turned off at 20A, set current = 20×1.1=22A)



## 5. Check status of operation by LED

2CT : Overcurrent, Phase failure, Lock/Stall
3CT : Overcurrent, Phase failure, Reverse phase, Phase unbalance, Lock/Stall

**1) In case of overcurrent**

- If there will be an overcurrent during motor operation, the red color of LED will flicker at 0.4 second intervals. After tripping because of overcurrent, the red color of LED will light up.

**2) In case of phase failure (2CT EMPR can protect motor from R or T phase failure.)**

- If a motor stops running due to phase failure, stall current flows. As a result, it is possible to protect the motor against overcurrent. If the motor keeps running in phase failure, it is necessary to protect against phase failure.
- If phase failure occurs in three-phase load (3CT), Trip occurs within three seconds. (O.L LED is turned on)
  R-phase phase failure - Fault LED flickers once (0.4 second) at an interval of three seconds.
  S-phase phase failure - Fault LED flickers twice at an interval of three seconds.
  T-phase phase failure - Fault LED flickers three times at an interval of three seconds

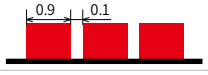
**3) In case of phase unbalance**

- If phase unbalance factor of three phase is about 50% or more after its calculation, Fault LED only flickers at an interval of 0.4 second and then trips after five seconds. (After Trip, the same display as phase failure appears.)

**4) In case of Reverse phase**

- Trip occurs within 1 second, and the lamp flickers red and green in turn (GMP22/40/60-□R type) or O.L LED and Fault LED flicker (GMP80-3SR). In this case, to detect reverse phase, a load current should be more than the minimum current setting range of EMPR.

**5) LED operation status**

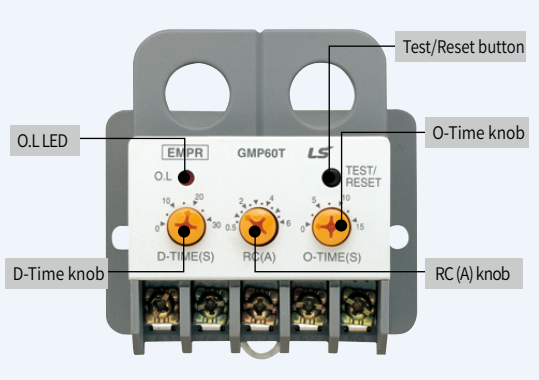
| | Condition | | LED Status | LED Diagram | Remark |
|---|---|---|---|---|---|
| Operating status | Normal | | LED OFF | | |
| | Over current | | 0.4 Second intervals | | |
| | Phase unbalance (50%, 3CT) | | 0.4 Second intervals | | GMP 80-3S/3SR model, only red color LED will flicker. |
| Tripped status | Over current | | O.L LED light up | | |
| | Phase failure (3CT) | R | 1 time for 3 seconds | | GMP 80-3S/3SR model, O.L LED will light up and also FAULT LED will flicker. |
| | | S | 2 time for 3 seconds | | |
| | | T | 3 time for 3 seconds | | |
| | Phase failure (2CT) | | Red LED light up for 0.9 sec<br>LED goes off for 0.1 sec |  | |
| | Reverse phase (3CT) | | Red & Green color LED flicker alternately | | GMP 80-3S/3SR model, Red/Green LED will flicker. |

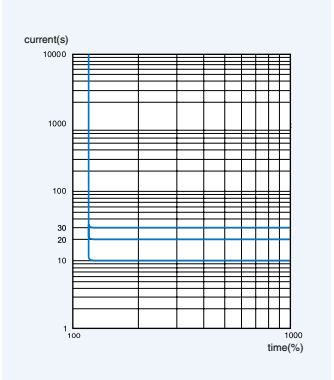
Note) There are two red color LEDs for O.L (Overload) & Fault in the model of GMP80-3S/SR

# Definite time characteristic 1

## 1. Check the rated voltage and apply the control power to A1 and A2 terminal

If 220V power is supplied to a model for AC110V, overvoltage occurs and thereby EMPR has a failure.




## 2. Check the Test/Reset button operation

1) If Test/Reset button is clicked once, O.L (display lamp) is turned on, EMPR is Tripped, and output contact runs.

2) If Test/Reset Button is clicked once again when EMPR is Tripped, the display lamp is turned off and the equipment returns to its original state (Reset).

Note) 1. To prevent a Trip accident, Test/Reset button is designed not to work while a motor is running. 2. If Test/Reset button is clicked twice within 0.5 second, it is possible to check the final failure cause.

## 3. Set the operating time

**D-Time (Delay Time) : 0~30 sec**

It refers to the time of delaying EMPR operation in order to prevent Trip from a motor's staring current.

1) With the use of D-Time Knob, set up a delay time taken from motor starting to normal running current.
2) If you are unaware of a start delay time, set it to the maximum time and measure how long it takes to reach the normal starting current of the motor, and then set it up again. (Reference: in case of general load, set it to about 3~5 seconds.)

Note) If actual load current fails to detect during a set time, a motor can be damaged. Set up a delay time rightly.

**O-Time (Operating Time) : 0~15 sec**

It refers to the time taken from the start of overcurrent to EMPR Trip. After the set O-Time, EMPR is Tripped.

1) With the use of O-Time Knob, set up an operating time.
2) If O-Time is the minimum value, EMPR is immediately tripped as soon as overload occurs. (Reference: generally, set it to 4~6 seconds.)

A-Time (Auto Reset Time): 0~120 seconds; set up an automatic reset time in auto reset type.

## 4. Set the operating current

Setting is based on the rated current of a motor (normal operating current).

1) Check that a motor's rated current is within the current control range of EMPR.
2) Set RC (Rating Current) Knob up to the maximum and run the motor.
3) In normal operation state, slowly turn RC Knob counter clockwise and stop at the point that overcurrent display lamp (O.L) flickers. At this point, the actual load current value (100%) of the motor is displayed.
4) From the point, turn RC Knob clockwise. Set up the knob at this point that O.L lamp is turned off (less than motor full load current).

Generally, set it to 110~120% of actual load current (set to a value lower than a motor full load current).

## 5. Check the LED condition when operation

**1) GMP60T**

| Condition | | Red O.L LED | Remarks |
|---|---|---|---|
| Operation normal | Off | | |
| Overcurrent | Flicker | | Flicker during overcurrent |
| Trip over-current | On | | The EMPR is tripped |

**2) GMP60-3T/3TR**

The same as the LED operation state in operation.

# Definite time characteristic 2 (GMP60-TD, TDa)

## 1. Function & setting menu

1) Set up “Slide S/W, Rated current, and Current transformer ratio” on the basis of a motor’s full load current.
To change Slide S/W, turn OFF control power. In the No. 1 menu (1.Cty), make sure to change to a relevant rated current.

| Full Load Current | Wire penetration | Slide S/W | Rated current (1.Cty) | Current ratio (5.Ctr) |
|---|---|---|---|---|
| 0.6A or less | 4 times | 6A | 6A | 0.25 |
| 0.7~1.5A | Twice | 6A | 6A | 0.5 |
| 1.6~6A | Once | 6A | 6A | 1 |
| 6~60A | Once | 60A | 60A | 10 |
| 60~100A | Once | 6A | 6A | 20 |
| 100A or more | Once | 6A | 6A | CT Ratio (Primary/Secondary) |




2) In the ‘0000’ display state, click Test/Reset button to go to Setting Mode (‘Test’ is displayed on screen).
Click FUN button to search for items and set up various values with the use of SEL button.
3) Push FUN button until ‘Stor’ is displayed, and make sure to save a value with SEL button.
4) If saved completely, ‘0000’ is displayed on screen. If no button operation occurs in ten seconds in the value setting process, the current screen goes to initial screen.
5) If Test/Reset button is clicked in operation, it is possible to check “Set Current/D-T/O-T”.
In case of Trip, it is possible to check failure current/failure cause with the use of SEL button.
Note) While a motor is running, a set value is unable to be changed, but is able to be checked only.

## 2. Setting menu

| FUNC | SEL | Description | Default Value | Remarks |
|---|---|---|---|---|
| 1.Cty | 6A/60A | Current type selection | 6A | Set the same with rated current S/W |
| 2.0-t | 0.5/1~30(SEC) | Trip time setting | 30 | Set 0.5 to 30 sec |
| 3.d-t | 1~60/1(SEC) | Time delay setting | 60 | Set 1~60 sec |
| 4.r-C | 0.5~6.0/5~60 | Rated current setting | 6/60 | - |
| 5.Ctr | 0.25/0.5/1~120 | Current ratio setting | 1 | - |
| 6.P-F | oFF/on | Phase loss enable | Off | Operation in less than 3 sec |
| 7.U-C | oFF/30~70(%) | Undercurrent setting | Off | For TDa model only (Overcurrent operation) |
| 8.A-r | oFF/1~20(MIN) | Automatic reset setting | Off | For TDa model only (Off, 1~20min) |
| 9.Srt | oFF/10~8760 | Operation hour setting | Off | For TDa model only |
| A.trt | - | Total running hour check | - | For TDa model only (Up to 10 years, 1 hour unit) |
| b.r-t | - | Running hour check | - | For TDa model only (Up to 10 years, 1 hour unit) |
| Sto | - | Store | | - |

Note) 1. Check final failure cause: push FUN+SEL (combination buttons) (if there is no failure cause, 'non' is displayed.)
2. Operating time setting: 'OrH' is displayed after a set operating time(Of, f10~8760 hours setting allowed)

## 3. Fault status configuration

| Protection | FND | Description | Remarks |
|---|---|---|---|
| Over current | O-L | More than set current : Within the set time | |
| Undercurrent | U-C | Lower than the undercurrent set ratio : Within 3S | For TDa model only |
| Phase Loss | PF-r | Over 70% of the rate of unbalance : Within 3S | R Phase Loss |
| | PF-t | Over 70% of the rate of unbalance : Within 3S | T Phase Loss |
| LOCK | Loc | More than lock set current ratio : Within 1S | |
| Approaching Running Time | OrH | When Running time approaches at setting time | For TDa model only |

Note) 1. If the set operating time in ‘9.Srt’ passes, ‘OrH’ is displayed and EMPR has no output.)
2. How to check ‘trt’ and ‘r-t’

| FUNC | Description | | | | | |
|---|---|---|---|---|---|---|
| trt | Press the SEL button | Daily Display | Press the SEL button | | Time Remaining, Display minutes | |
| r-t | Press the SEL button | Operation time indicator | Press the SEL button | Daily Display | Press the SEL button | Time Remaining, Display minutes |

In case of ‘trt’, if power is Off, the minute unit based time is removed.
If ‘r-t’ is checked, an operating time represents a total running time taken until a motor is turned Off. It is displayed in the units of day, hour, and minute.

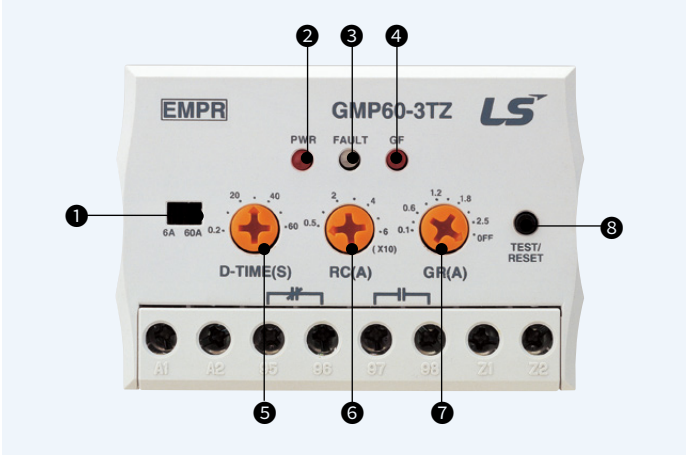
# Definite time characteristic 3 (GMP60-3TZ, TZR / 3TN, TNR)

## 1. This product has the characteristic of definite time.

For setting, see pages 21 & 22.

## 2. Protective function: overcurrent, locked rotor, phase loss, phase unbalance, ground fault (and phase reverse)

1) Overcurrent : trip within 3 sec. after D-time at 105% or more
2) Locked rotor : trip within 1 sec. after D-time at 300% or more
3) Phase loss : trip within 3 sec. (phases unbalance rate over 70%)
4) Phase unbalance : trip within 5 sec. (phases unbalance rate over 50%)
5) Ground fault : trip within 0.5 sec. after D-time at over 110% or under 90% of set value
6) Reverse phase: if two out of R, S, and T phases are changed with each other and a current flows.
   Run in 1 second (no detection after TDim- e)




Note) 1. Make power off before changing the rated current with S/W ①
2. The setting range of RC (A) KNOB ⑥ is recognized as 0.5 ~ 6A or 5 ~ 60 According to the setting value of S/W ①. The value of the scale for RC (A) KNOB ⑥ is 0.5, 1, 2, 3, 4, 5, 6 or 5, 10, 20, 30, 40, 50, 60(A) from the left.
3. Last fault cause function indicates the LED status for the last TRIP.

## 3. Overcurrent trip time

1) Time delay(D-time) setting: between 0.2-60 sec.
2) Trip time(O-time) setting: fixed at 3 sec.

## 4. Other functions

1) Last fault cause data stored
   • to display it press Test/Reset button 2 times within 0.5 sec.
   • PWR LED flicking in case of no fault

Note) In case of load less than minimum rating of EMPR make the number of penetrating through CT more than 2 times. If not, error may happen to phase loss .

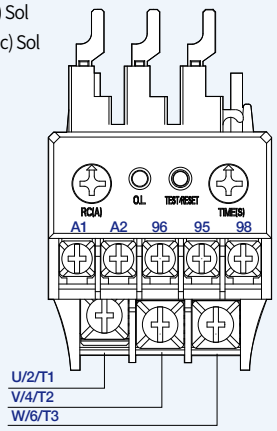
## 5. Status of LED configuration

| NO | Function | Setting | Description | Remark |
|---|---|---|---|---|
| ❶ | 6A/60A | Slide switch | Maximum rated current (6A/60A) setting | - |
| ❷ | PWR. | Red LED | Lights up when power is ON<br>Blinking in the failure mode | - |
| ❸ | Fault | Red / Green LED | Overcurrent / unbalance in progress :<br>Overcurrent TRIP :<br>Phase loss (unbalance) TRIP<br>·R-phase :<br>·S-phase :<br>·T-phase :<br>·Reverse phase : | Red LED<br>Green LED |
| ❹ | GF | Red LED | Lights up after blinking in the event of ground fault | - |
| ❺ | D-Time (S) | KNOB | Delay time (0.2 to 60 sec.) | - |
| ❻ | RC (A) | KNOB | Rated current setting: 0.5~6A/5~60A | |
| ❼ | GR (A) | KNOB | Zero phase current detection type<br>Sensitivity current setting (0.1~2.5A)<br>Residual current detection type<br>Sensitivity current setting (0.5~6A) | - |
| ❽ | Test/Reset | Button | TRIP / RESET alternately perform<br>1. Check relay contacts - displays fault cause<br>2. RESET | Pressing 2 times within 0.5 sec.<br>the final failure cause is displayed |

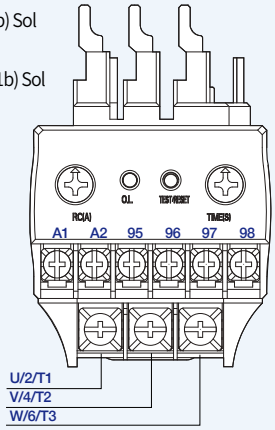
# Terminal configuration / Wiring & cable connection

## Terminal configuration

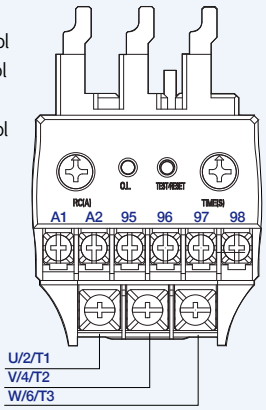
GMP22-2P (1c) Sol
GMP22-2PD (1c) Sol



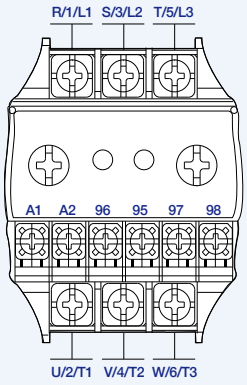

GMP22-2P (1a1b) Sol
GMP22-3P Sol
GMP22-2PA (1a1b) Sol
GMP22-3PR Sol



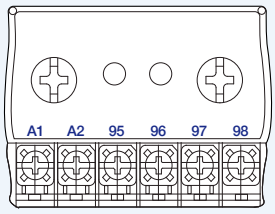

GMP40-2P Sol
GMP40-2PD Sol
GMP40-2PA Sol
GMP40-3P Sol
GMP40-3PR Sol



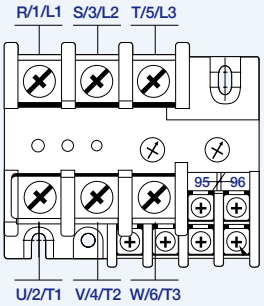

GMP22-2S
GMP22-3S
GMP22-3SR
GMP40-2S
GMP40-3S
GMP40-3SR



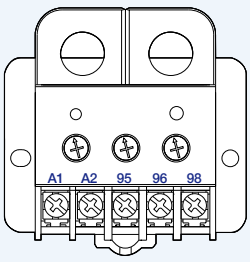

GMP22-2T
GMP22-3T
GMP22-3TR
GMP40-2T
GMP40-3T
GMP40-3TR



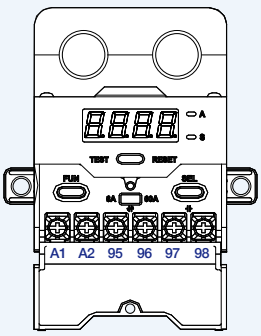

GMP80-2S
GMP80-3S
GMP80-3SR



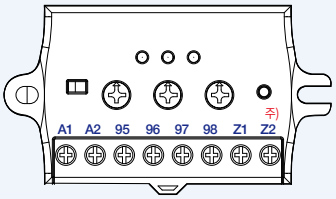

GMP60T
GMP60TE
GMP60TA




GMP60-TD
GMP60-TDa




GMP60-3TZ, TZR
GMP60-3TN, TNR
GMP60-3T, TR

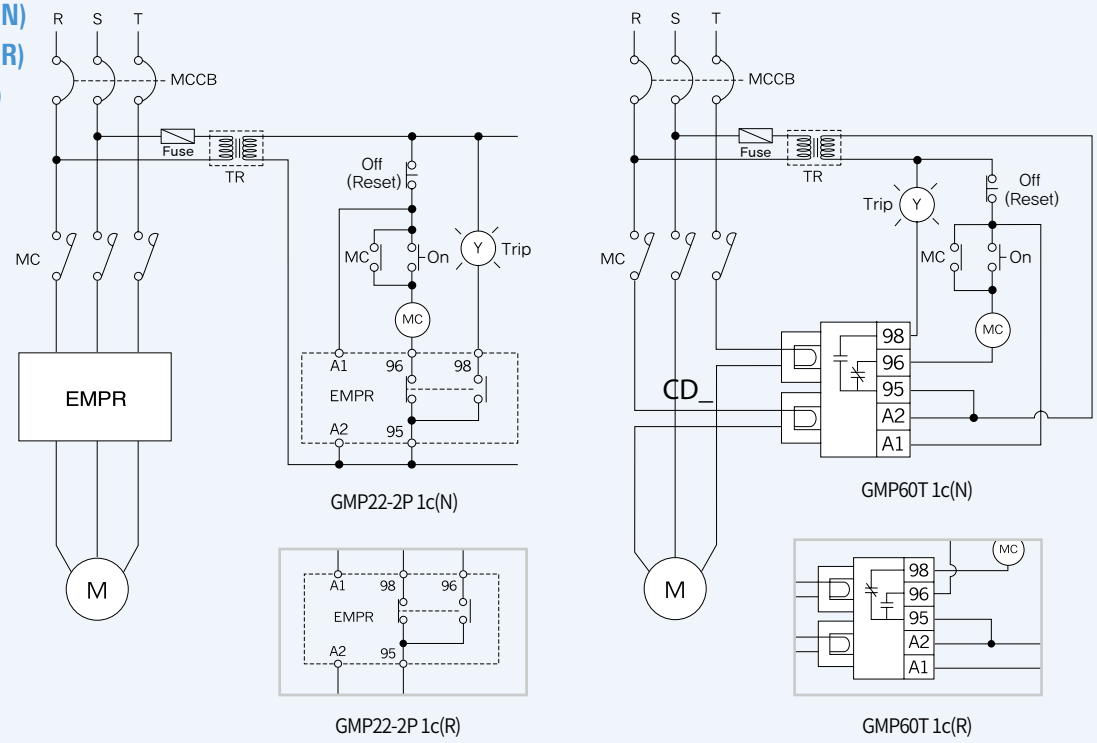



| Engrave | Description |
|---|---|
| A1, A2 | Input terminal for operation power |
| 95, 96, 98 | Output terminals at power-on |
| 95-96 | When the power is ON (NC contact output) |
| 97-98 | When the power is ON (NC contact output) |
| Z1, Z2 | ZCT output connection |
| U/2/T1, V/4/T2, W/6/T3 | Power side connection |
| R/1/L1, S/3/L2, T/5/L3 | Load side connection |

Note) 1. GMP60-3TN/3TNR and GMP60-3T/3TR models are not wired to Z1 and Z2 terminals.
2. In case of 1c(N), only if control power (A1, A2) is On, output contact occurs (if power Off or Trip, 95-96 : Open, 95-98 : Close)
3. In case of 1c(R), output contact occurs regardless of control power (A1, A2). (Contact chattering can occur in a very vibrating place.)

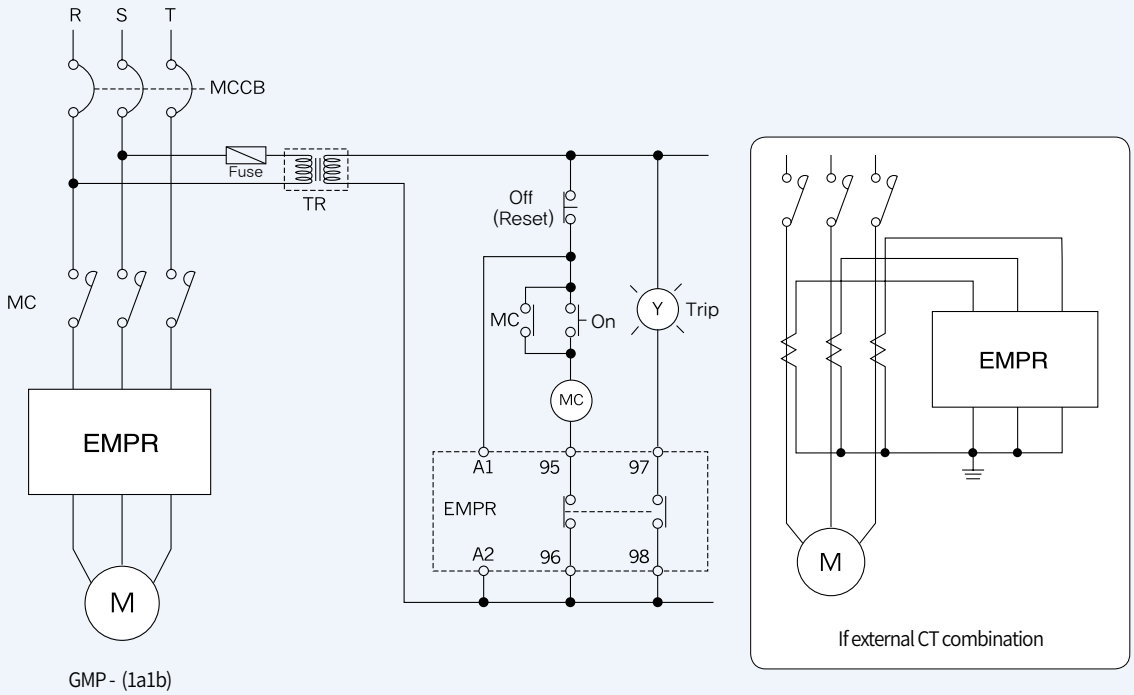
# Terminal configuration / Wiring & cable connection

## GMP22-2P 1c(N)
## GMP22-2P 1c(R)
## GMP60T 1c(N)
## GMP60T 1c(R)



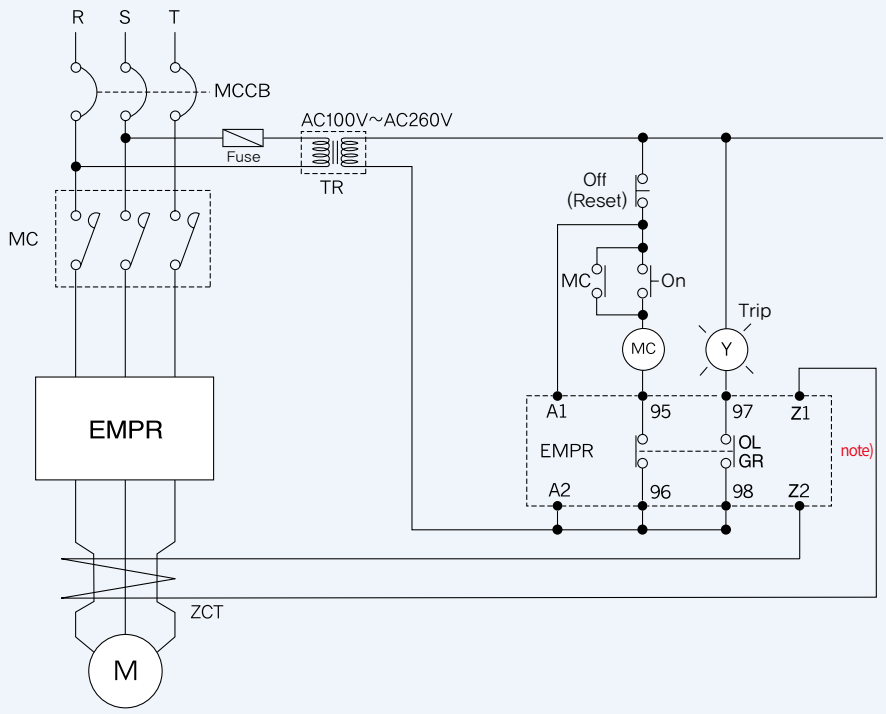

Note) 1. In case of 1c(N), only if control power (A1, A2) is On, output contact occurs (if power Off or Trip, 95-96 : Open, 95-98 : Close)
2. In case of 1c(R), output contact occurs regardless of control power (A1, A2). (Contact chattering can occur in a very vibrating place.)

## GMP-(1a1b)

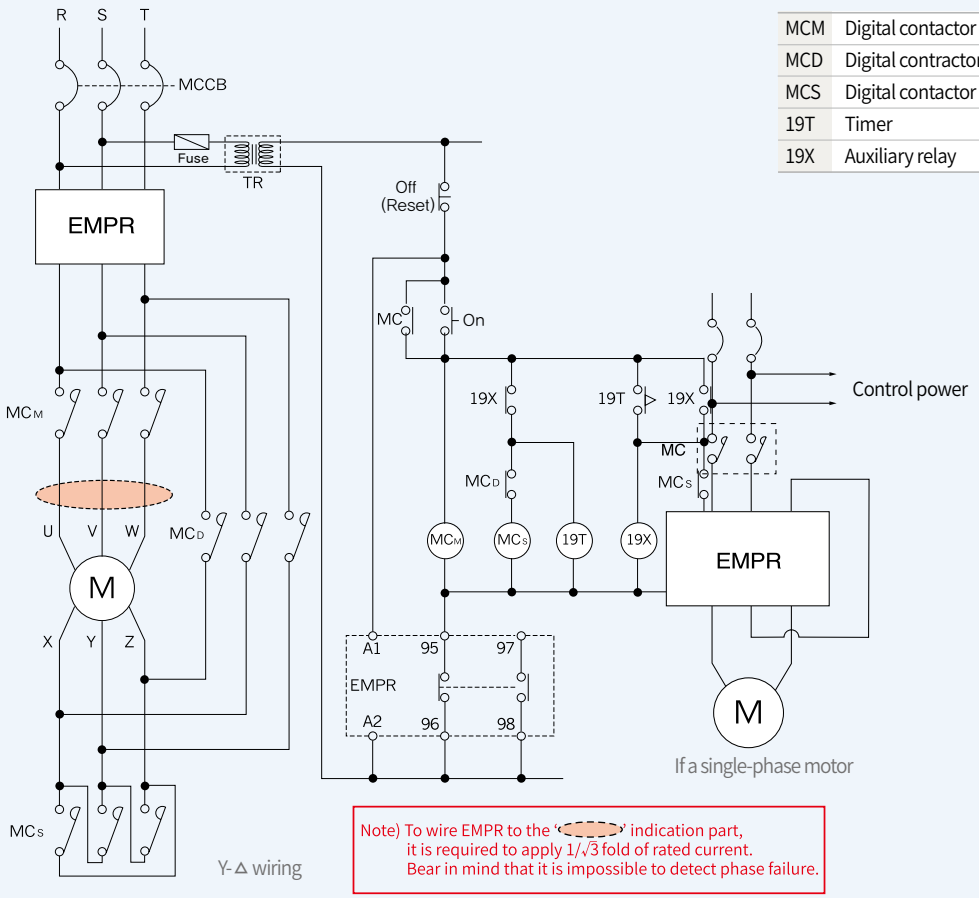



Note) 1. To use a single-phase motor, connect it with R & T phases of EMPR. 3CT Type is not allowed in a single-phase motor.
2. Output contact occurs only if control power (A1, A2) is On. (1a1b)

## GMP60-3TZ, TZR
## GMP60-3TN, TNR
## GMP60-3T, 3TR




Note) 1. In case of GMP60-3TZ/3TZR model, wire ZCT to Z1 and Z2 terminals.
2. In case of GMP60-3TN/3TNR and GMP60-3T/3TR models, do not wire ZCT to Z1 and Z2 terminals. (no need of ZCT)
3. Output contact occurs only if control power (A1, A2) is On. (1a1b)




| | |
|---|---|
| MCM | Digital contactor for power |
| MCD | Digital contractor for operating |
| MCS | Digital contactor for starting |
| 19T | Timer |
| 19X | Auxiliary relay |

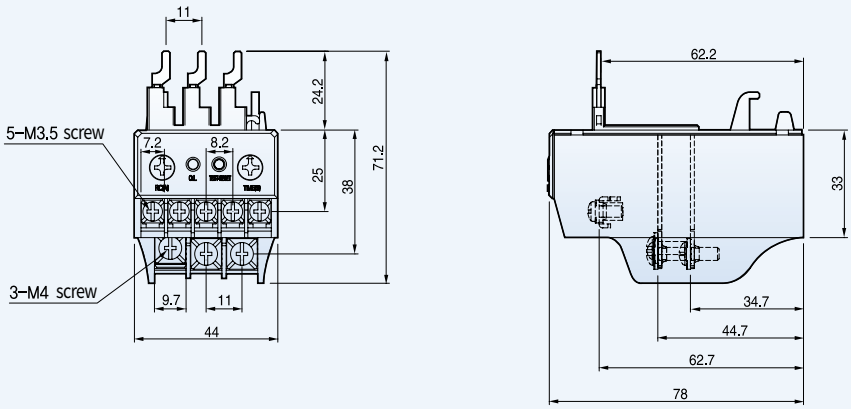
Note) 1. A reverse phase protection model (-R Type) is not applicable to a single-phase motor.
2. GMP60-3TN is unable to provide ground fault protection for a single-phase motor. (GMP60-3TZ applied)
3. Output contact occurs only if control power (A1, A2) is On. (1a1b)

# Dimensions

Unit : mm

GMP22-2P (1c) Sol
GMP22-2PD (1c) Sol

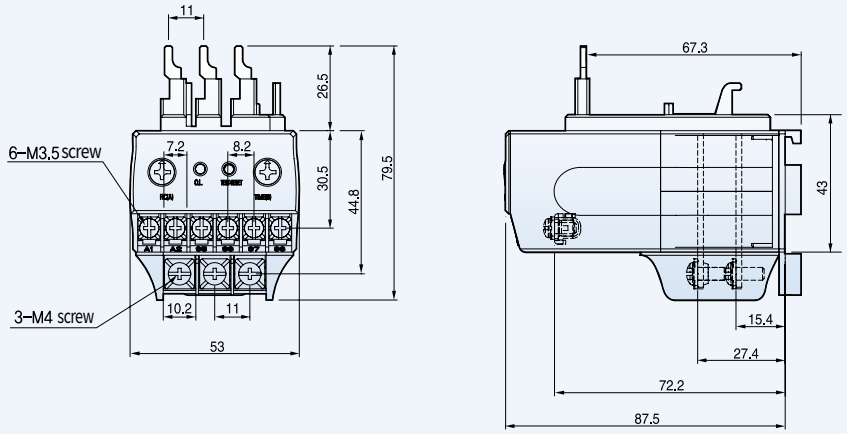
0.15kg




Unit : mm

GMP22-2P (1a1b) Sol
GMP22-3P Sol
GMP22-2PA (1a1b) Sol
GMP22-3PR Sol

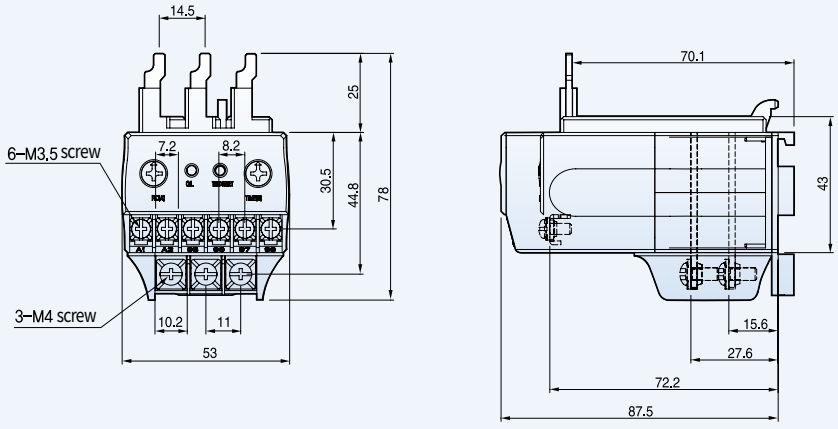
0.18kg




Unit : mm

GMP40-2P Sol
GMP40-2PD Sol
GMP40-2PA Sol
GMP40-3P Sol
GMP40-3PR Sol

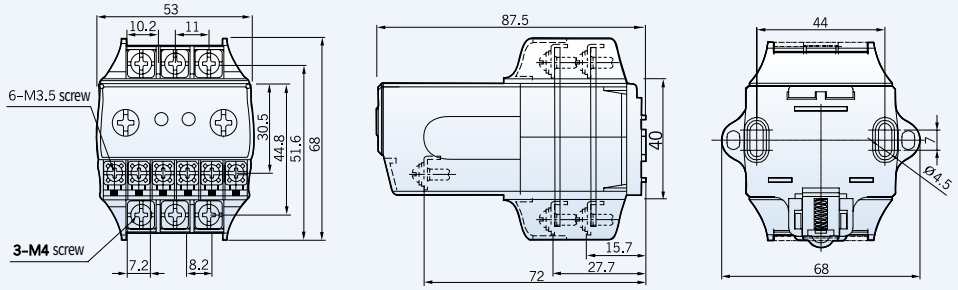
0.20kg/0.22kg



Unit : mm

GMP22-2S
GMP22-3S
GMP22-3SR
GMP40-2S
GMP40-3S
GMP40-3SR

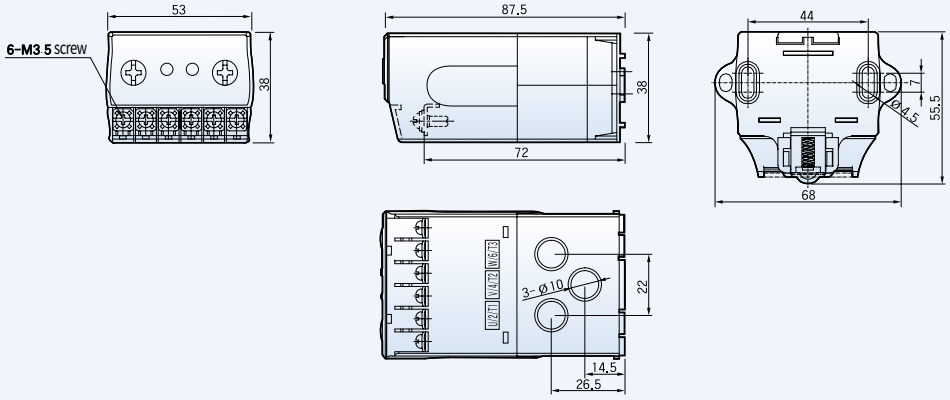
0.19kg/0.21kg




Unit : mm

GMP22-2T
GMP22-3T
GMP22-3TR
GMP40-2T
GMP40-3T
GMP40-3TR

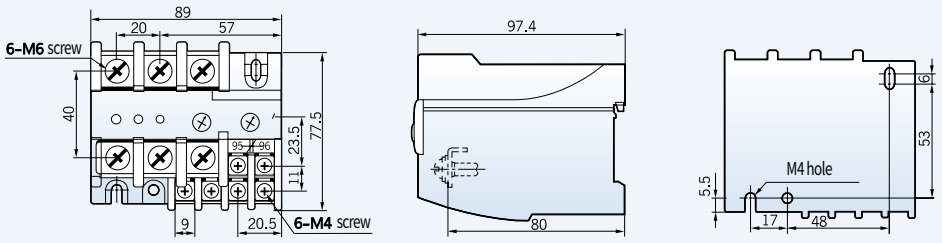
0.14kg/0.16kg




Unit : mm

GMP80-2S
GMP80-3S
GMP80-3SR

0.42kg/0.46kg

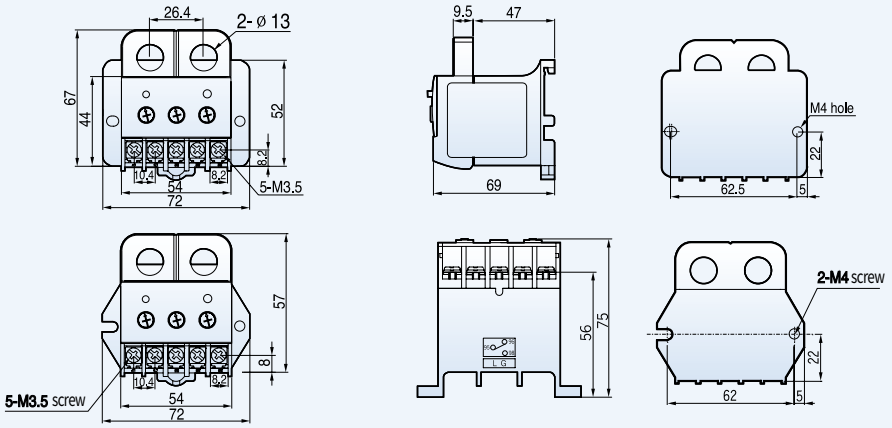


# Dimensions

Unit : mm

GMP60T
GMP60TE
GMP60TA

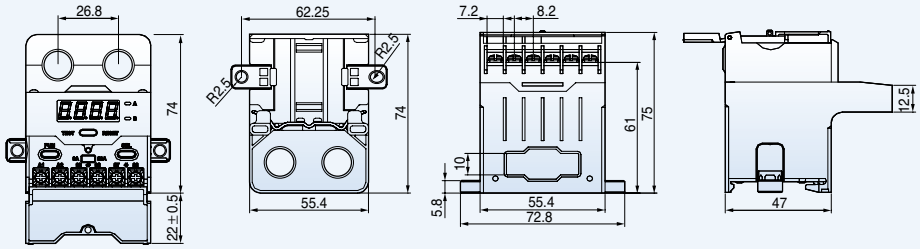
0.14kg




Unit : mm

GMP60-TD
GMP60-TDa

0.25kg

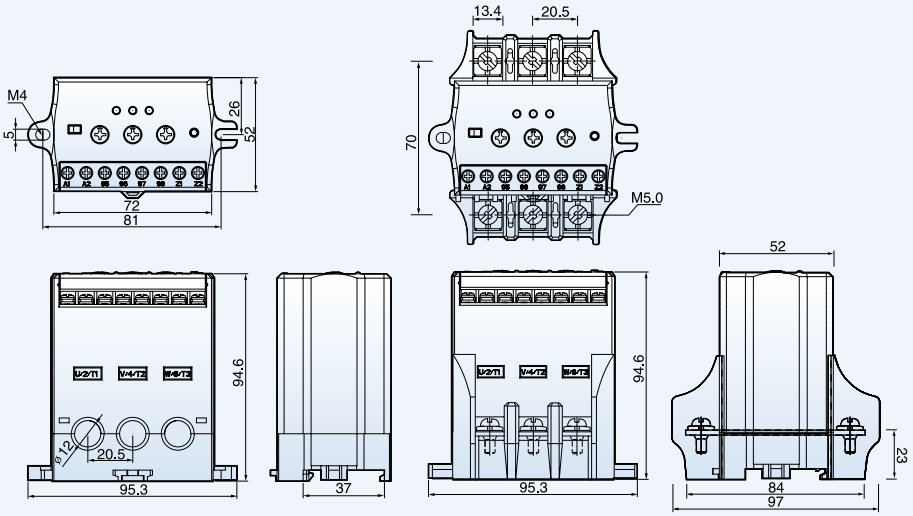



Unit : mm

GMP60-3TZ, TZR
GMP60-3TN, TNR
GMP60-3T, TR

Penetration type (Tunnel Type)

Terminal connection type (Screw Type) – to attach a terminal block




Note) If terminal connection type (Screw Type) is used, purchase a terminal block separately.

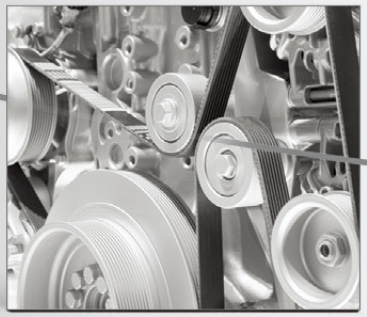
# Memo



# *Revolutionary development of motor protection relays*

*Complete motor protection is realized with real time data processing and high precision.*









# DMPi Series

## Intelligent Digital Motor Protection Relays

- Definite/Inverse time option and various protection methods
- Storage of failure causes
- Separated display part using cables
- MODBUS communication, 4~20mA DC output
- Operating time displayed for each model

Contents


36 A list of standard models
37 Product characteristics
41 Rated specifications & model numbering system
42 Operation & setting method
51 Terminal configuration / Wiring & cable connection
57 Dimensions




# A list of standard models

## A list of standard models

| Rated current | Connection method | Model No. | Over-current | Stall/ Locked rotor | Phase fail current | Phase un-balance | Reverse phase | Under current | Ground fault | Instant short circuit | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.5~6A | Terminal type | DMP06i-S | ● | ● | ● | ● | ● | ● | - | - | • If there is the function of RS485 communication, 'M' is appended to its type name. If there is the function of 4~20mA DC output, 'A' is appended to its type name.<br>• RS485 communication function and 4~20mA DC output function are not supported at the same time. |
| | | DMP06i-SZ, SB | ● | ● | ● | ● | ● | ● | ● | - | |
| | | DMP06i-SI | ● | ● | ● | ● | ● | ● | - | ● | |
| | | DMP06i-SZI, SBI Note1) | ● | ● | ● | ● | ● | ● | ● | ● | |
| | Penetrated type | DMP06i-T | ● | ● | ● | ● | ● | ● | - | - | |
| | | DMP06i-TZ, TB | ● | ● | ● | ● | ● | ● | ● | - | |
| | | DMP06i-TI | ● | ● | ● | ● | ● | ● | - | ● | |
| | | DMP06i-TZI, TBI Note1) | ● | ● | ● | ● | ● | ● | ● | ● | |
| 5~65A | Terminal type | DMP65i-S | ● | ● | ● | ● | ● | ● | - | - | |
| | | DMP65i-SZ, SB | ● | ● | ● | ● | ● | ● | ● | - | |
| | | DMP65i-SI | ● | ● | ● | ● | ● | ● | - | ● | |
| | | DMP65i-SZI, SBI Note1) | ● | ● | ● | ● | ● | ● | ● | ● | |
| | Penetrated type | DMP65i-T | ● | ● | ● | ● | ● | ● | - | - | |
| | | DMP65i-TZ, TB | ● | ● | ● | ● | ● | ● | ● | - | |
| | | DMP65i-TI | ● | ● | ● | ● | ● | ● | - | ● | |
| | | DMP65i-TZI, TBI Note1) | ● | ● | ● | ● | ● | ● | ● | ● | |

Note) 1. It is possible to set up ground fault and instantaenous trip contacts separately.

