

Top 100  
Global  
Innovator  
for 10 years

# 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.*



**GMP Series**



**DMPi Series**



**IMP Series**

**MMP Series**

**IMC-III**

## 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	110/220V	110/220V	110/220V	110/220V	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

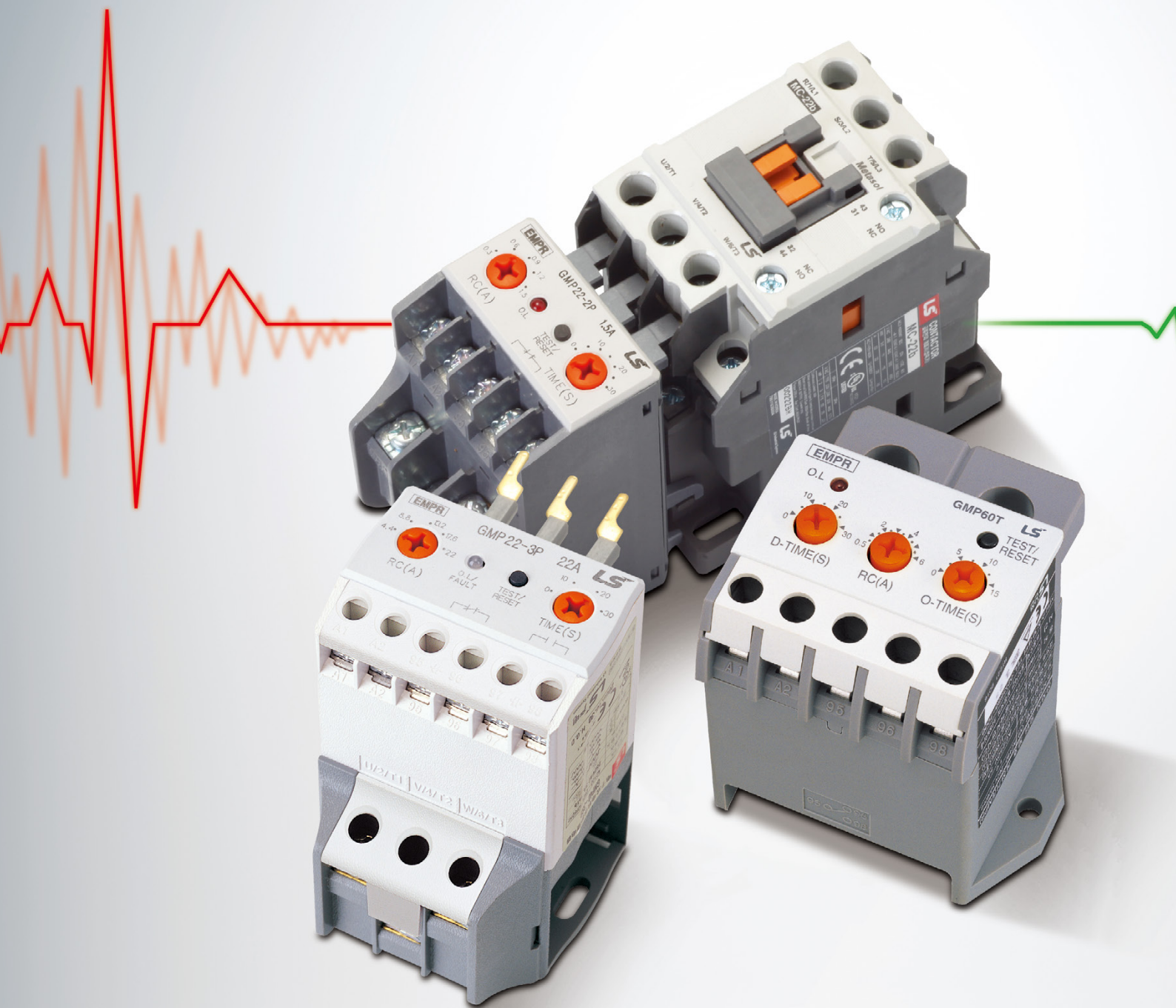
Functions	GMP22/40			GMP60				GMP80		
	2P/ 2PD/ 2PA 2T/2S	3P/3T/3S	3PR/3TR /3SR	T/TE/TA	TD/TDa	3T/3TR, 3S/3SR	3TZ/3TZR, 3TN/3TNR, 3SZ/3SZR, 3SN/3SNR	2S/2SA	3S/3SR	
Display	Phase current	-	-	-	-	-	-	-	-	-
	Ground current	-	-	-	-	-	-	-	-	-
	Active/Reactive Power	-	-	-	-	-	-	-	-	-
	Electric energy	-	-	-	-	-	-	-	-	-
	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	-	-	-	-	-	-	-	-	
Communication function	4~20mA output	-	-	-	-	-	-	-	-	
	MODBUS RS-485	-	-	-	-	-	-	-	-	

# 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	
●	●	●	●	●	-	●	●	●	●	●
-	-	-	-	-	-	●	●	●	●	●
-	-	-	-	-	-	-	-	●	-	-
-	-	-	-	-	-	-	-	●	-	-
-	-	-	-	-	-	-	-	-	●	-
-	-	-	-	-	-	-	-	-	●	-
●	●	●	●	●	●	●	●	●	●	●
●	●	●	●	●	-	●	●	●	●	●
●	●	●	●	●	-	●	●	●	●	●
●	●	●	●	●	-	-	-	-	●	●
4 digit 7-segment	4 digit 7-segment	4 digit 7-segment	4 digit 7-segment	4 digit 7-segment	4 digit 7-segment	4 digit 7-segment	4 digit 7-segment	4 digit 7-segment	4 digit 7-segment	4 digit 7-segment
●	●	●	●	●	●	●	●	●	●	●
●	●	●	●	●	●	●	●	●	●	-
●	●	●	●	●	●	●	●	●	●	●
●	●	●	●	●	●	●	●	●	●	-
●	●	●	●	●	●	●	●	●	●	-
●	●	●	●	●	●	●	●	●	●	●
●	●	●	●	●	●	●	●	●	●	●
-	-	-	-	-	-	●	●	●	●	-
-	-	-	-	-	-	●	●	●	●	●
-	-	-	-	-	-	●	●	●	-	●
-	-	-	-	-	-	●	●	●	-	-
-	●(B)	-	-	-	-	-	●	-	●	-
-	-	-	-	-	-	●	●	●	-	-
-	-	-	-	-	-	●	●	●	-	●
-	-	-	●(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



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- 13 Rated specifications & order type
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- 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 1~5 4.4~22A	Pin type <small>note 1)</small>	GMP22-2P Sol	●	●	●	-	-	-	-	Inverse time	
		GMP22-2PD Sol	●	●	●	-	-	-	-	Definite time	
		GMP22-2P Sol	●	●	●	-	-	-	-	Inverse time	
		GMP22-2PA Sol	●	●	●	-	-	-	-	Definite time/ Automatic return	
	Screw type	GMP22-3P Sol	●	●	●	●	-	-	-	Inverse time	
		GMP22-3PR Sol	●	●	●	●	●	-	-	Inverse time	
		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 8~40A	Pin type <small>note 1)</small>	GMP40-2PD Sol	●	●	●	-	-	-	-	Definite time	
		GMP40-2P Sol	●	●	●	-	-	-	-	Inverse time	
		GMP40-2PA Sol	●	●	●	-	-	-	-	Inverse time/ Automatic return	
		GMP40-3P Sol	●	●	●	●	-	-	-	Inverse time	
	Screw type	GMP40-3PR Sol	●	●	●	●	●	-	-	Inverse time	
		GMP40-2S	●	●	●	-	-	-	-	Inverse time	
		GMP40-3S	●	●	●	●	-	-	-	Inverse time	
		GMP40-3SR	●	●	●	●	●	-	-	Inverse time	
		Tunnel types	GMP40-2T	●	●	●	-	-	-	-	Inverse time
			GMP40-3T	●	●	●	●	-	-	-	Inverse time
	0.5~6 3~30 5~60A	Tunnel types	GMP40-3TR	●	●	●	●	●	-	-	Inverse time
			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 <small>※2)</small>	●	●	●	●	-	-	●	Definite time
			GMP60-3TN	●	●	●	●	-	-	●	Definite time
			GMP60-3TZR	●	●	●	●	●	-	●	Definite time
			GMP60-3TNR	●	●	●	●	●	-	●	Definite time
0.5~60A	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	Screw type	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 inverter 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.



**Various Protection Function**

Model	Protection Function				
	Over current	Phase Failure	Locked rotor	Phase Unbalance	Reverse Phase
GMP□-2P/2S/2T	●	●	●	-	-
GMP□-3P/3S/3T	●	●	●	●	●
GMP□-3PR/3SR/3TR	●	●	●	●	●

- Over current : Operation according to the Inverse characteristic curve.
- Phase Failure : Trip within 3 seconds if the phase imbalance is 70% or higher (However, only 2 phases are protected for 2CT models)
- Locked rotor : Operation according to the Inverse characteristic curve, Operation within 1 second after D-T when 300% or more is approved in Definite time.
- Phase Unbalance : Trip within 5 seconds if the phase unbalance is greater than 50%.
- Reverse Phase : Trip within 1 second.

## 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.

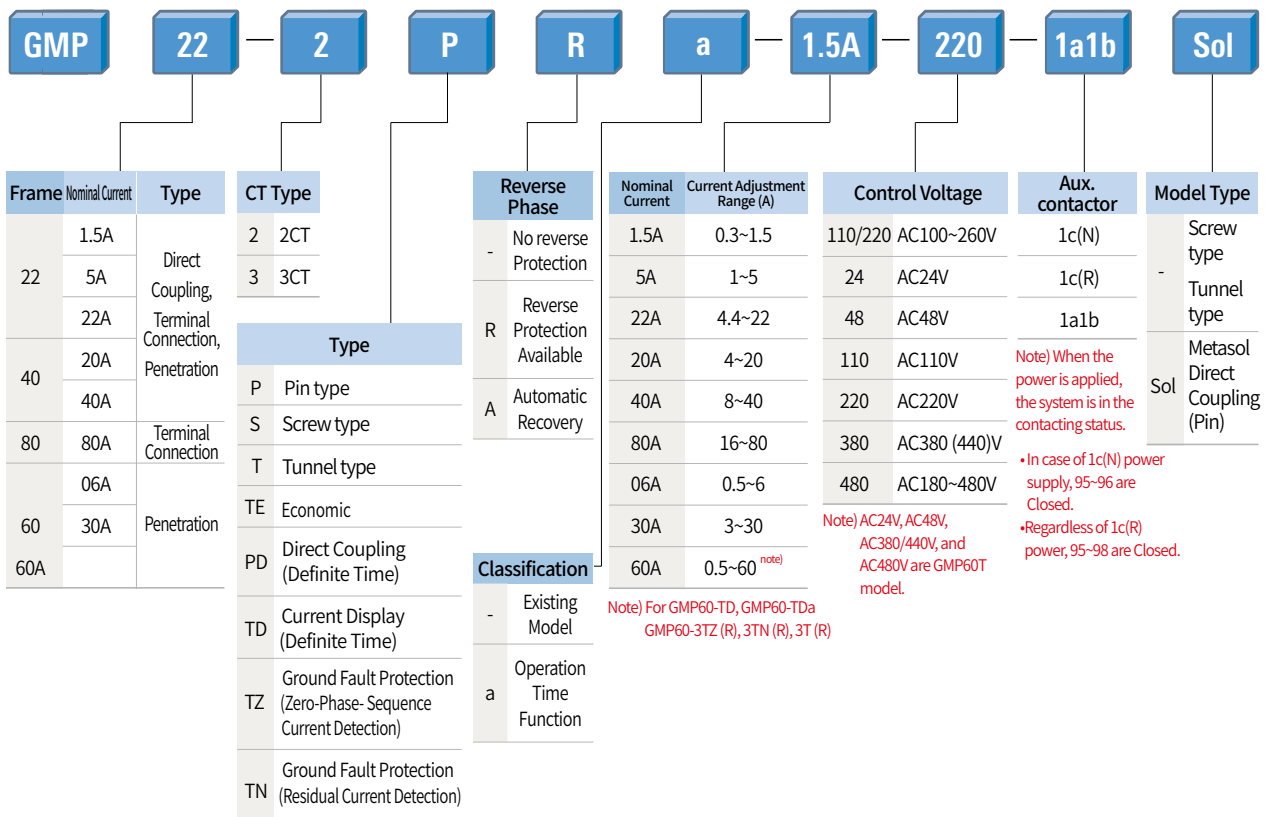
# Motor selection & model numbering system

## 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)	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) <small>note1)</small>
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	✓ <small>note 2)</small>
Certification	UL, CE	✓

### 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]
	GMP22-2PD(1c) - 2CT type	Definite time D-Time : 0~60sec 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	GMP22-2P(1c) 1.5A [R]	
			1 - 5A	GMP22-2P(1c) 5A [R]	
			4.4 - 22A	GMP22-2P(1c) 22A [R]	
			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 Energized) and R-type(Non Fail Safe / Normal De-Energized). 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.

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



Contactor  
Direct  
connection



### Technical information

Installation	Direct connection to contactors (not alone)
Tolerance	Current : ±5% 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 Storage : -30~80°C 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



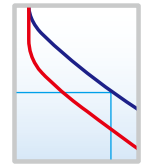
Screw type  
GMP22-□S, SR



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) Manual/Auto/Electrical return (2PA)
Using Inverter Secondary	Available (Exclude GMP22-3PR, 3TR, 3SR)



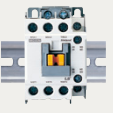


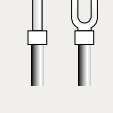

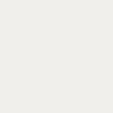
Inverse time

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

Type (GMP22-□)	2P, 2PA, 2T, 2S	3P, 3T, 3S	3PR, 3TR, 3SR
Overcurrent	✓	✓	✓
Lock/Stall	✓ <i>note)</i>	✓	✓
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   Electronic contactor MC-9b, 12b, 18b, 22b  	GMP22-2P (1a1b) - 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) - 2CT type - 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 - 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 - 3CT type - 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   Install Screw/Rail  	GMP22-2S - 2CT type	0.3 - 1.5A	GMP22-2S 1.5A	
		1 - 5A	GMP22-2S 5A	
		4.4 - 22A	GMP22-2S 22A	
	GMP22-3S - 3CT type	0.3 - 1.5A	GMP22-3S 1.5A	
		1-5A	GMP22-3S 5A	
		4.4-22A	GMP22-3S 22A	
	GMP22-3SR - 3CT type - Reverse phase protection	0.3 - 1.5A	GMP22-3SR 1.5A	
		1 - 5A	GMP22-3SR 5A	
		4.4 - 22A	GMP22-3SR 22A	
	Tunnel type   Install Screw/Rail  	GMP22-2T - 2CT type	0.3 - 1.5A	GMP22-2T 1.5A
			1 - 5A	GMP22-2T 5A
			4.4 - 22A	GMP22-2T 22A
GMP22-3T - 3CT type		0.3 - 1.5A	GMP22-3T 1.5A	
		1-5A	GMP22-3T 5A	
		4.4-22A	GMP22-3T 22A	
GMP22-3TR - 3CT type - 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



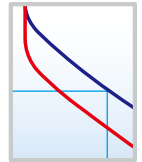
Screw type  
GMP40-□S, SR



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) Manual/Auto/Electrical return (2PA)
Using Inverter Secondary	Available (Exclude GMP40-3PR, 3TR, 3SR)



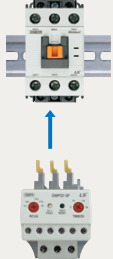
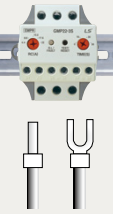

Inverse time

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

Type (GMP22-□)	2P, 2PD, 2PA, 2T, 2S	3P, 3T, 3S	3PR, 3TR, 3SR
Overcurrent	✓	✓	✓
Lock/Stall	✓	✓	✓
Phase failure	✓ <i>note</i>	✓	✓
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   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   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   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-□

### Front face configuration



GMP22



GMP40

Current setting	
GMP22	GMP40
0.3 - 1.5A	4 - 20A
1 - 5A	8 - 40A
4.4 - 22A	-

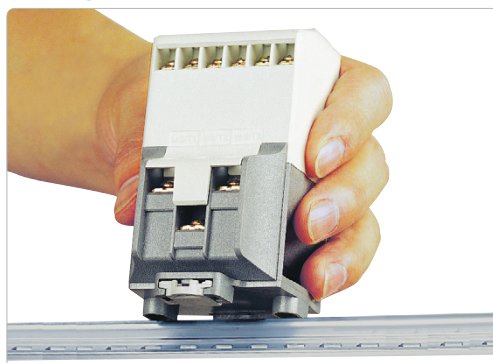
LED	
2CT type : Red LED	
3CT type : 2 colors LED (Red/Green)	
Operation status indication	Trip cause indication
normal	Overcurrent
Overcurrent	Phase failure
Phase unbalance (3CT)	Reverse phase (3CT)

Operation time adjustment dial
0~30sec (Class 5-10-20-30)
Set the operating time of inverse time characteristic
Set time is the trip time at 6 x set current

\*GMP22/40-2PD has the characteristic of definite time.

### 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% 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 Storage : -30~80°C Relative humidity : within 80% RH, no condensation
Trip indicator	2CT : Red LED, 3CT : Red/Green 2 colors LED
Application specification	IEC60947-1



# GMP60T

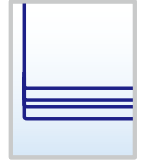


GMP60T(Din rail)

GMP60T(Panel)

## Specification (Tunnel type /Economic type EMPR)

Connection methods	Tunnel type
Auxiliary contact	1SPDT 1c (N type) <sup>note 1)</sup>
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) AC180~480V AC110V/220V (GMP60TA)
Return (reset) method/time	Manual/Electrical return (Standard) Manual/Auto/Electrical return (60TA)
Using Inverter Secondary	Available



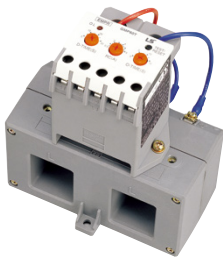
Definite time

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

<sup>Note 1</sup> 1. 1c contacts have two types of products: N-type (Fail Safe/Normal Energied) and R-type(Non Fail Safe / Normal De-Energied). In terms of product reliability, N-type (Fail Safe) product is recommended to be used

<sup>2</sup> 2. The product detects phase failure of the phase (R, T) connected with two CTs in order for protection.

## Order type



<sup>note 1)</sup>

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

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

\*Auto Reset: applicable only at Overcurrent Trip

<sup>Note 1)</sup> If you want to use the screw directly on the panel or a combination on top of your CT, please order the product code marked with "PANEL".

## Technical information

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

# Rated specifications & order type

## GMP60-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) Manual/Auto (GMP60-TDa)
Using Inverter Secondary	Available



Definite time

Type	GMP60-TD	GMP60-TDa
Protection	Overcurrent	✓
	Lock/Stall	✓
	Phase failure	✓ 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

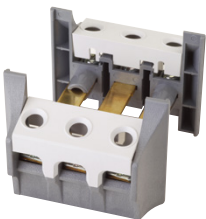
Mounting type	Model/CT	Operating characteristics	Current setting range	Order type
Tunnel type Screw / rail mounting	GMP60-TD - 2CT type	Defined Time characteristics D-Time : 1~60sec O-Time : 0.5~30sec	0.5 - 60A	GMP60-TD 6/60A
	GMP60-TDa - 2CT type - Low Current Protection - Auto-return	Defined Time characteristics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

### Technical information

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



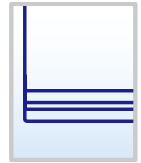
GMP60-3T (Din-rail only)  
GMP60-3TR  
GMP60-3T (Din-rail/PANEL)  
GMP60-3TR



Terminal Block

### 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)



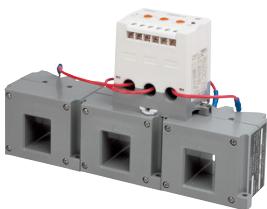
Definite time

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 Screw / rail mounting	GMP60-3T - 3CT type	Defined Time characteristics D-Time : 0.2~60sec O-Time : 0.2~15sec	0.5~60A	GMP60-3T 6/60A
	GMP60-TR - 3CT type - Reverse phase protection	Defined Time characteristics D-Time : 0.2~60sec O-Time : 0.2~15sec	0.5~60A	GMP60-3TR 6/60A
Screw type Screw / rail mounting	GMP60-3S - 3CT type	Defined Time characteristics D-Time : 0.2~60sec 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 - 3CT type - Reverse phase protection	Defined Time characteristics D-Time : 0.2~60sec O-Time : 0.2~15sec	0.5~60A	



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

### Technical information

Install	Screw / rail mounting
Tolerance	Current : ±5% 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 Storage : -30~80°C 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 (Din-rail only)  
GMP60-3TN, 3TNR  
GMP60-3TZ, 3TZR (Din-rail/PANEL)  
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 O-Time : 3sec
Using Inverter Secondary	Available (Exclude GMP60-3TZR, 3TNR) <i>note</i>



Definite time

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

Type	GMP60-3TZ, 3TN	GMP60-3TZR, 3TNR
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 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 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 : $\pm 5\%$ Time : $\pm 5\%$ (or $\pm 0.5\text{sec}$ )
Frequency	50/60Hz
Aux. contact Ratings	5A/250VAC Resistive load
Insulation resistance	Minimum 100M $\Omega$ /500VDC
Lightning impulse voltage	1.2 $\times$ 50 $\mu$ s 5kV With standard waveform (IEC60255-22-5)
Fast Transient Burst	2kV/1min (IEC61000-4-4)
Environment	Operation : -25~70°C Storage : -30~80°C Relative humidity : within 80% RH, no condensation
Trip indicator	Red / Green 2 colors LED, Red LED
Application specification	IEC 61000, IEC60947-1



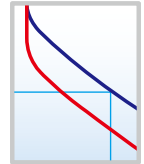
## GMP80



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) 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
Overcurrent	✓	✓	✓	✓
Locked rotor	✓	✓	✓	✓
Phase loss	✓ <i>note)</i>	✓ <i>note)</i>	✓	✓
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 Screw / rail mounting	GMP80-2S - 2CT	16 - 80A	GMP80-2S 80A
	GMP80-2SA - 2CT - Automatic return	16 - 80A	GMP80-2SA 80A
	GMP80-3S - 3CT	16 - 80A	GMP80-3S 80A
	GMP80-3SR - 3CT - Reverse phase protection	16 - 80A	GMP80-3SR 80A

### Rated specifications

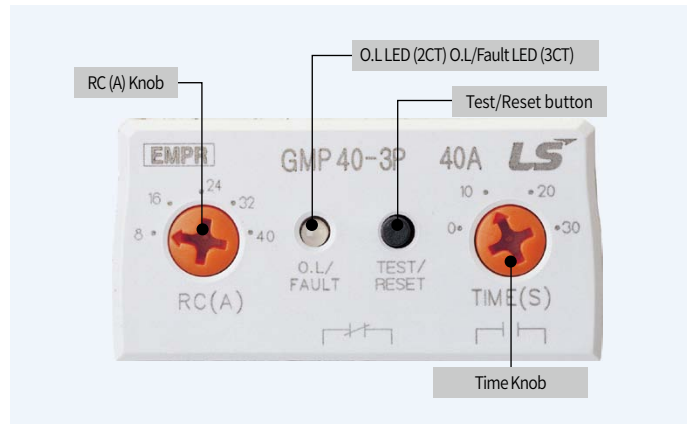
Tolerance	Current : $\pm 5\%$ Time : $\pm 5\%$ (or $\pm 0.5\text{sec}$ )
Frequency	50/60Hz
Aux. contact Ratings	5A/250VAC Resistive load
Insulation resistance	Min 100M $\Omega$ at 500V DC
Lightning impulse voltage	1.2 $\times$ 50 $\mu\text{s}$ 5kV With standard waveform (IEC60255-22-5)
Fast Transient Burst	2kV/1min (IEC61000-4-4)
Environment	Operation : -25~70°C Storage : -30~80°C 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.

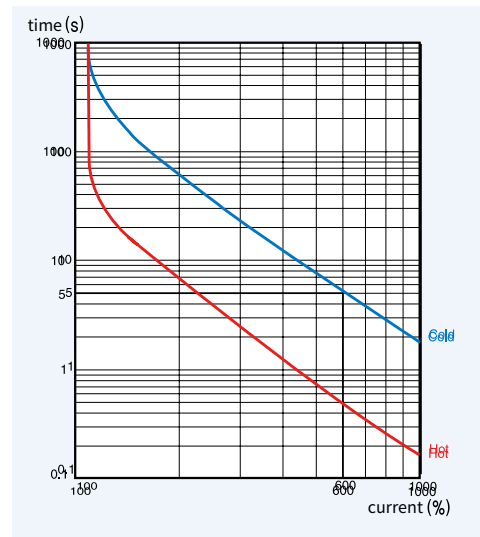
- 1) Set up the position of operating time control knob (Time Knob) in consideration of a starting time and starting current.  
(E.g., on the assumption that a starting current accounts for 600% of normal operating current and a starting time is 10 seconds, set Time Knob to about 11~12 seconds with 10-20% 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 =  $20 \times 1.1 = 22A$ )



## 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 within 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 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

# Operation & setting method

## 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 starting 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).

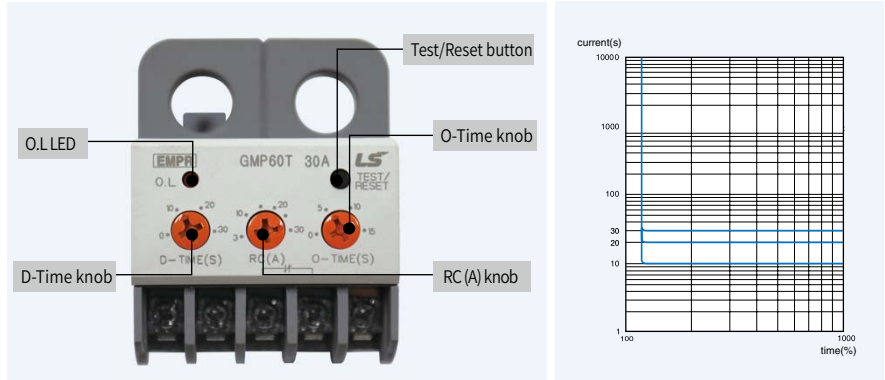
### 5. Check the LED condition when operation

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.Ct), make sure to change to a relevant rated current.

Full Load Current	Wire penetration	Slide S/W	Rated current (1.Ct)	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.Ct-4	6A/60A	Current type selection	6A	Set the same with rated current S/W
20-t	0.5/1~30 (SEC)	Trip time setting	30	Set 0.5 to 30 sec
3d-t	1~60/1 (SEC)	Time delay setting	60	Set 1~60 sec
4r-c	0.5~60/5~60	Rated current setting	6/60	-
5Ctr	0.25/0.5/1~120	Current ratio setting	1	-
6P-F	OFF/on	Phase loss enable	Off	Operation in less than 3 sec
7W-C	OFF/30~70 (%)	Undercurrent setting	Off	For TDa model only (Overcurrent operation)
8R-r	OFF/1~20 (MIN)	Automatic reset setting	Off	For TDa model only (Off, 1~20min)
95r-t	OFF/10~8760	Operation hour setting	Off	For TDa model only
Rt-r-t	-	Total running hour check	-	For TDa model only (Up to 10 years, 1 hour unit)
br-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 '95r-t' passes, 'OrH' is displayed and EMPR has no output.)

2. How to check 'OrH' and 'r-t'

FUNC	Description
t-r-t	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 't-r-t', 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.



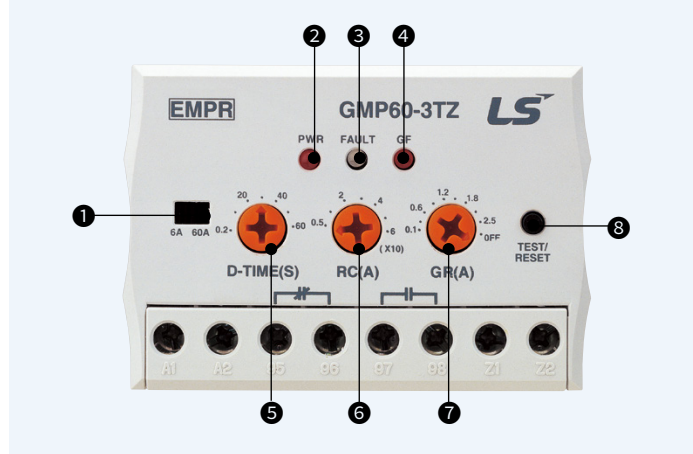
# Operation & setting method

## 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%
- 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

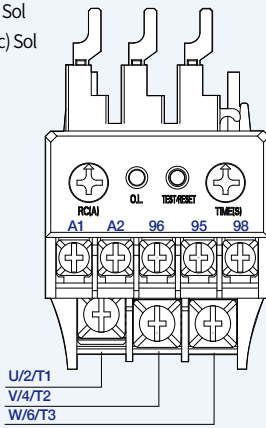
Note) In case of load less than minimum rating of EMPR make the number of penetrating through CT more than 2 times. If not, error may happen to phase loss .

### 5. Status of LED configuration

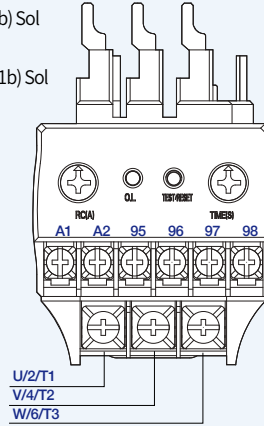
NO	Function	Setting	Description	Remark
①	6A/60A	Slide switch	Maximum rated current (6A/60A) setting	-
②	PWR.	Red LED	Lights up when power is ON Blinking in the failure mode	-
③	Fault	Red / Green LED	Overcurrent / unbalance in progress : Overcurrent TRIP : Phase loss (unbalance) TRIP · R-phase : · S-phase : · T-phase : · Reverse phase :	Red LED Green LED
④	GF	Red LED	Lights up after blinking in the event of ground fault	-
⑤	D-Time (S)	KNOB	Delay time (0.2 to 60 sec.)	-
⑥	RC (A)	KNOB	Rated current setting: 0.5~6A/5~60A	-
⑦	GR (A)	KNOB	Zero phase current detection type Sensitivity current setting (0.1~2.5A) Residual current detection type Sensitivity current setting (0.5~6A)	-
⑧	Test/Reset	Button	TRIP / RESET alternately perform 1. Check relay contacts - displays fault cause 2. RESET	Pressing 2 times within 0.5 sec. the final failure cause is displayed

## Terminal configuration

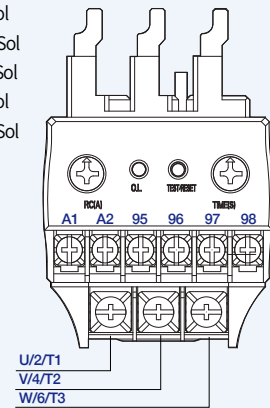
GMP22-2P (1c) Sol  
GMP22-2PD (1c) Sol



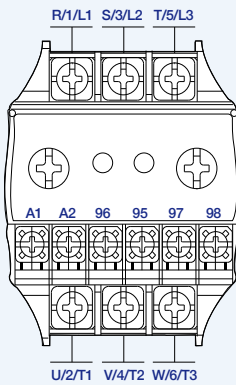
GMP22-2P (1a1b) Sol  
GMP22-3P Sol  
GMP22-2PA (1a1b) Sol  
GMP22-3PR Sol



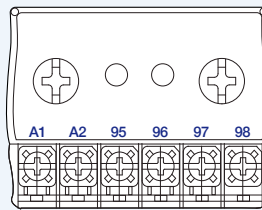
GMP40-2P Sol  
GMP40-2PD Sol  
GMP40-2PA Sol  
GMP40-3P Sol  
GMP40-3PR Sol



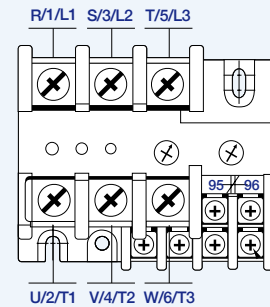
GMP22-2S  
GMP22-3S  
GMP22-3SR  
GMP40-2S  
GMP40-3S  
GMP40-3SR



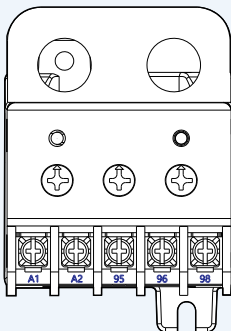
GMP22-2T  
GMP22-3T  
GMP22-3TR  
GMP40-2T  
GMP40-3T  
GMP40-3TR



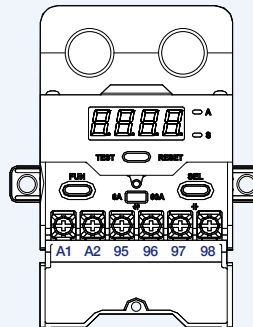
GMP80-2S  
GMP80-3S  
GMP80-3SR



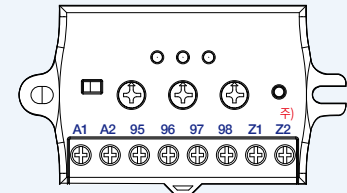
GMP60T  
GMP60TE  
GMP60TA



GMP60-TD  
GMP60-TDa



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

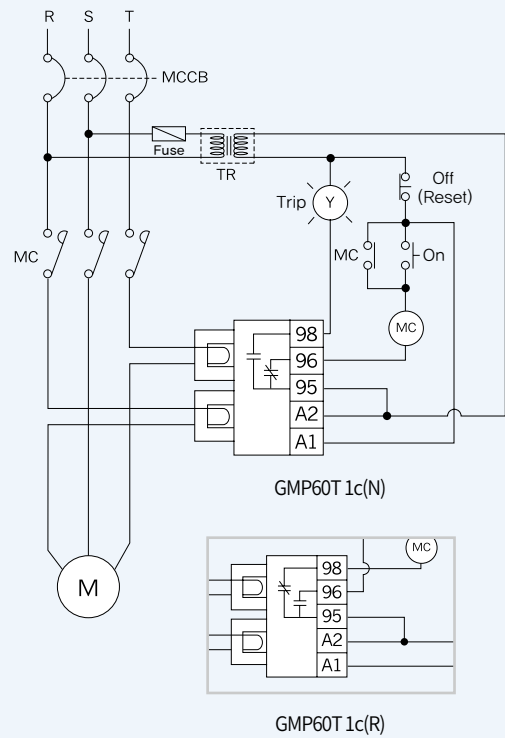
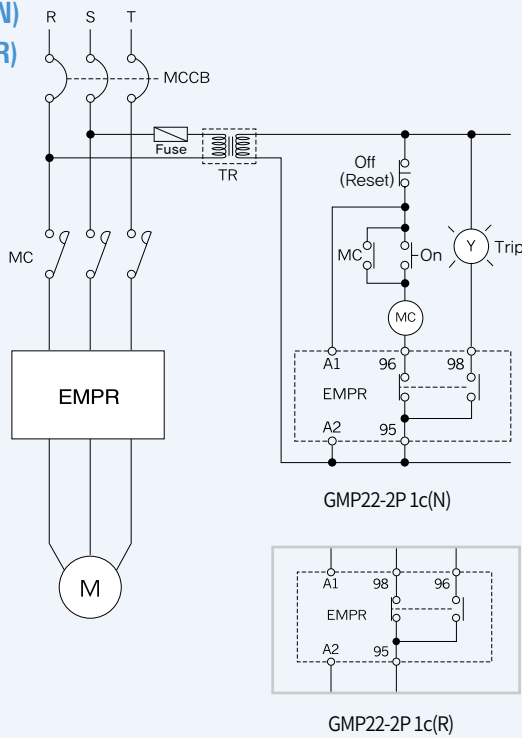


Engrave	Description
A1, A2	Input terminal for operation power
95, 96, 98	Output terminals at power-on
95-96	When the power is ON (NC contact output)
97-98	When the power is ON (NC contact output)
Z1, Z2	ZCT output connection
U/2/T1, V/4/T2, W/6/T3	Power side connection
R/1/L1, S/3/L2, T/5/L3	Load side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

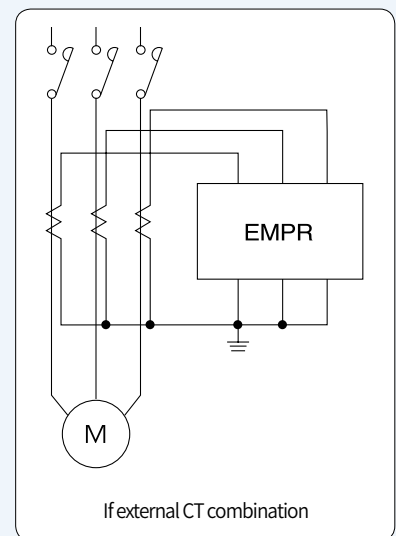
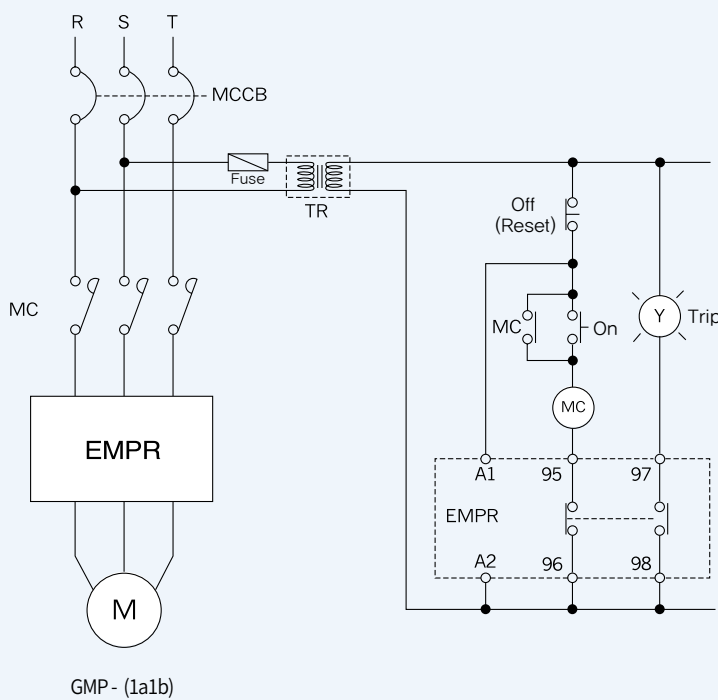
# Terminal configuration / Wiring & cable connection

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



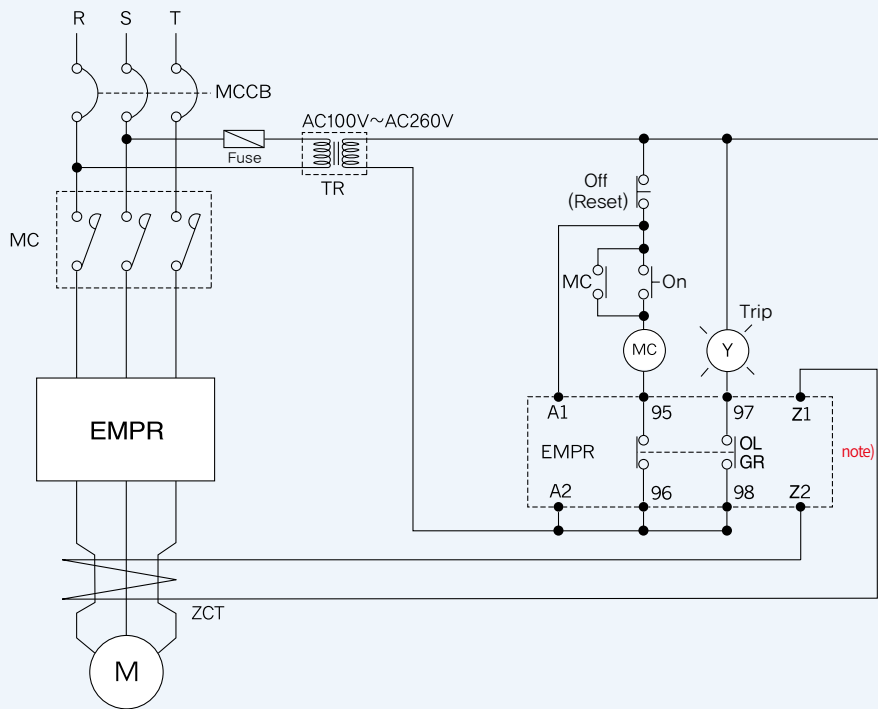
Note) 1. In case of 1c(N), only if control power (A1, A2) is On, output contact occurs (if power Off or Trip, 95-96 : Open, 95-98 : Close)  
 2. In case of 1c(R), output contact occurs regardless of control power (A1, A2). (Contact chattering can occur in a very vibrating place.)

