We touch your electricity everyday!

CSENEX-I

Intelligent Measuring and Protection Device

CSENEX
CSENEX
CSENEX
CSENEX
Series

Catalogue

C&S electric

CE

PMD Division

CONTENT

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 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).
- Three phase time over-current protection.
- Draw out with self CT shorting.
- Three phase instantaneous protection.
- Earth time over-current and earth instantaneous over current.
- Circuit breaker failure detection.
- Trip circuit supervision.
- Event recorder.
- Fault recorder.
- Disturbance recording.
- DI/DO programmable matrix.
- Protection blocking through DI for coordination.
- 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.

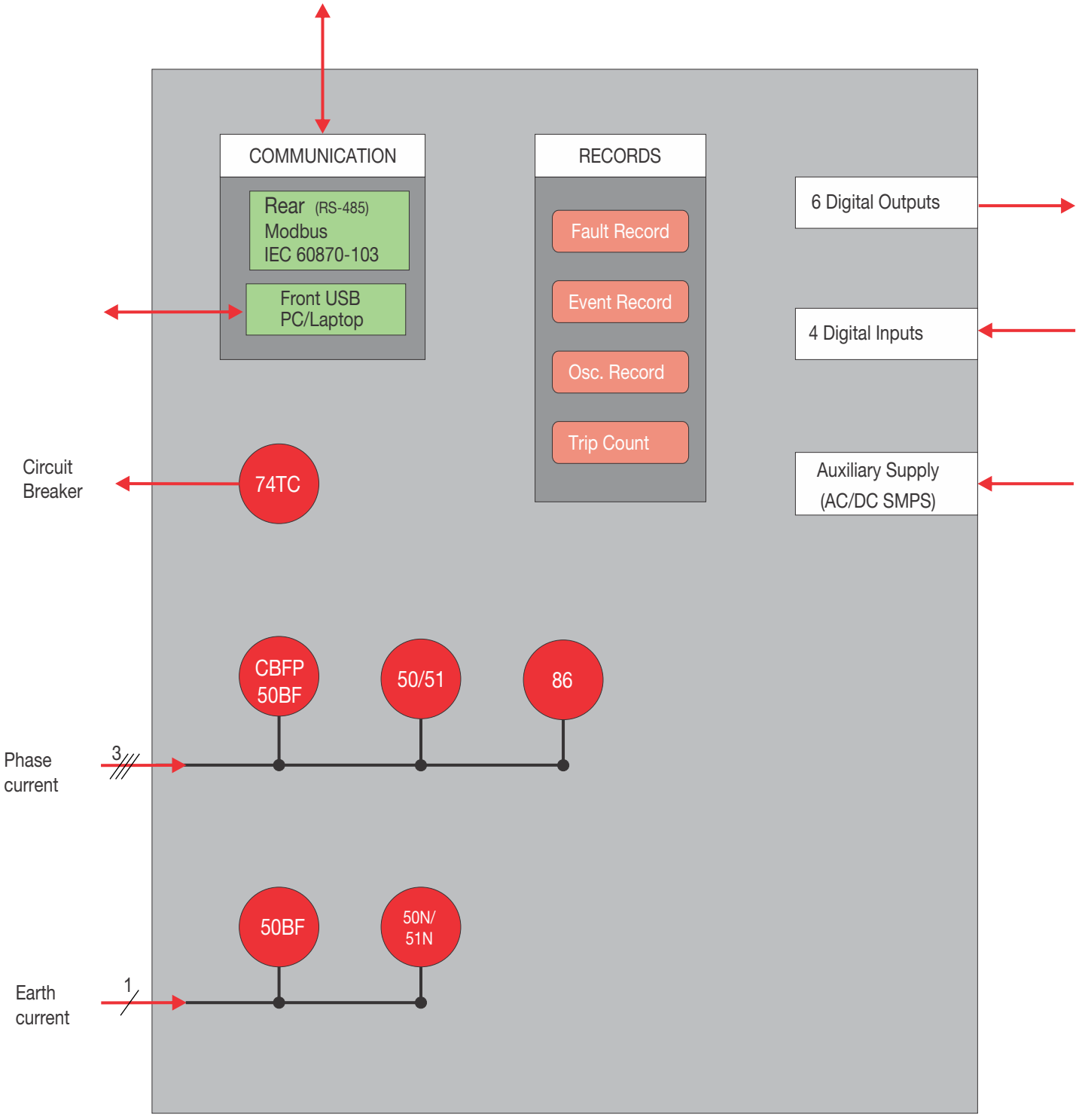
4) Hardware

- Digital Signal Processor based numeric design.
- Measures true RMS with DFT filter .
- 4 Current analog inputs for phase & earth fault current.
- 4 Digital Inputs.
- 6 Digital Outputs.
- 16 x 4 Alpha-numeric LCD.
- RS-485 & USB communication.
- 1 A & 5A common current terminal and programmable.

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).
- Circuit breaker failure protection (50BF)
- Trip circuit supervision (74TC)

6) Functional Diagram



(Figure 1)

Protection Function

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 (I>>) 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 (Ie>>) stage can be configured with definite time 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 Restrain

Harmonic setting is disable by default. Phase/Earth Harmonics can be Blocked/Unblocked & time setting can also be edited through MMI. If the Pickup current has %harmonics above the set value of Harmonic, 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 Circuit Breaker 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 rated within CBFP time setting. If one or more of the phase currents have not dropped to specified current within this time, Circuit Breaker Failure is detected and the assigned output relay is activated.

