PROMET 410

Power Protective Relays

Intelligent microprocessor type

Specifications

Model

PROMET-410I : OCR/OCGR (50/51)(50N/51N)
PROMET-410V : OVR/UVR/OVGR (59, 27, 64)
PROMET-410D : SGR(50/51)(50N/51N)(64)(67N)(67G)

1.Equipment (Drawout type)

1) Standard size (H×W×D): 187×110×182mm
2) Weight: 1.3kg

2.Control Power

1) Input voltage: AC/DC 110-220V (Free Voltage),
AC/DC 20-60V(option)
2) Power Consumption: 5W or less

3.Electric Current/Voltage Input & Display

1) Connection:
Three-phase three wire or three-phase four wire system.
2) Rated current input:
Rated current 5A(1A),continuous 3×In,50/60Hz.
ZCT(200/1.5mA).
CT ratio primary setting range:5-9999A.
3) Rated voltage input:
Rated voltage 110-220V,GPT110/190V,50/60Hz.
PT ratio primary setting range:0.1-200KV.
PT ratio secondary setting range:63.5-200V.
4) Actual current/voltage true RMS indicated.
5) Input Burden = 1VA and below
6) Accuracy: ±1%

4.Output

OutputType	OutputCapacity	Number of contact
TRIP	10A/250VAC, 10A/125VDC (AgCdO),30A(option)	1 main contact
Alarm	5A/250VAC(AgCdO)	2 programmable contacts

5.Indicator LED

1) RUN: The green LED blinks with normal operation of relay.
2) TRIP: The relay operation of generating fault turns on "TRIP" LED. (1 main contact)
3) PICK-UP: If current/voltage in excess of the level defined in the relay is permitted, the pick up LED will blink.
4) ALARM: The relay operaction of generating fault turns on “ALARM” LED (2 programmable contacts)

6.Display panel

1) LCD 16 char, ×2 lines backlight display.

7.Diagnosis function

Auto-diagnostic fault indication to facilitate repair after detection of permanent internal relay fault. Continuous self-supervision of relay hardware and software for enhanced system reliability and availability.

8.Communication(option)

Items	Specifications
Type	RS485 Two-wire, Half duplex, isolated (on rear side) optic port (on front side)
Baud Rate	9600/19200bps
Protocol	MODBUS-RTU, DNP3.0, IEC60870-5, Lonworks, BAC net

9. Test and Environment

Items		Specifications
Tem-Perature	Operating Temperature	-20 ~ 60 ℃
	Storage Temperature	-25 ~ 70 ℃
Humidity	30 ~ 90%	
Test	Insulation Resistance (IEC 60255-5)	>10MΩ
	AC Voltage Tests (IEC 60255-5)	AC 60Hz 2000V/1min
	Surge Impluse (IEC 60255-5)	1.2/50uS 5kV +/-
	Overload (IEC 60255-6)	Current: 100Arms for 2second Voltage: 1.15 times rated for 3 hours Power: 1.3 times rated for 3 hours
		Current: 35 In for 1 sec (option) Voltage: 1.2 Vn continuous (option)
	Oscillatory Transient	IEC60255-22-1 2.5kV
	EFT/Burst	IEC60255-22-4 Class A: 4kV
	RFI Susceptibility	IEC60255-22-6
	Radiated electromagnetic	IEC60255-22-4
	Surge	IEC60255-22-5: 4kV
	ESD	60255-22-2: Contact (6kV), Air(8kV)
	EMI	IEC 60255-25
	Vibration & shock test	IEC 60255-22-3
	Degree of Protection	Front-IP54 Rear-IP20

10.Housing

The OCR/OCGR relay modules are fully withdrawable for ease of maintenance and where applicable incorporate automatic short-circuiting CT connections to avoid dangerous open circuit CT overvoltages.
The rigid case wall is manufactured from a single sheet of hot dipped galvanized steel coated externally with Plastisol PVC and internally with a low gloss alkyd paint finish. This construction technique provides improved thermal transfer characteristics over plastic walled cases and combines exceptional corrosion and flame resilience with good electromagnetic and electrostatic screening properties allowing many relays to be freely situated in close proximity and hazardous environments.

Recording function

1. Operation recording function

It records and stores PROMET operation related informationupto16 events in the FRAM (Ferroelectric Random Access Memory) It enables you totrace evens because they are recorded in the order of event occurrence time (SOE: Sequence of Event). Items and details of information to berecorded in operation record are asfollows.

Saved Items	Saved Data
Pickup Event	Event Time
Fault Time Event	(Year/Month/Date/
Diagnosis Event	Hour/Minute/Sec)
Setting Change Event	Event ID
Restart Event	Event Name

The setting tap value is memorized by F-RAM, when the power supply turns off.

