

HG

Electronic Motor Protection Relays

Overview and Characteristics	4
Technical Data	
External Structure	6
Functions	8
Operational Characteristics	14
Model Selection Table	20
Dimensions	22
Circuit Diagram	23
Order Code	27
Optional Component	28
Handling and Maintenance Inspection	30

RELAY

HG Series

Electronic Motor Protection Relays

Optimal motor protection solution for today's "smart" devices



The HGMP electronic motor protection relay provides protection for the motor system from unstable condition of power system and maximizes utilization rate with user-friendly advanced motor protection functions.

Features by Model Type

Normal Type

Provides core motor protection functions to enable economical and practical motor control.
Earth leakage or instantaneous protection functions can be selected as options.

Advanced Type

All normal type features are offered, in addition protection function delay can be set in detail to implement more optimized motor protection system.
Optional RS-485/Modbus communication feature enables relay integration into the user's system management network.

Rated Current

0.5 ~ 60 A

Operational Reliability

Real-time data processing based on
32-bit ARM Core MCU
Rogowski CT provides highprecision measurement.

Control Power Range

100 ~ 240 VAC (50/60 Hz), 100 ~ 240 VDC

Multiple Protection Functions

Multiple motor protection relay functions
Overload warning
Real-time load rate display

User Convenience

Trip history log and display
Cumulative operating time counter



Earth Leakage HGMP N60 Z



Instantaneous HGMP N60 I



HGMP A60

Overview and Characteristics

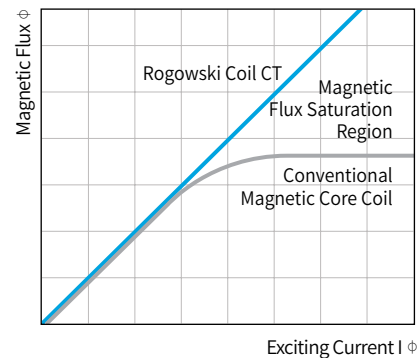
Microprocessor-Based Control

Advanced 32-bit ARM Core MCU provides precise measurements and calculations, maximizing relay stability and reliability.

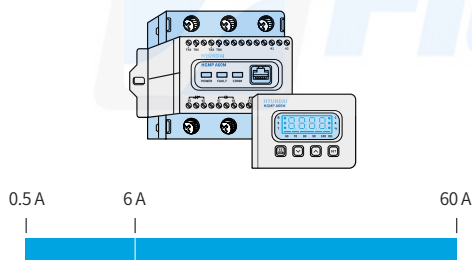
Wide Current Setting Range

Rogowski CT prevents issues with magnetic flux saturation, enabling a high degree of measurement accuracy.

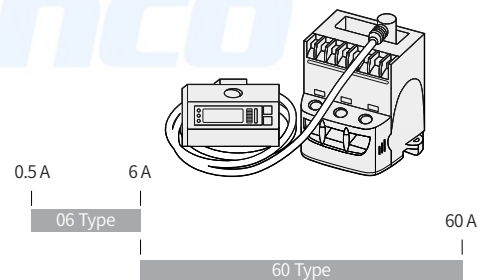
- Current settings can be set from 0.5 A to 60.0 A in a single device without additional setting; current settings of 0.125 A and 0.25 A are possible by changing the CT number of turns, with a rated current setting of up to 2,000 A possible with the external CT.



HGMP



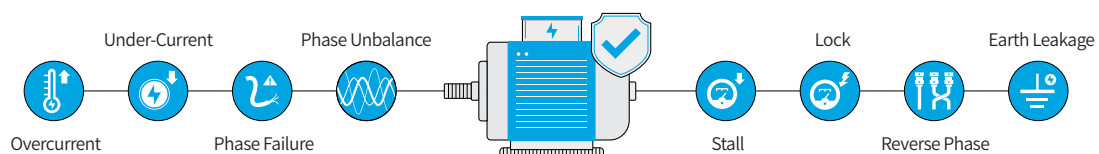
Conventional



Multiple Protection Functions

Key protection function provide a full suite of basic motor protection.

- Over-current protection provides stable motor protection according to the load characteristics for definite time, inverse time and thermal inverse time.
- A double layer of ground fault protection is provided by measuring zero current and residual current (Ground Fault Detection Current 100 mA to 60.0 A) (Earth Leakage Model of Normal Type, Advanced Type)
- Up to 1,500 % True-RMS instantaneous protection function (Instantaneous Model of Normal Type, Advanced Type)



Superior Noise Characteristics

Features superior harmonic noise characteristics and can be used for a wide frequency range (30 to 200 Hz), allowing application in the secondary coil of the inverter control circuit.
(For instantaneous, 50/60 Hz only).

Run-Time Alert Function

Total cumulative motor run time is displayed for convenient scheduling of maintenance and repair.

Overload Warning Feature

- A warning alert is activated during overload to prevent a system failure due to a sudden over-current trip.
- A bar graph on the display monitor during operation enables constant monitoring of load status, allowing easy maintenance.

Three-Phase Ammeter Function

Real-time current for each phase of the three-phase current is displayed continuously in sequence to allow constant monitoring of current values.

- Up to ten of the most recent failure events, up to 50 system events are stored (Advanced Type - Comm. Type)
- Up to the five latest events of failure and three-phase current values at the time can be checked on the indicator.
- A fault current waveform of the latest trip is stored to assist in diagnosis of the cause of the event. (Advanced Type - Comm. Type)
- Current waveform of the motor in operation can be easily viewed without the need of separate Current measuring equipment (Advanced Type - Comm. Type)



R-Phase



S-Phase



T-Phase

Trip History Recording Feature

When a trip occurs, the cause as well as the fault current is immediately displayed to assist in diagnosing the system failure.



Overcurrent



Undercurrent



Phase Failure

Technical Data

External Structure

Integrated type

- Main Unit : Control and display monitoring can be performed directly on the main unit of the relay. Tunnel type or screw type can be selected to suit the panel environment.

Separated type

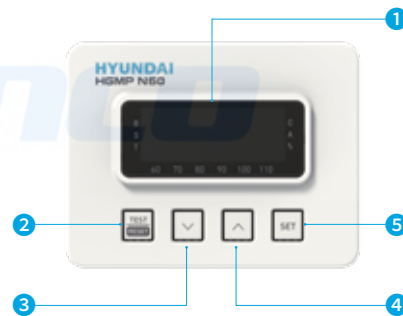
- Main Unit : Tunnel type or screw type can be selected to suit the panel environment.
- Display Unit : Separate display unit installed on the front of the panel can enable easy monitoring of current values and error diagnostics via the 4-digit 7-segment FND display.
- Connecting Cable : L-shaped terminals on each cable end allow efficient use of panel space.



Front Side of Display Unit (Separated Type)

No.	Type	Main Functions
1	4-Digit 7-Segment FND Display	Indicates Current, Trip Information, Parameter Settings
2	TEST/RESET Button	Select Test Mode, Reset Trip, Move to the Higher Settings Menu
3	∨ Button	Move Between Menus, Change Set Value
4	∧ Button	Move Between Menus, Change Set Value
5	SET Button	Store Set Values, Move to the Lower Menu

※ Refer to the additional instructions for more detailed button functions



Phase Indicator

Indicates which phase (R, S, T) the current displayed value corresponds to. All three indicators are lit in case of earth leakage and ground failure.

Information Display

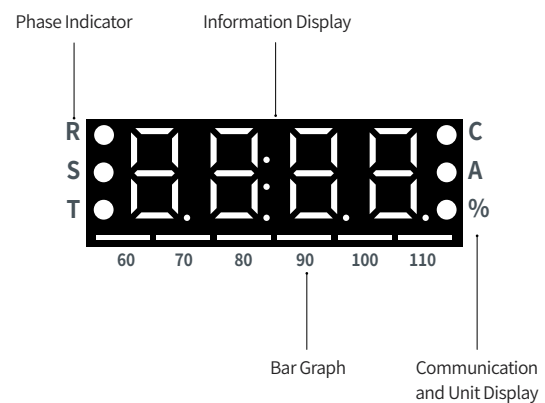
The current value or set value are indicated based on operational status.

Communication and Unit Display

- C - Indicates normal data transfer status between main unit and master network
- A - Indicates that the current value represents amperage (A)
- % - Indicates that the unit of the current value is a percentage (%)

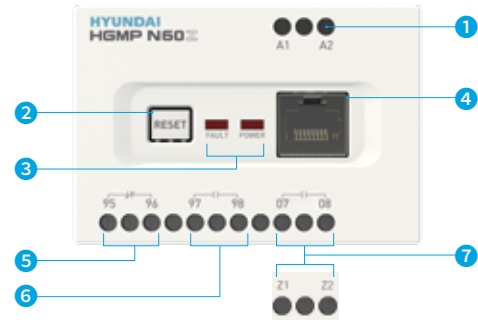
Bar Graph

Current actual load ratio to rated current is indicated in a percentage (60 to 110 %) to enable quick recognizing of current motor load conditions. The bar graph flashes when load ratio exceeds 100 %.



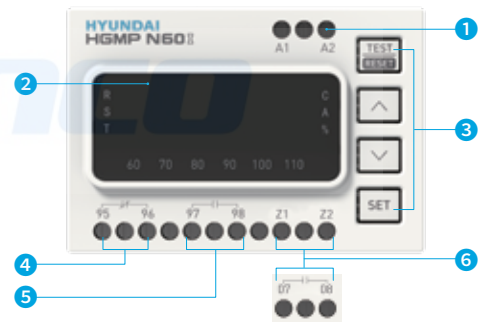
Front Side of Main Unit (Normal Type/Separated Type)

No.	Type	Main Functions
1	Power Connection Terminal	Relay Power Cable Connection Terminal
2	RESET Button	Manual Trip Reset
3	Status Indicator LED	POWER : Relay Power Status FAULT : Trip Activation Indicator
4	Connector Cable Port	Port For Cable Connection to the Display Unit (RJ45)
5	95-96 Main Contact ¹⁾	Functions as b contact for Default 1a1b Setting
6	97-98 Main Contact ¹⁾	Functions as a contact for Default 1a1b Setting
7	07-08 Auxiliary Contact ¹⁾	Instantaneous Type : Serves as Instantaneous and Overcurrent Alert Terminal (07-08) Ground Fault Type : External ZCT Connection Terminal (Z1-Z2)



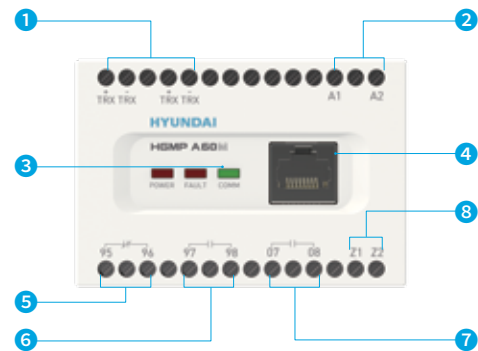
Front Side of Main Unit (Normal Type/Integrated Type)