## Convenience




**Integrated Digital Motor Protection Relay based on MCU(Microprocessor Control Unit)**
Real Time Processing and High Precision are implemented.




**Applicable to invertor circuits**
It may be applied to the secondary inverter control circuit with its outstanding resistance to harmonic noise. Permissible frequency range is 10~200Hz. When the percentage of harmonic is more than 30%, a harmonic filter is installed. (However, the ground fault protection function should be switched off.)




**Function to store the cause(s) of failure / Fault**
Up to 5 motor failure events may be saved in the system, so that the failure history can be easily identified.



**Integrated system for user convenience**
The display part is separated and attached to the front panel, so that information on current/operating time and setup can be viewed without taking out the unit. With the separated display, motor protection can be performed. The display part is controlled by a separate MCU(Microprocessor Control Unit), so it can be used for all DMPi types.



**Communication function**
General-purpose RS485/MODBUS communication mode is offered for various system and communication network configurations. Models with analog current signal (4~20mA DC) output are compatible with systems that uses the existing TD (Transducer).




**A wide range of reset functions**
Manual/Automatic/Electrical reset functions are provided for user convenience.



**Date information display**
When a failure occurs, the date and time of failure occurrence are saved in the system to accurately identify the date of motor failure.



**Password setting**
When changing the set values, a password must be inserted.




**Total operating time and operating time setting**
When the predefined operating time has elapsed, related information is displayed so that operators may replace the motor bearing and check the refueling cycle.




**Terminal/Penetrated types are shared for application in various installation environments**
Terminal blocks are detachable, which makes them applied to various installation environments.

## Reliability




**Thermal Inverse Time, Inverse Time and Definite Time Modes**
According to user's needs, the motor can be protected in the inverse time mode or definite time mode.



**Three-phase digital ampere-meter**
Three-phase current is displayed in cycle at intervals of 2 seconds for operators to check the motor state.




**Various protection elements and additional functions**
Single/3-phase is optional, and output contact as well as the operating time can be set.
Free Voltage power connection (AC/D85~260V) is possible with ZCT built-in option.



**High Reliability**
The current relay error is reduced from 5% to 3% and the minimum sensible current is lowered from 70% to 30% of the minimum rating. Phase fail/phase unbalance protection relay correction and delay time can be set.




**Inverse time characteristic good for motor protection**
Thanks to the inverse time characteristic in which a running time is determined by a size of overcurrent, the equipment is excellent at motor protection.

# Product characteristics

## Protection functions

### Over current. Overload

Considering the start-up time of a motor and based on 600% of the rated current, operating time is set by 1sec unit ranging from 1 to 60 seconds to establish an overload characteristic curve (Class 1~60). When a definite time characteristic is chosen, overcurrent is detected from the set operating delay time (D-Time) regardless of the quantity of heat generated from the motor. Then, Trip is generated when overcurrent continues, exceeding the operating time (O-Time).

### Stall / Locked rotor

It is a function to prevent burning caused by locked rotor, startup failure and startup delay. When the level of load current increases due to overheating and overcurrent during operation or when the load torque exceeds the motor torque, such failure is detected to break the related circuits.

### Phase fail / Phase unbalance

When phase fail occurs, a motor may not start to operate and the motor under operation will stop owing to the lack of torque or reverse phase current will continue to flow, generating heat. DMPi calculates the unbalance of three-phase current and when it reaches 100%, it operates at 3sec as phase fail. It can be set for tripping at 5sec when the phase unbalance in within 10~90%.

*Delay time may be set within the range of 0~200sec so that it does not function upon startup.

### Reverse phase

It is a function to prevent reversing of a motor. The phase difference of three-phase current is compared for operation within 0.1~1.0sec when the phase sequence has changed. Reverse phase is checked only upon motor startup.

### Under current protection

This equipment is mainly used to monitor no-load status caused by the separation or damage of the drive shaft of a motor, or to protect the idle rotation (no-load) status of pump. It is possible to set up 30~70% of rated current. At the time of third second, it runs.

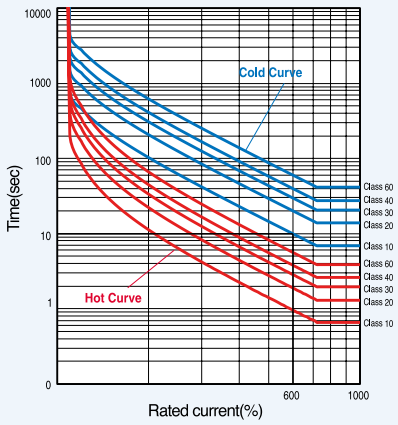
### Ground fault

Ground fault leakage current is detected to prevent ground faults arising from electric leakage and secondary accidents (Phase faults and electric shock accidents). Current sensitivity and operating time are set differently according to the grounded system or purpose of protection. Current sensitivity can be set within the range of 30mA~3A and the operating time within the range of 0.05~5.0sec.

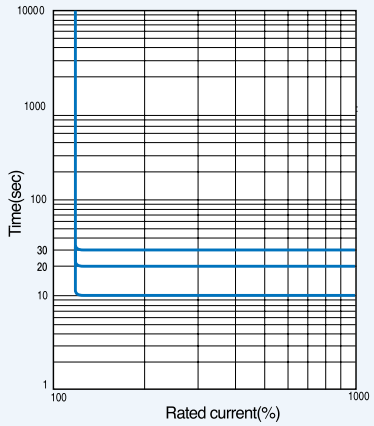
* Delay time may be set within the range of 0~200sec so that it does not function upon startup, and built-in ZCT is provided according to the Type.

### Instance

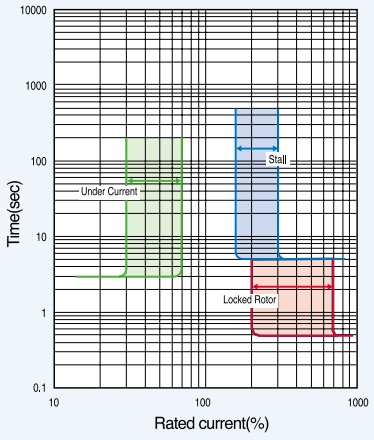
It is a function to protect a motor from short-circuit current. It operates within 50ms when fault current of more than 500~1500% is generated. Delay time may be set within the range of 0~200sec so that it does not function upon startup.




<Inverse time characteristic>




<Definite time characteristic>

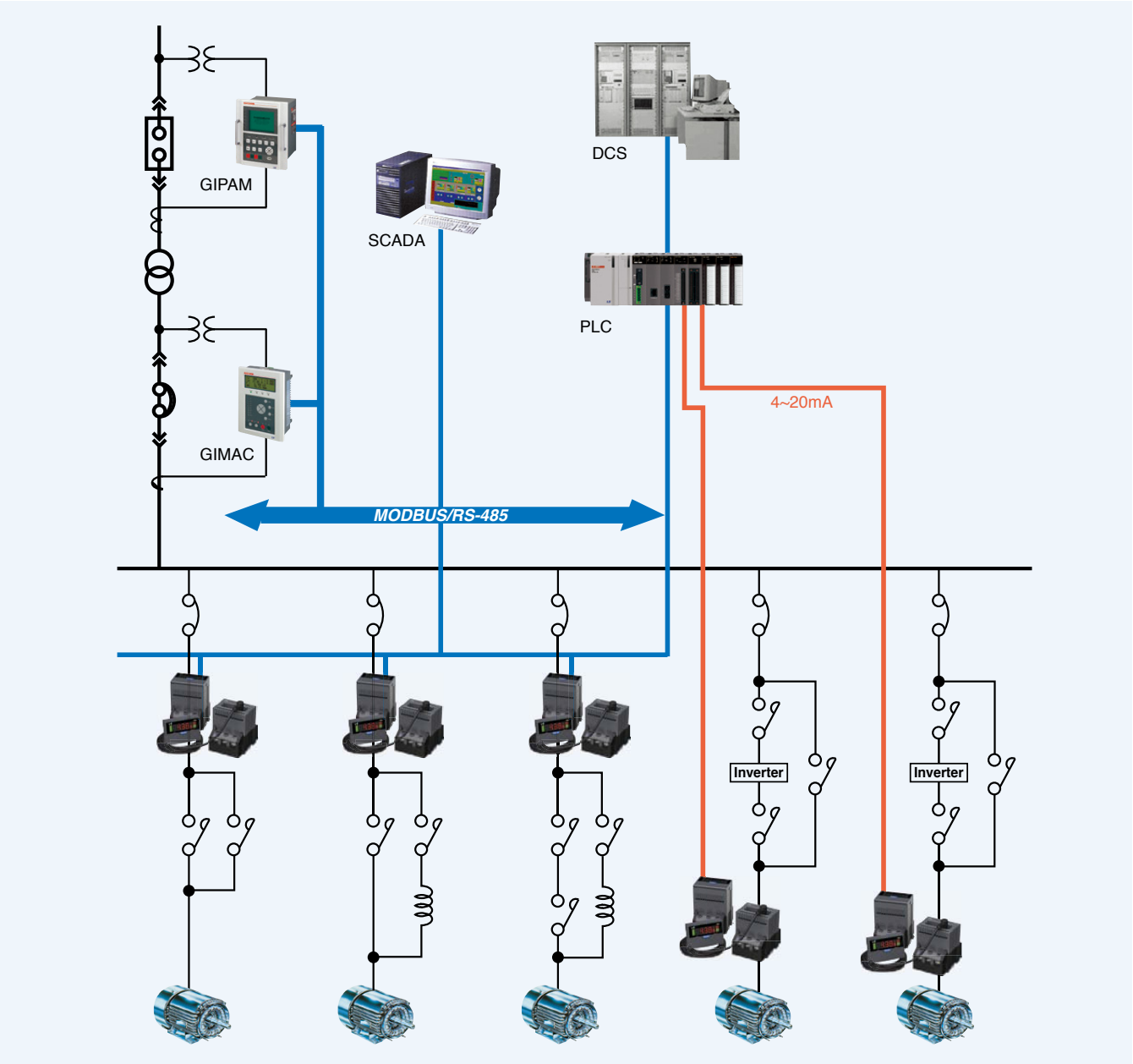


# Communication function

## MODBUS specifications

| | |
|---|---|
| Communication code | 1 ~ 247 |
| Communication speed | 9600, 19200, 38400, 57600 bps |
| Communication parity | None, Even, Odd |
| Fixed to 1bit | 1bit |
| Communication data swap | Limited to float, long data of Off / On (0x04 (Read input registers)) |

## Block diagram of communication system



# Analog (4~20mA) output function

## Specifications

- The measured values of current for the maximum phase among the measured values of three-phase current are converted into DC 4~20mA and the measured values of current can be displayed with a digital meter in the distance.
- 20mA output setting: 0.5~6A or 5~65A

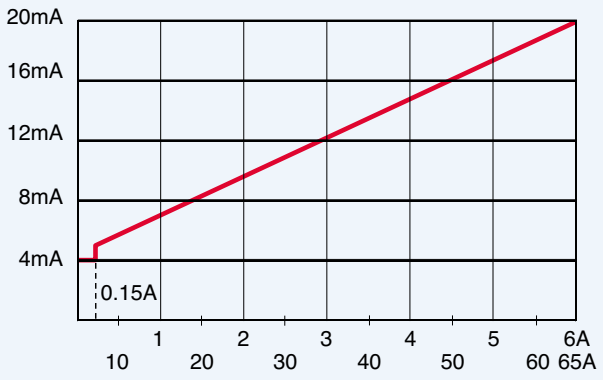
Note) 1. At the setting mode of 0.5~6A, the level of current is measured from 0.15A, so 0A is measured when less than 0.15A and the output value becomes 4mA. (When it is 0.15A, >4mA is actually measured.)
2. Measurement error based on temperature changes: ±0.15%/°C (Based on the room temperature of 25°C)

- Motor stop state: 4mA
- Setting value exceeding the rating: 20mA
- Load: Within 500Ω

Note) The allowable load of cables should be within 500Ω and the cables for shielding should be used considering the resistance of the received meta (Generally 250 Ω) and line resistance.

$$\text{Output current} = \frac{(\text{I Upper Limit} - (\text{I Lower limit})}{\text{TD Setting value}} \times \text{Load current} + 4\text{mA}$$

$$= \frac{16\text{mA}}{\text{TD setting value}} \times \text{Load current} + 4\text{mA}$$




Analog output when output setting is 6A (65A)

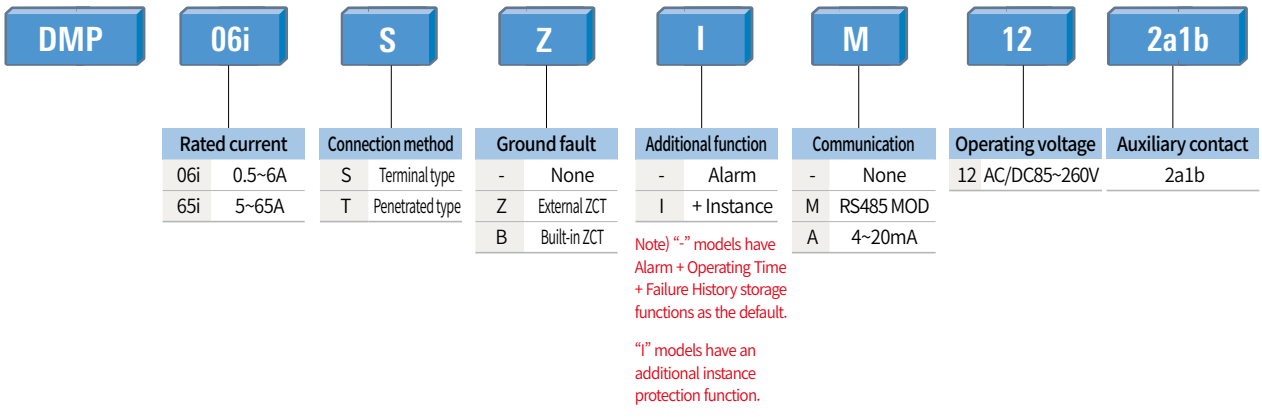
# Rated specifications & model numbering system

## Rated specifications

| Connection method | | Penetrated / Terminal type |
|---|---|---|
| Protection functions | | Overcurrent, phase fail, phase unbalance, stall, locked rotor,reverse phase, ground fault (Type option)Instance (Type option) |
| Connection method | | Penetrated / Terminaltype |
| Operating time characteristics | | Thermal heat build-up inverse time / Non-thermal heat build-up inverse time / Definite time |
| Rated current | | 0.5~6A/5~65A(Rating option upon placing an order) |
| Display | | 4 digit, 7-Segment |
| Operating power | | AC/DC 85~260V(50Hz/60Hz) |
| Reset method | Automatic | 1~20min (only for overcurrent) |
| | Manual | (Electrical reset) |
| Installation / Mounting method | | Display can be installed separately, 35mm DIN rail / Screw installation |
| Tolerance | Current | ±3% |
| | Time | ±5% |
| | 4~20mA output | ±5% |
| Time setting | Startup delay | 1~200sec |
| | Operation delay | 1~60sec |
| Aux. contact | Composition | 3-SPST(Power supply 1a1b, i nstantaneous operation 1a) Note1) |
| | Capacity | 3A/250VAC Resistive Load |
| | Contact minimum load | 100mA / 6VDC : (95-996, 97-98) |
| | | 10mA / 5VDC ( 07-08) |
| ZCT Input | External | 200mA/100mV(Exclusive ZCT) Note2) |
| | Built-in | Support (Separate connection unnecessary Note2) |
| Service environment | Service temperature | -20°C ~ 60°C |
| | Storage temperature | -30°C ~ 70°C |
| | Relative humidity | within 80% RH, no condensation |
| Insulation resistance | | 100MΩ/500VDC |
| Lightning impulse voltage | | 1.2X50us 5kV Prototype waveform supply |
| Fast transient | | 2kV/1Min |
| Power consumption | | Below 2W |

Note 1. See No. 21 to 23 of A-Group in Setting menu If single phase is set, the device measures R/S/T phase. In HMI, the maximum phase of three phases is displayed without any indication of phase.
2. It is used when zero current detection type is selected.
3. This product is used to protect a low-voltage motor with 1000V or less

## Model numbering system



# Operation & setting method

## Display explanation




| Type | Item | | Description | Remarks |
|---|---|---|---|---|
| Display |  | R S T N | Display of R, S, T, or N phase | If fixed, flickering |
| |  | 4 digit 7-segment | Display of a variety of information (numbers, text) | |
| |  | BAR GRAPH | Display of load factor (%) 50% ~ 120% | If 120% or more, flickering |
| |  | C | Display of communication status (C) | In communication, flickering |
| |  | % | Load factor (%) display unit | Depending on lighting status |
| |  | A | Current (A) display unit | Display of information |
| Button |  | TEST/RESET | Access TEST Mode and Release TRIP, Go to the top of menu | |
| |  | ENTER | Access Menu and Change & Save Setting Values | |
| |  | UP | Go to Items (Measurement Value, Group, Menu, Parameter Increase) | |
| |  | DOWN | Go to Items (Measurement Value, Group, Menu, Parameter Decrease) | |

## Operation & setting method

### Before starting the motor, the following setting should be completed.

### 1. Check the test / Reset button.

1) First, check whether the connection method is appropriate. (Refer to the section on the connection method.)
2) Press the Test/Reset button once. 'Test' will be shown on the display and the device will be tripped.
3) When the Test/Reset button is pressed one more time during the device Trip, the display will be switched to the operating mode and the device will be reset for normal operation.

Note) To prevent trip failures, the system is designed to prevent operation of the Test/Reset button when the motor is running.
Note) Setup and setting values may change during the motor operation. Thus, please be cautious.

### 2. Setting method

1) Press Enter from the current display screen, and A-gr will appear on the screen. Use the Up or Down button to choose a group that you want and press Enter to display a menu on the chosen group. Press the Test/Reset button again to return to the current display screen.

2) The first menu will be displayed in relation to the selected group. Use the Up or Down button to choose a menu that you want and press Enter. The screen on setting values will be displayed. Press the Test/Reset button to display the group selection mode

Note) Start menu may vary according to the model specifications.

3) If you press the Up or Down button from the screen on setting values, P-99 will appear on the screen. Here, use the Up or Down button to change the value to P-00 and press Enter to return to the screen on setting values. The setting value will flicker and can be changed with the Up or Down button.
After setting the value, press Enter. The value will be saved and the flicking values will be switched off.

4) With it switched on, press Enter to proceed to the next menu or press the Test/Reset button to go back to the previous menu. Related menus can be set with the same procedure.

Note) Password insertion (P-00) is performed only once when changing the setting values. When no changes are made for 10 minutes, it can be re-inserted and changed.
Note) With it switched on, press Enter to proceed to the next menu or press the Test/Reset button to go back to the previous menu. Related menus can be set with the same procedure.
Note) When power is supplied for the first time or after power failure, the date information must be inserted at b-gr 4,S-d.

### 3. How to check the failure history

1) Press the "Down + Up" buttons at the same time and the latest cause of a failure will be displayed on the screen. 1- -

Note) When there is no failure history, it will be displayed as "non".

2) When saving more than 2 failure cases, use the Up or Down button to check any Event that you want. Then press Enter from the Event display to view the details on the failure causes.

Note) There may be differences in details displayed according to the failure cause.
Note) 5 causes of Trip in total are saved and when it exceeds 5 cases, the previous data are deleted for storage.

### 4. Operating time setting

1) B group 35rt is used for time setting (10~8,760). After the set operating time has elapsed, Trip state will be displayed with OrH.
When A group 22AL is set with OrH, 07-08 contact will be output.

### 5. Total operating time and operating time check

1) Total operating time can be checked from B group , ltrt which is displayed in the following order: day/hour/minute.
2) Operating time can be checked from B group, 2r-t which is displayed in the following order: hour/minute.

Note) When no current flows in the motor, the operating time will be displayed as 0.
Note) The total operating time is saved every 10 minutes. When turned off, any value less than 10 minutes will be reset.

### 6. Heat quantity reset (The motor's heat quantity is reset by force to switch to the cold mode.)

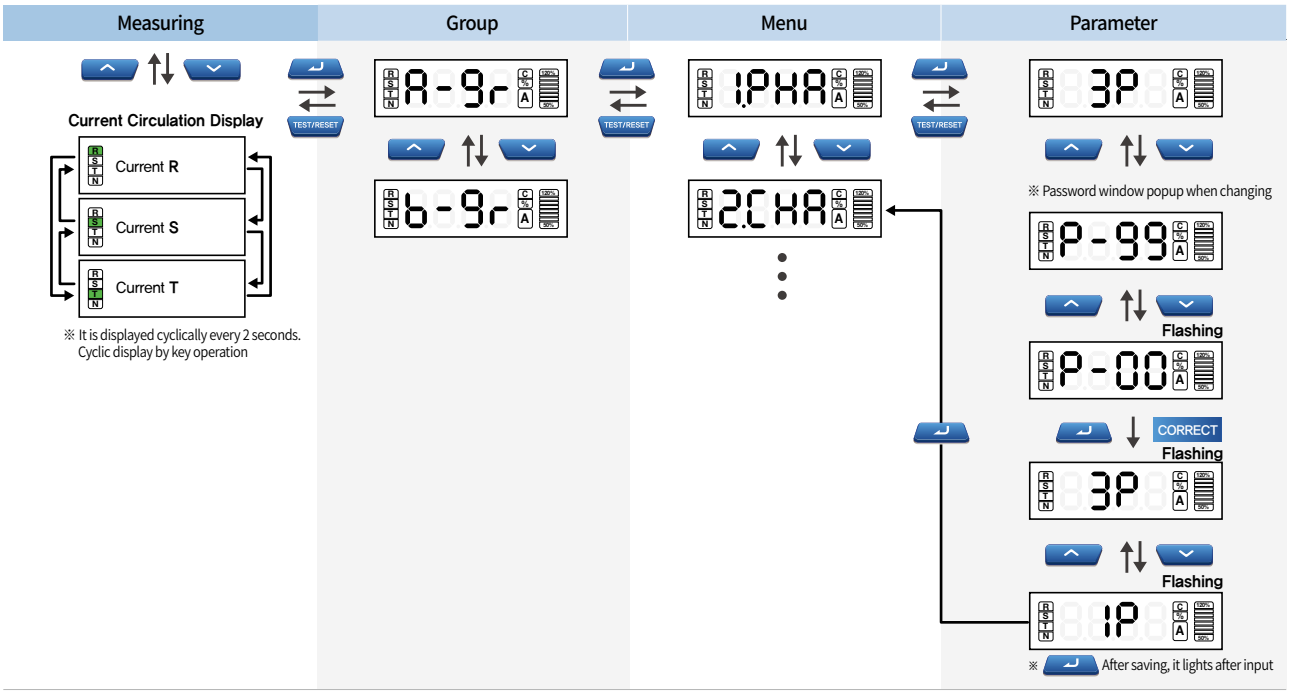
1) When the operating characteristics of A Group 2.CHA are set in the thermal heat build-up mode (th)
2) When the Test/Reset key is pressed under overload trip to return and then a motor is driven right away, the motor will be hot. Thus, trip is immediately performed.
3) On the other hand, when the Enter + Test / Reset keys are pressed simultaneously under overcurrent trip to return and then a motor is driven right away, the motor will be cold. Thus, trip will be executed after the set time.

# Operation & setting method

## 7. Three-phase current circulation display

1) Three-phase operating current that automatically circulates is displayed at intervals of 2 seconds.
2) To view a specific phase on the circulation display, press Enter in relation to such phase for 2 seconds. The phase will flicker and be displayed.
3) If you want to display the circulating three-phase current again, use the Up or Down key to cancel the state for circulation display.

## Menu configuration




## Information display

| Display information | | Failure state | Additional display information | Remarks |
|---|---|---|---|---|
| Failure information | O-L | Overcurrent | Fault current (R-phase, S-phase and T-phase)<br>Load factor, time | Operates at the set time |
| | Loc | Lock | Fault current (R-phase, S-phase and T-phase)<br>Load factor, time | Operates within 0.5sec |
| | StL | Stall | Fault current (R-phase, S-phase and T-phase)<br>Load factor, time | Operates in 3sec |
| | P-F | Phase fail | Fault current (R-phase, S-phase and T-phase)<br>Load factor, time | Operates in 3sec<br>(Delay time setting needed) |
| | P-U | Phase unbalance | R-phase, S-phase and T-phase,<br>Unbalance factor, time | Ooperates in 5 sec<br>(Delay time setting needed) |
| | r-P | Reverse phase | Time | Operates at the set time |
| | U-C | Under current | Fault current (R-phase, S-phase and T-phase)<br>Load factor, time | Operates in 3sec |
| | 9-F | Ground fault (ZCT) | Fault current (R-phase, S-phase and T-phase)<br>N-phase, time | Operates at the set time<br>(Delay time setting needed) |
| | Sho | Instance | Fault current (R-phase, S-phase and T-phase)<br>Load factor, time | Operate within 50ms<br>(Delay time setting needed) |
| Alarm information | OrH | Set operating time has elapsed | An alarm is displayed if a cumulative running time excesses a set running time | |
| Self-diagnosis information | L InE | Display communication error | When a communication error occurs between the display and body, please contact our office with the alarm maintained. | |
| | EErr | External memory error | When there is an error in the backup memory, please contact our office with the alarm maintained. | |

## A-Group

| Group | Display | Setting item | Setting value(Display value) | Single phase | Default | Remarks Note4) |
|---|---|---|---|---|---|---|
| A | 1.PHA | Single phase/Three-phase | 1P/3P | 1P Note1) | 3P | |
| | 2.CHA | Operating characteristic (Overcurrent protection) | dEF/n-th/th Note2) | O | n-th | |
| | 3.0-t | Operating time | 1~60sec | O | 60 | |
| | 4.d-t | Delay time | 1~200sec | O | 200 | Displayed upon 2.CHA dEFT setting |
| | 5.r-C | Rated current(6, 65) | 0.5~6A/5~65A | O | 6/65 | Maximum rated current display (06i: 6A, 65i: 65A) |
| | 6.CTr | CT Ratio | 0.25/0.5/1~200 Note3) | O | 1 | |
| | 7.Loc | LOCK | Off/200~800% | O | Off | |
| | 8.StL | STALL | Off/150~500% | O | Off | |
| | 9.P-F | Phase fail(100%) | On/Off | - | On | |
| | 10.Pd | Phase fail delay time | 0~200 | - | 0 | Displayed upon 9.P-F setting |
| | 11.PU | Phase unbalance | Off/10~90% | - | Off | |
| | 12.Ud | Phase unbalance delay time | 0~200 | - | 0 | Displayed upon 10.PU setting |
| | 13.rP | Reverse phase Note5) | Off/On | - | Off | |
| | 14.rt | Reverse phase operating time | 0.1~1.0 | - | 0.1 | Displayed upon 13.rP setting |
| | 15.UC | Under current | Off/30~90% | O | Off | |
| | 16.gF | Ground fault | Off/0.03/0.05/0.1~3.0A | O | Off | |
| | 17.gt | Ground fault operating time | 0.05, 0.1~5.0sec | O | 1 | Displayed upon 16.gF setting |
| | 18.gd | Ground fault delay time | 0~200sec | O | 200 | Displayed upon 16.gF setting |
| | 19.IC | Instance protection | Off/500~1500% Note6) | O | Off | |
| | 20.Id | Instance protection delay Time | 0~200 | O | 0 | Displayed upon 19.IC setting |
| | 21.cS | Output contact composition | 2a, 1a1b, 2b Note7) | O | 1a1b | |
| | 22.AL | Alarm output conditions | I-tp, I-AL, ALo, U-C, OrH, g-F | O | I-tp | |
| | 23.Ar | Current flow or not, alarm setting | On/60~110% | O | On | Displayed upon 22.AL Alo setting |

Note) 1. When setting A group 1.PHA menu with 1P, restricted setting with limited functions can be made.
2. Operating characteristic th refers to the thermal heat build-up inverse time characteristic and n-th refers to the non-thermal heat build-up inverse time characteristic. When th is used, the quantity of heat generated will be reset as power is turned off. Thus, please pay attention to it.
3. CT Ratio is fixed to 1 for 65A Type model.
4. Some menus will not be displayed depending on the function setting for each model.
5. Reverse phase will be detected for only 1.5 seconds after load is activated. It is recommended to set as Off for a motor not in normal-reverse operation.
6. In case of 'Instance', the maximum setting value may change according to the rated current setting.
7. For models with ground fault and instance protection functions, the ground fault and instantaneous trip contacts may be separately set for use.

# Operation & setting method

The output conditions of 95-96, 97-98 output contacts depending on the setting of A group 21.cS are as described below.

| 21.cS Setting | Output conditions | Contact output type | |
|---|---|---|---|
| | | 95-96 | 97-98 |
| 1a1b | Normal operation | NC Note) | NO Note) |
| | Ground fault / Short circuit | O Note) | C Note) |
| | Other failures, such as overcurrent, phase fail and reverse phase other than the ground fault | O | C |
| 2a | Normal operation | NO | NO |
| | Ground fault/Short circuit | O | C |
| | Other failures, such as overcurrent, phase fail and reverse phase other than the ground fault | C | O |
| 2b | Normal operation | NC | NC |
| | Ground fault/Short circuit | C | O |
| | Other failures, such as overcurrent, phase fail and reverse phase other than the ground fault | O | C |

Note) NC: Normal Close, NO: Normal Open, O: Open, C: Close

The output conditions of 07-08 output contacts depending on the setting of A group 22.AL are as described below.

| 23.Ar setting | Output conditions | Alarm output type | |
|---|---|---|---|
| | | Motor operation | 07-08 |
| I-tp | Momentary current detected | Motor stop | C |
| I-AL | Momentary current detected | State maintained | C |
| U-C | Current flow below the set low current detected | State maintained | C |
| OrH | Output exceeding the set operating time | State maintained | C |
| g-F | Ground fault detection | Motor stop | C |
| ALo | Conforming to the 23.Ar setting described below | | |
| **23.Ar setting** | **ALo setting from menu No.22** | **Motor operation** | **07-08** |
| On | Current flow exceeding the measured minimun current value detected Note) | State maintained | C |
| 60~110% | Current flow exceeding the setting value | State maintained | C |

Note) The measured minimum current value is 30% of the minimum rated current value (0.15A for 0.6i type; 1.5A for 65i type)

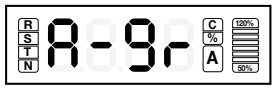
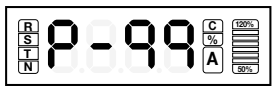
## B-Group

| Group | Display | Setting item | Setting value (Display value) | Single phase Note1) | Default | Remarks Note4) |
|---|---|---|---|---|---|---|
| B | 1trt | Total operating time | 0~9999day/0~23Time/0~59min | O | - | |
| | 2r-t | Operating time | 0~9999 Time/0~59min | O | - | |
| | 3Srt | Operating time setting | Off/10~8760 | O | Off | |
| | 4S-d | Date setting Note2) | 2017~2100yea/1~12month/1~31day/ 0~23hour/0~59min | O | 2017.07.01 00:00 | |
| | 5A-r | Automatic reset Note3) | Off/1~20min | O | Off | |
| | bAdr | Communication network address | 1~247 | O | 247 | Displayed only for M485 model |
| | 1bPS | Communication speed | 9.6k/19.2k/38.4k/56.7k | O | 9.6k | |
| | 8S-P | Swap On/Off | On/Off | O | Off | |
| | 9P-r | Parity setting | nonE/odd/EUEn | O | nonE | |
| | 6t-d | 20mA setting | 0.5~6/5~65 | O | 6/65 | Displayed only for A420 model |

Note) 1. It can be set even when A group 1.PHA is set with the single phase (1P).
2. When power is supplied for the first time or after power failure, date must be set. For date setting, month, day, hour and minute should be respectively set for complete setting. (After date setting, it is saved every 10 minutes. When power is supplied again after power failure, the date before such power failure will be saved.)
3. Automatic reset is restricted for overcurrent trip.
4. Menus vary according to the model. (refer to the remarks)

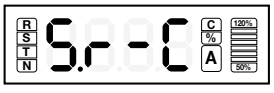
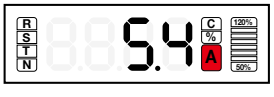
## Phase setting

This is a function tdo set current input either as single or three-phase.

| | |
|---|---|
|  | The DMPi main screen display (0.00A) |
|  | 1. Press Enter from the main screen. (A-gr) |
|  | 2. Press Enter from the A-gr screen. (1. PHR) |
|  | 3. Press Enter from the PHR screen and the initial value 3P will be displayed. |
|  | 4. Here, use the Up / Down key to display P-99 from the screen. Change it into P-00 with the Up/Down key and press Enter. You are now ready for setting. (Only required for initial setting) |
|  | |
|  | 5. The set value flickers. Use the Up / Down key to display 'phase' that is applicable depending on the motor specifications (1P: single-phase; 3P: three-phase). Then, press Enter to save the setting. (1P)<br>① Choose either 1P or 3P; the default is 3P<br>② When 1P is selected, A group items such as "9.P-F", "10.Pd", "11.PU", "12.Ud", "13.rP" and "14.rt" are excluded from the setting menu. |
| | 6. Press Test / Reset to return to the display screen. |

## Rated current setting

This is a function to set a rated current.

| | |
|---|---|
|  | The DMPi main screen display (0.00A) |
|  | 1. Press Enter from the main screen. (A-gr) |
|  | 2. Press Enter from the A-gr screen. (1. PHR) |
|  | 3. Press the Up-key menu 3 or 4 times from the PHR screen. (5.r-C) |
|  | 4. Press Enter from the 5.r-C screen and the initial value 6.0A will be displayed. |
|  | 5. Here, use the Up / Down key to set the value as 0.5~6.0A. Then, press Enter to save the setting. Note1) (6.0→5.4A)<br>① 6A model: Set by 0.1A unit ranging from 0.5A to 6A (the default is 6.0A)<br>② 65A model: Set by 1A unit ranging from 5A to 65A (the default is 65A) |
| | 6. Press Test / Reset to return to the display screen. |

Note 1) Upon initial setting, P-99 is displayed on the screen. Here, use the Up / Down key to change it into P-00 and press Enter. You are now ready for setting.

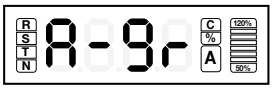
# Operation & setting method

## Overcurrent operating characteristic setting

This is a function to set the operating characteristic of the overcurrent element.




The DMPi main screen display (0.00A)



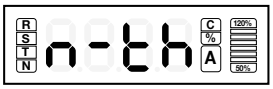

1. Press Enter from the main screen. (A-gr)




2. Press Enter from the A-gr screen. (1. PHR)

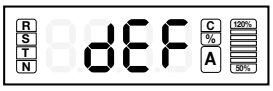



3. Press the Up-key menu once from the PHR screen. (2.CHA)




4. Press Enter from the 2.CHA screen to display 'n-th' (initial value).

5. The set value flickers. Use the Up / Down key to display the set value. Note1)




6. Press Enter for dEF setting.
   ① dEF (definite time), n-th (non-thermal heat build-up inverse time) or th (thermal heat build-up inverse time)
   ② When set as 'n-th' or 'th', "4.d-t" of the A group items is excluded from the setting menu.

7. Press Test / Reset to return to the display screen.

Note 1) Upon initial setting, P-99 is displayed on the screen. Here, use the Up / Down key to change it into P-00 and press Enter. You are now ready for setting.

## Overcurrent operating time setting

This is a function to set the operating time of the overcurrent element.



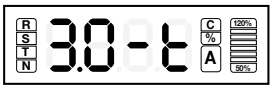

The DMPi main screen display (0.00A)



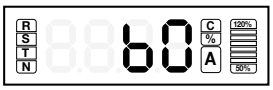

1. Press Enter from the main screen. (A-gr)




2. Press Enter from the A-gr screen. (1. PHR)




3. Press the Up-key menu twice from the PHR screen. (3.O-t)




4. Press Enter and the initial value 60sec will be displayed.

5. Use the Up / Down key to display the set value on the screen. Note1)




6. Press Enter to set as 30sec. (60 → 30 sec)

7. Press Test / Reset to return to the display screen.

Note 1) Upon initial setting, P-99 is displayed on the screen. Here, use the Up / Down key to change it into P-00 and press Enter. You are now ready for setting.

## Overcurrent delay time setting

This menu is displayed only when the overcurrent operating characteristic is set as dEF (definite time).



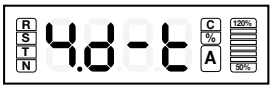

The DMPi main screen display (0.00A)




1. Press Enter from the main screen. (A-gr)




2. Press Enter from the A-gr screen. (1. PHR)




3. Press the Up-key menu 3 times from the 1.PHR screen. (4.d-t)




4. Press Enter from the 4.d-t screen and the initial value 200 will be displayed.

5. Use the Up/Down key to display the set value on the screen. Note1)




6. Press Enter to set as 100sec. (200 → 100sec)
   ① Set by 1sec unit ranging from 1 sec to 200sec; the default is 200sec.
   ② When the overcurrent operating characteristic is set as 'n-th' or 'th', it is excluded from the setting menu.

7. Press Test/Reset to return to the display screen.

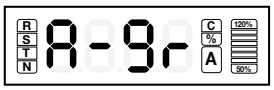
Note 1) Upon initial setting, P-99 is displayed on the screen. Here, use the Up/Down key to change it into P-00 and press Enter. You are now ready for setting.

## Ground fault operating value setting

This is a function to set the operating value of ground fault.




The DMPi main screen display (0.00A)




1. Press Enter from the main screen. (A-gr)




2. Press Enter from the A-gr screen. (1. PHR)




3. Press the Up-key menu from the 1.PHR screen to proceed to 16.gF.




4. Press Enter from the 16.gF screen and the initial value OFF will be displayed.




5. Here, use the Up/Down key to set the value. Press Enter to save the setting. Note1) (OFF → 0.1A)
   ① Set by 0.1A unit ranging from 0.1A to 3.0A; or OFF, 0.03A, or 0.05A. (the default is OFF)

6. Press Test / Reset to return to the display screen.

Note 1) Upon initial setting, P-99 is displayed on the screen. Here, use the Up/Down key to change it into P-00 and press Enter. You are now ready for setting.

# Operation & setting method

## Ground fault operating time setting

This is a function to set the operating time of ground fault.

| | |
|---|---|
|  | The DMPi main screen display (0.00A) |
|  | 1. Press Enter from the main screen. (A-gr) |
|  | 2. Press Enter from the A-gr screen. (1. PHR) |
|  | 3. Press the Up-key menu from the 1.PHR screen to proceed to 17.gt |
|  | 4. Press Enter from the 17.gt screen and the initial value 1.0sec will be displayed. |
|  | 5. Here, use the Up / Down key to set the value. Press Enter to save the setting. Note1)(1.0→0.1sec)<br>① Set by 0.1sec unit ranging from 0.1sec to 5.0sec; the default value is 1.0sec. |
| | 6. Press Test / Reset to return to the display screen. |

Note 1) Upon initial setting, P-99 is displayed on the screen. Here, use the Up/Down key to change it into P-00 and press Enter. You are now ready for setting.
Note 2) When the operating value of ground fault protection (16.gF) is set as OFF, it is excluded from the setting menu.

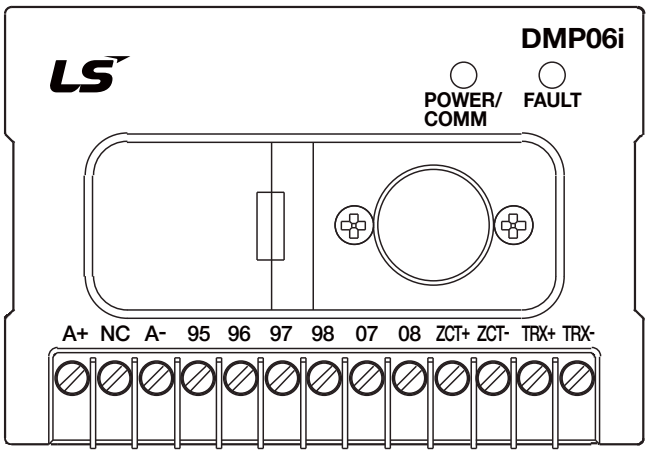
## Ground fault delay time setting

This is a function to set time for blocking operation of the ground fault element upon motor activation.

| | |
|---|---|
|  | The DMPi main screen display (0.00A) |
|  | 1. Press Enter from the main screen. (A-gr) |
|  | 2. Press Enter from the A-gr screen. (1. PHR) |
|  | 3. Press the Up-key menu from the 1.PHR screen to proceed to 18.gd. |
|  | 4. Press Enter from the 18.gd screen and the initial value 200sec will be displayed. |
|  | 5. Here, use the Up / Down key to set the value. Press Enter to save the setting. Note1) (200→100sec)<br>① Set by 1sec unit ranging from 0sec to 200sec; the default value is 200sec. |
| | 6. Press Test / Reset to return to the display screen. |

Note 1) Upon initial setting, P-99 is displayed on the screen. Here, use the Up/Down key to change it into P-00 and press Enter. You are now ready for setting.
Note 2) When the operating value of ground fault protection (16.gF) is set as OFF, it is excluded from the setting menu.

