We touch your electricity everyday!

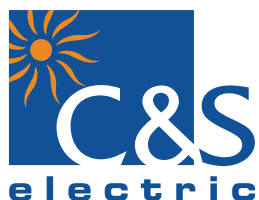**CSEZEN- M350**
Advance Motor Protection & Monitoring IED

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-M350 is an advanced motor protection solution which has fast, sensitive and secure protection for motor faults.

CSEZEN-M350 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-M350 offers following model based features to cover requirements of the wide range of users.

- 1A & 5A 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 solution 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

■   16 (15 programmable + 1 Fixed) Change over digital output contact

■   16 Digital Inputs for protection & supervision

■   10 LEDs (Programmable)

■   USB/RS-485/RJ-45 communications for automation

■   20x4 Alpha Numeric LCD

4.0 Protection Features

- Under Current
- Phase Over current
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- Phase Reversal
- Earth Fault
- Reverse Power
- Under / Over Frequency
- Under/Over Voltage
- Voltage Unbalance
- Negative Phase Sequence
- Thermal Over load
- Locked Rotor
- Jam / Stall
- Circuit Breaker Failure
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- Start Time Supervision
- Locked Rotor Protection via Speed Switch

5.0 Supervision Features

- Trip Circuit Supervision
- Anti Back spin Protection (with the name start interval)
- CT Secondary Supervision
- Temperature via sensors *

6.0 Functional Diagram
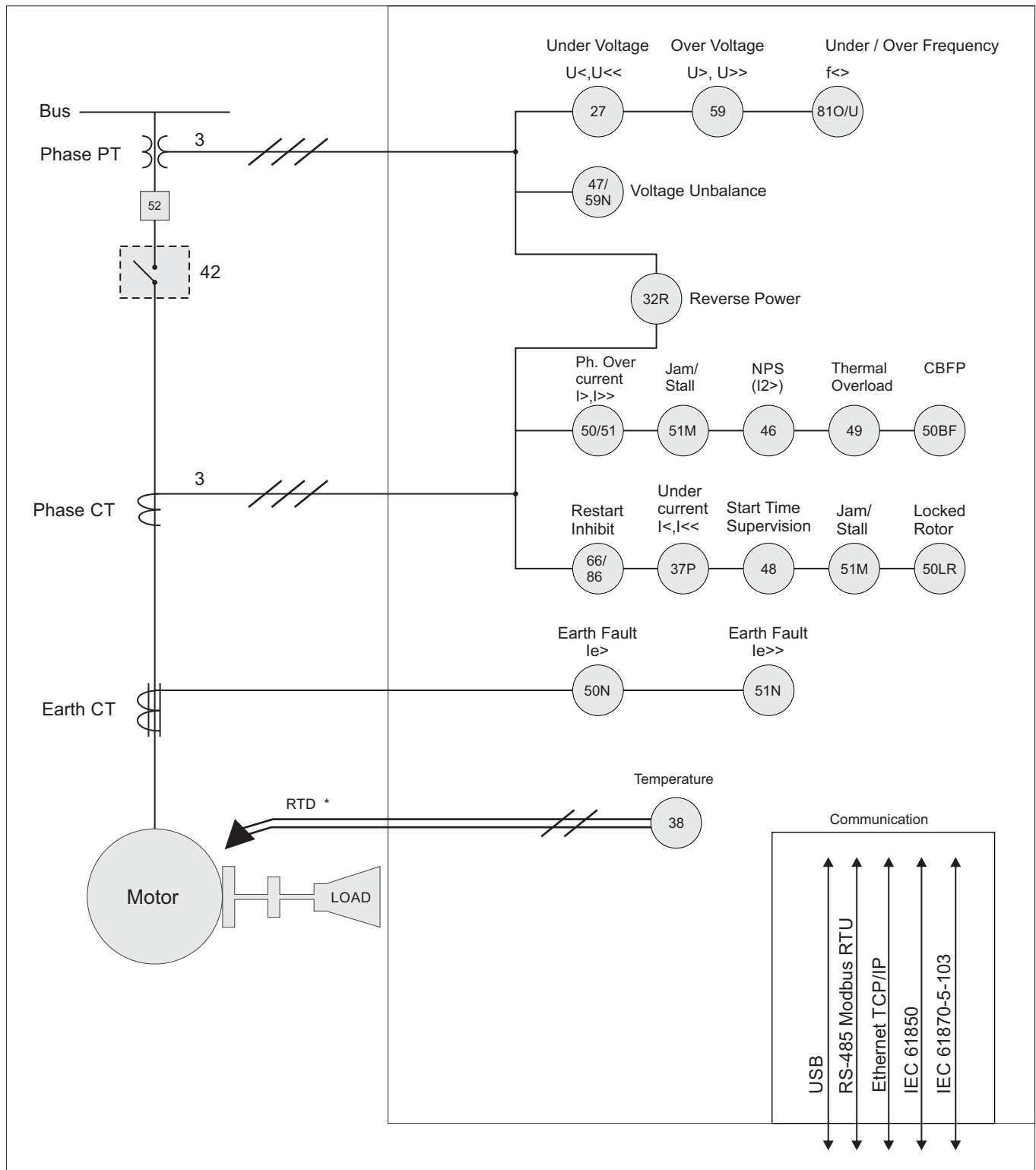
CSEZEN-M350 Functional Diagram

7.0 Protection Functions

Under current Protection
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
(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 $\qquad t = \dfrac{13.5}{(I / I_s) - 1}$ ti [s]

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

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

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

Where $\qquad$ t =Tripping time $\qquad$ ti =Time multiplier
$\qquad$ I =Fault current $\qquad$ 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
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 is monitored continuously, when any or all the three phase voltage below 5% of the rated voltage. CSEZEN-M will issue a stop command via assignable DO after a set defined time.

Under/Over Frequency Protection
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
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

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.
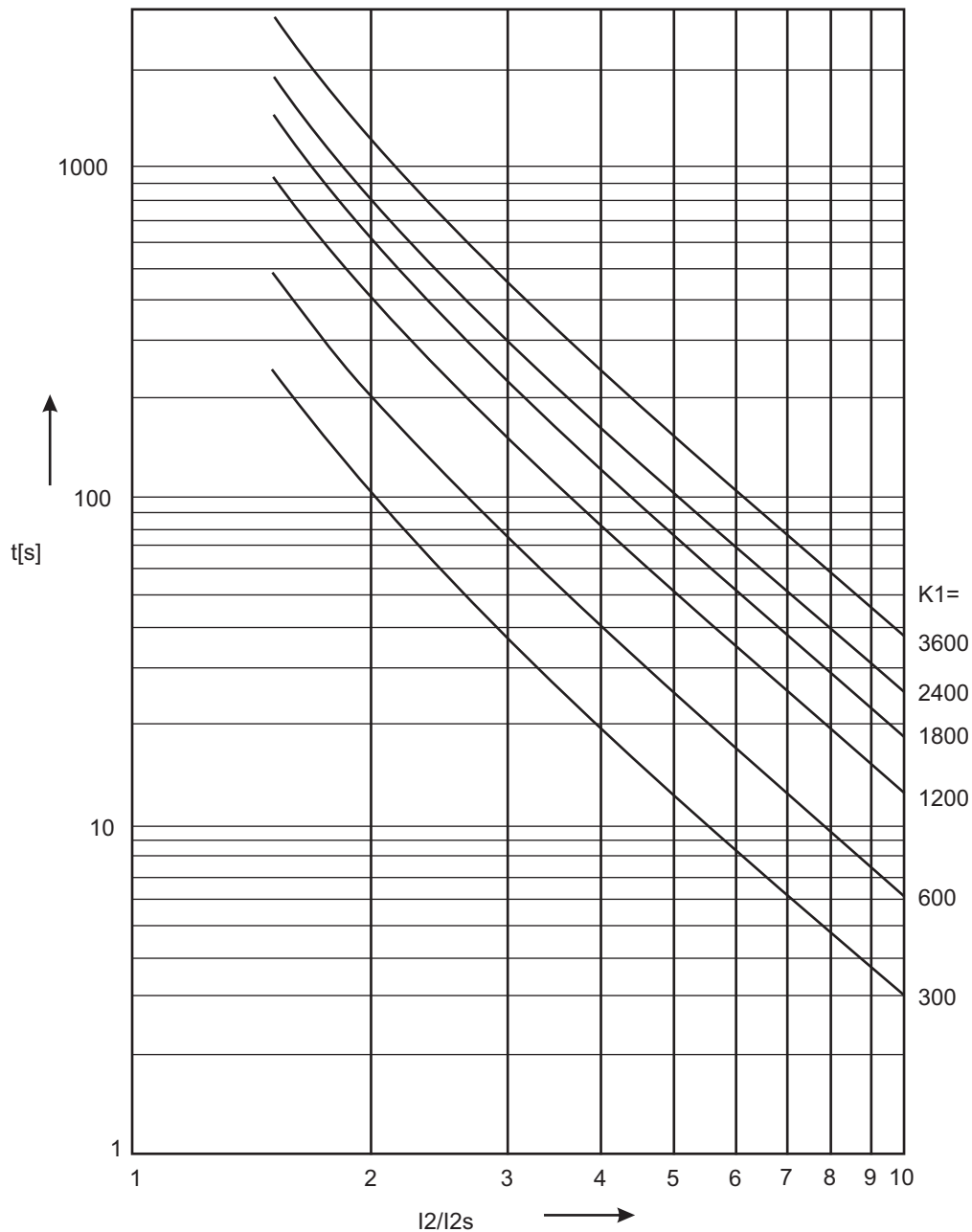
Negative Phase Sequence Equation

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

K_1 : TMS for Inverse characteristics of NPS
t : Expected Trip Time
I_2 : Measured negative sequence value
I_{2s} : Permissible NPS value

Locked Rotor

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

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:

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

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

    OR

(2) Thermal based on positive & negative sequence measured.
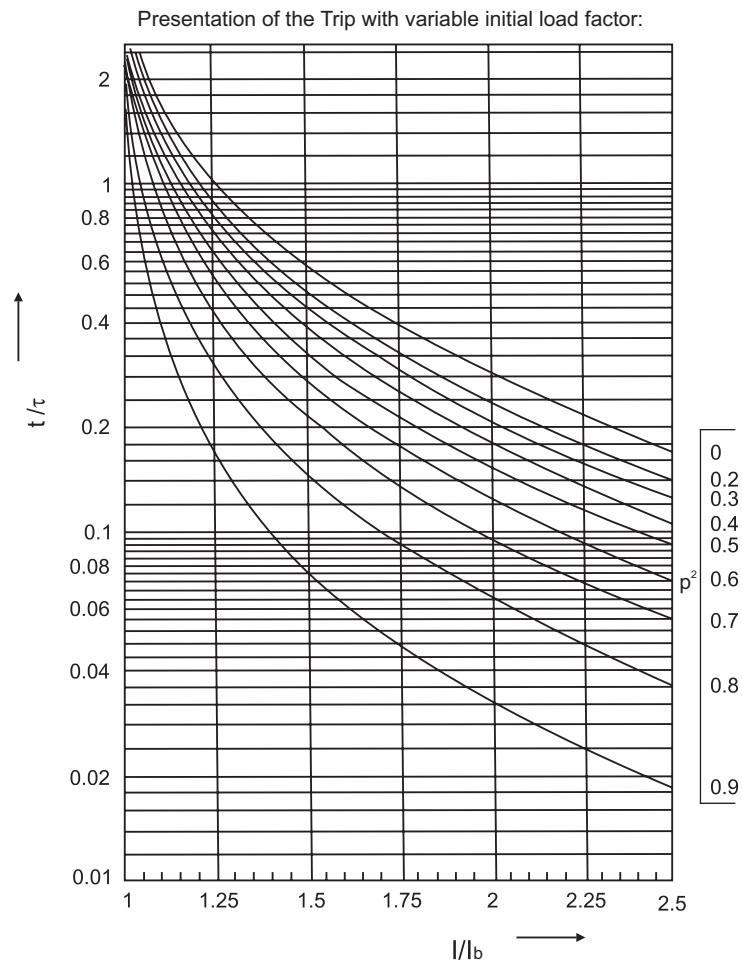
$$I = \sqrt{I_1^2 + Neg\_k \times I_2^2}$$

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:

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

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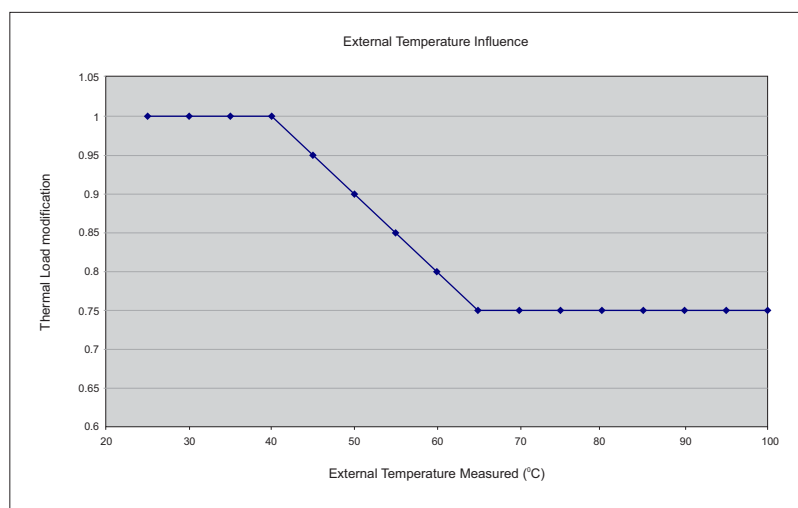
This compensation factor will be taken into account when any one of the 5 possible RTD's are selected to measure the external/ambient temperature (see menu Common Setting).

The CSEZEN relay can accommodate five PT100, Ni100, Ni120 RTDs. These RTDs 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

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

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

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

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

$U_0 = 1/3 \, (U_1 + U_2 + U_3)$

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.

$U_2 = 1/3 \, (U_1 + a^2 U_2 + aU_3)$

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.

$U_1 = 1/3 \, (U_1 + aU_2 + a^2 U_3)$

Circuit Breaker Failure Protection

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

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 recognition 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 does not 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.

Event Data recording on PC Software

Output Contacts

No. of digital outputs	: 16 (Fixed DO1 (WDT) and assignable DO2, DO3, DO4, ... DO16)
Type of outputs	: Relay
Programmable (DO Assignment)	: Yes
DO reset type inputs	: Programmable (Auto/Manual)

Input Contacts

No. of digital inputs	: 16 (DI1............................. DI16)
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.)

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 I_1/I_2
- % 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:
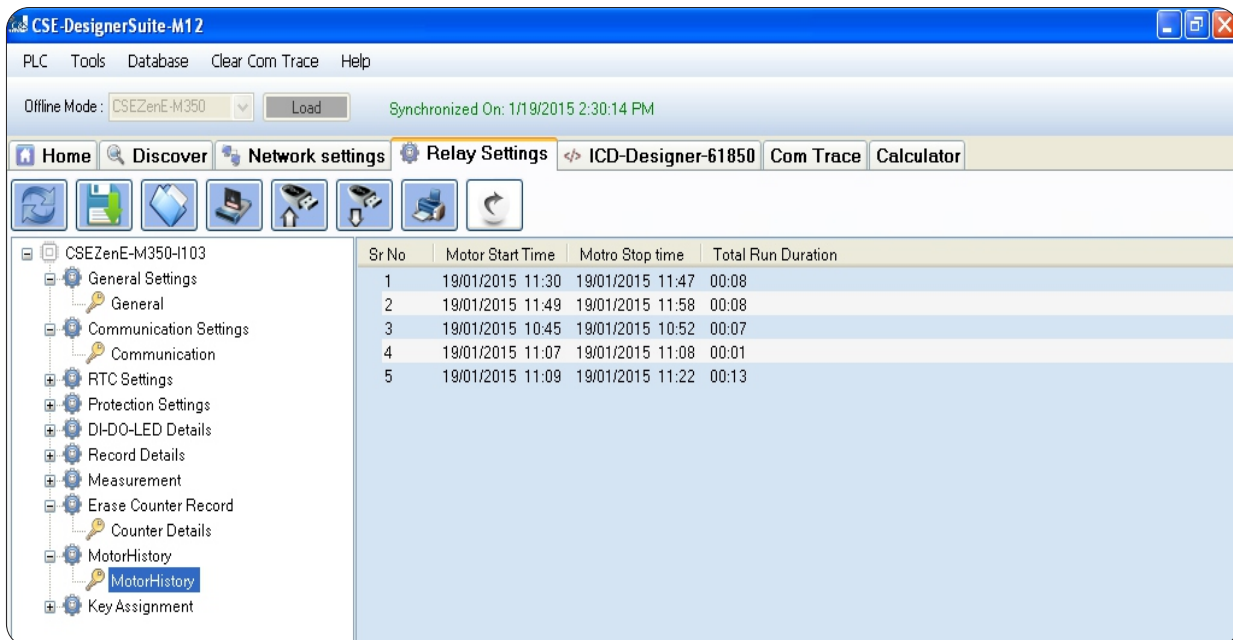
◆ Oscilloscopic recording can trigger on Pickup or on trip or via DI or on start i.e. change from pre-fault to post-fault stage. It is programmable.

◆ 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.

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.

Incomplete Sequence Record

CSEZEN-M350 records the incomplete sequence of the Motor start. If after Motor starting, RUN state does not 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 & 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 faults & 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.

10 Programmable LEDs
(Insertion Sticker reqd.)

Function Keys
(Insertion Sticker reqd.)
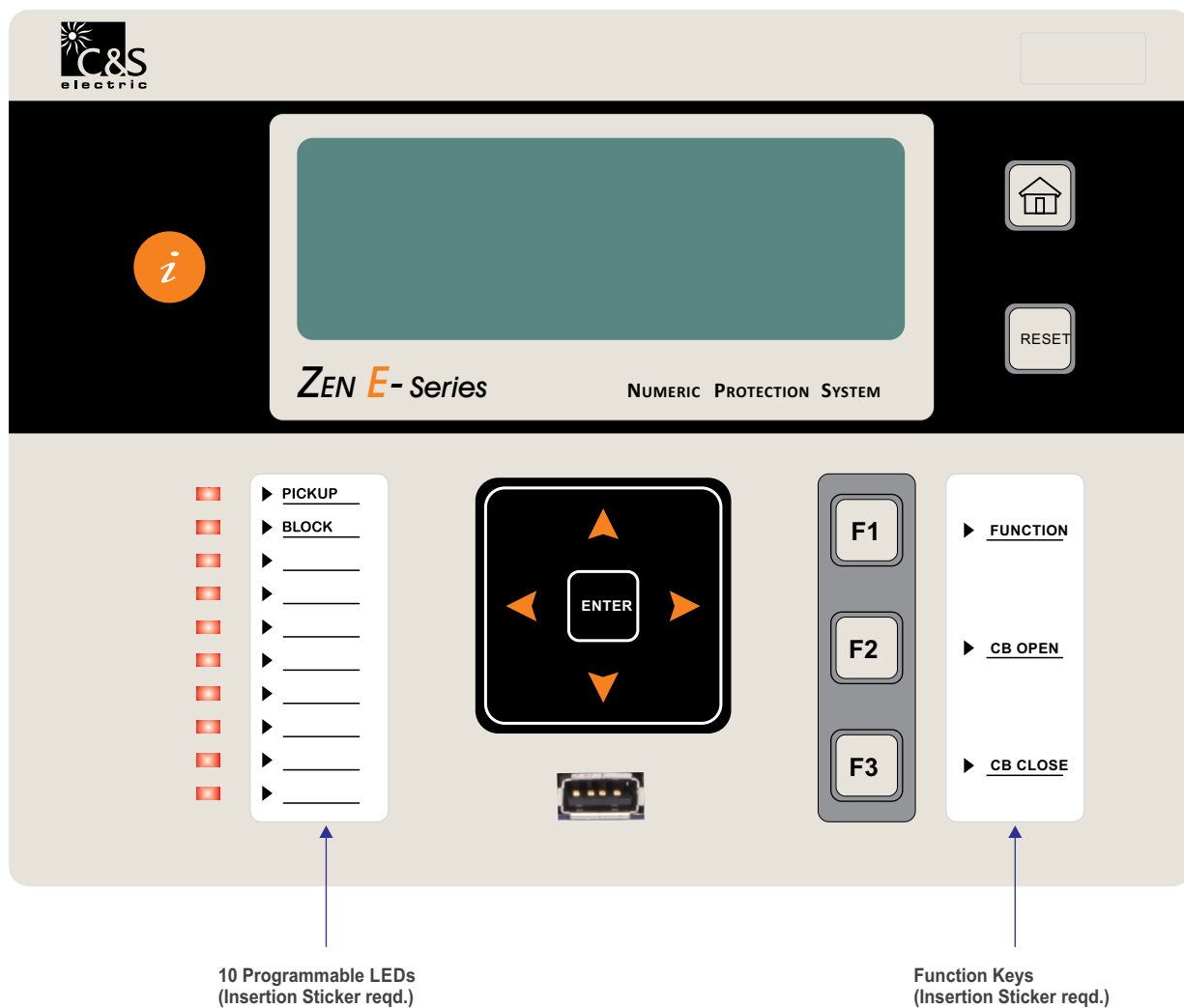
Key Description

Keys	Manual Key
i	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.
RESET	is used as a RESET key.
ENTER	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.
F1	is used as a FUNCTION key.
F2	is used as a Motor Start key.
F3	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 LEDs are programmable via front end software CSE Designer Suite - M12, available on front fascia. For these 10 LEDs 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
- Rear Ethernet port (RJ-45) for IEC-61850
- The ethernet port can be optionally replaced with Dual Fiber optics port

Dual Rear Communication (RS-485)

The choice of protocol for the rear RS-485 communication port is based on ordering information. The user can choose either MODBUS or IEC-60870-5-103 protocol.

