We touch your electricity everyday!

CSDPR-V2-300

Intelligent Measuring & Protection Device

Catalog

C&S electric

PMD Division

CONTENTS

1. Introduction

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

- Over current, Short Circuit, Earth Fault and Earth Fault High set protection
- DEFT and Inverse characteristics for O/C and E/F individually selected for phase and earth fault
- Remote trip
- Switch on to fault (SOTF) protection*
- Remote protection block input DI*
- Potential pulse output for direct triggering the circuit breaker coil.
- Potential free alarm contacts available
- Unbalance / Asymmetric protection
- Circuit breaker failure protection
- Harmonic blocking (via DFT Filter) to avoid any Inrush phenomena to protect unwanted tripping
- Two sets of setting groups
- Last 5 Fault and 10 Event record with Time stamp
- Rear RS-485 Modbus communication
- Front USB communication for PC / Laptop interface
- Wide operating ranges of the auxiliary supply voltage (AC/DC)

2. Design

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

- Aux. Supply
- CT Current
- Internal Battery
- USB Port

Relay will operate its trip contacts only when CT current is present or Aux. supply is available, with other power sources, only the relay display/HMI will be available.

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 20% of rated current or 15% 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, USB & Current.

a) Operation

The CSDPR-V2 is a CT operated protection relay with inverse time and definite time protection characteristics.

CSDPR-V2 works with standard CTs with secondary current and with defined VA burden.

CSDPR-V2 provides following protection functions:

- Three phase time over current protection
- Three phase instantaneous protection
- Earth time over-current
- Earth instantaneous over-current
- Circuit breaker failure protection
- Trip circuit supervision *

b) Analog Input

The analog input signal of the CT secondary currents as per the terminal details are fed to the protective device via separate input transformers. The continuously measured current values are galvanically isolated, analog & digitally filtered and finally fed to the analog/digital converter to get the RMS value. Filtration of DFT, results into pure fundamental measurement.

c) Front Panel

The front panel of the protective device CSDPR-V2 comprises the following operation and indication elements:

- LCD display with Bright white light
- Keypad for setting of the parameters of the relay
- 8 LEDs for fault annunciation & 1 LED for READY/HLTHY annunciation

Note: Relay goes into sleep mode, user has to press  **key to see the display.**

* model dependent

d) Keypads

The front panel keypad consists of six soft-touch keys. These keys are marked as ◄, ENTER, ►, RESET, & ON. The RESET key provides reset function to the relay & ENTER act as Enter key for HMI. The keys marked ◄ and ► are meant for backward & forward scrolling respectively and also used for decrementing & incrementing the selected parameter value.

key is used to ON the LCD. When available source (Aux supply, CT current, USB port) is present and no key is pressed for 1 min then LCD gets off.

ON Key is used to ON the LCD when the available source is only battery.

NOTE: Under Self powered condition (i.e. absence of Auxiliary Supply), Back light will be available in product if current is more than 20% in all phases or 40% in single phase by pressing Key.

e) LEDs

There are 09 LEDs on the front panel. Their functions are indicated by the appropriate inscriptions along with them. L1, L2, L3, E, Pickup, Trip, Block & CBFP LEDs are with memory backup & they will maintain the previous status until fault is acknowledged through manual reset. The working is equivalent to a digital flag as unit contains a battery inside.

There is one bi-color LED. READY HLTHY LED flashes green when it has sufficient energy to operate the Trip coil. Red is the steady indication of the HW Error.

BLOCK LED indicates the protection (selected in DI block menu) is blocked, when Block Digital Input is active.

f) Fault Recording

CSDPR-V2 records last 5 Faults. In Fault, it saves following information:

Value at fault	:	L1, L2, L3, E in Amps
Type of fault	:	SC / OC / U0>/CBFP
Time stamp	:	HH:MM:Sec
Date stamp	:	DD:MM:YY
Trip time of fault	:	xxxxxx Sec

g) Event Recording

CSDPR-V2 records last 10 events. It saves following information:

Event Type	:	01
Date	:	DD:MM:YY
Time stamp	:	HH:MM:Sec

* Event Type = Number

h) Trip Output

In presence of Aux supply:

4 Potential Free contacts and 1 Potential O/P (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 20% of the rated current must required in the phases to trip the breaker.

Trip Output

1 Potential Output (24V/12V@0.4Ws/50msec ON Pulse).

i) Flag Indicator

An output similar to above but with low energy is provided for operating a magnetic flag.(24V@0.01 joules)

j) Switch on to Fault Protection*

The relay have dedicated Switch-on-to Fault (SOTF) functionality to provide high speed tripping, If a fault is still present after the re-closer of the circuit breaker (close-on-to-fault) OR if earthing clamps are left connected after maintenance. This function allows to monitor 3 phase current for 10 AC cycles from the start up of relay with CT power and trips when any fault is detected based on users settings.

The sensitivity of the relay is the min. phase current required for the relay to energize, detect a fault and issues a trip as per the configuration. The sensitivity of self powered over current and earth fault relay shall be 20% of nominal current in single phase and 13% of nominal current in three phases.

Some faults may be caused by conditions not removed from the relay after a reclosing cycle or a manual trip or due to earthed clamps left on after maintenance works. In these cases, it may be desirable to clear the fault condition in fast time, rather than waiting for the Trip time delay associated with the I>> & I>>> protection. t_SOTF time delay is used for I>> & I>>> protection's in such condition's.

With the switch on to fault (SOTF) submenu, it is possible to shorten the time to trip For I>> & I>>> protection if selected, when for example the relay has detected a fault that is still present on a feeder after energizing.

* model dependent

k) Trip Circuit Supervision *

This feature continuously supervises trip circuit of both pre closing and post closing conditions in circuit breaker. It detects tripping mechanism failure like circuit breakage contact degeneration in wires, contacts and coils.

Note: Trip counter is incremented on the basis of getting trip command from relay and not on the basis of external mechanism (circuit breaker) operation.

l) Assignment of the Output Relays

CSDPR has 4 output DOs. There are Two latch DOs (DO-3 & DO-4). Two extra programmable output DOs (DO-1 & DO-2) available only with auxiliary supply. DO reset operation can be configurable in automatic reset or manual reset mode from HMI. In automatic reset mode DO 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 in presence of fault current also. RESET of latch contact is possible under presence of energizing current or Auxiliary supply Or presence of battery.

j) Potential Input *

Two Potential DIs are available for control. These DIs can be used as Remote Block & Remote Trip.

DI-2* : Remote block for 50/50N/51/51N & unbalance protection (U_0>) functions / CB Open.

DI-1* : Remote Trip / CB Close

DI-1: Remote Trip

Irrespective of any pickup or fault user can trip the Circuit breaker, by applying voltage to Remote trip DI.

This DI will trip the breaker only in presence of adequate load current only.

DI-2 : Blocking the protection functions

When this input, becomes high it will block the selected protections such as OC/SC/Earth/Earth-high set/ U_0>. The selection of protections for blocking is done from HMI. Blocking will remain active till the potential is available on DI terminal.