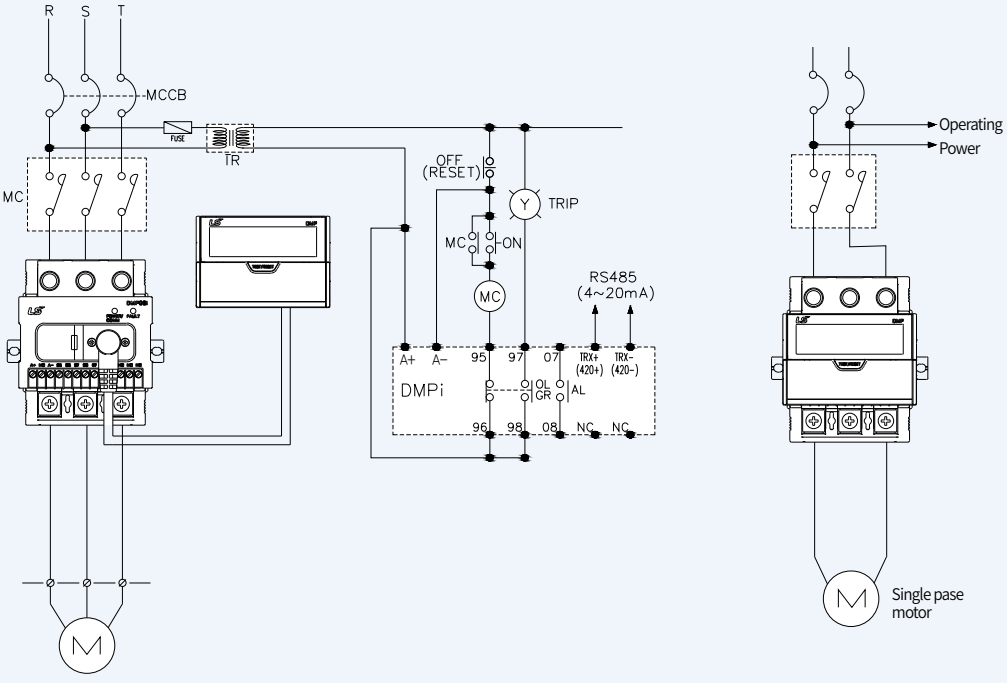
## Terminal configuration




| Engrave | Description |
|---|---|
| A+, A- | Input terminal for operation power |
| 95-96 | When the power is ON (NC contact output) |
| 97-98 | When the power is ON (NO contact output) |
| 07-08 | Alarm contact output terminal |
| ZCT+, ZCT- | ZCT output connection |
| TRX+, TRX-<br>420+, 420- | RS485 connect or 4~20mA output |

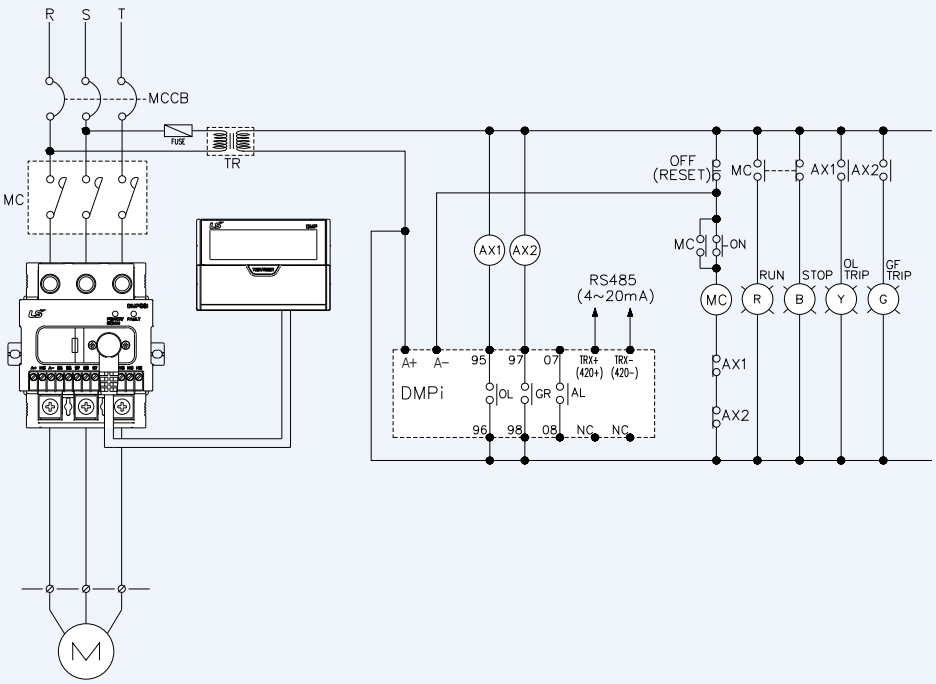
# DMPi-B built-in ground fault protection type (1a1b)

### DMPi-SB/TB



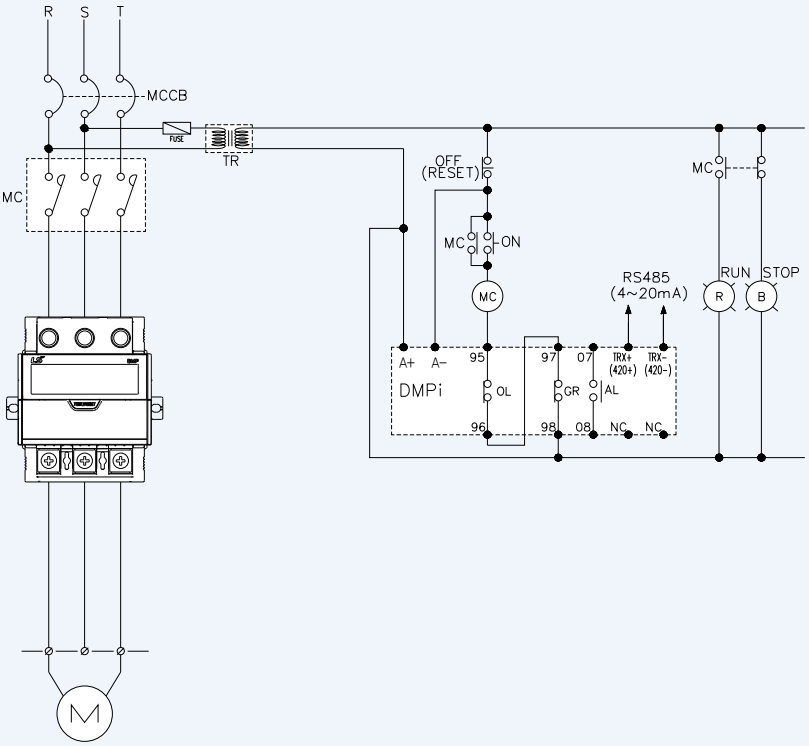
## DMPi-B built-in ground fault protection type (2a)

### DMPi-SB / TB



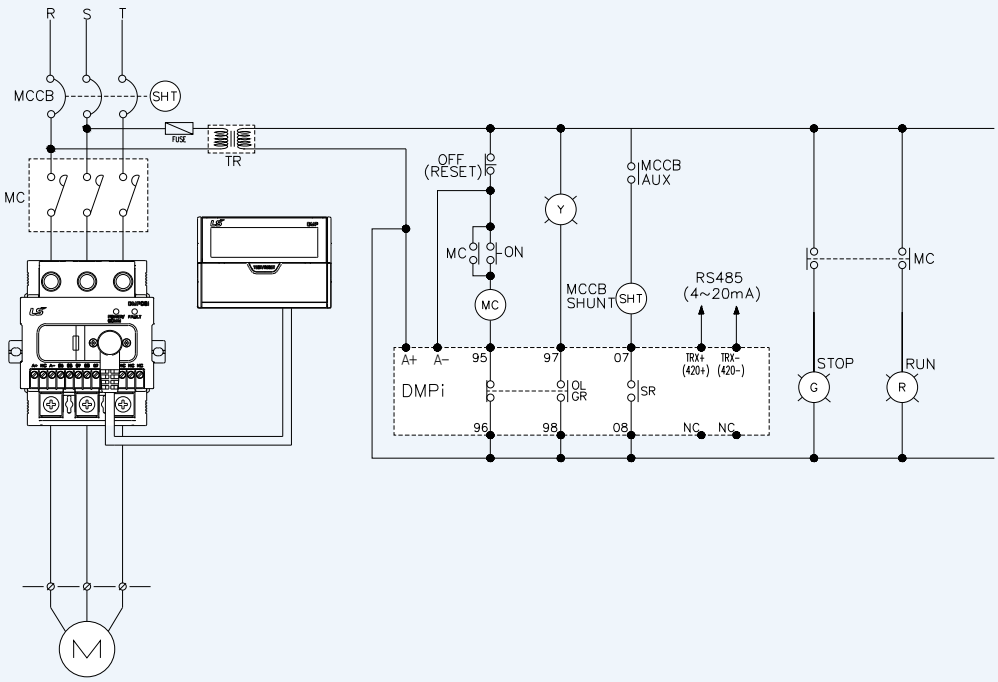

## DMPi-B built-in ground fault protection type (2b)

### DMPi-SB / TB



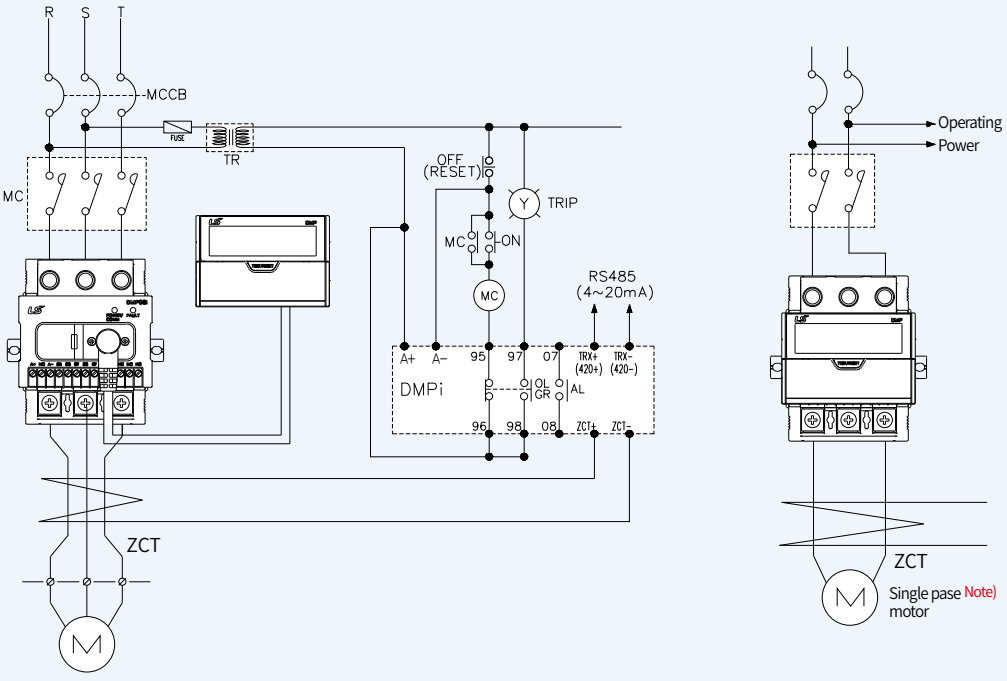
## DMPi-SBI / TBI, SI / TI built-in instant short-circuit protection type (1a1b)

### DMPi-SBI / TBI
### DMPi-SI / TI




## DMPi-SZ / TZ external ground fault protection type (1a1b)

### DMPi-SZ / TZ

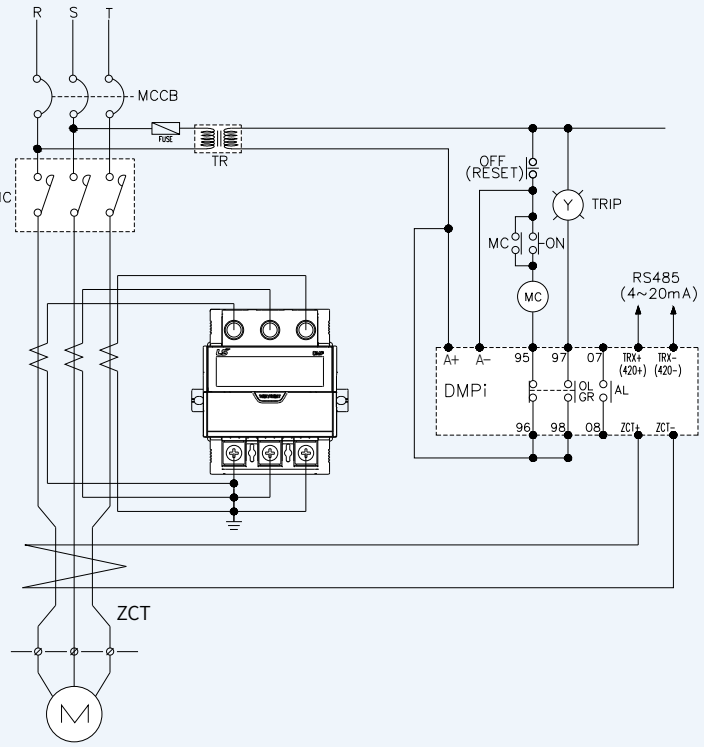



Note) 1. R-phase must be penetrated when connecting a single-phase motor. (Although there are S, T-phase CT in the product, values are measured based on R-phase.)

# Terminal configuration / Wiring & cable connection

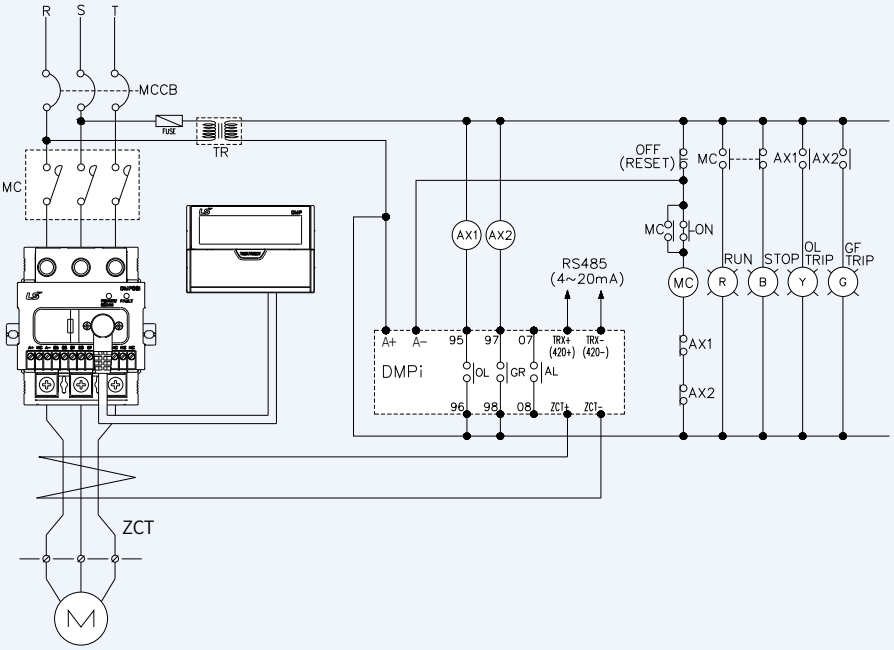
## DMPi-SZ / TZ external ground fault protection type (1a1b large-capacity motor applied with external CT)

DMPi-SZ / TZ



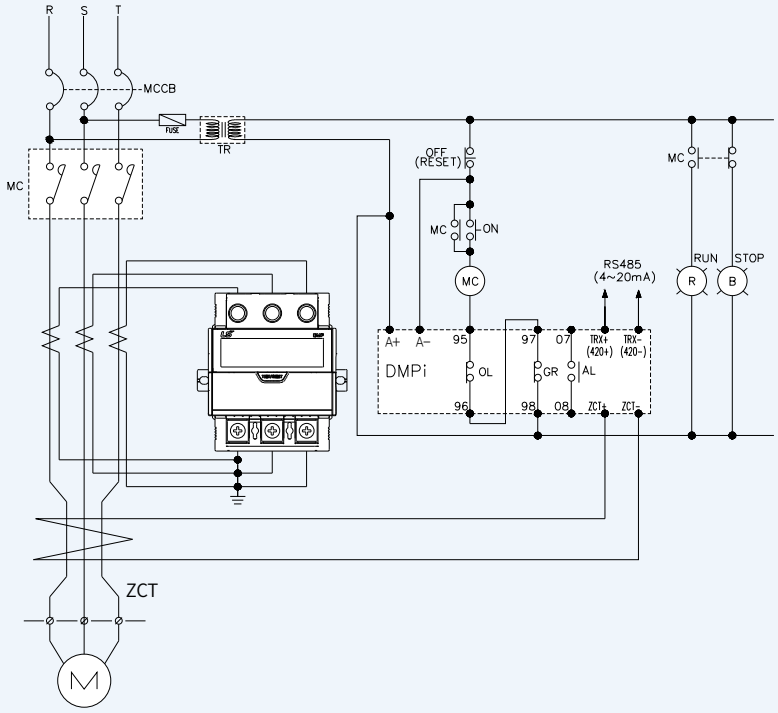

## DMPi-SZ / TZ external ground fault protection type (2a)

DMPi-SZ / TZ



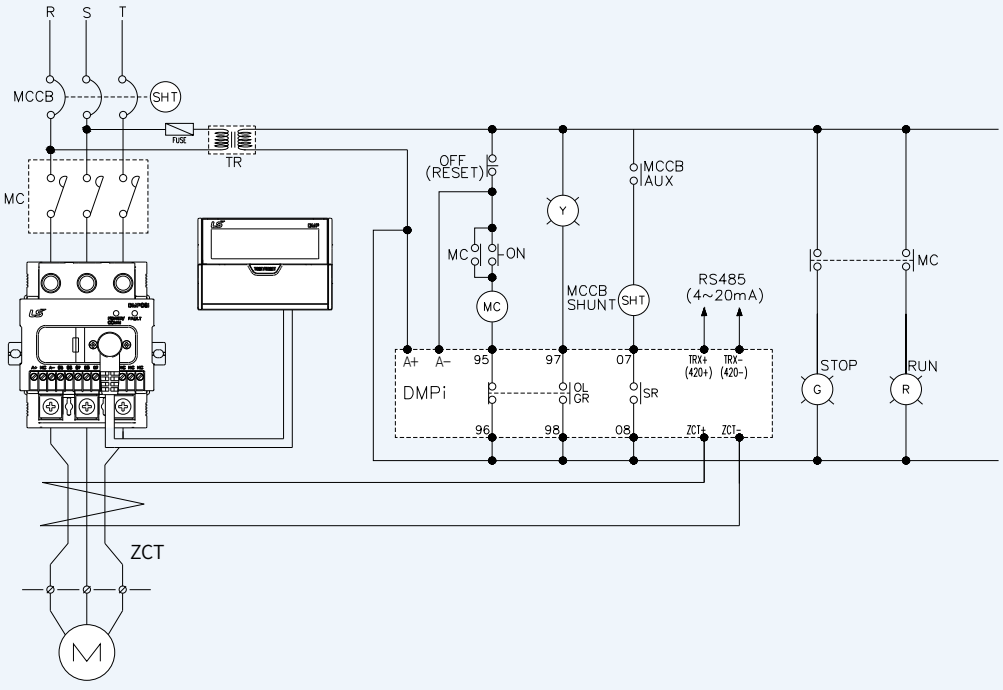
## DMPi-SZ / TZ external ground fault protection type (2b)

### DMPi-SZ / TZ



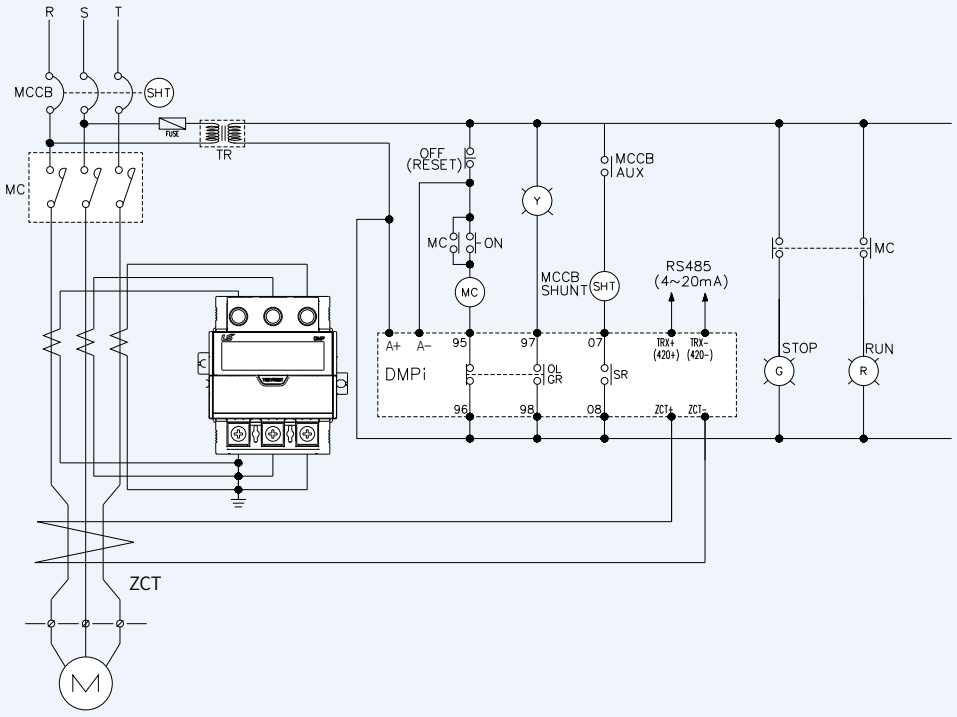

## DMPi-SZI, TZI instant short-circuit protection and external ground fault protection type (1a1b)

### DMPi-SZ / TZI



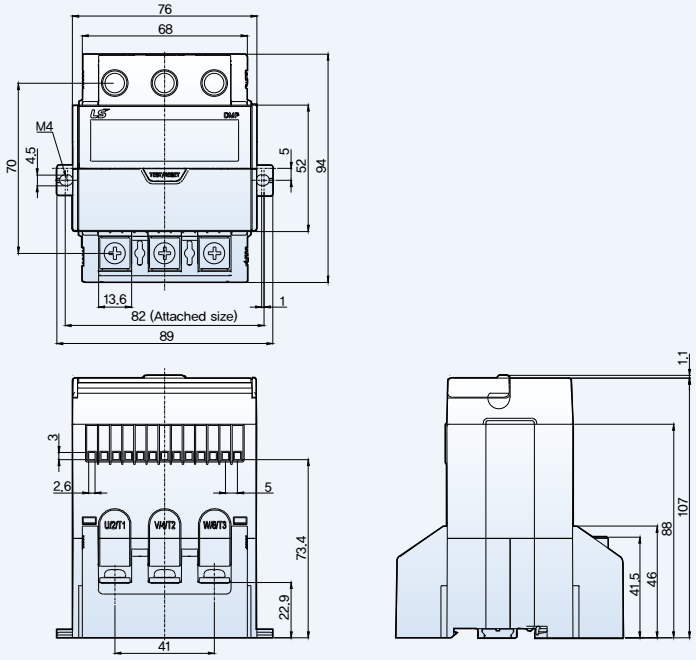
## DMPi-SZI, TZI instant short-circuit protection and external ground fault protection type
(1a1b large-capacity motor applied with external CT)

DMPi-SZ / TZI

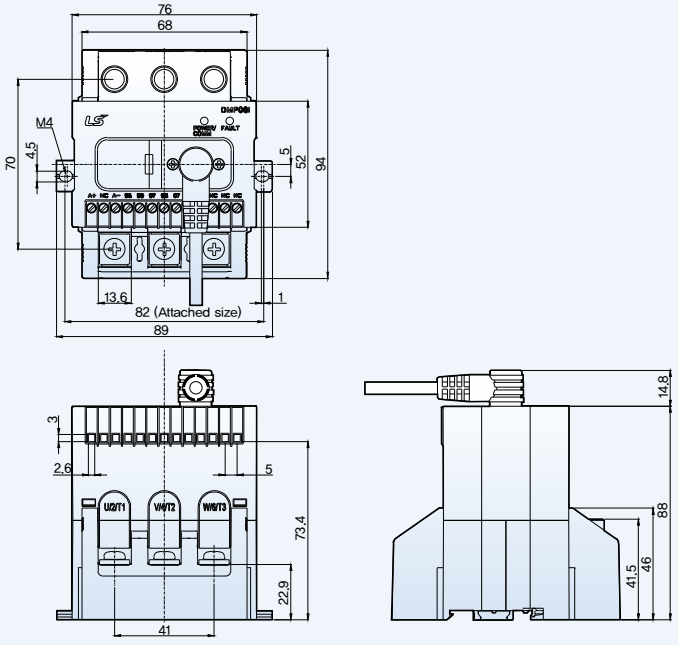


Unit : mm

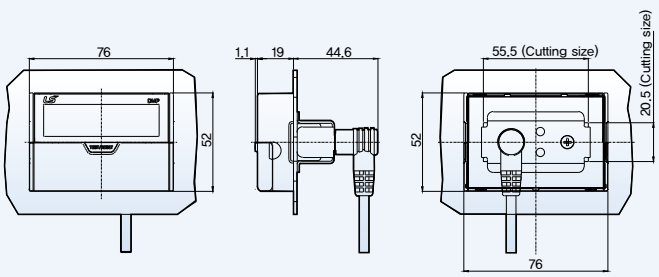
## Integrated terminal type




## Separated terminal type



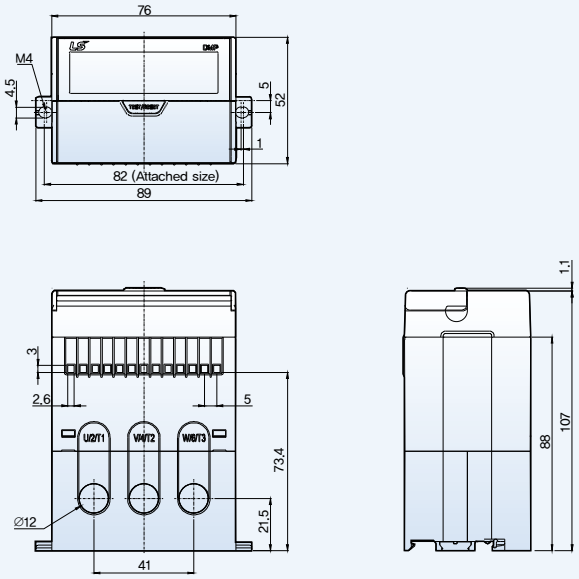

## Panel insertion



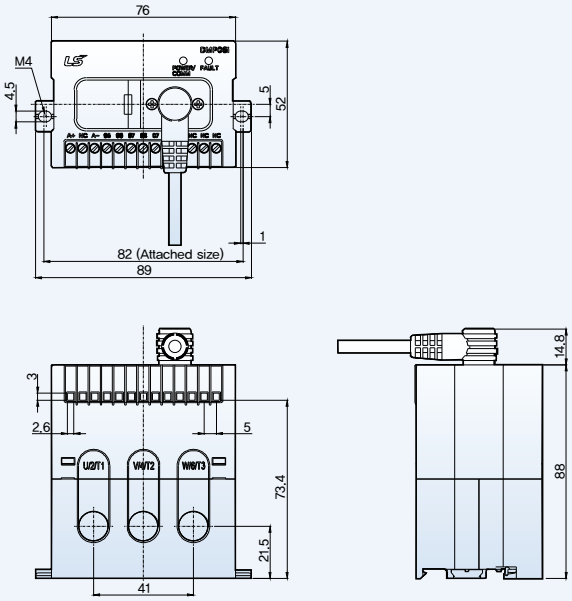
# Dimensions

Unit : mm

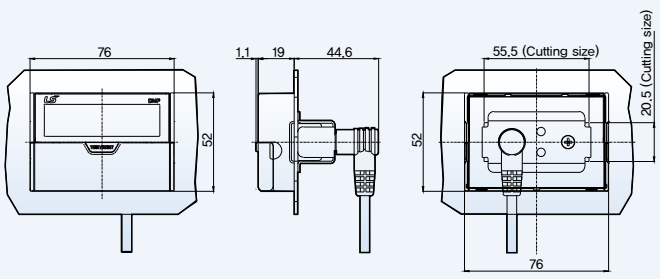
## Integrated penetration type




## Separated penetration type




### Panel insertion



# Memo



# *Perfect Selection of Motor Protection & Monitoring Device!*

*With the compact system structure and advanced protection functions, the device provides new standards of next-generation motor protection relay.*



# IMP Series

Intelligent Motor Protection Relays

- Ground fault protection for both zero current/residual current
- Support rated current 0.12~100A without external current transformer
- Definite/inverse time selection and diverse protection factors
- Basic application of ground fault/instance protection
- Separation of the display part with the use of Cable
- MODBUS communication and 4~20mA DC output

## Contents


**62** Product characteristics
**64** Rated specifications & model numbering system
**65** Operation & setting method
**69** Terminal configuration / Wiring & cable connection
**70** Dimensions

# Product characteristics

## Convenience




**Comprehensive Digital Motor Protection Relay with the MCU (Microprocessor Control Unit)**
Real-time processing and high precision




**Applicable to Inverter Circuits**
Thanks to its characteristics to harmonic noise, it can be applied to the inverter control circuits. The available frequency range is 20~200Hz. When the relative harmonic factor is over 30%, a harmonic filter should be installed (However, the ground fault function should be off).




**Storage of Fault Events**
Up to 5 fault events can be stored for easy fault history management.



**One-Body Type and Separate Body Type**
The display can be attached to the panel front so that current, operation time and settings can be checked without fetching the unit. With the display separated, the motor protection is available.



**Communication support type**
RS-485 MODBUS communication with various systems.The model with analogue signals (4~20mA) is compatible with transducer systems.




**Various Reset Functions**
Manual, automatic and electric reset functions are provided for customer convenience.



**Date and Total Operating Time Setup**
When a fault occurs, its date and time are stored for easy checkup. When the total operation time is over, it is displayed for changing motor bearings or supplying oil.



**Password**
Settings are protected with a password.




**Total operating time and operating time setting**
When the predefined operating time has elapsed, related information is displayed so that operators may replace the motor bearing and check the refueling cycle.



**Quick Setup**
All settings can be decided quickly on the display.



**Wide Setting of Ground Fault Current Sensitivity 30mA~25A**
Zero current sensing by zero sequence CT. zero current sensing by Residual circuit.

## Reliability



**Thermal Inverse Time, Inverse Time and Definite Time Modes**
According to user's needs, the motor can be protected in the inverse time mode or definite time mode.



**3-Phase Digital Ampere-Meter**
3-phase current is displayed every two seconds for motor monitoring.

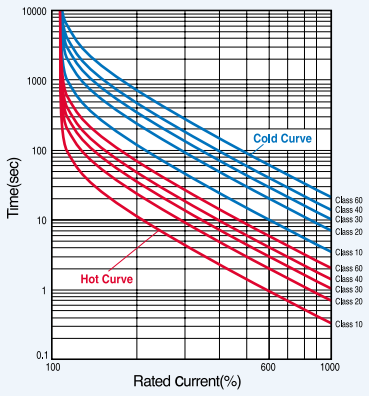



**Wide Current Setting Range: 0.125~100A for One Model**
With the slide S/W, the current setting range can be decided 0.5~10A or 5~100A. Depending on the number of CT penetration, even 0.125A current can be protected. (Wire penetration hole is required).

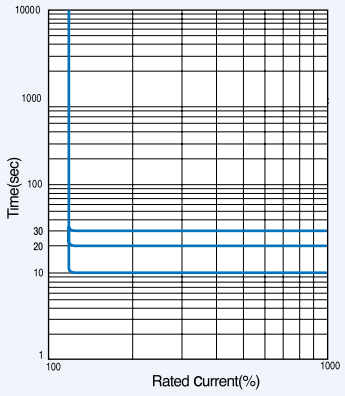
## Overcurrent-51

By setting up an operating time in the 1-60 seconds unit on the basis of 6005 of rated current in consideration of a motor's starting time, it is possible to configure the overload characteristic curve of Class 1-60.

If Definite Time Characteristic is selected, the equipment starts to detect overcurrent after the set operating delay time (D-Time) regardless of a motor's generated heat. If overcurrent continues to be supplied after an operating time (O-Time), Trip occurs.



<Inverse Time Characteristic>



<Definite Time Characteristic>

## Stall/Locked Rotor-48/51LR

This function is used to prevent the loss and damage made by a motor's rotor stall, starting failure, and staring delay, and to detect an increased load current by overheat overload in operation or the case that load torque exceeds motor torque in order to block a circuit. Overcurrent function by starting current works after a set delay time

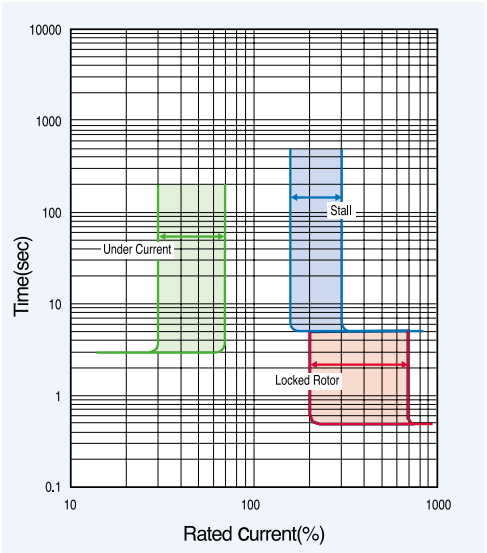
## Under current-37

This function is used to monitor the no-load caused by the separation or damage of a motor's drive shaft, or to prevent a pump's idle rotation (no-load). It is possible to set up to 30~70% of rated current. It works within three seconds.

## Phase fail/Phase unbalance-47P

If phase failure occurs, a motor fails to start. A motor in operation stops due to shortage of torque or has overheat due to continuous reverse phase current.
IMP calculates phase unbalance of three-phase current. It is possible to select one of the two cases: if the calculated result is 70% or more, this function is executed within 1.5 seconds; if phase unbalance factor is 10-70%, trip occurs within three seconds.

* In a single-phase motor, turn OFF phase fail and phase unbalance protection function.




## Reverse phase

This function is used to prevent a motor's reverse rotation. After the phase difference of three-phase current inputs is compared, this function is executed within 0.1 second if the phase sequence changes. Reverse phase is checked only if a motor starts up.
In a single-phase motor, turn OFF this function.

## Ground fault-51G

This function is used to detect ground fault leakage current. In other words, it aims to prevent leakage-induced ground fault and secondary accidents (short circuit and electric shock).
It is possible to set up a current sensitivity and an operating time differently depending on grounding system or protection purpose.
It is possible to set a current sensitivity to 30mA~25A and an operating time to 0.05~1.0 second.

# Rated specifications & model numbering system



Integral type



Extention type

## Rated specifications

| | | |
|---|---|---|
| Protection | | Over current, Lock/Stall, Phase failure, Phase unbalance, Reverse phase, Under current, Ground fault, Short circuit |
| Connection method | | Extention type |
| Operating Time Characteristics | | Heat accumulation inverse time / inverse time / definite time |
| Rated current | | 0.5~10A/5~100A (Separate) |
| Display | | 4digit, 7-Segment |
| Operating power | | AC/DC 85~245V (50Hz/60Hz) |
| Return method | Auto | 1~20min |
| | Manual / Electrical | On/Off Selectable |
| Installation / installation method | | Display can be installed separately, 35mm DIN rail / Screw installation |
| Tolerance | Current | ±5% |
| | Time | ±5% |
| | 4~20mA Output | ±5% |
| Time setting | Startup delay | 1~200sec |
| | Operation delay | 1~60sec |
| Aux. contact | Configuration | 3-SPST(Power supply 1a1b, instantaneous operation 1a) Note1) |
| | Capacity | 3A/250VAC Resistive Load |
| | Contact minimum load | 10mA / 5VDC |
| ZCT Input | | 200mA/100mV (Exclusive ZCT) Note2) |
| Environment | Operation | -10~55°C |
| | Storage | -20~70°C |
| | Relative humidity | within 80% RH, no condensation |
| Insulation Resistance | | 100Mohm/500VDC |
| Power consumption | | 1.2X50us 5kV Prototype waveform supply |
| Fast Transient | | 2kV/1Min |
| Power consumption | | Below 3W |

Note) 1. See No. 17-19 of A-Group in Setting menu.
2. It is used if zero current detection type is selected.
3. This product is designed for protecting a low-voltage motor with 1,000V or less. Therefore, it should not be used in high voltage lines.

## Model numbering system

IMP — C — A420 — 10A — 110/220

| Factors Protected | |
|---|---|
| C | Current |

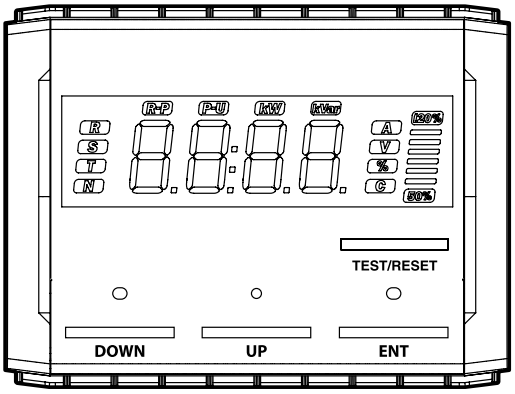
| Communication | |
|---|---|
| NO | None |
| A420 | 4~20mA Output |
| M485 | Modbus/RS-485 |

| Current adjustment range | |
|---|---|
| 10 | 0.5~10A |
| 100 | 5~100A |

| Control Voltage | |
|---|---|
| 110/220 | AC/DC85~245V |
| 24/36 | AC/DC24~36V |

# Operation & setting method

## 1. Check the Test/Reset button




1) Check wires.
2) Note) While the motor is running, the Test/Reset key does not work.
3) Press again the Test/Reset key to reset the EMPR.

Note) While the motor is running, the Test/Reset key does not work.

## 2. Setting

1) Press the Enter key. Then “P-99” is displayed.
   Use the Up/Down keys to change the password.
2) Press the Enter key to enter A-gr setup mode.
   Use the Up/Down keys to select a group and Press the Enter key to enter the selected group. Press the Test/Reset key to move back to the previous mode.
3) In the A-Grp mode, Press the Enter key. Then “1.CHA” is displayed.
   Use the Up/Down keys to select an item and Press the Enter key to enter the selected item.
   Press the Test/Reset key to move back to the previous mode.
4) Use the Up/Down keys to set up the value and Press the Enter key to save it.

Note) When the power is supplied first or is resupplied after a power failure, must set up the date in b-gr, 5.S-d.
Set up the rated current S/W while the power is off.

## 3. Quick setup

1) Press the “Up and Enter” keys at the same time. “UPLD” is displayed and settings are uploaded to the display.
2) Insert the display to the body without settings, and then press the Test key to enter the test mode.
3) Press the “Down and Enter” keys at the same time. “TEST” is displayed and downloading is completed.
4) Press the Test key to return to the normal mode.

Note) Communication settings cannot be uploaded or downloaded.

## 4. Setting checkup

1) Press the Enter key.
2) Use the Up/Down keys to select a group and Press the Enter key to enter the selected group.
   Press the Test/Reset key to move back to the previous mode.
3) Use the Up/Down keys to select an item and Press the Enter key to enter the selected item.
4) Press the Enter key again to check settings.

## 5. Failure event checkup

1) Press the Up and Down keys at the same time to display “1.O-C” (recent failure events).

Note) When no failure events are stored, “1.non” is displayed.

2) Use the Up/Down keys to select an event and press the Enter key to go to the selected event.
3) The R-phased failure current is displayed. Every time the Down key is pressed, S-phased failure current, Tphased failure current, overload rate and date are displayed one after the other.
4) Press the Test/Reset key to move back to the previous mode.
5) Press the Up and Down keys at the same time to get out of the failure event checkup mode.

## 6. Forced thermal reset

When the system is tripped while it is in the thermal inverse time mode, if you want to turn the EMPR into the cold mode by resetting the motor’s heat amount, Press the Enter and Test/Rest keys at the same time.

* When a trip occurs due to the thermal excess current, if the motor is started right after it is reset, as the motor is hot, it is highly likely that the motor is tripped again.

## **Setting menu** (A Group)

| Group | Menu | Setting Value | Description | Default Value |
|---|---|---|---|---|
| A | 1.CHA | dEF/th/n-th | Operation Characteristics (Definite/Thermal Inverse/Inverse) | n-th |
| | 2.0-t | 1~60s | Operation Time (sec) | 60 |
| | 3.d-t | 1~200s | Delay Time (sec) | If dEF |
| | 4.r-C | 0.5~10A/5~100A | Rated Current | Max. value |
| | 5.Ctr | 0.25, 0.5, 1~200 note 1) | CT Ratio (4 times, twice, once) | 1 |
| | 6.Loc | Off, 200~800% | Lock Protection (sec) | Off |
| | 7.StL | Off, 150~500% | Stall Protection (sec) | Off |
| | 8.P-F | Off/On | Open Phase | Off |
| | 9.P-U | Off, 10~70% | Unbalance Protection (%) | Off |
| | 10.rP | Off/On | Reverse Phase | Off |
| | 11.UC | Off, 30~90% | Under Current Protection (%) | Off |
| | 12.gF | 0ff, 0.03, 0.05/0.1~3A | Ground Fault Operation Current (Zero sequence CT) (A) | Off |
| | 13.gn | Off, 20~500% (FLCmin) note 2) | Ground Fault Operation Current (Residual circuit) (FLCmin) | Off |
| | 14.gt | 0.05, 0.1~1.0s | Ground Fault Operation Time(sec) | - |
| | 15.gd | On/Off | Ground Fault Delay During Start | On |
| | 16.IC | Off, 500~1000% | Instantaneous Protection (%) | Off |
| | 17.AL | I-tp, I-AL, ALo, U-C, OrH | 07-08 Output setting (see the output information described below.) | I-tp |
| | 18.Ar | On, 60~110/10% note 3) | 07-08 Output setting (current or no current, and alarm) | On |
| | 19.cS | 1A1b, 2A, 2b | Contact (95-96, 97-98) Setting | 1A1b |

Note) 1. In case of CT ratio, rated current setting S/W is not displayed; in case of 100A product, 5.Ctr(CT) item is not displayed.
2. In case of 10A rating, it is possible to set to 0.1~2.5A; in case of 100A rating, it is possible to set to 1~25A.
3. No. 18 menu appears only if "ALo" is enabled in No. 17 menu.
(On: if a current is recognized, 07-08 contacts are displayed. 60~110%: if an on-load current value is higher than a set load factor, 07-08 contacts are displayed.)
4. No. 17 menu operation

| 17.AL Setting | | Output conditions | Alarm display type | |
|---|---|---|---|---|
| | | | Motor operation | 07-08 |
| | I-tp | Detect instantaneous current | Motor stop | NC |
| | I-AL | Detect instantaneous current | Keep status | NC |
| | U-C | Detect on-load less than low current set value | Keep status | NC |
| | OrH | Set and display operating time | Keep status | NC |
| | ALo | Select 18.Ar setting | Comply with the set value of the No. 18 item | |
| **18.Ar Setting** | | If ALo is set in the No. 17 menu | Motor operation | 07-08 |
| | On | Display on-load status( I > 0A) | Keep status | NC |
| | 60~110% | On-load of current higher than a set value | Keep status | NC |

| 19.cS Setting | | Output conditions | Contact display type | |
|---|---|---|---|---|
| | | | 95-96 | 97-98 |
| | 1A1b | Normal operation status | NC | NO |
| | | Ground fault/leakage accident | NO | NC |
| | | Failures including overcurrent, phase failure, reverse phase, and ground fault | NO | NC |
| | 2A | Normal operation status | NO | NO |
| | | Ground fault/leakage accident | NO | NC |
| | | Failures including overcurrent, phase failure, reverse phase, and ground fault | NC | NO |
| | 2b | Normal operation status | NC | NC |
| | | Ground fault/leakage accident | NC | NO |
| | | Failures including overcurrent, phase failure, reverse phase, and ground fault | NO | NC |

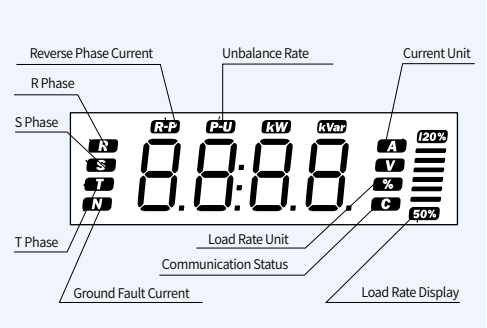
## Setting menu (B Group)

| Group | Menu | Setting Value | Description | Default Value |
|---|---|---|---|---|
| B | IE-r | On/Off | Electric Reset | On |
| | 2A-r | Off, 1~20min | Automatic Reset (min) | Off |
| | 3r-t | Hour/Minute | Run Time | Time Check |
| | 4Srt | Off, 1~8760 time | Run Time Setup (Hour) | - |
| | 5.S-d | 2009/01.01/00:00 | YY/MM/DD/ HH:MM (View/Setup) | - |
| | 6.trt | Day/time : min | Total Run Time | Time Check |
| | At-d | 0.5~10/5~100A | 20mA Output settings | A420 model |
| | A.Adr | 1~247 | Communication address | M485 model |
| | b.bPS | 96/192/384 | Communication speed | |
| | c.S-P | On/Off | SWAP | |

Note) 1. If power is first supplied or power is recovered after outage, make sure to enter date information (5.-sd).
2. Auto reset is applied only to overcurrent Trip.