No.	Type	Main Functions
1	Power Connection Terminal	Relay Power Cable Connection Terminal
2	4-Digit 7-Segment FND Display	Indicates Current, Trip Information and Parameter Settings
3	Control Buttons	TEST/RESET: Select Test Mode, Reset Trip and move to the Higher Settings Menu ^: Move Between Menus, Change Set Value v: Move Between Menus, Change Set Value SET: Store Set Values and move to the Lower Menu (Refer to the Additional Instructions for more Detailed Button Functions)
4	95-96 Main Contact ¹⁾	Functions as b contact for Default 1a1b Setting
5	97-98 Main Contact ¹⁾	Functions as a contact for Default 1a1b Setting
6	External ZCT	Ground Fault Type : External ZCT Connection Terminal (Z1-Z2) Instantaneous Type : Serves as Instantaneous and Overcurrent Alert Terminal (07-08)



Front Side of Main Unit (Advanced Type)

No.	Type	Main Functions
1	RS-485 Modbus-RTU Communications Terminal	Connector Terminal for Modbus Network
2	Power Connection Terminal	Relay Power Cable Connection Terminal
3	Status Indicator LED	POWER : Relay Power Status FAULT : Trip Activation Indicator COMM : Data Transfer Status Between Unit and Master Network
4	Connector Cable Port	Port For Cable Connection to the Display Unit (RJ45)
5	95-96 Main Contact ¹⁾	Functions as b contact for Default 1a1b Setting
6	97-98 Main Contact ¹⁾	Functions as a contact for Default 1a1b Setting
7	07-08 Auxiliary Contact ¹⁾	Can be set for Overcurrent Alert, Ground Fault, Instantaneous
8	External ZCT	External ZCT Connection Terminal



※ 1) Main and auxiliary terminal output can be various based on user settings. Check the settings instructions for proper use of the relay device.

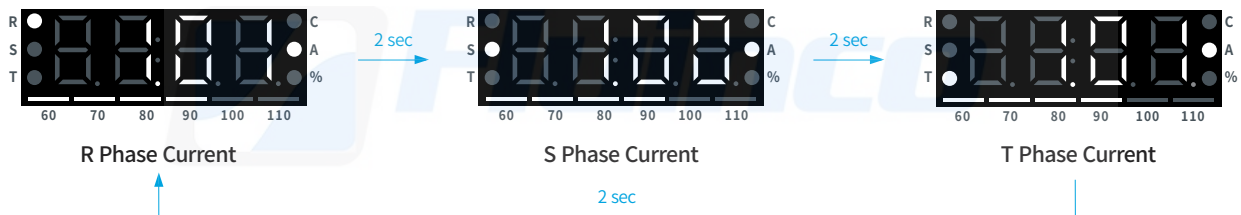
Technical Data

Functions

Display Unit Button Functions

Button	Picture	Main Functions and Key Information
TEST/RESET		Switch between normal and test modes. Can only be switched when the motor is stopped. Clears the trip if a trip has occurred. Ensure that the cause of the failure has been removed before resetting. In the menu screen, press to move to the higher settings menu.
DOWN		Move setting menus, or decrease set value. Manually switch phases sequence when the current values by phases are shown. (R → S → T → R sequence)
UP		Move setting menus, or increase set value. Manually switch phases sequence when the current values by phases are shown. (R → S → T → R sequence)
SET		Press to apply the indicated setting when adjusting settings and parameters. In the menu screen, press to move to the lower menu.

Three Phase Digital Ammeter Function



The display cycles by default every 2 seconds between R, S and T phases to show the real-time RMS current value and load ratio for each phase current. The indicator LEDs on the left show which phase is being displayed.

Use the directional buttons to quickly cycle between each phase to check the values. When no further key presses occur for a while, the display reverts to the automatic cycle mode.

Relay Circuit Test Procedure

Check the relay and circuit with the TEST/RESET button.

1. Check the circuit connection before testing.
2. Pressing the TEST/RESET button on the relay will display TEST until the trip is initiated, and the terminal output changes to simulate an overcurrent trip.
3. Test the circuit and motor based on the pre-set maintenance schedule.
4. After the test is complete, press the TEST/RESET button on the relay again to restore to normal operation mode.

Trip Reset Procedure

Three methods for clearing a trip are available.

1. Manual reset : Press the TEST/RESET button on the display unit to reset after a trip.
2. Electrical reset : When the electrical reset function is active, reset occurs when the relay's power is turned back on after being turned off. When the function is deactivated, the trip status is left unchanged even when power is reestablished.
3. Automatic reset : The relay resets after a pre-set period of time after the occurrence of a trip. The timer resumes after the power is turned off and on before the reset takes place. The "Automatic Reset" function becomes inactive after being activated five times in succession. This function becomes active again after being manually or electrically reset. Manual reset is always available by default, with the user able to activate or deactivate electrical or automatic reset.

Adjusting Settings

1. Enter Test Mode

- Stop the motor and verify that the amperage displayed on the ammeter is 0.00 A.
- Press the TEST/RESET button to switch to test mode. Verify that “TEST” is indicated on the display as shown.



2. Enter Password

- Press the “Set” button in test mode. Check if the four-digit password input window appears on the indicator.
- Move to the next digit by pressing the “Set” button. Use the $\wedge$ and $\vee$ buttons to find the number of your choice.
- After entering all four digits, press the “Set” button. Make sure to enter the right password to move on to the next menu item.



3. Enter Settings Menu

- Press the SET button while in test mode. Verify that the first settings item is indicated on the display as shown.



4-1. Moving Between Settings Menus (Using the SET Button)

※ This feature is useful for resetting all parameters on first use after installation.

- Press the SET button when the first settings item is displayed. Verify that the current settings are shown and flashing.
- Flashing indicates that the value can be changed.
- Use the $\wedge$, $\vee$ directional buttons to change the value. Check the reference table for details on each settings value. Pressing and holding the $\wedge$, $\vee$ buttons will accelerate the counter for certain functions.
- Pressing the SET button while the desired value is flashing on the display to confirm the relay's new settings.
- After setting the first item, verify that the second settings item is displayed as shown.



Repeat the above process to adjust the settings as needed.

Technical Data

Adjusting Settings

4-2. Moving between the Settings Menus (∧, ∨ Buttons)

※ This feature is useful for adjusting certain settings while the relay is in operation.

- Pressing the ∧, ∨ at the first settings menu enables cycling through the settings menus. Refer to the table below for the sequence of the menus displayed.
- Additional settings menus will not display when some parameters are set to OFF to enhance user convenience.
- When overcurrent characteristic is set to inverse time, the activation delay time setting item is indicated as cLs, instead of oc-t.

5. Return to Test Mode

- Press the TEST/RESET button while in the settings screen will return to the test mode.
- When the current settings value is being displayed (settings flashing), pressing the TEST/RESET button twice will return to the test mode.
- The relay will automatically revert to the test mode if no key inputs are made for a certain period of time while in the settings menu or while current value is flashing.

6. Checking Settings During Operation

- Repeatedly pressing the SET button during operational mode will scroll through the current settings (regardless of operational status).

7. To Change the Set Value in Operation Mode

- The set value for rated current can be changed in operation mode.
- Just press the “Reset” button in operation mode and enter the password.
- To ensure safety, it is not allowed to set the value beyond the maximum rating of 60 A and the minimum rating of 0.5 A directly.