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 time stamp. Each record has the following information: fault Format

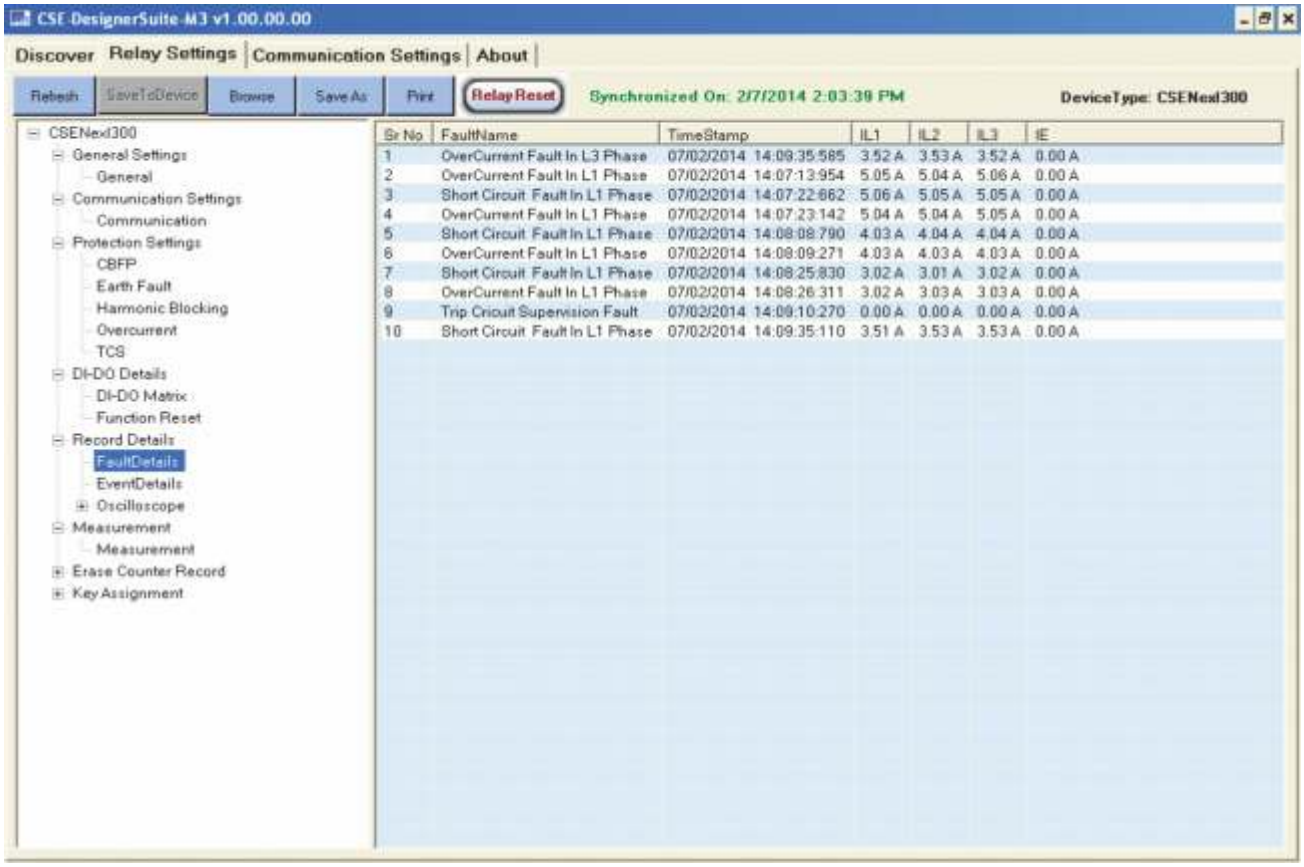
[F] IL1	:	00.00A
[F] IL2	:	00.00A
[F] IL3	:	00.00A
[F] Ie	:	00.00A
HOUR MIN	:	HH:MM
SEC mSEC	:	Sec:mSec
F-TYPE	:	FAULT TYPE

Where

[F][ILx]	Magnitude of phase current's.
[F]Ie	Magnitude earth fault current's
F-Type	Origin of fault (over current etc.)

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.



(Figure 2) (Fault Data Recording on PC software)

8) Event Recording

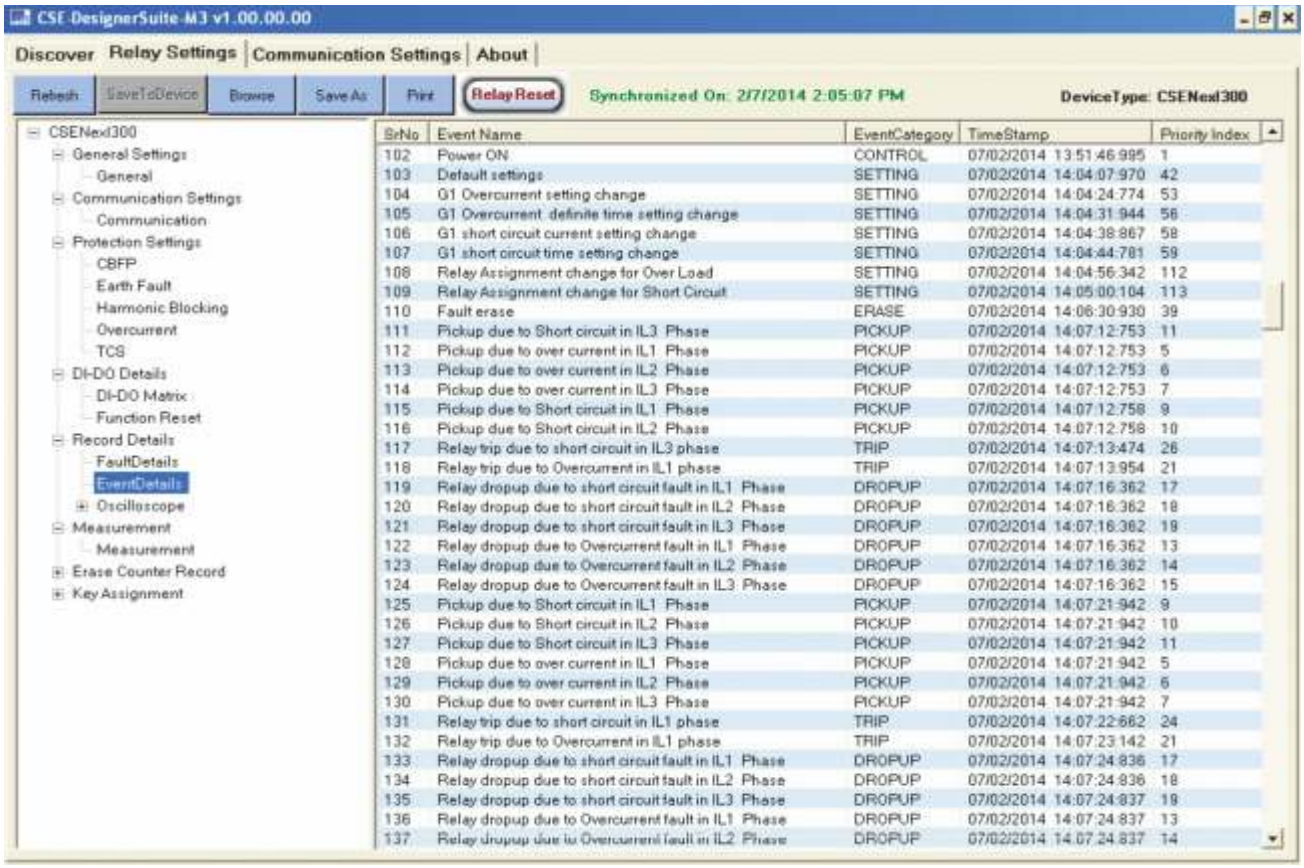
The unit stores in non volatile memory the last 500 events. When the available memory space is exhausted, the new event automatically overwrites the oldest event which can be retrieved from a PC, with the following format:

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.

* Description of event number available in event list or in front end software

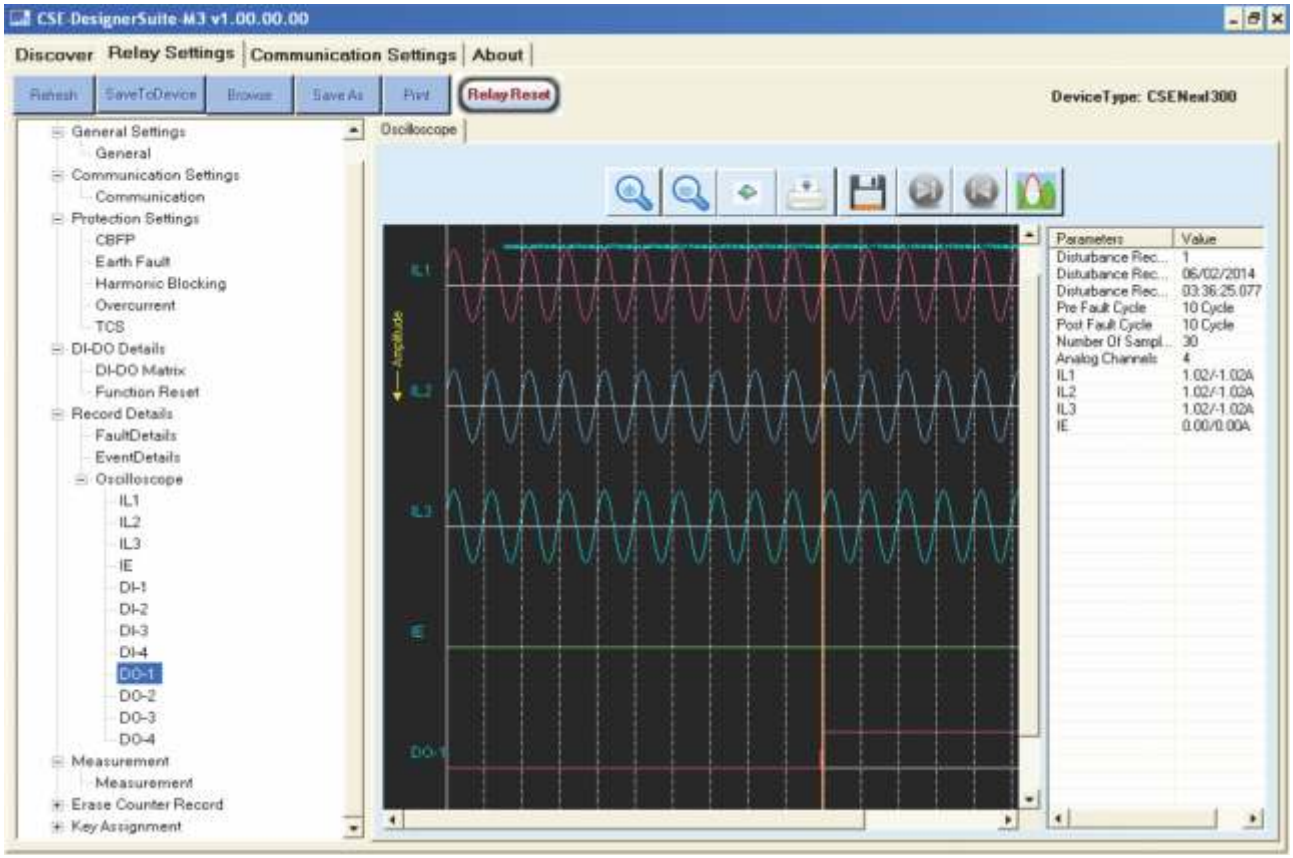


(Figure 3) (Event Data Recording on PC software)

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 4 digital inputs and 6 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 4) (Disturbance Recording on PC software)

Output Contacts

No. of Relays	:	4 (DO1, DO2, DO3, DO4)
No. of Digital output contacts	:	6 (Combination of NO/NC/COM See Connection diagram on Page no. 18)
Programmable (DO Assignment)	:	Yes (See Table on Page no. 13)
Relay reset type	:	Programmable (Auto/Manual)
Trip Test	:	Relay is having Trip Test facility to check the operation of each Do's individually via front HMI / key pad in TRIP TEST menu.