## Operation display

| display | Description | Remark |
|---|---|---|
| O-C | Over current Trip | Operate within predefined time. |
| U-C | Under current Trip | Operate within 3 seconds |
| P-F | Open Phase Trip | Operate within 1.5 seconds when the unbalance rate is over 70%. |
| P-U | Unbalance Trip | Operate within 3 seconds. note 4) |
| Loc | Lock Trip | Operate within 0.5 seconds. note 4) |
| StL | stall Trip | Operate within 3 seconds. |
| r-P | Reverse Phase Trip | Operate within 0.1 second. |
| G-F | Ground Fault Trip | Operate within predefined time. |
| Sho | Instantaneous Trip | Operate within 0.05 seconds. |
| OrH | Elapsed Time (No Trip) | The operation time is reset when the Reset key is pressed. |
| CErr | Communication Fault between Body and Display (Press the ENTER/RESET key to return to the normal mode) | |
| uErr | Different program version between main body and display part (if this message appears, contact our company.) | |




Note) kW, kVar, and V indicate the specification of the voltage models (under development).

Note) 1. The maximum allowable operating time of Loc function and reverse phase function is +50mSec.
2. Reverse phase function is detected for one second at the time of startup.
3. The allowable operating time of the instant function is +20mSec.
4. Inverse time: detect after O.t, Definite time: detect after D-t

## 7. IMP Specifications for low voltage 3-Phase induction motors (Reference)

| Full Load Current for the Motor | IMP Settings | | | External CT | Motor Output (Less than kW) | | |
|---|---|---|---|---|---|---|---|
| | Current Selection S/W | Wire Tunnel | CT ratio | | 220V | 380V | 440V |
| 0.7A or less | 0.5~10A | 4 times | 0.25 | - | 0.1 | 0.18 | 0.2 |
| 0.7~1.6A | | Twice | 0.5 | - | 0.25 | 0.55 | 0.6 |
| 1.6~8A | | Once | 1 | - | 1.5 | 3 | 3.7 |
| 7~100A | 5~100A | Once | 1 | - | 25 | 45 | 55 |
| 90~120A | 0.5~10A | Once | 30 | SCT-150 | 30 | 55 | 55 |
| 120A~160A | | Once | 40 | SCT-200 | 45 | 75 | 90 |
| 160~240A | | Once | 60 | SCT-300 | 55 | 110 | 132 |
| 240~320A | | Once | 80 | SCT-400 | 90 | 160 | 160 |
| 320~400A | | Once | 100 | 500 : 5 | 110 | 200 | 200 |
| 400~480A | | Once | 120 | 600 : 5 | 132 | 250 | 250 |
| 480~640A | | Once | 160 | 800 : 5 | 160 | 320 | 320 |

Note) 1. This table is written based on the full load current.
2. The CT is selected as a reference for the EMPR's current setting range.

## 8.Analog (DC 4~20mA) output

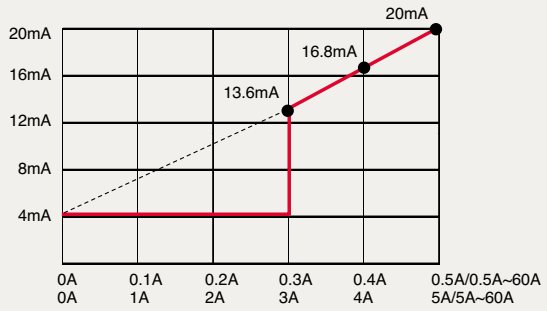
1) The biggest current out of measured 3-phase currents is converted into DC 4mA~20mA and the current measured remotely by digital meter can be displayed.
2) When there is no current, 4mA is sent. If the current goes beyond the predefined value, 20mA is sent.

$$\text{• Output Current} = \frac{16\text{mA} \times \text{Load Current} + 4\text{mA (Settings are changed in A.t-d of b-gr)}}{\text{Setting}}$$

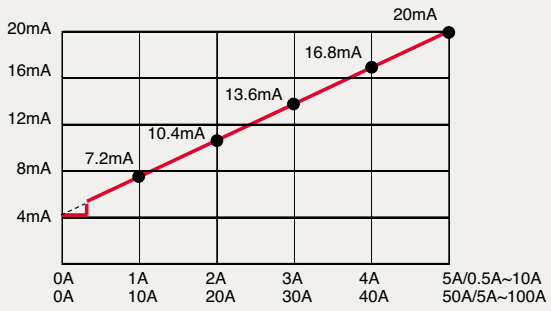
3) When the system is the 0.5A~10A setting mode, measurement starts from 0.3A. When the system is the 5A~100A setting mode, measurement starts from 3A. Thus, when the current is under 0.3A (3A), 0A is measured and output is 4mA. (To measure the load current correctly, an appropriate CT should be used).

Note) The allowable burden is less than 500Ω. Considering the receiver resistance (usually 250Ω) and track resistance), the shielding cable should be used.

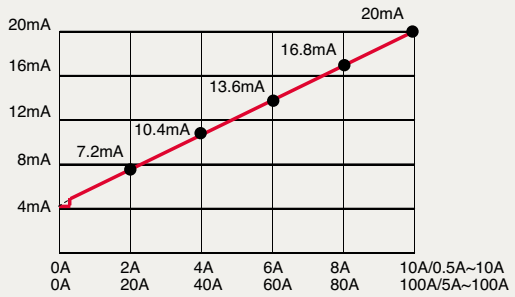
**Analogue output when the output is set to be 0.5A (5A)**




**Analogue output when the output is set to be 5A (50A)**

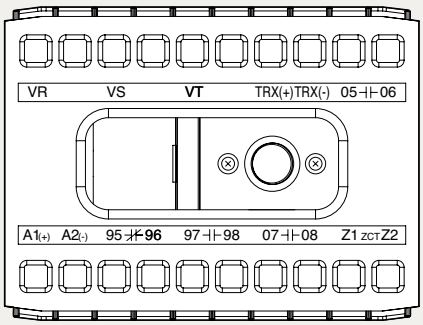



**Analogue output when the output is set to be 10A (100A)**



# Terminal configuration / Wiring & cable connection

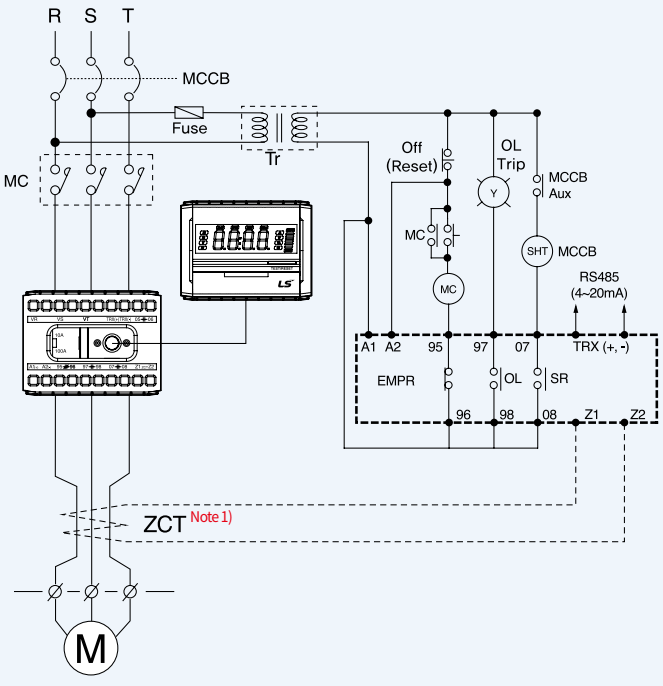
## Terminal configuration

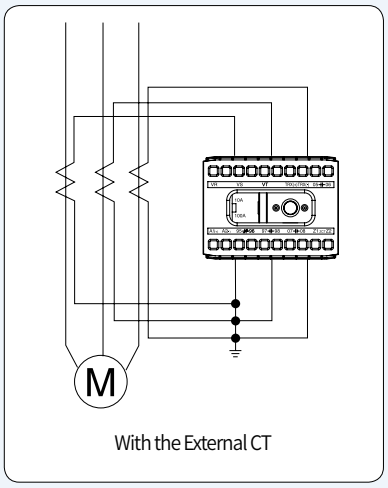
| Terminal layout | Communication specification |
|---|---|
|  | • Operation mode: Differential<br>• Distance: Max. 1.2km<br>• General RS-485 shielded twist 2-pair cable<br>• Baud rate: 9600/19200/38400bps<br>• Transmission Method : Half-Duplex<br>• Max. In/Output Voltage : -7V~+12V |



| Engrave | Description | Remark |
|---|---|---|
| A1(+), A2(-) | Input terminal for operation power | AC/DC85~245V |
| 95-96 | When the power is ON (NC contact output) | Settings Menu Reference |
| 97-98 | When the power is ON (NO contact output) | |
| 07-08 | Converted to the NC mode only when an instantaneous trip occurs. | |
| Z1, Z2 | Output terminal for the zero-phase sequence current transformer | Specific ZCT (for the EMPR) |
| TRX(+) | RS485 terminal (TRX+) Or 4~20mA (+) output | M485, A420 Type |
| TRX(-) | RS485 terminal (TRX-) Or 4~20mA (-) output | |
| VR/VS/VT | 3-phase voltage input terminal | Specifications not available for IMP-C models |
| 05-06 | Output terminal for voltage protection | |

Note) 1. The 3-phase voltage input terminal and 05-06 output terminal should be connected only for voltage protection models, which will be released in the future.
2. For RS485 connection, the terminal resistance should be 120Ω.
3. For 4~20mA current, the maximum burden should be less than 500Ω.



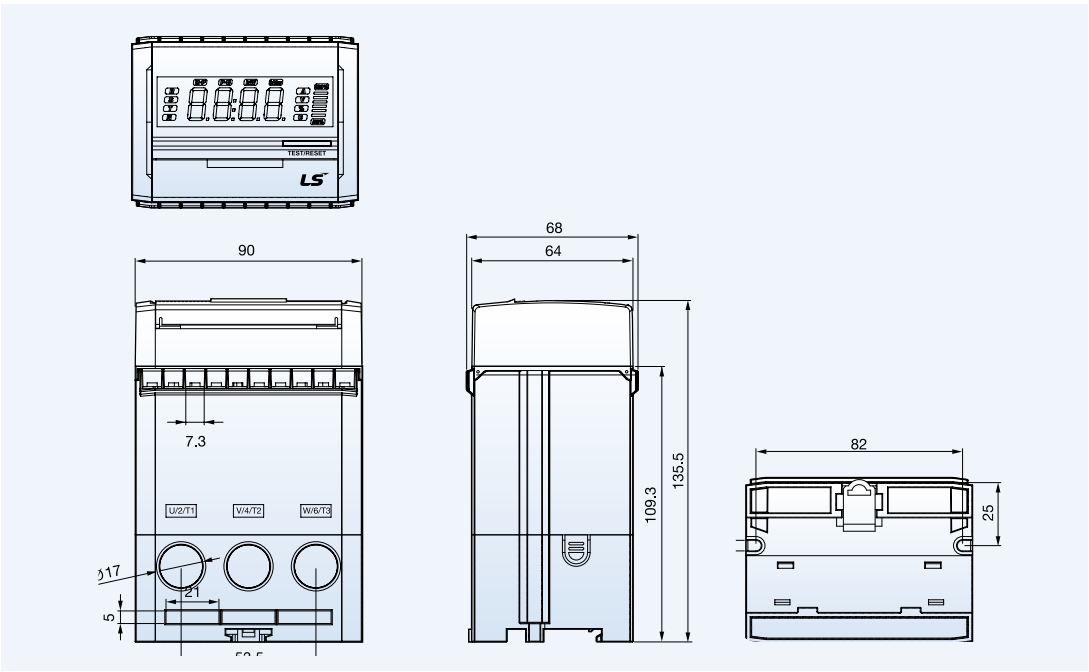




Note) 1. When the zero-phase-sequence current transformer is used to detect ground faults, connect the ZCT.
2. When the single-phase motor is used, all phases are connected except the S phase, and open-phase, unbalance and ground fault should be set OFF.
3. It is possible to change settings of output contact(95-96, 97-98, 07-08) at your discretion.

# Dimensions

## One-body type

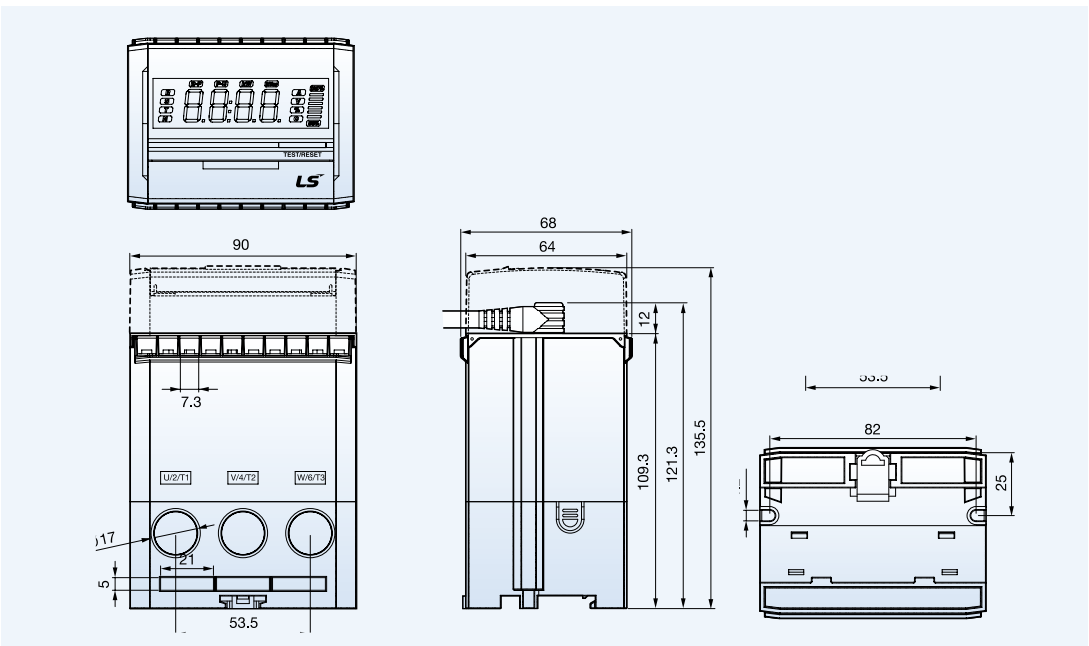
Unit : mm

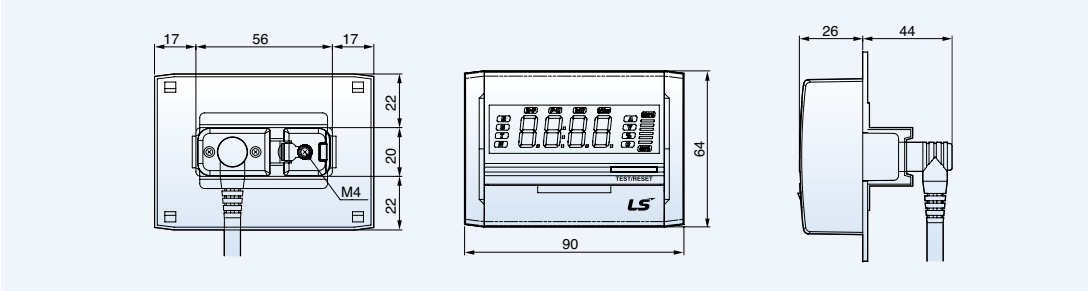



Note) The cable should be purchased separately (1m/1.5m/2m/3m).

## Separate body type

Unit : mm



# Memo

# *Innovative Upgrade of Motor Control Panel!*

*More compact and Safer! We implement perfect motor protection.*




- Power, Voltage, Current (measurement error: 1%)
- Power, Voltage, Current, Power Factor Protection
- Harmonic measurement (1st to 16th )
- Diverse motor starting types
  (Full voltage, Y-D, Reversible, Reactor, Inverter Starting)
- Modbus communication and 4~20mA

**One model with various motor starting types**

One S-EMPR model is applicable to various motor staring types, such as full voltage starting, Y-△ starting, reversible staring, Reactor starting, and Inverter starting.

**A variety of SCADA functions based on sequence structure**

With a simple sequence, it is possible to not only control local operation panel (LOP) and MCC panel, but conduct Supervisory Control And Data Acquisition through SPLC or DCS based auto operation and communication.





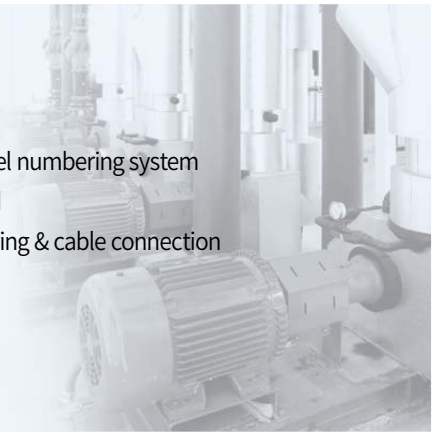
# MMP Series

## Smart Electronic Motor Protection Relays

- Current, Voltage, Power Measurement and Power Factor Protection
- Instantaneous interruption compensation and restarting
- Harmonic measurement (1st to 16th )
- Modbus communication and 4~20mA

Contents


74 Product characteristics
83 Rated specifications & model numbering system
84 Operation & setting method
96 Terminal configuration / Wiring & cable connection
103 Dimensions

# Product characteristics

## Convenience




**Comprehensive Digital Motor Protection Relay with the MCU (Microprocessor Control Unit)**
Providing real-time processing and high precision




**Applicable to invertor circuits**
It can be installed in the downstream of a speed driver where harmonic noise exists. The allowable frequency range is 10 to 400Hz.
A harmonic filter must be used if THD (Total Harmonic Distortion) is over 30%.
* Set the ground fault mode off to avoid the trip due to current unbalace.
* Voltage parameters are not available. Power measurement accuracy is not guaranteed.




**Function to store the cause(s) of failure / Fault**
Up to 5 motor failure events may be saved in the system, so that the failure history can be easily identified.



**Communication function (RS485 Modbus and 4~20mA output)**
With universal RS485/Modbus communication types, it is possible to establish various system and communication networks.
Analog current signal (4~20mA) output is compatible with conventional TD(Transducer) based system.




**A wide range of reset functions**
Manual/Automatic/Electrical reset functions are provided for user convenience.



**Date information display**
When a failure occurs, the date and time of failure occurrence are saved in the system to accurately identify the date of motor failure.



**Password setting**
When changing the set values, a password must be inserted.




**Total operating time and operating time setting**
When the predefined operating time has elapsed, related information is displayed so that operators may replace the motor bearing and check the refueling cycle.



**Quick Setup**
Same setting for another devices in different panels can be done simply via the display unit.

## Reliability



**Thermal heat build-up inverse time/inverse time/definite time selection function**

It is possible to select one of two types of inverse time and definite time in order to protect a motor perfectly.



**Wide setting range and Dual protection**

Providing Ground fault protection by dual detections -Zero-phase current and Residual current levels.




**Up to 100A the device can be used without external CT to providing convenience and cost-effective solution.**



**Various Motor Starting Modes**

In a Single Device several starting modes of operation available : Full voltage start, Y-△ start, Reversible start, Reactor start, Inverter start.




**Metering of Current, Voltage and Energy (with 1% accuracy for A & V)**

Real-time energy metering with high accuracy to support energy-saving Current / Voltage THD measurements (16 harmonic)




**Carrying out complex relay functions related to Current, Voltage, Energy and Power Factor**

Overpower alarm supported for energy monitoring




**Self-diagnosis and Sequence monitoring**

Providing a self-diagnosis function such as internal memory check in order to check fault conditions quickly



**Power loss and Restarting**

Device restarts after the momentary power loss for less than 30 seconds and returns to the former state. Time-delay setting between 0 to 300 sec. is available to prevent overload from all the motors' restarting at the same time.




**Frequent-Starting Protection**

The number of automatic resets for the set time (20 minutes) is settable to provide frequent-starting protection.

# Product characteristics

## Protective functions

### Product functions

| Type | Function | MMP-C (Current type) | MMP-S (Select ground fault) | MMP-P (Power type) | MMP-IR (Insulation Resistance) |
|---|---|---|---|---|---|
| Currents | Overcurrent | ● | ● | ● | ● |
| | Locked Rotor | ● | ● | ● | ● |
| | Stall | ● | ● | ● | ● |
| | Phase loss | ● | ● | ● | ● |
| | Imbalance | ● | ● | ● | ● |
| | Phase reversal overcurrent | ● | ● | ● | ● |
| | Undercurrent | ● | ● | ● | ● |
| | Zero-phase ground current | ● | ● | ● | ● |
| | Residual ground current | ● | ● | ● | ● |
| | Instanteous | ● | ● | ● | ● |
| | Select ground fault | - | ● | - | - |
| Voltages | Overvoltage | - | - | ● | - |
| | Undervoltage | - | - | ● | - |
| | Phase loss | - | - | ● | - |
| | Imbalance | - | - | ● | - |
| | Phase reversal overvoltage | - | - | ● | - |
| | ground current overvoltage | | ● | - | - |
| Power | Overpower | - | - | ●(Alarm) | - |
| | Underpower | - | - | ●(Alarm) | - |
| | Over power factor | - | - | ● | - |
| | Under power factor | - | - | ● | - |
| Additional function | Insulation resistance | - | - | - | ● |
| | Motor temperature | - | - | - | ● |

### Measurement function

| Measurement | Range | Accuracy(%) | Remarks |
|---|---|---|---|
| Voltage(V) | 0.00V~9999V | ±1.0% | Phase1 : Phase voltage, Phase3 : Line voltage |
| Current(A) | 0.00A~9999A | ±1.0% | Phase current |
| Zero-phase current(In) | 0.00A~9999A | ±3.0% | - |
| Reverse current($I_2$) | 0.00A~9999A | ±3.0% | - |
| Active power(W) | 0.000W~999.9MW | ±1.0% | Forward |
| Reactive power(VAR) | 0.000W~999.9MVAR | ±1.0% | Forward |
| Active power amount(WH) | 0.000W~999.9MWH | ±1.0% | - |
| Reactive power amount(WVARH) | 0.000W~999.9MVARH | ±1.0% | - |
| PF | -1.00~1.00 | ±0.03 | cosθ |
| Voltage hamonics(%) | 0~100% | ±5.0% | $2^{nd}$ -$16^{th}$ odd harmonics |
| Current hamonics(%) | 0~100% | ±5.0% | $2^{nd}$ -$16^{th}$ odd harmonics |
| Insulation Resistance | 0.2MΩ~50MΩ | ±10% | - |
| Motor temperature | -50°C~200°C | ±10% | - |

# Current protection

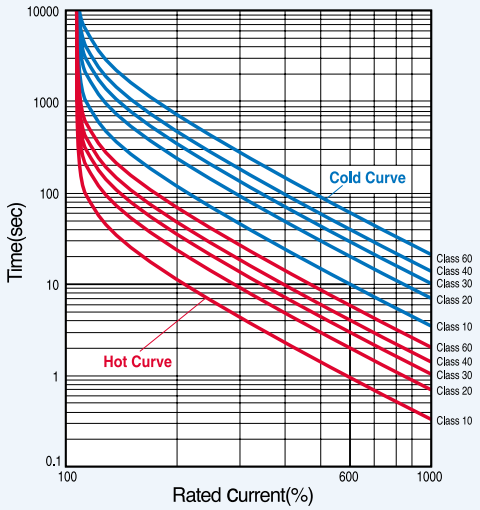
## Over current

The device provides overcurrent protection either with inverse-time or with definite-time element.

**1) Inverse-time delay curve**

The trip time decreases as the overcurrent increases in an inversetime curve.

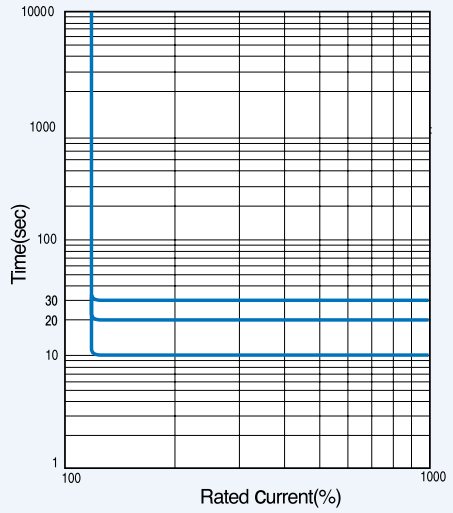
Inverse-time delay curve




**2) Definite-time delay curve**

The operating time is unaffected by the magnitude of the overcurrent.

Definite-time delay curve




## Stall/Locked rotor

Stall activates when the motor is unable to rotate due to any externally mechanical obstruction, and Lock activates due to internal issue of the motor.

## Phase fail/Phase unbalance

The motor is unable to start under phase loss. If it occurs while the motor is running it causes motor stopping by lack of torque, or significant rotor heating by reverse current. The S-EMPR calculates the percent three-phase unbalance current. If it exceeds 70%, which is determined to be phase loss, the device trips within 1.5 sec. If it is between 10 to 70% the device trips within3 sec. This function is disabled for a single-phase mode.

# Product characteristics

### Reverse phase

This protection is for preventing the motor from reverse rotation. The device detects motor phase rotation and trips within 0.1 sec. if phase sequence is incorrect. It detects when the motor is starting.

* This function is disabled for a single-phase mode.

### Under current

If the real load current falls below the warning or trip level for longer than the time-delay setting, the device can issue a warning or trip signal.

## Ground fault protection

### Ground fault

Stall activates when the motor is unable to rotate due to any externally mechanical obstruction, and Lock activates due to internal issue of the motor.

### Zero-phase ground current

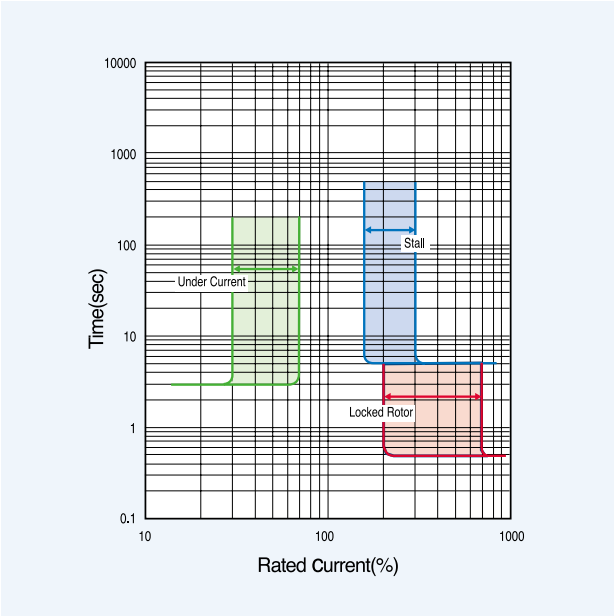
ZCT in or out of the product is used to detect zero current flowing in three phases.

### Selective ground fault

If a non-grounding system has ground fault, the current over the zero current transformer of each distribution line flows from the load side to the power side in a good line, and from the power side to the load side in a bad line. This protection function is able to select and block a bad line by determining the direction of failure current on the basis of the zero voltage.

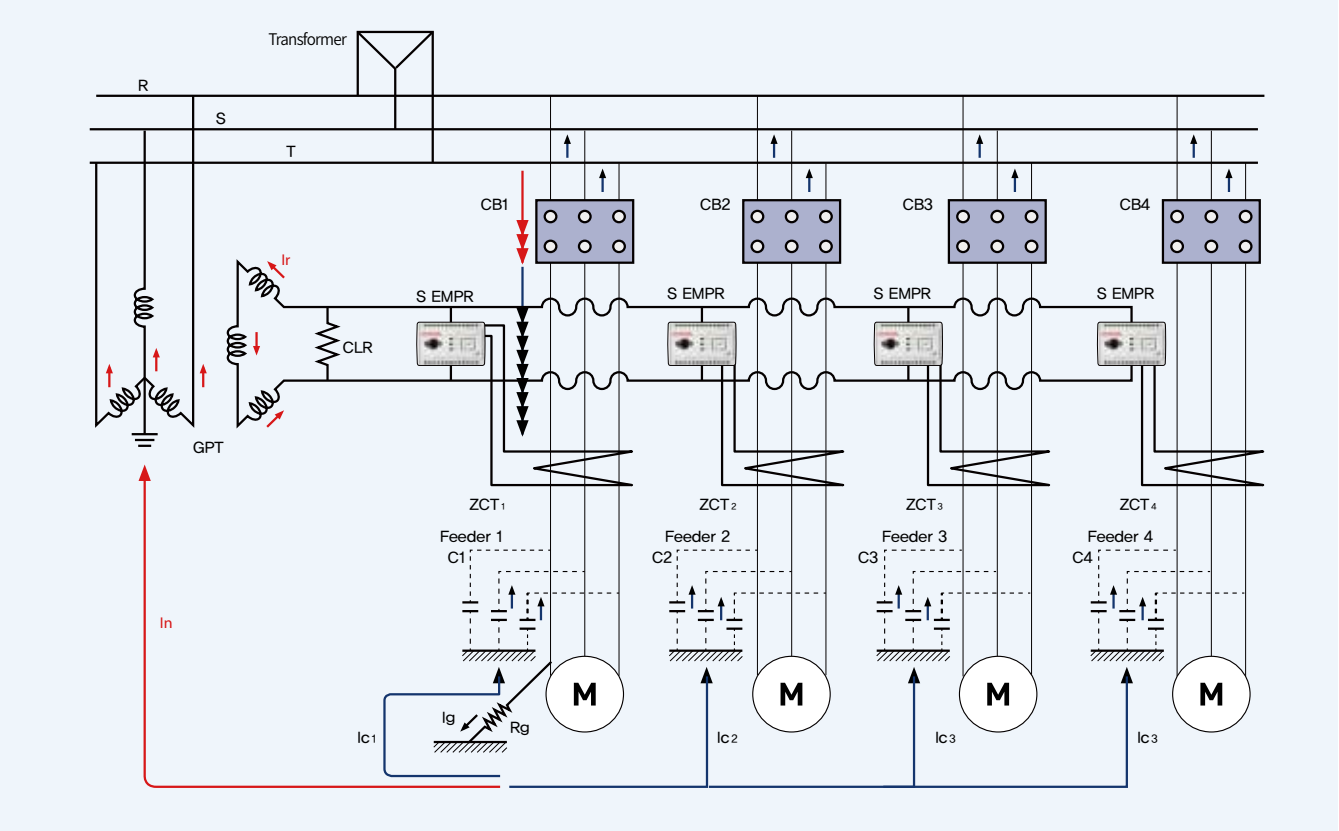
### Instance

While an AC motor is running, if an actual load current value is higher than an set value of instantaneous current, Trip occurs in 50msec.



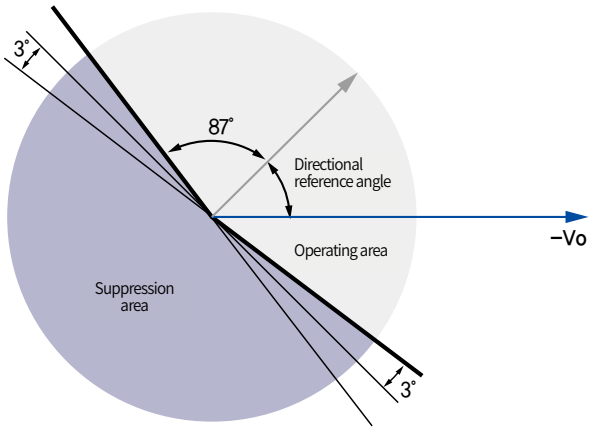
# Selective ground fault protection

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❶ - GPT : Grounding Potential Transformer
❷ - ZCT1, ZCT2, ZCT3, ZCT4 : Zero current transformer
❸ - CLR : Current-limiting resistor
❹ - CB : Circuit breaker
❺ - In : Current over GPT
❻ - S-EMPR MMP S : Smart digital motor protection relay
❼ - Ir : Current-limiting resistor current
❽ - Rg : Ground fault resistance at ground fault point
❾ - In : Current over GPT
❿ - C1, C2, C3, C4 : Line capacitance of each feeder
⓫ - Ig : Ground fault current
⓬ - Ic : Line charging current (1c1+Ic2+Ic3+Ic4)

## Operating characteristic




As shown the figure, the bad line (Feeder1) and the good line has an opposite current direction. With the use of this current direction, it is possible to select one. If another line has a failure, the charging current of the line flows in an opposite direction from the current flowing at the time of the accident. Therefore, it does not run.

In a non-grounding system, the ground fault current is the sum of the line charging current and the limiting-resistance current. Since it is relatively small, zero CT(ZCT) is needed. This product has ZCT built in so that it is possible to make a system simply.

# Voltage & Power protection

## Over current

Overvoltage protection detects the voltage levels and operates if they are greater than the setting to protect the sensitive loads or circuits against such condition.

## Under voltage

If the voltage levels fall below the setting the Undervoltage protection issues a warning or trip signal to protect the sensitive loads such as a inductive motor.

## Phase fail/Phase unbalance

This protection operates if the percent phase-to-phase voltage unbalance is greater than the setting.

Used to prevent an excessive vibration of three-phase induction motor and a damage of the stator and rotor windings.

This function is disabled under a single-phase mode.

## Reverse phase

This protection operates if the percent phase reversal voltage is greater than the setting.

It detects when the motor is starting. This function is disabled for a single-phase mode.

## Over power

The overpower element operates if the three-phase active power exceeds the setting level.
This element can be used to prevent the power from entering the generator before disconnecting from the system when the generator operation is finished.

## Under power

The underpower element operates if the three-phase active power falls below the setting level.

## Over power factor

The over power factor element operates if the power factor exceeds the setting level.
If the load is very small, especially for no-load the capacitive current may flow due to overcapacity of the capacitor in line, which causes the power loss of the line and transformer, and electric stress on motors. This element can be used to protect against such current.

## Under power factor

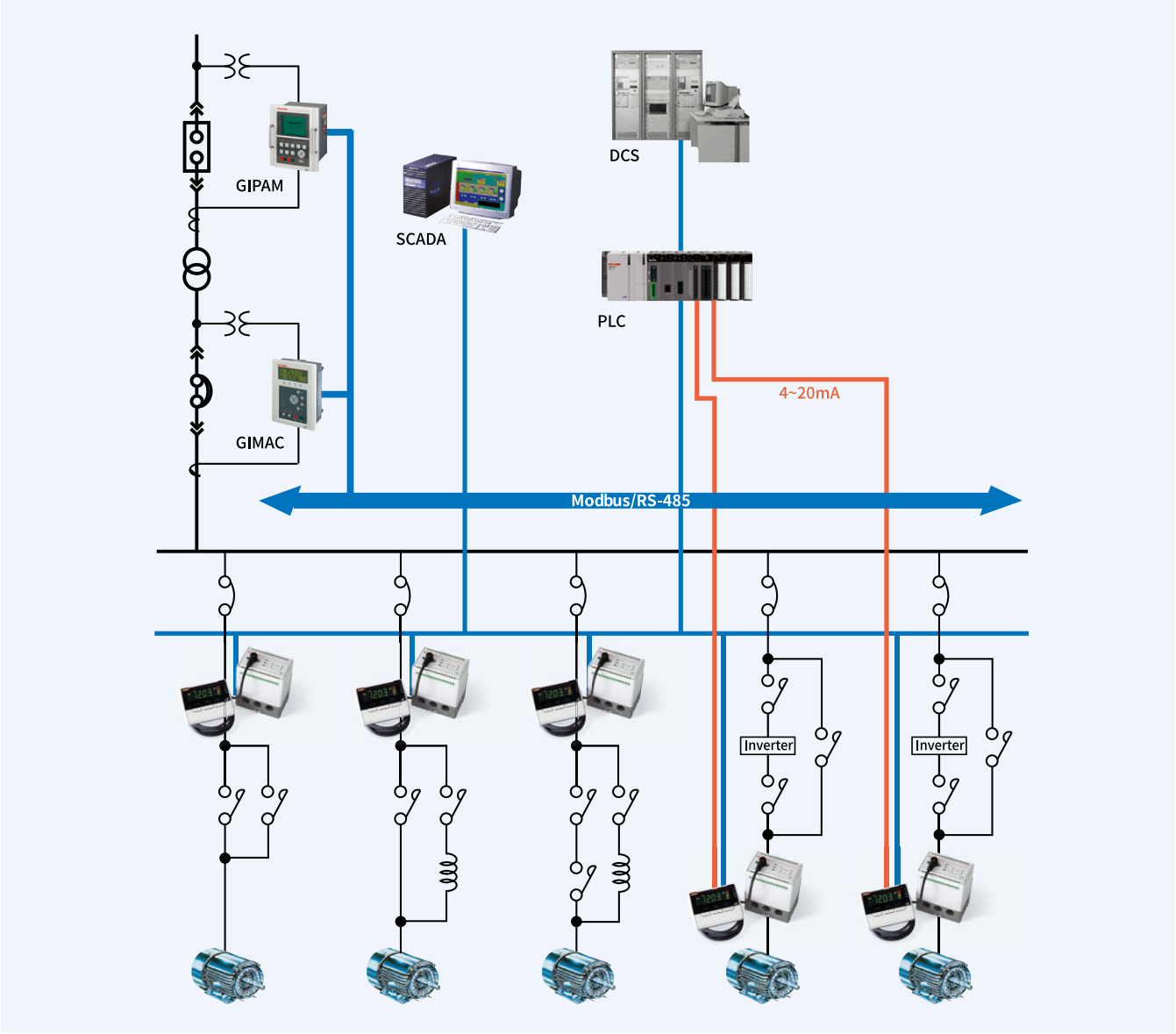
The under power factor element operates if the power factor falls below the setting level.
If the power factor of a customer falls below that of a generator in a power plant the generator current increases over the rated current or the power output is limited. For this reason, the power factor of a customer is regulated.
In addition, the under power factor causes the increase of the input current which prevents the temperature rise in cables, transformers and motors.

# Communications

## Modbus specification

| | |
|---|---|
| Communication number | 1~247 |
| Baud rate | 9600, 19200, 38400 bps |
| Communication Parity | None, Even, Odd |
| Stop Bit | 1bit (fixed) |
| Communication data swap | OFF / ON (Limited to float, long data of 0x04 (Read Input Registers) ) |
| Operation mode | Differential |
| Communication distance | Max. 1.2km |
| Cable | RS-485 Shielded Twist 2-Pair Cable |
| Transmission Method | Half-Duplex– |
| Max. In/Output Voltage | -7V~+12V |

## Communication system configuration



# Analog (4~20mA) output function

## Specification

- This function measures the maximum out of the 3-phase currents and converts it into DC 4~20mA for output, which can be converted back to the original value by a digital meter.

- 20mA Output Settings : 0.5~10A or 5~100A

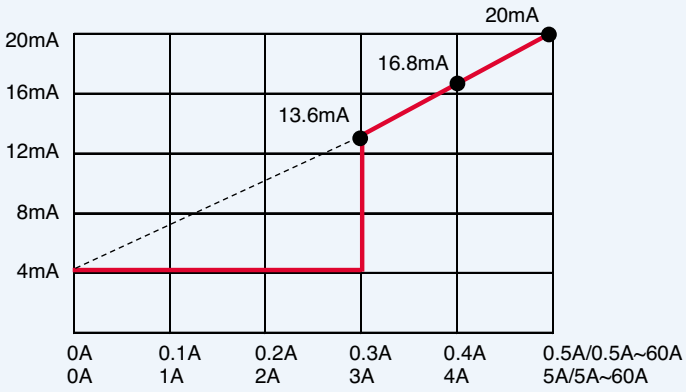
Note) 1. In the 0.5~10A setting mode the device starts to measure from 0.15A, which means the current 0.15A or less is measured as 0A and the output becomes 4mA. (0.15A when one> 4mA is being a real measurement)
2. Accuracy at 25℃ : ± 0.15% / ℃

- During stopping : 4mA
- Rated setting value or more : 20mA
- Load : 500Ω or less

Note) The allowable burden of cable must be less than 500Ω.Shielded cables are recommended in consideration of the resistance of the receiving meter (typically 250Ω) and the line resistance.

$$\text{* Output current} = \frac{\text{(I upper - I lower)}}{\text{TD setting}} \times \text{load current} + 4\text{mA}$$

$$= \frac{16\text{mA}}{\text{TD setting}} \times \text{load current} + 4\text{mA}$$



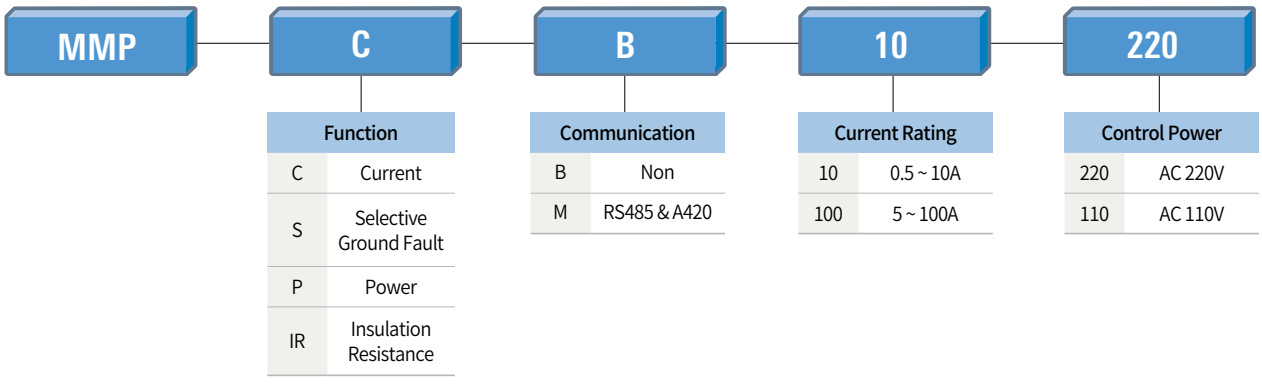

Analog output for 10A (100A) output setting

# Rated specifications & model numbering system

## Rated specifications

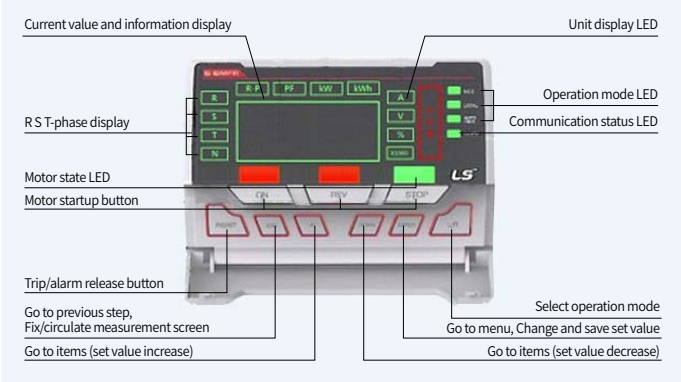
| Connection | | Tunnel type (Passing through CT holes) |
|---|---|---|
| Operation characteristic | | Thermal-inverse / Inverse / Definite |
| Rated current | | 0.5~10A/5~100A (Select Rated on Order) |
| Display screen | | 4 digit, 7-Segment, LED |
| Control Power | | 110Vac or 220Vac 50/60Hz |
| Reset | Auto | 1-20 minutes |
| | Manual | ON / OFF selectable |
| Mounting | | Display unit : sepatately mountable |
| Accuracy | | Current and voltage metering : ± 1% of rating or ± 2% of minimum rating |
| | | 4~20mA output : ± 5% |
| Time delay | Start | 1-200 seconds |
| | Operation | 1-60 seconds |
| Auxiliary contacts | | 6 contacts (3A / 250VAC at resistive load, power type based) |
| | Contact minimum load | 10mA / 5VDC |
| ZCT input | | Basic installation of built-in ZCT<br>External ZCT (200mA/1.5mA, universal ZCT connectable) |
| I/O assured voltage | 110V Type | 63V ±10% |
| | 220V Type | 140V ±10% |
| Environment | Operation Temp. | -10~55°C |
| | Storage Temp. | -20~70°C |
| | Humidity | within 80% RH, no condensation |
| Insulation resistance | | 100MΩ/500VDC |
| Lightning impulse voltage | | 1.2 × 50μs 5kV standard waveform applied |
| Fast Transient | | 2kV/1Min |
| Power consumption | | 5W or under |

## Model numbering system



# MMP-CB/CM/PB/PM/SB/SM-10/100 Model

**Before starting the motor, proceed as follows :**




## 1. Connect the display unit to the main unit of the device and then turn on. Verify that Power LED is switched on and the measurement screen is displayed.

