We touch your electricity everyday!

CSEZEN-M350

Advance Motor Protection & Monitoring IED

ZEN E-Series

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 with reliable and fast protection solutions in a single unit.

In this family of CSEZEN series, the CSEZEN-Mxxx is an advanced motor protection solution which has fast, sensitive and secure protection for motor faults.

CSEZEN-Mxxx 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-Mxxx offers following model based features to cover requirements of the wide range of users.

- 1A & 5A Programmable Rated Current
- Draw out enclosure have modular design with self CT shorting
- Measurement, Protection & Control
- SCADA Communication (Local & Remote)
- DI/DO 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 for root cause analysis of trip
- CSEZEN-M350 relays are equipped with self supervision function
- Star & Delta configuration 63.5/110V
- Password protection for all settings

2.0 Application

The CSEZEN-M350 relay is the ideal solutuion to problems requiring more versatile or accurate protection for a motor that can be offered by standard thermal overload relay. It employs the latest micro controller techniques to provide the complete solution for the protection of medium & large sized three phase motors with high inertia load in all type of ordinary contactors controlled or circuit breaker controlled motor drives. It handles fault condition during motor start up, normal run, idling and cooling down at standstill in, for example pump, fan, mill, crusher applications.

Uses:

- Helps in extending life time of motor.
- Helps in optimizing motor size.
- Helps in planning maintenance work.
- Protects the drive for mechanical damage.

3.0 Hardware

- Digital Signal Processor based numeric design
- Measures true RMS with DFT filter
- 1A & 5A common current terminal & programmable
- 4 Current transformers
- 3 Voltage transformers
- 8 (7 programmable + 1 Fixed) Change over digital output contact
- 8 Digital Inputs for protection & supervision
- 10 LEDs (Programmable)
- USB/RS-485/RJ-45 communications for automation
- 20x4 Alpha Numeric LCD

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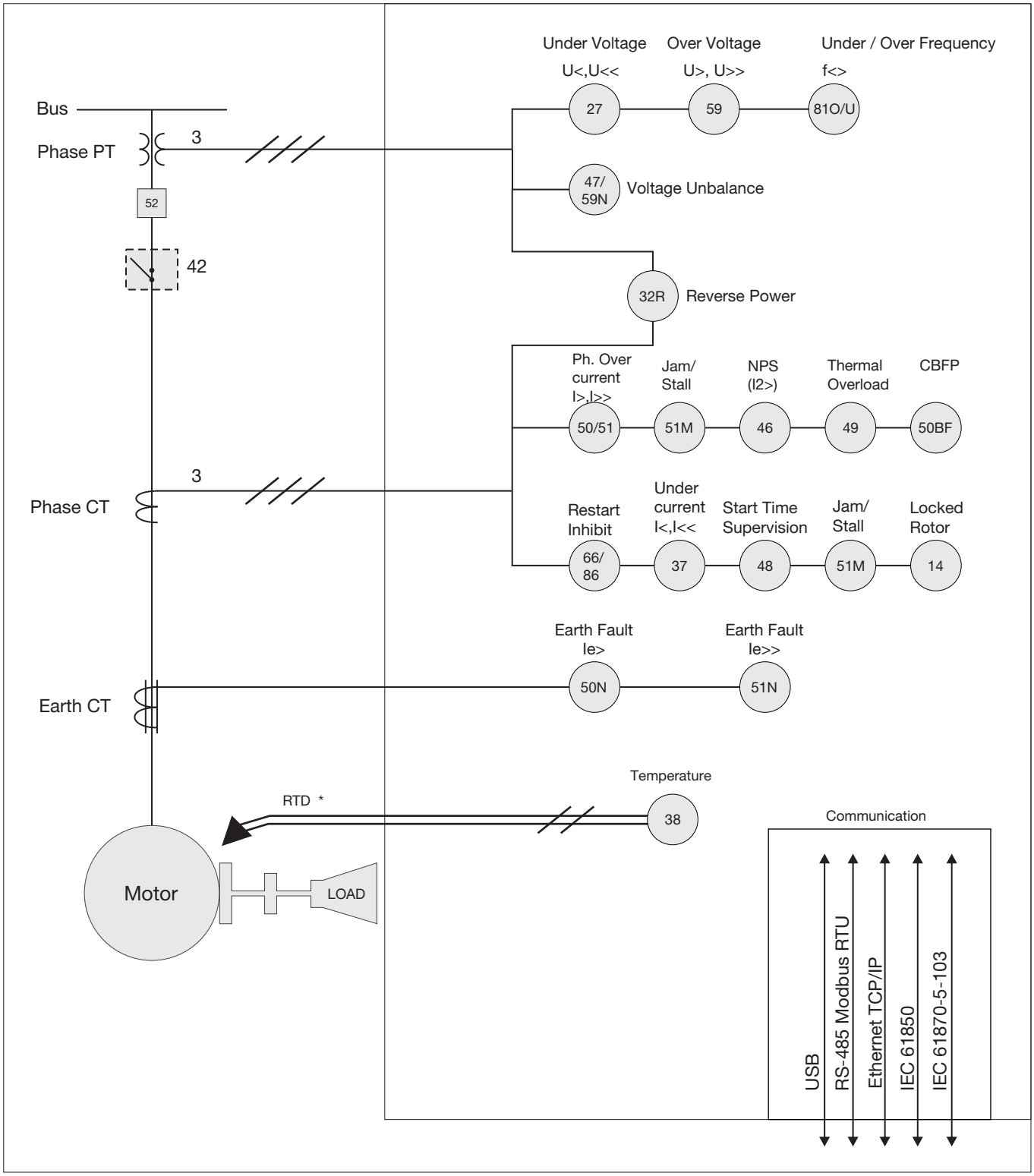


Figure-1

CSEZEN-M350 Functional Diagram

7.0 Protection Functions

Under current Protection (37P)

The under current function is used to detect a decrease in motor current caused by decrease in motor load. This is especially useful for indication of condition such as loss of suction for pumps, loss of air flow for fans, V-belt split or shaft failure or a pump running un-primed or Running dry Protection, Broken conveyer belt.

while running condition, if at least one of the three phase current goes below the adjusted current level (but not below than motor stop current) for a defined time, CSEZEN-M will trip the assigned DO to stop the motor.

Phase Over-current (50/51)

(A) Over Load

This protection gives backup protection for motor external faults. If the external faults are not cleared by the primary protections, this over current unit will actuate, otherwise the motor will be seriously damaged due to overloads. Each winding has overload as well as short-circuit protection. Over current Protection is active only in motor Run condition.

(1) Refer following formula for EINV, VINV, LINV, NINV1.3, NINV3.0 characteristics:

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

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

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

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

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

(B) Short Circuit

A Phase to phase short circuit at the terminal of the motor or in the motor cables, draws very large current capable of damaging the motor and its motor cable. This also poses the threat of fire within the motor room, It is essential to detect the fault and to send the tripping command immediately to the breaking device. This protection is active in both Start & Run state of the motor.

Earth Fault (50N/51N)

Over-heating of the stator winding is likely to lead to insulation deterioration. Since the windings are surrounded by an earthed metal case, Stator faults usually manifest themselves as earth faults.

To protects against this, two independent earth fault (low set and high set protection) over current element with defined settable time delays are provided. This protection is active both in Start & Run condition of motor.

Phase Loss or Single Phase Protection

During a Phase loss, Voltage & Current are monitored continuously, when any or all the three phase voltage below 5% of the rated voltage or when any of the phase current falls below 3% of rated current or when all phase current falls below 3% of rated current provided all the three phase voltage are also less than 5% of the rated voltage. CSEZEN-M will issue a stop command via assignable DO after a set defined time.

Under/Over Frequency Protection (81U/O)

This element is used to detect the tendency of the unwanted variation of frequency due to severe disturbances. Frequency changes in the network can be detected any load can be removed at fixed frequency setting. Two thresholds are available for under and over frequency function. Each one can be independently activated or deactivated.

Reverse Power Protection (32R)

The protection actuates when the power flow gets reversed and the measured value of active power is greater than the set value, the protection will trip the corresponding relay. Two thresholds are available for over power function. Each one can be independently activated or deactivated.

Negative Phase Sequence (46)

Running motors at unbalance conditions results in overheating. They are often fed through fuses and may be energized with one fuse blown causing single phasing of motor, the relay detects the negative phase sequence & trip according to set characteristics (DEFT/INV). Under normal motor running conditions only positive sequence current components flow. The presence of a negative sequence component produces a field revolving in an opposite direction to that of the rotor. which will increase the resistance of the rotors and this imposes additional heating of the stator that is excess of the manufactures rating. This protection is also active in both Start & Run condition of motor.

Negative Phase Sequence Equation

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

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

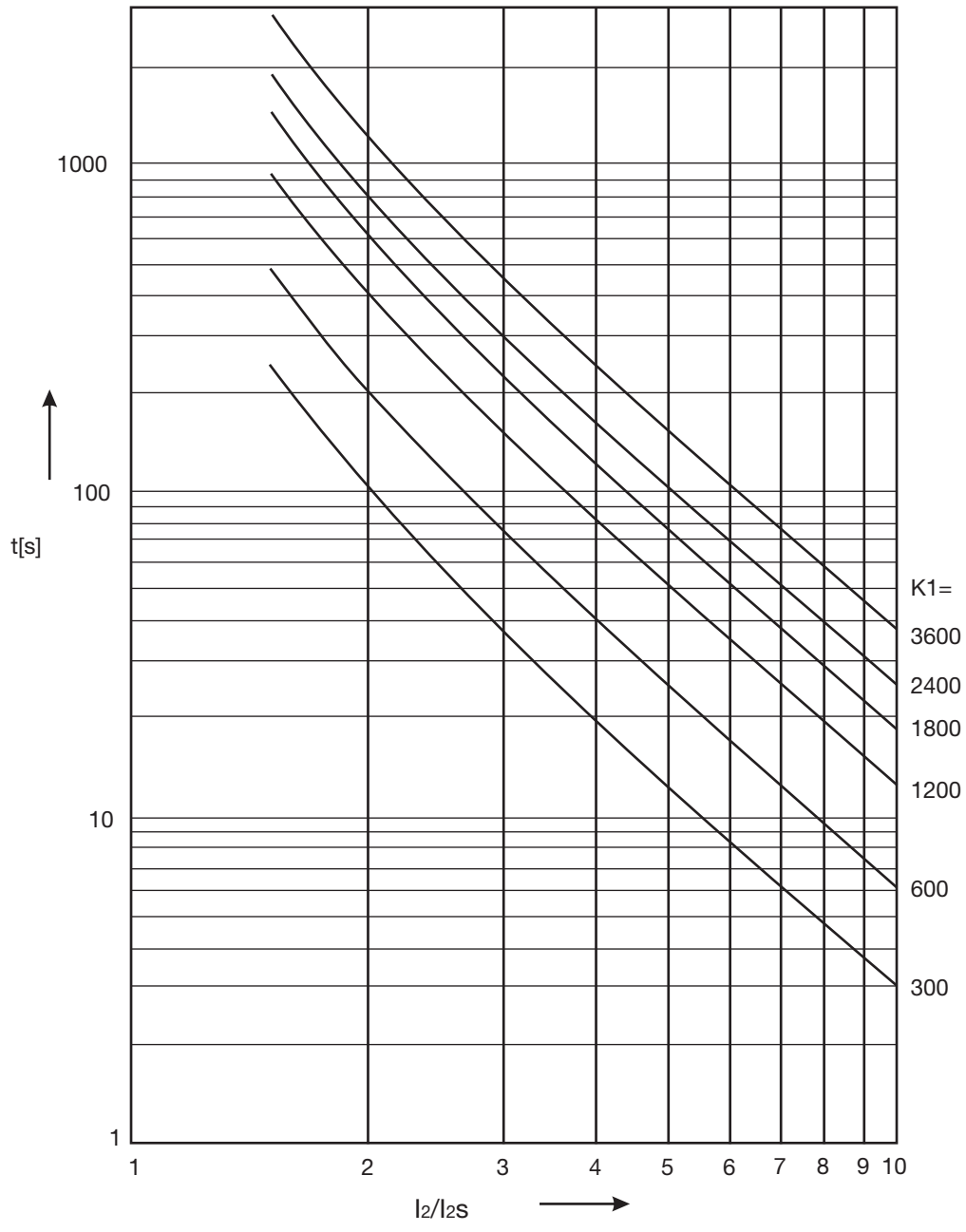


Figure-2

Locked Rotor (50LR)

This protection is enabled only during motor start-up, a locked rotor is detected with the state of increased phase current above the set value within the defined start time. Once the start time expires, Locked Rotor condition is not be protected. The common application is on motors used on crushers, chippers or conveyors. Motor Start-up is detected on crossing full load current when previous state was STOP under the motor startup time.

NOTE * : Locked Rotor time will always be less than Start Time.

Thermal Overload Protection (49)

Overload can result in excessive stator temperature rises in excess of the thermal limit of the winding insulation. Whilst this may not cause the motor to burn out immediately, it has been shown that life of the motor can be short-end if the over load condition persists. The life of the motor is not purely dependent on the temperature of the winding but on the time that is exposed to these temperatures.

CSEZEN-M Provides reliable protection for motor starting as well as for heavy and repeated starting.

CAUTION: * Make sure that at the of installation of relay, motor is in complete cold state having no thermal content otherwise thermal modeling of relay will not be in synchronisation with actual thermal state of motor.
(Changing this, M1 model will immediately affect the thermal of motor, take caution when use this M1 setting)

Thermal memory is saved all to selection in HMI
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.

The below equation used to calculate the trip time at 100% of thermal state.

The formula for calculating the trip characteristics is as follows:

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

with τ = thermal time constant of the object to be protected.
I_b= Basic current
I= 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.

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

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)

Presentation of the Trip with variable initial load factor:

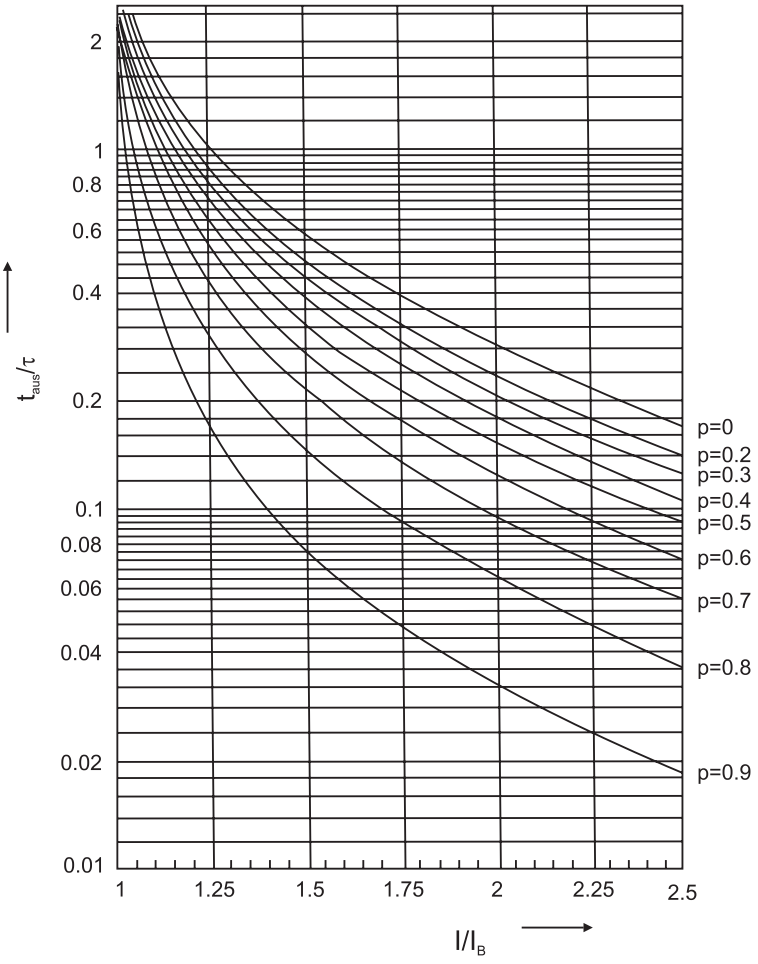


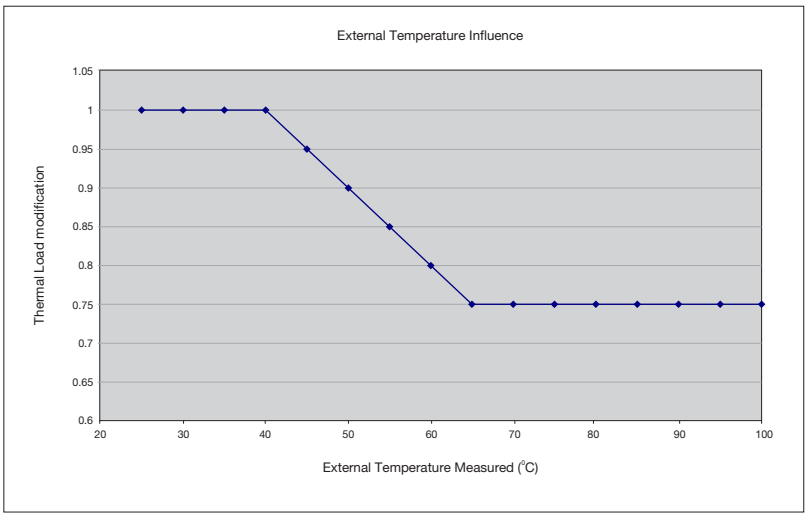
Figure-3

Compensation for ambient temperature by RTD *

To compensate for the ambient temperature variation, the thermal setting is corrected dependent upon the ambient temperature. The new value used to calculate the trip time at 100% of thermal state is then changed to **100% * Coef**.