Input Contacts

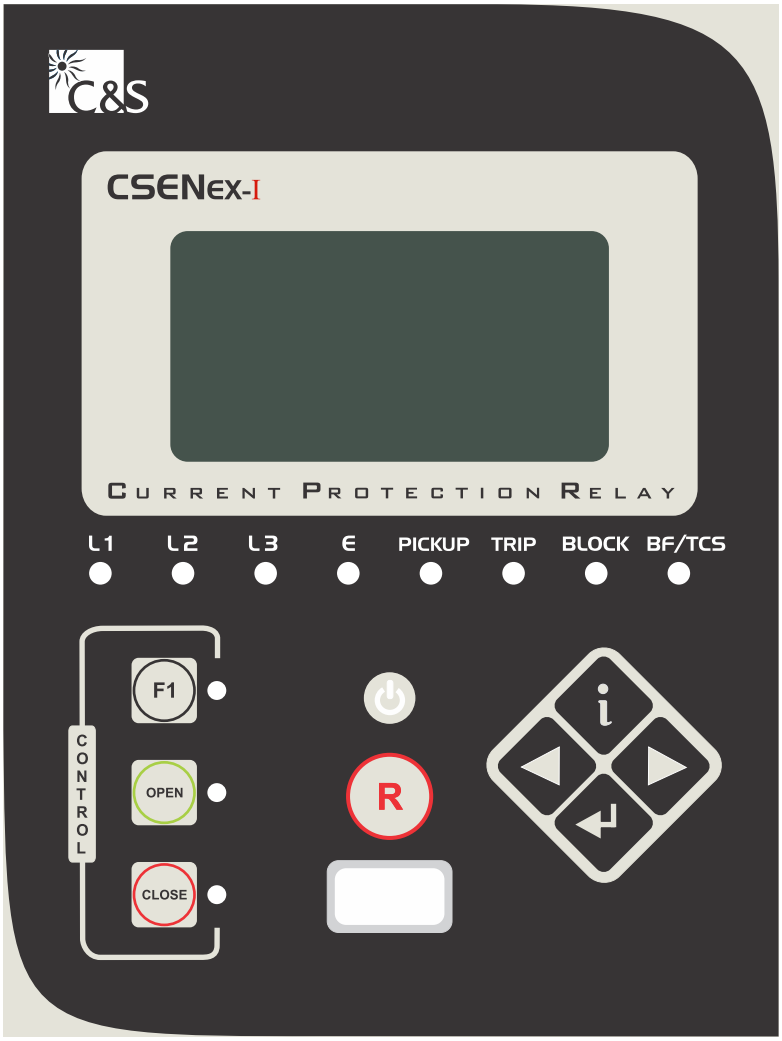
No of digital inputs	:	4 (DI1, DI2, DI3, DI4)
Programmable (DI Assignment)	:	Programmable

10) 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.
- One push switch for the functions assigned in the 'HMI' to 'F1' key, 2 push switch to open or close circuit breaker.
- Eight RED color LEDs for pickup or tripping on fault and event in any phase.

Keys	Manual Key
	is used as intelligent key to see the details of last fault and Relay status.
	is used as a "ENTER" key.
	is used to manual reset (after pressing for 2 sec).
	is used to scroll in backward direction.
	is used to scroll in forward direction.
	To perform the assigned task either DO trip or Relay reset.
	To open the circuit breaker.
	To close the circuit breaker.



(Figure 5) (HMI)

11) Communication (Local and Remote)

The unit has:

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

11.1) Rear Communication

The protocol for the rear port is MODBUS-RTU / IEC 60870-103.

11.2) 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.

12) Setting Ranges

CSENEX-I 3xx Relay is having two group of protection settings, any one can be activated by selection in active group. All editable settings are password protected.

Active Group Setting

Parameters	Display	Setting Range		Step Size
		Min	Max	
Active Group	ACTIVE	Group1	Group2	1

Over Current and 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>	0.20xIp 0.1 Sec 0.01	4.0xIp 150 Sec 1.50	0.01xIp 0.01Sec 0.005	Disable 0.10 Sec 0.01
4	Phase over-current hi-set pickup setting Phase over-current hi-set definite timing	I>> t>>	0.5xIp 0.02 Sec	30xIp 20 Sec	0.5xIp 0.01Sec	Disable 0.02 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	Disable 0.03 Sec 0.01
6	Earth over-current hi-set pickup setting Earth over-current hi-set definite timing	Ie>> te>>	0.5xIn 0.02 Sec	15xIn 20 Sec	0.05xIn 0.01 Sec	Disable 0.02 Sec

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 ±30mSec (whichever is higher)

Trip Circuit Supervision Protection

S.No.	Parameter	Display	Setting Range		Step Size	Default Setting
			Min.	Max.		
1	TCS	t_TCS	0.03 Sec	2 Sec	0.01	Disable

Circuit Breaker Failure Protection

S.No.	Parameter	Display	Setting Range		Step Size	Default Setting
			Min.	Max.		
1	CBFP	t_CBFP	0.03 Sec	2 Sec	0.01	Disable

Harmonic Setting

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Phase 2nd harmonic block	P2ndH	10%If	50%If	2	Disable
Phase 3rd harmonic block	P3rdH	10%If	50%If	2	Disable
Earth 2nd harmonic block	E2ndH	10%If	50%If	2	Disable
Earth 3rd harmonic block	E3rdH	10%If	50%If	2	Disable
Phase blocking time	tPHASE	0 Sec	20 Sec	0.1 Sec	0 Sec
Earth block time	tEARTH	0 Sec	20 Sec	0.1 Sec	0 Sec

Cold Load Pickup Setting

S.No	Parameter	Display	Min	Max
1	Cold Load Pickup enable	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

DI Assignment

Parameters	Display
Circuit breaker close	CB Close
Circuit breaker open	CB Open
Remote trip	Rmt Trp
Group toggle	GRP togg
Remote reset	RMT RSET
Oscillator trigger	OSC Trig
Over current block	I>BLK
Short circuit block	I>>BLK
Earth block	Ie>BLK
Earth high block	Ie>>BLK

DO Assignment

S.No	Parameter	Display	Setting Range		Step Size	Default Setting
			Min.	Max.		
1	Phase over-current low set	I>	---	—	DO1/DO2/DO3/DO4	---
2	Phase over-current hi-set	I>>	---	---	DO1/DO2/DO3/DO4	---
3	Earth over-current low set	Ie>	---	---	DO1/DO2/DO3/DO4	---
4	Earth over-current hi-set	Ie>>	---	---	DO1/DO2/DO3/DO4	---
5	Self supervision	SELF SUP	---	---	DO1/DO2/DO3/DO4	---
6	Circuit breaker failure protection	CBFP	---	---	DO1/DO2/DO3/DO4	---
7	Trip circuit supervision	TCS	---	---	DO1/DO2/DO3/DO4	---
8	Circuit breaker open	CB_Open	---	---	DO1/DO2/DO3/DO4	---
9	Circuit breaker close	CB_Close	---	---	DO1/DO2/DO3/DO4	—
10	Remote Trip	Rmt Trip	---	---	DO1/DO2/DO3/DO4	---