1) Verify the operations of ON, REVand STOP keys which are used to control motor starting. Press ON key and then the red LED above the key is switched on and motor on signal is issued .
Press STOP key and then the green LED above the key is switched on and motor on signal is stopped .
Note) REV key is activated when the motor control is set to reverse starting mode.

2) Verify the operations of a mode control key. Each time pressing L / R key the control mode changes : MCC → AUTO → REMOTE → COM

3) When the device is booted up the measurement screen is display by default. Pressing Enter key allows to access the modes : Group → Menu → Setting value. Press Esc key to return to the previous mode.
Use Up & Down keys to change values in the screens of Measurement, Group, Menu, Setting. When the relay / alarm operates press Reset key to reset.
Note) refer to a manual for the details.

## 2. Verify the operations of Test function and Reset key through trip.

1) Verify the wiring first. Press Enter key to access Group menu, and use Up / Down keys to access B Group as shown "b-gr" and press Enter to access Menu with displaying "1.Loc". Use Up / Down keys to access "6.r-p" which denotes Phase reveral menu, and press Enter to access "CHEC" which denotes Setting value, and press Enter to view current wiring information.
Note) 1. The phase information is displayed only when current is applied. If there is no current "---" is displayed.
2. Voltage wiring information is available via "c-gr" (C group) → "8.urp" (Voltage phase reveral settings) → "CHEC" → Pressing Enter Key. The phase information is available when a voltage is applied.

2) Turn on the motor and access "d-gr" which denotes D group and move to "tESt" menu using Up / Down keys and press Enter to access Fault items. Select the desired Fault item and press Enter to trip the device.

3) Press Reset key to reset the device and return to the measurement screen.
Note) In the first access to change a parameter "P-99" for password input is displayed. Press Up key to change it to "P-00" and press Enter and then Setting change is allowed. If there is no input for 2 minutes it returns to the measurement screen.

## 3. Check the settings.

1) At normal state pressing Enter key access mode "A-gr" which enables setting. Select the desired group using the Up / Down keys and press Enter key to enter the desired group. To enter previous mode, press the Esc key.

2) The desired group displays from No. 1 menu. Select the desired menu using the Up / Down keys and press Enter key to enter the setting mode. To enter previous mode, press the Esc key.

3) Press Up / Down keys in the setting screen and then "P-99" is displayed. Press Up / Down keys to change the password to "P-00" and press Enter to release it. After that select the desired value and press Enter to save the setting.
Note) Enter the date exactly when the power is turned on for the first time or recovered after the outage.

## Menu List (MMP-CB/CM/PB/PM-10/100 )

### A-group

| Group | Menu | Description | Setting range | Default |
|---|---|---|---|---|
| A | 1.PHA | Single-phase / 3-phase | 1P/3P | 3P |
| | 2.5-F | Frequency | 50/60 | 60 |
| | 3.CHA | Characteristics (Over Current Protection) | Off/dEF/th/n-th Note 1) | n-th |
| | 4.0-t | Operating time | 1~60sec (5/10/20/30/60) | 60 |
| | 5.d-t | Time Delay | 1~200sec | 200 |
| | 6.r-C | Rated current (10, 100) | 0.5~10/5~100 | 10 |
| | 7.Ctr | CT ratio Note 2) | 0.25/0.5/1~200 | 1 |
| | 8.drU | Starting mode | dir/y-d/F-r/Ind/lut | dir |
| | 9.d-t | Y start time (lut start time) | 1~120sec (lut : 0.1~1sec) | 5 (0) |
| | 10.Yd | Y-D switching time | 0.05/0.1/0.2 | 0.2 |
| | 11.St | Outage compensation time | Off/1~30sec | Off |
| | 12.Sd | Restart time | 0~300sec | 0 |

Note) 1. Operating characteristic th denotes inverse-time curve with thermal-memory and n-th denotes inverse-time curve without thermal-memory .
2. For the 100A type there is no CT ratio as it is fixed as 1.
3. Some menu are not disabled depending on the related setting.
4. Phase reversal mode needs to be switched on only during test starting, or verify wiring via wiring CHEC function. it is recommended to turn off during normal running, .
(An error on phase reversal may occur due to noise.)

### B-group

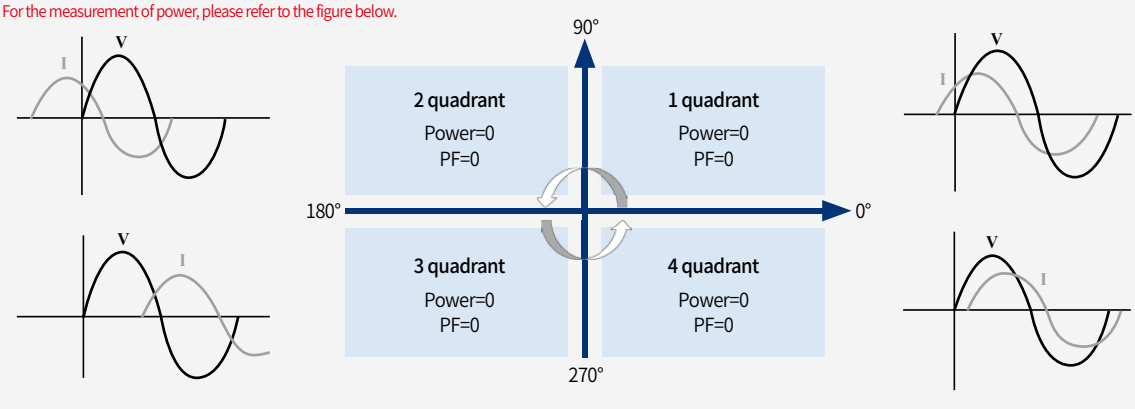
| Group | Menu | Description | Setting range | Default |
|---|---|---|---|---|
| B | 1.Loc | LOCK | Off/200~800% | Off |
| | 2.StL | STALL | Off/150%~500% | Off |
| | 3.P-F | Phasee loss (current) | On/Off | On |
| | 4.P-U | Phasee unbalance (current) | Off/30~70% | Off |
| | 5.Pdt | Phasee loss / unbalance Time-delay | 0~200sec | 0 |
| | 6.r-P | Phase reversal (current) | Off/On/CHEC Note 1) | Off |
| | 7.Crt | Phase reversal operation time | 0.1~1.0sec | 0.1 |
| | 8.U-C | Undercurrent | Off/30~90% | Off |
| | 9.Ect | ZCT selection (PC mV, 1.5mA) | 100/1.5 Note 2) | Enbd |
| | 10.9F | Ground fault (Zero-phase) | Off/0.03/0.05/0.1~3.0 | Off |
| | 11.9n | Ground fault (Residual current) | Off/30~100% | Off |
| | 12.9t | Ground fault operation time | 0.05~3.0sec | 3.0 |
| | 13.9d | Phase unbalance delay time | 0~00sec | 60 |
| | 14.I C | Intance | OFF/10A type : ~100A Note3)<br>/100A type : ~800A,<br>100A or more: using external CT | OFF |
| | 15.AL | Output contact method | ALL I-tp, ALo, U-C, OrH Note4) | |
| | 16.Ar | Current Y / N, Alarm | ON/60~110% | |
| | 17.th | THD (voltage) | 0~100% | |

Note) 1. When CHEC set value of negative sequence item is selected, additional wire information is displayed.
2. ZCT selection is set depending on whether company dedicated product or universal product in the market is used.
3. Tolerance guarantee scope for 10A type: ~100A/100A type: 600A for 50Hz, 720A for 60Hz
4. I-tp: Instantaneous trip, Circuit breaker trip (interlocked), Alo: Current alarm setting, U-C: When operating under low current factor, OrH: When the motor consecutive operating time is over the set value and when ALL is set, output (AUX-C3) will be released at the time of all current relay factor (including I-tp) operation.

## C-group : Menu for power type activation

| Group | Menu | Description | Setting range | Default |
|---|---|---|---|---|
| C | 1.r-u | Rated voltage (line to line) | 110~480 | 380 |
| | 2.O-u | Over voltage | Off/105~130% | Off |
| | 3.O-t | Over voltage operation time | 1~30sec | 30 |
| | 4.U-u | Under voltage | Off/50~95% | Off |
| | 5.U-t | Under voltage operation time | 1~30sec | 30 |
| | 6.uPF | Phasee loss (voltage) | Off/On | Off |
| | 7.uPU | Unbalance (voltage) | Off/5~40% | Off |
| | 8.rP | Phase reversal (voltage) | Off/On/CHEC | Off |
| | 9.rt | Phase reversal operation time | 0.1~1.0sec | 1 |
| | 10.nP | Rated power | 0.1~999.9KW | 999.9 |
| | 11.OP | Over power | Off/100~800% | Off |
| | 12.Pt | Over power operation time | 1~100sec | 100 |
| | 13.UP | Under power | Off/20~100% | Off |
| | 14.Pt | Under power operation time | 1~100sec | 100 |
| | 15.OF | Over power factor | Off/0.20~1.00 | Off |
| | 16.Ft | Over power factor operation time | 1~30sec | 30 |
| | 17.UF | Under power factor | Off/0.20~1.00 | Off |
| | 18.Ft | Under power factor operation time | 1~30sec | 30 |
| | 19.ry | Relay output selection | u-AL/u-tP | u-tP |
| | 20.1P | Reactive power (meter) | 0~999.9 Mvar | Unit : Kvar |
| | 21.1h | Free Power Amount | 0~999.9 Mvah | Unit : Kvah |
| | 22.th | THD (Free Power Amount) | 0~100% | Unit : % |

Note) 1. For the measurement of power, please refer to the figure below.



## D-group

| Group | Menu | Description | Setting range | Default |
|---|---|---|---|---|
| D | 1trt | Total running time | 0~9999day / 0~23h / 0~59m | - |
| | 2r-t | Running time | 0~9999h / | - |
| | | | 0~59m | |
| | 3Srt | Running time setting | Off/10~8760 | Off |
| | 4CCh | Contactor check | Off/On | Off |
| | 5S-d | Date note 1) | 2013~2100y | 2014 |
| | | | / 1~12 (Mon), 1~31 (Day) | 01.01. |
| | | | / 0~23h, 0~59m | 0:00 |
| | 6CCC | Contactor counter note 2) | - | - |
| | 7FLt | Fault cause check note 3) | 1. The most recent | - |
| | | | 2. The 2nd. recent | |
| | | | 3. The 3rd. recent | |
| | | | 4. The 4th. recent | |
| | | | 5. The 5th. recent | |
| | 8A-r | Automatic reset time note 4) | OFF / 1~20m | Off |
| | 9r-n | Automatic reset number | Off/1~5 | Off |
| | | Set number of times | | |
| | 10Ad | Communication address note 5) | 1~247 | 247 |
| | 11bS | Communication speed note 5) | 9.6/19.2/38.4K | 9.6K |
| | 12SP | Swap note 5) | On/Off | Off |
| | 13Pr | Parity setting note 5) | nonE/odd/EUEn | nonE |
| | 14td | 20mA setting note 5) | 0.5~10/5~100 | 10/100 |
| | rSt | Stored data deletion | All : for all subparameters | - |
| | | | A-P : active energy | |
| | | | rA-P : reactive energy | |
| | | | trt : total running time | |
| | | | CCC : contactor counter | |
| | | | CALo : calories | |
| | | | FALt : fault events | |
| | tESt | Operation test | o-L : overcurrent test | - |
| | | | o-U : overvoltage test | |
| | | | g-F : ground fault test | |
| | | | I-C : instantaneous test | |

Note) 1. When power is supplied for the first time or recovered after blackout, date information (5.S-d) should be set up to enter the year, month, date, hour and minute.
2. The date setting can be stored after filling up month, day, hour and minute.
3. The trip cause can be stored up to 5 recent events and then the oldest event is deleted first.
4. Automatic recovery activates only in case of trip due to overload.
5. 10.Ad, 11.bs, 12.SP, 13.Pr, 14.td are available for communication type products.
6. Data clear and test can be inputted in the normal state, and test items can be viewed while a motor is switched on.

# Operation & setting method

## Menu List (MMP-SB/SM-10/100 )

### A-group

| Group | Menu | Description | Setting range | Default |
|---|---|---|---|---|
| A | 1.PHA | Single-phase / 3-phase | 1P/3P | 3P |
| | 2.5-F | Frequency | 50/60 | 60 |
| | 3.CHA | Characteristics (Over Current Protection) | Off/dEF/th/n-th Note 1) | n-th |
| | 4.0-t | Operating time | 1~60sec (5/10/20/30/60) | 60 |
| | 5.d-t | Time Delay | 1~200sec | 200 |
| | 6.r-C | Rated current (10, 100) | 0.5~10/5~100 | 10 |
| | 7.Ctr | CT ratio Note 2) | 0.25/0.5/1~200 | 1 |
| | 8.drU | Starting mode | dir/y-d/F-r/Ind/lut | dir |
| | 9.d-t | Y start time (lut start time) | 1~120sec (lut : 0.1~1sec) | 5 (0) |
| | 10.Yd | Y-D switching time | 0.05/0.1/0.2 | 0.2 |
| | 11.St | Outage compensation time | Off/1~30sec | Off |
| | 12.Sd | Restart time | 0~300sec | 0 |

Note) 1. Operating characteristic th denotes inverse-time curve with thermal-memory and n-th denotes inverse-time curve without thermal-memory .
2. For the 100A type there is no CT ratio as it is fixed as 1.
3. Some menu are not disabled depending on the related setting.
4. Phase reversal mode needs to be switched on only during test starting, or verify wiring via wiring CHEC function. it is recommended to turn off during normal running, .
(An error on phase reversal may occur due to noise.)

### B-group

| Group | Menu | Description | Setting range | Default | Remarks |
|---|---|---|---|---|---|
| B | 1.Loc | LOCK | Off/200~800% | Off | |
| | 2.StL | STALL | Off/150%~500% | Off | |
| | 3.P-F | Phasee loss (current) | On/Off | On | ✓ |
| | 4.P-U | Phasee unbalance (current) | Off/30~70% | Off | ✓ |
| | 5.Pdt | Phasee loss / unbalance Time-delay | 0~200sec | 0 | ✓ |
| | 6.r-P | Phase reversal (current) | Off/On/CHEC Note 1) | Off | ✓ |
| | 7.Crt | Phase reversal operation time | 0.1~1.0sec | 0.1 | ✓ |
| | 8.U-C | Undercurrent | Off/30~90% | Off | |
| | 9.Ect | ZCT selection (PC mV, 1.5mA) | 100/1.5 Note 2) | Enbd | |
| | 10.GF | Ground fault (Zero-phase) | Off/0.03/0.05/0.1~3.0 | Off | |
| | 11.Gn | Ground fault (Residual current) | Off/30~100% | Off | ✓ |
| | 12.Gt | Ground fault operation time | 0.05~3.0sec | 3.0 | |
| | 13.Gr | Selective ground fault(SGR) current setting | Off/0.03/0.05/0.1~3.0 | Off | |
| | 14.GU | Selective ground fault(SGR) voltage setting | 8~80V | 80 | |
| | 15.GA | Selective ground fault(SGR) reference angle setting | 0~90 angular measure | 0 | |
| | 16.Gt | Selective ground fault(SGR) operating time | 0.05~3.0sec. | 3.0 | |
| | 17.Gd | Ground fault Time-delay(Ground fault, SGR) | 0~200sec | 60 | |
| | 18.IC | Instantaneous protection | Off/500~5000% Note 3) | Off | |
| | 19.AL | Output contact method | I-tp, ALo, U-C, OrH Note 4) | I-tp | |
| | 20.Ar | Current Y / N, Alarm | On/60~110% | On | |
| | 21.oG | Ground fault Overvoltage | Off/8~80V | Off | |
| | 22.ot | Operating time | 0.05~3.0sec | 3.0 | |
| | 23.ry | Relay output selection | u-AL, AtP | u-AL | |
| | 24.th | THD (voltage) | 0~100% | Unit : % | |

Note) 1. If CHEC set value of reverse phase is selected, wiring information additionally appears.
2. ZCT is selected differently depending on whether to use our product or other universal products.
3. Tolerance guarantee scope for 10A type: ~100A/100A type : 600A for 50Hz, 720A for 60Hz
4. I-tp: Instantaneous trip, circuit breaker trip(interaction), Alo: instantaneous alarm, U-C: in case of low-current operation, OrH: if a motor's continuous operating time is higher than a set value In case of ATP setting, when all current relay factors (including I-tp) work, output (AUX-C3) appears.
5. No support is given for a single-phase motor.

## D-group

| Group | Menu | Description | Setting range | Default |
|---|---|---|---|---|
| D | 1trt | Total running time | 0~9999day / 0~23h / 0~59m | - |
| | 2r-t | Running time | 0~9999h / | - |
| | | | 0~59m | |
| | 3Srt | Running time setting | Off/10~8760 | Off |
| | 4CCh | Contactor check | Off/On | Off |
| | 5S-d | Date note 1) | 2013~2100y | 2014 |
| | | | / 1~12 (Mon), 1~31 (Day) | 01.01. |
| | | | / 0~23h, 0~59m | 0:00 |
| | 6CCC | Contactor counter note 2) | - | - |
| | 7FLt | Fault cause check note 3) | 1. The most recent | - |
| | | | 2. The 2nd. recent | |
| | | | 3. The 3rd. recent | |
| | | | 4. The 4th. recent | |
| | | | 5. The 5th. recent | |
| | 8A-r | Automatic reset time note 4) | OFF / 1~20m | Off |
| | 9r-n | Automatic reset number | Off/1~5 | Off |
| | | Set number of times | | |
| | 10Ad | Communication address note 5) | 1~247 | 247 |
| | 11bS | Communication speed note 5) | 9.6/19.2/38.4K | 9.6K |
| | 12SP | Swap note 5) | On/Off | Off |
| | 13Pr | Parity setting note 5) | nonE/odd/EUEn | nonE |
| | 14td | 20mA setting note 5) | 0.5~10/5~100 | 10/100 |
| | rSt | Stored data deletion | All : for all subparameters | - |
| | | | trt : total running time | |
| | | | CCC : contactor counter | |
| | | | CALo : calories | |
| | | | FALt : fault events | |
| | tESt | Operation test | o-L : overcurrent test | - |
| | | | g-F : ground fault test | |
| | | | I-C : instantaneous test | |

Note) 1. When power is supplied for the first time or recovered after blackout, date information (5.S-d) should be set up to enter the year, month, date, hour and minute.
2. Switch count is counted up to 65,000, and it resets once it reaches the limit.
3. Up to 5 trip causes are saved, and the oldest data is overwritten when a new entry is saved.
4. Automatic recovery activates only in case of trip due to overload.
5. 10Ad, 11.bs, 12.SP, 13.Pr and 14.td can be set only at communication type product.
6. Data clear and Test can be normally inputted only during NORMAL, and TEST item can be checked only when the motor is ON.

## 4. Up & downloading of all settings once (Quick setup)

1) Press Up and Enter keys at the same time at the status of normal, MCC mode and motor stop,
then "UPLd" begins to flash on the screen which denotes the setting values of the device are being uploaded in the display unit
and "U.END" is displayed when completed. Press Enter key to return to the measurement screen.

2) After installing the uploaded display unit onto the device that is not set yet, press Down and
Enter keys at the same time at the status of normal, MCC mode and motor stop,
then "dnLd" begins to flash on the screen which denotes the setting values of the display unit
are being downloaded in the device and "d.END" is displayed when completed.
Press Enter key to return to the measurement screen.

Note) 1. Up & downloading is available between the same models. If the models are different each other an error occurs with "d.Err" message.
2. Up & downloading of date, running time and fault cause are not available.

## 5. Checking fault history

1) Press Esc and Enter keys at the same time in the measurement screen,
then the most recent fault cause in #7 menu of D-group is displayed.
Note) If there is no fault history "1.non" is displayed.

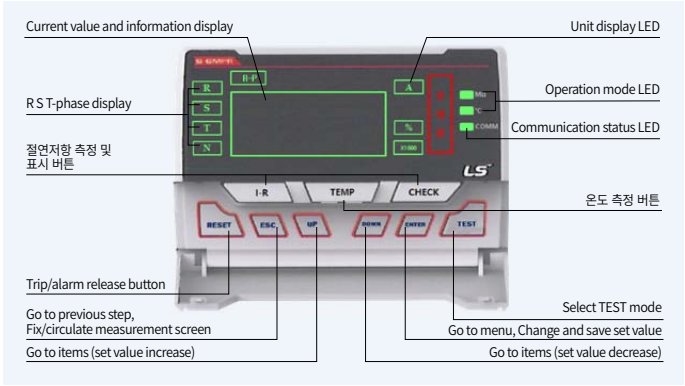
2) Use Up and Down keys to move to the desired one out of 5 fault events and select by pressing Enter key.
3) The fault current of phase R is displayed. Each time pressing the down key following informations are displayed in turn :
fault current of phase S / fault current of phase T / overload ratio / date
4) To enter the previous mode, press Esc key.
5) Press Esc and Enter keys at the same time to return to the measurement screen.

## 6. Forced reset of thermal memory

Press Esc and Stop keys at the same time to make the tripped motor become a cold state by force
when operating characteristic is set to inverse-time curve with thermal-memory (th).
If a motor is tripped due to overcurrent the immediate pressing of reset key at the hot state of the motor causes immediate tripping.
To avoid it reset via pressing Esc and Stop keys at the same time which makes the motor cold state.

# MMP-IR-10/100 Model

**Before starting the motor, proceed as follows :**




## 1. Connect the display unit to the main unit of the device and then turn on. Verify that Power LED is switched on and the measurement screen is displayed.

1) Press and hold I-R Key and CHECK key simultaneously for 3 seconds to measure insulation resistance value of the motor. Insulation resistance is measured for 60 seconds and the measurement value is displayed.
Note) When the motor is operating, insulation resistance cannot be measured.

2) If TEMP key is pressed, temperature value measured is displayed.

3) When the device is booted up the measurement screen is display by default. Pressing Enter key allows to access the modes : Group → Menu → Setting value. Press Esc key to return to the previous mode.
Use Up & Down keys to change values in the screens of Measurement, Group, Menu, Setting. When the relay / alarm operates press Reset key to reset.
Note) refer to a manual for the details.

## 2. Verify the operations of Test key and Reset key through trip.

1) Verify the wiring first. Press Enter key to access Group menu, and use Up / Down keys to access B Group as shown "b-gr" and press Enter to access Menu with displaying "1.Loc". Use Up / Down keys to access "6.r-p" which denotes Phase reveral menu, and press Enter to access "CHEC" which denotes Setting value, and press Enter to view current wiring information.
Note) 1. The phase information is displayed only when current is applied. If there is no current "---" is displayed

2) If TEST key is pressed "TEST" appears at the screen and the device is Tripped.

3) Press Reset key to reset the device and return to the measurement screen.
Note) In the first access to change a parameter "P-99" for password input is displayed. Press Up key to change it to "P-00" and press Enter and then Setting change is allowed. If there is no input for 2 minutes it returns to the measurement screen.

## 3. Check the settings.

1) At normal state pressing Enter key access mode "A-gr" which enables setting. Select the desired group using the Up / Down keys and press Enter key to enter the desired group. To enter previous mode, press the Esc key.

2) The desired group displays from No. 1 menu. Select the desired menu using the Up / Down keys and press Enter key to enter the setting mode. To enter previous mode, press the Esc key.

3) Press Up / Down keys in the setting screen and then "P-99" is displayed. Press Up / Down keys to change the password to "P-00" and press Enter to release it. After that select the desired value and press Enter to save the setting.
Note) Enter the date exactly when the power is turned on for the first time or recovered after the outage.

# Operation & setting method

## Menu List (MMP-SB/SM-10/100 )

### A-group

| Group | Menu | Description | Setting range | Default |
|---|---|---|---|---|
| A | 1.PHA | Single-phase / 3-phase | 1P/3P | 3P |
| | 2.5-F | Frequency | 60 | 60 |
| | 3.CHA | Characteristics (Over Current Protection) | Off/dEF/th/n-th Note 1) | n-th |
| | 4.0-t | Operating time | 1~60sec (5/10/20/30/60) | 60 |
| | 5.d-t | Time Delay | 1~200sec | 200 |
| | 6.r-C | Rated current (10, 100) | 0.5~10/5~100 | 10 |
| | 7.Ctr | CT ratio | 0.25/0.5/1~200 Note 2) | 1 |
| | 8.1-r | Insulation resistance | n-c/Off/1/5/10/20 | Off |
| | 9.tEP | Temperature | n-c/Off/50~150°C (1°C Step) | Off |
| | t.CAL | Temperature compensation | 0~50°C (1°C Step) | 25 |

Note) 1. Operating characteristic th is the characteristic for thermal heat build-up type inverse time, and n-th is the characteristic for thermal heat non build-up type inverse time.
2. In case of 100A TYPE model, CT ratio is not indicated and fixed as 1.
3. Some menus are not displayed depending on function settings.

### B-group

| Group | Menu | Description | Setting range | Default | Remarks |
|---|---|---|---|---|---|
| B | 1.Loc | LOCK | Off/200~800% | Off | |
| | 2.StL | STALL | Off/150%~500% | Off | |
| | 3.P-F | Phasee loss (current) | On/Off | On | |
| | 4.P-U | Phasee unbalance (current) | Off/30~70% | Off | ✓ |
| | 5.Pdt | Phasee loss / unbalance Time-delay | 0~200sec | 0 | ✓ |
| | 6.r-P | Phase reversal (current) | Off/On/CHEC Note 1) | Off | ✓ |
| | 7.Crt | Phase reversal operation time | 0.1~1.0sec | 0.1 | ✓ |
| | 8.U-C | Undercurrent | Off/30~90% | Off | ✓ |
| | 9.Ect | ZCT selection (PC mV, 1.5mA) | 100/1.5 Note 2) | Enbd | |
| | 10.9F | Ground fault (Zero-phase) | Off/0.03/0.05/0.1~3.0 | Off | |
| | 11.9n | Ground fault (Residual current) | Off/30~100% | Off | |
| | 12.9t | Ground fault operation time | 0.05~3.0sec | 3.0 | ✓ |
| | 13.9d | Ground fault Time-delay | 0~200초 | 60 | |
| | 14.IC | Instantaneous protection | Off/10A type: ~100A, 100A type: ~800A, 100A or more: using external CT Note 3) | Off | |
| | 15.AL | Output contact method | I-tp, I-AL, Alo, U-C, OrH, tEP, Ir, IrtE Note 4) | I-세 | Refer to contact output information |
| | 16.Ar | Current Y / N, Alarm | On/60~110% | On | Refer to contact output information |
| | 17.th | THD (Voltage) | 0~100% | Unit :% | |

Note) 1. When CHEC set value of negative sequence item is selected, additional wire information is displayed.
2. ZCT selection is set depending on whether built in ZCT or external ZCT is used.
3. Tolerance guarantee scope for 10A type: ~100A/100A type : 600A for 50Hz, 720A for 60Hz
4. I-tp: Instantaneous trip, Circuit breaker trip (interlocked), I-AL: Instantaneous alarm, Alo: Current alarm setting, U-C: When low current factor works, OrH: When continuous motor operating hour is over the set value, tEP: Alarm when temperature is over the set value, Ir: Alarm when the value is below insulation resistance value set, IrtE: Alarm when temperature is over the set value or insulation resistance is below the set value.
5. Menu 16 is displayed only when "Alo" is set at menu 15.

## Contact output information

| 15.AL setting | | Output condition | Alarm output type | |
|---|---|---|---|---|
| | | | Motor operation | 07-08 |
| | I-tp | Detection of instantaneous current | Motor stop | NC |
| | I-AL | Detection of instantaneous current | Maintain status | NC |
| | U-C | Detection of current carrying below low current set value | Maintain status | NC |
| | OrH | Operating time setting and output | Maintain status | NC |
| | Alo | Select 18.Ar setting | Follows setting at item 16 | |
| | tEP | Exceeding set temperature | Maintain status | NC |
| | Ir | Detection of insulation resistance below set value | Maintain status | NC |
| | IrtE | In case of irregularity with temperature or insulation resistance | Maintain status | NC |
| 16.Ar setting | | In case Alo is set at item 15 | Motor operation | 07-08 |
| | On | Output of current carrying (I>0A) status | Maintain status | NC |
| | 60~110% | Current carrying of over the set value | Maintain status | NC |

## C-group

| Group | Menu | Description | Setting range | Default |
|---|---|---|---|---|
| C | 1trt | Total operating hour | 0~9999day/0~23hr/0~59min | - |
| | 2r-t | Operating hour | 0~9999hr | - |
| | | | 0~59min | |
| | 3.Srt | Setting of operating hour | Off/10~8760 | Off |
| | 4.S-d | Date setting Note1) | 2019~2100 | 2019 |
| | | | 1~12Month, 1~31f day | 01.01. |
| | | | 0~23hr, 0~59min | 0:00 |
| | 5.FLt | Checking reason of failure | - | - |
| | 6.A-r | Automatic recovery Note2) | Off/1~20min | Off |
| | 7r-n | Restriction of restart | Off/1~5 | Off |
| | 8.Ad | Communication address | 1~247 | 247 |
| | 9.bS | Communication speed | 9.6/19.2/38.4K | 9.6K |
| | 10.SP | Swap or not | On/Off | Off |
| | 11.Pr | Parity setting | nonE/odd/EUEn | nonE |
| | 12.td | Setting of 20mA | 0.5~10/5~100 | 10/100 |
| | rSt | Deleting stored data Note3) | All the lower level items | - |
| | | | trt : Total operating hour | |
| | | | CALo : Heat quantity | |
| | | | FALt : Failure event | |

Note) 1. In case power was supplied for the first time or recovered after blackout, date information (5.S-d) should be set up to enter the year, month, date, hour and minute.
2. Automatic recovery activates only in case of trip due to overload.
3. Data clear can be inputted normally only during NORMAL.

## 4. Up & downloading of all settings once (Quick setup)

1) When Up key and Enter key are pressed at the same time in the normal status or motor STOP status, “UpLd” blinks at screen and set value of main body is saved at display, and “U.End” is displayed after completion of saving. At this time, if Enter Key is pressed for confirmation, screen returns to measurement mode.

2) If Down key and Enter key are pressed at the same time in the normal status or motor STOP status, “dnLd” blinks at screen and set value of display is saved at main body, and “d.End” is displayed after completion of downloading. At this time, if Enter Key is pressed for confirmation, screen returns to measurement mode

Note) 1. Up & downloading is available between the same models. If the models are different each other an error occurs with "d.Err" message.
2. Up & downloading of date, running time and fault cause are not available.

## 5. Checking fault history

1) Press Esc and Enter keys at the same time in the measurement screen,
then the most recent fault cause in #7 menu of D-group is displayed.
Note) If there is no fault history "1.non" is displayed.

2) Use Up and Down keys to move to the desired one out of 5 fault events and select by pressing Enter key.
3) The fault current of phase R is displayed. Each time pressing the down key following informations are displayed in turn :
fault current of phase S / fault current of phase T / overload ratio / date
4) To enter the previous mode, press Esc key.
5) Press Esc and Enter keys at the same time to return to the measurement screen.

## 6. Forced reset of thermal memory

Press Esc and CHECK keys at the same time to make the tripped motor become a cold state by force
when operating characteristic is set to inverse-time curve with thermal-memory (th).
If a motor is tripped due to overcurrent the immediate pressing of reset key at the hot state of the motor causes immediate tripping.
To avoid it reset via pressing Esc and CHECK keys at the same time which makes the motor cold state.

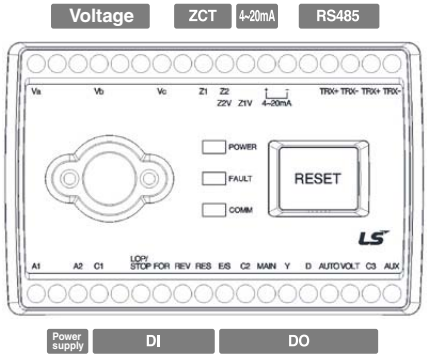
## Fault cause information

| Screen | | Fault cause | Additional information |
|---|---|---|---|
| Current | O-L | Overcurrent | phase, load rate, time |
| | LOC | Lock | phase, load rate, time |
| | StL | Stall | phase, load rate, time |
| | P-F | Phasee loss | phase, unbalance rate, time |
| | P-U | Phasee unbalance | phase, unbalance rate, time |
| | r-P | Phase reversal | time |
| | U-C | Undercurrent | phase, load rate, time |
| | Sho | Instantaneous | phase, load rate, time |
| | G-F | Ground fault (ZCT) | phase and neutral, time |
| | G-n | Ground fault (Residual) | phase and neutral, time |
| Voltage | O-u | Overvoltage | phase, rate, time |
| | U-u | Undervoltage | phase, rate, time |
| | uPF | Phasee loss | phase, unbalance rate, time |
| | uPU | Phasee unbalance | phase, unbalance rate, time |
| | urP | Phase reversal | time |
| Voltage | O-P | Overpower | phase voltage, rate, time |
| | U-P | Underpower | phase voltage, rate, time |
| | OPF | Over power factor | phase voltage, rate, time |
| | UPF | Under power factor | phase voltage, rate, time |
| Others | EtP | External input trip | time |
| | Err.1 | Error.1 occured | Current detected after motor off |
| | Err.2 | Error.2 occured | No current detected after motor on |
| | Err.3 | Error.3 occured | For / Rev starting signal input at the same time in local / auto mode |
| | Err.4 | Error.4 occured | External storage memory error |
| | OrH | Running hour over | Alarm occurs when accumulated running hour is over the setting value |
| | tAP | Temperature over the set degree | |
| | u Ir | In case insulation resistance below set value is measured | |
| | AcOn | In case measurement of insulation resistance is attempted during operation | |
| | L InE | Display comm. error | Comm. error occur between display unit and device.<br>※ Please contact us. |
| | Ex) 1.0 1.0 | Version check | Press Reset+Esc keys in normal state |

# Terminal configuration / Wiring & cable connection

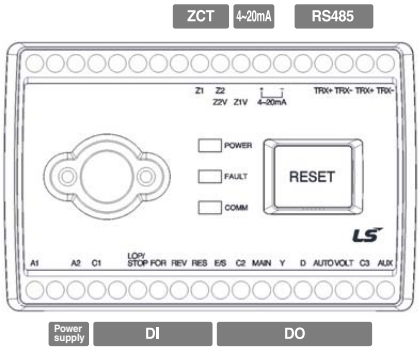
## Terminal configuration (S-EMPR MMP-PM)

| Terminals | Description | Remarks |
|---|---|---|
| Va, Vb, Vc | Voltage input | Current model Blank |
| Z1, Z2 | ZCT input | Universal (Z1, Z2 : 1.5mA)<br>Z2V, Z1V Dedicated (Z2V, Z1V : 100mV) |
| Z2V, Z1V | | |
| 4~20mA (+), (-) | 4~20mA output | - |
| TRX1+, TRX1- | RS485 communication | Modbus(1 channel) |
| TRX2+, TRX2- | | |
| A1, A2 | Control power input | 110Vac or 220Vac 50/60Hz |
| C1 | Contact input Common | - |
| Lop/Stop, For, Rev, Res, E/S | Contact input | RES : Reset, E/S: Emergency Stop |
| C2 | Relay output Common | - |
| Main, Y, D, Auto, Volt | Relay output | D: Delta, VOLT : output contacts for voltage & power elements |
| C3 | Relay output Common | Aux output Common |
| Aux | Relay output | Current element output contacts |



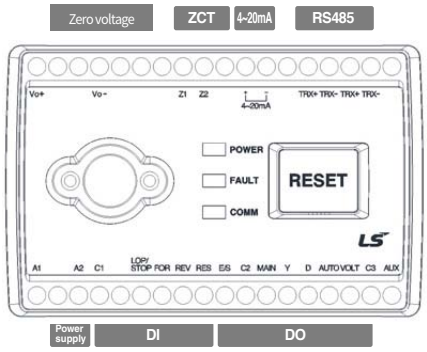

## Terminal configuration (S-EMPR MMP-CM)

| Terminals | Description | Remarks |
|---|---|---|
| A1, A2 | Operating power input terminal | 110Vac or 220Vac 50/60Hz |
| C1 | Contact point in put common | Lop/Stop, For, Rev, Res, E/S contact point |
| Lop/Stop | Lop operation mode selection and external stop S/W | - |
| For | External On(Forward) input S/W | On input in Lop/Auto operation |
| Rev | Reverse input S/W in forward/reverse starting | REV input in Lop/Auto operation |
| Res | External Reset S/W | Reset input in Lop operation |
| E/S | External Emergency Stop S/W | - |
| C2 | Contact point output common | Main, Y, D, Auto contact point |
| Main | Motor On output | If forward/backward staring, forward rotation output |
| Y | Y-Delta starting: Y contact point output | - |
| | Inverter starting: Inverter contact point output | - |
| | Full voltage starting: No use | - |
| | Forward/backward staring: No use | - |
| | Reactor starting: No use | - |
| D | Y-Delta starting: Delta contact point output | - |
| | Forward/backward staring: reverse rotation contact point output | - |
| | Reactor starting: Reactor (R) contact point output | - |
| | Inverter starting: Bypass contact point output | - |
| | Full voltage starting: No use | - |
| Auto | Auto state signal output | If Auto state mode is selected |
| C3 | Contact point output common | Aux contact point only |
| Aux | Current factors contact point output | - |
| Z1,Z2 | Zero current transformer output connection terminal | Universal ZCT(200mA/1.5mA) |
| Z1V, Z2V | Zero current transformer output connection terminal | ZCT(200mA/100mV) |
| +,- | 4~20mA output | - |
| TRX+,TRX- | RS485terminal | - |



## Terminal configuration (S-EMPR MMP-SM)

| Terminals | Description | Remarks |
|---|---|---|
| A1, A2 | Operating power input terminal | 110Vac or 220Vac 50/60Hz |
| C1 | Contact point in put common | Lop/Stop, For, Rev, Res, E/S contact point |
| Lop/Stop | Lop operation mode selection and external stop S/W | - |
| For | External On(Forward) input S/W | On input in Lop/Auto operation |
| Rev | Reverse input S/W in forward/reverse starting | REV input in Lop/Auto operation |
| Res | External Reset S/W | Reset input in Lop operation |
| E/S | External Emergency Stop S/W | - |
| C2 | Contact point output common | Main, Y, D, Auto contact point |
| Main | Motor On output | If forward/backward staring, forward rotation output |
| Y | Y-Delta starting: Y contact point output | - |
| | Inverter starting: Inverter contact point output | - |
| | Full voltage starting: No use | - |
| | Forward/backward staring: No use | - |
| | Reactor starting: No use | - |
| D | Y-Delta starting: Delta contact point output | - |
| | Forward/backward staring: reverse rotation contact point output | - |
| | Reactor starting: Reactor (R) contact point output | - |
| | Inverter starting: Bypass contact point output | - |
| | Full voltage starting: No use | - |
| Auto | Auto state signal output | If Auto state mode is selected |
| Volt | Ground fault overvoltage factors and current trip contact point output | - |
| C3 | Contact point output common | Aux contact point only |
| AUX | Other current factors contact point output | - |
| Vo+, Vo- | Zero voltage input | - |
| Z1,Z2 | Zero current transformer output connection terminal | Universal ZCT(200mA/1.5mA) |
| +,- | 4~20mA output | - |
| TRX+,TRX- | RS485terminal | - |




## *Attention in panel design

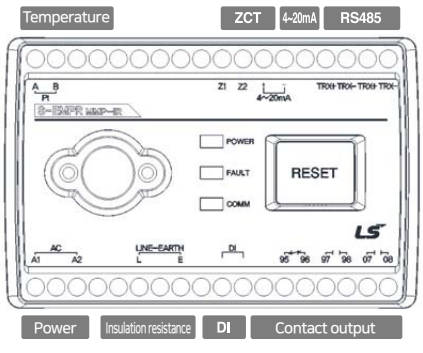
1. It is required to have grounding connection with all equipment.
2. It is required to minimize wiring as most as possible.
3. After a shield-type cable is applied, it is required to ground the shield.

## *If induced voltage occurs

1. It is required to add a proper capacitor in parallel depending on the parasitic capacitance of product input part.
2. If induced voltage occurs even after the capacitor is added, it is required to get auxiliary relay energyed in order for an input to make possible through an auxiliary contact point when a circuit is designed.

