We touch your electricity everyday!

CSDPR-V2-500

INTELLIGENT MEASURING & PROTECTION DEVICE

(WITH COLLAR)

(WITH-OUT COLLAR)

CURRENT PROTECTION RELAY

Catalog

C&S electric

PMD Division

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1) Introduction

In the family of protection relay, CSDPR-V2-500 is numeric multi powered feeder protection relay specially designed for ring main units. It combines the following functions in one unit:

2) Features

- Relay get energize either from Current, Aux. voltage, front USB or internal battery (whichever is available)
- DEFT & Inverse characteristics for Over current & Earth fault, individually selected for phase & earth fault
- Potential pulse output for direct triggering the circuit breaker coil. Potential free alarm contacts also available
- Self supervision function
- Remote Trip & Protection block through Digital Input
- Two set of setting group
- DI/DO programmable matrix
- Protection blocking through Digital Input
- Wide operating ranges of Aux. supply voltage (AC/DC)
- Last 10 Fault and 50 Event record with Date & Time stamp
- Disturbance record with Date & Time stamp
- Condition monitoring *
- Rear RS-485 communication
- Front USB communication for PC / Laptop interface

3) Protections

- Over current
- Short circuit
- Earth fault
- Earth fault High set
- Under current
- Cold load pickup
- Broken conductor
- Thermal overload
- Inrush blocking
- Negative phase sequence over current
- Auto-recloser
- Unbalance / Asymmetric
- Circuit breaker failure

* Model Dependent

4) Design

Relay will get energized from any of the following available sources:

- Aux. supply
- CT current
- USB port
- Internal Battery

In the absence of Aux supply / Battery voltage / USB, LCD will get energized, if CT current is 10% of (single phase or sum of three phases) rated current or above. Trip coil will be operated, if CT current in single phase is at least 10% of rated current or 8% of rated current in three phases. Relay is not powered from Earth CT, so for earth fault protection, phase current is mandatory.

Note: Battery works when no other supply is present i.e. in the absence of Aux Supply & Current.

a) Analog Input

The analog input signal of the CT secondary currents as per the terminal detail on page 22, are fed to the protective device via separate input transformers. The secondary circuit is galvanic Isolated and after analogue & digitally filtered and finally fed to the analog/digital converter to get the True RMS value. Relay displays the load current in all the phases. Residual connection is internally configured so that earth/unbalance current can be measured. The load current display starts at a minimum of 3%.

Front Interface

Note-1 : The Relay goes into sleep mode after one minute if no activeness is found, user has to press key to see the display.

Note-2 : The Relay goes into sleep mode, If the user pressed Left scroll, Right scroll & simultaneously at the same time.

Front panel : LED / LCD Display

There are 09 LEDs on the front panel,

Their functions are indicated by the appropriate inscriptions along with them. These LEDs are with memory backup & they will maintain the previous status until fault is acknowledged through manual reset. The front panel of the protective device Relay comprises the following operation and indication elements:

- LCD : 16x2 Alpha Numeric LCD display
- L1 : Phase LED for Pickup/Trip indication
- L2 : Phase LED for Pickup/Trip indication
- L3 : Phase LED for Pickup/Trip indication
- E : Earth fault LED for Pickup/Trip indication
- PICKUP : Pickup LED for common pickup fault indication
- TRIP : Trip LED in Steady state for Trip on faulty conditions indication
- BLOCK : Block LED when the protection (selected in DI block menu) is blocked, when Block DI is active indication
- CBFP : CBFP LED for the external breaker failure condition of the Relay indication
- There is One bi-color LED. MHT READY / MHT NOT READY blinks green when it has sufficient energy to operate the Trip coil. Red is the steady indication of the HW Error.

c) Keypads

The front panel keypad consists of Six soft-touch keys. These keys are marked as below :-

	Key is used to ON the Display (in absence of Aux supply & USB).
	Key is used to ON the Back light of LCD.
	Key is used to set the parameters. It act as a ENTER key for HMI
	Key is used to scroll in right direction for parameters / to decrease the value of parameters.
	Key is used to scroll in left direction for parameters / to increase the value of parameters.
	Key is used to reset the fault status. (Manual Reset on pressing for 2 sec.)

Trip Output

In presence of Aux supply:

4 Potential Free contacts and 1 Potential Output (24V/12V@0.4Ws /50msec ON Pulse). Duty cycle will depend upon the strength of available current.

In presence of only adequate CT current:

2 Potential free latch contact and 1 Potential Output (24V/12V@0.4Ws/50msec ON Pulse). Duty cycle will depend upon the strength of available current.

Average 10% of the rated current must be present in the phases to trip the breaker.

NOTE: Magnetic Trip Flag can be used in parallel with Trip Contacts Terminal (A6/A7)as they have same pulse configuration.

Assignment of the Output Relays

CSDPR has 4 output relays are user programmable. Relay reset operation for DO-1 & DO-2 (works only with auxiliary supply) can be configurable on selection based from HMI. Two latch relay DO-3 & DO-4 (without Auxiliary supply) is available in all models.

DO Reset

In automatic reset mode : Relay will be reset after the current goes below the pickup level.

In manual mode : Relay will be reset by pressing reset button.

*Auto/Manual option is not applicable for latch relay.

NOTE: Latch Contact (DO-3 & DO-4) will get actuate only in presence of fault current. RESET of latch contact is possible under presence of Energizing current Or Auxiliary supply Or presence of battery.

Potential Input

Three Potential DIs are available for control.

Out of Three DIs, One DI is dedicated to Remote Trip, Other Two are programmable.

5) Communication

Rear (RS-485) Communication

The CSDPR-V2-500 includes an RS-485 communication on rear port This port is available for MODBUS protocol. CSDPR-V2-500 relay has feature to transmit the data such as settings, measurements and faults to the SCADA system. For this communication auxiliary supply is required. A communication failure dose not affects any protection functionality.

Front (USB) Communication

The front USB communication port is designed for CSE LIVELINK for which the front end Software is provided. The S/w has features of retrieving the records and changing the settings. A Male USB cable Tpye A/A is required for communication is required for interface between PC/Laptop & Relay.

Note: Relay is plug & play on USB port. It automatically get energizes from USB port itself.

6) Protection Functions

CSDPR-V2-500 offers 50P/51P/50N/51N/37/49/46/47/50H/62CLD/46BC/79/Unbalance/50BF protections.

Over-current Characteristic : DEFT/VINV/EINV/ NINV3.0/ NINV1.3/LINV/RI/HV-FUSE

Unbalance Protection

This is provided by the relay tripping in phase unbalance greater than setting % difference in terms of maximum phase current

$$I_{unb}: \frac{(I_{MAX} - I_{MIN})}{I_{MAX}} \times 100\ [\%]$$

Circuit Breaker Failure Protection

The C.B. failure protection is based on supervision of phase current during tripping events. This protective function becomes active only after tripping. The criteria is whether all phase currents are dropped to <5%xIN within set time of tCBFP. If not, then CB failure is detected and the assigned relay is activated. Annunciation relay for CBFP only manually reset.

Cold Load Pickup

In CSDPR-V2 unit, this feature is provided to avoid non desired trips, when line de-energized for a period of time and re energized later, the load exceeds the protection setting without the presence of a fault.

To avoid such conditions, CSDPR-V2 switches from protection usual setting to cold load pickup setting (refer Cold Load pickup Setting table) for settable time. After expiry of settable time, it will shift back to the original protection setting.

Broken Conductor Protection

Majority of faults on a power system are shunt faults and induce appreciable current increase so easily detectable by standard over current protection element.

Another type of unbalanced system condition is the series or open circuit fault. This fault can arise from broken conductors, mal operation of single phase switchgear or the operation of fuses.

Series faults will not induce an increase in phase current on the system and hence are not easily detectable. However on a lightly loaded line, the negative sequence current resulting from a series fault condition may be very close to or less than the full load steady state unbalance arising from CT errors, load unbalance etc. a negative sequence protection element therefore would not operate at low load levels.

CSDPR-V2 relays incorporate a protection element, which measures the ratio of negative to positive phase sequence current (I_2/I_1). This protection element will be affected to a lesser extent than the measurement of negative sequence current alone, since the ratio is approximately constant with variations in load current. Hence a more sensitive setting may be achieved.

Thermal Over load Protection

Thermal overload protection can be applied to prevent damages to the electrical plant equipment when operating at temperatures in excess of the designed maximum withstand. A prolonged over loading causes excessive heating, which may result in premature deterioration of the insulation or in extreme cases, insulation failure.

CSDPR-V2 relays incorporate a current based thermal replica, using load current to reproduce the heating and cooling of the equipment to be protected. The element thermal overload protection can be set with both alarm and trip stages.

The heating within any plant equipment, such as cables or transformers is of resistive type ($I^2R \times t$), thus the quantity of heat generated is directly proportional to current squared (I^2). The thermal time characteristics used in the relay is based on current squared, integrated over time.

The CSDPR-V2 relays automatically use the highest phase current as input information for the thermal model. Thermal protection can be inhibited on start-up. The thermal time characteristic is given by following formula on next page :-

The formula for calculating the trip characteristics is as follows:

$$\text{Trip time (taus)} = \tau . \ln \left[\frac{\left\langle \frac{I^2}{Ib^2} \right\rangle - p^2}{\left\langle \frac{I^2}{Ib^2} \right\rangle - k^2} \right] \quad \text{for } p^2 < \frac{I^2}{(Ib^2)} \cap p^2 \leqslant k^2$$

with τ= thermal time constant of the object to be protected.