Settings Sequence and Menus

Order Shown	Settings Item	Indicator Code	Code Displayed	Description	Settings Range	Initial Value	Unit
1	Rated Current	rc	rc	Set the rated current for the protection characteristics.	0.5, 0.6, ... 60.0	60	A
2	CT Ratios ²⁾	ctr	ctr	Enter the CT ratio for external CT.	0.25, 0.5, 1, 2, ... 200	1	
3	Operating Time Characteristics	chA	chA	Select current Operating time characteristics between definite time/inverse time/thermal inverse time - dEF (definite time), thr (thermal inverse time), nthr(non-thermal inverse time).	dEF, thr, nthr	dEF	
4-1	Activation Delay ³⁾	oc-t	oc-t	Set the activation delay (operation time) for the overcurrent characteristics.	oFF, 0.2, 0.5, 1, 2, ... 60	60	sec
4-2	Time Profile for Inverse Time ³⁾	cLS	cLS	Select the overcurrent time class for inverse time.	oFF, 1, 2, ... 60	60	
5	Startup Delay	oc-d	oc-d	Set the motor expected startup time (delay time)	0, 1, 2, ... 200	200	sec
6	Lock Protection	Loc	Loc	Set the lock current value under operation to a percentage of rated current (200 to 1,000 %). Only applicable under definite time (dEF).	oFF, 200, 300, ... 1,000	oFF	%
7	Lock Activation Delay ⁴⁾	Lc-t	Lc-t	Set the activation delay for the lock protection feature. The oc-d takes priority before Lc-t is applied.	0.1, 0.2, ... 10.0	10	sec
8	Stall Protection	StL	StL	Set the stall current value under operation as a percentage of the rated current (150 to 700 %). Only applicable under definite time (dEF).	oFF, 150, 200, 300, ... 700	oFF	%
9	Stall Activation Delay ⁴⁾	St-t	St-t	Set the activation delay for the stall protection feature. The oc-d takes priority before St-t is applied.	0.5, 1, 2, ... 10.0	10	sec
10	Phase Failure	PF	PF	Activate the phase failure protection function.	oFF, on	oFF	
11	Phase Failure Activation Delay ⁴⁾	PF-t	PF-t	Set the activation delay for the phase failure protection function.	0.5, 1, 2, ... 10.0	10	sec
12	Phase Unbalance	Ub	Ub	Activate the phase unbalance protection feature, set current value.	oFF, 10, 20 ... 70	oFF	%
13	Phase Unbalance Activation Delay ⁴⁾	Ub-t	Ub-t	Set the activation delay for the phase unbalance protection feature.	0.5, 1, 2, ... 10.0	10	sec
14	Reverse Phase	rP	rP	Activate reverse phase protection function.	oFF, on	oFF	
15	Undercurrent	Uc	Uc	Activate the undercurrent protection function, set current value to percentage of rated current (30 to 90 %)	oFF, 30, 40, ... 90	oFF	%
16	Undercurrent Activation Delay	Uc-t	Uc-t	Set the activation delay for the undercurrent protection function.	0.5, 1, 2, ... 30.0	30	sec
17	Earth Leakage (ZCT) ⁵⁾	EL	EL	Set the activation current value for the earth leakage (ZCT) protection function.	oFF, 0.1, 0.2, ... 2.5	oFF	A
18	Earth Leakage (ZCT) Activation Delay ⁵⁾	EL-t	EL-t	Set the activation delay for the earth leakage (ZCT) protection function.	0.1, 0.2, ... 10.0	10	sec
19	Ground Fault (NCT)	gF	gF	Set the activation current value for the ground fault (NCT) protection function.	oFF, 0.5, 0.6, ... 60	60	A
20	Ground Fault (NCT) Activation Delay	gF-t	gF-t	Set the activation delay for the ground fault (NCT) protection function.	0.1, 0.2, ... 10.0	10	sec
21	Ground Fault Delay During Startup	gF-d	gF-d	Set the application of oc-d for the ground fault (NCT) protection function. The oc-d takes priority before gF-t when set to ON;	oFF, on	on	
22	Instantaneous ⁶⁾	Sc	Sc	Set the activation current value for the instantaneous protection function to percentage of rated current (600 to 1,500 %).	oFF, 600, 700, ... 1,500	oFF	%
23	Instantaneous Delay During Startup ⁶⁾	Sc-d	Sc-d	Set the application of oc-d for instantaneous protection. The oc-d is applied with set to ON, and not applied when set to OFF.	oFF, on	on	
24	Overcurrent Warning	AL	AL	SET the activation current value for the overcurrent warning function to percentage of rated current (60 to 110 %).	oFF, 60, 70, ... 110	oFF	%
25	Electrical Reset	ErSt	ErSt	Activate electrical reset feature.	oFF, on	on	
26	Automatic Reset	ArSt	ArSt	Set the activation parameters for the automatic reset feature between 0.5 seconds to 20 minutes.	oFF, 0.5, 1, 2, ... 1,200	oFF	sec
27	Motor Runtime Warning	rhS	rhS	Set motor runtime alert function. If motor runs under load for more than the set duration, "orh" will be displayed on the screen.	oFF, 1, 2, ... 9,999	oFF	hour
28	Motor Runtime	rh	rh	Total cumulative runtime after relay is energized; reset to zero when power is turned OFF and ON.	-	-	hour
29	Total Runtime	t-rh	t-rh	Total cumulative runtime after relay installation; cannot be reset.	-	-	hour
30	Comm. Address ⁴⁾	Addr	Addr	Set Modbus communication address for the relay.	1, 2, ... 247	1	
31	Comm. Speed ⁴⁾	bPS	bPS	Set Modbus communication speed baudrate -0.96: 9,600 bps, 1.92: 19,200 bps, 3.84: 38,400 bps	0.96, 1.92, 3.84	0.96	
32	Comm. Data SWAP ⁴⁾	SAP	SAP	Activate Modbus communication data swap feature.	oFF, on	oFF	
33	Clock Setting - year ⁴⁾	2016	2016	Set relay internal clock - year. Clock resets when the relay is powered OFF/ON.	2016, 2017, ... 2099	2016	
34	Clock Setting - month/day ⁴⁾	1228	1228	Set relay internal clock - month/day. Clock resets when the relay is powered OFF/ON.	0101, 0102, ... 1231	0101	
35	Clock Setting - hour/minute ⁴⁾	1038	1038	Set relay internal clock - hour/minute. Clock resets when the relay is powered OFF/ON.	0000, 0001, ... 2359	0000	
36	Main Terminal Settings	cont	cont	Select terminal output for main terminals (95-96, 97-98).	1a1b, 2a, 2b	1a1b	
37	Auxiliary Terminal Settings	Au-c	AU-c	Set terminal output for auxiliary terminals (07-08). - AL-c: overcurrent warning (Alert), gF-c: for ground fault, Sc-c: for instantaneous	AL-c, gF-c, Sc-c	AL-c	
38	Password Settings	PASS	PASS	Set security password 4 digits	0000 ... 9999	9999	

※ 1) To enhance user convenience, time settings for certain features will not be displayed when certain protection features are deactivated.

2) CT ratio setting (ctr) can be set to less than 2,000 A in conjunction with the rc setting.

3) The menu indicates oc-t when overcurrent settings are set at definite time (dEF), and cLS when set to inverse time (thr, nthr)

4) This feature is only available on the advanced type.

5) Feature not offered for the instantaneous model.

6) Feature not offered for the ground fault model.

Technical Data

Functions

Function Inventory

Functions		Details	Notes
Protection Function	Overcurrent	Protection from overload damage based on motor's thermal characteristics Trip initiated when current exceeds 112.5 % of set rated current, based on operating time characteristics (inverse/definite time)	Basic function refer to cold/hot curve function
	Undercurrent	Protection from unloaded operation due to motor load breakdown Trip initiated according to set undercurrent multiple and runtime	Refer to cold/hot curve function
	Phase Failure	Protection from phase failure due to short or contact failure Trip initiated at set time if phase difference exceeds 70 %	Selectable function
	Phase Unbalance	Protection from phase unbalance due to insulation failure or incorrect wiring Trip initiated at set time if phase different exceeds pre-set parameters	Selectable function
	Stall	Protection from motor slowdown or lock due to increased load under operation If overcurrent occurs in definite time, trip initiates when current exceeds a set multiple after the delay period	Selectable function Only usable under definite time setting
	Lock	Protection from motor damage due to sudden increase in load or a lock If overcurrent occurs in definite time, trip initiates when current exceeds set multiple factor after the delay period	Selectable function Only usable under definite time setting
	Reverse Phase	Protection from motor reversal due to Incorrect wiring Detects reversal during startup and trips within 100 msec	Selectable function
	Earth Eakage/ Ground Fault	Protection from current leakage due to insulation failure or damage Trip initiated when current leakage exceeds set parameters	Selectable function
	Instantaneous	Protection from shorts of more than two phases due to motor insulation failure or Incorrect wiring Trips within 50 msec for current in excess of set multiple factor	Selectable function Dedicated terminal ¹⁾
	Overload Warning	Alert activated to prevent a trip from a sudden overcurrent event Alert switch activates until trip when current exceeds the set activation multiple	Selectable function Alert terminal removed under instant-time setting
Cumulative Runtime		Cumulative runtime under minimum of 70 % rated current during relay lifetime Unit : hours	RESET disabled
Runtime Alert		Runtime management for maintenance, i.e. motor oil replacement Indicator activates after pre-set runtime is reached	Selectable function
CT Ratio		Increases the number of CT turns for low current; external CT is used for high current. Actual motor current and current indicated on relay converted to correlate CT ratio is set to convert rated current parameters and indicated value (Ex.) For 100: 5 CT, CT ratio set at 20	0.25, 0.5, 1 ~ 200
Delay		Delay time for protection function based on motor startup characteristic	Selectable function
Test		Check relay and sequence status without energizing circuit	Off during operation under
Contact		Output contact activation method selectable 95-96, 97-98: 1a1b, 2a, 2b Auxiliary contact activation method selectable 07-08 : Dedicated for overcurrent alert, ground fault or instantaneous	
RESET		Select RESET method after trip Manual (non) / Electrical (Pr) / Automatic (0 ~ 20 min) RESET can be selected : - Manual reset by pressing the RESET button - Electrical reset by switching the power off - Automatic reset by timer (Timer resumes if power is turned off/on before reset)	Manual reset available for electrical and automatic settings
Cold/Hot Curve		Overcurrent protection curve based on motor thermal conditions - Cold : initial period of operation after period of inactivity - Hot : sufficient heat applied after motor has been in sustained operation	Applicable only for inverse time overcurrent protection characteristics

※ 1) Under instantaneous setting, auxiliary terminal 07-08 is automatically set to instantaneous terminal. Refer to information on operational characteristics for details

Controls and Settings

Trip Cause Indicator

Cause of Event	Indicator Code	Code Displayed	Details
Overcurrent (Definite time)	oc		Under definite time characteristics, trip occurs when current exceeds 112.5 % of set rated current.
Overcurrent (Inverse time)	oc		Under inverse time characteristics, trip occurs when current exceeds set rated current. Reset cannot be carried out when the motor has tripped under thermal inverse time in order to protect the motor; and reset is possible after a certain span of time has elapsed after the trip. Forcing a reset may cause damage to the motor.
Lock	Loc		Current in excess of the rated current protection factor (200 to 1,000 % of rated current) parameters (limited to overcurrent definite time characteristics)
Stall	StL		Current in excess of the rated current protection factor (150 to 700 % of rated current) parameters (limited to overcurrent definite time characteristics)
Phase Failure	PF		Difference between minimum and maximum current between three phases in excess of 70 %
Phase Unbalance	Ub		Difference between minimum and maximum current between three phases exceeds parameters (10 to 70 %)
Reverse Phase	rP		Detection of phase reversal during motor startup
Undercurrent	Uc		Current flow under rated current factor (30 to 70 % of rated current) parameters
Earth Leakage (ZCT)	gF		Current in excess of earth leakage current parameters
Ground Fault (NCT)	gF		Current in excess of ground fault current parameters
Instantaneous	Sc		Current in excess of the rated current protection factor (600 to 1,500 % of rated current) parameters

※ The current value at the time of the trip can be identified by pressing the $\wedge$, $\vee$ directional buttons while the trip cause indicator is displayed.

Checking the Recent Event History

A maximum of five trip information and corresponding current value can be verified.

- Press and hold the $\wedge$ button while the current value is shown on the display (both while motor is operating or offline) to check the immediately preceding trip item and current information at time of trip.
- The previous trip information will flash on the display.
- Pressing the $\wedge$, $\vee$ buttons at this time will indicate the current value at moment of event for all R, S and T phases. Respective current values are displayed for earth leakage or ground failure.
- Press the “Set” button to check the past events of failure in reverse chronological order. The closer to the left of the load factor graph, the more recent the events are.

► The events are marked on the first through fifth bars of the graph from the latest to the earliest.


- Pressing the TEST/RESET button in the previous event information screen will restore the display to the normal operational mode.

