We touch your electricity everyday!

CSEZEN-F100

Advance Feeder Protection & Monitoring IED

- DRAW-OUT WITH SELF CT SHORTING
- FAULT EVENT DISTURBANCE RECORDER
- DI/DO PROGRAMMABLE MATRIX
- METERING PROTECTION

CATALOG

C&S electric

PMD Division

CONTENTS

1.0 Introduction

CSEZEN series offers a multi functional comprehensive smart protection solution for Feeder, Generator, Motor & Transformer segment.

CSEZEN family of protective relays are advance numerical relays that provide multi protection and monitoring with reliable and fast protection solution in a single unit.

In this family of CSEZEN series, the CSEZEN-F is an advanced Feeder protection relay designed for controlling, protecting and monitoring industrial installations, public distribution networks and substations.

CSEZEN-F also provides an automation solution of power control. It complies with IEC 60870-5-103, IEC 61850, Modbus protocol for high integration of protection & control. CSEZEN-F offers following features in a compact & smart flush mounting enclosure.

- Programmable Rated Current 1A & 5A
- Measurement, Protection & Metering
- Draw-out enclosure have modular design with CT shorting
- Communication (Local & Remote)
- DI/DO/LED Matrix Programmability
- Intelligent key for DI & DO status, details of fault pickup & status of last fault occurred
- Last 20 fault record (non-volatile memory) with time stamp
- Last 500 event record (non-volatile memory) with time stamp
- Disturbance Recording
- CSEZEN-F relays are equipped with self supervision function

2.0 Application

CSEZEN-F relay will cover wide range of protection functions required for feeder segment. It can be used as part of protection scheme for transformers and generator transformers. CSEZEN-F relays can also provide back-up protection for HV and EHV transmission systems.

3.0 Hardware

- Digital Signal Processor based numeric design
- Measures true RMS with DFT filter
- 1A & 5A site selectable
- CT Terminal with self shorting
- 4 Current Analog Input
- 8 Digital Inputs
- 8 Digital Outputs
- 16 LEDs at Pickup & Trip on fault
- LAN-RJ45/RS-485/USB ports for Communication
- 16x2 Alpha numeric LCD
- 5 Push button on the front for HMI

4.0 Protection Features

- Three Phase Time Over Current Protection
- Three Phase Instantaneous Over Current Protection
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- Output Relay Latching
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- Circuit Breaker Failure Protection

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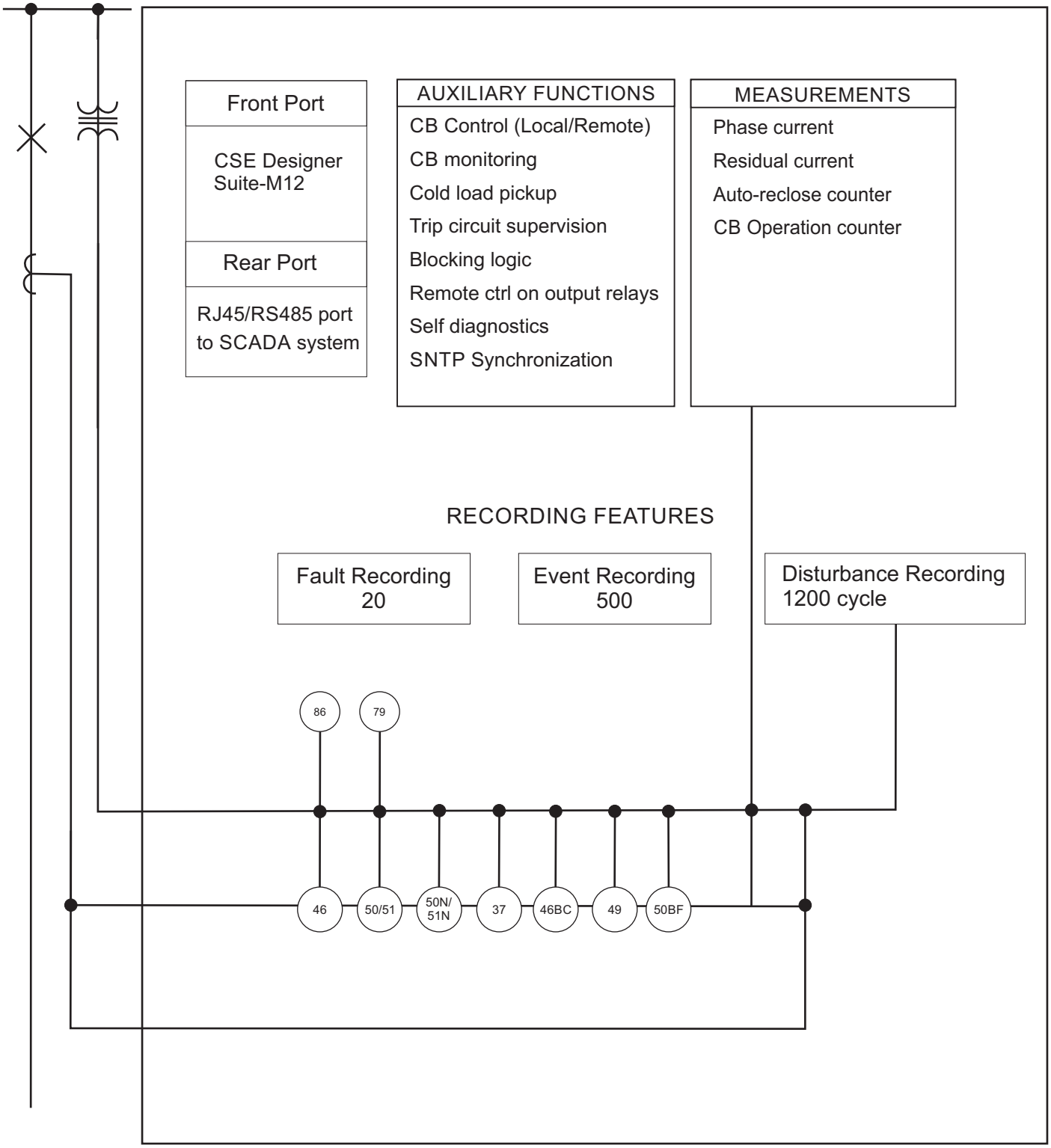
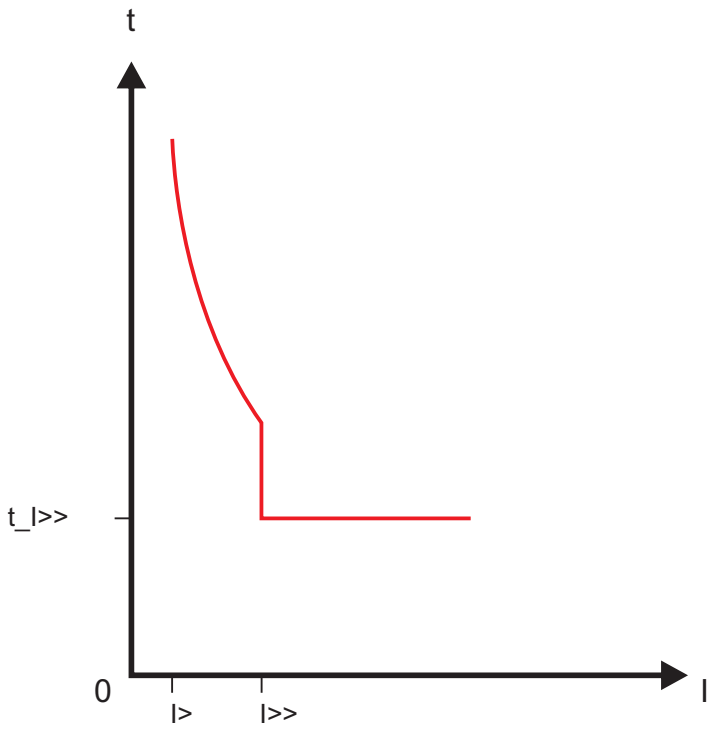


7.0 Protection Functions

Three Phase Over-current

Three Phase over current element (50P/51P) operates in a time period that depends on the applied current and on the set curve. The protection element trip when phase current exceeds the set current threshold for the set time.

The independent two stages are available for phase fault protection. For I> & I>> the user may independently select definite time delay or inverse time delay with different type of curves.



Over current Element

Inverse Characteristics Formula

Refer following formula for EINV, VINV, LINV, NINV1.3, NINV3.0, NINV0.6 characteristics:

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

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

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

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

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

Earth Over current

Relay provides two stage of definite/inverse time earth fault protection. It can apply to over head transmission line, underground cable and feeder.

The earth current is measured from the CT earth input terminals only If REF is in Disable condition. In this case Ie> = 5% - 250% x In

The independent two stages (Ie> & Ie>>) 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 (Ie>>) can be configured with definite time only.

In Model C : If REF protection is enabled. In that case, Earth fault protection will be offered only from derived earth fault from three phase.

In Model D : Sensitive Earth Fault current is measured directly from CT terminals and Earth fault is derived numerically from three phase currents (3Io) .

Derived Earth Over current (Only Available in Model C & Model D)

The derived earth over current element protection is used to cover application such as HTB/HTA transformers. The derived earth current (Ie_d>) is the vector summation:

$Ie\_d\ (3Io) = (\vec{I}_{L1} + \vec{I}_{L2} + \vec{I}_{L3})$

In this case : Ie_d> = 10% - 250% x In

The derived earth over current has two independent thresholds: Ie_d> and Ie_d>>.

Restricted Earth Protection (* Available in Model B & Model C)

The restricted earth fault relay is high impedance differential scheme which balances zero sequence current flowing in the transformer neutral against zero sequence current flowing in the transformer phase windings. Any unbalance for in-zone fault will result in ana increasing voltage on the CT and thus will activate the Ref protection.

In Model C : If REF is enabled then Restricted Earth Fault current is measured directly from CT terminals and Earth fault is derived from three phase currents (3Io) .

This scheme is very sensitive and can than protect against low levels of fault current in resistance grounded systems where the earthing impedance and the fault voltage limit the fault current.

Negative Phase Sequence Over current (** Available in Model A, C & D)

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 I_2 is Negative phase sequence current then

$$3 \bullet \left|\vec{I}_2\right| = \left|\vec{Ia} + a^2 \bullet \vec{Ib} + a \bullet \vec{Ic}\right| \text{ Where } a = 1\angle 120^0$$

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

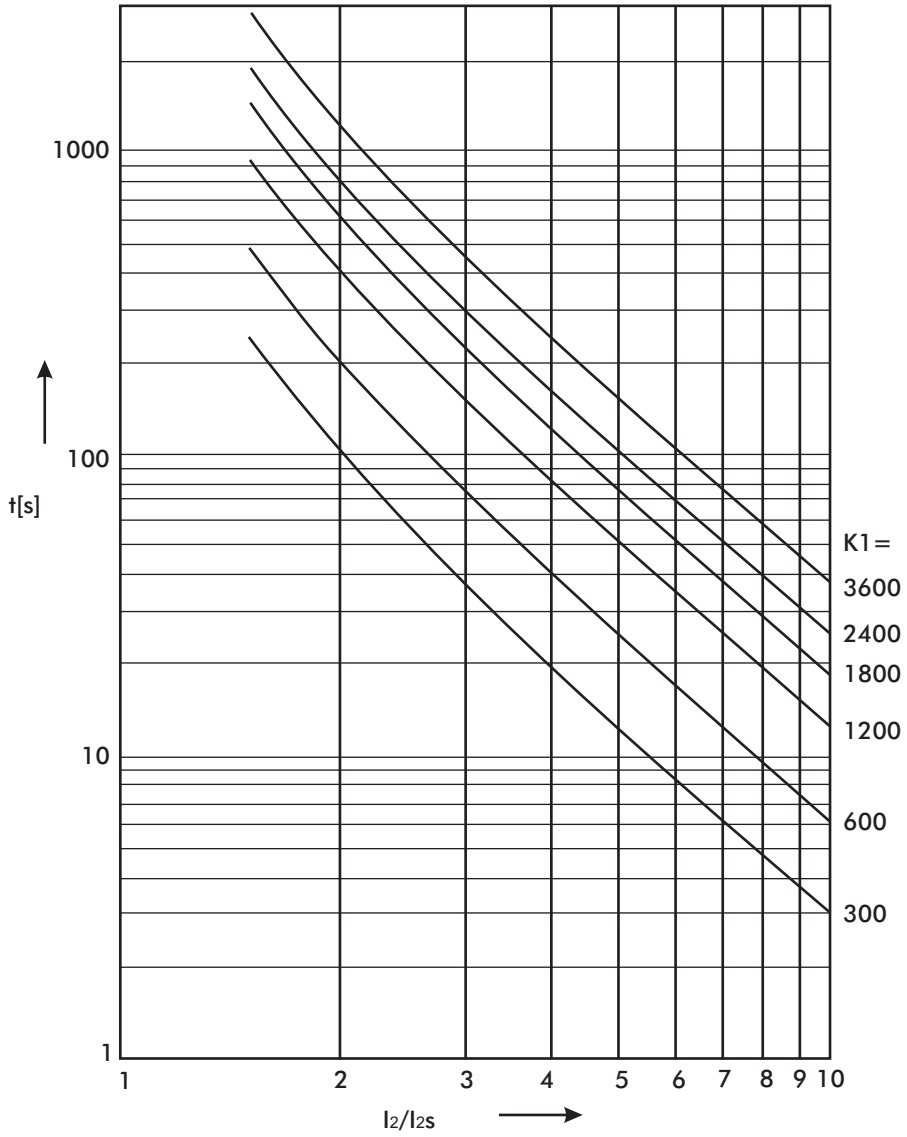
$$t = \frac{K1}{(I_2/I_{2s})^2 - 1}$$

K_1 : 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

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.

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.

CSEZEN 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 CSEZEN 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:-

The formula for calculating the trip characteristics is as follows:

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

with tau= 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
(1) Thermal based on highest measured RMS current

$$I = \sqrt{I_1^2 + I_2^2 + I_0^2}$$

OR
(2) Thermal based on positive & negative sequence measured.

$$I = \sqrt{I_1^2 + \text{Neg\_k} \times I_2^2}$$

where
I_0 = Zero phase sequence current (ZPS)
I_1 = Positive phase sequence current (PPS)
I_2 = Negative phase sequence current (NPS)
Neg_k= is weighting factor of NPS (constant value)

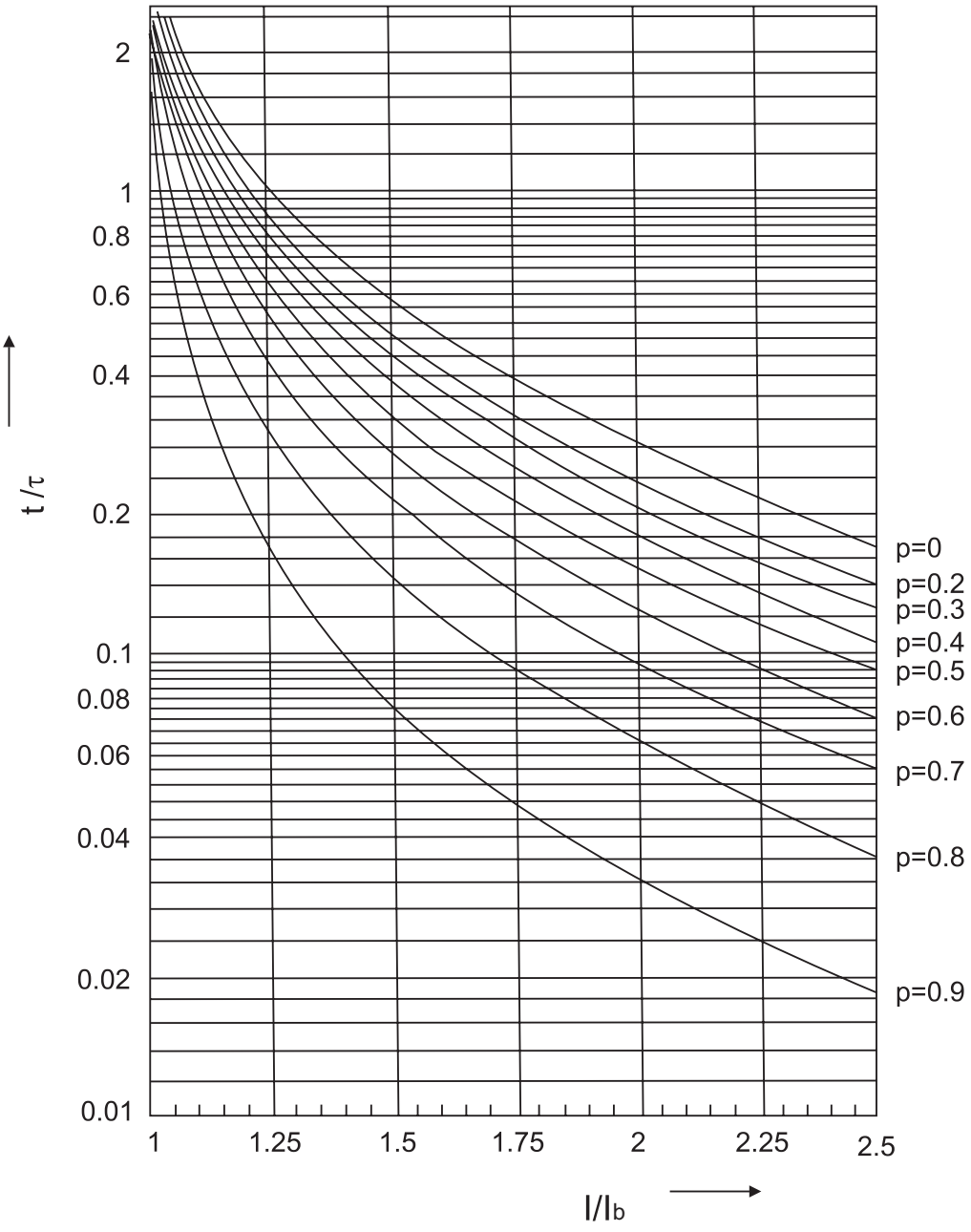
In CSEZEN relay three modes are available for saving of thermal memory during power reset. These modes are programmable.

