

EMPR "IMP Series"
**Intelligent Motor
Protection Relay**



Electric Equipment



EMPR IMP Series Intelligent Motor Protection Relay



Intelligent Motor Protection Relay

The EMPR is a digital intelligent motor protection relay with an onboard MCU (Microprocessor Control Unit) and guarantees high reliability with real-time data processing, superb precision and antisurge functions.

The EMPR IMP series are optimal solutions for protecting and monitoring motors in complex industrial fields and provide high safety and productivity.

- Where monitoring panel for the MCC is required
- Where reliability and stable protection are needed
- Semiconductor, chemical, automobile, textile and pharmaceutical plants
- Oil, gas, railway, water supply/drainage, and buildings
- Steel, cement, paper and ship building



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Beyond Motor Protection...

The new EMPR IMP series support MODBUS RS-485 communications or 4~20mA analogue output and are the most economic and reliable solution for MCC monitoring panels



■ Wide Current Control Range

The internal CT can be applied to up to 100 A motors without saturation based on inverse time characteristics. An escape hole is installed in the CT to make it easy to penetrate more than two wires.

■ Double Protection for Ground Faults

As both zero-phase-sequence current and post-arc current are detected simultaneously, non-grounded and directly-grounded systems are reliably protected from leaks and ground faults.

■ Various Protection Mode

The system can be operated in the definite time, inverse time, and heat accumulation inverse time modes to protect motors according to their operation ratings, load characteristics and external environments.

IMP Features



Total Digital Motor Protection Relay with the MCU (Microprocessor Control Unit)

Real-time processing and high precision



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 can be protected.



Applicable to Inverter Circuits

Thanks to its good high harmonic noise characteristics, it can be applied to the 2nd stage of 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).



Wide Current Control Range: 0.125~100A for One Model

With the slide S/W, the current control range can be decided 0.5~10A or 5~100A. According to the CT penetration number, even 0.125A current can be controlled. (Wire penetration hole).



Up to 100A current, it can be used without an external current transformer for convenience and economic efficiency.



Various Recovery Functions

Manual, automatic and electric recovery functions are provided for customer convenience.



Wide Ground Fault Sensitivity Current Control and Double Protection: 30mA~25A

Both zero-phase-sequence current and post-arc current are detected simultaneously to provide customers with convenience and economic efficiency.



Password

Settings are protected with a password.



Heat Accumulation 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.



Storage of Fault Events

Up to five fault events can be stored for easy fault history management.



3-Phase Digital Ampere-Meter

3-phase current is displayed every two seconds for motor monitoring.



Quick Setup

All settings can be decided quickly on the display.



Date

When a fault occurs, its date and time are stored for easy checkup.



Total Operating Time Setup

When the total operation time is over, it is displayed for changing motor bearings or supplying oil.



Communication

RS485 and MODBUS are supported for communication with various systems. The model with analogue signals (4~20mA) is compatible with transducer systems.

Major Functions

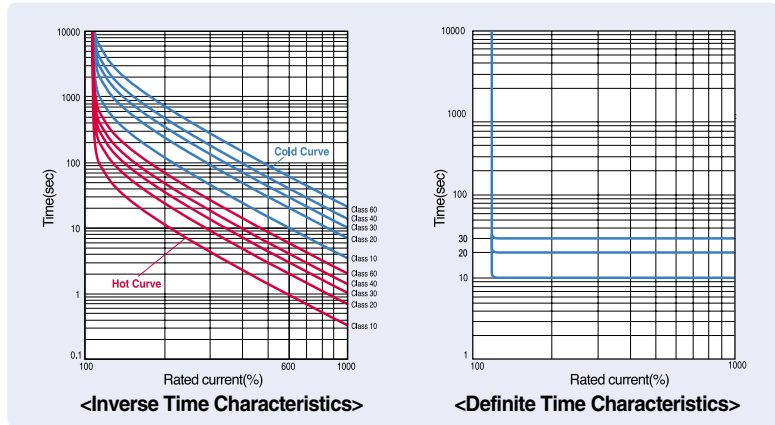
Protection

● Overload-49

Motor current is detected and is applied to I_{2t}. If it reaches the characteristic curve, overload protection is on.

The overload function can be set to be on when the current is increased by 600% in consideration of motor operating time. Since operation time can be set from 1 second to 60 seconds in 1-second increments, up to 60 classes can be decided for overload characteristic curves.

In the definite time mode, regardless of motor heat, current after delaytime is recognized as excess current and if it lasts over operation time, a trip occurs.



● Stall/Locked Rotor - 48/51L

Losses caused by motor rotor's stall, failure or operation delay are prevented. Load current or load torque is over the predefined value, it is detected to shut down the circuit. Excess current operation triggered by start electric current is on after the delay time

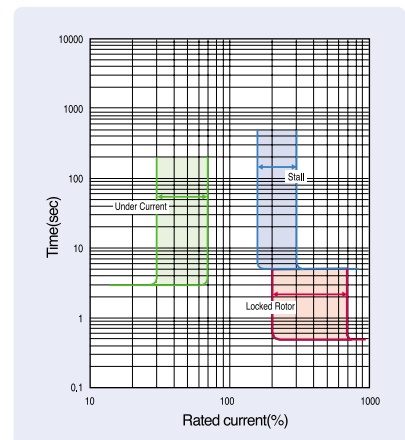
● Under Current - 37

This function detects no-load conditions that take place as the motor shaft is dislocated or damaged or prevents pump idling. Up to 30~70% of rated current can be predefined and the system is on within three seconds

● Phase Fail/Phase Unbalance - 47P

When a phase failure occurs in the motor or power, the motor cannot start and the operating motor will stop due to a torque shortage or be overheated as negative sequence current keeps flowing in. The IMP is set to be on within 1.5 seconds when the 3-phase current unbalance is over 70% and be tripped within three seconds when the unbalance rate is over 10~70%.

* For the single-phase motor, Phase Fail/Phase Unbalance should be off.