Technical Data

Operational Characteristics

Contact Characteristics

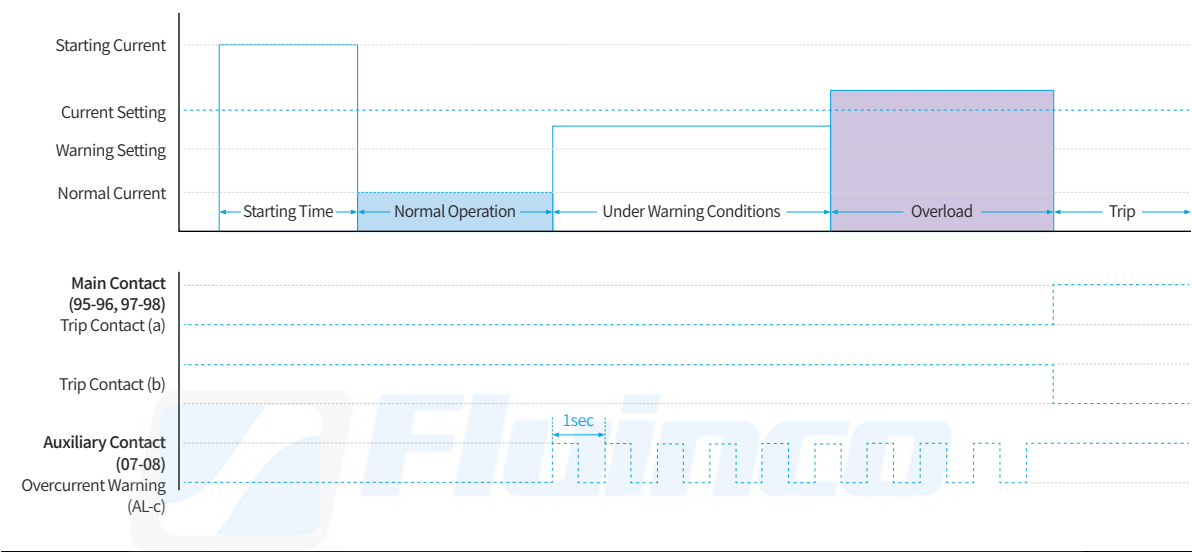
The operational characteristics for the relay's main contacts (95-96, 97-98) and auxiliary contact (07-08) can be various based on the Cont settings and the Au-c settings. The inverse of normal mode is applied during test mode

Model	Status	Menu Setting		Trip Cause	Contact Output			Notes
		Cont	Au-c		95-96	97-98	07-08	
HGMP A60 Advanced Type/ HGMP N60 I Instantaneous Type	Normal	1a1b	Sc-c, gF-c, AL-c	—	●	—	—	
		2a			—	—	—	
		2b			●	●	—	
	Test	1a1b	Sc-c, gF-c, AL-c	—	—	●	●	
		2a			●	●	●	
		2b			—	—	●	
	Trip	1a1b	Sc-c	Instantaneous	●	—	●	
			gF-c	Ground fault	●	—	●	
			AL-c	Overcurrent	—	●	●	
			Sc-c, gF-c, AL-c	Others ¹⁾	—	●	—	
		2a	Sc-c	Instantaneous	—	—	●	
			gF-c	Ground fault	—	—	●	
			AL-c	Overcurrent	●	●	●	
			Sc-c, gF-c, AL-c	Others ¹⁾	●	●	—	
			Sc-c	Instantaneous	●	●	●	
			gF-c	Ground fault	●	●	●	
			AL-c	Overcurrent	—	—	●	
			Sc-c, gF-c, AL-c	Others ¹⁾	—	—	—	
		2b	Sc-c	Instantaneous	●	●	●	
			gF-c	Ground fault	●	●	●	
			AL-c	Overcurrent	—	—	●	
HGMP N60 Z Leakage Type	Normal	1a1b	—	—	●	—	—	
		2a			—	—	—	
		2b			●	●	—	
	Test	1a1b	—	—	—	●	—	
		2a			●	●	—	
		2b			—	—	—	
	Trip	1a1b	—	All	—	●	—	
		2a			●	●	—	
		2b			—	—	—	

※ ¹⁾ Indicates trip causes except earth leakage and ground fault.

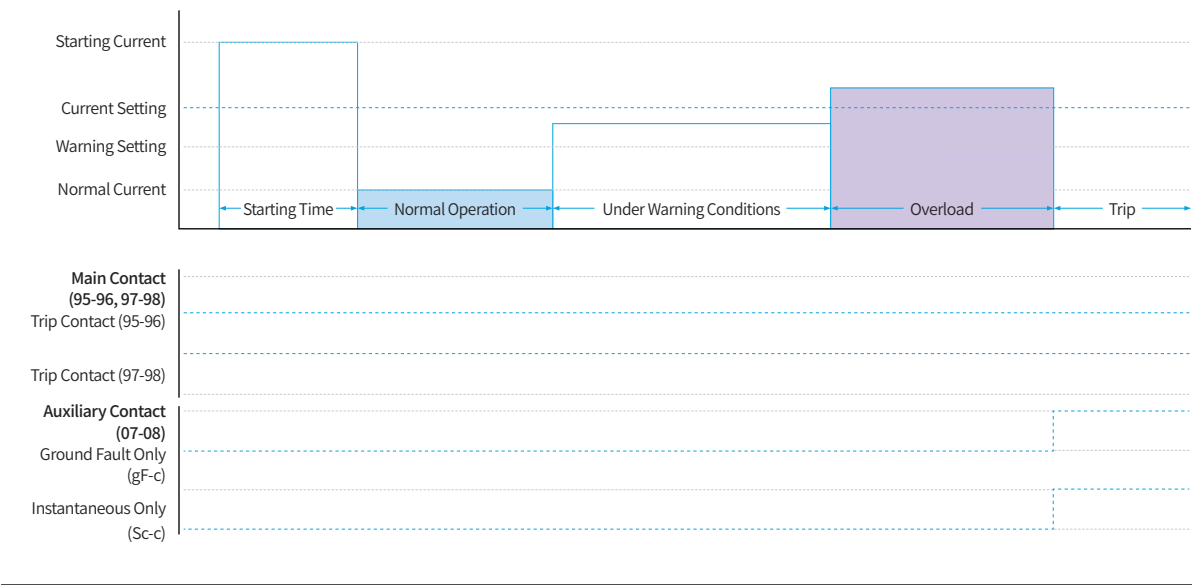
Contact Output Example for Overcurrent Warning

The 07-08 auxiliary contact can be used for overcurrent warning, dedicated ground fault or dedicated instantaneous according to settings. Activating the instantaneous function (Sc) forces the contact to be set for instantaneous. When current flow exceeds overcurrent warning threshold parameters, the warning terminal opens and closes repeatedly every second. When the trip occurs, the alert contact output would be identical to the trip contact (a).



Example when using the Dedicated Ground Fault/Instantaneous Contact

When using the dedicated ground fault/instantaneous contact, the main contacts (95-96, 97-98) will not activate under ground fault/instantaneous conditions. When the dedicated ground fault contact function is not used, the main terminals (95-96, 97-98) activate identically to normal trip conditions when a ground fault/instantaneous occurs. When the instantaneous setting is activated, the auxiliary terminal (07-08) is automatically set to instantaneous contact, and can no longer be used as overcurrent warning or ground fault contact.



Technical Data

Operational Characteristics

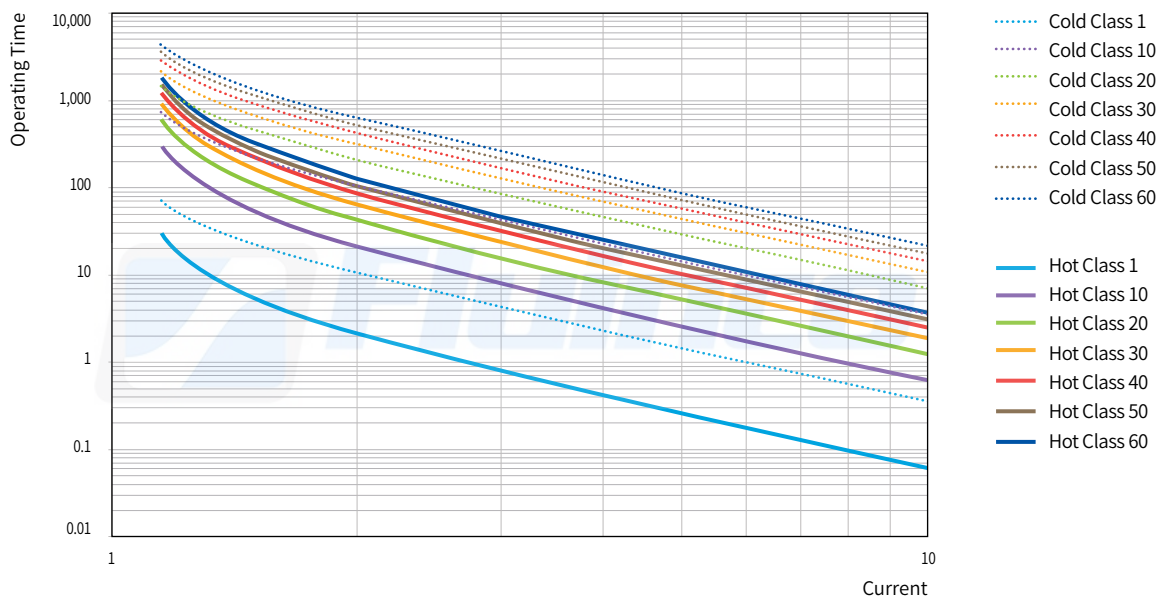
Thermal Curve

In accordance with IEC 60255-8 Thermal Electrical Relays specifications, protection functions activate based on hot curves and cold curves depending on the thermal characteristics of the load current before an overload can occur. The operating characteristic curves are as shown on the graph, represented as functions of current and time from class 1 to 60.

The relay takes real-time measurement of motor heating accumulation, and in the event of an overload activates the protection function that is optimized to the motor's operational conditions based on the cumulative heat data.

The formula for each operating characteristic curve can be represented as follows:

Cold curve indicates that the load current before the overload, I_p is zero in the hot curve formula.