Front Communication (USB)

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

IEC-61850 Communication

Our IEDs now support several enhanced features of the **Edition-2** of **IEC-61850** standard, such as peer-to-peer communication between the relays, known as GOOSE messaging, buffered and unbuffered reporting, settings change as well as support for all control models as described in IEC 61850-7-2 Ed2.

Further, **Edition-2** introduces the concept of Goose subscription and monitoring via the LGOS logical node supported by our IEDs.

The IEC 61850 and a companion standard, the IEC 62439 defines two additional requirements by way of the **Parallel Redundancy Protocol (PRP)** and **High Availability Seamless Redundancy (HSR)** protocol to attain zero packet loss. While PRP achieves network redundancy by packet replication over two independent networks operating in parallel, HSR is realized using a ring topology to transmit packets in either direction. CSEZEN-F series relays **support both PRP as well as HSR over dual redundant RJ 45 ports** (*Model dependent, please speak with our sales team for models that support HSR/PRP).

All relay models that support HSR/PRP also offer enhanced cyber security features and comply with cyber security requirements.

The IEC 61850 interface is configured with familiar, user-friendly CSE Designer M12 software.
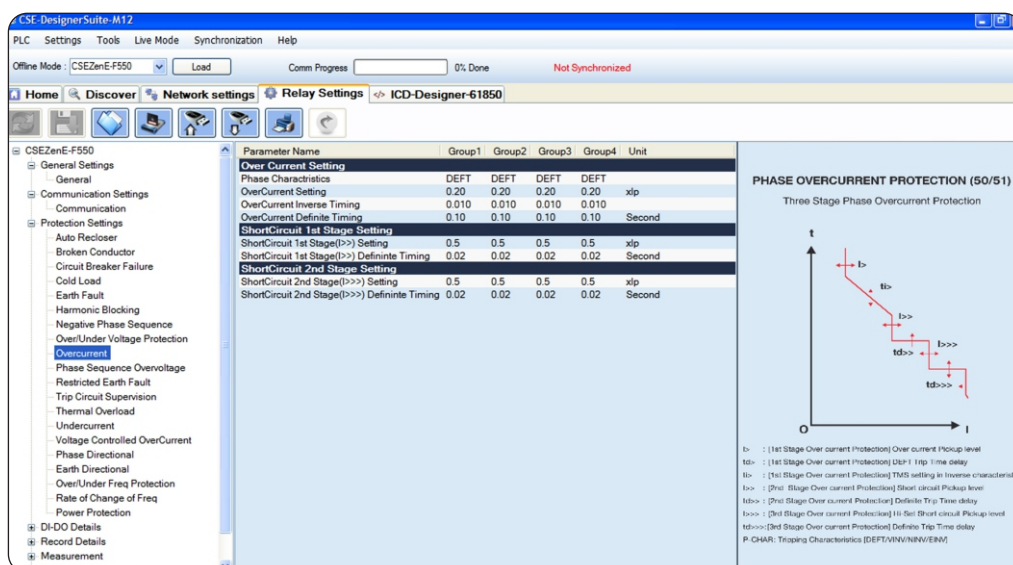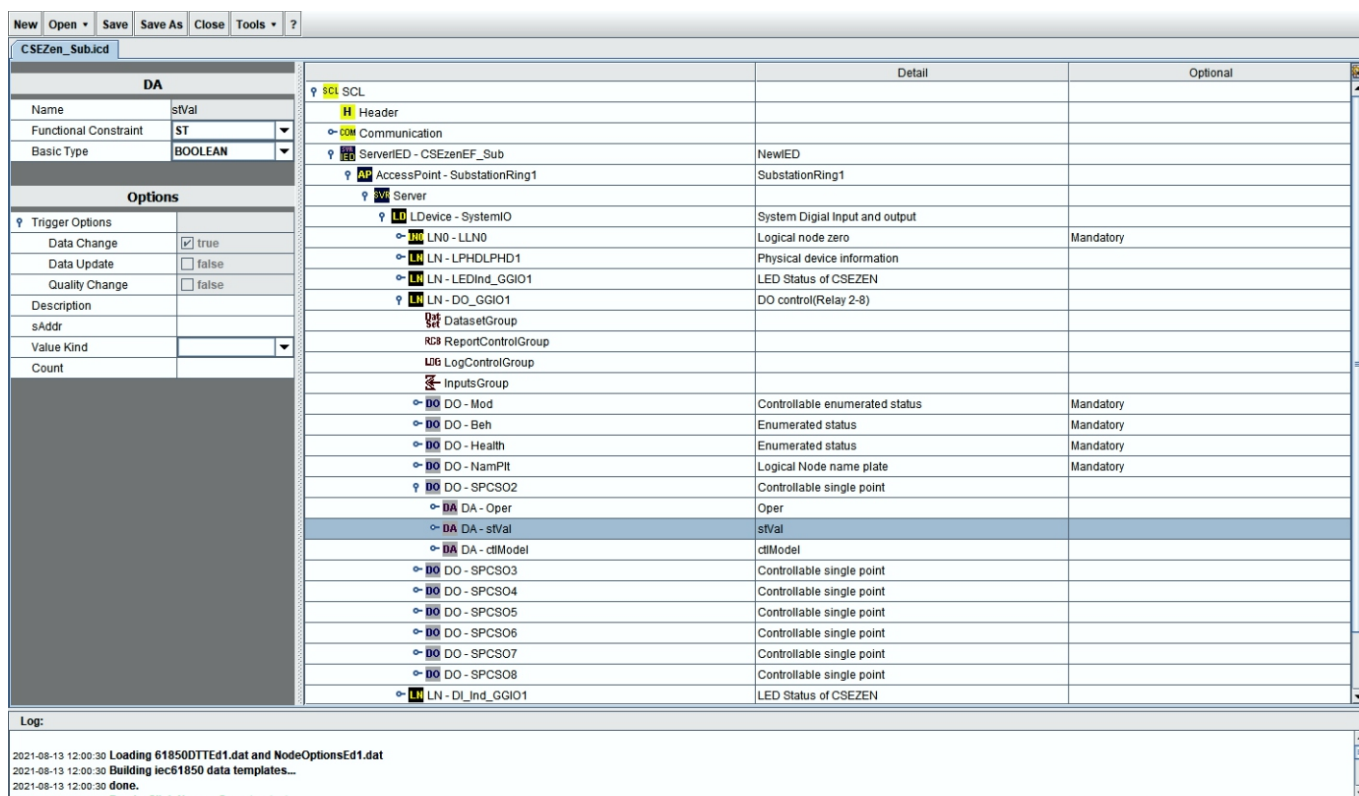
IEC 61850 Features

CSCSEZEN IEDs come with a powerful Software suite called `IED Assistant` for easy configuration of IEC-61850 related settings during installation or for troubleshooting.

CSEZEN IEDs support the following IEC-61850 features:
- Full Buffered and Unbuffered Reports on all optional fields triggered on General Interrogation or Data Change.
- GOOSE Publish and Subscribe on all IED parameters.
- Time Synchronization with Time Zone Support
- Supports all control schemes as defined by the standard.
- PLC based programming & logic equations for GOOSE parameters
- GOOSE parameter mapping to LED & Dos
- Support for metering parameters (Analog values)
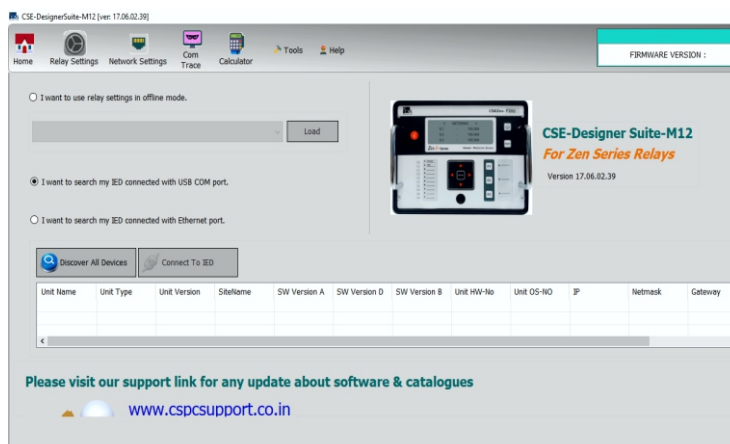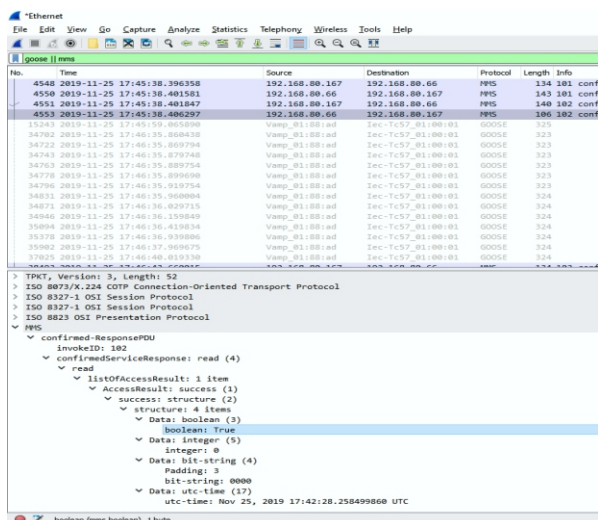
15.0 Setting Ranges

Group Setting

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Active Group	Act_Grp	Grp1	Grp4	1	Grp1
Group Toggle Step	Grp_Tog_Stp	+1	+3	1	+1

Common Setting   These are the settings common for all the protections:

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Rated Phase Current (Ip)	Ip	1A	5A	----	5A
Rated Earth Current (In)	In	1A	5A	----	1A
Phase CT Ratio	Ph CTRtio	1	9999	1	100
Earth CT Ratio	E CTRatio	1	9999	1	50
PT Ratio	PT Ratio	1.0	6500	0.1	1
Wiring Configuration	WireConfg	STAR	DELTA	----	STAR
Voltage Operate Mode	Volt_Op_Mod	SINGLE	THREE	----	SINGLE
Full Load (Ifl)	Ifl	10%Ip	200%Ip	1%Ip	100%Ip
Nominal Frequency	FREQ (Fn)	50Hz	60Hz	10Hz	50Hz
Fault Popup	Flt Popup	Disable	Enable	----	Enable
Service Mode	Service Mode	Out	In	----	In
SNTP Synchronisation	SNTP Sync	Disable	Enable	----	Disable
Event Function	Evnt Func	Disable	Enable	----	Disable
History Select	Hstr Slct	Disable	Enable	----	Disable
PLC Function	PLC Func	Disable	Enable	----	Disable
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.