● Reverse Phase

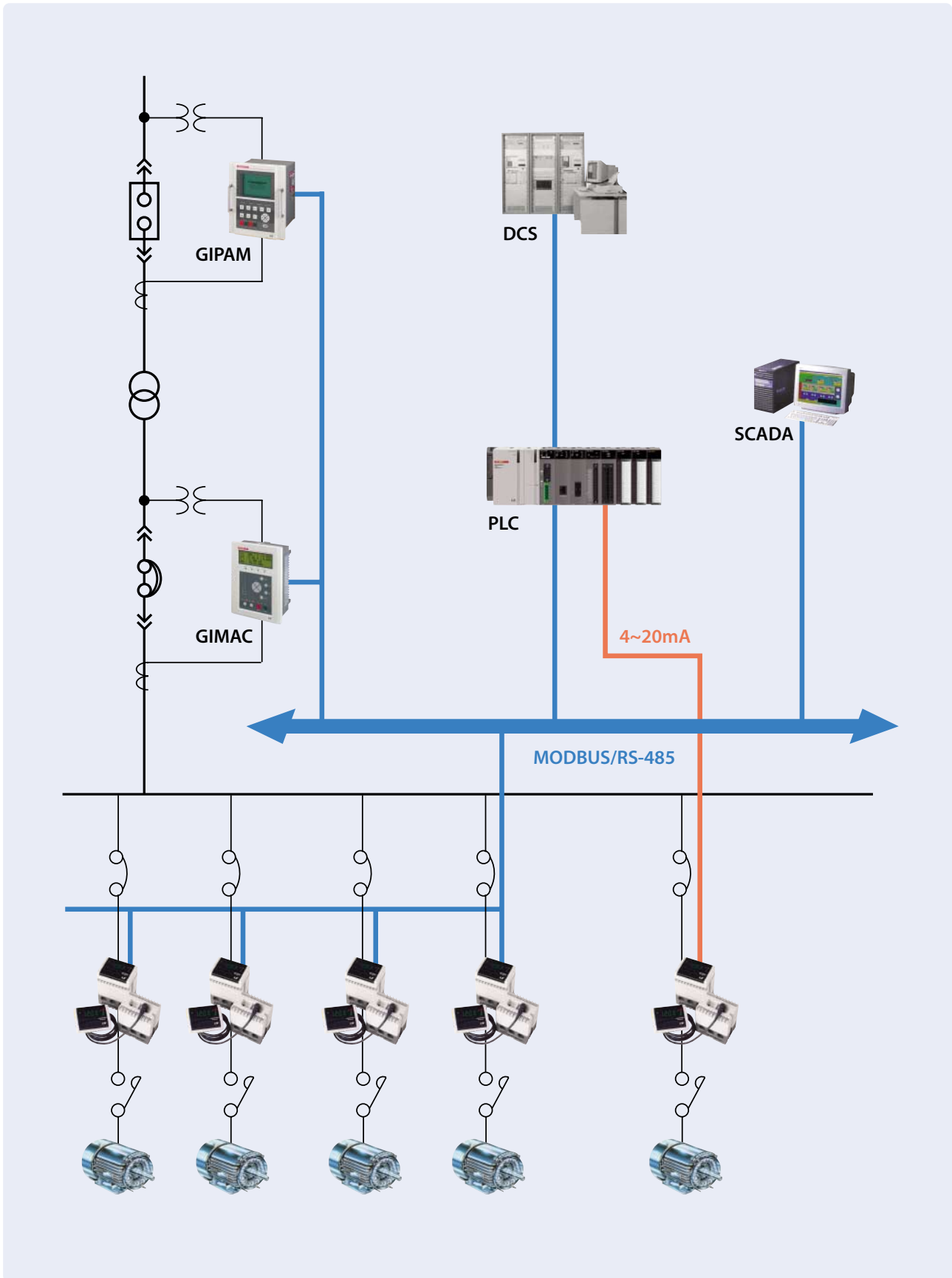
This function prevents the motor's reverse revolution. The phase difference of 3-phase input current is compared and if the phase sequence is changed, this function is on within 0.1 second. Only with the motor running, the phase reversion is checked. As this function is not available for the single motor, turn it off for the single motor.

● Ground Fault - 51G

This function is on when leakage current is detected to prevent ground faults and 2nd faults (short circuit and electric shock). Current sensitivity and operation time can be set differently for each ground systems. Current sensitivity can be set 30mA~25A and operation time 0.05~1.0 second.

Communication

Since the IMP supports RS-485/MODBUS, communication networks with various systems can be established. Also, as analogue current signals (4~20mA) can be used, it is compatible with existing systems with transducers. (See the system architecture.)



Ratings and Type

Ratings



One-Body Type

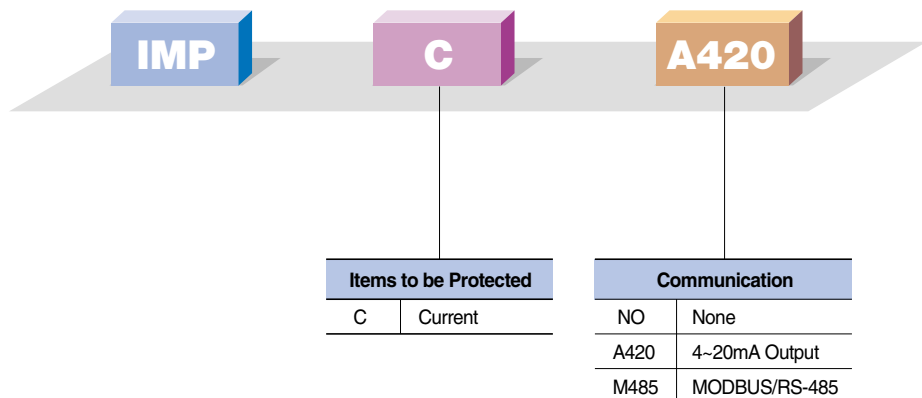


Separate Body Type

Protection	Excess Current, Under Current, Instantaneous, Reverse Phase, Stall, Phase Failure, Unbalance, Constraint, Ground Fault	
Connection	Penetration	
Operation Time Characteristics	Heat Accumulation Inverse Time /Inverse Time /Definite Time	
Rated Current	0.5~10A/5~100A (Selected by Slide S/W)	
Display	7-SEGMENT	
Power	AC/DC 85~245V (50Hz/60Hz)	
Recovery Type	Automatic	1~20 minutes
	Manual /Electric (ON/OFF Selectable)	
Installation Method	The display can be installed separately. 35mm DIN rail /nut	
Tolerance	Current: $\pm 5\%$; Time: $\pm 5\%$	
	4~20mA Output: $\pm 5\%$	
Time Setup	Start Delay	1~200 sec.
	Operation Delay	1~60 sec.
Auxiliary Contact	3-SPST 3A/250VAC Resistance (Momentary contacts should be purchased separately)	
ZCT Input <small>Note</small>	200mA/100mV (Specific ZCT)	
Operation Environment	Operation Temperature	-10~55°C
	Storage Temperature	-20~70°C
	Relative Humidity	80%RH or less (No condensation)
Insulated Resistance	100Mohm/500VDC	
Lightning Impulse Voltage	1.2×50us 6kV Standard Wave	
Fast Transient	2kV/1Min	
Power Consumption	3W or less	

Note) Available when the zero-phase-sequence current is selected.

Ordering Method (Explaining the Model Name)



Operation and Setting

1. Test/Reset

- 1) Check wires.
- 2) Press the Test/Reset key once. Then "TEST" is displayed and the system is tripped.
- 3) With the system tripped, press the Test/Reset key to reset the system.

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 system is tripped.
- 2) Press the Enter key. Then "P-99" is displayed. Use the Up/Down keys to change the password.
- 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 SW 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 Heat Amount Reset

When the system is tripped while it is in the heat accumulation inverse time mode, if you want to turn the system 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 heat accumulation excess current, if the motor is started right after it is reset, as the motor is hot, it is highly likely that the motor is tripped again.*

Setting Menu (A Group)

Group	Menu	Setting Value	Item	Default Value
A	1CHA	dEF/th/n-th	Operation Characteristics (Definite Time / Heat Accumulation Inverse Time /Inverse Time)	n-th
	20-t	1~60s	Operation Time (sec)	60
	3d-t	1~200s	Operation Delay (sec)	In chase of dEF
	4r-C	0.5~10A/5~100A	Rated Current	Max.
	5Ctr	0.25, 0.5, 1~200	CT Ratio (4 times, twice, once)	1
	6Loc	OFF, 200~800%	Lock Protection (sec)	OFF
	7StL	OFF, 150~500%	Stall Protection (sec)	OFF
	8P-F	OFF/On	Open Phase	OFF
	9P-U	OFF, 10~70%	Unbalance Protection (%)	OFF
	10rP	OFF/On	Reverse Phase	OFF
	11UC	OFF, 30~90%	Low Current Protection (%)	OFF
	12gF	OFF, 0.03, 0.05/0.1~3A	Ground Fault Operation Current (Zero-Phase-Sequence Current) (A)	OFF
	13gn	OFF, 20~500% (FLCmin)	Ground Fault Operation Current (Post-Arc Current) (FLCmin)	OFF
	14gt	0.05, 0.1~1.0s	Ground Fault Operation Time (Current)	-
	15gd	On/OFF	Ground Fault Delay During Start	ON
	16IC	OFF, 500~1000%	Instantaneous Protection (%)	OFF
17Io	ALt/TriP	Instantaneous Warning/Operation	TriP	

Note 1) When the rated current S/W is 100A, the CT ratio is not displayed.