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	Trip Circuit Supervision	TCS	Auto	Manual	-----	Auto
6	Remote Trip	RmtTrip	Auto	Manual	-----	Auto

Oscilloscope (Disturbance) Record Setting

Parameters	Display	Setting Range	
		Min	Max
Oscilloscope recording selection	RECORD	No	Yes
Pre-fault cycle	PRE CYCLE	2	298
Post-fault cycle	POST CYCLE	2	298
Triggering mode	TRIG. MODE	Pickup	Trip, DI, anyone

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	Ph CT Rtio	1	9999	1	1
4	Earth CT ratio	E CT Rtio	1	9999	1	1
5	Nominal frequency	FREQ(Fn)	50 Hz	60 Hz	-----	50 Hz
6	Fault Message status	[F] Stat	Enable	Disable	-----	Enable

Rear port communication setting

(*Availability as per Model Selection)

RS-485 Communication	
Protocol	MODBUS RTU / IEC 60870-103
Baud rate selection (programmable)	4800/9600/19200/38400/57600 bps (MODBUS RTU)
	9600/19200/38400 bps (IEC 60870-103)
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
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 40V AC/DC
Power Consumption	Quiescent approx. 3W	Operating approx. <7W

Measurement Accuracy

S.No	Quantity	Range	Frequency Range	Accuracy
1	Phase Current	1 - 30 xI_p	50 - 60 Hz	±2%
2	Earth Current	1 - 15 xIn	50 - 60 Hz	±2%

Pickup Accuracy

S.No	Quantity	Range	Frequency Range	Accuracy
1	Current	1 - 30 xI_p, 1-15xIn	50 - 60 Hz	±5% of Pickup setting

13) Technical Data

Measuring Input

Rated Data	Rated current I_p : 1A or 5A Rated frequency F_n : 50 Hz/60Hz	
Drop out to Pickup Ratio	>96%	
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	
	(half wave)	: 250 x I_p
	for 1 Sec	: 100 x I_p
	for 10 Sec	: 30 x I_p
	continuously	: 4 x I_p

Trip Contact Rating

Contact Rating	
Contact relay	Dry contact Ag Ni
Make current	Max. 30A & carry for 3S
Carry capacity	8A continuous
Rated voltage	250V AC/ 30V DC
DC Current Carrying Capacity	8A@30VDC / 0.3A@110VDC/ 0.2A@220VDC
Breaking Characteristics	
Breaking capacity AC	1500VA resistive
	1500VA inductive (PF=0.5)
	220V AC, 5A (cosØ <=0.6)
Breaking capacity DC	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

Over-voltage category : II, Insulation voltage : 300V, Pollution Degree : 2, IP 54 from Front

14) Type Test

DESIGN STANDARD	
Specified ambient service 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