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.

Presentation of the Trip with variable initial load factor:



Broken Conductor Protection (** Available in Model A, C, D)

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.

CSEZEN 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.

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

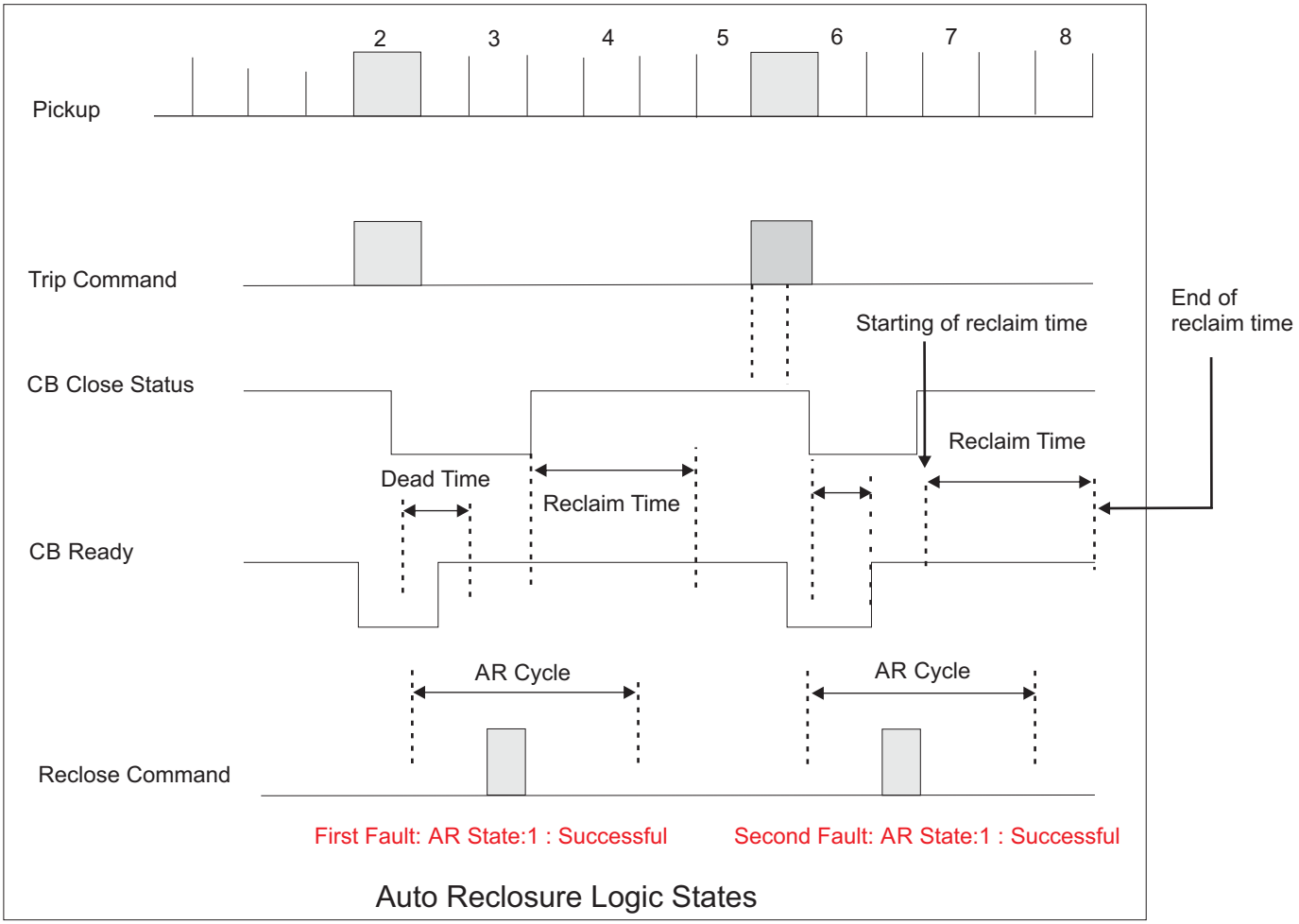
1) AR should be enabled by manual setting.
2) AR blocked DI is not available
3) Respective protection AR cycle should not in exit condition.

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

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 values are replaced by the cold load pickup ones (cold load group settings). 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 (cold load group settings). When expiring this time, the settings are again the usual ones.

Harmonic Blocking

In the CSEZEN relays, starting of the phase current and earth current stage can be blocked under inrush conditions to avoid unsuitable trip during transformer magnetization.
As soon as the ratio of second harmonic component is above the programmed value (in percentage) then selected over current and earth protection will be blocked for a settable duration.

Circuit Breaker Failure Protection

The CB failure protection is based on supervision of phase currents and earth current after tripping events. The test criterion is whether all phase currents have dropped to less than 5% of Nominal value of rated current within the set time (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.

Trip Circuit Supervision

This feature detects any anomalies in the circuit with the switch open or close. It detects trip circuit supply failure of circuit breaker, tripping mechanism failure like circuit breaker contact degeneration in wires, contacts and coils.

Output Relay Latching

Any digital output can be latched. Reset of the latched output is possible by logic input front panel operator interface or by remote communication or through RESET key.

Blocking Logic

CSEZEN relay includes logic inputs, which can be configured to block the selected protection functions. Each protection functions can be locked via a digital input as selected and assigned.

Test of Output Relays

Select the TRIP TEST menu from HMI, then by using backward/forward key it will start operating the output relays & LEDs one by one unless the enter key is pressed again.

Local / Remote CB Control

In CSEZEN-F circuit breaker can be controlled remotely using configurable DIs as well as communication mode.

Setting Group

CSEZEN-F relays have two protection related setting groups. Changes between the groups are executed via the front interface, a dedicated logic input or through the communication port.

To avoid any undesirable tripping, the setting group change is only executed when none of the protection functions are running (deactivated or inhibited).

Time Synchronization

Inside CSEZen there is an internal time clock. Relay supports SNTP Protocol (ordering based). SNTP (Simple network Time Protocol) have mechanisms within the protocol to synchronize the clock and keep it accurate to certain accuracy. The protocol itself has the ability to send commands and re-synchronize the clock so that each attached IED using its synchronization capability on the network is accurate within resolution.. The relay makes the synchronization automatically using SNTP protocol. The internal clock of the relay is synchronized to the UTC time of the NTP server.

8.0 Data Acquisition Function

Measurement

- 3 Phase Current
- Earth current measurement
- Derived Earth current measurement
- Negative / Positive phase sequence current
- Trip counter
- Thermal memory
- AR cycles
- Restricted Earth current

Breaker Maintenance & Analysis

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,

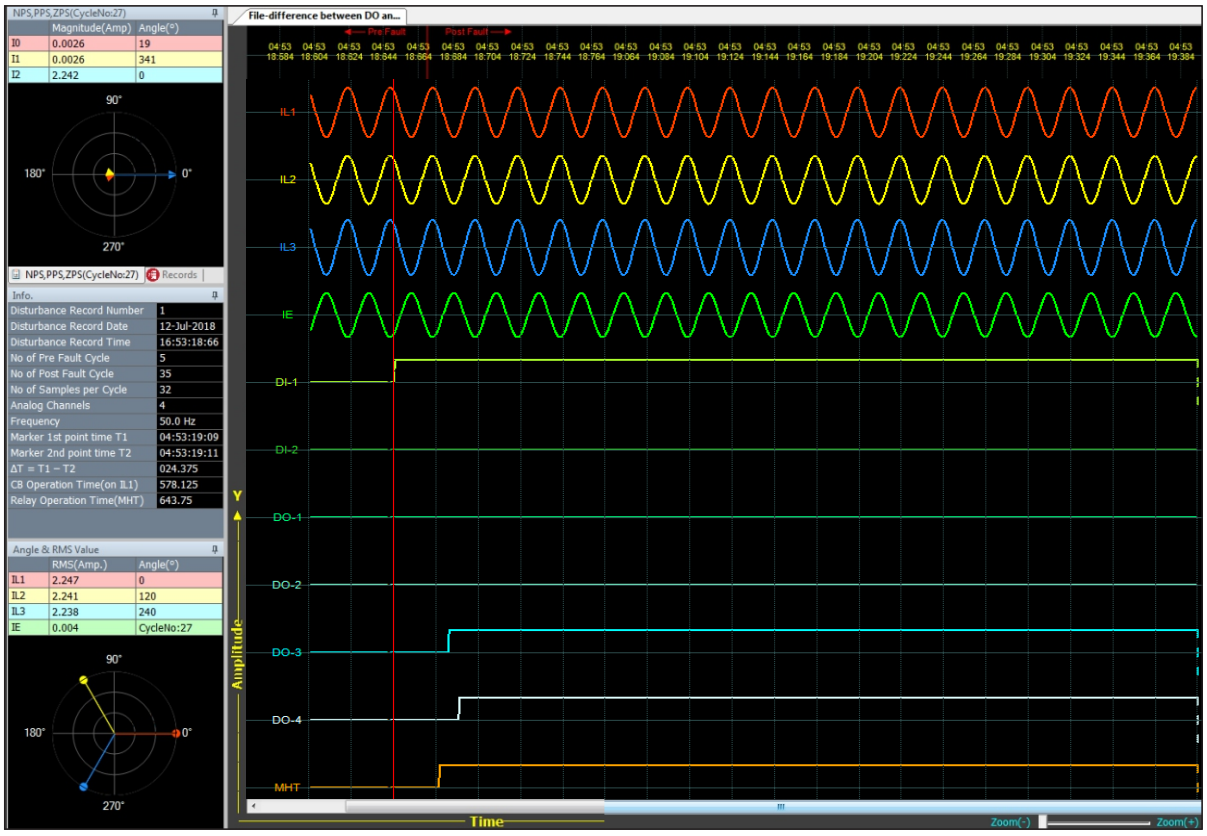
b) Trip coil operation Time

c) Breaker Opening Time

d) Fault clearance Time

e) Breaker Closer Time

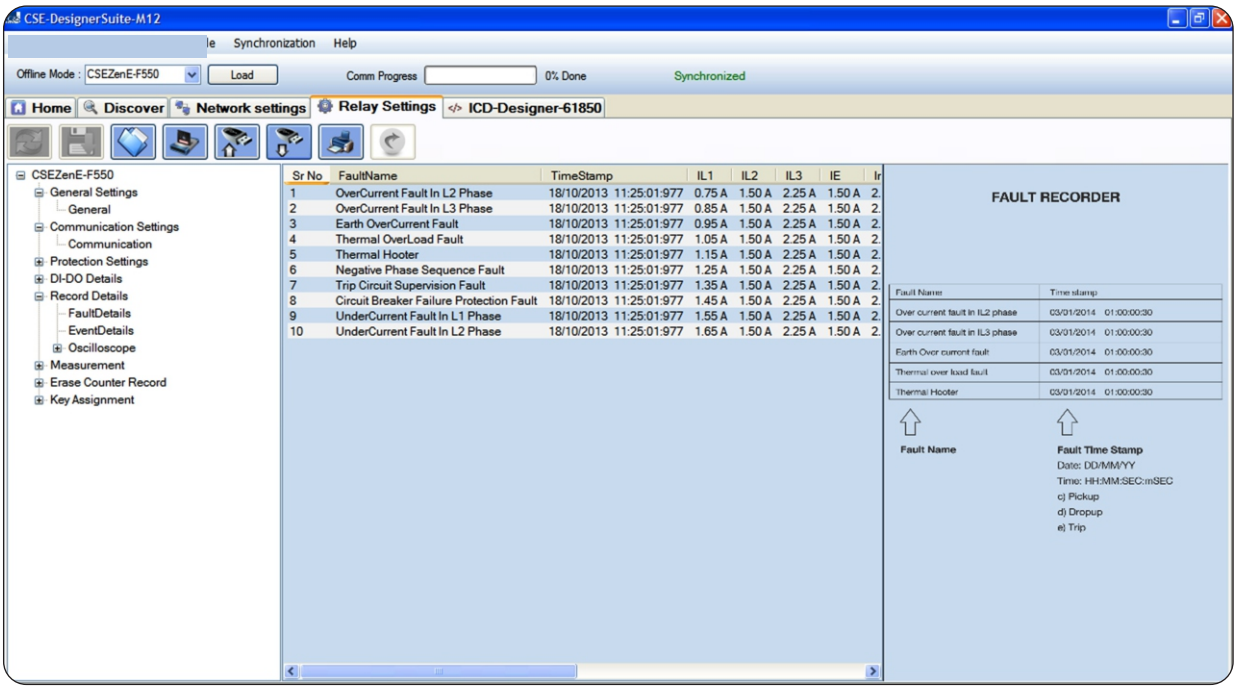
f) Alarm ON system/breaker abnormality



9.0 Fault Record

CSEZEN-F records last 20 faults in its non volatile memory with its time stamp. Each record has the following information:

Fault Format		
I_{I1}	:	XX.XXA
I_{I2}	:	XX.XXA
I_{I3}	:	XX.XXA
I_e	:	XX.XXA
I_2	:	XX.XXA
Iref	:	XX.XXA
Them_mem	:	XXXX%
HR MIN	:	HH:MIN
SEC Ms	:	Sec: mSec
DATE	:	DD:MM:YY
F-TYPE	:	Type of fault

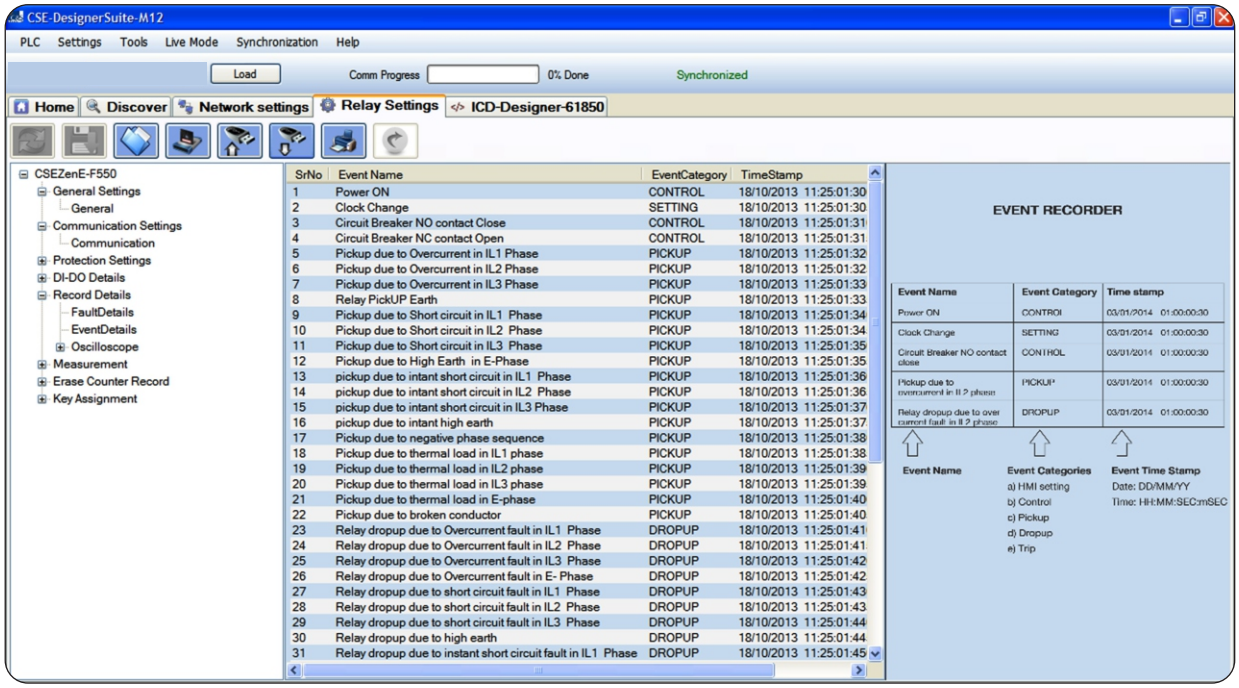


Fault Data recording on PC software

10.0 Event Record

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

The user can view event records via the front USB interface software.