3. Communication

a) Rear RS-485 Communication

The CSDPR-V2 includes an RS-485 communication on rear port This port is available for MODBUS protocol. CSDPR-V2 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 protection function.

b) 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

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

4. Protection Functions

CSDPR-V2 offers 50/51/50N/51N/Unbalance/CBFP 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 [CBFP]

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%xI_N 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.

5. Display Mode

CSDPR-V2 works in two modes (AutoOFF/Live)

AutoOFF Mode : LCD gets on by pressing back light key & gets off after 45 second, if no key is pressed.

Live Mode : LCD remains on as long as auxiliary supply / phase current is available.

6. Battery Pack

CSDPR-V2 comes with internal Li battery pack, which energizes its LCD display to view and set the parameters at the time of initial installation especially when the current/voltage is not available in the RMU. This battery has a life & so it is not meant for long future use. Whenever operator is going at RMU site to fetch the fault record Or to edit/view the settings, we recommend to carry external USB power pack, which will get plugged to front USB of the relay. User can operate the relay using USB power source. We recommended to use rechargeable USB Power Pack external accessory; however user can use any USB power source to energize the relay from USB.

Note: CSDPR-V2 will not charge the battery.

* model dependent

7. Specification Table of the Relay

Function	ANSI	CSDPR-V2-300
3 Phase Over current protection	51P	✓
3 Phase Instantaneous protection	50P	✓
Earth time Over Current	51N	✓
Earth time Instantaneous Over Current	50N	✓
Circuit Breaker Failure protection	50BF	✓
Switch onto fault *	SOTF	✓
Trip circuit supervision *	74TC	✓
Harmonic blocking on phase & earth	50H	✓
Phase unbalance/Asymmetric	-	✓
Fault Record	-	05
Event Record	-	10
LCD Display 16x2 Alpha Numeric	-	
Digital Input*		
Remote Trip* / CB Close	-	✓
Remote Block* / CB Open	-	✓
Digital Output	-	✓
Pulse Output	-	✓
Powered Nature	-	CT powered / Internal battery Aux. powered / USB port
Front usb Communication	-	✓
Rear (RS-485) Communication	-	✓
Battery Backup	-	✓

* ordering based

8. Setting Ranges **Protection Settings**

Parameter	Display	Setting Range	Step Size
CT Ratio for primary current display	Ct Rt	1-2500	1
Frequency	Freq	50/60Hz	1
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>	0.20 – 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 – 1.500	0.005
2nd Stage phase pickup	I>>	0.5 – 30 x IN	0.05 x IN
2nd Stage phase trip time	t>>	0.03 – 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 – 1.500	0.005
2nd Stage earth fault pickup	Ie>>	0.5 – 15 x IN	0.05 x IN
2nd Stage earth fault trip time	te>>	0.04 – 20 s	0.01s
Phase unbalance pickup	Unb	5 - 80%	1%
Phase unbalance trip time	tUnb	0.1-150 s	0.01 s
Enable CBFP protection	CBFP	YES / NO	-
CBFP time	tCBFP	0.05-2.0 s	0.01 s

Display Mode Setting

Parameter	Display	Setting Range	Step	Unit
Display Mode	MOD	AutoOFF/Live	1	-

DO Assignment

Parameter	Display	Setting Range
Over current	I>	DISABLE/DO1/DO2/DO1DO2
Short Circuit	I>>	DISABLE/DO1/DO2/DO1DO2
Earth Low set	Ie>	DISABLE/DO1/DO2/DO1DO2
Earth High set	Ie>>	DISABLE/DO1/DO2/DO1DO2
Unbalance	Unb	DISABLE/DO1/DO2/DO1DO2
Circuit Breaker Failure Protection	CBFP	DISABLE/DO1/DO2/DO1DO2
Digital Input	Remote	DISABLE/DO1/DO2/DO1DO2
All Fault	AlFlt	DISABLE/DO1/DO2/DO1DO2
Trip Circuit Supervision	TCS	DISABLE/DO1/DO2/DO1DO2

DO Reset

Parameter	Display	Setting Range
Digital output1	DO1	Auto/Manual
Digital output2	DO2	Auto/Manual

DI Blocking

Parameter	Display	Setting Range
Phase Over current Low set	I>	Unblock/Block
Phase Over current High set	I>>	Unblock/Block
Earth Over current Low set	Ie>	Unblock/Block
Earth Over current High set	Ie>>	Unblock/Block
Unbalance	U0	Unblock/Block

Trip Type

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

Rear (RS-485) Communication 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 USB cable type A/A

Technical Data

General Data

Rated auxiliary voltage U_H	Universal:	L: (18V - 60V DC)
		H: (85V - 260V AC / 85V - 280V DC)
Rated supply for digital input	Normal voltage U_N	L: (18V - 60V DC)
		H: (85V - 260V AC / 85V - 280V DC)
Power consumption of Aux supply	Quiescent approx. 3W	Operating approx. 6W
Dropout pickup ratio	> 95 %	

Measuring Input

Rated data	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 - 20xIs)
	For VINV/NINV/RI : ± 5% or ± 40 mSec
	For LINV/EINV/HV-Fuse : ± 7.5% or ± 60 mSec
Pickup accuracy	+5%
Boot-up time in self powered mode	≤ 100 mSec; (Event recorder enabled : 20mSec extra)

Measurement Accuracy

Quantity	Range	Frequency Range	Accuracy
Current	1.0 - 20 xI_p	50 / 60 Hz	±2% Above 20xI_p (5%)

Output Contact (Relay Specs)

Number of DOs	4
DO contacts (DO: 1, 2) configurable	DO-1 and DO-2 are user programmable for I>, I>>, Ie> and Ie>>, CBFP, Unbalance ($U_{0>}$), Remote DI, All faults
DO contacts: 3, 4	Latch type of DO common for all protection trip
Max. breaking capacity	1250VA / 150W resistive 500VA / 90W inductive
Max. breaking voltage	400V AC, 125V DC
Max. continuous AC current	5A

Active Group Setting

Parameters	Display	Setting Range		Default Setting
		Min	Max	
Active Group	ACTIVE	GROUP1	GROUP2	GROUP1

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

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

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

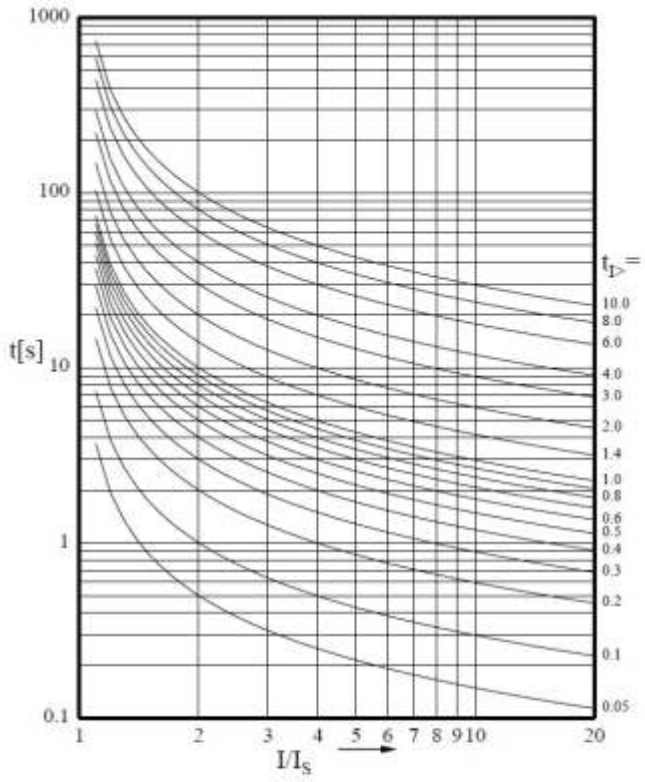
I: Injected current
Is: Pickup set level
ti: TMS for inverse characteristic
t: Definite delay in DEFT characteristic

!!! **CAUTION** !!!