GMP-(1a1b)

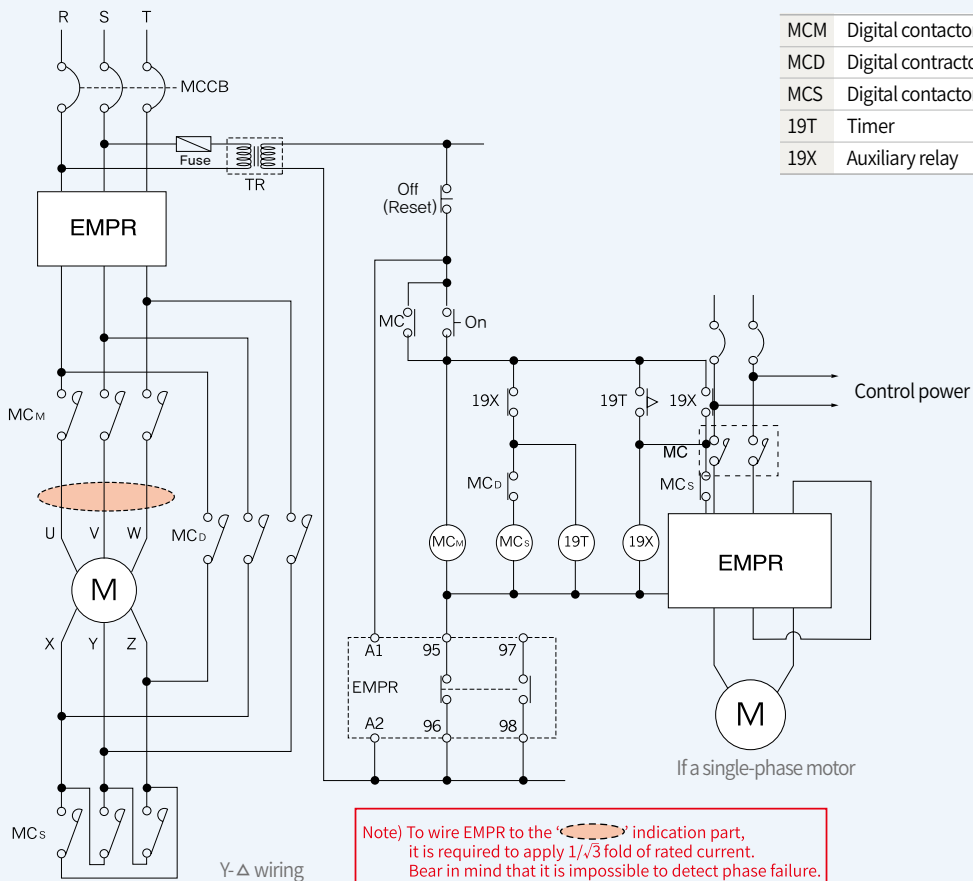


Note) 1. To use a single-phase motor, connect it with R & T phases of EMPR. GMP60-3TR, 3TN, 3TNR, 3TZR is not allowed in a single-phase motor.  
 2. Output contact occurs only if control power (A1, A2) is On. (1a1b)

**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)

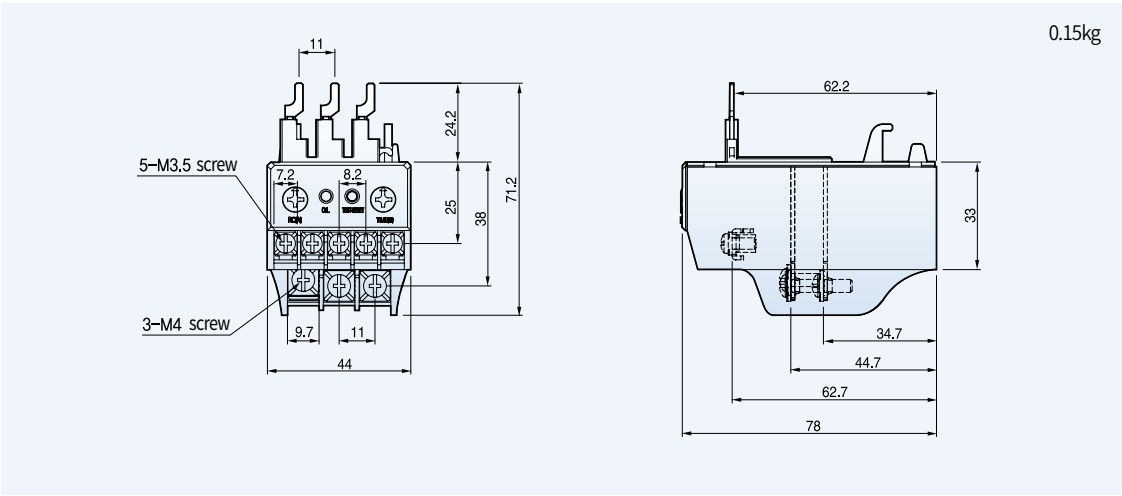


- Note) 1. GMP60-3TR, 3TN, 3TNR, and 3TZR cannot be applied to single phase motors. However, GMP60-3TZ can be applied to single phase motors for earth fault protection purposes.
- 2. Output contact occurs only if control power (A1, A2) is On. (1a1b)

# Dimensions

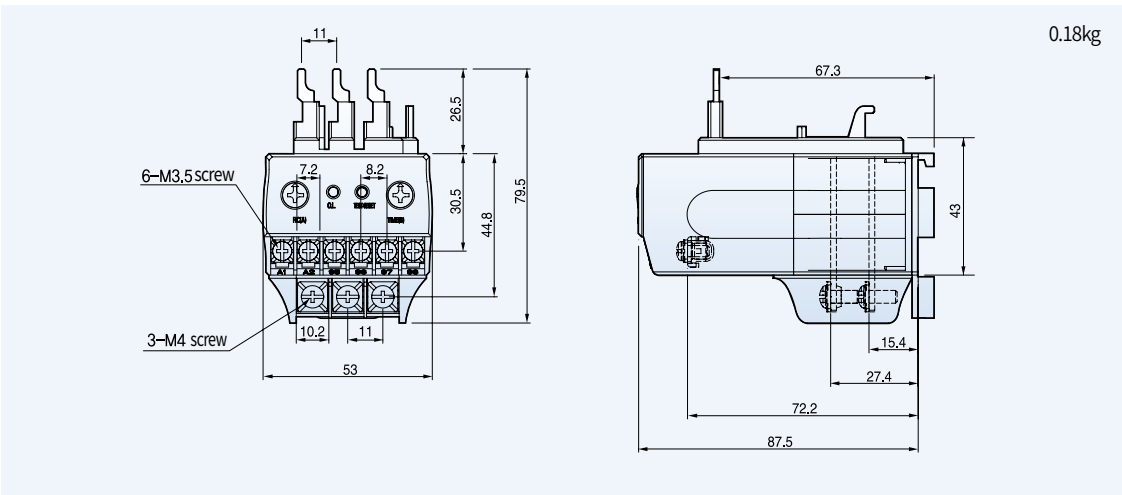
- GMP22-2P (1c) Sol
- GMP22-2PD (1c) Sol

Unit: mm  
0.15kg



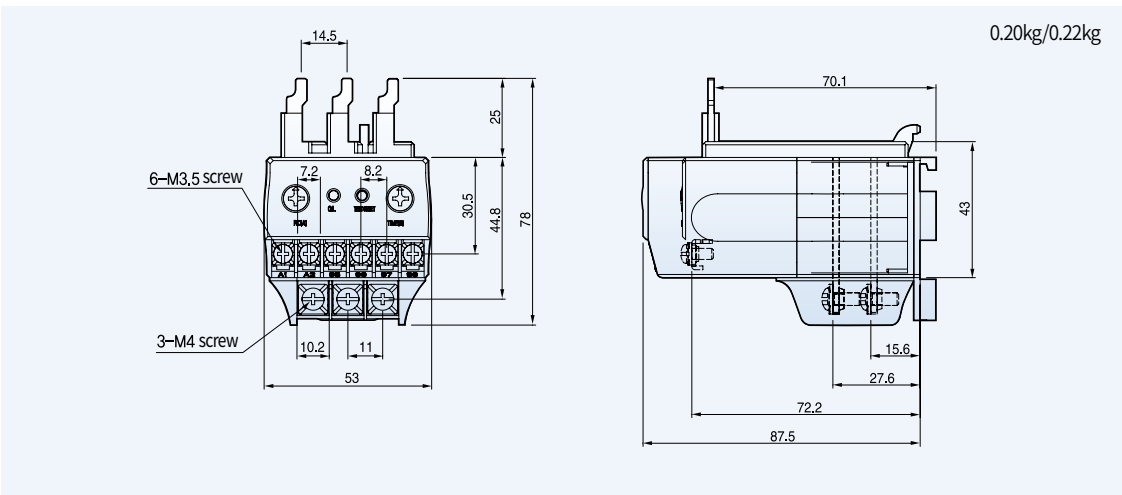
- GMP22-2P (1a1b) Sol
- GMP22-3P Sol
- GMP22-2PA (1a1b) Sol
- GMP22-3PR Sol

Unit: mm  
0.18kg



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

Unit: mm  
0.20kg/0.22kg

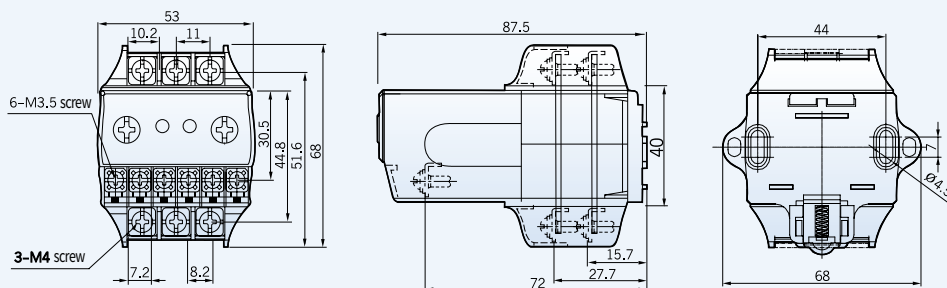




Unit: mm

0.19kg/0.21kg

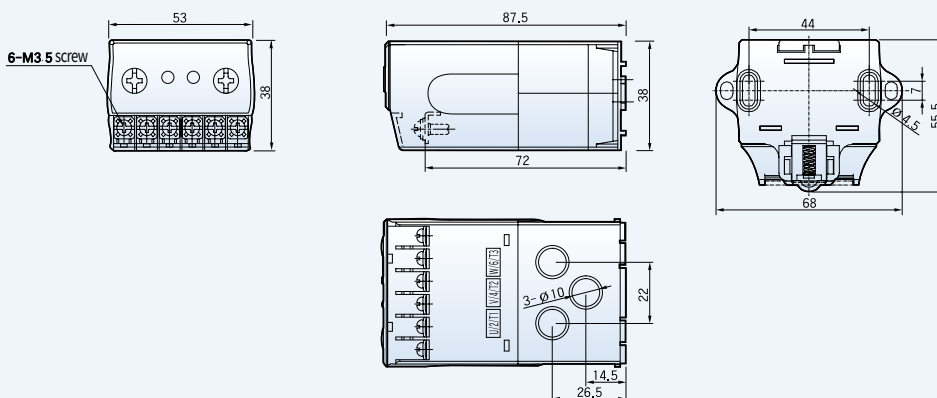
- GMP22-2S
- GMP22-3S
- GMP22-3SR
- GMP40-2S
- GMP40-3S
- GMP40-3SR



Unit: mm

0.14kg/0.16kg

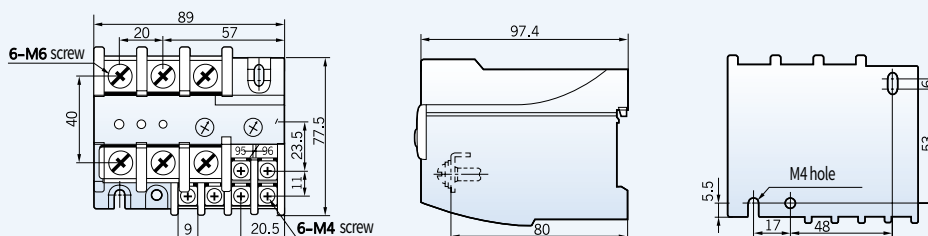
- GMP22-2T
- GMP22-3T
- GMP22-3TR
- GMP40-2T
- GMP40-3T
- GMP40-3TR



Unit: mm

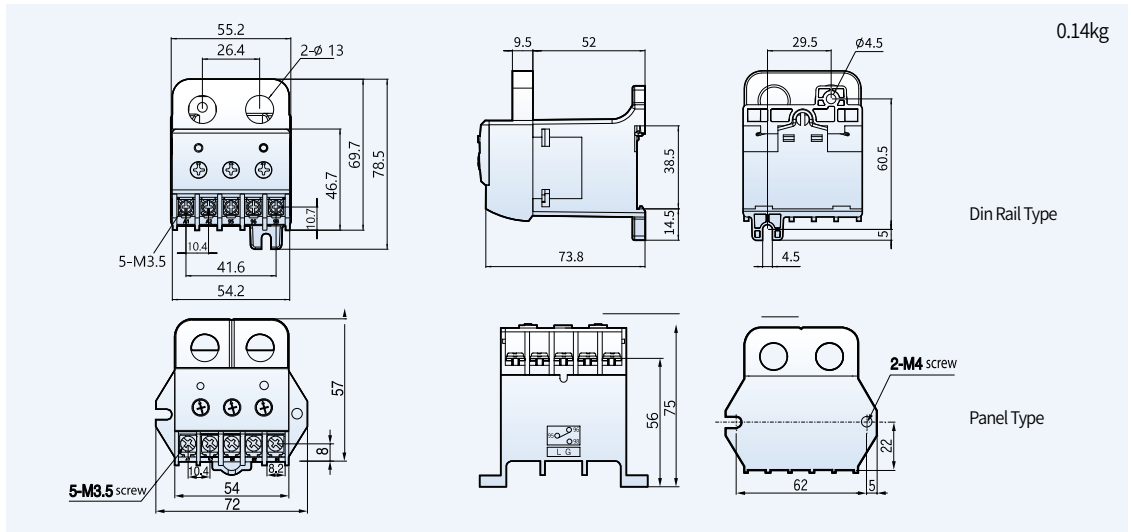
0.42kg/0.46kg

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



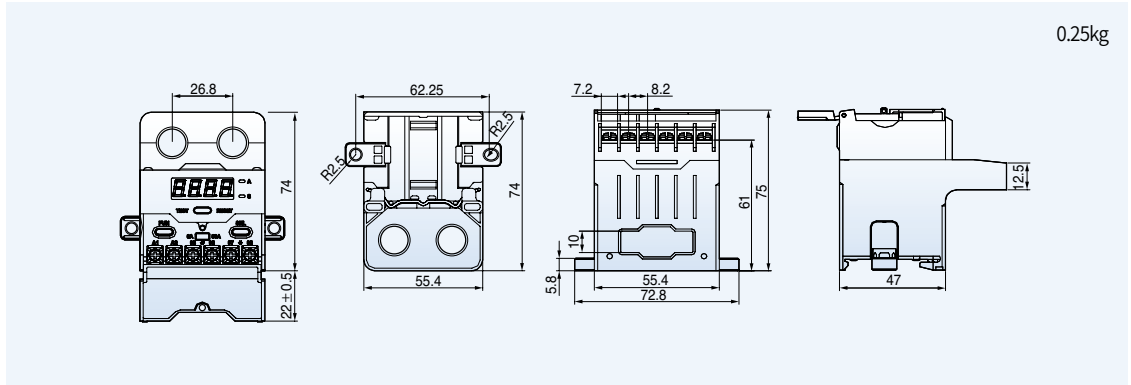
# Dimensions

- GMP60T
- GMP60TE
- GMP60TA

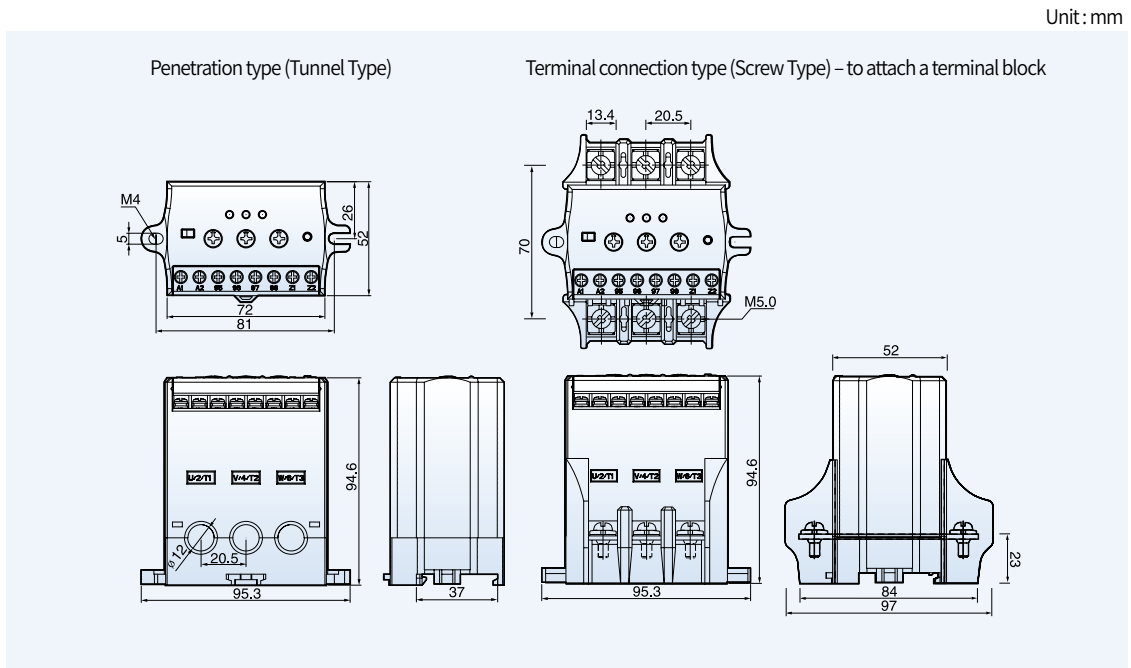


Note) If you want to use the screw directly on the panel or a combination on top of your CT, please order the product code marked with "PANEL".

- GMP60-TD
- GMP60-TDa



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



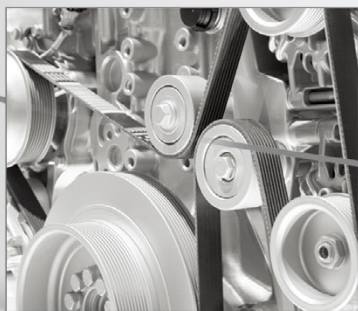
Note) If terminal connection type (Screw Type) is used, purchase a terminal block separately.

A large empty rectangular box with a thin black border, intended for writing a 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



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# 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	●	●	●	●	●	●	-	-	<ul style="list-style-type: none"> <li>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.</li> <li>RS485 communication function and 4~20mA DC output function are not supported at the same time.</li> </ul>
		DMP06i-SZ, SB	●	●	●	●	●	●	●	-	
		DMP06i-SI	●	●	●	●	●	●	-	●	
		DMP06i-SZI, SBI <sup>Note1</sup>	●	●	●	●	●	●	●	●	
	Penetrated type	DMP06i-T	●	●	●	●	●	●	-	-	
		DMP06i-TZ, TB	●	●	●	●	●	●	●	-	
		DMP06i-TI	●	●	●	●	●	●	-	●	
		DMP06i-TZI, TBI <sup>Note1</sup>	●	●	●	●	●	●	●	●	
5~65A	Terminal type	DMP65i-S	●	●	●	●	●	●	-	-	
		DMP65i-SZ, SB	●	●	●	●	●	●	●	-	
		DMP65i-SI	●	●	●	●	●	●	-	●	
		DMP65i-SZI, SBI <sup>Note1</sup>	●	●	●	●	●	●	●	●	
	Penetrated type	DMP65i-T	●	●	●	●	●	●	-	-	
		DMP65i-TZ, TB	●	●	●	●	●	●	●	-	
		DMP65i-TI	●	●	●	●	●	●	-	●	
		DMP65i-TZI, TBI <sup>Note1</sup>	●	●	●	●	●	●	●	●	

Note) 1. It is possible to set up ground fault and instantaneous 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 inverter 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

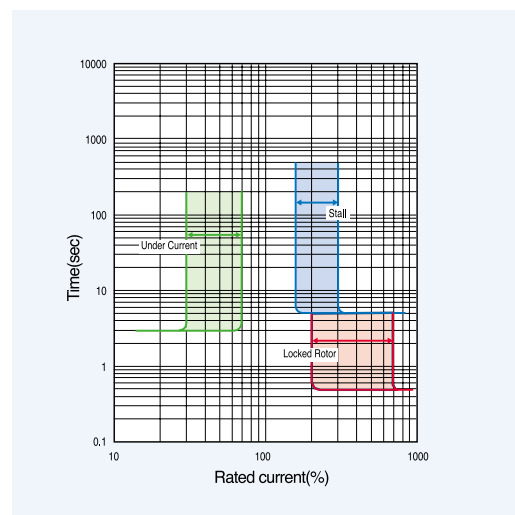
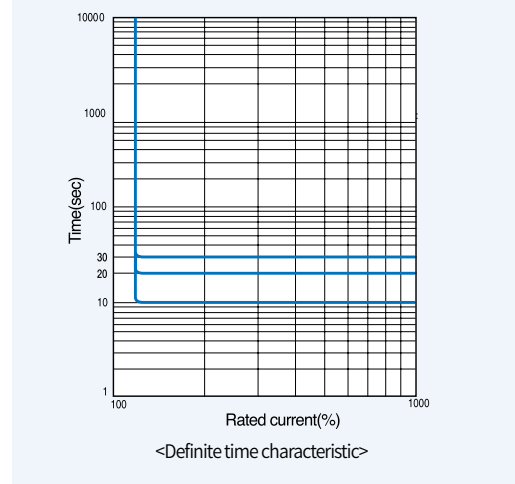
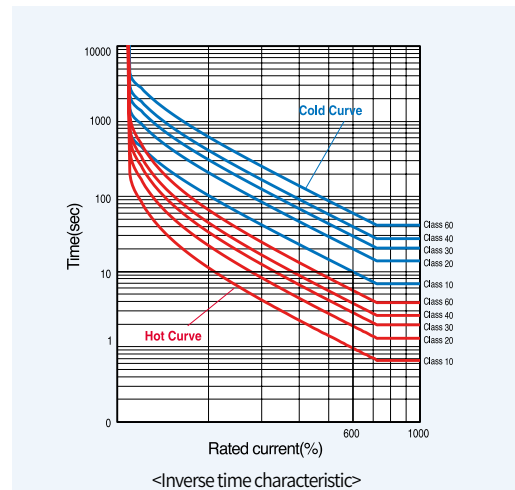
Ground fault leakage current is detected to prevent ground faults arising from electric leakage and secondary accidents (Phase faults and electric shock accidents). Current sensitivity and operating time are set differently according to the grounded system or purpose of protection. Current sensitivity 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.

*\* The maximum setting value changes depending on the rated current setting.*

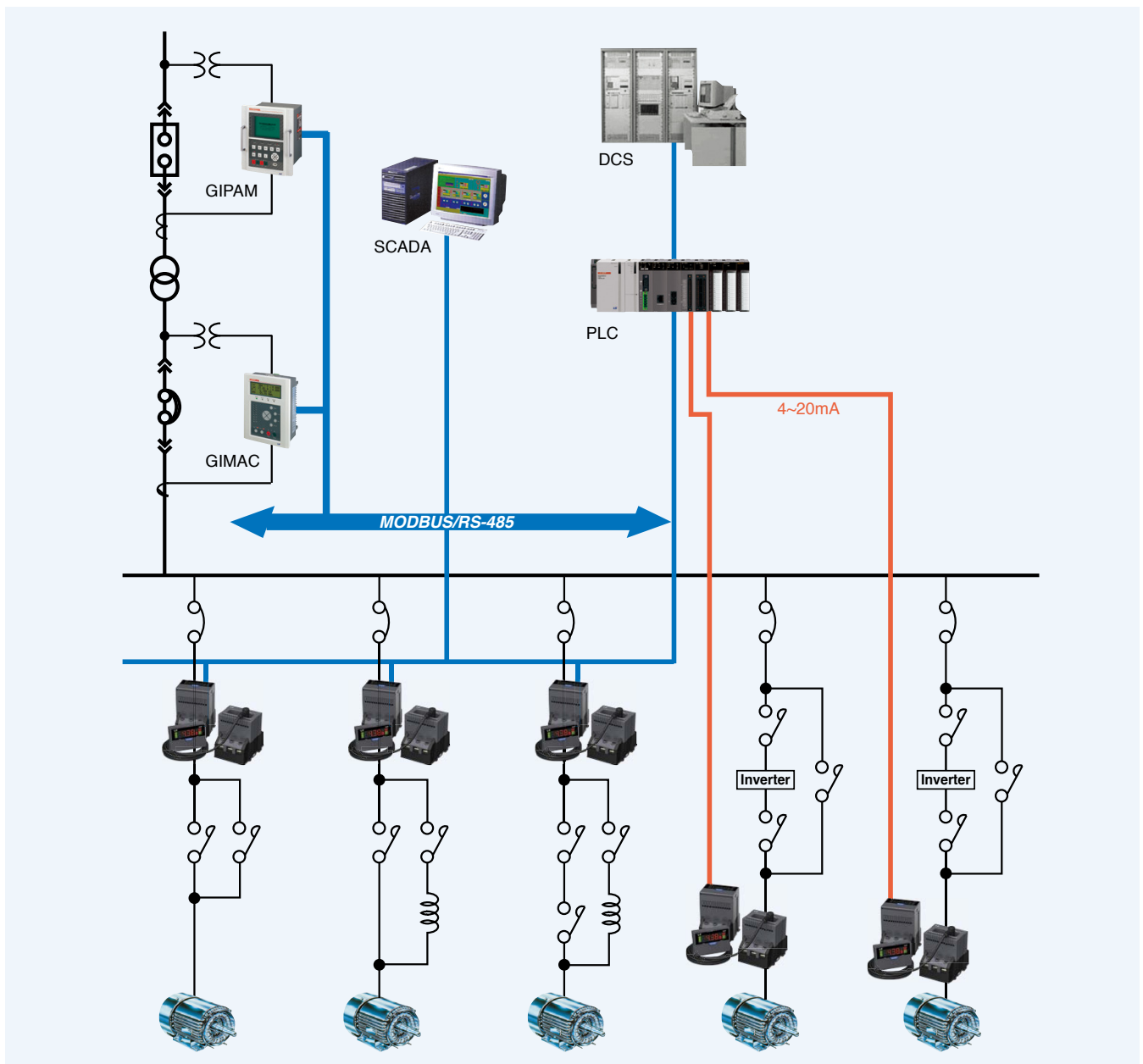


## Communication function

### 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



# Product characteristics

## Analog (4~20mA) output function

### Specifications

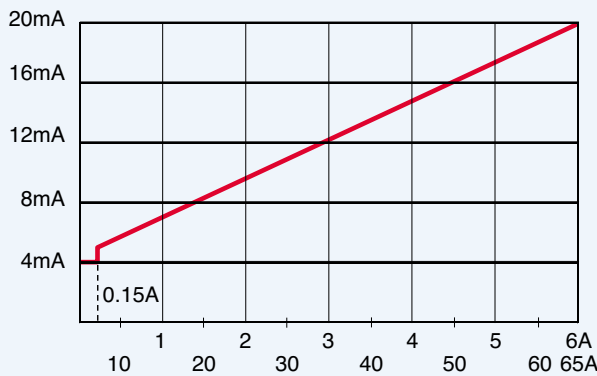
- The measured values of current for the maximum phase among the measured values of three-phase current are converted into DC 4~20mA and the measured values of current can be displayed with a digital meter in the distance.
- 20mA output setting: 0.5~6A or 5~65A

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.

$$\begin{aligned} \text{Output current} &= \frac{(I \text{ Upper Limit} - I \text{ Lower limit})}{\text{TD Setting value}} \times \text{Load current} + 4\text{mA} \\ &= \frac{16\text{mA}}{\text{TD setting value}} \times \text{Load current} + 4\text{mA} \end{aligned}$$



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

## Rated specifications

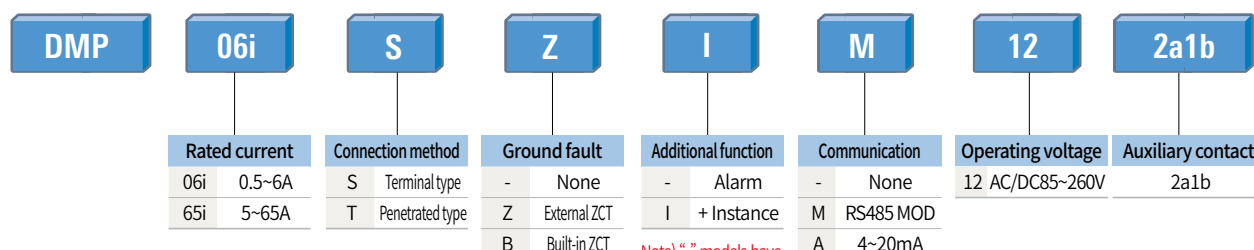
Connection method		Penetrated / Terminal type
Protection functions		Overcurrent, phase fail, phase unbalance, stall, locked rotor, reverse phase, ground fault (Type option) Instance (Type option)
Connection method		Penetrated / Terminal type
Operating time characteristics		Thermal heat build-up inverse 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, instantaneous operation 1a) <sup>Note1)</sup>
	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) <sup>Note2)</sup>
	Built-in	Support (Separate connection unnecessary) <sup>Note2)</sup>
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



Note) "-" models have Alarm + Operating Time + Failure History storage functions as the default.

"I" models have an additional instance protection function.











\*When using Display separately, please purchase a dedicated cable as well. (See Other Options)



# 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. **---**

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 **35rE** 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 **22rL** 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, **1trE** which is displayed in the following order: day/hour/minute.
- 2) Operating time can be checked from B group, **2r-E** 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.)