Event Data recording on PC Software

11.0 Disturbance Record

The CSEZEN-F 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 max. 4 analog signals (depends upon the different models) and the status of maximum 8 DIs & max 8 DOs. There will be 30 samples per cycle.
- Relay saves max.1200 cycles, and the no.of cycles per record is programmable which limits the max. no.of records possible to store in the relay (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.
- 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

Output Contacts

Max. No. of digital outputs	:	8 (DO1, DO2 .....DO8) (1 change over)
Type of outputs	:	Relay
Programmable (DO Assignment)	:	Yes
Relay reset type	:	Programmable (Auto/Manual)

Input Contacts

Max. No of digital inputs	:	8 (DI1, DI2..... DI 8)
Type of inputs	:	AC/DC Voltage
Programmable (DI Assignment)	:	Yes

12.0 Communication (Local & Remote)

The unit has:

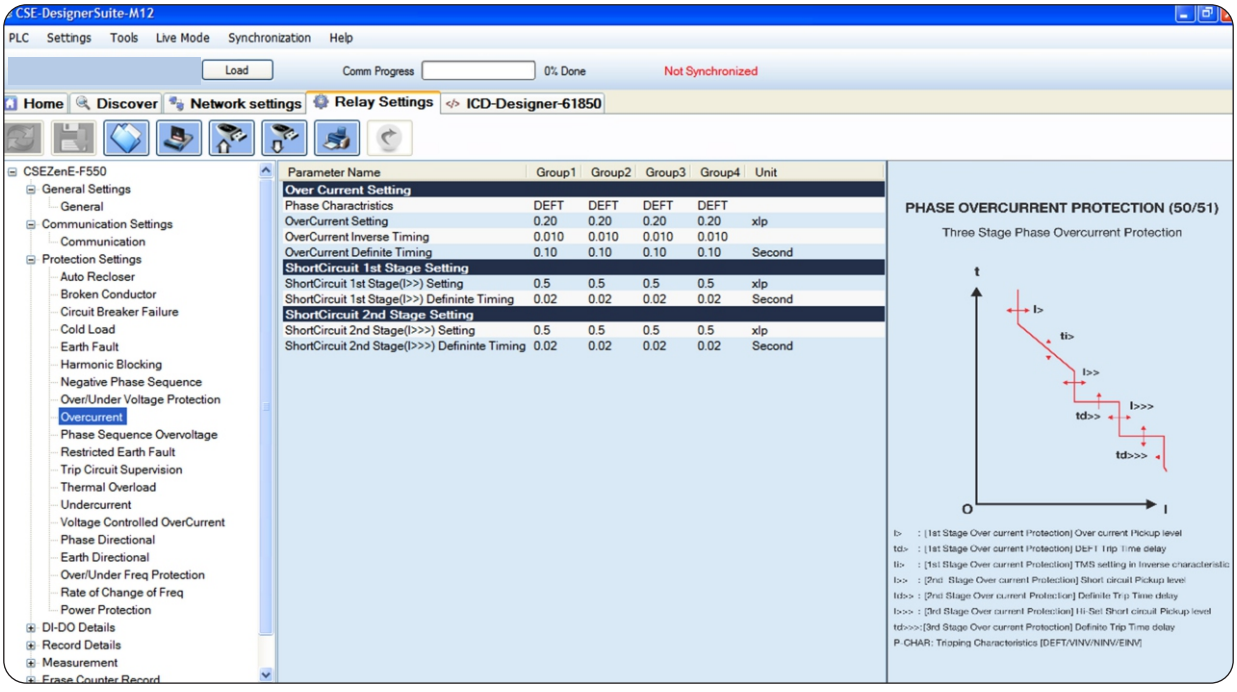
- 1 Front USB port for direct connection to a PC.
- 1 Rear RS-485 communication port.
- 1/2 Rear terminal RJ-45 communication port.

Dual Rear Communication

The communication protocol for the rear port is available in IEC 61850 on RJ-45 and IEC 870-5-103 protocol on RS-485 communication.

Front Communication (USB)

The entire setting including protection parameter setting for both group, Fault, Event & Disturbance record are available on A to 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.

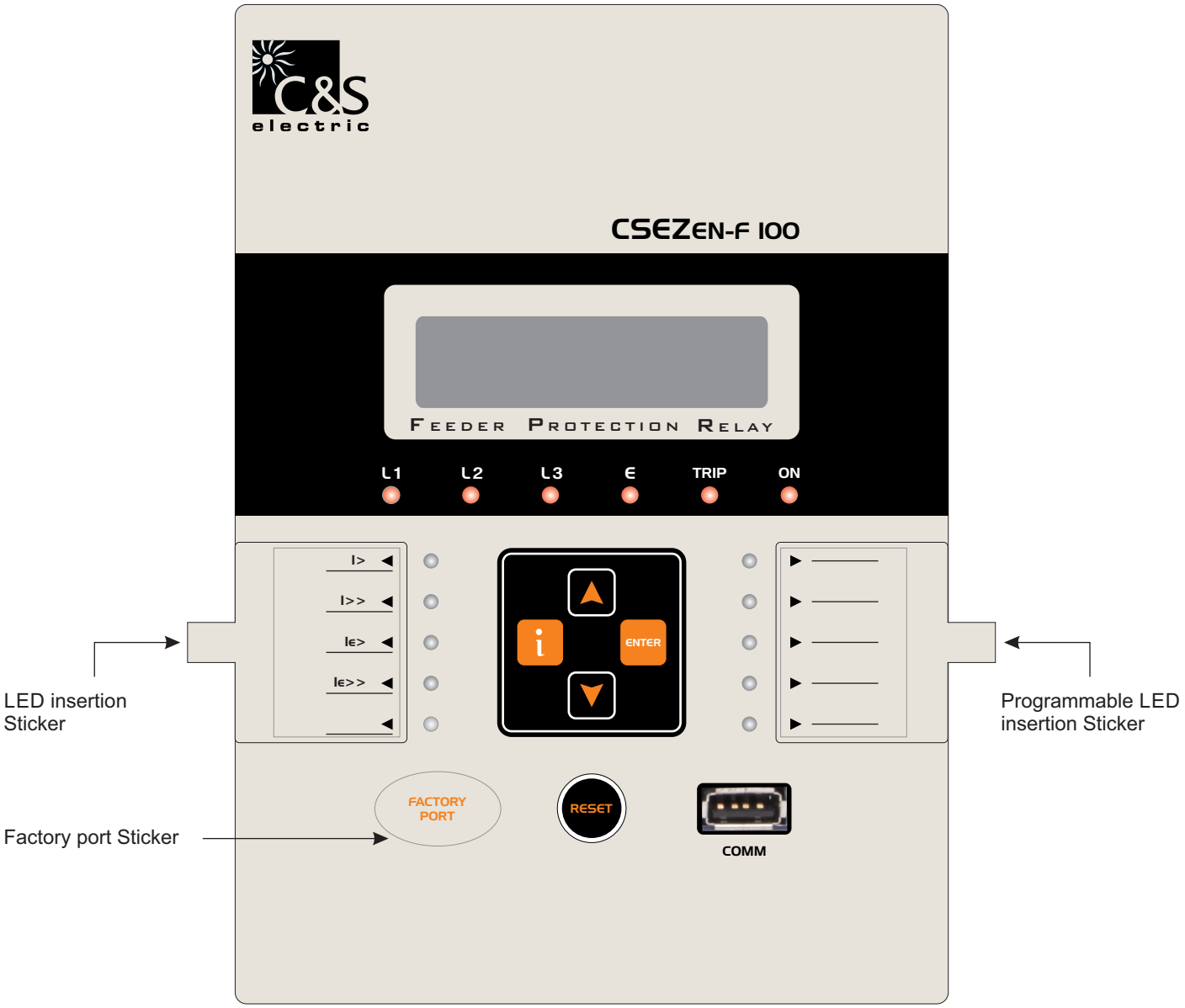


13.0 Human Machine Interface

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.



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.

14.0 Setting Ranges

Over current Protection

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
I> pickup setting Stage-1	I>	0.20xIp	5.00xIp	0.01xIp	Disable
Phase trip characteristic Stage-1	PCURVE	DEFT	EINV,VINV,LIINV,NINV1.3, NINV3.0,NINV0.6	-	DEFT
ti> inverse timing Stage-1	ti>	0.01	1.5	0.005	0.010
t> definite timing Stage-1	t>	000.10sec	150.00sec	0.01sec	000.10sec
I>> pickup setting Stage-2	I>>	0.50xIp	40.00xIp	0.01xIp	Disable
t>> definite timing Stage-2	t>>	000.02sec	20.00sec	0.01sec	000.02sec

(Table-1)

Under Current Protection

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Under Current Pickup Setting	I<	0.20xIp	1.00xIp	0.01xIp	Disable
Under Current Timing	t<	001.00sec	260.00sec	000.01sec	002.00sec
Under Current Threshold	ThrsSet	0.50xIp	1.00xIp	0.05xIp	0.50xIp

(Table-2)

Earth Fault Protection

(* These setting are available for C & D model only)

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Earth pickup setting	Ie>	0.05xIn	2.5xIn	0.01xIn	Disable
Earth characteristic	E-CURVE	DEFT	EINV,VINV,LIINV,NINV1.3, NINV3.0, NINV0.6	-	DEFT
Earth inverse timing	tie>	0.010	1.500	0.005	0.050
Earth definite timing	te>	000.03sec	150.00sec	000.01sec	000.10sec
Earth hi-set pickup setting	Ie>>	0.05xIn	20.00xIn	0.01xIn	Disable
Earth hi-set definite timing	te>>	00.02sec	20.00sec	00.01sec	00.10sec
Derived Earth current function *	Ie_d> Function	Disable	Enable	-	Disable
Derived Earth current Pickup *	Ie_d> Pickup	00.10xIn	15.00xIn	00.01xIn	01.00xIn
Derived Earth current Def. time *	Ie_d> Deft Time	00.02sec	100.00sec	00.01sec	00.10sec
Derived Earth current Hi-set *	Ie_d>> Function	Disable	Enable	-	Disable
Derived Earth current Hi-set Pkup*	Ie_d>> Pickup	00.10xIn	15.00xIn	00.01xIn	01.00xIn
Derived Earth Hi-set Def. time *	Ie_d>> Deft Time	00.02sec	100.00sec	00.01sec	00.10sec

(Table-3)

Restricted Earth Fault

(* Available in Model B & C only)

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
REF pickup current	Iref>	0.05xIn	20xIn	0.01xIn	00.20xIn
REFtrip time	tref>	0 Sec	10 Sec	0.01Sec	1.0 Sec
Earth CT correction factor	ECTcorr	0.1	4.0	0.01	1.0

(Table-4)

Sensitive Earth Over Current

(* Available in Model D only)

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Phase Characteristics	Curve Type	DEFT	EINV, VINV, NINV1.3, LINV NINV3.0, NINV0.6	-----	DEFT
Ie> Current Setting	Ie> Pickup	0.01 Amp	1.5 Amp	0.01 Amp	0.1Amp
Ie> inverse timing	Ie> TD Multiplier	0.01 sec	1.5 sec	0.005 sec	0.1 sec
Ie> Definite timing	Ie> Deft Time	0.03 sec	150 sec	0.01 sec	0.03 sec
Ie>> Current Setting	Ie>> Pickup	0.01Amp	1.5 Amp	0.01 Amp	0.1 Amp
Ie>> Definite timing	Ie>> Deft Time	0.03 sec	150 sec	0.01 sec	0.03 sec

(Table-5)

Cold Load Protection

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Cold load pickup	CLP PKUP	ENABLE	DISABLE	-	100
Cold load time	tcold	00000sec	1000sec	0.1sec	0001.0sec
Cold load pickup time	tclp	0.1sec	1000sec	0.1sec	0001.0sec
I> pickup setting Stage-1	I>	0.20xIp	5.00xIp	0.01xIp	Disable
Phase trip characteristic Stage-1	PCURVE	DEFT	EINV,VINV,LIINV,NINV1.3, NINV3.0,NINV0.6		DEFT
ti> inverse timing Stage-1	ti>	0.01	1.5	0.005	0.050
t> definite timing Stage-1	t>	000.10sec	150.00sec	0.01sec	000.10sec
I>> pickup setting Stage-2	I>>	0.50xIp	40.00xIp	0.01xIp	Disable
t>> definite timing Stage-2	t>>	000.02sec	20.00sec	0.01sec	000.10sec
Ie> pickup setting Stage-1	Ie>	0.05xIn	2.5xIn	0.01xIn	Disable
Earth characteristic	E-CURVE	DEFT	EINV,VINV,LIINV,NINV1.3, NINV3.0, NINV0.6		DEFT
Earth inverse timing	tie>	0.010	1.500	0.005	0.050
Earth definite timing	te>	0.03sec	150.0sec	0.01sec	0.10sec
Earth hi-set pickup setting	Ie>>	0.05xIn	20.0xIn	0.01xIn	Disable
Earth hi-set definite timing	te>>	00.02sec	20.0sec	0.01sec	0.10sec

(Table-6)

Trip Circuit Supervision

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Trip circuit supervision	td	0.03sec	2.00sec	0.01sec	Disable

(Table-7)

Negative Phase Sequence

(* Available in Model A, B, C only)

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
NPS Pickup Setting	I2> Pickup	0.10xIp	1.00xIp	0.01xIp	Disable
NPS Trip Characteristic	I2> Characteristics	DEFT	INVERSE	-	DEFT
Time Multiple	K1 TD Multiplier	05	600	01	05
Definite Time Delay	t2> Deft time	00.1sec	600.0sec	00.1sec	00.2sec

(Table-8)

Circuit Breaker Failure

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Circuit breaker failure protection time delay	tCBFP	0.03sec	2.00sec	0.01sec	Disable

(Table-9)

Harmonic Blocking

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Phase 2nd harmonic block	P2ndH	10%If	50%If	1%If	Disable
Phase 3rd harmonic block	P3rdH	10%If	50%If	1%If	Disable
Earth 2nd harmonic block	E2ndH	10%If	50%If	1%If	Disable
Earth 3rd harmonic block	E3rdH	10%If	50%If	1%If	Disable
Phase blocking time	tPHASE	00.00sec	20.00sec	00.10sec	00.00sec
Earth block time	tEARTH	00.00sec	20.00sec	00.10sec	00.00sec

(Table-10)