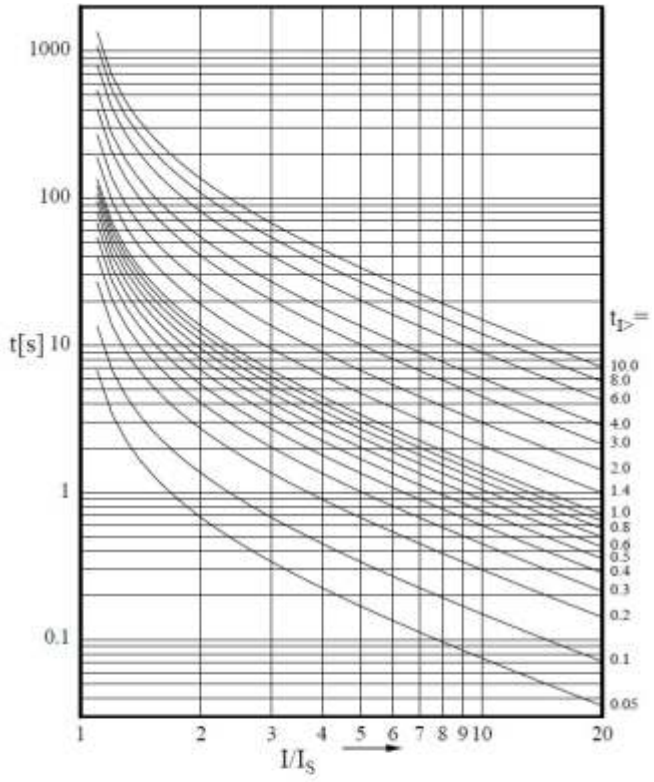
O/C, S/C, E and EH protections are available with DISABLE option in HMI.