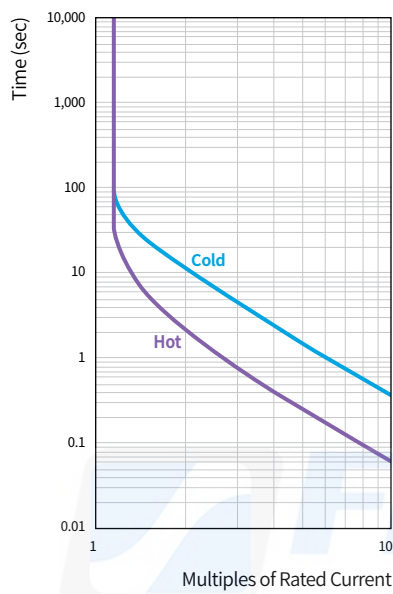
Hot Curve
$$t = \tau \ln \frac{I^2 - I_p^2}{I^2 - (kI_B)^2} [\text{sec}]$$

Cold Curve
$$t = \tau \ln \frac{I^2}{I^2 - (kI_B)^2} [\text{sec}]$$

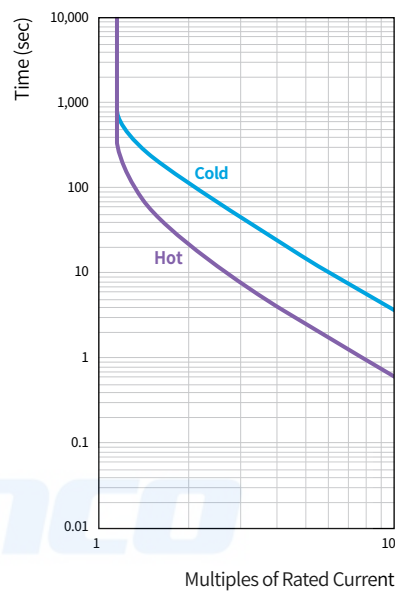
Item		Details							
t	Operating Time	Duration of the operation of the relay.							
τ	Time Constant	According to the above OC formula, the values for time constant τ for time T under 600 % of rated current and $k = 1.1$ are as follows.							
		T	1	10	20	30	40	50	60
		τ	29.25	292.49	584.98	877.48	1,169.97	1,462.46	1,754.95
I_B	Rated Load Current	Rated current set value							
I	Fault Current (Input Current)	Fault current value where a trip occurs. The reference value is six times (600 %) the rated current.							
I_p	Load Current Before Overload	Load current recorded by the relay prior to the overload.							
k	Overload Factor	Represents the motor's service factor value. $K = 1.1$							

Overcurrent Time Characteristics Curves

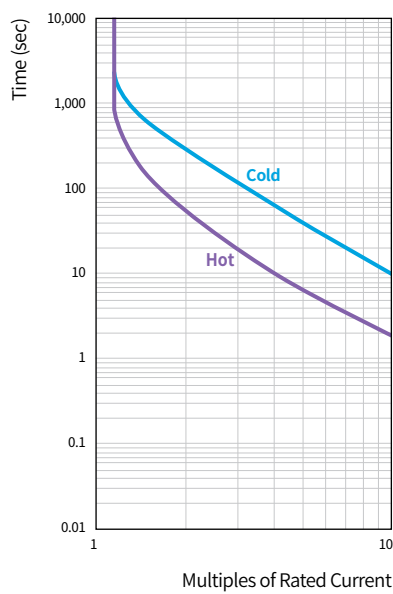
Inverse Time Class 1



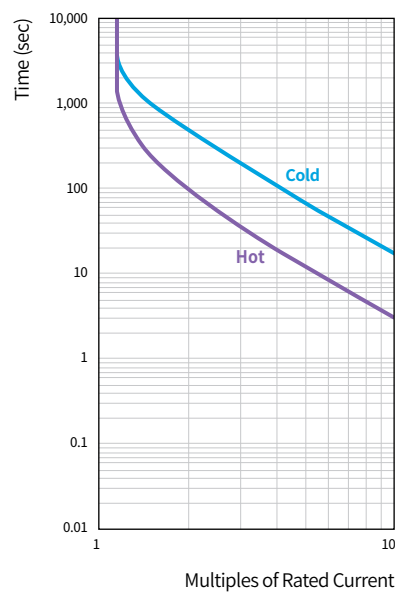
Inverse Time Class 10



Inverse Time Class 30



Inverse Time Class 50

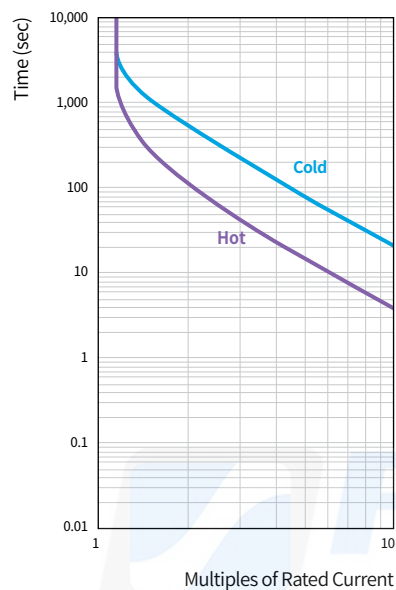


Technical Data

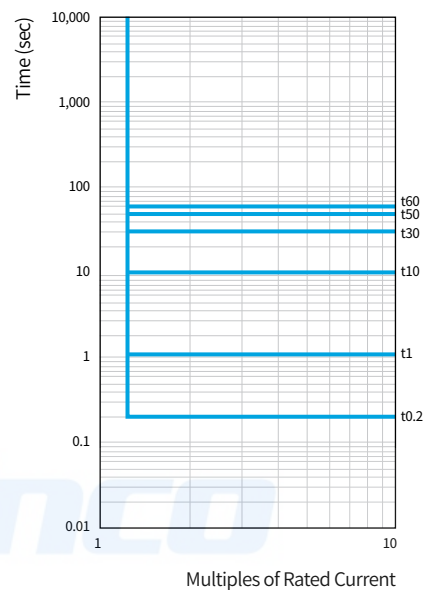
Operational Characteristics

Overcurrent Time Characteristics Curves

Inverse Time Class 60

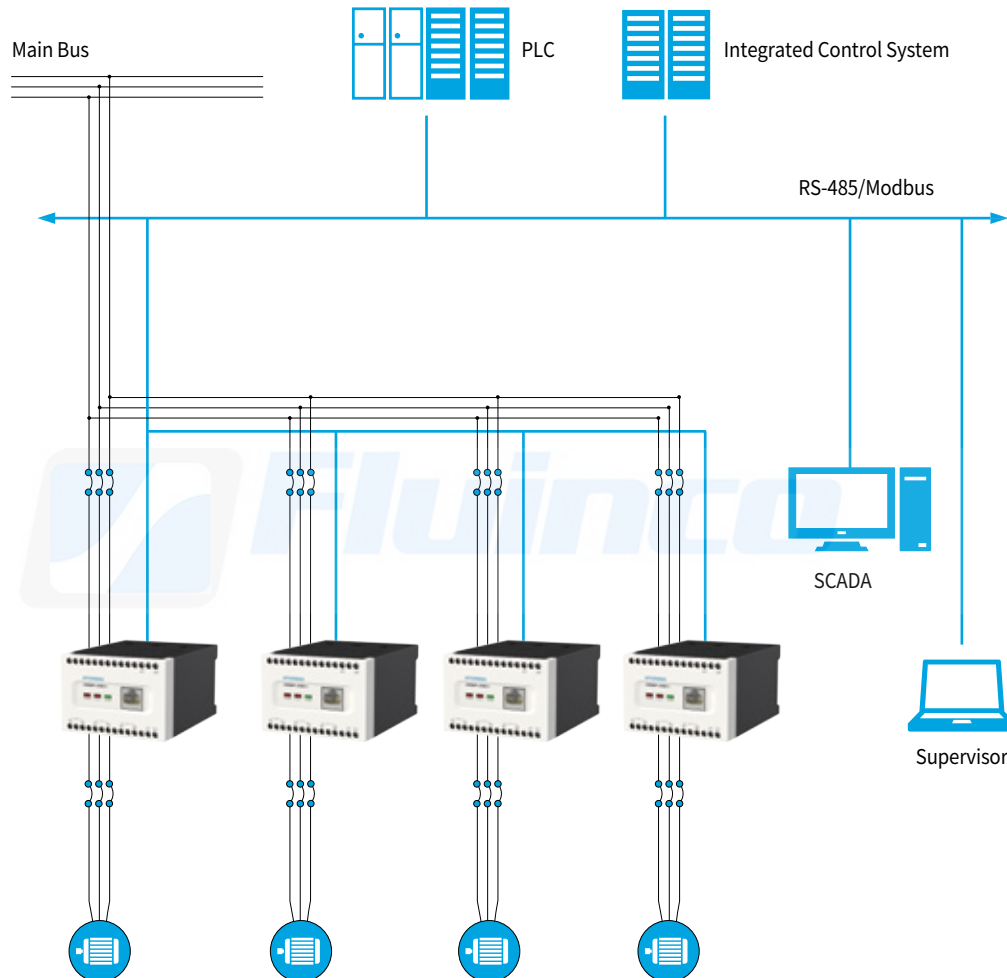


Definite Time



Communication Function (Advanced Type)

Supports the universal industrial communication protocol RS-485/Modbus to enable easy interfacing into the user's integrated control network.



Installation Compatibility

- Can be easily connected to the main circuit terminal block, with both tunnel and screw type connection available to suit the installation environment.
- Can be installed with screws or on DIN rails (for screw mounting, additional mounting block is supplied with relay).

Model Selection Table

Specifications Comparison by Model

Spec Classification		Electronic Motor Protection Relay			
		Normal – Earth Leakage HGMP N60 Z	Normal - Instantaneous HGMP N60 I	Advanced – Comm. Disabled HGMP A60 N	Advanced – Comm. Enabled HGMP A60 M
Protection Functions					
Overcurrent		●	●	●	●
Undercurrent		●	●	●	●
Phase Failure		●	●	●	●
Phase Unbalance		●	●	●	●
Rotor	Stall	●	●	●	●
	Lock	●	●	●	●
Reverse Phase		●	●	●	●
Earth Leakage		●	—	●	●
Ground Fault		●	●	●	●
Instantaneous		—	●	●	●
Display Information					
Real-Time Load Current		●	●	●	●
Real-Time Load Rate		●	●	●	●
Check Parameters During Operation		●	●	●	●
Check Total Running Hours		●	●	●	●
Comm. Protocol					
RS-485/Modbus		—	—	—	●
Contact Configuration					
Main Contact (1a1b, 2a, 2b)					
Auxiliary Contact (1a-Ground Fault/Warning/Instantaneous)		95-96, 97-98	95-96, 97-98, 07-08	95-96, 97-98, 07-08	95-96, 97-98, 07-08