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

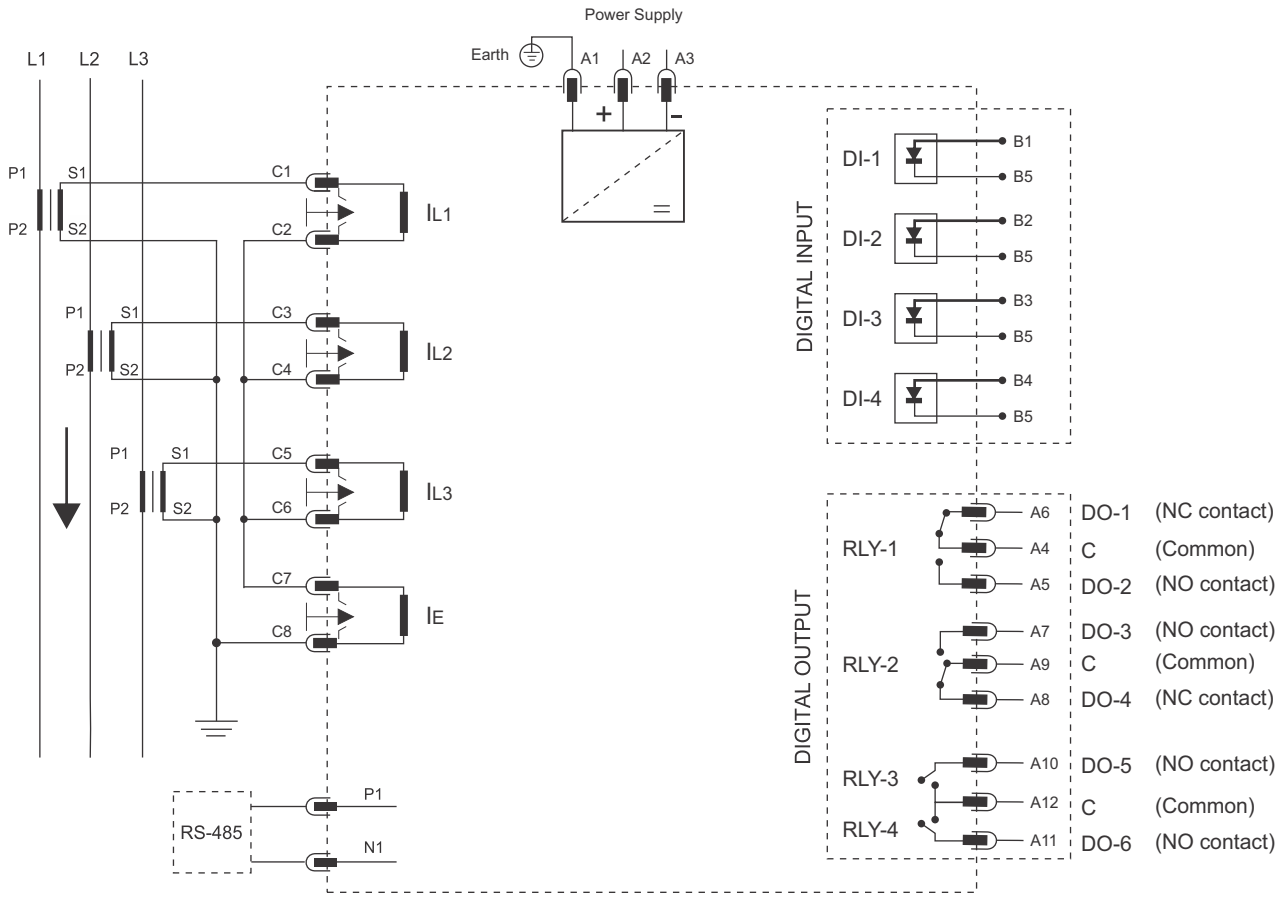
16) Other variants of CSENEX-I family

Model Selection Table

Function	ANSI	NEX-I 300	Nex-I 2xx	Nex-I 100
CT inputs	–	4	4	4
Over current	50/51	✓	✓	✓
Earth Fault	50N/51N	✓	✓	✓
CBFP	50BF	✓	✓	✓
Trip circuit	74TC	✓	✓	✓
Inrush blocking	51H	✓	✓	✓
Digital input	–	4	6	2
Digital output	–	6	6	6
Fault record	–	10	10	10
Event record	–	500	50	16
Oscilloscope Record	–	✓	x	x
Selection of 1/5A	–	Site selectable	Site selectable	Site selectable
Enclosure type	–	Draw out	Draw out	Draw out
Enclosure size (WxHxD) mm	–	(125x154x156)	(125x154x156)	(125x154x156)
Front communication	–	✓	✓	✓
Rear comm. (RS-485)	–	✓	✓	✓

Enclose size dimensions are in mm.

17) Connection Diagram

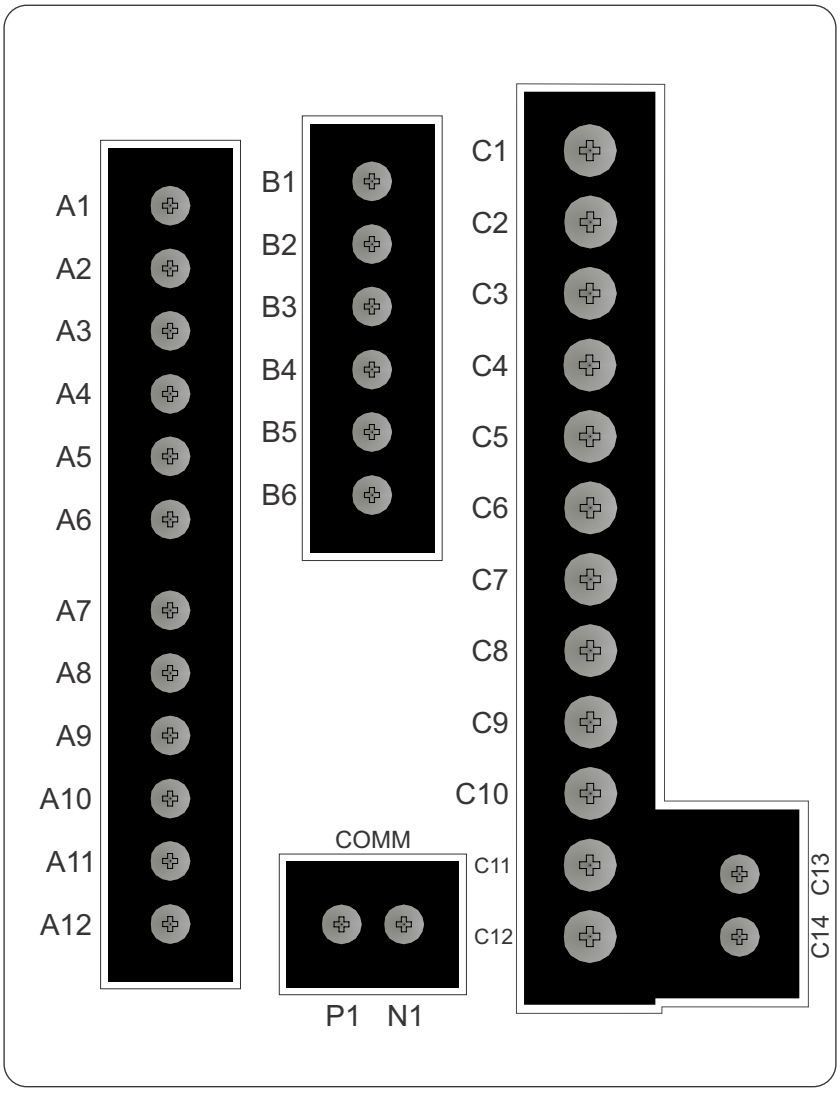


(Figure 6)