Where the correction coefficient is calculated depending upon the ambient temperature as shown below:-

Coef = 1	for $T < 40^0$ C
Coef = 1.4 - (0.01T)	for 40^0 C $\leq T \leq 65^0$ C
Coef = 0.75	for $T > 65^0$ C



This compensation factor will be taken into account when any one of the 5 possible RTD's are selected to measure the external/ambient temperature (see menu 'Common Setting').

The CSEZEN relay can accommodate five PT100, Ni100, Ni120 RTD's. These RTD's are used to monitor the temperature of the stator windings, bearing and ambient temperature. Each RTD software element has two time delayed outputs, One for Alarm and One for Trip.

Only one external RTD will influence the thermal curve, which is selected for the ambient RTD selection in common setting table.

Phase Reversal (47)

Reversing any two of the three phases will cause a three phase motor to run in opposite direction. This may cause damage to the machinery. CSEZEN-M relay uses the voltage (which should be greater then 10% of the rated voltage) to determine that the phase rotation of the signal applied to the relay are in proper order, if finds out of order, the relay trips in after a defined settable time. It helps to protect a three phase motor while installation.

Jam / Stall (51M)

Mechanical equipment such as pumps or fans can be quickly damaged if it jam, resulting in a locked rotor stall. Protect the motor. Load jam protection is available only when the CSEZEN-M350 relay detects the motor in RUNNING state. During the load- jam condition the motor stalls and the phase current rises near to the locked rotor value .when the load jam tripping is enabled and the phase current exceeds the jam trip level setting for longer than the delay set time, the relay trips. Set the Jam trip level greater than the expected normal load current but less than the rated locked rotor current.

VOLTAGE PROTECTION

The relay is equipped with an independent (U>) and under voltage supervision (U<)simultaneously with separately adjustable tripping values and delay times. Voltage measuring is 3-phase. In this process there is a continuous comparison of the line conductor voltages in case of a delta connection and of the phase voltages in case of a star connection with the preset limit values.

a) Under / Over voltage (27/59)

Two thresholds are available for each function: each one can be independently activated or deactivated.

Refer following formula for V_INV characteristics for over/under voltage

$$t = \frac{TMS}{(V/V_s) - 1}$$

Where

t	=	Operating time in seconds
TMS	=	Time multiplier setting
V	=	Applied Input Voltage
V_s	=	Relay Setting Voltage

Note: This equation is only valid for V/Vs ratio < 0.95 (for under voltage) and > 1.1 (for over voltage)

b) Zero Sequence (59N)

CSEZEN-M350 relays will operate from the zero sequence voltage, which is calculated internally and measured as below:-

U0=1/3 (U1+U2+U3)

c) Negative Sequence

This function is based on the negative sequence component of the voltage, which is calculated internally and displayed on the screen of the front panel. It is designed to detect any voltage unbalance condition.

$U2=1/3(U1+a^2U_2+aU3)$

d) Positive Sequence

This function is based on the positive sequence component of the voltage, which is calculated internally and displayed on the screen of the front panel. It is designed to detect any voltage unbalance condition.

Circuit Breaker Failure Protection (50BF)

The CB Failure Protection is based on supervision of current after fault tripping events. If the motor is not disconnected when a trip command is issued to a circuit breaker, another trip command is initiated using the breaker failure protection which trip the circuit breaker. The test criterion is whether all phase/earth currents have dropped to less than 5% of In 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.

Harmonic Blocking

Harmonic component of the differential current (2nd for each phase, whereas 2nd is for earth) is calculated & extracted using Digital Fourier transforms. The magnitude of these current is used to discriminate between faults and inrush conditions that will restrain differential function during inrush caused by energisation and over excitation. If blocking on harmonic setting is enabled then the relay blocks all the tripping operations when if 2nd harmonic for phase & 2nd for earth are higher than set values.

Resistor Temperature Device (RTD) *

CSEZEN M-350 relays provide temperature protection from 10PT100 / Ni100 / Ni120 resistor temperature devices (RTD). Each RTD has a definite time trip and alarm stage.

The adaptation of the thermal replica will be according to the external ambient temperature measurement .

8.0 Supervision Functions

Trip Circuit Supervision (74TC)

Two binary inputs can be used for the circuit breaker trip coil including its incoming cables. 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.

Anti backspin Protection (With the name Start interval)

For certain applications, such as pumping a fluid up a pipe, the motor may be driven backward for a period of time after it stops. The CSEZEN-M350 provides an start interval timer (minimum time between stop and restart) to prevent starting the motor while it is spinning in the reverse direction. The relay starts the timer countdown form the moment a stop is declared by the relay except in blocking state.

CT secondary open supervision

The relay supervise the external wiring between the relay terminals and current transformers (CT) and the CT themselves. further more, this is a safety functions as well. since an open secondary of a CT, causes dangerous voltages.

The CT supervisor function measures phase currents. if one of the three currents drops below IminSet, while another phase current is exceeding the ImaxSet, the function will issue an alarm after the operation delay has elapsed.

Load Monitoring

If the load value (in terms of %FLC) increased the set limit, then after the set delay assigned relay gets trip to avoid the damage of motor and load.

Circuit Breaker Controlling

Through function key, by selecting CB control option, circuit breaker can be operated by assignable CB control DO.

9.0 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.

START WORKING PRINCIPLE

START RECOGNISATION:
CSEZEN-M350 monitors the flow of current from which the following operational conditions of the motor are gathered
1) STOP
2) START (Resistance Start, Direct Start, Star Delta switch-over, Start-up via inverter control)
3) RUNNING

STOP- CONDITION:
If no current is measured (I<3% of Ip) STOP conditions are recognized after expiry of the stop time. The stop time is adjustable in order to tolerate a brief – off time of the current flow.

START CONDITION:
Start is only recognized if the previous condition was STOP and the motor current has exceeded 3% of Ip. if the STOP or RUNNING conditions are recognized, the start condition is terminated.

RUNNING -CONDITION: RUNNING can be recognized in different ways:
1) If the start has been successfully completed. This is the case when motor current has dropped below KxIb setting (Full load current) & the start time has elapsed (direct start).

2) If the motor is connected across several resistance steps, it is possible that KxIb setting is crossed repeatedly. Running conditions are recognized when the start time has run out after the last step & current has settled between KxIb and 3% of Ip. (Resistance start).

3) If after STOP a motor current has settled between 3% of Ip and KxIb and the start recognization time has elapsed. (Soft start).

4) If Motor Running Identification input was activate, it will go in run state.

START-STOP PARAMETERS
1. Start Limiting Time
2. Start Attempt
3. Start Time
4. Start Intervals
5. Start Blocking time
6. Stop Time

1) **Start Limiting Time:** This is the time in which max start attempts as per settings are allowed, if start attempt has crossed its set value within this time period then next start is blocked, for the period of set start blocking time. While motor running if attempts doesn't cross the set value and motor is still running and start limiting time elapsed then attempts get reset.

2) **Start Attempt:** These are the max attempts which are allowed within start limiting time.

3) **Start Time:** This adjustable time has only to be extended for special start procedures in order to prevent that the running conditions are indicated too early in advance. The time is running from the instance the current flow exceeded 3% of Ip. Running is only accepted by the supervision after the time has elapsed.

Case-1:
If once motor starts & I falls below 3% of Ip for the time less than stop time and again exceeds 3% of Ip then the motor comes to run state not after the set start time but after the time which was left in preceding case.

Case-2:
If I falls below 3% of Ip before the expiry of start time (i.e. before run state) and remains in the state then the start timer expires after the motor get stopped (i.e. after the expires of stop timer).

4) **Start Interval:** This is the time allowed between two consecutive starts.

5) **Start Blocking Time:** This time inhibit the start process and assigned relay will block the start for the set blocking time.

6) **Stop Time**: If current goes below 3% of Ip, then motor stops after set stop time.

10.0 Event Record

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 data:

- ❖ Date & Time of the Event
- ❖ Descriptive Text of the Event

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

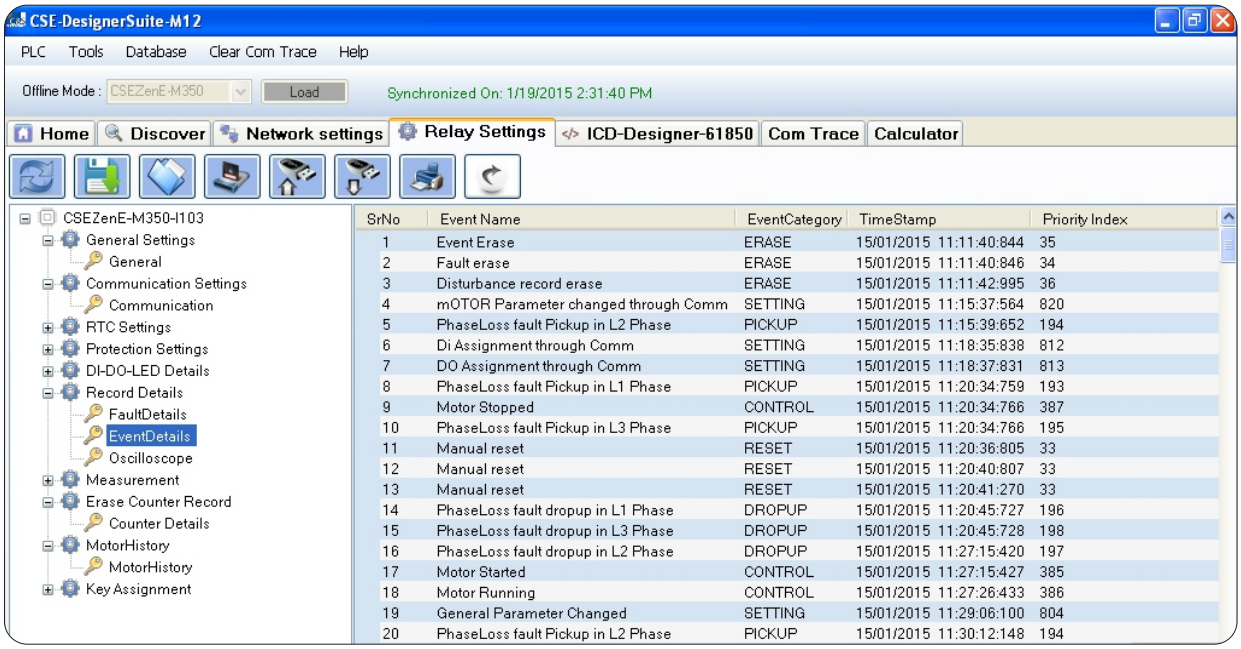


Figure-4

Event Data recording on PC Software

Output Contacts

No. of digital outputs	: 8 (Fixed DO1 (WDT) and assignable DO2, DO3, DO4, DO5, DO6, DO7, DO8)
Type of outputs	: Relay
Programmable (DO Assignment)	: Yes
DO reset type inputs	: Programmable (Auto/Manual)

Input Contacts

No of digital inputs	: 8 (DI1, DI2, DI3, DI4, DI5, DI6, DI7, DI8)
Type of inputs	: AC/DC Voltage
Programmable (DI Assignment)	: Yes

11.0 Fault Record

The data recorded during the fault sequence is called Fault Record. CSEZEN-M350 records last 20 faults in its non volatile memory with time stamp. Each record has following information :

- ❖ Phase, Earth & NPS fault currents, voltage, zero sequence voltage
- ❖ Date and time of fault
- ❖ Origin of fault (over current, thermal .... etc.)

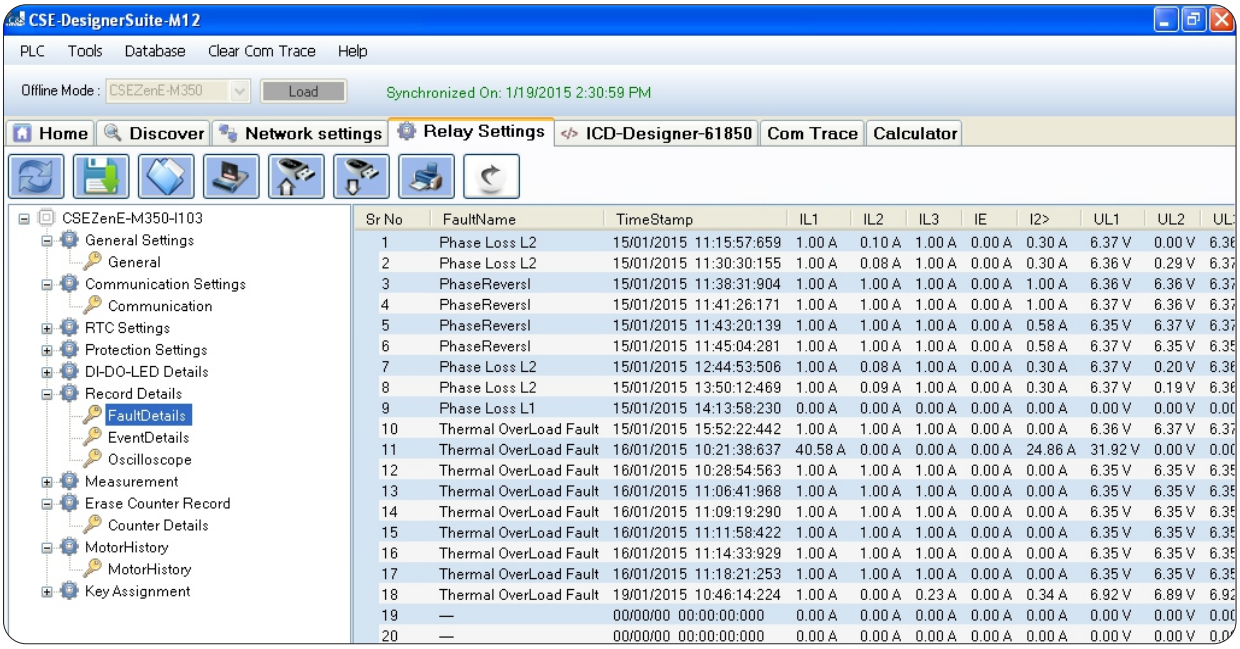


Figure-5

Fault Data recording on PC Software

Fault indicator helps the user to identify clearly the fault and to monitor relay setting and operation. When the available memory space is exhausted, the new fault automatically overwrites the oldest Fault. The user can view fault records either from the front panel or remotely via the RS-485 communication.

DATA ACQUISITION FUNCTION

Measurements

- ❖ L1, L2, L3 phase current measurements
- ❖ L1, L2, L3 phase Star, Delta voltage measurements
- ❖ Earth current measurement
- ❖ Negative Sequence current
- ❖ Frequency
- ❖ Negative/Positive/Zero Phase Sequence
- ❖ Percentage of Harmonics
- ❖ Thermal Memory
- ❖ Trip Counter
- ❖ Origin of Faults
- ❖ Motor Run Hour
- ❖ Temperature by RTD Sensors *
- ❖ Thermal Equivalent (It is the max phase current which contribute in thermal content and measured only when thermal protection is enable.
- ❖ Three Phase Active/Reactive/Apparent Power
- ❖ Three Phase/Single Phase Power Factor
- ❖ Forward/Reverse Active Energy
- ❖ Forward/Reverse Reactive Energy
- ❖ Maxi-meter for both voltage & current
- ❖ Ratio of I1/I2
- ❖ % of Load Value
- ❖ Motor Start current

* Model Dependent

12.0 Disturbance Record

The CSEZEN-M350 relay has an oscillograph data recorder with the following characteristics:

- ❖ Oscilloscopic recording can trigger on Pickup or on trip or via DI or on start i.e. change from pre-fault to post-fault stage. It is programmable.
- ❖ Each record comprises the samples from 7 analog signals and the status of 8 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.
- ❖ 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 IEC 60255-24 is also provided.

