

Beyond X™

EMPR Series

Electronic Motor Protection Relays



vector Energy

LS ELECTRIC

The new standard of next-generation motor protection relay

Beyond X™ EMPR Series

Electronic Motor Protection Relays

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





Electronic Motor Protection Relays

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A list of standard models

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

Electronic Motor Protection Relays

	DMPi				IMP	MMP			
	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
						-	-	-	-
	50/60Hz	50/60Hz	50/60Hz	50/60Hz	50/60Hz	50/60Hz	50/60Hz	50/60Hz	60Hz
	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●
	-	-	-	-	-	-	-	-	-
	●(T)	●(T)	●(T)	●(T)	●	●	●	●	●
	●(S)	●(S)	●(S)	●(S)	-	-	-	-	-
	-	-	-	-	-	-	-	-	-
	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●
	-	●(Z/B)	-	-	●	●	●	●	●
	-	-	●(I)	-	●	●	●	●	●
	●	●	●	●	●	●	●	●	●
	-	-	-	-	-	●	●	●	●
	●	●	●	●	-	●	●	●	●
	-	-	-	-	-	-	●	-	-
	-	-	-	-	-	-	-	●	-
	-	-	-	-	-	-	-	●	-
	-	-	-	-	-	-	-	●	-
	-	-	-	-	-	-	-	●	-
	-	-	-	-	-	-	-	●	-
	-	-	-	-	-	-	●	-	-
	-	-	-	-	-	-	-	●(Alarm)	-
	-	-	-	-	-	-	-	●(Alarm)	-
	-	-	-	-	-	-	-	●	-
	-	-	-	-	-	-	-	●	-
	-	-	-	-	-	-	-	-	●
	-	-	-	-	-	-	-	-	●

A list of standard models

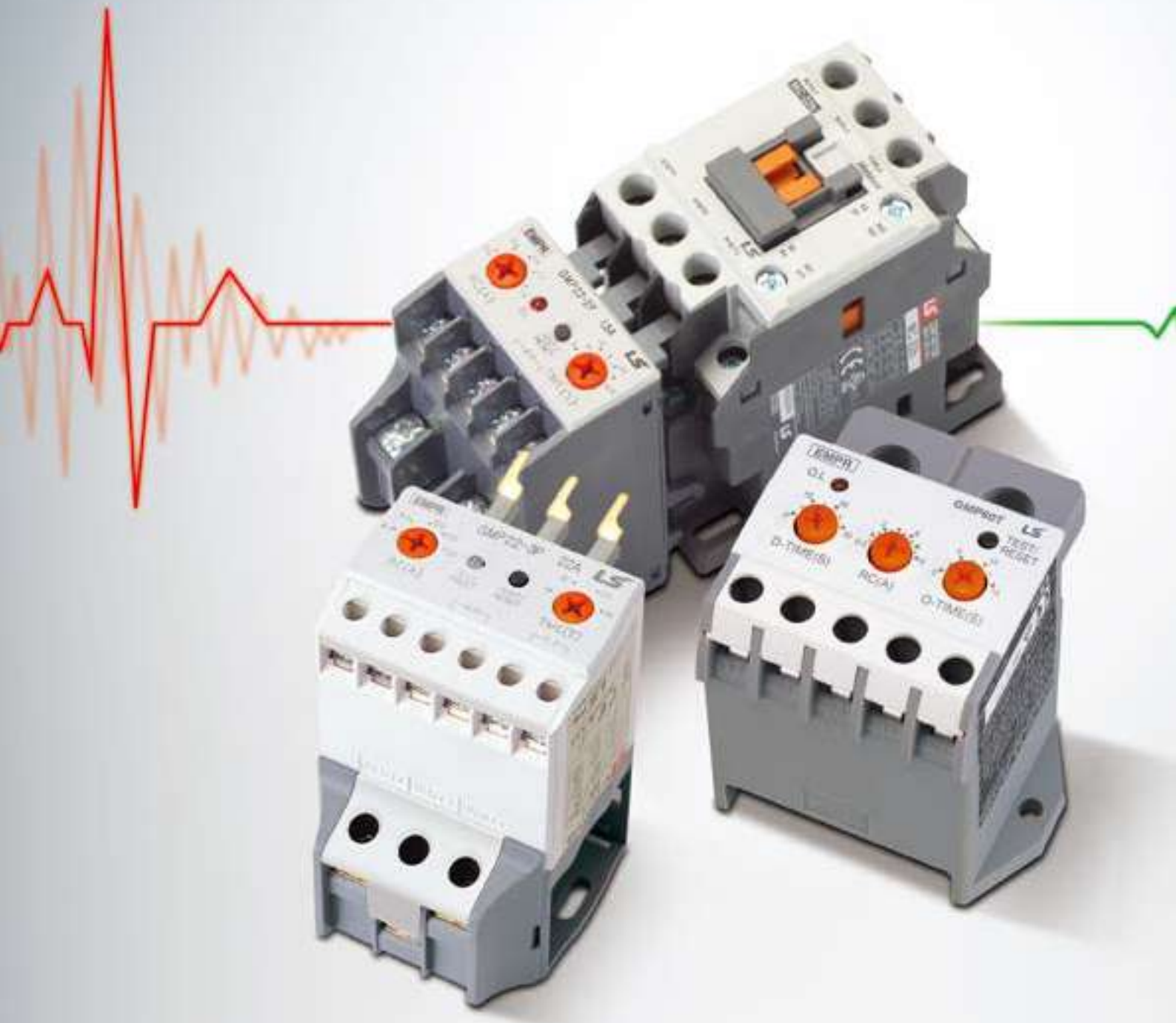
Functions		GMP22/40			GMP60				GMP80	
		2P/ 2PD/ 2PA 2T/2S	3P/3T/3S	3PR/3TR /3SR	T/TE/TA	TD/TDa	3T/3TR, 3S/3SR	3TZ/3TZR, 3TN/3TNR, 3SZ/3SZR, 3SN/3SNR	2S/2SA	3S/3SR
Display	Phase current	-	-	-	-	-	-	-	-	-
	Ground current	-	-	-	-	-	-	-	-	-
	Active/Reactive Power	-	-	-	-	-	-	-	-	-
	Electric energy	-	-	-	-	-	-	-	-	-
	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			
	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
	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●
	-	-	-	-	-	●	●	●	●
	-	-	-	-	-	●	●	●	●
	-	-	-	-	-	●	●	●	-
	-	-	-	-	-	●	●	●	-
	-	●(B)	-	-	-	-	●	-	●
	-	-	-	-	-	●	●	●	-
	-	-	-	-	-	●	●	●	-
	-	-	-	●(A)	●	●(M)	●(M)	●(M)	●
	-	-	-	●(M)	●	●(M)	●(M)	●(M)	●

The new standard of next-generation motor protection relay!

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



Beyond X 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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11 Product characteristics
12 Motor selection & model numbering system
13 Rated specifications & order type
23 Operation & setting method
28 Terminal configuration / Wiring & cable connection
31 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 note 1)	GMP22-2P Sol	●	●	●	-	-	-	-	Inverse time
		GMP22-2PD Sol	●	●	●	-	-	-	-	Definite time
		GMP22-2P Sol	●	●	●	-	-	-	-	Inverse time
		GMP22-2PA Sol	●	●	●	-	-	-	-	Definite time/ Automatic return
		GMP22-3P Sol	●	●	●	●	-	-	-	Inverse time
		GMP22-3PR Sol	●	●	●	●	●	-	-	Inverse time
	Screw type	GMP22-2S	●	●	●	-	-	-	-	Inverse time
		GMP22-3S	●	●	●	●	-	-	-	Inverse time
		GMP22-3SR	●	●	●	●	●	-	-	Inverse time
	Tunnel types	GMP22-2T	●	●	●	-	-	-	-	Inverse time
		GMP22-3T	●	●	●	●	-	-	-	Inverse time
		GMP22-3TR	●	●	●	●	●	-	-	Inverse time
4~20 8~40A	Pin type note 1)	GMP40-2PD Sol	●	●	●	-	-	-	-	Definite time
		GMP40-2P Sol	●	●	●	-	-	-	-	Inverse time
		GMP40-2PA Sol	●	●	●	-	-	-	-	Inverse time/ Automatic return
		GMP40-3P Sol	●	●	●	●	-	-	-	Inverse time
		GMP40-3PR Sol	●	●	●	●	●	-	-	Inverse time
	Screw type	GMP40-2S	●	●	●	-	-	-	-	Inverse time
		GMP40-3S	●	●	●	●	-	-	-	Inverse time
		GMP40-3SR	●	●	●	●	●	-	-	Inverse time
	Tunnel types	GMP40-2T	●	●	●	-	-	-	-	Inverse time
		GMP40-3T	●	●	●	●	-	-	-	Inverse time
		GMP40-3TR	●	●	●	●	●	-	-	Inverse time
0.5~6 3~30 5~60A	Tunnel types	GMP60T	●	●	●	-	-	-	-	Inverse time
		GMP60TE	●	●	●	-	-	-	-	Inverse time
		GMP60TA	●	●	●	-	-	-	-	Definite time/ Automatic return
0.5~60A		GMP60TD	●	●	●	-	-	-	-	Definite time
		GMP60TDa	●	●	●	-	-	●	-	Definite time/ Automatic return
0.5~60A	Tunnel types	GMP60-3T	●	●	●	●	-	-	-	Definite time
		GMP60-3TR	●	●	●	●	●	-	-	Definite time
		GMP60-3TZ note 2)	●	●	●	●	-	-	●	Definite time
		GMP60-3TN	●	●	●	●	-	-	●	Definite time
		GMP60-3TZR	●	●	●	●	●	-	●	Definite time
		GMP60-3TNR	●	●	●	●	●	-	●	Definite time
0.5~ 60A	Screw type	GMP60-3S	●	●	●	●	-	-	-	Definite time
		GMP60-3SR	●	●	●	●	●	-	-	Definite time
		GMP60-3SZ	●	●	●	●	-	-	●	Definite time
		GMP60-3SN	●	●	●	●	-	-	●	Definite time
		GMP60-3SZR	●	●	●	●	●	-	●	Definite time
		GMP60-3SNR	●	●	●	●	●	-	●	Definite time
16~80A		GMP80-2S	●	●	●	-	-	-	-	Inverse time
		GMP80-2SA	●	●	●	-	-	-	-	Inverse time/ Automatic return
		GMP80-3S	●	●	●	●	-	-	-	Inverse time
		GMP80-3SR	●	●	●	●	●	-	-	Inverse time

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

Convenience

Integrated Digital Motor Protection Relay using MCU(Microprocessor Control Unit)

It offers real time data processing and high precision.

Applicable to invertor circuits

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

Save the last fault cause

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

Sharing of terminal contact type and penetration type

It is possible to detach and attach a terminal block and conveniently apply the product to a variety of installation conditions.

Perfect connection with LS Digital Contactor Metasol MC

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



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

Various Installation Ways

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

Wide Current Control Range

Since this product has a wide current control range, it is more convenient than thermal overload relays.

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

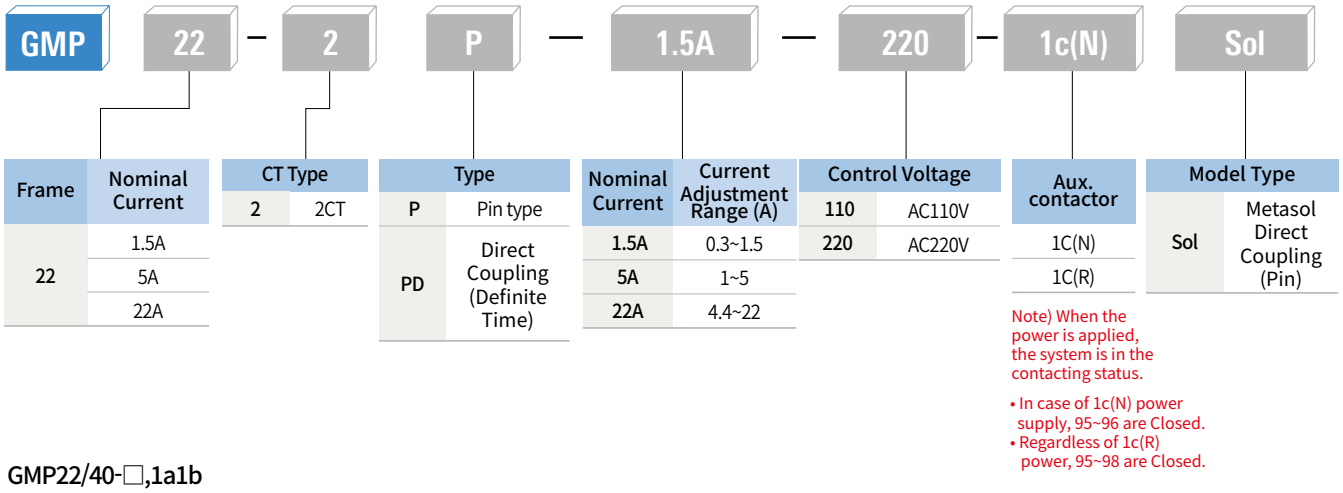
Motor selection

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)
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,1c



Frame	Nominal Current
22	1.5A
	5A
	22A

CT Type	
2	2CT

Type	
P	Pin type
PD	Direct Coupling (Definite Time)

Nominal Current	Current Adjustment Range (A)
1.5A	0.3~1.5
5A	1~5
22A	4.4~22

Control Voltage	
110	AC110V
220	AC220V

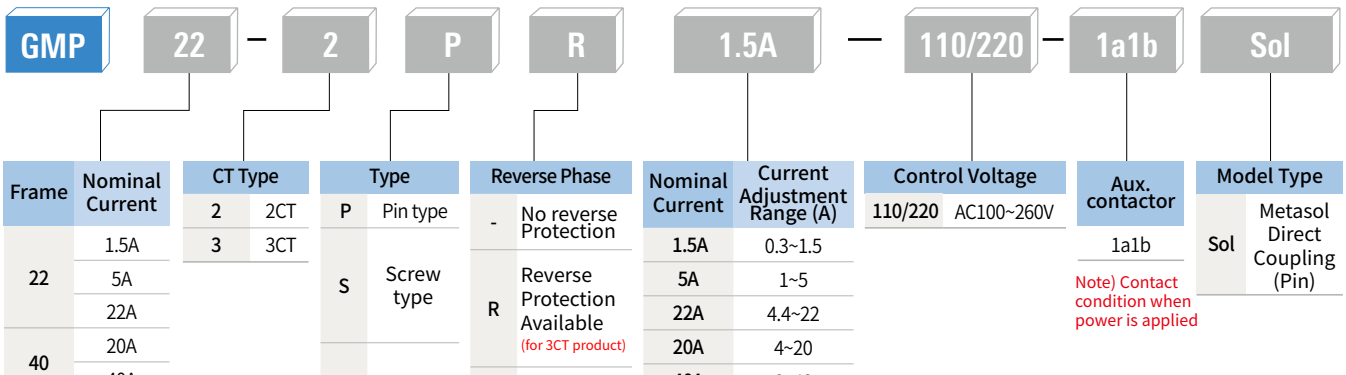
Aux. contactor
1C(N)
1C(R)

Note) When the power is applied, the system is in the contacting status.

- In case of 1c(N) power supply, 95~96 are Closed.
- Regardless of 1c(R) power, 95~98 are Closed.

Model Type	
Sol	Metasol Direct Coupling (Pin)

GMP22/40-□,1a1b



Frame	Nominal Current
22	1.5A
	5A
	22A
40	20A
	40A

CT Type	
2	2CT
3	3CT

Type	
P	Pin type
S	Screw type
T	Tunnel type
PD	Direct Coupling (Definite Time)

Reverse Phase	
-	No reverse Protection
R	Reverse Protection Available (for 3CT product)
A	Automatic Recovery (for P-2CT product) Except for Definite Time

Nominal Current	Current Adjustment Range (A)
1.5A	0.3~1.5
5A	1~5
22A	4.4~22
20A	4~20
40A	8~40

Control Voltage	
110/220	AC100~260V

Aux. contactor
1a1b

Note) Contact condition when power is applied

Model Type	
Sol	Metasol Direct Coupling (Pin)

GMP22-2P, 2PD 1c



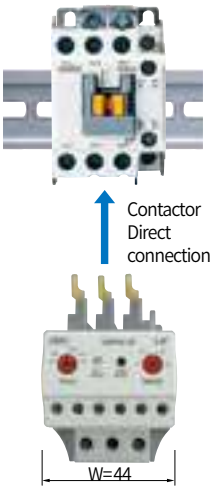
GMP22-2P(1c)
GMP22-2PD(1c)

Specification (Direct type EMPR)

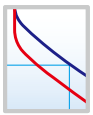
Connection: Accessible electronic contactors	Minimum direct connection with width 44mm : MC-9b, 12b, 18b, 22b
Auxiliary contact	1SPDT 1c (N type) note1)
Current setting range	0.3~1.5/1~5/4.4~22A
Operating time characteristics	Inverse time, Definite time (PD)
Number of built-in CT (deflector)	2 (R, T phase)
Operating power	AC 110/220V (±10%)
Return (reset) method/time	Manual/Electrical return note3)
Using Inverter Secondary	Available

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

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



Order type

Type	Model/CT	Operating characteristics	Current setting range	Order type
Pin type	GMP22-2P(1c) - 2CT type	Inverse time (0~30sec) 	0.3 - 1.5A	GMP22-2P(1c) 1.5A Sol
			1 - 5A	GMP22-2P(1c) 5A Sol
			4.4 - 22A	GMP22-2P(1c) 22A Sol
			0.3 - 1.5A	GMP22-2P(1c) 1.5A [N]
			1 - 5A	GMP22-2P(1c) 5A [N]
			4.4 - 22A	GMP22-2P(1c) 22A [N]
			0.3 - 1.5A	GMP22-2P(1c) 1.5A [R]
			1 - 5A	GMP22-2P(1c) 5A [R]
			4.4 - 22A	GMP22-2P(1c) 22A [R]
	GMP22-2PD(1c) - 2CT type	Definite time 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	GMP22-2PD(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.
3. Upon turning the control power off and then on again, the product will return to its original state.



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



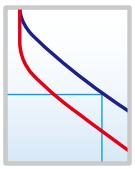
Screw type
GMP22-□S, SR



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)



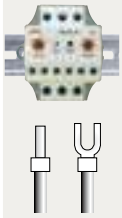
Inverse time

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

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

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

Order type

Mounting type	Model/CT	Current setting range	Order type
Direct mount onto a Metasol MC  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



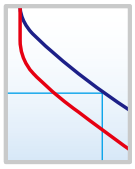
Screw type
GMP40-□S, SR



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)



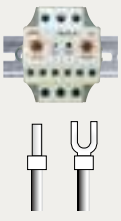
Inverse time

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

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

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

Order type

Mounting type	Model/CT	Current setting range	Order type
Direct mount onto a Metasol MC  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-□



GMP22



GMP40

Front face configuration

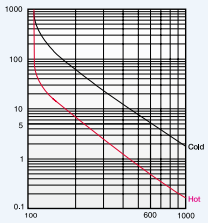


Current setting	
GMP22	GMP40
0.3 - 1.5A	4 - 20A
1 - 5A	8 - 40A
4.4 - 22A	-

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

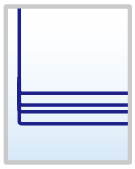
GMP60T



GMP60T(Din rail) GMP60T(Panel)

Specification (Tunnel type / Economic type EMPR)

Connection methods	Tunnel type
Auxiliary contact	1SPDT 1c (N type) note 1)
Current setting range	0.5~6/3~30/5~60A
Operating time characteristics	Definite time
Number of built-in CT (deflector)	2 (R, T type)
Operating power	AC24V/48V/110V/220V/380V(440) 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	✓ note 2)	✓ note 2)	✓ note 2)
Operation time setting		0~30sec	5sec (Fixed)	5sec (Fixed)
Auto-return setting		-	-	0~120sec
Certification	UL, CE	✓	✓	-

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

Order type



note 1)
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
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".

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 LED
Application specification	IEC60947-1

Rated specifications & order type

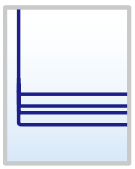
GMP60-TD, TDa



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)	✓ 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 : ±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
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

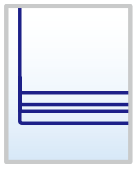


GMP60-3T (Din-rail only)
GMP60-3TR

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

Specification (Tunnel type / Screw type EMPR)

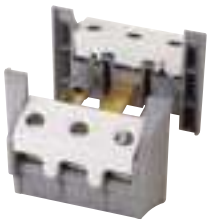
Connection methods	Tunnel type / Screw type
Auxiliary contact	2SPST (1a1b at energization)
Current setting range	0.5~60A
Operating time characteristics	Definite time
Number of built-in CT (deflector)	3
Operating power	AC 100~260V
Return (reset) method/time	Manual/Electrical return
Using Inverter Secondary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



Terminal Block

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

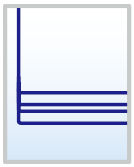


GMP60-3TZ, 3TZR (Din-rail only)
GMP60-3TN, 3TNR

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) note)



Definite time

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

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

Order type

Mounting type	Model/CT	Operating characteristics	Current setting range	Order type
Tunnel type 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 : ±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	IEC 61000, IEC60947-1

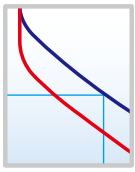
GMP80



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
Functions	Overcurrent	✓	✓	✓	✓
	Locked rotor	✓	✓	✓	✓
	Phase loss	✓ note)	✓ note)	✓	✓
	Phase unbalance	-	-	✓	✓
	Reverse phase	-	-	-	✓
Certification	UL, CE	✓	-	✓	✓

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



Order type

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

Rated specifications & order type

1c Contact Operation Description

1. N-Type (fail-safe, No volt release)

1) When power is ON, the a-contact closes and the b-contact opens. (Self-diagnosis function: NVR (No Volt Release))

2) If the control power is not supplied or an EMPR TRIP occurs, all functions are disabled.

3) For sites subject to strong vibrations, the use of N-Type products is recommended.

Status	95-96	95-98	Remark
Power OFF	Open	Close	- The contact status is the same when the power is OFF and during TRIP. - The MC should be connected to 95-96.
Power ON	Close	Open	
TRIP	Open	Close	

2. R-Type(non fail safe)

1) Regardless of whether the power is ON or OFF, the b-contact remains closed from the beginning. (no change in contact status)

2) The motor can be operated regardless of the power ON/OFF status, and motor operation can only be stopped during a TRIP event.

3) During TRIP, the a-contact closes and the b-contact opens.

Status	95-96	95-98	Remark
Power OFF	Open	Close	- The contact status is the same when the power is OFF and during TRIP. - The MC should be connected to 95-98.
Power ON	Open	Close	
TRIP	Close	Open	

1a1b Contact Operation Description

1) When the power is ON, one of the two a-contacts is in the closed state, while the other a-contact remains open.

2) If the control power is not supplied or an EMPR TRIP occurs, all functions are disabled.

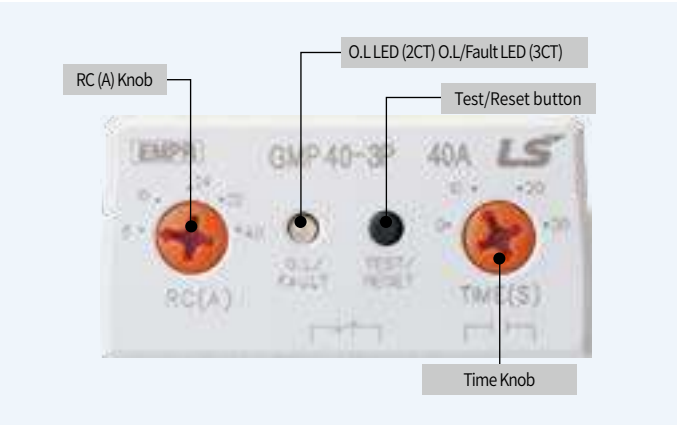
3) Recommended for sites with significant vibration.

Status	95-96	97-98	Remark
Power OFF	Open	Open	- The MC should be connected to 95-96.
Power ON	Close	Open	
TRIP	Open	Close	

Inverse time characteristic

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

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



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

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

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

3. Set the operating time

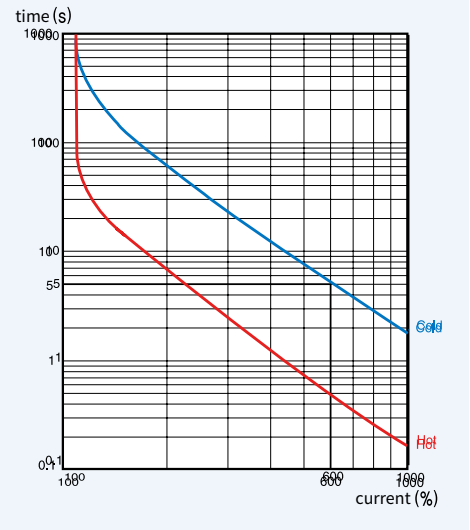
An operating time is based on 600% of rated current in the characteristic curve.

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

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

4. Set up a rated current.

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



Operation & setting method

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

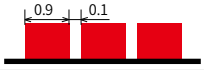
3) In case of phase unbalance

- 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

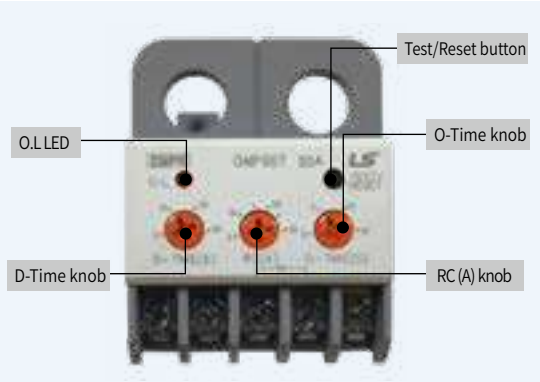
Condition			LED Status	LED Diagram	Remark
Operating status	Normal		LED OFF		
	Over current		0.4 Second intervals		
	Phase unbalance (50%, 3CT)		0.4 Second intervals		
Tripped status	Over current		O.L LED light up		
	Phase failure (3CT)	R	1 time for 3 seconds		GMP 80-3S/3SR model, O.L LED will light up 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.