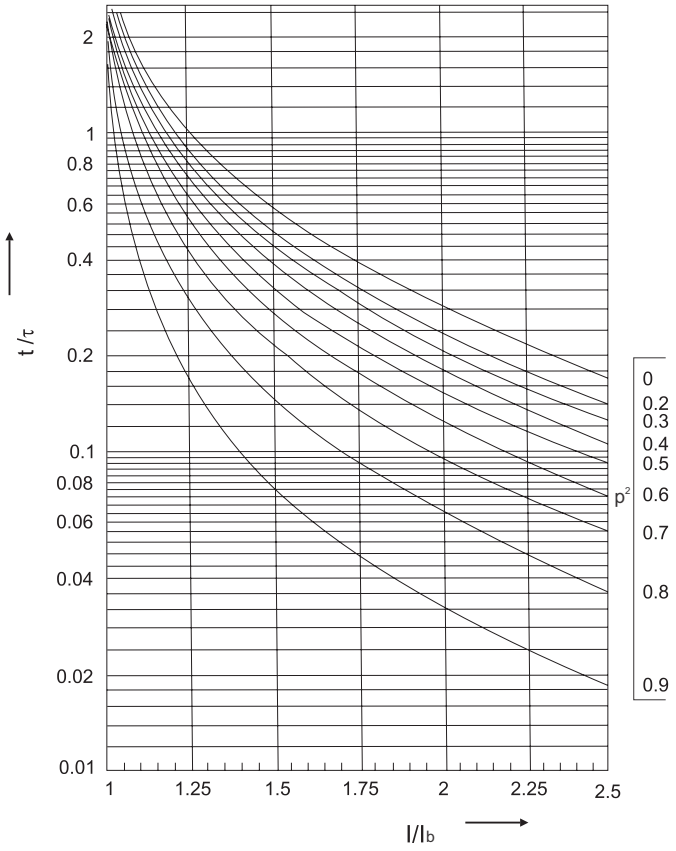
I_b = Basic current

I_p = Initial load current

P = Initial load factor (p= 0 means cold operating component)

k = constant

Presentation of the Trip with variable initial load factor:



Three Phase Under current

The undercurrent protection makes it possible to detect a loss of load (for example the draining of a pump or breakage of a conveyor belt). If the phase current goes below the programmed undercurrent threshold for a programmed definite time the trip signal is given.

Auto Re-closer Strategy

As 80% of faults in overhead lines are transient, the use of the auto recloser is very advantageous. Automatic auto-recloser allows a substation to operate unattended. The number of visits on site to manually reclose a circuit breaker after a fault, can then be substantially reduced. This feature gives an important advantage for substations supervised remotely.

Typically this auto reclose (AR) sequence of Instantaneous Trip(s) and Reclose Delays (Dead times) followed by Delayed Trip(s) provide the automatic optimum method of clearing all types of faults i.e. both Transient and Permanent, as quickly as possible and helps in improving the up time of the network in service.

DI Inputs

AR Blocking	-	To block the auto re-closer through remote DI
CB Close DI	-	To get the circuit breaker status
CB Ready	-	To get the CB ready or to give the closing command

Configurable Outputs: 79 AR Close, 79 Lockout

AR - Blocked

Unit changes immediately to "AR-blocked" status when an external AR Blocking DI is applied or internal EXIT is chosen for AR cycle in HMI. No Auto reclosing is possible in "AR-blocked" status.

Activating of AR

Prior to every AR it is possible to select which kind of tripping (I> or I>>, Ie>, I>>> etc.) will lead to automatic reclosing. This can be separately fixed for each protection.

Dead time (td)

Starts with the off signal of the circuit breaker. No closing command to the circuit breaker is given till expiry of the set dead time.
User programmable dead times are available for each protection trip operation.
The dead time is initiated when the trip output contact resets, the pickup is reset and the CB is open.
The CB close output relay is energized after the dead time has elapsed If CB ready input is present.
The dead time (dead time td1, dead time td2 dead time td3 dead time td4) starts when the feedback on 'CB CLOSE DI' is not available.

Reclaim time (tr)

This is the time during which after switching on or after AR a subsequent reclosing is prevented.
If the number of the set shots is reached, the relay is locked for this time after the last reclosing attempt.
If CB Ready DI is not available relay will not generate closing command.
If the circuit breaker dose not trip again, the auto re-close cycle resets to original STATE-1 at the end of the reclaim time.
After Successful re-closure the relays goes to the lock out state.

- If the protection operates during the reclaim time of the relay:
- either advances to the next AR cycle that is expected in next auto re-close state or if all the programmed re-closer attempts have been accomplished, it locks out.

The reclaim time is started with the automatic closing command.

Once a CB has reclosed and remained closed for a specified time period (the reclaim time), the AR sequence is reinitialized and a successful close output issued. A single common reclaim time is used (Reclaim Timer). when an auto reclose sequence does not result in a Starting Condition for Auto recloser

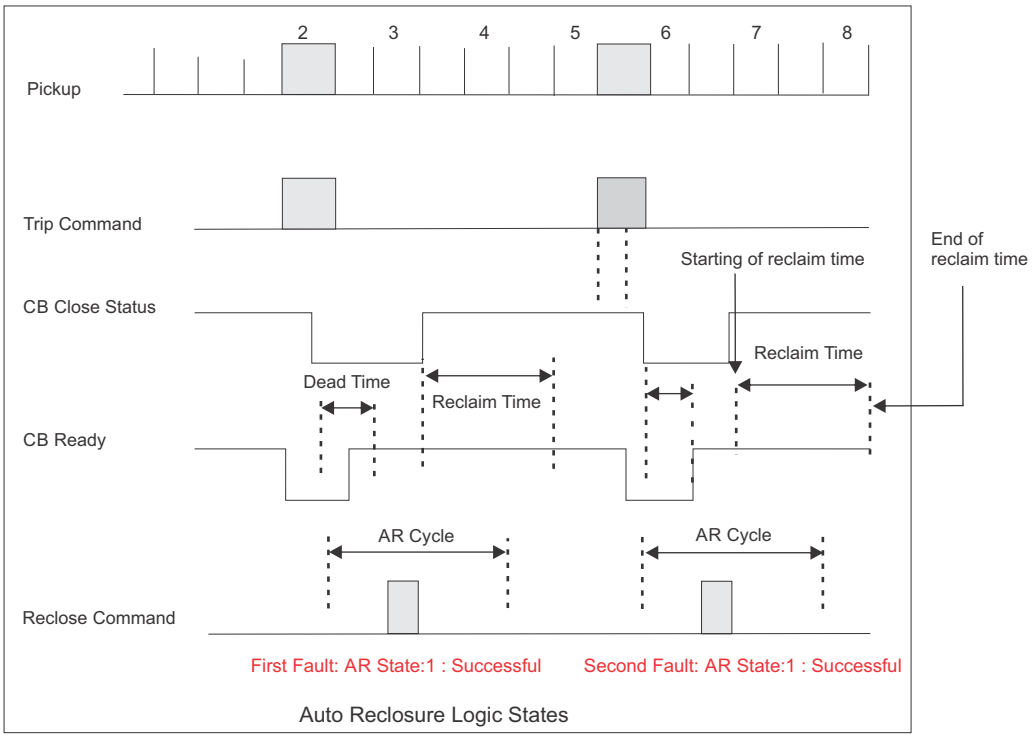
1) AR should be enabled by manual setting.
2) AR blocked DI is not available
3) Respective protection AR cycle should not in exit condition.

Lock out State:

Lockout state of the breaker means no further attempts to AR in these conditions

1) Lockout occurs when all auto re-closure attempts are over and protection operates during the final Reclaim Time.
2) If CBFP failure appeared in relay (if CBFP enable).
3) At the end of the each reclaim timer if the CB is in the open position (Close DI is not present).
4) If a Close pulse of AR relay is given and the CB fails to close through close DI input or expiry of Trip Contact Sense time.
5) If a open pulse given to CB and CB fails to open in between Trip Contact Sense time.

In any of these cases, Manual reset will be required to reinitiate the AR.



Auto Reclosure Logic States

Negative Phase Sequence Over current

This function protects against current unbalances resulting from anomalies in the power System or unbalanced loads. Negative phase sequence over current element give greater sensitivity to resistive phase to phase faults, where phase overcurrent element may not operate. If I2 is Negative phase sequence current then

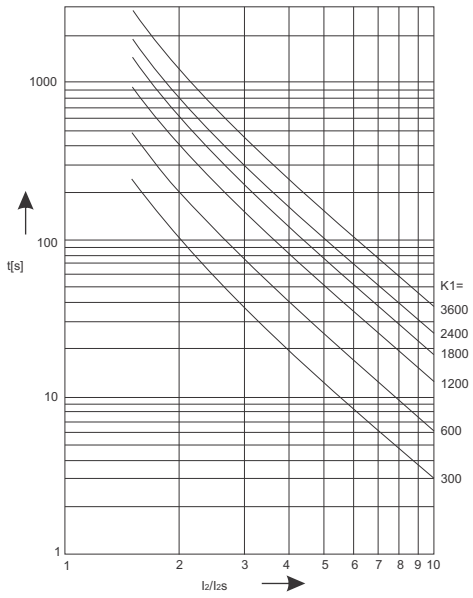
$$3\bullet|\vec{I}_2|=|\vec{I}a+a^2\bullet\vec{I}b+a\bullet\vec{I}c| \text{ Where } a=1\angle 120^0$$

The Trip can be time delayed by a curve selectable by settings.
Refer following formula for the inverse characteristics of Negative Phase Sequence protection: -

Negative Phase Sequence Equation

$$t = \frac{K1}{(I_2/I_{2s})^2 - 1}$$

K1 : TMS for Inverse characteristics of NPS
t : Expected Trip Time
I_2 : Measured negative sequence value
I_{2s} : Permissible NPS value



Negative Phase Sequence Inverse Time Characteristics

Inrush Blocking

Inrush blocking is a built-in protection feature in CSDPR-500 relay that prevents selected protection stages from being activated when inrush conditions occur on a line.