Phase Over Current

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Over Current Setting					
Phase Characteristics	S1CURVE	DEFT	EINV, VINV, LINV NINV1.3, NINV3.0	1	DEFT
Over current Setting	I>	0.20xIp	4.00xIp	0.05xIp	1.00xIp
Over current Inverse Time Multiplier	ti>	0.04	25.00	0.01	00.10
Over current Definite Trip Time	td>	0.05sec	260.00sec	0.01sec	000.10sec
Short Circuit Stage 1 Setting					
Short Circuit Current Setting	I>>	0.20xIp	30.00xIp	0.02xIp	Disable
Short Circuit Definite Trip Time	t>>	0.04sec	20.00sec	0.02sec	00.04sec
Short Circuit Stage 2 Setting					
Short Circuit Current Setting	I>>>	0.20xIp	30.00xIp	0.02xIp	Disable
Short Circuit Definite Trip Time	t>>>	0.04sec	20.00sec	0.02sec	00.04sec

Over / Under Voltage

Parameters	Display	Setting Ranges		Step Size	Default Setting
		Min.	Max.		
Voltage Loss Block	U los Blk	Disable	Enable	—	Disable
Under Voltage Threshold	UV-Thre	5 %Un	100 %Un	1 %Un	010%Un
Under Voltage Characteristic	U< char	DEFT	U_INV	—	DEFT
Under Voltage in Start	U< Strt	NO	YES	—	NO
Under Voltage Setting	U< Pkup	20 %Un	130 %Un	1 %Un	Disable
Under Voltage Inverse Time Multiplier	U< Ti	0.05	2.00	0.01	0.05
Under Voltage Definite Trip Time	U< Td	0.01sec	300.00sec	0.01sec	000.03sec
Under Voltage in start	U<<Strt	NO	YES	1	NO
Under Voltage Setting	U<<Pkup	5 %Un	120 %Un	1 %Un	Disable
Under Voltage Definite Trip Time	U<< Td	0.01 sec	300 sec	0.01 sec	000.05sec
Over Voltage Characteristics	U> char	DEFT	U_INV	—	DEFT
Over Voltage Setting	U> Pkup	20 %Un	150 %Un	1 %Un	Disable
Over Voltage Inverse Time Multiplier	U> Ti	0.05	2.00	0.01	0.05
Over Voltage Definite Trip Time	U> Td	0.01 sec	300.00 sec	0.01 sec	000.05sec
Over Voltage Setting	U>>Pkup	20 %Un	150 %Un	1 %Un	Disable
Over Voltage Definite Trip Time	U>>Td	0.01 sec	300.00 sec	0.01 sec	000.05sec

U0 / U1 / U2 Setting

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Zero Sequence Volt. Setting	U0> Pkup	2%Un	100%Un	1%Un	Disable
Zero Seq Volt. Characteristic	U0> char	DEFT	U_INV	-----	DEFT
Zero Seq Volt. Inverse Time Multiplier	U0> Ti	0.05	2.00	0.01	0.05
Zero Seq Volt. Definite Trip Time	U0> Td	0.03 sec	20.00 sec	0.01 sec	00.05sec
Pos. Seq Volt. Setting	U1< Pkup	10%Un	100%Un	1%Un	Disable
Pos. Seq Volt. Definite Trip Time	U1< Td	0.03 sec	10.00 sec	0.01 sec	00.10sec
Neg Seq Volt. Setting	U2> Pkup	10%Un	100%Un	1%Un	Disable
Neg Seq Volt. Definite Trip Time	U2> Td	0.03sec	10.00sec	0.01sec	00.10sec

Thermal Over-load

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Thermal Memory Mode	TH_M_Mode	M1	M2, M3	1	M1
Permissible basic current	Prmsbl Ib	0.20xIp	4.00xIp	0.02xIp	Disable
Constant	TH Const	0.50	2.00	0.01	1.00
Heating Time Constant	HT Const	000.5min	180.0min	0.1min	000.5min
Cooling Constant	C1 Const	1.00xTh	8.00xTh	0.01xTh	1.00xTh
Thermal Alarm	Th Alarm	20%	99%	1%	20%
NPS Weighting Factor	NPS Fctr	0.05	2.50	0.05	2.50
Thermal Reset	Th Reset	0%	99%	1%	70%
Thermal Characteristic	Th Char	Th1	Th2	1	Th1

Sensitive Earth Over Current Setting (based on Ordering information)

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Phase Characteristics	SE-CURVE	DEFT	EINV, VINV, NINV1.3, LINV NINV3.0	-----	DEFT
Ie> Current Setting	ISe> Pkup	0.002xIn	1xIn	0.001xIn	0.010xIn
Ie> inverse timing	ISe> Ti	0.01	20.00	0.05	0.05
Ie> Definite timing	ISe> Td	0.03 sec	260 sec	0.01 sec	0.03 sec
Ie>> Current Setting	ISe>>Pkup	0.002xIn	1xIn	0.001xIn	0.280xIn
Ie>> Definite timing	ISe>>Td	0.02 sec	20 sec	0.01 sec	0.02 sec

Negative Phase Sequence Setting

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
NPS Characteristic	I2> Char	DEFT	NPS_INV	----	DEFT
NPS Pickup setting	I2> Pkup	0.10xIp	1.00xIp	0.01xIp	Disable
Constant	K1>	005	600	1	005
NPS Definite Trip Time	I2> Td	0.1sec	600.0sec	0.1sec	0.5sec

Under current Setting

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

Motor Control Setting

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Start Limit	St Lmt Tm	1min	300min	1min	Disable
Start Attempt	St Atmpt	1	20	1	3
Start Time	St Time	0.20sec	500.00sec	0.01sec	3.00sec
Time between Two Start	St Intvl	1min	240min	1min	Disable
Start Blocking Selection	St Blkng	THERMAL	MOTOR START, BOTH	-----	Start
Start Blocking Time	St BlkTm	1min	60min	1min	2min
Stop Time	Stp Time	0.05sec	10.00sec	0.01sec	3.00sec
Phase Loss Trip Time	Ph Loss	0.10 min	10.00min	0.01min	Disable
Locked Rotor Current Setting	Lk Rtr I	2xIp	30xIp	02xIp	Disable
Locked Rotor Trip Time	Lk Rtr Tm	0.04sec	20.00sec	0.01sec	0.10sec
Stall Current Setting	Stall I	0.5xIp	30.0xIp	0.1xIp	Disable
Stall Trip Time	Stall Tm	1sec	60sec	1sec	5sec
Phase Reversal Setting	Ph Rvrsl	Disable	Enable	-----	Disable
Phase Reversal Trip Time	Ph RslTm	0.1sec	30.0sec	0.1sec	1.0sec
External Trip Time	Trip Dly	0.1sec	260.0sec	0.1sec	1.0sec

CT Supervision

Parameters	Display	Setting Ranges		Step Size	Default Setting
		Min.	Max.		
CT Supervision	CT_Sup	ENABLE	DISABLE	---	
Current Minimum Setting	I Mn Set	0.1xIp	10.0xIp	0.1xIp	0.2xIp
Current Maximum Setting	I Mx Set	0.1xIp	10.0xIp	0.1xIp	2.0xIp
Current Supervision Trip Time	CTS Dly	0.05sec	600.00sec	0.01sec	0.10sec

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

Load Monitoring

Parameters	Display	Setting Ranges		Step Size	Default Setting
		Min.	Max.		
Load Setting	Ld> Set	10%IFL	200%IFL	1%IFL	Disable
Load Trip Time	Ld> Dly	0.1sec	30sec	0.1sec	2.0sec

Harmonic Restrain

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Phase 2nd Harmonic Block	Ph 2ndH	10%If	50%If	2%If	Disable
Phase Blocking Time	Ph Td	0.0sec	20.0sec	0.1%If	2.00 sec
Earth 2nd Harmonic Block	E 2ndH	10%If	50%If	2%If	Disable
Earth Blocking Time	E Td	0.0sec	20.0sec	0.1%If	2.00 sec

Trip Circuit Supervision

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Trip Circuit Sup. Delay Time	TCS Td	0.03sec	2.00sec	0.01sec	Disable

Circuit Breaker Failure

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
CBFP Trip Time	CBFP Td	0.03sec	2.00sec	0.01sec	Disable

Frequency

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

Reverse Power

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Reverse Power	RP>	DISABLE	ENABLE	-	NO
Reverse Power Setting	RP> Pkup	5%Pn	200%Pn	1%Pn	005%Pn
Reverse Power Trip Time	RP> Time	0.03sec	60.00sec	0.01sec	0.03sec

Earth Fault

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Earth Stage 1 Settings					
Earth Characteristics	E-CURVE	DEFT	EINV, VINV, LINV NINV1.3, NINV3.0	--	DEFT
Earth Protection In start	Ie> Strt	NO	YES	--	YES
Earth Current Setting	Ie>	0.05	2.50	0.05	Disable
Earth Inverse Time Multiplier	ti>	0.05	20.00	0.05	0.100
Earth Definite Trip Time	td>	0.03sec	260.00sec	0.01sec	0.03sec
Earth Stage 2 Setting					
Earth Protection In start	Ie>> Strt	NO	YES	—	YES
Earth Current Setting	Ie>>	0.50	8.00	0.05	Disable
Earth Definite Trip Time	td>>	0.02sec	20.00sec	0.01sec	0.02sec