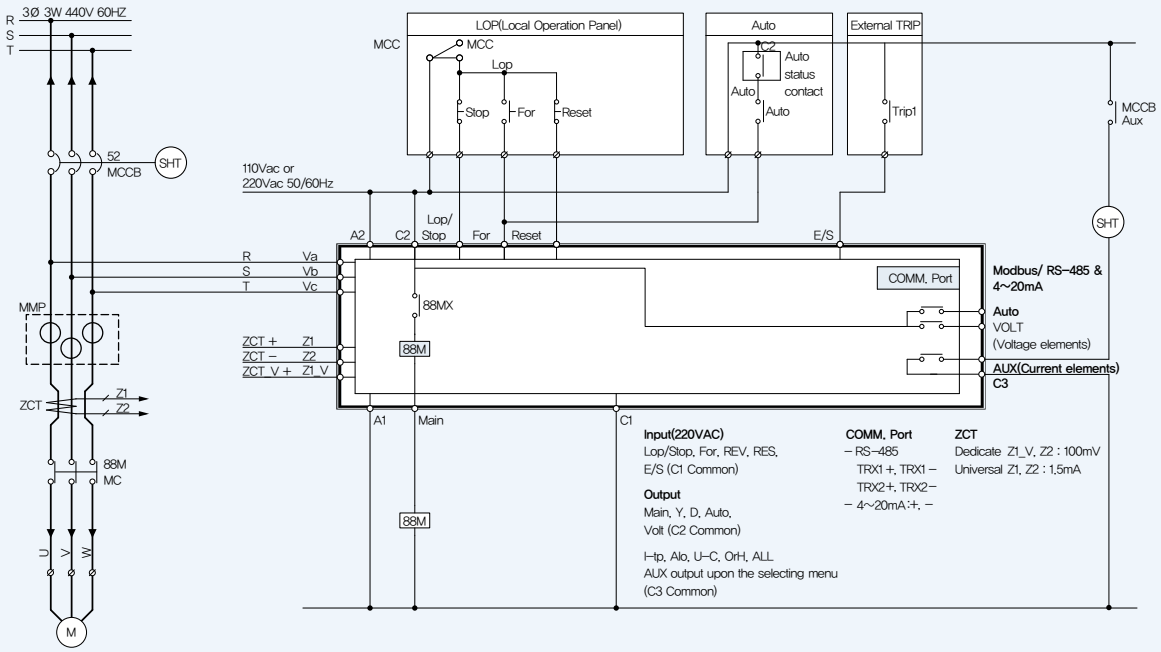
## Terminal configuration (S-EMPR MMP-IR)

| Terminals | Description | Remarks |
|---|---|---|
| A1, A2 | Operating power input terminal | 110Vac 60Hz |
| L, E | Terminal for insulation resistance measurement | Lop/Stop, For, Rev, Res, E/S contact point |
| DI | M/C status input terminal | 110Vac 60Hz |
| 95-96 | In case of Power On (NC contact output terminal), (NO contact output terminal) | |
| 97-98 | In case of Power On (NC contact output terminal), (NO contact output terminal) | |
| 07-08 | Output of Instantaneous, Low current and Other alarm | |
| A-B | Temperature sensor input connection terminal | |
| Z1-Z2 | Zero current transformer output connection terminal | ZCT(200mA/100mV) |
| +, - | 4~20mA output | |
| TRX+,TRX- | RS485terminal | |



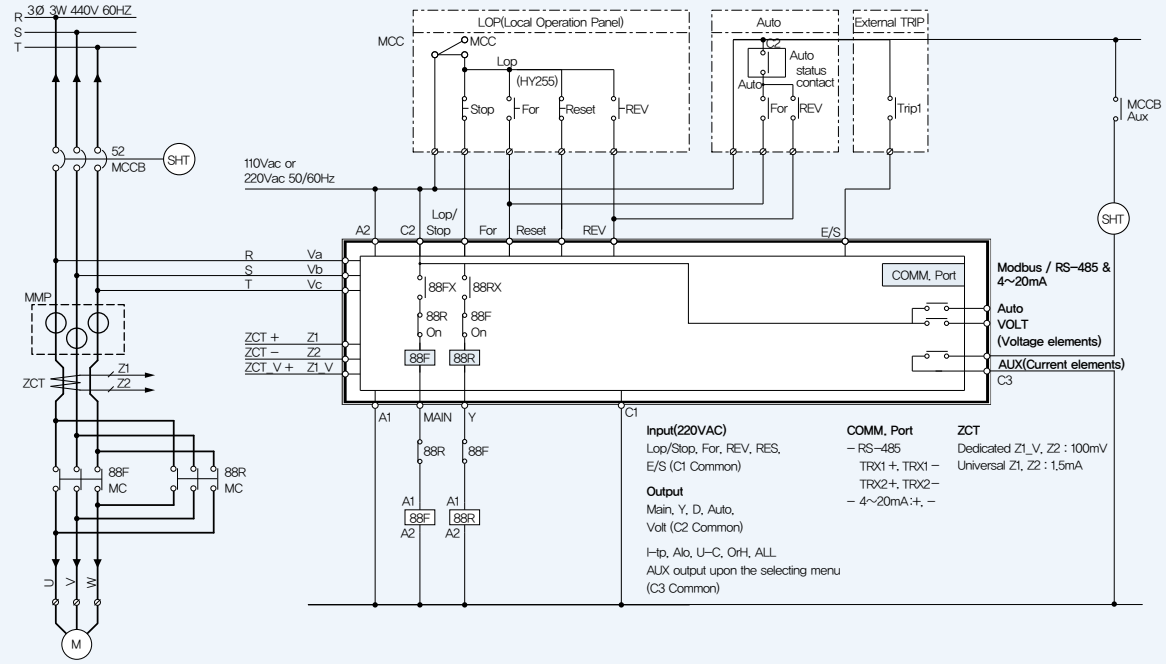
# Terminal configuration / Wiring & cable connection

## Full voltage start

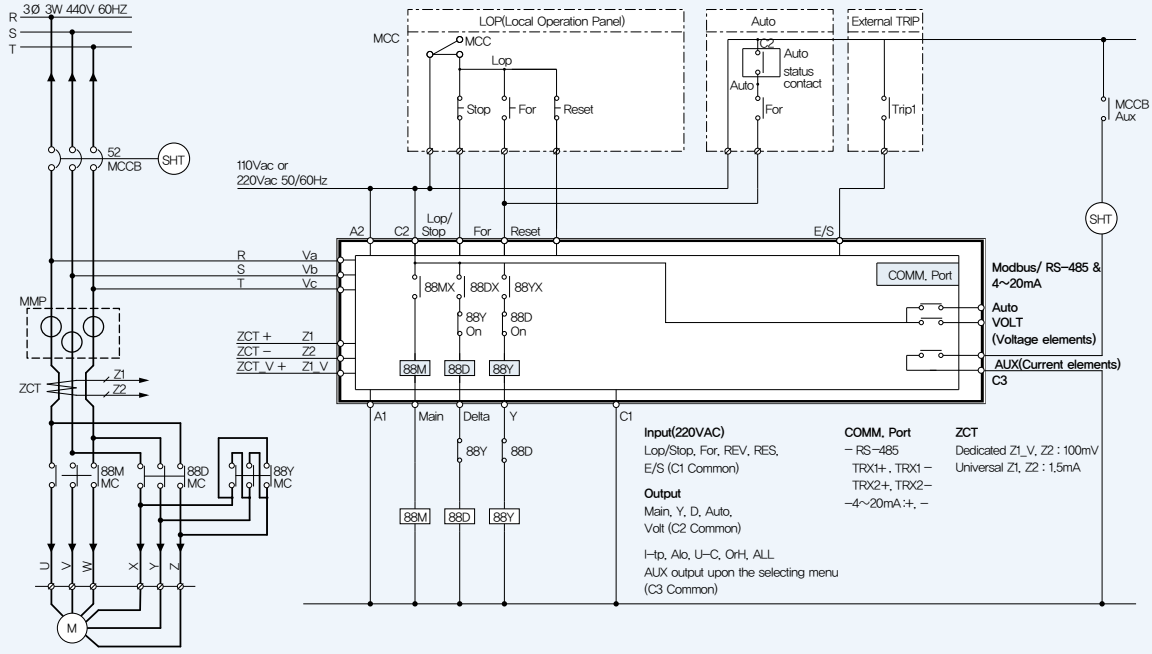



Note) In case of distance operation (LOP / AUTO), if a wiring distance is too long, induced voltage can cause malfunction. Therefore, bear in mind this point at the time of designing a panel.

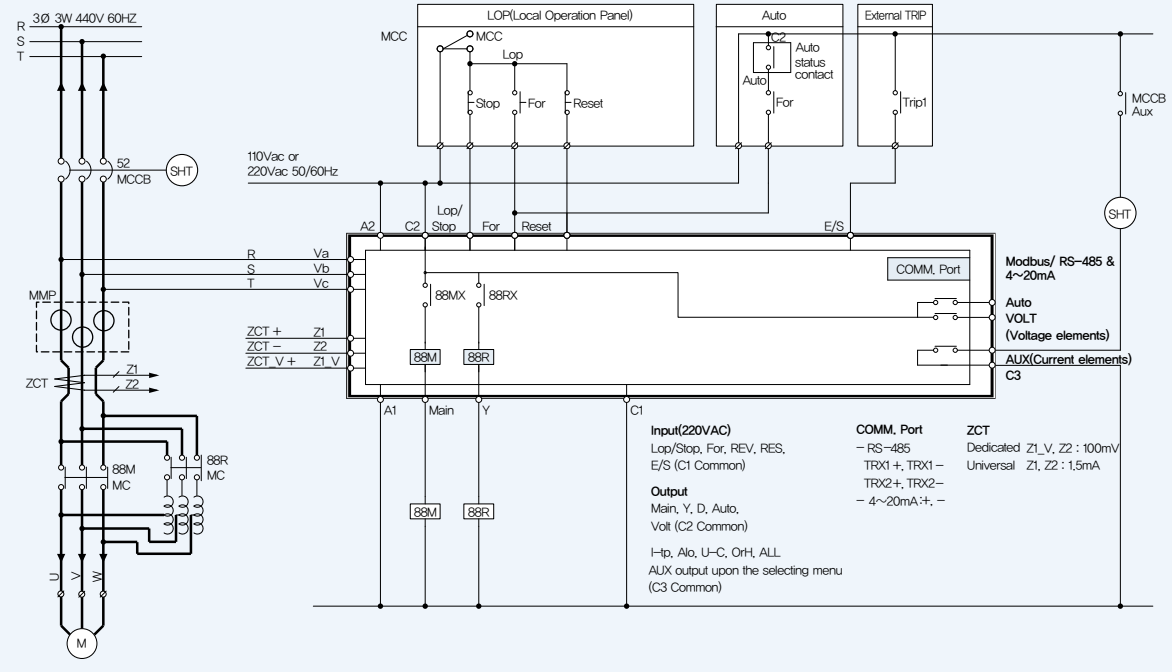
## Reversible operation



## Y-D start

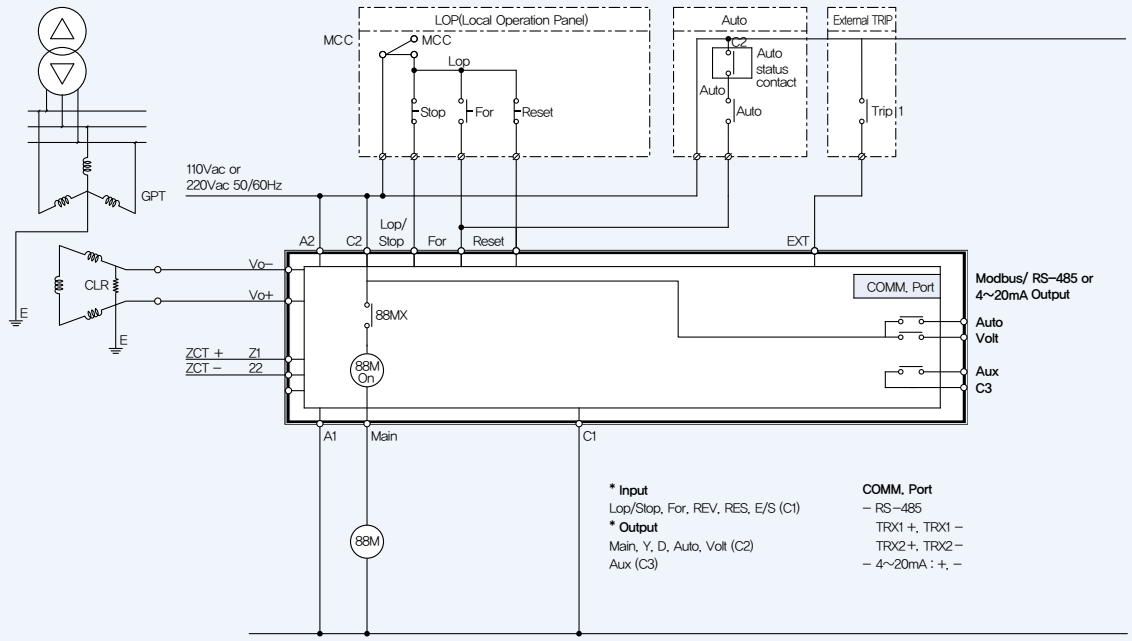



## Reactor start

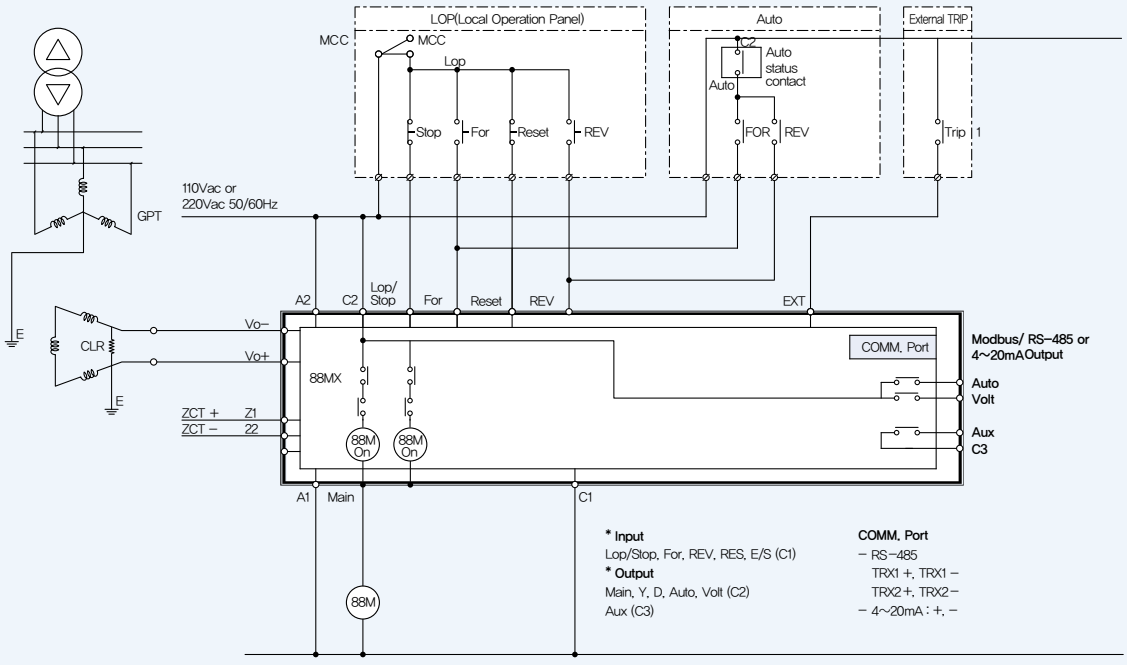


# Terminal configuration / Wiring & cable connection

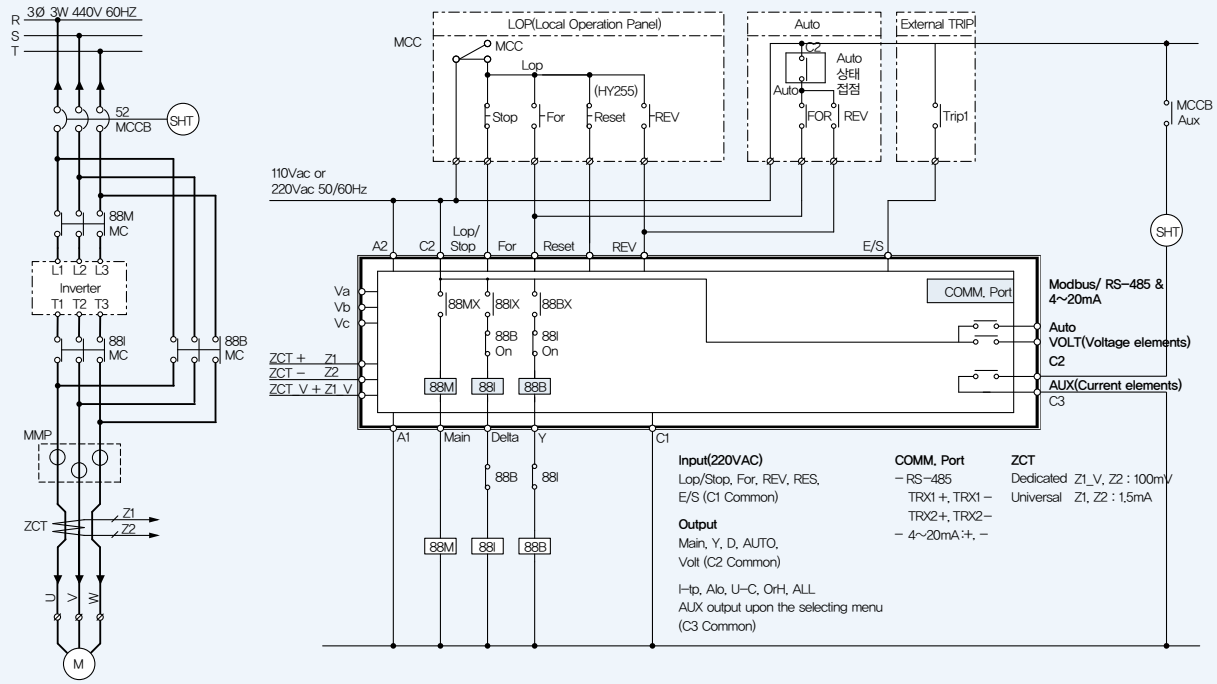
## Irreversible full voltage starting



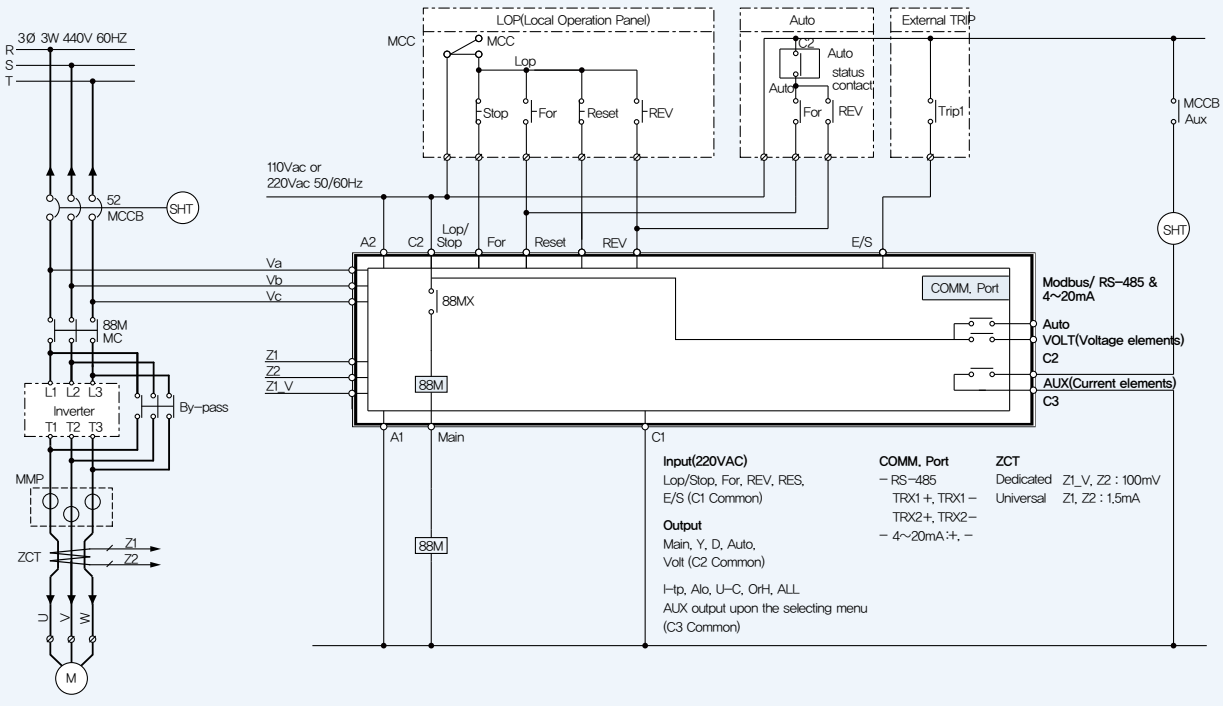

## Reversible full voltage starting



## Inverter start (Current)

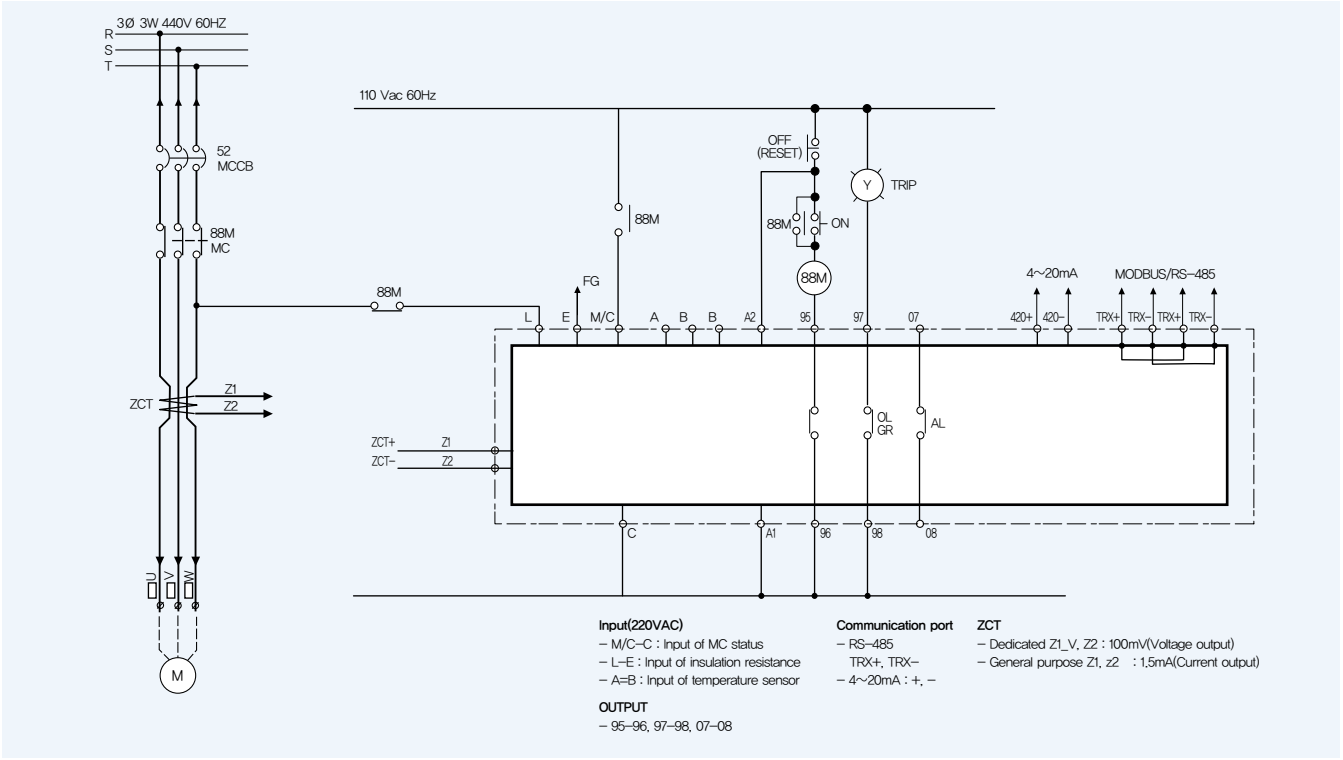



## Soft starter start



# Terminal configuration / Wiring & cable connection

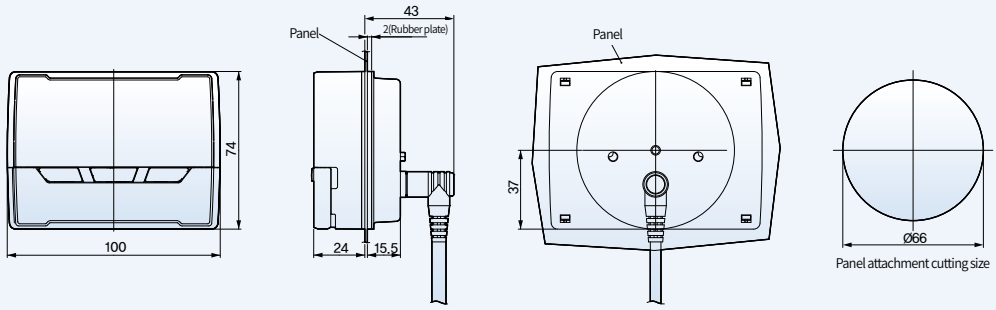
## MMP-IR TYPE



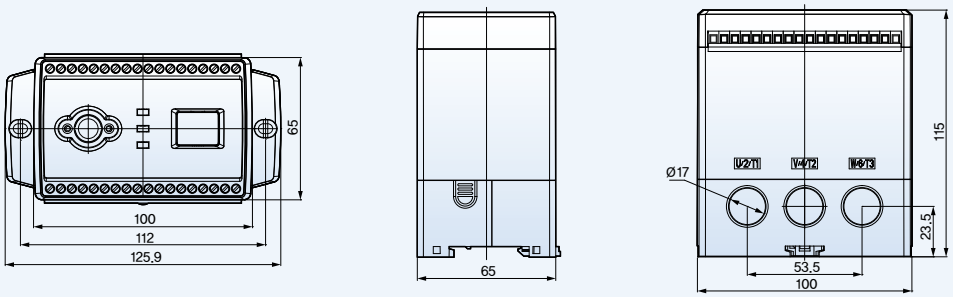

Note) IR model does not support start mode.

## Dimensions

Unit : mm




Display part size in case of panel attachment




Size in case of panel attachment

*Digital motor protection control device is suited for multiple motor starting method with a single model*



# IMC-III

Intelligent Motor Controller

- 1 model can be used on various motor start methods
- Wide range of protection functions
- Variety of remote surveillance control functions according to the sequence structure

## Contents


**108** Product characteristics
**113** Rated specifications & model numbering system
**114** Operation & setting method
**118** Wiring & cable connection
**122** Dimensions




# IMC-III

Intelligent Motor Controller




## 1 model can be used on various motor starting methods

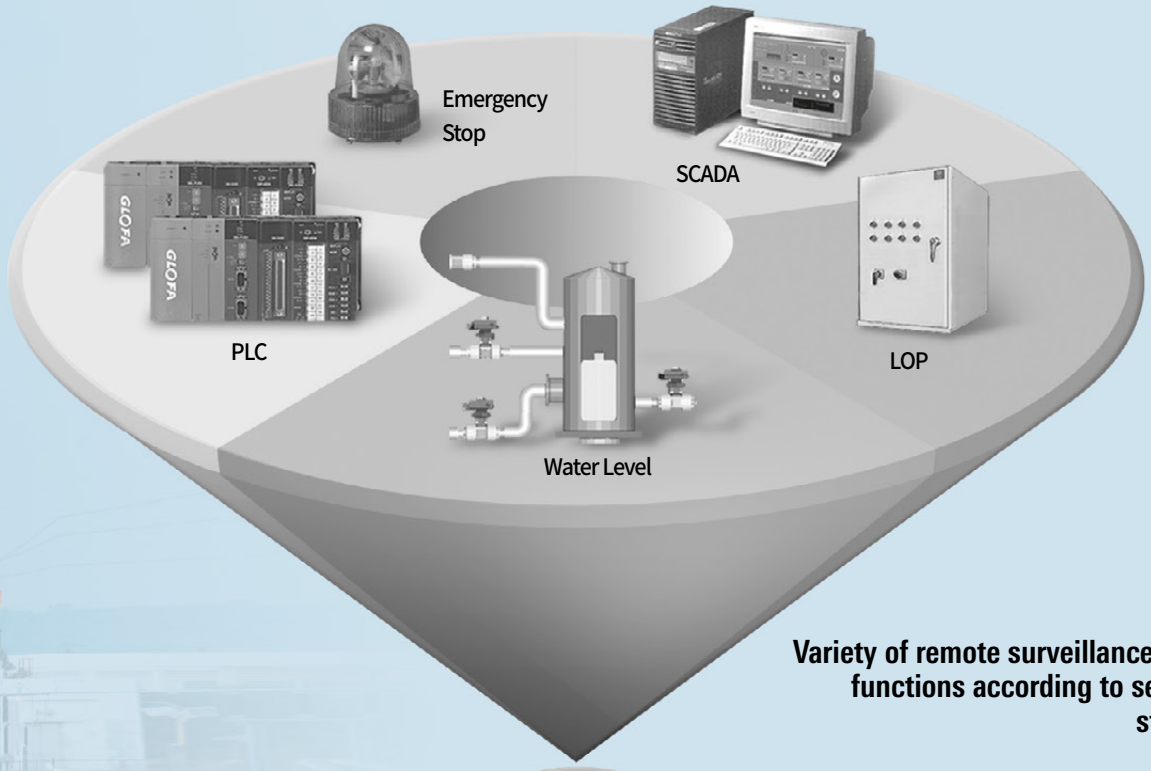
1 IMC-III model can be applied on direct input drive, Y-△ drive, reversible drive, reactor drive, inverter drive and S/V drive, and it is also easy to respond to sequence changes.

Direct start
Y-△ start
Reactor start
For/Rev start
INVERTER start
S/V valve start

Overcurrent
Under current
Unbalance
Stall/Locked rotor
Phase failure
Reverse phase
Ground fault

## Wide range of protection functions

Overcurrent, undercurrent, open phase, reverse phase, unbalance, stall/lock, ground fault protection and alarm functions protect the motor safely.




## Variety of remote surveillance control functions according to sequence structure

Simple sequence structures can not only enable local operation (LOP) and MCC control, but this also enables remote surveillance control using PLC or DCS-based auto operation and auto-operation and communication according to level changes.



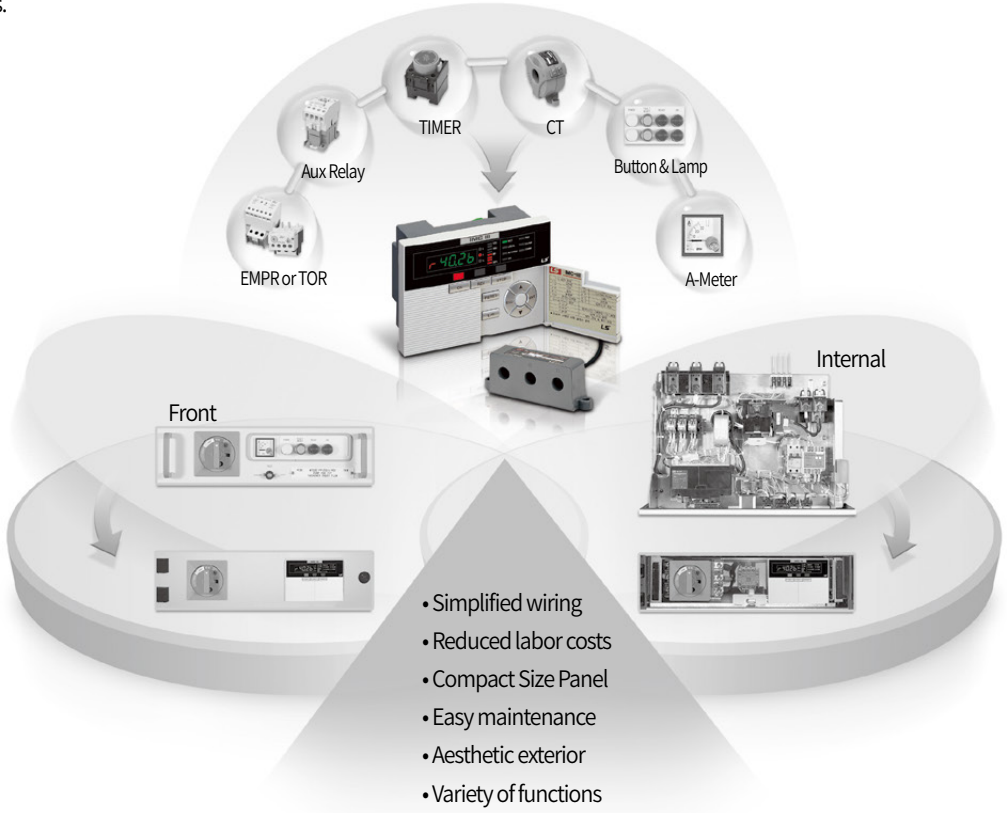





# Product characteristics

## Ease of Use and Installation

By separating the main body with MCT and inserting it in the front panel, it allows the user to check various fault causes/fault current value as well as operating the motor, and it also allows current/operation time and various functions to be set with simple button controls without taking out the MCC unit. Furthermore, minimized installation space and simplified wiring creates a compact MCC unit and achieves easy maintenance and reduced labor costs.

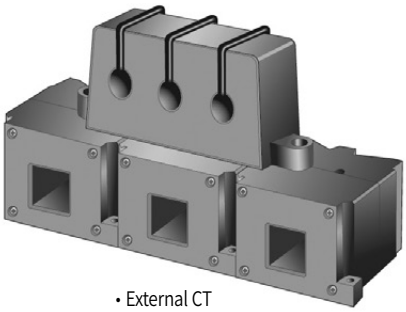



## Available on Inverter Circuits

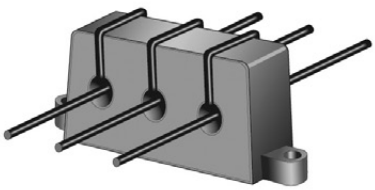
Due to the outstanding current detection capabilities according to frequency change, the system can be used on secondary circuits of inverters.
The operable frequency range is 20~200Hz, and for details of other specifications, please contact the manufacturer.
However, ground fault protection function is only available at 50/60Hz, so if the ground fault protection function is enabled, it cannot be used with an inverter.
If the start frequency is 20Hz, the system may malfunction.

## Wide Current Adjustment Range: 1 model is capable of covering 0.125-1000A

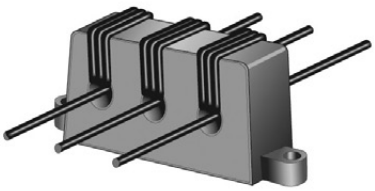
Adjust the Dip S/W to modify the current adjustment range from 0.5-6A to 5-60A, and depending on the MCT wire penetration count, the current can be adjusted up to 0.125A. If a separate external CT is used, it can be adjusted up to 1000A.



• External CT



• 2times(0.25 ~ 3A)



• 4 times(0.125 ~ 1.5A)

* External CT: Refer to supplementary devices (sold separately)
* MCT: Molded Current Transformer(must be purchased separately)

## The moment stopping of power supply compensation and Restart

- **The moment stopping of power supply compensation**
  - Line current reduces under 65% of rated voltage.
  - When the moment stopping of power supply within 10S, IMC-IIIa makes it restart same as before condition.
- **Restart delayed time(0 ~ 300S)**
  - When the line voltage recovers over 75% rated voltage, it can be restarted.
  - when it restarted, IMC-IIIa makes it sequence restart 0~300s for prohibition overload.
  - Indication of Restart delayed time countdown.
- **Operating condition and maintain operation mode**
  - It can be maintained before the moment stopping power supply condition(Local, MCC, Auto, Remote)

Ex) Incase of restarting delayed time 30S

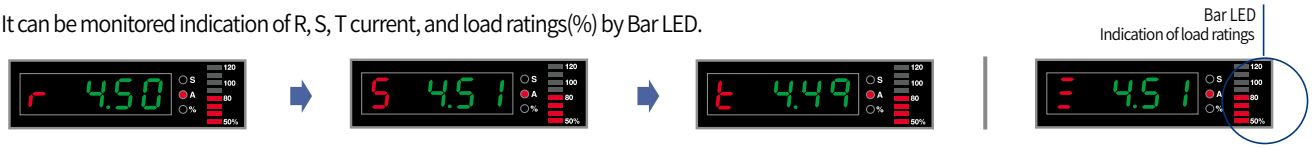



**Information**

- It can be changed operation mode (ON, OFF) and count time during countdown
- Changed operation mode can be applied after finishing count.
- When the short stopping power supply generates under 100ms, IMC-IIIa dose not detect, so the motor will maintain normal condition

## Digital Ampere-Meter

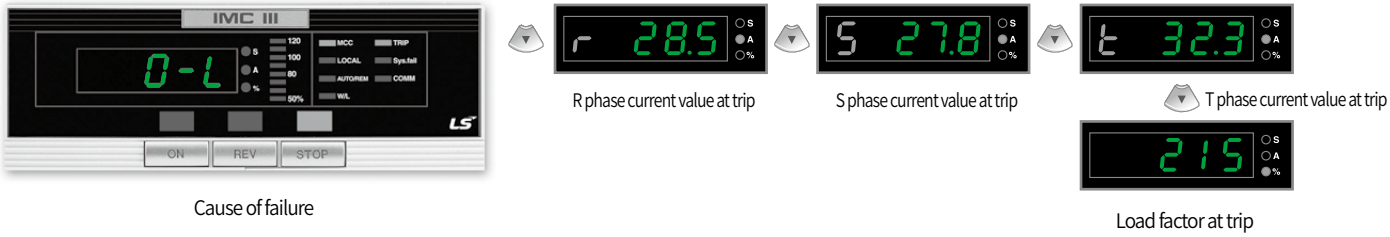
It can be monitored indication of R, S, T current, and load ratings(%) by Bar LED.




R-phase S-phase T-phase Max current

## Fault analysis and Recording

It can be indicated fault cause and fault current value by 7-segment and LED.
At the moment of instantaneous stopping of power supply, it can solve the problem. Because of the fault storage.




Cause of failure

R phase current value at trip

S phase current value at trip

T phase current value at trip

Load factor at trip

## Self-supervision and contactor failure function

IMC-IIIa can be checked self-supervision like a memory fault. When the motor starts/stops, that indicates Error.No and turn on Sys.Fail LED by supervising Input/output condition.

## Total operation time setting and storage

The total time the motor has been operated is stored for up to 10 years, so it is easy to manage the motor by checking the total operation time of the motor, Continuous operation time can be stored and set for up to one year (8760 hours) without stopping, and the contact output and "OrH" are displayed when the set operation time has elapsed It can be conveniently used for maintenance such as replacing the bearing of the motor and oiling cycle.

**Information**

When the user contact mode is normal mode, even if indicating “OrH Alarm, motor operates in normal condition

## Communication function

It’s possible to communicate with other system and organize various communication Network by MODBUS/RS-485. And it’s also possible to communicate with system by Analog current signal(4 ~ 20mA). So that makes it possible to interchange by using TD(Transducer).

- **4 ~ 20mA output**

| 0.5 ~ 6A TYPE | | External current transformer (Secondary Current) | | 5 ~ 60A TYPE | |
|---|---|---|---|---|---|
| Under 0.35A | Over 6A | Under 0.35A | Over 5A | Under 3.5A | Over 60A |
| 4mA | 20mA | 4mA | 20mA | 4mA | 20mA |

# Product characteristics

## Motor protection

| Type | | Operating condition | Operating Time | Remark |
|---|---|---|---|---|
| Over current | Inverse | Over 110% setting current | 1 ~ 60s/1s | 600% standard operating time |
| | Definite | Over 105% setting current | 1 ~ 60s/1s | Delay time 1 ~ 200s |
| Phase fault | | Over 70% current phase unbalance | Within 1.5s | Phase fault rate = $\frac{\text{Maximum Phase Current - Minimum Phase Current}}{\text{Maximum Phase Current}} \times 100(\%)$ |
| Phase unbalance | | Current phase unbalance 30 ~ 50% | Within 5s | |
| Reverse phase | | Reverse the current phase | Within 0.1s | Over 110% minimum ratings |
| Under current | | Rating current 30 ~ 70% | Within 3s | |
| Holding | Stall | Rating current 150 ~ 300% | Within 5s | Detection after over current setting time |
| | Lock | Rating current 200 ~ 700% | Within 0.5s | |
| Ground fault | | The current rating 0.1 ~ 2.5A setting | 0.05 ~ 1.0s setting | Ground fault delay operation |
| Pre-Alarm | | Over 120% setting value | | Bar-LED blinking |

## Sequence function

| Type | | | Contents | Remark |
|---|---|---|---|---|
| Operating type | Direct operation | | Non-reversible direct operation | |
| | Y-Δ operation | Y operation time | 1 ~ 120sec / 1sec | |
| | | Y-Δ switching time | 0.05, 0.1, 0.2sec | |
| | Forward / Reverse operating | | Reversible direct operation | |
| | Reactor | Reactor time | 1 ~ 120sec / 1sec | |
| | Inverter | Inverter delayed time | 0 ~ 1sec / 0.1sec | |
| Instantaneous power failure compensation | Compensation time | | OFF, 1 ~ 20sec / 1sec | |
| | Re-operation delay time | | 0 ~ 300sec / 1sec | |
| | Under voltage detection | | (Rating control voltage × 65%) ± 10% | |
| | Recovering voltage detection | | (Rating control voltage × 75%) ± 10% | |
| | I / O Guaranteed Voltage | | (Rating control voltage × 60%) ±10% | |
| User contact mode | Normal (nor) | | Normal Mode | |
| | Time Delay (t-d) | ON Delay Timer | 0 ~ 300sec / 1sec | MC-IIIa exclusion |
| | | OFF Delay Timer | | |
| | Flow Switch (F-S) | ON Delay Timer (T3) | 0 ~ 300sec / 1sec | Compare Timer › ON Delay Timer<br>MC-IIIa exclusion |
| | | OFF Delay Timer (T1) | | |
| | | Compare Timer Timer (T2) | | |
| Remote control | Local | | LOP(Local Operation Panel) | |
| | MCC | | Motor Control Center(IMC-III) | |
| | Auto | | PLC, DDC, DCS auto operation | |
| | W/L | | Water Level | |
| | Remote | | Modbus/RS485 communication | |
| | Emergency Stop | | External Trip 1, 2 | IMC-IIIa exclusion |

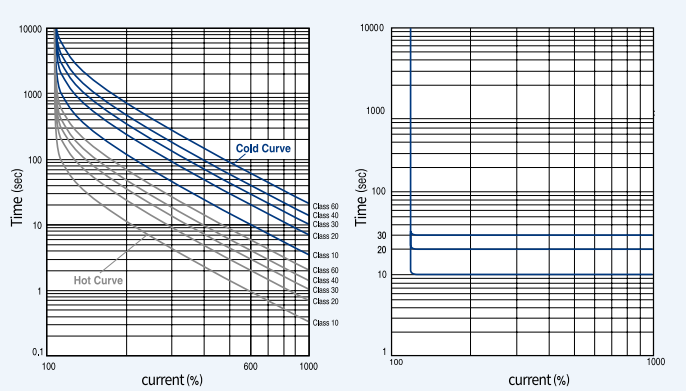
## Communication function

| Type | Contents | Specification | Remark |
|---|---|---|---|
| MODBUS / RS485 | Protocol | MODBUS_RTU | |
| | Communication | RS485 | |
| | Operation | Differential | |
| | Baud rate | 9600, 19200, 38400bps | |
| | Length | Max 1.2km | Different from local situation |
| | Cable | RS-485 Shielded twist 2-pair cable | |
| | Transmission | Half-Duplex | |
| | Max in/Output voltage | -7V ~ +12V | |

## Protection function

- **Overload protection (Overload-49)**

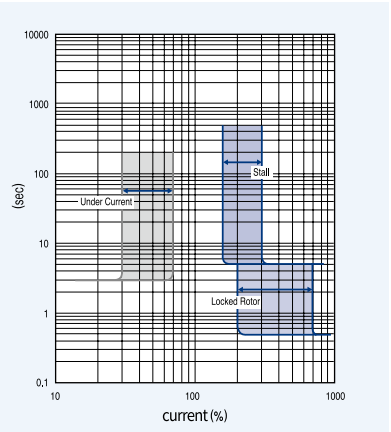
Overload protection function of IMC-III detects currents flowing in a motor and tracks the thermal capacity of the motor to protect the motor from overheating. If 100% of the thermal capacity is reached, an overload trip occurs, and the thermal capacity is then calculated based upon the selected overload characteristic curve and accumulated I2t value. By setting the rated current of the motor and considering the motor start time, with 600% of the set current as reference, 1-60 seconds are set as operation time in 1sec units to determine an overload characteristic curve of Class1-Class60. If definite time characteristic is selected, overcurrent is detected after the operation delay time (D-Time) regardless of the motor's thermal capacity and if overcurrent continues to be applied beyond the operation time (O-Time), a power trip occurs.