9. Inverse Graph Representation

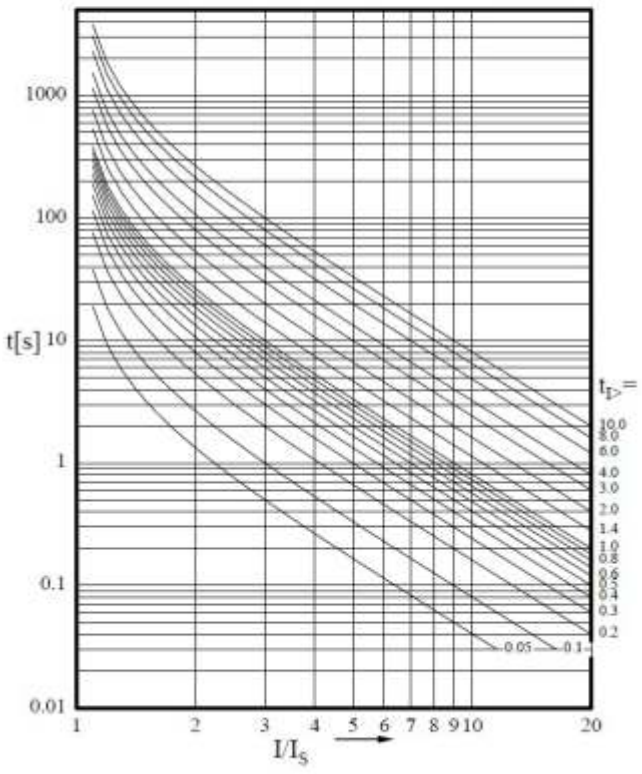
Inverse Time Characteristics



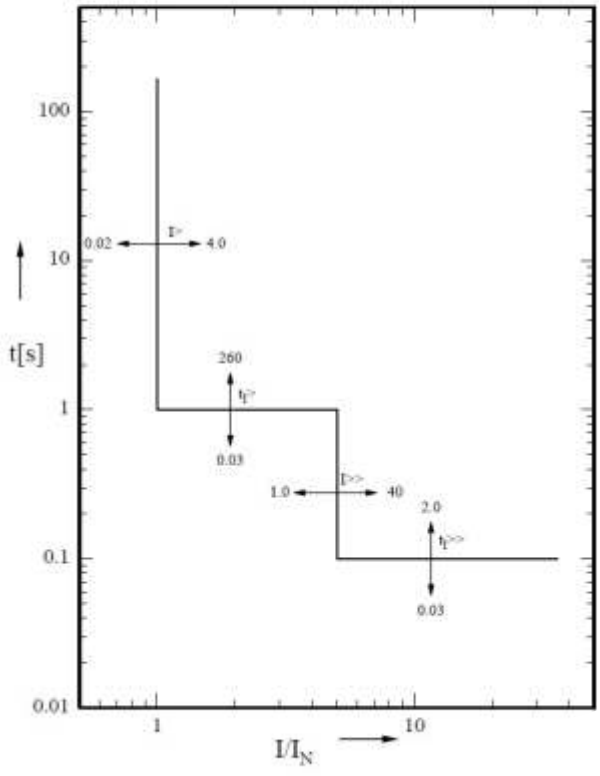
Normal Inverse



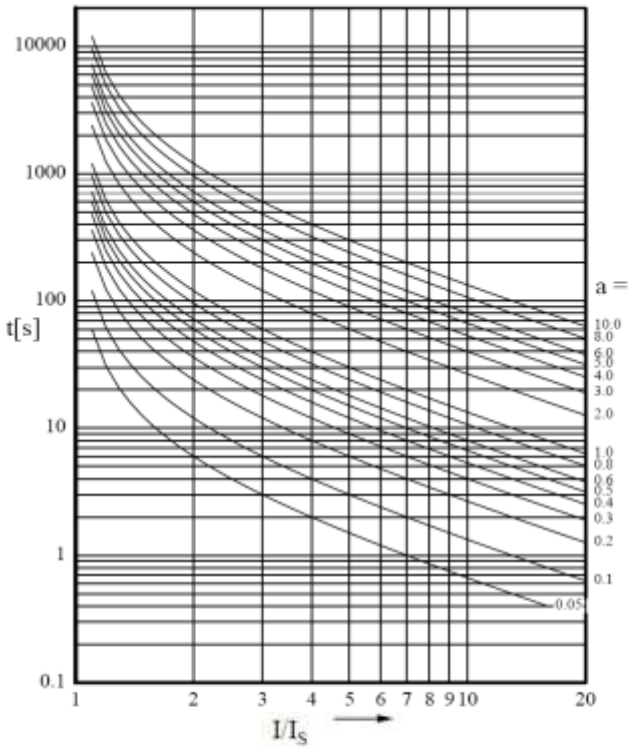
Very Inverse



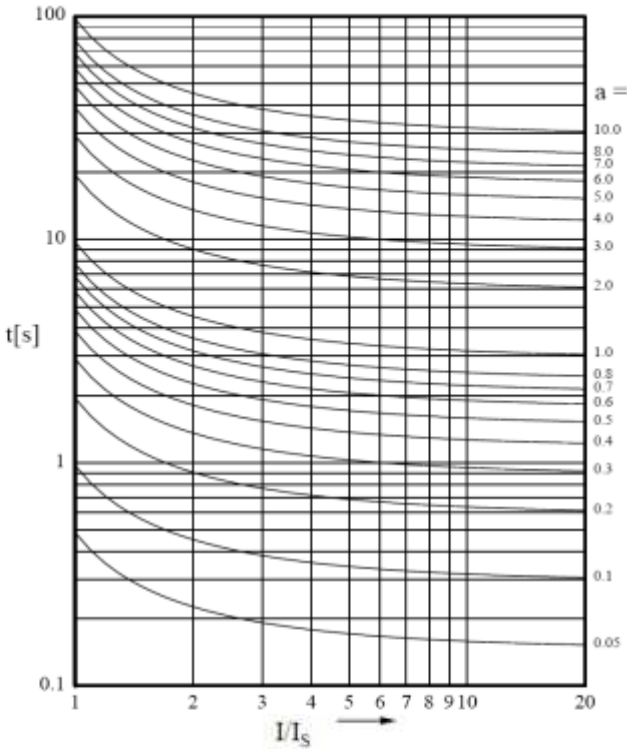
Extremely Inverse



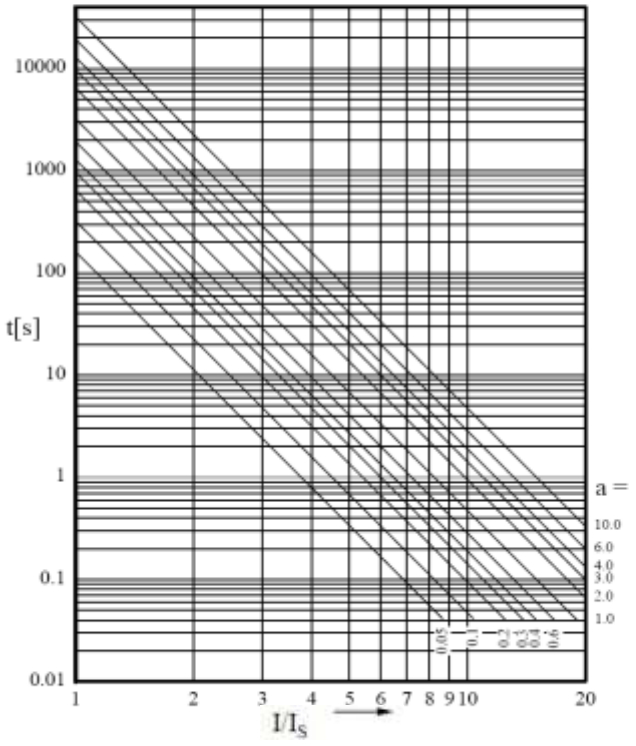
Definite time overcurrent relay



Long time inverse



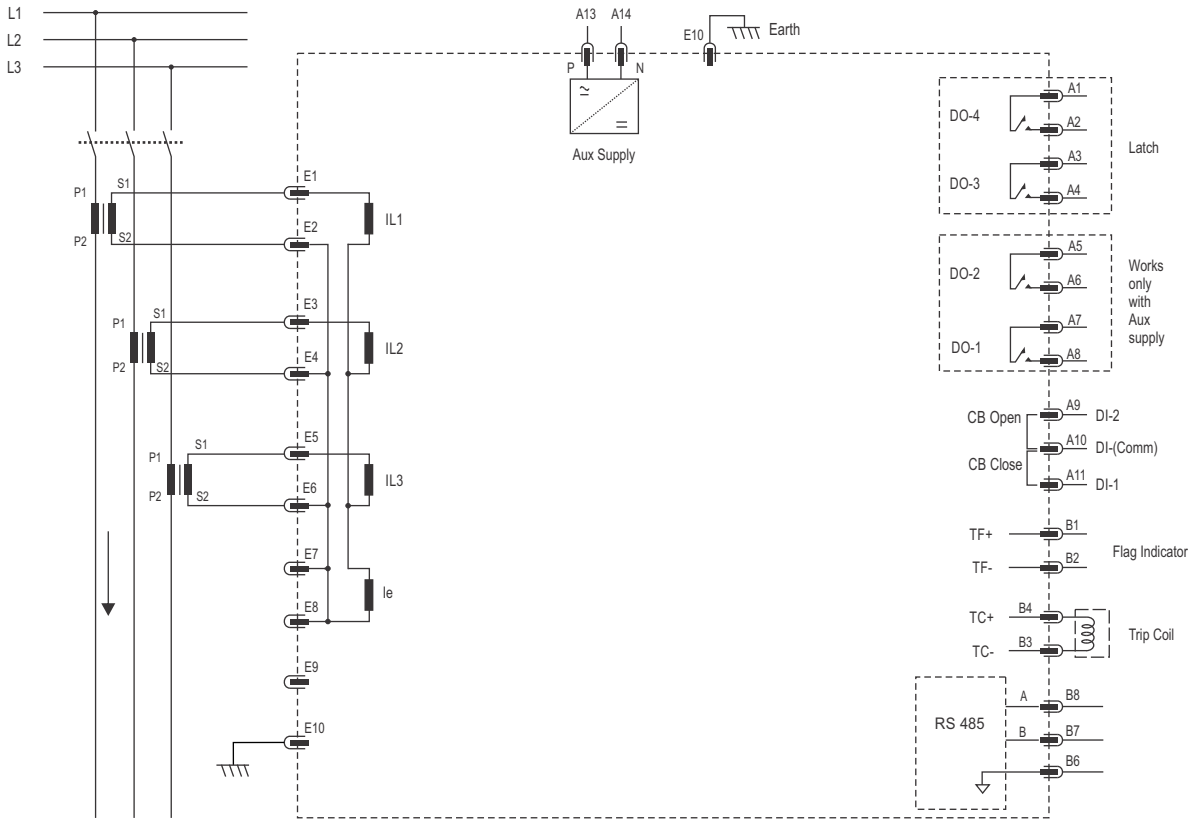
RI-Inverse



HV-fuse

10. Connection Diagram (with TCS model)

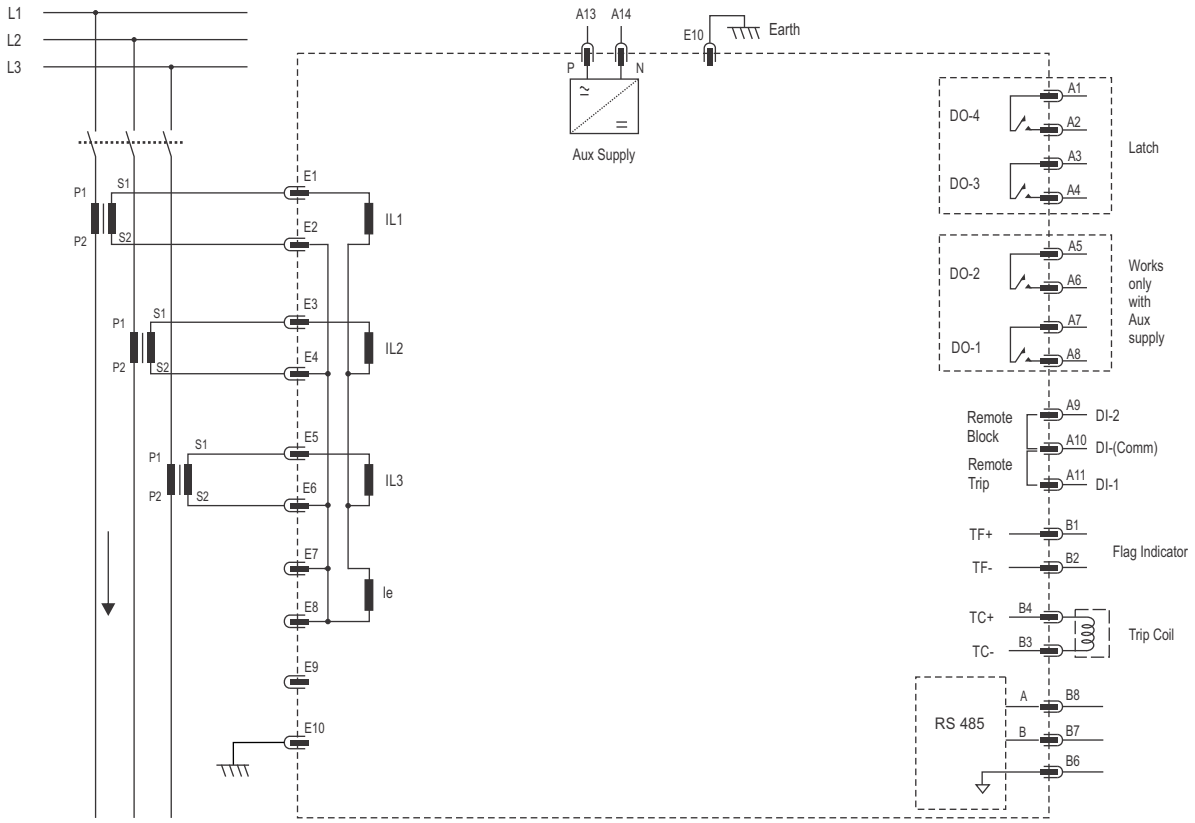
In TCS model : Remote Trip & Remote Block DI will not be available.



11. 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
E6-E7-E8	CT common point
