We touch your electricity everyday!

CSNEX-I 350

Intelligent Measuring & Protection Device

CSENEX
CSENEX
CSENEX
CSENEX
Series

Catalogue

C&S electric

Over Current Protection Relay

INDEX

1) Introduction

CSENEX Series offers a compact Multi-functional Over-current protection solution for Feeder, Generator, Motor & Transformer segment.

CSENEX-I Family of protective relays are numeric relays that provides multi protection and monitoring with reliable and fast protection solution in a single unit.

In this family of CSENEX series, the CSENEX-I 350 is an advanced feeder protection solution which has fast, sensitive and secure protection for feeder internal & external faults.

CSENEX-I offers different model based features to cover the wide range of user.

2) Features

- 1A & 5A rated CT input (programmable)
- Draw out with self CT shorting
- DI/DO programmable matrix
- Protection blocking through DI
- Three phase time over-current protection
- Three phase instantaneous protection
- Protection against Cold Load
- Earth time over-current and earth instantaneous over current
- Circuit breaker failure detection
- Trip circuit supervision
- Thermal Over load
- Auto Re-closing function
- Two sets of setting groups
- Programmable Scheme Logic
- Disturbance recording
- Fault recorder
- Event recorder
- Communication (Local & Remote)

3) Application

The CSENEX-I relays have been designed for controlling, protecting and monitoring industrial, utility distribution networks and substations. They can also be used as part of a protection scheme for feeders, transformers and generators.

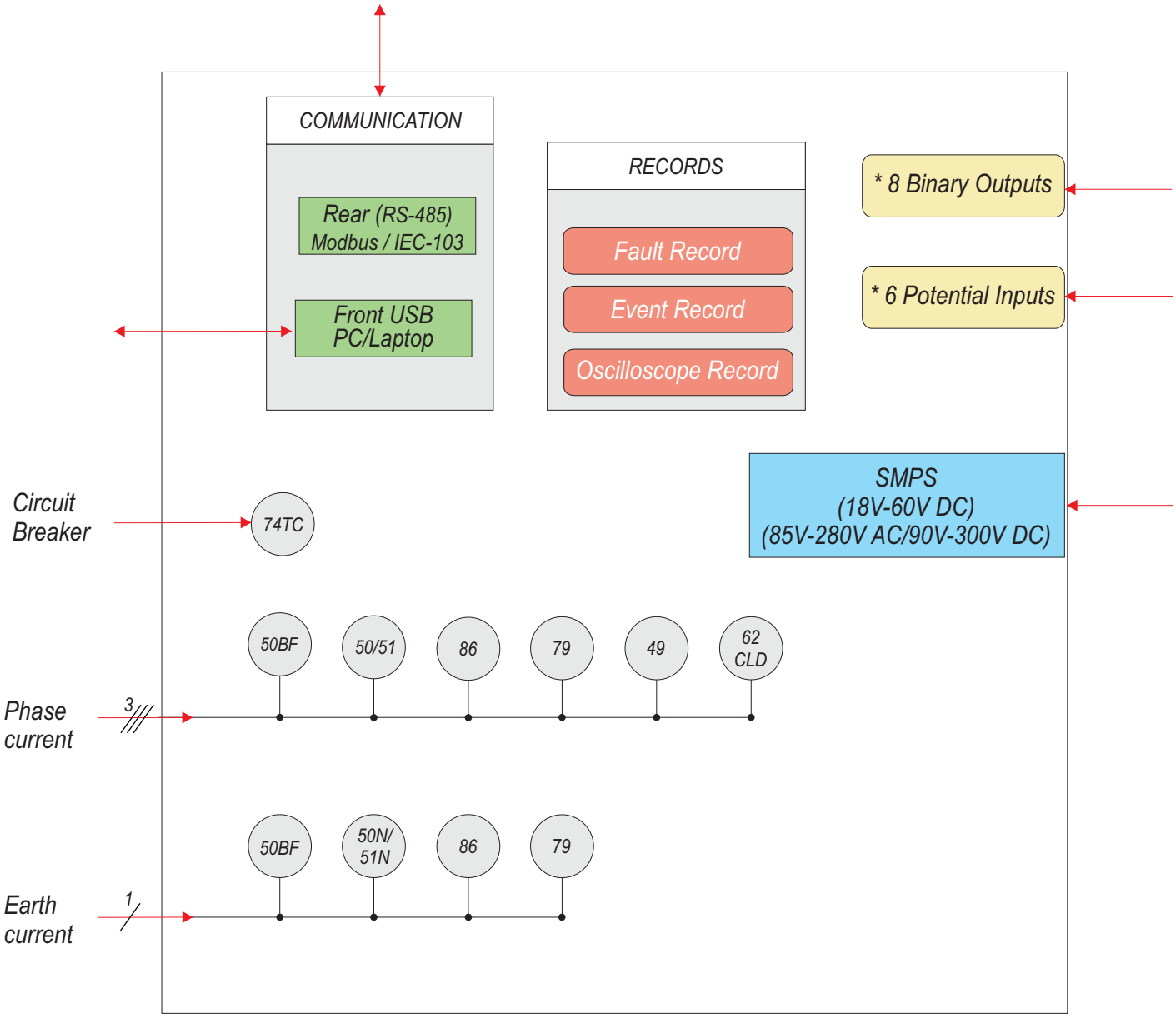
4) Hardware

- Measures true RMS with DFT filter
- 4 Current analog inputs for phase & earth fault current
- Max. 6 Digital Inputs
- Max. 8 Digital Outputs
- 16 x 2 Alpha-numeric LCD
- RS-485 & USB communication
- 1A & 5A site selectable
- 16 LEDs for Pickup & fault annunciation
- CT Terminal with Self shorting

5) Protection Features

- Three phase time over current protection (51)
- Three phase instantaneous protection (50)
- Earth time over-current (51N)
- Earth instantaneous over-current (50N)
- Thermal over load (49)
- Circuit breaker failure protection (50BF)
- Harmonic Restrain
- Trip Circuit Supervision (74TC)
- Protection against Cold Load (62 CLD)

6) Functional Diagram



(Figure 1)

** Based on Ordering Information*

Protection Functions

Three Phase Over-current Protection (50/51)

The independent two stages are available for phase fault protection. For I> the user may independently select definite time delay or inverse time delay with different type of curves. The second Hi-Set stage can be configured with definite time only.

Earth Fault Protection (50N/51N)

The independent two stages are available for earth fault protection. For first stage (Ie>) the user can select definite time delay or inverse time delay with different type of curves. The second Hi-Set stage can be configured with definite time only.

Relay Latching (86)

Relay can be configured to Latch /Unlatch depending on configuration. (Latching is possible in presence of Auxiliary supply voltage only)

Trip Circuit Supervision (74TC)

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.

Harmonic Blocking

Harmonic setting is by default 20% of injected current. Phase/Earth Harmonics can be Blocked/Unblocked & time setting can also be edited through MMI. If the Pickup current has %harmonics above 20%, the protection will blocked for the harmonics blocking time .Tripping occurs according to the higher time setting i.e. if the harmonics time setting is greater it will trip according to the harmonics time setting otherwise according to the fault time setting.

Circuit Breaker Failure Protection (50 BF)

The CB Failure Protection is based on supervision of phase and earth currents after tripping events. The test criterion is whether all phase currents have dropped to less than 5% of In within tCBFP. If one or more of the phase currents have not dropped to specified current within this time, CB failure is detected and the assigned output relay is activated.

Reset Delay

This parameter introduces a delay in opening of relay contacts, when the current goes below the drop out value for over current, short circuit, earth fault, earth high set etc. This parameter will not work when manual reset mode is selected.

Auto Re-closer (79)

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

Typically this auto re-close (AR) sequence of Instantaneous Trip(s) and Re-close 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 CB
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 MMI. No Auto re-closing 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> etc.) will lead to automatic re-closing. 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.

NOTE: Trip Test is available in HMI to check all LEDs and Digital Output (Relay)

Reclaim time (tr):

This is the time during which after switching on or after AR a subsequent re-closing is prevented. If the number of the set shots is reached, the relay is locked for this time after the last re-closing 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.
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 re-closed 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 re-close sequence does not result in a successful re-closure the relays goes to the lock out state.