Electronic Motor Protection Relays

Classification		Normal Type – Earth Leakage HGMP N60 Z	Normal Type - Instantaneous HGMP N60 I	Advanced Type HGMP A60
Panel Installation Type		Separated/Integrated		Separated
Connection Type		Screw type/Tunnel type		
Rated Current		60 : 0.5 ~ 60 A ¹⁾		
Current Configuration Range		Minimum rated current ~ maximum rated current		
Control Voltage (50/60 Hz)		A/DC 100 ~ 240 V		
Function				
Overcurrent		Over 112.5 % ± 5 % – Definite time, inverse time (thermal, non-thermal)		
Undercurrent		User set (30 to 90 % of rated current) ¹⁾		
Phase Failure		Over 70 ± 10 % of phase current deviation		
Phase Unbalance		Over user set ± 10 % of phase current deviation		
Rotor	Stall	User set after startup (Over 150 ~ 700 % of rated current) – Definite time only		
	Lock	User set after startup (Over 200 ~ 1,000 % of rated current) – Definite time only		
Reverse Phase		Detection during startup		
Earth Leakage		User set (100 ~ 2,500 mA)	—	User set (100 ~ 2,500 mA)
Ground Fault		0.5 ~ 60 A		
Instantaneous		—	User set (600 ~ 1,500 % of rated current)	
Time Settings				
Overcurrent	Inverse	Operation time: 1 ~ 60 class (for 600 %)		
	Definite	Delay time : 0, 1 ~ 200 sec, operation time : 0.2 ~ 60 sec		
Undercurrent		User set (0.5 ~ 30 sec)		
Phase Failure		Less than 2 sec	User set (0.5 ~ 10 sec)	
Phase Unbalance		Less than 5 sec	User set (0.5 ~ 10 sec)	
Rotor	Stall	Less than 5 sec	User set (0.5 ~ 10 sec)	
	Lock	Less than 500 msec	User set (0.5 ~ 10 sec)	
Reverse Phase		Less than 100 msec		
Earth Leakage		User set (0.1 ~ 10 sec) ³⁾	—	User set (0.1 ~ 10 sec) ³⁾
Ground Fault		User set (0.1 ~ 10 sec) ³⁾		
Instantaneous		—	Less than 50 msec – Operation delay during startup can be set	
Overload Warning Function Setting		60 ~ 110 % of rated current ¹⁾		
Runtime Alert Function		OFF/1 ~ 9,999 Hour		
Accuracy				
Current		± 5 % (or 100 mA) ²⁾		
Time		± 10 % (or 0.5 sec)		
Contact				
No. of Contacts		Main contact : 2SPST	Main contact : 2SPST, Auxiliary contact : 1SPST	
Capacity		3 A/250 VAC (Resistive load)		
Environment				
Operation		-20 ~ 60 °C		
Storage		-30 ~ 85 °C		
Relative Humidity		35 ~ 85 % RH (No freezing)		
Withstand Voltage				
Between Main Circuit And Enclosure		2,000 VAC/1 min		
Between Main Circuits		2,000 VAC/1 min		
Between Contacts		1,000 VAC/1 min		
The Others				
Insulation Resistance		over 100 MΩ at 500 VDC		
Standard		IEC 60947-4-1		
ZCT input		200 mA/100 mV		
Cable Spec.		1.5 m, 2 m, 3 m		
Power Consumption		under 2 W		

※ 1) Minimum operational current is over 70 % of minimum rated current

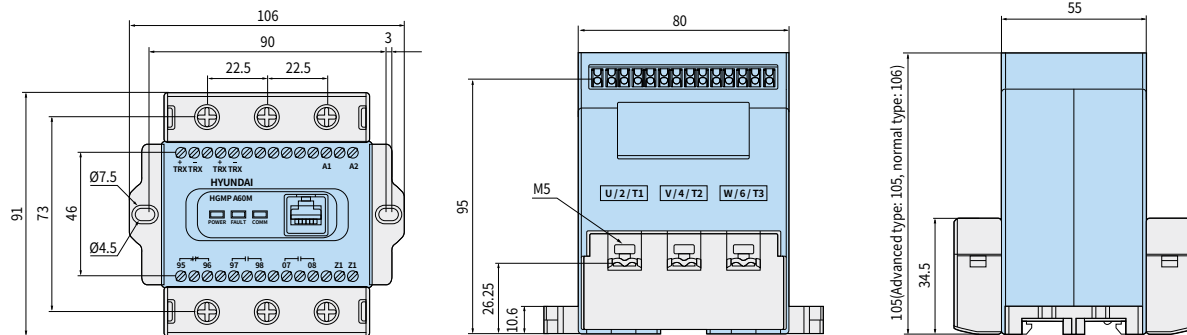
2) 50 % for earth leakage

3) Operation delay during startup can be set. (For HGMP N60 Z, earth leakage and ground fault share the operation time configuration)

Dimensions

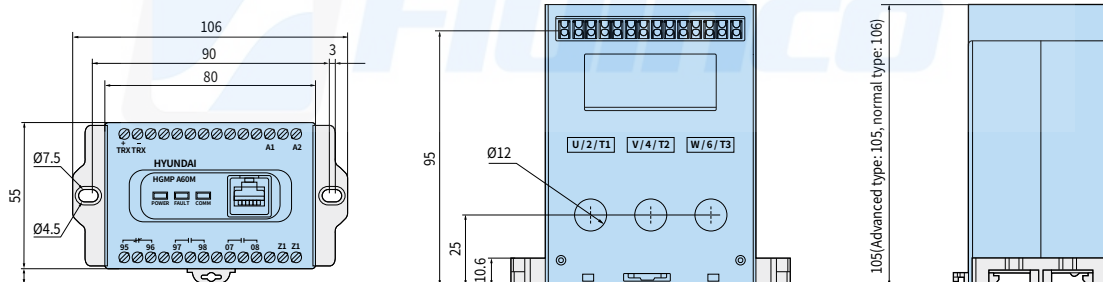
Main Unit and Screw Type

Unit : mm



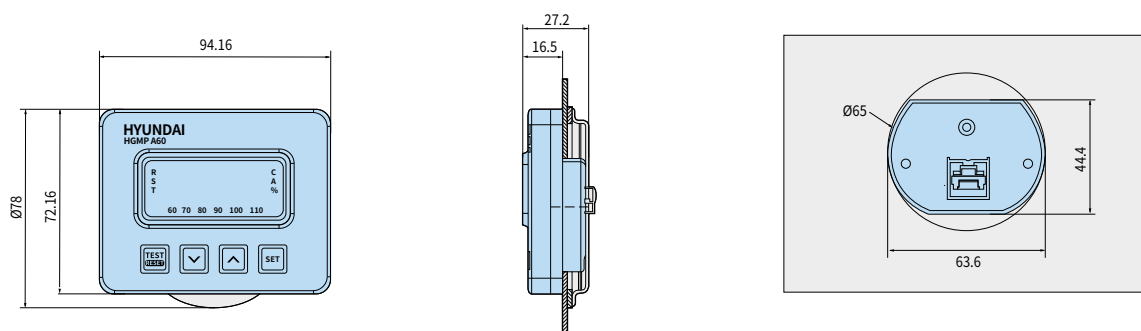
Main Unit and Tunnel Type

Unit : mm



Panel Installation of the Display Unit

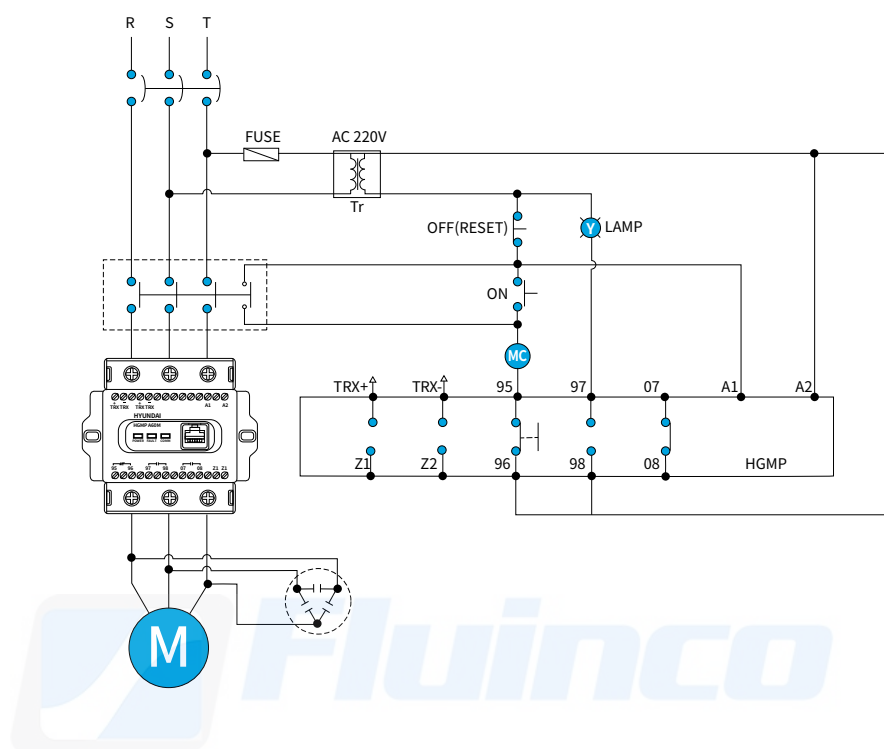
Unit : mm



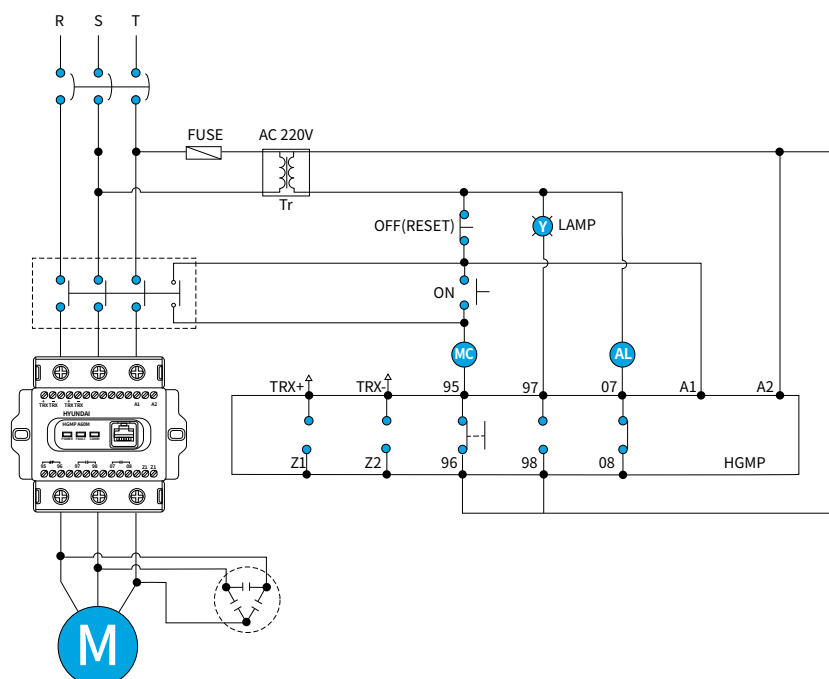
※ The sizes of the normal type and advanced type are same excluding the height of the product.