2. Fault information recording function

PROMET records and stores operation fault related information up to 4 events in its FRAM as well as provides line protection as part of its protection relay function

The details of records are as follows:

- Fault occurrence time (Year/month/day/time/minute/second)
- Fault ID
- Fault occurred phase (A/B/C/N)
- Action phases of Relay
- Size of fault current/voltage... by phase

3. Fault wave recording function (option)

PROMET records and stores before and after fault instantaneous waves of 60 cycle for 2 latest fault events.

The wave information will allow you to conduct wave and cause/effect analysis in relation to line fault.

Details of Fault waves to be stored are as follows:

- Fault occurrence time
- Sample value of each phase current/voltage...

Communication Circuit Connection

For the connection to its higher supervisory control system, it provides insulated RS485 Half Duplex communication method. This communication method allows multi-drop connections for maximum 32EA and provides communication distance up to 1 KM.
It is recommended to link the vertical section of RS485 line to 120 ohm and 0.01uF capacitor as shown in the following picture. Even if it is difficult to link it to capacitor, it must be linked to 120 ohm (vertical impedance).
PROMET is equipped with various standard protocols in order to provide the communication solution that allows communication with any supervisory systems.

Thanks to such a feature, users don't have to install a separate protocol switcher according to system protocol changes thereby allowing them to save time and cost for system installation.

The protocols loaded on PROMET are as follows:

- DNP3.0
- ModBus
- IEC60870-5-103
- Lonworks
- BACnet

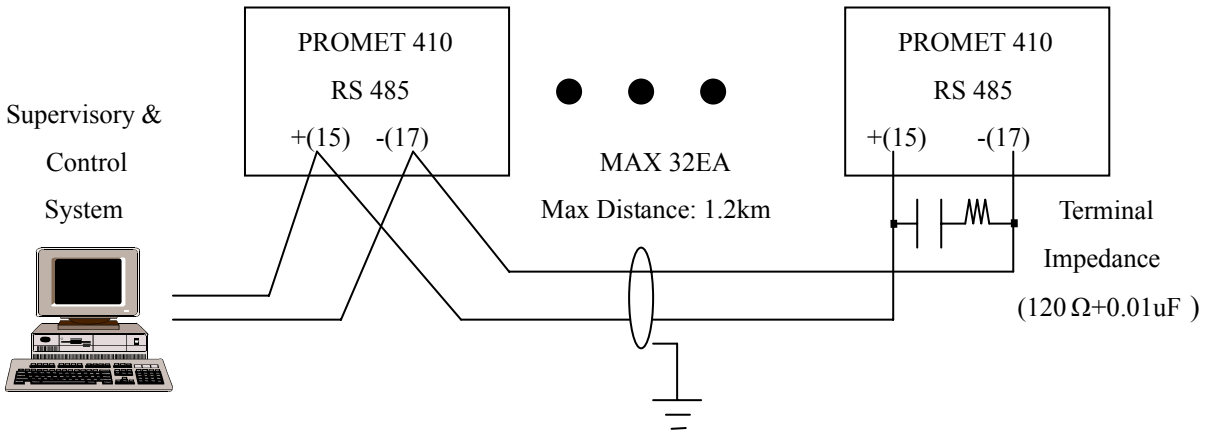


Fig 1. PROMET Communication Connection

FEATURES

The multi-OCR is a microprocessor based digital type protective relay that has 3 phases over current with residual ground over current detecting function and is provided with normal-inverse, very inverse, extremely inverse, definite and instantaneous functions. OCR and OCGR can be set the functions independently.

The relay has electric current relaying elements, OCR and OCGR etc Moreover, It enables real-time and remote supervisory & control by facilitating alignment with central supervisory system through various communication methods. It's main functions and features are as follows:

1.Compact facility

It boasts of its compact digital switchboard as well as easy installation and operation; it incorporates several analog relays used for existing switchboards into 1 digital relay thereby allowing compact composition of its switchboard.

2.Provision of various communication interfaces

It provides various communication interfaces which can be applied to any environment as it accommodates different standard protocols. Therefore, without installing a separate protocol converter, a user can implement the supervisory and control system in a fast and convenient manner.

3.Provision of various event information

- Operation event

It stores and manages up to 16 events which take place during operation such as control event (On, Off, Trip) and diagnosis event in the order of occurrence time sequence.

- Fault Event

In case of line fault, it stores and manages fault information (time, type of failure, operation, relay elements, etc.) up to 4 events in the order of time sequence.

4.Fault Wave Storage function (option)

As for the latest failures, it stores and manages 60 cycle sample data for maximum 2 events. Users can utilize such stored fault waves in their cause/effect analysis.

5.Convenient User interface

Through the communication port installed on the fore part of the body. You can easily key-in and define various setup and calibration controls using PC (using the software provided by our company)

6.Self-diagnosis and Backup function in case of power outage

PROMET performs on-going self-diagnosis such as CPU Check, Memory problem identification. I/O diagnosis and control power check, and it issues warning and stores diagnostic events to enable rapid user response if there are any defects or failures identified.