Starting Condition for Auto Re-closer

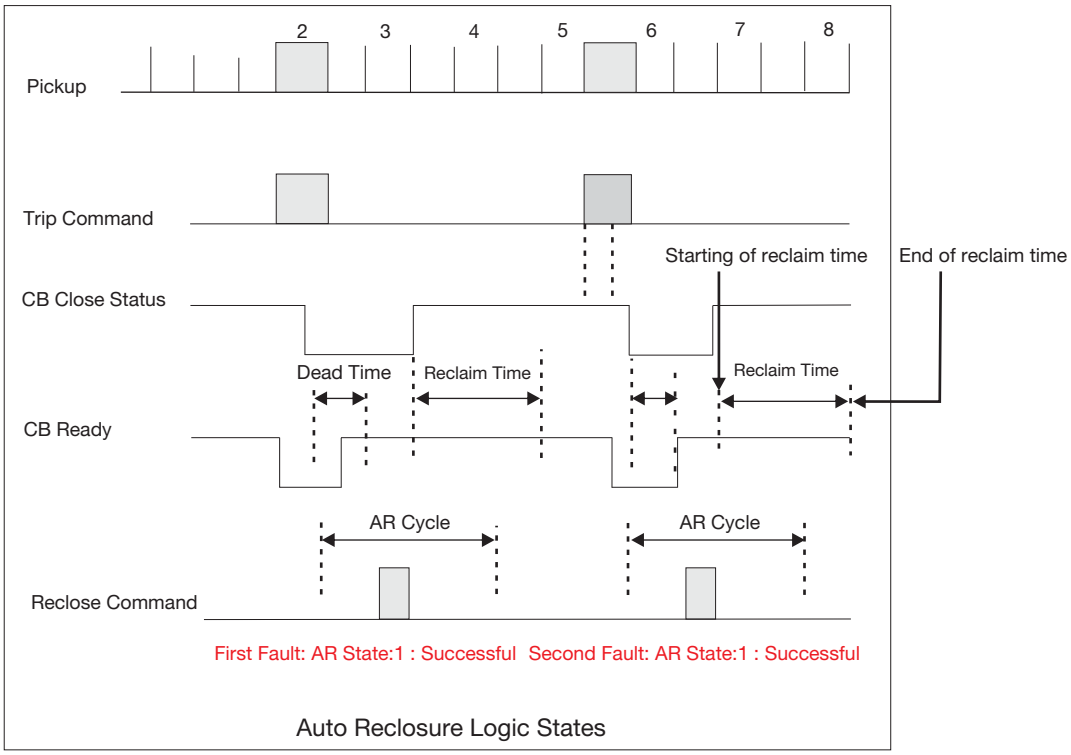
1) AR should be enabled by manual setting.
2) AR blocked DI is not available
3) Respective protection AR cycle should not in exit condition.

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.



(Figure 2)

Thermal Over load Protection (49)

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.

CSENEX-I 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 x 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 CSENEX-I relays automatically use the highest phase current as input information for the thermal model.

The thermal time characteristic is given by following formula:-

The formula for calculating the trip characteristics is as follows:

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

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

I_b= Basic current

I_P= Initial load current

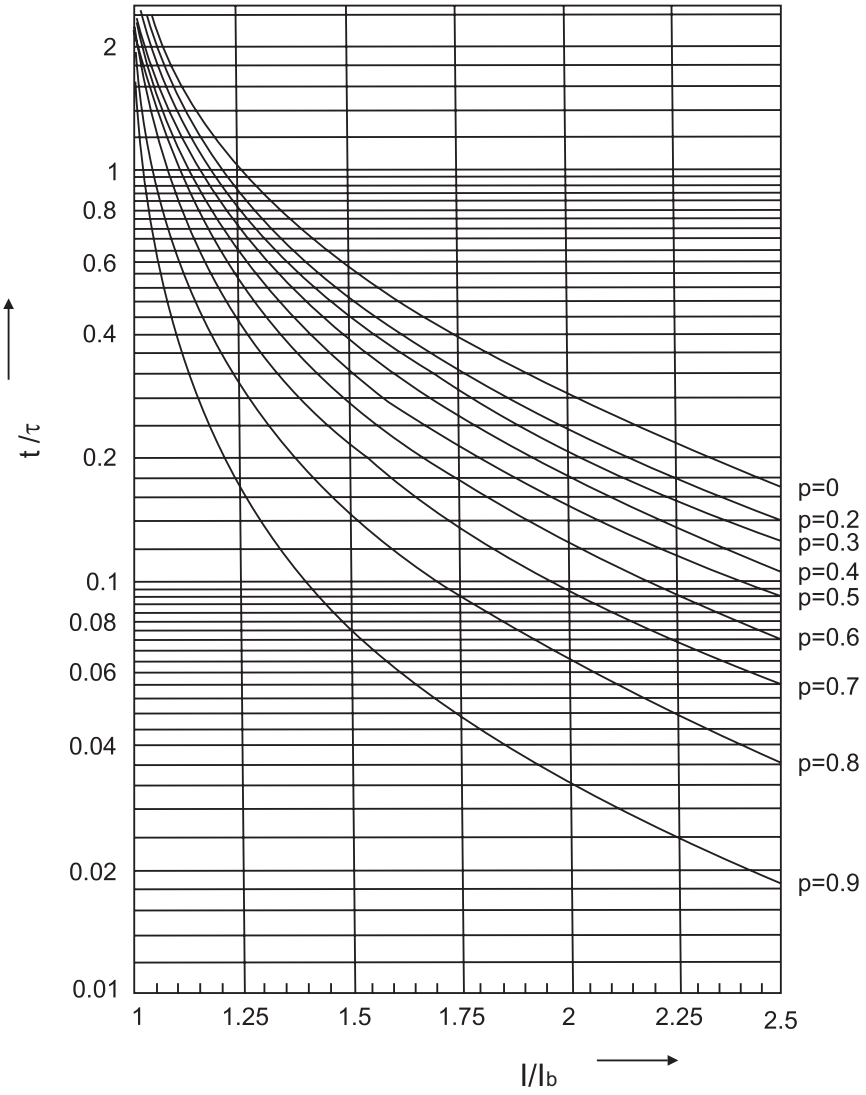
p= Initial load factor (p=0 means cold operating component)

k= constant

for thermal characteristics user has two choices

Thermal is based on highest measured RMS current

In CSENEX-I relay three modes are available for saving of thermal memory during power reset. These modes are programmable.
M1: On Power Reset thermal memory becomes 0.
M2: On Power Reset thermal memory starts from the same value as at the time of Power Off.
M3: On Power Reset thermal memory subtracts for the time it is in Off state & starts from the remaining value.



Cold Load Pickup

This function aims to avoid non-desired trips in the following situation: after being the line de-energized for a period of time and re-energized later, the load exceed the protection setting without the presence of a fault. This may be due to the fact that the “off” period of all the loads (furnaces, heaters, coolers etc.) is elapse and they are all connected at the same time, producing a strong inrush current in the line, but which can be supported within certain time. This phenomenon can occur not only at the moment of the breaker manual closing, after having remained open for a certain time, but also with the breaker permanently closed due to the operation of another upstream breaker.

What the function does is detecting when those conditions are given and changing the tripping settings during a programmable time.

The function is activated when the current in the 3 phases is below 0.08A, then the programmed time starts to run to determine that the load is “cold” (this time can be 0, what means that any circuit breaker opening could lead to the cold load situation). Once that time has expired and the current has not exceed again 0.15A, the protection usual setting (Group1) values are replaced by the cold load pickup ones (Group2). When any of the phase current exceed 0.15A a counter with programmable time starts, during which the setting are the cold load pickup ones (Group2). When expiring this time, the settings are again the usual ones (Group1). For settings Refer Cold Load Pickup Table in Setting Ranges.