Figure-6

Oscilloscope recording on PC software

Motor Start-up Record

The CSEZEN-M350 stores the last 5 start-stop time records in non-volatile memory. when one available memory space is exhausted, the new record automatically overwrites the oldest record.

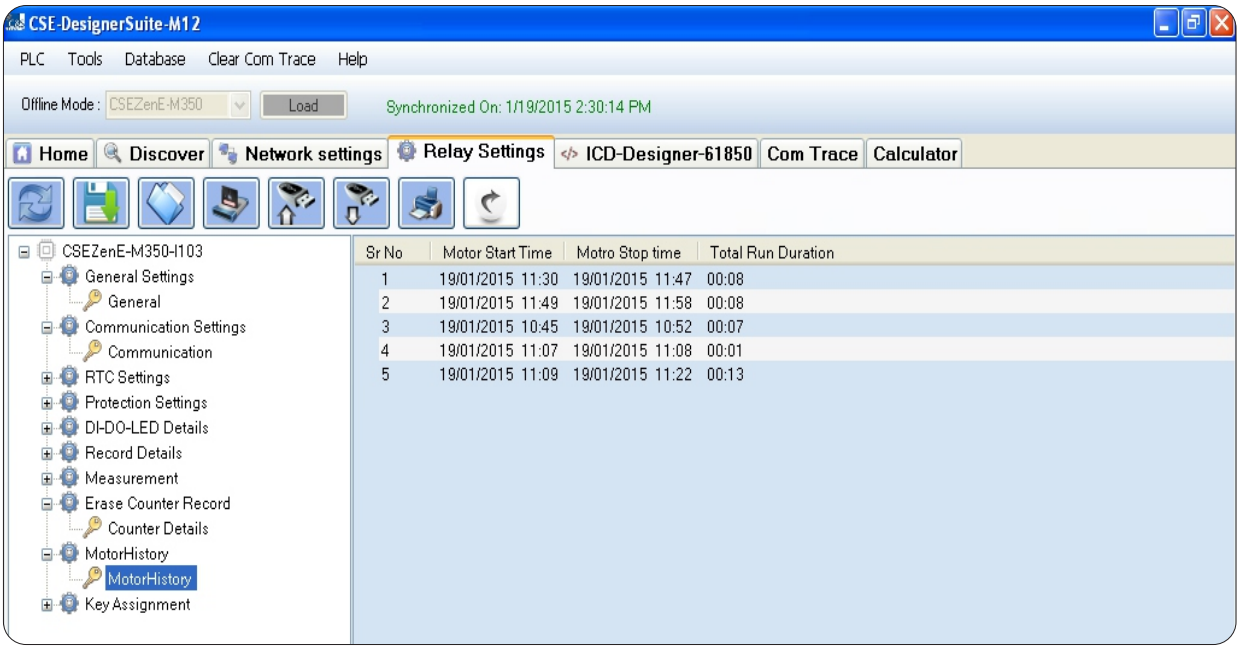


Figure-7

Incomplete Sequence Record

CSEZEN-M350 records the incomplete sequence of the Motor start. If after Motor starting, RUN state doesn't come (i.e motor stops) then that will be called as incomplete sequence and increments the counter by one.

Maxi-meter

The unit stores the maximum current value and maximum voltage value for the moment when it occurs.

Here voltage will be phase to phase for delta connection and phase to neutral for star connection.

13.0 Human Machine Interface

CSEZEN-M offers a variety of front user interfaces, including:

Human-Machine Interface (HMI)

It comprises of 20x4 Alpha numeric display and 11 push buttons for setting and other operations for local access:

- Two push switches for set values of normal tripping characteristics.
- One 'RESET' push switch & One 'ENTER' push switch.
- One intelligent (I) Key.
- One push switch for the tripping of relay assigned to 'F1' Key.
- Two push switches for the tripping of relay assigned to Circuit breaker open & Circuit breaker close.
- Ten LEDs for pickup or tripping on fault's & events in any phase.

In order to change any setting first press enter then only (◀ / ▶) key will act as decrement/increment else these key will function as scroll in backward/forward direction.

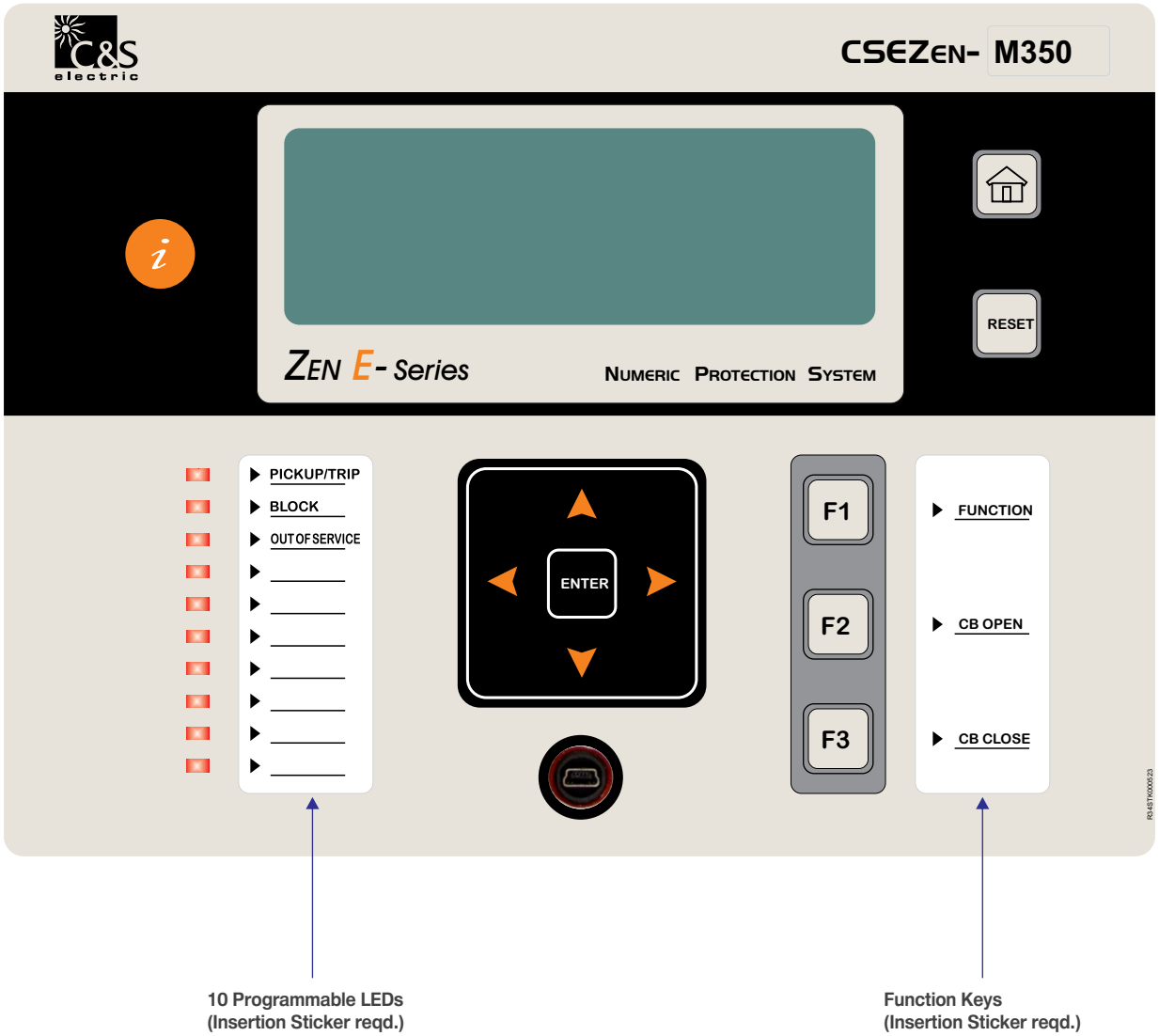


Figure-8

Key Description

Keys	Manual Key
	is used as intelligent key to see the details of the fault pickup / digital input / output status & last fault details / LED Status.
	is used as a “HOME” key.
	is used as a “RESET” key.
	is used as a “ENTER” key.
	is used to scroll in upward direction for parameters.
	is used to scroll in downward direction for parameters.
	is used to scroll in backward direction and for decrement of parameters.
	is used to scroll in forward direction and for increment of parameters.
	is used as a “FUNCTION” key.
	is used as a “Motor Start” key.
	is used as a “Motor Stop” key.

LED Description

In CSEZEN Relay Ten LEDs are given for pickup or tripping on faults & events in any phase. 3 LEDs are fix

1) PICKUP/TRIP — Relay is in Pickup / Trip mode
2) BLOCK — Some protection function is blocked
3) OUT OF SERVICE — Relay is in out of service mode (Protection on hold)

All 10 LED’s are programmable via front end software CSE Designer Suite - M12, available on front fascia. For these 10 LED’s protection function naming sticker is needed to be inserted.

14.0 Communication (Local & Remote)

The unit has:

- ❖ 1 Front USB port for direct connection to a PC.
- ❖ 1 Rear RS-485 communication port.
- ❖ 1 Rear terminal can be for: RJ-45 or plastic F.O (optional).

Rear Communication (RS-485/RJ-45/Fiber optics (based on ordering model))

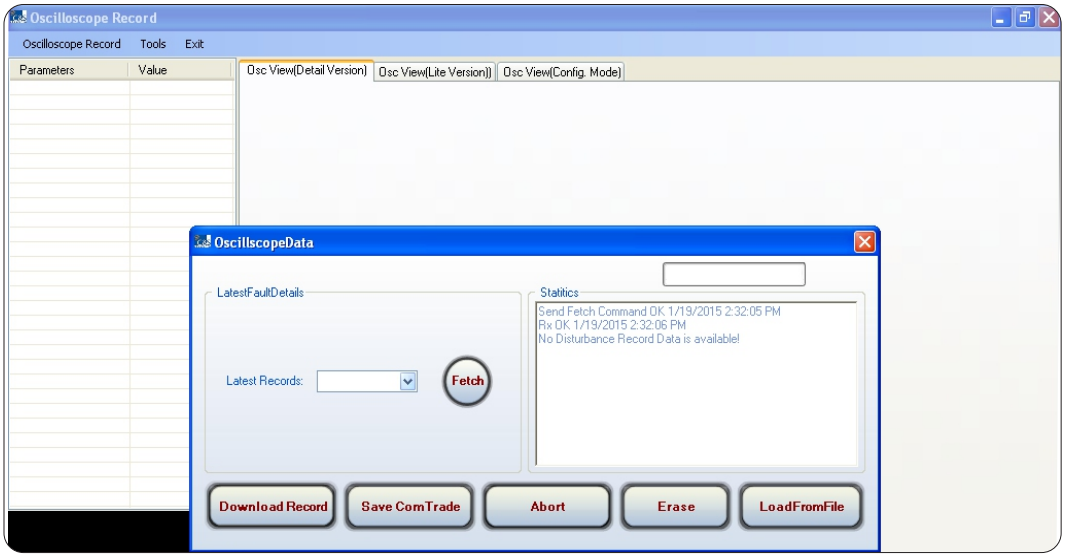
The protocol for the rear port is programmable. The user can choose either MODBUS or IEC 870-5-103 protocol for RS-485/RJ-45 communication.

Front Communication (USB)

The entire setting including protection parameter setting for both group, Fault, Event & Disturbance record are available on Mini-Type B-A, USB (female) interface with CSE DesignerSuite-M12 with saving & printing option.

PC interface

All the group's setting, Fault, Event & Disturbance record is available on USB interface with CSE DesignerSuite-M12 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.



15.0 Setting Ranges

Oscilloscope (Disturbance) Record Setting

Parameters	Display	Setting Range		Step Size
		Min	Max	
Oscilloscope recording	OSC.RECORD	NO	YES	---
Number of Pre Fault Cycle	Pre Cycle	2	298	1
Number of Post Fault Cycle	Post Cycle	2	298	1
Trigger mode	Trig. Mode	PICKUP	TRIP, DI, ANYONE, START	—

Group Setting

Parameters	Display	Setting Range		Step Size
		Min	Max	
Active Group	Act_Grp	GROUP1	GROUP4	1
Group Toggle Step	Grp_Tog_Stp	+1	+3	1

Common Setting

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

Parameters	Display	Setting Range		Step Size
		Min	Max	
Rated Phase Current (Ip)	Ip	1A	5A	1A
Rated Earth Current (In)	In	1A	5A	1A
Phase CT Ratio	Ph CTRtio	1	9999	1
Earth CT Ratio	E CTRatio	1	9999	1
PT Ratio	PT Ratio	1.0	6500	0.1
Wiring Configuration	WireConfg	STAR	DELTA	----
Voltage Operate Mode	Volt_Op_Mod	SINGLE PHASE	THREE PHASE	----
Full Load (Ifl)	Ifl	10%Ip	200%Ip	1%Ip
Nominal Frequency	FREQ (Fn)	50Hz	60Hz	10Hz
Fault Popup	Flt Popup	DISABLE	ENABLE	----
Service Mode	Service Mode	Out of Serive	In Service	----
RTD Type	RTD Type	Ni120	Ni100, Pt100	----
Ambient RTD	Ambnt RTD	None	RTD5	RTD1

*** Note: Protection selection setting is applicable only on under/over voltage protection.**
By changing CT/PT ratio, Energy content will change accordingly, before changing CT/PT ratio Erase energy counter.

Communication

RS-485 Communication		Default Setting
Baud rate selection (programmable)	9600 / 19200 / 38400 / 57600 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)	247/254	1
Cable required for Interface	Two wire twisted shielded cable	------

˚ For MODBUS : Remote Address Setting Range is 1 - 247
& For IEC 103 : Remote Address Setting Range is 1 - 254

Phase OverCurrent

Parameters	Display	Setting Range		Step Size
		Min	Max	
Over Current Setting				
Phase Characteristics	PCURVE	DEFT	EINV, VINV, LINV NINV1.3, NINV3.0	1
Overcurrent Setting	I>	0.20xIp	4.00xIp	0.05xIp
Overcurrent Inverse Time Multiplier	ti>	0.04	25.00	0.01
Overcurrent Definite Trip Time	td>	0.05sec	260.00sec	0.01sec
Short Circuit Stage 1 Setting				
Short Circuit Current Setting	I>>	0.20xIp	30.00xIp	0.02xIp
Short Circuit Definite Trip Time	t>>	0.04sec	20.00sec	0.02sec
Short Circuit Stage 2 Setting				
Short Circuit Current Setting	I>>>	0.20xIp	30.00xIp	0.02xIp
Short Circuit Definite Trip Time	t>>>	0.04sec	20.00sec	0.02sec

Negative Phase Sequence Setting

Parameters	Display	Setting Range		Step Size
		Min	Max	
NPS Characteristic	I2>	DEFT	NPS_INV	---
NPS Pickup setting	I2> PKUP	0.10xIp	1.00xIp	0.01xIp
Constant	K1	5	600	1
NPS Definite Trip Time	td1	0.1sec	600.0sec	0.1sec

USB Communication		
Protocol	:	CSE Proprietary Protocol: available with front software
Baud rate	:	115200 bps
Cable required for Interface	:	USB cable type Mini (B to A)

RTC Settings

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Day	Day	SUN	SAT	1	—
Date	Date	1	31	1	—
Month	MONTH	1	12	1	—
Year	YEAR	2000	2099	1	—
Hour	HOUR	0	23	1	—
Minute	MINUTE	0	59	1	—
Second	SECOND	0	59	1	—

Phase UnderCurrent

Parameters	Display	Setting Range		Step Size
		Min	Max	
Under Current Setting				
Under Current Setting	I<	0.20xIp	1.00xIp	0.01xIp
Under Current Trip Time	t<	0.05sec	260.00sec	0.01sec

Sensitive Earth Over Current Setting (51SG)* (based on Ordering information)

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	0.002 Amp	1 Amp	0.001 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	0.002 Amp	1 Amp	0.001 Amp	0.1 Amp
Ie>> Definite timing	Ie>> Deft Time	0.03 sec	150 sec	0.01 sec	0.03 sec

Earth Fault

Parameters	Display	Setting Range		Step Size
		Min	Max	
Earth Stage 1 Settings				
Earth Characteristics	E-CURVE	DEFT	EINV, VINV, LINV NINV1.3, NINV3.0	—
Earth Protection In start	Ie> Strt	NO	YES	—
Earth Current Setting	Ie>	0.05xIn	2.50xIn	0.05xIn
Earth Inverse Time Multiplier	ti>	0.05	20.00	0.05
Earth Definite Trip Time	td>	0.03sec	260.00sec	0.01sec
Earth Stage 2 Setting				
Earth Protection In start	Ie>> Strt	NO	YES	---
Earth Current Setting	Ie>>	0.50xIn	8.00xIn	0.05xIn
Earth Definite Trip Time	td>>	0.02sec	20.00sec	0.01sec