Function

1.Over Current Protection

PROMET performs relay functions by using 4 inverse time characteristic curves for electric current and 1 definite time characteristic curve in compliance with IEC-60255 standards.

The following is a formula of inverse time characteristic curve for current.

$$T = \left(\frac{\beta}{I^{\alpha} - 1} - C \right) \times \frac{T_m}{10}$$

	α	β	C
Normal Inverse	0.02	0.14	0
Very Inverse	1	13.5	0
Extremely Inverse	2	80	0
Long Inverse	1	54	0

The following is a formula of definite time curve for current.

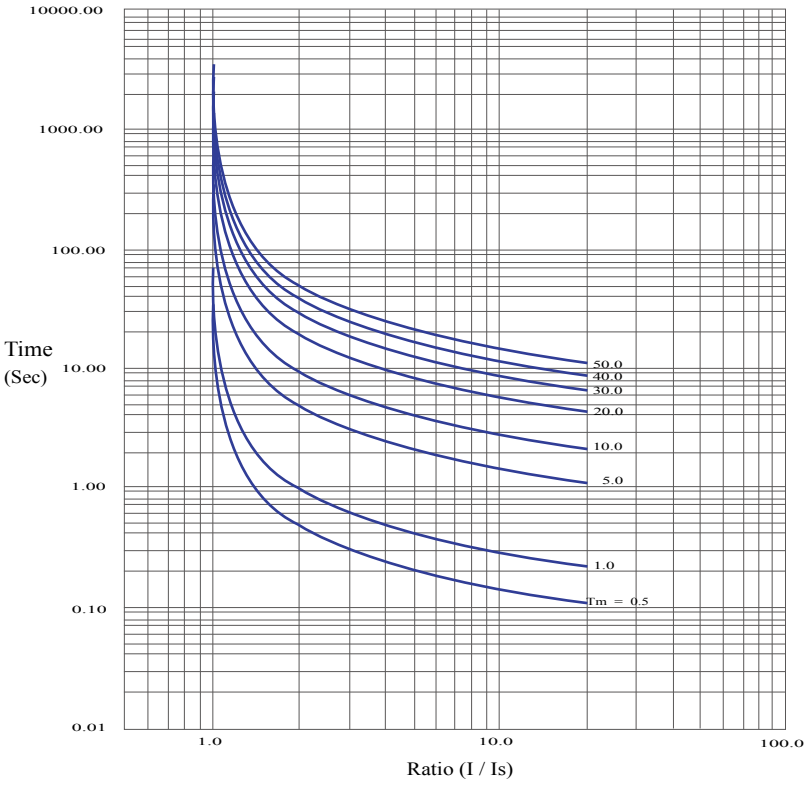
$$T = 2 \times \frac{T_m}{10}$$

2.Setting range and characteristic of relay protection functions

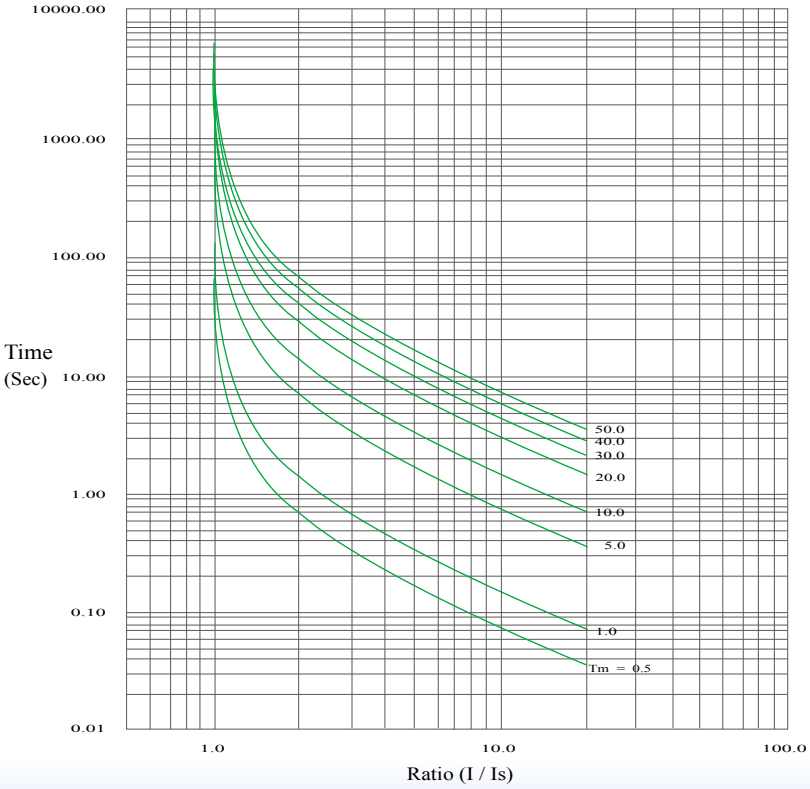
Relay Function	Relay type	Pickup set		Operation time set		Characteristic
		Setting range	Step	Setting range	Step	
OCR (50/51)	Instant Time (I>>)	1.0~120(A) ,Block	1A	0.04-120s	0.01	Instant
	Delay Time (I>)	0.5~25(A) ,Block	0.1A	0.1-50.0	0.1	Normal Inverse Very Inverse Extremely Inverse Long inverse
				0.1-50.0Sec	0.1Sec	Definite time
OCGR (50/51N)	Instant Time (Io>>)	0.5~80(A) ,Block	0.1A	0.04-120s	0.01	Instant
	Delay Time (Io>)	0.1~20(A) ,Block	0.1A	0.1-50.0	0.1	Normal Inverse Very Inverse Extremely Inverse Long inverse
				0.1-50.0Sec	0.1Sec	Definite time