E9	Not connected
E10	Earth Terminal
A1-A8	Digital Output
A9	Digital Input (DI-2) for CB open
A10	Digital Input (DI-(Comm.)) common for DI-1 & DI-2
A11	Digital Input (DI-1) for CB close
A12	Not connected
A13	Aux Supply (+)
A14	Aux Supply (-)
B1-B2	Trip Flag (TF) pulse output B1(+)-B2(-)
B3-B4	Trip Coil (TC) pulse output B3(-)-B4(+)
B5	Not Connected
B6	Communication Ground
B7-B8	RS-485 Modbus Terminal B7(B)-B8(A)

12. Connection Diagram (without TCS model)



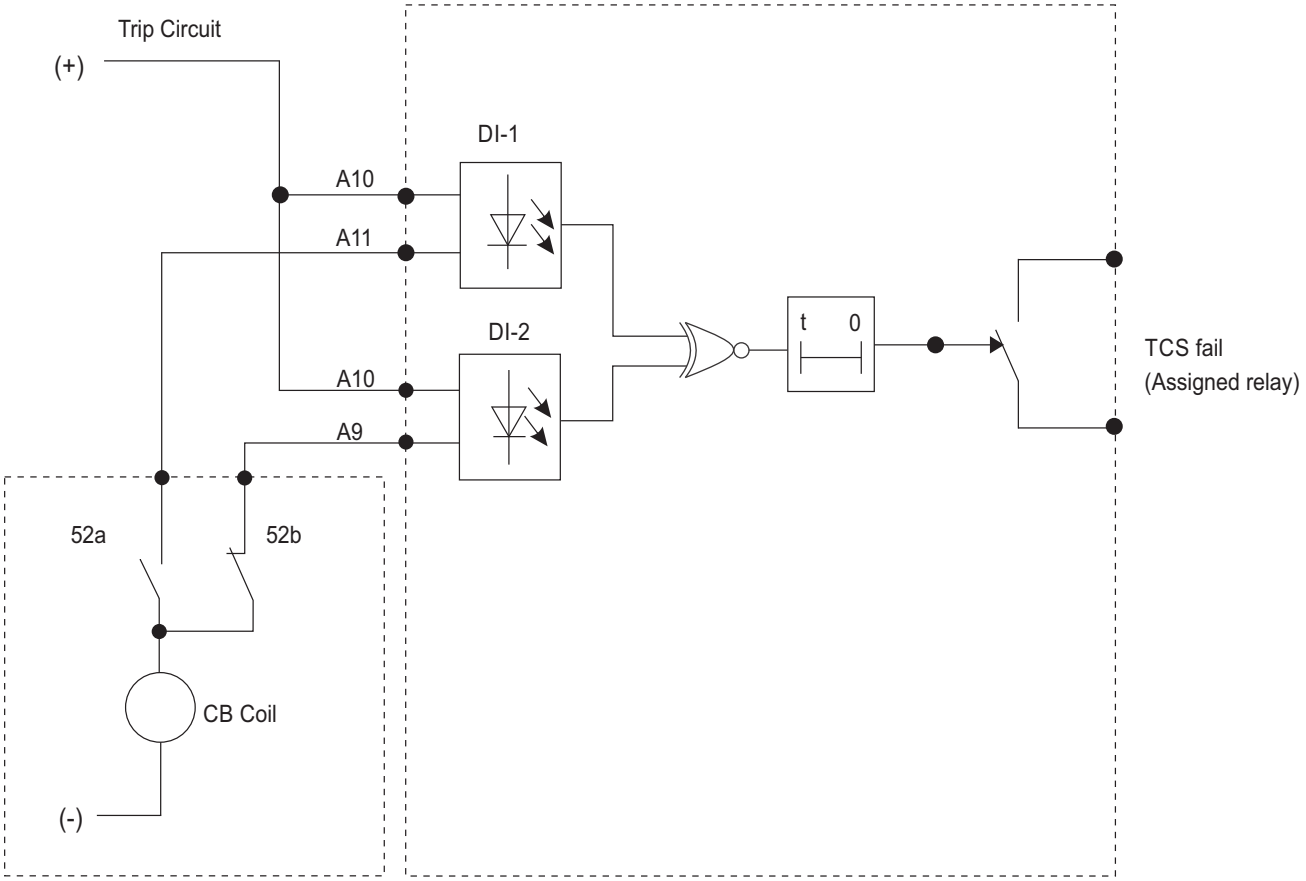
NOTE: "While doing the HV test, don't connect the Trip coil terminal (B3-B4), as internal capacitor bank could be in charged state & it can harm the circuitry".