Active Group Setting

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Active Group	ACTIVE	GROUP1	GROUP2	-	GROUP1
Group Toggle Step	TOGGLE STEP	+1	+2	1	+1

(Table-11)

Broken Conductor Protection

(* Available in Model A, C, D only)

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
NPS to PPS Ratio	I2/I1 Ratio	0.10	0.50	0.01	Disable
Definite Time for broken conductor fault	(BC)Deft Time	0.05sec	20.00sec	0.01sec	0.10sec

(Table-12)

Auto Re-closer 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	000.20sec	300.00sec	000.01sec	000.20sec
Set Dead Time-2	D2	000.2sec	300.00sec	000.01sec	000.20sec
Set Dead Time-3	D3	000.2sec	300.00sec	000.01sec	000.20sec
Set Dead Time-4	D4	000.2sec	300.00sec	000.01sec	000.20sec
Set Reclaim Time	tR	000.2sec	300.00sec	000.01sec	000.20sec
Cycle I>	Cyc I>	2	4/Disable	1	2
Cycle I>>	Cyc I>>	2	4/Disable	1	2
Cycle Ie>	Cyc Ie>	2	4/Disable	1	2
Cycle Ie>>	Cyc Ie>>	2	4/Disable	1	2
Trip sense time	t_TST	0.05sec	2.00sec	0.01sec	0.02sec

(Table-13)

Thermal Replica Setting

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Thermal memory mode	MemMod	M1	M2/M3	-	M1
Permissible basic current	Ib	0.20xIp	4.00xIp	0.02xIp	Disable
Constant	k	0.50	2.00	0.01	1.00
Heating time constant	Th	000.5min	180.0min	000.1min	000.5min
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%

(Table-14)

DO Assignment

Parameters	Display
Over current alarm	aI>
Over current trip	tI>
Short circuit stage alarm	aI>>
Short circuit stage trip	tI>>
Earth protection alarm	aIe>
Earth protection trip	tIe>
Earth high protection alarm	aIe>>
Earth high protection trip	tIe>>
Restricted Earth Fault alarm***	aREF
Restricted Earth Fault trip***	tREF
Negative phase sequence protection alarm **	aI2>
Negative phase sequence protection trip **	tI2>
Thermal alarm	TH Alm
Thermal relay	TH trp
Auto re-close	AR CLS
Auto re-close lockout	Arlock
Trip circuit supervision	TCS
Circuit breaker failure protection	CBFP
Self supervision	SLF SU
Under current protection alarm	aI<
Under current protection trip	tI<
Derived Earth Stage1 Pickup *	Ie_d>Pickup1
Derived Earth Stage1 Trip *	Ie_d>Trip1
Derived Earth Stage2 Pickup *	Ie_d>Pickup2
Derived Earth Stage2 Trip *	Ie_d>Trip2
Broken conductor protection alarm **	aBC>
Broken conductor protection trip **	tBC>
Circuit breaker open	CB open
Circuit breaker close	CB close
Remote trip-1	RmtTp1
Remote trip-2	RmtTp2
Remote trip-3	RmtTp3
Remote trip-4	RmtTp4
Remote trip-5	RmtTp5
Remote trip-6	RmtTp6
DO Block	DOBlk

(Table-15)

Note: * Available in Model C, D only

** Available in Model A, C, D only

*** Available in Model B, C only

LED Assignment

Parameters	Display
Over current alarm	aI>
Over current trip	tI>
Short circuit stage alarm	aI>>
Short circuit stage trip	tI>>
Earth protection alarm	aIe>
Earth protection trip	tIe>
Earth high protection alarm	aE>>
Earth high protection trip	tE>>
Negative phase sequence protection alarm **	aI2>
Negative phase sequence protection trip **	tI2>
Restricted earth fault protection alarm ***	aRE>
Restricted earth fault protection trip ***	tRE>
Broken conductor protection alarm **	aBC>
Broken conductor protection trip **	tBC>
Circuit breaker open	CB open
Circuit breaker close	CB close
Thermal trip	Thtp
Thermal alarm	Thal
Auto re-close	ARCL
Auto re-close lockout	Arlk
Trip circuit supervision	TCS
Circuit breaker failure protection	CBFP
Self supervision	SLFS
Under current protection alarm	aI<
Under current protection trip	tI<
Derived Earth Stage1 Pickup *	Ie_d>Pickup1
Derived Earth Stage1 Trip *	Ie_d>Trip1
Derived Earth Stage2 Pickup *	Ie_d>Pickup2
Derived Earth Stage2 Trip *	Ie_d>Trip2
Remote trip-1	RmT1
Remote trip-2	RmT2
Remote trip-3	RmT3
Remote trip-4	RmT4
Remote trip-5	RmT5
Remote trip-6	RmT6
Common Block	Cblk
Common Pickup	CmPk
Common Trip	CmTr
Healthy LED	Hled
Out of Service	Oofs

Note: * Available in Model C, D only

** Available in Model A, C, D only

*** Available in Model B, C only

(Table-16)

DI Assignment

Parameters	Display
Circuit breaker close	CB Cls
Circuit breaker open	CB Opn
CB Ready	CB Rdy
Remote trip-1	RmtTp1
Remote trip-2	RmtTp2
Remote trip-3	RmtTp3
Remote trip-4	RmtTp4
Remote trip-5	RmtTp5
Remote trip-6	RmtTp6
Group toggle	GRP tog
Remote reset	RmtRst
Oscillator trigger	OSC Tg
Over current block	I> BLK
Short circuit stage1 block	I>> BK
Earth block	E> BLK
Earth high block	E>> BK
Auto re-close block	AR BLK
Thermal block	Th BLK
Cold load pickup block	CldBLK
Restricted earth fault block ***	REF>BK
Under current block	I<BLK
Derived Earth Stage1 Blocking *	Ie_d>Blk1
Derived Earth Stage2 Blocking *	Ie_d>Blk2
Negative phase sequence block **	I2> BLK
Broken conductor block **	BC BLK

(Table-17)

Note: * Available in Model C, D only

** Available in Model A, C, D only

*** Available in Model B, C only

Function Reset

Parameters	Display
Over current alarm	aI>
Over current trip	tI>
Short circuit stage alarm	aI>>
Short circuit stage trip	tI>>
Earth protection alarm	aIe>
Earth protection trip	tIe>
Earth high protection alarm	aIe>>
Earth high protection trip	tIe>>
Negative phase sequence protection alarm **	aI2>
Negative phase sequence protection trip **	tI2>
Restricted earth fault protection alarm ***	aREF
Restricted earth fault protection trip ***	tREF
Thermal alarm	Thm Alrm
Thermal trip	Thm Trip
Auto reclose	AR Close
Trip circuit supervision	TCS
Under current protection alarm	aI<
Under current protection trip	tI<
Derived Earth Stage1 Pickup *	Ie_d>Pickup1
Derived Earth Stage1 Trip *	Ie_d>Trip1
Derived Earth Stage2 Pickup *	Ie_d>Pickup2
Derived Earth Stage2 Trip *	Ie_d>Trip2
Broken conductor protection alarm **	aBC>
Broken conductor protection trip **	tBC>
Remote trip-1	RmtTrp1
Remote trip-2	RmtTrp2
Remote trip-3	RmtTrp3
Remote trip-4	RmtTrp4
Remote trip-5	RmtTrp5
Remote trip-6	RmtTrp6
DO Block	DOBlk

Note: * Available in Model C, D only

** Available in Model A, C, D only

*** Available in Model B, C only

(Table-18)

Erase Counter Record

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Trip Count	Trip_Cntr	NO	YES	-	NO
Thermal Memory Reset	ThrmLRset	NO	YES	-	NO
Erase Events	EventsErase	NO	YES	-	NO
Erase Faults	FaultsErase	NO	YES	-	NO
Oscillator Record Erase	OscRcrdEras	NO	YES	-	NO

(Table-19)

Common Setting

These are the setting's common for all the protections:

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Phase Rated Current	Ip	1.00Amp	5.00Amp	-	1.00Amp
Earth Rated Current	In	1.00Amp	5.00Amp	-	1.00Amp
REF Rated Current	Iref	1.00Amp	5.00Amp	-	1.00Amp
Phase CT Ratio	Ph CTR	001	9999	1	001
Earth CT Ratio	E CTR	001	9999	1	001
Nominal Frequency	FREQ (Fn)	50Hz	60Hz	10Hz	50Hz
Fault Message Status	[F]Stat	Disable	Enable	-	Disable
Out of Service	OutofSer	Disable	Enable	-	Disable

(Table-20)

Disturbance Record

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

(Table-21)

Rear Communication (* Model dependent)

Parameters		Default Setting
Baud rate selection (programmable)	9600 / 19200 / 38400 bps	9600 bps
Parity selection (programmable)	EVEN / ODD / NONE	NONE
Stop bit	1 Bit	1 Bit
Data bit	8 Bit data	8 Bit data
Remote address (programmable)	254	1
Cable required for Interface	Two wire twisted shielded cable	------

(Table-22)

Front Communication	
Protocol	CSE Proprietary Protocol: available with front software
Baud rate	19200 bps
Cable required for Interface	USB cable type (A to A)

(Table-23)

15.0 Technical Data

Measuring Input

Rated Data	Rated current I_n :1A or 5A
	Rated frequency F_n : 50 Hz / 60 Hz
Drop out to Pickup Ratio	>96%
Reset Time	30mSec
AC Current	At I_n=1A <0.1 VA
VA Burden	At I_n=5A <0.2 VA
AC Voltage VA Burden	 At V_n=110V <0.06 VA
Thermal withstand capability in current circuit	Dynamic current withstand for 1 Sec : 100 x I_n for 10 Sec : 30 x I_n continuously : 4 x I_n

(Table-24)

Trip Time Accuracy for Current Protections

Parameters	Accuracy
Trip time accuracy for protections except NPS & REF	±30mSec OR ±5% (whichever is higher)
Trip time accuracy for NPS	±60mSec OR ±7.5% (whichever is higher)
Trip time accuracy for REF	Corresponding to error generated by inaccuracies in each phase ±30mSec OR ±5% (whichever is higher)

(Table-25)

Measurement Accuracy

Parameters	Range	Frequency Range	Accuracy
Current in Ampere	1.0-30xIn	50-60Hz	Less than ± 2%

(Table-26)

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	10,000 operation minimum
Unloaded contact	30,000 operation minimum

(Table-27)

Auxiliary Supply

Rated auxiliary voltage U_H	For L Model	18V-150V DC ±10%
	For H Model	80V-280V AC / 90V-300V DC ±10%
Rated supply for digital input	Normal Voltage U_N For H Model	40V-280V AC (Active)
		40V-300V DC (Active)
		<25V AC (Inactive)
		<25V DC (Inactive)
	Normal Voltage U_N For L Model	18V - 150V DC (Active)
		<10V DC (Inactive)
Power consumption	Quiescent approx. 3W	Operating approx. <7W

(Table-28)

Common Data

Dropout ratio	> 96%
Relay reset time	30 ms
Minimum operating time	30 ms
Transient overreach at instantaneous operation	≤5 %

(Table-29)

Date & Time Setting

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Hour	HOUR	0	23	1	---
Minute	MIN	0	59	1	---
Second	SEC	0	59	1	---
Date	DATE	1	31	1	---
Day	DAY	SUN	SAT	1	---
Month	MONTH	Jan	Dec	1	---
Year	YEAR	00	99	1	---

(Table-30)

Specification Table of CSEZEN-F (Model A, Model B, Model C & Model D)

Function	ANSI	Model - A	Model - B	Model - C	Model - D
CT Configuration	–	3OC + 1EF	2 OC+1EF+1REF	3 OC+EF+REF	3 OC+EF+SEF
3 Phase Over current	50/51P	✓	✓	✓	✓
3 Phase instantaneous Over current	50	✓	✓	✓	✓
Ground Time Over current	50N	✓	✓	✓	✓
Ground Time instantaneous Over current	50N	✓	✓	✓	✓
Derived Earth Over current	50N	x	x	✓	✓
Negative Phase Seq. Over current	46	✓	x	✓	✓
Broken Conductor	46BC	✓	x	✓	✓
Auto Re-closer	79	✓	✓	✓	✓
Cold Load Pickup	62 CLD	✓	✓	✓	✓
Thermal Over-load	49	✓	✓	✓	✓
3 Phase under current	37P	✓	✓	✓	✓
Restricted Earth (High impedance)	64R	x	✓	✓	x
Sensitive Earth Fault	51SG	x	x	x	✓
Harmonic Blocking	50H	✓	✓	✓	✓
Trip Circuit Supervision (TCS)	74TC	✓	✓	✓	✓
CBFP	50BF	✓	✓	✓	✓
Output Relay Latching	86	✓	✓	✓	✓
Self Supervision	–	✓	✓	✓	✓
Current Analog Input	–	4	4	4	4
Fault Record	–	20	20	20	20
Event Record	–	500	500	500	500
Disturbance Record	–	✓	✓	✓	✓
Selection of 1/5A (Site selectable)	–	✓	✓	✓	✓
Digital Input	–	8	8	8	8
Digital Output	–	8	8	8	8
Alpha numeric LCD Display	–	16x2	16x2	16x2	16x2
LEDs for Pickup & Trip on fault	–	16	16	16	16
Push Button for HMI	–	5	5	5	5
Draw out Enclosure with self CT shorting	–	✓	✓	✓	✓
Front Communication	–	✓	✓	✓	✓
Rear Communication (RS-485/RJ-45) (ordering based)	–	✓	✓	✓	✓

(Table-31)

16.0 Standards

Type Test			
F1	Functional Tests	Internal Design	Performance in line with Specification & Standards
		Specifications & IEC60255-6 IEC60255-3	Pickup/Drop down/Power consumption in Current/Voltage/Aux Supply/Trip timing accuracy: OC/ Directional/NPS/Thermal/OV/Zero Seq/Over Power/ freq/Rate of change of Freq

Climatic Test			
C1	Temperature Dry Cold (Relay operational)	IEC 60068-2-1	-20 deg C, 96 hours
C2	Temperature Dry Cold Transportation & Storage	IEC 60068-2-1	-25 deg C, 96 hours
C3	Temperature Dry Heat (Relay operational)	IEC 60068-2-2	55 deg C, 96 hours
C4	Temperature Dry Heat Transportation & Storage	IEC 60068-2-2	70 deg C, 96 hours
C5	Damp Heat Test (Relay operational)	IEC 60068-2-3	95% @ +55 / +25 deg C, 6 cycle (12hr + 12hr each)

Enclosure			
C6	Enclosure	IEC 529	Front IP54 (Dust5x + Water x4)

Mechanical Test

Relay Operational			
M1	Vibration response / Endurance test	IEC 60255-21-1	Class I Vibration response (Relay operational) 10Hz~150 Hz - peak displacement 0.035 mm below 58/60 Hz, 0.5 g above, 1 sweep cycle in each axis Vibration endurance (Relay de-energised) 10 Hz~150 Hz 1g, 20 sweep cycles in each axis
M2	Shock Response / withstand test	IEC 60255-21-1	Class I Shock response (Relay operational) 5g 11mS 3 pulse in each axis Shock withstand (Relay de-energised) 15g 11mS 3 pulses in each axis
M3	Bump	IEC 60255-21-1	Bump (Relay de-energised) 10g 16mS 1000 pulses in each axis
M4	Seismic	IEC 60255-21-3	Class I Method A single axis sine sweep 1 Hz~35 Hz–below 8/9 Hz 3.5 mm peak displacement horizontal axis, 1.5 mm vertical axis above 8/9 Hz 1g horizontal, 0.5 g vertical 1 sweep cycle in each axis