Operating time/curve

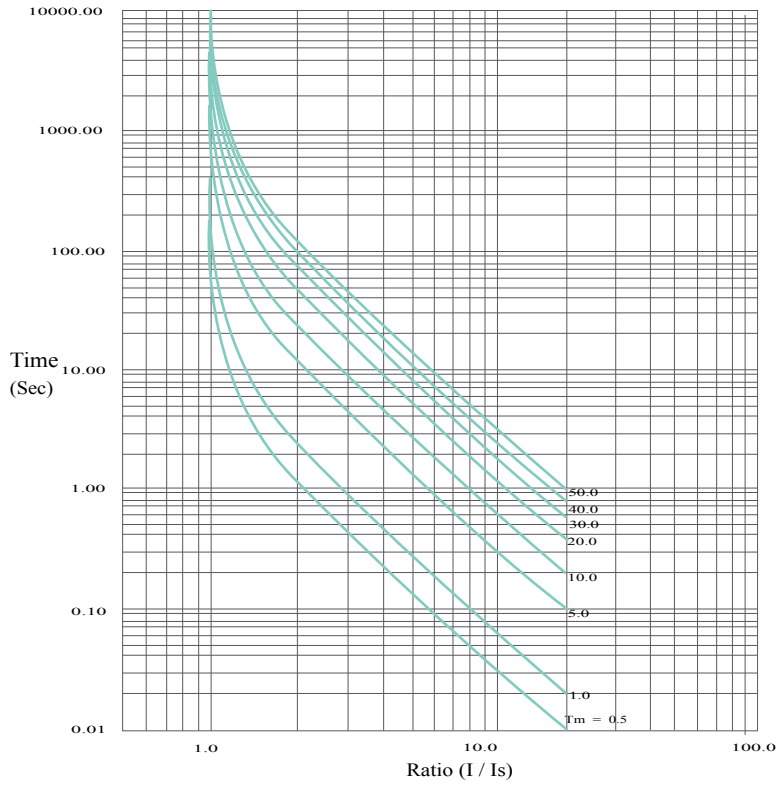
1.Normal Inverse Characteristic



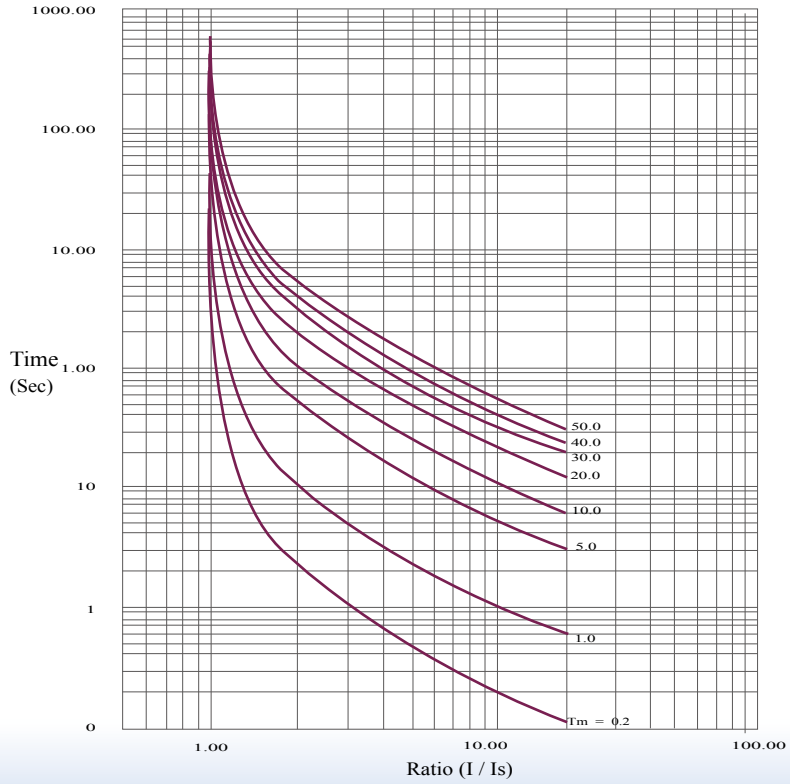
2.Very Inverse Characteristic



3.Extremely Inverse Characteristic



4.Long Inverse Characteristic



The relay has voltage relay elements, UVR, OVR and OVGR etc Moreover, It enables real-time and remote supervisory & control by facilitating alignment with central supervisory system through various communication methods.