<Inverse Time Characteristic> <Definite Time Characteristic>

- **Stall/Locked rotor protection (Stall/Locked Rotor-48/51LR)**

Equipment such as pumps or fans can be easily damaged if fault occurs due to which the rotor locking occurs. IMC-III prevents rotor locking or failure or constant supply of large starting current due to operation delay, and it also features blocking the circuit by detecting drastic increase in load current due to overheating or overload during start, or detecting motor torque exceeding load torques. It ensures that delay time is set so the functions do not trip due to operation current during motor operation.




- **Under Current protection (Under Current-37)**

It is commonly used to prevent motor overheating by performing surveillance on unload status due to the motor drive shaft dislocation or damage, pump's continued idle (unload) status, or overheating due to coolant or fan-based cooling damage. It can be set at 30-70% of the rated current, and it operates within 3 seconds.

- **Phase failure/ Unbalance protection (Phase Fail/Phase Unbalance-47P)**

If open phase occurs due to internal faults of the motor or wiring issues, the motor cannot rotate or continues to rotate. In such case, large reverse phase current flows into the rotor of the motor causing overheating. IMC-III calculates the imbalance ratio of 3-phase current, operates as open phase at imbalance ratio of 70% or higher that trips within 1.5 seconds, and if the imbalance ratio is 30-50%, it operates as phase imbalance that trips within 5 seconds. If a single-phase motor is used, please set it as OFF because open phase and imbalance protection are impossible.

- **Reverse Phase protection (Reverse Phase)**

This function is to prevent the input current phase changing during motor start operation, in other words, reverse rotation. If the input 3-phase current changes its phase order when comparing the phase differences, the function operates within 0.1 seconds. However, reverse phase can be detected at 110% of the minimum set current of IMC-III, and it only checks reverse phases during motor operation. If a single-phase motor is used, please set it as OFF because open phase and unbalance protection are impossible.

- **Ground Fault protection (Ground Fault - 51G)**

This function is used to prevent secondary accidents (short circuit, electrocution) due to electrical shorting by detecting short circuit or short circuit current running in a motor. Depending on the protection system or protection purpose, the current sensitivity and operation time must be set differently. Ground fault current sensitivity can be set between 100 and 2500mA, and ground fault operation time can be set between 0.05 and 1.0 second. To detect the ground fault current, a separate ZCT (Zero phase Current Transformer) is used. However, during inverter start, ground fault protection is unavailable, so one needs to set the function OFF in such a case.

# Product characteristics

## Various Fault Cause, Display and Save Fault Value

With UP/DOWN[▲/▼] button, fault current values of each phase can be checked. and Fault Recording can be checked by pressing the [ESC+ENT] combination.



Overload



Under Current



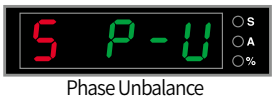
Locked Rotor



Stall



Phase Loss



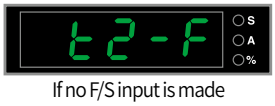
Phase Unbalance



Reverse Phase



Ground Fault

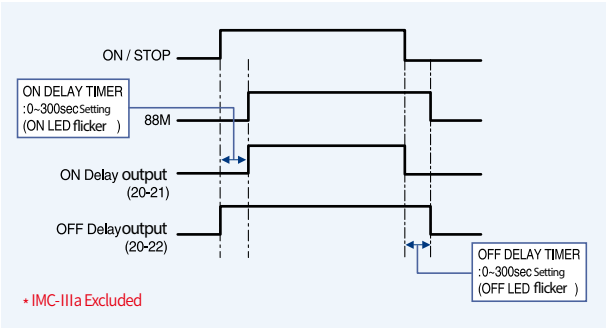


If no F/S input is made within the set time,



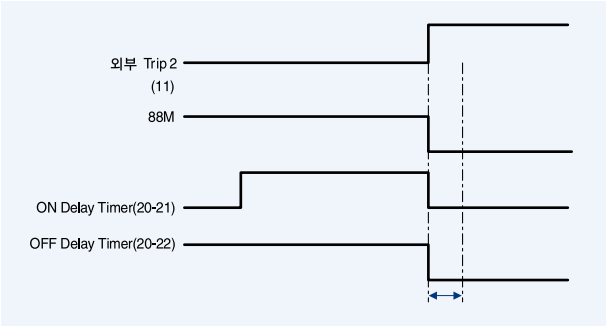
If set operation time is exceeded

## Time Delay (t-d) Mode




1) Once ON Delay Time passes after ON control, 88M turns On and the motor starts.
2) Once OFF Delay Time passes after OFF control. 88M turns OFF and the motor stops.

## External Trip Input




*External TRIP 1 (Terminal 10) is designed to suit FO/FC vale operation.
*External TRIP 2 (Terminal 11) executes trip and displays "Etrp" on the screen after receiving a signal. (Remove external TRIP 2 signal, reset to release, and resume normal operation)

## Self-diagnostic function



MC status after Output Contact OFF control If input contact is ON



MC status after Output Contact OFF control If input contact is ON

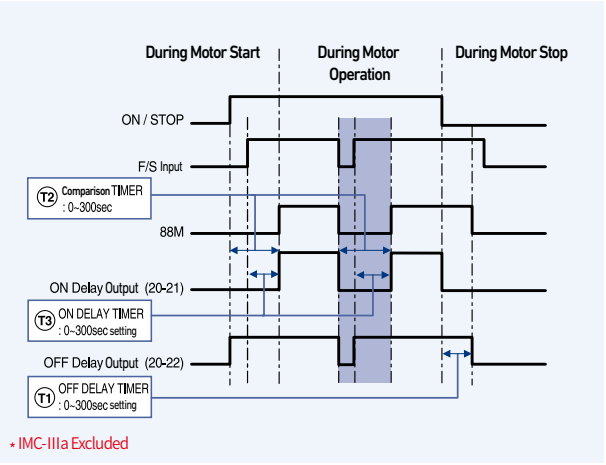


External contact inputs "FOR" and "REV" are made simultaneously



EEPROM Fault

## Flow Switch (F-S) Mode




### During Motor Start

1) After ON control, if the F/S (Flow Switch) input is made within the set comparison timer - On delay timer duration, the motor starts after ON Delay Time.
2) If F/S input is not provided, the ON execution is canceled, "t2-F" is displayed, and OFF continues.

### During Motor Operation

1) If F/S input disappears during motor operation, 88M turns OFF and the motor stops.
2) Then, the comparison timing operates, and if F/S input is made within the comparison Time - On Delay Time duration, the motor restarts after ON Delay Time.
3) If F/S input is not made within the comparison Time - On Delay Time, "t2-F" is displayed, and OFF status continues.
4) If OFF control is made, 88M turns OFF after the predefined OFF Delay Time and the motor stops.

ex) Motor operates normally with T1 Timer: 1S, T2 Timer: 10S, T3 Timer: 5S setting After F/S input is turned OFF, the re-input must be made within 10S-5S=5S in order to resume motor operation without displaying "t2-F."

Note) Comparison Timer must be larger than the ON Delay Timer.

# Rated specifications & model numbering system

## Rated specifications

| Type | | | | IMC-III(a) |
|---|---|---|---|---|
| Operating time | | | | Inverse time / Definite time |
| Current | | | | 0.125~60A (Within 1 model) |
| Indication | | | | 4 digit, 7-Segment |
| Control power | | | | AC 110/220V (50/60Hz) |
| Return method | Auto | | | 1~20min |
| | Manual | | | Return immediately |
| Installation | | | | Panel purchase installation |
| Tolerance | Current | | | ±5% |
| | Time | | | ±5% |
| | 4~20mA | | | ±5% |
| Time setting | Inverse time | | | 1~60sec/1s |
| | Definite time | D-Time | | 1~200sec/1s |
| | | O-Time | | 1~60sec/1s |
| Output contact (9EA) | Capacity | | | 5A/250VAC impedance load |
| | Composition | Operating contact | 3a | Forward/Reverse, Y-Δ, Reactor, Inverter start |
| | | Condition contact | 3a | Local, Auto, W/L Status display (W/L: IMC-IIIa exclusion) |
| | | Timer contact | 2a | ON Delay, OFF Delay (IMC-IIIa exclusion) |
| | | Trip contact | 1a | Fault output |
| Input contact (9EA) | Operating input | | 5a | Local, Auto, Water Level, Flow Switch Operation input (Flow Switch: IMC-IIIa exclusion) |
| | MC condition input | | 1a | Sequence status monitoring (LED lights up) |
| | External trip | | 2a | Utilize sequences such as emergency stop |
| ZCT | Ratings | | | 200mA/0.1mA (ZCT) |
| | Specification | | | ø25, ø40, ø80 |
| Service environment | Service temperature | | | -10°C ~ 55°C |
| | Storage temperature | | | -20°C ~ 70°C |
| | Relative humidity | | | within 80% RH, no condensation |
| Insulation Resistance | | | | DC 500V 10MΩ more |
| Lightning impulse voltage | | | | 1.2×50μs 5kV Standard waveform application |
| Fast Transient | | | | 2kV/1Min |
| Power Consumption | | | | 6W or less |

## Model numbering System

IMC - III [a] [NO] [2M] [AC 110V] [50/60Hz]

| Function | |
|---|---|
| - | Option |
| a | Standard |

| Communication | |
|---|---|
| NO | Normal (No communication) |
| M485 | MODBUS/RS485 |
| A420 | Analog 4~20mA |

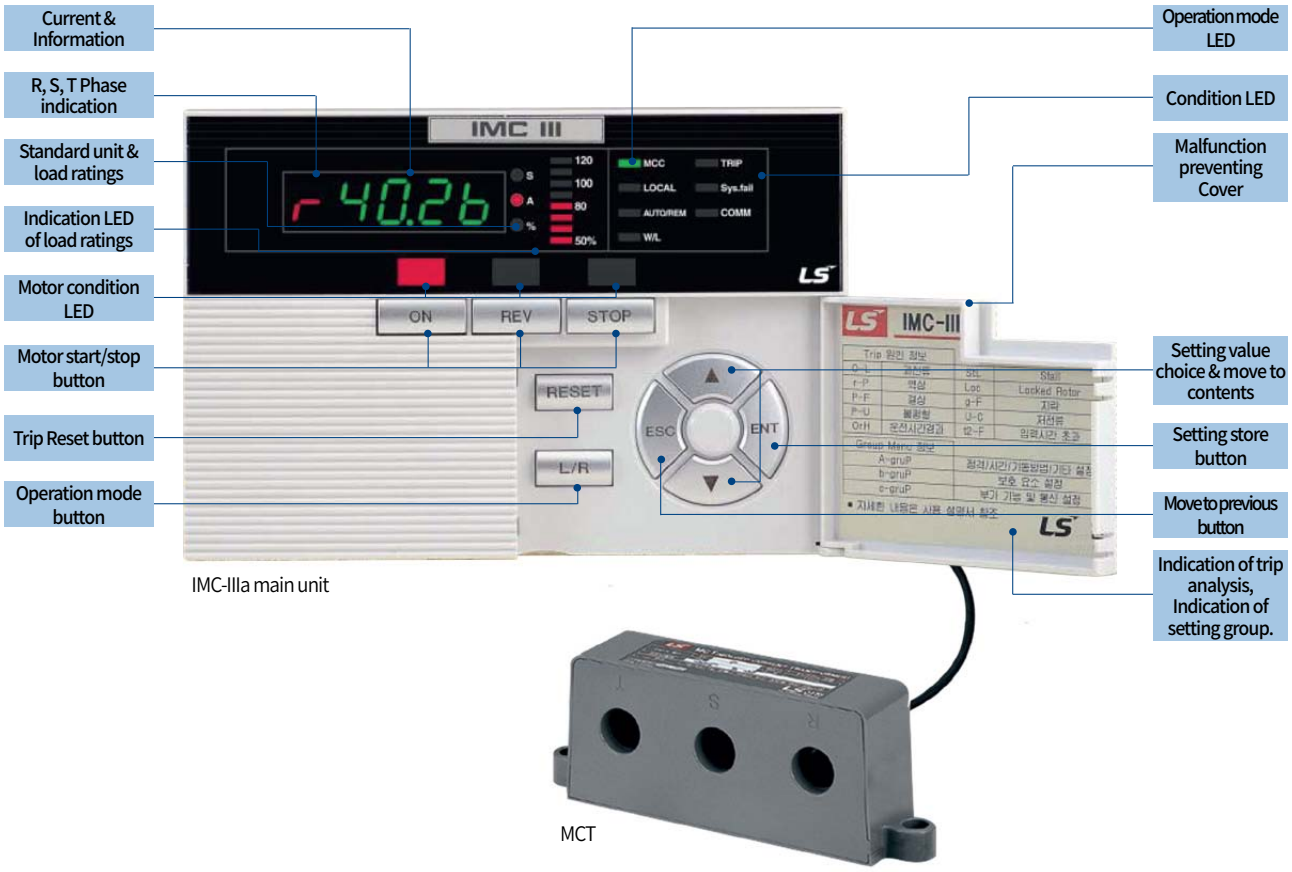
| MCT Cable Length | |
|---|---|
| 2M | 2m |
| 4M | 4m |

| Control Power |
|---|
| AC 110V |
| AC 220V |

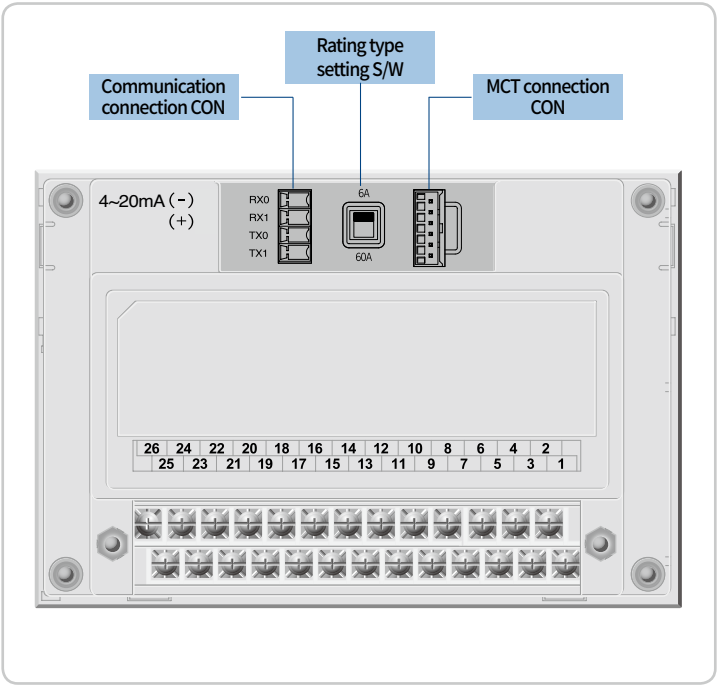
| Frequency |
|---|
| 50/60Hz |

# Operation & setting method

## Display configuration




## Rear view




## Setting method

① The first stage will be indicated maximum current in znormal condition

② When the UP/DOWN(▲/▼) button is pushed, A, B, C group is indicated.

③ When user push the ENT button after selecting group, it move to the detail setting contents.

④ After selecting contents by pushing UP/DOWN(▲/▼) button, if user push the ENT button, the setting value will be stored.

⑤ When UP/DOWN(▲/▼) button is pushed, the setting value will change, so that after selecting contents, if you push the ENT button , setting value will be stored.

⑥ After setting, if user push the ESC button, IMC-IIIa will be returned normal operating condition.

⑦ Set the other setting items in the same way.

⑧ Press the RESET button during the setting to return to normal operation mode.

Note) 1. Pls note that setting value can be changed during motor operation.
2. If user did not operate for 10S , Setting value and group setting contents will returned to current indication mode automatically.

| Group | No. | Setting | Indication | Setting value | Default value | Remark |
|---|---|---|---|---|---|---|
| A. grp Basic setting | 1 | Operating Characterist (Over current protection) | A. 1.CHA | Inu/dEF | Inu | Inverse/Definite time selection |
| | 2 | Operating time (Over current protection) | A. 2.0-t | 1~60/1s | 60 | In case of definite time, motor operating time |
| | 3 | Operating delayed time (Over current protection) | A. 3.d-t | 1~200/1s | 200 | |
| | 4 | Setting of rated current | A. 4.r-C | 0.5~6/0.1(A), 5~60/1(A) | 6/60 | 6/60A selection |
| | 5 | CT ratio | A. 5.Ctr | 0.25, 0.5, 1~200/1 | 1 | Impossible to set in case of selection 60A |
| | 6 | Start type selection | A. 6.dru | dir/y-d/F-r/Ind/Iut | dir | Direct, Y-Δ. Reactor, Inverter start |
| | 7 | Y operation time | A. 7.d-t | 1~120/1 | 5 (Inverter start: 0) | Reactor start time Inverter start delayed time(0 ~ 1s) |
| | 8 | Y-D switching time | A. 8.ydt | 0.05, 0.1, 0.2 (s) | 0.2 | |
| | 9 | Short time power off compensation time | A. 9.S-t | OFF, 1~20/1s | OFF | |
| | 10 | Re-start time | A. 10.Sd | 0~300/1s | - | 9. It can be indicated only in case of short time power stop compensation time |
| B. grp Protection function | 1 | Lock protection | b. 1.Loc | OFF, 200~700/100 (%) | OFF | |
| | 2 | Stall protection | b. 2.StL | OFF, 150, 200, 300 (%) | OFF | |
| | 3 | Phase-fault protection enabled | b. 3.P-F | OFF/On | On | |
| | 4 | Unbalance protection | b. 4.P-U | OFF, 30, 40, 50 (%) | OFF | |
| | 5 | Reverse phase protection | b. 5.r-P | OFF/On | OFF | Only during operation |
| | 6 | Under current protection | b. 6.U-C | OFF, 30~70/5 (%) | OFF | |
| | 7 | Ground fault protection | b. 7.9-F | OFF/On | OFF | OFF setting in case of inverter start |
| | 8 | Ground fault operation current | b. 8.9-C | 0.1, 0.2, 0.5, 1.0, 1.5, 2.0, 2.5 (A) | 0.1 | 7. Indication by ground fault protection seleection |
| | 9 | Ground fault operation time | b. 9.9-t | 0.05, 0.1~1.0/0.1s | 0.05 | |
| | 10 | Ground fault delay | b. 10.9d | OFF/On | OFF | |
| C. grp Additional function | 1 | I/O state information | C. 1.I-O | 4-segment | | Notify the manual |
| | 2 | Total operation time | C. 2.trt | Total operation time checking | Time check, Setting disabled | Day → hour, min (Max.1year : 8760 hour) |
| | 3 | Operation time | C. 3.r-t | Operation time checking | Time check, Setting disabled | Operation time →Day → Hour, min (Max.1year : 8760 hour) |
| | 4 | Operation time setting | C. 4.Srt | OFF, 10~8760/10 (H) | OFF | After reached setting operation time, indicating "OrH" |
| | 5 | Contactor check | C. 5.CCh | OFF/On | On | MC condition input check (OFF→not indicated Err1,2) |
| | 6 | User contact mode | C. 6.n-F | nor/t-d/F-S | nor | Normal/Time delay/Flow switch |
| | 7 | ON Delay Timer | C. 7.tOn | 0~300s/1s | 0 | Can be set when t-d or F-S mode is selected |
| | 8 | OFF Delay Timer | C. 8.tOF | 0~300s/1s | 0 | |
| | 9 | comparison Timer | C. 9.t-C | 0~300s/1s | 0 | Can be set when selecting F-S mode comparison Timer > ON Delay Timer |
| | 10 | Auto- returning | C. 10.Ar | OFF, 1~20min/1min | OFF | |
| | 11 | Communication address | C. 11.Ad | 1~255 | 1 | Only indication of communication model |
| | 12 | Communication Spped | C. 12.bS | 96, 192, 384 | 96 | bps (×100) |
| | 13 | SWAP | C. 13.SP | OFF/On | On | Floating data frame reverse (3, 4, 1, 2) selection |

*Changing 6. Start Setting of A.grp basic settings, and 6. User Contact Mode of C.grp additional functions during motor operation can cause motor malfunctioning, so do not change their settings.
*If 10. Ground Fault Delay Function of B.grp protection function is set as ON, ground fault is detected after O-t in case of inverse time and d-t in case of definite time
*Menus 6-9 of C.grp additional functions are not displayed on IMC-IIIa.
*Some menus are not displayed according to their specific function settings (refer to remarks).

# Operation & setting method

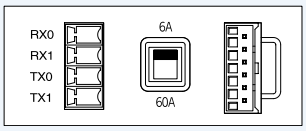
## Rated current setting

1) IMC-IIIa rated current can be selected 6A(0.5 ~ 6A), 60A(5 ~ 60A)

① Protective operation is possible only above the minimum rated current.
(6A Tap is 0.5A or less, 60A Tap is 5A or less)

② Be sure to operate within the rated range because the current may be displayed incorrectly or the protection may be malfunctioning.

③ When changing the adjustment software, be sure to turn off the power.




Note) Don't change the switch during the operation.

2) To select the rated current.

① User has to switch the IMC-IIIa power OFF → ON

② User has to switch the IMC-IIIa ON → OFF

③ Turn on the IMC-III control

④ Move to [4.r-C] item in setting group A and set the detailed rated current.

- After finishing motor starting, set the 110~115% of real load current in the load operation condition.

| | |
|---|---|
| • Load under 0.5A | • Over 60A load |
| - Set the CT ratio 0.5 or 0.25 in the [6.ctr] | - Usage of external CT |
| - MCT cable penetration increase from 2 times to 4 times | - CT ratio (1 ~ 200) : Maximum 1000A |
| - Rated current setting range : 0.25 ~ 3A(2 times), 0.125 ~ 1.5A (4 times) | |

## Operating time setting

1) It can be set 1 ~ 60s in the A group in [2.O-t]

① In case of selecting inverse time in the [1.CHA]
- Setting operation time is 600% standard of rated current

② In case of selecting the definite time
- The standard is over 105% of rated current.
- User has to set the operation delayed time 1 ~ 200s In the [3.d-t] considering motor operating time.

## Special function key

- **Turn the heating capacity into clear and return by force**

IMC-IIIa inverse time protects overload fault by sensing the applied current on the motor, trace heating condition of motor. Motor has heating capacity until completed cold status even if . motor stopped. IMC-IIIa accumulates heating capacity values similar with motor.

In case of continuous re-start, or generating the trip, it can be tripped by acknowledgement Hot curve through the cumulated heating capacity.

**Information**

If user want to re-start even if damaged to motor, push the STOP + RESET button. in conclusion, cumulative heating capacity remove and can be reset.

- **Fault Recording**

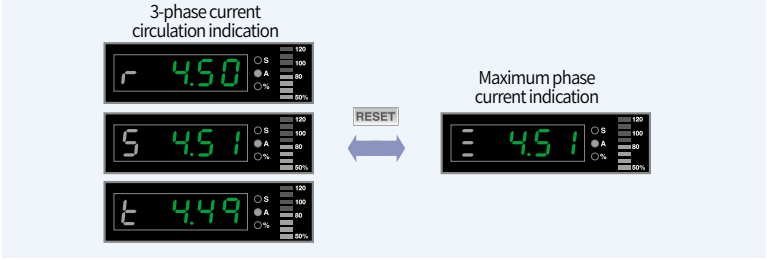
IMC-IIIa provides fault recording function even if power is OFF.

If user push the ESC + ENT button, user can check the Fault analysis and fault current value. If user push the RESET button, fault analysis and fault recording will be deleted.

If there is no string data, it will be indicated "non" And then if user push the ESC + ENT button, it will come back to normal mode.

- **Transfer to current indication mode.**

If user push the RESET button for 2 seconds, it will come back to current indication mode.




Note) If user push the RESET button for over 10s, IMC-IIIa will come back first manufacturing status. At this time, user has to know that setting and storing value is deleted and comes back first manufacturing status.

## Total operation time

- Total operation time check: 2.trt → ENT → day → ▼ → Hour minute

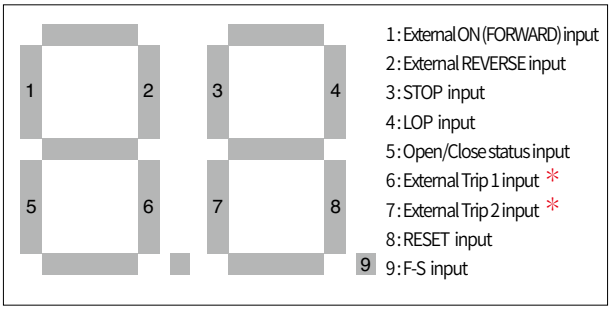
  ex) If total operation time is 50hours 50 minutes: 2.trt → ENT → 2 days → ▼ → 2.50(2 hours 50 minutes)

- Operation time 3.r-t → ENT → Total operation time → ▼ → converse day → ▼ → Extra hour, minutes

  ex) If operation time is 50 hours 50minutes: 3.r-t → ENT → 5 0 hours → ▼ → 2days → ▼ → 2.50 (2 hours 50 minutes)

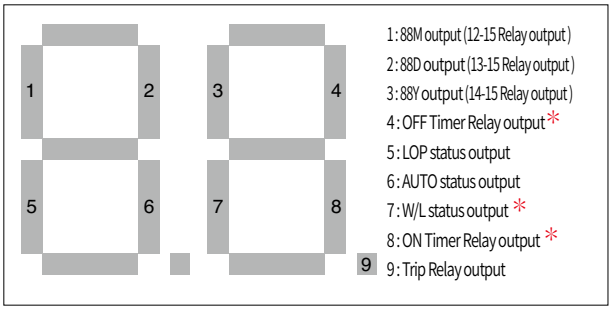
## Refer to the following for I/O information:

- 1st and 2nd 7-segment are DI information which are as follows




- 3rd and 4th 7-segment are DO information which are as follows

  (#9 is trip relay output for which I/O information cannot be checked during trip status)




Note) Items with ✻ do not support IMC- II

## Operation mode handling method

Operation priority: Local > MCC > Auto, W/L > Remote



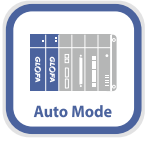

### Local Operation Panel mode

The local operation mode is the highest priority mode, When the emergency situation generates, it can control motor in the local site. Only in case of closing switch to the local site, motor can be controlled.
At that time, Local LED of IMC-IIIa is lighting on, can not be controlled in another modes.




### Motor Control Center mode

This mode is possible to operate in the IMC-IIIa of MCC panel. If MCC LED is lighting up by pushing the L/R button, it's possible to control motor in the IMC-IIIa.
At this time, it can not be controlled by in AUTO.




### Auto - PLC automatic operation mode

This mode can provides automatic operation and remote control by PLC, DDC, DCS.
If Auto/Rem LED is lighting up by pushing the L/R button, it's possible to control motor in the IMC-IIIa.
In such a case, controls from MCC, Auto and Remote are unavailable.




### W/L- Water Level Auto Operation Mode

It is the mode that allows auto operation and remote control according to level change.
If W/L LED is lighting up by pushing the L/R button, it's possible to control motor in the IMC-IIIa. Like Auto mode, auto operations using PLC or DDC are also available.
In such a case, controls from MCC, Auto and Remote are unavailable.

*If LOP/Auto mode are used together, to differentiate inputs, the interlock circuit must be configured with status output contacts. (refer to Wiring Method)

*IMC-IIIa excluded



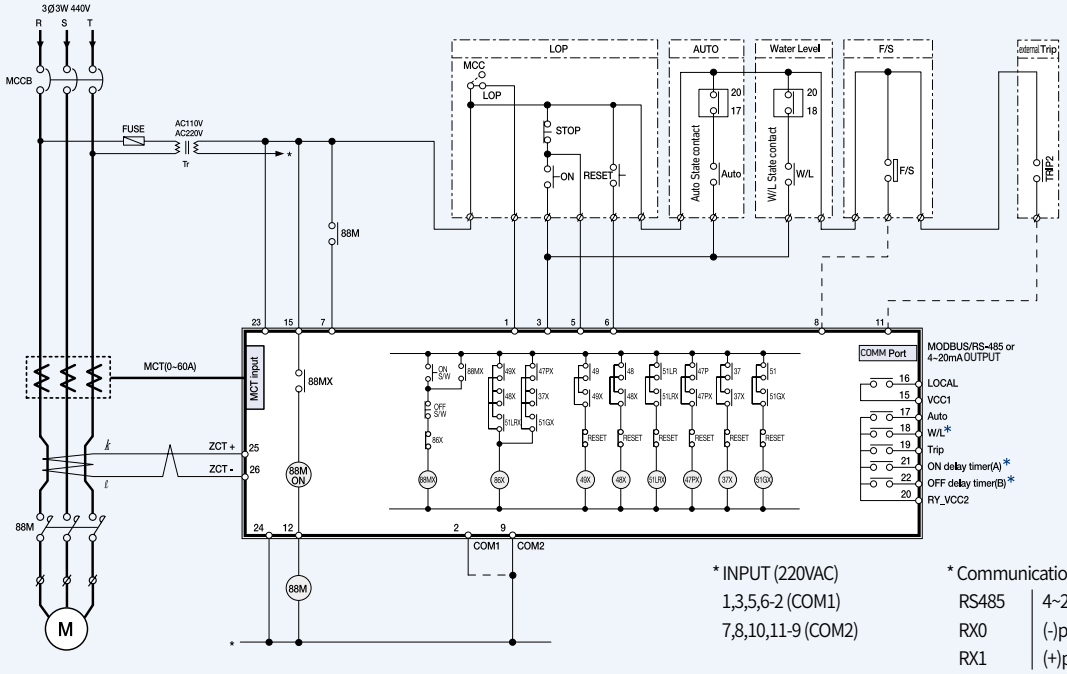

### Remote - communication operation mode

This mode is for remote monitoring control by Modbus, RS-485.
If the Auto / Remote LED blinks by operating the L/R button of IMC-III, remote control by MODBUS / RS485 communication is possible, and data such as 3-phase current value, fault value, and various setting values can be checked.
In such a case, controls from MCC, Auto and Remote are unavailable.

• 4~20mA output model can check only current Value through the Analog communication(4~20mA)

# Wiring & cable connection

## Direct start sequence




* INPUT (220VAC)
1,3,5,6-2 (COM1)
7,8,10,11-9 (COM2)

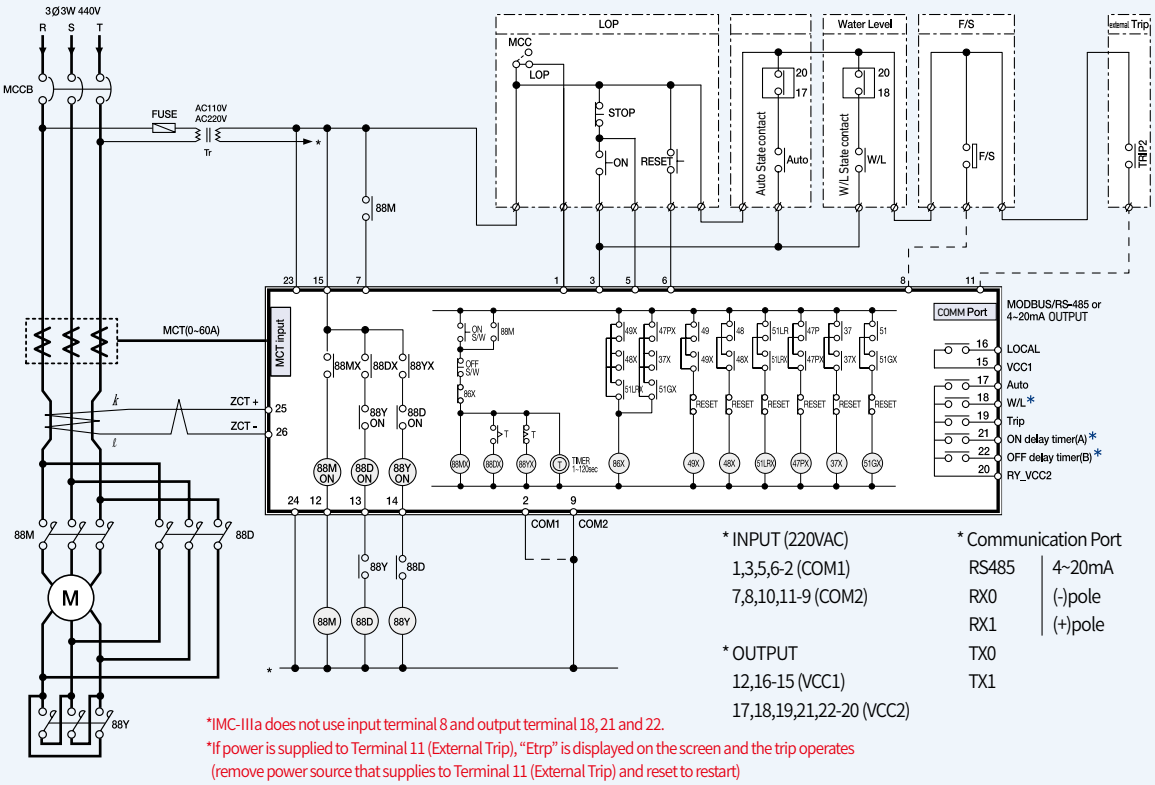
* OUTPUT
12,16-15 (VCC1)
17,18,19,21,22-20 (VCC2)

* Communication Port

| | |
|---|---|
| RS485 | 4~20mA |
| RX0 | (-)pole |
| RX1 | (+)pole |
| TX0 | |
| TX1 | |

*IMC-IIIa does not use input terminal 8 and output terminal 18, 21 and 22.
*If power is supplied to Terminal 11 (External Trip), "Etrp" is displayed on the screen and the trip operates (remove power source that supplies to Terminal 11 (External Trip) and reset to restart)

## Y-△ start




* INPUT (220VAC)
1,3,5,6-2 (COM1)
7,8,10,11-9 (COM2)

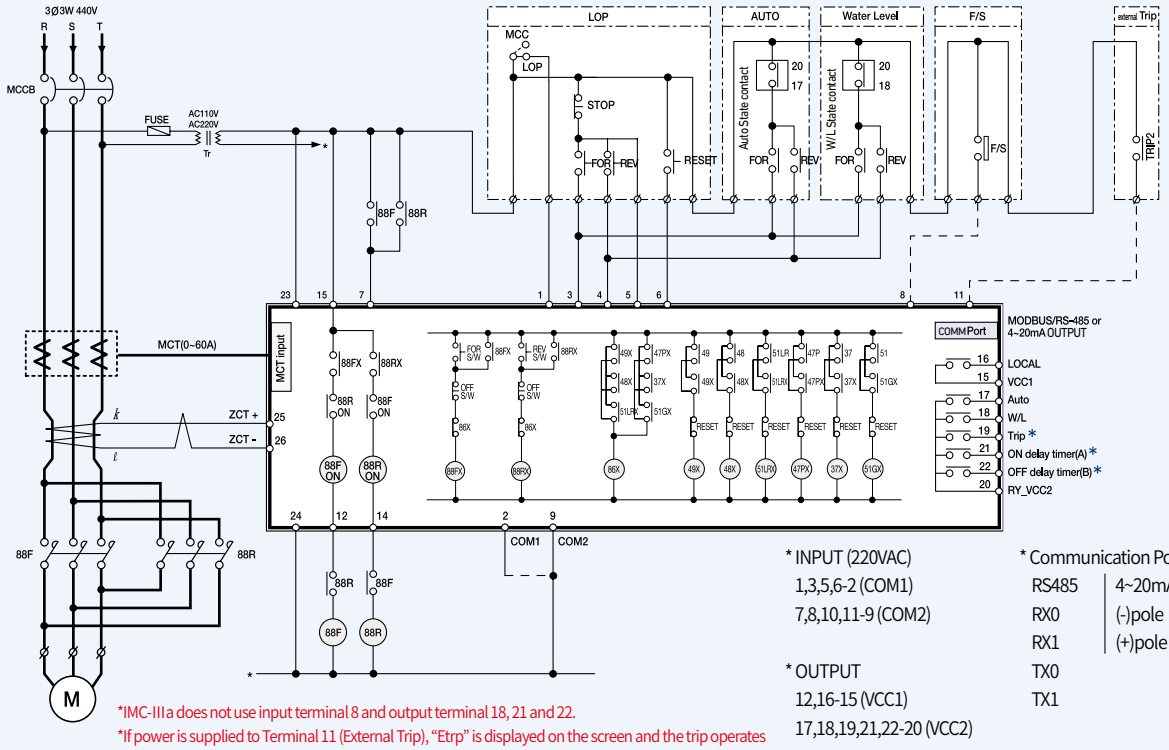
* OUTPUT
12,16-15 (VCC1)
17,18,19,21,22-20 (VCC2)

* Communication Port

| | |
|---|---|
| RS485 | 4~20mA |
| RX0 | (-)pole |
| RX1 | (+)pole |
| TX0 | |
| TX1 | |

*IMC-IIIa does not use input terminal 8 and output terminal 18, 21 and 22.
*If power is supplied to Terminal 11 (External Trip), "Etrp" is displayed on the screen and the trip operates (remove power source that supplies to Terminal 11 (External Trip) and reset to restart)

## For/Rev start




* INPUT (220VAC)
1,3,5,6-2 (COM1)
7,8,10,11-9 (COM2)

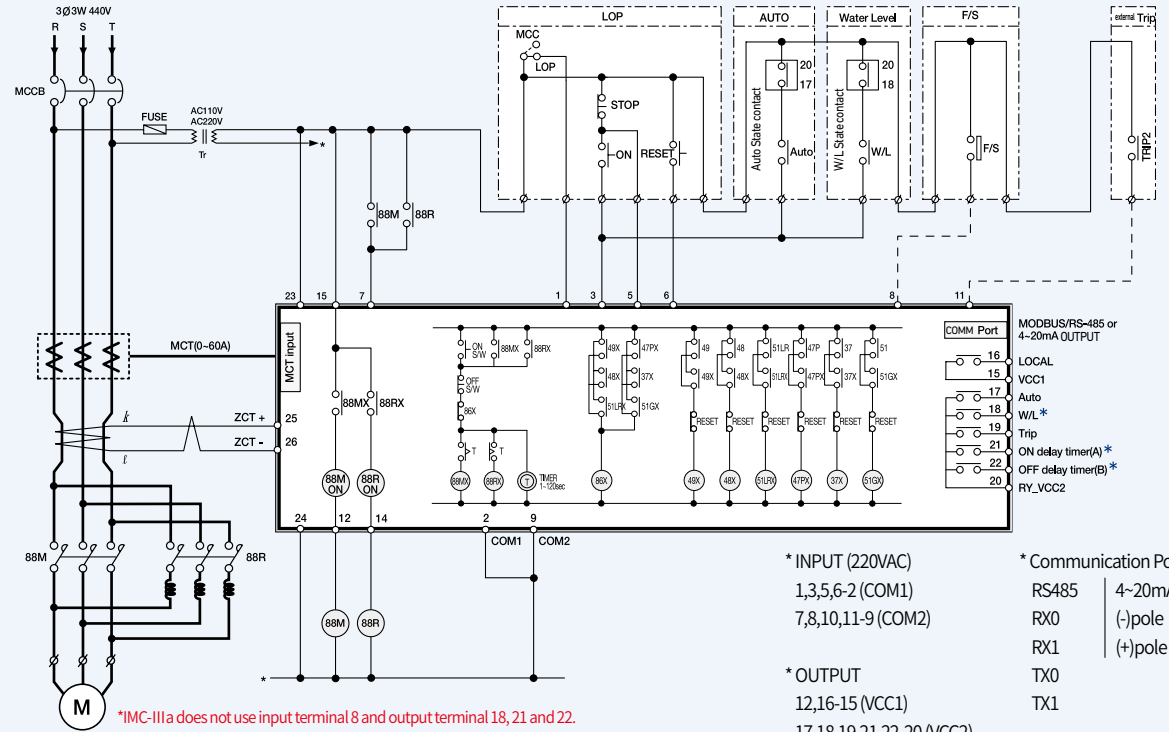
* OUTPUT
12,16-15 (VCC1)
17,18,19,21,22-20 (VCC2)

* Communication Port

| | |
|---|---|
| RS485 | 4~20mA |
| RX0 | (-)pole |
| RX1 | (+)pole |
| TX0 | |
| TX1 | |

*IMC-IIIa does not use input terminal 8 and output terminal 18, 21 and 22.
*If power is supplied to Terminal 11 (External Trip), "Etrp" is displayed on the screen and the trip operates (remove power source that supplies to Terminal 11 (External Trip) and reset to restart)

## Reactor start




* INPUT (220VAC)
1,3,5,6-2 (COM1)
7,8,10,11-9 (COM2)

* OUTPUT
12,16-15 (VCC1)
17,18,19,21,22-20 (VCC2)