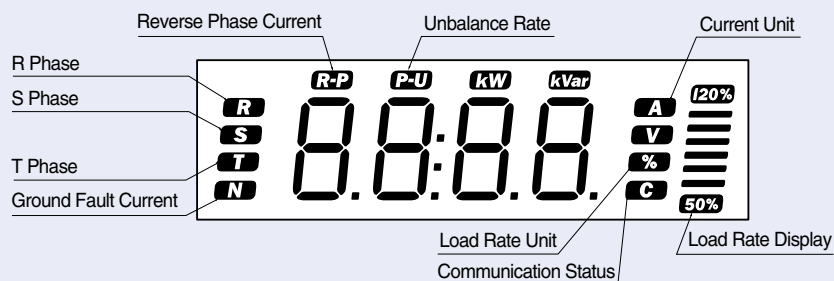
Note 2) Some menus are not displayed if relevant functions are not available.

Setting Menu (B Group)

Group	Menu	Setting Value	Item	Default Value
B	1E-r	On/OFF	Electric Recovery	On
	2A-r	OFF, 1~20 min	Automatic Recovery (Minute)	OFF
	3r-t	Hour/Minute	Operation Time	Time Check
	4Srt	OFF, 1~8760Hour	Operation Time Setup (Hour)	-
	5S-d	2009/01.01/00:00	YY/MM/DD/ HH:MM	
	6trt	Day/hour:minute	Total Operation Time	Time Check
	AR-d	0.5~10/5~100A	20mA Output Setup	420 Model
	AAdr	1~247	Communication Address	M485 Model
	bbPS	96/192/384	Communication Speed	
	cS-P	On/OFF	SWAP	

Note 1) When the power is supplied first or is resupplied after a power failure, must set up the date (5.S-d).

Note 2) Automatic recovery is only possible in case of an excess current trip.



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

Operation Display

Display	Description	Remark
0-C	Excess Current Trip	Operate within predefined time.
U-C	Low Current Trip	Operate within three seconds.
P-F	Open Phase Trip	Operate within 1.5 seconds when the unbalance rate is over 70%.
P-U	Unbalance Trip	Operate within three seconds.
Loc	Constraint Trip	Operate within 0.5 seconds.
StL	Stall Trip	Operate within three 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)	

7. IMP Specifications for Low Voltage 3-Phase Induction Motors (Reference)

Full Load Current for the Motor	IMP Settings			External CT	Motor Output (Less than kW)		
	Current Selection S/W	Wire Penetration	CT Setup		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.

Note 2) The CT is selected as a reference for the EMPR's current setting range.

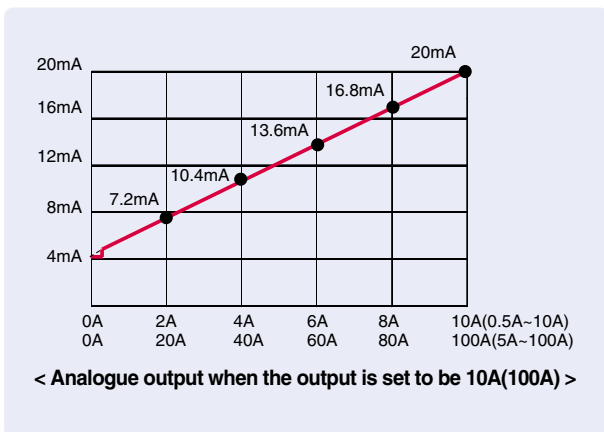
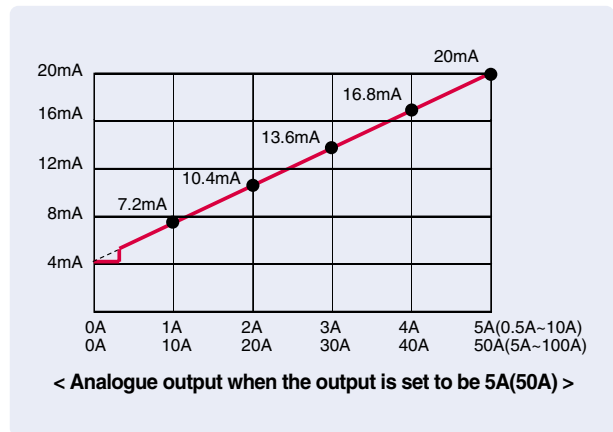
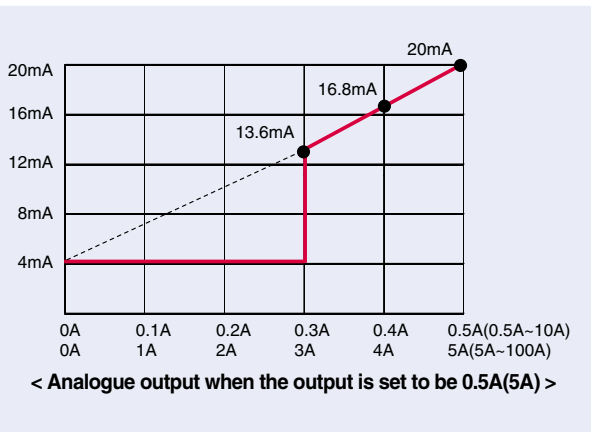
8. Current Signal (DC 4~20mA) Output

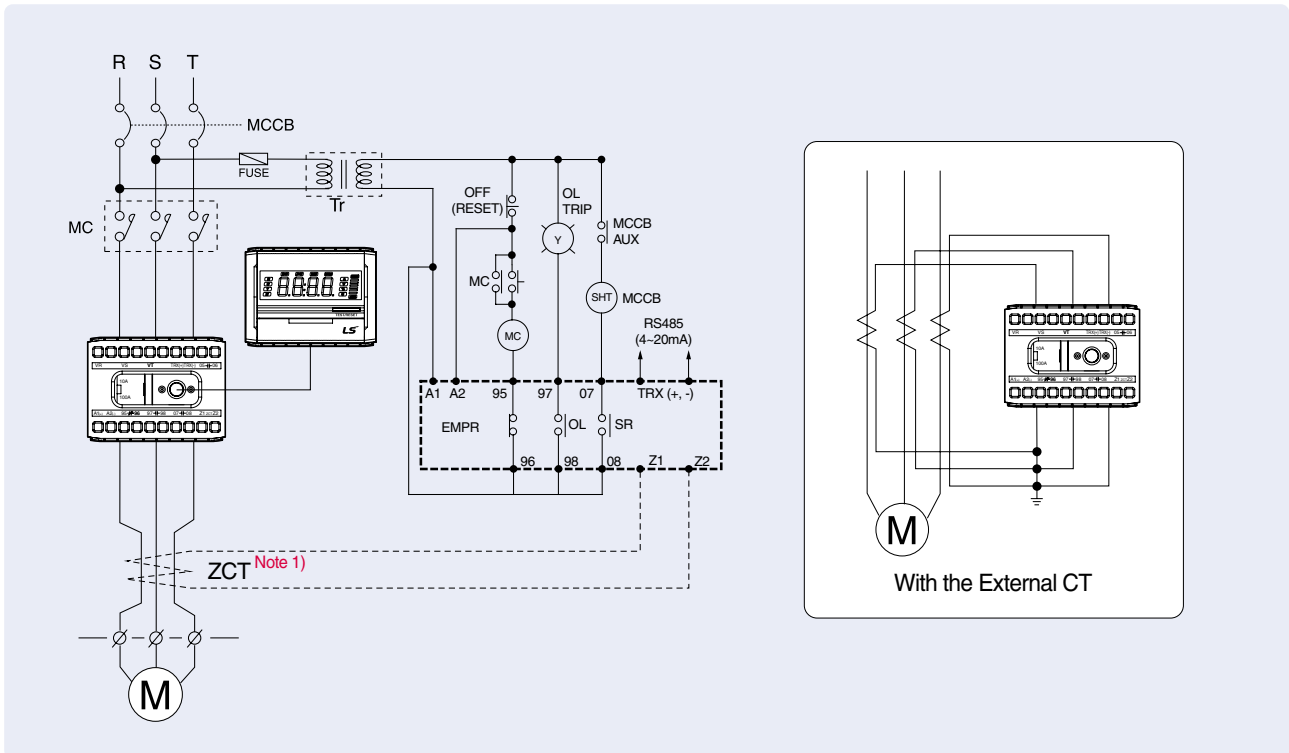
- 1) The biggest current out of measured 3-phase currents is converted into DC 4mA~20mA and the current measured remotely by digital meter can be displayed.
- 2) When there is no current, 4mA is sent. If the current goes beyond the predefined value, 20mA is sent.