7) Fault Recording

CSENEX-I records last 10 faults in its non volatile memory with it's Date & time stamp. Each record has the following information:

fault Format

[F] IL1	:	00.00A
[F] IL2	:	00.00A
[F] IL3	:	00.00A
[F] Ie	:	00.00A
HOUR MIN	:	HH:MM
SEC mSEC	:	Sec:mSec
F-TYPE	:	FAULT TYPE

Where

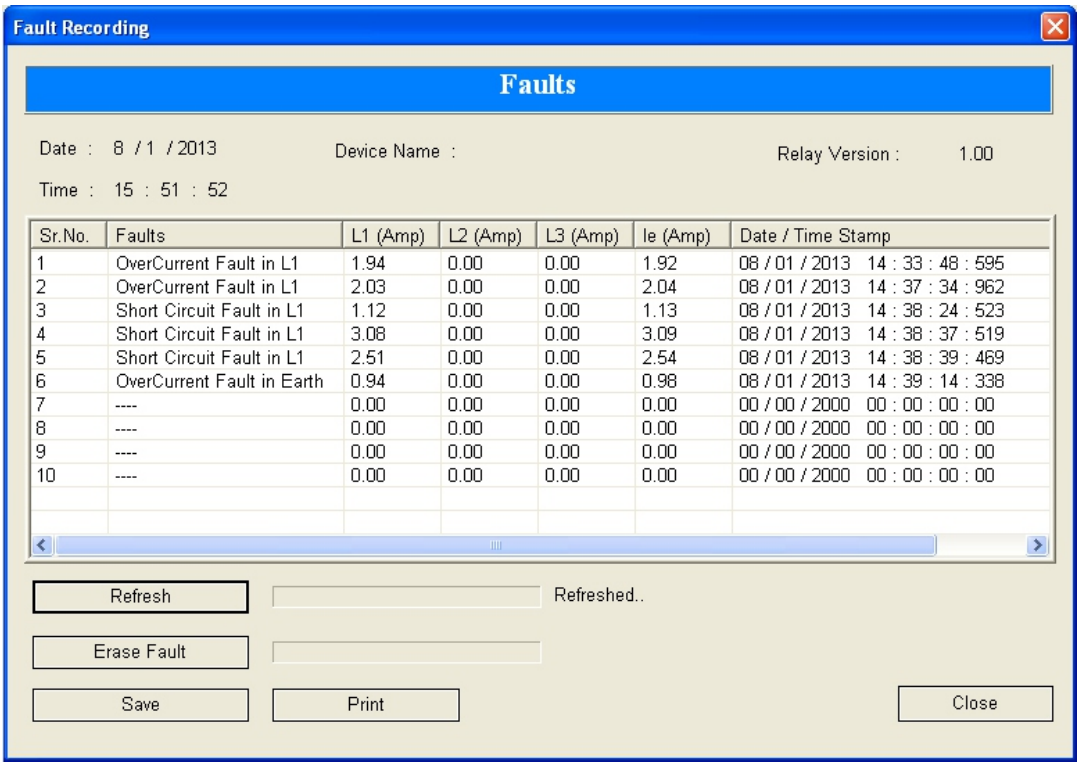
[F][ILx] Magnitude of phase current's.

[F]Ie Magnitude earth fault current's

F-Type Origin of fault (over current etc.) (See Figure 3)

whenever the available memory space is exhausted the new fault automatically over writes the oldest fault. When the relay trips the description of fault in the feeder will appears on the LCD screen automatically and by pressing 'i'key one can easily get all the detailed information of that fault.

The user can view the fault record either via the front USB interface software or remotely via the RS-485 communication. (See figure-3)



Sr.No.	Faults	L1 (Amp)	L2 (Amp)	L3 (Amp)	Ie (Amp)	Date / Time Stamp
1	OverCurrent Fault in L1	1.94	0.00	0.00	1.92	08 / 01 / 2013 14 : 33 : 48 : 595
2	OverCurrent Fault in L1	2.03	0.00	0.00	2.04	08 / 01 / 2013 14 : 37 : 34 : 962
3	Short Circuit Fault in L1	1.12	0.00	0.00	1.13	08 / 01 / 2013 14 : 38 : 24 : 523
4	Short Circuit Fault in L1	3.08	0.00	0.00	3.09	08 / 01 / 2013 14 : 38 : 37 : 519
5	Short Circuit Fault in L1	2.51	0.00	0.00	2.54	08 / 01 / 2013 14 : 38 : 39 : 469
6	OverCurrent Fault in Earth	0.94	0.00	0.00	0.98	08 / 01 / 2013 14 : 39 : 14 : 338
7	----	0.00	0.00	0.00	0.00	00 / 00 / 2000 00 : 00 : 00 : 00
8	----	0.00	0.00	0.00	0.00	00 / 00 / 2000 00 : 00 : 00 : 00
9	----	0.00	0.00	0.00	0.00	00 / 00 / 2000 00 : 00 : 00 : 00
10	----	0.00	0.00	0.00	0.00	00 / 00 / 2000 00 : 00 : 00 : 00

(Figure 3) (Fault Data Recording on PC software)

8) Event Recording

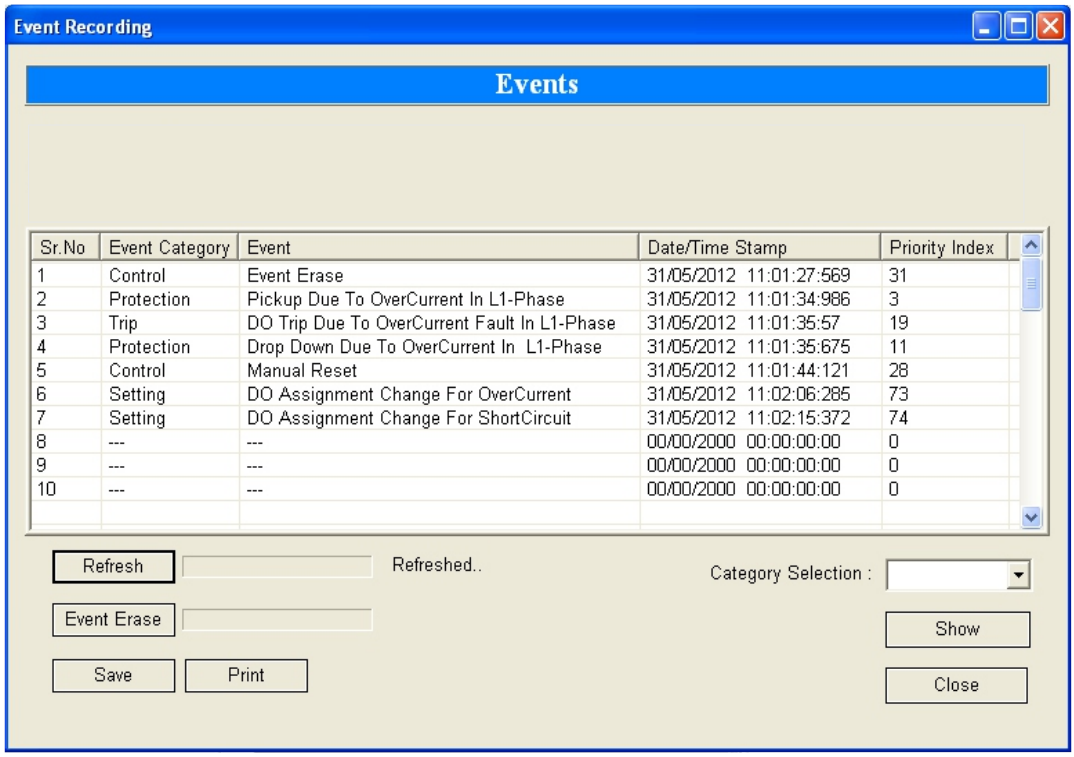
The unit stores in non volatile memory the last 100 events. When the available memory space is exhausted, the new event automatically overwrites the oldest event which can be retrieved from a PC, with the following format:

EVENT	:	EVENT NUMBER
HOUR	:	HH:MM
SEC mSEC	:	SEC:mSEC
DATE	:	DD/MM/YY
E-TYPE	:	TYPE OF EVENT

- ❖ Date and time of the event
- ❖ Descriptive text of the even

The user can view event records via the front USB interface software (See Figure 4)

* Description of event number available in event list or in front end software, Pickup & Trip events are recorded.



(Figure 4) (Event Data Recording on PC Software)

Output Contacts

No. of digital outputs	:	08 Nos. (configurable)
Type of outputs	:	Relay
Programmable (DO Assignment)	:	Yes
Relay reset type	:	Programmable (Auto/Manual)