Trip Circuit Supervision

Parameters	Display	Setting Range		Step Size
		Min	Max	
Trip Circuit Supervision Delay Time	td	0.03sec	2.00sec	0.01sec

Circuit Breaker Failure

Parameters	Display	Setting Range		Step Size
		Min	Max	
CBFP Trip Time	td	0.03sec	2.00sec	0.01sec

Thermal Over-load

Parameters	Display	Setting Range		Step Size
		Min	Max	
Thermal Memory Mode	TH_M_Mode	M1	M2, M3	1
Permissible basic current	Ib	0.20xIp	4.00xIp	0.02xIp
Constant	k	0.50	2.00	0.01
Heating Time Constant	τc	000.5min	180.0min	0.1min
Cooling Constant	C1 Const	1.00xTh	8.00xTh	0.01xTh
Thermal Alarm	Th Alarm	20%	99%	1%
NPS Weighting Factor	I2_Wgt	0.05	2.50	0.05
Thermal Reset	Th_Reset	0%	99%	1%
Thermal Characteristic	Th_Char	Th1	Th2	1

Motor Control Setting

Parameters	Display	Setting Range		Step Size
		Min	Max	
Start Limit	St tLmt Tm	1min	300min	1min
Start Attempt	St Atmpt	1	20	1
Start Time	St Time	0.20sec	500.00sec	0.01sec
Time between Two Start	St Intvl	1min	240min	1min
Start Blocking Selection	St Blkng	THERMAL	MOTOR START, BOTH	---
Start Blocking Time	St BlkTm	1min	60min	1min
Stop Time	Stp Time	0.05sec	10.00sec	0.01sec
Phase Loss Trip Time	Ph Loss	0.10 min	10.00min	0.01min
Locked Rotor Current Setting	Lk Rtr I	2xIp	30xIp	02xIp
Locked Rotor Trip Time	Lk RtrTm	0.04sec	20.00sec	0.01sec
Stall Current Setting	Stall I	0.5xIp	30.0xIp	0.1xIp
Stall Trip Time	Stall Tm	1sec	60sec	1sec
Phase Reversal Setting	Ph Rvrsl	DISABLE	ENABLE	---
Phase Reversal Trip Time	Ph RslTm	0.1sec	30.0sec	0.1sec
External Trip Time	Trip Dly	0.1sec	260.0sec	0.1sec

CT Supervision

Parameters	Display	Setting Ranges		Step Size
		Min.	Max.	
CT Supervision	CT_Sup	ENABLE	DISABLE	---
Current Minimum Setting	I Mn_Set	0.1xIp	10.0xIp	0.1xIp
Current Maximum Setting	I Mx_Set	0.1xIp	10.0xIp	0.1xIp
Current Supervision Trip Time	CTS Dly	0.05sec	600.00sec	0.01sec

Note: Current maximum setting should not be > current minimum setting.

Load Monitoring

Parameters	Display	Setting Ranges		Step Size
		Min.	Max.	
Load Setting	Load_Set	10%ifl	200%ifl	1%ifl
Load Trip Time	Ld_Tr_Tm	0.1sec	30sec	0.1sec

Harmonic Restrain

Parameters	Display	Setting Range		Step Size
		Min	Max	
Phase 2nd Harmonic Block	Ph 2ndH	10%If	50%If	2%If
Earth 2nd Harmonic Block	E 2ndH	10%If	50%If	2%If
Phase Blocking Time	Ph Td	0.0sec	20.0sec	0.1%If
Earth Blocking Time	E Td	0.0sec	20.0sec	0.1%If

RTD Input (* Model Dependent)

Parameters	Display	Setting Range		Step Size
		Min	Max	
RTD1 Alarm Setting	RTD1 Alarm	20°C	200°C	001°C
RTD1 Alarm Trip Time	RTD1 AlrTm	0.2sec	100.0sec	0.1sec
RTD1 Trip Setting	RTD1 Trip	20°C	200°C	001°C
RTD1 Trip Time	RTD1 TrpTm	0.2sec	100.0sec	0.1sec
RTD2 Alarm Setting	RTD2 Alarm	20°C	200°C	001°C
RTD2 Alarm Trip Time	RTD2 AlrTm	0.2sec	100.0sec	0.1sec
RTD2 Trip Setting	RTD2 Trip	20°C	200°C	001°C
RTD2 Trip Time	RTD2 TrpTm	0.2sec	100.0sec	0.1sec
RTD3 Alarm Setting	RTD3 Alarm	20°C	200°C	001°C
RTD3 Alarm Trip Time	RTD3 AlrTm	0.2sec	100.0sec	0.1sec
RTD3 Trip Setting	RTD3 Trip	20°C	200°C	001°C
RTD3 Trip Time	RTD3 TrpTm	0.2sec	100.0sec	0.1sec
RTD4 Alarm Setting	RTD4 Alarm	20°C	200°C	001°C
RTD4 Alarm Trip Time	RTD4 AlrTm	0.2sec	100.0sec	0.1sec
RTD4 Trip Setting	RTD4 Trip	20°C	200°C	001°C
RTD4 Trip Time	RTD4 TrpTm	0.2sec	100.0sec	0.1sec
RTD5 Alarm Setting	RTD5 Alarm	20°C	200°C	001°C
RTD5 Alarm Trip Time	RTD5 AlrTm	0.2sec	100.0sec	0.1sec
RTD5 Trip Setting	RTD5 Trip	20°C	200°C	001°C
RTD5 Trip Time	RTD5 TrpTm	0.2sec	100.0sec	0.1sec

Over / Under Voltage

Parameters	Display	Setting Ranges		Step Size
		Min.	Max.	
Voltage Loss Block	UlosBlk	DISABLE	ENABLE	—
Under Voltage Threshold	U_th	5 %Un	100 %Un	1 %Un
Under Voltage Characteristic	U<Char	DEFT	U_INV	---
Under Voltage in Start	U<Start	NO	YES	---
Under Voltage Setting	U<Pkup	20 %Un	130 %Un	1 %Un
Under Voltage Inverse Time Multiplier	U<Ti	0.05	2.00	0.01
Under Voltage Definite Trip Time	U<Td	0.01sec	300.00sec	0.01sec
Under Voltage in start	U<<Strt	NO	YES	1
Under Voltage Setting	U<<Pkup	5 %Un	120 %Un	1 %Un
Under Voltage Definite Trip Time	U<<Td	0.01 sec	300 sec	0.01 sec
Over Voltage Characteristics	U>Char	DEFT	U_INV	---
Over Voltage Setting	U>Pkup	20 %Un	150 %Un	1 %Un
Over Voltage Inverse Time Multiplier	U>Ti	0.05	2.00	0.01
Over Voltage Definite Trip Time	U>Td	0.01 sec	300.00 sec	0.01 sec
Over Voltage Setting	U>>Pkup	20 %Un	150 %Un	1 %Un
Over Voltage Definite Trip Time	U>>Td	0.01 sec	300.00 sec	0.01 sec

U0 / U1 / U2 Setting

Parameters	Display	Setting Range		Step Size
		Min	Max	
Zero Sequence Voltage Setting	U0>Pkup	2%Un	100%Un	1%Un
Zero Sequence Voltage Characteristic	U0>Char	DEFT	U_INV	---
Zero Sequence Voltage Inverse Time Multiplier	U0>Ti	0.05	2.00	0.01
Zero Sequence Voltage Definite Trip Time	U0>Td	0.03 sec	20.00 sec	0.01 sec
Positive Sequence Voltage Setting	U1<Pkup	10%Un	100%Un	1%Un
Positive Sequence Voltage Definite Trip Time	U1<Td	0.03 sec	10.00 sec	0.01 sec
Negative Sequence Voltage Setting	U2>Pkup	10%Un	100%Un	1%Un
Negative Sequence Voltage Definite Trip Time	U2>Td	0.03sec	10.00sec	0.01sec

Frequency

Parameters	Display	Setting Range		Step Size
		Min	Max	
Pickup Cycle	PkupCycl	3	15	1
Voltage Threshold	Req.MinV	20Volt	100Volt	1Volt
Under Frequency Setting	f<Pickup	40.00Hz	70.00Hz	0.01Hz
Under Frequency Definite Trip Time	f<Td	0.02sec	60.00sec	0.01sec
Over Frequency Setting	f>Pkup	40.00Hz	70.00Hz	0.01Hz
Over Frequency Definite Trip Time	f>Td	0.02sec	60.00sec	0.01sec

Reverse Power

Parameters	Display	Setting Range		Step Size
		Min	Max	
Reverse Power	RP>	DISABLE	ENABLE	-
Reverse Power Setting	RP>Pkup	5%Pn	200%Pn	1%Pn
Reverse Power Trip Time	RP>Time	0.03sec	60.00sec	0.01sec

DO Assignment

(* Model Dependent)

Parameters	
1	Over-current protection
2	Short circuit protection
3	Under-current
4	Earth timed protection
5	Earth instant protection
6	Negative phase sequence protection
7	Circuit breaker failure protection
8	Start block
9	Common fault
10	Start relay
11	Stop relay
12	Thermal relay
13	Thermal alarm
14	Phase loss
15	Stall
16	Locked Rotor
17	Phase reversal
18	External trip1
19	Trip circuit supervision
20	Motor running
21	Self supervision
22	Under-voltage
23	Under voltage Hi-set
24	Over-voltage
25	Over voltage Hi-set
26	CT Secondary supervision
27	Load supervision
28	Zero sequence over voltage protection
29	Positive sequence over voltage protection
30	Negative sequence over voltage protection
31	Circuit breaker control

Parameters	
32	External trip2
33	External trip3
34	External trip4
35	External trip5
36	External trip6
37	RTD1 Alarm Pickup *
38	RTD1 Alarm Trip *
39	RTD1 Fault Pickup *
40	RTD1 Fault Trip *
41	RTD2 Alarm Pickup *
42	RTD2 Alarm Trip *
43	RTD2 Fault Pickup *
44	RTD2 Fault Trip *
45	RTD3 Alarm Pickup *
46	RTD3 Alarm Trip *
47	RTD3 Fault Pickup *
48	RTD3 Fault Trip *
49	RTD4 Alarm Pickup *
50	RTD4 Alarm Trip *
51	RTD4 Fault Pickup *
52	RTD4 Fault Trip *
53	RTD5 Alarm Pickup *
54	RTD5 Alarm Trip *
55	RTD5 Fault Pickup *
56	RTD5 Fault Trip *
57	Motor Running Status
58	Restart Inhibit
59	Motor Start Command
60	Motor Stop Command
61	Common Fault Trip

DI Assignment

Parameters	
1	Circuit breaker open
2	Circuit breaker close
3	Remote start
4	Remote stop
5	Remote reset
6	Over-current blocking
7	Short circuit blocking
8	Earth timed blocking
9	Earth instant blocking
10	Locked Rotor blocking
11	Stall blocking
12	Phase loss blocking
13	Phase reversal blocking
14	Thermal blocking
15	NPS blocking
16	Under-current blocking
17	External delay trigger
18	External un-delay trigger-1
19	Motor running identification
20	Oscilloscope record triggering
21	Group toggling
22	Emergency start
23	Start blocking
24	Under-voltage blocking
25	Under-voltage Hi-set blocking
26	Over-voltage blocking
27	Over-voltage Hi-set blocking
28	Zero sequence over voltage blocking
29	Positive sequence over voltage blocking
30	Negative sequence over voltage blocking
31	External un-delay trigger-2
32	External un-delay trigger-3
33	External un-delay trigger-4
34	External un-delay trigger-5
35	External un-delay trigger-6

Function Reset

Parameters	Function Status
Over Current Pickup	Auto/Manual
Over Current Trip	Auto/Manual
Short Circuit Stage1 Pickup	Auto/Manual
Short Circuit Stage1 Trip	Auto/Manual
Short Circuit Stage2 Pickup	Auto/Manual
Short Circuit Stage2 Trip	Auto/Manual
Under Current Pickup	Auto/Manual
Under Current Trip	Auto/Manual
Earth Fault Stage 1 Pickup	Auto/Manual
Earth Fault Stage 1 Trip	Auto/Manual
Negative Phase Sequence Current Pickup	Auto/Manual
Negative Phase Sequence Current Trip	Auto/Manual
Stall Pickup	Auto/Manual
Stall Trip	Auto/Manual
Locked Rotor Pickup	Auto/Manual
Locked Rotor Trip	Auto/Manual
Under Voltage Pickup (U<)	Auto/Manual
Under Voltage Trip (U<)	Auto/Manual
Under Voltage Pickup (U<<)	Auto/Manual
Under Voltage Trip (U<<)	Auto/Manual
Over Voltage Pickup (U<)	Auto/Manual
Over Voltage Trip (U<)	Auto/Manual
Over Voltage Pickup (U<<)	Auto/Manual
Over Voltage Trip (U<<)	Auto/Manual
Zero Sequence Voltage Pickup	Auto/Manual
Positive Sequence Voltage Pickup	Auto/Manual
Positive Sequence Voltage Trip	Auto/Manual
Negative Sequence Voltage Pickup	Auto/Manual
Negative Sequence Voltage Trip	Auto/Manual
Thermal Overload Trip	Auto/Manual
Thermal Overload Alarm	Auto/Manual
Reverse Power Pickup	Auto/Manual
Reverse Power Trip	Auto/Manual
Over Frequency Pickup	Auto/Manual
Over Frequency Trip	Auto/Manual
Under Frequency Pickup	Auto/Manual
Under Frequency Trip	Auto/Manual
Phase Reversal Pickup	Auto/Manual
Phase Reversal Trip	Auto/Manual
Trip Circuit Unhealthy	Auto/Manual
Circuit Breaker Failure Protection	Auto/Manual
CT Secondary Open	Auto/Manual

Function Reset setting contd. on next page

(* Model Dependent)

Parameters	Function Status
Load Alarm	Auto/Manual
Phase Loss Trip	Auto/Manual
External Trip1	Auto/Manual
External Trip2	Auto/Manual
External Trip3	Auto/Manual
External Trip4	Auto/Manual
External Trip5	Auto/Manual
External Trip6	Auto/Manual
RTD1 Alarm Pickup *	Auto/Manual
RTD1 Alarm Trip *	Auto/Manual
RTD1 Fault Pickup *	Auto/Manual
RTD1 Fault Trip *	Auto/Manual
RTD2 Alarm Pickup *	Auto/Manual
RTD2 Alarm Trip *	Auto/Manual
RTD2 Fault Pickup *	Auto/Manual
RTD2 Fault Trip *	Auto/Manual
RTD3 Alarm Pickup *	Auto/Manual
RTD3 Alarm Trip *	Auto/Manual
RTD3 Fault Pickup *	Auto/Manual
RTD3 Fault Trip *	Auto/Manual
RTD4 Alarm Pickup *	Auto/Manual
RTD4 Alarm Trip *	Auto/Manual
RTD4 Fault Pickup *	Auto/Manual
RTD4 Fault Trip *	Auto/Manual
RTD5 Alarm Pickup *	Auto/Manual
RTD5 Alarm Trip *	Auto/Manual
RTD5 Fault Pickup *	Auto/Manual
RTD5 Fault Trip *	Auto/Manual
Motor Running Status	Auto/Manual
Restart Inhibit	Auto/Manual
Motor Start Command	Auto/Manual
Motor Stop Command	Auto/Manual
Common Fault Trip	Auto/Manual

LED Matrix

(* Model Dependent)

Parameters	Function Status
Over Current Pickup	
Over Current Trip	
Short Circuit Stage1 Pickup	
Short Circuit Stage1 Trip	
Short Circuit Stage2 Pickup	
Short Circuit Stage2 Trip	
Under Current Pickup	
Under Current Trip	
Earth Fault Stage 1 Pickup	
Earth Fault Stage 1 Trip	
Negative Phase Sequence Current Pickup	
Negative Phase Sequence Current Trip	
Stall Pickup	
Stall Trip	
Locked Rotor Pickup	
Locked Rotor Trip	
Under Voltage Pickup (U<)	
Under Voltage Trip (U<)	
Under Voltage Pickup (U<<)	
Under Voltage Trip (U<<)	
Over Voltage Pickup (U<)	
Over Voltage Trip (U<)	
Over Voltage Pickup (U<<)	
Over Voltage Trip (U<<)	
Zero Sequence Voltage Pickup	
Positive Sequence Voltage Pickup	
Positive Sequence Voltage Trip	
Negative Sequence Voltage Pickup	
Negative Sequence Voltage Trip	
Thermal Overload Trip	
Thermal Overload Alarm	
Reverse Power Pickup	
Reverse Power Trip	
Over Frequency Pickup	
Over Frequency Trip	
Under Frequency Pickup	
Under Frequency Trip	
Phase Reversal Pickup	
Phase Reversal Trip	
Trip Circuit Unhealthy	
Circuit Breaker Failure Protection	
CT Secondary Open	