Disturbance Record Setting

Parameters	Display	Setting Range		Step Size	Default Setting
		Min	Max		
Oscilloscope recording	OSC.RECORD	NO	YES	-	NO
Number of Pre Fault Cycle	Pre Cycle	2C	298C	1C	002C
Number of Post Fault Cycle	Post Cycle	2C	298C	1C	002C
Trigger mode	Trig. Mode	PK-UP	TRIP, DI, AnyOne, Start	-	PK-UP

Date & Time Settings (RTC)

Parameters	Display	Setting Range		Step Size
		Min	Max	
Date	DATE	1	31	1
Month	MONTH	1	12	1
Year	YEAR(2K)	2000	2099	1
Day	DAY	SUN	SAT	1
Hour	HOUR	0	23	1
Minute	MINUTE	0	59	1
Second	SECOND	0	59	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

RTD Input (* Model Dependent)

Parameters	Display	Setting Range		Step Size
		Min	Max	
RTD1 Alarm Setting	RTD1 Alarm	20^0C	200^0C	001^0C
RTD1 Alarm Trip Time	RTD1 AlrTm	0.2sec	100.0sec	0.1sec
RTD1 Trip Setting	RTD1 Trip	20^0C	200^0C	001^0C
RTD1 Trip Time	RTD1 TrpTm	0.2sec	100.0sec	0.1sec
RTD2 Alarm Setting	RTD2 Alarm	20^0C	200^0C	001^0C
RTD2 Alarm Trip Time	RTD2 AlrTm	0.2sec	100.0sec	0.1sec
RTD2 Trip Setting	RTD2 Trip	20^0C	200^0C	001^0C
RTD2 Trip Time	RTD2 TrpTm	0.2sec	100.0sec	0.1sec
RTD3 Alarm Setting	RTD3 Alarm	20^0C	200^0C	001^0C
RTD3 Alarm Trip Time	RTD3 AlrTm	0.2sec	100.0sec	0.1sec
RTD3 Trip Setting	RTD3 Trip	20^0C	200^0C	001^0C
RTD3 Trip Time	RTD3 TrpTm	0.2sec	100.0sec	0.1sec
RTD4 Alarm Setting	RTD4 Alarm	20^0C	200^0C	001^0C
RTD4 Alarm Trip Time	RTD4 AlrTm	0.2sec	100.0sec	0.1sec
RTD4 Trip Setting	RTD4 Trip	20^0C	200^0C	001^0C
RTD4 Trip Time	RTD4 TrpTm	0.2sec	100.0sec	0.1sec
RTD5 Alarm Setting	RTD5 Alarm	20^0C	200^0C	001^0C
RTD5 Alarm Trip Time	RTD5 AlrTm	0.2sec	100.0sec	0.1sec
RTD5 Trip Setting	RTD5 Trip	20^0C	200^0C	001^0C
RTD5 Trip Time	RTD5 TrpTm	0.2sec	100.0sec	0.1sec

Erase Record

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

Front (USB) Communication

Protocol	CSE Proprietary Protocol : available with front software
Baud rate	9600/19200/38400/57600 bps
PARITY	NONE / EVEN / ODD
SLAVE ID	001-247
Cable required for Interface	USB cable type (A to A)

Rear (RS-485) Communication   (* Model dependent)

Description		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

DO Assignment   (* Model Dependent)

	Parameters			Parameters
1	Over-current protection		32	External trip2
2	Short circuit protection		33	External trip3
3	Under-current		34	External trip4
4	Earth timed protection		35	External trip5
5	Earth instant protection		36	External trip6
6	Negative phase sequence protection		37	RTD1 Alarm Pickup *
7	Circuit breaker failure protection		38	RTD1 Alarm Trip *
8	Start block		39	RTD1 Fault Pickup *
9	Common fault		40	RTD1 Fault Trip *
10	Start relay		41	RTD2 Alarm Pickup *
11	Stop relay		42	RTD2 Alarm Trip *
12	Thermal relay		43	RTD2 Fault Pickup *
13	Thermal alarm		44	RTD2 Fault Trip *
14	Phase loss		45	RTD3 Alarm Pickup *
15	Stall		46	RTD3 Alarm Trip *
16	Locked Rotor		47	RTD3 Fault Pickup *
17	Phase reversal		48	RTD3 Fault Trip *
18	External trip1		49	RTD4 Alarm Pickup *
19	Trip circuit supervision		50	RTD4 Alarm Trip *
20	Motor running		51	RTD4 Fault Pickup *
21	Self supervision		52	RTD4 Fault Trip *
22	Under-voltage		53	RTD5 Alarm Pickup *
23	Under voltage Hi-set		54	RTD5 Alarm Trip *
24	Over-voltage		55	RTD5 Fault Pickup *
25	Over voltage Hi-set		56	RTD5 Fault Trip *
26	CT Secondary supervision		57	Motor Running Status
27	Load supervision		58	Restart Inhibit
28	Zero sequence over voltage protection		59	Motor Start Command
29	Positive sequence over voltage protection		60	Motor Stop Command
30	Negative sequence over voltage protection		61	Common Fault Trip
31	Circuit breaker control			

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

Parameters	
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
Neg. Phase Seq Current Pickup	Auto/Manual
Neg. Phase Seq 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

Parameters	Function Status
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 Seq Voltage Pickup	Auto/Manual
Positive Seq Voltage Pickup	Auto/Manual
Positive Seq Voltage Trip	Auto/Manual
Negative Seq Voltage Pickup	Auto/Manual
Negative Seq 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	Auto/Manual
CT Secondary Open	Auto/Manual

Function Reset   (* 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

Parameters	Function Status
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
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   (* Model Dependent)

Parameters	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 *	
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

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	At I_n=1A 0.1 VA
in current circuit	At I_n=5A 0.2 VA
Thermal withstand	Dynamic current withstand
capability in	for 1 Sec : 100 x I_n
current circuit	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 $\pm$2%
Voltage	5-150%Un	50-60Hz	Less than $\pm$2%
Power	-	-	Less than $\pm$5%
Power Factor	-	-	Less than $\pm$0.02

Trip Time Accuracy for Current Protections

Parameters	Accuracy
Trip time accuracy for protections except NPS	$\pm$30mSec OR $\pm$5% (whichever is higher)
Trip time accuracy for NPS	$\pm$60mSec OR $\pm$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 $\pm$2% error in measured voltage OR $\pm$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	$\leq$5 %

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	Default Setting
Function key	F1	DO1/DO2......................DO16 RELAY RESET, THERMAL RESET, CB CONTROL	1	-

17.0 Standards

Type Test

F1	Functional Tests	Internal Design	Performance in line with Specification & Standards
			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.
		Specifications & IEC60255-6 IEC60255-3	

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 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