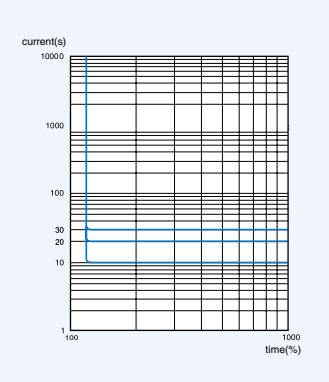
Note) There are two red color LEDs for O.L (Overload) & Fault in the model of GMP80-3S/SR

Definite time characteristic 1

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

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





2. Check the Test/Reset button operation

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

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

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

3. Set the operating time

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

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

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

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

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

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

1) With the use of O-Time Knob, set up an operating time.
2) If O-Time is the minimum value, EMPR is immediately tripped as soon as overload occurs. (Reference: generally, set it to 4~6 seconds.)
A-Time (Auto Reset Time): 0~120 seconds; set up an automatic reset time in auto reset type.

4. Set the operating current

Setting is based on the rated current of a motor (normal operating current).
1) Check that a motor's rated current is within the current control range of EMPR.
2) Set RC (Rating Current) Knob up to the maximum and run the motor.
3) In normal operation state, slowly turn RC Knob counter clockwise and stop at the point that overcurrent display lamp (O.L) flickers. At this point, the actual load current value (100%) of the motor is displayed.
4) From the point, turn RC Knob clockwise. Set up the knob at this point that O.L lamp is turned off (less than motor full load current).
Generally, set it to 110~120% of actual load current (set to a value lower than a motor full load current).

5. Check the LED condition when operation

1) GMP60T

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

2) GMP60-3T/3TR

The same as the LED operation state in operation.

Definite time characteristic 2 (GMP60-TD, TDa)

1. Function & setting menu

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

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



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

2. Setting menu

FUNC	SEL	Description	Default Value	Remarks
1.Cty	6A/60A	Current type selection	6A	Set the same with rated current S/W
2D-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	0.5~6.0/5~60	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
7U-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)
9Srt	oFF/10~8760	Operation hour setting	Off	For TDa model only
Atrt	-	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 '9Srt' passes, 'OrH' is displayed and EMPR has no output.)
2. How to check 'trt' and 'r-t'

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

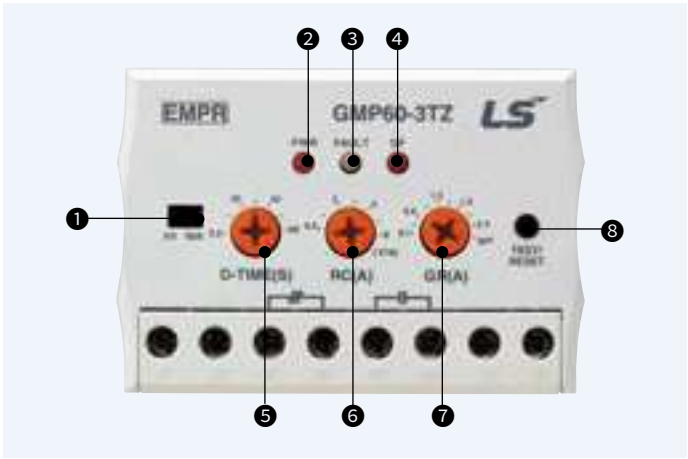
In case of 'trt', if power is Off, the minute unit based time is removed.
If 'r-t' is checked, an operating time represents a total running time taken until a motor is turned Off. It is displayed in the units of day, hour, and minute.

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

1. This product has the characteristic of definite time.
For setting, see pages 21 & 22.

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

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



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

3. Overcurrent trip time

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

4. Other functions

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

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

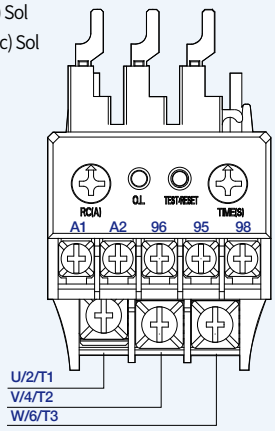
5. Status of LED configuration

NO	Function	Setting	Description	Remark
❶	6A/60A	Slide switch	Maximum rated current (6A/60A) setting	-
❷	PWR.	Red LED	Lights up when power is ON Blinking in the failure mode	-
❸	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
❹	GF	Red LED	Lights up after blinking in the event of ground fault	-
❺	D-Time (S)	KNOB	Delay time (0.2 to 60 sec.)	-
❻	RC (A)	KNOB	Rated current setting: 0.5~6A/5~60A	
❼	GR (A)	KNOB	Zero phase current detection type Sensitivity current setting (0.1~2.5A) Residual current detection type Sensitivity current setting (0.5~6A)	-
❽	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

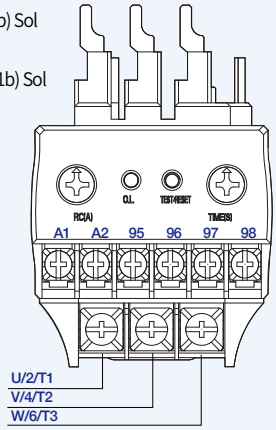
Terminal configuration / Wiring & cable connection

Terminal configuration

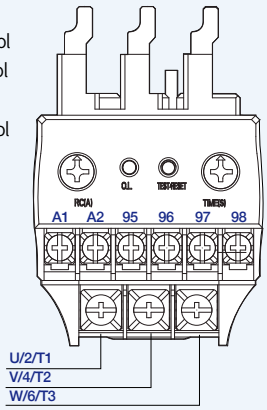
GMP22-2P (1c) Sol
GMP22-2PD (1c) Sol



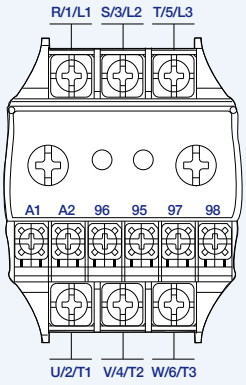
GMP22-2P (1a1b) Sol
GMP22-3P Sol
GMP22-2PA (1a1b) Sol
GMP22-3PR Sol



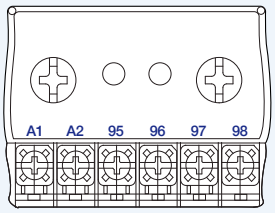
GMP40-2P Sol
GMP40-2PD Sol
GMP40-2PA Sol
GMP40-3P Sol
GMP40-3PR Sol



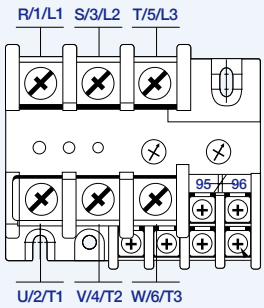
GMP22-2S
GMP22-3S
GMP22-3SR
GMP40-2S
GMP40-3S
GMP40-3SR



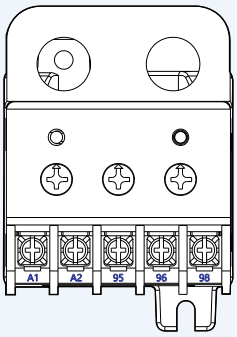
GMP22-2T
GMP22-3T
GMP22-3TR
GMP40-2T
GMP40-3T
GMP40-3TR



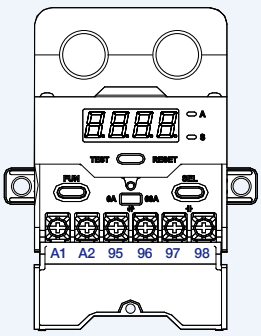
GMP80-2S
GMP80-3S
GMP80-3SR



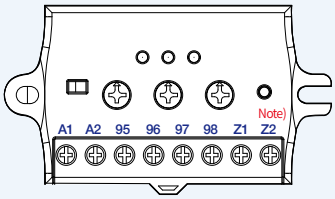
GMP60T
GMP60TE
GMP60TA



GMP60-TD
GMP60-TDa



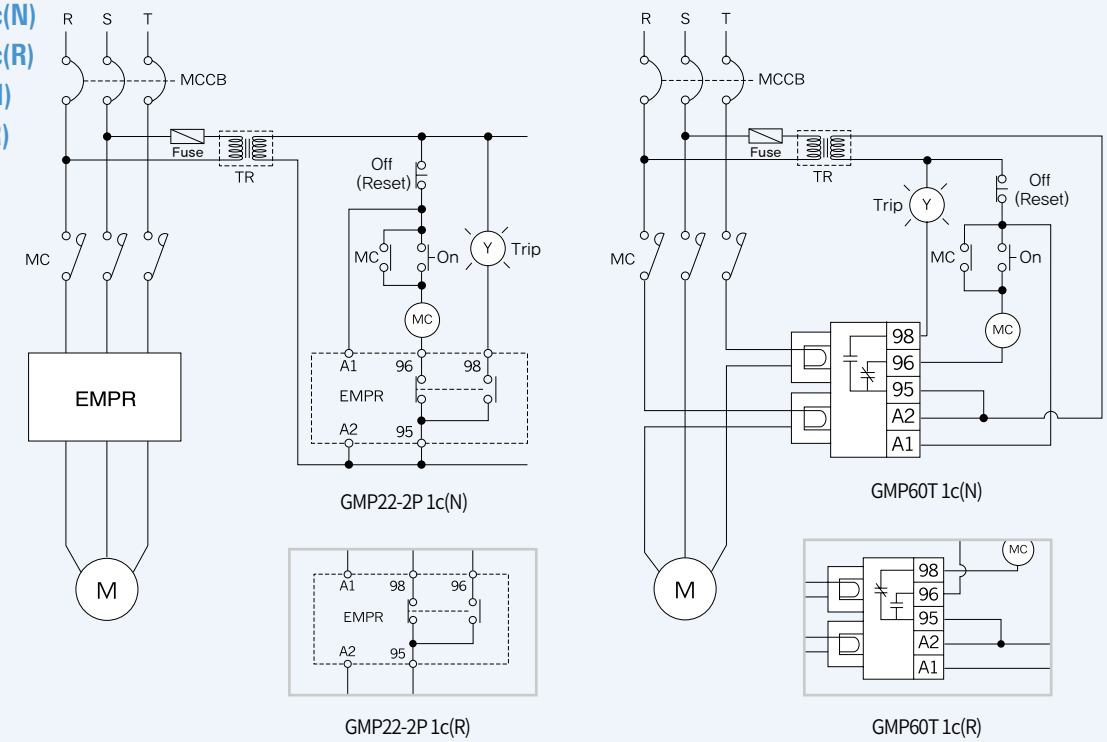
GMP60-3TZ, TZR
GMP60-3TN, TNR
GMP60-3T, TR



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

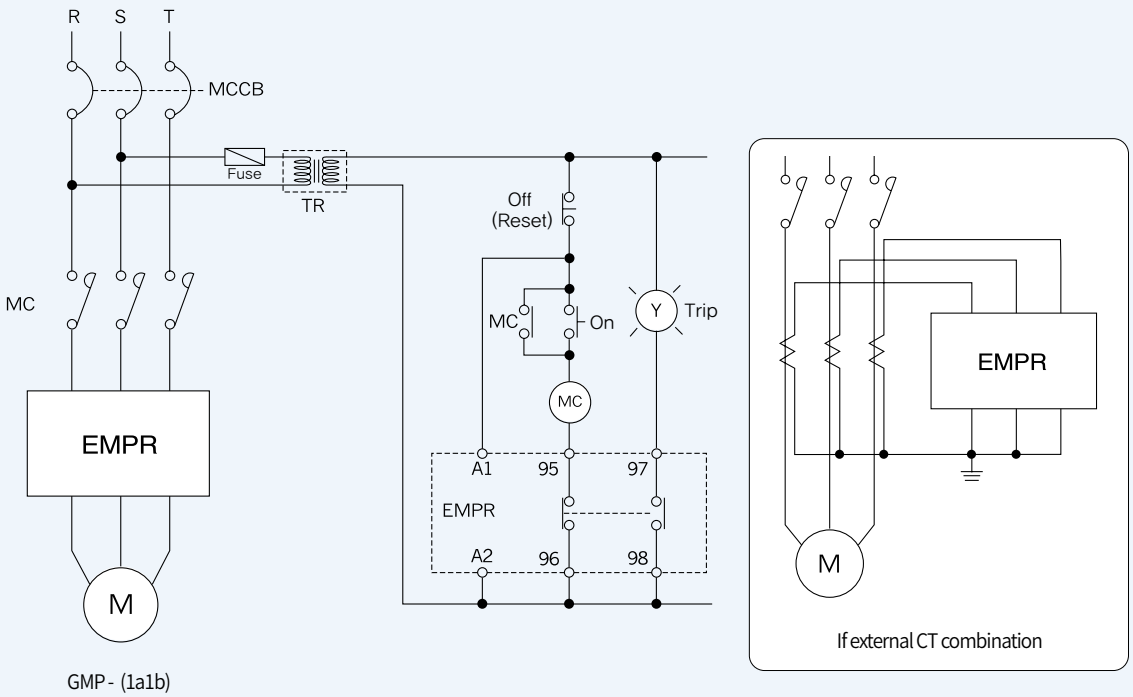
Note) 1. GMP60-3TN/3TNR and GMP60-3T/3TR models are not wired to Z1 and Z2 terminals.
2. In case of 1c(N), only if control power (A1, A2) is On, output contact occurs (if power Off or Trip, 95-96 : Open, 95-98 : Close)
3. In case of 1c(R), output contact occurs regardless of control power (A1, A2). (Contact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

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.)

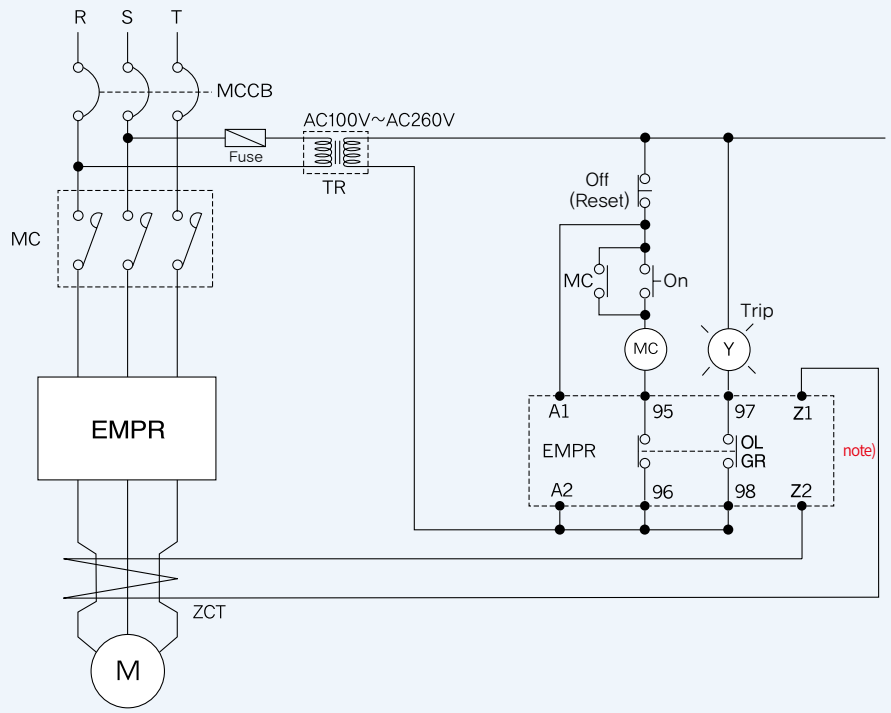
GMP-(1a1b)



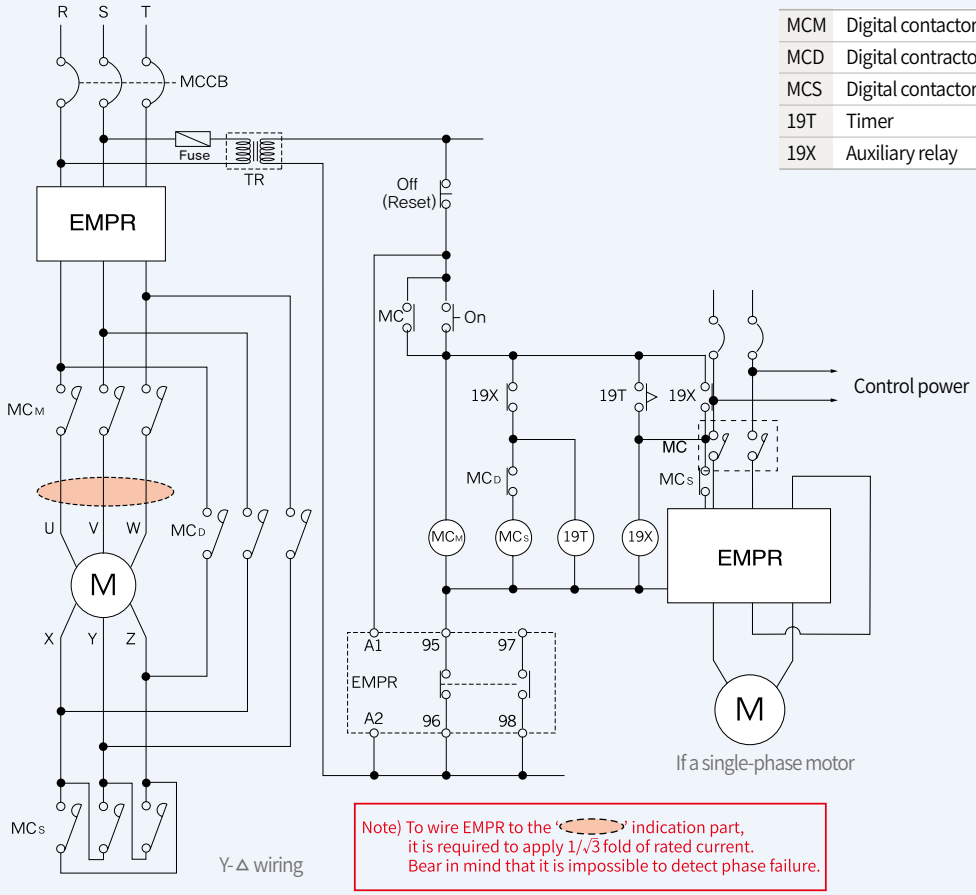
Note) 1. To use a single-phase motor, connect it with R & T phases of EMPR. GMP60-3TR, 3TN, 3TNR, 3TZR is not allowed in a single-phase motor.
2. Output contact occurs only if control power (A1, A2) is On. (1a1b)

Terminal configuration / Wiring & cable connection

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



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



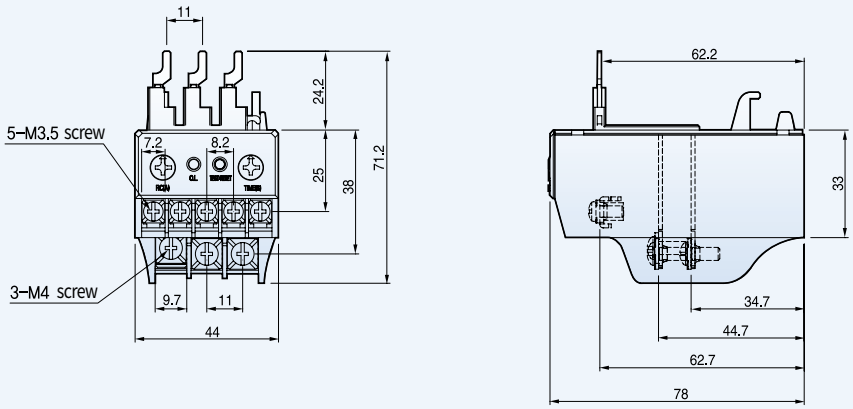
MCM	Digital contactor for power
MCD	Digital contractor for operating
MCS	Digital contactor for starting
19T	Timer
19X	Auxiliary relay

Note) 1. 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)

Unit : mm

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

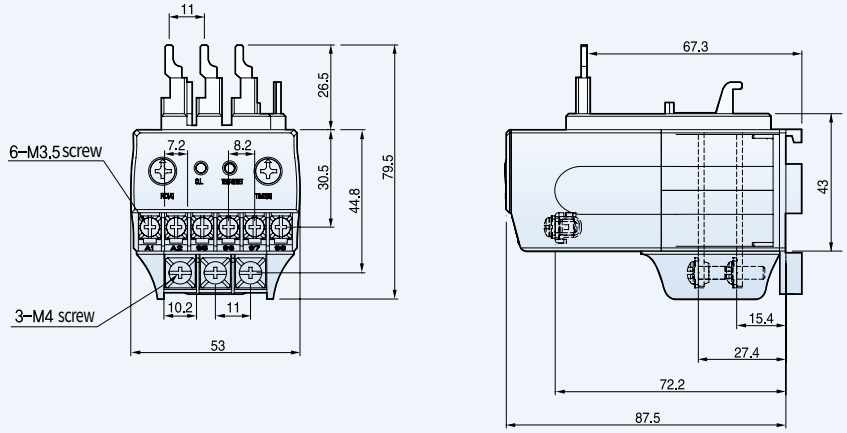
0.15kg



Unit : mm

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

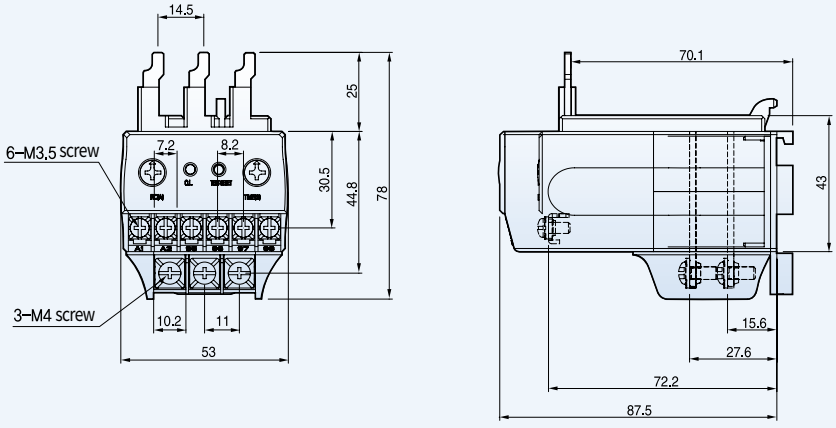
0.18kg



Unit : mm

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

0.20kg/0.22kg

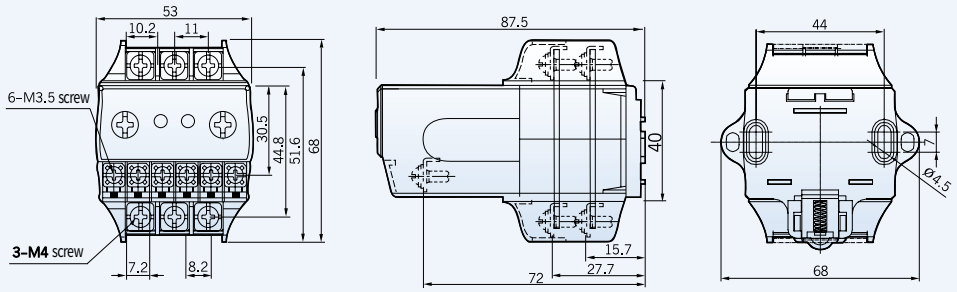


Dimensions

Unit : mm

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

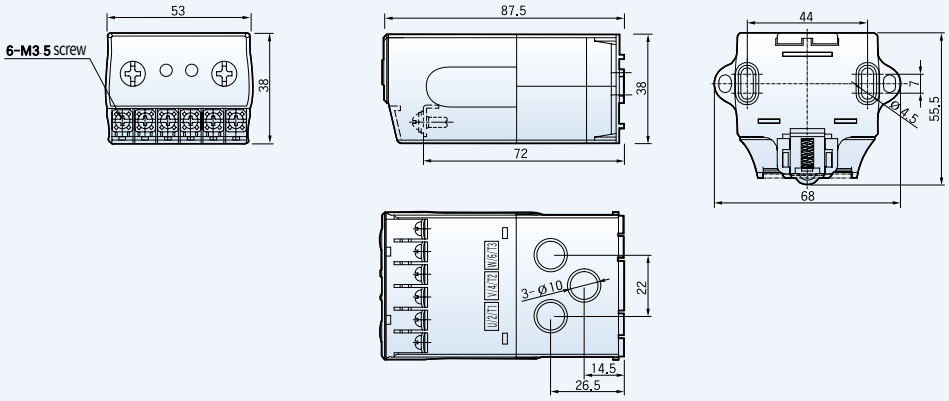
0.19kg/0.21kg



Unit : mm

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

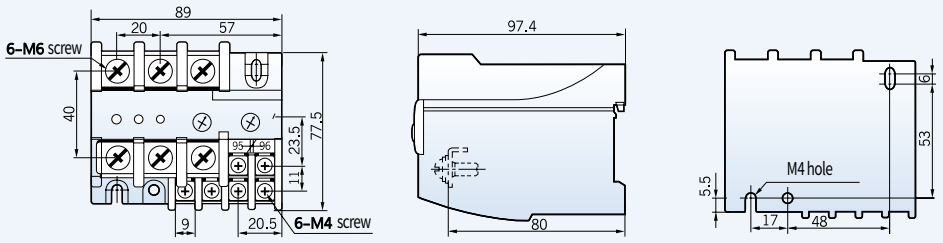
0.14kg/0.16kg



Unit : mm

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

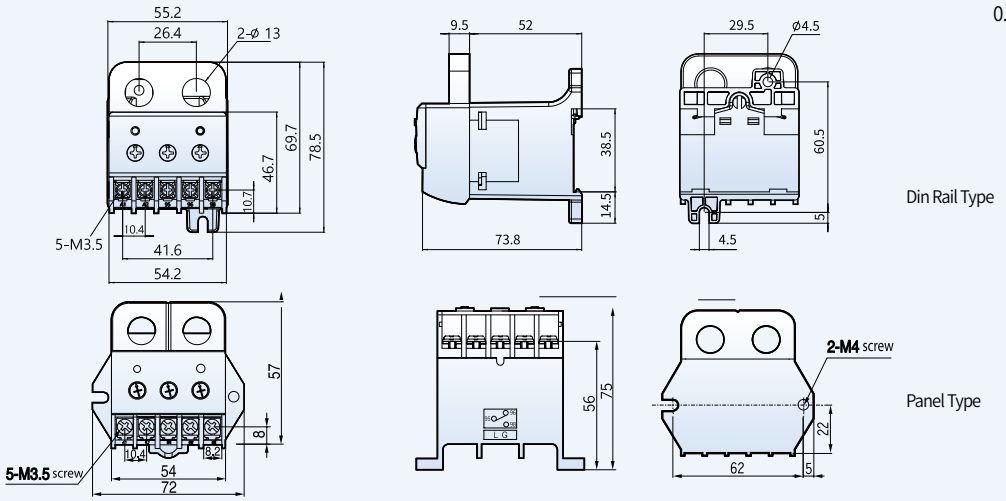
0.42kg/0.46kg



Unit : mm

GMP60T
GMP60TE
GMP60TA

0.14kg

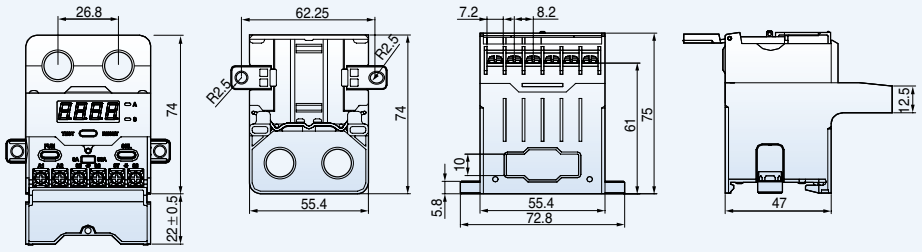


Note) If you want to use the screw directly on the panel or a combination on top of your CT, please order the product code marked with "PANEL".