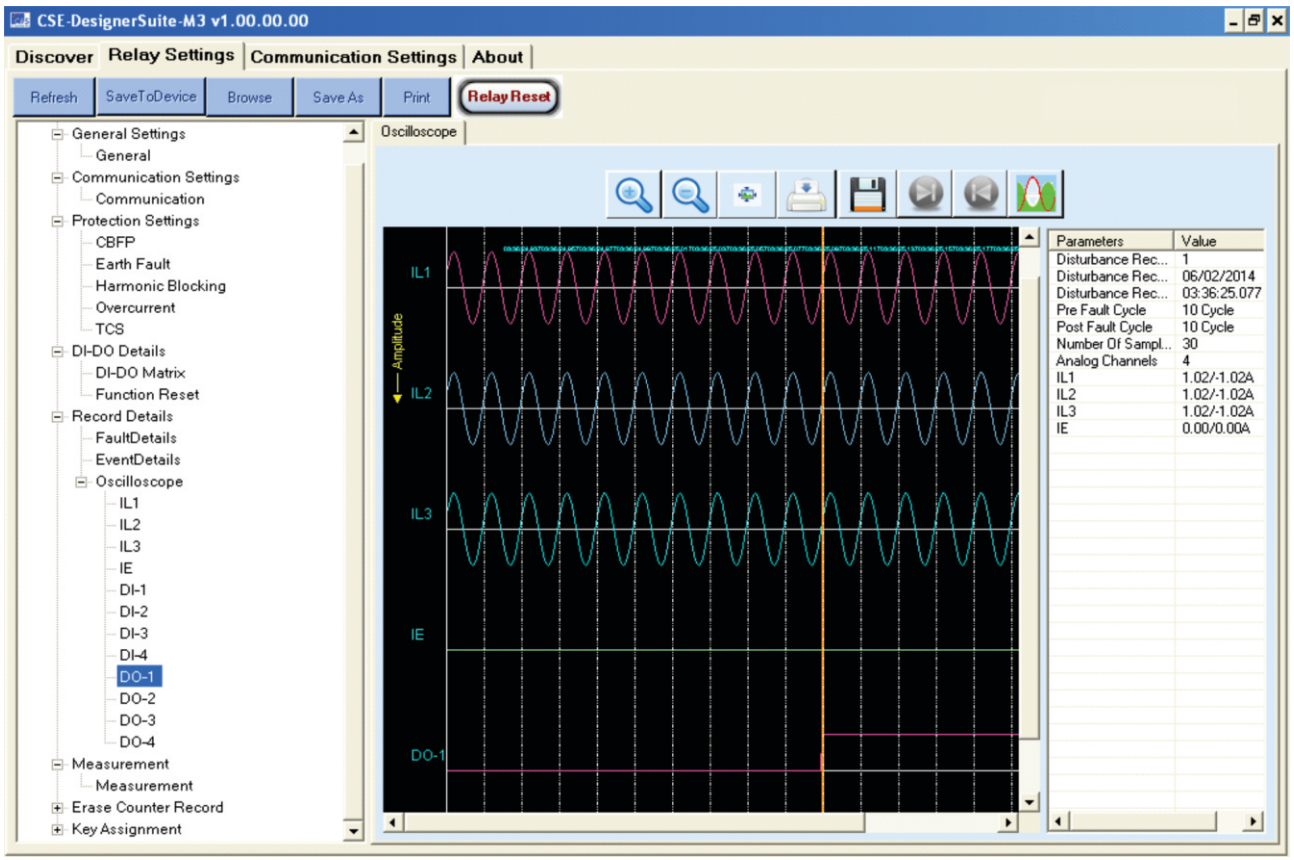
Input Contacts

No of digital inputs	:	06 Nos. (configurable)
Programmable (DI Assignment)	:	Yes

9) Disturbance Record

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

- Oscilloscopic recording can trigger on Pickup or on trip or via DI i.e. change from pre-fault to post-fault stage. It is programmable.
- Each record comprises the samples from 4 analog signals and the status of 6 digital inputs and 8 digital outputs. There will be 30 samples per cycle.
- Relay saves maximum 1200 cycles, and the number of cycles per record is programmable (for example: if 40 cycles are selected, then there will be maximum 30 records of 40 cycles each).
- The pre-fault and post-fault cycles are programmable of oscilloscope (disturbance) record setting).
- Records are in the non volatile memory.
- The records are transferred to PC using USB interface. The data is graphically displayed & can be taken on printer.
- Record 1 is always latest record. 2nd record is older than 1st..... and so on.
- Disturbance record in comtrade format as per IEC60255-24.



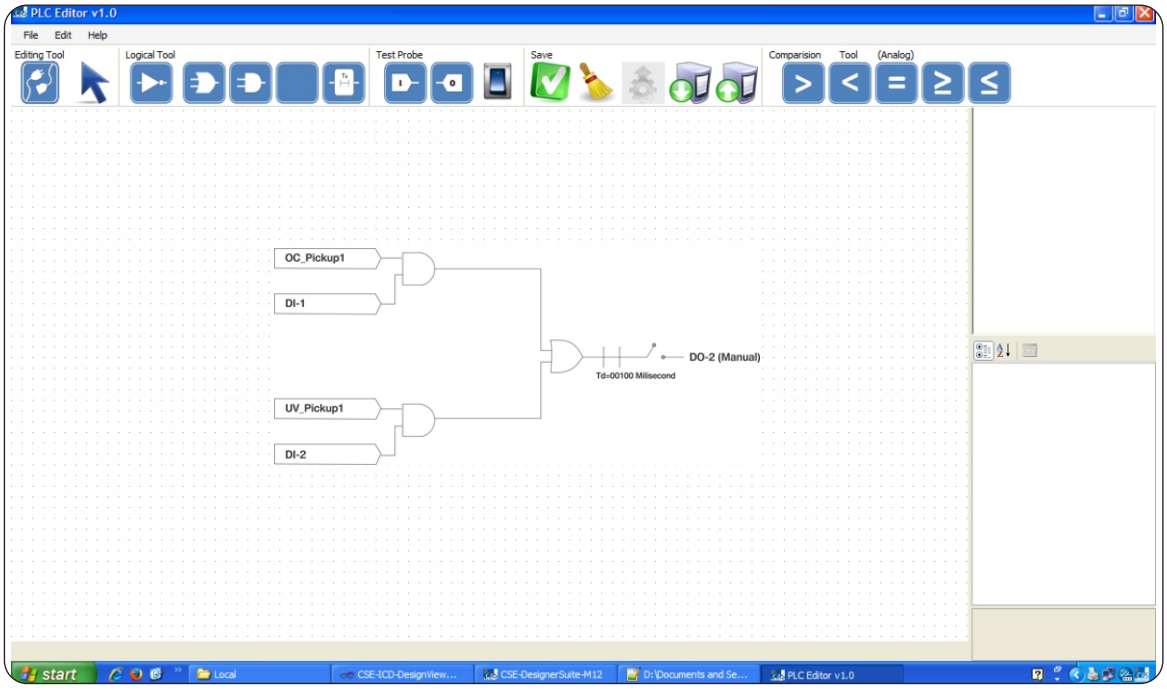
(Figure 5) (Disturbance Recording on PC software)

10) Programmable Scheme Logic

Programmable scheme logic is configured using the front end interface PLC Editor. This interface uses Boolean equations. Flexible logic allows user to create logic diagram to be assigned digital output.

The designed logic is event driven to ensure that protection is not delayed.

The following figure describes the use of protection schemes using the over current pickup & under voltage pickup from downstream relays to block operation of upstream relays using a digital output.

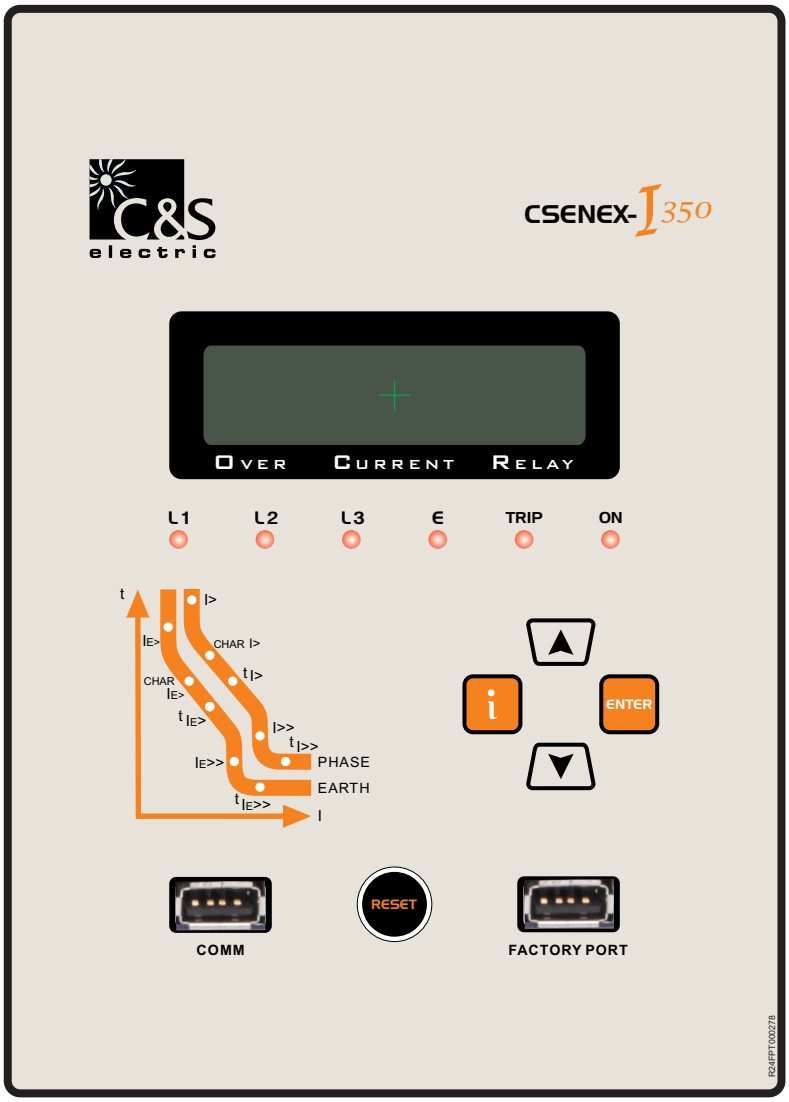


(Figure 6)

11) Human Machine Interface

It comprises of bright LCD display

- ❖ Four push switches for setting values of normal tripping characteristics and other operations for local access.
- ❖ One 'RESET' push switch.
- ❖ LEDs for pickup or tripping on fault and event in any phase.