13. Terminal Description

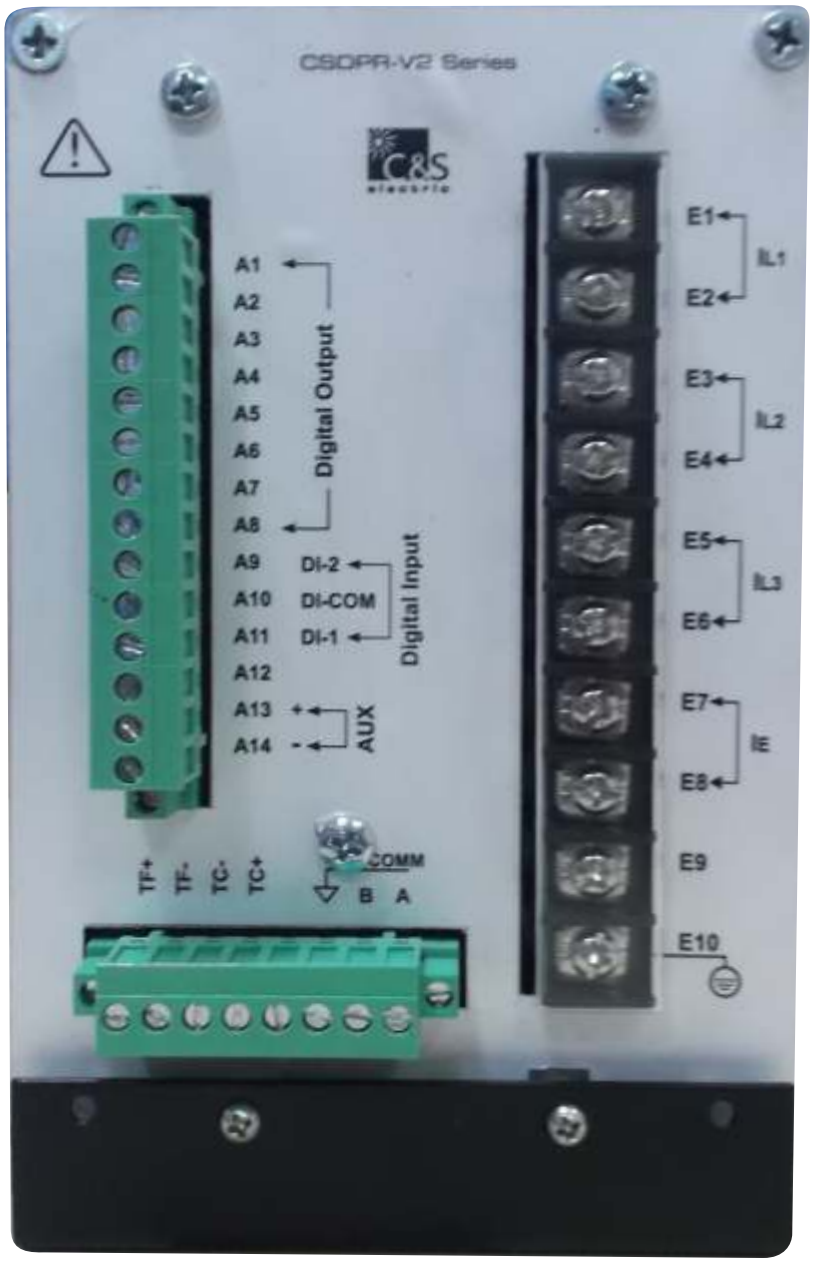
Terminal Name	Terminal Description
E1-E2	Current Terminal for L1 Phase
E3-E4	Current Terminal for L2 Phase
E5-E6	Current Terminal for L3 Phase
E6-E7-E8	CT common point
E9	Not connected
E10	Earth Terminal
A1-A8	Digital Output
A9	Digital Input (DI-2) for Remote Block
A10	Digital Input (DI-(Comm.)) common for DI-1 & DI-2
A11	Digital Input (DI-1) for Remote Trip
A12	Not connected
A13	Aux Supply (+)
A14	Aux Supply (-)
B1-B2	Trip Flag (TF) pulse output B1(+)-B2(-)
B3-B4	Trip Coil (TC) pulse output B3(-)-B4(+)
B5	Not Connected
B6	Communication Ground
B7-B8	RS-485 Modbus Terminal B7(B)-B8(A)

14. Trip Circuit Supervision Diagram

This feature detects any anomalies in the trip circuit with continuously supervising both pre closing & post closing condition in the circuit breaker with the help of two Digital Inputs as feedback. It detects trip circuit supply failure of circuit breaker, tripping mechanism failure like circuit breaker contact degeneration in wires, contacts and coils.



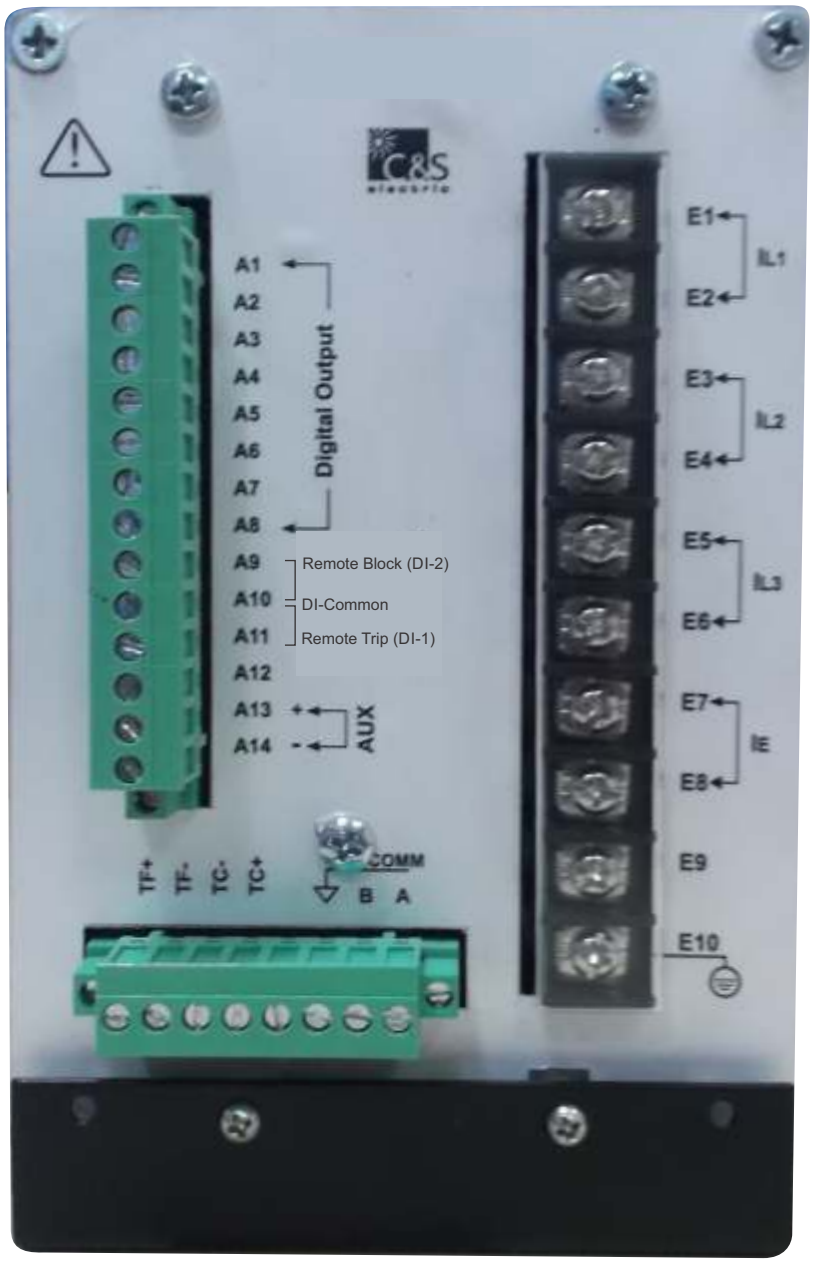
15. Back Terminal View (with TCS model)