FEATURES

- Up to now OVR and UVR relays were separately set and also operated but they are compacted in one relay unit, so very convenient for handling, too.
- As assembled with state of art and multifunction, it is most suitable and applicable to protective coordination.
- Volt meter being installed it can be used for measuring.
- Electronic indicator can accurately detect troubles, and surely indicate electric trouble.
- It is able to continue self-supervision with auto-diagnosis of internal faults.
- It is able to record the last time fault and event for statistical analysis.
- The setting tap value is memorized by F-RAM, when the power supply turns off. It is able to confirm each setting tap value by "Enter" key, after the power supply is restored.

It's main functions and features are as follows:

1.Compact facility

It boasts of its compact digital switchboard as well as easy installation and operation; it incorporates several analog relays used for existing switchboards into 1 digital relay thereby allowing compact composition of its switchboard.

2.Provision of various communication interfaces

It provides various communication interfaces which can be applied to any environment as it accommodates different standard protocols. Therefore, without installing a separate protocol converter, a user can implement the supervisory and control system in a fast and convenient manner.

3.Provision of various event information

-Operationevent
It stores and manages up to 16 events which take place during operation such as control event (On, Off, Trip) and diagnosis event in the order of occurrence time sequence.
-Fault Event
In case of line fault, itstores and manages fault information (time, type of failure, operation, relay elements, etc.) up to 32 events in the order of time sequence.

4.Fault Wave Storage function (option)

As for the latest failures, it stores and manages 60 cycle sample data for maximum 2 events. Users can utilize such stored fault waves in their cause/effect analysis.

5.Convenient User interface

Through the communication port installed on the fore part of the body. You can easily key-in and define various setup and calibration controls using PC (using the software provided by our company)

6.Self-diagnosis and Backup function in case of power outage

PROMET performs on-going self-diagnosis such as CPU Check, Memory problem identification. I/O diagnosis and control power check, and it issues warning and stores diagnostic events to enable rapid user response if there are any defects or failures identified.

7.Voltage Protection

PROMET410 performs relay functions by using inverse time characteristic curves for electric current and 1 definite time characteristic curve in compliance with IEC-60255 standards.

- The following is a formula of inverse time characteristic curve for voltage.

$$T = \left(\frac{\beta}{V^{\alpha} - 1} - C \right) \times \frac{T_m}{10} \quad \text{(OVR, OVGR Type)}$$

$$T = \left(\frac{8}{1 - (V)^2} \right) \times \frac{T_m}{10} \quad \text{(UVR Type)}$$

	α	β	C	*Relay Type*
Normal Inverse	2	10.5	0	OVR
Normal Inverse	2	11.5	0	OVGR
Normal Inverse	2	8	0	UVR

- The following is a formula of definite time curve for voltage.