Parameters
Load Alarm
Phase Loss Trip
External Trip1
External Trip2
External Trip3
External Trip4
External Trip5
External Trip6
RTD1 Alarm Pickup *
RTD1 Alarm Trip *
RTD1 Fault Pickup *
RTD1 Fault Trip *
RTD2 Alarm Pickup *
RTD2 Alarm Trip *
RTD2 Fault Pickup *
RTD2 Fault Trip *
RTD3 Alarm Pickup *
RTD3 Alarm Trip *
RTD3 Fault Pickup *
RTD3 Fault Trip *
RTD4 Alarm Pickup *
RTD4 Alarm Trip *
RTD4 Fault Pickup *
RTD4 Fault Trip *
RTD5 Alarm Pickup *
RTD5 Alarm Trip *
RTD5 Fault Pickup *
RTD5 Fault Trip *
Motor Running Status
Restart Inhibit
Motor Start Command
Motor Stop Command
Common Fault Trip

Measurement

Parameters	Value	Unit	
Phase Current			
IL1		A	
IL2		A	
IL3		A	
Earth Current			
Ie		A	
NPS Current			
I2		A	
PPS Current			
I1		A	
Trip Count			
Thermal Content		%	
Motor Status			
Remaining Starting Blocking Time			
Run Minute			
Run Hour			
Start Attempt			
Incomplete Sequence			
Harmonics			
Phase 2nd Harmonics		%	
Earth 2nd Harmonics		%	
Phase Voltage			
UL1		V	
UL2		V	
UL3		V	
Phase to Phase Voltage			
UL23		V	
UL31		V	
UL12		V	
Phase Sequence Voltage			
U1		V	
U2		V	
U0		V	
Active Power		kW	
Reactive Power		kVar	
Apparent Power		kVa	
Forward Energy		kWh	
Reverse Energy		kWh	
Forward Reactive Energy		kVarh	
Reverse Reactive Energy		kVarh	

Measurement

(* Model Dependent)

Parameters	Value	Unit	
PowerFactor_R Phase			
PowerFactor_Y Phase			
PowerFactor_B Phase			
Three Phs Power Factor			
Frequency		Hz	
Thermal Equivalent Current			
Th_Ieq		A	
Unbalance Ratio			
I2/I1			
Load Value			
Load Value		%FL	
Motor Starting Current		A	
Maxi Meter			
MAX_I		A	
MAX_U		V	
RTD Temperature *			
RTD1 *			
RTD2 *			
RTD3 *			
RTD4 *			
RTD5 *			

Erase Counter Record

Parameters	Display	Setting Range		Step Size
		Min	Max	
Trip Counter	Trip Cnt	NO	YES	1
Incomplete Sequence Counter	Inc Sq Cnt	NO	YES	1
Thermal Memory Record	Th m/m Rst	NO	YES	1
Run Hour Record	RunLogRst	NO	YES	1
Maxi Meter Record	Mx Mtr Rst	NO	YES	1
Energy Record	Energy Rst	NO	YES	1
Starting Current Record	Strtt_I Rst	NO	YES	1
Event Record	Events Rst	NO	YES	1
Fault Record	Faults Rst	NO	YES	1
Oscilloscope Record	OscRcrdRst	NO	YES	1

Key Assignment

Relay is having one function key (F1). It can be assign to trip any of 8 DO or to Relay reset, Thermal reset of the relay.

Parameters	Display	Setting Range	Step Size
Function key	F1	DO2/DO3/DO4/DO5/DO6/DO7/DO8 RELAY RESET, THERMAL RESET, CB CONTROL	1

Motor History

Parameters	Display
Srt1	00/00/00-00:00
Stp1	00/00/00-00:00
Run Tm1	0000hh:00mm
Srt2	00/00/00-00:00
Stp2	00/00/00-00:00
Run Tm2	0000hh:00mm
Srt3	00/00/00-00:00
Stp3	00/00/00-00:00
Run Tm3	0000hh:00mm
Srt4	00/00/00-00:00
Stp4	00/00/00-00:00
Run Tm4	0000hh:00mm
Srt5	00/00/00-00:00
Stp5	00/00/00-00:00
Run Tm5	0000hh:00mm

16.0 Technical Data

Measuring Input

Rated Data	Rated current I_n :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_n=1A 0.1 VA
	At I_n=5A 0.2 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

Measurement Accuracy

Parameters	Range	Frequency Range	Accuracy
Current in Ampere	1.0-30.0xIn	50-60Hz	Less than ±2%
Voltage	5-150%Un	50-60Hz	Less than ±2%
Power	—	—	Less than ±5%
Power Factor	—	—	Less than ±0.02

Trip Time Accuracy for Current Protections

Parameters	Accuracy
Trip time accuracy for protections except NPS	±30mSec OR ±5% (whichever is higher)
Trip time accuracy for NPS	±60mSec OR ±7.5% (whichever is higher)

Trip Time Accuracy for Voltage Protections

Parameters	Accuracy
Trip time accuracy for voltage protections	Inaccuracy in Trip Timing in reference to ±2% error in measured voltage OR ±30mSec

Trip Contact Rating

Contact Rating	
Contact Relay	Dry contact Ag Ni
Make current	Max. 30A & carry for 3 sec
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=30mSec)
	250V DC, 50W resistive or
	25W inductive (L/R=40mSec)
Operating time	<10ms
Durability	
Loaded contact	10,000 operation minimum
Unloaded contact	30,000 operation minimum

Auxiliary Supply

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

Common Setting

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

17.0 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)	IEC60068-2-1	-20 deg C, 96 hours
C2	Temperature Dry Cold Transportation & Storage	IEC60068-2-1	-25 deg C, 96 hours
C3	Temperature Dry Heat (Relay operational)	IEC60068-2-2	55 deg C, 96 hours
C4	Temperature Dry Heat Transportation & Storage	IEC60068-2-2	70 deg C, 96 hours
C5	Damp Heat Test (Relay operational)	IEC60068-2-3	95% @ +55 / +25 deg C, 6 cycle (12hr + 12hr each)

Enclosure			
C6	Enclosure	IEC529	Front IP54 (Dust5x + Water x4)

Mechanical Test

Relay Operational			
M1	Vibration response / Endurance test	IEC60255-21-1	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	IEC60255-21-1	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	IEC60255-21-1	Bump (Relay de-energised) 10g 16mS 1000 pulses in each axis
M4	Seismic	IEC60255-21-3	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	IEC60255-5	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)		IEC60255-6 Voltage 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)	IEC60255-11	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	IEC60255-5	2.0 KV @ 1min All circuit to Earth / Between IP & OP
E6	High Voltage Impulse (Relay de-energised)	IEC60255-5	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	IEC60255-14,15 IEC60255-23	

Electro-magnetic Compatibility			
R1	Electrical fast Transient/Burst (Relay operational)	IEC60255-22-4 IEC60100-4-4	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)	IEC60255-22-1	Class III Longitudinal 2.5 kV peak, 2sec between independent circuits & case earth
R3	Electrostatic Discharge (Relay operational)	IEC60255-22-2 IEC61000-4-2	Class III 8kV air discharge, 6KV contact No of Discharge : 10 both polarities at 1 sec intervals
R4	Conducted Disturbance RF fields (Relay operational)	IEC61000-4-6 IEC60255-22-6	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)	IEC60255-22-3 IEC61000-4-3	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)	IEC61000-4-5 Class 5 Test level 4 IEC60255-22-5: 2008 Latest: IEC60255-26:2013	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)	IEC61000-4-8	100 A/m for 1 minute in each of 3 axes
R8	Conducted & Radiated RF Interference Emission (Relay operational)	EN55011 IEC60255-25	CISPR11/ Class A
R9	Power Frequency, conducted common mode	IEC 1000-4-16 IEC60255-22-7	D.C. to 150 kHz Test Level 4 300V at 16 2/3 Hz and 50 Hz

18.0 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 Mini - B 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

Figure-9

USB Cable required for Front communication (Mini-Type B to A)

Figure-10

OTG Cable required for Pen Drive Interface

Figure-11

19.0 Motor Connection Diagram

WITH 8 DI /DO

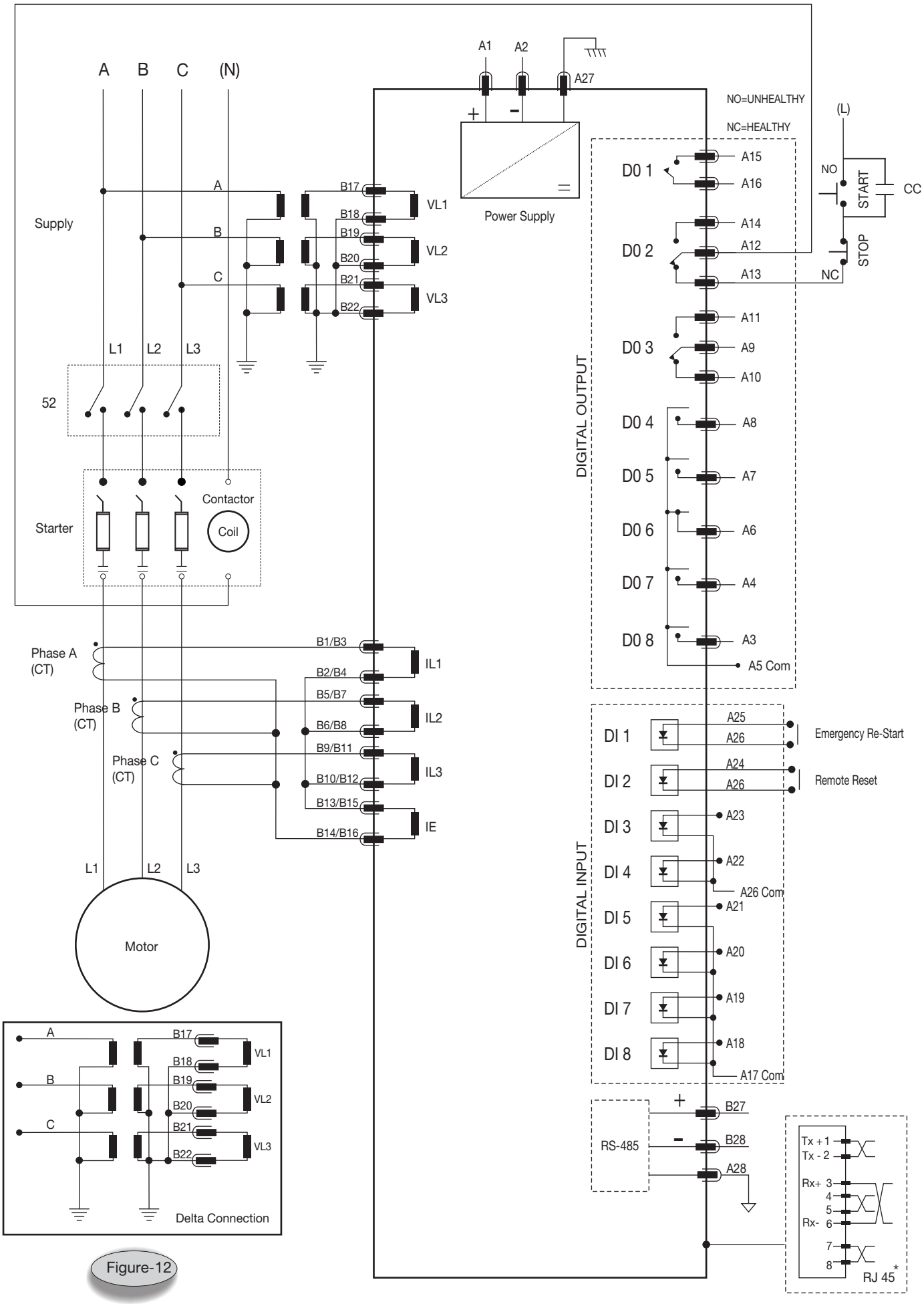


Figure-12

Terminal Description

Terminal No.		Terminal Description		Contact Details
A1	:	Auxiliary Supply (+)		
A2	:	Auxiliary Supply (-)		
A27	:	Earth		
A3-A5	:	Digital Output-8 (DO-8)	:	(NO-COMMON)
A4-A5	:	Digital Output-7 (DO-7)	:	(NO-COMMON)
A6-A5	:	Digital Output-6 (DO-6)	:	(NC-COMMON)
A7-A5	:	Digital Output-5 (DO-5)	:	(NO-COMMON)
A8-A5	:	Digital Output-4 (DO-4)	:	(NO-COMMON)
A11-A9-A10	:	Digital Output-3 (DO-3)	:	(NO-COMMON-NC)
A14-A12-A13	:	Digital Output-2 (DO-2)	:	(NO-COMMON-NC)
A15-A16	:	Digital Output-1 (DO-1)	:	(NO-COMMON)
A18-A17	:	Digital Input-8 (DI-8)		
A19-A17	:	Digital Input-7 (DI-7)		
A20-A17	:	Digital Input-6 (DI-6)		
A21-A17	:	Digital Input-5 (DI-5)		
A22-A26	:	Digital Input-4 (DI-4)		
A23-A26	:	Digital Input-3 (DI-3)		
A24-A26	:	Digital Input-2 (DI-2)		
A25-A26	:	Digital Input-1 (DI-1)		
B1-B2	:	CT Terminal for Phase current (1A) input in L1 Phase		
B3-B4	:	CT Terminal for Phase current (5A) input in L1 Phase		
B5-B6	:	CT Terminal for Phase current (1A) input in L2 Phase		
B7-B8	:	CT Terminal for Phase current (5A) input in L2 Phase		
B9-B10	:	CT Terminal for Phase current (1A) input in L3 Phase		
B11-B12	:	CT Terminal for Phase current (5A) input in L3 Phase		
B13-B14	:	CT Terminal for Neutral current (1A) input		
B15-B16	:	CT Terminal for Neutral current (5A) input		
B17-B18	:	PT Terminal for Phase voltage (L1)		
B19-B20	:	PT Terminal for Phase voltage (L2)		
B21-B22	:	PT Terminal for Phase voltage (L3)		
B27	:	RS-485 MODBUS (+)		
B28	:	RS-485 MODBUS (-)		
A28	:	RS-485 Ground		