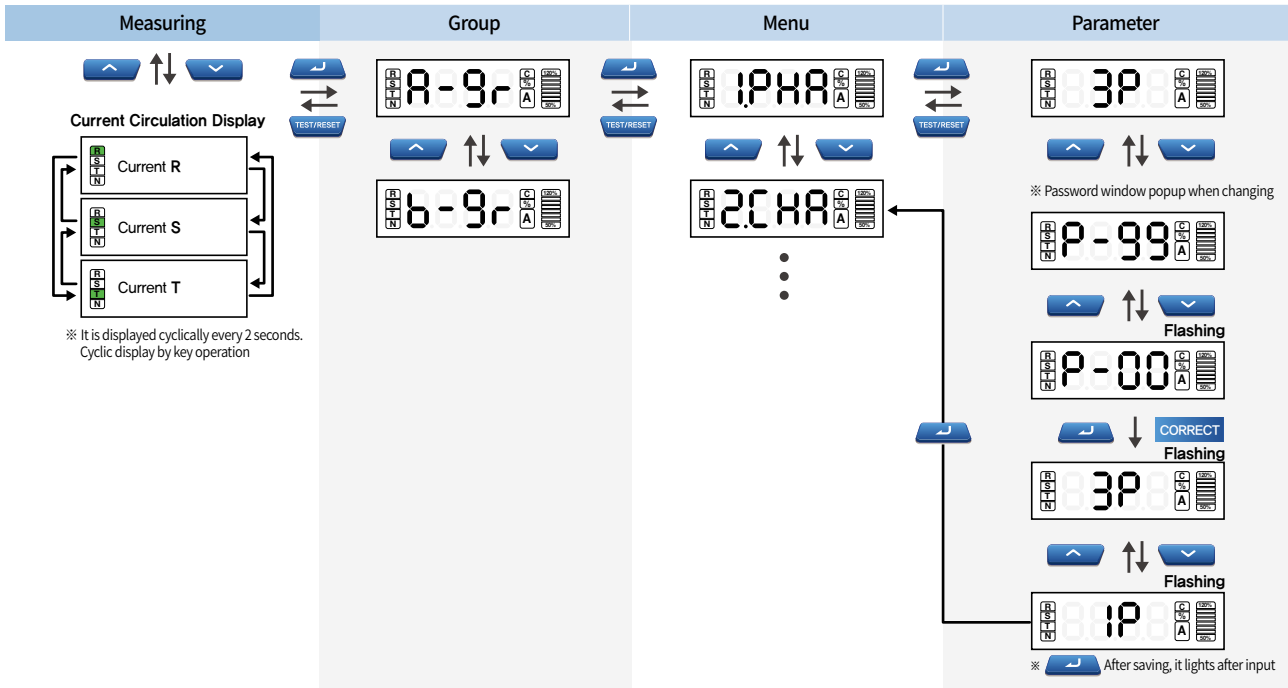
- 1) When the operating characteristics of A Group 2.CHA are set in the thermal heat build-up mode (th)
- 2) When the Test/Reset key is pressed under overload trip to return and then a motor is driven right away, the motor will be hot.  
Thus, trip is immediately performed.
- 3) On the other hand, when 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
<code>0-L</code>	Overcurrent	Fault current (R-phase, S-phase and T-phase) Load factor, time	Operates at the set time
<code>Loc</code>	Lock	Fault current (R-phase, S-phase and T-phase) Load factor, time	Operates within 0.5sec
<code>StL</code>	Stall	Fault current (R-phase, S-phase and T-phase) Load factor, time	Operates in 3sec
<code>P-F</code>	Phase fail	Fault current (R-phase, S-phase and T-phase) Load factor, time	Operates in 3sec (Delay time setting needed)
<code>P-U</code>	Phase unbalance	R-phase, S-phase and T-phase, Unbalance factor, time	Operates in 5 sec (Delay time setting needed)
<code>r-P</code>	Reverse phase	Time	Operates at the set time
<code>U-C</code>	Under current	Fault current (R-phase, S-phase and T-phase) Load factor, time	Operates in 3sec
<code>g-F</code>	Ground fault (ZCT)	Fault current (R-phase, S-phase and T-phase) N-phase, time	Operates at the set time (Delay time setting needed)
<code>Sho</code>	Instance	Fault current (R-phase, S-phase and T-phase) Load factor, time	Operate within 50ms (Delay time setting needed)
Alarm information	<code>OrH</code>	Set operating time has elapsed	An alarm is displayed if a cumulative running time exceeds a set running time
Self-diagnosis information	<code>LInE</code>	Display communication error	When a communication error occurs between the display and body, please contact our office with the alarm maintained.
	<code>EErr</code>	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 <sup>Note4)</sup>
A	1PHA	Single phase/Three-phase	1P/3P	1P <sup>Note1)</sup>	3P	
	2CHA	Operating characteristic (Overcurrent protection)	dEF/n-th/th <sup>Note2)</sup>	0	n-th	
	30-t	Operating time	1~60sec	0	60	
	4d-t	Delay time	1~200sec	0	200	Displayed upon 2.CHA dEFT setting
	5r-C	Rated current(6, 65)	0.5~6A/5~65A	0	6/65	Maximum rated current display (06i: 6A, 65i: 65A)
	6CTr	CT Ratio	0.25/0.5/1~200 <sup>Note3)</sup>	0	1	
	7Loc	LOCK	Off/200~800%	0	Off	
	8StL	STALL	Off/150~500%	0	Off	
	9P-F	Phase fail(100%)	On/Off	-	On	
	10Pd	Phase fail delay time	0~200	-	0	Displayed upon 9.P-F setting
	11PU	Phase unbalance	Off/10~90%	-	Off	
	12Ud	Phase unbalance delay time	0~200	-	0	Displayed upon 10.PU setting
	13rP	Reverse phase <sup>Note5)</sup>	Off/On	-	Off	
	14rT	Reverse phase operating time	0.1~1.0	-	0.1	Displayed upon 13.rP setting
	15UC	Under current	Off/30~90%	0	Off	
	16gF	Ground fault	Off/0.03/0.05/0.1~3.0A	0	Off	
	17gT	Ground fault operating time	0.05, 0.1~5.0sec	0	1	Displayed upon 16.gF setting
	18gD	Ground fault delay time	0~200sec	0	200	Displayed upon 16.gF setting
	19IC	Instance protection	Off/500~1500% <sup>Note6)</sup>	0	Off	
	20Id	Instance protection delay Time	0~200	0	0	Displayed upon 19.IC setting
21cS	Output contact composition	2a, 1a1b, 2b <sup>Note7)</sup>	0	1a1b		
22AL	Alarm output conditions	I-tp, I-AL, ALo, U-C, OrH, g-F	0	I-tp		
23Ar	Current flow or not, alarm setting	On/60~110%	0	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 <sup>Note)</sup>	NO <sup>Note)</sup>
	Ground fault / Short circuit	O <sup>Note)</sup>	C <sup>Note)</sup>
	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 minimum current value detected <sup>Note)</sup>	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 <sup>Note1)</sup>	Default	Remarks <sup>Note4)</sup>
B	1E-r-t	Total operating time	0~9999day/0~23Time/0~59min	O	-	
	2r-t	Operating time	0~9999 Time/0~59min	O	-	
	3S-r-t	Operating time setting	Off/10~8760	O	Off	
	4S-d	Date setting <sup>Note2)</sup>	2017~2100yea/1~12month/1~31day/ 0~23hour/0~59min	O	2017.07.01 00:00	
	5A-r	Automatic reset <sup>Note3)</sup>	Off/1~20min	O	Off	w
	6Ad-r	Communication network address	1~247	O	247	Displayed only for M485 model
	7bPS	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	
		6E-d	20mA setting	0.5~6/5~65	O	6/65

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 to 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)

- ① Choose either 1P or 3P; the default is 3P
- 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.



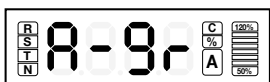
6. Press Test / Reset to return to the display screen.

## Rated current setting

This is a function to set a rated current.



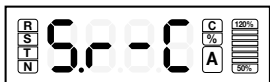
The DMPi main screen display (0.00A)



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)

- ① 6A model: Set by 0.1A unit ranging from 0.5A to 6A (the default is 6.0A)
- 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)



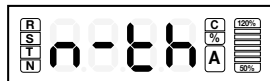
1. Press Enter from the main screen. (A-gr)



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

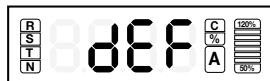


3. Press the Up-key menu once from the PHR screen. (2.CHA)



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.



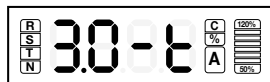
The DMPi main screen display (0.00A)



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.



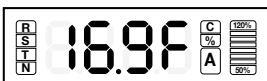
The DMPi main screen display (0.00A)



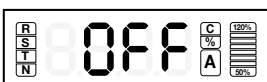
1. Press Enter from the main screen. (A-gr)



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)**  
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.

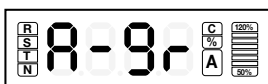
Note 1) Upon initial setting, P-99 is displayed on the screen. Here, use the Up/Down key to change it into P-00 and press Enter. You are now ready for setting.  
Note 2) When the operating value of ground fault protection (16.gF) is set as OFF, it is excluded from the setting menu.

## Ground fault delay time setting

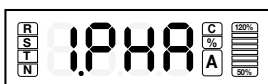
This is a function to set time for blocking operation of the ground fault element upon motor activation.



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.

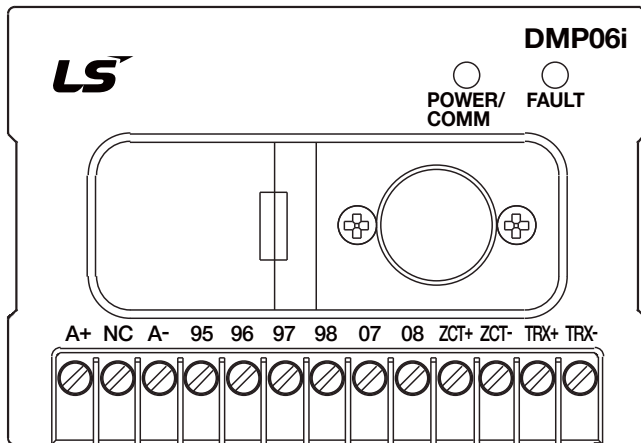


5. Here, use the Up / Down key to set the value. Press Enter to save the setting. **Note1)(200→100sec)**  
① Set by 1sec unit ranging from 0sec to 200sec; the default value is 200sec.

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

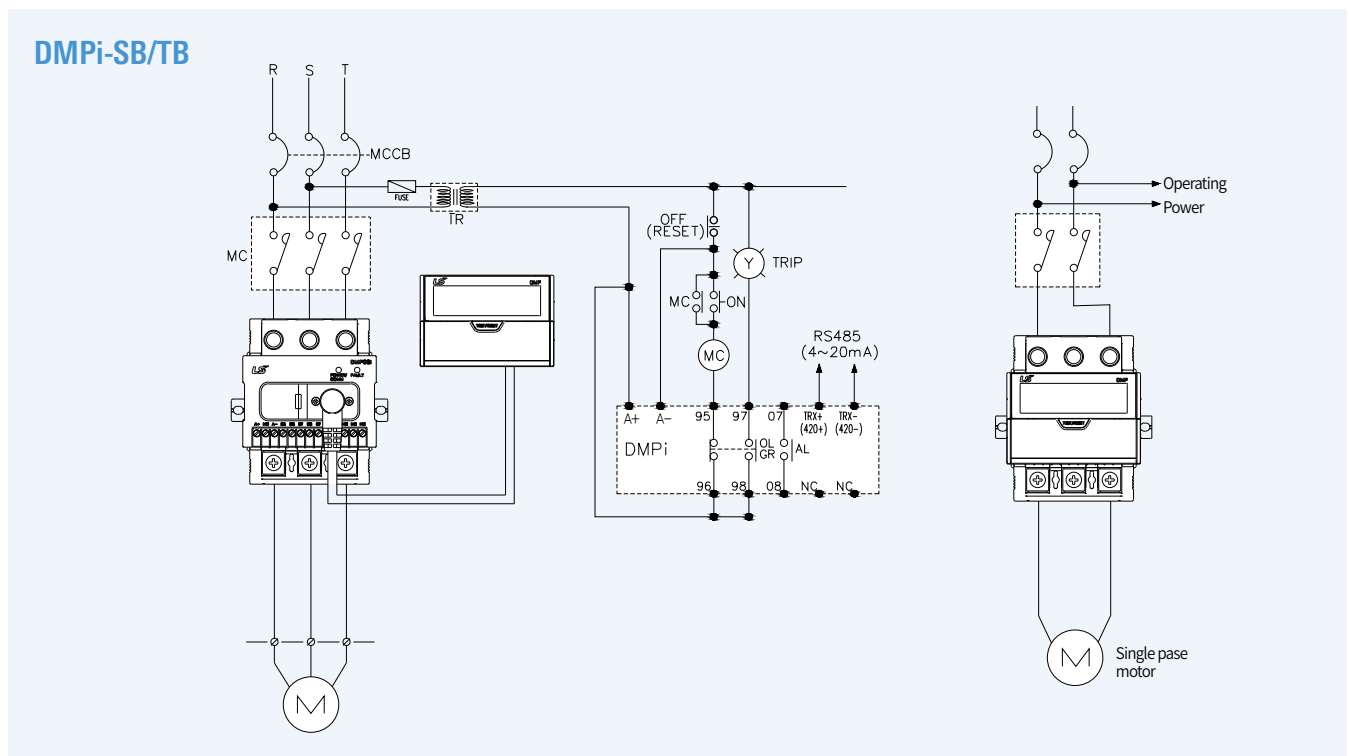
Note 1) Upon initial setting, P-99 is displayed on the screen. Here, use the Up/Down key to change it into P-00 and press Enter. You are now ready for setting.  
Note 2) When the operating value of ground fault protection (16.gF) is set as OFF, it is excluded from the setting menu.

## 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- 420+, 420-	RS485 connect or 4~20mA output

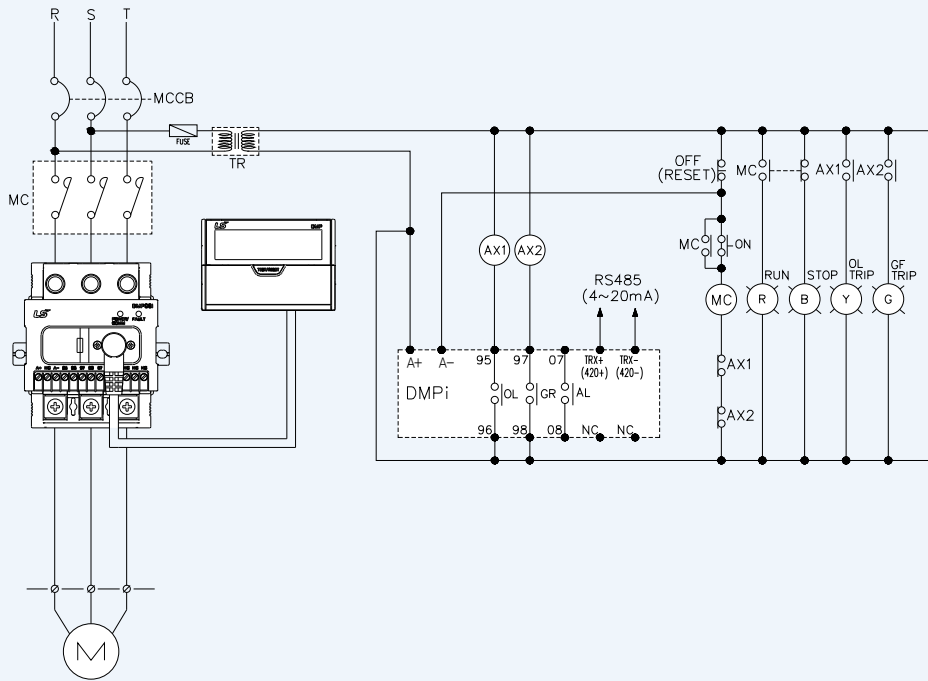
## DMPi-B built-in ground fault protection type (1a1b)



# Terminal configuration / Wiring & cable connection

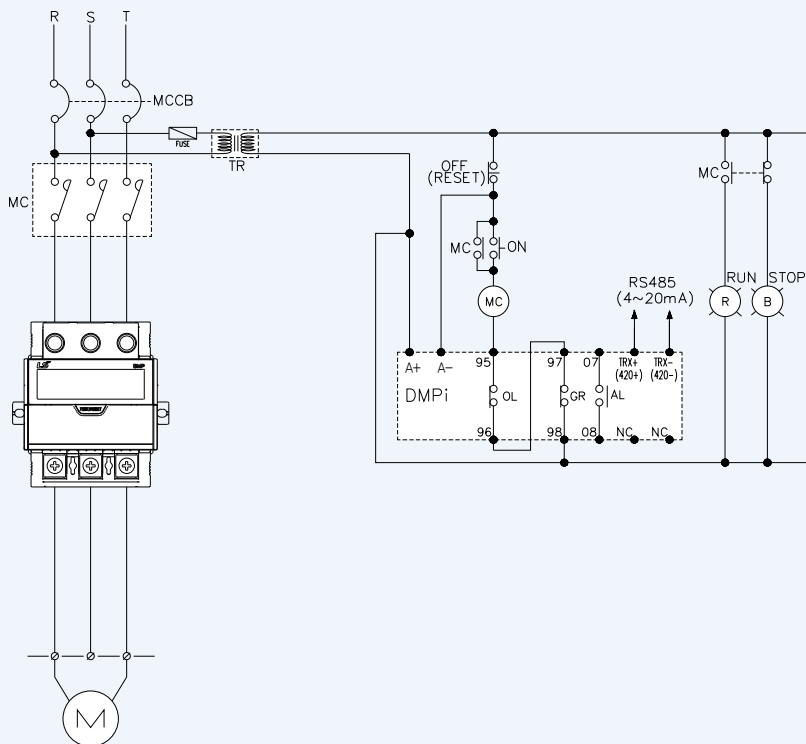
## DMPi-B built-in ground fault protection type (2a)

DMPi-SB / TB

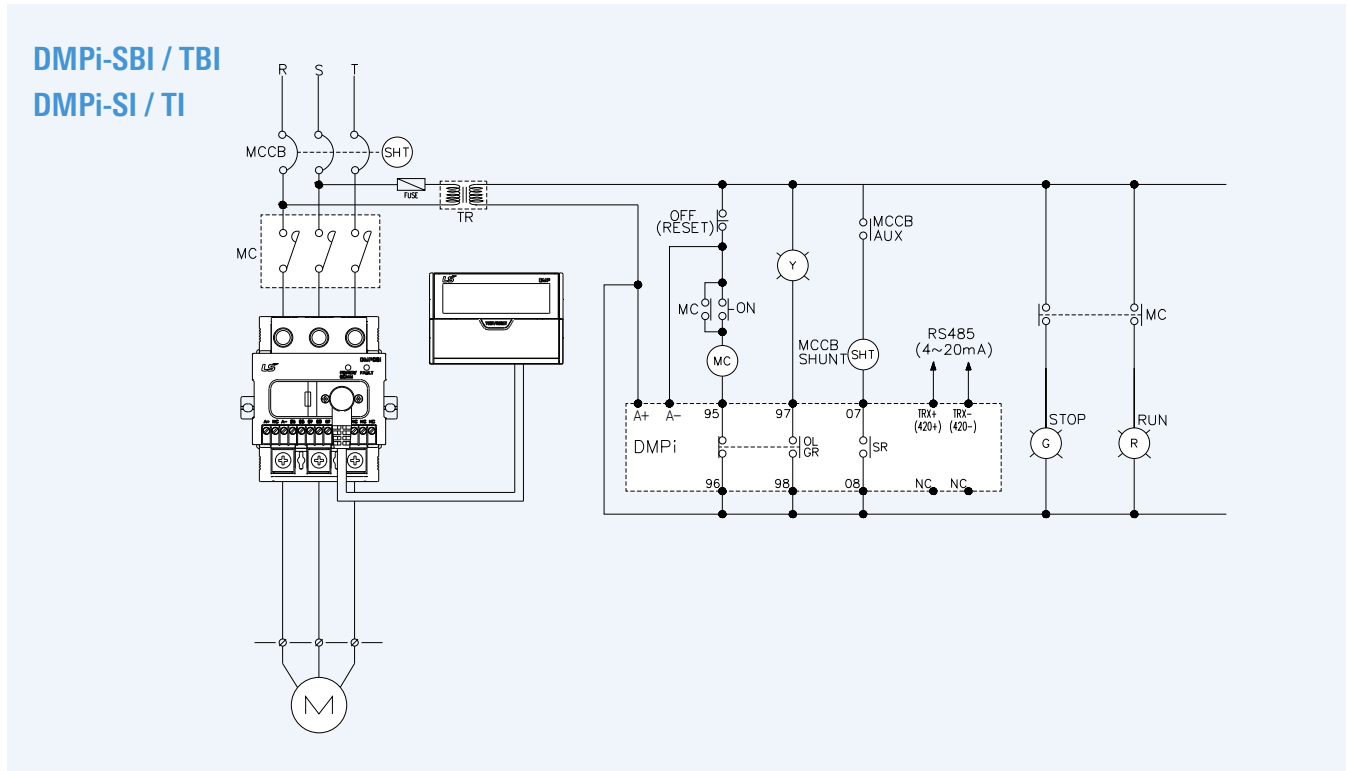


## DMPi-B built-in ground fault protection type (2b)

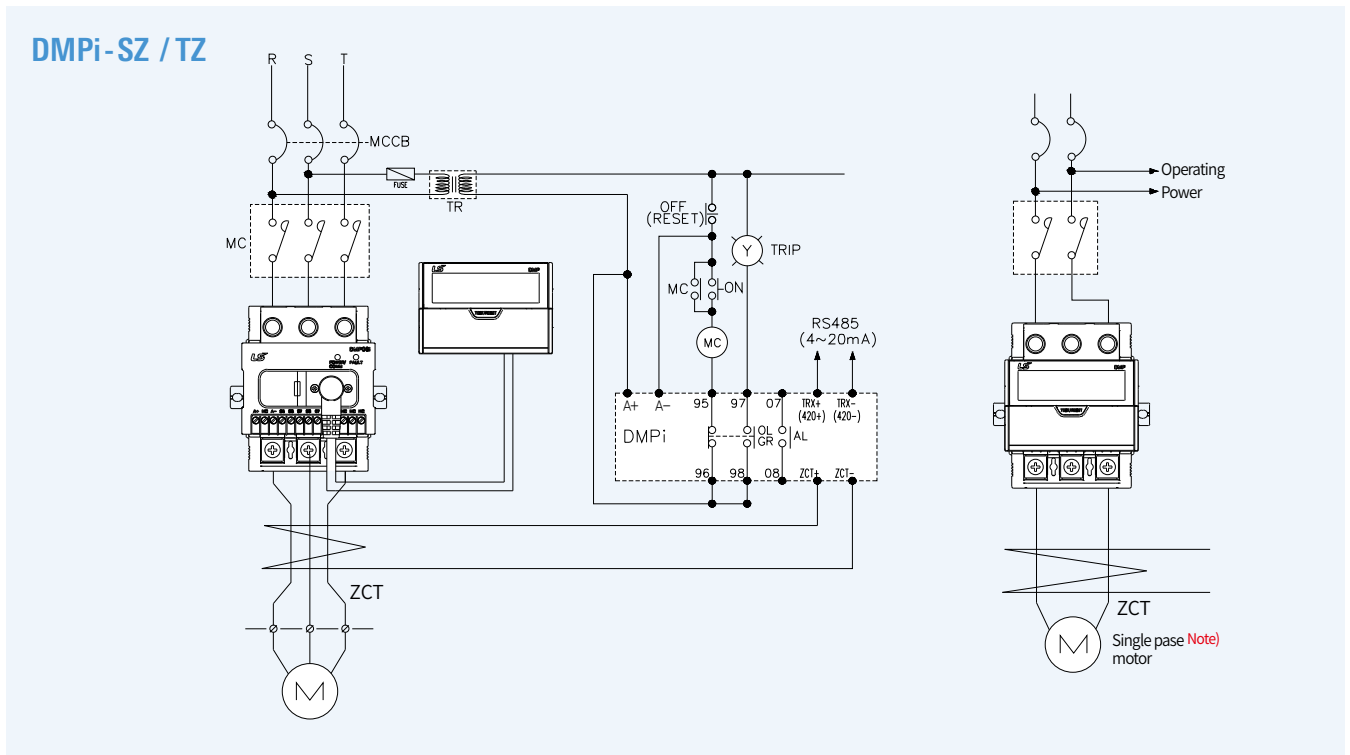
DMPi-SB / TB



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



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

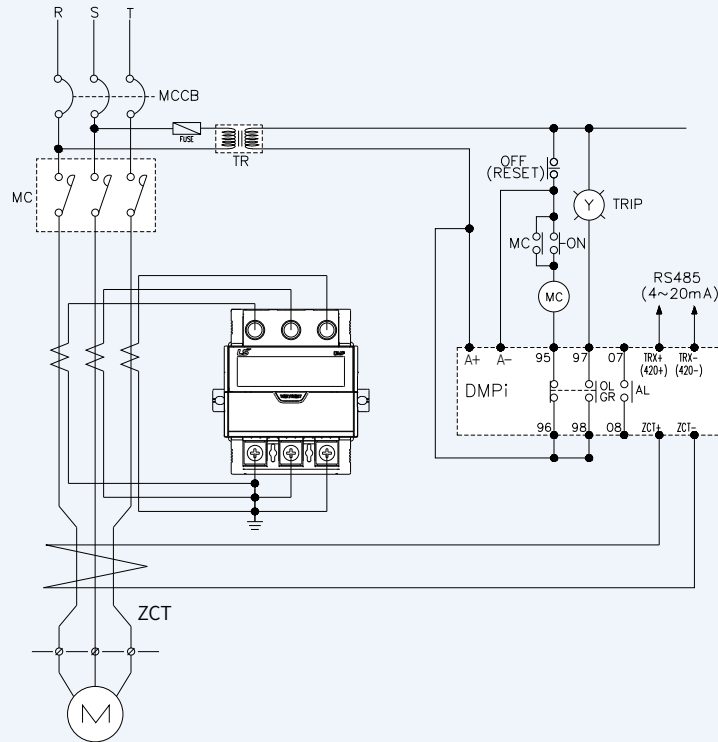


Note) 1. R-phase must be penetrated when connecting a single-phase motor. (Although there are S, T-phase CT in the product, values are measured based on R-phase.)

# Terminal configuration / Wiring & cable connection

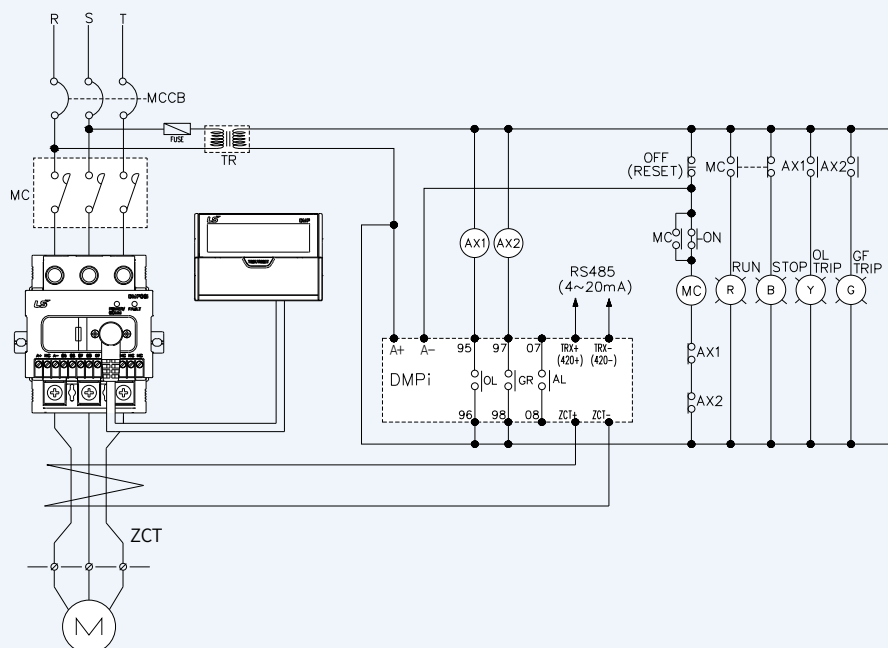
## DMPi-SZ / TZ external ground fault protection type (1a1b large-capacity motor applied with external CT)

DMPi-SZ / TZ



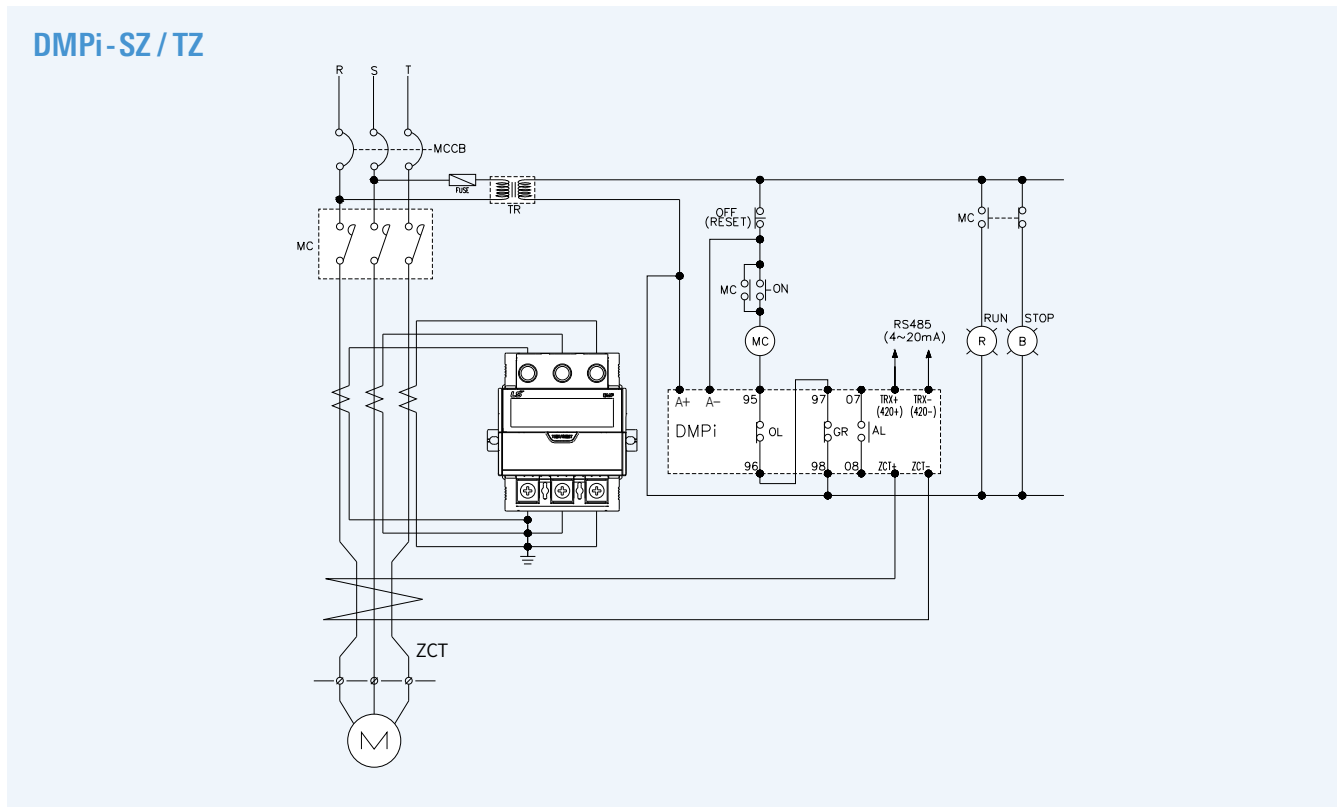
## DMPi-SZ / TZ external ground fault protection type (2a)