7) Battery Pack

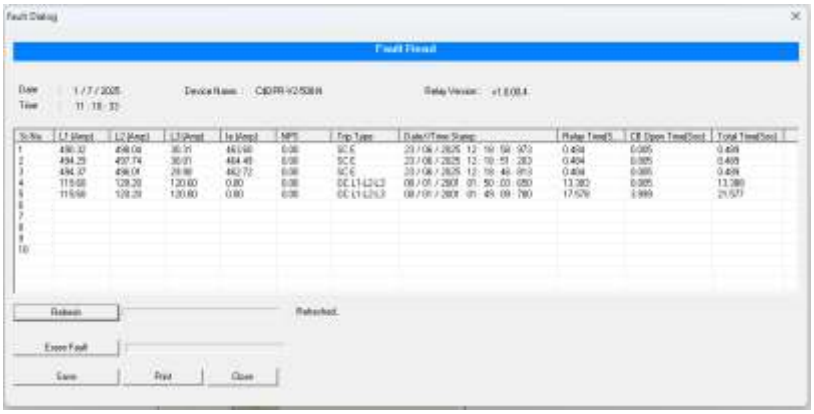
CSDPR-V2-500 comes with internal non rechargeable 3.6V / 2700mAh Li chloride battery pack, which energizes its LCD display to view and set the parameters when the current/voltage is not available in the RMU.

8) Fault Record

Relay records last 10 faults in its non volatile memory with its time stamp. Each record has the following information:

Fault Format		
L1 (Amp)	:	XX.XXA
L2 (Amp)	:	XX.XXA
L3 (Amp)	:	XX.XXA
Ie (Amp)	:	XX.XXA
Trip Type	:	XX.XX
Date/Time Stamp	:	DD:MM:YY HR:MIN:SEC:MS
Trip Time (sec)	:	XX.XX

The user can view the fault record / various parameters via the front USB interface software.

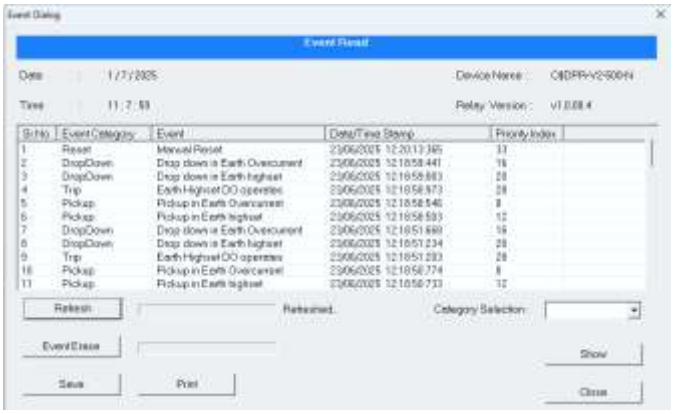


(Fault Data Recording on PC Software)

Picture shown here for have an idea only

9) Event Record

The unit stores in its non-volatile memory the last 50 events with its time stamp. When the available memory space is exhausted, the new vent automatically overwrites the oldest event, which can be retrieved from the PC.



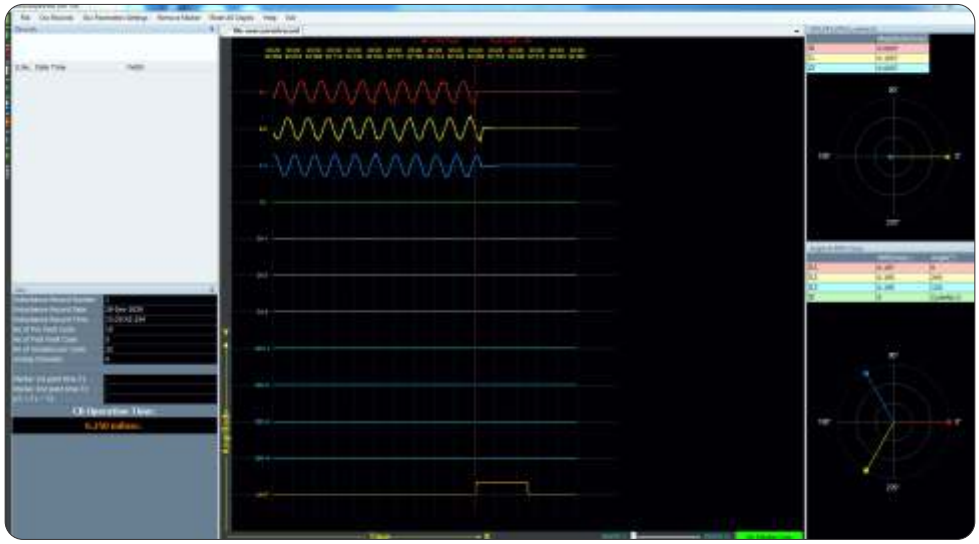
(Event Data Recording on PC Software)

NOTE : Once data has been downloaded after that offline this data can also be visualize in front end software.

10) Disturbance Recording

The CSDPR-V2-500 relay has an oscillograph data recorder with the following characteristics:

- Disturbance recording can trigger on Pickup or on trip i.e. change from pre-fault to post-fault stage. It is programmable.
- Each record comprises the samples from max. 4 analog signals and the status of max. 3 DIs & max. 4 DOs. There will be 30 samples per cycle.
- Relay saves max. 40 cycles and the number of cycles per record is programmable which limits the maximum no. of records possible to store in the relay.
- The pre-fault and post-fault cycles are programmable.
- Records are in the non volatile memory.
- The records are transferred to PC using USB interface. The data is graphically displayed and can be taken on printer.
- Record 1 is always latest record. 2nd record is older than 1st..... and so on.
- Disturbance record is available in comtrade format as per IEC60255-24.



Oscilloscope recording on PC software

11) Condition monitoring *

The relay has an oscillograph data recorder with the following characteristics:

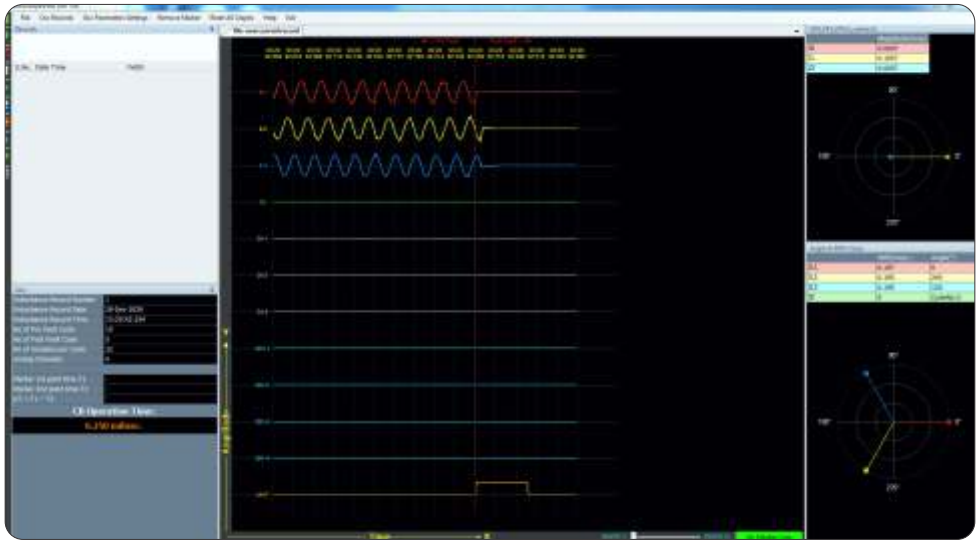
- High-speed recording is used to capture the individual samples of the currents and voltages measured by the device with a sampling frequency high enough to display power system faults and transients
- Display NPS, PPS, ZPS & PHASE diagram of each cycle
- This analyzer provides the following CRITICAL information like:-

a) Relay Operation Time – starting from Fault Detection to Tripping time,

b) Breaker operating time

c) Load Resume time after fault

"CB Operating Time Capturing Error: <= ±20msec" ; for further accuracy need to refer the Oscilloscope graph



* Model Dependent

12) Setting Ranges

Common Setting

Parameter	Display	Setting Range		Step Size	Default Setting
		Min.	Max.		
CT Ratio	Ct Rt	1	2500	1	1
Frequency	Freq	50/60Hz		10Hz	50Hz