Figure-9

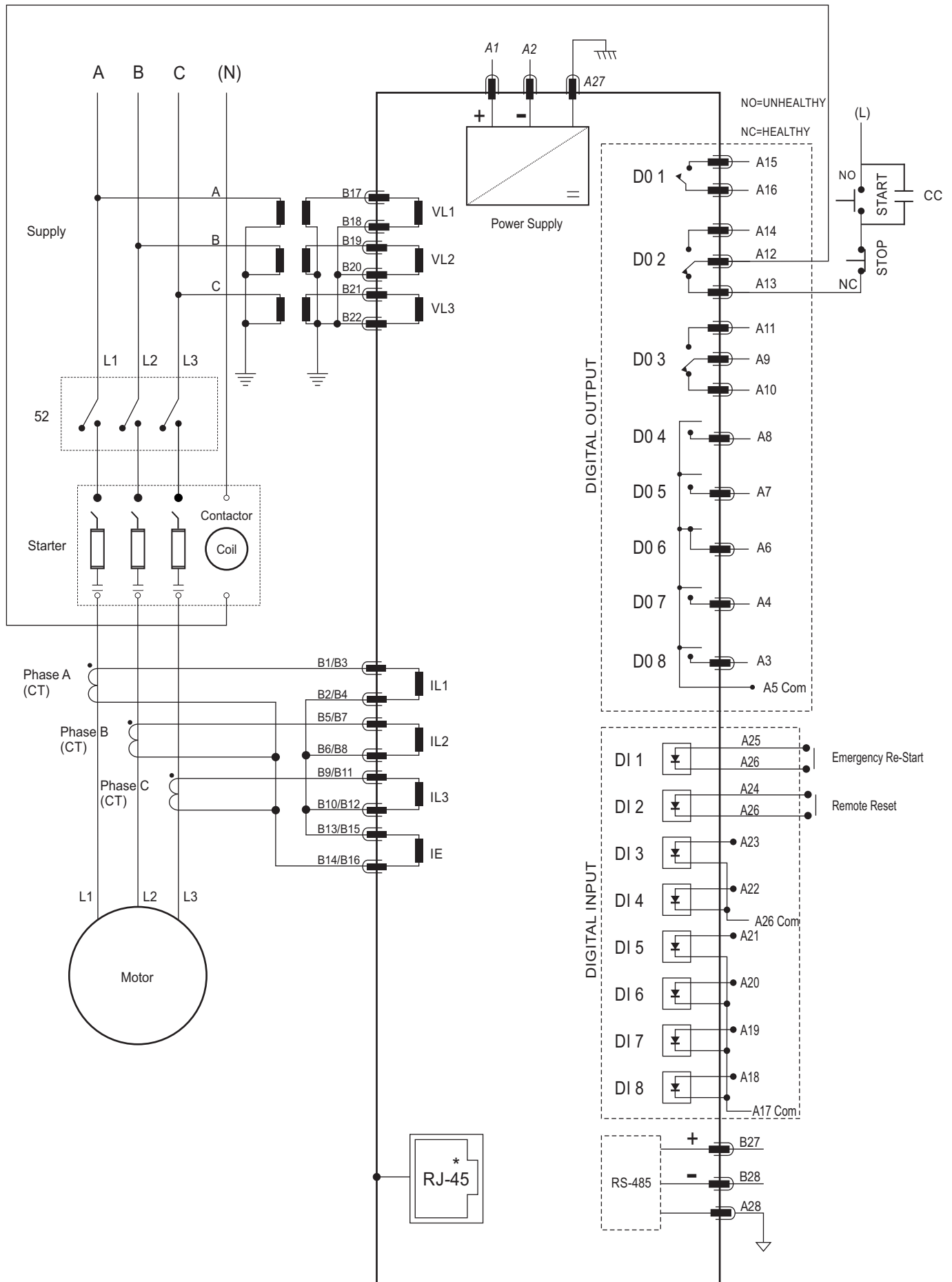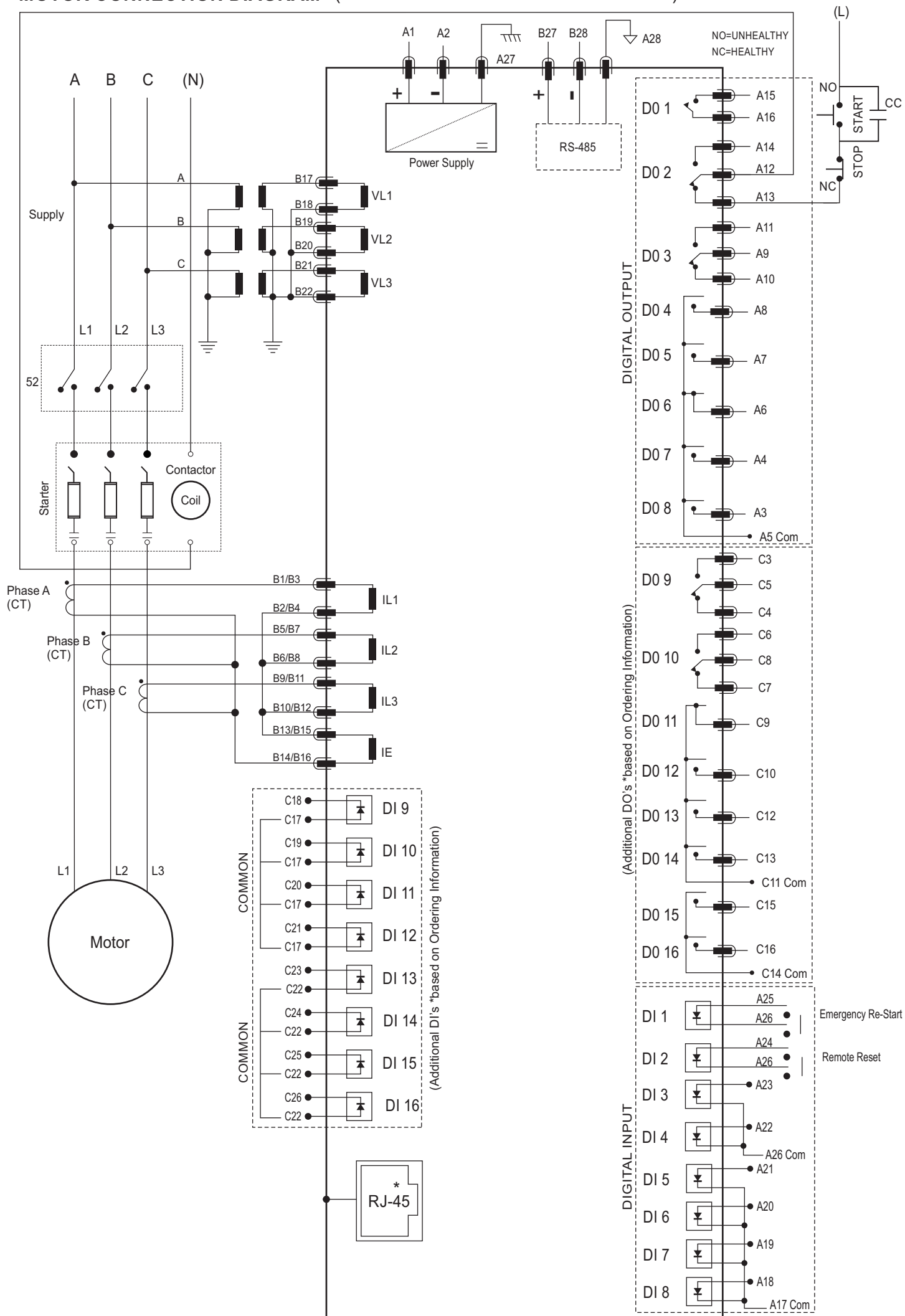**USB Cable required for Front communication (Type A to A)**

Figure-10

19A Motor Connection Diagram

(8 DI / DO for Non-Sensitive Earth Fault)

MOTOR CONNECTION DIAGRAM (16 DI / DO for Non-Sensitive Earth Fault)

MOTOR CBCT CONNECTION DIAGRAM
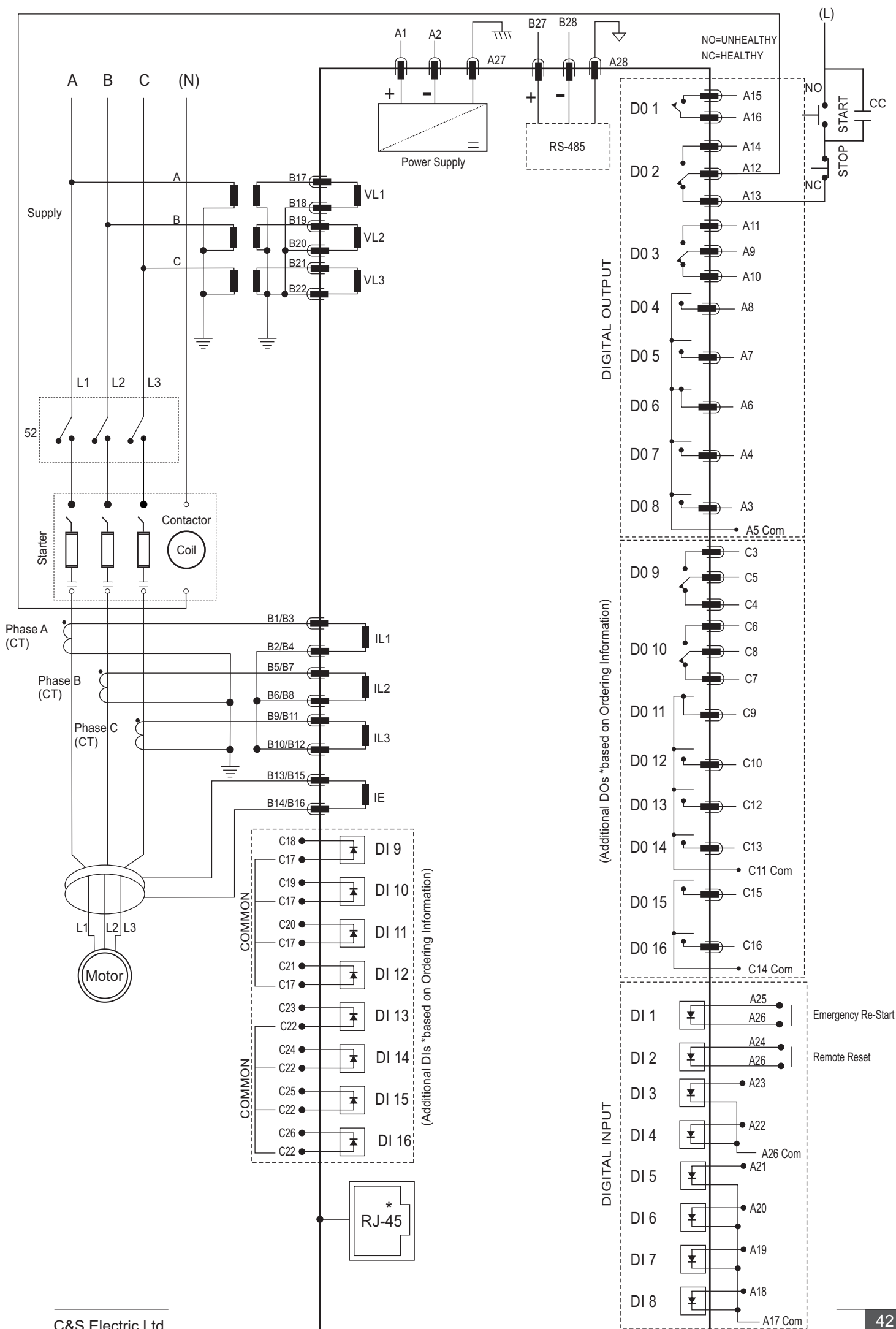
C&S Electric Ltd.

MOTOR CBCT CONNECTION DIAGRAM FOR SEF WITH 8 DI / DO

NOTE : For Sensitive Earth Fault connection,
use B13-B14 Terminals.

Figure-15

MOTOR CBCT CONNECTION DIAGRAM

with 8 DIs / DOs + 5 RTD

A1 A2 A27 B27 B28 A28

Power Supply

RS-485

RJ-45 *

NO=UNHEALTHY
NC=HEALTHY

LINE VT ANALOG INPUT

B17 B18 — V_{L1}
B19 B20 — V_{L2}
B21 B22 — V_{L3}

CT-1A-ANALOG INPUT

B1 B2 — 1A — I_{L1}
B5 B6 — 1A — I_{L2}
B9 B10 — 1A — I_{L3}
B13 B14 — 1A — I_N

CT-5A-ANALOG INPUT

B3 B4 — 5A — I_{L1}
B7 B8 — 5A — I_{L2}
B11 B12 — 5A — I_{L3}
B15 B16 — 5A — I_N

DIGITAL OUTPUT

DO 1 — A15, A16
DO 2 — A14, A12, A13
DO 3 — A11, A9, A10
DO 4 — A8
DO 5 — A7
DO 6 — A6
DO 7 — A4
DO 8 — A3
A5 Com

(Additional DO's *based on Ordering Information)