DMPi-SZ / TZ

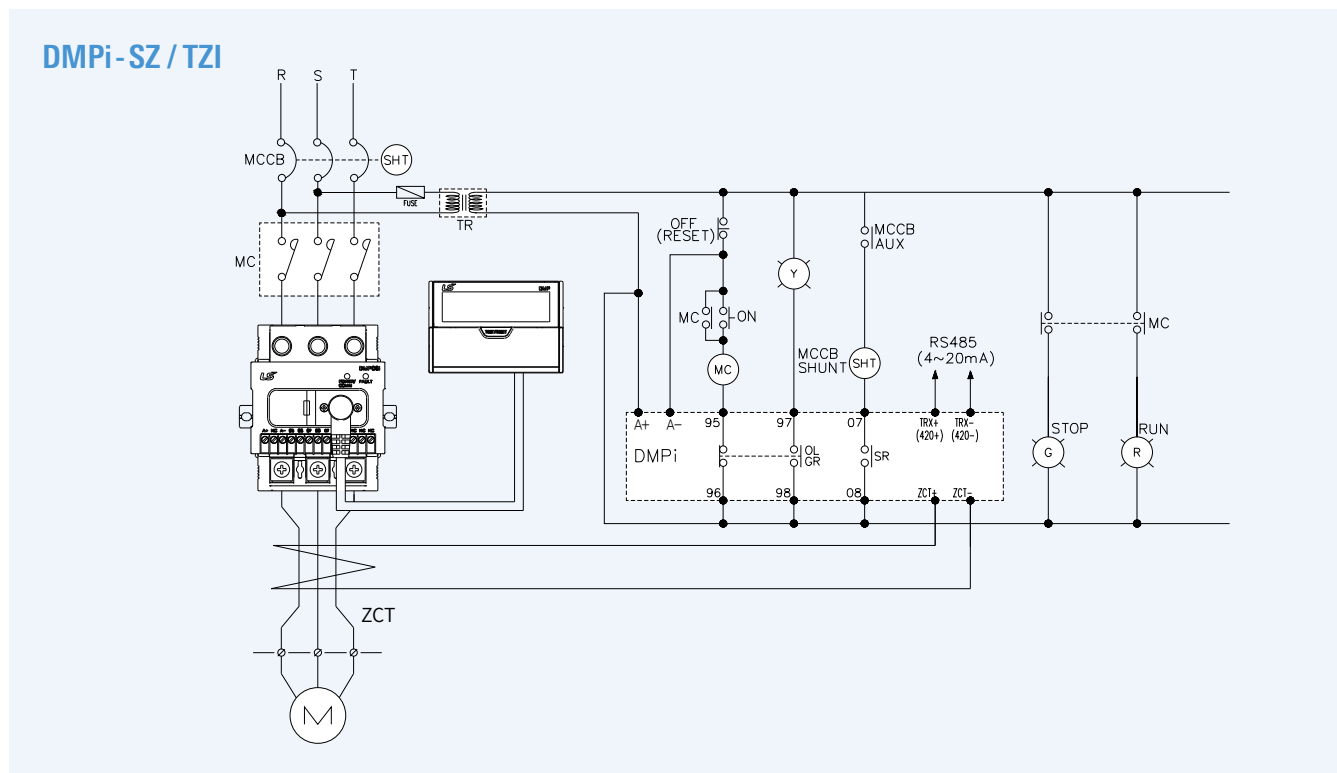




## DMPi-SZ / TZ external ground fault protection type (2b)

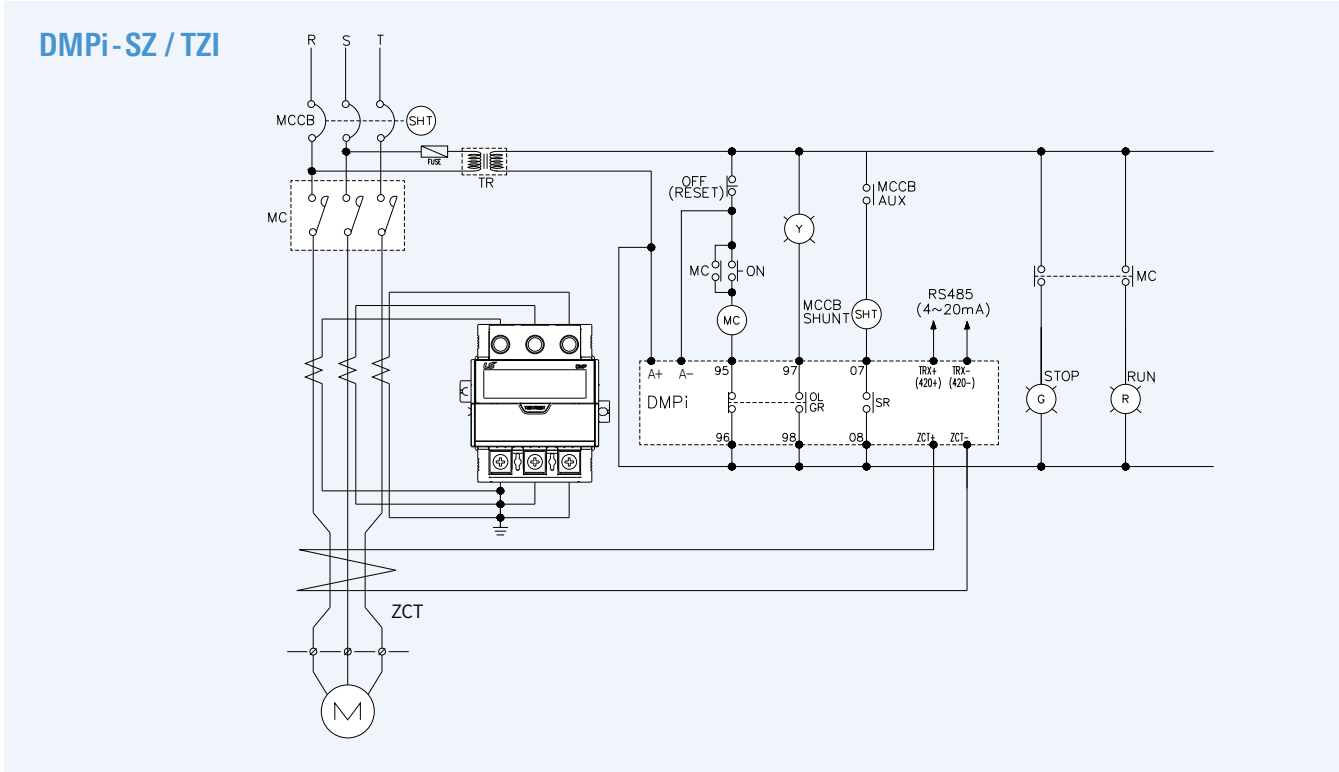


## DMPi-SZI, TZI instant short-circuit protection and external ground fault protection type (1a1b)



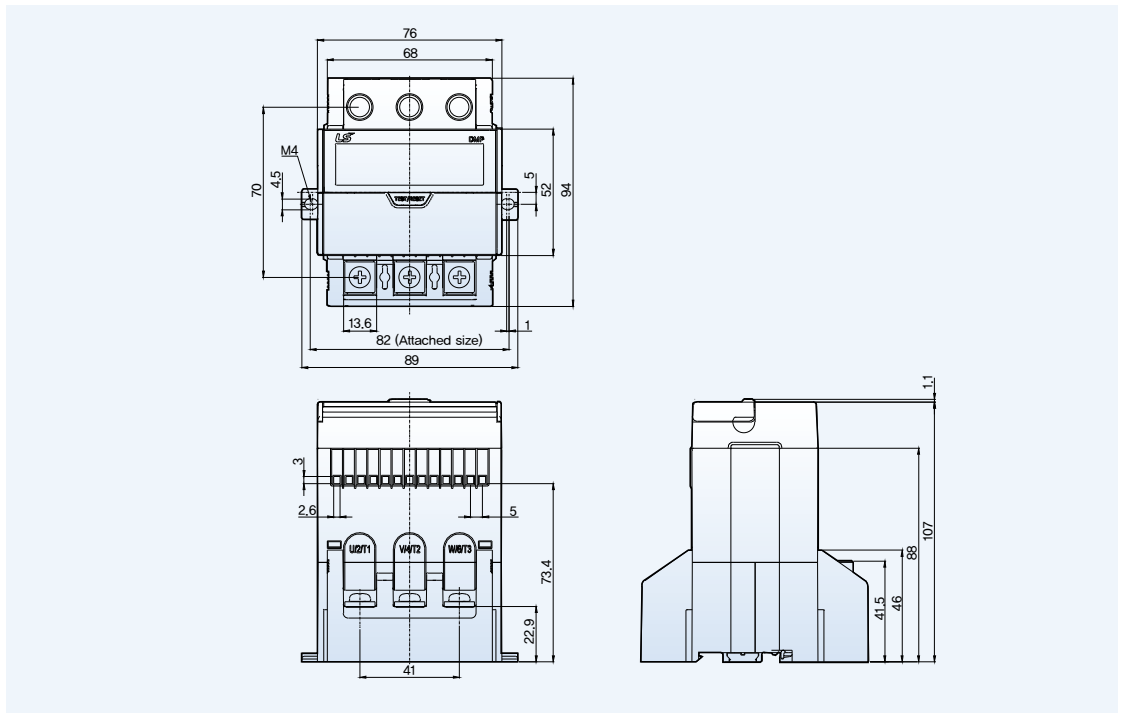
# Terminal configuration / Wiring & cable connection

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

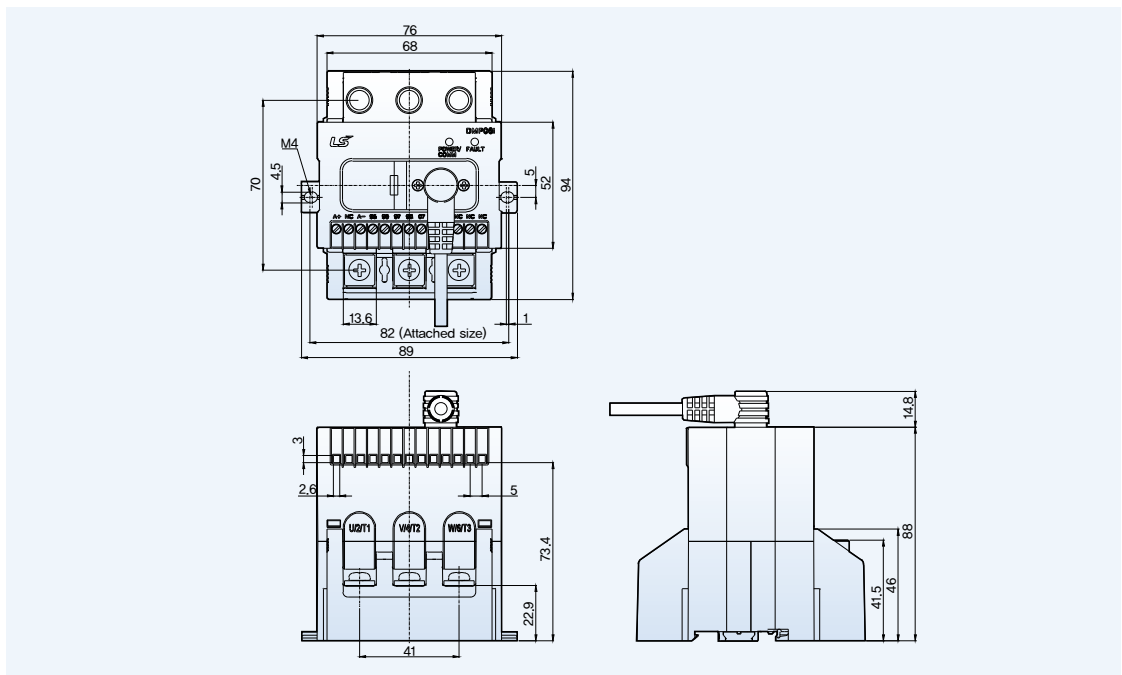


Unit : mm

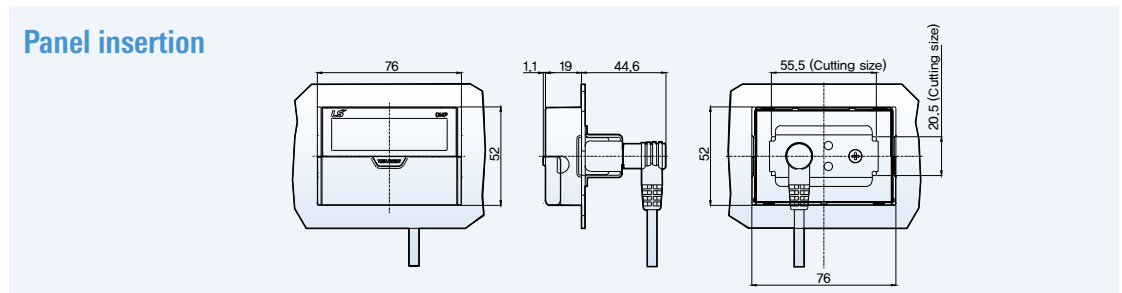
## Integrated terminal type



## Separated terminal type



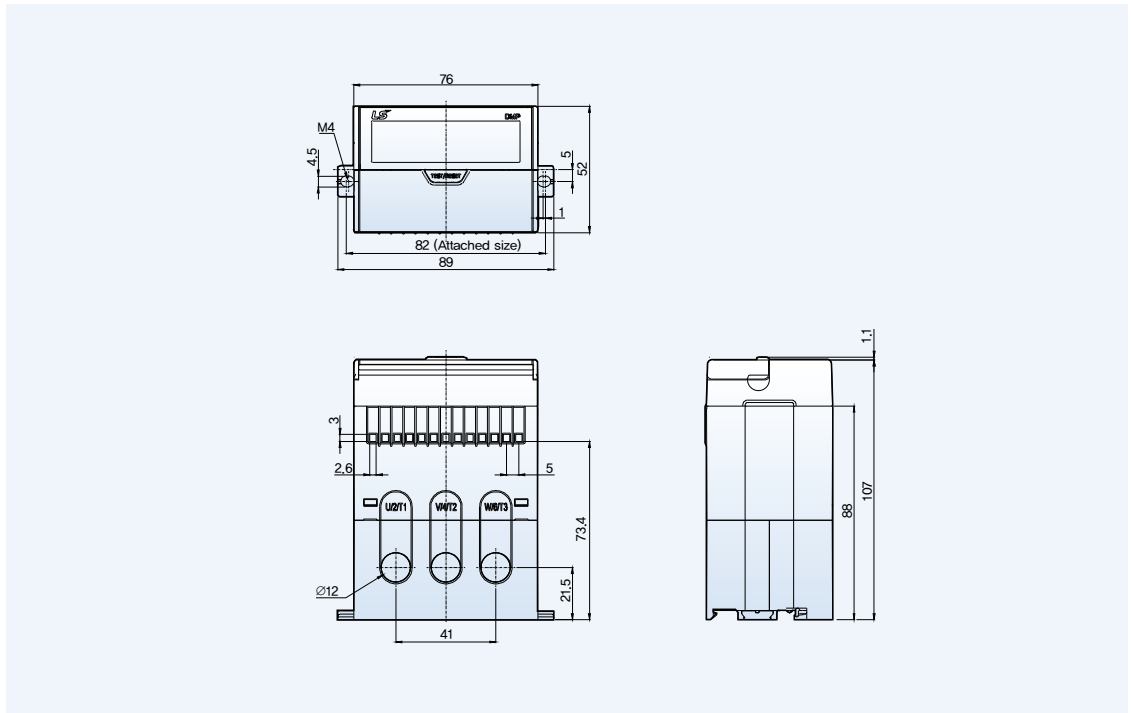
## Panel insertion



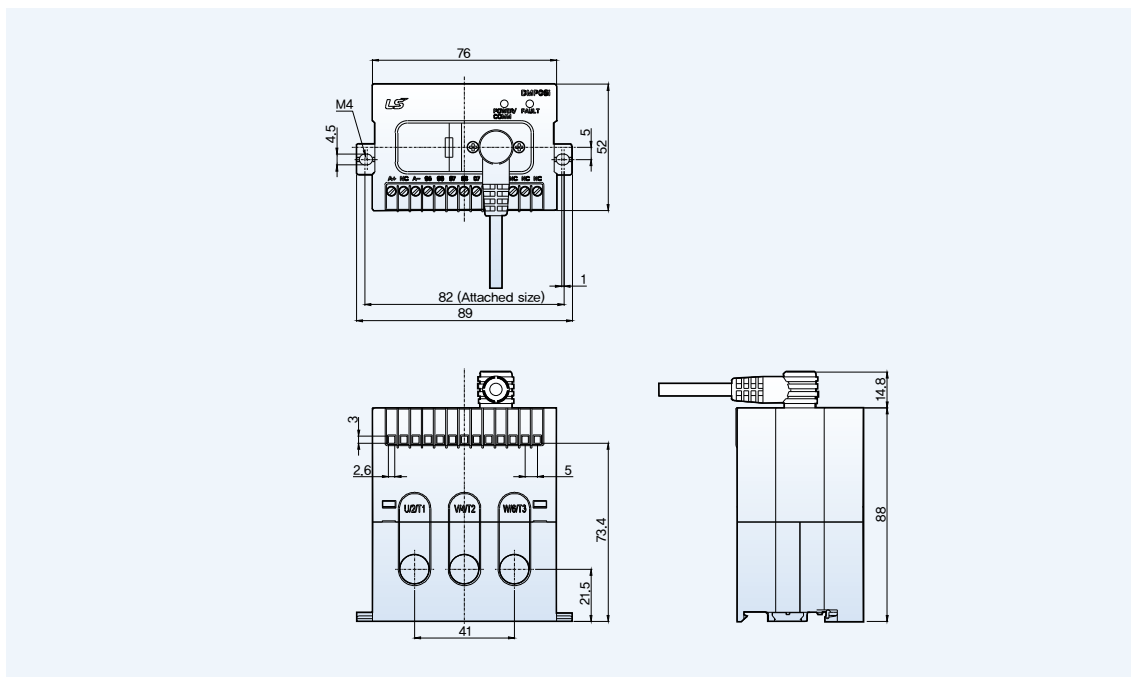
# Dimensions

Unit : mm

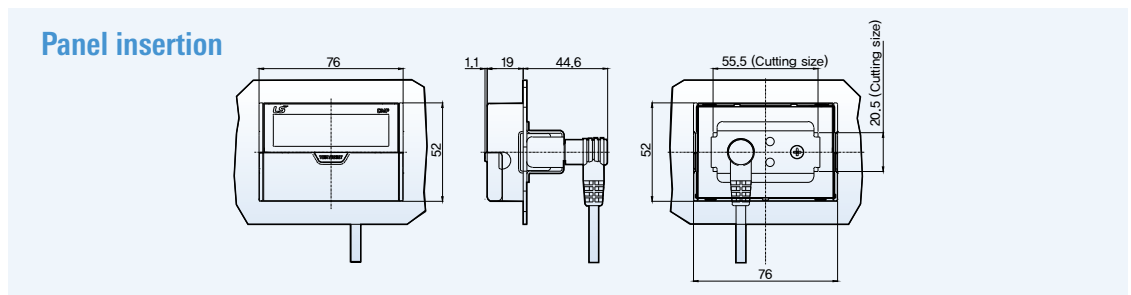
## Integrated penetration type



## Separated penetration type



## Panel insertion







## ***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.



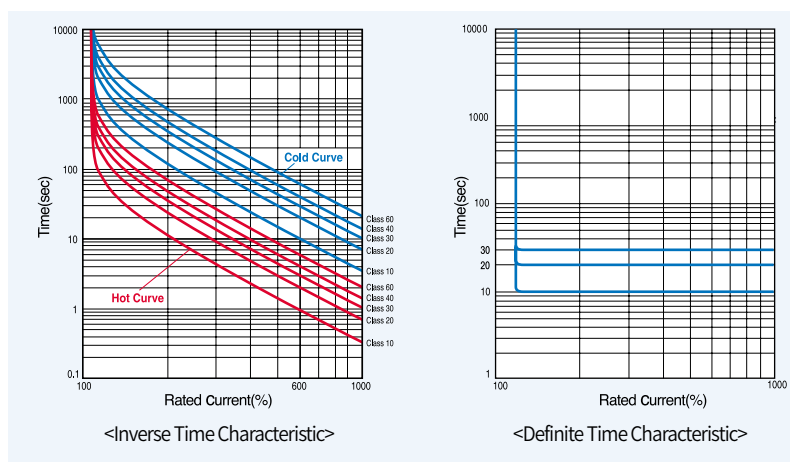
### Wide Current Setting Range: 0.125~100A for One Model

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 600% 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.



### 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 starting delay, and to detect an increased load current by 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

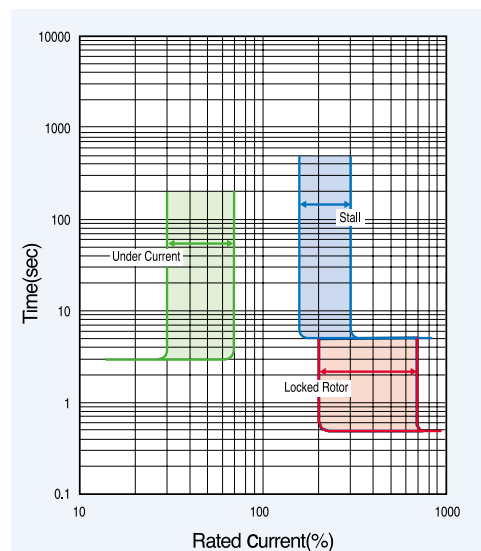
### Under current-37

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

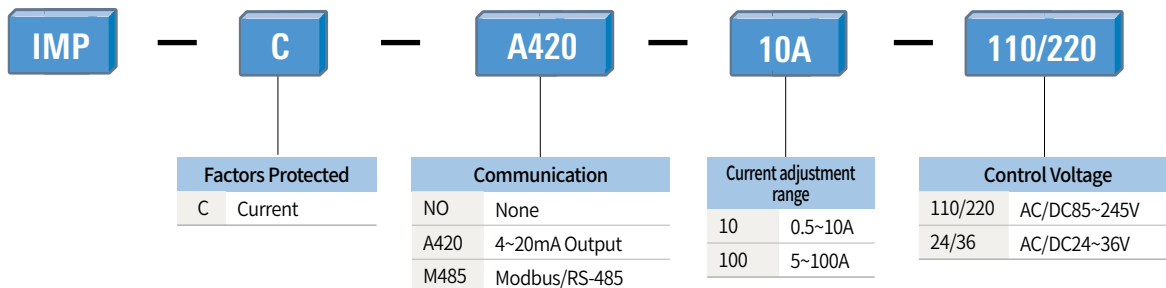
Protection	Over current, Lock/Stall, Phase failure, Phase unbalance, Reverse phase, Under current, Ground fault, Short circuit	
Connection method	Extention type	
Operating Time Characteristics	Heat accumulation inverse time / inverse time / definite time	
Rated current	0.5~10A/5~100A (Separate)	
Display	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) <sup>Note1)</sup>
	Capacity	3A/250VAC Resistive Load
	Contact minimum load	10mA / 5VDC
ZCT Input	200mA/100mV (Exclusive ZCT) <sup>Note2)</sup>	
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



\*When using Display separately, please purchase a dedicated cable as well. (See Other Options)

## 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 Test/Reset key once. Then “TEST” is displayed and the EMPR is tripped.
- 2) Press the Enter key. Then “P-99” is displayed.  
Use the Up/Down keys to change the password(P-00).
- 3) 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.
- 4) 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.
- 5) 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.

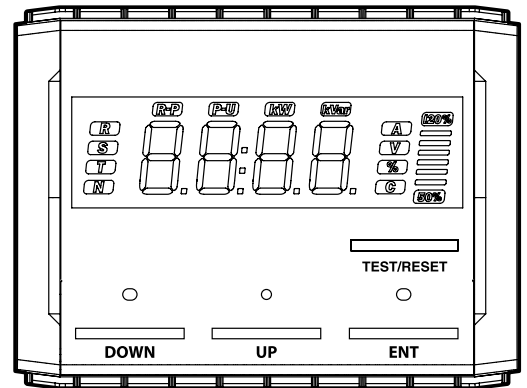
## 5. Failure event checkup

- 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.



# Operation & setting method

## Setting menu (A Group)

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

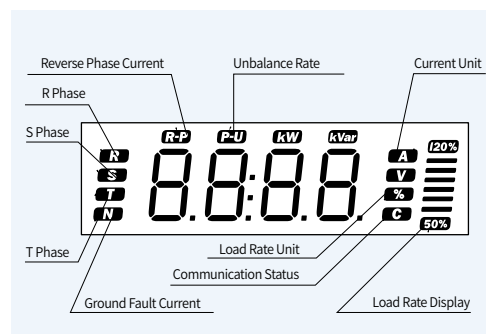
Group	Menu	Setting Value	Description	Default Value
B	1E-r	On/Off	Electric Reset	On
	2R-r	Off, 1~20min	Automatic Reset (min)	Off
	3r-t	Hour/Minute	Run Time	Time Check
	4S-r	Off, 1~8760 time	Run Time Setup (Hour)	-
	5S-d	2009/01.01/00:00	YY/MM/DD/ HH:MM (View/Setup)	-
	6t-r	Day/time : min	Total Run Time	Time Check
	7t-d	0.5~10/5~100A	20mA Output settings	A420 model
	8Adr	1~247	Communication address	M485 model
	9bPS	96/192/384	Communication speed	
	0S-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
0-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. <small>note 4)</small>
Loc	Lock Trip	Operate within 0.5 seconds. <small>note 4)</small>
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) 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



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

### 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		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.

# Operation & setting method

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

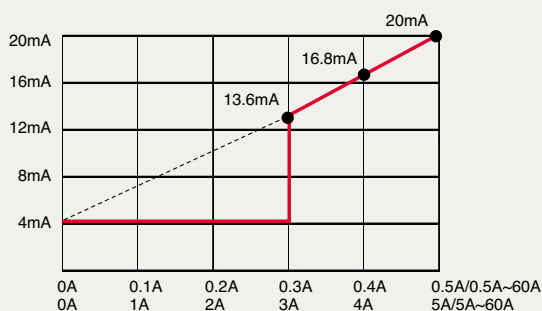
- 1) The biggest current out of measured 3-phase currents is converted into DC 4mA~20mA and the current measured remotely by digital meter can be displayed.
- 2) When there is no current, 4mA is sent. If the current goes beyond the predefined value, 20mA is sent.

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

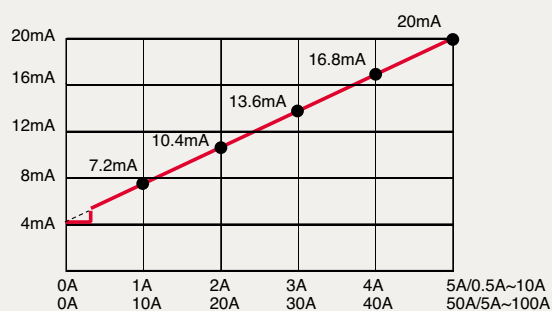
- 3) When the system is the 0.5A~10A setting mode, measurement starts from 0.3A. When the system is the 5A~100A setting mode, measurement starts from 3A. Thus, when the current is under 0.3A (3A), 0A is measured and output is 4mA. (To measure the load current correctly, an appropriate CT should be used).

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

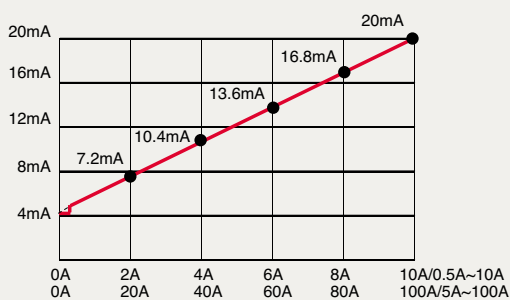
Analogue output when the output is set to be 0.5A (5A)



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



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





## Terminal configuration

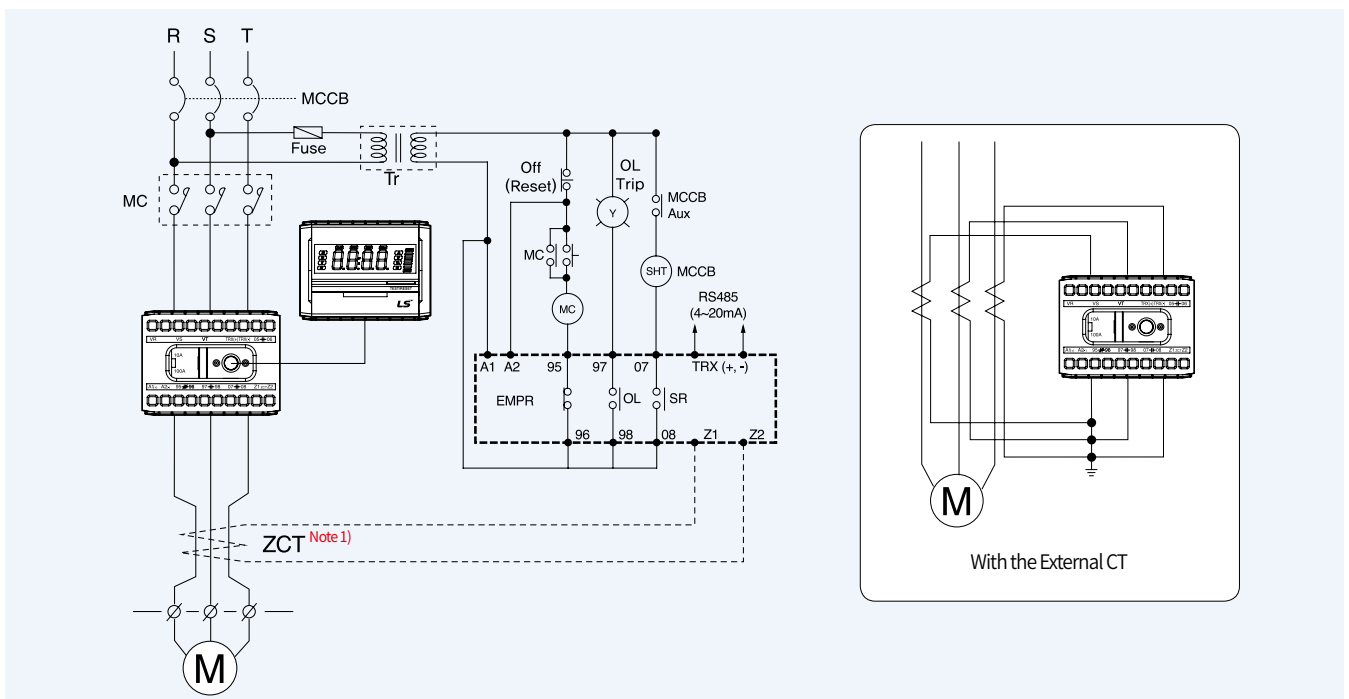
Terminal layout	Communication specification
	<ul style="list-style-type: none"> <li>• Operation mode: Differential</li> <li>• Distance: Max. 1.2km</li> <li>• General RS-485 shielded twist 2-pair cable</li> <li>• Baud rate: 9600/19200/38400bps</li> <li>• Transmission Method : Half-Duplex</li> <li>• Max. In/Output Voltage : -7V~+12V</li> </ul>

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.







# 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 starting types, such as full voltage starting, Y- $\Delta$  starting, reversible starting, 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 S PLC 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 (1<sup>st</sup> to 16<sup>th</sup>)
- Modbus communication and 4~20mA



## Contents

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- 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 inverter 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 unbalance.

\* 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- $\Delta$  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 & Control 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	-	-	-	●
Control function	Motor ON/ OFF	●	●	●	-

### 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 <sub>2</sub> )	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 <sup>nd</sup> -16 <sup>th</sup> odd harmonics
Current hamonics(%)	0~100%	±5.0%	2 <sup>nd</sup> -16 <sup>th</sup> odd harmonics
Insulation Resistance	0.2MΩ~50MΩ	±10%	-
Motor temperature	-50°C~200°C	±10%	-



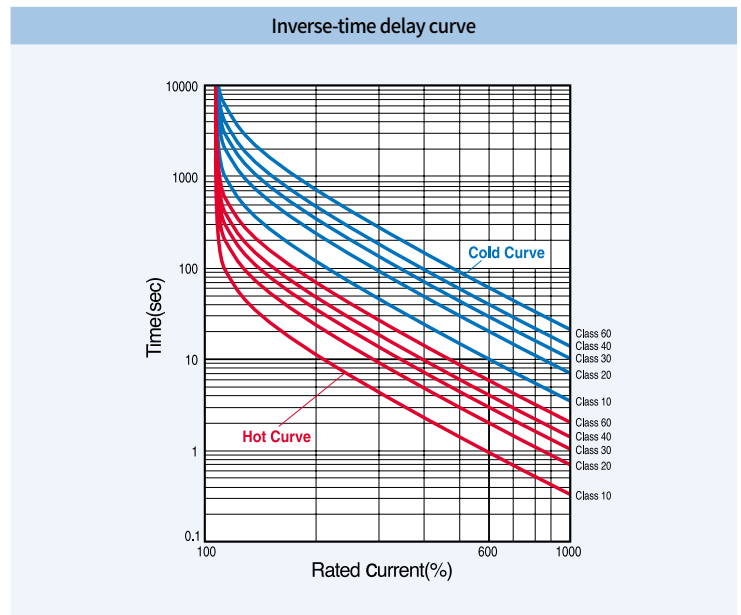
## Current protection

### Over current

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

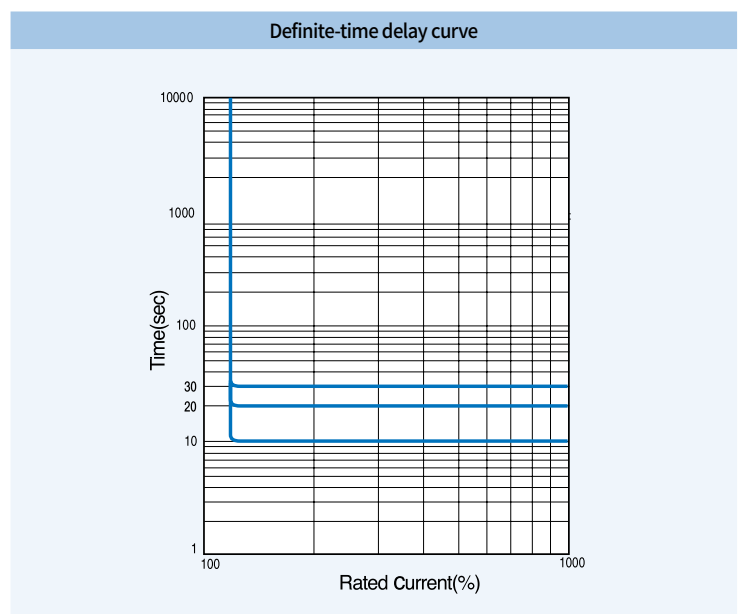
#### 1) Inverse-time delay curve

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



#### 2) Definite-time delay curve

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



### 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 within 3 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.

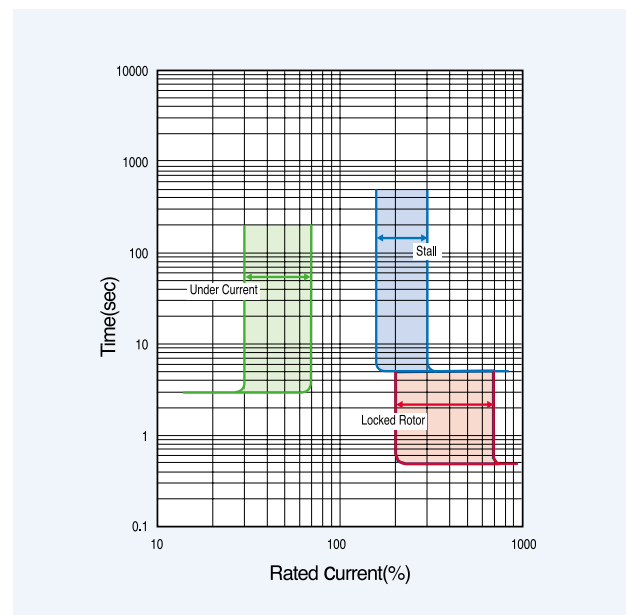
\*When applying external CT with a large capacity motor, be sure to use an external ZCT

### 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.

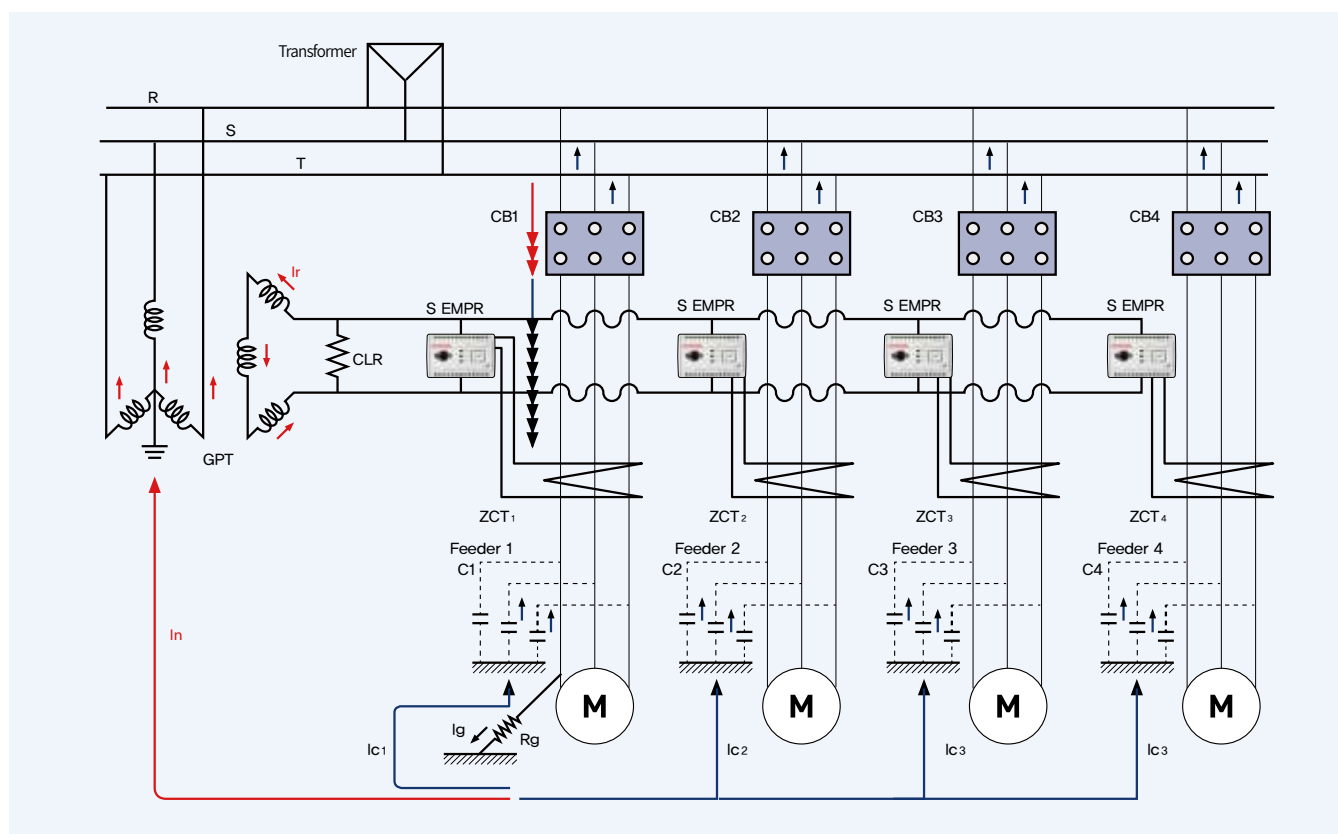
## Instance

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.