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

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

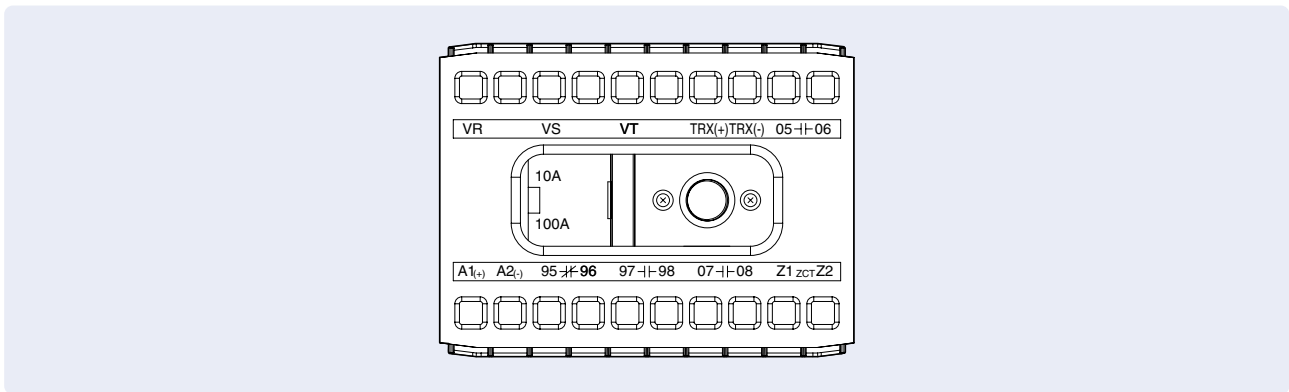
Note) The allowable burden is less than 500Ω . Considering the receiver resistance (usually 250Ω) and track resistance), the shielding cable should be used.





Note 1) When the zero-phase-sequence current transformer is used to detect ground faults, connect the ZCT.

Note 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.



Terminal Configuration

Engrave	Description	Remark
A1(+), A2(-)	Input terminal for operation power	AC/DC85~245V
95-96	When the power is ON (NC contact output)	In case of an instantaneous trip, if 17.lo is ALT, it is NC, and if 17.lo is Trip, it is NO.
97-98	When the power is ON (NC contact output)	In case of an instantaneous trip, regardless of 17 .lo setup, it is NC.
07-08	Converted to the NC mode only when an instantaneous trip occurs.	
Z1, Z2	Output terminal for the zero-phasesequence current transformer	Specific ZCT (for the EMPR)
TRX(+)	RS485 terminal (TRX+) Or 4~20mA (+) output	
TRX(-)	RS485 terminal (TRX-) Or 4~20mA (-) output	
10A/100A	Max. rated current change S/W	10A : 0.5~10A, 100A : 5~100A
VR/VS/VT	3-phase voltage input terminal	
05-06	Output terminal for voltage protection	

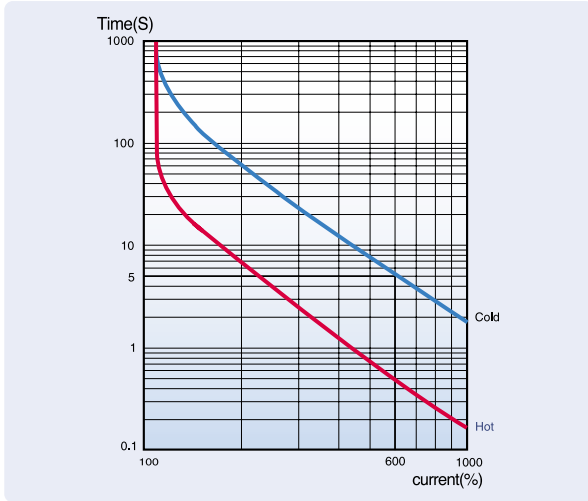
Note 1) The 3-phase voltage input terminal and 05-06 output terminal should be connected only for voltage protection models, which will be released in the future.

Note 2) For RS485 connection, the terminal resistance should be 120Ω .

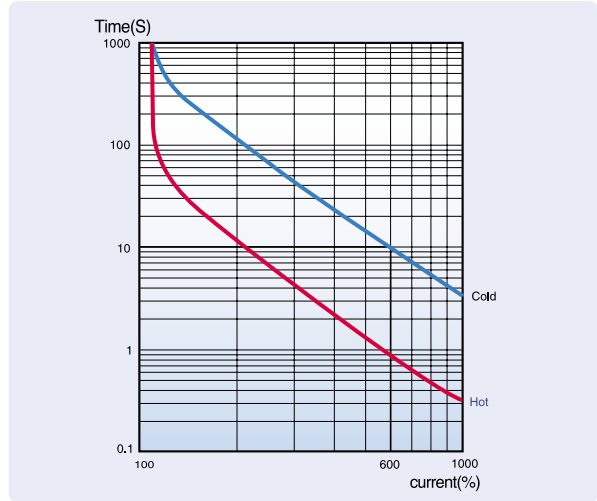
Note 3) For 4~20mA current, the maximum burden should be less than 500Ω .