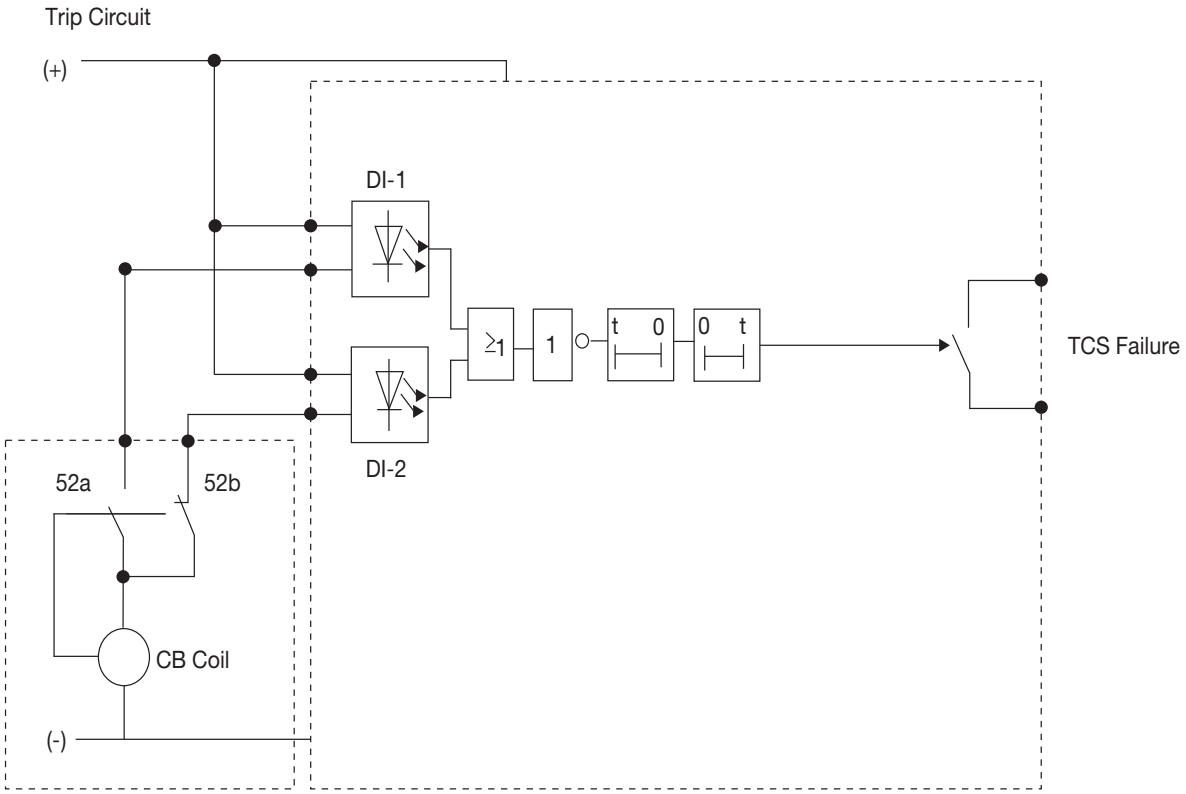
Terminal Description

Terminal Name		Terminal Description
A1	:	Auxiliary Supply Earth
A2-A3	:	Auxiliary Supply
P1-N1	:	RS-485 Modbus P1, N1
A5-A4-A6	:	Potential free Relay-1 Output
A7-A9-A8	:	Potential free Relay-2 Output
A10-A12	:	Potential free Relay-3 Output
A11-A12	:	Potential free Relay-4 Output
DI-1	:	B1-B5
DI-2	:	B2-B5
DI-3	:	B3-B5
DI-4	:	B4-B5
DO-1 Contact	:	A4-A6
DO-2 Contact	:	A4-A5
DO-3 Contact	:	A7-A9
DO-4 Contact	:	A9-A8
DO-5 Contact	:	A10-A12
DO-6 Contact	:	A12-A11
C1-C6	:	CT Terminal for Phase current Input L1(C1-C2), L2(C3-C4), L3(C5-C6)
C7-C8	:	CT Terminal for Earth current input

18) Back Terminal Diagram



19) Trip Circuit Supervision

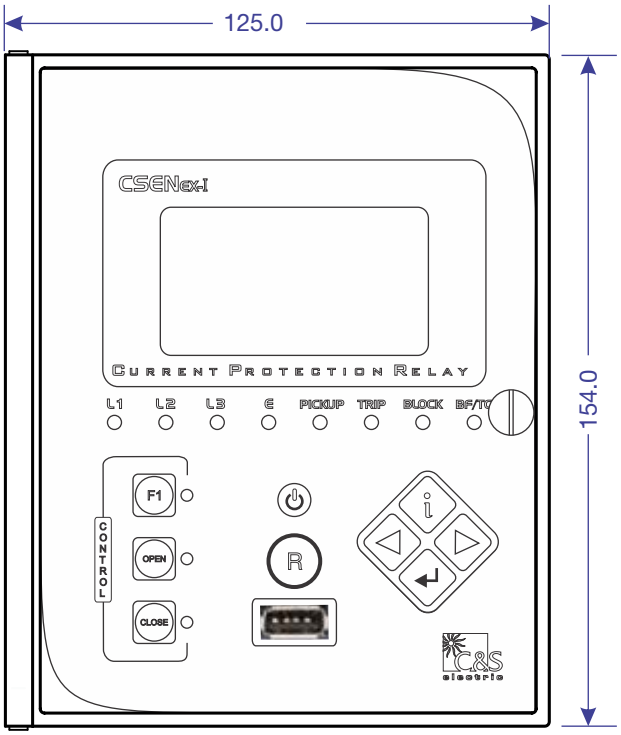


(Figure 7)

(Note: CB coil resistance should be such that at least 4mA current must flow in each Digital Input)

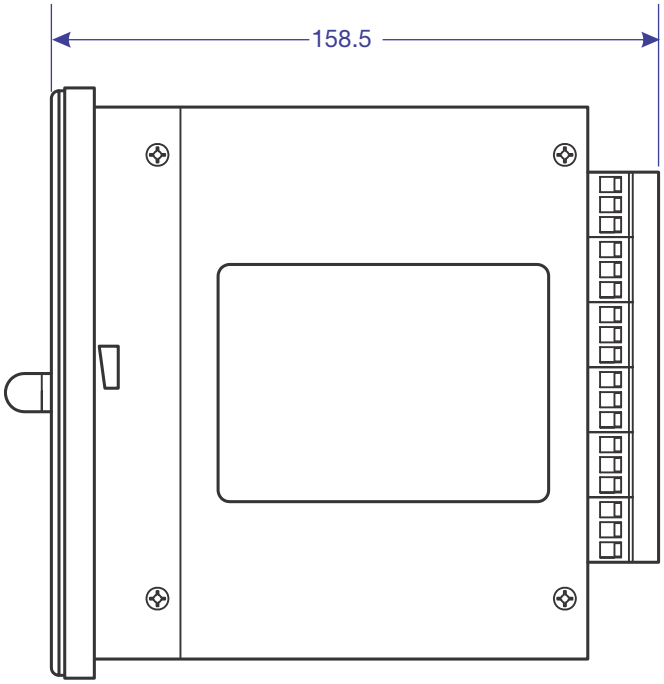
20) Dimensional Details (All the dim. are in mm, Gen. Tol.: ± 1.0mm)