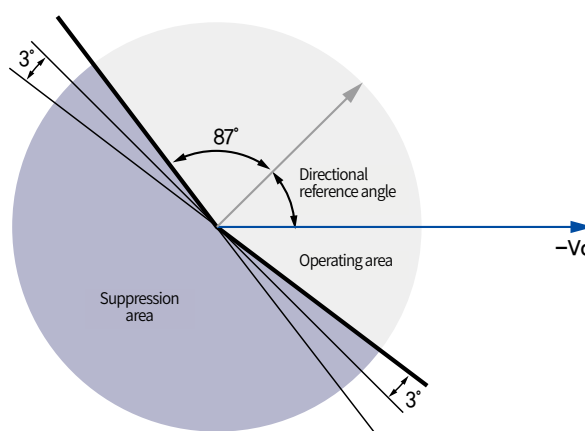
## Selective ground fault protection

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- ① - GPT : Grounding Potential Transformer
- ② - ZCT1, ZCT2, ZCT3, ZCT4 : Zero current transformer
- ③ - CLR : Current-limiting resistor
- ④ - CB : Circuit breaker
- ⑤ -  $I_n$  : Current over GPT
- ⑥ - S-EMPR MMP S : Smart digital motor protection relay
- ⑦ -  $I_r$  : Current-limiting resistor current
- ⑧ -  $R_g$  : Ground fault resistance at ground fault point
- ⑨ -  $I_n$  : Current over GPT
- ⑩ - C1, C2, C3, C4 : Line capacitance of each feeder
- ⑪ -  $I_g$  : Ground fault current
- ⑫ -  $I_c$  : Line charging current ( $I_{c1}+I_{c2}+I_{c3}+I_{c4}$ )

### 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.

# Product characteristics

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## Voltage & Power protection

### Over current

Overtoltage 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

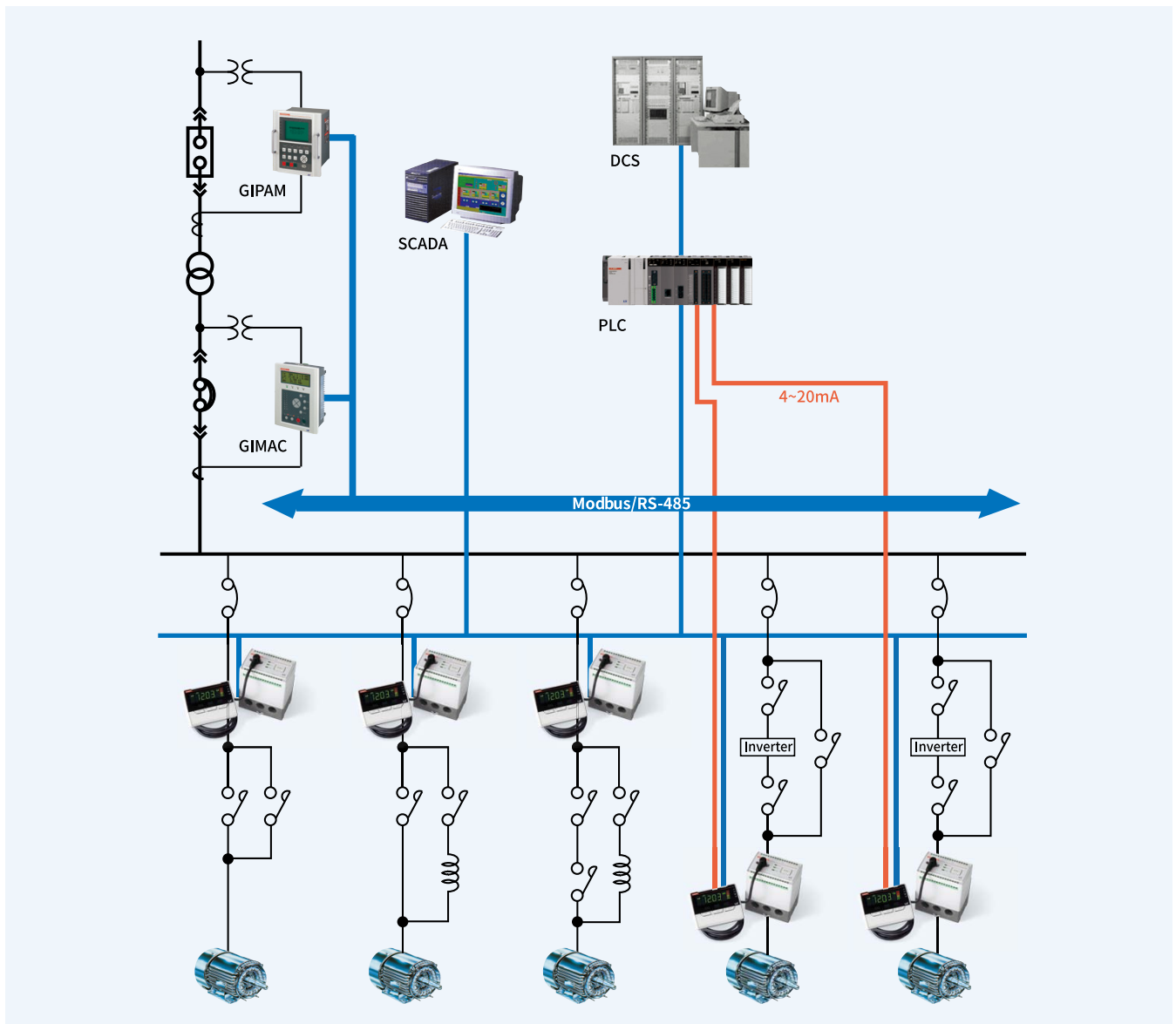
The under power factor element operates if the power factor falls below the setting level. If the power factor of a customer falls below that of a generator in a power plant the generator current increases over the rated current or the power output is limited. For this reason, the power factor of a customer 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



# Product characteristics

## 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.

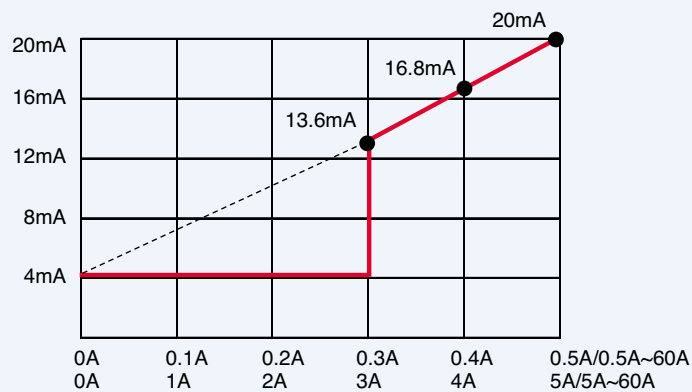
- 20mA Output Settings : 0.5~10A or 5~100A

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°C : ± 0.15% / °C

- 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.

$$\begin{aligned}
 \text{* Output current} &= \frac{(I_{\text{upper}} - I_{\text{lower}})}{\text{TD setting}} \times \text{load current} + 4\text{mA} \\
 &= \frac{16\text{mA}}{\text{TD setting}} \times \text{load current} + 4\text{mA}
 \end{aligned}$$

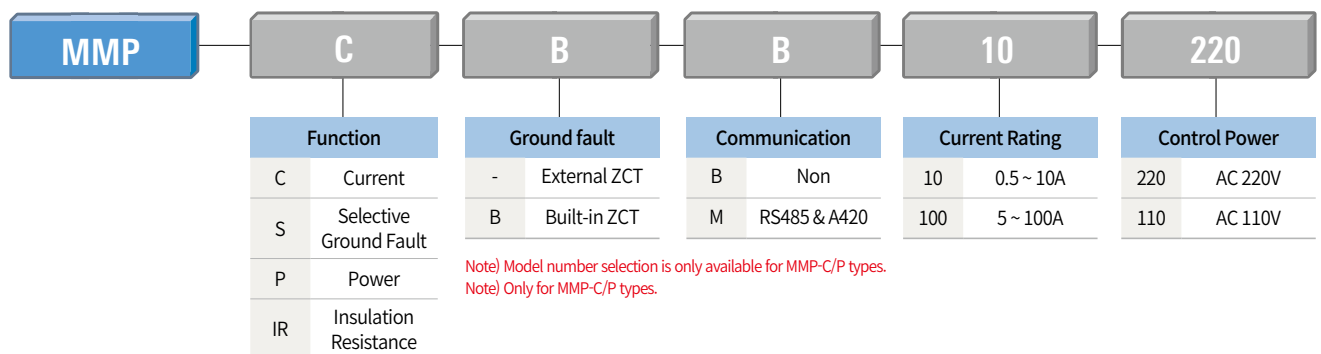


Analog output for 10A (100A) output setting

## 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		AC 110V, AC 220V 50/60Hz
Reset	Auto	1-20 minutes
	Manual	ON / OFF selectable
Mounting		Display unit : separately mountable
Accuracy		Current and voltage metering : $\pm 1\%$ of rating or $\pm 2\%$ of minimum rating 4~20mA output : $\pm 5\%$
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		200mA/100mV(our product), 200mA/1.5mA(universal ZCT) *Connection is unnecessary in built-in ZCT Model.
I/O assured voltage	110V Type	63V $\pm 10\%$
	220V Type	140V $\pm 10\%$
Environment	Operation Temp.	-10~55°C
	Storage Temp.	-20~70°C
	Humidity	within 80% RH, no condensation
Insulation resistance		100M $\Omega$ /500VDC
Lightning impulse voltage		1.2 $\times$ 50 $\mu$ s 5kV standard waveform applied
Fast Transient		2kV/1Min
Power consumption		5W or under

## Model numbering system



\* When purchasing the product, please purchase the dedicated cable as well. (See Other Options)  
Note) MMP-IR Type Only for 60HZ.

# Operation & setting method

## MMP-C\*/P\*/S\* -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, REV and 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 reversal 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 reversal settings) → "CHEC" → Pressing Enter Key. The phase information is available when a voltage is applied.

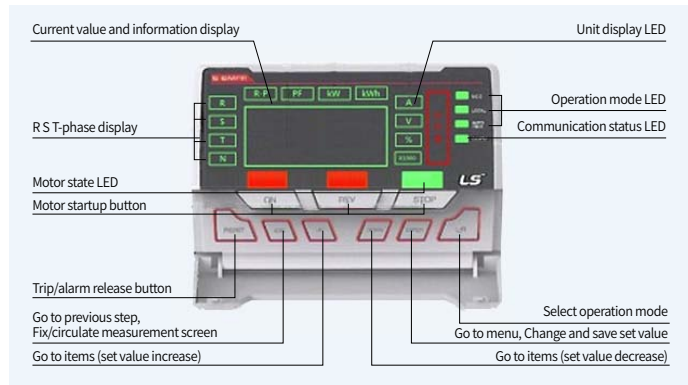
- 2) Turn on the motor and access "d-gr" which denotes D group and move to "ESEL" menu using Up / Down keys and press Enter to access Fault items. Select the desired Fault item and press Enter to trip the device.
- 3) Press Reset key to reset the device and return to the measurement screen.

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-C\*/P\*-10/100)

## A-group

Group	Menu	Description	Setting range	Default
A	1P H A	Single-phase / 3-phase	1P/3P	3P
	25 - F	Frequency	50/60	60
	3C H A	Characteristics (Over Current Protection)	Off/dEF/th/n-th <sup>Note 1)</sup>	n-th
	40 - t	Operating time	1~60sec (5/10/20/30/60)	60
	5d - t	Time Delay	1~200sec	200
	6r - C	Rated current (10, 100)	0.5~10/5~100	10
	7C t r	CT ratio <sup>Note 2)</sup>	0.25/0.5/1~200	1
	8d r U	Starting mode	dir(Full voltage starting)/ y-d(y-d starting)/ F-r(Forward rotation, Reverse rotation)/ Ind(Reactor starting)/ lut(Inverter starting) <sup>Note 5)</sup>	dir
	9d - t	Y start time (lut start time)	1~120sec (lut : 0.1~1sec)	5 (0)
	104d	Y-D switching time	0.05/0.1/0.2	0.2
	115t	Outage compensation time	Off/1~30sec	Off
	125d	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.)

5. Lut (Inverter Start) settings can only be set in the ampere type model.

## B-group

Group	Menu	Description	Setting range	Default	
B	1L o c	LOCK	Off/200~800%	Off	
	25 t L	STALL	Off/150%~500%	Off	
	3P - F	Phasee loss (current)	On/Off	On	
	4P - U	Phasee unbalance (current)	Off/30~70%	Off	
	5P d t	Phasee loss / unbalance Time-delay	0~200sec	0	
	6r - P	Phase reversal (current)	Off/On/CHEC <sup>Note 1)</sup>	Off	
	7C r t	Phase reversal operation time	0.1~1.0sec	0.1	
	8U - C	Undercurrent	Off/30~90%	Off	
	9E c t	ZCT selection	External	100/1.5 <sup>Note 2)</sup>	100
			Built-in	Enbd/100 <sup>Note 3)</sup>	Enbd
	109F	Ground fault (Zero-phase)	Off/0.03/0.05/0.1~3.0	Off	
	119n	Ground fault (Residual current)	Off/30~100%	Off	
	129t	Ground fault operation time	0.05~3.0sec	3.0	
	139d	Phase unbalance delay time	0~00sec	60	
	141 C	Intance	OFF/10A type : ~100A <sup>Note 4)</sup> /100A type : ~800A, 100A or more: using external CT		OFF
	15A L	Output contact method	ALL I-tp, ALo, U-C, OrH <sup>Note 5)</sup>		
	16A r	Current Y / N, Alarm	ON/60~110%		
17t h	THD (voltage)	0~100%			

Note) 1. When CHEC set value of negative sequence item is selected, additional wire information is displayed.

2. When using our product(200mA/100mV) : 100 / When using universal ZCT(200mA/1.5mA) : 1.5

3. The built-in type is set to Enbd (Built-in ZCT) or 100 (our product) (When setting the CT ratio to 2 or more, be sure to use an external ZCT.)

4. Tolerance guarantee scope for 10A type: ~100A/100A type: 600A for 50Hz, 720A for 60Hz

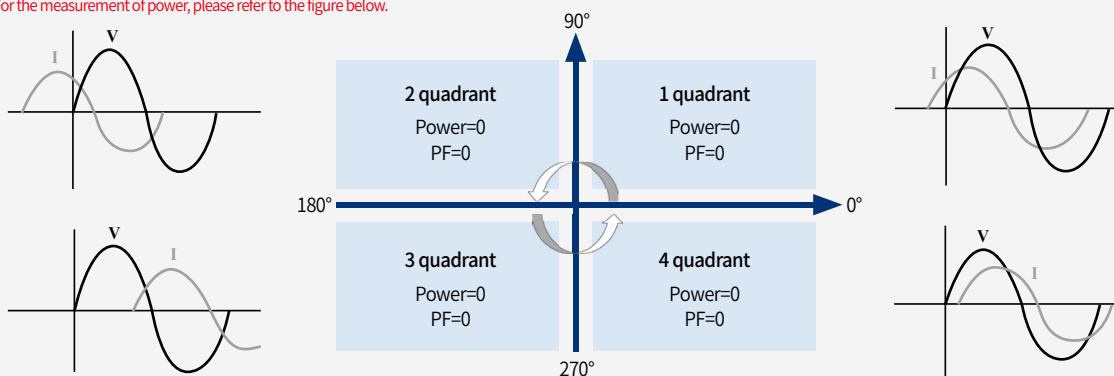
5. I-tp: Instantaneous trip, Circuit breaker trip (interlocked), ALo: Current alarm setting, U-C: When operating under low current factor, OrH: When the motor consecutive operating time is over the set value and when ALL is set, output (AUX-C3) will be released at the time of all current relay factor (including I-tp) operation.

# Operation & setting method

## C-group : Menu for power type activation

Group	Menu	Description	Setting range	Default
C	1r-u	Rated voltage (line to line)	110~480	380
	20-u	Over voltage	Off/105~130%	Off
	30-t	Over voltage operation time	1~30sec	30
	4U-u	Under voltage	Off/50~95%	Off
	5U-t	Under voltage operation time	1~30sec	30
	6uPF	Phasee loss (voltage)	Off/On	Off
	7uPU	Unbalance (voltage)	Off/5~40%	Off
	8urP	Phase reversal (voltage)	Off/On/CHEC	Off
	9urt	Phase reversal operation time	0.1~1.0sec	1
	10nP	Rated power	0.1~999.9KW	999.9
	110P	Over power	Off/100~800%	Off
	12Pt	Over power operation time	1~100sec	100
	13UP	Under power	Off/20~100%	Off
	14Pt	Under power operation time	1~100sec	100
	150F	Over power factor	Off/0.20~1.00	Off
	16Ft	Over power factor operation time	1~30sec	30
	17UF	Under power factor	Off/0.20~1.00	Off
	18Ft	Under power factor operation time	1~30sec	30
	19rY	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	
22.1h	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	1t r t	Total running time	0~9999day / 0~23h / 0~59m	-
	2r - t	Running time	0~9999h / 0~59m	-
	3S r t	Running time setting	Off/10~8760	Off
	4C C h	Contacteur check	Off/On	Off
	5S - d	Date <sup>note 1)</sup>	2013~2100y / 1~12 (Mon), 1~31 (Day) / 0~23h, 0~59m	2014 01.01. 0:00
	6C C C	Contacteur counter <sup>note 2)</sup>	-	-
	7F L t	Fault cause check <sup>note 3)</sup>	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 <sup>note 4)</sup>	OFF / 1~20m	Off
	9r - n	Automatic reset number Set number of times	Off/1-5	Off
	10A d	Communication address <sup>note 5)</sup>	1~247	247
	11b S	Communication speed <sup>note 5)</sup>	9.6/19.2/38.4K/57.6K	9.6K
	12S P	Swap <sup>note 5)</sup>	On/Off	Off
	13P r	Parity setting <sup>note 5)</sup>	nonE/odd/EUEn	nonE
	14t d	20mA setting <sup>note 5)</sup>	0.5~10/5~100	10/100
	r S t	Stored data deletion	All : for all subparameters A-P : active energy rA-P : reactive energy trt : total running time CCC : contacteur counter CALo : calories FALt : fault events	-
	t E S t	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-S\*-10/100)

### A-group

Group	Menu	Description	Setting range	Default
A	1P/HA	Single-phase / 3-phase	1P/3P	3P
	25-F	Frequency	50/60	60
	3CHA	Characteristics (Over Current Protection)	Off/dEF/th/n-th <small>Note 1</small>	n-th
	40-t	Operating time	1~60sec (5/10/20/30/60)	60
	5d-t	Time Delay	1~200sec	200
	6r-C	Rated current (10, 100)	0.5~10/5~100	10
	7Ct-r	CT ratio <small>Note 2</small>	0.25/0.5/1~200	1
	8dr-U	Starting mode	dir(Full voltage starting)/y-d(y-d starting)/ F-r(Forward rotation, Reverse rotation)/ Ind(Reactor starting)/lut(Inverter starting)	dir
	9d-t	Y start time (lut start time)	1~120sec (lut : 0~1sec)	5 (0)
	10Yd	Y-D switching time	0.05/0.1/0.2	0.2
	11St	Outage compensation time	Off/1~30sec	Off
	12Sd	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 <small>Note 5</small>
B	1LoC	LOCK	Off/200~800%	Off	
	2StL	STALL	Off/150%~500%	Off	
	3P-F	Phasee loss (current)	On/Off	On	✓
	4P-U	Phasee unbalance (current)	Off/30~70%	Off	✓
	5Pd-t	Phasee loss / unbalance Time-delay	0~200sec	0	✓
	6r-P	Phase reversal (current)	Off/On/CHEC <small>Note 1</small>	Off	✓
	7Ct-r-t	Phase reversal operation time	0.1~1.0sec	0.1	✓
	8U-C	Undercurrent	Off/30~90%	Off	
	9Ect	ZCT selection	Enbd/1.5 <small>Note 2</small>	Enbd	
	10GF	Ground fault (Zero-phase)	Off/0.03/0.05/0.1~3.0	Off	
	11Gn	Ground fault (Residual current)	Off/30~100%	Off	✓
	12Gt	Ground fault operation time	0.05~3.0sec	3.0	
	13Gr	Selective ground fault(SGR) current setting	Off/0.03/0.05/0.1~3.0	Off	
	14GU	Selective ground fault(SGR) voltage setting	8~80V	80	
	15GrA	Selective ground fault(SGR) reference angle setting	0~90 angular measure	0	
	16Gt	Selective ground fault(SGR) operating time	0.05~3.0sec.	3.0	
	17Gd	Ground fault Time-delay(Ground fault, SGR)	0~200sec	60	
	18IC	Instantaneous protection	Off/500~5000% <small>Note 3</small>	Off	
	19AL	Output contact method	l-tp, ALo, U-C, OrH, Atp <small>Note 4</small>	l-tp	
	20Ar	Current Y / N, Alarm	On/60~110%	On	
	21o9	Ground fault Overvoltage	Off/8~80V	Off	
	22ot	Operating time	0.05~3.0sec	3.0	
23r4	Relay output selection	u-AL, Atp	u-AL		
24th	THD (voltage)	0~100%	Unit : %		

Note) 1. If CHEC set value of reverse phase is selected, wiring information additionally appears.

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. l-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 l-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	Contacteur check	Off/On	Off
	5S-d	Date <sup>note 1)</sup>	2013~2100y / 1~12 (Mon), 1~31 (Day) / 0~23h, 0~59m	2014 01.01. 0:00
	6CCC	Contacteur counter <sup>note 2)</sup>	-	-
	7FLt	Fault cause check <sup>note 3)</sup>	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 <sup>note 4)</sup>	OFF / 1~20m	Off
	9r-n	Automatic reset number Set number of times	Off/1-5	Off
	10Ad	Communication address <sup>note 5)</sup>	1~247	247
	11bs	Communication speed <sup>note 5)</sup>	9.6/19.2/38.4/57.6	9.6
	12SP	Swap <sup>note 5)</sup>	On/Off	Off
	13Pr	Parity setting <sup>note 5)</sup>	nonE/odd/EUEn	nonE
	14td	20mA setting <sup>note 5)</sup>	0.5~10/5~100	10/100
	rSt	Stored data deletion	All : for all subparameters trt : total running time CCC : contacteur 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.

# Operation & setting method

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## 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.

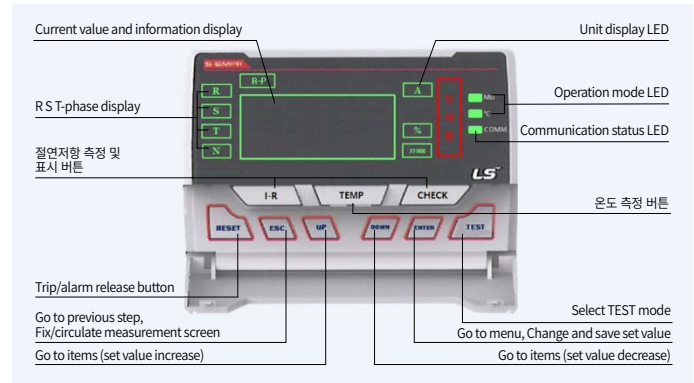
Verify that Power LED is switched on and the measurement screen is displayed.

- 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 reversal 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 "E E E E" 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-IR-10/100)

### A-group

Group	Menu	Description	Setting range	Default
A	1P/3P	Single-phase / 3-phase	1P/3P	3P
	25-F	Frequency	60	60
	3CH	Characteristics (Over Current Protection)	Off/dEF/th/n-th <small>Note 1)</small>	n-th
	40-t	Operating time	1~60sec (5/10/20/30/60)	60
	5d-t	Time Delay	1~200sec	200
	6r-c	Rated current (10, 100)	0.5~10/5~100	10
	7CTr	CT ratio	0.25/0.5/1~200 <small>Note 2)</small>	1
	8.1-r	Insulation resistance	n-c/Off/1/5/10/20MΩ	Off
	9tEP	Temperature	n-c/Off/50~150°C (1°C Step)	Off
	tCAL	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	1LoC	LOCK	Off/200~800%	Off	
	2StL	STALL	Off/150%~500%	Off	
	3P-F	Phase loss (current)	On/Off	On	
	4P-U	Phase unbalance (current)	Off/30~70%	Off	✓
	5PdL	Phase loss / unbalance Time-delay	0~200sec	0	✓
	6r-P	Phase reversal (current)	Off/On/CHEC <small>Note 1)</small>	Off	✓
	7CrL	Phase reversal operation time	0.1~1.0sec	0.1	✓
	8U-C	Undercurrent	Off/30~90%	Off	✓
	9EcL	ZCT selection (PC mV, 1.5mA)	100/1.5 <small>Note 2)</small>	Enbd	
	10GF	Ground fault (Zero-phase)	Off/0.03/0.05/0.1~3.0	Off	
	11Gn	Ground fault (Residual current)	Off/30~100%	Off	
	12Gt	Ground fault operation time	0.05~3.0sec	3.0	✓
	13Gd	Ground fault Time-delay	0~200초	60	
	14IC	Instantaneous protection	Off/10A type: ~100A, 100A type: ~800A, 100A or more: using external CT <small>Note 3)</small>	Off	
	15AL	Output contact method	I-tp, I-AL, Alo, U-C, OrH, tEP, Ir, IrTE <small>Note 4)</small>	I-세	Refer to contact output information
	16Ar	Current Y / N, Alarm	On/60~110%	On	Refer to contact output information
	17tH	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
lr	Detection of insulation resistance below set value	Maintain status	NC
lrtE	In case of irregularity with temperature or insulation resistance	Maintain status	NC
<b>16.Ar setting</b>	In case Alo is set at item 15	Motor operation	07-08
On	Output of current carrying (>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	
	3sr-t	Setting of operating hour	Off/10~8760	Off
	4S-d	Date setting <sup>Note1)</sup>	2019~2100	2019
			1~12Month, 1~31f day	01.01.
			0~23hr, 0~59min	0:00
	5FLt	Checking reason of failure	-	-
	6Ar-r	Automatic recovery <sup>Note2)</sup>	Off/1~20min	Off
	7r-n	Restriction of restart	Off/1~5	Off
	8Ad	Communication address	1~247	247
	9bS	Communication speed	9.6/19.2/38.4K/57.6K	9.6K
	10SP	Swap or not	On/Off	Off
	11Pr	Parity setting	nonE/odd/EUEn	nonE
12td	Setting of 20mA	0.5~10/5~100	10/100	
rSt	Deleting stored data <sup>Note3)</sup>	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 (5S-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.

# Operation & setting method

## 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.

## 7. How to check the output contact according to the conditions.

If the product is powered off, the contact output changes to 3a and 2a1b when the power is turned on. Contact 07-08 is an alarm contact and is output according to the menu setting. If you press the Test Key, you can check for all output abnormalities.

Output Conditions	Output Contact Type		
	95-96	97-98	07-08
Normal Operation (Power OFF)	OPEN	OPEN	OPEN
Normal Operation (Power ON)	CLOSE	OPEN	OPEN
TEST	OPEN	CLOSE	CLOSE
Reset(Test Mode)	CLOSE	OPEN	OPEN
TRIP	OPEN	CLOSE	According to Alarm Setting
Reset(Trip Mode)	CLOSE	OPEN	According to Alarm Setting

## 8. How to check the Insulation resistance.

- 1) Mode entry display method depending on the presence or absence of current.
  - ① If there is a current, measurement is not possible, and it is marked as "McOn". At this time, press Enter Key to enter normal mode.
  - ② If there is no current, enter the insulation resistance inspection mode and start measuring the insulation resistance value.  
Note) n-c is set in the menu, entry is impossible.
- 2) How to enter the insulation resistance test mode.
  - ① Press the "Check" button on the display and press the "I-R" button for 3 seconds to enter the inspection mode. (Press the I-R button to display the measured insulation resistance value)
  - ② "60" is displayed on the display and measurement is performed for 60 seconds.
  - ③ Cancellation during measurement will be canceled if you press Esc Key.

3) Insulation resistance measurement result.

- ① If the insulation resistance measurement value is more than 50 MΩ, mark it as "PASS".
- ② If the insulation resistance measurement value is less than 0.2 MΩ, mark it as "FAIL". - When the insulation resistance level is set, Alarm Relay (07-08 contact) is output. (When setting alarm output)
- ③ When measuring 0.2MΩ to 50MΩ, the insulation resistance measurement value is numerically flicking on the display. - The insulation resistance measurement value, which is more than the insulation resistance level value, is flicking on the display in numbers, and when you press Enter KEY, it enters the normal mode. - If the insulation resistance level value is less than or equal to the value, mark "ulr" and alarm relay (07-08 contact point) is output (when setting alarm output)
- 4) Indication of insulation resistance value.
  - ① Pressing the "I-R" button displays the measured insulation resistance value. If set to n-c, mark it as "n-c", and if there is no previous measurement, mark it as "—".
  - ② When the "I-R" button is pressed again, it is displayed in the previous normal mode. If you don't press the "I-R" button, it automatically enters the previous normal mode after 2 minutes.

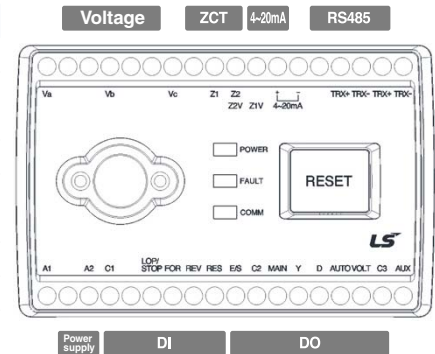
## Fault cause information

	Screen	Fault cause	Additional information	
Current		Overcurrent	phase, load rate, time	Setting time Operation
		Lock	phase, load rate, time	0.5s Operation
		Stall	phase, load rate, time	3.0s Operation
		Phasee loss	phase, unbalance rate, time	0.5s Operation
		Phasee unbalance	phase, unbalance rate, time	2.0s Operation
		Phase reversal	time	Setting time Operation
		Undercurrent	phase, load rate, time	3.0s Operation
		Instantaneous	phase, load rate, time	Operation Within 50ms(60HZ) or 60ms(50HZ)
		Ground fault (ZCT)	phase and neutral, time	Setting time Operation
		Ground fault (Residual)	phase and neutral, time	Setting time Operation
Voltage		Overvoltage	phase, rate, time	Setting time Operation
		Undervoltage	phase, rate, time	
		Phasee loss	phase, unbalance rate, time	0.5s Operation
		Phasee unbalance	phase, unbalance rate, time	2.0s Operation
		Phase reversal	time	Setting time Operation
Voltage		Overpower	phase voltage, rate, time	Setting time Operation
		Underpower	phase voltage, rate, time	Setting time Operation
		Over power factor	phase voltage, rate, time	Setting time Operation
		Under power factor	phase voltage, rate, time	Setting time Operation
Others		External input trip	time	
		Error.1 occured	Current detected after motor off	
		Error.2 occured	No current detected after motor on	
		Error.3 occured	For / Rev starting signal input at the same time in local / auto mode	
		Error.4 occured	External storage memory error	
		Running hour over	Alarm occurs when accumulated running hour is over the setting value	
		Temperature over the set degree		
		In case insulation resistance below set value is measured		
		In case measurement of insulation resistance is attempted during operation		
		Display comm. error	Comm. error occur between display unit and device. ※ Please contact us.	
Ex)		Version check	Press Reset+Esc keys in normal state	

# Terminal configuration / Wiring & cable connection

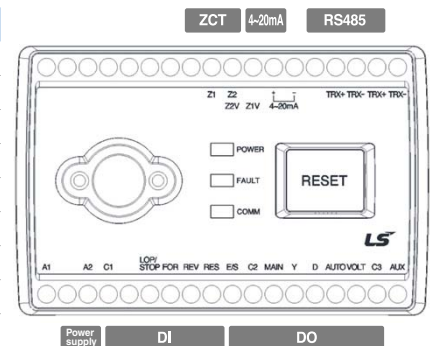
## Terminal configuration(S-EMPR MMP-P\*)

Terminals	Description	Remarks
Va, Vb, Vc	Voltage input	Current model Blank
Z1, Z2	ZCT input	Universal (Z1, Z2 : 1.5mA) Z2V, Z1V Dedicated (Z2V, Z1V : 100mV)
Z2V, Z1V		
4~20mA (+), (-)	4~20mA output	-
TRX1+, TRX1- TRX2+, TRX2-	RS485 communication	Modbus(1 channel)
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



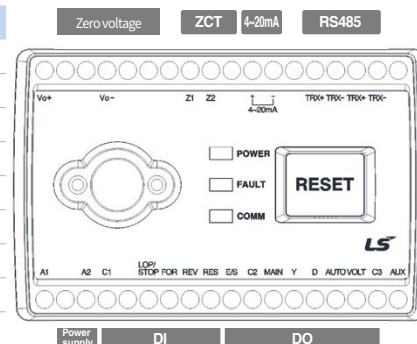
## Terminal configuration (S-EMPR MMP-C\*)

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
Y	Motor On output	If forward/backward starting, forward rotation output
	Y-Delta starting: Y contact point output	-
	Inverter starting: Inverter contact point output	-
	Full voltage starting: No use	-
D	Forward/backward starting: No use	-
	Reactor starting: No use	-
	Y-Delta starting: Delta contact point output	-
	Forward/backward starting: reverse rotation contact point output	-
Auto	Reactor starting: Reactor (R) contact point output	-
	Inverter starting: Bypass contact point output	-
	Full voltage starting: No use	-
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-S\*)

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 starting, forward rotation output
Y	Y-Delta starting: Y contact point output	-
	Inverter starting: Inverter contact point output	-
	Full voltage starting: No use	-
	Forward/backward starting: No use	-
	Reactor starting: No use	-
D	Y-Delta starting: Delta contact point output	-
	Forward/backward starting: 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

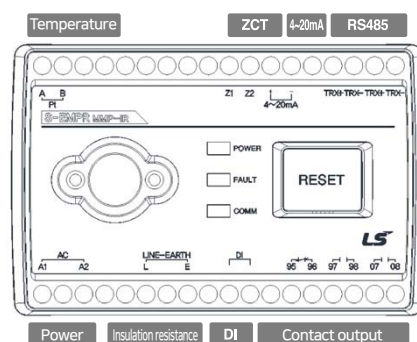
1. It is required to have grounding connection with all equipment.
2. It is required to minimize wiring as most as possible.
3. After a shield-type cable is applied, it is required to ground the shield.

### \*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 energized in order for an input to make possible through an auxiliary contact point when a circuit is designed.