(Figure 7)

Keys	Manual Key
i	is used as intelligent key to see the details of last fault and Relay status.
ENTER	is used as a "ENTER" key.
RESET	is used to manual reset (after pressing for 2 sec).
▲	is used to scroll in upward direction.
▼	is used to scroll in downward direction.

12) Communication (Local and Remote)

The unit has:

- ❖ 1 Front USB port for direct connection to a PC
- ❖ 1 Rear RS-485 communication port

12.1) Rear Communication

The protocol for the rear port is MODBUS-RTU.

12.2) Front Communication

The entire setting, Fault & Event are available on 'A' type USB (female) interface with CSE LIVELINK with saving & printing option. This unit also has Front-end Live Link simulation support for testing of relay even without any three phase injection source.

13) Setting Ranges

Over Current & Earth Protection

S. No	Parameter	Display	Setting Range		Step Size	Default Setting
			Min.	Max.		
1	Phase characteristics	P-Char			DEFT/EINV/VINV /LINV/NINV1.3/ NINV3.0/NINV0.6	DEFT
2	Earth Characteristics	E-Char			DEFT/EINV/VINV /LINV/NINV1.3/ NINV3.0/NINV0.6	DEFT
3	Phase over-current low set pickup setting Phase over-current definite timing Phase over-current inverse timing	I> t> ti>	0.05xIp 0.05 Sec 0.01	2.5xIp 150 Sec 1.50	0.01xIp 0.01Sec 0.005	EXIT 0.10 Sec 0.05
4	Phase over-current hi-set pickup setting Phase over-current hi-set definite timing	I>> t>>	0.05xIp 0.02 Sec	25xIp 20 Sec	0.1xIp 0.01Sec	EXIT 0.10 Sec
5	Earth over-current low set pickup setting Earth over-current low set definite timing Earth over-current low set inverse timing	Ie> te> tie>	0.05xIn 0.03 Sec 0.01	2.5xIn 150 Sec 1.50	0.01xIn 0.01Sec 0.005	EXIT 0.10 Sec 0.05
6	Earth over-current hi-set pickup setting Earth over-current hi-set definite timing	Ie>> te>>	0.05xIn 0.02 Sec	25xIn 20 Sec	0.01xIn 0.01 Sec	EXIT 0.10 Sec

Note: All parameters are Password protected

Very Inverse $t = \frac{13.5}{(I/IS) - 1} ti\ [s]$

Extremely Inverse $t = \frac{80}{(I/IS)2 - 1} ti\ [s]$

Long time Inverse $t = \frac{120}{(I/IS)-1}\ ti\ [s]$

Normal Inverse 3.0/1.3/0.6 $t = \frac{0.14/0.061/0.028}{(I/IS)\,0.02-1}\ ti\ [s]$

Where t = Tripping time ti = Time multiplier
I = Fault current IS = Setting value of current

Trip timing Accuracy : DEFT/ NINV 0.6 / NINV 3.0 / 1.3 : ±5% OR ±30mSec (whichever is higher)
EINV / VINV / LINV : ±7.5% OR ±40mSec (whichever is higher)

Cold Load Pickup Setting

S.No	Parameter	Display	Setting Range		Step Size	Default Setting
			Min	Max		
1	Cold Load Pickup	CLP PKUP	Enable	Disable		
2	Cold Load Time	tcold	0.00 s	100.00 s		
3	Cold Load Pickup Time	tclp	0.00 s	100.00 s		

Trip Circuit Supervision Protection

S.No.	Parameter	Display	Setting Range		Step Size	Default Setting
			Min.	Max.		
1	Enable TCS	Enable	NO	YES	-----	NO
2	TCS	t_TCS	0.05 Sec	2 Sec	0.01	0.05 Sec

Circuit Breaker Failure Protection

S.No.	Parameter	Display	Setting Range		Step Size	Default Setting
			Min.	Max.		
1	Enable CBFP	Enable	NO	YES	-----	NO
2	CBFP	t_CBFP	0.05 Sec	2 Sec	0.01	0.05 Sec

Thermal Over load

S.No.	Parameters	Display	Setting Range		Step Size	Default Setting
			Min	Max		
1	Thermal memory	Thermal m/m Mode	M1	M3	1.0	M1
2	Permissible basic current	Permissible Current	0.20xIp	4.00xIp	0.02xIp	Disable
3	Constant	Thermal Constant	0.50	2.00	0.01	1.00
4	Heating time constant	Heating Constant	000.5min	180.0min	000.1min	000.5min
5	Cooling constant	Cooling Constant	1.00xTh	8.00xTh	0.01xTh	1.00xTh
6	Thermal alarm	Thermal Alarm Val	20%	99%	1%	20%
7	Thermal reset	Thermal Reset	00%	99%	1%	70%

Harmonic Setting

S.No.	Parameter	Display	Setting Range		Step Size	Default Setting
			Min.	Max.		
1	Enable Phase block	PH Block	NO	YES	-----	NO
2	Phase Blocking time	tPHASE	0.0 Sec	20 Sec	0.1	0.0 Sec
3	Enable Earth block	E Block	NO	YES	-----	NO
4	Earth Blocking time	tEARTH	0.0 Sec	20 Sec	0.1	0.0 Sec

DI Blocking

S.No.	Parameter	Display	Setting Range		Step Size	Default Setting
			Min.	Max.		
1	Phase over-current low set	I>	Unblock	Block	-----	Unblock
2	Phase over-current hi-set	I>>	Unblock	Block	-----	Unblock
3	Earth over-current low set	Ie>	Unblock	Block	-----	Unblock
4	Earth over-current hi-set	Ie>>	Unblock	Block	-----	Unblock
5	Auto Re-closer	AR	Unblock	Block	-----	Unblock

Oscilloscope (Disturbance) Record

These are the settings for Oscilloscope recording:

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Oscilloscope recording selection	OSC. RECORD	NO	YES	-	NO
Pre-fault cycle	PRE CYCLE	002C	298C	1C	002C
Post-fault cycle	POST CYCLE	002C	298C	1C	002C
Triggering mode	TRIGGER MODE	PK-UP	PK-UP/TRIP/DI/ Anyone	-	PK-UP

DI Assignment

Parameter	Display
Digital Input 1	DI-1
Digital Input 2	DI-2
Digital Input 3	DI-3
Digital Input 4	DI-4
Digital Input 5	DI-5
Digital Input 6	DI-6
Digital Input 7	DI-7
Digital Input 8	DI-8

Following functions can be assigned to the 6 DIs

S.No.	(Configurable)
1	CB Close
2	CB Open
3	CB Ready
4	AR Block
5	Remote Trip 1
6	Remote Trip 2
7	Remote Trip 3
8	Protection Block
9	Remote Reset
10	Oscilloscope Record Triggering

DO Assignment

S.No	Parameter	Display	Setting Range		Step Size	Default Setting
			Min.	Max.		
1	Phase over-current low set	I>	---	—	DO1/DO2.....DO8	---
2	Phase over-current hi-set	I>>	---	---	DO1/DO2.....DO8	---
3	Earth over-current low set	Ie>	---	---	DO1/DO2.....DO8	---
4	Earth over-current hi-set	Ie>>	---	---	DO1/DO2.....DO8	---
5	Self supervision	SELF SUP	---	---	DO1/DO2.....DO8	---
6	Circuit breaker failure protection	CBFP	---	---	DO1/DO2.....DO8	---
7	Trip circuit supervision	TCS	---	---	DO1/DO2.....DO8	---
8	Circuit breaker open	CB_Open	---	---	DO1/DO2.....DO8	---
9	Circuit breaker close	CB_Close	---	---	DO1/DO2.....DO8	---
10	Auto Re-closer Relay	AR Close	---	---	DO1/DO2.....DO8	---
11	Lockout relay	AR Lockout	---	---	DO1/DO2.....DO8	—
12	Thermal Alarm	Thm-Alarm	---	---	DO1/DO2.....DO8	---
13	Thermal Relay	Thm-Relay	---	---	DO1/DO2.....DO8	---