Characteristic Curve

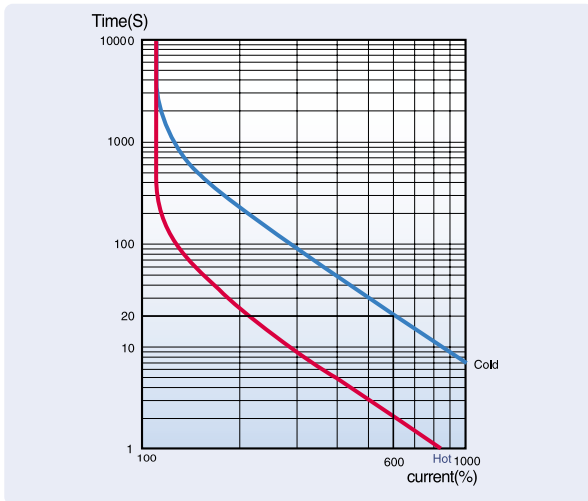
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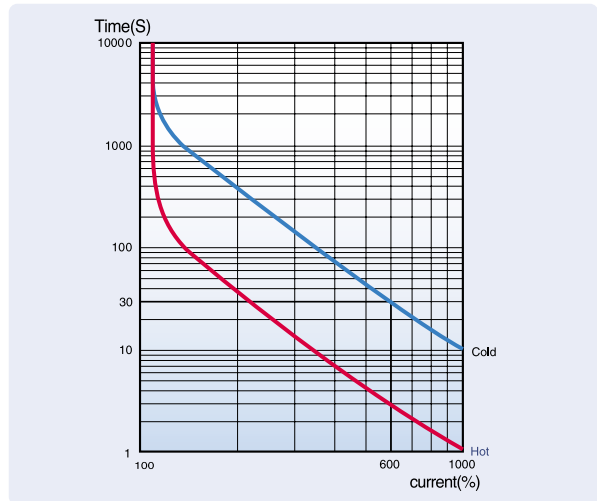
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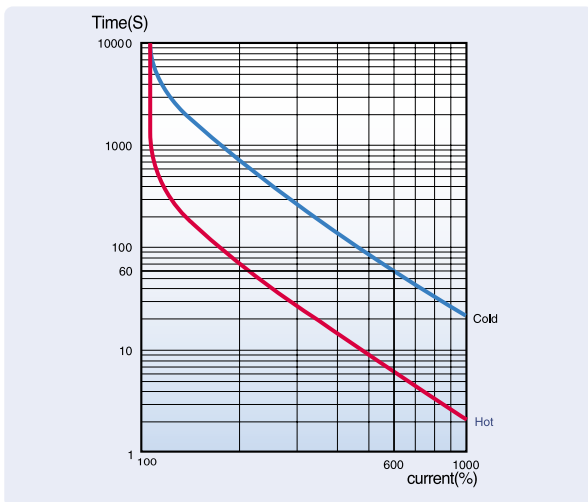
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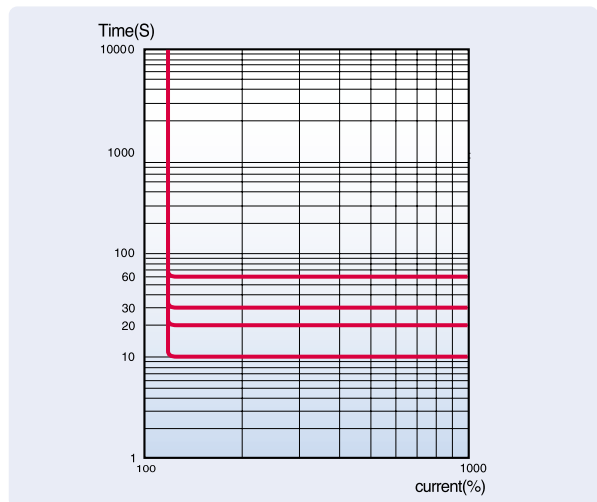
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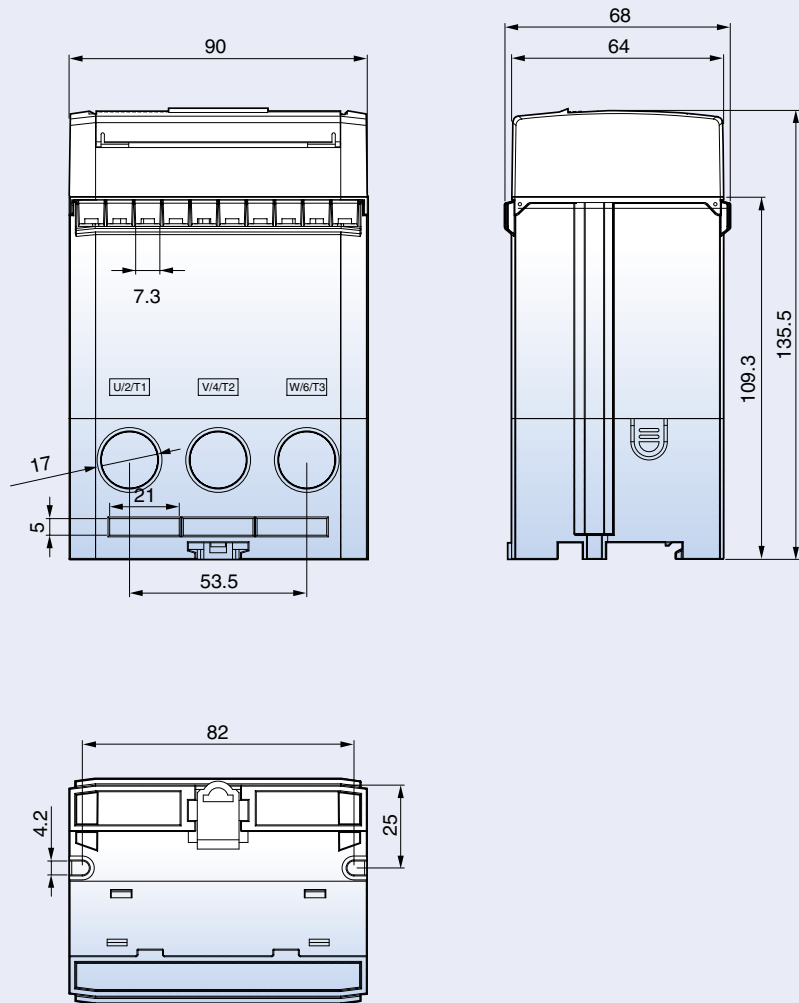
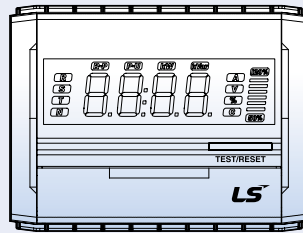


<Definite Time Characteristics>



(Unit: mm)