RTD1 — C28, C27
RTD2 — C26, C25
RTD3 — C24, C23
RTD4 — C22, C21
RTD5 — C20, C19

DIGITAL INPUT

DI 8 DI 7 DI 6 DI 5 DI 4 DI 3 DI 2 DI 1

A17 Com A18 A19 A20 A21 A26 Com A22 A23 A24 A25

Figure-16

MOTOR CBCT CONNECTION DIAGRAM

with 14 DIs / DOs + 5 RTD

NO=UNHEALTHY

NC=HEALTHY

B17 V$_{L1}$
B18

B19 V$_{L2}$
B20

B21 V$_{L3}$
B22

LINE VT ANALOG INPUT

A1 A2 A27

Power Supply

B27 B28 A28

RS-485

RJ-45 *

DO 1 — A15 / A16
DO 2 — A14 / A12 / A13
DO 3 — A11 / A9 / A10
DO 4 — A8
DO 5 — A7
DO 6 — A6
DO 7 — A4
DO 8 — A3
A5 Com

DIGITAL OUTPUT

B1 1A I$_{L1}$
B2

B5 1A I$_{L2}$
B6

B9 1A I$_{L3}$
B10

B13 1A I$_{N}$
B14

CT-1A-ANALOG INPUT

B3 5A I$_{L1}$
B4

B7 5A I$_{L2}$
B8

B11 5A I$_{L3}$
B12

B15 5A I$_{N}$
B16

CT-5A-ANALOG INPUT

RTD1 — C28 / C27
RTD2 — C26 / C25
RTD3 — C24 / C23
RTD4 — C22 / C21
RTD5 — C20 / C19
DO 9 — C10 / C9 / C8
DO 10 — C12 / C11
DO 11 — C14 / C13
DO 12 — C15
DO 13 — C16
DO 14 — C17
C18 Com

(Additional DO's *based on Ordering Information)

(Additional DI's *based on Ordering Information)

DI 14 DI 13 DI 12 DI 11 DI 10 DI 9
C7 Com C6 C5 C4 C3 C2 C7 C1

DIGITAL INPUT

DI 8 DI 7 DI 6 DI 5 DI 4 DI 3 DI 2 DI 1
A17 Com A18 A19 A20 A21 A26 Com A22 A23 A24 A25

Figure-16

20.0 VT Connection Diagram

Figure-17
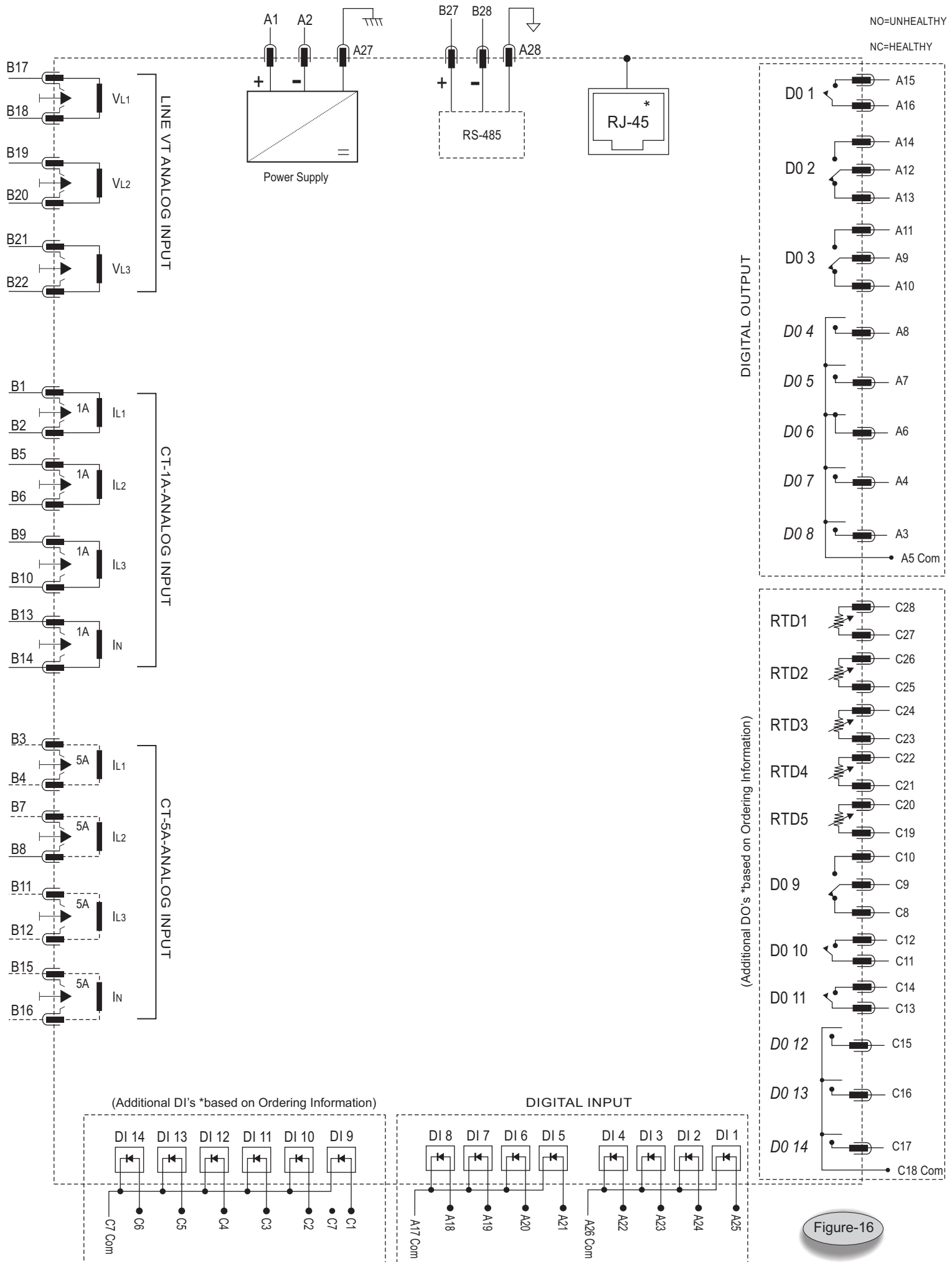

Figure-18

21.0 CT Connection Diagram
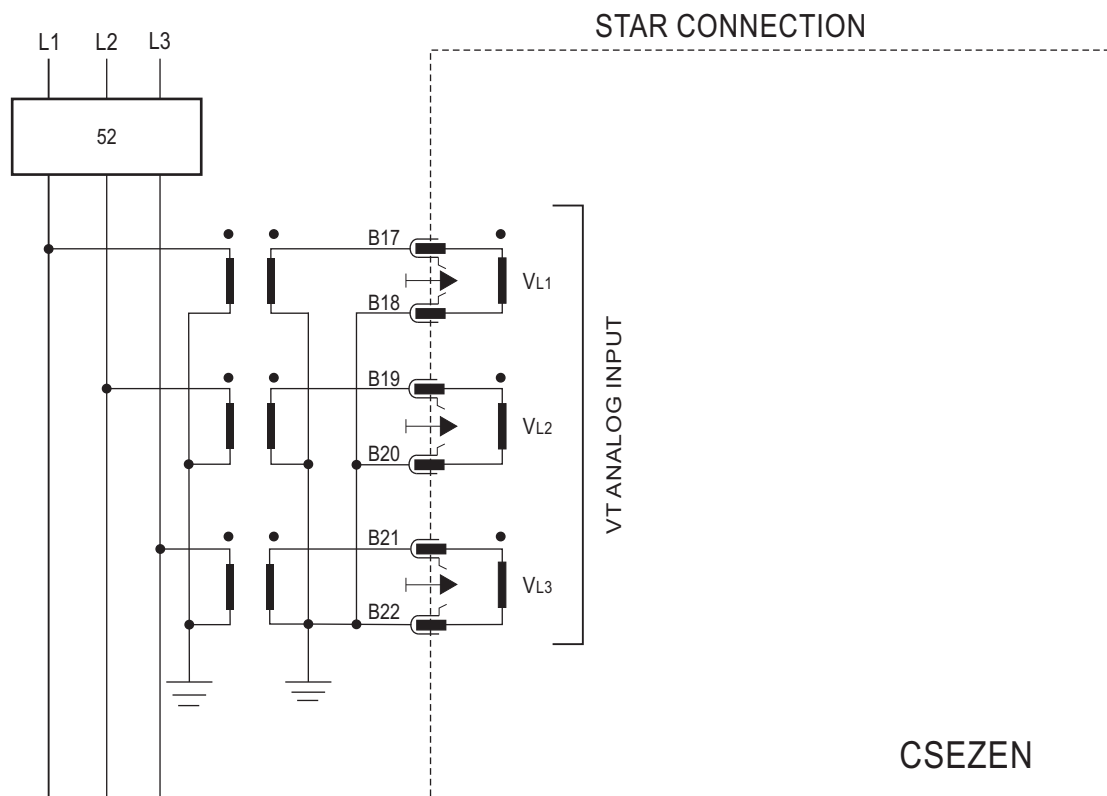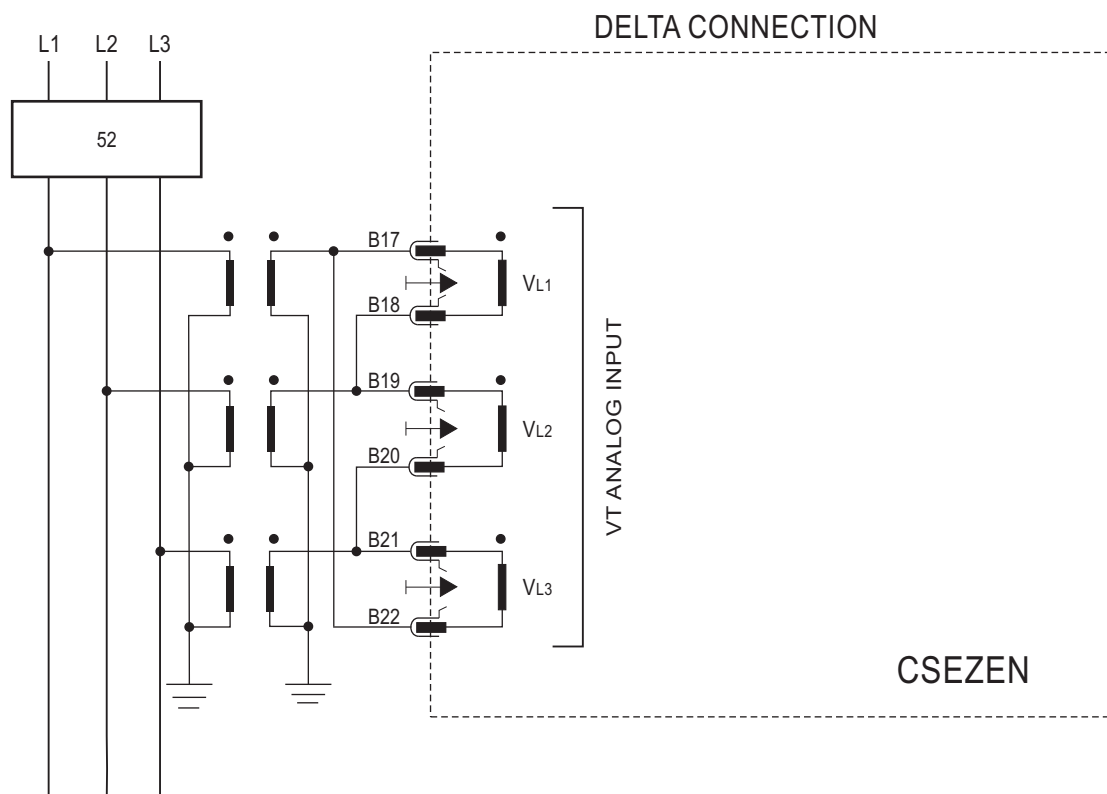
CT Schemes Holmgreen Residual CTs Connection for 1A
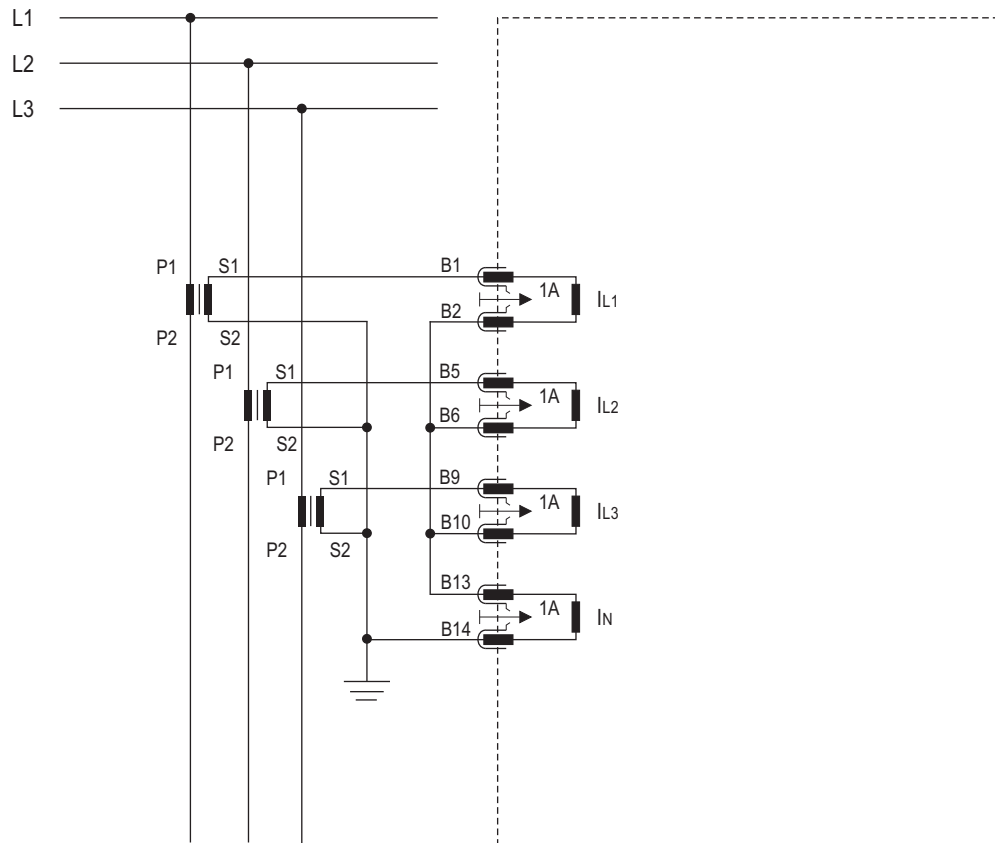
Figure-19