Electrical Test			
E1	Insulation Resistance >100MΩ	IEC 60255-5	500V DC, 5 sec between all terminals & case earth, between terminals of independent circuits including contact circuits and across open contacts
E2	DC & AC Supply Voltage (Relay operational)		IEC60255-6Voltage range, upper & lower limit continuous withstand, ramp up & down over 1 minute
E3	Voltage Dips, Short Interruptions & Voltage variations immunity (Relay operational)	IEC 1000-4-11	IEC60255-113 Dips & 3 Interruptions at 10 sec intervals of duration between 10mS and 500mS at zero crossings & at other points on wave Variation: 100% to 40% over 2s, hold for 1s, return to 100% over 2s
E4	Ripple in DC supply (Relay operational)	IEC 60255-11	12% AC ripple
E5	Dielectric Test (Relay de-energised) No breakdown or flash over Test voltage 45~65 Hz sinusoidal or with DC voltage at 1.4x the stated AC values	IEC 60255-5	2.0 KV @ 1min All circuit to Earth / Between IP & OP except communication terminals
E6	High Voltage Impulse (Relay de-energised)	IEC 60255-5	5 kV peak 1.2/50uS, 0.5 J-3 positive, 3 negative between all terminals to case earth between independent circuits
E7	VT Input Thermal Withstand		1.5xVn, continuous
E8	CT Input Thermal Withstand		250xIn half wave 100xIn for 1 second 30xIn for 10 second 4xIn continuously
E9	Contact performance & endurance tests	IEC 60255-14,15 IEC 60255-23	

Electro-magnetic Compatibility			
R1	Electrical fast Transient/Burst (Relay operational)	IEC 60255-22-4 IEC 60100-4-4	Class IV ±4.0 kV All Circuits. Pulse 5/50msec / Duration 15msec / Period: 300msec/ Pulse Freq: 5KHz / 2KV at I/O
R2	HF Disturbance Test (Oscillatory Waves) 1 MHz Burst (Relay operational)	IEC 60255-22-1	Class III Longitudinal 2.5 kV peak, 2sec between independent circuits & case earth
R3	Electrostatic Discharge (Relay operational)	IEC 60255-22-2 IEC 61000-4-2	Class III 8kV air discharge, 6KV contact No of Discharge : 10 both polarities at 1 sec intervals
R4	Conducted Disturbance RF fields (Relay operational)	IEC 61000-4-6 IEC 60255-22-6	0.15 to 80 MHz (Level-3) Severity Level 10V RMS + sweeps 0.05-0.15 MHz & 80-100 MHz
R5	Radiated RF E-M field immunity test (Relay operational)	IEC 60255-22-3 IEC 61000-4-3	Class III Test method A + sweep 80-1000 MHz or IEC 1000-4-3 80-1000 MHz severity 10 V/m 80% modulated 1 kHz
R6	Surge Immunity capacitively coupled (Relay operational)	IEC 61000-4-5 Class 5 Test level 4 IEC 60255-22-5: 2008 Latest: IEC 60255-26:2013	Short circuit combination wave generator 1.2 uS/50 uS open circuit repetition rate 1 per minute Power supply, CT & VT circuits – 4kV common mode 2 Ohm source 2kV differential mode 12 Ohm source
R7	Power Frequency Magnetic Field (Relay operational)	IEC 61000-4-8	100 A/m for 1 minute in each of 3 axes
R8	Conducted & Radiated RF Interference Emission (Relay operational)	EN55011 IEC 60255-25	CISPR11 / Class A
R9	Power Frequency, conducted common mode	IEC 1000-4-16 IEC 60255-22-7	D.C. to 150 kHz Test Level 4 300V at 16 2/3 Hz and 50 Hz

17.0 Recommended Terminal Lugs Specifications

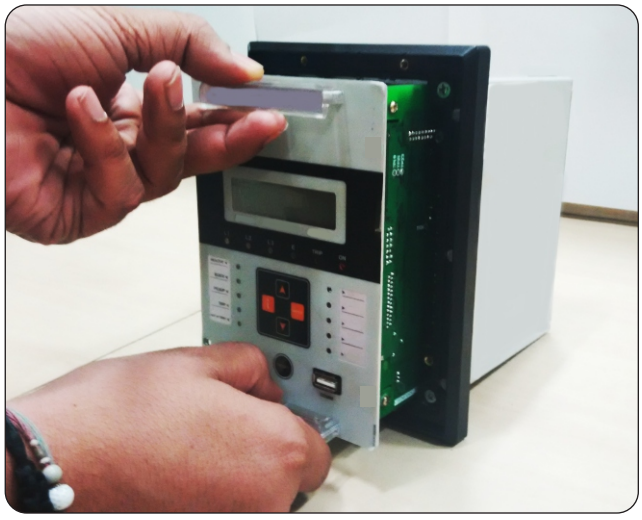
Term Blocks	Type/Cable Specifications
Current Inputs	Ring Type lug / 2.5mm^2 or 4 mm^2 control cable
Auxiliary Supply	Pin Type lug / 1.5 mm^2 / 2.5 mm^2 control cable
Rear Comm. Port	Pin Type lug / 1.5 mm^2 / 2.5 mm^2 control cable
Front Comm. Port	USB, Type A to A
Binary Input	Pin Type lug / 1.5mm^2 / 2.5mm^2 control cable
Binary Output	Pin Type lug / 4.0mm^2 control cable
Earth Connections	Ring Type / 2.5mm^2 or 4 mm^2 contact cable

Cable required for Front USB Communication (Type A to A)

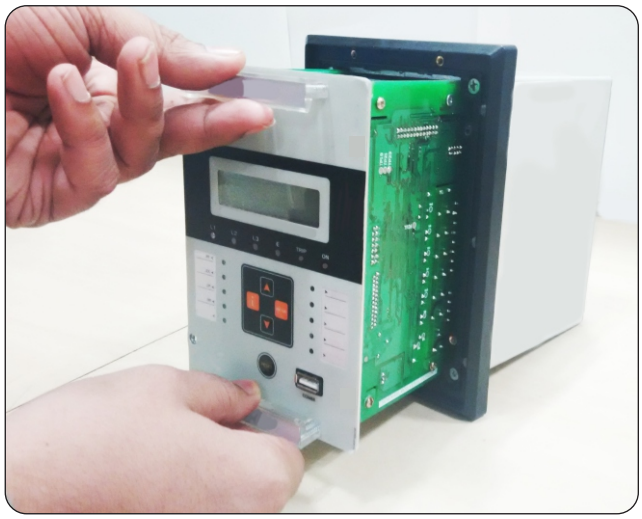
* Additional Accessories (Not a part of standard supply)

18.0 Draw out process of the Relay

First Open the screw fitted with Bezel using the appropriate screw driver then hold the Eject Handle.



Use the Eject handle to bring out the Relay from the enclosure as shown in the left image.



Bring out the Relay gently by dragging it outside, extra pressure can be the cause of relay damage.

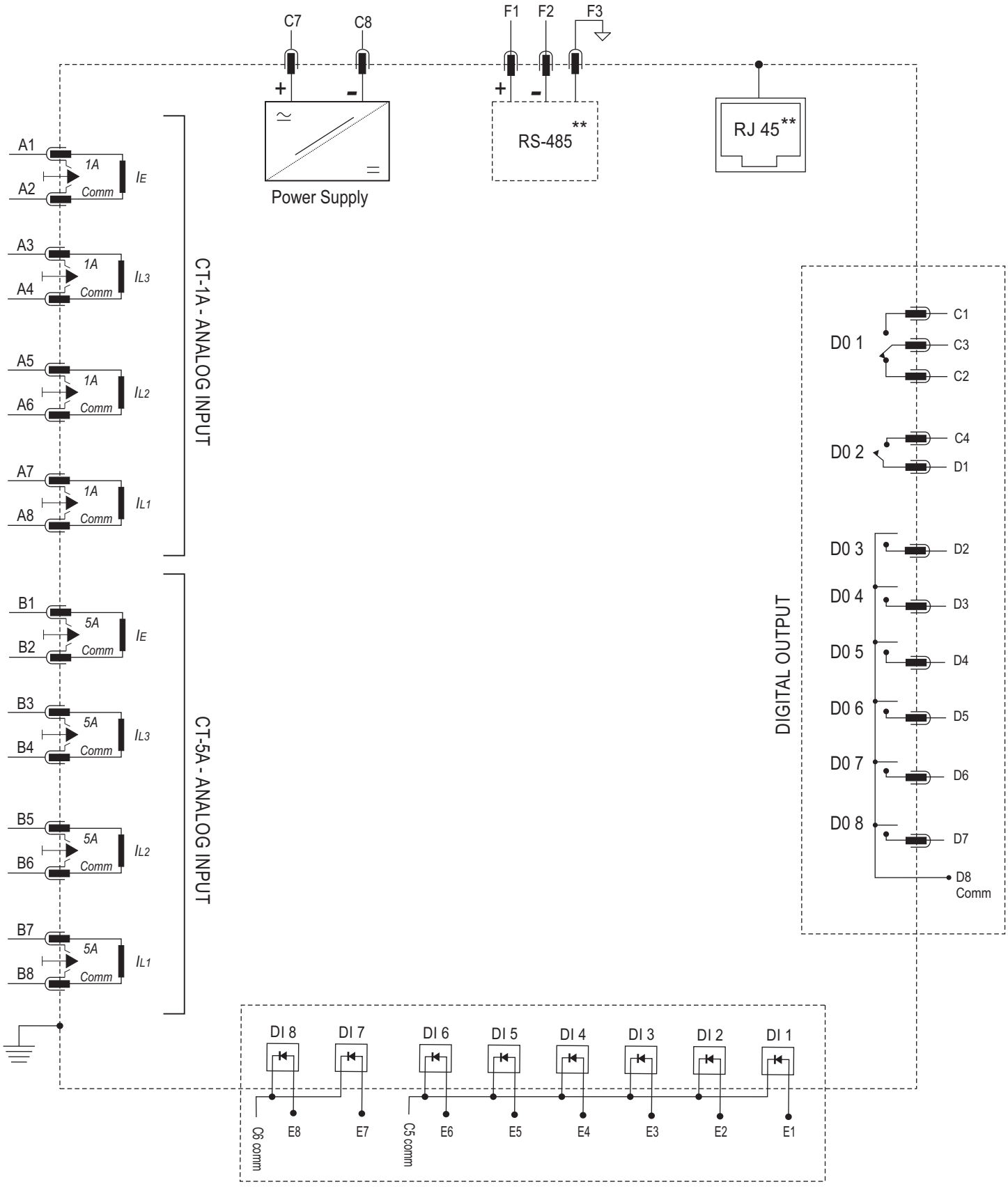
Similarly while bringing in the Relay, Handle should be in uplift condition.

19.0 Back Terminal view of the Relay

Back view with RJ-45 Rear communication

Back view with RS-485 Rear communication

20.0 Terminal Diagram - ZEN-F100-A Model

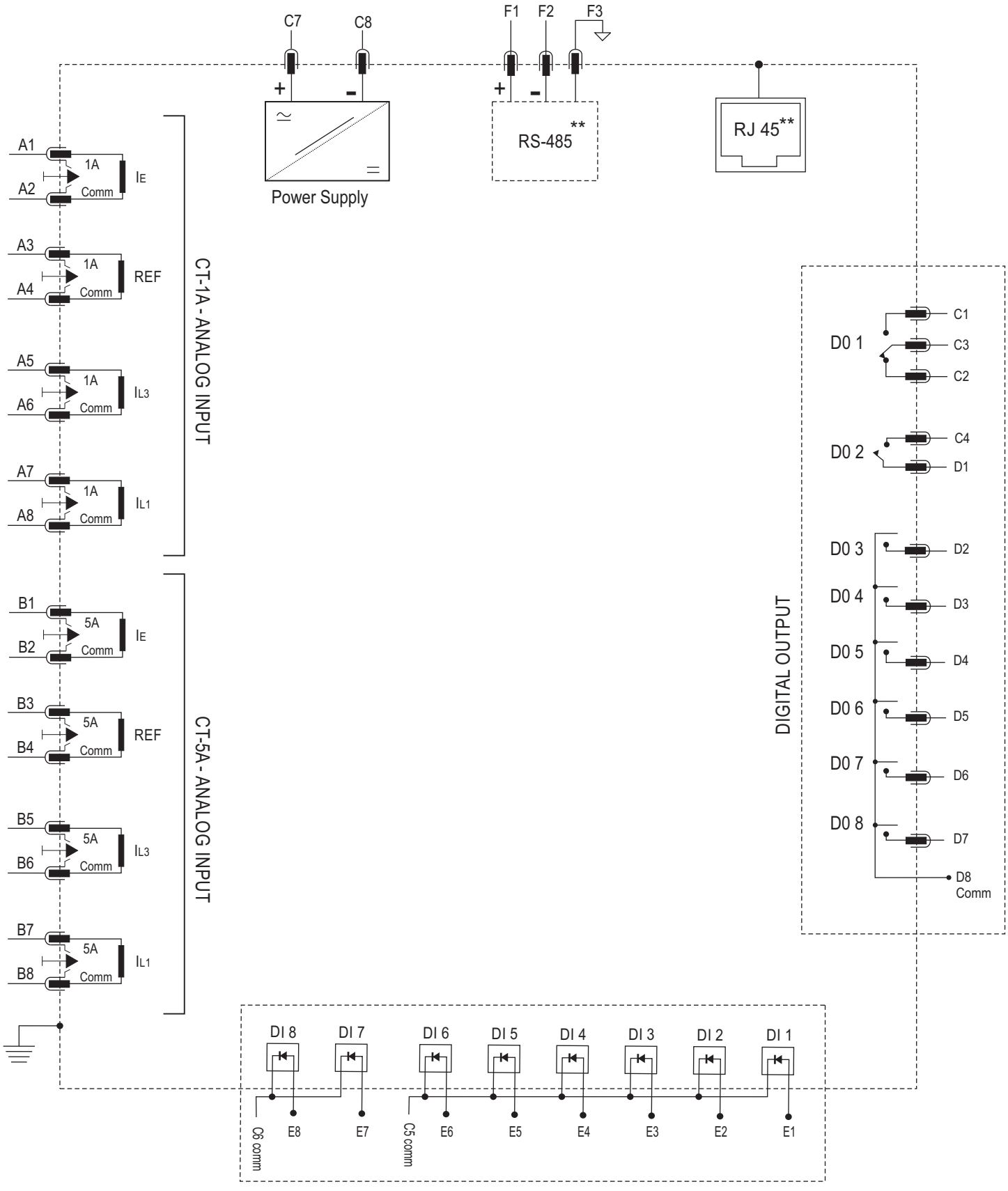


** *Optional*

Terminal Description - 'A' model

Terminal No.		Terminal Description		Contact Details
A1-A2	:	CT Terminal for Earth current input (1A)		
A3-A4	:	CT Terminal for Phase current (1A) input in L3 Phase		
A5-A6	:	CT Terminal for Phase current (1A) input in L2 Phase		
A7-A8	:	CT Terminal for Phase current (1A) input in L1 Phase		
B1-B2	:	CT Terminal for Earth current input (5A)		
B3-B4	:	CT Terminal for Phase current (5A) input in L3 Phase		
B5-B6	:	CT Terminal for Phase current (5A) input in L2 Phase		
B7-B8	:	CT Terminal for Phase current (5A) input in L1 Phase		
C1-C3-C2	:	Digital Output-1 (DO-1)	:	(NO-COMMON-NC)
C4-D1	:	Digital Output-2 (DO-2)	:	(NO-COMMON)
C7	:	Auxiliary Supply (+)		
C8	:	Auxiliary Supply (-)		
D2-D8	:	Digital Output-3 (DO-3)	:	(NO-COMMON)
D3-D8	:	Digital Output-4 (DO-4)	:	(NO-COMMON)
D4-D8	:	Digital Output-5 (DO-5)	:	(NO-COMMON)
D5-D8	:	Digital Output-6 (DO-6)	:	(NO-COMMON)
D6-D8	:	Digital Output-7 (DO-7)	:	(NO-COMMON)
D7-D8	:	Digital Output-8 (DO-8)	:	(NO-COMMON)
E1-C5	:	Digital Input-1 (DI-1)		
E2-C5	:	Digital Input-2 (DI-2)		
E3-C5	:	Digital Input-3 (DI-3)		
E4-C5	:	Digital Input-4 (DI-4)		
E5-C5	:	Digital Input-5 (DI-5)		
E6-C5	:	Digital Input-6 (DI-6)		
E7-C6	:	Digital Input-7 (DI-7)		
E8-C6	:	Digital Input-8 (DI-8)		
F1	:	RS-485 MODBUS (+)		
F2	:	RS-485 MODBUS (-)		
F3	:	Earth (RS-485)		