MOTOR CONNECTION DIAGRAM WITH 16 DI /DO

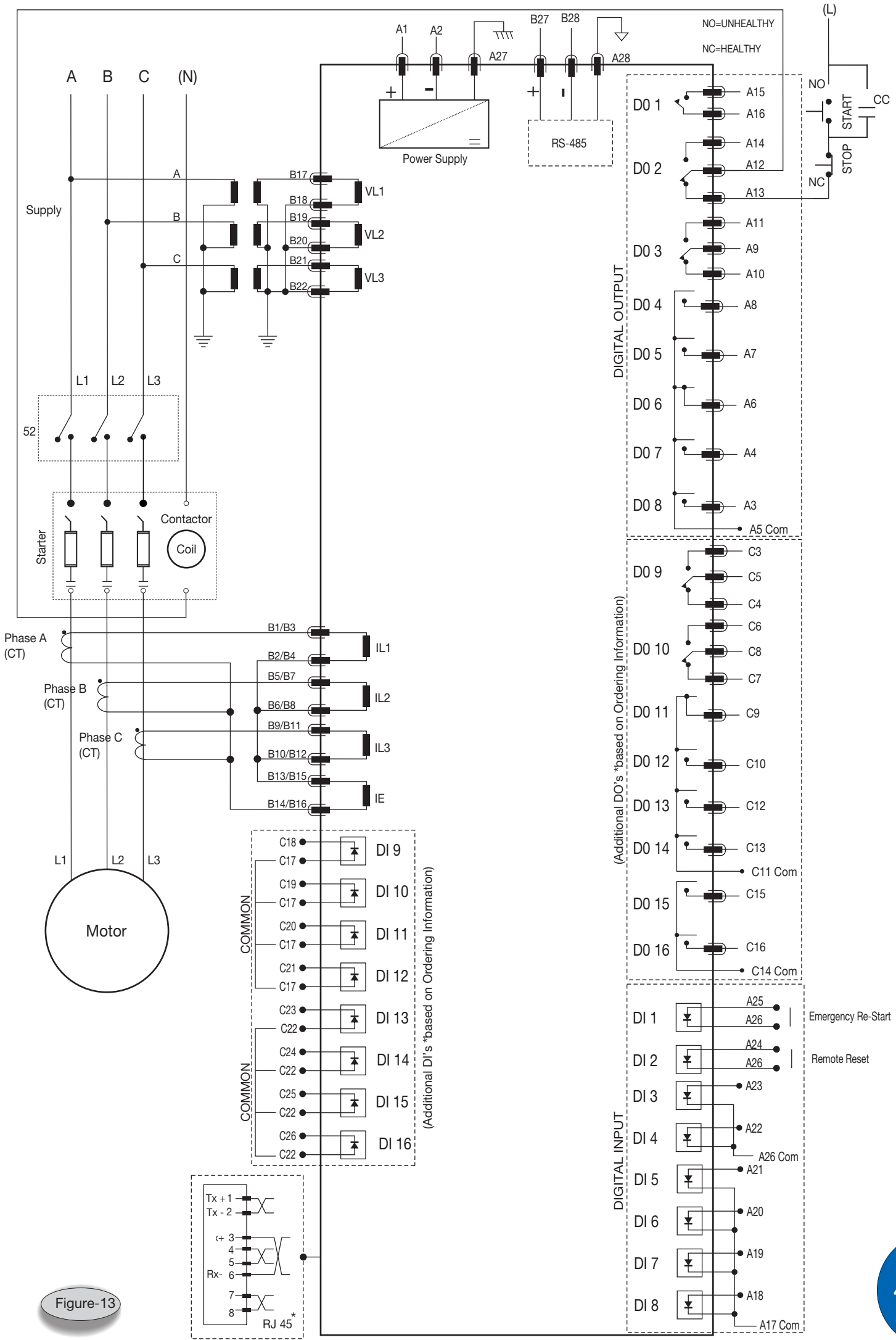


Figure-13

Terminal Description

Terminal No.		Terminal Description		Contact Details
A1	:	Auxiliary Supply (+)		
A2	:	Auxiliary Supply (-)		
A27	:	Earth		
A3-A5	:	Digital Output-8 (DO-8)	:	(NO-COMMON)
A4-A5	:	Digital Output-7 (DO-7)	:	(NO-COMMON)
A6-A5	:	Digital Output-6 (DO-6)	:	(NC-COMMON)
A7-A5	:	Digital Output-5 (DO-5)	:	(NO-COMMON)
A8-A5	:	Digital Output-4 (DO-4)	:	(NO-COMMON)
A11-A9-A10	:	Digital Output-3 (DO-3)	:	(NO-COMMON-NC)
A14-A12-A13	:	Digital Output-2 (DO-2)	:	(NO-COMMON-NC)
A15-A16	:	Digital Output-1 (DO-1)	:	(NO-COMMON)
A18-A17	:	Digital Input-8 (DI-8)		
A19-A17	:	Digital Input-7 (DI-7)		
A20-A17	:	Digital Input-6 (DI-6)		
A21-A17	:	Digital Input-5 (DI-5)		
A22-A26	:	Digital Input-4 (DI-4)		
A23-A26	:	Digital Input-3 (DI-3)		
A24-A26	:	Digital Input-2 (DI-2)		
A25-A26	:	Digital Input-1 (DI-1)		
B1-B2	:	CT Terminal for Phase current (1A) input in L1 Phase		
B3-B4	:	CT Terminal for Phase current (5A) input in L1 Phase		
B5-B6	:	CT Terminal for Phase current (1A) input in L2 Phase		
B7-B8	:	CT Terminal for Phase current (5A) input in L2 Phase		
B9-B10	:	CT Terminal for Phase current (1A) input in L3 Phase		
B11-B12	:	CT Terminal for Phase current (5A) input in L3 Phase		
B13-B14	:	CT Terminal for Neutral current (1A) input (LV Winding)		
B15-B16	:	CT Terminal for Neutral current (5A) input (LV Winding)		
B17-B18	:	CT Terminal for Phase voltage (L1)		
B19-B20	:	CT Terminal for Phase voltage (L2)		
B21-B22	:	CT Terminal for Phase voltage (L3)		
B27	:	RS-485 MODBUS (+)		
B28	:	RS-485 MODBUS (-)		
A28	:	RS-485 Ground		
C26-C22	:	Digital Input-16 (DI-14)		
C25-C22	:	Digital Input-15 (DI-13)		
C24-C22	:	Digital Input-14 (DI-14)		
C23-C22	:	Digital Input-13 (DI-13)		
C21-C17	:	Digital Input-12 (DI-12)		
C20-C17	:	Digital Input-11 (DI-11)		
C19-C17	:	Digital Input-10 (DI-10)		
C18-C17	:	Digital Input-9 (DI-9)		
C3-C5-C4	:	Digital Output-9 (DO-9)	:	(NO-COMMON-NC)
C6-C8-C7	:	Digital Output-10 (DO-10)	:	(NO-COMMON)
C9-C11	:	Digital Output-11 (DO-11)	:	(NC-COMMON)
C10-C11	:	Digital Output-12 (DO-12)	:	(NO-COMMON)
C12-C11	:	Digital Output-13 (DO-13)	:	(NO-COMMON)
C13-C11	:	Digital Output-14 (DO-14)	:	(NO-COMMON)
C15-C14	:	Digital Output-15 (DO-15)	:	(NO-COMMON)
C16-C14	:	Digital Output-16 (DO-16)	:	(NO-COMMON)