Unit : mm

GMP60-TD
GMP60-TDa

0.25kg

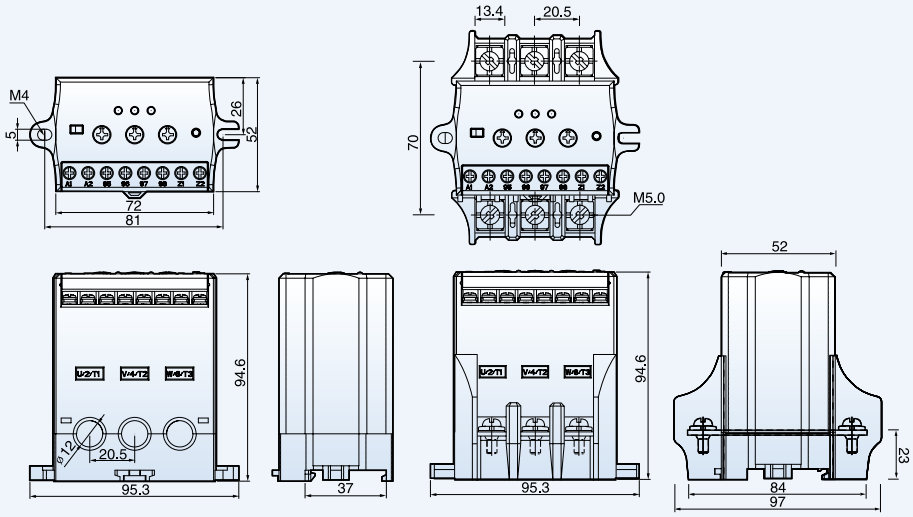


Unit : mm

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

Penetration type (Tunnel Type)

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



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

Revolutionary development of motor protection relays

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













Beyond X™ DMPi Series

Intelligent Digital Motor Protection Relays

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

Contents

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



A list of standard models

A list of standard models

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

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

Convenience



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



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



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



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



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



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



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



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



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



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

Reliability



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



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



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



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



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

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

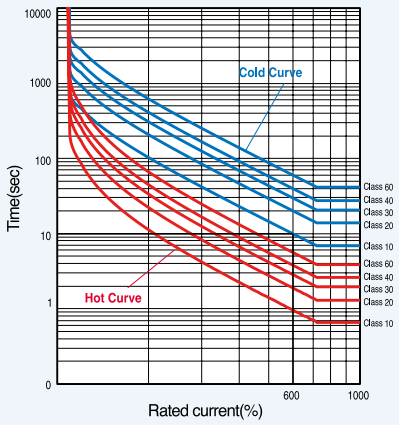
Ground fault leakage current is detected to prevent ground faults arising from electric leakage and secondary accidents (Phase faults and electric shock accidents). Current sensitivity and operating time are set differently according to the grounded system or purpose of protection. Current sensitivity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

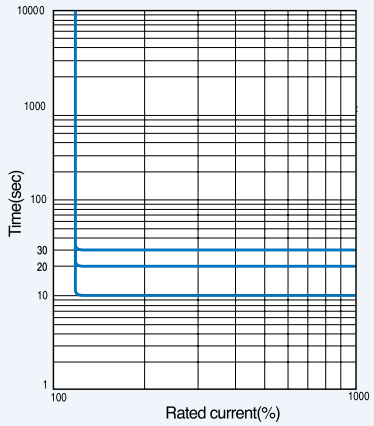
Instance

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.

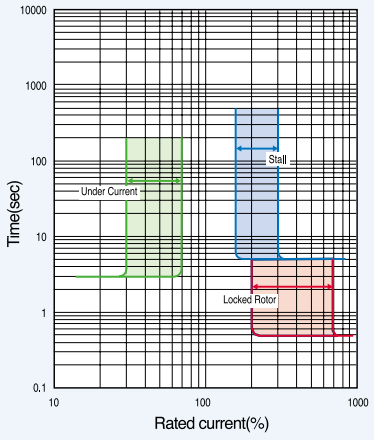
* The maximum setting value changes depending on the rated current setting.



<Inverse time characteristic>



<Definite time characteristic>

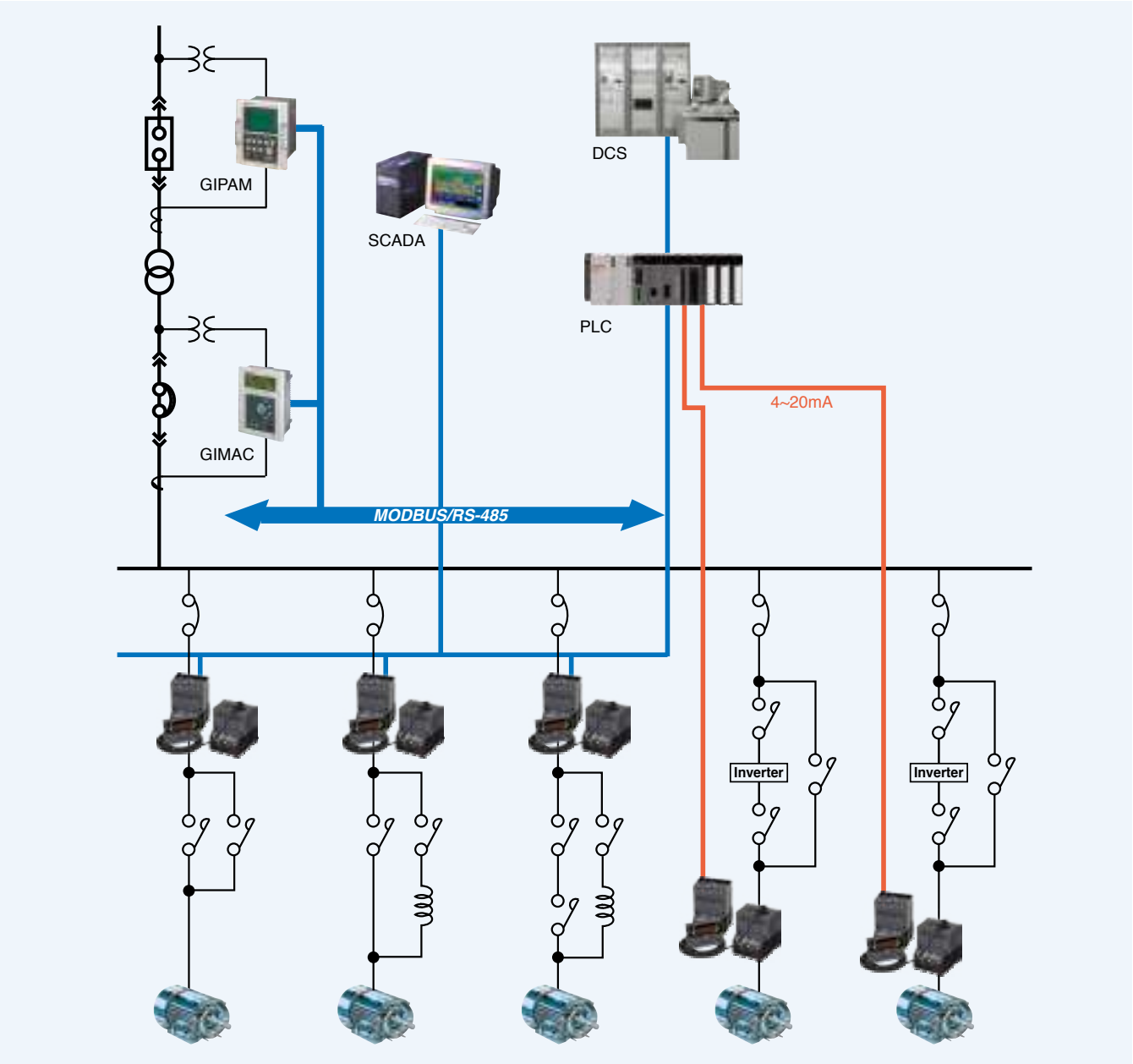


Communication function

MODBUS specifications

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

Block diagram of communication system



Analog (4~20mA) output function

Specifications

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

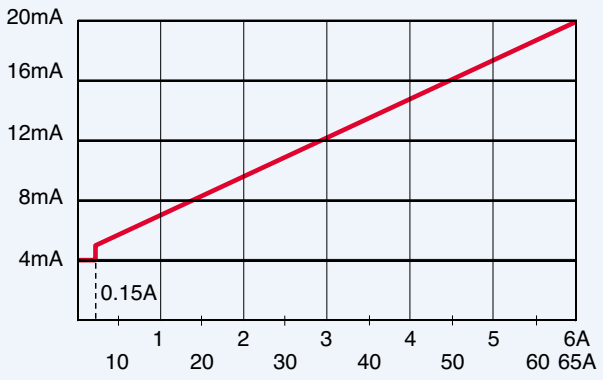
Note) 1. At the setting mode of 0.5~6A, the level of current is measured from 0.15A, so 0A is measured when less than 0.15A and the output value becomes 4mA. (When it is 0.15A, >4mA is actually measured.)
2. Measurement error based on temperature changes: ±0.15%/°C (Based on the room temperature of 25°C)

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

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

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

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



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

Rated specifications

Connection method		Penetrated / Terminal type
Protection functions		Overcurrent, phase fail, phase unbalance, stall, locked rotor,reverse phase, ground fault (Type option)Instance (Type option)
Connection method		Penetrated / Terminaltype
Operating time characteristics		Thermal heat build-up inverse time / Non-thermal heat build-up inverse time / Definite time
Rated current		0.5~6A/5~65A(Rating option upon placing an order)
Display		4 digit, 7-Segment
Operating power		AC/DC 85~260V, AC/DC 24V(50Hz/60Hz)
Reset method	Automatic	1~20min (only for overcurrent)
	Manual	(Electrical reset)
Installation / Mounting method		Display can be installed separately, 35mm DIN rail / Screw installation
Tolerance	Current	±3%
	Time	±5%
	4~20mA output	±5%
Time setting	Startup delay	1~200sec
	Operation delay	1~60sec
Aux. contact	Composition	3-SPST(Power supply 1a1b, i nstantaneous operation 1a) Note1)
	Capacity	3A/250VAC Resistive Load
	Contact minimum load	100mA / 6VDC : (95-996, 97-98)
		10mA / 5VDC (07-08)
ZCT Input	External	200mA/100mV(Exclusive ZCT) Note2)
	Built-in	Support (Separate connection unnecessary Note3)
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		1.2 X 50μs 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

DMP	06i	S	Z	I	M	AC/DC85~260V, AC/DC24V	2a1b
	Rated current	Connection method	Ground fault	Additional function	Communication	Operating voltage	Auxiliary contact
	06i 0.5~6A	S Terminal type	- None	- Alarm	- None	AC/DC85~260V	2a1b
	65i 5~65A	T Penetrated type	Z External ZCT	I + Instance	M RS485 MOD	AC/DC24V	
			B Built-in ZCT		A 4~20mA		

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

"I" models have an additional instance protection function.

Note) Contact state when power is applied.
95-96: b (modifiable in menu items)
97-98: a (modifiable in menu items)
07-08: a

*When using Display separately, please purchase a dedicated cable as well. (See Other Options)
*Please ensure that at least one of the R, S, and T phases carries a current above the minimum rated value during the ground fault protection test.
*For unbalanced loads, selecting an external ZCT model allows for both unbalance and ground fault protection.

Operation & setting method

Display explanation



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

Operation & setting method

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

1. Check the test / Reset button.

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

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

2. Setting method

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

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

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

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

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

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

3. How to check the failure history

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

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

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

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

4. Operating time setting

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

5. Total operating time and operating time check

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

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

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

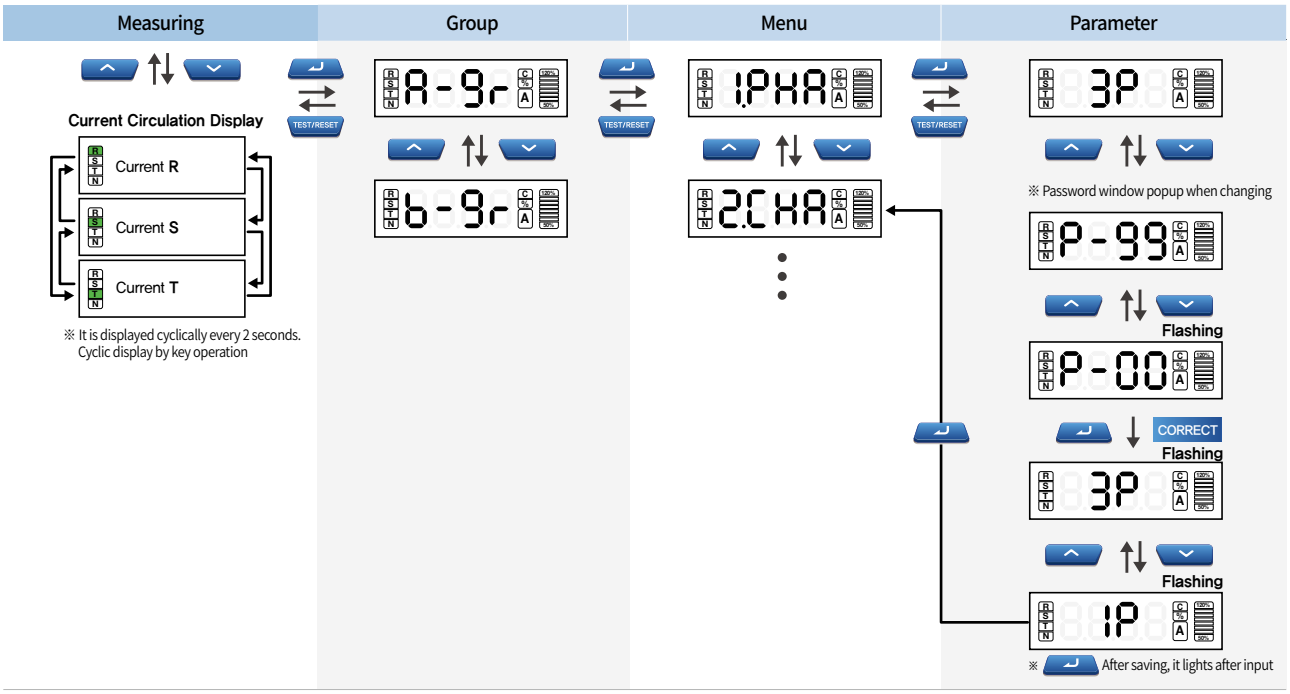
1) When the operating characteristics of A Group 2.CHA are set in the thermal heat build-up mode (th)
2) When the Test/Reset key is pressed under overload trip to return and then a motor is driven right away, the motor will be hot. Thus, trip is immediately performed.
3) On the other hand, when the Enter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

Operation & setting method

7. Three-phase current circulation display

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

Menu configuration



Information display

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

A-Group

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

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

Operation & setting method

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

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

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

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

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

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

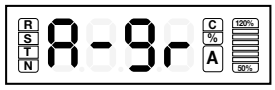
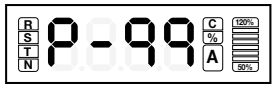
B-Group

Group	Display	Setting item	Setting value (Display value)	Single phase Note1)	Default	Remarks Note4)
B	ltrt	Total operating time	0~9999day/0~23Time/0~59min	O	-	
	2r-t	Operating time	0~9999 Time/0~59min	O	-	
	3Srt	Operating time setting	Off/10~8760	O	Off	
	4S-d	Date setting Note2)	2017~2100yea/1~12month/1~31day/ 0~23hour/0~59min	O	2017.07.01 00:00	
	SA-r	Automatic reset Note3)	Off/1~20min	O	Off	w
	bAdr	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	
	6t-d	20mA setting	0.5~6/5~65	O	6/65	Displayed only for A420 model

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

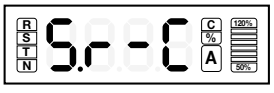
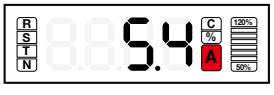
Phase setting

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

	The DMPi main screen display (0.00A)
	1. Press Enter from the main screen. (A-gr)
	2. Press Enter from the A-gr screen. (1. PHR)
	3. Press Enter from the PHR screen and the initial value 3P will be displayed.
	4. Here, use the Up / Down key to display P-99 from the screen. Change it into P-00 with the Up/Down key and press Enter. You are now ready for setting. (Only required for initial setting)
	
	5. The set value flickers. Use the Up / Down key to display 'phase' that is applicable depending on the motor specifications (1P: single-phase; 3P: three-phase). Then, press Enter to save the setting. (1P) 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.

• Load Below 0.5A Range
- In [5.Cr] setting, set the CT ratio to 0.5 or 0.25
- Increase wire passing count by 2 ~ 4 times
- Rated current range: 0.25~3A(2 times), 0.125~1.5A(4 times)

• Load over 65A
- Use a separate external CT
- In [6.Cr] setting, set the CT ratio to 1~200: maximum 1000A
- If the CT ratio is set first in [5.Cr], it is displayed based on the primary side of the external CT

Ex) If CT ratio is set 40 in [6.Ctr] by using the external CT 200/5, [5.r-C] displays 20~240.
- When setting [6.Ctr] later, [5.r-C] is displayed based on the secondary side of the external CT, but it is automatically indicated as matching after setting CT ratio.

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.

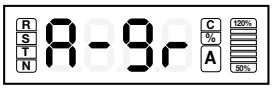
Operation & setting method

Overcurrent operating characteristic setting

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



The DMPi main screen display (0.00A)



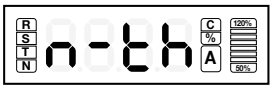
1. Press Enter from the main screen. (A-gr)



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

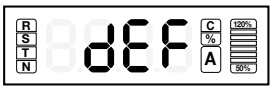


3. Press the Up-key menu once from the PHR screen. (2.CHA)



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.



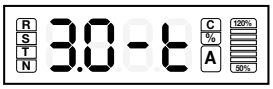
The DMPi main screen display (0.00A)



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).



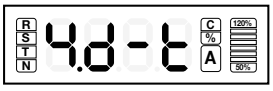
The DMPi main screen display (0.00A)



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.
Note 2) Please ensure that at least one of the R, S, and T phases carries a current above the minimum rated value during the ground fault protection test.
Note 3) For unbalanced loads, selecting an external ZCT model allows for both unbalance and ground fault protection.

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.

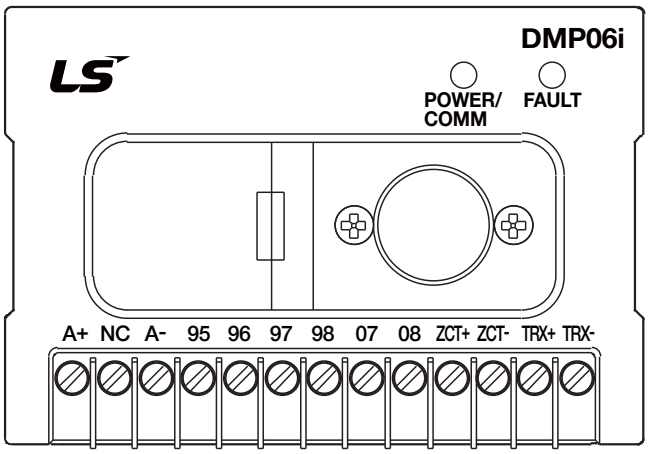
Ground fault delay time setting

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.

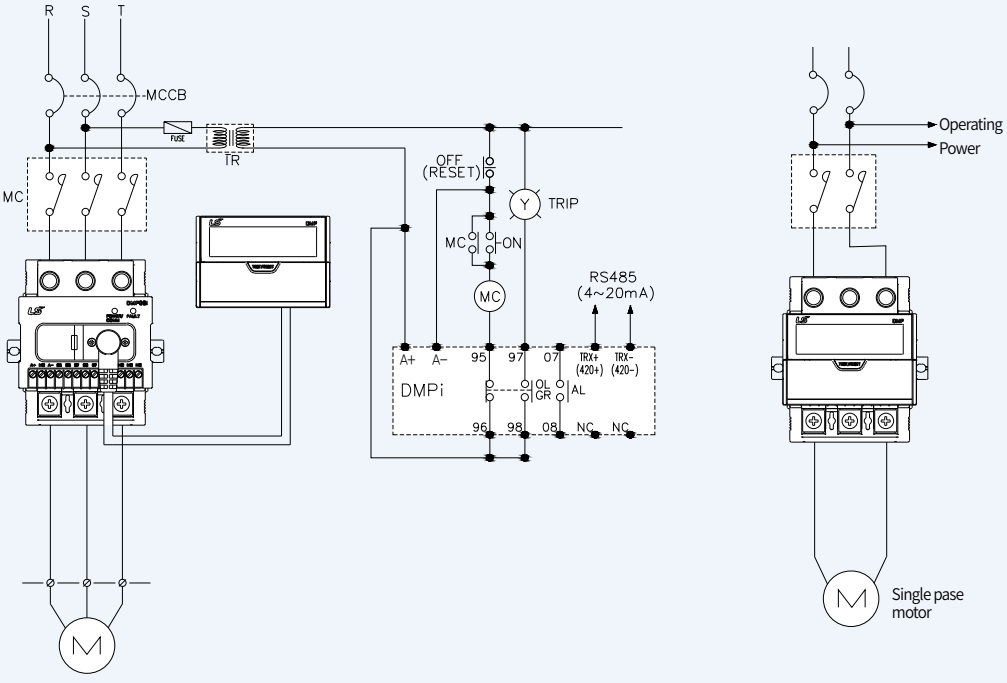
Terminal configuration



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

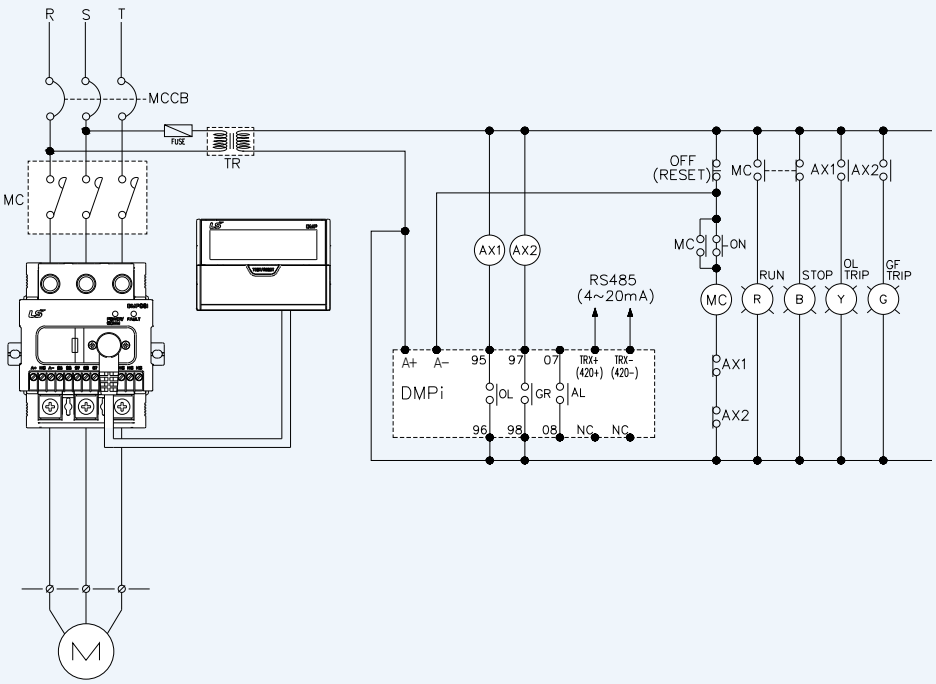
DMPi-B built-in ground fault protection type (1a1b)