Front View



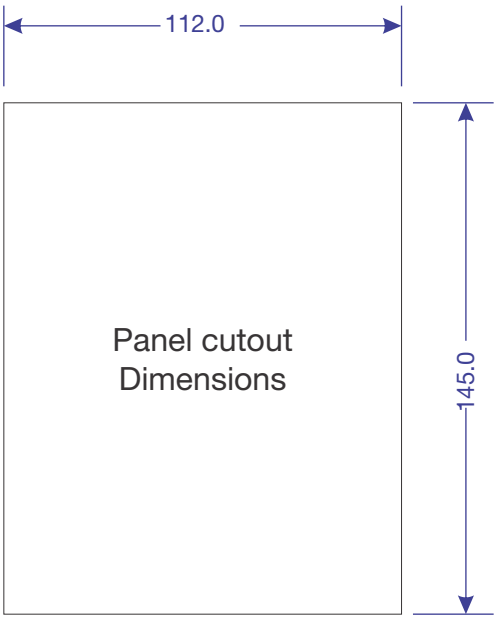
(Figure 8)

Side View



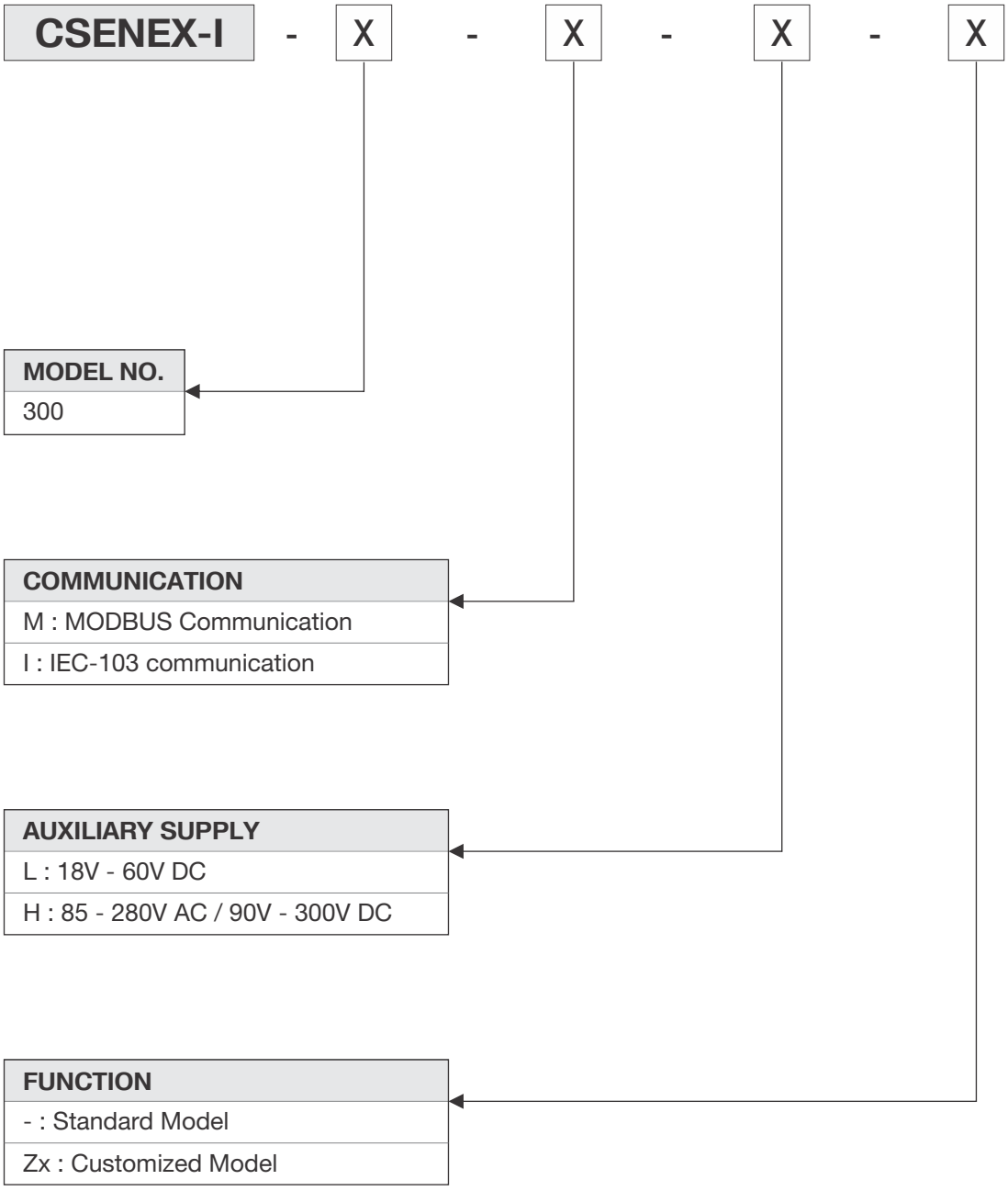
(Figure 9)

Panel cutout dimensions: WxH = 112.0x145.0mm



(Figure 10)

21) Ordering Information



Revision History

S.No.	Rev.No.	Details	Date
01	08	Inclusion of Cold Load Pickup Description & its Table	04.11.14
02	09	Change in TCS Diagram	07.09.15

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 : +91-120-3874800/01 Fax: +91-120-3874802, E-mail: cspc@cselectric.co.in

Issue Date: 11.03.13

Rev. No: 09

Rev. Date: 07.09.15

Branch office

Branch	Phone	Fax	E-mail
Ahmedabad:	+91 79 30074534/35/36	+91 79 30074519	cspc.ahmedabad@cselectric.co.in
Bangalore:	+91 80 3057 0372/73, 3057 0347	+91 2558 4839	cspc.bangalore@cselectric.co.in
Bhubaneswar:	+91 674 2507265	+91 674 2507265	cspc.bhubaneswar@cselectric.co.in
Chennai:	+91 44 3918 0531-35	+91 44 39180514	cspc.chennai@cselectric.co.in
Cochin:	+91 0484 3071717	+91 0484 3071716	cspc.cochin@cselectric.co.in
Delhi:	+91 11 33849 00/10/11	+91 11 30838826	cspc.delhi@cselectric.co.in
Hyderabad:	+91 40 3918 2496/97	+91 40 3910 3631	cspc.hyderabad@cselectric.co.in
Kolkata:	+91 33 22275850/51	+91 33 2227 5849	cspc.kolkata@cselectric.co.in
Mumbai:	+91 22 30487146/47/48	+91 22 2412 6631	cspc.mumbai@cselectric.co.in
Pune:	+91 20 30283244/45	+91 20 30283244	cspc.pune@cselectric.co.in