Group Setting

Parameter	Display	Setting Range
Group No.	ACT.GRP	Group1 / Group2

Phase / Earth Over current & Short Circuit Settings

Parameter	Display	Setting Range	Step
Phase Characteristics	PChr	DEFT, EINV, VINV, NINV3.0, NINV1.3 LINV, RI, HV-FUSE	1
Earth Characteristics	EChr	DEFT, EINV, VINV, NINV3.0, NINV1.3 LINV, RI, HV-FUSE	1
1st Stage phase pickup	I>	0.10 – 2.5 x IN	0.01 x IN
DEFT Trip time for 1st stage over-current	t>	0.1 –150 s	0.01 s
Inverse TMS for 1st stage phase over-current	ti>	0.01 – 1.50	0.005
2nd Stage phase pickup	I>>	0.5 – 30 x IN	0.05 x IN
2nd Stage phase trip time	t>>	0.00 – 20 s	0.01 s
Earth fault 1st stage pickup	Ie>	0.05 - 2.5 x IN	0.01 x IN
DEFT trip time for 1st stage earth fault	te>	0.05 - 150 s	0.01s
Inverse TMS for 1st stage earth fault over-current	tie>	0.01 – 1.50	0.005
2nd Stage earth fault pickup	Ie>>	0.5 – 15 x IN	0.05 x IN
2nd Stage earth fault trip time	te>>	0.00 – 20 s	0.01s

Unbalance Settings

Parameter	Display	Setting Range	Step
Phase unbalance pickup	Unb	5 - 80%	1%
Phase unbalance trip time	tUnb	0.1-150 s	0.01 s

CBFP Settings

Parameter	Display	Setting Range	Step
Enable CBFP protection	CBFP	YES / NO	-
CBFP time	tCBFP	0.05-2.0 s	0.01 s

Cold Load pickup Setting

Parameter	Display	Setting Range	Step
Selection of Cold Load Protection	CldLdPrt	DISABLE/ENABLE	-
Cold Load Active Time	tCldLoad	0.1 Sec -20 Sec	0.01 Sec
1st Stage phase pickup	I>clp	0.10 - 2.5 x IN	0.01 x IN
Inverse TMS for 1st stage phase over-current	ti>clp	0.01 - 1.50	0.005
DEFT Trip time for 1st stage over-current	t>clp	0.1 - 150 s	0.01 s
2nd Stage phase pickup	I>>clp	0.5 - 30 x IN	0.05 x IN
2nd Stage phase trip time	t>>clp	0.00 - 20 s	0.01 s
Earth fault 1st stage pickup	Ie>clp	0.05 - 2.5 x IN	0.01 x IN
Inverse TMS for 1st stage earth fault over-current	tie>clp	0.01 - 1.50	0.005
DEFT trip time for 1st stage earth fault	te>clp	0.05 - 150 s	0.01s
2nd Stage earth fault pickup	Ie>>clp	0.5 - 15 x IN	0.05 x IN
2nd Stage earth fault trip time	te>>clp	0.00 - 20 s	0.01s

Disturbance Record

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Oscilloscope recording selection	RECORD	NO	YES	-	NO
Pre-fault cycle	PRE CYCLE	2C	38C	1C	002C
Post-fault cycle	POST CYCL	2C	38C	1C	002C

Broken Conductor

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
NPS to PPS Ratio	I2/I1 Ratio	0.10	1.0	0.01	Disable
Definite Time for broken conductor fault	(BC)Deft Time	0.05sec	20.00sec	0.01sec	0.10sec

Thermal Overload

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Permissible basic current	Ib	0.20xIn	4.00xIn	0.02xIn	Disable
Constant	k	0.50	2.00	0.01	1.00
Heating time constant	Th	0.5min	180.0min	0.1min	0.5min
Cooling constant	Tc	1.00xTh	8.00xTh	0.01xTh	1.00xTh
Thermal alarm	Alrm_R	20%	99%	1%	20%
Thermal reset	TH_Rst	00%	99%	1%	50%

Under Current

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Under Current Pickup Setting	I<	0.20xIn	1.00xIn	0.01xIn	Disable
Under Current Timing	t<	1.00sec	260.00sec	0.01sec	2.00sec
Under Current Threshold	ThrsSet	0.50xIn	1.00xIn	0.05xIn	0.50xIn

Auto Recloser Setting

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Blocking of Auto-recloser	FUN ENB	NO	YES	-	NO
Set Dead Time-1	D1	0.2sec	300.00sec	0.01sec	0.20sec
Set Dead Time-2	D2	0.2sec	300.00sec	0.01sec	0.20sec
Set Dead Time-3	D3	0.2sec	300.00sec	0.01sec	0.20sec
Set Dead Time-4	D4	0.2sec	300.00sec	0.01sec	0.20sec
Set Reclaim Time	tR	0.2sec	300.00sec	0.01sec	0.20sec
Cycle I>	Cyc I>	1	4/Disable	1	2
Cycle I>>	Cyc I>>	1	4/Disable	1	2
Cycle Ie>	Cyc Ie>	1	4/Disable	1	2
Cycle Ie>>	Cyc Ie>>	1	4/Disable	1	2
Trip sense time	t_TST	0.05sec	2.00sec	0.01sec	0.02sec

Negative Phase Sequence

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
NPS Pickup Setting	I2> Pickup	0.10xIn	1.00xIn	0.01xIn	Disable
NPS Trip Characteristic	I2> Characteristics	DEFT	INVERSE	-	DEFT
Time Multiple	K1 TD Multiplier	05	600	01	05
Definite Time Delay	t2> Deft time	0.1sec	600.0sec	0.1sec	00.2sec

Relay Assignment

Parameter	Display	Setting Range
Over current	I>	DISABLE/RLY1/RLY2/RLY3/RLY4
Short Circuit	I>>	DISABLE/RLY1/RLY2/RLY3/RLY4
Earth Low set	Ie>	DISABLE/RLY1/RLY2/RLY3/RLY4
Earth High set	Ie>>	DISABLE/RLY1/RLY2/RLY3/RLY4
Unbalance	Unb	DISABLE/RLY1/RLY2/RLY3/RLY4
Circuit Breaker Failure Protection	CBFP	DISABLE/RLY1/RLY2/RLY3/RLY4
Digital Input	Remote	DISABLE/RLY1/RLY2/RLY3/RLY4
All Fault	AlFlt	DISABLE/RLY1/RLY2/RLY3/RLY4
Negative phase sequence	NPS	DISABLE/RLY1/RLY2/RLY3/RLY4
Broken conductor	BCTrip	DISABLE/RLY1/RLY2/RLY3/RLY4
Thermal overload	ThmL	DISABLE/RLY1/RLY2/RLY3/RLY4
Under current	ti<	DISABLE/RLY1/RLY2/RLY3/RLY4
Auto-recloser	ARCls	DISABLE/RLY1/RLY2/RLY3/RLY4
Self supervision function	SlfSup	DISABLE/RLY1/RLY2/RLY3/RLY4

Note:

1) Two nos. of Potential free relay (with Aux supply) and two nos of Latch relay (without Aux supply) are assignable.

2) The DOs with Aux supply can be set in Auto / Manual Reset mode.

3) Latch Relay reset by Manual Reset button press.

DO Reset

Parameter	Display	Setting Range
Digital output1	RLY1	Auto/Manual
Digital output2	RLY2	Auto/Manual

DI Assignment * (Out of Three Digital Inputs, only Two are assignable)

Parameter	Display	Setting Range
CB close	CB Cls	1,2
CB Open	CB Opn	1,2
CB Ready	CB Rdy	1,2
Phase Over current Low set blocking	I> BLK	1,2
Phase Over current High set blocking	I>> BLK	1,2
Earth Over current Low set blocking	Ie> BLK	1,2
Earth Over current High set blocking	Ie>> BLK	1,2
Unbalance blocking	Unb BLK	1,2
Negative phase sequence blocking	NPS BLK	1,2
Broken conductor blocking	BC BLK	1,2
Auto-recloser blocking	AR BLK	1,2
Thermal overload blocking	Th BLK	1,2
Under current blocking	UC BLK	1,2
Remote Reset	Rmt_Rst	1,2

Trip Type

Parameter	Display	Setting Range
Mode of tripping	Trip Type	TRIP COIL/LATCH RLY/DUAL

Common Setting

Parameter	Display	Setting Range
Slave Address	SLV Add	1-32
Baud Rate	BD Rate	9600/19200
Parity	Parity	NONE/EVEN/ODD

Front (USB) Communication

Front Port	CSE protocol with CSE LIVELINK on Male USB cable type A/A

General Data

Rated auxiliary voltage U_H	Universal	L: 18V - 60V DC
		H: 85V - 260V AC / 85V - 300V DC
Voltage Range for Digital Inputs	Normal voltage U_N (H)	Active: ≥ 70V DC / ≥ 85V AC
		Inactive: ≤ 35V DC / ≤ 40V AC
	Normal voltage U_N (L)	Active : ≥ 14V DC
		Inactive : ≤ 10V DC
Power consumption of Aux supply	Quiescent approx. 3W	Operating approx. 6W
Dropout pickup ratio	> 95 %	

Measuring Input

Rated current	I_N (1A)
Frequency	F_N: 50/60 Hz
Measurement	Measurement of Phase / Earth current starts from 5%

Phase / Earth VA Burden : (2.5VA @ Rated Current)

Thermal Withstand Capacity

Thermal withstand capacity for In=1A	Continuously	2.5A
	10s	15A
	1s	80A

Accuracy

Tripping times with pre fault	DMT : ± 5% of the setting value or ±40 mSec
	IDMT : Accuracy as per IEC-255-3 (2xIs to 20xIs)
	For VINV / NINV / RI : ± 5% or ± 40 mSec
	For LINV /EINV / HV-Fuse / NPS : ± 7.5% or ± 60 mSec
Pickup accuracy	+5%
Boot up time in self powered mode	≤ 80 mSec

Measurement Accuracy

DescrIntion	Range	Frequency Range	Accuracy
Current	1.0 - 30 $x I_n$	50/60 Hz	±2%

Output Contact (Relay Specs)

Number of Relays	4
Relay contacts are configurable & available	All DO's are user programmable for I>, I>>,
	Ie> and Ie>>, CBFP, Unbalance ($I_{unb>}$) etc.
DO contacts	DO-1 & DO-2 works with Aux supply
	DO-3 & DO-4 works without Aux supply
Max. breaking capacity	1250VA / 150W resistive
	500VA / 90W inductive
Max. breaking voltage	400V AC, 125 VDC
Max. continuous AC current	5A

Certified Type Test

Environmental Conditions (Recommended ambient temperature range)

Operating temperature range : Continuous withstand -25°C to +60°C
Limit (Note-1) -25°C to +70°C.