DMPi-SB/TB



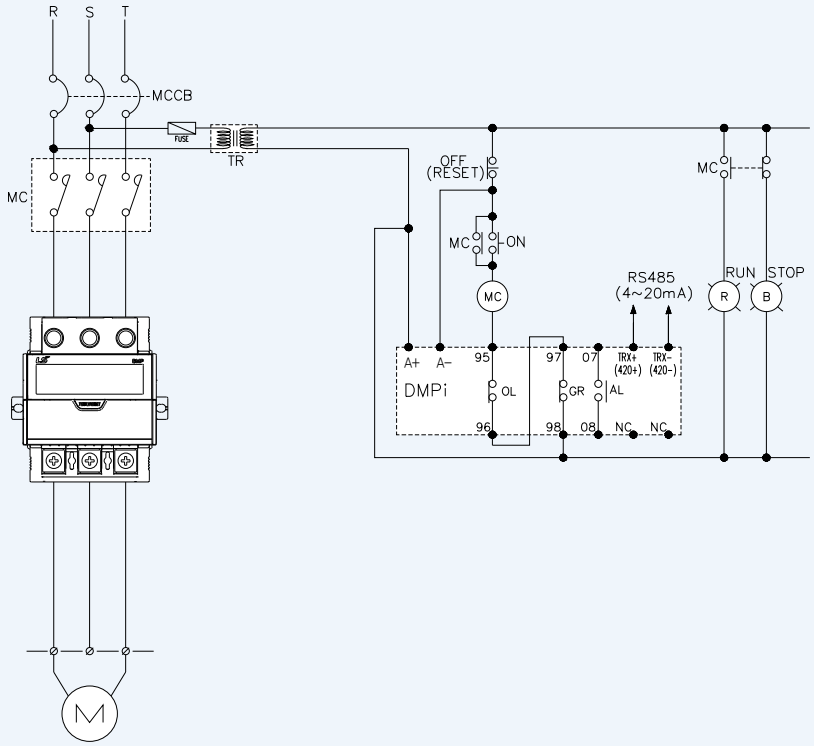
DMPi-B built-in ground fault protection type (2a)

DMPi-SB / TB



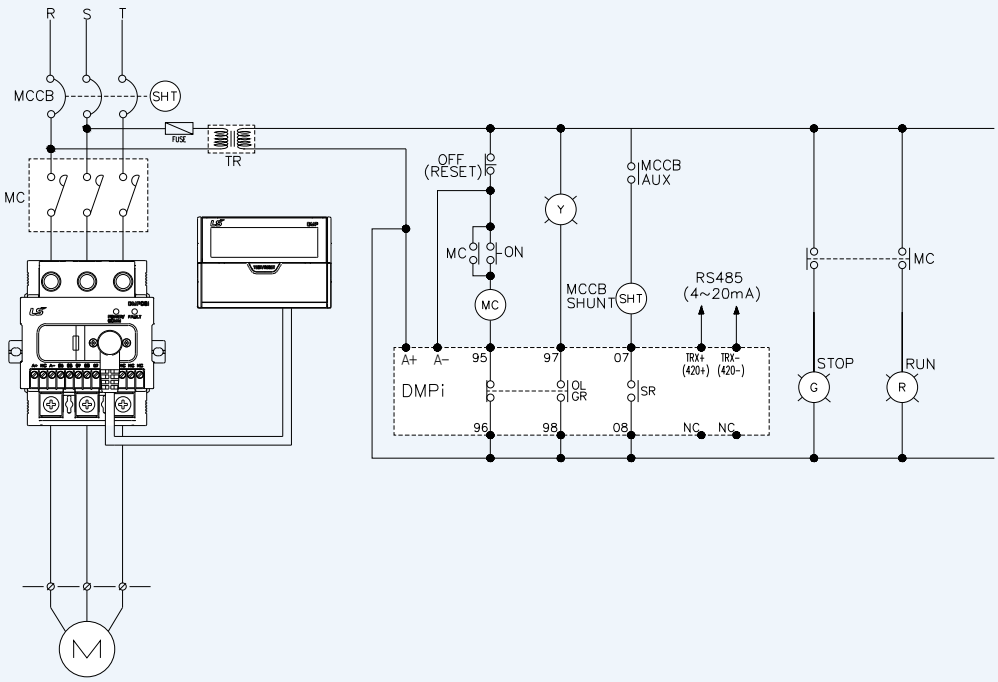
DMPi-B built-in ground fault protection type (2b)

DMPi-SB / TB



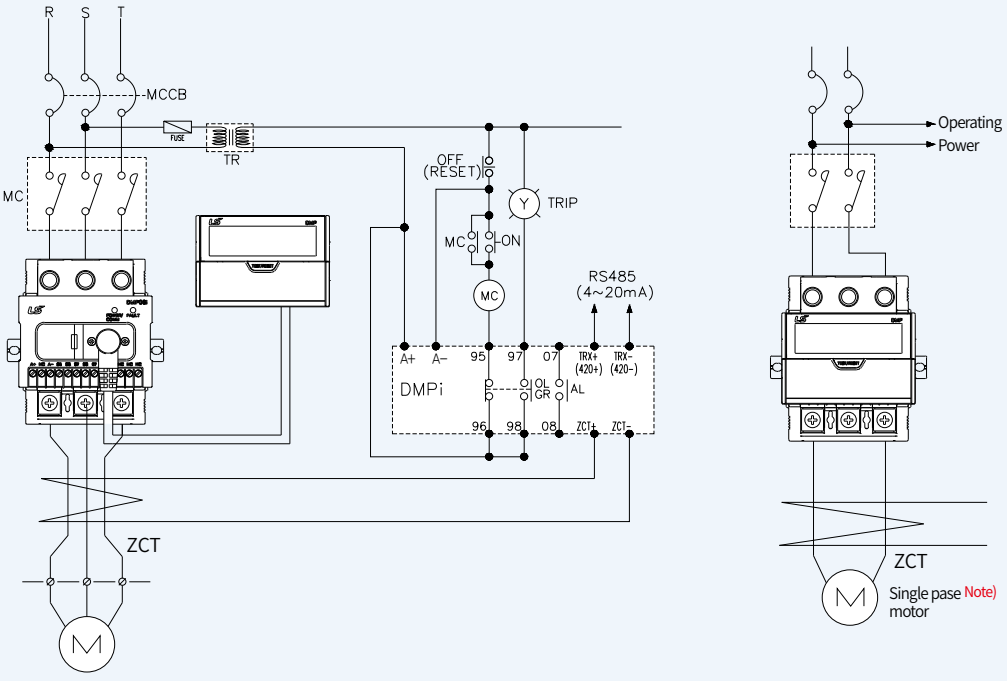
DMPi-SBI / TBI, SI / TI built-in instant short-circuit protection type (1a1b)

DMPi-SBI / TBI
DMPi-SI / TI



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

DMPi-SZ / TZ

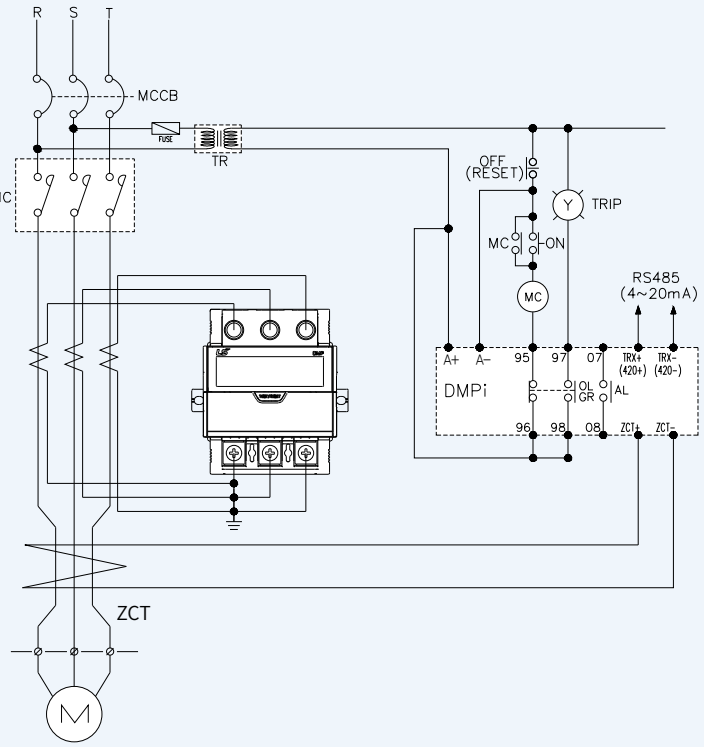


Note) 1. R-phase must be penetrated when connecting a single-phase motor. (Although there are S, T-phase CT in the product, values are measured based on R-phase.)

Terminal configuration / Wiring & cable connection

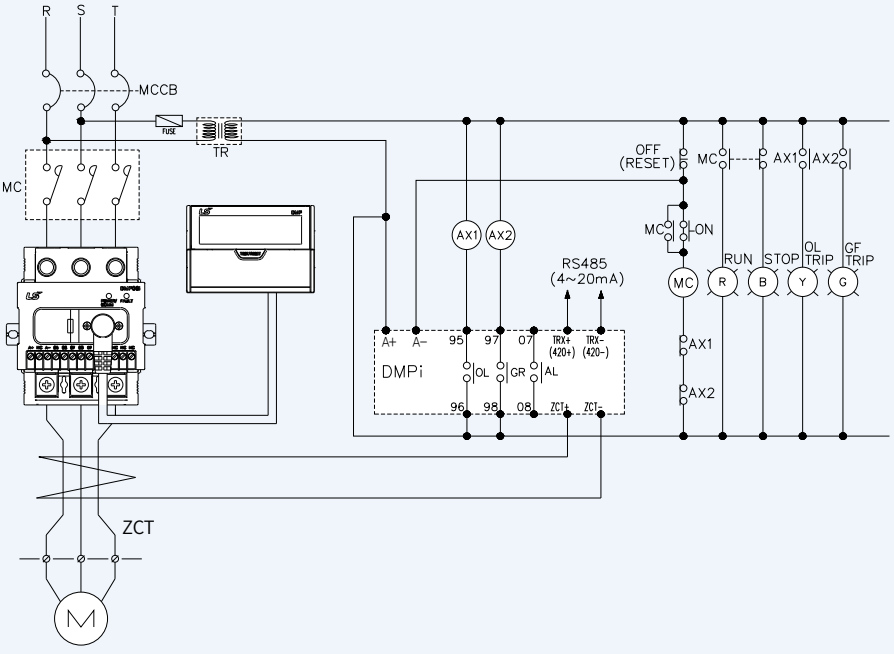
DMPi-SZ / TZ external ground fault protection type (1a1b large-capacity motor applied with external CT)

DMPi-SZ / TZ



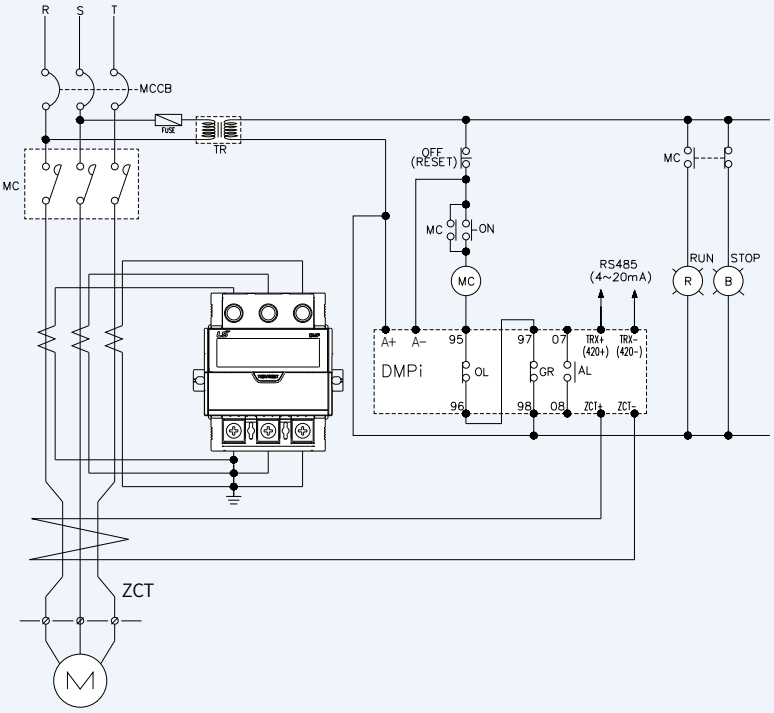
DMPi-SZ / TZ external ground fault protection type (2a)

DMPi-SZ / TZ



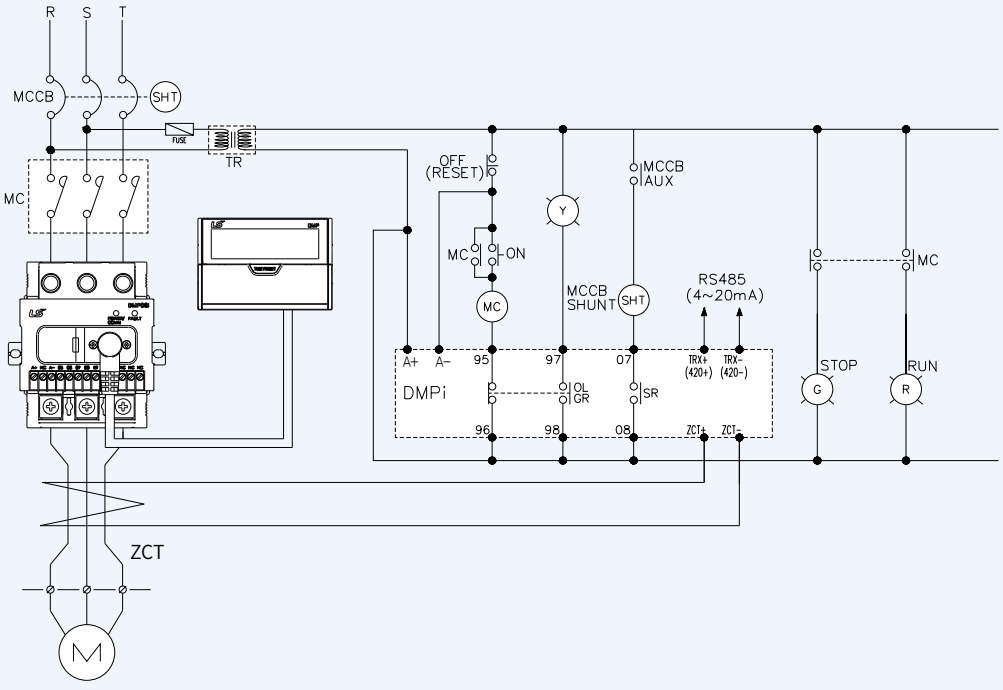
DMPi-SZ / TZ external ground fault protection type (2b)

DMPi-SZ / TZ



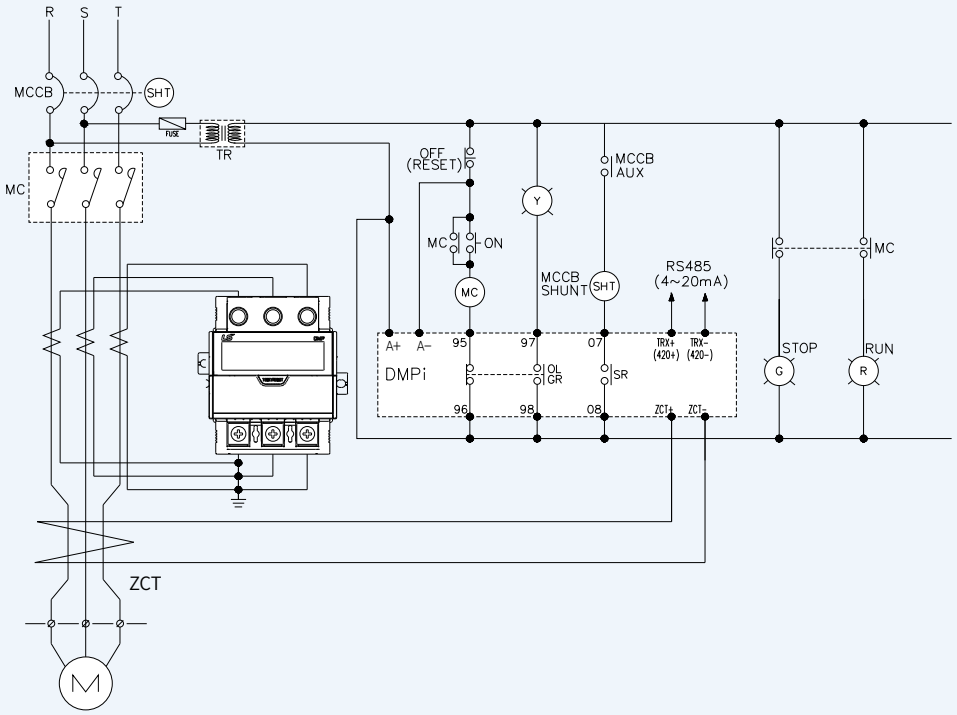
DMPi-SZI, TZI instant short-circuit protection and external ground fault protection type (1a1b)

DMPi-SZ / TZI



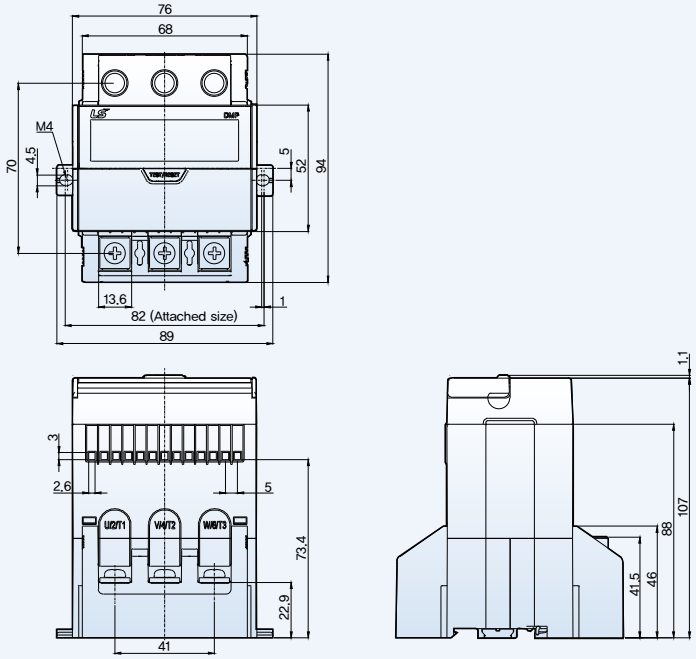
DMPi-SZI, TZI instant short-circuit protection and external ground fault protection type
(1a1b large-capacity motor applied with external CT)

DMPi-SZ / TZI

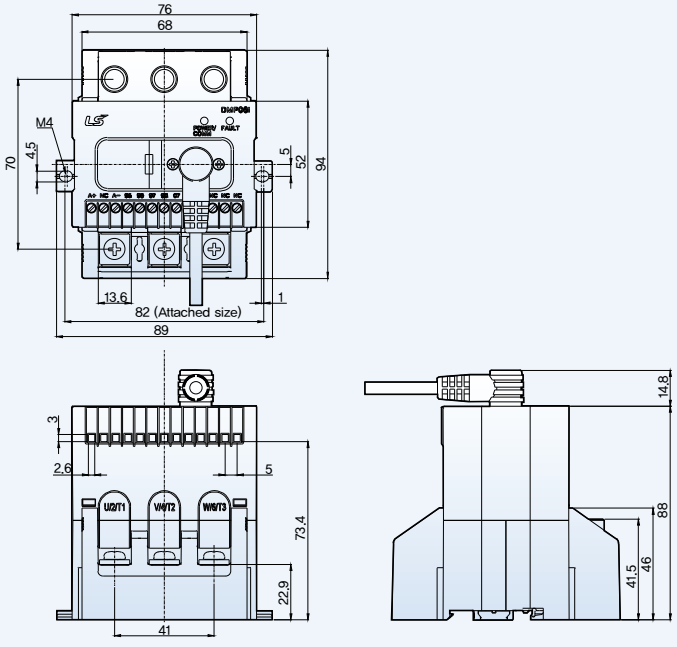


Unit : mm

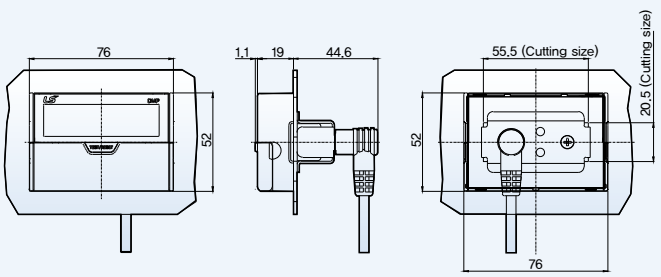
Integrated terminal type



Separated terminal type



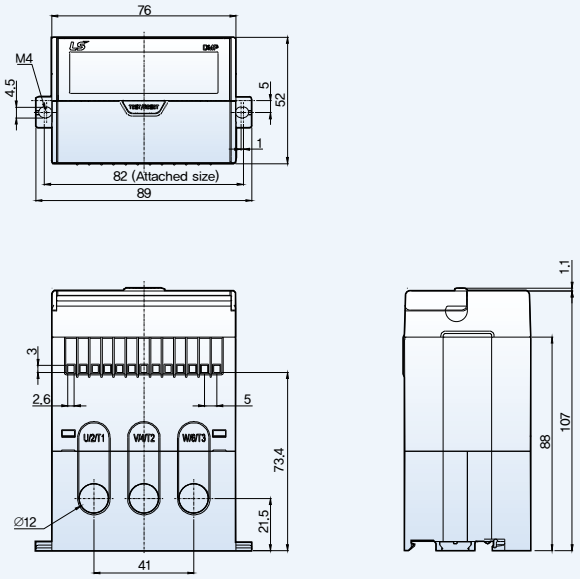
Panel insertion



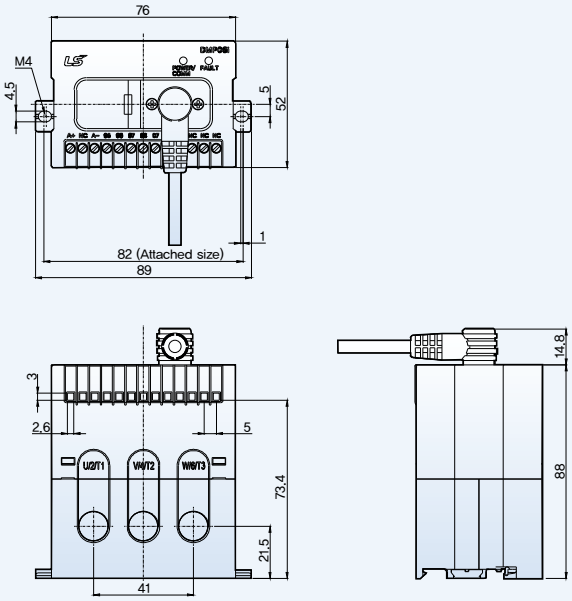
Dimensions

Unit : mm

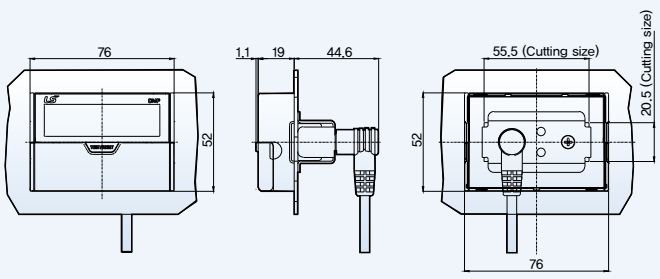
Integrated penetration type



Separated penetration type



Panel insertion



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.







Beyond X™ IMP Series

Intelligent Motor Protection Relays

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

Contents

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

Product characteristics

Convenience



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



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



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



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



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



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



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



Password
Settings are protected with a password.



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



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



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

Reliability



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



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

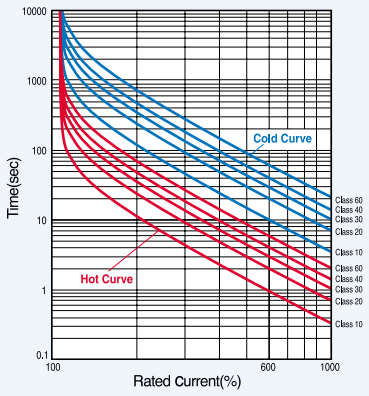


Wide Current Setting Range: 0.125~100A for One Model
With the slide S/W, the current setting range can be decided 0.5~10A or 5~100A. Depending on the number of CT penetration, even 0.125A current can be protected. (Wire penetration hole is required).