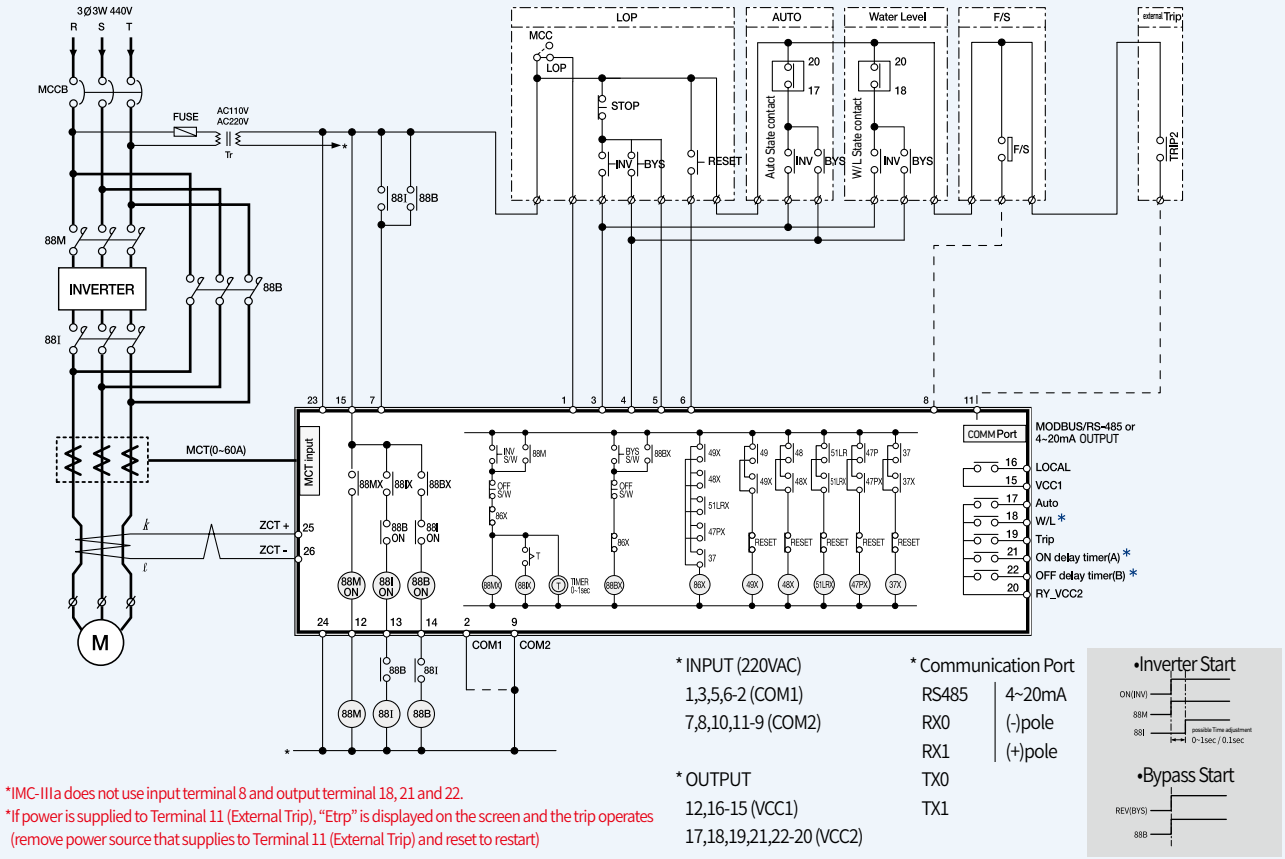
* Communication Port

| | |
|---|---|
| RS485 | 4~20mA |
| RX0 | (-)pole |
| RX1 | (+)pole |
| TX0 | |
| TX1 | |

*IMC-IIIa does not use input terminal 8 and output terminal 18, 21 and 22.
*If power is supplied to Terminal 11 (External Trip), "Etrp" is displayed on the screen and the trip operates (remove power source that supplies to Terminal 11 (External Trip) and reset to restart)

# Wiring & cable connection

## Inverter start




*IMC-IIIa does not use input terminal 8 and output terminal 18, 21 and 22.
*If power is supplied to Terminal 11 (External Trip), "Etrp" is displayed on the screen and the trip operates (remove power source that supplies to Terminal 11 (External Trip) and reset to restart)

* INPUT (220VAC)
1,3,5,6-2 (COM1)
7,8,10,11-9 (COM2)

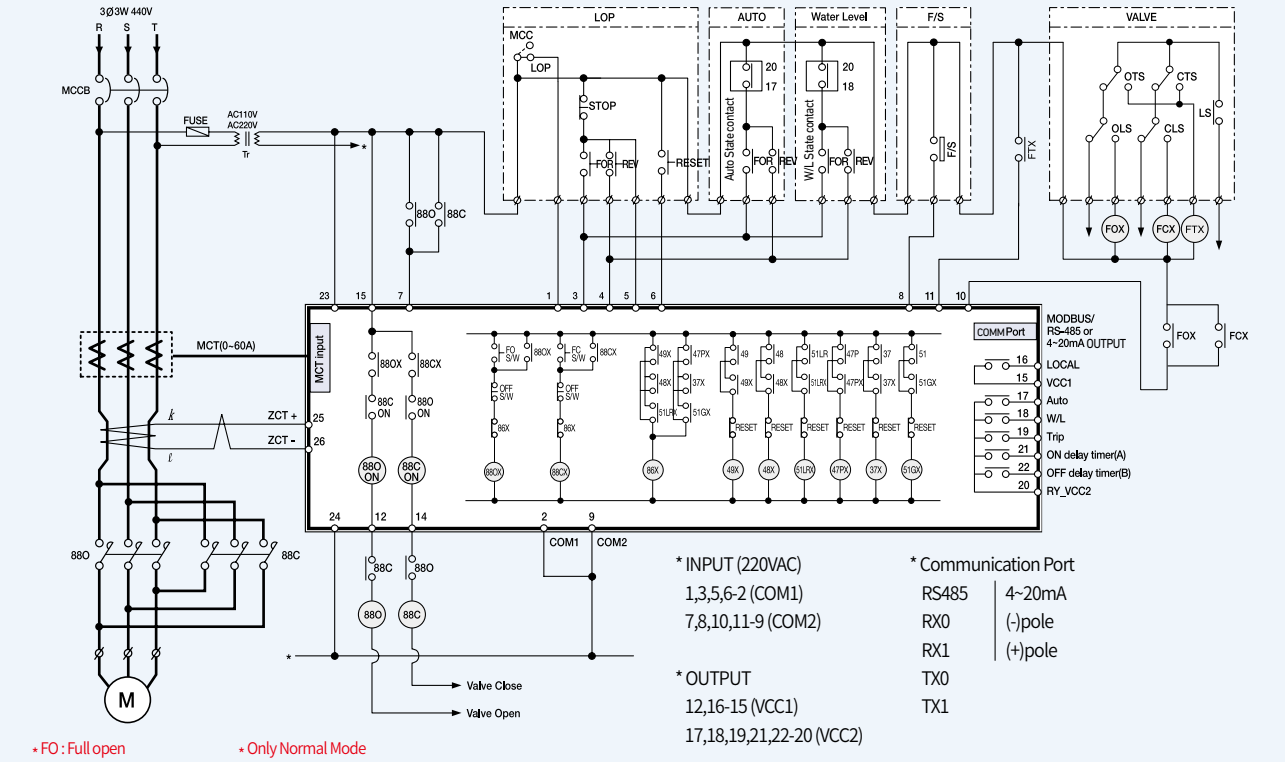
* OUTPUT
12,16-15 (VCC1)
17,18,19,21,22-20 (VCC2)

* Communication Port

| | |
|---|---|
| RS485 | 4~20mA |
| RX0 | (-)pole |
| RX1 | (+)pole |
| TX0 | |
| TX1 | |




## FO/FC valve start (Forward/Reverse) (IMC-IIIa excluded)




* FO : Full open
FC : Full close

* Only Normal Mode

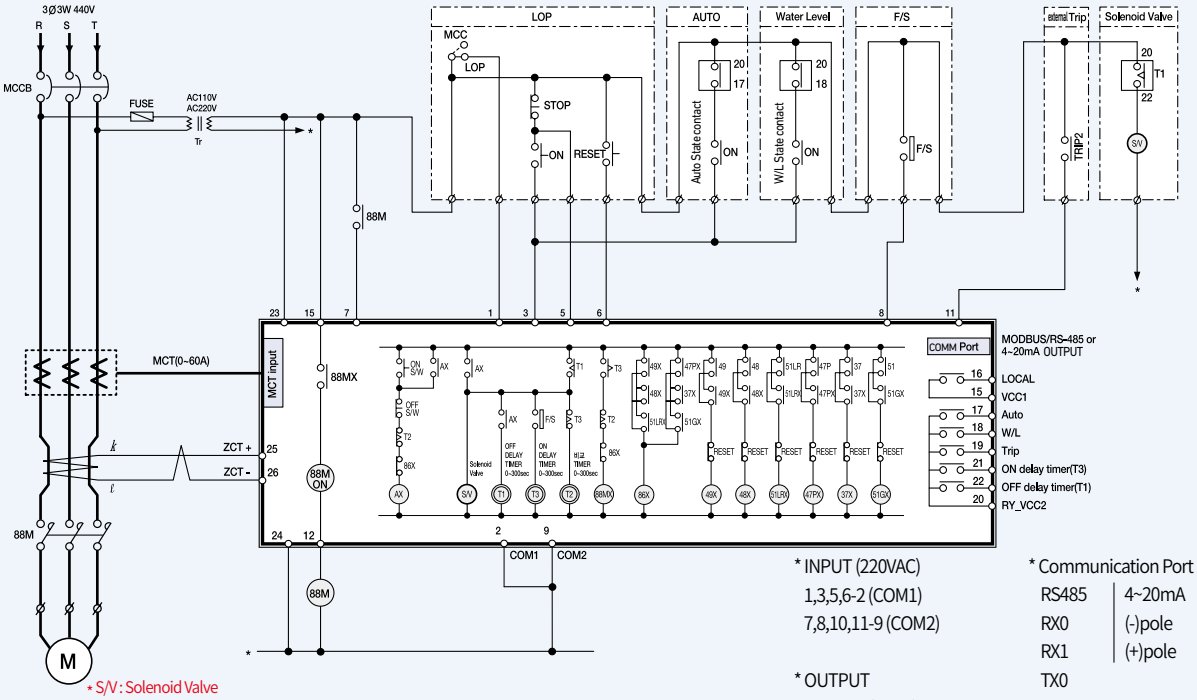
* INPUT (220VAC)
1,3,5,6-2 (COM1)
7,8,10,11-9 (COM2)

* OUTPUT
12,16-15 (VCC1)
17,18,19,21,22-20 (VCC2)

* Communication Port

| | |
|---|---|
| RS485 | 4~20mA |
| RX0 | (-)pole |
| RX1 | (+)pole |
| TX0 | |
| TX1 | |

## S/V Start (Direct Input) (IMC-IIIa excluded)




① Once ON S/W input is made, S/V (Solenoid Valve) turns ON and OFF Delay Timer (T1) turns ON.
② If F/S (Flow Switch) input is made with set [T2-T3] time, ON Delay Timer (T3) turns ON.
③ After the set time since activation of ON (T3), the comparison timer (T2) turns OFF, 88MX turns ON and the motor starts.
④ If F/S input is not made within a set [T2-T3] time, ON execution is cancelled and "t2-F" is displayed.
⑤ Comparison timer (T2) must be larger than ON Delay Timer (T3), and it must consider the time needed for F/S inputs to be made.
⑥ If OFF S/W input is made to stop the motor, S/V and motor are OFF Delayed by the (T1) set time.
⑦ If F/S input is removed during motor operation

## Terminal number

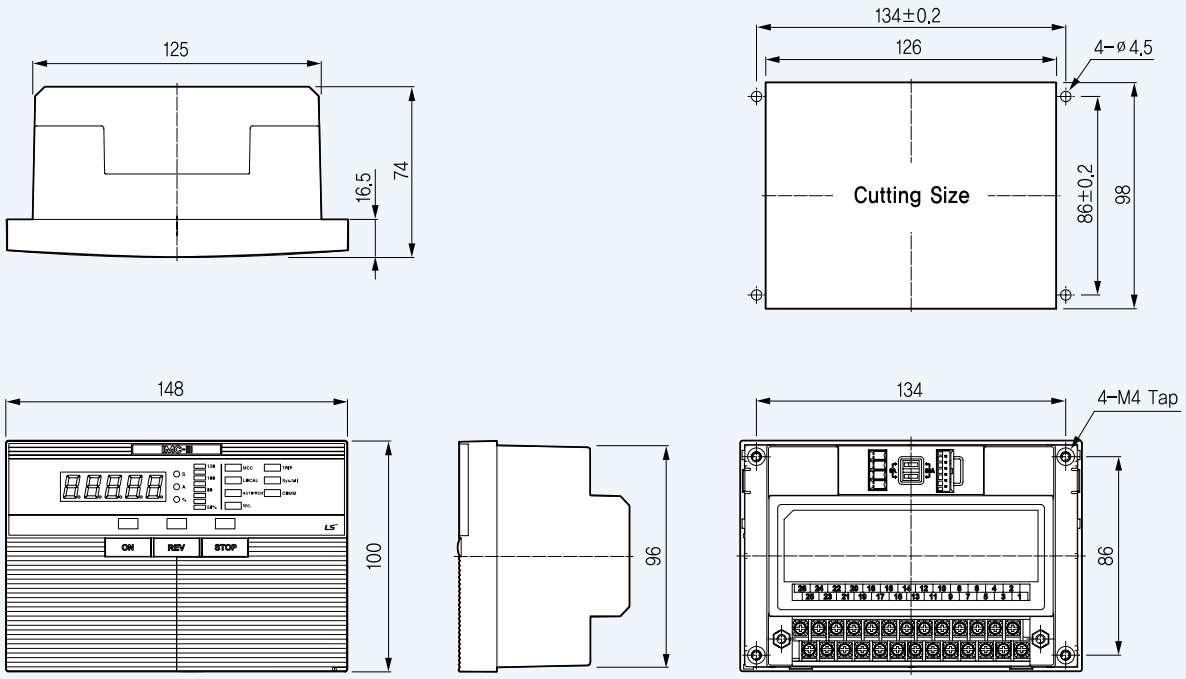
| Terminal No | Explanation | Terminal No | |
|---|---|---|---|
| 1 | LOP selection input | 14 | Y Start/Reverse Rotation /Reactor/Bypass Contact Output |
| 2 | COM1 (1, 3, 4, 5, 6) | 15 | VCC1 (12, 13, 14, 16) |
| 3 | ON input | 16 | LOP condition output |
| 4 | Reverse Rotation ON Input (Bypass) | 17 | AUTO condition output |
| 5 | STOP input | 18 | Water Level condition output |
| 6 | RESET input | 19 | TRIP output (1a) |
| 7 | MC condition input | 20 | VCC2 (17, 18, 19, 21, 22) |
| 8 | F-S mode input | * 21 | ON Delay Timer output (t-d, F-S mode) |
| 9 | COM2 (7, 8, 10, 11) | * 22 | OFF Delay Timer output (t-d, F-S mode) |
| 10 | External trip1 input | 23 | Control Power (AC 110V or 220V) |
| 11 | External trip2 input | 24 | Control Power (AC 110V or 220V) |
| 12 | ON output | 25 | ZCT input ( k ) |
| 13 | △Start/Inverter Contact Output | 26 | ZCT input (ℓ) |

* Normal Mode
20 - 21 : Operation Time Alarm("OrH") Output
20 - 22 : Not Used

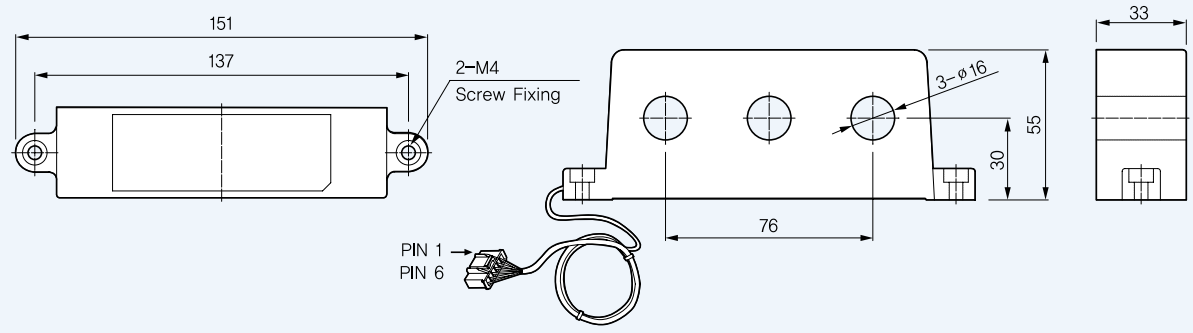
# Dimensions

## Dimensions

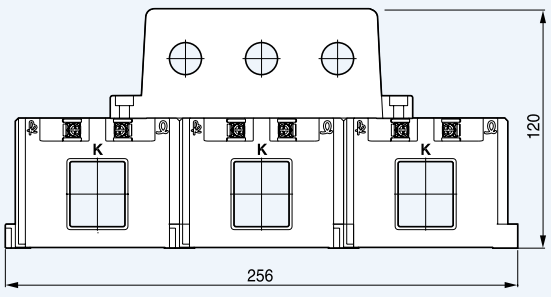
### IMC-IIIa main unit




### MCT




### In case of MCT combination




Note) 1. This product is only for EMPR, IMC, user must not use for other service
2. Pls order each 3EA with IMC-IIIa, because this product is 1CT type.

# Memo

# EMPR Rated specifications

## Rated specifications

| Type | Primary current | Current setting range(A) | Applied 3-phase motor capacity(KW) | | Operating characteristic |
|---|---|---|---|---|---|
| | | | 220~240VAC | 380~440VAC | |
| GMP-series | GMP22-2P/2PA, 3P/3PR | 0.3~1.5<br>1~5<br>4.4~22 | ~0.18<br>0.18~1.1<br>1.1~5.5 | 0.12~0.55<br>0.37~2.2<br>2.2~11 | Inverse-time |
| | GMP22-2S, 3S/3SR | | | | |
| | GMP22-2T, 3T/3TR | | | | |
| | GMP22-2PD | | | | Definite-time |
| | GMP40-2P/2PA, 3P/3PR | 4~20<br>8~40 | 1.1~5.5<br>2.2~11 | 2.2~7.5<br>4~18.5 | Inverse-time |
| | GMP40-2S, 3S/3SR | | | | |
| | GMP40-2T, 3T/3TR | | | | |
| | GMP40-2PD | | | | Definite-time |
| | GMP80-2S, 3S/3SR | 16~80 | 5.5~22 | 11~45 | Inverse-time |
| | GMP60T, 60TE, 60TA | 0.5~6<br>3~30<br>5~60 | 0.09~1.1<br>0.5~7.5<br>1.5~15 | 0.18~2.2<br>1.5~15<br>3.0~30 | Definite-time |
| | GMP60TD/TDa | 0.125~60 | 0.06~15 | 0.06~30 | Definite-time/Inverse-time |
| | GMP60-3T/3TR | 0.5~60 | 0.09~15 | 0.18~30 | Definite-time |
| | GMP60-3TZ/3TZR | | | | Definite-time(Ground Fault) |
| | GMP60-3TN/3TNR | | | | |
| DMPi-series | DMP06i | 0.5~6<br>5~655~60 | 0.09~1.1<br>1.5~18.5<br>1.5~15 | 0.18~2.2<br>3.0~303.0~30 | Definite-time/Inverse-time<br>(Instanteous/Ground Fault) |
| | DMP65i | | | | |
| IMP-series | IMP-C-NO | 0.125~100 | 0.06~30 | 0.06~55 | Definite-time/Inverse-time<br>(Instanteous/Ground Fault) |
| | IMP-C-A420 | | | | |
| | IMP-C-M485 | | | | |
| MMP-series | S-EMPR MMP-CB/CM-10 | 0.125~10 | 0.06~2.2 | 0.06~4 | Definite-time/Inverse-time<br>(Current type) |
| | S-EMPR MMP-PB/PM-10 | | | | Definite-time/Inverse-time<br>(Power type) |
| | S-EMPR MMP-SB/SM-10 | | | | Definite-time/Inverse-time<br>(SGR type) |
| | S-EMPR MMP-IR-10 | 0.125~10 | 0.06~2.2 | 0.06~4 | Definite-time/Inverse-time<br>(IR type) |
| | S-EMPR MMP-CB/CM-100 | 5~100 | 1.5~30 | 3.0~55 | Definite-time/Inverse-time<br>(Current type) |
| | S-EMPR MMP-PB/PM-100 | | | | Definite-time/Inverse-time<br>(Power type) |
| | S-EMPR MMP-SB/SM-100 | | | | Definite-time/Inverse-time<br>(SGR type) |
| | S-EMPR MMP-IR-100 | 5~100 | 1.5~30 | 3.0~55 | Definite-time/Inverse-time<br>(IR type) |
| IMC-III-series | IMC-IIIa | 0.125~60 | 0.06~15 | 0.06~30 | Definite-time/Inverse-time |
| | IMC-III | 0.125~60 | 0.06~15 | 0.06~30 | Definite-time/Inverse-time |

# ZCT (Zero-phase Seguence Current Transformer) (Voltage output type)

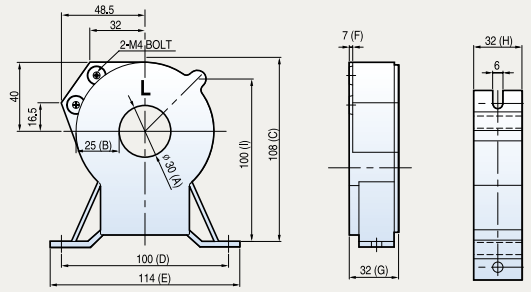
## Rated specifications

Unit : mm

| Code | Model name | Inside diameter (mm) | Zero phase current transformer ratio | Weight (kg) |
|---|---|---|---|---|
| 76512121001 | LZT-030 | 30 | 200mA/100mV (LS only) | 0.5 |
| 76512121002 | LZT-050 | 50 | | 0.7 |
| 76512121003 | LZT-065 | 65 | | 0.9 |
| 76512121004 | LZT-080 | 80 | | 1.5 |

## Dimensions

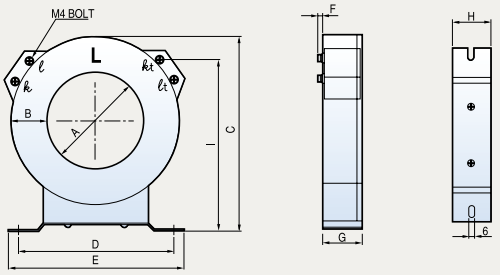
ZCT 30




Unit : mm

| Model name | A | B | C | D | E | F | G | H | I | Ø |
|---|---|---|---|---|---|---|---|---|---|---|
| LZT-030 | 30 | 25 | 108 | 100 | 114 | 7 | 32 | 32 | 110 | 6 |

ZCT 50, 65, 80




Unit : mm

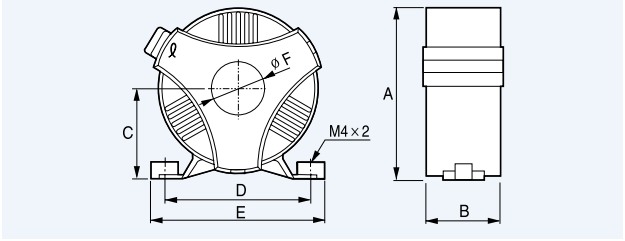
| Model name | A | B | C | D | E | F | G | H | I | Ø |
|---|---|---|---|---|---|---|---|---|---|---|
| LZT-050 | 50 | 25 | 131 | 100 | 122 | 7 | 32 | 36 | 114 | 6 |
| LZT-065 | 65 | 26 | 143 | 114 | 133 | 7 | 39 | 37 | 126 | 6 |
| LZT-080 | 80 | 34 | 174 | 160 | 180 | 7 | 40 | 40 | 151 | 6 |

# ZCT (Zero-phase Seguence Current Transformer) IMC-III only (Current output type)

## Rated specifications

| Code | Model name | Inside diameter (mm) | Zero phase current transformer ratio | Weight (kg) |
|---|---|---|---|---|
| 76512532025 | LZT-025 (I) | 25 | 200mA/0.1mA | 0.5 |
| 76512532040 | LZT-040 (I) | 40 | | 0.8 |
| 76512532080 | LZT-080 (I) | 80 | | 0.4 |

## Dimensions




Dimension (mm)

| Model name | A | B | C | D | E | øF |
|---|---|---|---|---|---|---|
| LZT-025 (I) | 81 | 43 | 43.5 | 68 | 81 | 25 |
| LZT-040 (I) | 101 | 43 | 53.5 | 88 | 101 | 40 |
| LZT-080 (I) | 146 | 43 | 76 | 133 | 146 | 80 |

Note) 1. This product is exclusively for IMC ZCT and must be used for IMC exclusive ZCT.
2. EMPR exclusive ZCT can't protect ground fault when used with IMC-III as secondary output is voltage output.

# EMPR Optional accessories

## CT (Current Transformer)

### Rated specifications

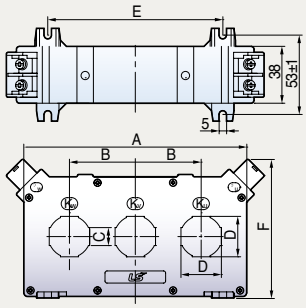
| Classification | Code | Model name | Primary current | Secondary current | Load(VA) | Penetrating hole [mm] | Upper installation EMPR | Remarks |
|---|---|---|---|---|---|---|---|---|
| 3CT type | 76012116026 | 3CT-23 | 50A | 5A | 1.5 | 21×21 | GMP22/40/60T | 1) Error class: Class 1.0<br>2) Insulation voltage: 690V<br>3) Withstanding voltage: 4kV/min<br>4) Overcurrent strength: 40 x 1n<br>5) Insulation resistance: 10MΩ (DC 500V Megger)<br>6) Frequency: 50/60Hz |
| | 76012116011 | 3CT-23 | 80A | | | | | |
| | 76012116012 | 3CT-23 | 100A | | | | | |
| | 76012116013 | 3CT-23 | 150A | | | | | |
| | 76012116014 | 3CT-23 | 180A | | | | | |
| | 76012116015 | 3CT-23 | 200A | | | | | |
| | 76012116016 | 3CT-43 | 100A | | | 27×27 | IMP/DMPi entire series GMP60-3T/3TN/3TZ GMP22/40/60T | |
| | 76012116017 | 3CT-43 | 150A | | | | | |
| | 76012116018 | 3CT-43 | 200A | | | | | |
| | 76012116019 | 3CT-43 | 250A | | | | | |
| | 76012116020 | 3CT-43 | 300A | | | | | |
| | 76012116021 | 3CT-43 | 350A | | | | | |
| | 76012116022 | 3CT-43 | 400A | | | | | |
| | 76012116023 | 3CT-63 | 400A | | | 45×30 | | |
| | 76012116024 | 3CT-63 | 500A | | | | | |
| | 76012116025 | 3CT-63 | 600A | | | | | |
| 2CT type | 76012116001 | DCT-100 | 100A | 5A | 5 | 28.5×33.5 | GMP22/40/60T | |
| | 76012116002 | DCT-150 | 150A | | | | | |
| | 76012116003 | DCT-200 | 200A | | | | | |
| | 76012116004 | DCT-300 | 300A | | | | | |
| | 76012116005 | DCT-400 | 400A | | | | | |
| 1CT type | 76012116006 | SCT-100 | 100A | 5A | 5 | 27.5×32.5 | IMP/DMPi entire series GMP60-3T/3TN/3TZ GMP22/40/60T | |
| | 76012116007 | SCT-150 | 150A | | | | | |
| | 76012116008 | SCT-200 | 200A | | | | | |
| | 76012116009 | SCT-300 | 300A | | | | | |
| | 76012116010 | SCT-400 | 400A | | | | | |

*Note: If the CT secondary cable thickness is 2.5mm2, the load of 3m is 0.52VA.

### Dimensions

3CT type (3CT-□□)



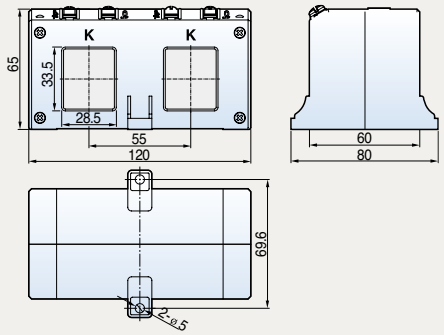



| Type | 3CT-23 | 3CT-43 | 3CT-63 |
|---|---|---|---|
| A | 119 | 149 | 218 |
| B | 35 | 44 | 70 |
| C | 9 | 12 | 20 |
| D | 21.5 | 27 | 45/30 |
| E | 89 | 117 | 183 |
| F | 76 | 91 | 94 |

### Dimensions

2CT type (DCT-□□□)

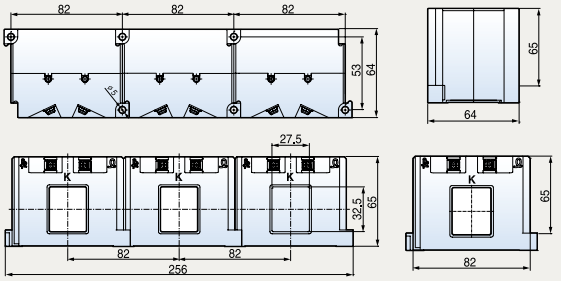




## Dimensions

1CT type (SCT-□□□)




# Other options

## Cable

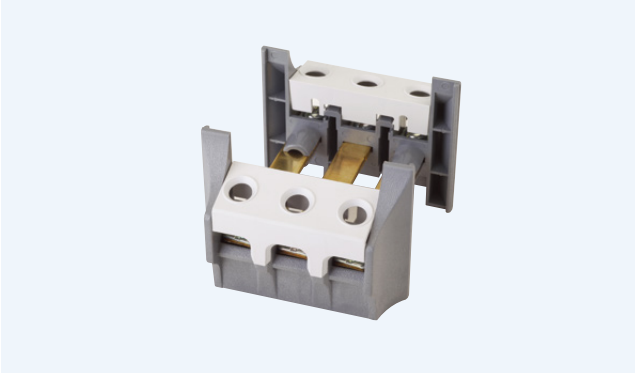


| | |
|---|---|
| Applied products | IMP, DMPi series |
| Spec. | 1m, 1.5m, 2m, 3m |
| purpose | For separated display installation |



| | |
|---|---|
| Applied products | MMP series |
| Spec. | 1m, 1.5m, 2m, 3m |
| purpose | For separated display installation |

## Terminal block



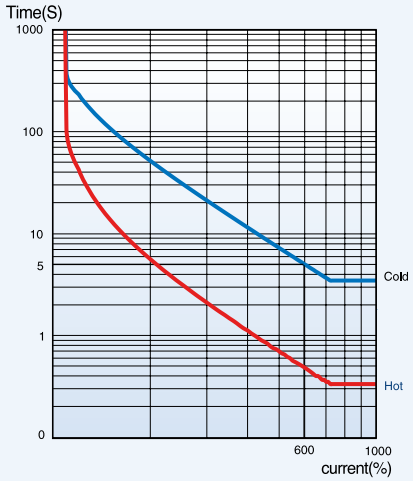
| | |
|---|---|
| Applied products | Terminal block with the application of GMP60-3T Series |
| Spec. | Less than 60A |



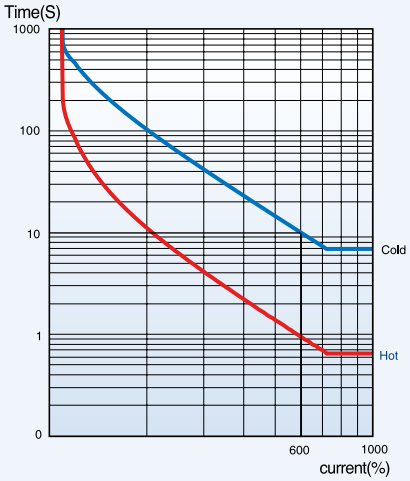
| | |
|---|---|
| Applied products | DMPi series |
| Spec. | Less than 65A |

# EMPR Operating characteristic curve

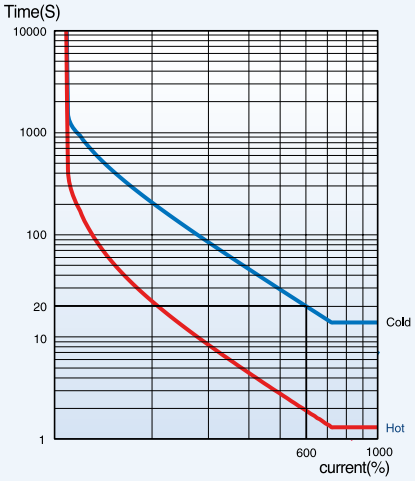
## Class5



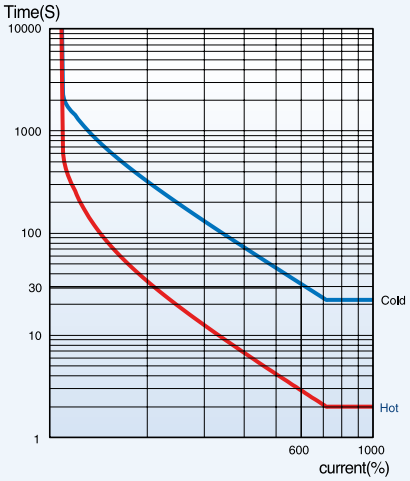

## Class10



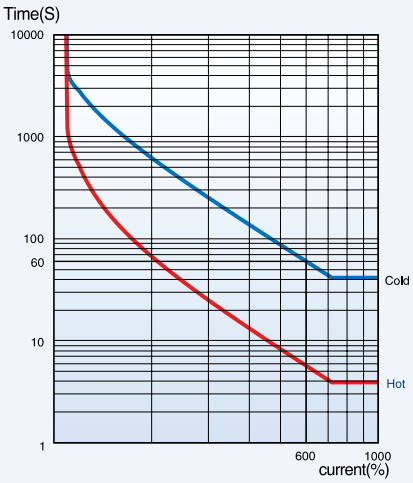

## Class20



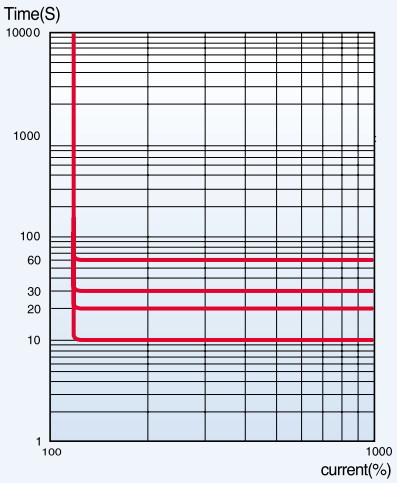

## Class30



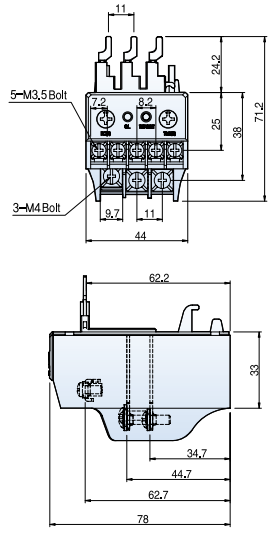
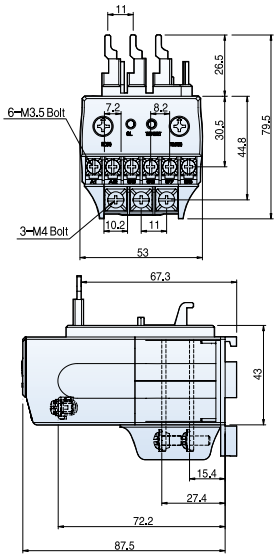
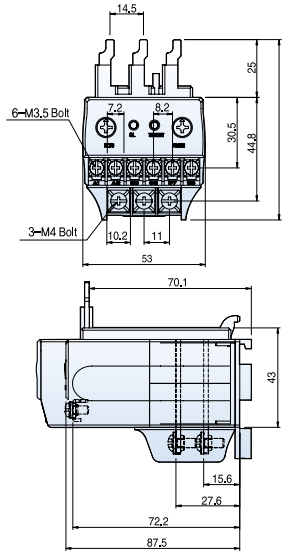
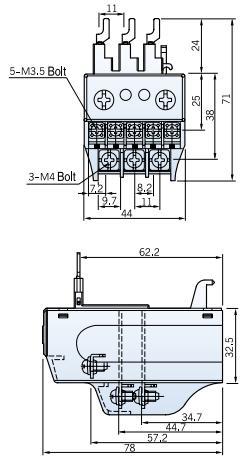
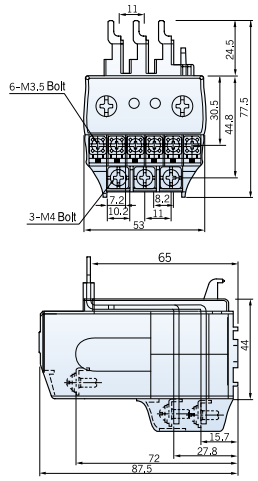
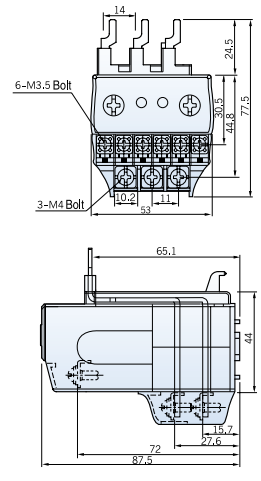

## Class60




## Definite time characteristic



# Direct mounting EMPR new/old comparative table

| Type | | GMP22-2P (1c) | GMP22-2P | GMP22-3P | GMP40-2P | GMP40-3P |
|---|---|---|---|---|---|---|
| | Extended model | GMP22-2PD (1c) | GMP22-2PA | GMP22-3PR | GMP40-2PD<br>GMP40-2PA | GMP40-3PR |
| Number of sensors | | 2 | 2 | 3 | 2 | 3 |
| Protective function | Over current | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Phase failure | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Locked rotor | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Phase unbalance | | | ✓ | | ✓ |
| | Reverse phase | | | ✓ (PR) | | ✓ (PR) |
| Aux. contact (at Energization) | | 1SPDT (1c) | 2SPST (1a1b) | | 2SPST (1a1b) | |
| Rating Current | | 0.3~1.5, 1~5, 4.4~22A | 0.3~1.5, 1~5, 4.4~22A | | 4~20, 8~40A | |
| Metasol (New) | EMPR Demension |  |  | |  | |
| | Direct connection possible MC | MC-9b, 12b, 18b, 22b | MC-9b, 12b, 18b, 22b | | MC-32a, 40a | |
| Meta-MEC (Old) | EMPR Demension |  |  | |  | |
| | Type of contactors | GMC-9, 12, 18, 22 | GMC-9, 12, 18, 22 | | GMC-32, 40 | |
| Wiring/Mounting Compatibity | | NO | NO | | NO | |
| Retrofit Type (Tunnel) | | GMP60T (1c)<br>GMP22-2T | GMP22-2T | GMP22-3T | GMP40-2T | GMP40-3T |
| | | | GMP60TA (1c) | GMP22-3TR | GMP60T (1c)<br>GMP60TA (1c) | GMP40-3TR |

*When you order a product with Metasol MC direct coupling type, it is required to write 'Sol' at the end of the product type name in order to identify from an old-type product

# Certificates

| Type | A Species of Certification | Approvals | | | | | | Certificates |
|---|---|---|---|---|---|---|---|---|
| | A Species of Standard | KC | Safety certi | IEC | UL | GB | Gosstandart | IEC |
| | Mark or certification |  |  |  |  |  |  |  |
| | | KC | S-Mark | CE | cUL | CCC | GOST | KEMA |
| Type | | Korea | Korea | Europe | U.S.A/Canada | China | Russia | Netherlands |
| GMP | GMP22-2P | ● | ● | ● | ● | ● | ● | |
| | GMP22-3P | ● | ● | ● | ● | ● | ● | ● |
| | GMP22-3PR | ● | ● | ● | ● | ● | ● | ● |
| | GMP22-2S | ● | ● | ● | ● | ● | ● | |
| | GMP22-3S | ● | ● | ● | ● | ● | ● | ● |
| | GMP22-3SR | ● | ● | ● | ● | ● | ● | ● |
| | GMP22-2T | ● | ● | ● | ● | ● | ● | |
| | GMP22-3T | ● | ● | ● | ● | ● | ● | ● |
| | GMP22-3TR | ● | ● | ● | ● | ● | ● | ● |
| | GMP40-2P | ● | ● | ● | ● | ● | ● | |
| | GMP40-3P | ● | ● | ● | ● | ● | ● | ● |
| | GMP40-3PR | ● | ● | ● | ● | ● | ● | ● |
| | GMP40-2S | ● | ● | ● | ● | ● | ● | |
| | GMP40-3S | ● | ● | ● | ● | ● | ● | ● |
| | GMP40-3SR | ● | ● | ● | ● | ● | ● | ● |
| | GMP40-2T | ● | ● | ● | ● | ● | ● | |
| | GMP40-3T | ● | ● | ● | ● | ● | ● | ● |
| | GMP40-3TR | ● | ● | ● | ● | ● | ● | ● |
| | GMP60-T | ● | ● | ● | ● | ● | ● | |
| | GMP60-TE | ● | ● | ● | ● | ● | ● | |
| | GMP80-2S | ● | ● | ● | ● | ● | ● | |
| | GMP80-3S | ● | ● | ● | ● | ● | ● | |
| | GMP80-3SR | ● | ● | ● | ● | ● | ● | |
| DMPi | DMP06i-S | ● | | ● | ● | ● | | |
| | DMPi06-SZ | ● | | ● | ● | ● | | |
| | DMPi06-SB | ● | | ● | ● | ● | | |
| | DMPi06-T | ● | | ● | ● | ● | | |
| | DMPi06-TZ | ● | | ● | ● | ● | | |
| | DMPi06-TB | ● | | ● | ● | ● | | |
| | DMPi65-S | ● | | ● | ● | ● | | |
| | DMPi65-SZ | ● | | ● | ● | ● | | |
| | DMPi65-SB | ● | | ● | ● | ● | | |
| | DMPi65-T | ● | | ● | ● | ● | | |
| | DMPi65-TZ | ● | | ● | ● | ● | | |
| | DMPi65-TB | ● | | ● | ● | ● | | |
| IMP | IMP-C NO 10A | ● | ● | ● | ● | ● | | |
| | IMP-C NO 100A | ● | ● | ● | ● | ● | | |
| | IMP-C A420 10A | ● | ● | ● | ● | ● | | |
| | IMP-C A420 100A | ● | ● | ● | ● | ● | | |
| | IMP-C M485 10A | ● | ● | ● | ● | ● | | |
| | IMP-C M485 100A | ● | ● | ● | ● | ● | | |

| | A Species of Certification | Approvals | | | | | | Certificates |
|---|---|---|---|---|---|---|---|---|
| | A Species of Standard | KC | Safety certi | IEC | UL | GB | Gosstandart | IEC |
| | Mark or certification |  |  |  |  |  |  |  |
| | | KC | S-Mark | CE | cUL | CCC | GOST | KEMA |
| Type | | Korea | Korea | Europe | U.S.A/Canada | China | Russia | Netherlands |
| MMP | MMP-C B 10A | ● | | ● | ● | ● | | |
| | MMP-C B 100A | ● | | ● | ● | ● | | |
| | MMP-C M 10A | ● | | ● | ● | ● | | |
| | MMP-C M 100A | ● | | ● | ● | ● | | |
| | MMP-S B 10A | ● | | ● | ● | ● | | |
| | MMP-S B 100A | ● | | ● | ● | ● | | |
| | MMP-S M 10A | ● | | ● | ● | ● | | |
| | MMP-S M 100A | ● | | ● | ● | ● | | |
| | MMP-P B 10A | ● | | ● | ● | ● | | |
| | MMP-P B 100A | ● | | ● | ● | ● | | |
| | MMP-P M 10A | ● | | ● | ● | ● | | |
| | MMP-P M 100A | ● | | ● | ● | ● | | |
| | MMP-IR 10A | ● | | | | | | |
| | MMP-IR 100A | ● | | | | | | |
| IMC-III | IMC-IIIa | ● | | | | | | |
| | IMC-III | ● | | | | | | |

FUTURING SMART ENERGY

We open up a brighter future through
efficient and convenient energy solutions.



**Safety Instructions**

- For your safety, please read user's manual thoroughly before operating.
- Contact the nearest authorized service facility for examination, repair, or adjustment.
- Please contact qualified service technician when you need maintenance.
  Do not disassemble or repair by yourself!
- Any maintenance and inspection shall be performed by the personnel having expertise concerned.



- According to The WEEE Directive, please do not discard the device with your household waste.

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