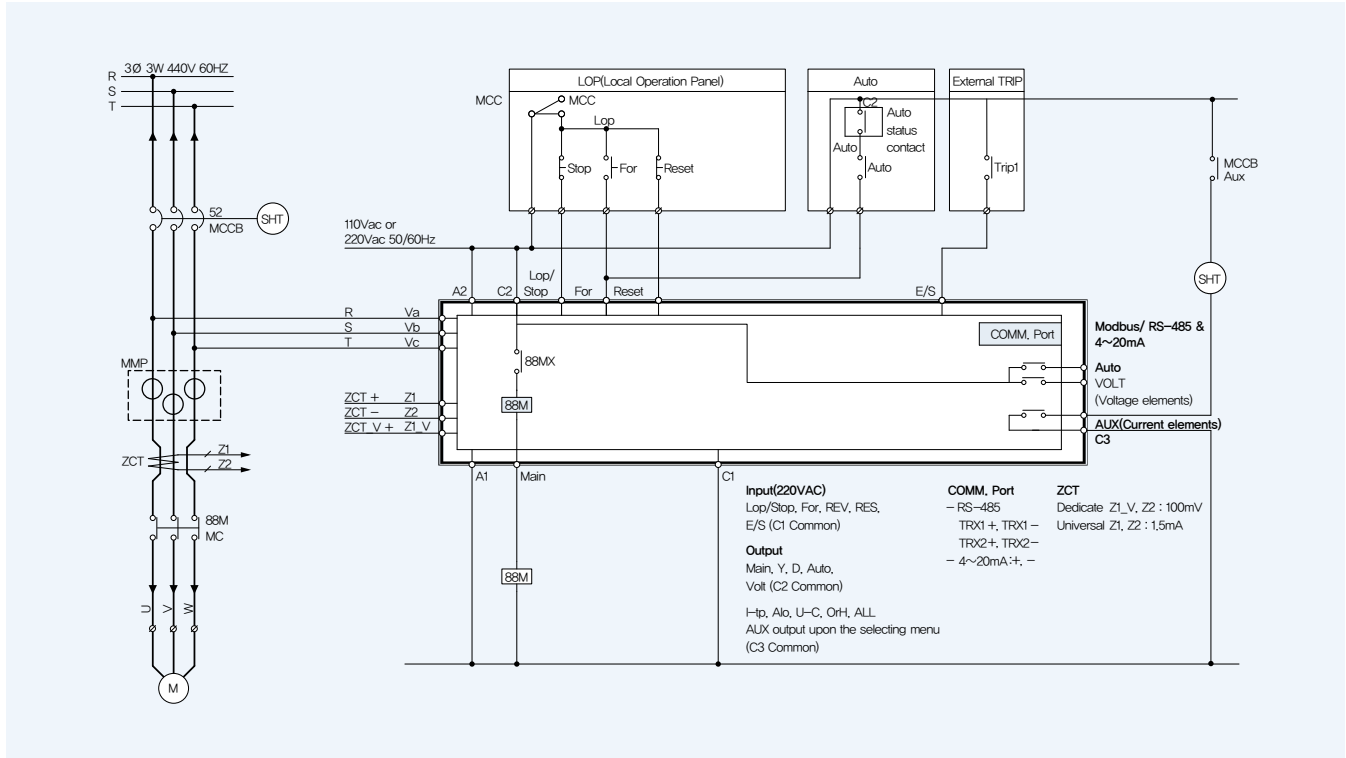
### Terminal configuration (S-EMPR MMP-IR)

Terminals	Description	Remarks
A1, A2	Operating power input terminal	110Vac or 220Vac 60Hz
L, E	Terminal for insulation resistance measurement	Lop/Stop, For, Rev, Res, E/S contact point
DI	M/C status input terminal	110Vac or 220Vac 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	



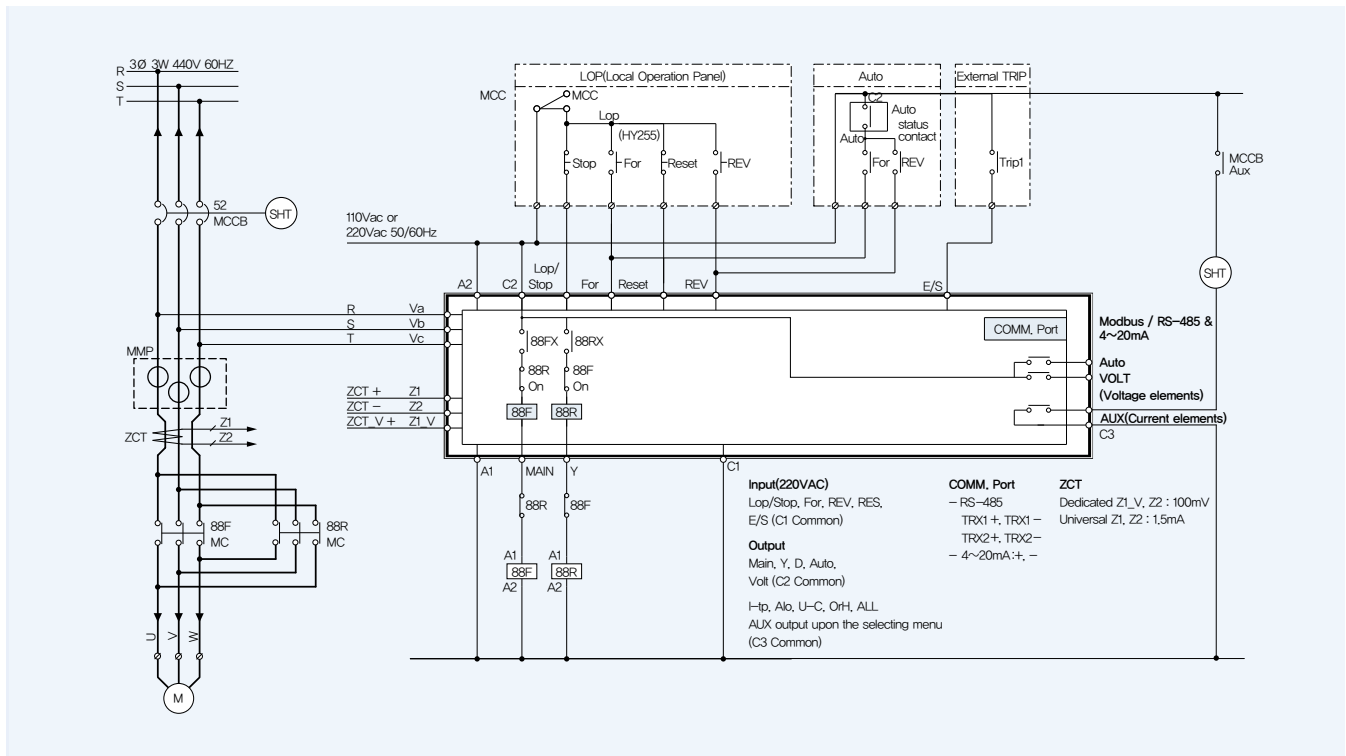
# Terminal configuration / Wiring & cable connection

## Full voltage start

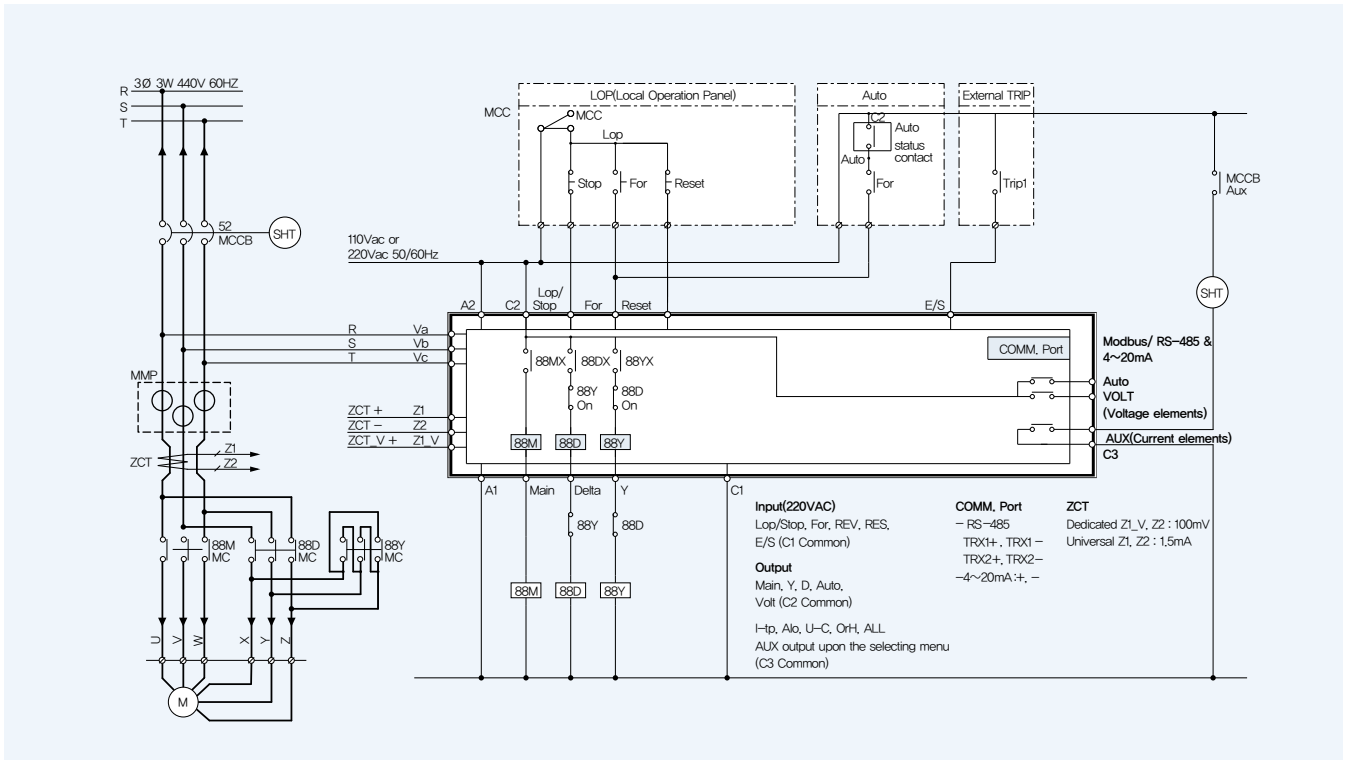


Note) In case of distance operation (LOP / AUTO), if a wiring distance is too long, induced voltage can cause malfunction. Therefore, bear in mind this point at the time of designing a panel.

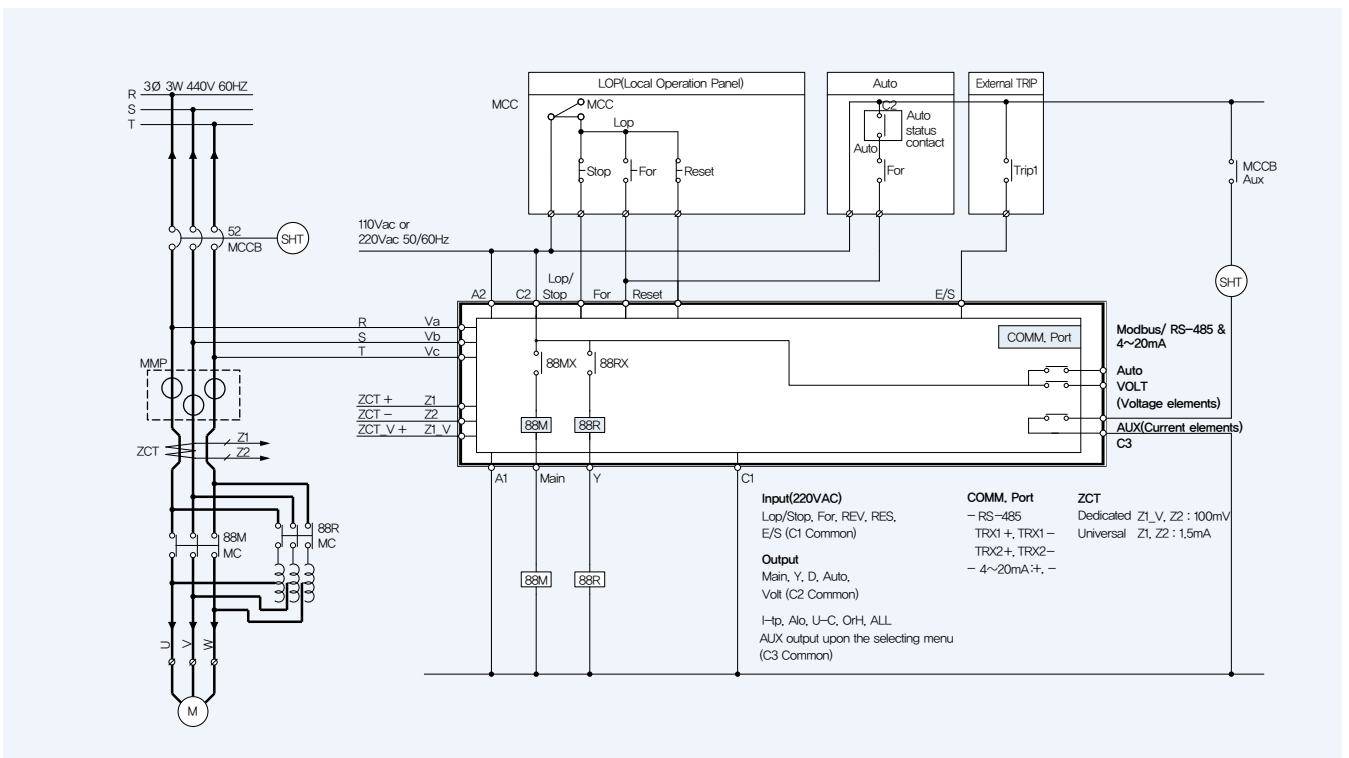
## Reversible operation



### Y-D start

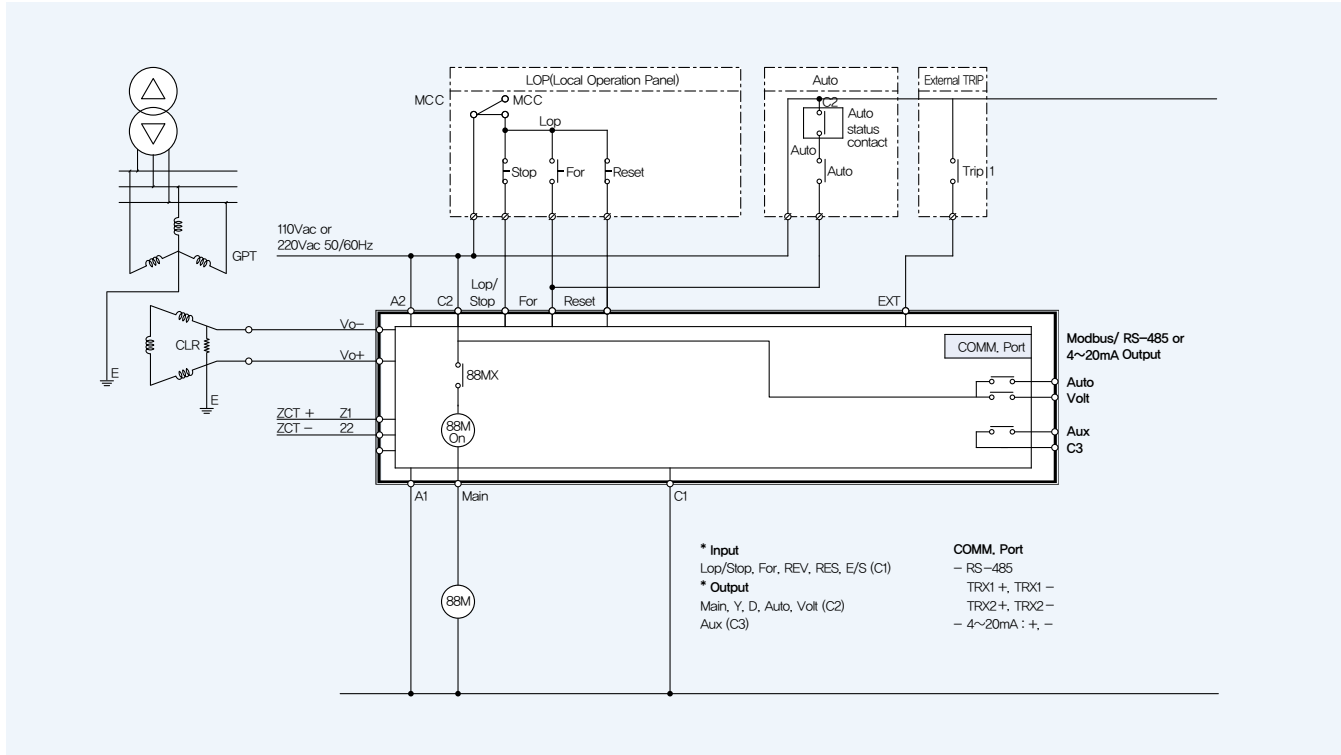


### Reactor start

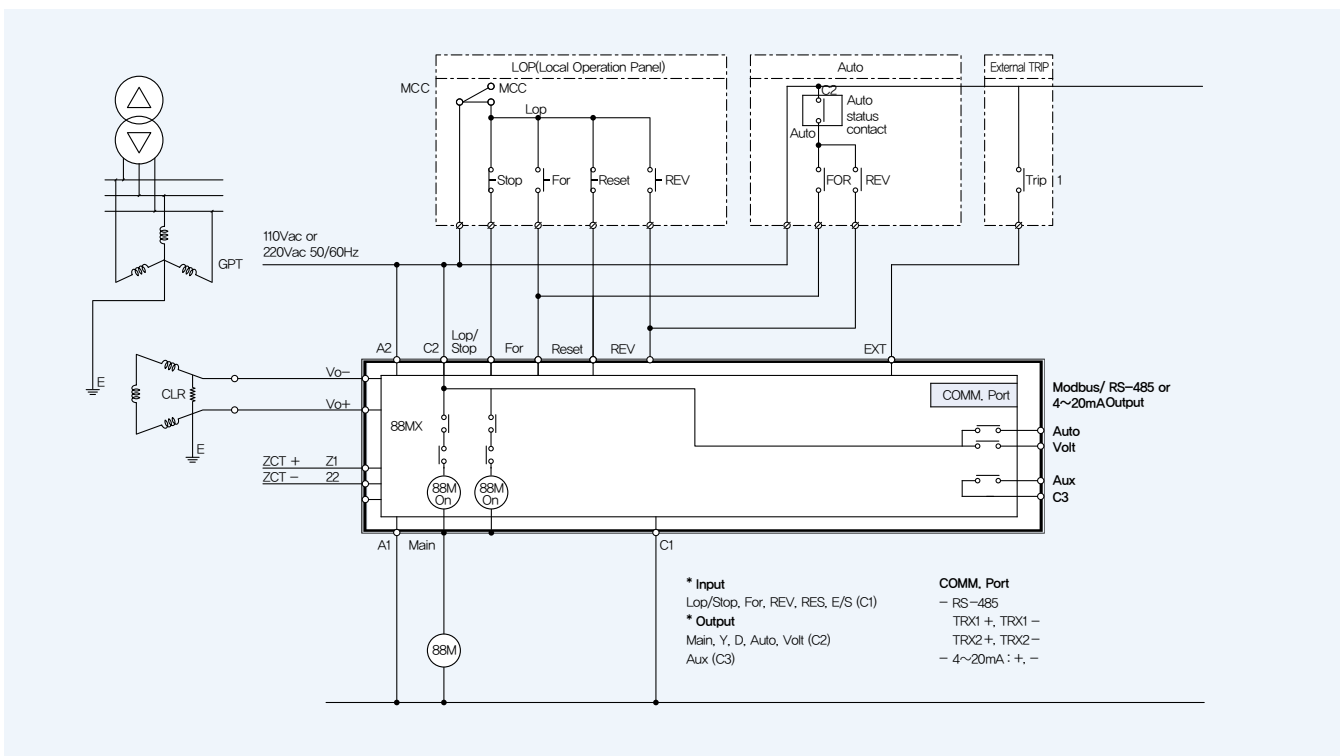


# Terminal configuration / Wiring & cable connection

## Irreversible full voltage starting

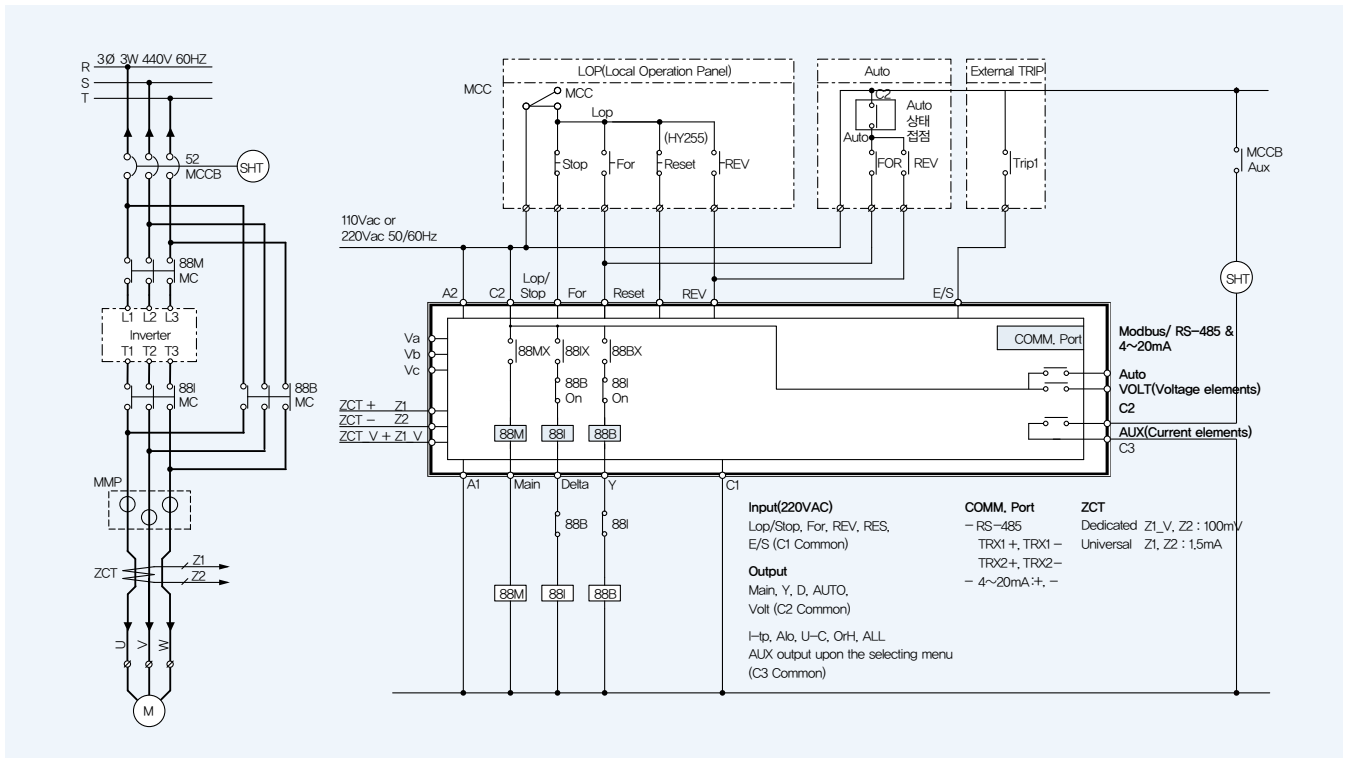


## Reversible full voltage starting

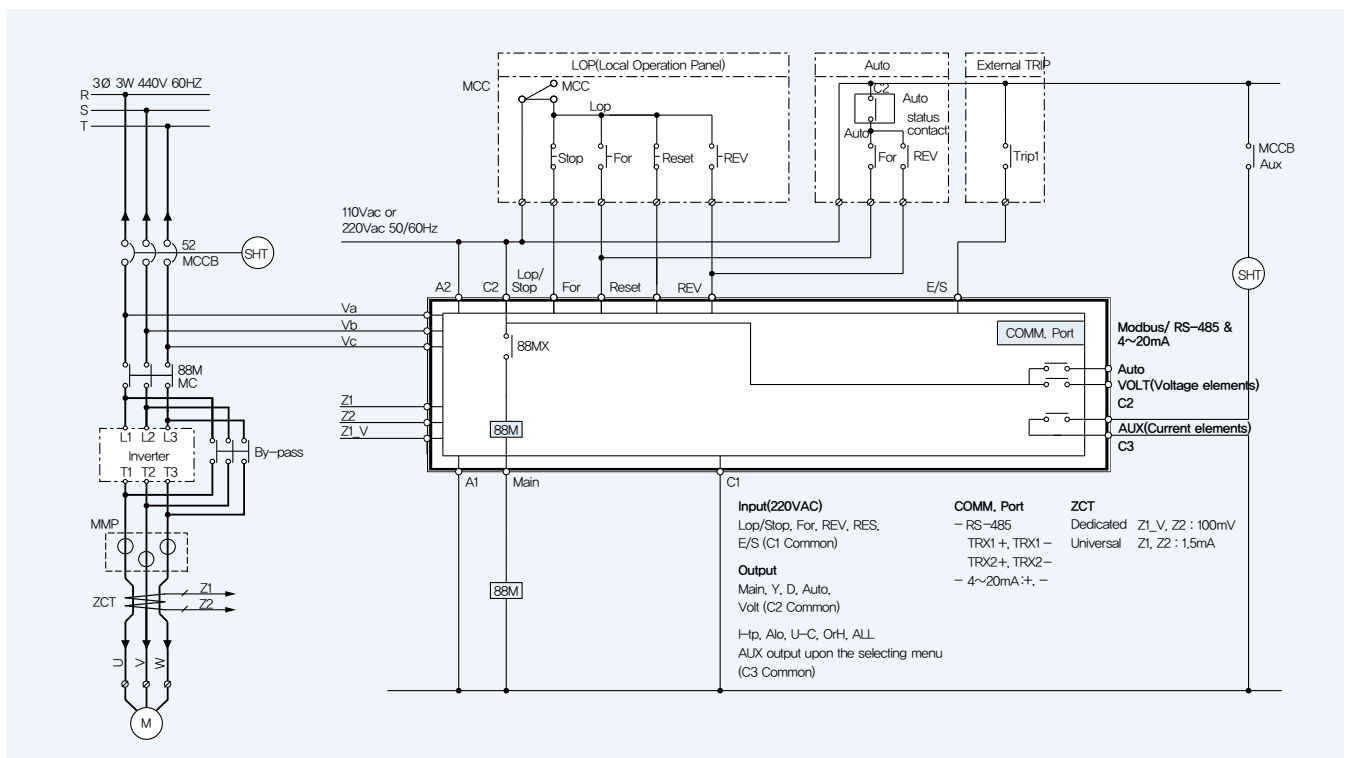




### Inverter start (Current)

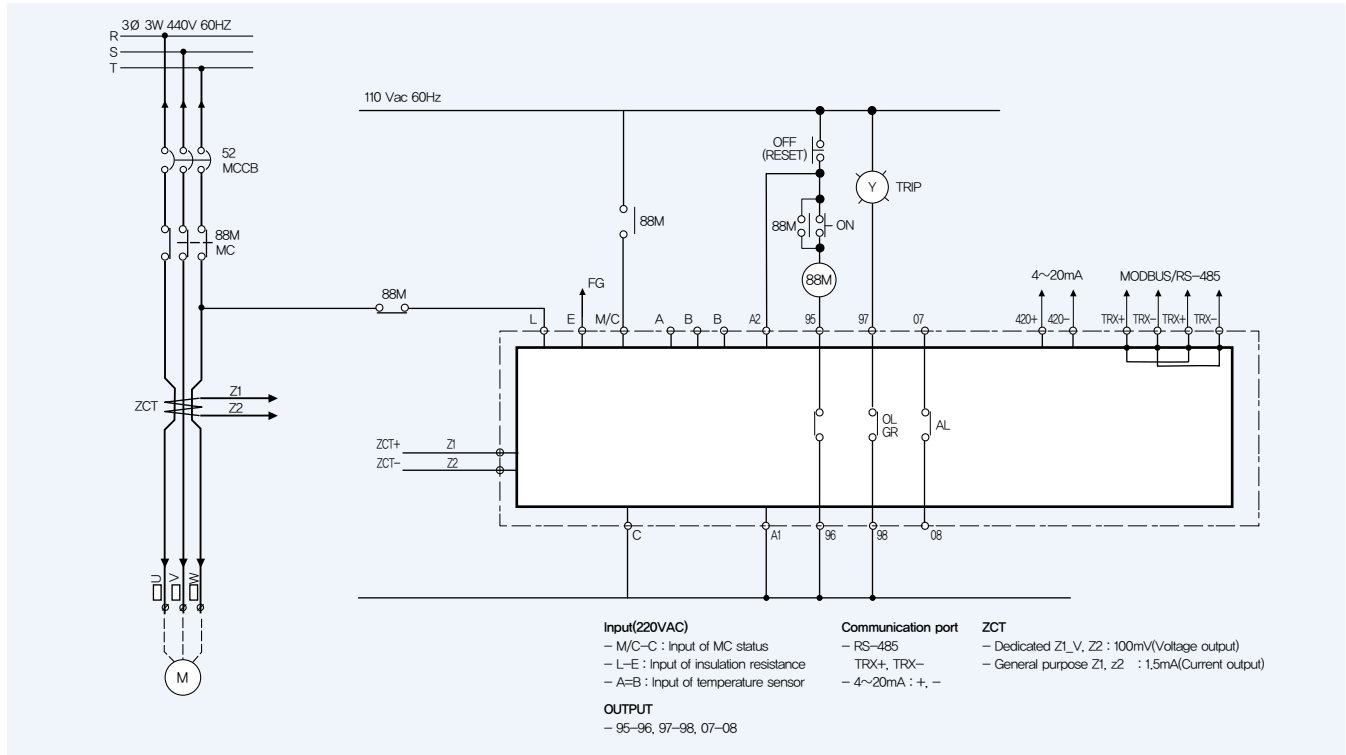


### Soft starter start



# Terminal configuration / Wiring & cable connection

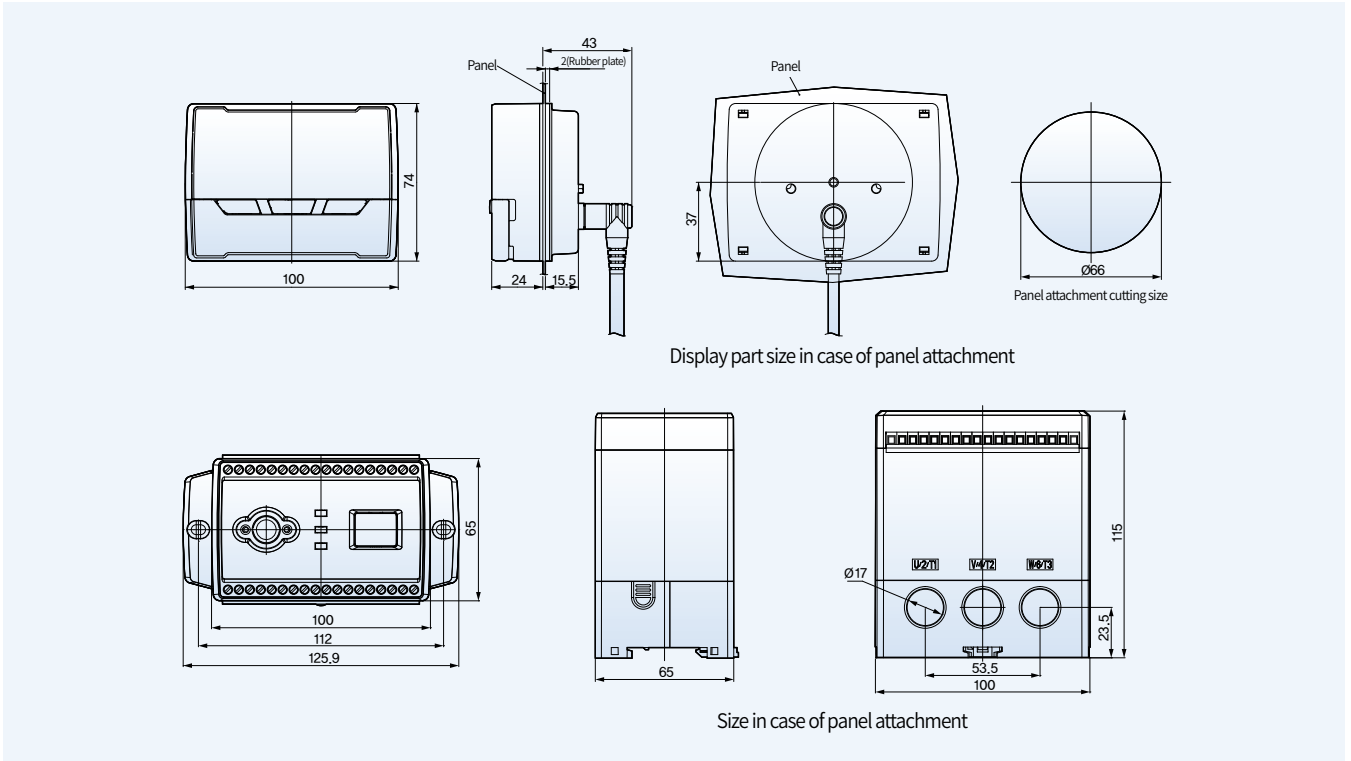
## MMP-IR TYPE

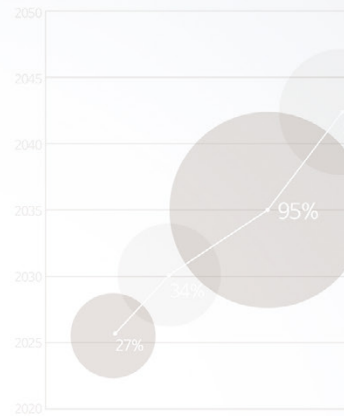


Note) IR model does not support start mode.