MOTOR CBCT CONNECTION DIAGRAM

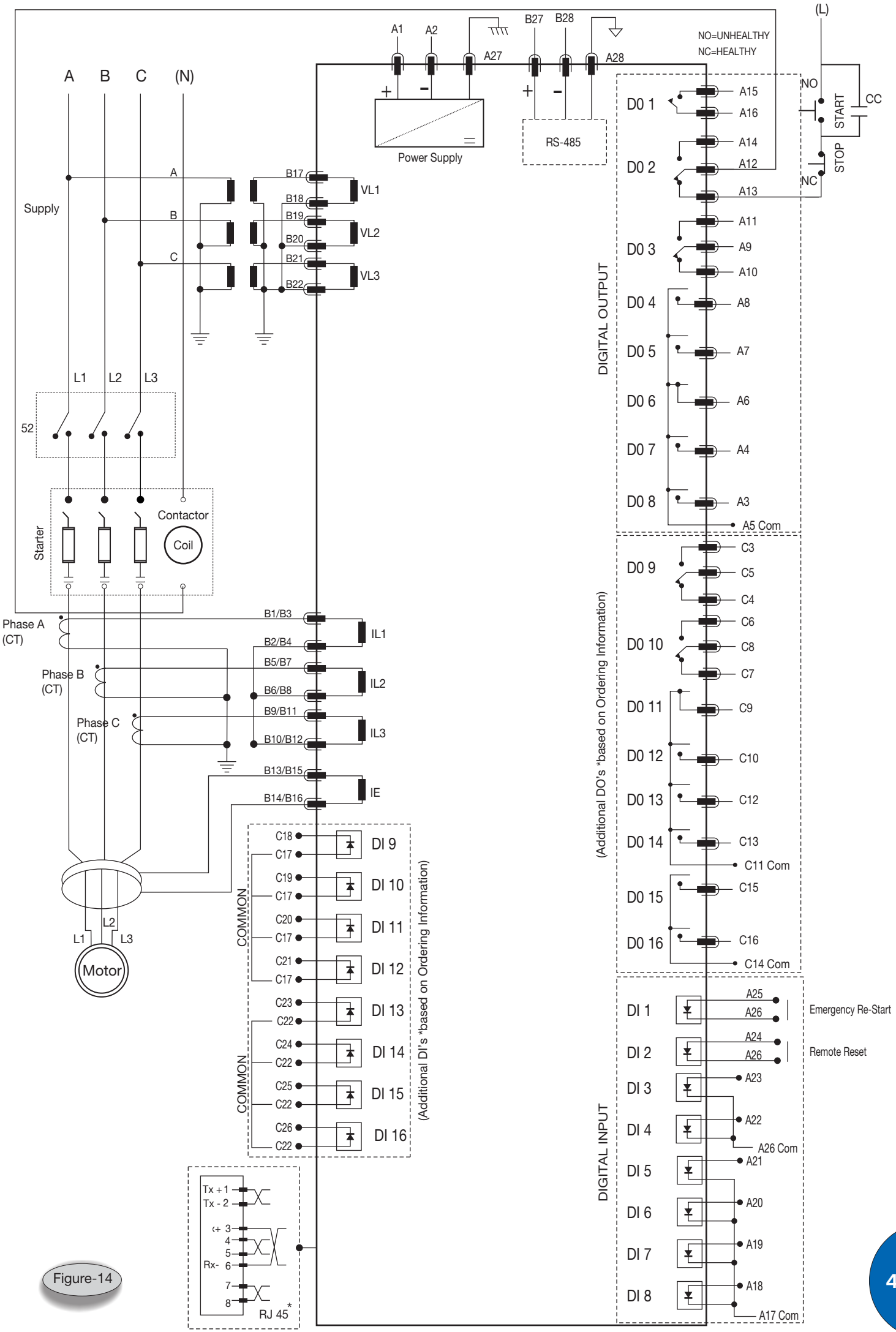


Figure-14

MOTOR CBCT CONNECTION DIAGRAM FOR SEF WITH 8 DI / DO

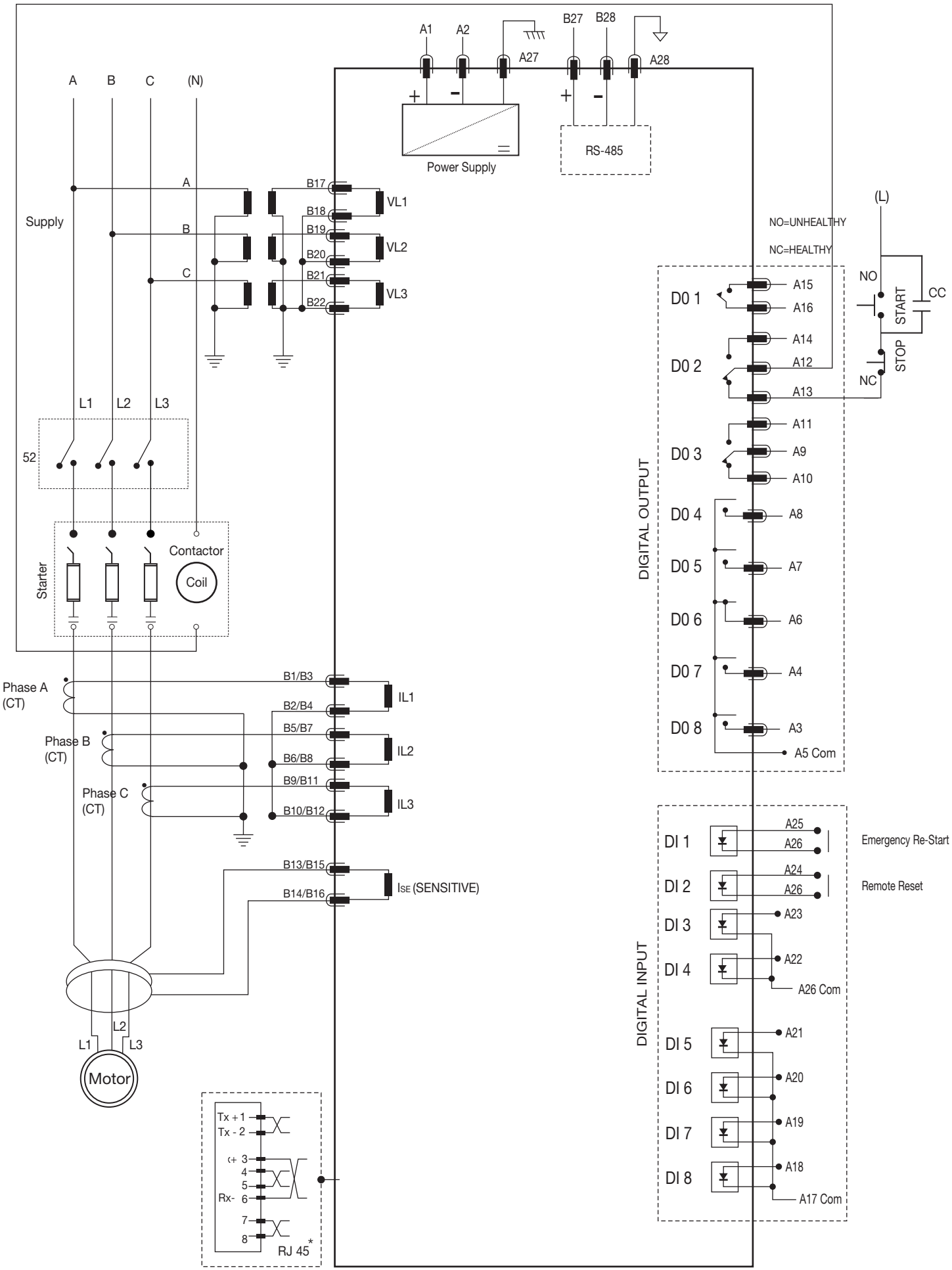


Figure-15

MOTOR CBCT CONNECTION DIAGRAM

with 14 DIs / DOs + 5 RTD

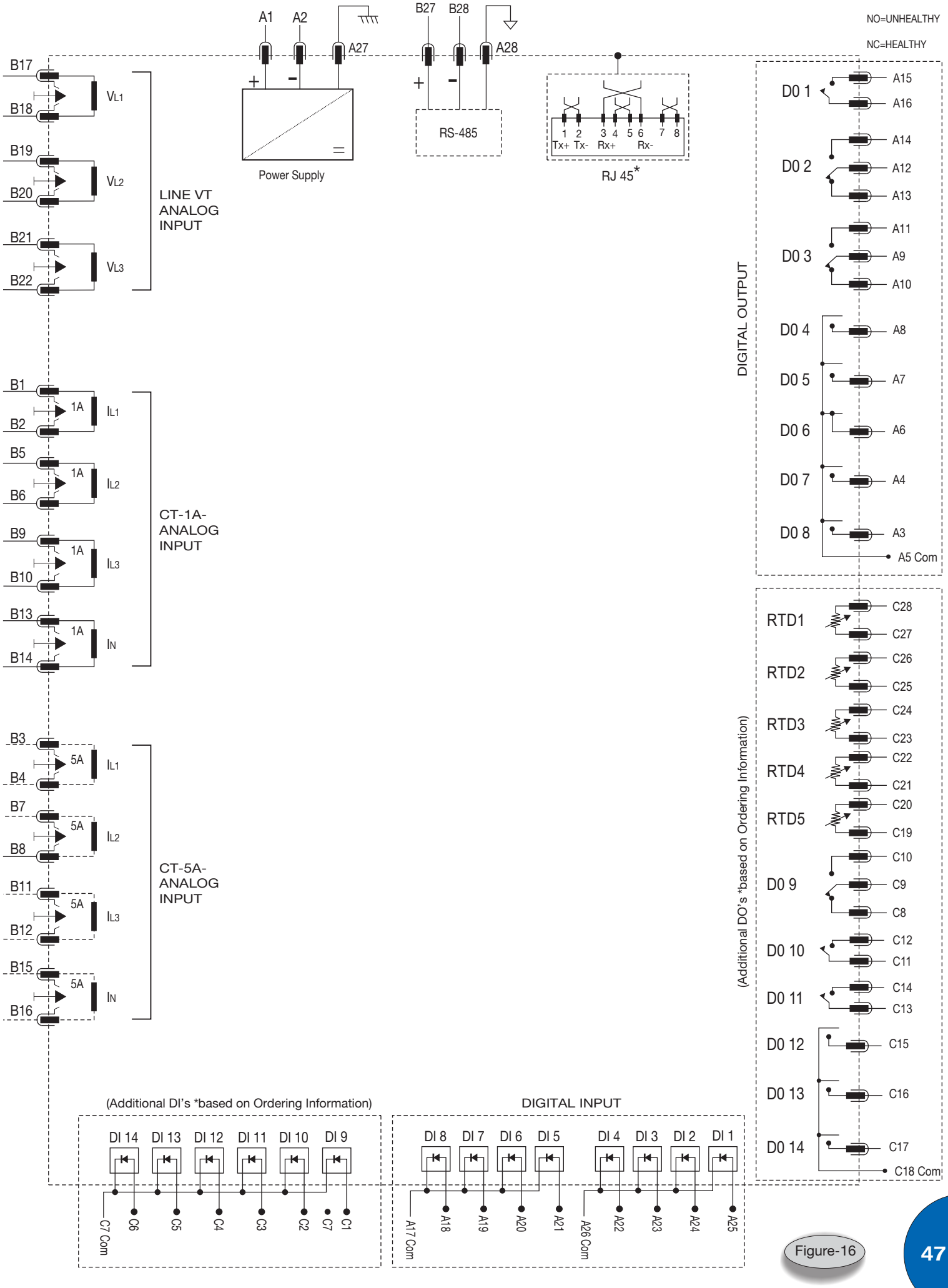


Figure-16

Terminal Description

Terminal No.		Terminal Description		Contact Details
A1	:	Auxiliary Supply (+)		
A2	:	Auxiliary Supply (-)		
A27	:	Earth		
A3-A5	:	Digital Output-8 (DO-8)	:	(NO-COMMON)
A4-A5	:	Digital Output-7 (DO-7)	:	(NO-COMMON)
A6-A5	:	Digital Output-6 (DO-6)	:	(NC-COMMON)
A7-A5	:	Digital Output-5 (DO-5)	:	(NO-COMMON)
A8-A5	:	Digital Output-4 (DO-4)	:	(NO-COMMON)
A11-A9-A10	:	Digital Output-3 (DO-3)	:	(NO-COMMON-NC)
A14-A12-A13	:	Digital Output-2 (DO-2)	:	(NO-COMMON-NC)
A15-A16	:	Digital Output-1 (DO-1)	:	(NO-COMMON)
A18-A17	:	Digital Input-8 (DI-8)		
A19-A17	:	Digital Input-7 (DI-7)		
A20-A17	:	Digital Input-6 (DI-6)		
A21-A17	:	Digital Input-5 (DI-5)		
A22-A26	:	Digital Input-4 (DI-4)		
A23-A26	:	Digital Input-3 (DI-3)		
A24-A26	:	Digital Input-2 (DI-2)		
A25-A26	:	Digital Input-1 (DI-1)		
B1-B2	:	CT Terminal for Phase current (1A) input (HV Winding) in L1 Phase		
B3-B4	:	CT Terminal for Phase current (5A) input (HV Winding) in L1 Phase		
B5-B6	:	CT Terminal for Phase current (1A) input (HV Winding) in L2 Phase		
B7-B8	:	CT Terminal for Phase current (5A) input (HV Winding) in L2 Phase		
B9-B10	:	CT Terminal for Phase current (1A) input (HV Winding) in L3 Phase		
B11-B12	:	CT Terminal for Phase current (5A) input (HV Winding) in L3 Phase		
B13-B14	:	CT Terminal for Neutral current (1A) input (LV Winding)		
B15-B16	:	CT Terminal for Neutral current (5A) input (LV Winding)		
B17-B18	:	CT Terminal for Phase voltage (L1)		
B19-B20	:	CT Terminal for Phase voltage (L2)		
B21-B22	:	CT Terminal for Phase voltage (L3)		
B27	:	RS-485 MODBUS (+)		
B28	:	RS-485 MODBUS (-)		
A28	:	RS-485 Ground		
C6-C7	:	Digital Input-14 (DI-14)		
C5-C7	:	Digital Input-13 (DI-13)		
C4-C7	:	Digital Input-12 (DI-12)		
C3-C7	:	Digital Input-11 (DI-11)		
C2-C7	:	Digital Input-10 (DI-10)		
C1-C7	:	Digital Input-9 (DI-9)		
C10-C9-C8	:	Digital Output-9 (DO-9)	:	(NO-COMMON-NC)
C12-C11	:	Digital Output-10 (DO-10)	:	(NO-COMMON)
C14-C13	:	Digital Output-11 (DO-11)	:	(NO-COMMON)
C15-C18	:	Digital Output-12 (DO-12)	:	(NO-COMMON)
C16-C18	:	Digital Output-13 (DO-13)	:	(NO-COMMON)
C17-C18	:	Digital Output-14 (DO-14)	:	(NO-COMMON)
C20-C19	:	RTD5		
C22-C21	:	RTD4		
C24-C23	:	RTD3		
C26-C25	:	RTD2		
C28-C27	:	RTD1		

20.0 VT Connection Diagram

STAR CONNECTION

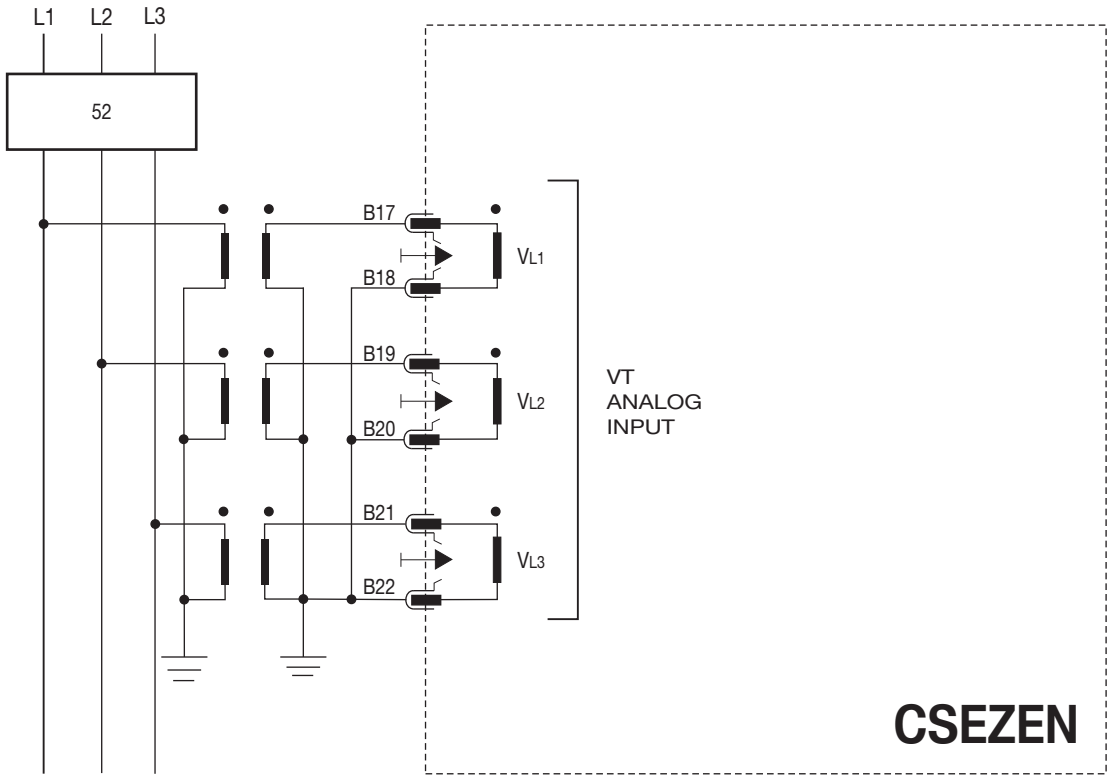


Figure-17

DELTA CONNECTION

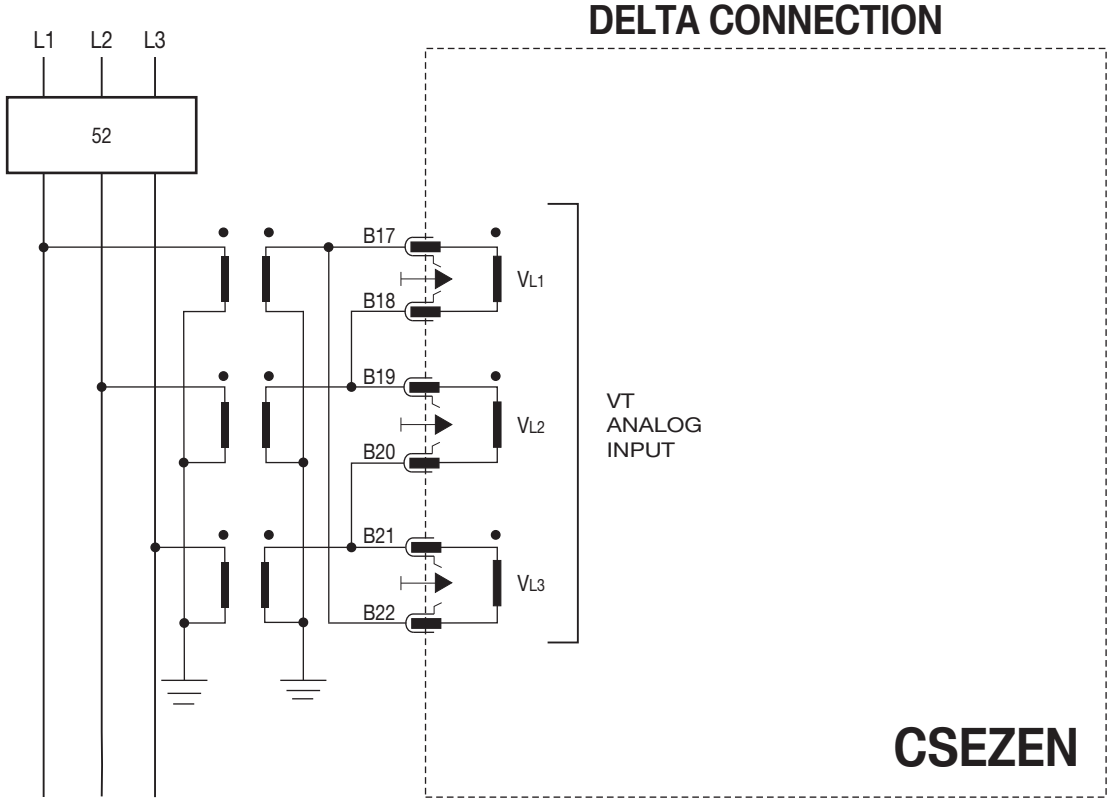


Figure-18

21.0 CT Connection Diagram

CT Schemes
Holmgreen Residual CT's Connection for 1A

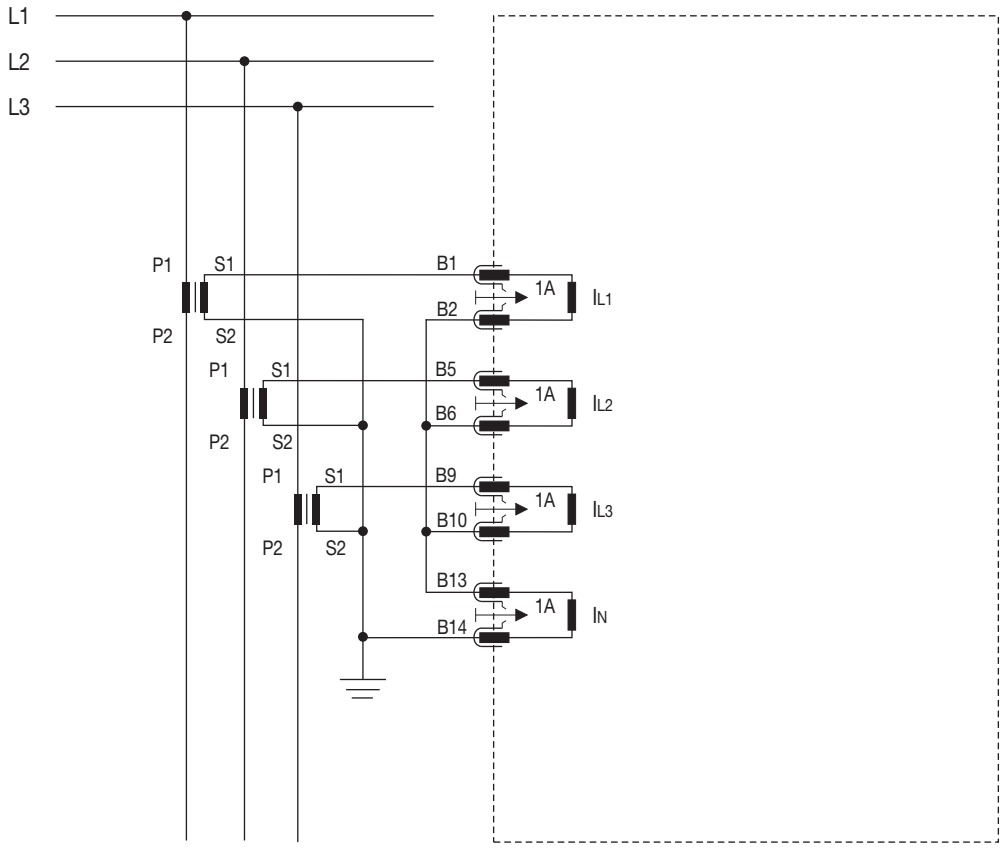


Figure-19

22.0 CT Connection Diagram

CT Schemes
Holmgreen Residual CT's Connection for 5A

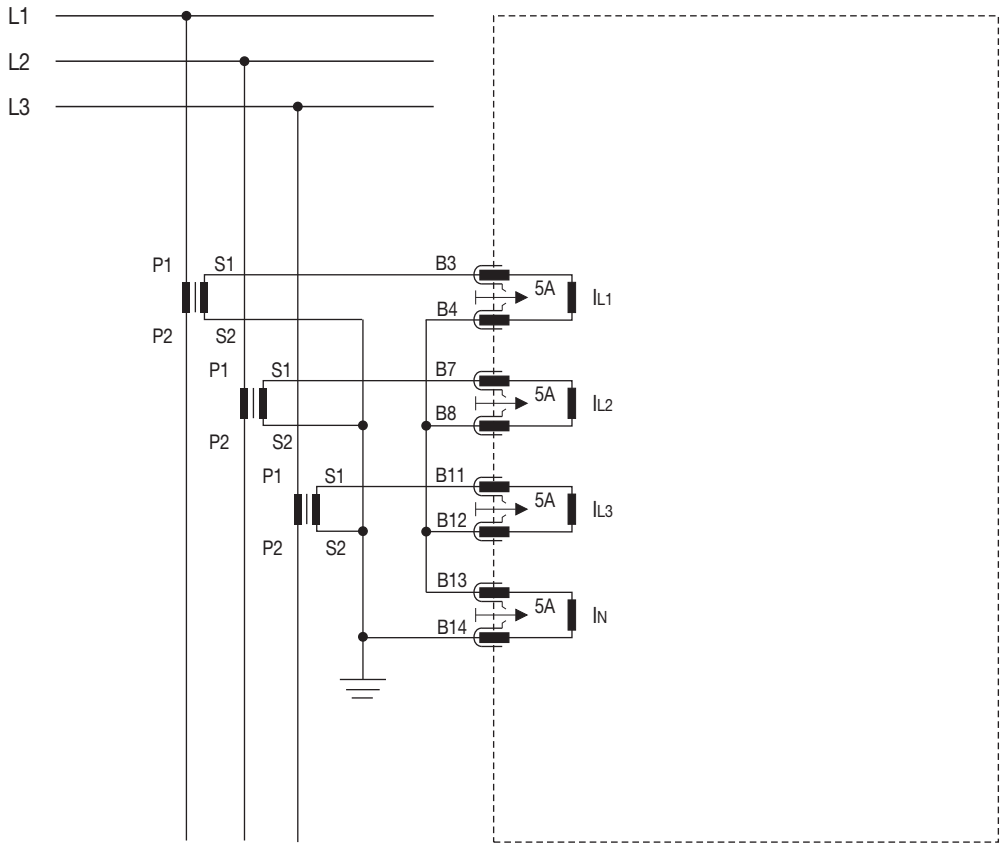
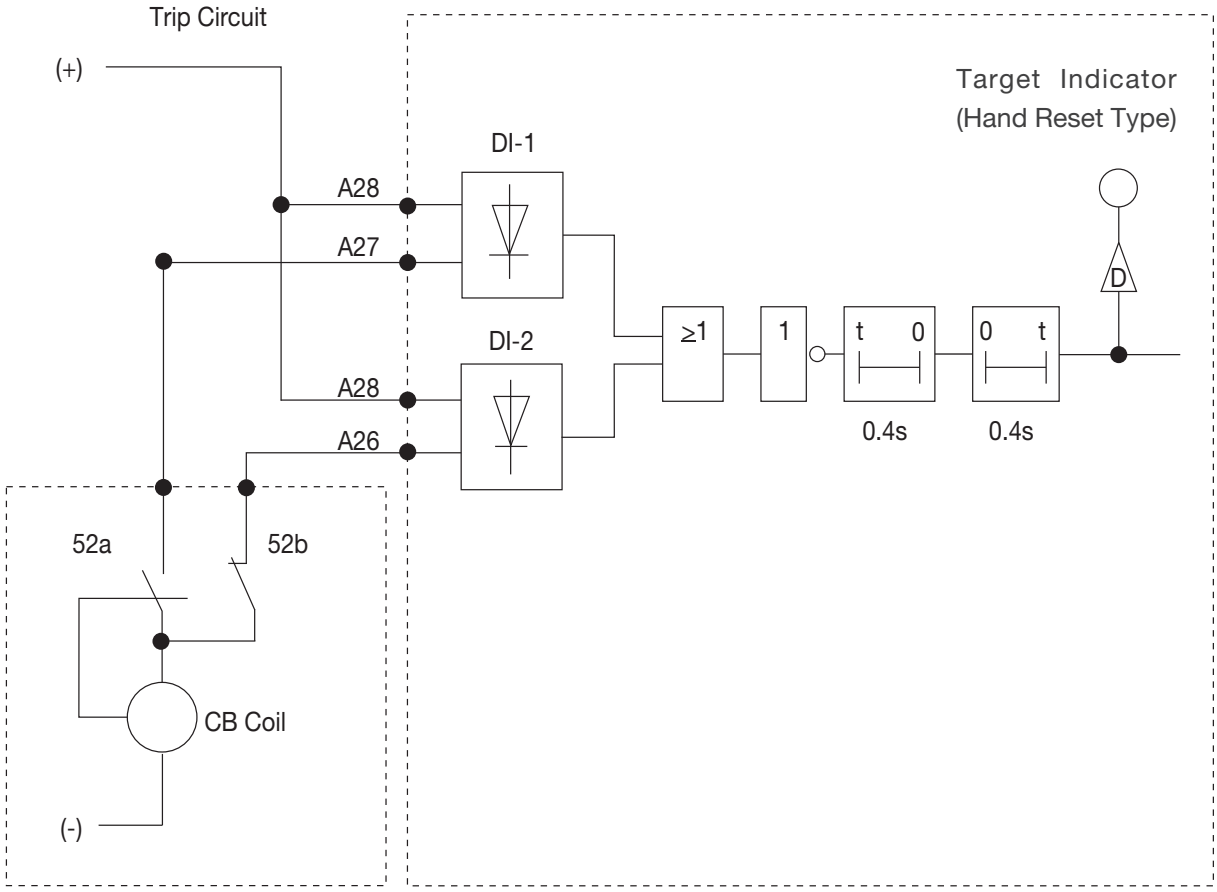