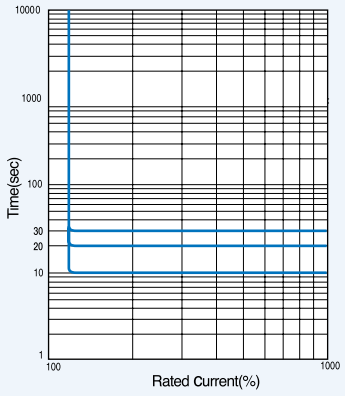
Overcurrent-51

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

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



<Inverse Time Characteristic>



<Definite Time Characteristic>

Stall/Locked Rotor-48/51LR

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

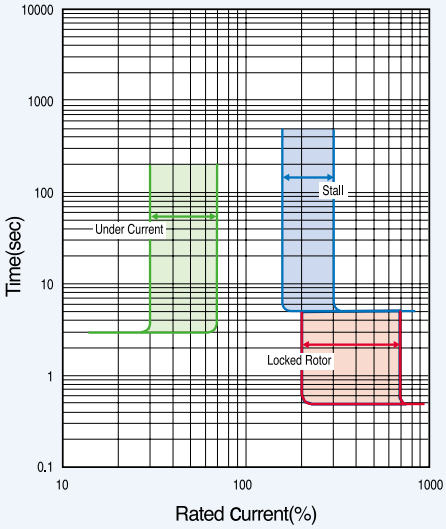
Under current-37

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

Phase fail/Phase unbalance-47P

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

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



Reverse phase

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

Ground fault-51G

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

Rated specifications & model numbering system



Integral type



Extention type

Rated specifications

Protection		Over current, Lock/Stall, Phase failure, Phase unbalance, Reverse phase, Under current, Ground fault, Short circuit
Connection method		Extention type
Operating Time Characteristics		Heat accumulation inverse time / inverse time / definite time
Rated current		0.5~10A/5~100A (Separate)
Display		4digit, 7-Segment
Operating power		AC/DC 85~245V (50Hz/60Hz)
Return method	Auto	1~20min
	Manual / Electrical	On/Off Selectable
Installation / installation method		Display can be installed separately, 35mm DIN rail / Screw installation
Tolerance	Current	±5%
	Time	±5%
	4~20mA Output	±5%
Time setting	Startup delay	1~200sec
	Operation delay	1~60sec
Aux. contact	Configuration	3-SPST(Power supply 1a1b, instantaneous operation 1a) Note1)
	Capacity	3A/250VAC Resistive Load
	Contact minimum load	10mA / 5VDC
ZCT Input		200mA/100mV (Exclusive ZCT) Note2)
Environment	Operation	-10~55°C
	Storage	-20~70°C
	Relative humidity	within 80% RH, no condensation
Insulation Resistance		100Mohm/500VDC
Impulse voltage		1.2X50μs 5kV Prototype waveform supply
Fast Transient		2kV/1Min
Power consumption		Below 3W

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

Model numbering system

IMP — C — A420 — 10A — 110/220

Factors Protected	
C	Current

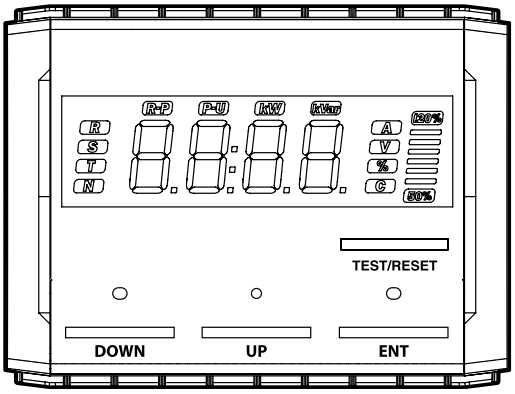
Communication	
NO	None
A420	4~20mA Output
M485	Modbus/RS-485

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

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

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

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

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

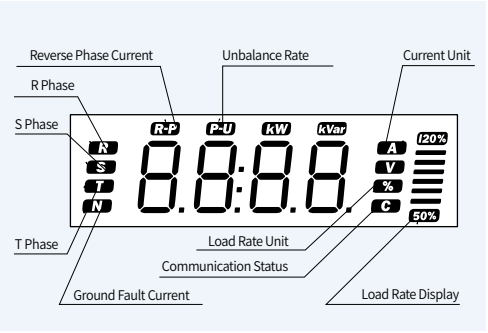
Setting menu (B Group)

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

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

Operation display

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



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

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

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

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

8.Analog (DC 4~20mA) output

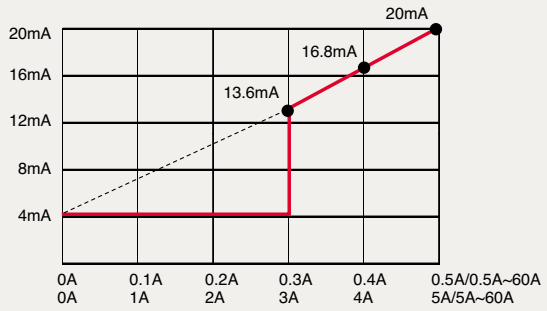
1) The biggest current out of measured 3-phase currents is converted into DC 4mA~20mA and the current measured remotely by digital meter can be displayed.
2) When there is no current, 4mA is sent. If the current goes beyond the predefined value, 20mA is sent.

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

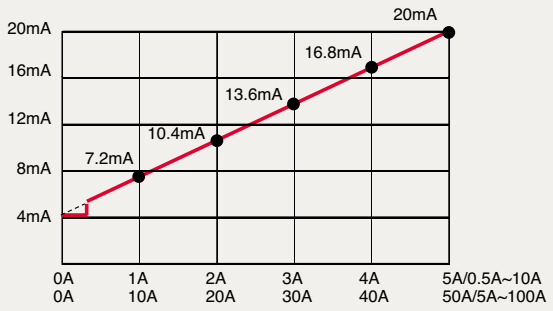
3) When the system is the 0.5A~10A setting mode, measurement starts from 0.3A. When the system is the 5A~100A setting mode, measurement starts from 3A. Thus, when the current is under 0.3A (3A), 0A is measured and output is 4mA. (To measure the load current correctly, an appropriate CT should be used).

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

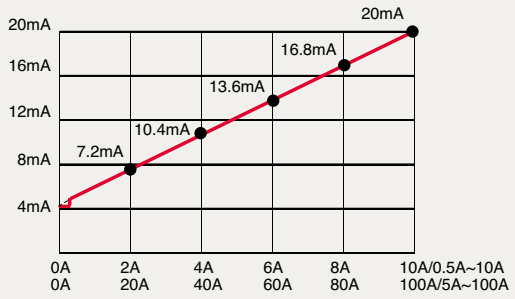
Analogue output when the output is set to be 0.5A (5A)



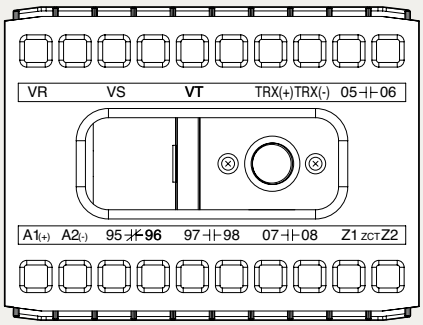
Analogue output when the output is set to be 5A (50A)



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

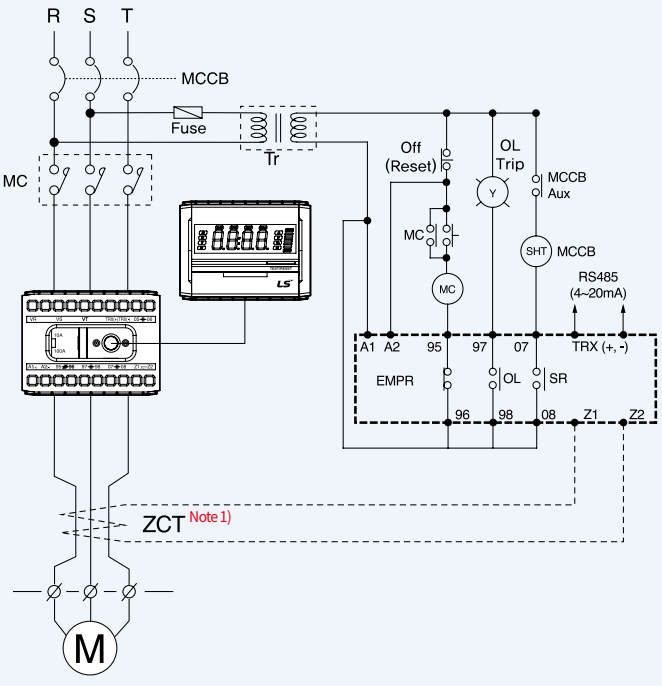


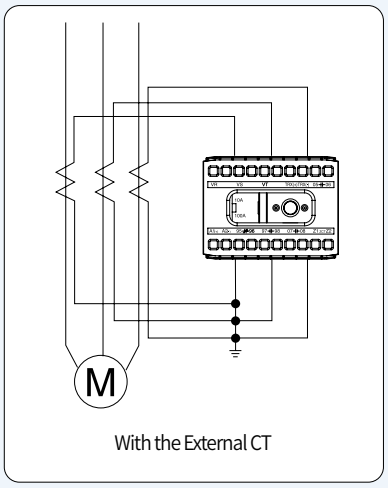
Terminal configuration

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

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

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





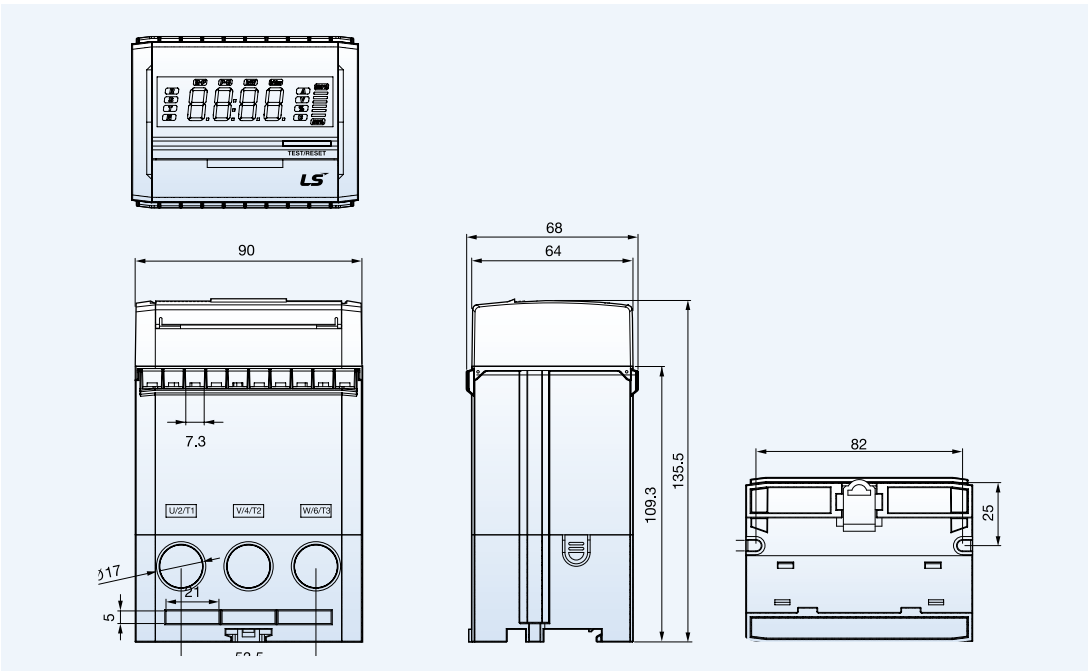
With the External CT

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

Dimensions

One-body type

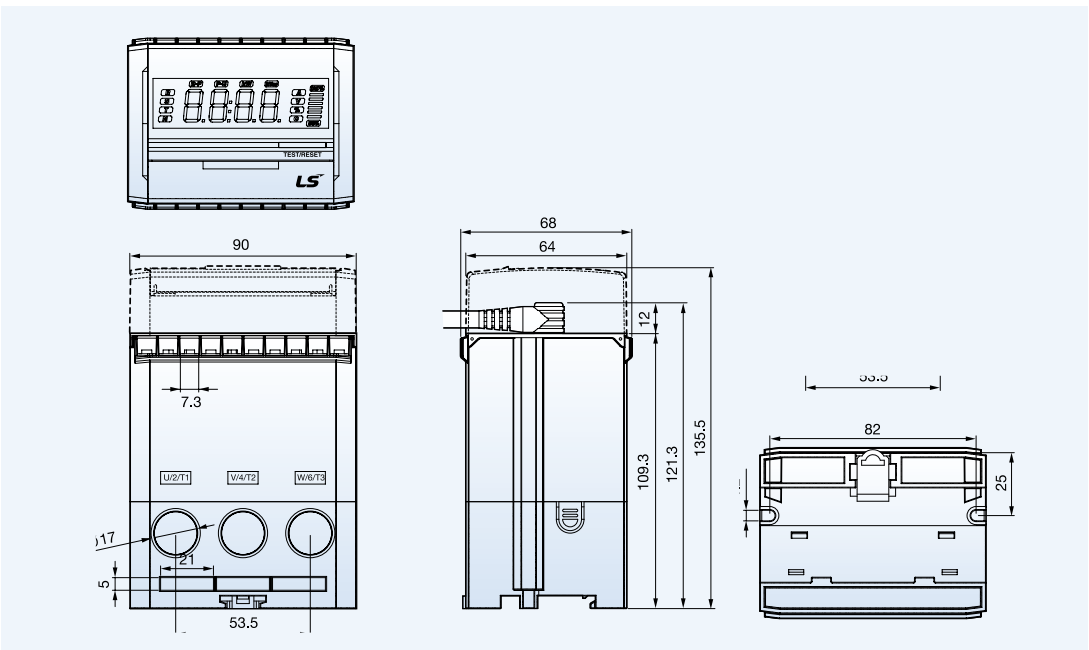
Unit : mm

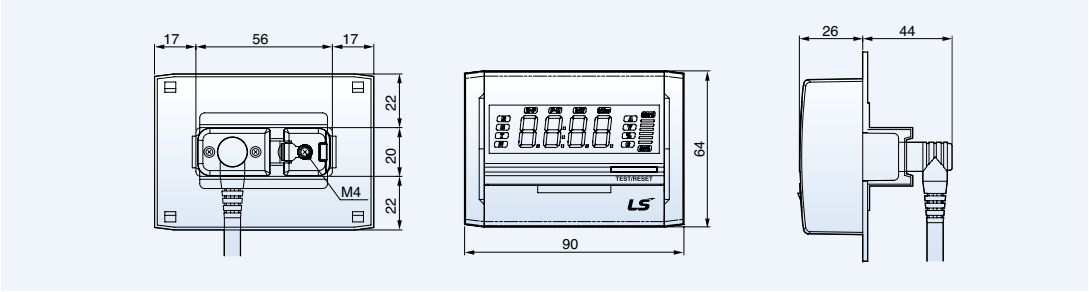


Note) The cable should be purchased separately (1m/1.5m/2m/3m).

Separate body type

Unit : mm





Innovative Upgrade of Motor Control Panel!

More compact and Safer! We implement perfect motor protection.



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

One model with various motor starting types

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

A variety of SCADA functions based on sequence structure

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



Beyond X™ MMP Series

Smart Electronic Motor Protection Relays

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

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87 Operation & setting method
99 Terminal configuration / Wiring & cable connection
105 Dimensions

Product characteristics

Convenience



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



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



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



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



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



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



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



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



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

Reliability



Thermal heat build-up inverse time/inverse time/definite time selection function
It is possible to select one of two types of inverse time and definite time in order to protect a motor perfectly.



Wide setting range and Dual protection
Providing Ground fault protection by dual detections -Zero-phase current and Residual current levels.



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



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



Metering of Current, Voltage and Energy (with 1% accuracy for A & V)
Real-time energy metering with high accuracy for monitoring energy consumption 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_2)	0.00A~9999A	±3.0%	-
Active power(W)	0.000W~999.9MW	±1.0%	Forward
Reactive power(VAR)	0.000W~999.9MVAR	±1.0%	Forward
Active power amount(WH)	0.000W~999.9MWH	±1.0%	-
Reactive power amount(WVARH)	0.000W~999.9MVARH	±1.0%	-
PF	-1.00~1.00	±0.03	cosθ
Voltage hamonics(%)	0~100%	±5.0%	2^{nd} -16^{th} odd harmonics
Current hamonics(%)	0~100%	±5.0%	2^{nd} -16^{th} odd harmonics
Insulation Resistance	0.2MΩ~50MΩ	±10%	-
Motor temperature	-50°C~200°C	±10%	-

Current protection

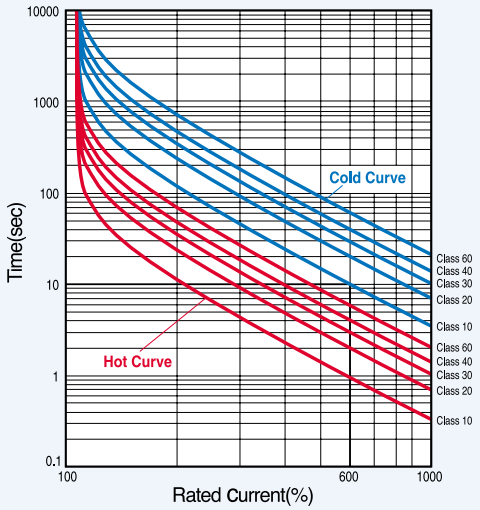
Over current

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

1) Inverse-time delay curve

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

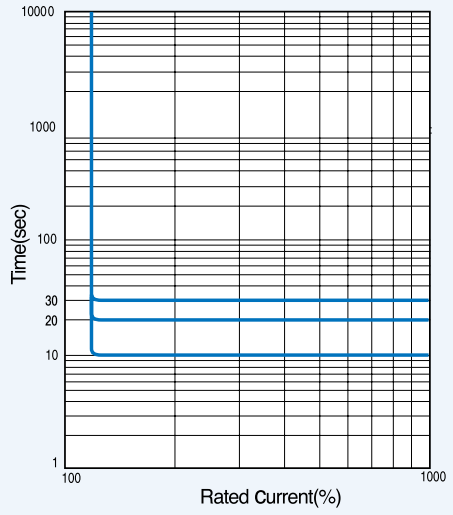
Inverse-time delay curve



2) Definite-time delay curve

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

Definite-time delay curve



Stall/Locked rotor

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

Phase fail/Phase unbalance

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

Product characteristics

Reverse phase

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

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

Under current

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

Ground fault protection

Ground fault

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

Zero-phase ground current

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

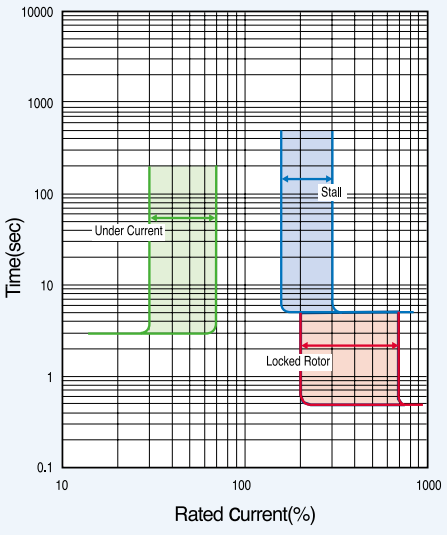
*When applying external CT with a large capacity motor, be sure to use an external ZCT

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.

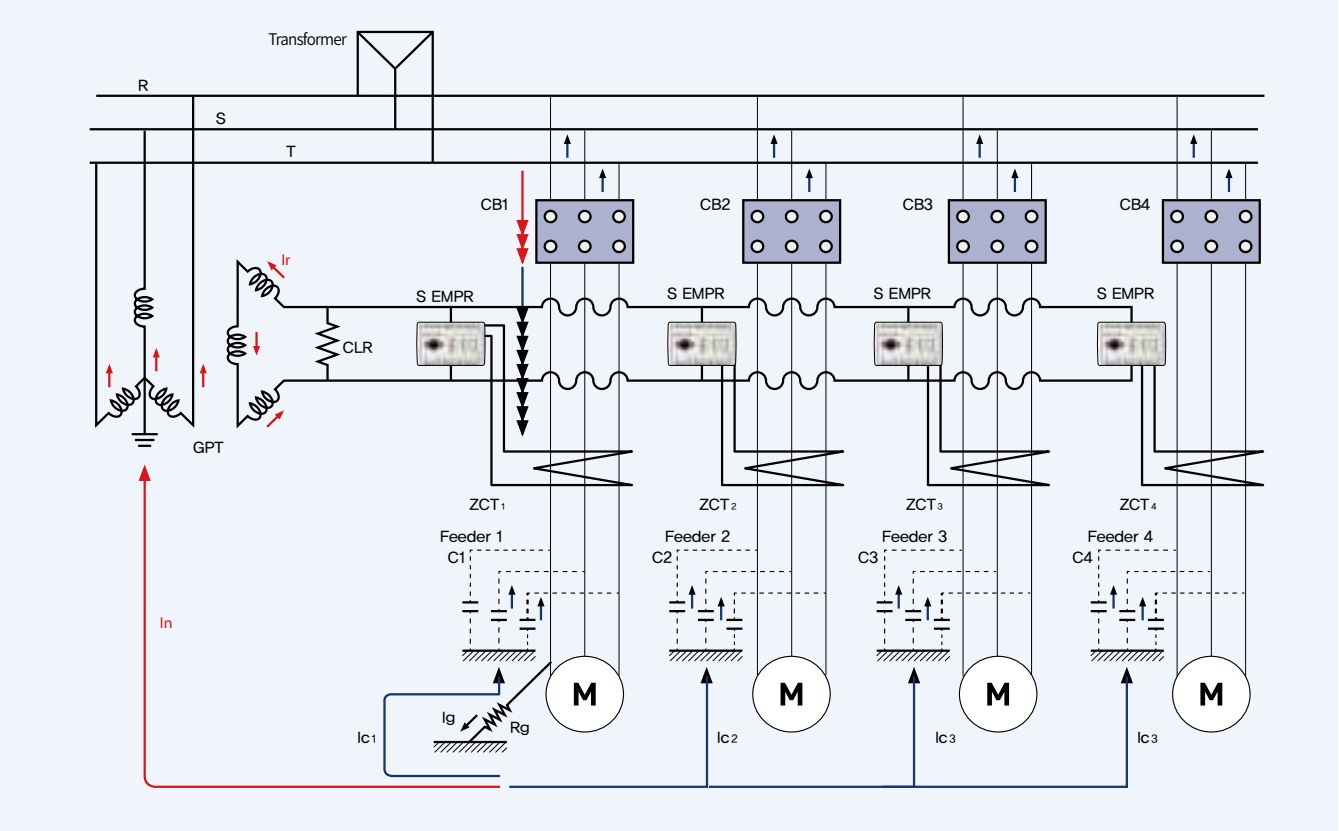
Instance

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.



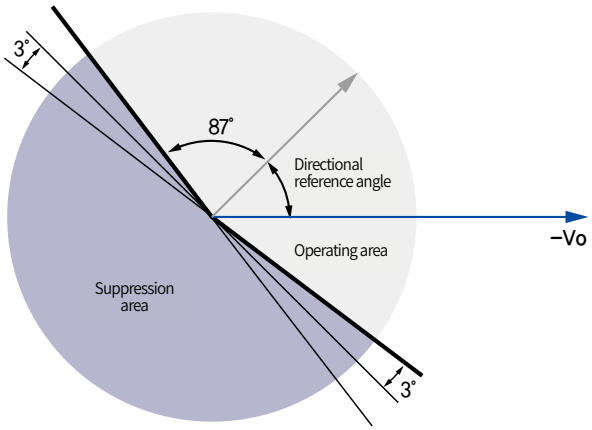
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❶ - GPT : Grounding Potential Transformer
❷ - ZCT1, ZCT2, ZCT3, ZCT4 : Zero current transformer
❸ - CLR : Current-limiting resistor
❹ - CB : Circuit breaker
❺ - In : Current over GPT
❻ - S-EMPR MMP S : Smart digital motor protection relay
❼ - Ir :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

Operating characteristic



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

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

Voltage & Power protection

Over current

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

Under voltage

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

Phase fail/Phase unbalance

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

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

This function is disabled under a single-phase mode.