Storage temperature Range : -25°C to +70°C
Note: The upper limit is permissible not for continuous period.

Mechanical Environment

Vibration Test : IEC 60255-21-1, class 2.

Shock : IEC 60255-21-2, class 1.

S.No	Description of Test	Standard
1	Insulation test	IEC 60255-5
2	Di-electric test	IEC 60255-5
3	5 KV impulse voltage test	IEC 60255-5
4	High freq. interference test severity class 3	IEC 60255-22-1
5	Radio interference suppression test	EN55011 cl 5.1.2
6	Radio interference suppression test	EN55011 cl 5.22.2
7	Radiated radio frequency electromagnetic field immunity test	IEC 60255-22-3
8	Conductive RF immunity test	ENV50141
9	Surge immunity	EN61000.4.5
10	ESD test severity class 3	EN61000-4-2
11	Fast transient disturbance test	IEC 60255-22-4
12	Power frequency magnetic field immunity test	IEC 61000-4-8

Tripping Characteristics (IEC 255-3 or BS 142)

Normal Inverse 3.0/1.3 $= \dfrac{0.14/0.06}{(I / I_s)^{0.02} - 1}$ ti [s]

Very Inverse $= \dfrac{13.5}{(I / I_s) - 1}$ ti [s]

Extremely Inverse $= \dfrac{80}{(I / I_s)^2 - 1}$ ti [s]

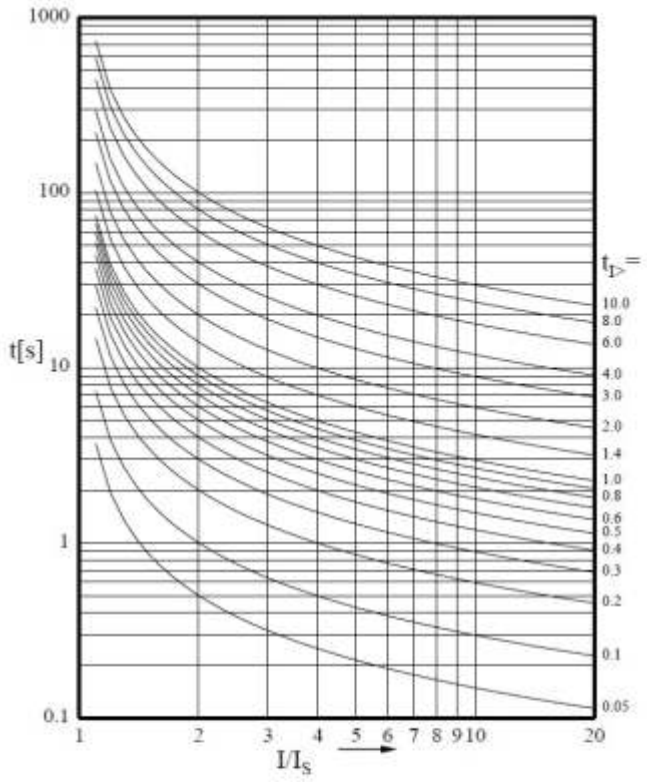
I : Injected current
Is : Pickup set level
ti : TMS for inverse characteristic
t : Definite delay in DEFT characteristic

!!! **CAUTION** !!!

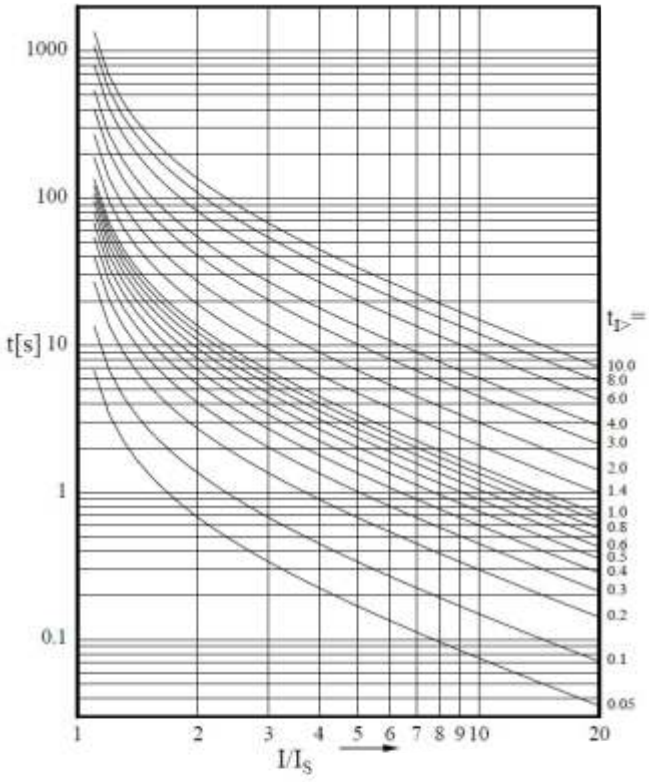
O/C, S/C, E and EH protections are available with DISABLE option in HMI.