Function Reset

S.No.	Parameter	Display	Setting Range		Step Size	Default Setting
			Min.	Max.		
1	Phase over-current low set	I>	Auto	Manual	-----	Auto
2	Phase over-current hi set	I>>	Auto	Manual	-----	Auto
3	Earth over-current low set	Ie>	Auto	Manual	-----	Auto
4	Earth over-current hi set	Ie>>	Auto	Manual	-----	Auto
5	Auto recloser	AR	Auto	Manual	-----	Auto
6	Thermal Alarm	Thm-Alarm	Auto	Manual	-----	Auto
7	Thermal Relay	Thm-Relay	Auto	Manual	-----	Auto

Auto Re-closer Mode

S.No.	Parameter	Display	Setting Range		Step Size	Default Setting
			Min.	Max.		
1	Enable Auto-recloser	Enable	Yes	No		Yes
2	Dead time 1	D1	0.20 Sec	300 Sec	0.01 Sec	0.20 Sec
3	Dead time 2	D2	0.20 Sec	300 Sec	0.01 Sec	0.20 Sec
4	Dead time 3	D3	0.20 Sec	300 Sec	0.01 Sec	0.20 Sec
5	Dead time 4	D4	0.20 Sec	300 Sec	0.01 Sec	0.20 Sec
6	Reclaim time	tR	0.20 Sec	300 Sec	0.01 Sec	0.20 Sec
7	Phase over-current low set max AR cycle	I>cycle	2	4	1	2
8	Phase over-current hi-set max AR cycle	I>>cycle	2	4	1	2
9	Earth over-current low set max AR cycle	Ie>cycle	2	4	1	2
10	Earth over-current hi-set max AR cycle	Ie>>cycle	2	4	1	2
11	Trip sense time	t_TST	0.05 Sec	2 Sec	0.01 Sec	0.05 Sec

General Setting: (These are the settings common for all protections)

S.No.	Parameter	Display	Setting Range		Step Size	Default Setting
			Min.	Max.		
1	Rated Phase Current	Ip	1.00 Amp	5.00 Amp	-----	1.00 Amp
2	Rated Earth Current	In	1.00 Amp	5.00 Amp	-----	1.00 Amp
3	Phase CT Ratio	PCTRATIO	1	7000	1	1
4	Earth CT Ratio	ECTRATIO	1	7000	1	1
5	Nominal Frequency	RATDFREQ	50 Hz	60 Hz	-----	50 Hz
6	Reset Delay	ResetDly	0	20 Sec	0.1 Sec	0 Sec

Rear port communication setting

RS-485 Communication	
Protocol	MODBUS RTU
Baud rate selection (programmable)	4800/9600/19200/38400/57600bps
Parity selection (programmable)	Even / Odd / None
Stop bit	1 Bit
Data bit	8 Bit data
Remote Address (programmable)	(1 to 247)
Cable required for interface	Two wire twisted shielded cable

USB Communication	
Protocol	CSE proprietary protocol: available with front software
Baud rate	19200 bps
Cable required for interface	USB cable type (A to A)

Auxiliary Supply

Auxiliary Voltage Range	For 'L' Model	18V-60V DC
	For 'H' Model	85V-280V AC / 90V-300V DC
Supply Range for Digital Input	For 'L & H' Model	Above 24V AC/DC
Power Consumption		Quiescent approx. 3W Operating approx. <7W

Measurement Accuracy

S.No	Quantity	Range	Frequency Range	Accuracy
1	Current	1 - 30 xI_p	50 - 60 Hz	$\pm$2%

Pickup Accuracy

S.No	Quantity	Range	Frequency Range	Accuracy
1	Current	1 - 30 xI_p	50 - 60 Hz	+5% of Pickup setting

14) Technical Data

Measuring Inputs

Rated Data	Rated current I_p :1A or 5A Rated frequency F_n : 50 Hz/60Hz
Drop out to Pickup Ratio	>96%
Reset Time	30mSec
Power consumption in current circuit	At I_p=1A 0.2 VA At I_p=5A 0.4 VA
Thermal withstand capability in current circuit	Dynamic current withstand for 1 Sec : 100 x I_p for 10 Sec : 30 x I_p continuously : 4 x I_p

Relay Contact Rating

Contact Rating	
Contact relay	Dry contact Ag Ni
Make current	Max. 30A & carry for 3S
Carry capacity	8A continuous : Relay 1, Relay 2
	5A continuous : Relay 3, 4, 5, 6, 7, 8
Rated voltage	250V AC/ 30V DC
Breaking Characteristics	
Breaking capacity AC	1500VA resistive 1500VA inductive (PF=0.5)
Breaking capacity DC	220V AC, 5A (cosØ <=0.6) 135V DC, 0.3A (L/R=30ms) 250V DC, 50W resistive or
	25W inductive (L/R=40ms)
Operation time	<10ms
Durability	
Loaded contact	10000 operation minimum
Unloaded contact	30000 operation minimum

15) Mechanical Test

Shock	As per DIN IEC 41 B (CO) 38: class 1
Vibration	As per DIN IEC 41 B (CO) 35: class 1
Protection-Front Panel	IP-54
Protection-Rear Panel	IP-00
Weight	Approx. 1.0 Kg