Reverse phase

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

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

Over power

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

Under power

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

Over power factor

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

Under power factor

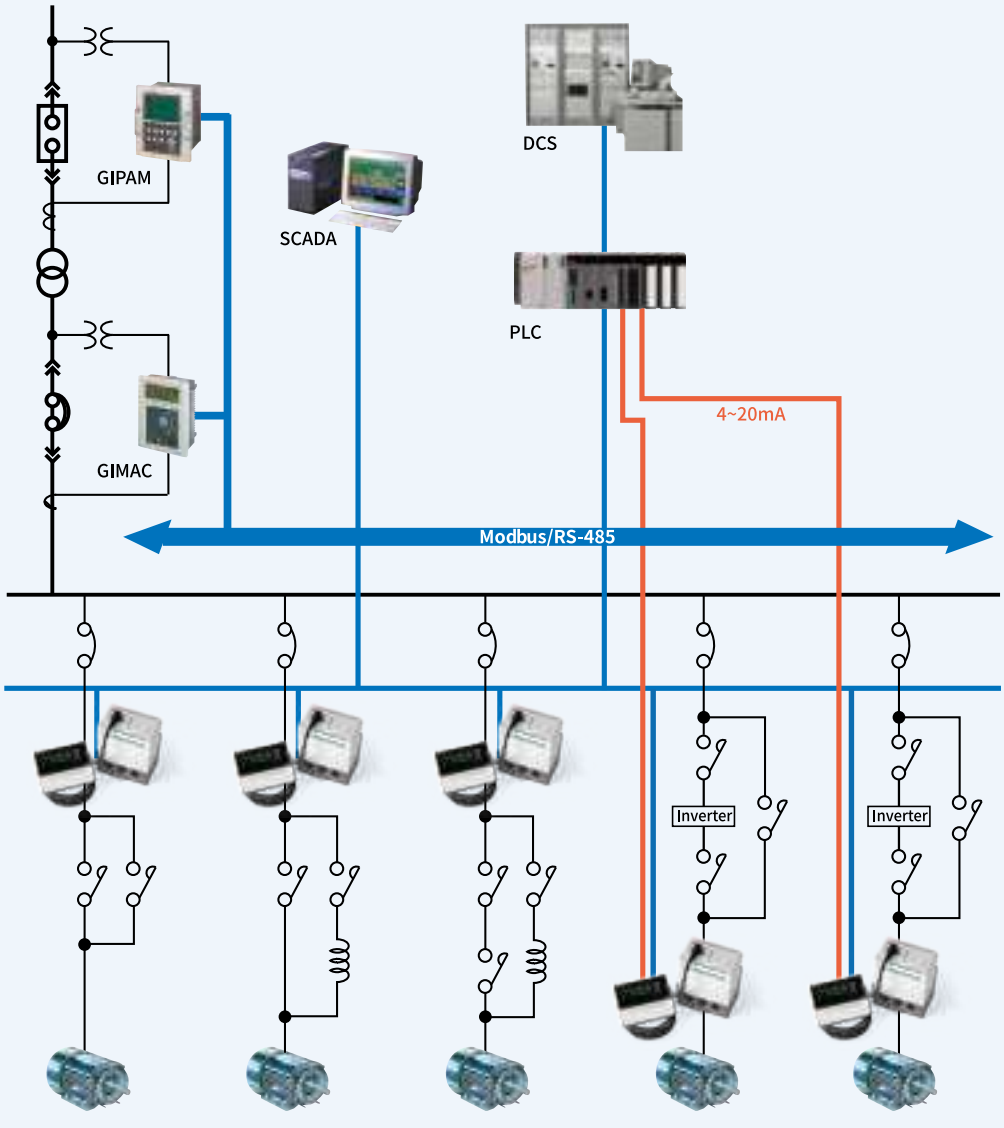
The under power factor element operates if the power factor falls below the setting level.
If the power factor of a customer falls below that of a generator in a power plant the generator current increases over the rated current or the power output is limited. For this reason, the power factor of a customer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

Communications

Modbus specification

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

Communication system configuration



Analog (4~20mA) output function

Specification

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

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

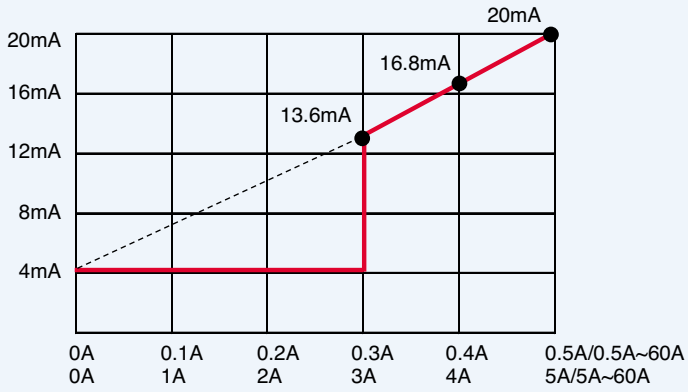
Note) 1. In the 0.5~10A setting mode the device starts to measure from 0.15A, which means the current 0.15A or less is measured as 0A and the output becomes 4mA. (0.15A when one> 4mA is being a real measurement)
2. Accuracy at 25℃ : ± 0.15% / ℃

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

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

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

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



Analog output for 10A (100A) output setting

Instantaneous blackout compensation and restart delay function.

Instantaneous blackout

1) If the Line Voltage is less than the fault detection voltage (fault detection voltage is 65-75%) and blackout occurs within 30s the system will compensate the previous state after reclosing.

Reclosing Delay Time

1) If the Line Voltage recovers within the fault compensation time and above the recovery detection voltage, the system will reclose.
2) To prevent overload when reclosing, the delay time can be set from 0 to 300 seconds, allowing for sequential reclosing.
3) The HMI displays a countdown during reclosing.

Upon Power Restoration After an outage

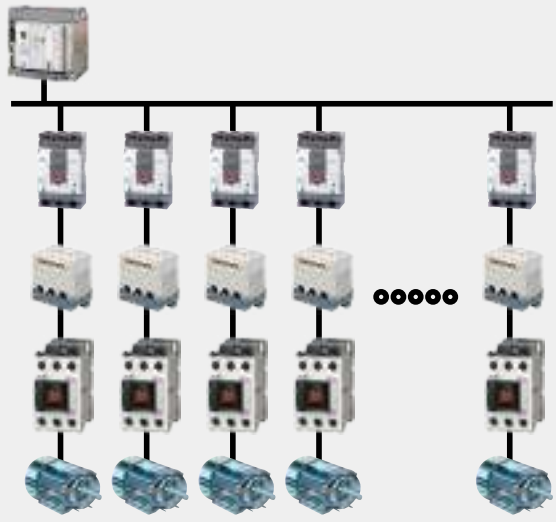
1) Allows for stable operation with sequential reclosing
2) Reduces the inconvenience of manual engagement.

Advantage

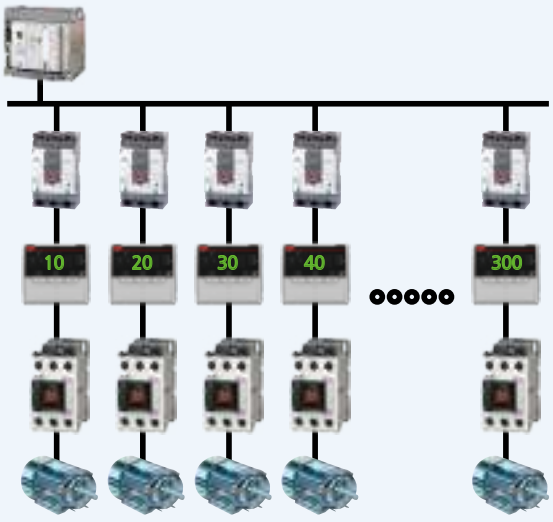
1) Sequential restart -> prevent to cut off the ACB and provide stable motor driving.
2) Reduced hands(workload) from self-start works.

Applicable environment – On the wide field

existing
- Total motor restart => ACB OCR TRIP
- Take time to turn on the motors again.



After application
- Restart sequentially after restoration



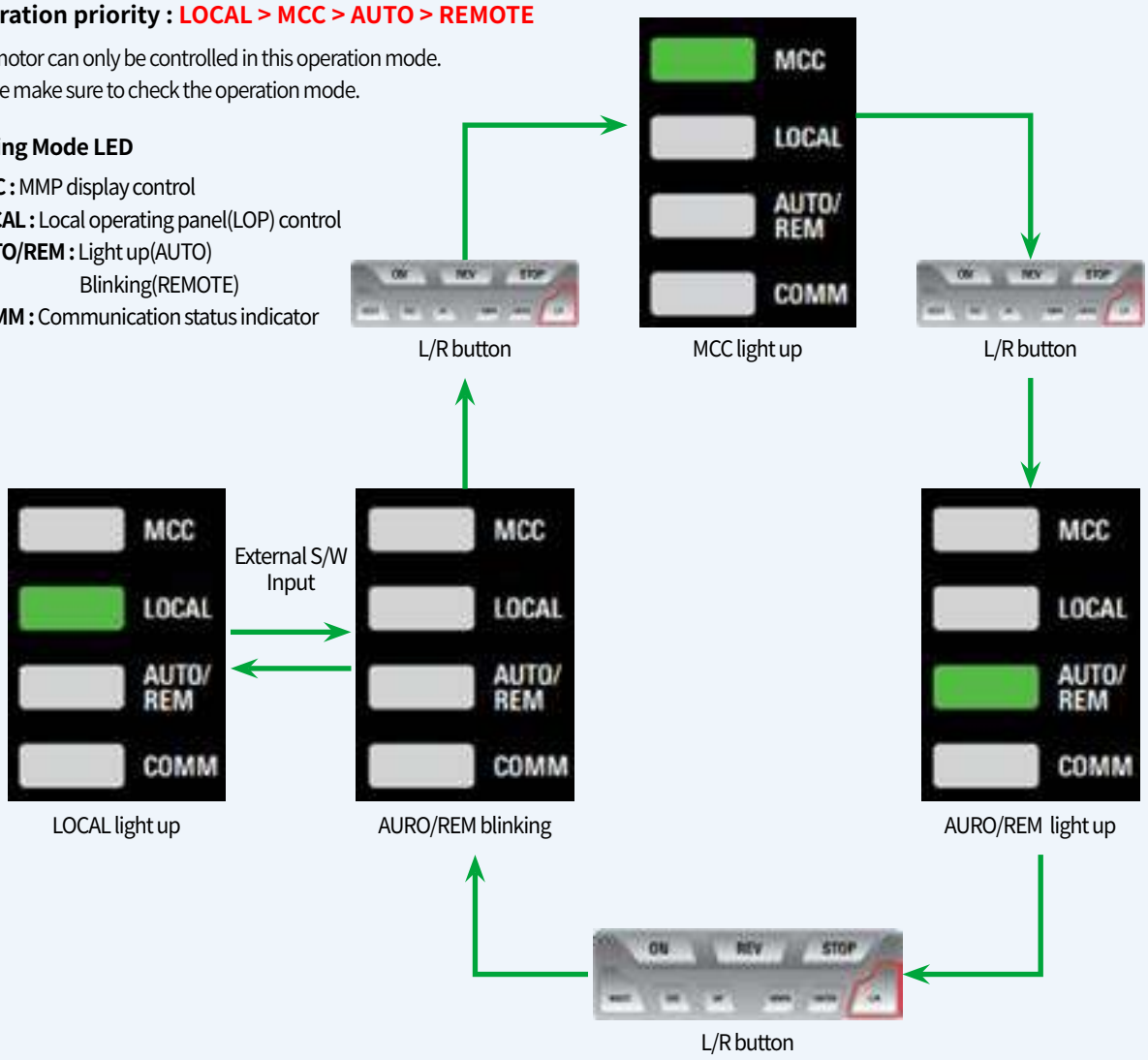
How to choose MMP mode

Operation priority : LOCAL > MCC > AUTO > REMOTE

The motor can only be controlled in this operation mode.
Please make sure to check the operation mode.

Driving Mode LED

- **MCC :** MMP display control
- **LOCAL :** Local operating panel(LOP) control
- **AUTO/REM :** Light up(AUTO)
  Blinking(REMOTE)
- **COMM :** Communication status indicator



1) Local : field operation mode (LOP : Local Operation Panel)

- Highest priority mode.
- Not operable in other modes.
- If operation from the MCC panel is not possible, check the input at the local operating panel(LOP).

2) MCC : mcc operation mode (Motor Control Center)

- Control by the Display on the MCC Panel of MMP.

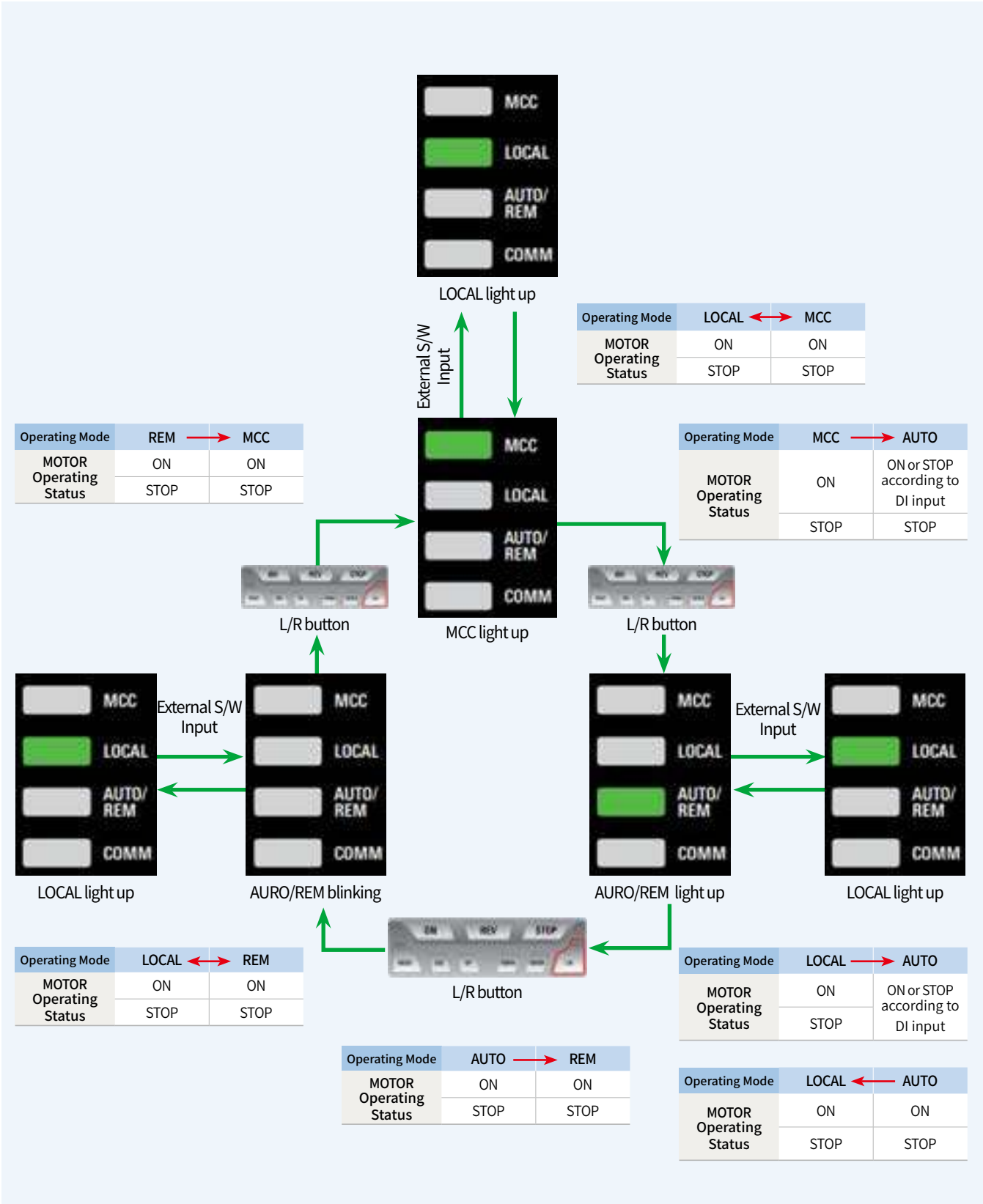
3) Auto : auto-operation (PLC etc)

- Automatic operation and remote control through PLC, DDC, DCS etc.
- AUTO/REM LED light up .

4) Remote : remote operation mode (Only for models built in Communication)

- RS485/Analog420.
- Auto/REM blinking.
- The load should be within a maximum of 500Ω.

Motor operating status by operation mode



Operating Mode	LOCAL ↔ MCC	
MOTOR Operating Status	ON	ON
	STOP	STOP

Operating Mode	REM → MCC	
MOTOR Operating Status	ON	ON
	STOP	STOP

Operating Mode	MCC → AUTO	
MOTOR Operating Status	ON	ON or STOP according to DI input
	STOP	STOP

Operating Mode	LOCAL ↔ REM	
MOTOR Operating Status	ON	ON
	STOP	STOP

Operating Mode	LOCAL → AUTO	
MOTOR Operating Status	ON	ON or STOP according to DI input
	STOP	

Operating Mode	AUTO → REM	
MOTOR Operating Status	ON	ON
	STOP	STOP

Operating Mode	LOCAL ← AUTO	
MOTOR Operating Status	ON	ON
	STOP	STOP

Rated specifications & model numbering system

Rated specifications

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

Model numbering system

MMP — **C** — **B** — **B** — **10** — **220**

Function	
C	Current
S	Selective Ground Fault
P	Power
IR	Insulation Resistance

Ground fault	
-	External ZCT
B	Built-in ZCT

Communication	
B	Non
M	RS485 & A420

Current Rating	
10	0.5 ~ 10A
100	5 ~ 100A

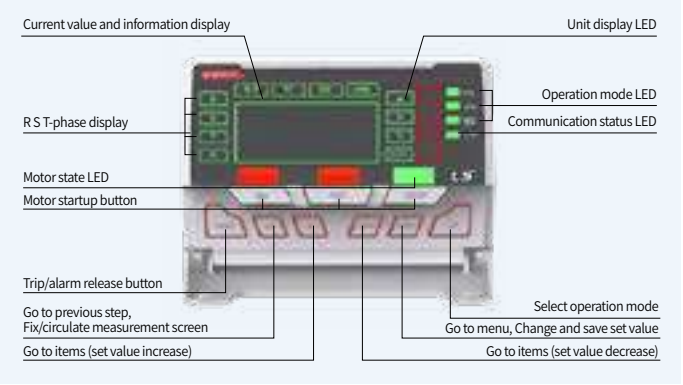
Control Power	
220	AC 220V
110	AC 110V

Note) Model number selection is only available for MMP-C/P types.
Note) Only for MMP-C/P types.

* When purchasing the product, please purchase the dedicated cable as well. (See Other Options)
Note) MMP-IR Type Only for 60HZ.
*S/IR Type is a basic built-in ZCT product, and 'Ground fault' do not need to be selected separately.

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

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

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

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

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

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

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

3. Check the settings.

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

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

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

Menu List (MMP-C*/P*-10/100)

A-group

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

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

B-group

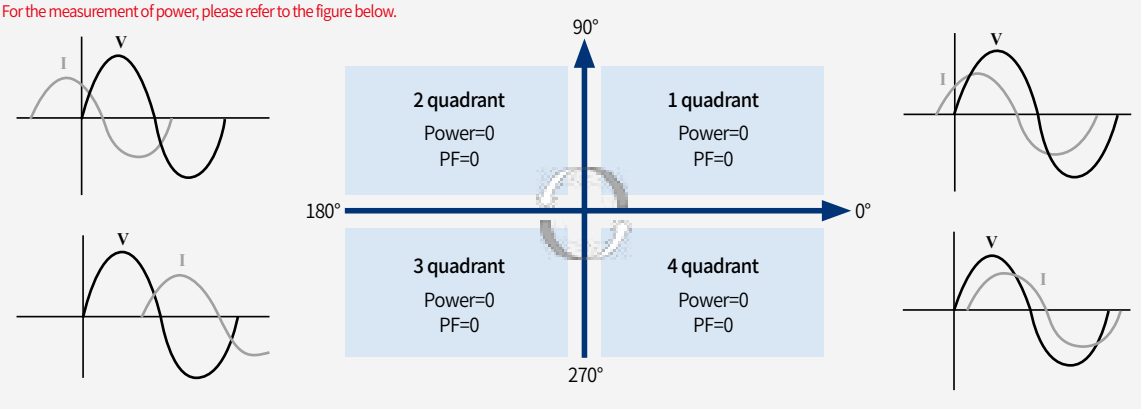
Group	Menu	Description		Setting range	Default
B	1.Loc	LOCK		Off/200~800%	Off
	2.StL	STALL		Off/150%~500%	Off
	3.P-F	Phasee loss (current)		On/Off	On
	4.P-U	Phasee unbalance (current)		Off/30~70%	Off
	5.Pdt	Phasee loss / unbalance Time-delay		0~200sec	0
	6.r-P	Phase reversal (current)		Off/On/CHEC Note 1)	Off
	7.Crt	Phase reversal operation time		0.1~1.0sec	0.1
	8.U-C	Undercurrent		Off/30~90%	Off
	9.Ect	ZCT selection	External	100/1.5 Note 2)	100
			Built-in	Enbd/100 Note 3)	Enbd
	10.9F	Ground fault (Zero-phase)		Off/0.03/0.05/0.1~3.0	Off
	11.9n	Ground fault (Residual current)		Off/30~100%	Off
	12.9t	Ground fault operation time		0.05~3.0sec	3.0
	13.9d	Phase unbalance delay time		0~00sec	60
	14.I C	Intance		OFF/10A type : ~100A Note4) /100A type : ~800A, 100A or more: using external CT	OFF
	15.AL	Output contact method		ALL I-tp, ALo, U-C, OrH Note5)	
	16.Ar	Current Y / N, Alarm		ON/60~110%	
	17.th	THD (voltage)		0~100%	

Note) 1. When CHEC set value of negative sequence item is selected, additional wire information is displayed.
2. 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.

C-group : Menu for power type activation

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

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



D-group

Group	Menu	Description	Setting range	Default
D	1.trt	Total running time	0~9999day / 0~23h / 0~59m	-
	2.r-t	Running time	0~9999h /	-
			0~59m	
	3.srt	Running time setting	Off/10~8760	Off
	4.CCh	Contactor check	Off/On	Off
	5.S-d	Date note 1)	2013~2100y	2014
			/ 1~12 (Mon), 1~31 (Day)	01.01.
			/ 0~23h, 0~59m	0:00
	6.CCC	Contactor counter note 2)	-	-
	7.FLt	Fault cause check note 3)	1. The most recent	-
			2. The 2nd. recent	
			3. The 3rd. recent	
			4. The 4th. recent	
			5. The 5th. recent	
	8.A-r	Automatic reset time note 4)	OFF / 1~20m	Off
	9.r-n	Automatic reset number	Off/1~5	Off
		Set number of times		
	10.Ad	Communication address note 5)	1~247	247
	11.bS	Communication speed note 5)	9.6/19.2/38.4K/57.6K	9.6K
	12.SP	Swap note 5)	On/Off	Off
	13.Pr	Parity setting note 5)	nonE/odd/EUEn	nonE
	14.td	20mA setting note 5)	0.5~10/5~100	10/100
	rSt	Stored data deletion	All : for all subparameters	-
			A-P : active energy	
			rA-P : reactive energy	
			trt : total running time	
			CCC : contactor counter	
			CALo : calories	
			FALt : fault events	
	tESt	Operation test	o-L : overcurrent test	-
			o-U : overvoltage test	
			g-F : ground fault test	
			I-C : instantaneous test	

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

Menu List (MMP-S*-10/100)

A-group

Group	Menu	Description	Setting range	Default
A	1PHA	Single-phase / 3-phase	1P/3P	3P
	25-F	Frequency	50/60	60
	3CHA	Characteristics (Over Current Protection)	Off/dEF/th/n-th Note 1)	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 Note 2)	0.25/0.5/1~200	1
	8drU	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 Note 5)
B	1Loc	LOCK	Off/200~800%	Off	
	25tL	STALL	Off/150%~500%	Off	
	3P-F	Phasee loss (current)	On/Off	On	✓
	4P-U	Phasee unbalance (current)	Off/30~70%	Off	✓
	5Pdt	Phasee loss / unbalance Time-delay	0~200sec	0	✓
	6r-P	Phase reversal (current)	Off/On/CHEC Note 1)	Off	✓
	7Crt	Phase reversal operation time	0.1~1.0sec	0.1	✓
	8U-C	Undercurrent	Off/30~90%	Off	
	9Ect	ZCT selection	Enbd/1.5 Note 2)	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	
	15GA	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	
	18 IC	Instantaneous protection	Off/500~5000% Note 3)	Off	
	19AL	Output contact method	I-tp, ALo, U-C, OrH, Atp Note 4)	I-tp	
	20Ar	Current Y / N, Alarm	On/60~110%	On	
	21oG	Ground fault Overvoltage	Off/8~80V	Off	
	22ot	Operating time	0.05~3.0sec	3.0	
	23ry	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. I-tp: Instantaneous trip, circuit breaker trip(interaction), Alo: instantaneous alarm, U-C: in case of low-current operation, OrH: if a motor's continuous operating time is higher than a set value In case of ATP setting, when all current relay factors (including I-tp) work, output (AUX-C3) appears.
5. No support is given for a single-phase motor.

D-group

Group	Menu	Description	Setting range	Default
D	1.trt	Total running time	0~9999day / 0~23h / 0~59m	-
	2.r-t	Running time	0~9999h /	-
			0~59m	
	3.Srt	Running time setting	Off/10~8760	Off
	4.CCh	Contactor check	Off/On	Off
	5.S-d	Date note 1)	2013~2100y	2014
			/ 1~12 (Mon), 1~31 (Day)	01.01.
			/ 0~23h, 0~59m	0:00
	6.CCC	Contactor counter note 2)	-	-
	7.FLt	Fault cause check note 3)	1. The most recent	-
			2. The 2nd. recent	
			3. The 3rd. recent	
			4. The 4th. recent	
			5. The 5th. recent	
	8.A-r	Automatic reset time note 4)	OFF / 1~20m	Off
	9.r-n	Automatic reset number	Off/1~5	Off
		Set number of times		
	10.Ad	Communication address note 5)	1~247	247
	11.bS	Communication speed note 5)	9.6/19.2/38.4/57.6	9.6
	12.SP	Swap note 5)	On/Off	Off
	13.Pr	Parity setting note 5)	nonE/odd/EUEn	nonE
	14.td	20mA setting note 5)	0.5~10/5~100	10/100
	rSt	Stored data deletion	All : for all subparameters	-
			trt : total running time	
			CCC : contactor counter	
			CALo : calories	
			FALt : fault events	
	tESt	Operation test	o-L : overcurrent test	-
			g-F : ground fault test	
			I-C : instantaneous test	

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

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

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

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

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

5. Checking fault history

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

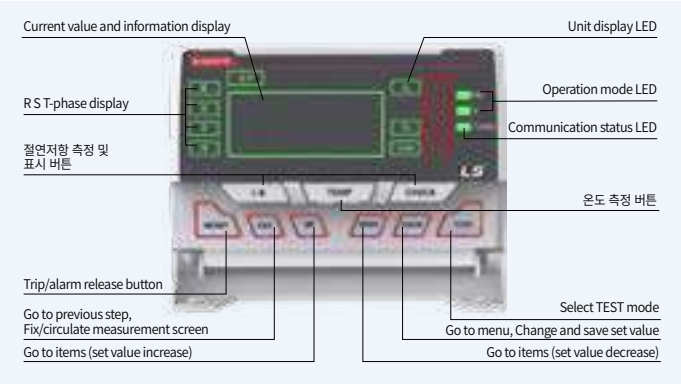
2) Use Up and Down keys to move to the desired one out of 5 fault events and select by pressing Enter key.
3) The fault current of phase R is displayed. Each time pressing the down key following informations are displayed in turn :
fault current of phase S / fault current of phase T / overload ratio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

6. Forced reset of thermal memory

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

MMP-IR-10/100 Model

Before starting the motor, proceed as follows :



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

1) Press and hold I-R Key and CHECK key simultaneously for 3 seconds to measure insulation resistance value of the motor. Insulation resistance is measured for 60 seconds and the measurement value is displayed.