13) Inverse Graph Representation

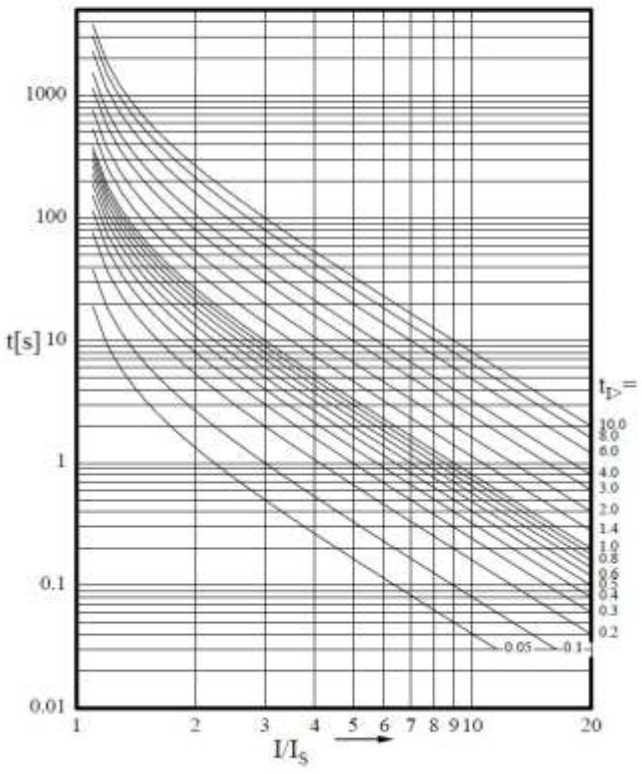
Inverse Time Characteristics



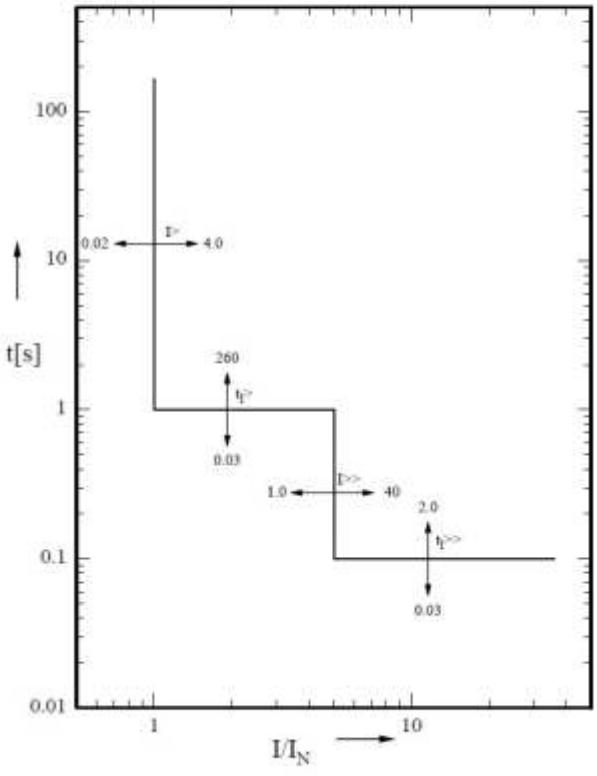
Normal Inverse



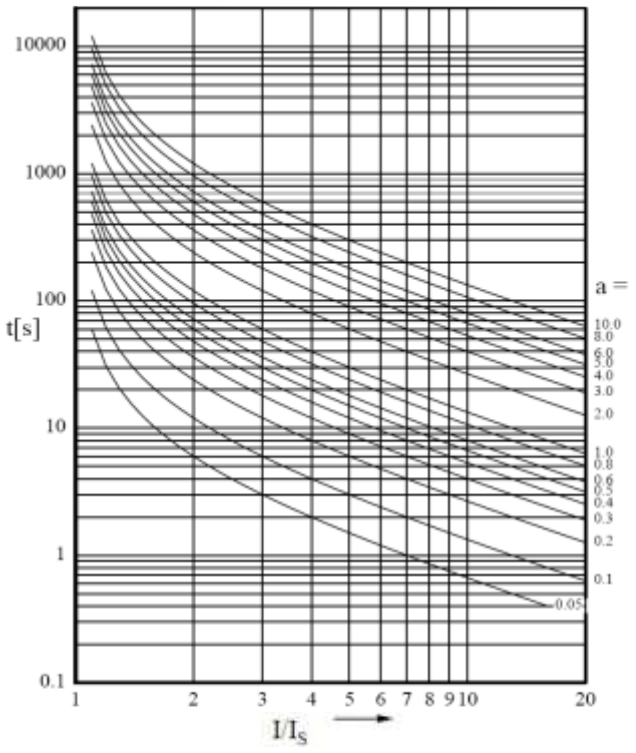
Very Inverse



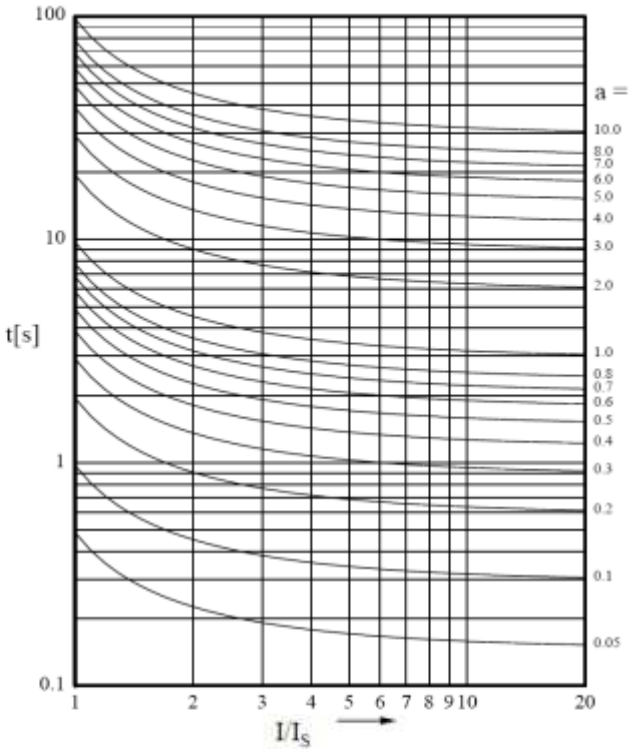
Extremely Inverse



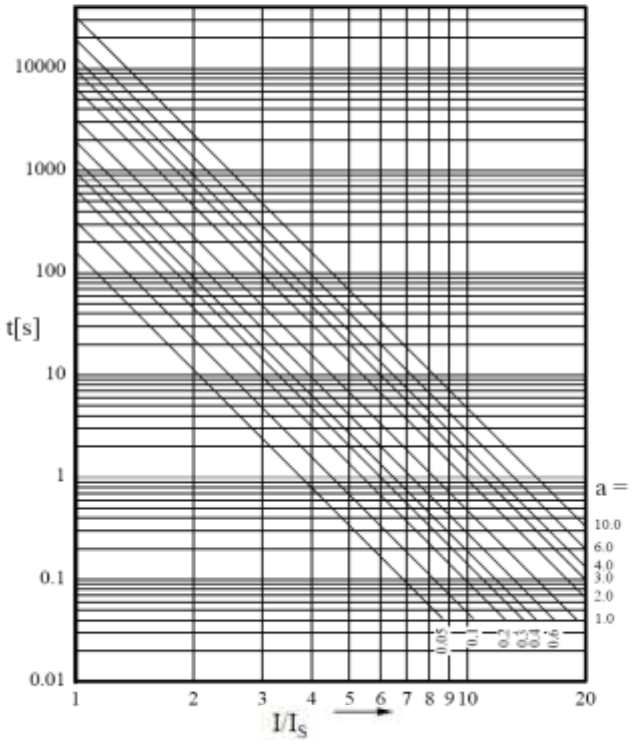
Definite time overcurrent relay



Long time inverse

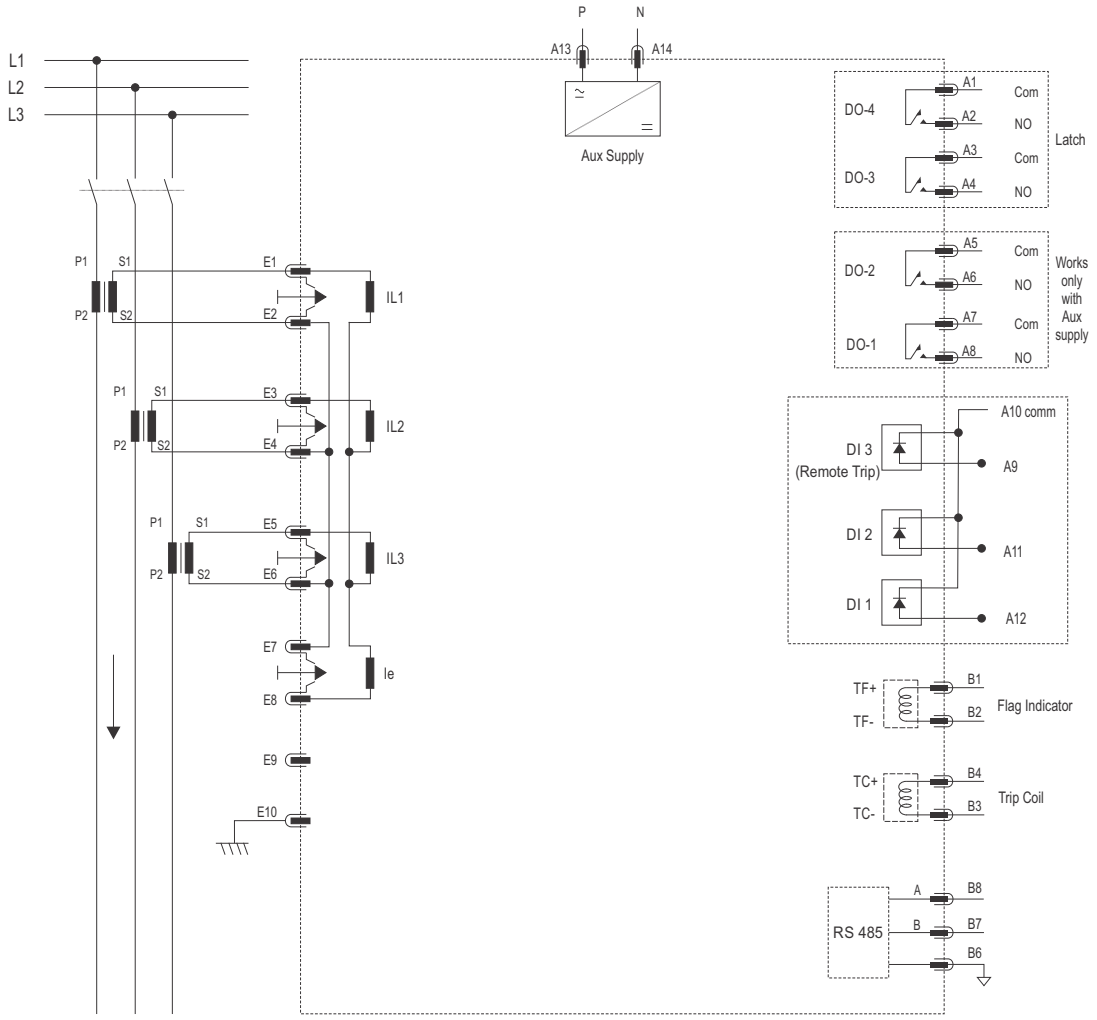


RI-Inverse



HV-fuse

14) Connection Diagram



NOTE: While doing the HV test, do not connect the MHT terminal (B1-B2, B3-B4), as internal capacitor bank could be in charged state & it can harm the circuitry.

15) Terminal Description

Terminal Name	Terminal Description
E1-E2	Current Terminal for L1 Phase
E3-E4	Current Terminal for L2 Phase
E5-E6	Current Terminal for L3 Phase
E7-E8	CT Common point
E10	Earth Terminal
A1-A2	DO-4 for all faults with (COM NO) latch contact
A3-A4	DO-3 for all faults with (COM NO) latch contact
A5-A6	DO-2 assignable relays with (COM NO) contact (with Aux Supply)
A7-A8	DO-1 assignable relays with (COM NO) contact (with Aux Supply)
A9-A10	Digital Input DI-3 (Remote Trip)
A11-A10	Digital Input DI-2
A12-A10	Digital Input DI-1
A13-A14-A15	Aux. Supply ; P(A13), N(A14)
B1-B2	Trip flag (TF) ; Pulse output (B1(+) - B2(-)
B3-B4	Trip coil (TC) ; Pulse output (B4(+) - B3(-)
RS-485 comm.	MODBUS Terminal : (B8-A), (B7-B), B6(Ground)

16) Battery changing Procedure

Open the screw of Battery holder by using the appropriate screw driver

Remove the Battery cover by twisting it on the left side as shown in the Left image.

Remove the Sticker placed on Battery to start the unit with Battery.