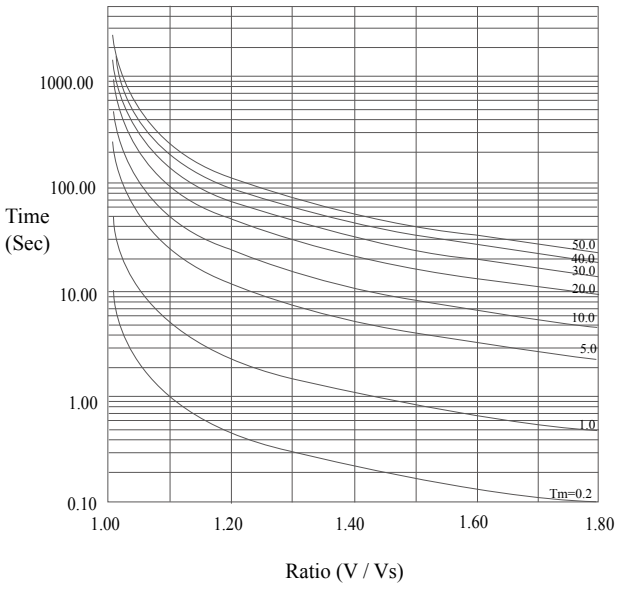
$$T = 2 \times \frac{T_m}{10}$$

1)Setting range and characteristic of relay protection functions

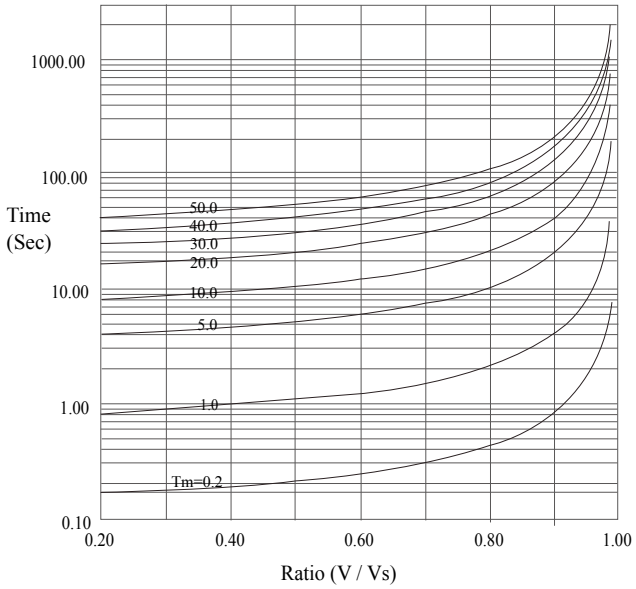
Relay Function	Relay type	Pickup set		Operation time set		Characteristic
		Setting range	Step	Setting range	Step	
UVR(27)	Delay time	10~140V, Block	1V	0.1~300sec	0.1sec	Normal Inverse
				0.1~300sec	0.1sec	Definite time
OVR(59)	Delay time	50~180V, Block	1V	0.1~300sec	0.1sec	Normal Inverse
				0.1~300sec	0.1sec	Definite time
OVGR(64G)	Instant time	50~140V, Block	1V	0.04~120sec	0.01sec	Instant
	Delay time	8~140V, Block	1V	0.1~50sec	0.1sec	Normal Inverse
				0.1~50sec	0.1sec	Definite time

2)Operating time/curve

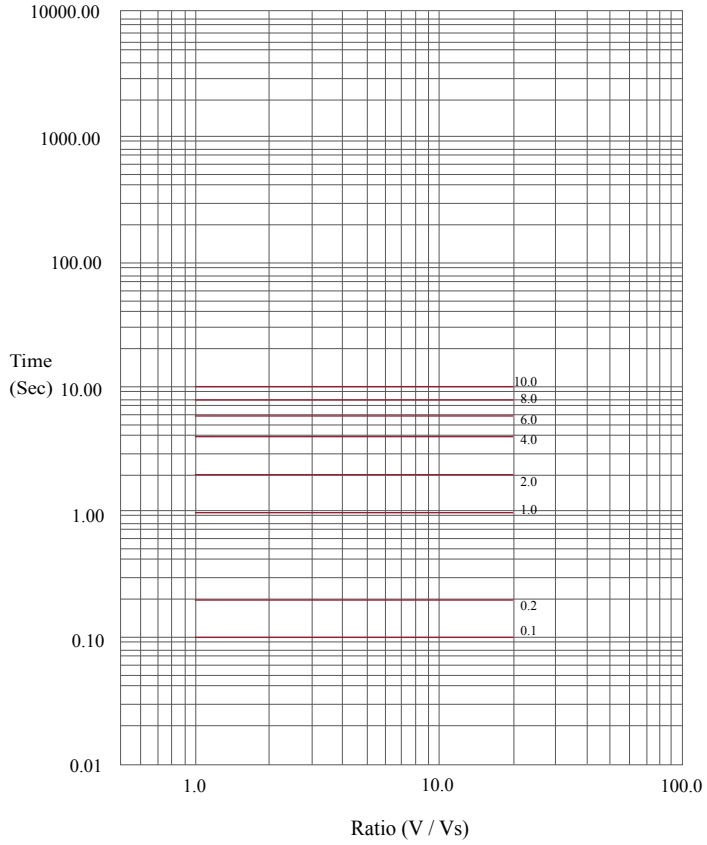
Normal inverse for OVR and OVGR



Normal inverse for UVR



Definie time characteristic



Connection View

The current input will be linked to A, B, C phases using 3 CT, 01, 03 and 05 and N phase will be connected using the sum of the three phases. If connection is done based on ZCT, electric current input will be linked to 07 and 08 of ZCT terminal unlike the picture and remaining 02, 04 and 06 terminals of A, B and C phases will be connected to CT L terminal of A, B and C phases. (Fig. 2)

AC/DC 110-220V free voltage can be connected to power input terminal 16 and 18. Frame ground of power can be connected to A20 of PROMET. Trip coil will be connected to 09 and 10 : +power is to 09 and -power is to 10.