Figure-20

23.0 Trip Circuit Supervision Diagram



(Trip Circuit Supervision Function)

Figure-21

24.0 Dimensional Details

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

Front View

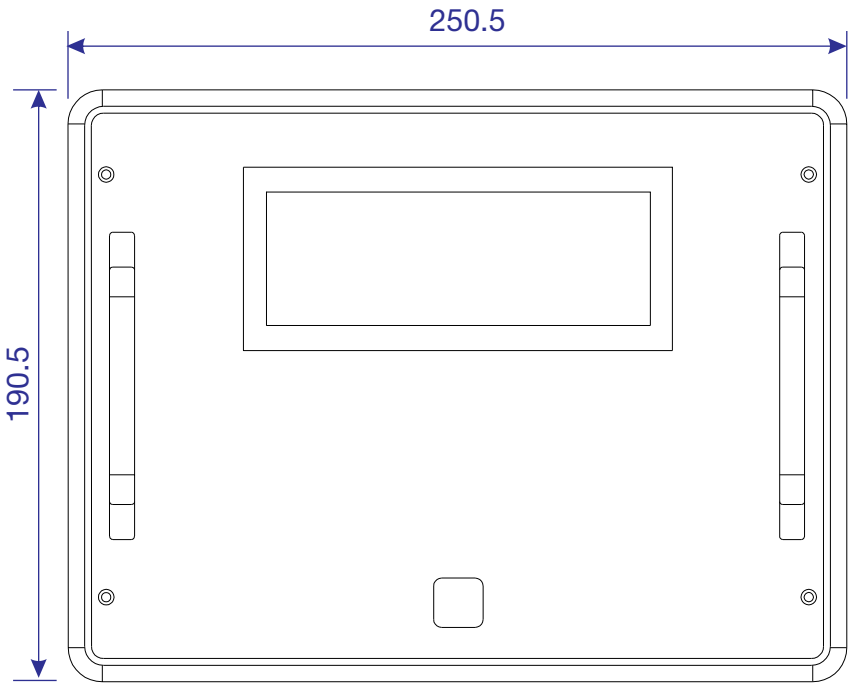


Figure-22

Top View

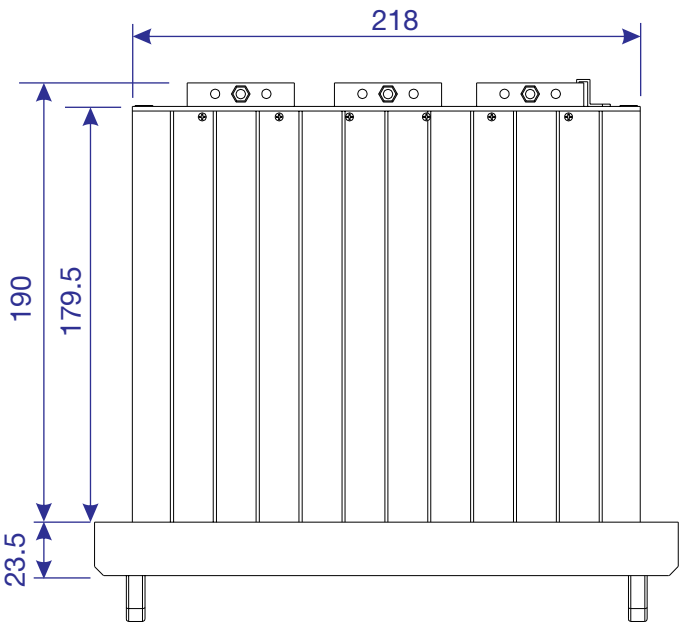


Figure-23

Side View

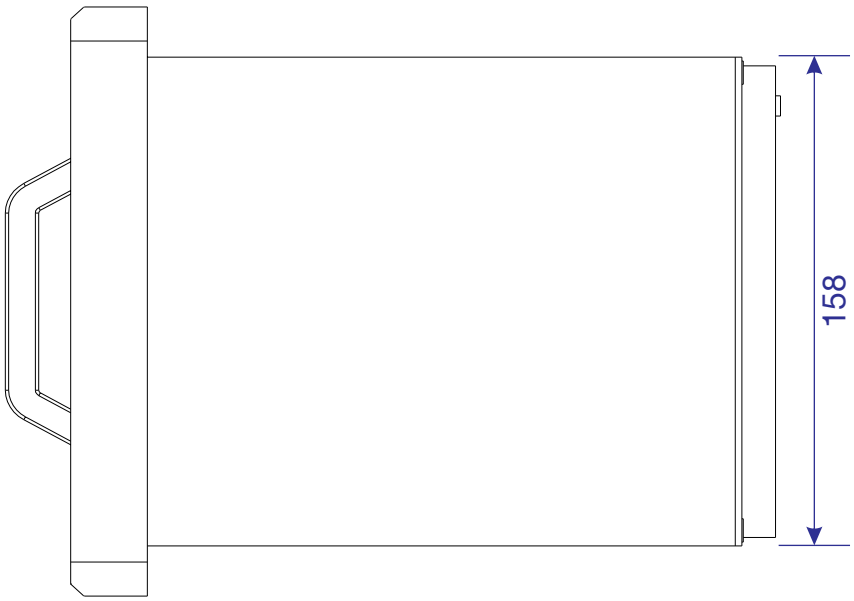


Figure-24

25.0 Panel mounting of the Relay

for Panel mounting		
Screw	:	M4x12mm
Qty	:	8 Nos.

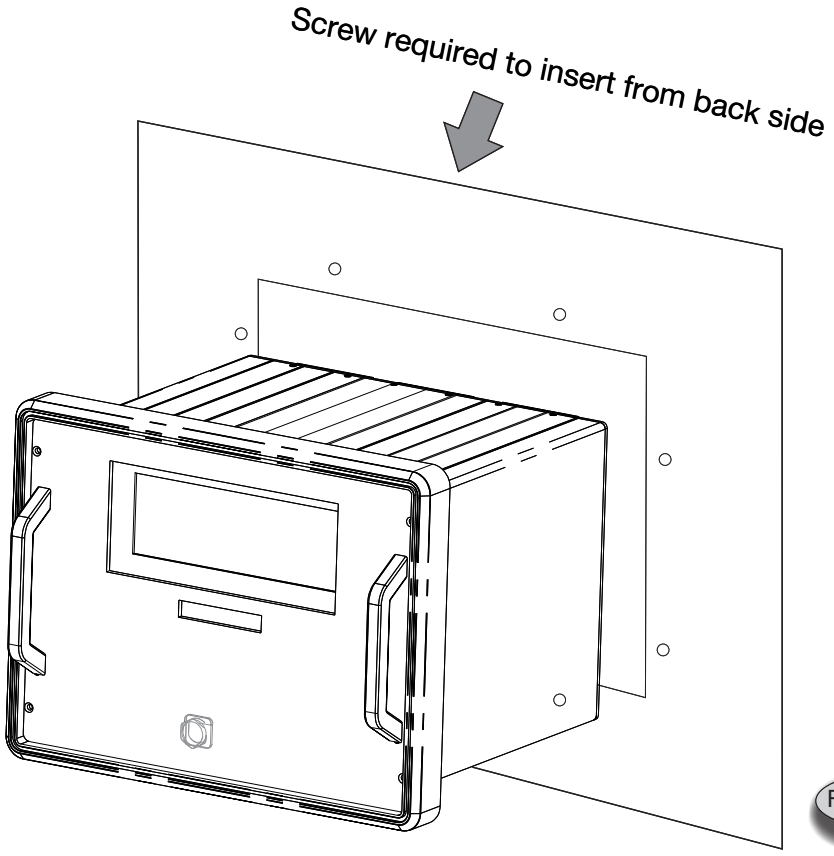


Figure-25

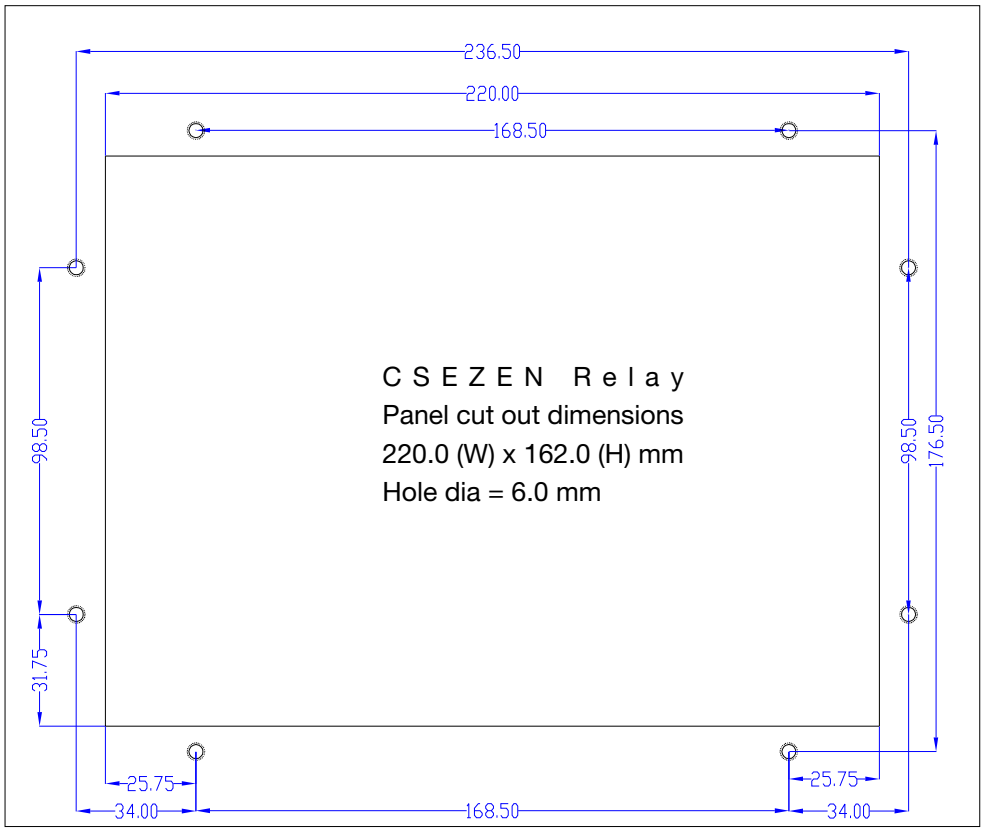


Figure-26

Different views of the Relay

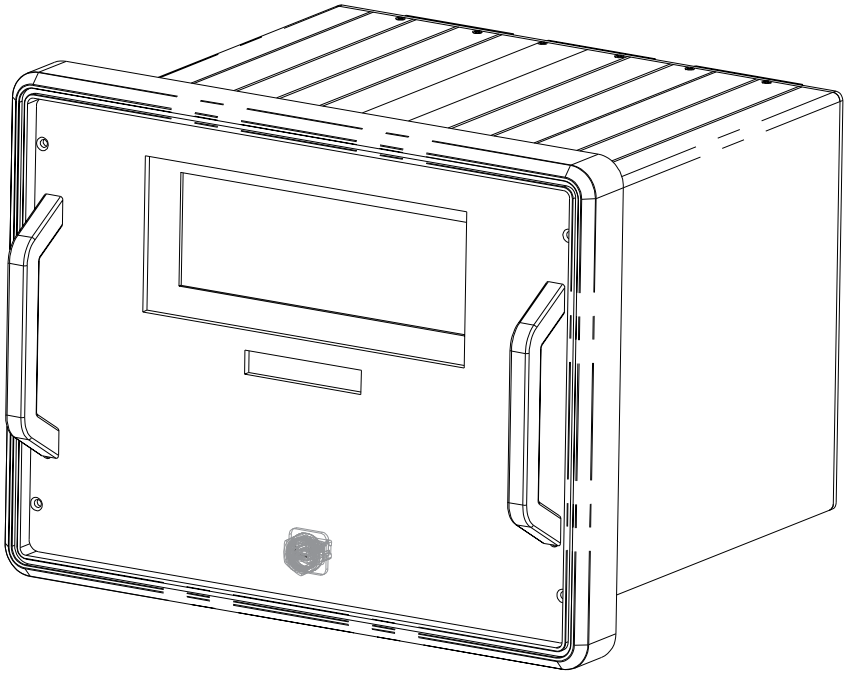


Figure-27

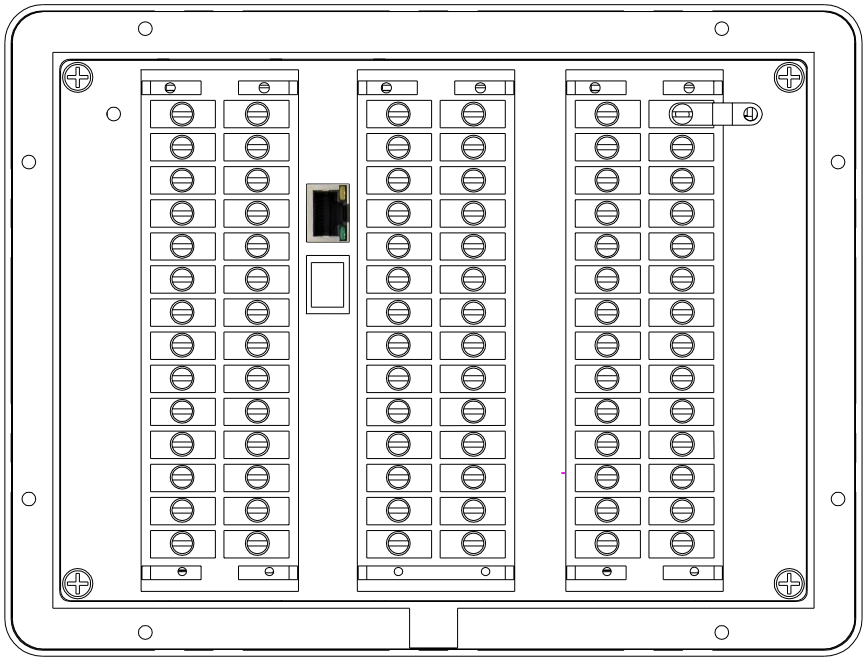


Figure-28

26.0 Ordering Information

CSEZEN - M - 350 - x - D - x - x - x - x - x - E - H

VOLTAGE INPUT	
110V	1
400V	4

EARTH FAULT	
Sensitive	S
Non Sensitive	N

DIGITAL I O CARD	
8 DI / DO	0
16 DI / DO	1
8 DI / DO + 5 RTD	2
14 DI / DO + 5 RTD	3

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

COMMUNICATION	
MODBUS on RS-485	A
IEC 60870-5-103 on RS-485	B
IEC 61850 on RJ-45 single port	C
IEC 61850 on RJ-45 Dual port	D

TIME SYNCHRONIZATION	
None	0
SNTP on RJ-45	S

C&S electric

Issue Date : 14.06.17
Rev. No : 02
Rev. Date : 15.01.18

CSEZEN- E Cat al ogue

Revision History

S.No.	Rev.No.	Details	Date
01	01	Removed programming scheme logic	07.11.17
02	02	Include “Healthy, unhealthy” in connection diagrams on page 41, 43, 45, 46, 47	15.01.18