20.0 Terminal Diagram - ZEN-F100-B Model

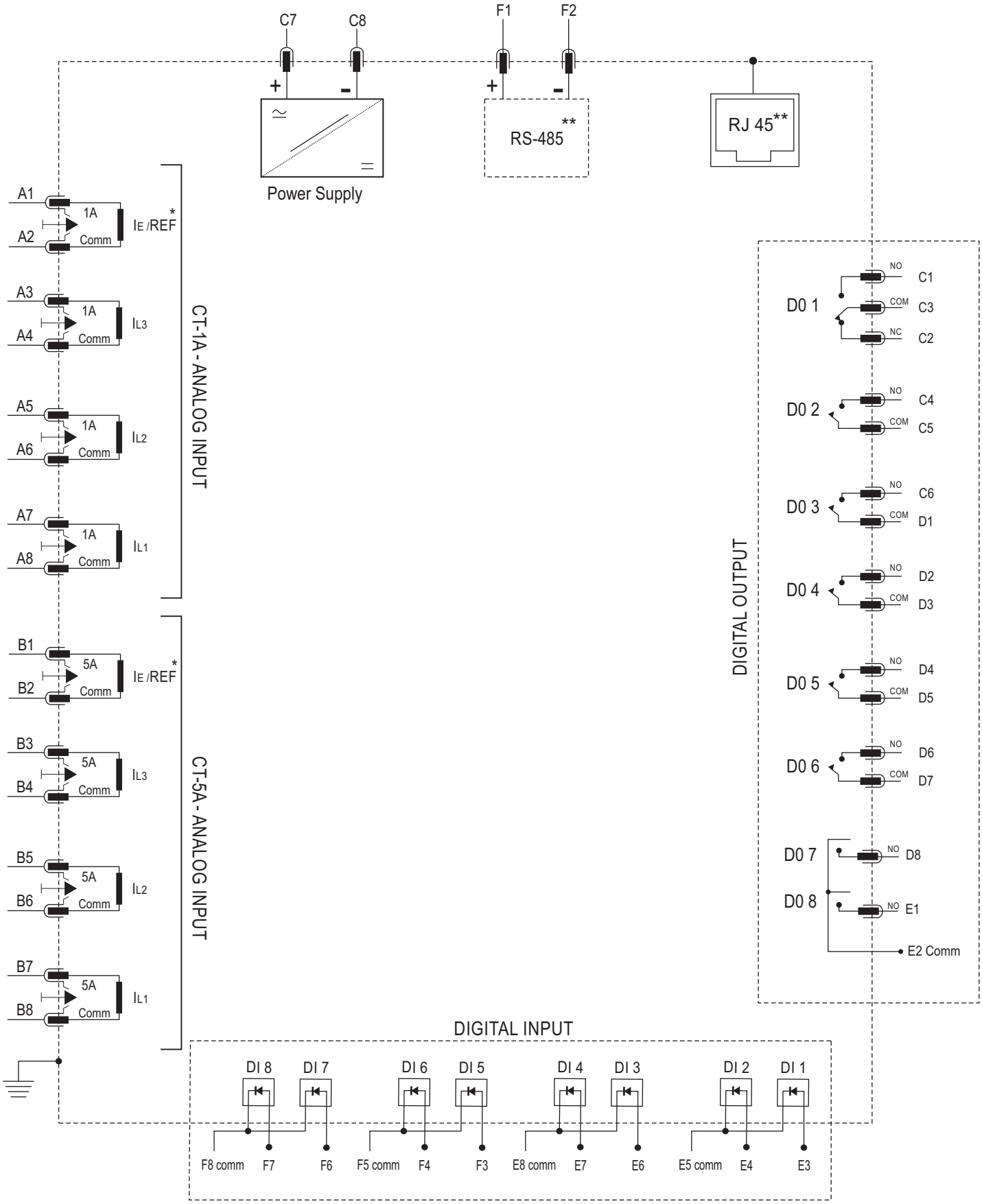


** Optional

Terminal Description - 'B' model

Terminal No.		Terminal Description		Contact Details
A1-A2	:	CT Terminal for Earth current input (1A)		
A3-A4	:	CT Terminal for Phase current (1A) input in REF Phase		
A5-A6	:	CT Terminal for Phase current (1A) input in L3 Phase		
A7-A8	:	CT Terminal for Phase current (1A) input in L1 Phase		
B1-B2	:	CT Terminal for Earth current input (5A)		
B3-B4	:	CT Terminal for Phase current (5A) input in REF Phase		
B5-B6	:	CT Terminal for Phase current (5A) input in L3 Phase		
B7-B8	:	CT Terminal for Phase current (5A) input in L1 Phase		
C1-C3-C2	:	Digital Output-1 (DO-1)	:	(NO-COMMON-NC)
C4-D1	:	Digital Output-2 (DO-2)	:	(NO-COMMON)
C7	:	Auxiliary Supply (+)		
C8	:	Auxiliary Supply (-)		
D2-D8	:	Digital Output-3 (DO-3)	:	(NO-COMMON)
D3-D8	:	Digital Output-4 (DO-4)	:	(NO-COMMON)
D4-D8	:	Digital Output-5 (DO-5)	:	(NO-COMMON)
D5-D8	:	Digital Output-6 (DO-6)	:	(NO-COMMON)
D6-D8	:	Digital Output-7 (DO-7)	:	(NO-COMMON)
D7-D8	:	Digital Output-8 (DO-8)	:	(NO-COMMON)
E1-C5	:	Digital Input-1 (DI-1)		
E2-C5	:	Digital Input-2 (DI-2)		
E3-C5	:	Digital Input-3 (DI-3)		
E4-C5	:	Digital Input-4 (DI-4)		
E5-C5	:	Digital Input-5 (DI-5)		
E6-C5	:	Digital Input-6 (DI-6)		
E7-C6	:	Digital Input-7 (DI-7)		
E8-C6	:	Digital Input-8 (DI-8)		
F1	:	RS-485 MODBUS (+)		
F2	:	RS-485 MODBUS (-)		
F3	:	Earth (RS-485)		

Terminal Diagram - ZEN-F100-C Model



* Earth current measure from CT earth input terminal, only if REF is disable

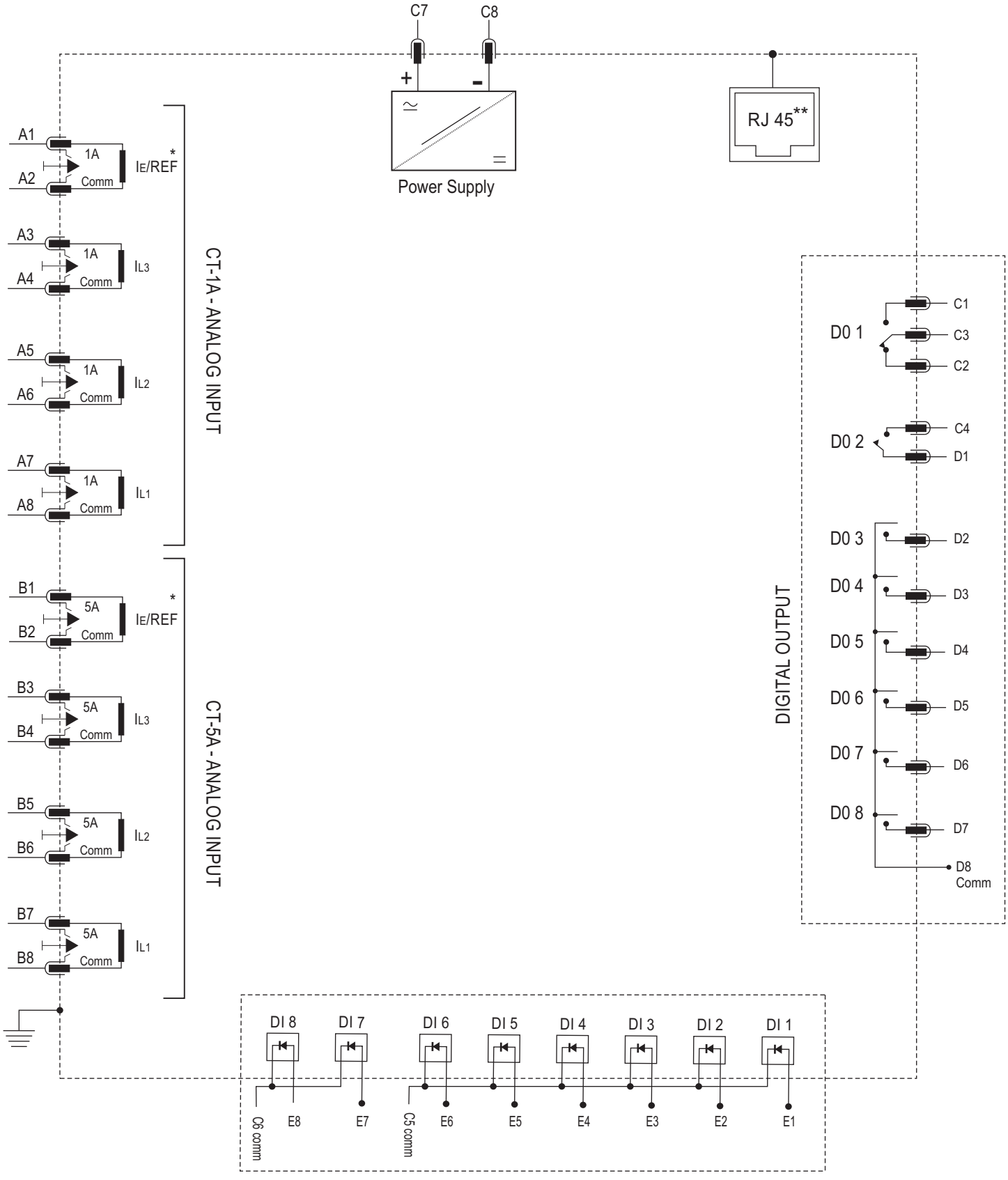
* REF current measure from CT, if REF is enable

** Optional

Terminal Description - 'C' model

Terminal No.		Terminal Description		Contact Details
A1-A2	:	CT Terminal for Earth current input / REF (1A)		
A3-A4	:	CT Terminal for Phase current (1A) input in L3 Phase		
A5-A6	:	CT Terminal for Phase current (1A) input in L2 Phase		
A7-A8	:	CT Terminal for Phase current (1A) input in L1 Phase		
B1-B2	:	CT Terminal for Earth current input / REF (5A)		
B3-B4	:	CT Terminal for Phase current (5A) input in L3 Phase		
B5-B6	:	CT Terminal for Phase current (5A) input in L2 Phase		
B7-B8	:	CT Terminal for Phase current (5A) input in L1 Phase		
C1-C3-C2	:	Digital Output-1 (DO-1)	:	(NO-COMMON-NC)
C4-D1	:	Digital Output-2 (DO-2)	:	(NO-COMMON)
C7	:	Auxiliary Supply (+)		
C8	:	Auxiliary Supply (-)		
D2-D8	:	Digital Output-3 (DO-3)	:	(NO-COMMON)
D3-D8	:	Digital Output-4 (DO-4)	:	(NO-COMMON)
D4-D8	:	Digital Output-5 (DO-5)	:	(NO-COMMON)
D5-D8	:	Digital Output-6 (DO-6)	:	(NO-COMMON)
D6-D8	:	Digital Output-7 (DO-7)	:	(NO-COMMON)
D7-D8	:	Digital Output-8 (DO-8)	:	(NO-COMMON)
E1-C5	:	Digital Input-1 (DI-1)		
E2-C5	:	Digital Input-2 (DI-2)		
E3-C5	:	Digital Input-3 (DI-3)		
E4-C5	:	Digital Input-4 (DI-4)		
E5-C5	:	Digital Input-5 (DI-5)		
E6-C5	:	Digital Input-6 (DI-6)		
E7-C6	:	Digital Input-7 (DI-7)		
E8-C6	:	Digital Input-8 (DI-8)		

Terminal Diagram - ZEN-F100-D model



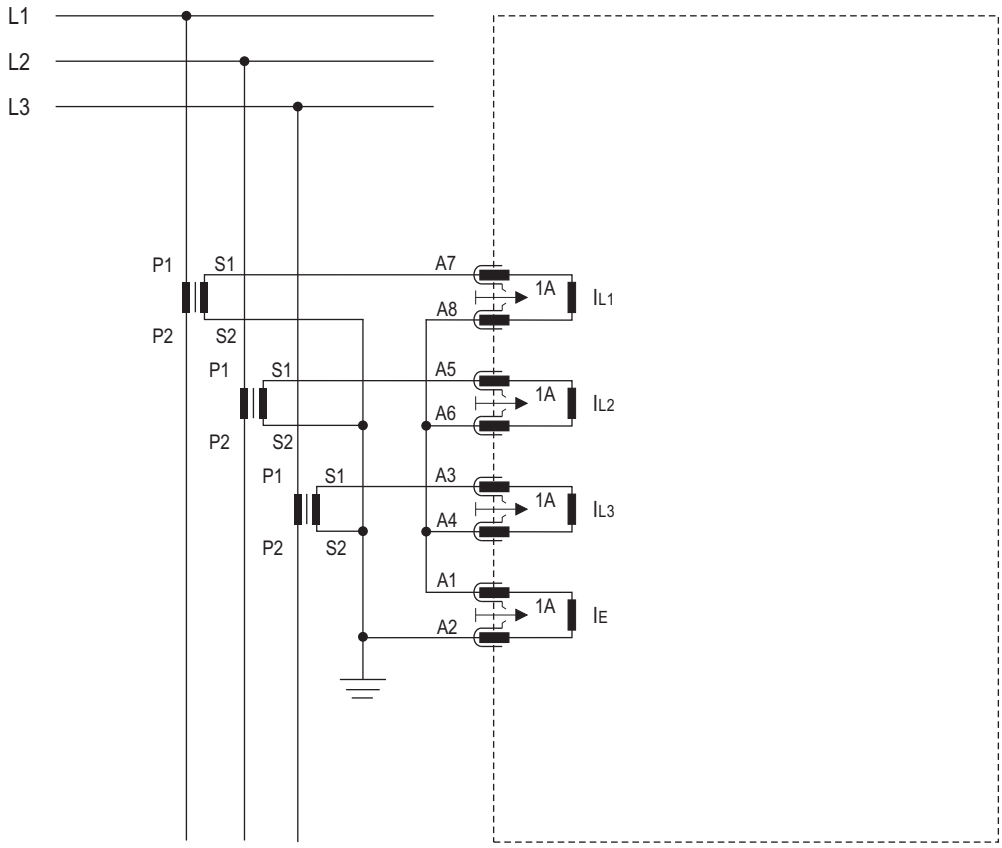
* Earth current measure from CT earth input terminal, only if REF is disable

* REF current measure from CT, if REF is enable

** Optional

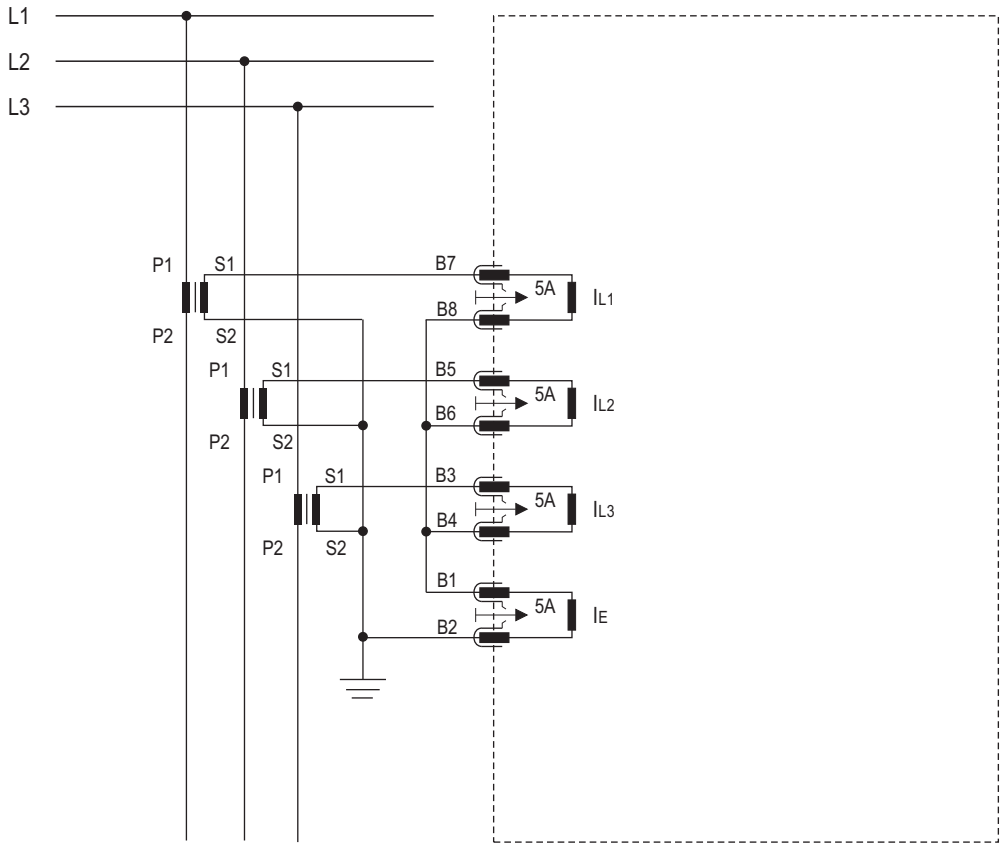
21.0 CT Connection Diagram for 1A Model A [3 OC + 1 EF]