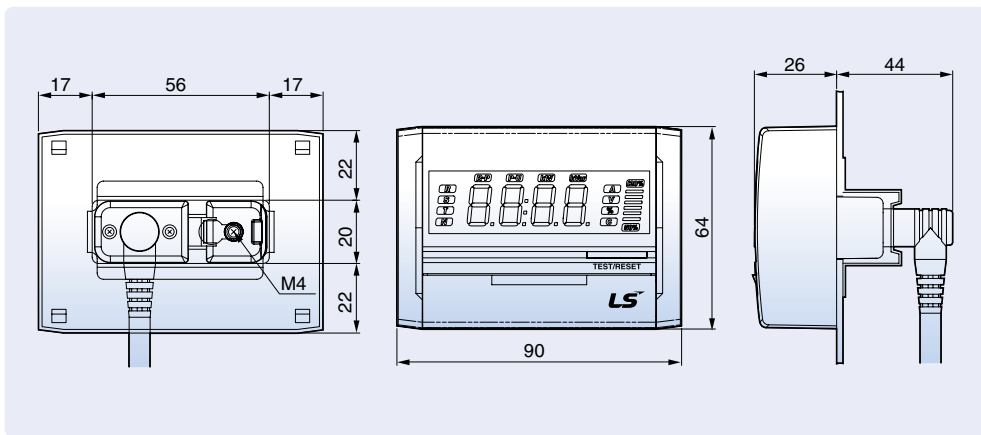
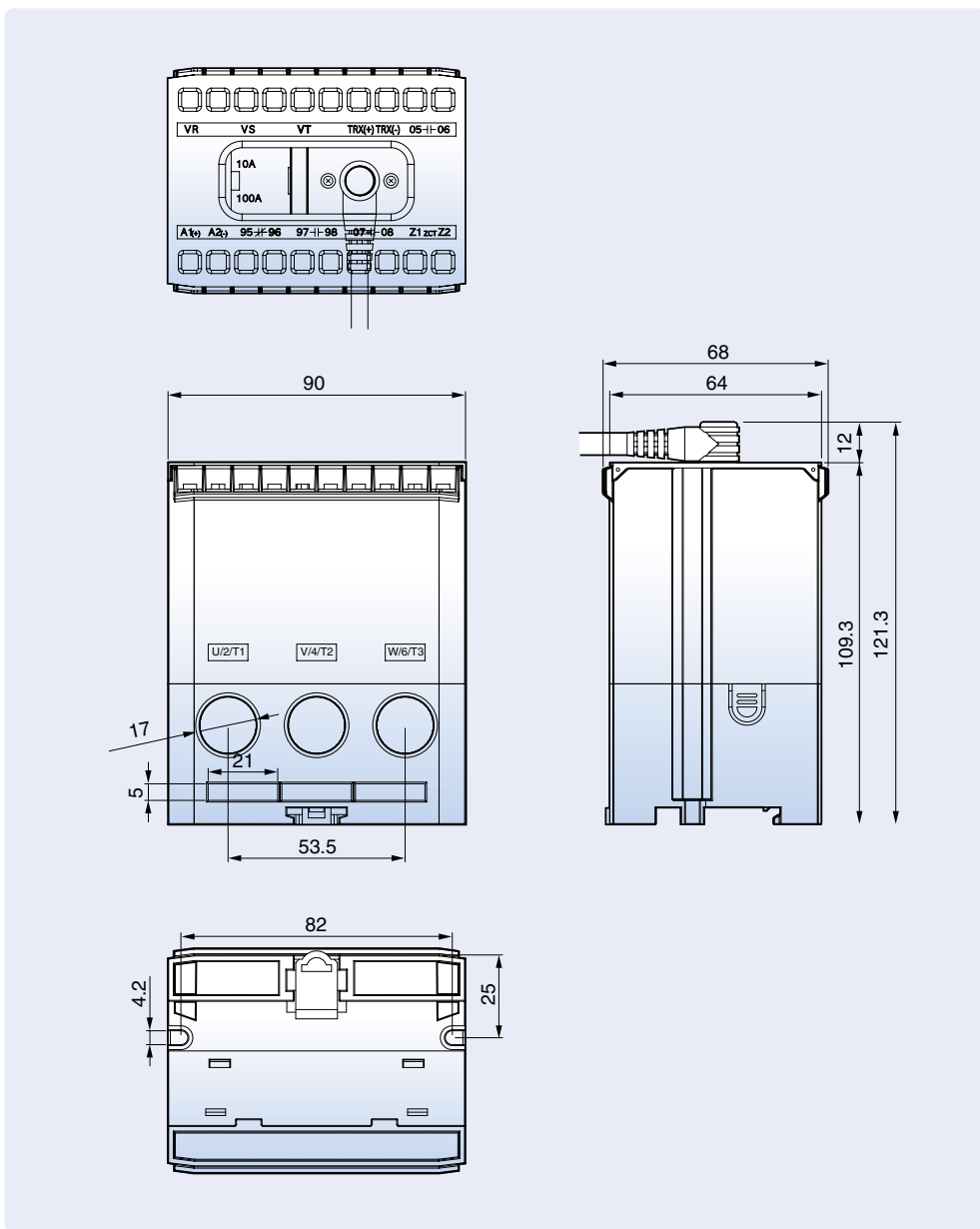
One-Body Type



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

(Unit: mm)

Separate Body Type



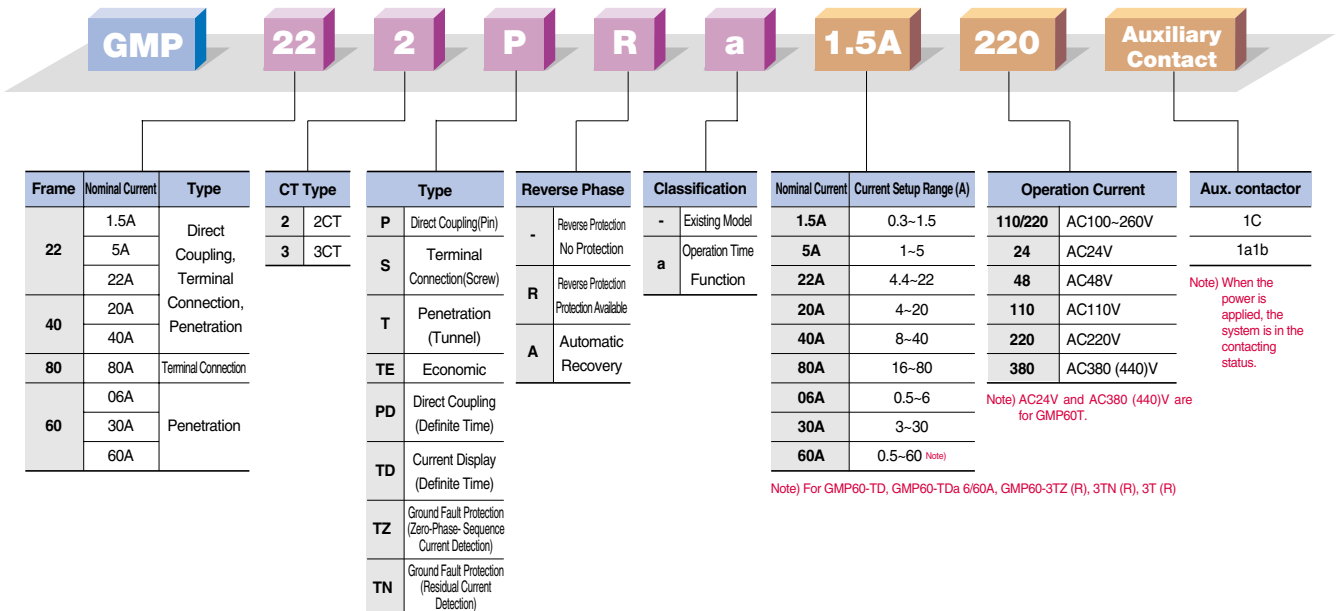
List of the Standard Model

Functions of the Digital Motor Protection Relay (GMP Type)