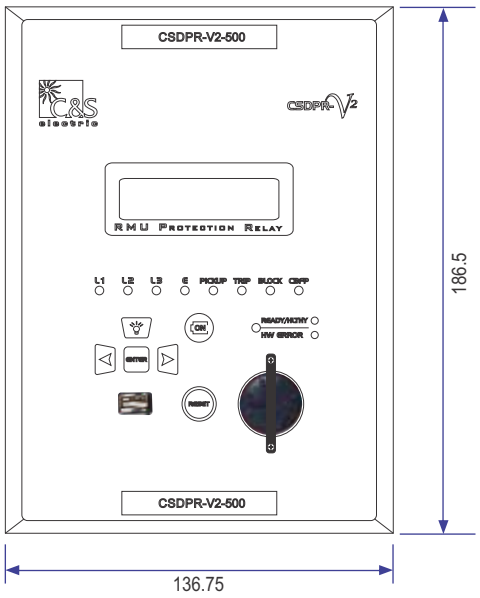
Replace the prescribed 1/2 AA size suitable battery with the new one.

Close the Battery cover by twisting it on the right side as shown in the Left image.

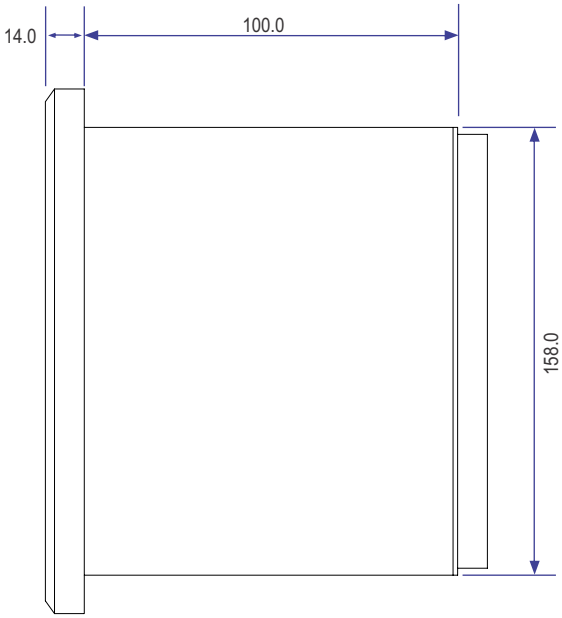
17) Dimension Details of the Relay

All the dim are in mm (Gen. Tol ± 1.0mm)

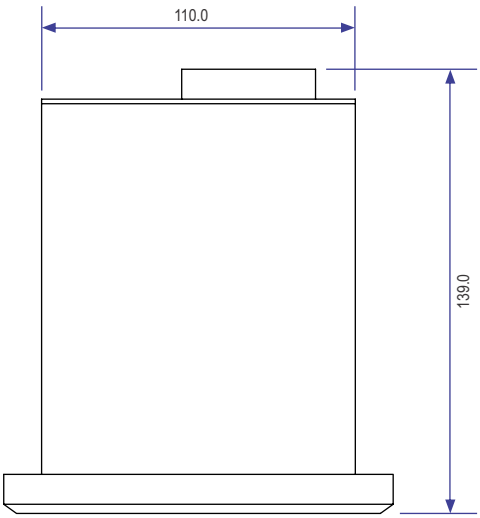
Front View



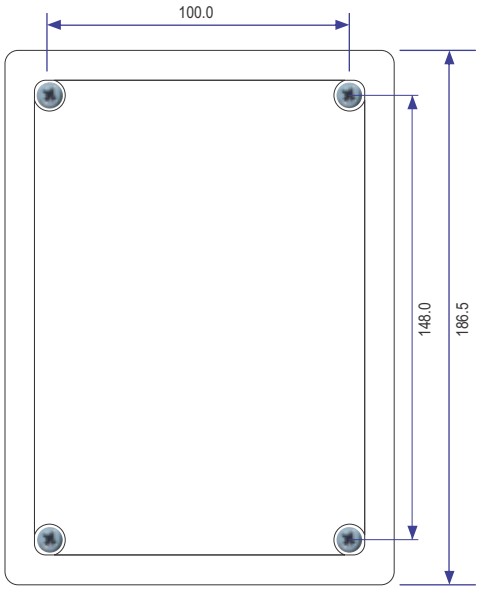
Side View



Top View

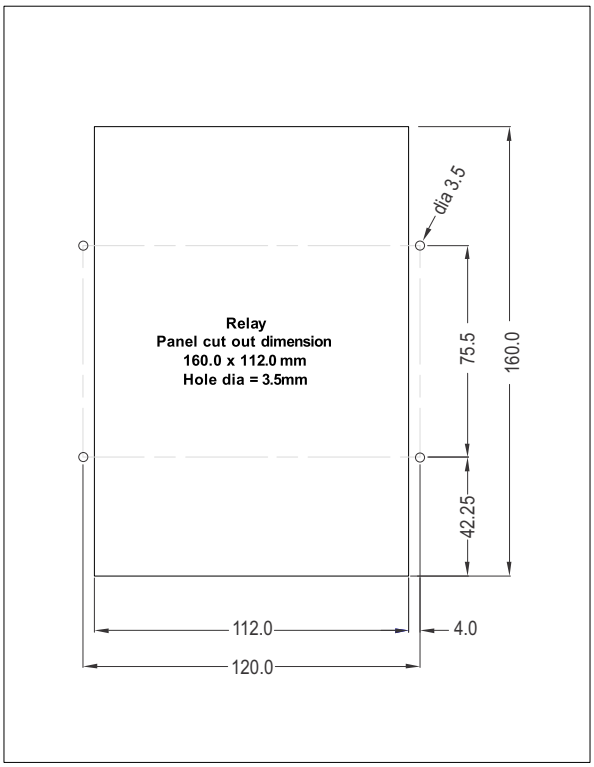


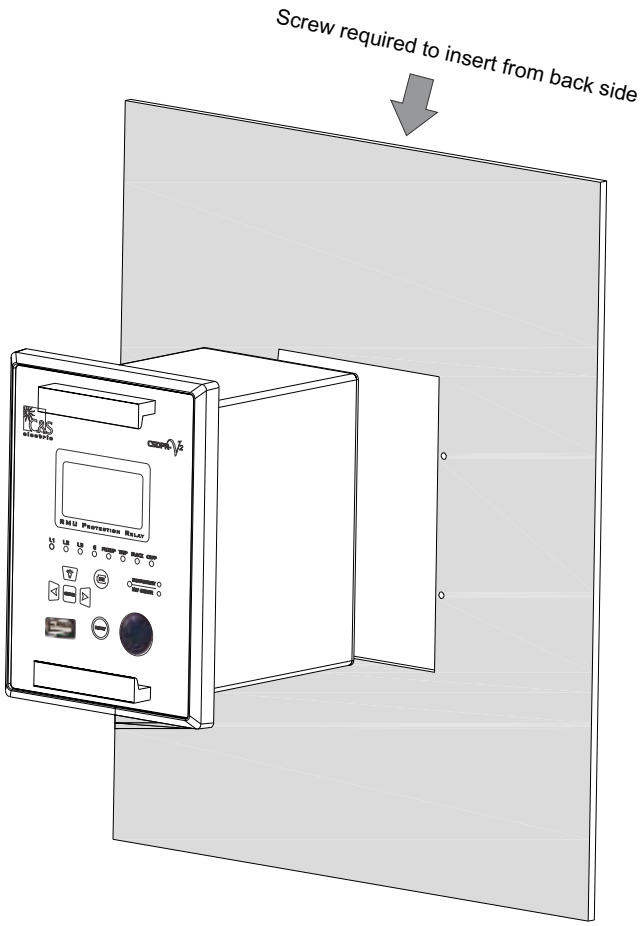
Back Dimension



18) Panel mounting Details

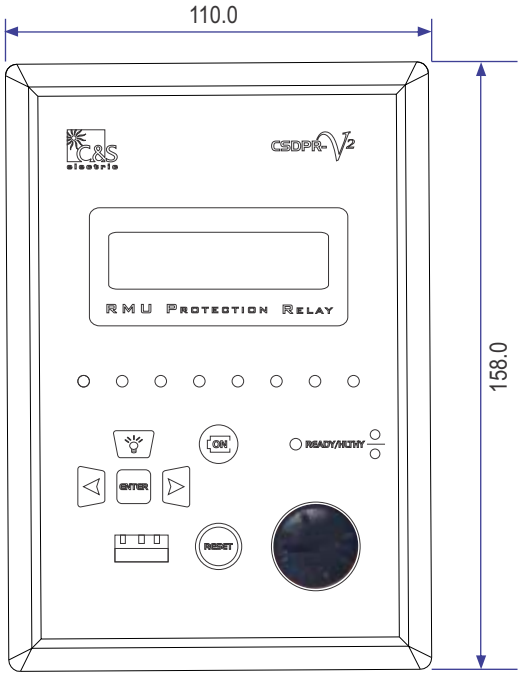
Panel cut out Dimension: HeightxWidth=160x112mm Screw : M3, Qty : 04 Nos.