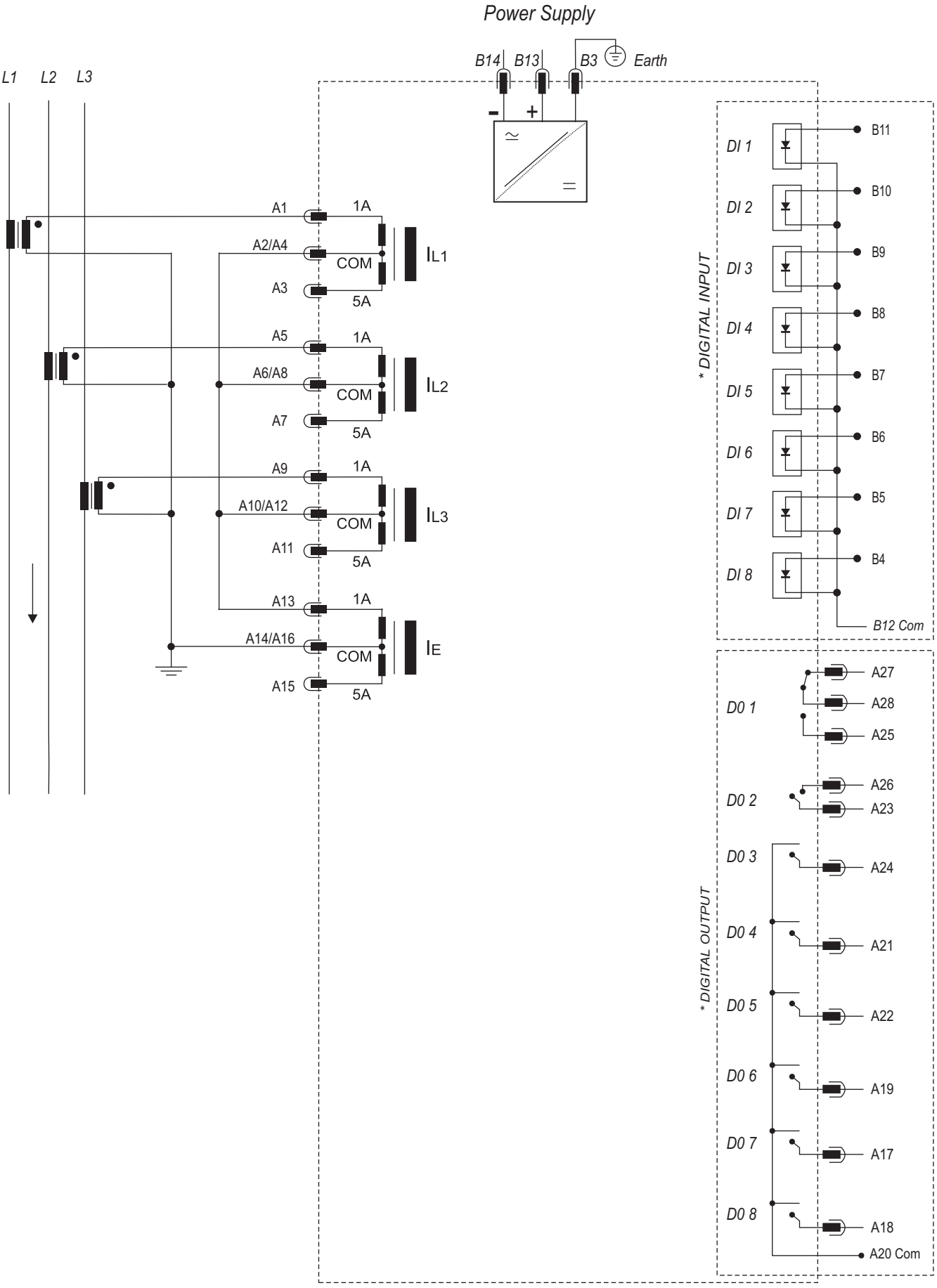
16) Type Test

DESIGN STANDARD		
Specified ambient setvice temp. range	:	VDE 04355 part 303, IEC 255-4, BS 142
For storage	:	40 deg C to + 85 deg C
For operation	:	-20 deg C to 70 deg C
Environmental protection class 'F' as per DIN 40040 and per DIN IEC 68, part 2.3	:	relative humidity 95% at 40 deg C for 56 days.
Isolation test voltage, inputs and outputs between themselves and to the relay frame as per VDE 0435, part 303	:	2.5 KV (eff.) / 50 Hz, 1 min.
Impulse test voltage, inputs and outputs between themselves and to the relay frame as per VDE IEC 0435, part 303	:	5 KV, 1.2/50 μs, 0.5J
High frequency interference test voltage, inputs and outputs between themselves and to the relay frame as per DIN IEC 255, part 22-1	:	2.5 KV/1MHz
Electrical fast transient (burst) test as per DIN VDE 0843 part 4	:	4KV / 2.5 kHz, 15ms
Radio interference suppression test as per DIN VDE 57 871	:	Limit value class 'B'
Electrostatic discharge (ESD) test as per DIN VDE 0843 part 2	:	8 KV
Radiated electromagnetic field test as per VDE 0843 part2	:	10 V/m

17) Specification Table of I-350

Function	ANSI	NEX-I 350
CT inputs	–	4
PT Inputs	–	x
Over current	50/51	✓
Earth Fault	50N/51N	✓
CBFP	50BF	✓
Trip Circuit	74TC	✓
Inrush Blocking	-	✓
Cold Load Pickup	62 CLD	✓
Programmable Scheme Logic	-	✓
Auto Re-closer	79	✓
Thermal Over-load	49	✓
Fault Record	–	10
Event Record	–	100
Disturbance Record	–	✓
Selection of 1/5A	–	Site selectable
Digital Input	–	6
Digital Output	–	8
Enclosure Type	–	Draw out with CT shorting
Front Communication	–	✓
Rear Communication (RS-485)	–	✓

18) Connection Diagram



** Based on Ordering Information*

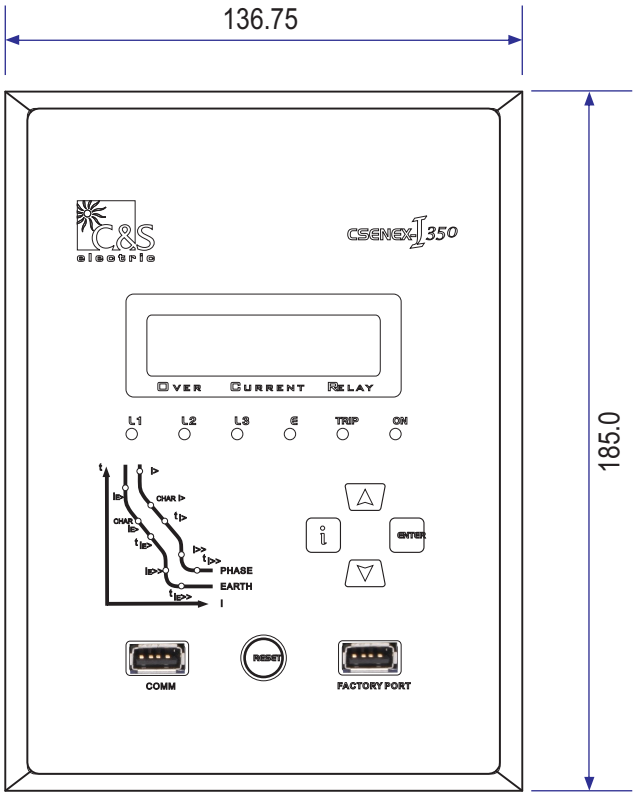
(Figure 8)

19) Terminal Description

Term Name	Terminal Description
B14-B13-B3	Aux supply (B14: '-' B13: '+', B3: 'Earth')
B11-B12	Digital Input (DI-1)
B10-B12	Digital Input (DI-2)
B9-B12	Digital Input (DI-3)
B8-B12	Digital Input (DI-4)
B7-B12	Digital Input (DI-5)
B6-B12	Digital Input (DI-6)
B5-B12	Digital Input (DI-7)
B4-B12	Digital Input (DI-8)
A27-A28-A25	Digital Output (DO-1) (NC-COM-NO)
A26-A23	Digital Output (DO-2) (NO-COM)
A24-A20	Digital Output (DO-3) (NO-COM)
A21-A20	Digital Output (DO-4) (NO-COM)
A22-A20	Digital Output (DO-5) (NO-COM)
A19-A20	Digital Output (DO-6) (NO-COM)
A17-A20	Digital Output (DO-7) (NO-COM)
A18-A20	Digital Output (DO-8) (NO-COM)
A1-A2	CT Terminal for Phase current input (1A) in L1 Phase
A3-A4	CT Terminal for Phase current input (5A) in L1 Phase
A5-A6	CT Terminal for Phase current input (1A) in L2 Phase
A7-A8	CT Terminal for Phase current input (5A) in L2 Phase
A9-A10	CT Terminal for Phase current input (1A) in L3 Phase
A11-A12	CT Terminal for Phase current input (5A) in L3 Phase
A13-A14	CT Terminal for Phase current input (1A) in Neutral current
A15-A16	CT Terminal for Phase current input (5A) in Neutral current

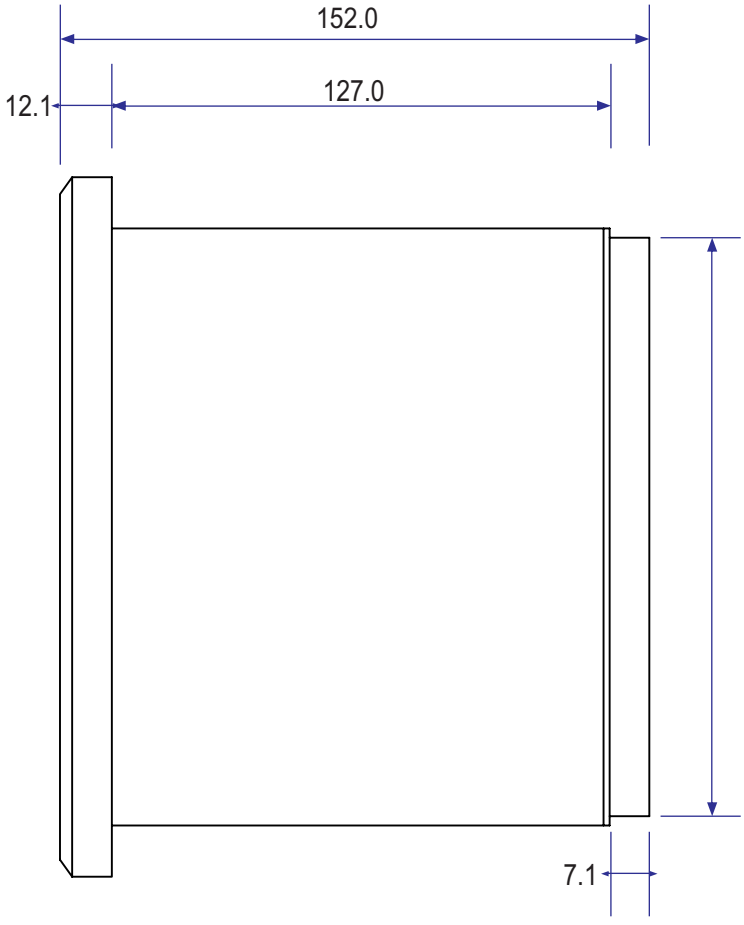
20) Dimensional Details

Front View



(Figure 10)