CT Schemes
Holmgreen Residual CT's Connection for 1A



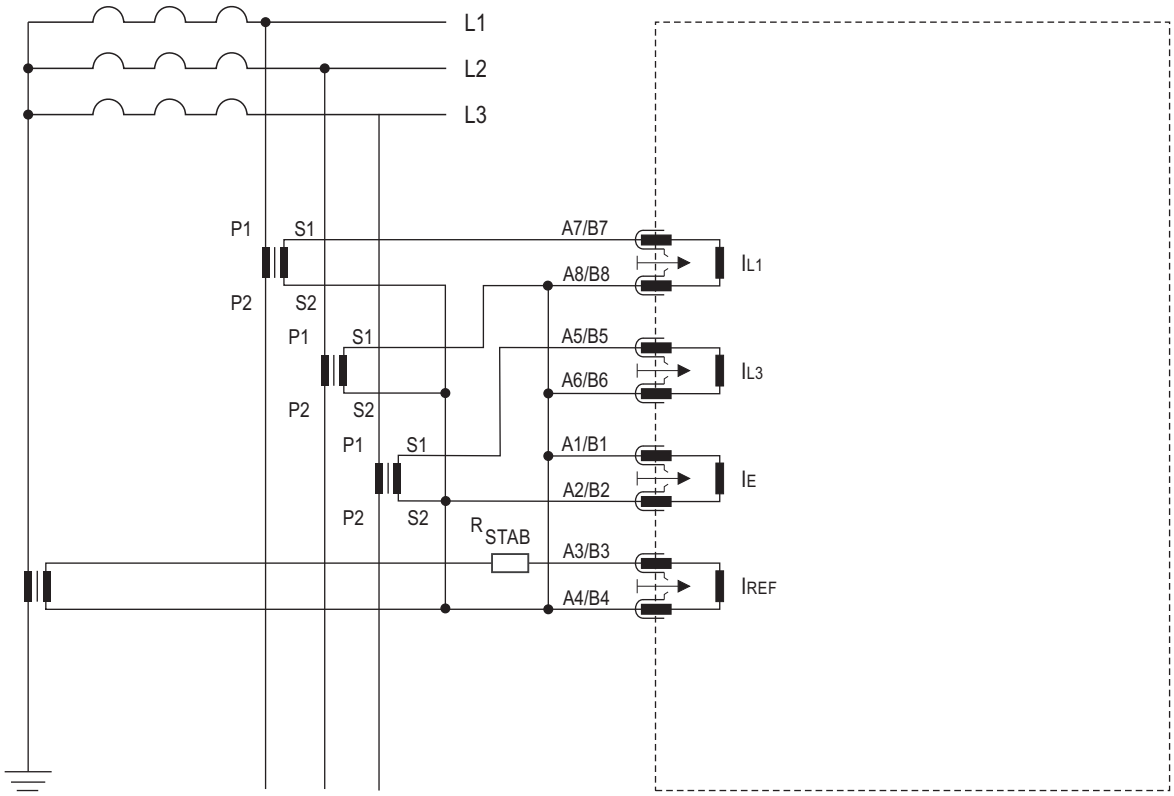
22.0 CT Connection Diagram for 5A Model A [3 OC + 1 EF]

CT Schemes
Holmgreen Residual CT's Connection for 5A

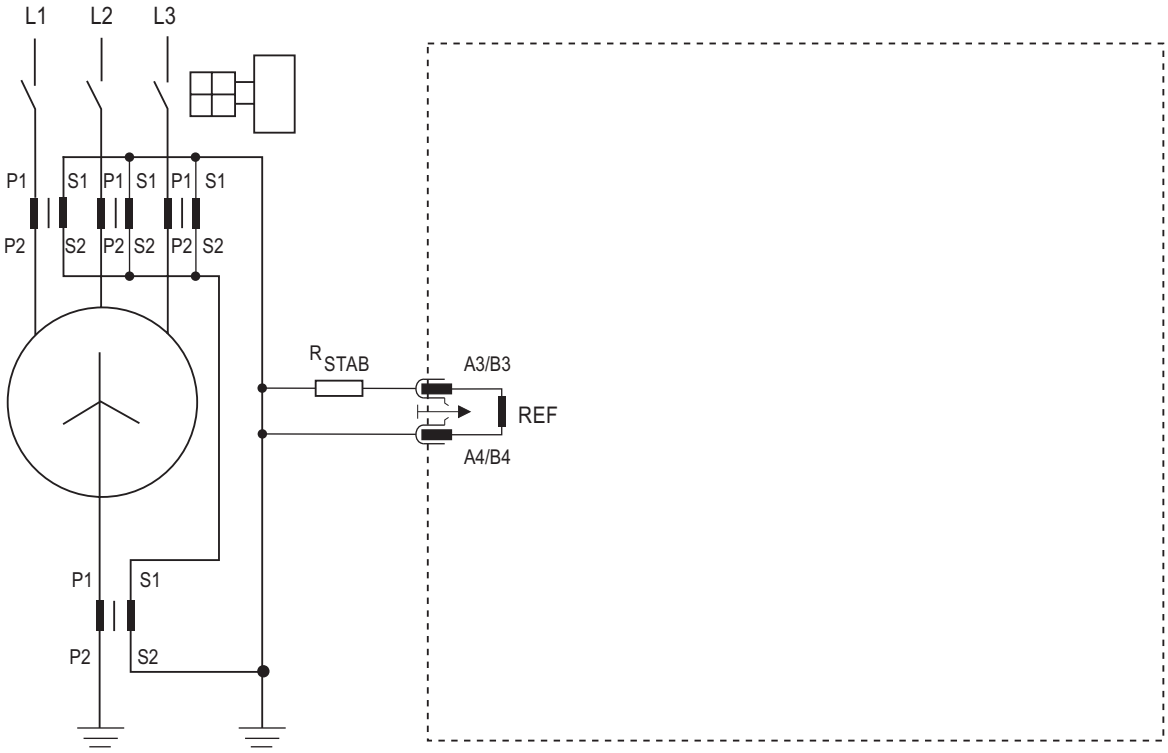


23.0 CT Connection Diagram for Model B [2 OC + 1 EF + 1REF]

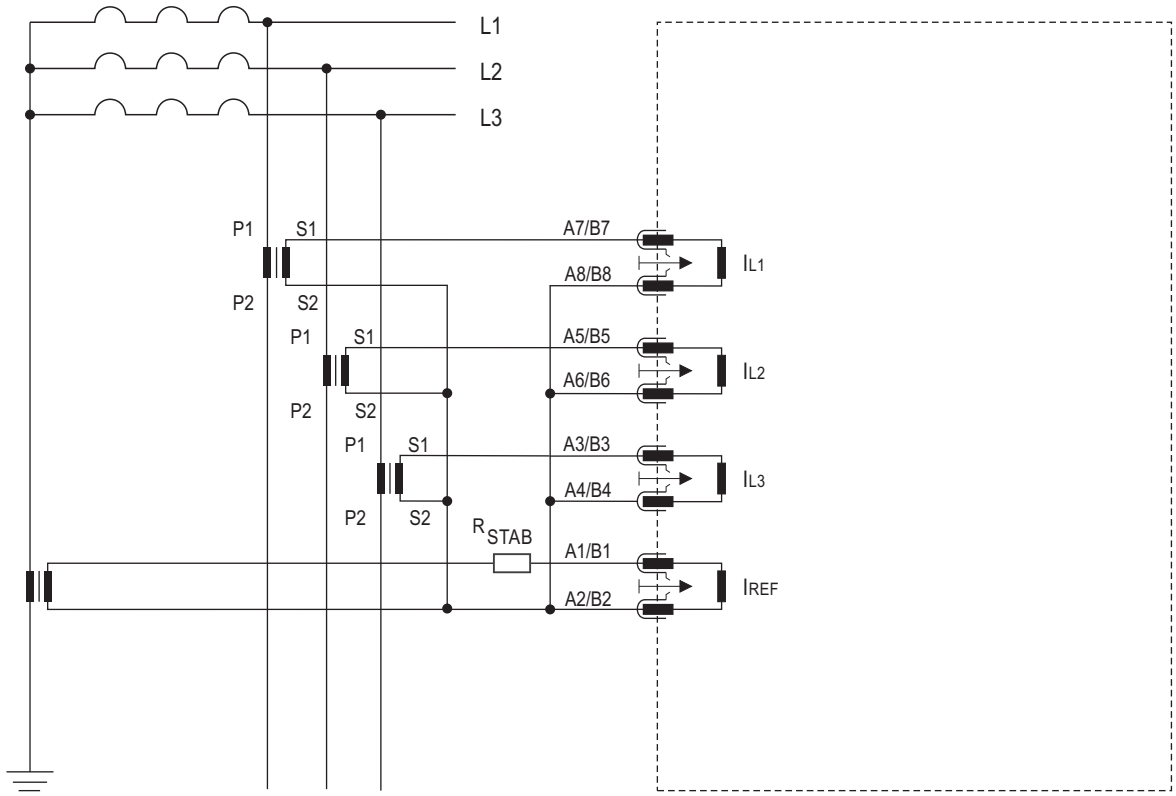
(Based on ordering information)



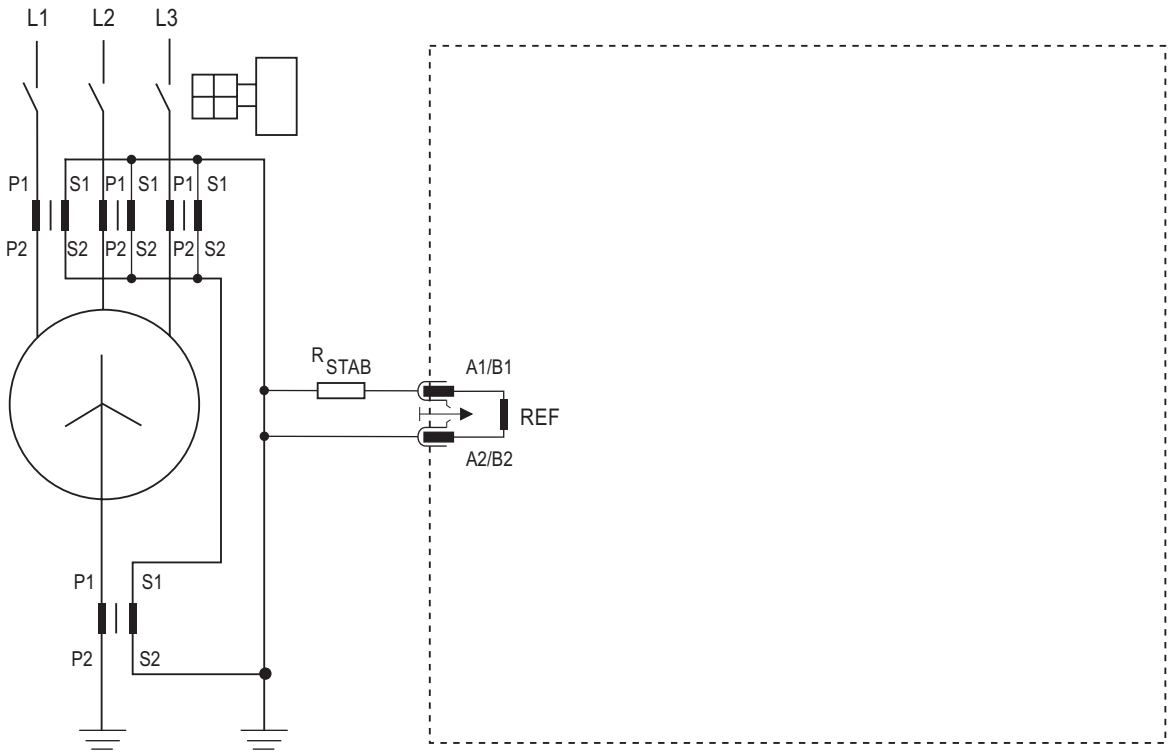
CT Connection Diagram for High Impedance REF Application