Connection	Model	Device	Characteristic	Attachment	Excess Current	Overcurrent	Phase failure	Stall	Asymmetry	Reverse phase	Ground Fault	Setup	Output	Rated Current
관통	GMP60-TE	2CT	D	Manual	P/R	■	▲	▲				O+D	1c	6,30,60A
	GMP60-T	2CT	D	Manual	P/R	■	▲	▲				O/D	1c	6,30,60A
	GMP22-2T	2CT	I	Manual	P/R	■	▲	■				O	1a1b	1.5,5,22A
	GMP40-2T	2CT	I	Manual	P/R	■	▲	■				O	1a1b	20,40A
	GMP60-3T(R)	3CT	D	Manual	P/R	■	■	▲	■	■ (R)		O/D	1a1b	6,36,60A
	GMP60-TA	2CT	D	Manual/Automatic	P/R	■	▲	▲				O/R	1c	6,30,60A
	GMP60-3TN(R)	3CT	D	Manual	P/R	■	■	▲	■	■ (R)	■	D/G	1a1b	6,60A
	GMP60-3TZ(R)	3CT	D	Manual	P/R	■	■	▲	■	■ (R)	■	D/G	1a1b	6,60A
	GMP22-3T(R)	3CT	I	Manual	P/R	■	■	■	■	■ (R)		O	1a1b	1.5,5,22A
	GMP40-3T(R)	3CT	I	Manual	P/R	■	■	■	■	■ (R)		O	1a1b	20,40A
관통	GMP60-TD	2CT	D	Manual	P/R	■	▲	▲				PRG	1a1b	6,60A
	GMP60-TDa	2CT	D	Manual/Automatic	P/R	■	■	■	*Additional functions including time and low current			PRG	1a1b	6,60A
직결	GMP22-2PD	2CT	D	Manual	MC	■	▲	▲				O/5	1c	1.5,5,22A
	GMP40-2PD	2CT	D	Manual	MC	■	▲	▲				O/5	1a1b	20,40A
	GMP22-2P	2CT	I	Manual	MC	■	▲	■				O	1a1b,1c	1.5,5,22A
	GMP40-2P	2CT	I	Manual	MC	■	▲	■				O	1a1b	20,40A
	GMP22-3P(R)	3CT	I	Manual	MC	■	■	■	■	■ (R)		O	1a1b	1.5,5,22A
	GMP40-3P(R)	3CT	I	Manual	MC	■	■	■	■	■ (R)		O	1a1b	20,40A
	GMP22-2PA	2CT	I	Automatic	MC	■	▲	■				O	1a1b	1.5,5,22A
직결	GMP40-2PA	2CT	I	Automatic	MC	■	▲	■				O	1a1b	20,40A
	단자	GMP60-3S(R)*	3CT	D	Manual	P/R	■	■	▲	■	■ (R)		O/D	1a1b
GMP22-3S*		3CT	I	Manual	P/R	■	■	■	■	■ (R)		O	1a1b	1.5,5,22A
GMP40-3S(R)*		3CT	I	Manual	P/R	■	■	■	■	■ (R)		O	1a1b	20,40A
GMP22-2S*		2CT	I	Manual	P/R	■	▲	■				O	1a1b	1.5,5,22A
GMP40-2S*		2CT	I	Manual	P/R	■	▲	■				O	1a1b	20,40A
GMP80-2S		2CT	I	Manual	P/R	■	▲	■				O	1a1b	80A
GMP80-3S(R)		3CT	I	Manual	P/R	■	■	■	■	■ (R)		O	1a1b	80A
GMP80-2SA		2CT	I	Automatic	P/R	■	▲	■				O	1a1b	80A

- (1) Device: D = Definite Time, I = Inverse Time (2) Attachment: P = Nut, R = Din-Rail. MC = Mag. Contactor Direct Attachment
 (3) Open Phase: The 2CT model detects excess current or two phases (4) Constraint: Operate after the predefined time in the define time mode.
 (5) Setting: O+D = Operation and Delay times are set as a whole, O/D= Operation and Delay times are set separately, PRG = Program setup,
 (6) In the inverse time mode, it can be used without external CTs (7) Model '* ' indicates additional terminal platforms are required.

Ordering Method (Explaining the Model Name)

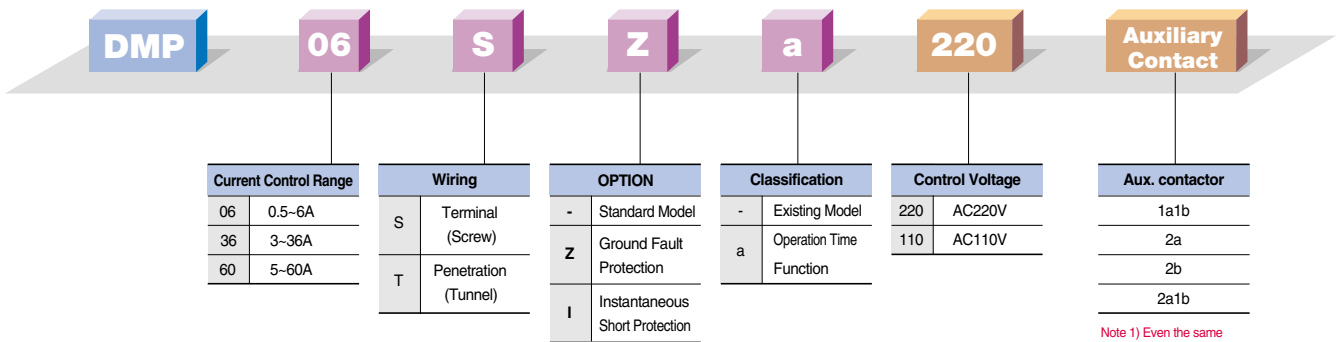


Functions the Digital Motor Protection Relay (GMP Type)

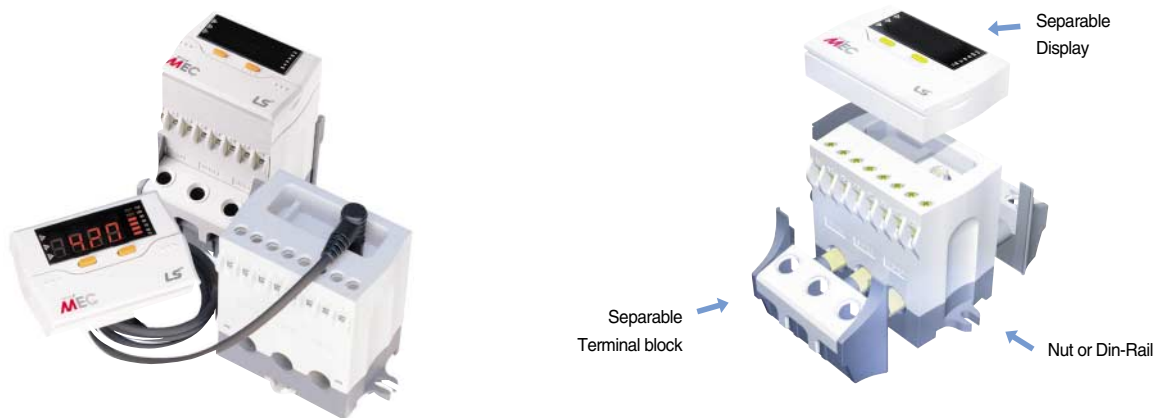
Function	Wiring	Display	Model	Output	Operation	Excess Current Low Current	Constraint	Reverse Phase	Unbalance Open Phase	Others	Time Setup
Standard	Penetration	One/Separate Body	DMP □ -T	2a1b	Define Time/Inverse Time	■	■	■	■		
			DMP □ -Ta	2a1b	Define Time/Inverse Time	■	■	■	■		■
	Terminal	One/Separate Body	DMP □ -S	2a1b	Define Time/Inverse Time	■	■	■	■		
			DMP □ -Sa	2a1b	Define Time/Inverse Time	■	■	■	■		■
Ground Fault	Penetration	One/Separate Body	DMP □ -TZ	1a1b,2a	Define Time/Inverse Time	■	■	■	■	Ground Fault	
			DMP □ -TZa	1a1b,2a	Define Time/Inverse Time	■	■	■	■	Ground Fault	■
	Terminal	One/Separate Body	DMP □ -SZ	1a1b,2a	Define Time/Inverse Time	■	■	■	■	Ground Fault	
			DMP □ -SZa	1a1b,2a	Define Time/Inverse Time	■	■	■	■	Ground Fault	■
Instantaneous	Penetration	One/Separate Body	DMP □ -TI	2a1b	Define Time/Inverse Time	■	■	■	■	Instantaneous	
	Terminal	One/Separate Body	DMP □ -SI	2a1b	Define Time/Inverse Time	■	■	■	■	Instantaneous	

(1) For the separate body model, cables should be purchased separately. For the wiring terminal model, terminals can be bought separately.
 (2) '□' indicates 06, 36, and 60 are removed (Rated current).

Ordering Method (Explaining the Model Name)



Note 1) Even the same model has different contact specifications.
 Note 2) When the power is applied, the system is in the contacting status.