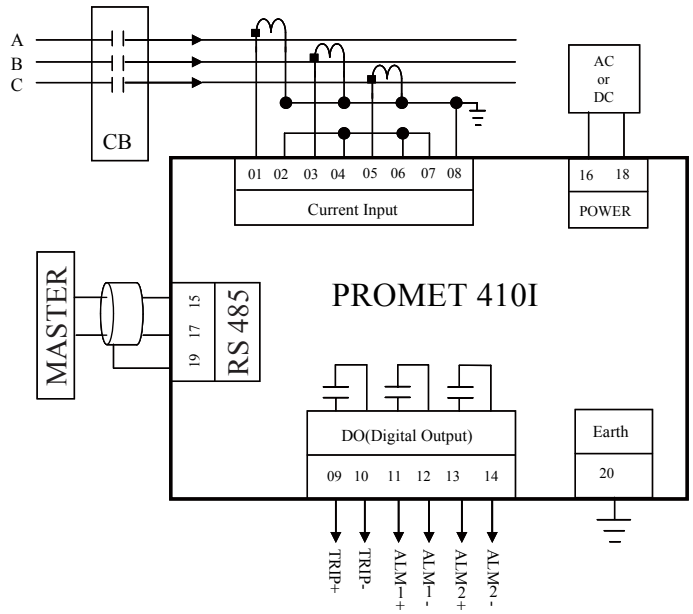


Fig 2. PROMET 410I

The voltage inputs will be linked to A, B, C phases using 3 PT(01-06),and N phase will be connected using GPT(07-08).Vo will be connected using GPT(07-08).(Fig.3)

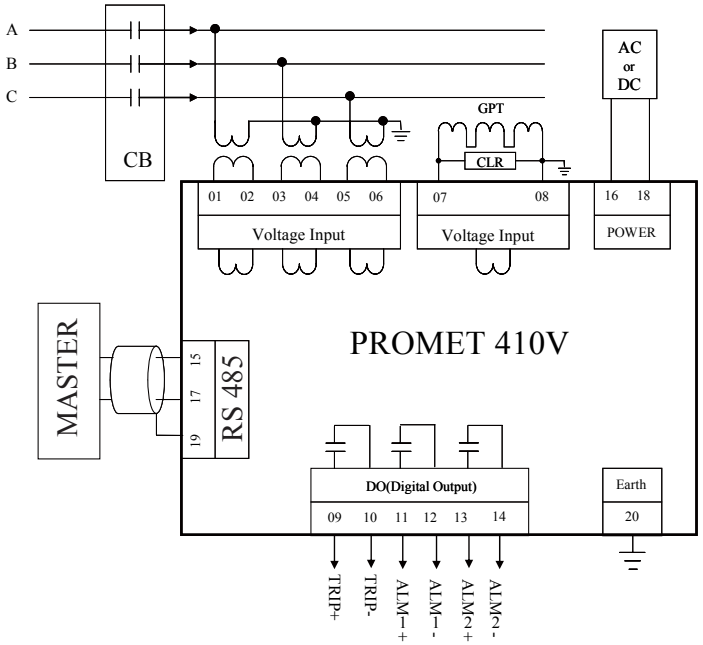
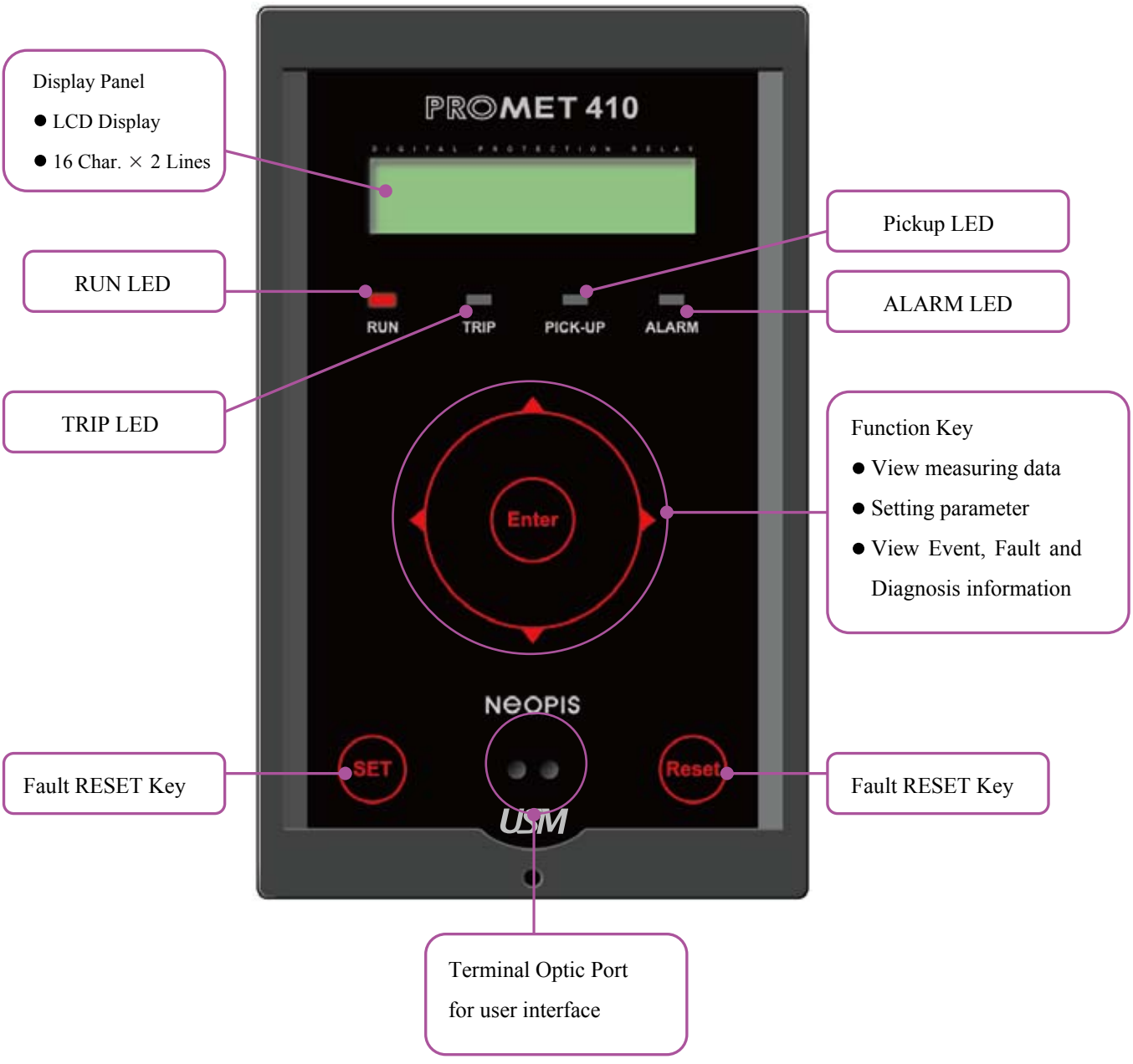