Circuit Diagram

3 Phase Circuit

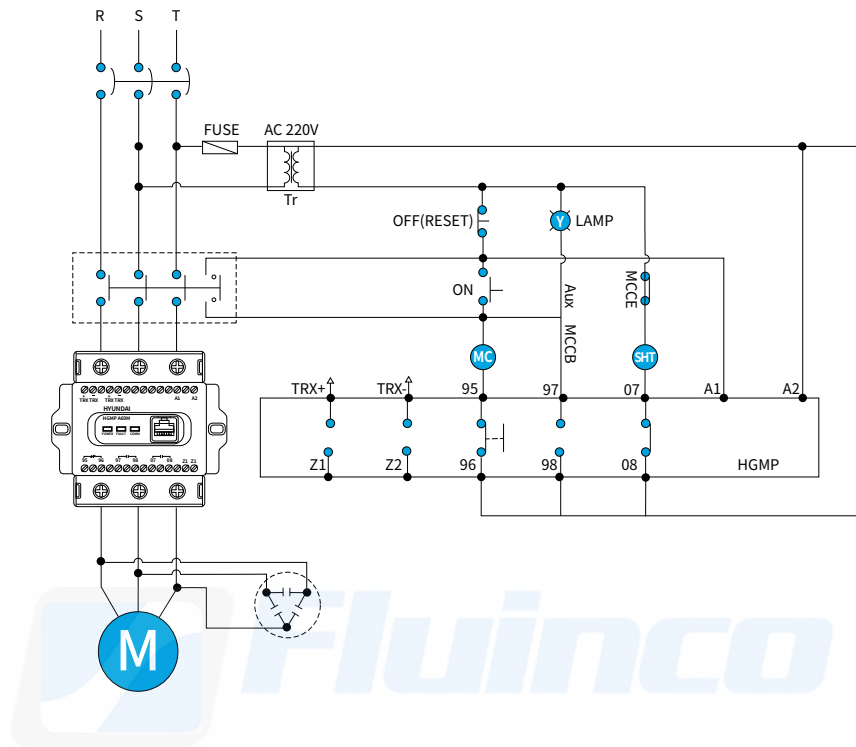


3 Phase Circuit (Aux. Terminal : Overcurrent Warning)

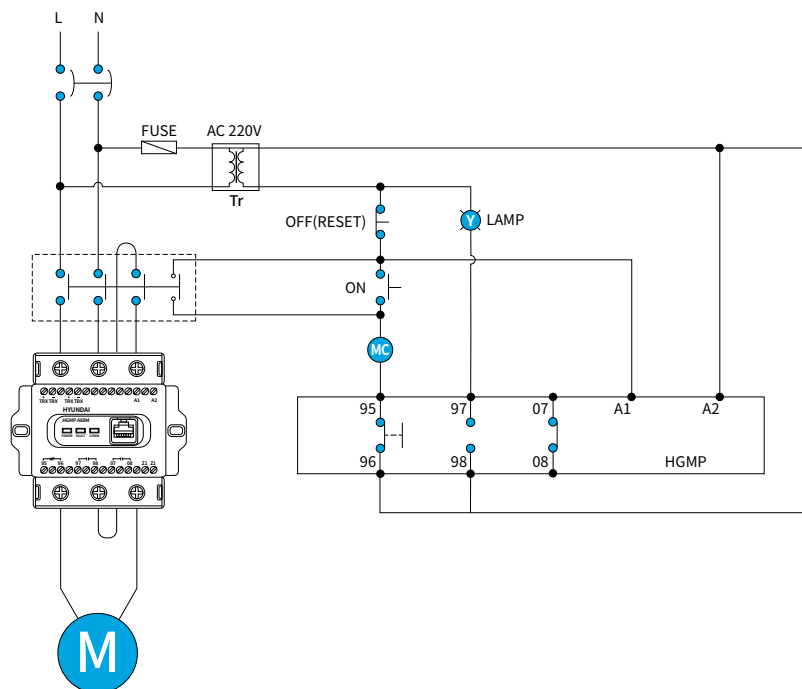


Circuit Diagram

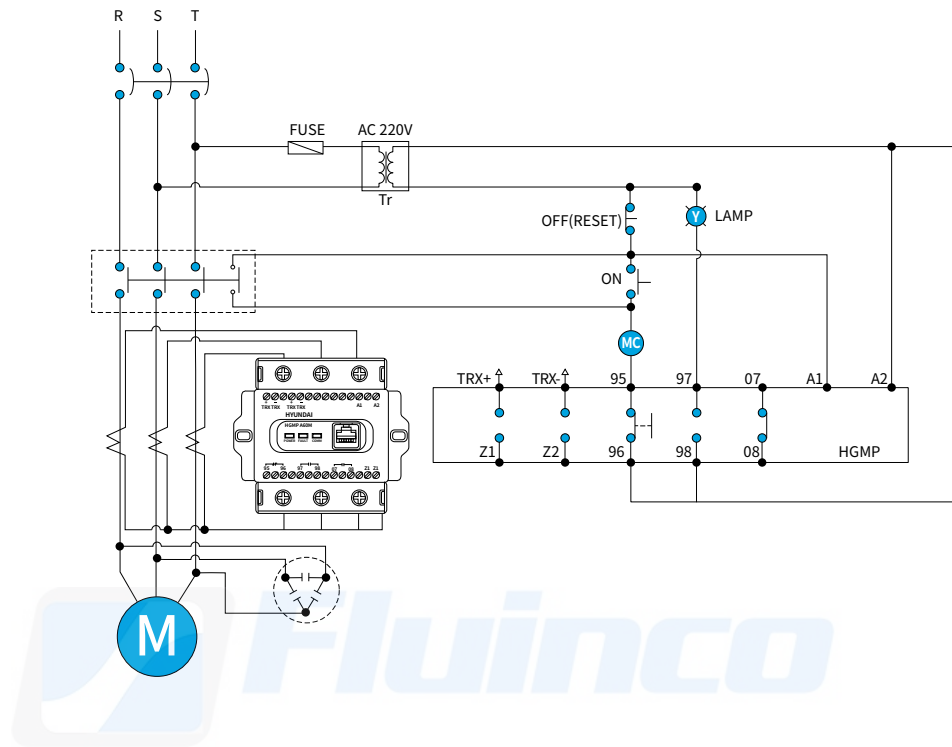
3 Phase Circuit (Aux. Terminal : Instantaneous)



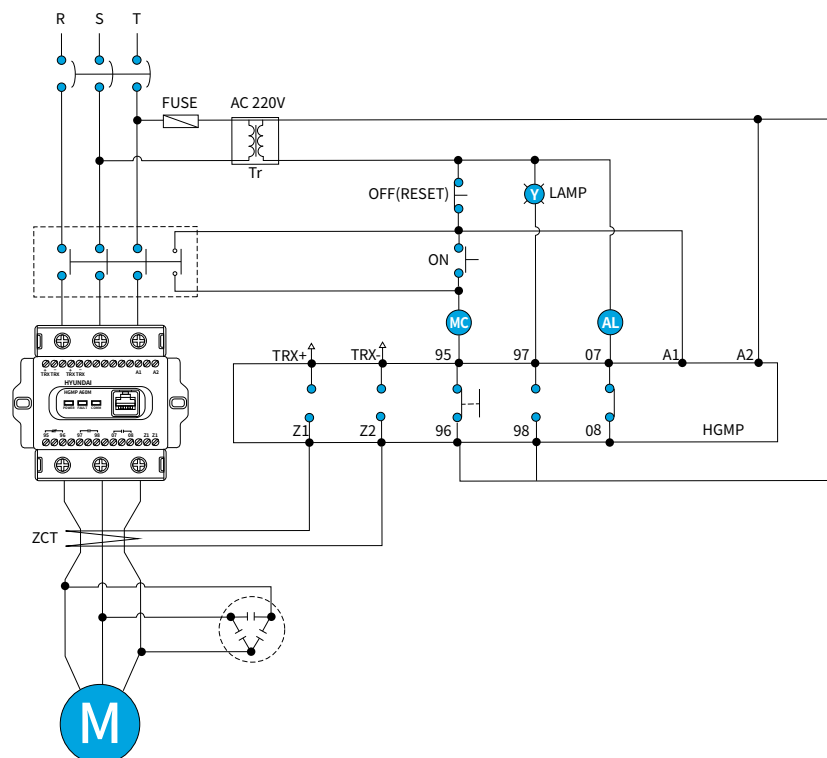
Single Phase Circuit



With External CT

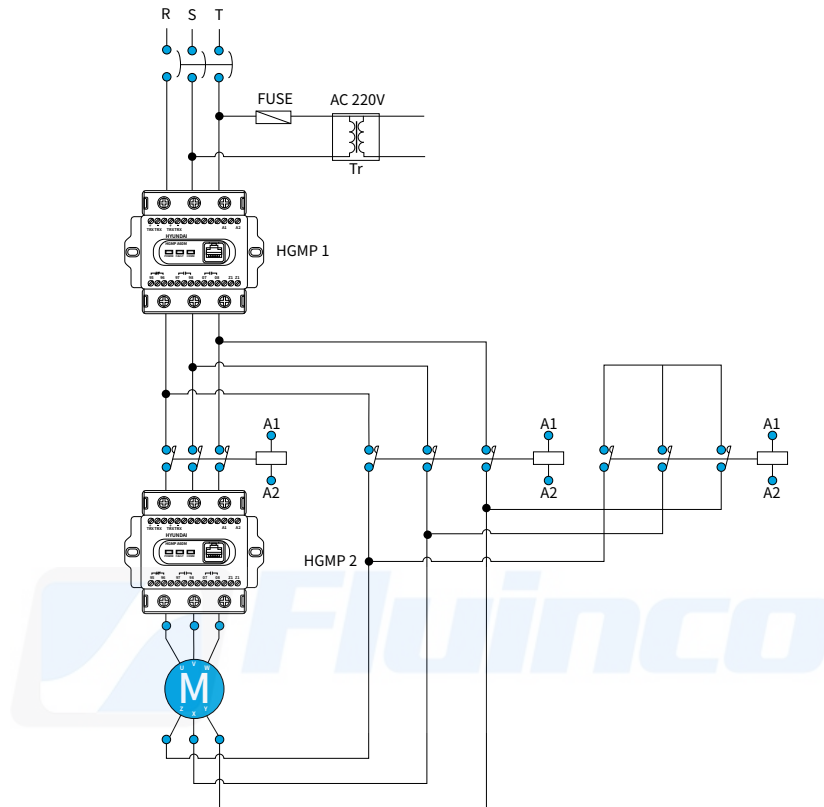


With Earth Leakage Protection ZCT



Circuit Diagram

Y-Δ with HGMP



Detects full load current when wired as HGMP 1, and $1/\sqrt{3}$ of full load current (58 %) when wired as HGMP 2. Motor protection functions can be utilized for both HGMP 1 and 2 circuit placements.