EMPR IMP Series

Current Transformer CT, ZCT - Zero Phase Sequence Current Transformer

1CT



Specifications

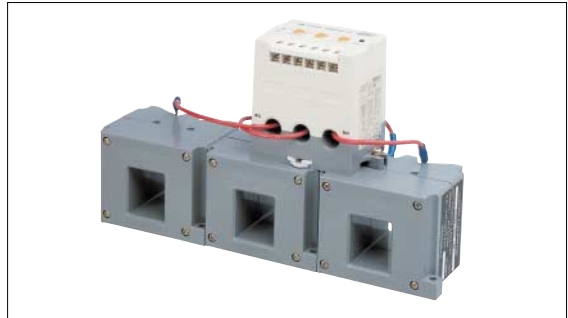
Model		3CT
Current Transformation Ratio	SCT-100	100:5A
	SCT-150	150:5A
	SCT-200	200:5A
	SCT-300	300:5A
	SCT-400	400:5A
Grade		1.0
Burden		5VA
Insulation Voltage		AC 600V
Dielectric Strength		2kV
Insulation Resistance		10MΩ (DC 500V Megger)
Attachment		Panel

Note) Use this product only for EMPR

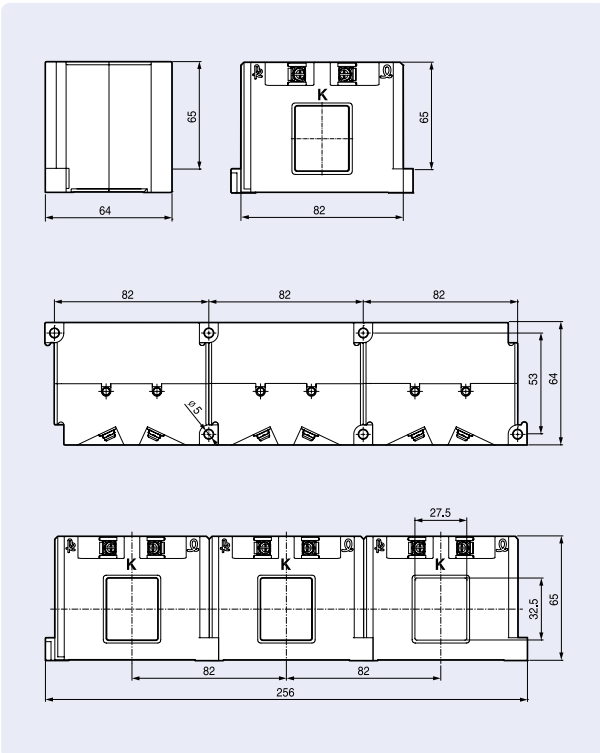
3CTs



With GMP60-3T



Dimensions



With DMP



With IMP



Annex

Definite Time, Inverse Time and Heat Accumulation Inverse Time

- Definite Time** : In this mode, if the current goes beyond the predefined value, regardless of the current size, the system is on after a certain period of time. This is suitable for heaters, circuits and lights which have constant load current.
- Inverse Time** : In this mode, if the current goes beyond the predefined value, the system operates in inverse proportion to the current size. The mode is divided into cold mode and hot mode.

In the cold mode, the motor starts based on normal temperatures (initial starting current). In the hot mode, after starting is completed, the motor moves from cold to hot mode according to current and operation time. If the motor is in the hot mode, it operates faster than the cold one.

Ex) When the motor is running with 10 seconds of the operation time, if the current is increased by 600% for 10 seconds, the system is on in the cold mode. However, in the hot mode, when the current is increased by 600, the system is tripped only for one second.

The motor loss caused by the excess current is in proportion to generated heat (I²t). So, the system in the inverse time mode is suitable for motor protection. And as the circuit breaker (ACB, MCCB) for the power stage has inverse time characteristics, the motor protection relay with inverse time characteristics is suitable. Though motor protection relays with inverse time characteristics are used often because they are easy to set up and handle, EMPR with inverse time characteristics are suitable for delicate and reliable motor protection.
- Heat Accumulation Inverse Time** : Heat Accumulation Inverse Time: In this mode, though the system has the same characteristics as the inverse time mode, some time after the motor stops, the system enters the cold mode.

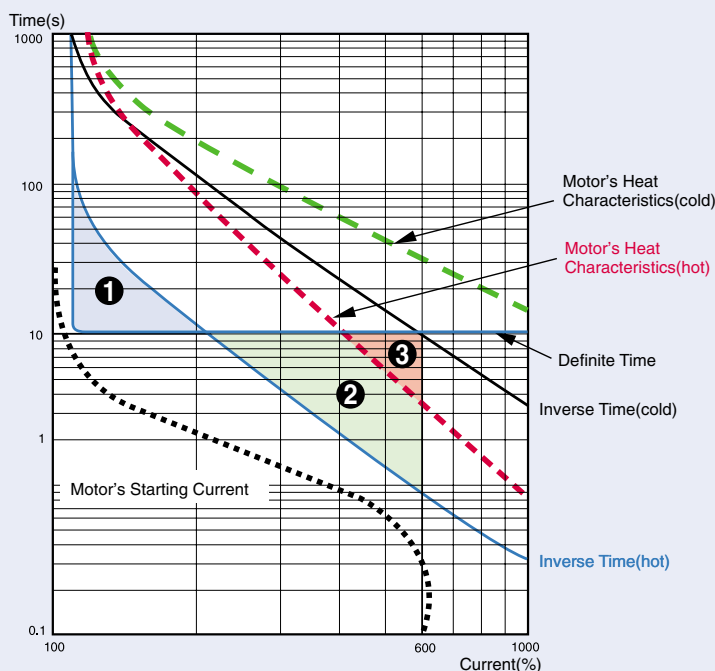
That is, the system has similar characteristics as the TOR. Only after certain time in the overload mode, the system can be operated again. This mode is used when the motor can be damaged because of frequent forward/backward operation and restarting. If frequent starting and forward/backward operation are required, it is convenient to operate the system in the inverse time mode as heat is not accumulated

Inverse Time Characteristics and Excess Current Saturation in the CT

When the system is running in the inverse time mode, the operation current should be recognized precisely by the motor protection relay. If the current is much bigger than the relay's rated current, the internal CT is saturated and its size is recognized small, which results in incorrect inverse time operation.

LG's motor protection relay can recognize the current which is eight times bigger than the rated current. So, it can operate in the inverse time mode to protect motors with a rated current of 60A or 100A without external CTs.

Comparison of Inverse Time/Definite Time



<When the Operation Time is 10 Seconds >

Area	Motor Status	Inverse Time	Definite Time
①	No motor deterioration or burning	Non operation	Operation
②	Hot status: Possible motor deterioration or burning	Operation	Non operation
	Cold status: No motor deterioration or burning	Non operation	
③	Hot status: Motor burning	Operation	Non operation
	Cold status: No motor deterioration or burning	Non operation	



Safety Instructions

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

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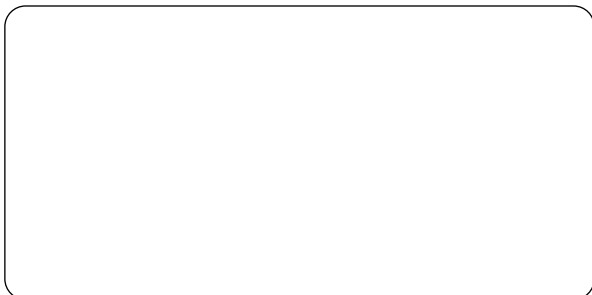
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Specifications in this catalog are subject to change without notice due to continuous product development and improvement.

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