Fig 3. PROMET 410V

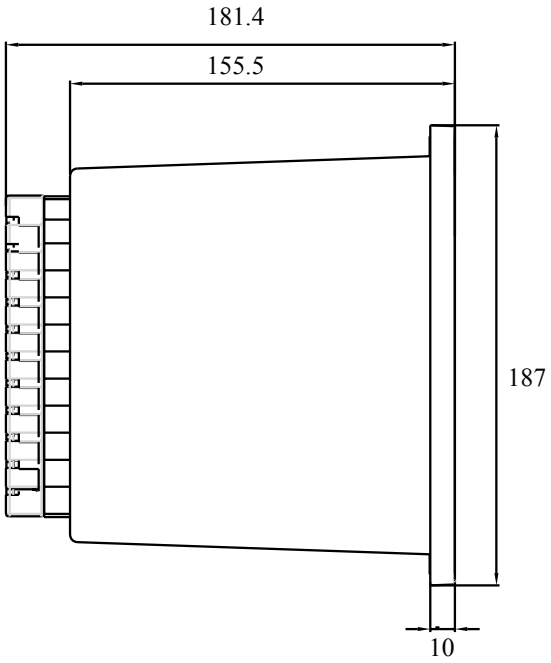
Front Panel Layout



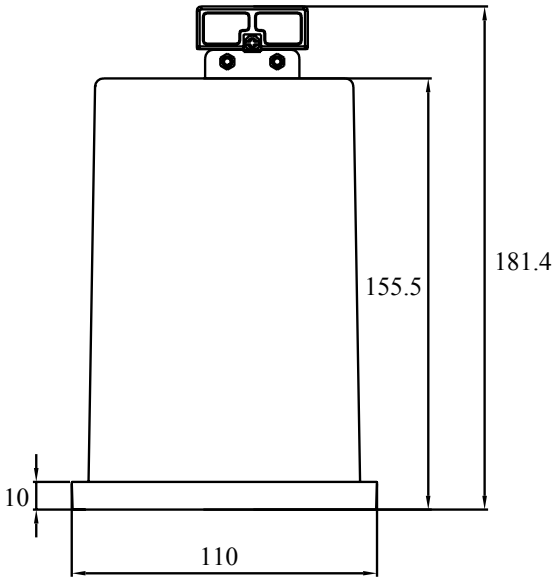
Dimensional and Panel Cutout size (Unit : mm)

1.Front View

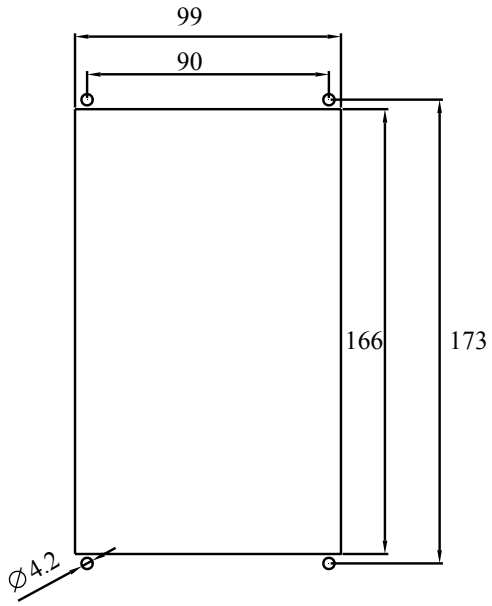
2.Side View



3.Top View



4.Panel Cut out



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