Note) When the motor is operating, insulation resistance cannot be measured.

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

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

Note) refer to a manual for the details.

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

1) Verify the wiring first. Press Enter key to access Group menu, and use Up / Down keys to access B Group as shown "b-gr" and press Enter to access Menu with displaying "1.Loc". Use Up / Down keys to access "6.r-p" which denotes Phase reveral menu, and press Enter to access "CHEC" which denotes Setting value, and press Enter to view current wiring information.

Note) The phase information is displayed only when current is applied. If there is no current "---" is displayed

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

3) Press Reset key to reset the device and return to the measurement screen.

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

3. Check the settings.

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

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

3) Press Up / Down keys in the setting screen and then "P-99" is displayed. Press Up / Down keys to change the password to "P-00" and press Enter to release it. After that select the desired value and press Enter to save the setting.

Note) Enter the date exactly when the power is turned on for the first time or recovered after the outage.

Menu List (MMP-IR-10/100)

A-group

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

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

B-group

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

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

Contact output information

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

C-group

Group	Menu	Description	Setting range	Default
C	1trt	Total operating hour	0~9999day/0~23hr/0~59min	-
	2r-t	Operating hour	0~9999hr	-
			0~59min	
	3.Srt	Setting of operating hour	Off/10~8760	Off
	4.S-d	Date setting Note1)	2019~2100	2019
			1~12Month, 1~31f day	01.01.
			0~23hr, 0~59min	0:00
	5.FLt	Checking reason of failure	-	-
	6.A-r	Automatic recovery Note2)	Off/1~20min	Off
	7.r-n	Restriction of restart	Off/1~5	Off
	8.Ad	Communication address	1~247	247
	9.bS	Communication speed	9.6/19.2/38.4K/57.6K	9.6K
	10.SP	Swap or not	On/Off	Off
	11.Pr	Parity setting	nonE/odd/EUEn	nonE
	12.td	Setting of 20mA	0.5~10/5~100	10/100
	rSt	Deleting stored data Note3)	All the lower level items	-
			trt : Total operating hour	
			CALo : Heat quantity	
			FALt : Failure event	

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

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

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

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

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

5. Checking fault history

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

2) Use Up and Down keys to move to the desired one out of 5 fault events and select by pressing Enter key.

3) The fault current of phase R is displayed. Each time pressing the down key following informations are displayed in turn : fault current of phase S / fault current of phase T / overload ratio / date

4) To enter the previous mode, press Esc key.

5) Press Esc and Enter keys at the same time to return to the measurement screen.

6. Forced reset of thermal memory

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

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 M Ω, 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 0.2M Ω to 50M Ω, 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 "---".

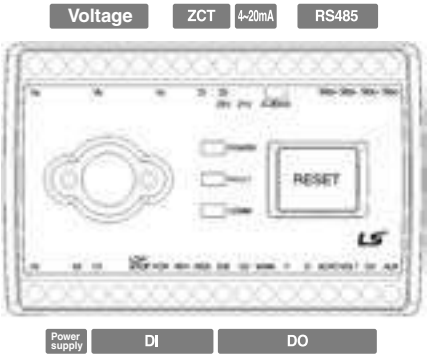
② When the "I-R" button is pressed again, it is displayed in the previous normal mode. If you don't press the "I-R" button, it automatically enters the previous normal mode after 2 minutes.

Fault cause information

Screen		Fault cause	Additional information	
Current	O-L	Overcurrent	phase, load rate, time	Setting time Operation
	Loc	Lock	phase, load rate, time	0.5s Operation
	StL	Stall	phase, load rate, time	3.0s Operation
	P-F	Phasee loss	phase, unbalance rate, time	0.5s Operation
	P-U	Phasee unbalance	phase, unbalance rate, time	2.0s Operation
	r-P	Phase reversal	time	Setting time Operation
	U-C	Undercurrent	phase, load rate, time	3.0s Operation
	Sho	Instantaneous	phase, load rate, time	Operation Within 50ms(60HZ) or 60ms(50HZ)
	G-F	Ground fault (ZCT)	phase and neutral, time	Setting time Operation
	G-n	Ground fault (Residual)	phase and neutral, time	Setting time Operation
Voltage	O-u	Overvoltage	phase, rate, time	Setting time Operation
	U-u	Undervoltage	phase, rate, time	
	uPF	Phasee loss	phase, unbalance rate, time	0.5s Operation
	uPU	Phasee unbalance	phase, unbalance rate, time	2.0s Operation
	urP	Phase reversal	time	Setting time Operation
Voltage	O-P	Overpower	phase voltage, rate, time	Setting time Operation
	U-P	Underpower	phase voltage, rate, time	Setting time Operation
	OPF	Over power factor	phase voltage, rate, time	Setting time Operation
	UPF	Under power factor	phase voltage, rate, time	Setting time Operation
Others	EtP	External input trip	time	
	Err.1	Error.1 occured	Current detected after motor off	
	Err.2	Error.2 occured	No current detected after motor on	
	Err.3	Error.3 occured	For / Rev starting signal input at the same time in local / auto mode	
	Err.4	Error.4 occured	External storage memory error	
	OrH	Running hour over	Alarm occurs when accumulated running hour is over the setting value	
	tAP	Temperature over the set degree		
	u Ir	In case insulation resistance below set value is measured		
	AcOn	In case measurement of insulation resistance is attempted during operation		
	L InE	Display comm. error	Comm. error occur between display unit and device. ※ Please contact us.	
	1.0 1.0	Version check	Press Reset+Esc keys in normal state	

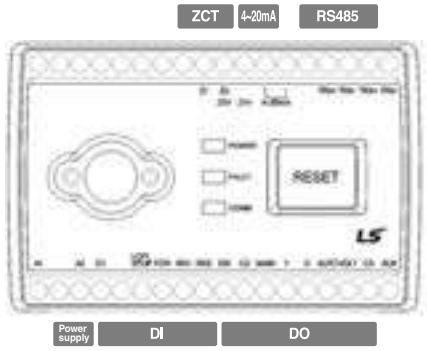
Terminal configuration(S-EMPR MMP-P*)

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-	RS485 communication	Modbus(1 channel)
TRX2+, TRX2-		
A1, A2	Control power input	110Vac or 220Vac 50/60Hz
C1	Contact input Common	-
Lop/Stop, For, Rev, Res, E/S	Contact input	RES : Reset, E/S: Emergency Stop
C2	Relay output Common	-
Main, Y, D, Auto, Volt	Relay output	D: Delta, VOLT : output contacts for voltage & power elements
C3	Relay output Common	Aux output Common
Aux	Relay output	Current element output contacts



Terminal configuration (S-EMPR MMP-C*)

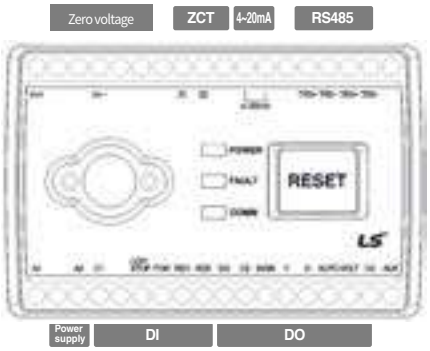
Terminals	Description	Remarks
A1, A2	Operating power input terminal	110Vac or 220Vac 50/60Hz
C1	Contact point in put common	Lop/Stop, For, Rev, Res, E/S contact point
Lop/Stop	Lop operation mode selection and external stop S/W	-
For	External On(Forward) input S/W	On input in Lop/Auto operation
Rev	Reverse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



Terminal configuration / Wiring & cable connection

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 staring, forward rotation output
Y	Y-Delta starting: Y contact point output	-
	Inverter starting: Inverter contact point output	-
	Full voltage starting: No use	-
	Forward/backward staring: No use	-
	Reactor starting: No use	-
D	Y-Delta starting: Delta contact point output	-
	Forward/backward staring: reverse rotation contact point output	-
	Reactor starting: Reactor (R) contact point output	-
	Inverter starting: Bypass contact point output	-
	Full voltage starting: No use	-
Auto	Auto state signal output	If Auto state mode is selected
Volt	Ground fault overvoltage factors and current trip contact point output	-
C3	Contact point output common	Aux contact point only
AUX	Other current factors contact point output	-
Vo+, Vo-	Zero voltage input	-
Z1,Z2	Zero current transformer output connection terminal	Universal ZCT(200mA/1.5mA)
+,-	4~20mA output	-
TRX+,TRX-	RS485terminal	-



*Attention in panel design

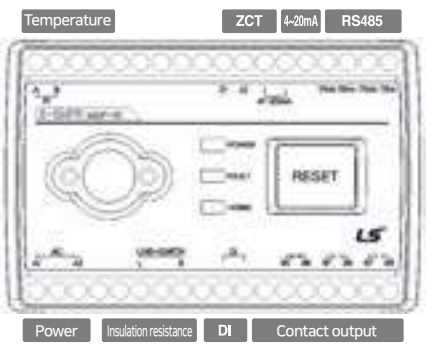
1. It is required to have grounding connection with all equipment.
2. It is required to minimize wiring as much as possible.
3. After a shield-type cable is applied, it is required to ground the shield.

*If induced voltage occurs

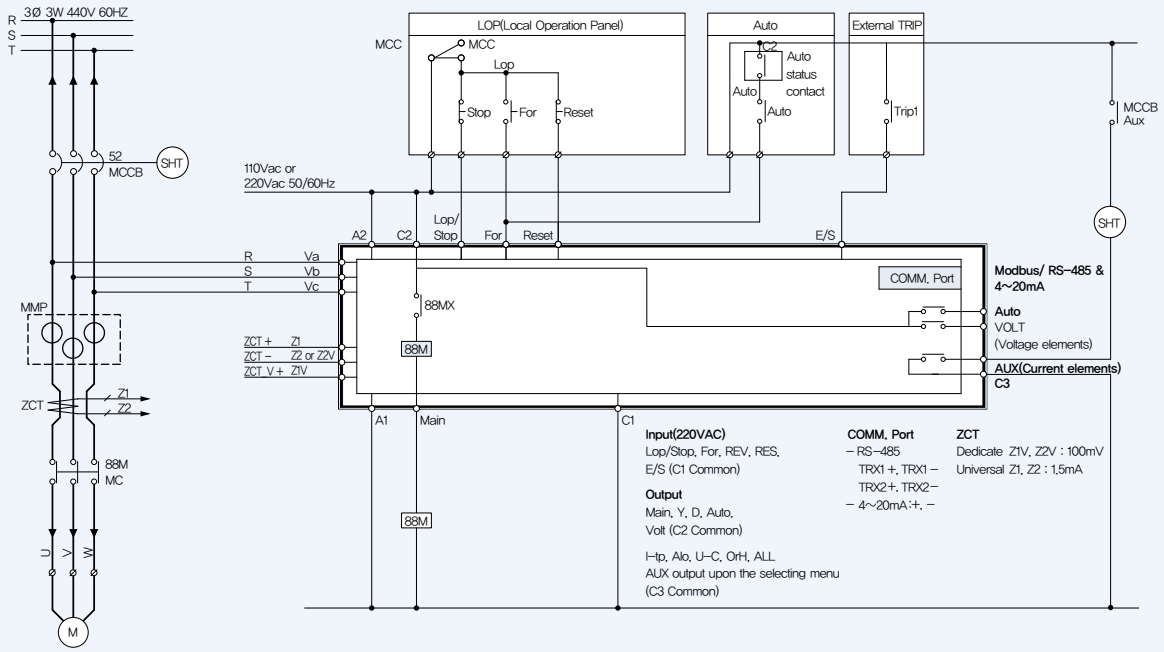
1. It is required to add a proper capacitor in parallel depending on the parasitic capacitance of product input part.
2. If induced voltage occurs even after the capacitor is added, it is required to get auxiliary relay energyed in order for an input to make possible through an auxiliary contact point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

Terminal configuration (S-EMPR MMP-IR)

Terminals	Description	Remarks
A1, A2	Operating power input terminal	110Vac 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	

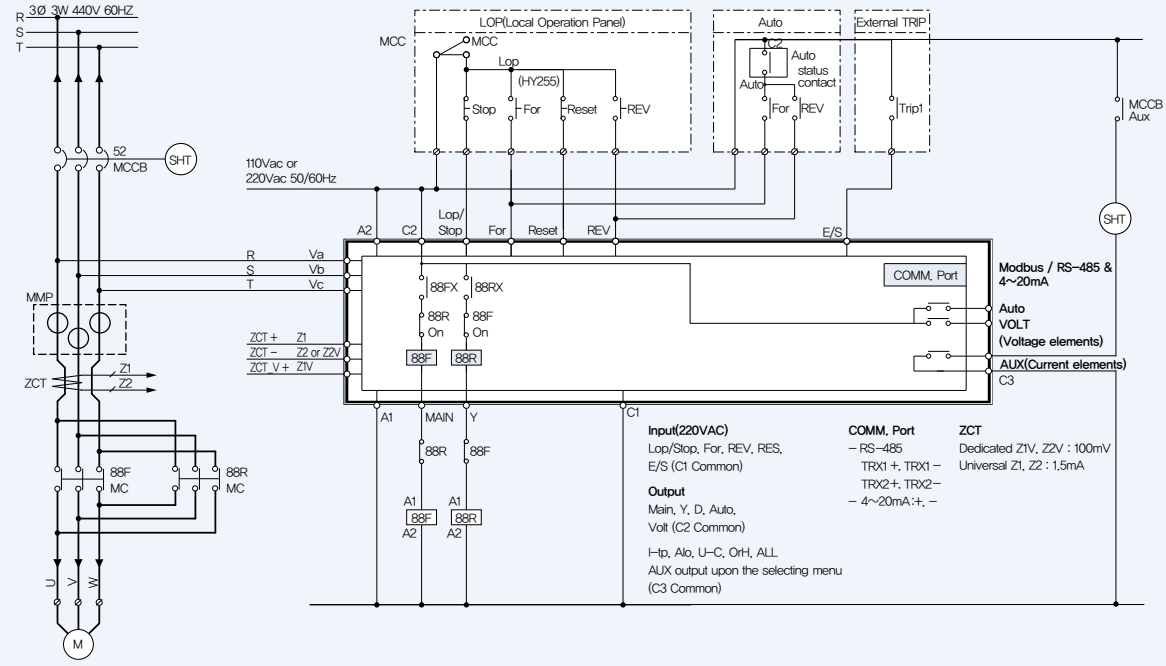


Full voltage start



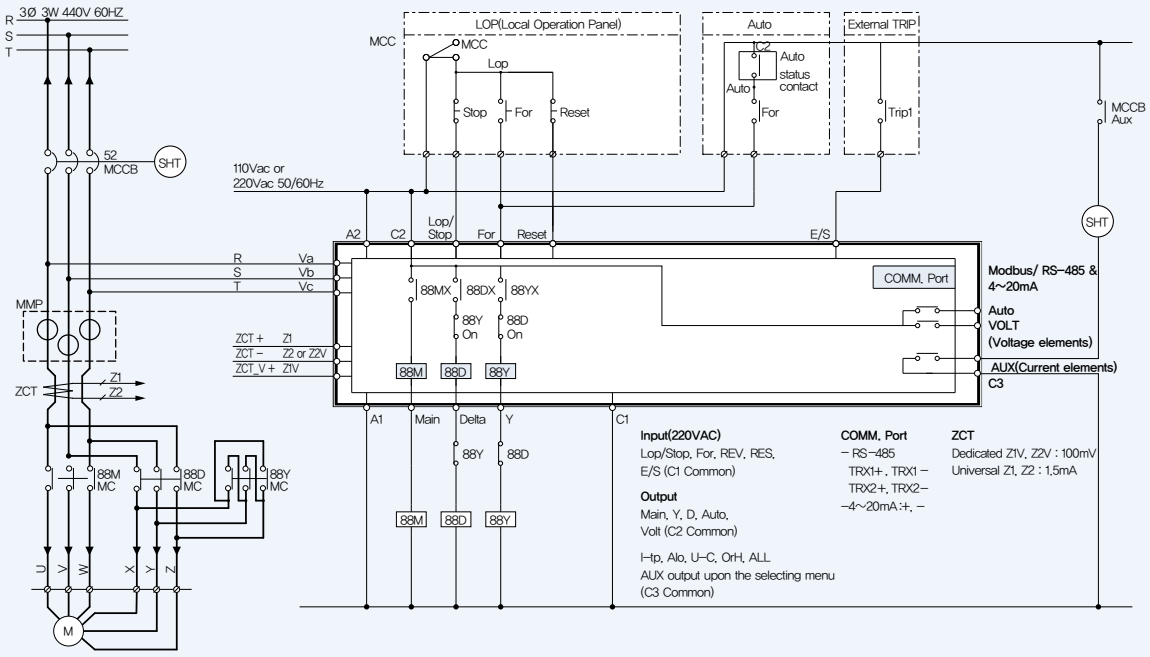
Note) In case of distance operation (LOP / AUTO), if a wiring distance is too long, induced voltage can cause malfunction. Therefore, bear in mind this point at the time of designing a panel.