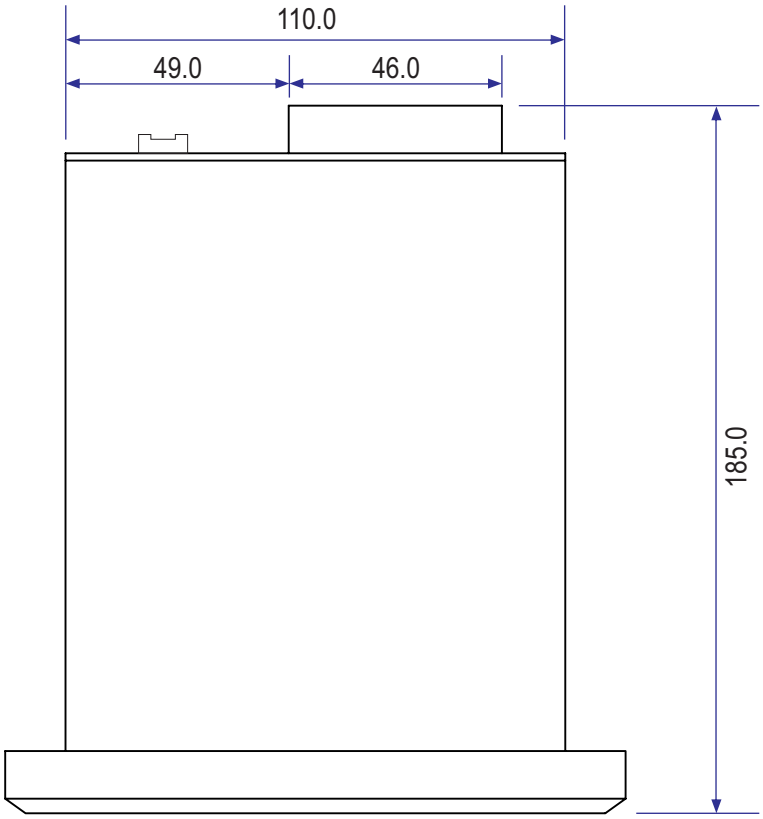
Side View



(Figure 11)

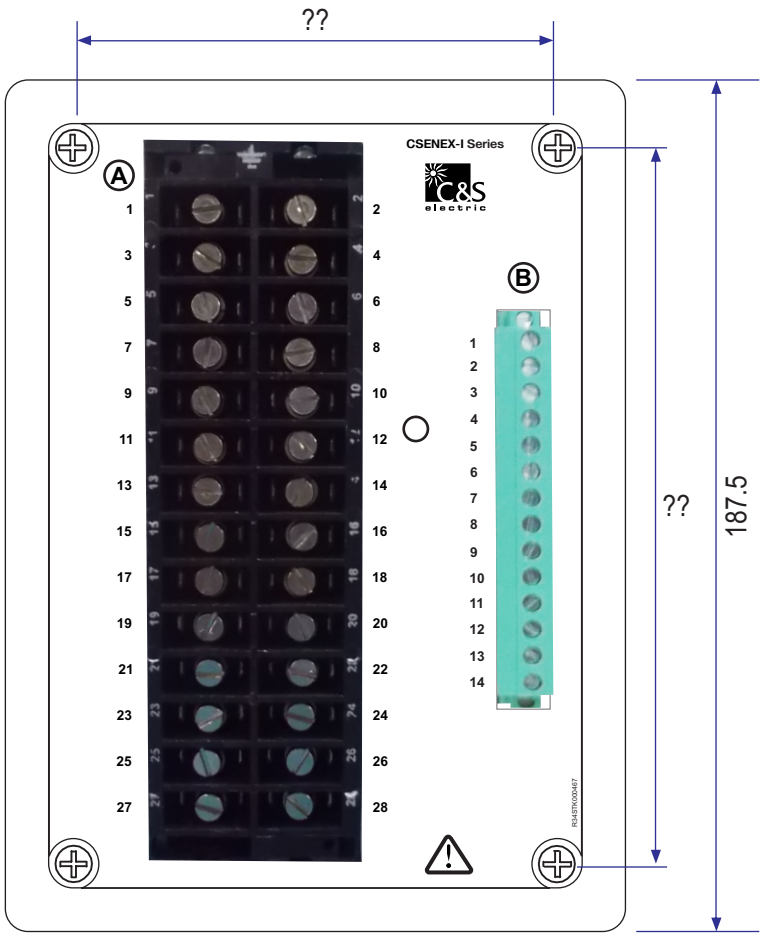
Dimensional Details contd..

Top View



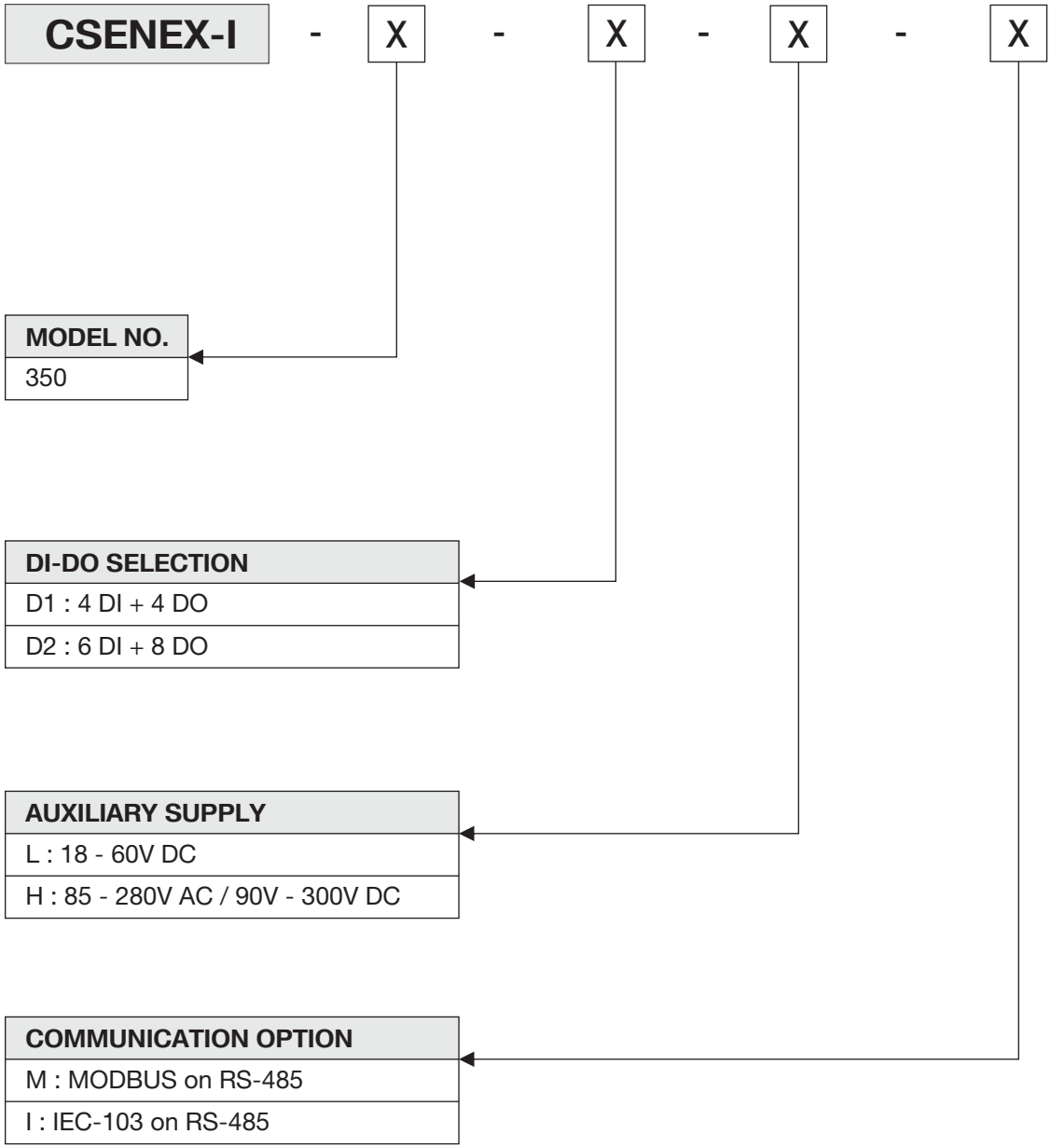
(Figure 12)

Back View



(Figure 13)

21) Ordering Information



Revision History

S.No.	Rev.No.	Details	Date
01	01	Inclusion of 'Reset Time' in Measuring Input Technical Data clause 14	20.07.15
02	02	Removed "Program Scheme Logic" details from the catalogue	07.08.15
03	03	Include "Cold Load Pickup" & "Program Scheme Logic" details in the catalogue	22.09.15
04	04	Change in Connection Diagram & its description	25.09.15

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Issue Date: 03.06.15

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Rev. Date: 25.09.15

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