HV Test

"While doing the HV test (CSDPR-V2-300 model), don't connect the Trip coil terminal (B1, B2, B3, B4), as internal capacitor bank could be in charged state & it can harm the circuitry".

16. Back Terminal View (without TCS model)



HV Test

While doing the HV test (CSDPR-V2-300 model), do not connect the Trip coil terminal (B1, B2, B3, B4), as internal capacitor bank could be in charged state & it can harm the circuitry.

(Photographs shown here for have an idea only)

17. Battery changing procedure

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

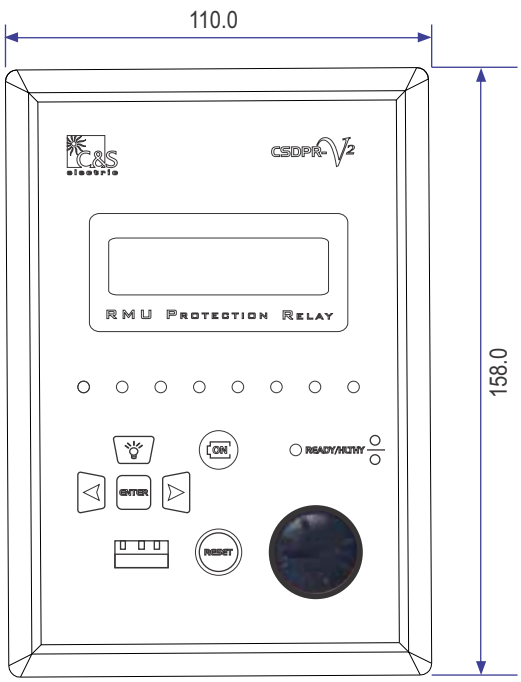
Remove the Sticker placed on Battery to start the unit with Battery.

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

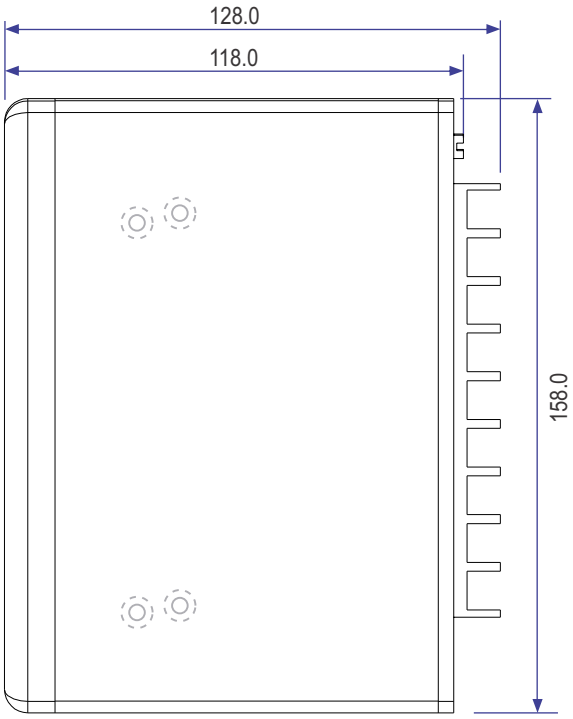
Close the Battery cover by twisting it on the right side as shown in the Left image.

18. Dimensional Details

Front View



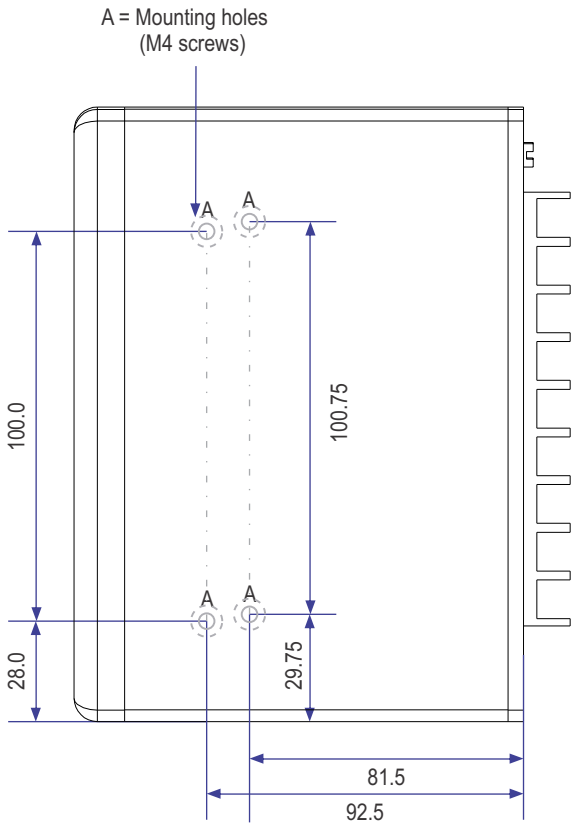
Side View



Mounting Details

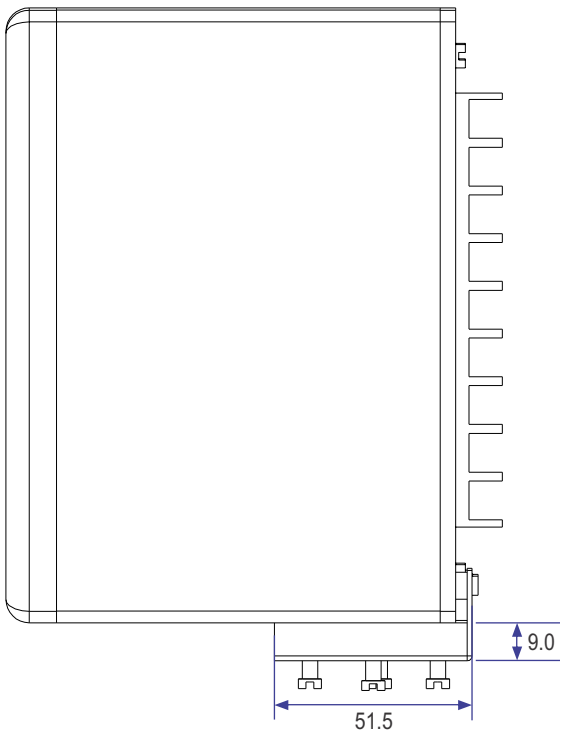
OPTION-1

(Mounting on side screws)