24.0 CT Connection Diagram for Model C [3 OC + 1 REF + EF (Calculated from derived earth)]

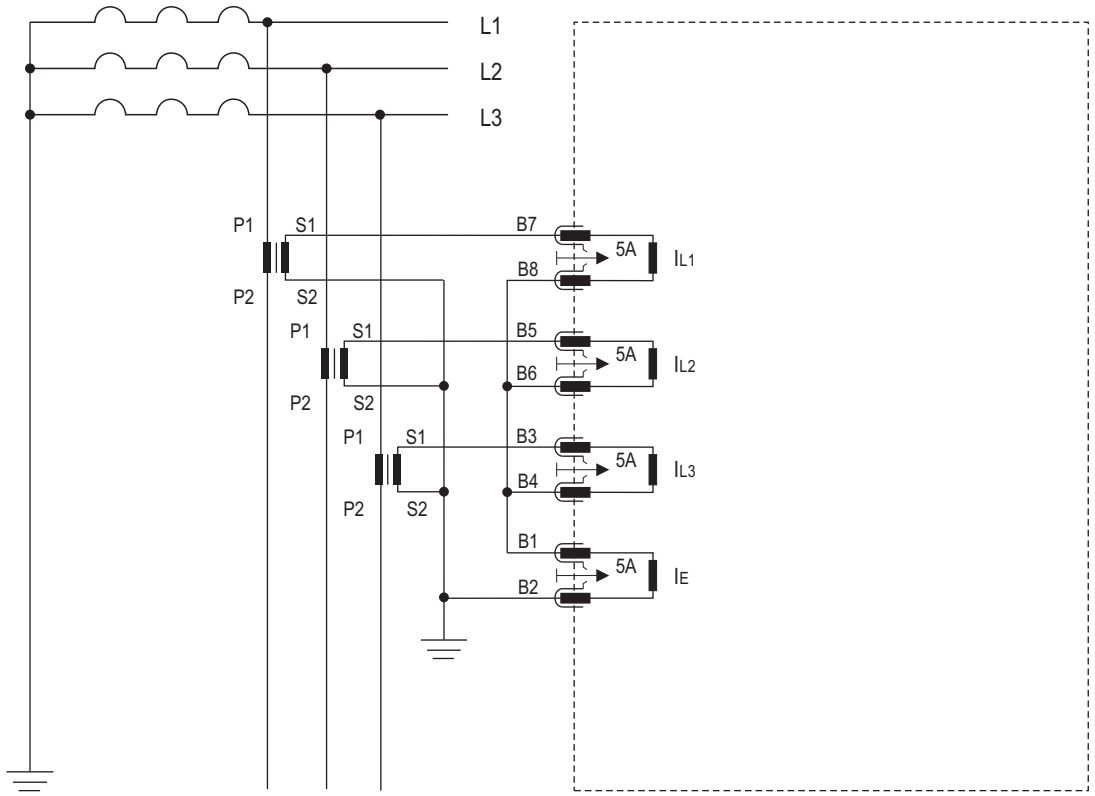


CT Connection Diagram for High Impedance REF Application

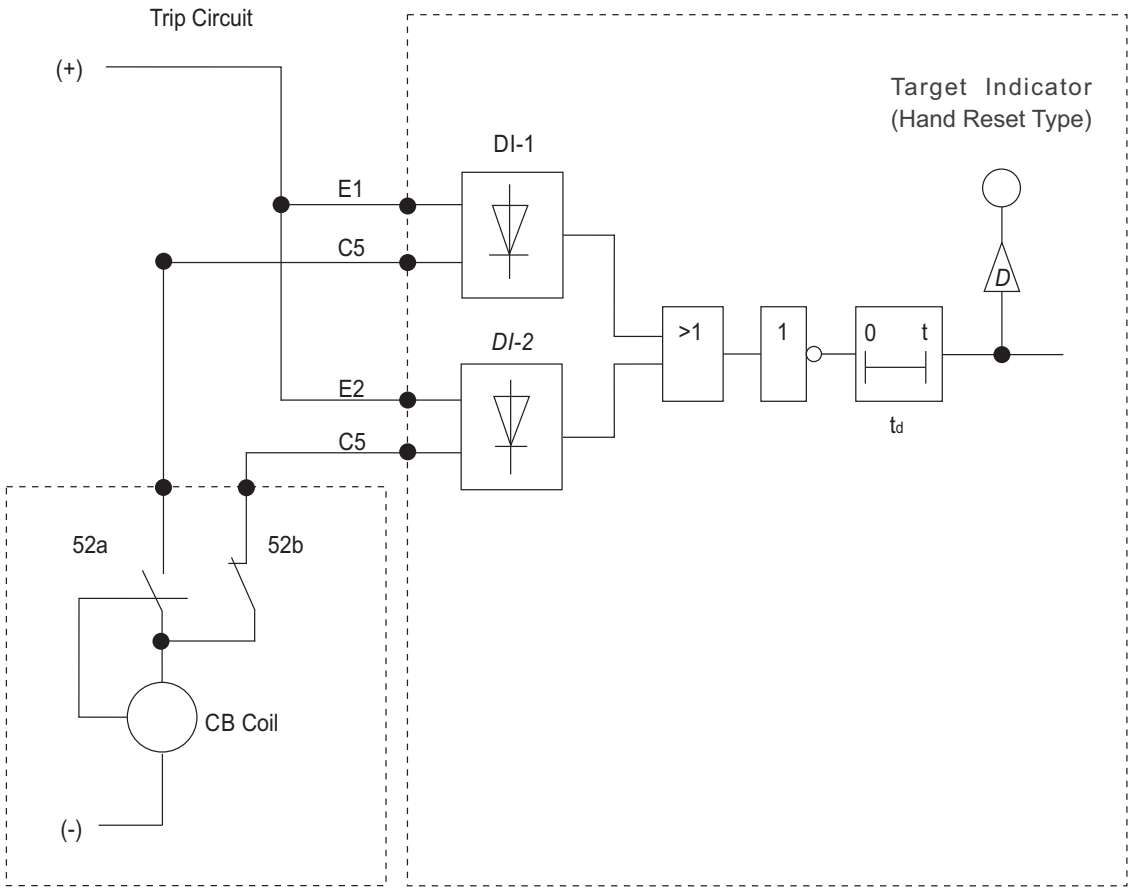


Earth fault protection will be offered only from derived earth of three phase line current.

24.0 CT Connection Diagram for Model C [3 OC + EF (Calculated from derived earth)]



25.0 Trip Circuit Supervision Diagram

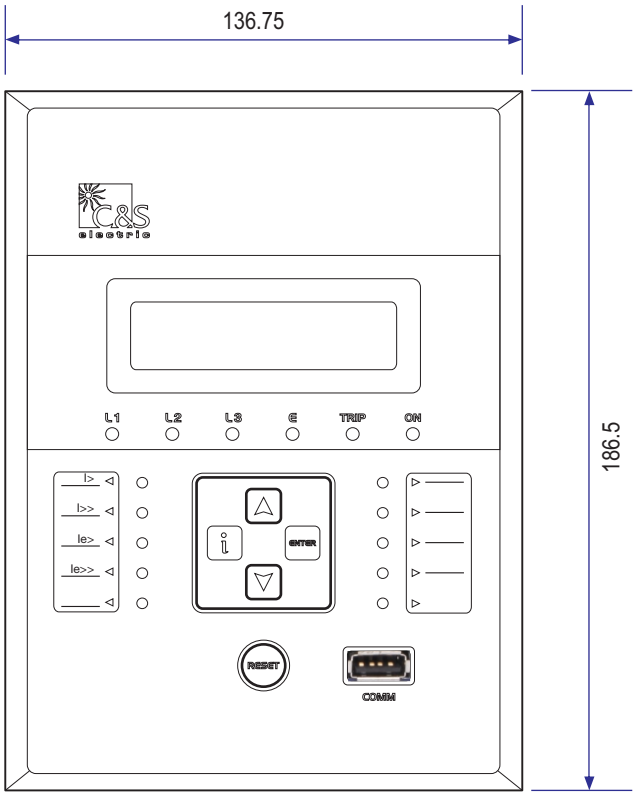


(Trip Circuit Supervision Function)

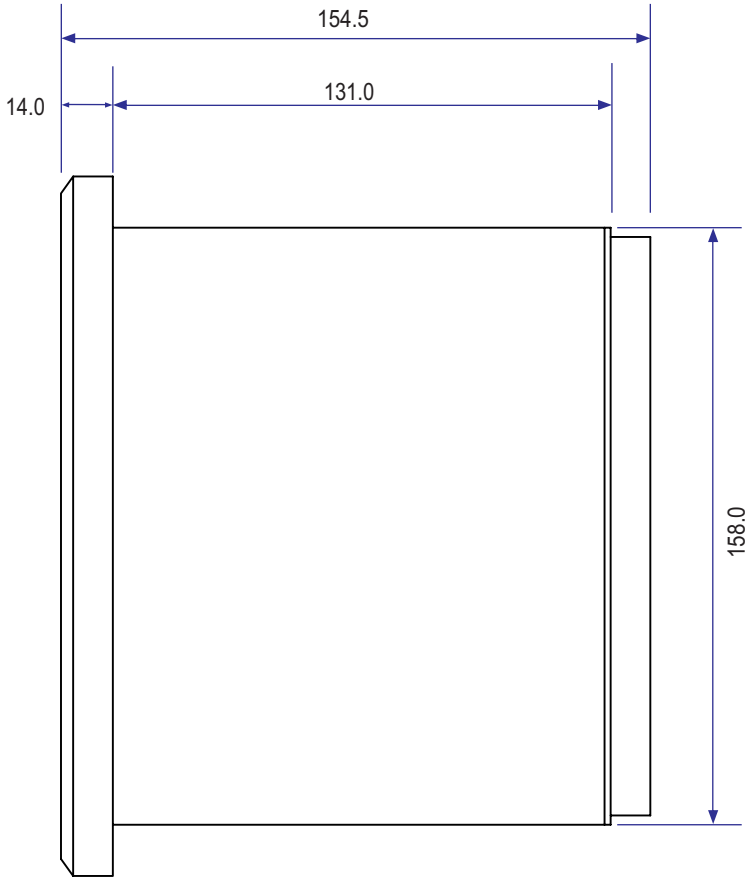
26.0 Dimensional Details

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

Front View

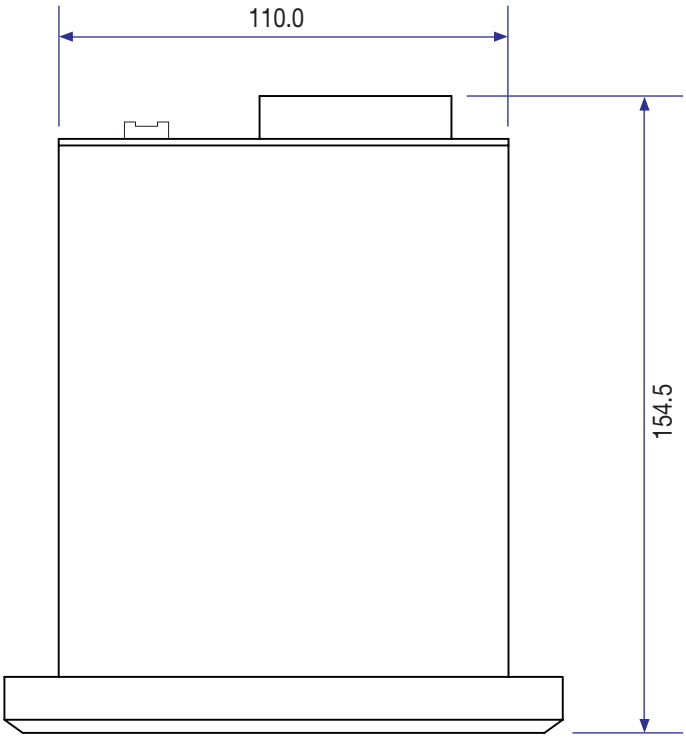


Side View

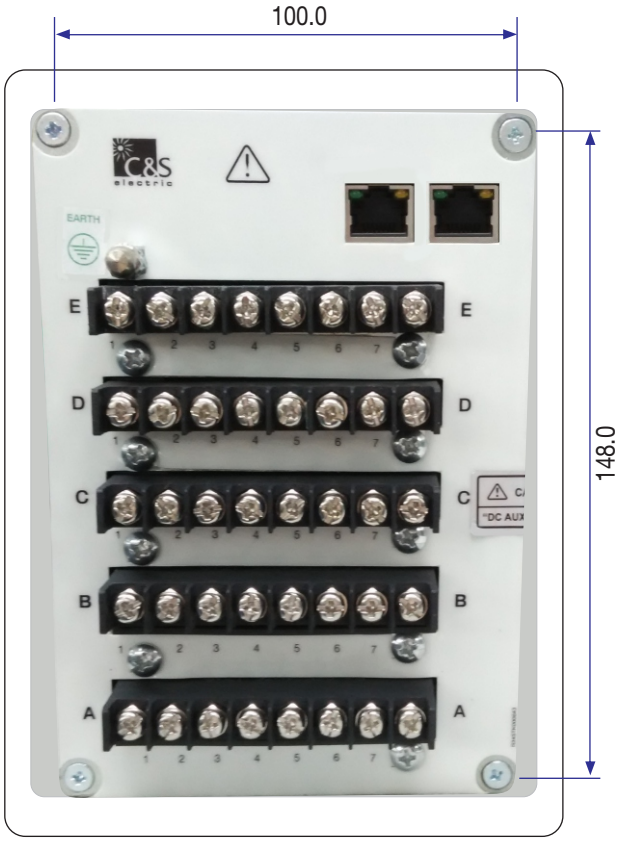


Dimension Details contd..

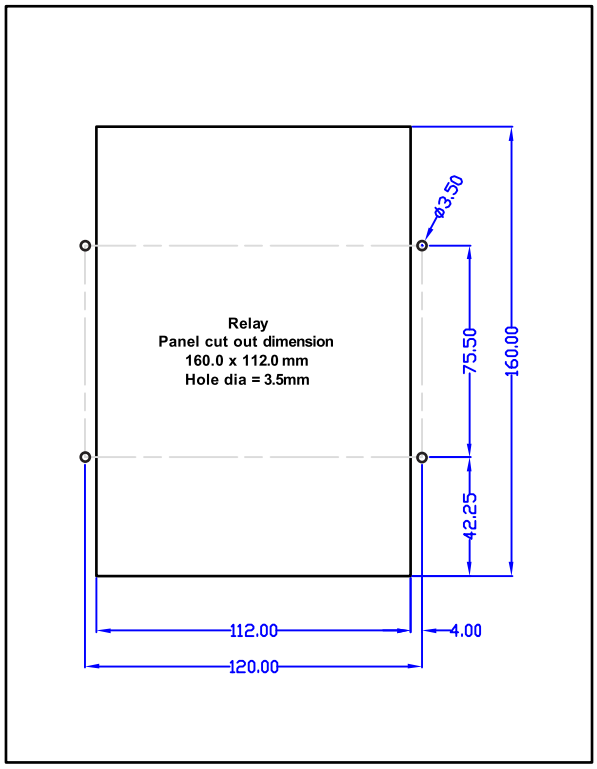
Top View

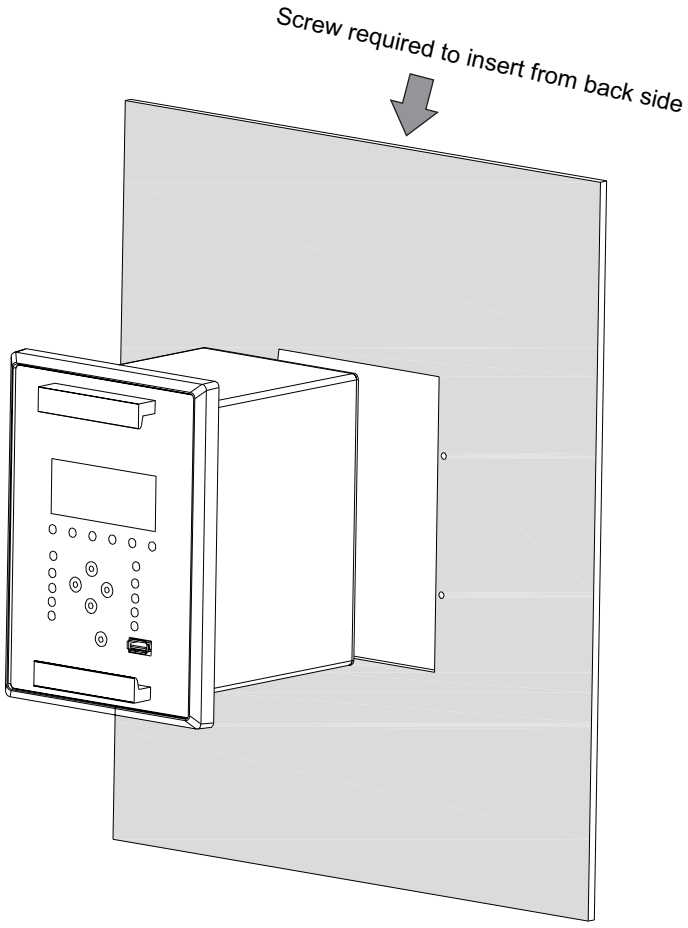


Back View



27.0 Panel Mounting Details





28.0 Ordering Information

CSEZEN - F - 100 - x - x - D - 0 - x

PROTECTIONS	
A	Model A (3 OC + 1EF)
B	Model B (2 OC + 1EF + 1REF)
C	Model C (3 OC + EF + REF)
D	Model D (3 OC + EF + SEF)

Rear Communication Protocol	
M	MODBUS on RS-485
I 103	IEC 60870-5-103 on RS-485
I 650	IEC 61850 on Single RJ-45 port
D	IEC 61850 on Dual RJ-45 port
T	MODBUS on TCP-IP

ENCLOSURE TYPE	
D	Draw-out Enclosure

DIGITAL I O CARD	
0	8 DI / DO

AUXILIARY SUPPLY	
L	18V-150V DC
H	80V-280V AC / 90V-300V DC

Issue Date : 15.03.18
Rev. No : 07
Rev. Date : 07.10.19

CSEZEN- E Cat al ogue

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NOTE

The material in this document is for general information, performance data and proper model selection. Although every attempt has been made to ensure that the information contained in this catalog is correct. C&S reserves the right to change the design, material or specification contained in this, without prior notice.

Revision History

S.No.	Rev.No.	Details	Date
01	01	Include one more RJ-45 picture in Back view of the relay on page 39 & 47	25.05.18
02	01	Change in Description of Earth Over Current on Page 8 & Communication on page 21	25.05.18
03	02	Include CT Conn. diagram for Model C on Page 45	28.05.18
04	03	Include Terminal diagram & Terminal description for Model C on Page 42 & 43	14.06.18
05	04	Include Term. diagram for Model D on Page 44, change in ordering information	22.06.18
06	05	Include Modbus on TCIP in rear port communication of ordering information	04.09.18
07	06	Include description of breaker maintenance and analysis and D model conn. diagram	06.06.19
08	07	Separate conn. diagram for B model after doing modification in A & B combined conn diagram	07.10.19