Reversible operation

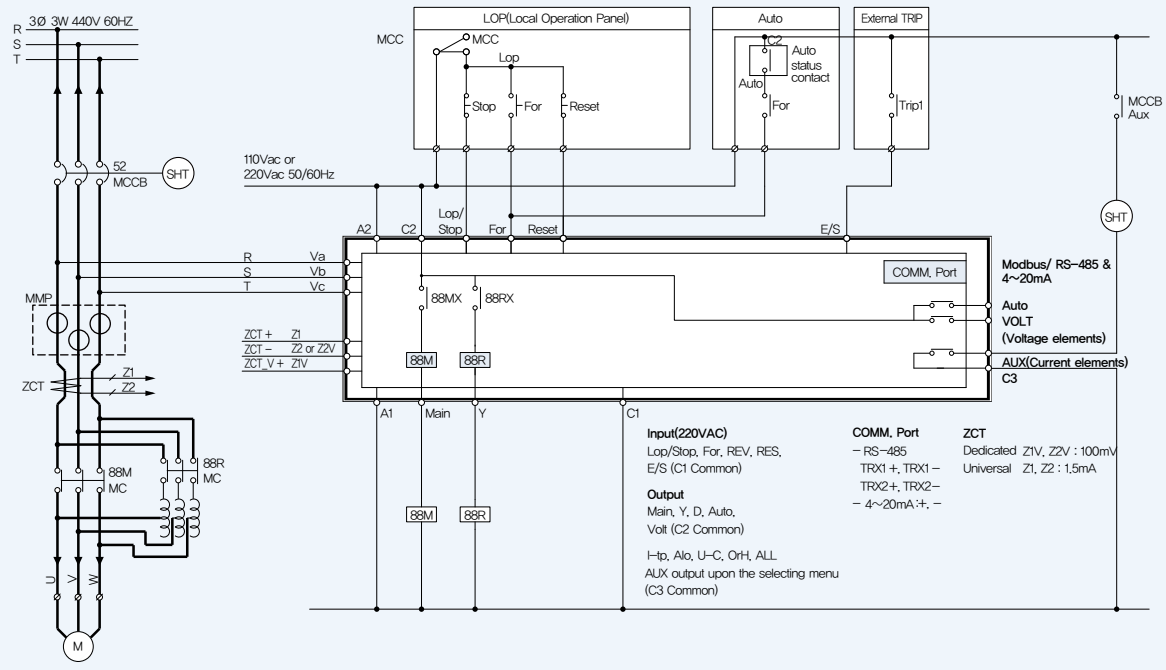


Terminal configuration / Wiring & cable connection

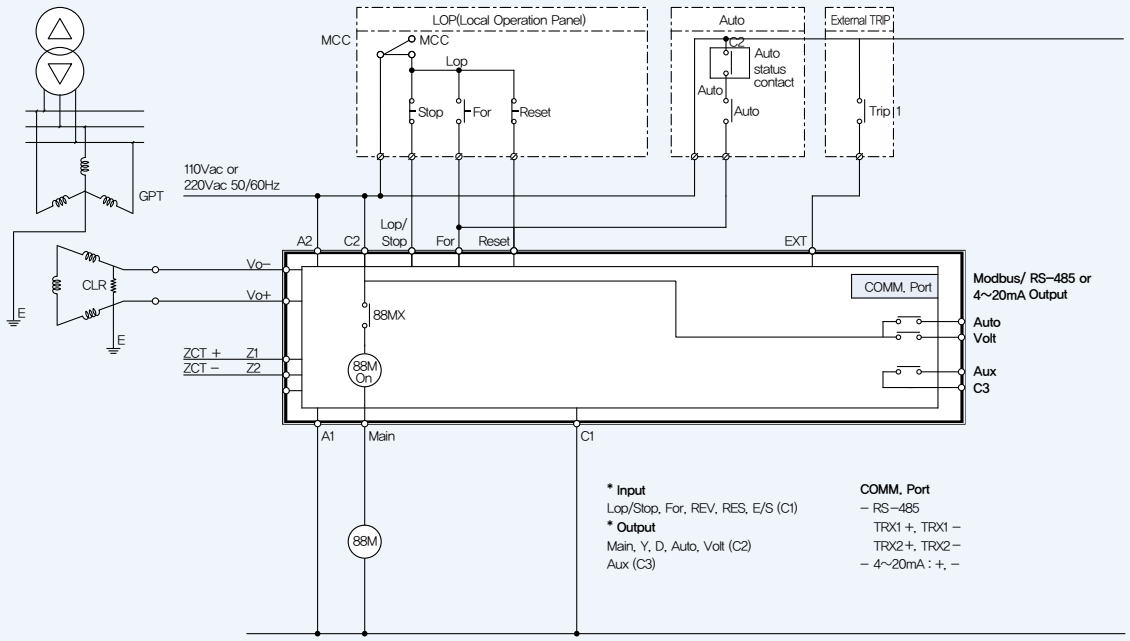
Y-D start



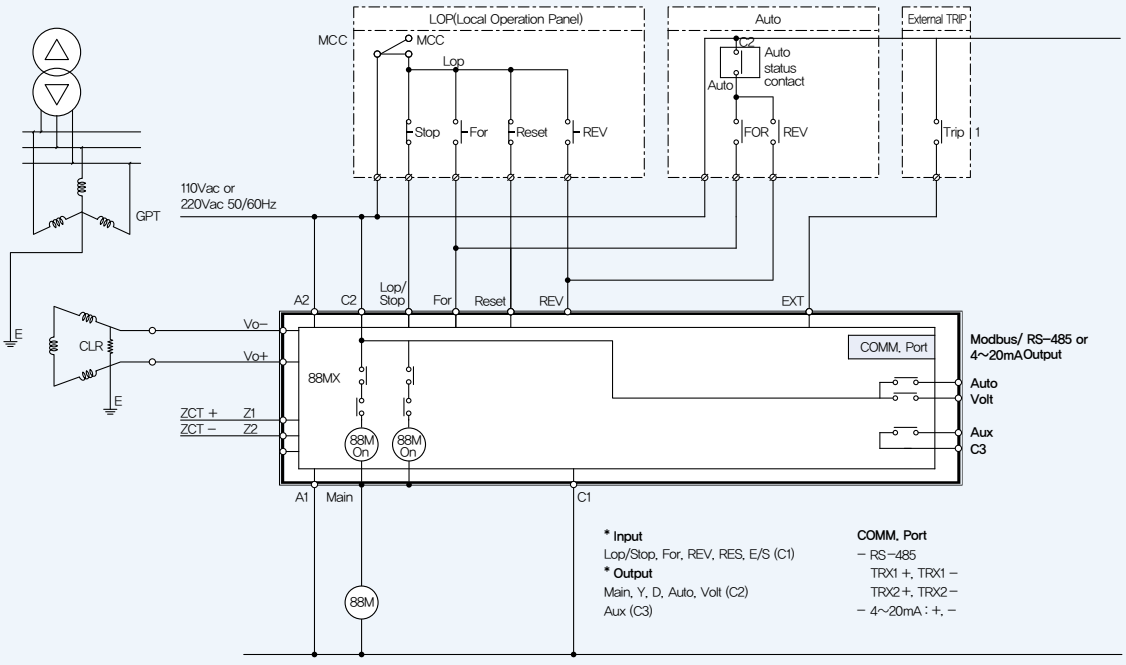
Reactor start



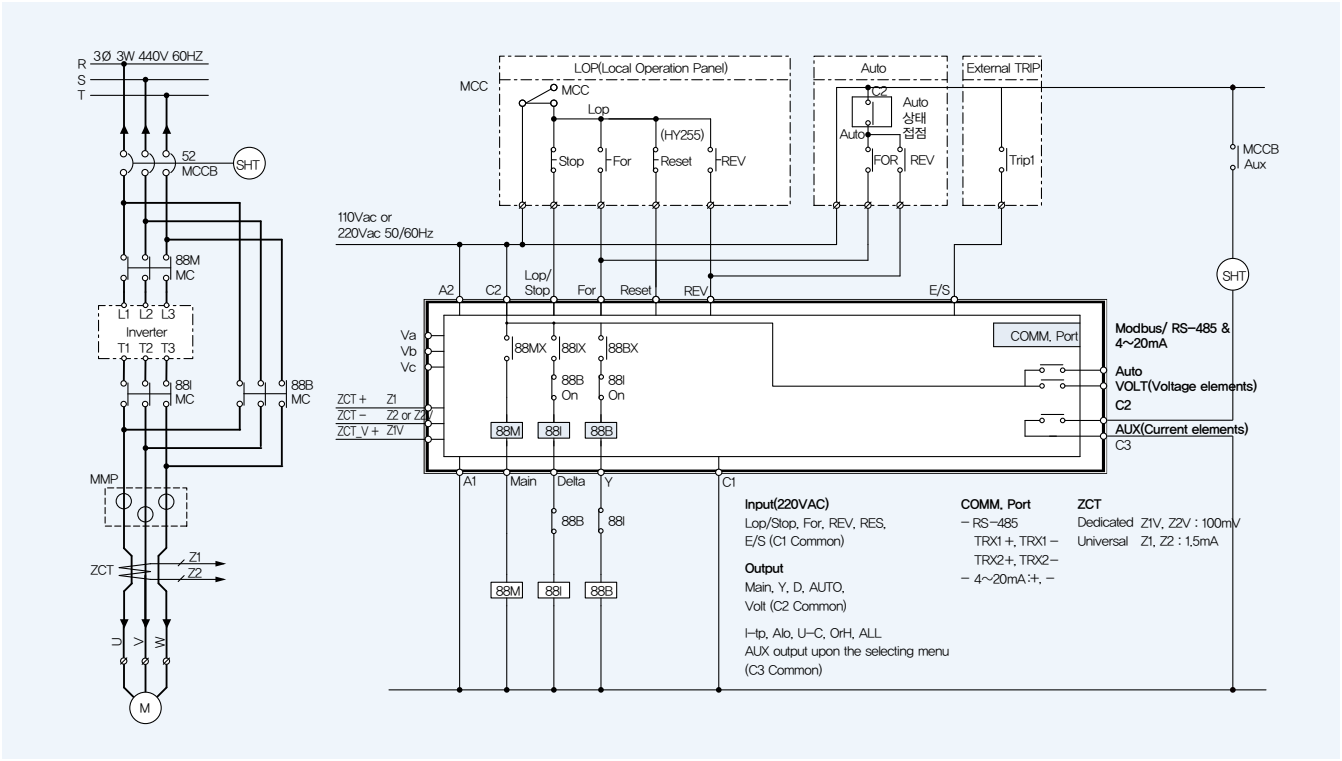
Irreversible full voltage starting



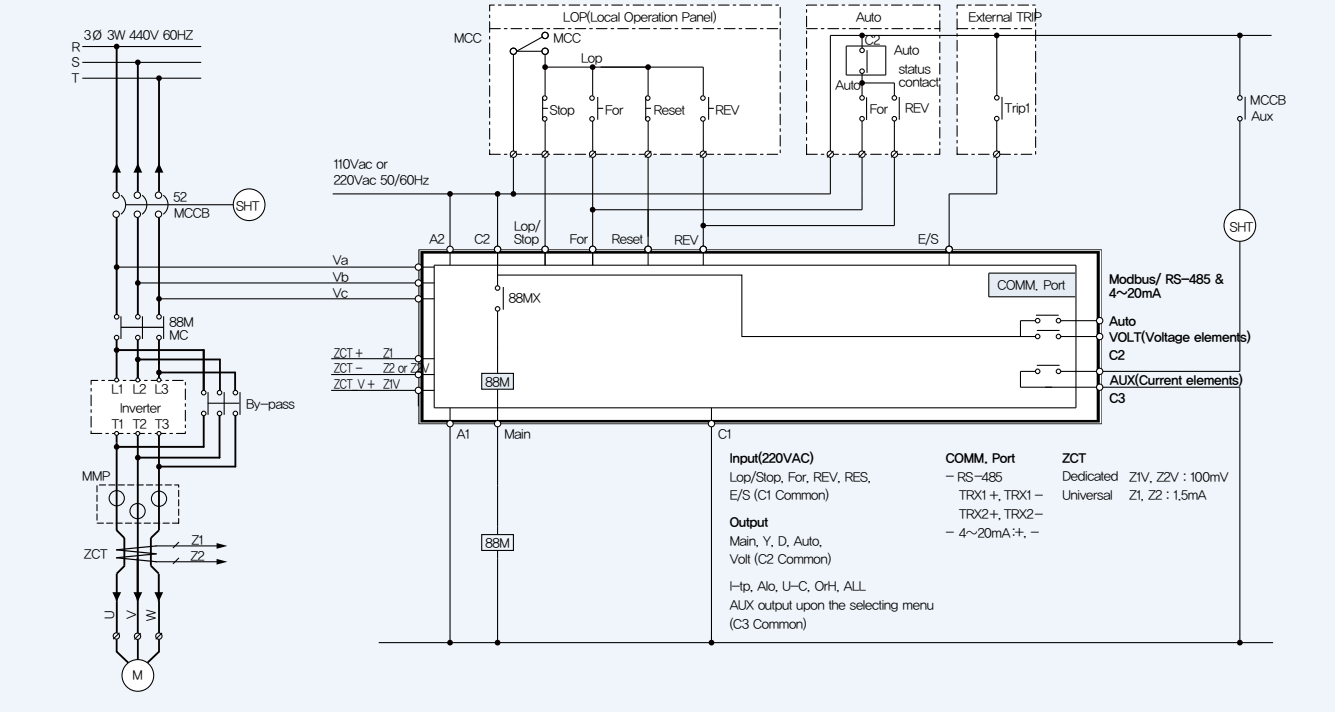
Reversible full voltage starting



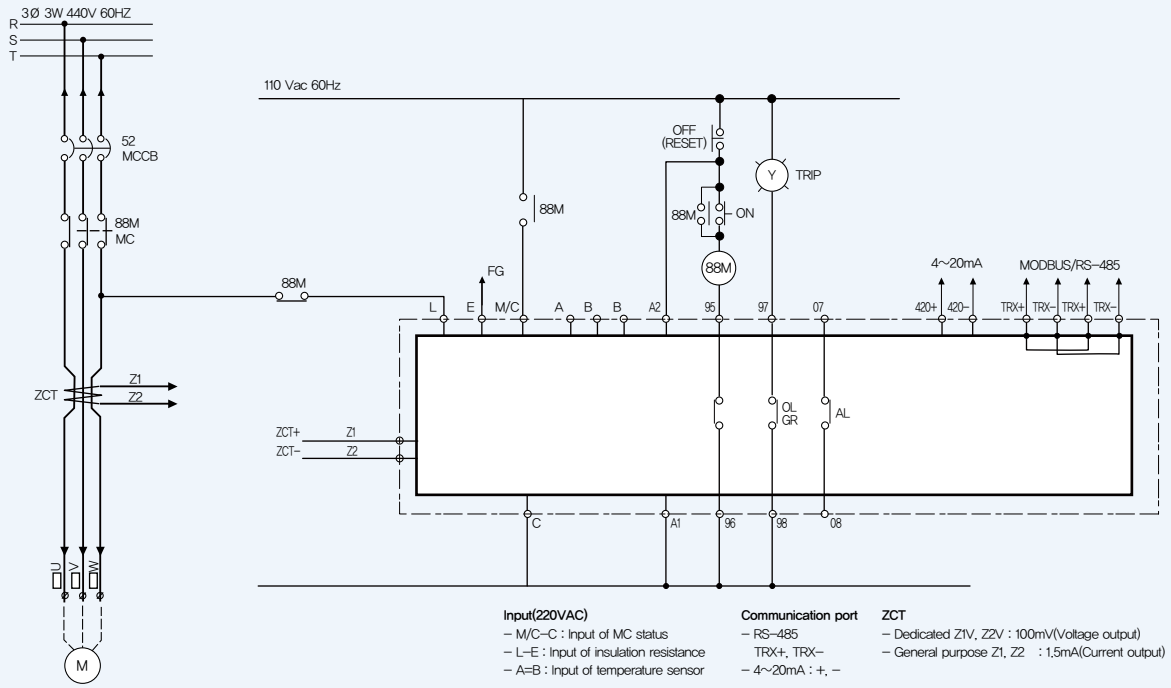
Inverter start (Current)



Soft starter start



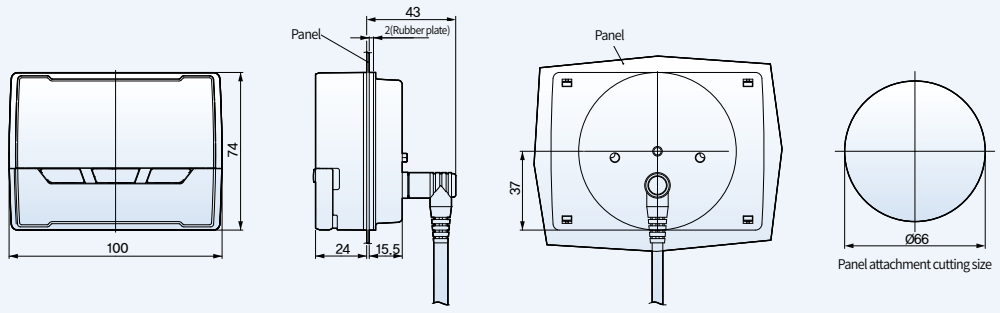
MMP-IR TYPE



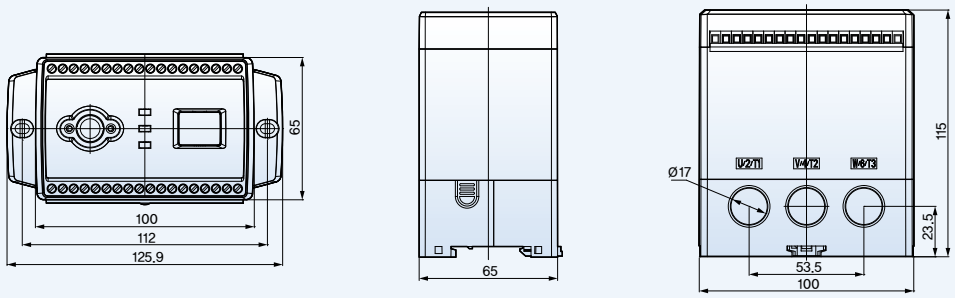
Note) IR model does not support start mode.

Dimensions

Unit : mm



Display part size in case of panel attachment



Size in case of panel attachment

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	0.5~60	0.09~15	0.18~30	Definite-time
	GMP60-3TZ/3TZR				Definite-time(Ground Fault)
	GMP60-3TN/3TNR				
DMPi-series	DMP06i	0.5~6 5~655~60	0.09~1.1 1.5~18.5 1.5~15	0.18~2.2 3.0~303.0~30	Definite-time/Inverse-time (Instanteous/Ground Fault)
	DMP65i				
IMP-series	IMP-C-NO	0.125~100	0.06~30	0.06~55	Definite-time/Inverse-time (Instanteous/Ground Fault)
	IMP-C-A420				
	IMP-C-M485				
MMP-series	S-EMPR MMP-CB/CM-10	0.125~10	0.06~2.2	0.06~4	Definite-time/Inverse-time (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)

Torque

Model	Type	Terminal SCREW Sixe	TORQUE (kg·cm)			Suitable Wire and Crimp Terminal		
						Wire (mm^2,mm)		Crimp Terminal SIZE
			Standard	Maximun	Pre-tightening	Standed Wire	Solid Wire	
GMP60T, TE	Auxiliary Terminal	M3.5	12	18	12	1.25~2	Ø1.6	1.25-3.5 ~ 2-3.5
GMP22-2P, PD GMP22-3P, 3PR, 3S, 3SR GMP40-2P, 2PD, 2S, 3P, 3PR, 3S, 3SR	Main Terminal	M4	15	22.5	15	1.25~14	Ø1.6, Ø2	2-4 ~ 5.5-4
	Auxiliary Terminal	M3.5	12	18	11	1.25 ~ 2	Ø1.6	1.25-3.5 ~ 2-3.5
GMP80-2S, 3S, 3SR	Main Terminal	M6	45	67.5	45	2~38	-	2-6 ~ 22-6
	Auxiliary Terminal	M4	15	22.5	15	2~5.5	Ø1.6	5-4
GMP60-3T, 3TR,3TN,3TNR,3TZ,3TZR, 3S,3SR,3SN, 3SNR, 3SZ,3SZR	Main Terminal	M5	41	55	30	4~6	Ø2.0	4-6
	Auxiliary Terminal	M3.5	12	18	11	1.25~2	Ø1.6	1.25-3.5 ~ 2-3.5
GMP60TD	Auxiliary Terminal	M3.5	12	18	11	1.25~2	Ø1.6	1.25-3.5 ~ 2-3.5
DMPi	Main Terminal	M5	41	55	30	4~6	Ø2.0	4-6
	Auxiliary Terminal	M2.6	5	8	3	0.75~1.25	Ø1.2	0.75-2.5
IMP	Auxiliary Terminal	M3.5	12	18	11	1.25~2	Ø1.6	1.25-3.5 ~ 2-3.5
MMP	Auxiliary Terminal	M2.6	5	8	3	0.75~1.25	Ø1.2	0.75-2.5

EMPR Optional accessories

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

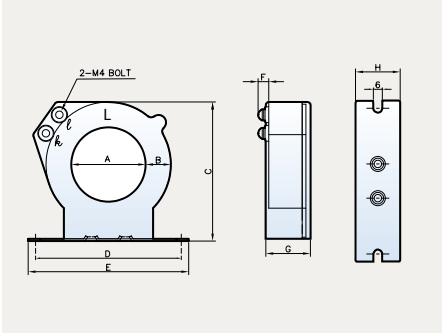
Rated specifications

Code	Model name	Inside diameter (mm)	Zero phase current transformer ratio	Weight (kg)
76512124011	LZR-030(V)	30	200mA/100mV (LS only) Note 1)	0.2
76512124012	LZR-050(V)	50		0.3
76512124013	LZR-065(V)	65		0.4
76512124014	LZR-080(V)	80		0.8
76512124106	LZR-120(V)	120		1.0

Note 1) The nameplate of the ZCT product is labeled based on a primary side current of 100mA (same product).

Dimensions

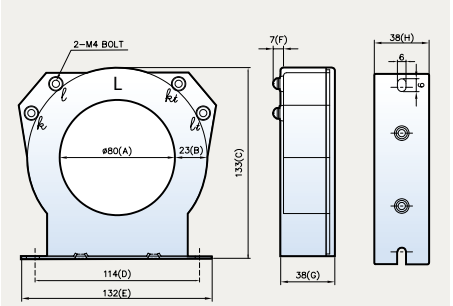
ZCT 30, 50, 65



Unit : mm

Model	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

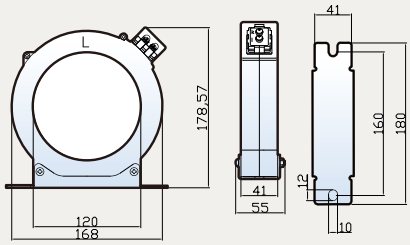
ZCT 80



Unit : mm

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

ZCT 120



Unit : mm

Model	A	B	C	D
LZR-120(V)	120	168	91	179

CT (Current Transformer)

Rated specifications

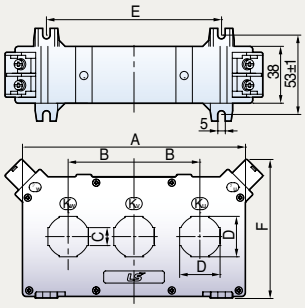
Classification	Code	Model name	Primary current	Secondary current	Load (VA)	Error class	Penetrating hole[mm]	Upper installation EMPR	Remarks
3CT type	76012116026	3CT-23	50A	5A	1.0	3.0	21×21	GMP22/40/60T note1)	1) Insulation voltage: 690V 2) Withstanding voltage: 4kV/min 3) Overcurrent strength: 40 x 1n 4) Insulation resistance: 10MΩ (DC 500V Megger) 5) Frequency: 50/60Hz
	76012116011	3CT-23	80A						
	76012116012	3CT-23	100A		1.5	1.0			
	76012116013	3CT-23	150A						
	76012116014	3CT-23	180A						
	76012116015	3CT-23	200A						
	76012116016	3CT-43	100A				27×27	IMP/DMPi entire series GMP60-3T/3TN/3TZ GMP22/40/60T note1)	
	76012116017	3CT-43	150A						
	76012116018	3CT-43	200A						
	76012116019	3CT-43	250A						
	76012116020	3CT-43	300A						
	76012116021	3CT-43	350A						
	76012116022	3CT-43	400A						
	76012116023	3CT-63	400A				45×30		
	76012116024	3CT-63	500A						
	76012116025	3CT-63	600A						
2CT type	76012116001	DCT-100	100A	5A			28.5×33.5	GMP22/40/60T note1)	
	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 note1)	
	76012116007	SCT-150	150A						
	76012116008	SCT-200	200A						
	76012116009	SCT-300	300A						
	76012116010	SCT-400	400A						

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



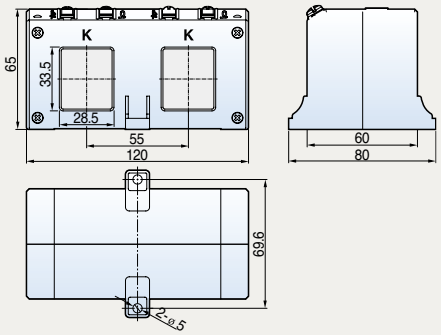


Type	3CT-23	3CT-43	3CT-63
A	119	149	218
B	35	44	70
C	9	12	20
D	21.5	27	45/30
E	89	117	183
F	76	91	94

Dimensions

2CT type (DCT-□□□)



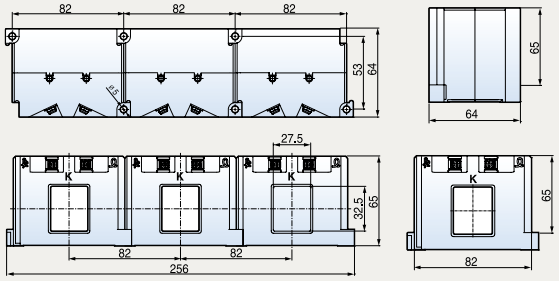


EMPR Optional accessories

Dimensions

1CT type (SCT-□□□)





Other options

Cable

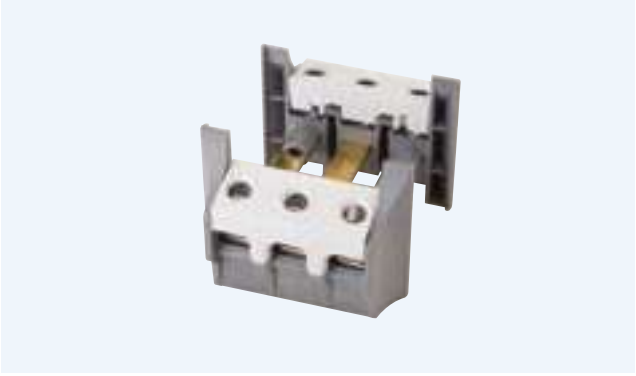


Applied products	IMP, DMPi series
Spec.	1m, 1.5m, 2m, 3m
purpose	For separated display installation



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

Terminal block

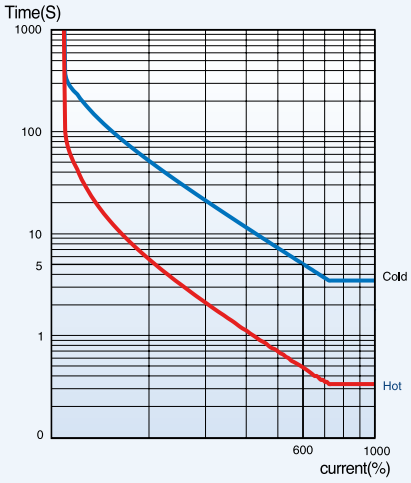


Applied products	Terminal block with the application of GMP60-3T Series
Spec.	Less than 60A

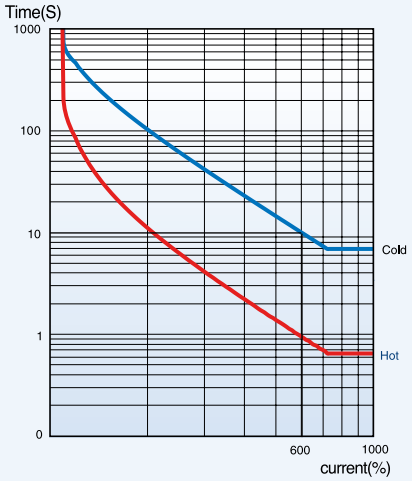


Applied products	DMPi series
Spec.	Less than 65A

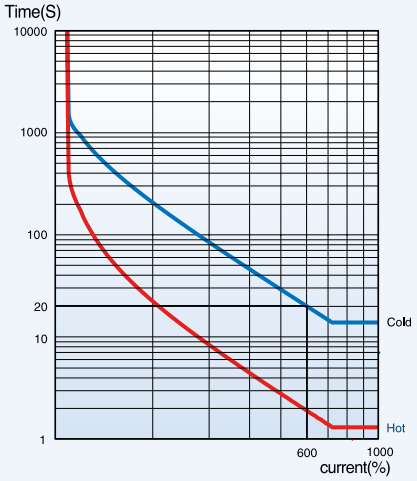
Class5



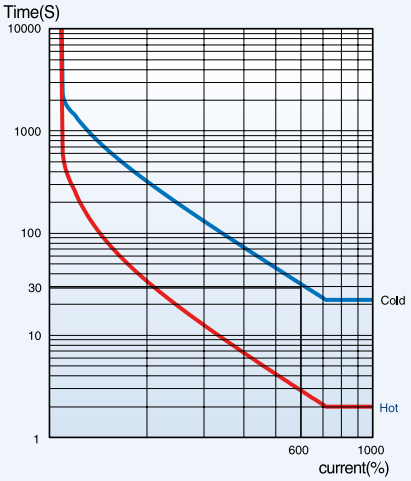
Class10



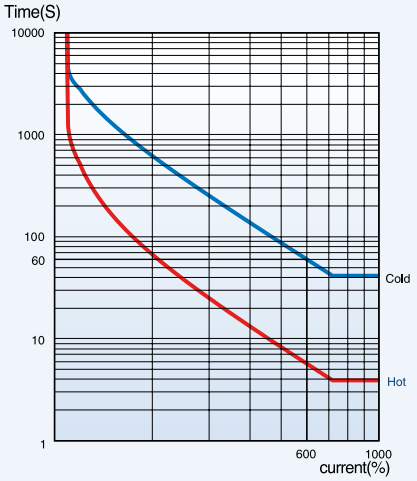
Class20



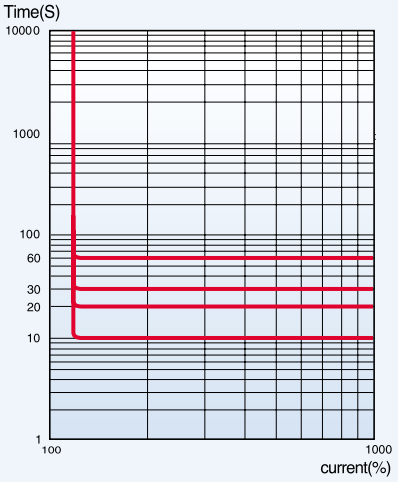
Class30



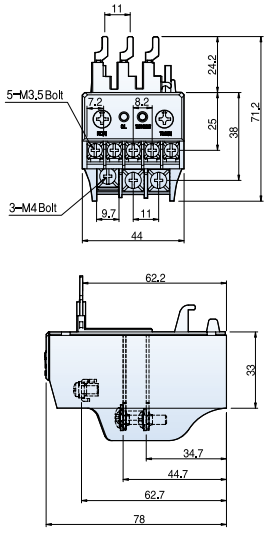
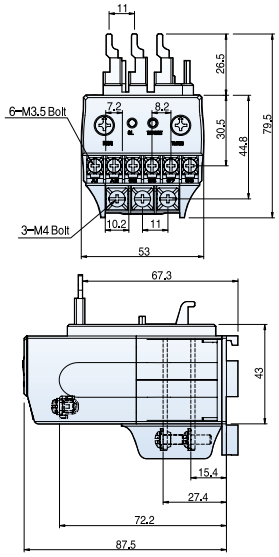
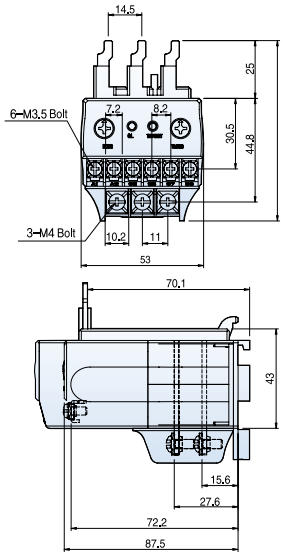
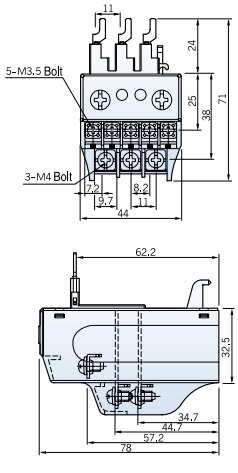
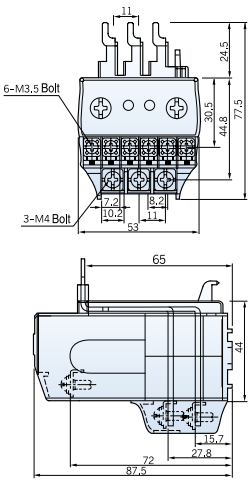
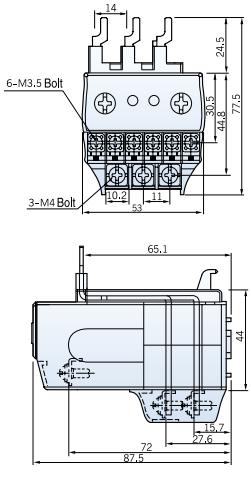
Class60



Definite time characteristic



Direct mounting EMPR new/old comparative table

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

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

Certificates

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

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