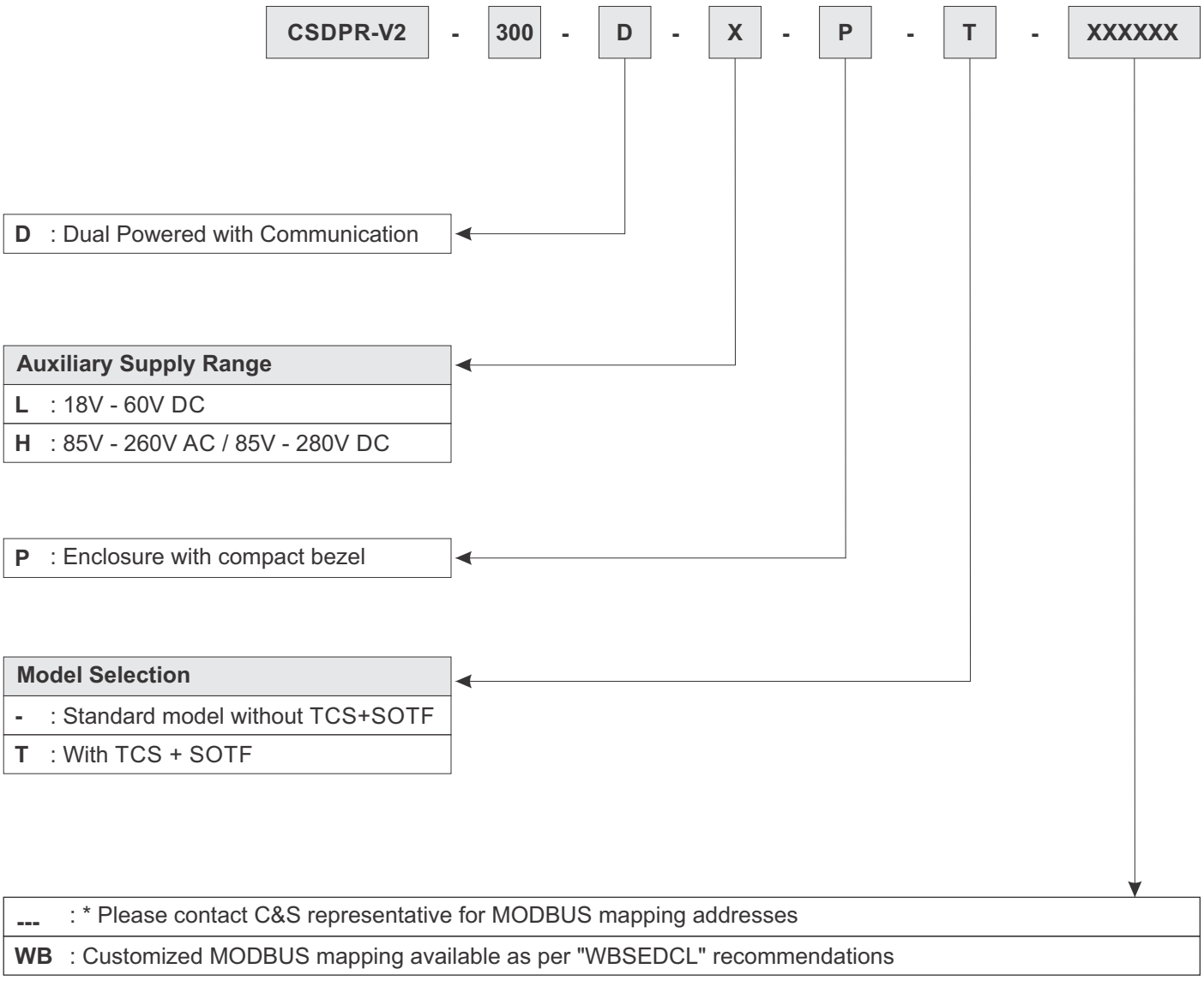
OPTION-2

(Mounting on Bottom Plate)



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

19. Ordering Information



Revision History

S.No.	Rev.No.	Details	Date
01	01	Include with TCS conn. diagram & TCS diagram on page 12 & 14, Back view without TCS on page 16	04.07.19
02	02	Add description for VA burden & Earth/Phase current measurement	09.07.20
03	03	Change in Dimension Details of page 18 & include mounting details on page 19	12.09.22
04	04	Include Electricity board option in ordering information on page 20	24.04.24
05	05	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 20) & General Data (Pg 8)	07.10.24
06	06	On Page 4, In Trip output "24V/12V@0.2Ws/50msec" ON Pulse is changed to "24V/12V@0.4Ws/50msec"	02.04.25
07	07	Aux supp range H : 85-260V AC/ 85V-**300**V DC change to H : 85-260V AC/ 85V-**280**V DC in ordering info (Pg 20) & General Data (Pg 8)	16.10.25

NOTE

The content in this document are not binding and is for general information.
C&S reserves the right to change the design, content or specification contained in this document without prior notice.

For further information, please contact:

C&S Electric Ltd.
(Protection & Measurement Devices)

C-60, Wing-A, Phase-II, Noida-201 305, Dist: Gautam Budh Nagar (U.P) INDIA
Phone : +91-120-38748 00 / 01

Technical Question or After-sales Service

Customer Center Quick Response Service, Excellent Technical Support

1800 572 2012

Branch office

Branch	Phone	Fax	E-mail
Ahmedabad	+91-79-615651 22/23/24	+91-79-61565130	cspc.ahemdabad@cselectric.co.in
Bangalore	+91-80-305703 72/73, 30570347	+91-2558-4839	bangalore@cselectric.co.in
Bhubaneswar	+91-674-2507265	+91-674 2507265	bhubaneswar@cselectric.co.in
Chennai	+91-44-33534501,33534521-23	----	chennaiteam@cselectric.co.in
Cochin	+91-484-3071717	+91-484-3071716	----
Delhi	+91-11-338490 00/10/11	+91-11-30838826	sales.pmd@cselectric.co.in
Hyderabad	+91-40-485340 80/82	----	hyderabad@cselectric.co.in
Kolkata	+91-33-392121 19-21	----	----
Mumbai	+91-22-241147 27/28	----	mumbaiteam@cselectric.co.in
Pune:	+91-20-242505 18/19	+91-20-30283244	pune@cselectric.co.in

Issue Date : 03.07.19, Rev. No : 05, Rev. Date : 07.10.24