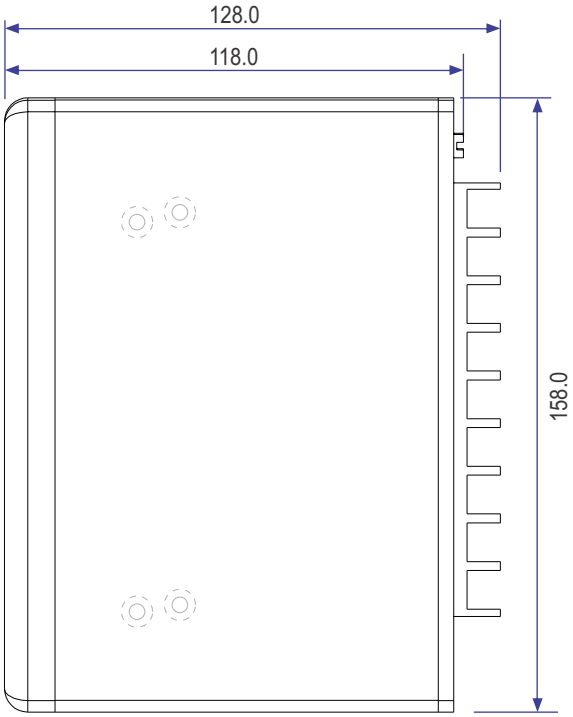


19) Dimension Details of the Relay (without collar variant)

Front View



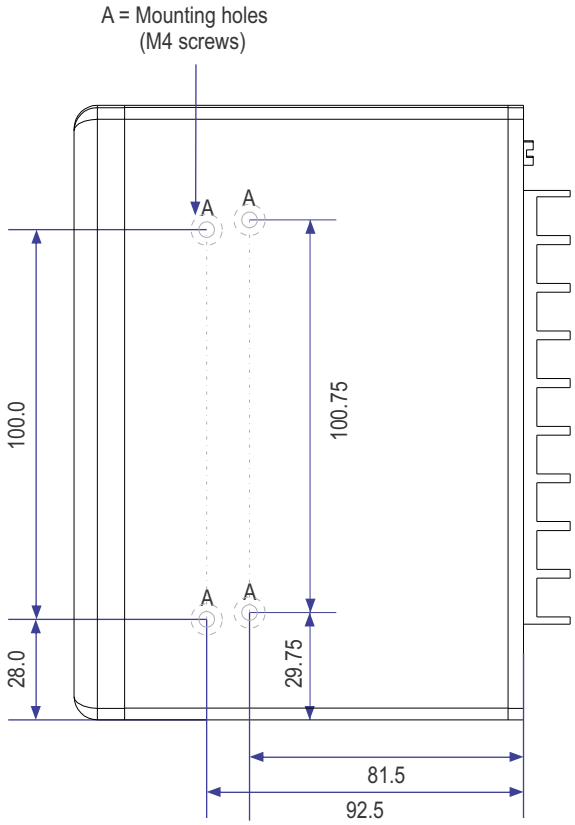
Side View



Mounting Details

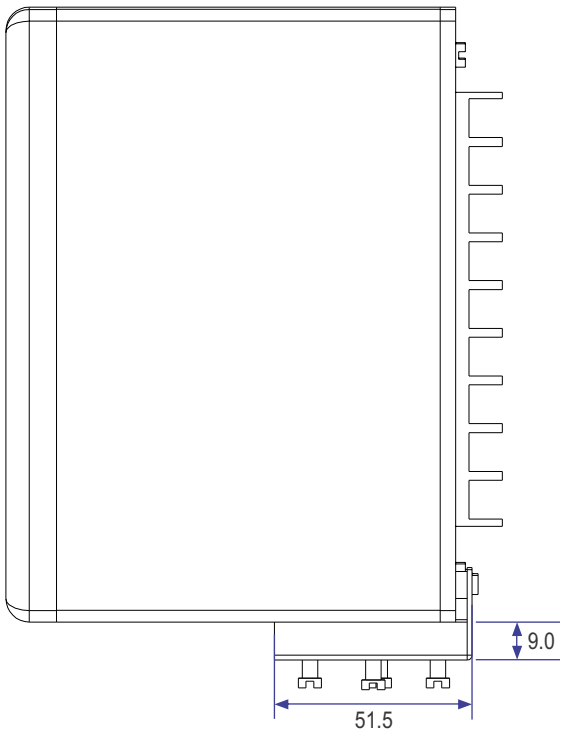
OPTION-1

(Mounting on side screws)



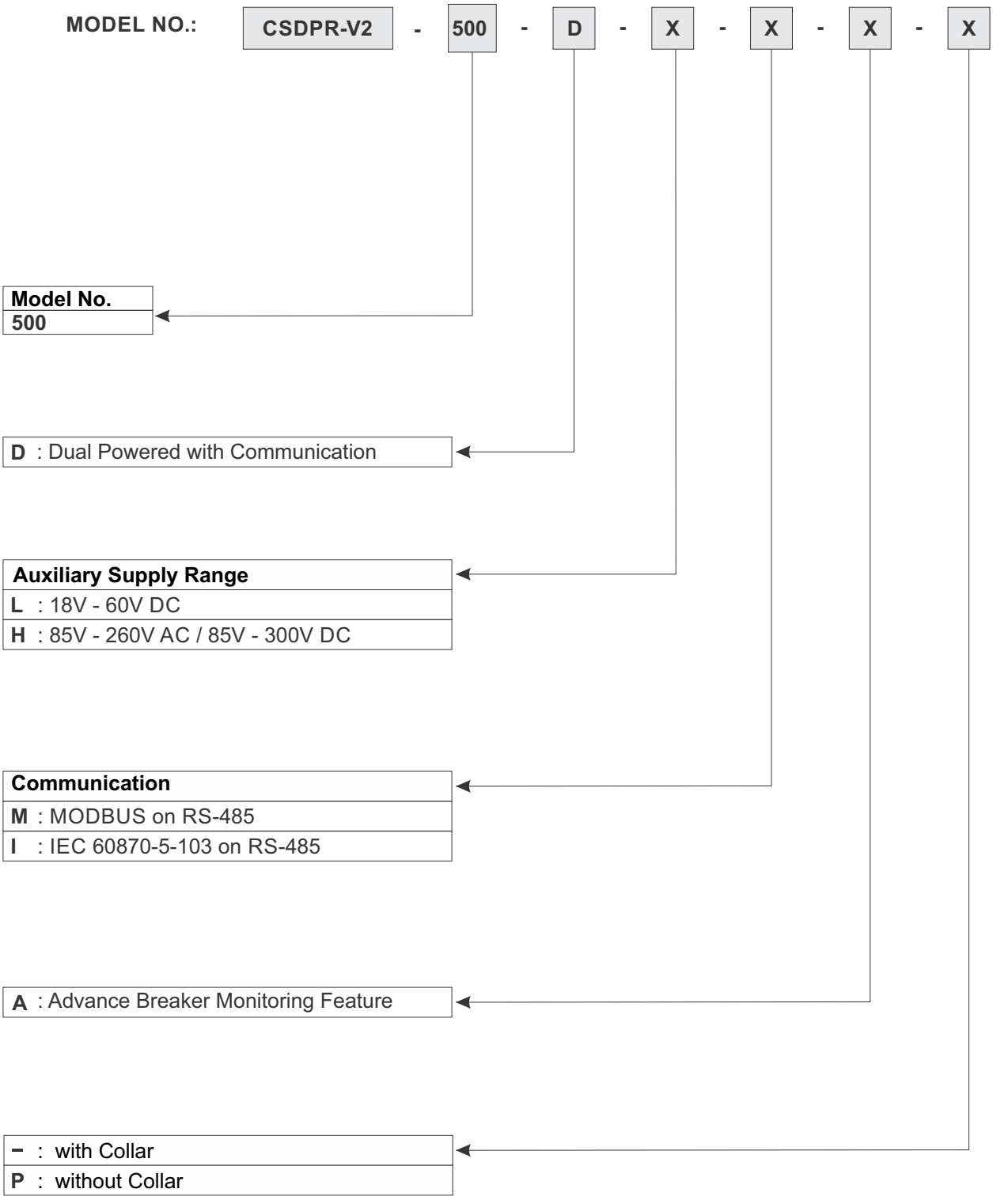
OPTION-2

(Mounting on Bottom Plate)



(All the dim are in mm, Gen. Tol.: ± 1.0 mm)

20) Ordering Information



CSDPR-V2-500

Revision

S.No.	Rev.No.	Details	Date
01	01	Protection setting ranges of earth fault phase fault change	18.03.19
02	02	change in output contacts relay specs on page 18	29.07.19
03	03	Basic Protection of Phase & Earth Min / Max setting changed	27.05.20
03	03	Change in Order information section : include Advance monitoring feature	27.05.20
04	04	Change Ip in to In	06.07.20
05	05	Add description for VA burden & Earth/Phase current measurement	09.07.20
06	06	Boot-up time change from 100 to 80	08.08.20
07	07	Change in ordering information (collar details added)	24.04.23
08	08	Change in connection diagram on page-22	23.02.24
09	09	Change in dimension details of the product on page 24 & 25	18.04.24
10	10	Aux supp range H : 85-260V AC/ **110**V-300V DC change to H : 85-260V AC/ **85**V-300V DC in ordering info (Pg 27) & General Data (Pg 18)	03.10.24
11	11	Include Inrush blocking details on page 11 & Include Remote Reset in DI assignment on page 17.	17.12.24
12	12	On page 6, in Trip output “24V/12V@0.2Ws /50msec” ON Pulse is changed to “24V/12V@0.4Ws /50msec”.	02.04.25
13	13	On page 26, of without collar relay dimensions detail, mounting holes dimension included.	10.04.25
14	14	“Display mode setting”-page 18 Removed, DOs description- page 6 & 18 changed, Cold load setting-page 15 changed, AR setting-Page 16 changed.	30.06.25

NOTE

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