Order Code

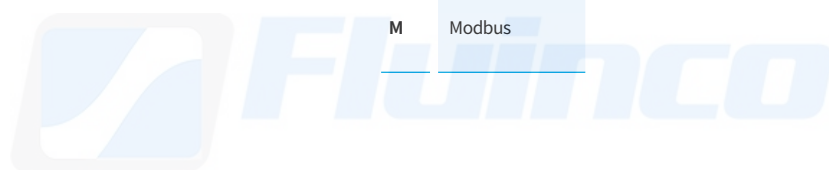
Order Process

MPR	HGMP	N60	Z	S	T	F220
Product Category	Model Name	Type and A/F	Normal Type Protection Features ¹⁾	Panel Installation Type	Contact Type	Control Voltage
		N60 Normal Type	Z Earth Leakage Type	S Separated Unit	T Tunnel Type	F220 AC/DC 100 ~ 240 V
		A60 Advanced Type	I Instantaneous Type	I Integrated Unit ³⁾	S Screw Type	
			Advanced type comm. feature ²⁾			
			N None			
			M Modbus			

※ ¹⁾ Indicates the optional protection function for the normal type model

²⁾ Indicates the availability of the communication feature for the advanced type model

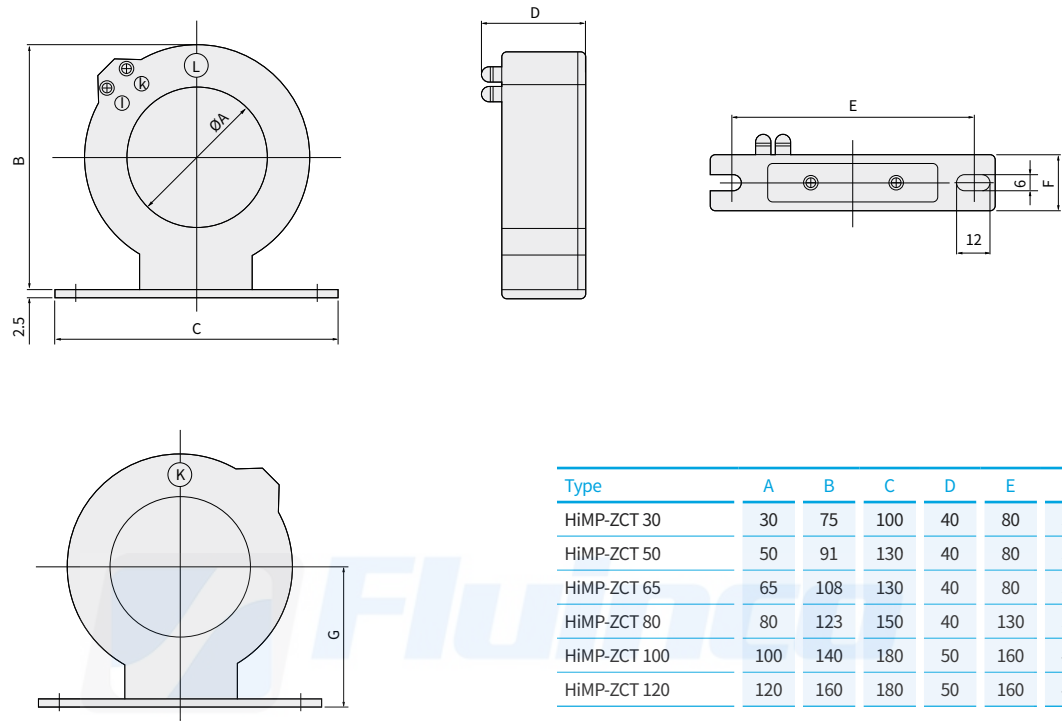
³⁾ Only the separated unit type is available for the A60 advanced type



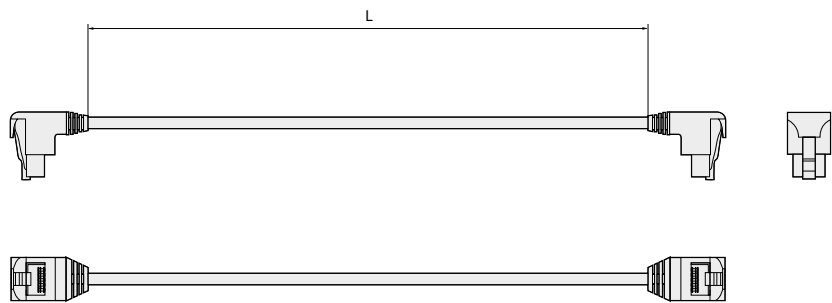
Optional Component

ZCT

Unit : mm



Connection Cable

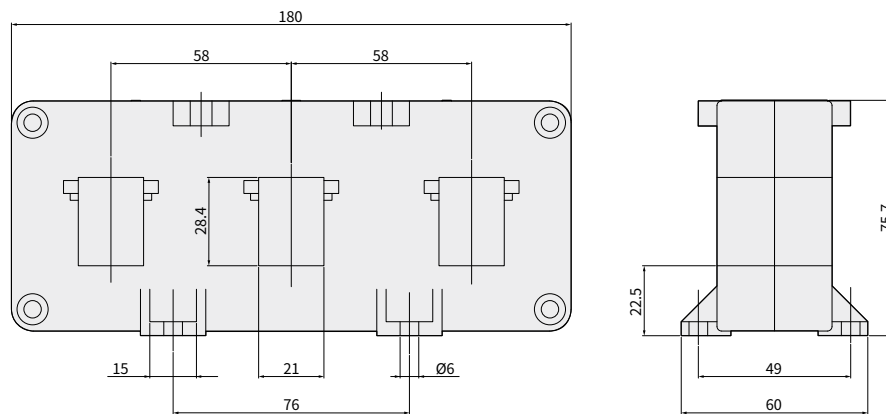


Type	L
HGMPCL1.5	1.5 M
HGMPCL2	2 M
HGMPCL3	3 M

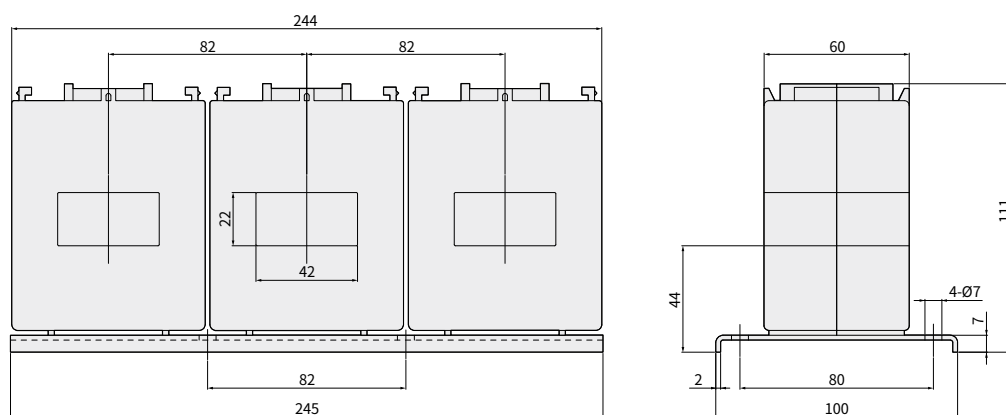
External CT

Unit: mm

HiMP-CT80 ~ CT500



HiMP-CT630 ~ CT800



※ It is not supplied with mounting plate for assembling on the external CT.

VCB

ACB

MCCB

MS

RELAY

Handling and Maintenance Inspection

Storage and Transportation

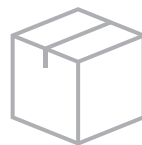
Storage Precaution

| **Ambient Temperature** | -5 ~ +40 °C
 (Below the average daily temperature of 35 °C)
 | **Altitude** | Below 1,000 m above sea level
 | **Relative Humidity** | Within 45 % ~ 85 %

The surrounding environment may affect the insulation performance and durability of the Electronic Motor Protection Relay so the environment condition for usage must accurately be checked before application.



- **Relative humidity to be within the range of 45% ~ 85%**
Do not store in places with high humidity for a long period of time.
- **Avoid places with a lot of dust**
Do not store in exposed places and use cover or packing material to prevent dust from piling up on the protection relay.



- **Store in packaged state**
During storage, store in packaged state. Store in a state using shelf or equivalent devices and do not leave it neglected on the floor. Do not transport heavy products manually. It may cause injury.



- **Do not leave under direct sunlight for a long period of time.**



- **Avoid storage in high or low temperature**
Storage temperature must be maintained between -20 °C ~ + 60 °C.



- **Do not store in places with corrosive gas**
Do not leave it around gas containing sulfurous gas or sulfur or ammonia gas and others.

Transportation Precautions

⚠ Caution

- Do not apply impact during transportation. Dropping or applying strong impact may cause defect.
- Do not handle while holding the protection relay's accessory or external plug-in wire of the accessory. It may cause injury in the handler or a malfunction of the protection relay.



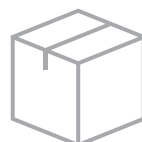
- **Hold the main unit during transportation.**
Holding relay by connection cable of display unit may cause defect.



- **Pay attention when handling metal accessories**
Sharp planes or edges in the metal accessory may cause injury.



- **Do not apply impact during transportation**
Dropping or applying strong impact may cause defect.



- **Pay attention to the packaging of the protection relay before transportation**
Inappropriate packaging may cause damage in the protection relay during transportation.

Handling Precautions

Caution

- Do not store and use in abnormal environment such as high temperature, high humidity, dust, corrosive gas, vibration, impact and others. It may cause electric shock, fire and malfunction.
- Ensure that rubbish, foreign substances such as concrete powder, metal powder, rainwater and others do not flow in.
- When handling the product, do not use lubricants. It may cause electric shock and fire.
- Electrical works must be conducted by qualified technicians with certifications related to electrical works. It may cause electric shock and fire.

Inspection items before use

- Ensure that calibration work is not skipped. It may cause malfunction.

Installation, usage and maintenance precautions

- Frequently check the fastening state, assembly and combination status of the bolt. It may cause electric shock, fire and malfunction.
- Check whether the rated current, voltage and frequency conform to the intended specification. It may cause electric shock, fire and malfunction.
- As for the wiring work, check whether the upper protection relay has been turned off so that electricity does not flow. It may cause electric shock.
- Connect the power that conforms to the ratings of the switch/contactors's main unit. It may cause fire and malfunction.
- As for the wiring and terminal, use the standard product and as for the terminal screw, fasten using the torque indicated in the user manual. It may cause fire.
- Frequently check the wiring state and shape. It may cause electric shock, fire and malfunction.
- Check whether parts have been omitted and replace damaged products and parts. It may cause electric shock, fire and malfunction.
- In case of abnormality in the contact, replace immediately and do not arbitrarily process such as trimming the contact using string or use lubricant. It may cause electric shock, fire and malfunction.
- Use the specified tool. It may cause damage and malfunction.