## Dimensions

Unit: mm





*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





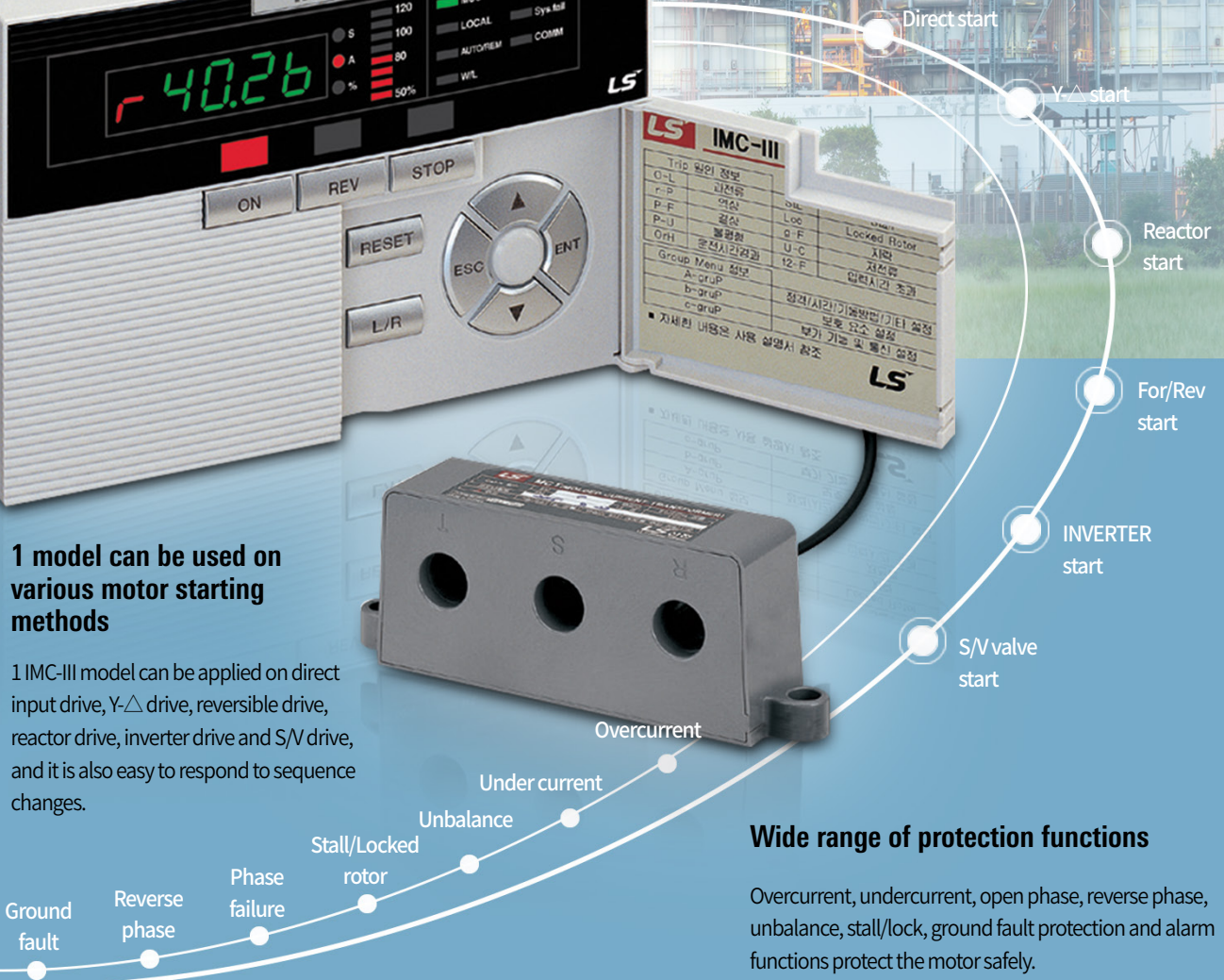
# IMC-III

Intelligent Motor Controller



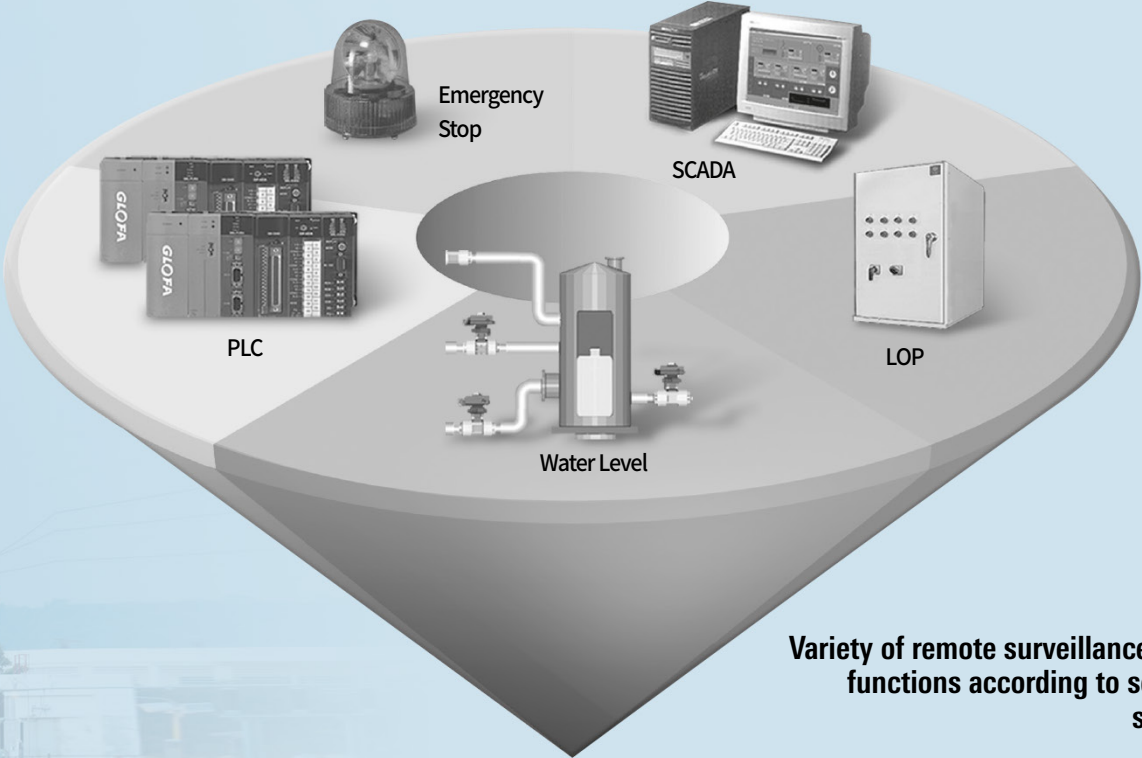
## 1 model can be used on various motor starting methods

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



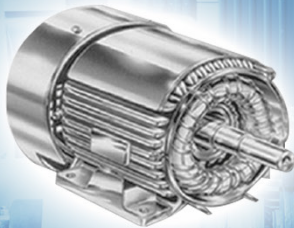
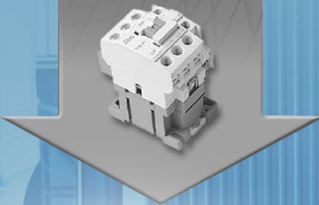
## Wide range of protection functions

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.

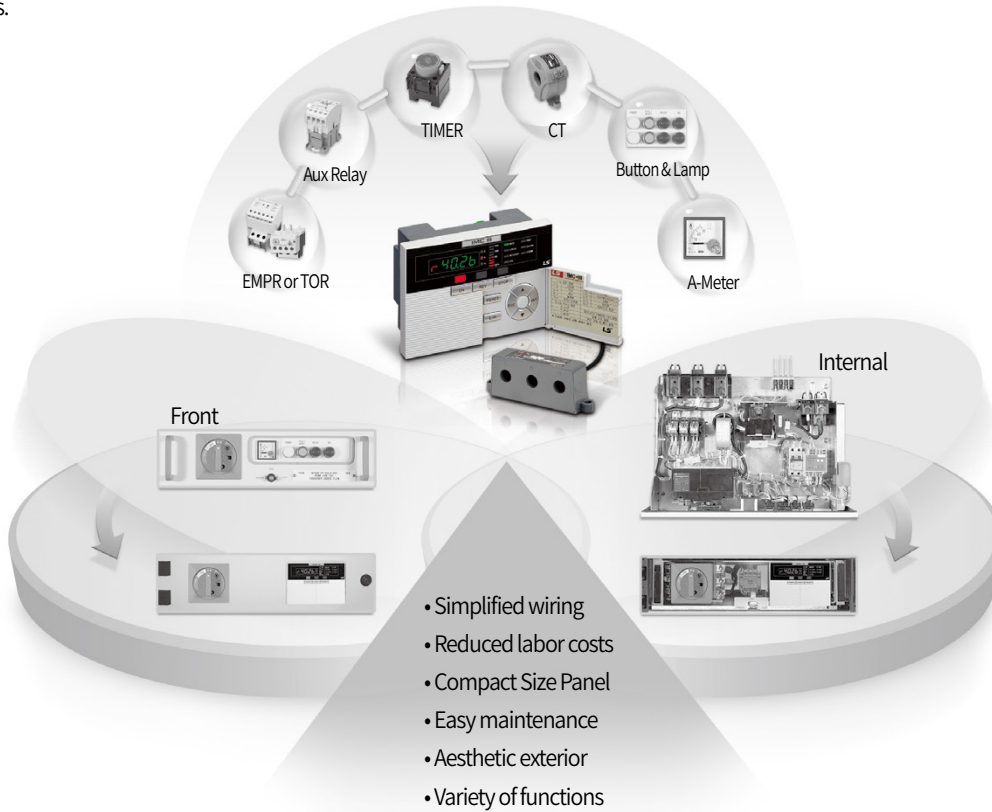




# Product characteristics

## 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

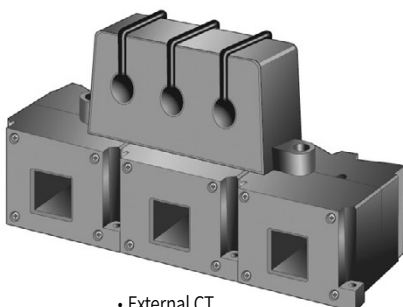
Due to the outstanding current detection capabilities according to frequency change, the system can be used on secondary circuits of inverters. The operable frequency range is 20~200Hz, and for details of other specifications, please contact the manufacturer.

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.

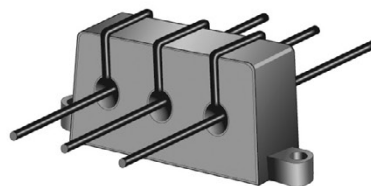
If the start frequency is 20Hz, the system may malfunction.

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

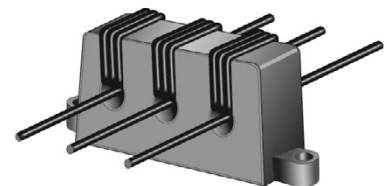
Adjust the Dip S/W to modify the current adjustment range from 0.5-6A to 5-60A, and depending on the MCT wire penetration count, the current can be adjusted up to 0.125A. If a separate external CT is used, it can be adjusted up to 1000A.



• 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)



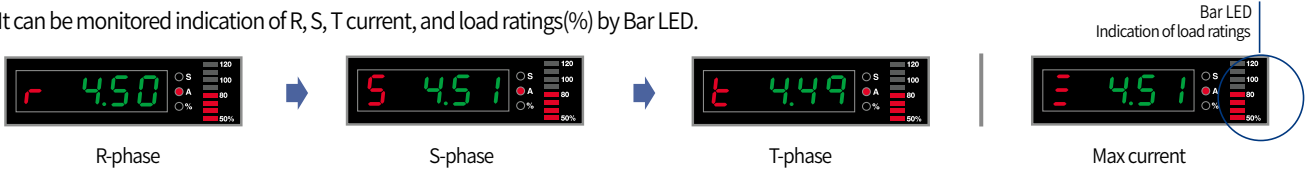
Ex) Incase of restarting delayed time 30S

**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

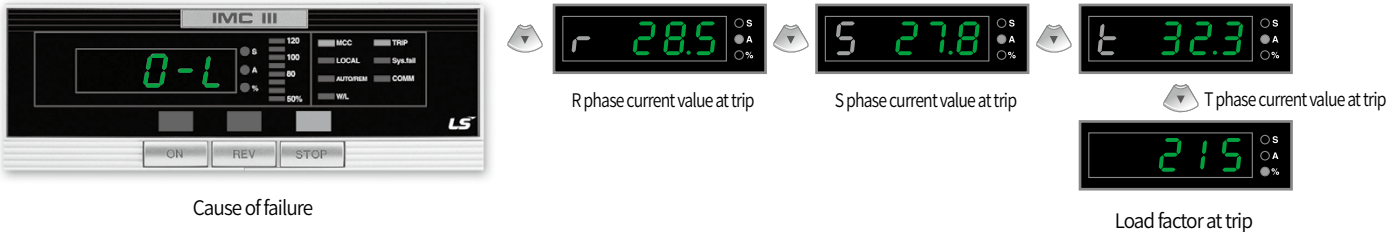
It can be monitored indication of R, S, T current, and load ratings(%) by Bar LED.



### 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.



### 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 = $\frac{\text{Maximum Phase Current} - \text{Minimum Phase Current}}{\text{Maximum Phase Current}} \times 100(\%)$	
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
		OFF Delay Timer	
	Flow Switch (F-S)	ON Delay Timer (T3)	0 ~ 300sec/1sec
		OFF Delay Timer (T1)	
Compare 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

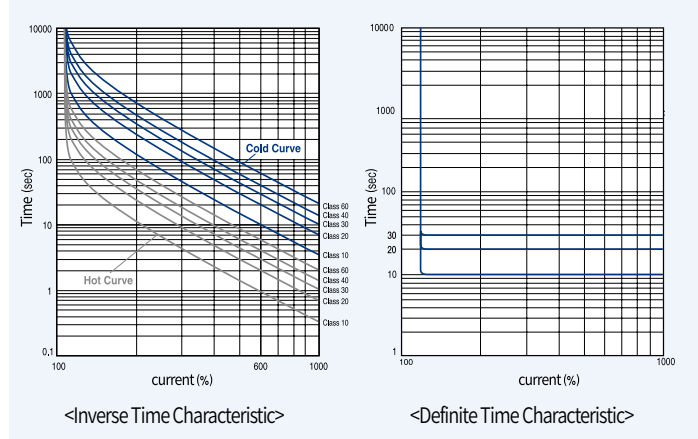
## Communication function

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 I<sup>2</sup>t 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.

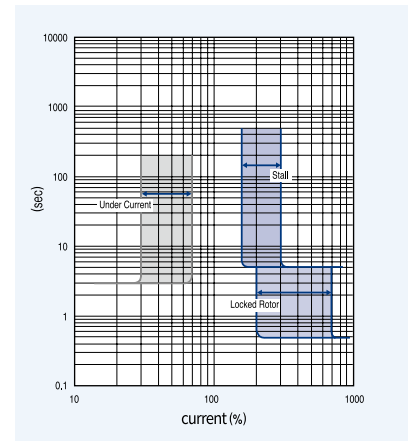


- **Stall/Locked rotor protection (Stall/Locked Rotor-48/51LR)**

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.

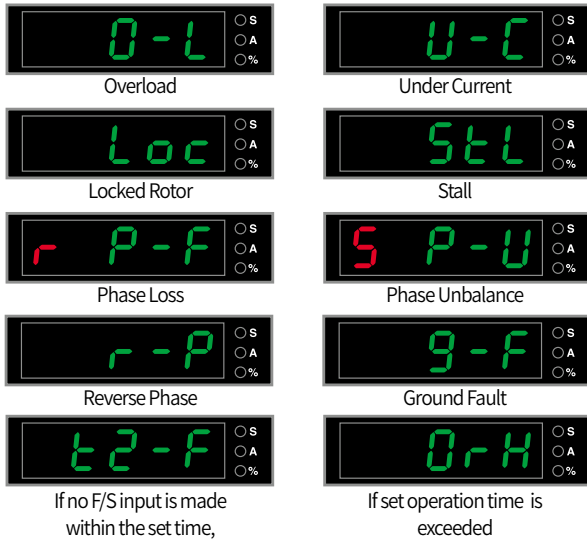
- **Ground Fault protection (Ground Fault - 51G)**

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.

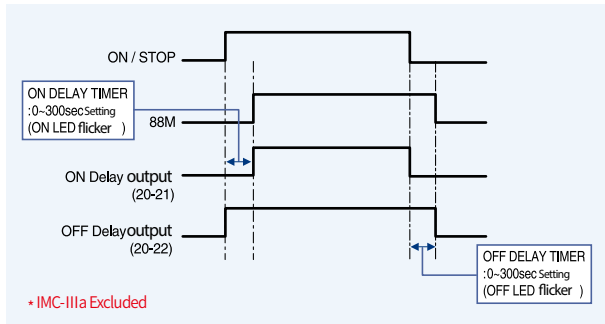
# Product characteristics

## 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.

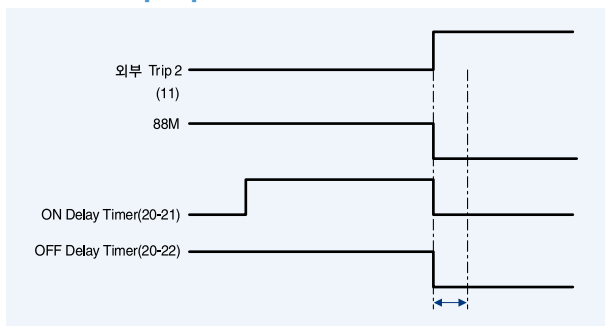


## Time Delay (t-d) Mode



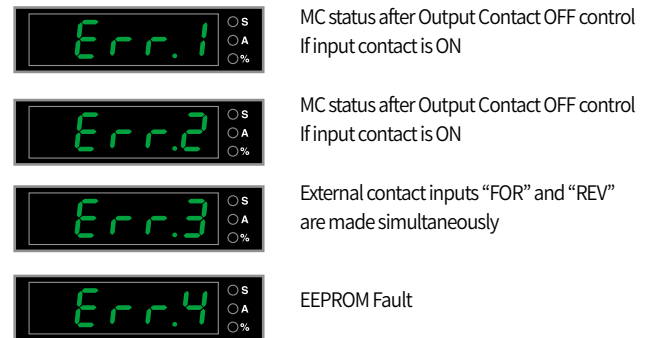
- 1) Once ON Delay Time passes after ON control, 88M turns On and the motor starts.
- 2) Once OFF Delay Time passes after OFF control. 88M turns OFF and the motor stops.

## External Trip Input

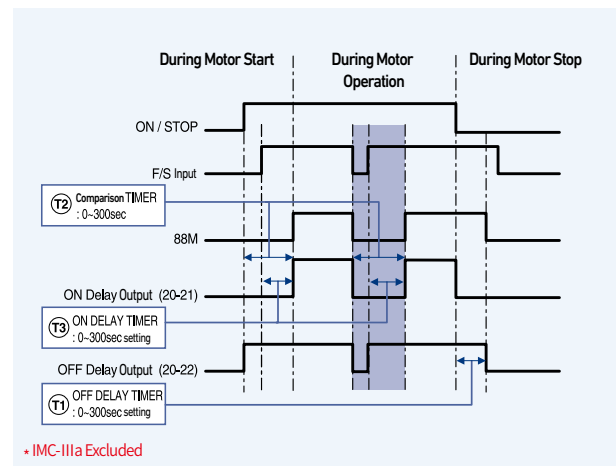


\*External TRIP 1 (Terminal 10) is designed to suit FO/FC vale operation.  
 \*External TRIP 2 (Terminal 11) executes trip and displays "Etrp" on the screen after receiving a signal.  
 (Remove external TRIP 2 signal, reset to release, and resume normal operation)

## Self-diagnostic function



## 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.

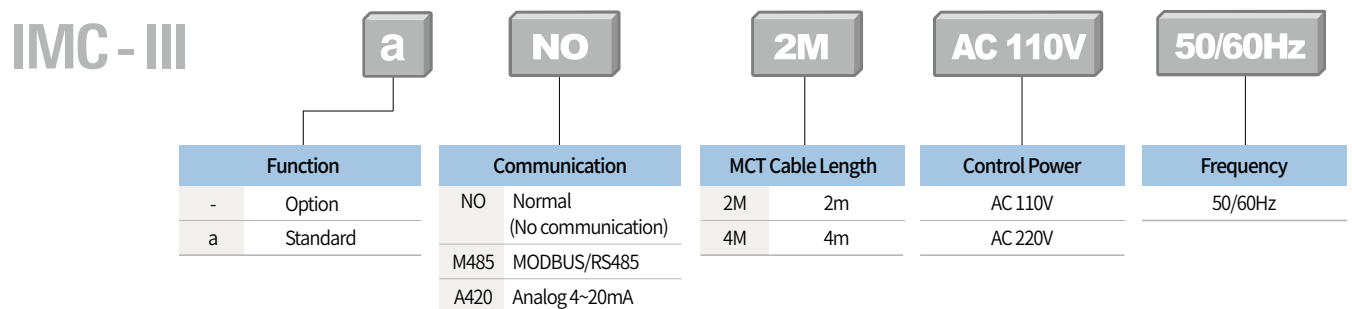
# Rated specifications & model numbering system

IMC-III

## Rated specifications

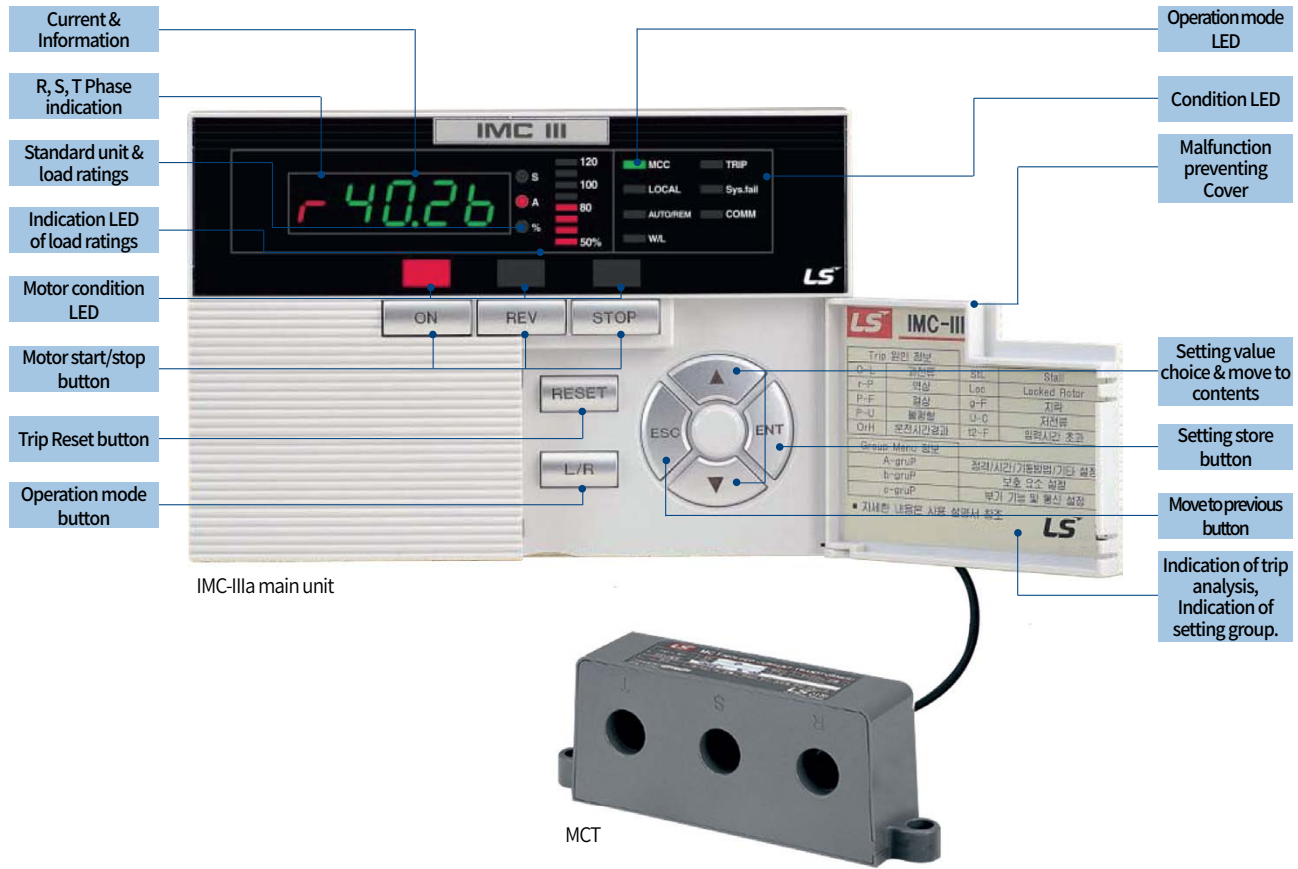
Type		IMC-III(a)		
Operating time		Inverse time / Definite time		
Current		0.125~60A (Within 1 model)		
Indication		4 digit, 7-Segment		
Control power		AC 110/220V (50/60Hz)		
Return method	Auto	1~20min		
	Manual	Return immediately		
Installation		Panel purchase installation		
Tolerance	Current	±5%		
	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

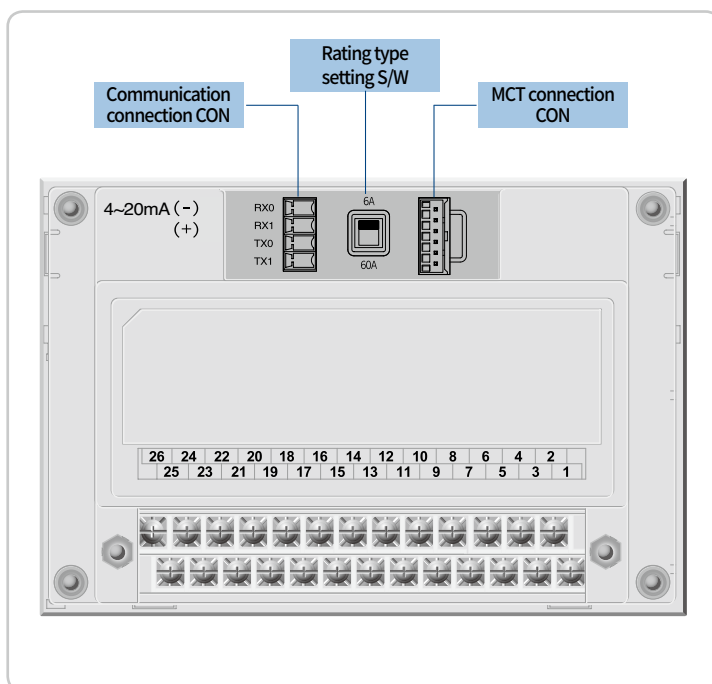


# Operation & setting method

## Display configuration



## Rear view



## Setting method

- ① The first stage will be indicated maximum current in normal 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.CHR	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/lut	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.G-F	OFF/On	OFF	OFF setting in case of inverter start
	8	Ground fault operation current	b.8.G-C	0.1, 0.2, 0.5, 1.0, 1.5, 2.0, 2.5 (A)	0.1	7. Indication by ground fault protection selection
	9	Ground fault operation time	b.9.G-t	0.05, 0.1 ~ 1.0/0.1s	0.05	
	10	Ground fault delay	b.10.Gd	OFF/On	OFF	
C. grp Additional function	1	I/O state information	C.1.1-0	4-segment		Notify the manual
	2	Total operation time	C.2.t-r-t	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.S-r-t	OFF, 10 ~ 8760/10 (H)	OFF	After reached setting operation time, indicating "OrH"
	5	Contact 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).

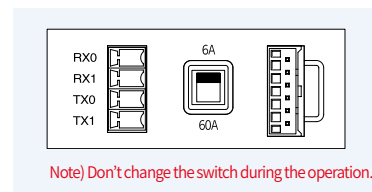


# Operation & setting method

## 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.



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.

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>• Load under 0.5A</li> <li>- Set the CT ratio 0.5 or 0.25 in the [6.ctr]</li> <li>- MCT cable penetration increase from 2 times to 4 times</li> <li>- Rated current setting range: 0.25 ~ 3A(2 times), 0.125 ~ 1.5A (4 times)</li> </ul> | <ul style="list-style-type: none"> <li>• Over 60A load</li> <li>- Usage of external CT</li> <li>- CT ratio (1 ~ 200) : Maximum 1000A</li> </ul> |
|---|---|

## Operating time setting

1) It can be set 1 ~ 60s in the A group in [2.0-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

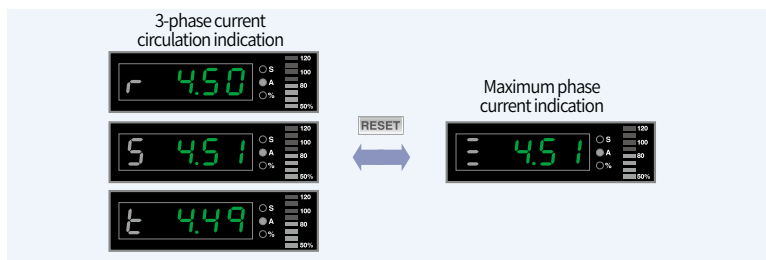
IMC-IIIa provides fault recording function even if power is OFF.

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.

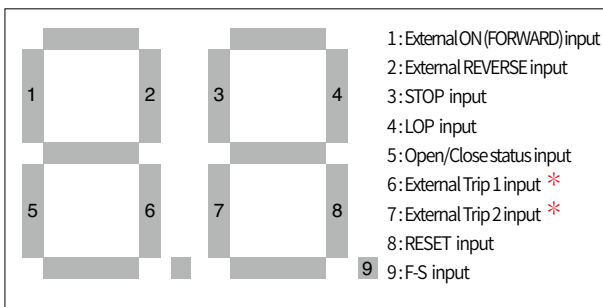


### Total operation time

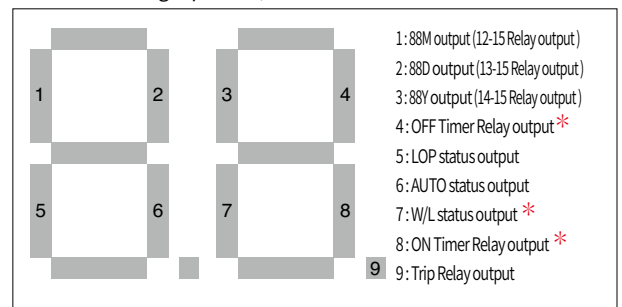
- Total operation time check: → → day → → Hour minute  
 ex) If total operation time is 50hours 50 minutes: → → 2 days → → 2.50(2 hours 50 minutes)
- Operation time → → Total operation time → → converse day → → Extra hour, minutes  
 ex) If operation time is 50 hours 50minutes: → → 5 0 hours → → 2days → → 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 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 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 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.

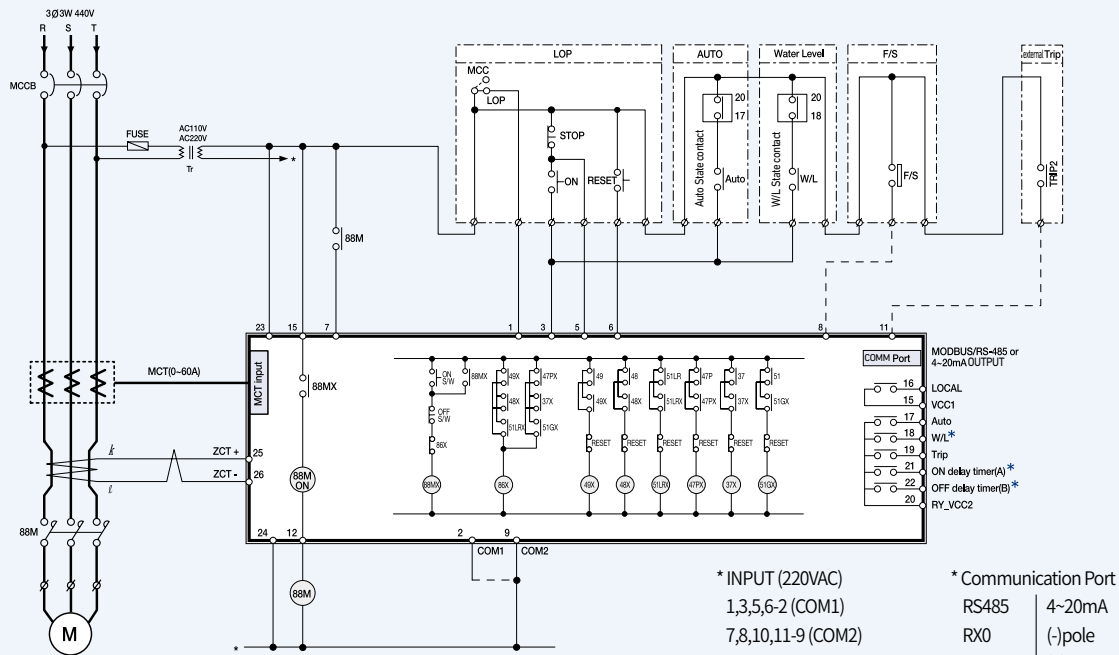
If the Auto / Remote LED blinks by operating the button of IMC-III, remote control by MODBUS / RS485 communication is possible, and data such as 3-phase current value, fault value, and various setting values can be checked.

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



\*IC-IIIa does not use input terminal 8 and output terminal 18, 21 and 22.

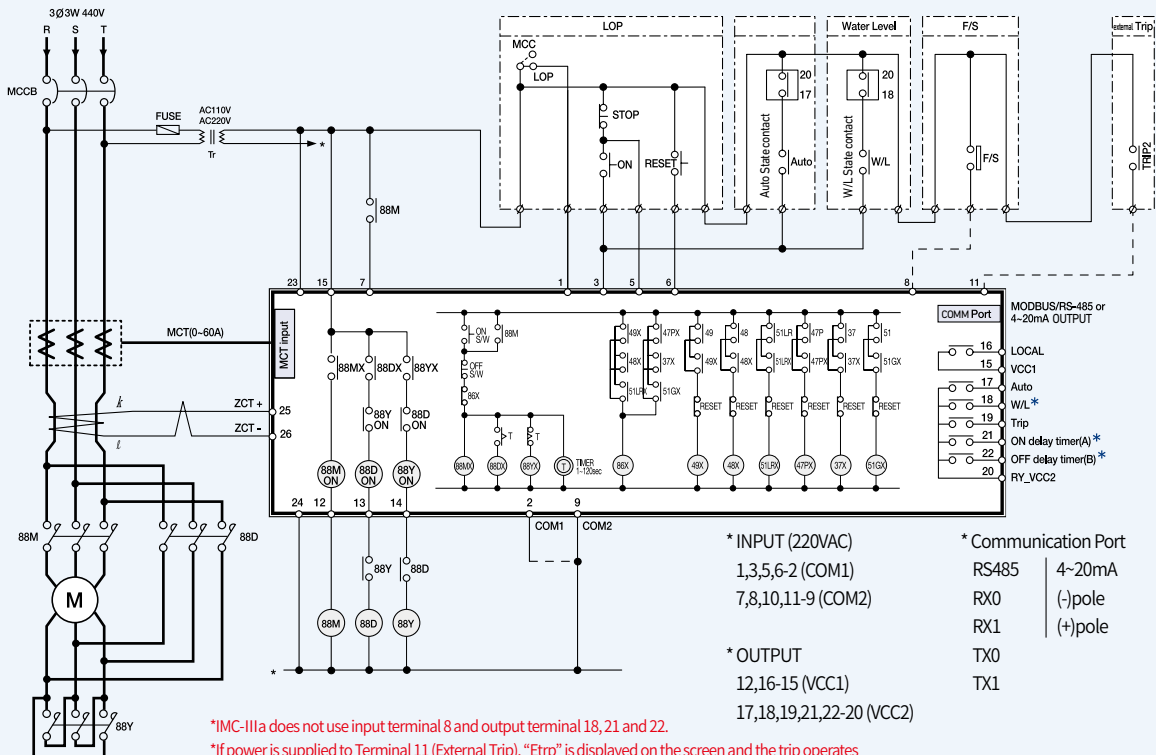
\*If power is supplied to Terminal 11 (External Trip), "Etrp" is displayed on the screen and the trip operates (remove power source that supplies to Terminal 11 (External Trip) and reset to restart)

\* 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

## Y-Δ start



\*IC-IIIa does not use input terminal 8 and output terminal 18, 21 and 22.

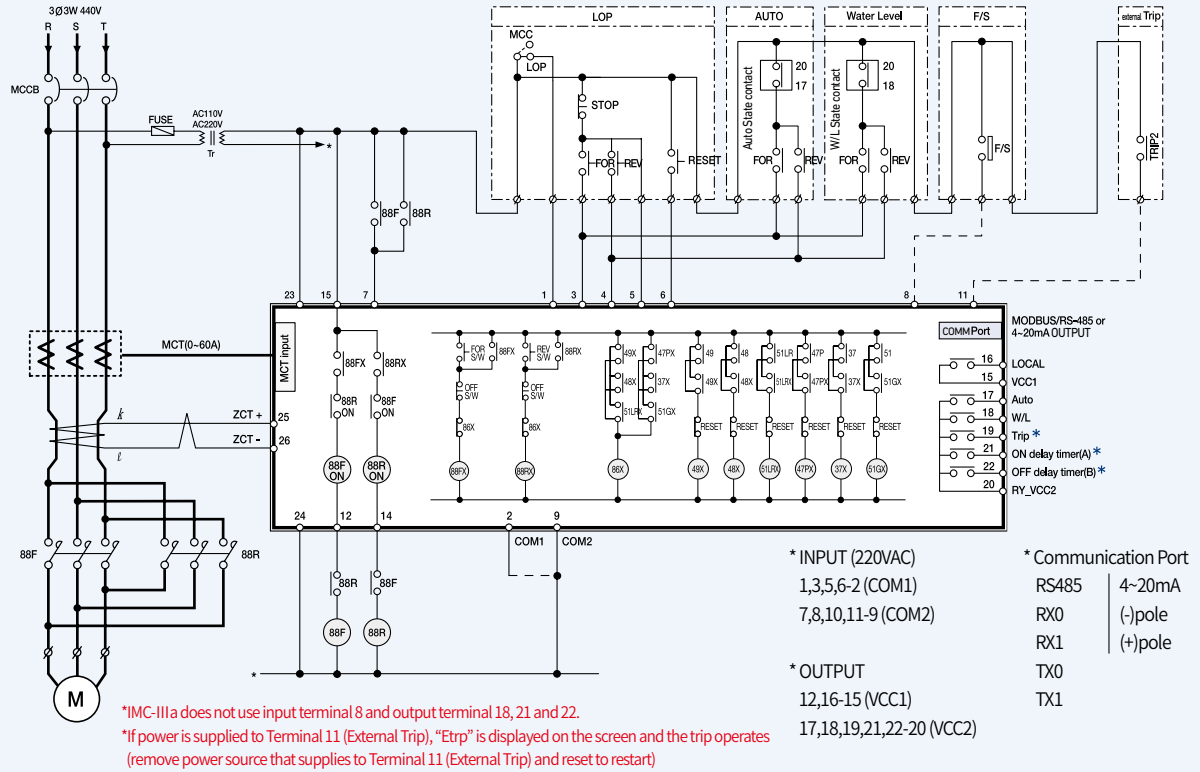
\*If power is supplied to Terminal 11 (External Trip), "Etrp" is displayed on the screen and the trip operates (remove power source that supplies to Terminal 11 (External Trip) and reset to restart)

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

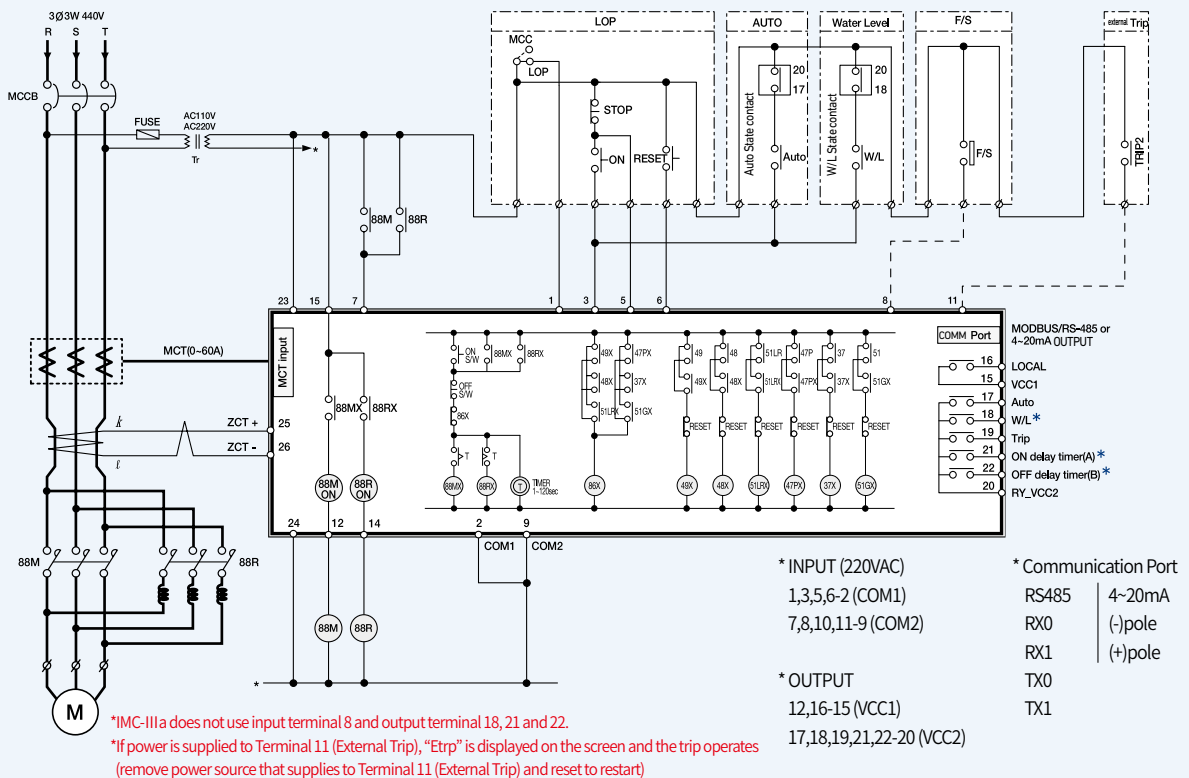
\* OUTPUT  
12,16-15 (VCC1)  
17,18,19,21,22-20 (VCC2)

\* Communication Port  
RS485 | 4~20mA  
RX0 | (-)pole  
RX1 | (+)pole  
TX0  
TX1

For/Rev start

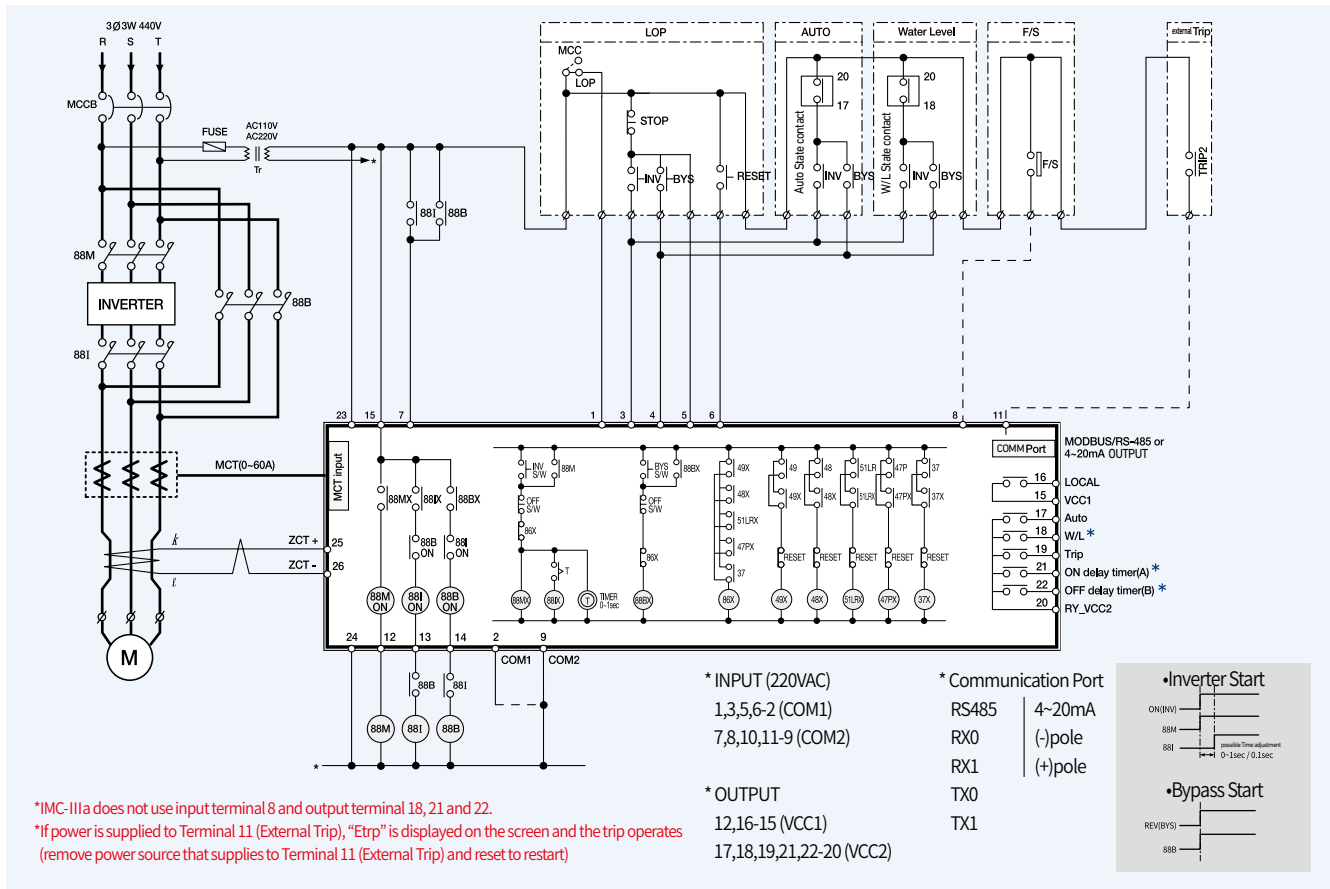


Reactor start

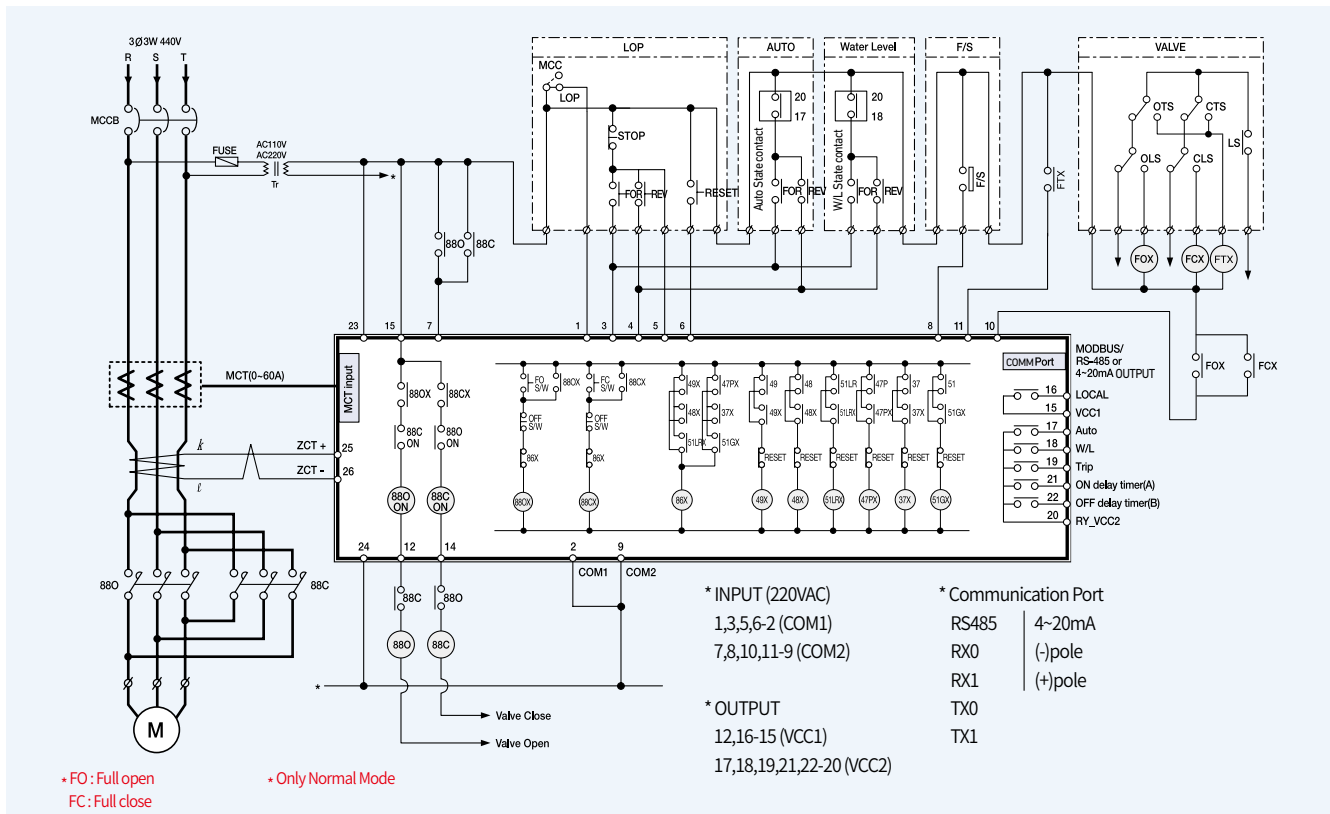


# Wiring & cable connection

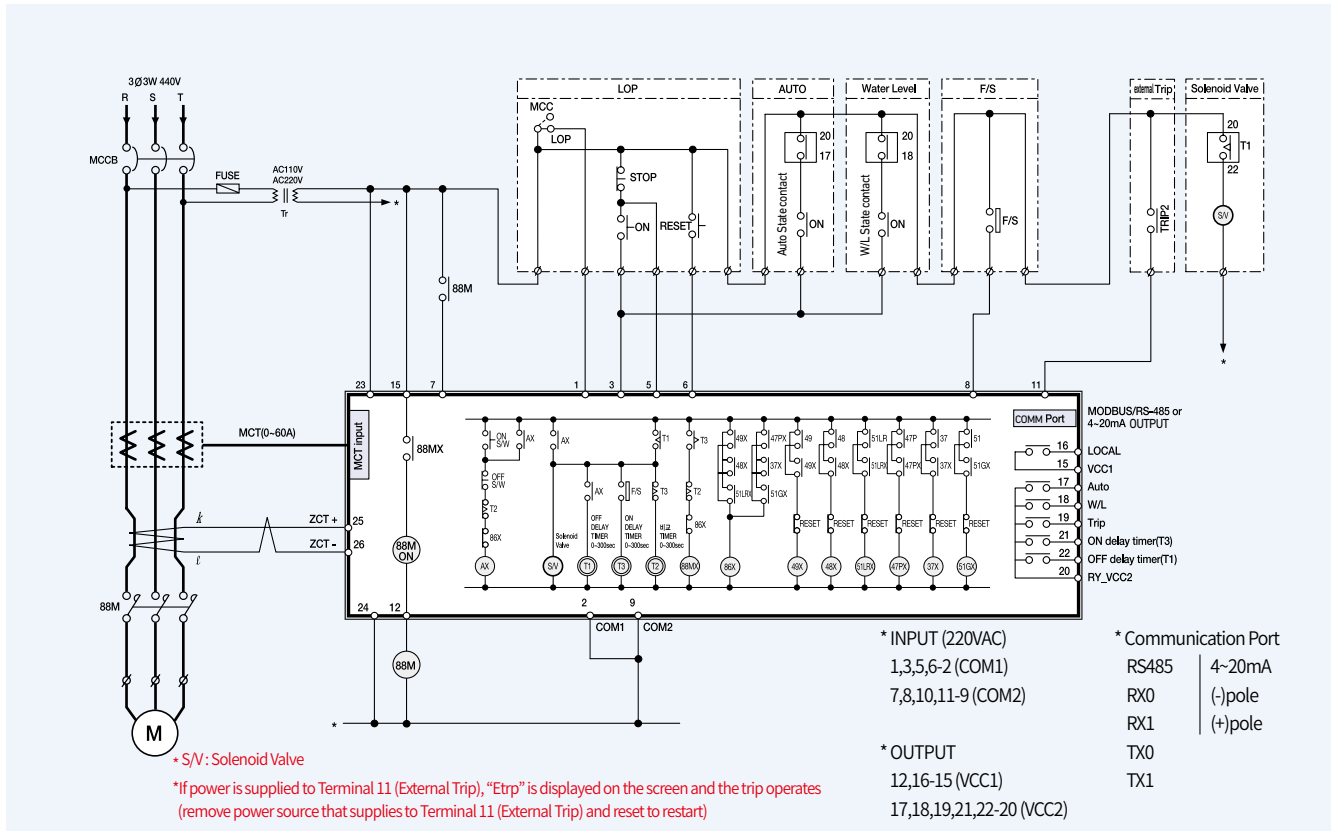
## Inverter start



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



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	Explanation
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 (∅)

+ Normal Mode

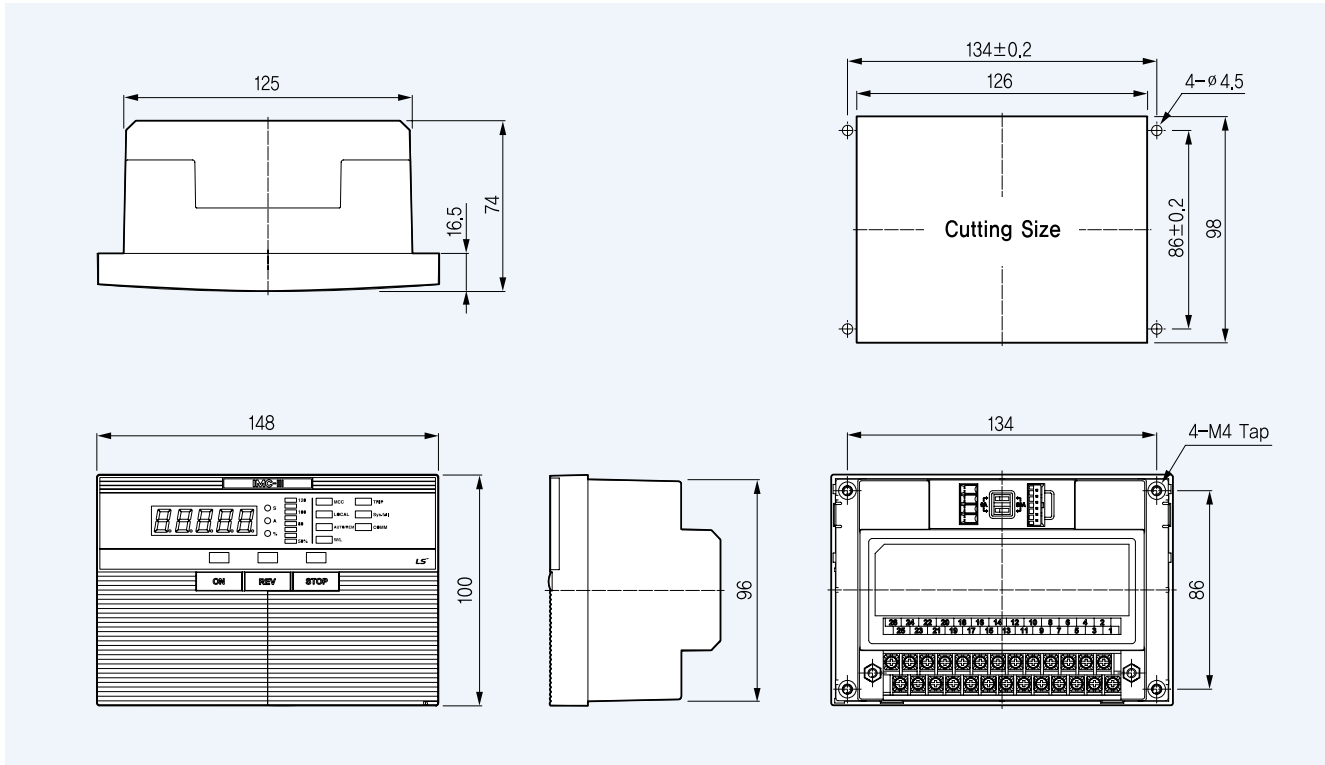
20-21 : Operation Time Alarm("OrH") Output

20-22 : Not Used

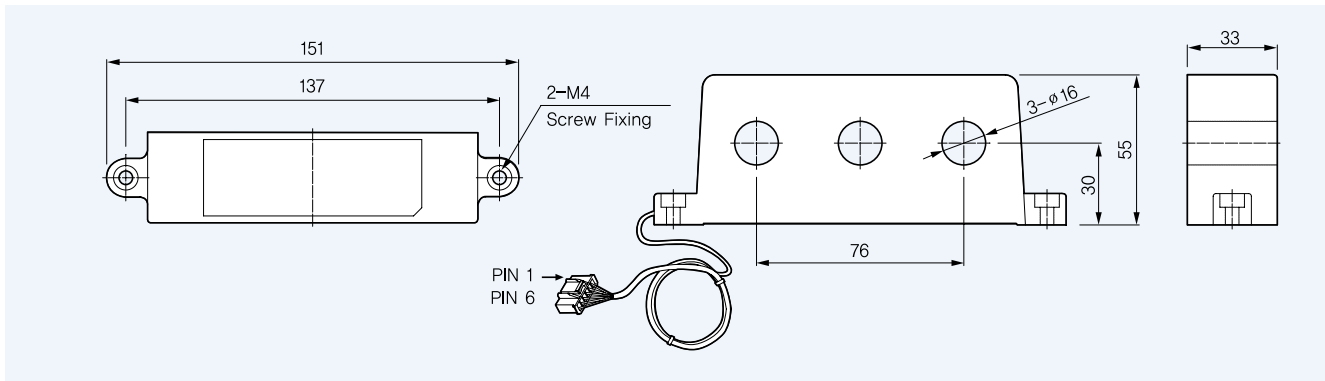
# Dimensions

## Dimensions

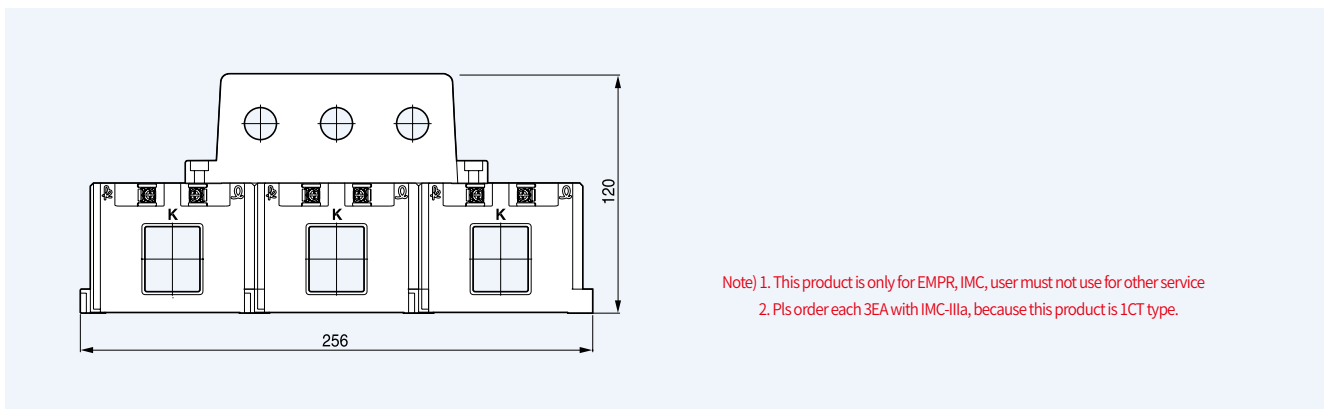
### IMC-IIIa main unit



### MCT



### In case of MCT combination





# 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 1~5 4.4~22	~0.18 0.18~1.1 1.1~5.5	0.12~0.55 0.37~2.2 2.2~11	Inverse-time
	GMP22-2S, 3S/3SR				
	GMP22-2T, 3T/3TR				
	GMP22-2PD				Definite-time
	GMP40-2P/2PA, 3P/3PR	4~20 8~40	1.1~5.5 2.2~11	2.2~7.5 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 3~30 5~60	0.09~1.1 0.5~7.5 1.5~15	0.18~2.2 1.5~15 3.0~30	Definite-time
	GMP60TD/TDa	0.125~60	0.06~15	0.06~30	Definite-time/Inverse-time
	GMP60-3T/3TR				Definite-time
	GMP60-3TZ/3TZR	0.5~60	0.09~15	0.18~30	Definite-time(Ground Fault)
	GMP60-3TN/3TNR				
	DMPi-series	DMP06i	0.5~6	0.09~1.1 1.5~18.5	0.18~2.2 3.0~303.0~30
DMP65i		5~655~60	1.5~15		
IMP-series	IMP-C-NO	0.125~100	0.06~30	0.06~55	Definite-time/Inverse-time (Instantaneous/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 (Current type)
	S-EMPR MMP-PB/PM-10				Definite-time/Inverse-time (Power type)
	S-EMPR MMP-SB/SM-10				Definite-time/Inverse-time (SGR type)
	S-EMPR MMP-IR-10	0.125~10	0.06~2.2	0.06~4	Definite-time/Inverse-time (IR type)
	S-EMPR MMP-CB/CM-100	5~100	1.5~30	3.0~55	Definite-time/Inverse-time (Current type)
	S-EMPR MMP-PB/PM-100				Definite-time/Inverse-time (Power type)
	S-EMPR MMP-SB/SM-100				Definite-time/Inverse-time (SGR type)
	S-EMPR MMP-IR-100	5~100	1.5~30	3.0~55	Definite-time/Inverse-time (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



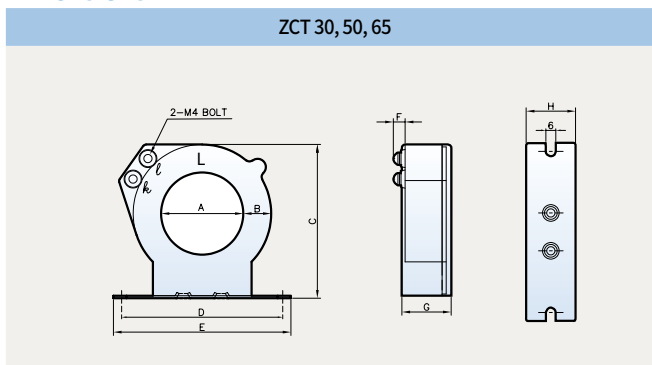
## ZCT (Zero-phase Sequence Current Transformer) (Voltage output type)

### Rated specifications

Unit : mm

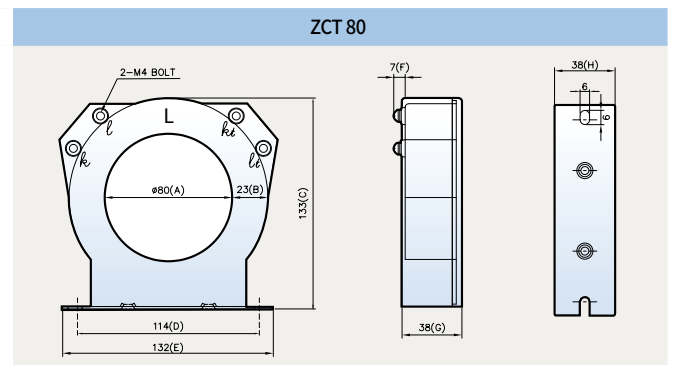
Code	Model name	Inside diameter (mm)	Zero phase current transformer ratio	Weight (kg)
76512124011	LZR-030(V)	30	200mA/100mV (LS only)	0.2
76512124012	LZR-050(V)	50		0.3
76512124013	LZR-065(V)	65		0.4
76512124014	LZR-080(V)	80		0.8

### Dimensions



Unit : mm

Model name	A	B	C	D	E	F	G	H	Ø
LZR-030(V)	30	17	74	75	85	7	23	25	6
LZR-050(V)	50	17	94	98	108	7	30	30	6
LZR-065(V)	65	17	108	98	108	7	30	30	6



Unit : mm

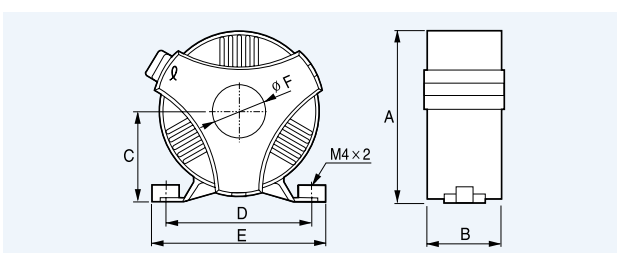
Model name	A	B	C	D	E	F	G	H	Ø
LZR-080(V)	80	23	133	114	132	7	38	38	6

## ZCT (Zero-phase Sequence 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)	Error class	Penetrating hole[mm]	Upper installation EMPR	Remarks
3CT type	76012116026	3CT-23	50A	5A	1.0	3.0	21×21	GMP22/40/60T <i>note1)</i>	1) Insulation voltage: 690V 2) Withstanding voltage: 4kV/min 3) Overcurrent strength: 40 x 1n 4) Insulation resistance: 10MΩ (DC 500V Megger) 5) 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						
	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						
76012116024	3CT-63	500A							
76012116025	3CT-63	600A							
2CT type	76012116001	DCT-100	100A	5A			28.5×33.5	GMP22/40/60T <i>note1)</i>	
	76012116002	DCT-150	150A						
	76012116003	DCT-200	200A						
	76012116004	DCT-300	300A						
	76012116005	DCT-400	400A						
1CT type	76012116006	SCT-100	100A	5A			27.5×32.5	IMP/DMPi entire series GMP60-3T/3TN/3TZ GMP22/40/60T <i>note1)</i>	
	76012116007	SCT-150	150A						
	76012116008	SCT-200	200A						
	76012116009	SCT-300	300A						
	76012116010	SCT-400	400A						

\*Note: If the CT secondary cable thickness is 2.5mm<sup>2</sup>, the load of 3m is 0.52VA.

Note 1) If you want to use the screw directly on the panel or a combination on top of your CT, please order the product code marked with "PANEL".

### Dimensions

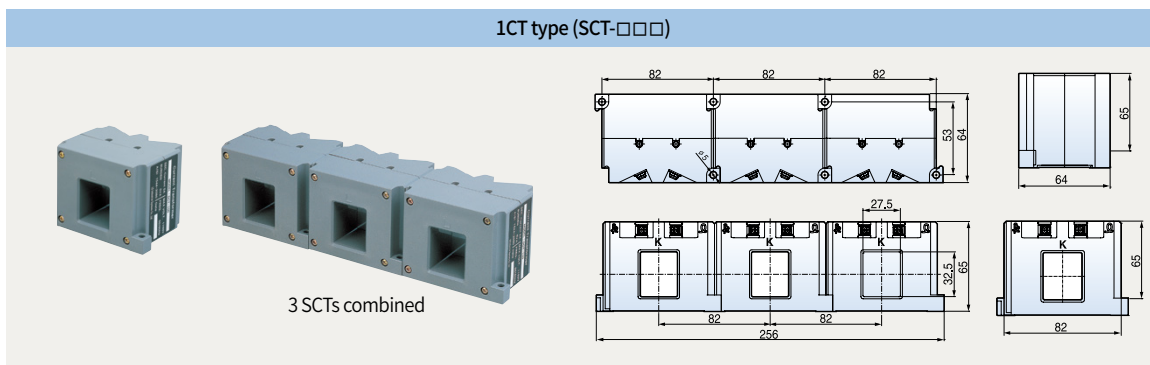
**3CT type (3CT-□□□)**

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



## Other options

### Cable

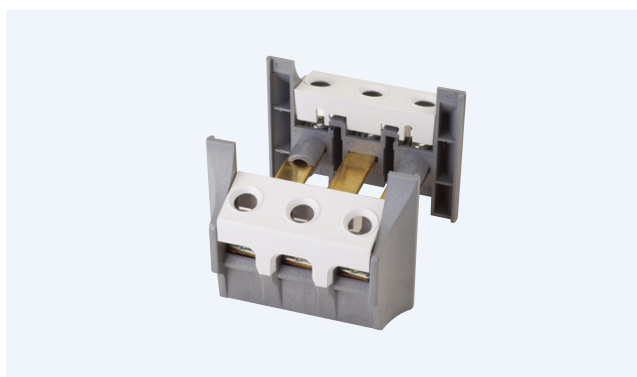


Applied products	IMP, DMPi series
Spec.	1m, 1.5m, 2m, 3m
purpose	For separated display installation



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

### Terminal block



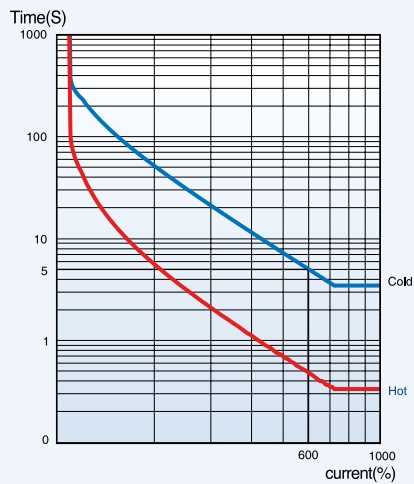
Applied products	Terminal block with the application of GMP60-3T Series
Spec.	Less than 60A



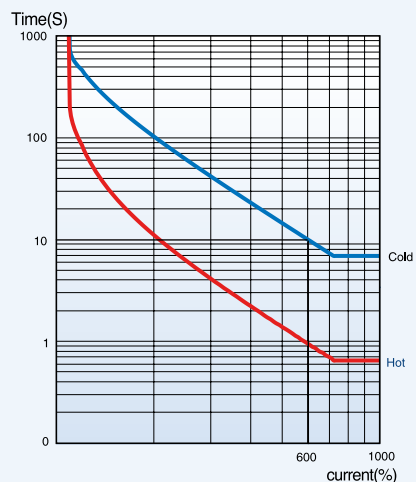
Applied products	DMPi series
Spec.	Less than 65A

# EMPR Operating characteristic curve

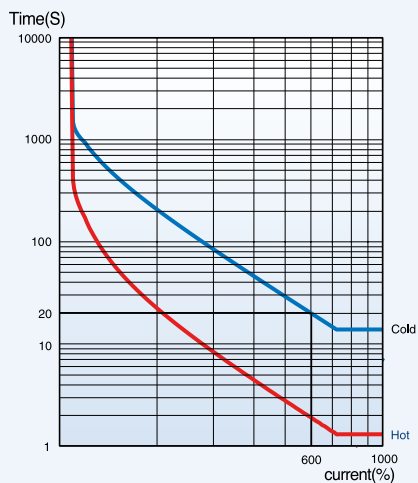
Class5



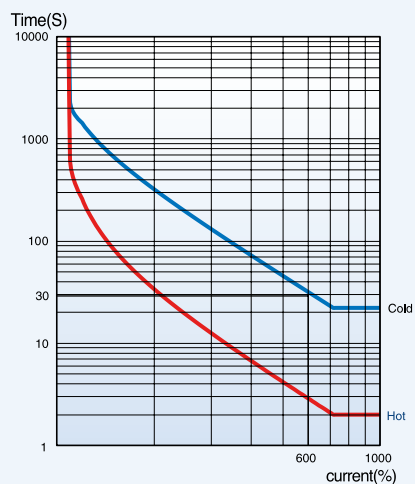
Class10



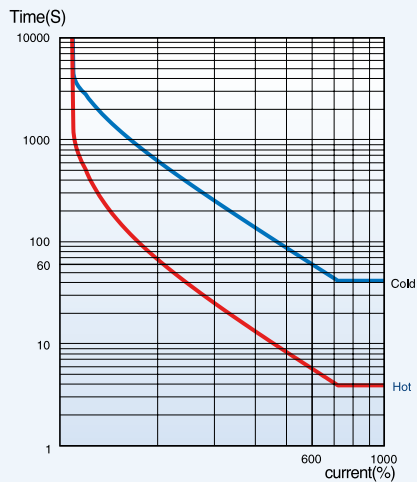
Class20



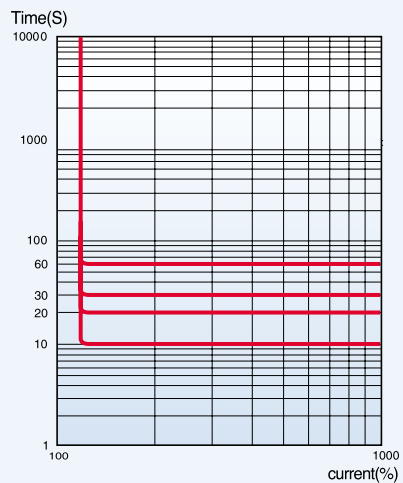
Class30



Class60



Definite time characteristic










# Direct mounting EMPR new/old comparative table








EMPR Series

Type	Extended model	GMP22-2P (1c)	GMP22-2P	GMP22-3P	GMP40-2P	GMP40-3P
		GMP22-2PD (1c)	GMP22-2PA	GMP22-3PR	GMP40-2PD 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)	2SPST (1a1b)	2SPST (1a1b)	2SPST (1a1b)
Rating Current	0.3~1.5, 1~5, 4.4~22A	0.3~1.5, 1~5, 4.4~22A	0.3~1.5, 1~5, 4.4~22A	4~20, 8~40A	4~20, 8~40A	4~20, 8~40A
Metasol (New)	EMPR Dimension					
		Direct connection possible MC	MC-9b, 12b, 18b, 22b	MC-9b, 12b, 18b, 22b	MC-32a, 40a	
Meta-MEC (Old)	EMPR Dimension					
		Type of contactors	GMC-9, 12, 18, 22	GMC-9, 12, 18, 22	GMC-32, 40	
Wiring/Mounting Compatibility		NO	NO	NO		
Retrofit Type (Tunnel)		GMP60T (1c)	GMP22-2T	GMP22-3T	GMP40-2T	GMP40-3T
		GMP22-2T	GMP60TA (1c)	GMP22-3TR	GMP60T (1c) 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
	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	GMP80-2S	●	●	●	●	●	●	
	GMP80-3S	●	●	●	●	●	●	
	GMP80-3SR	●	●	●	●	●	●	
DMPi	DMPi06i-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	●	●	●	●	●		

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
	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	●						



## 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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