22.0 CT Connection Diagram

CT Schemes Holmgreen Residual CTs Connection for 5A

L1
L2
L3

P1   S1   B3
                    5A I_{L1}
          B4
P2   S2
P1   S1   B7
                    5A I_{L2}
          B8
P2   S2
P1   S1   B11
                    5A I_{L3}
          B12
P2   S2
               B13
                    5A I_N
          B14

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)
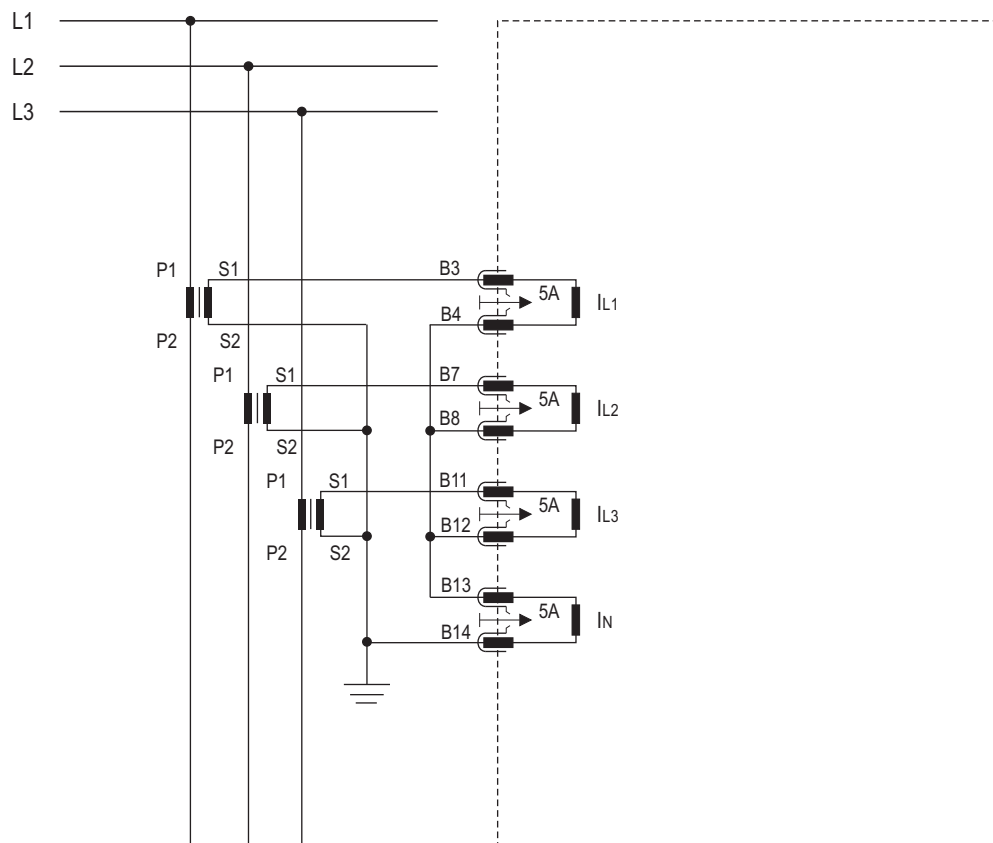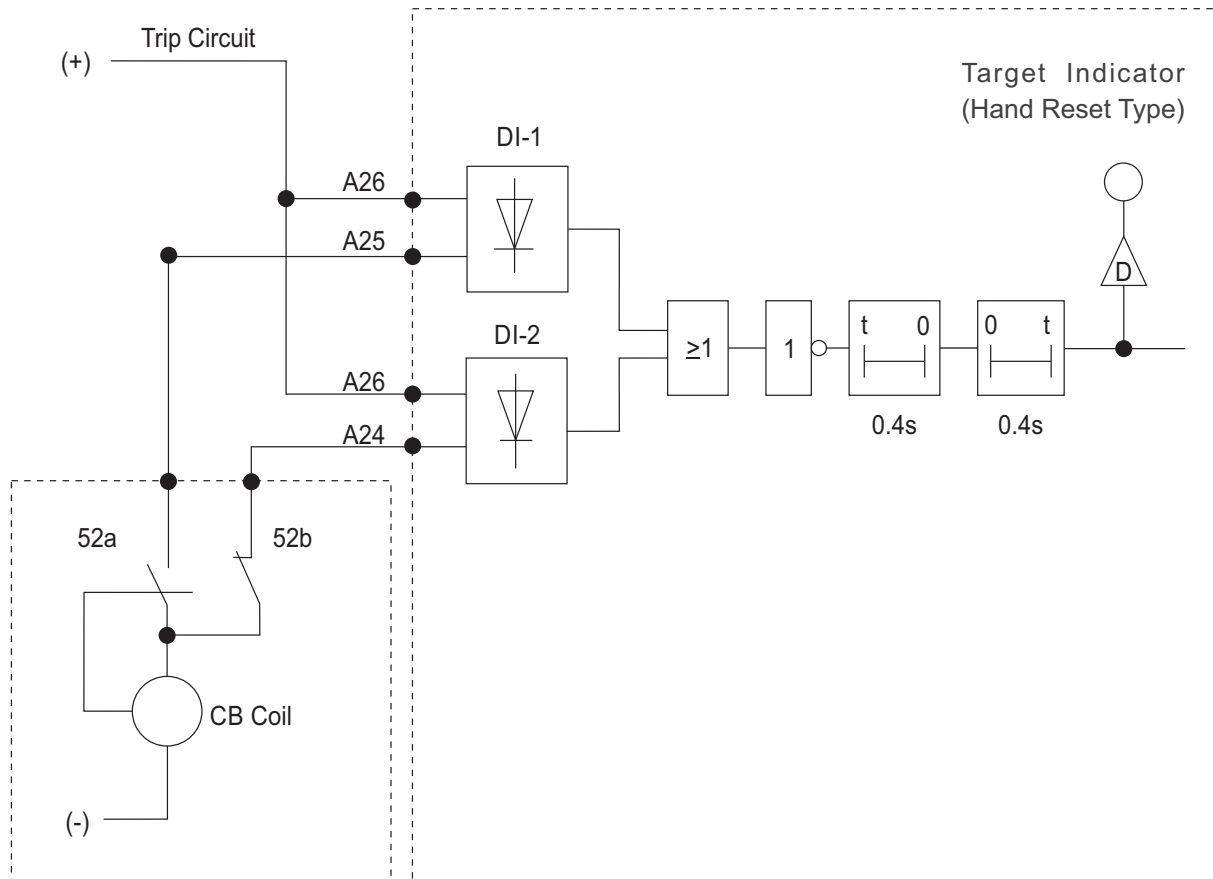
Front View

250.5

190.5

Top View

218

190

179.5

23.5

Side View

158
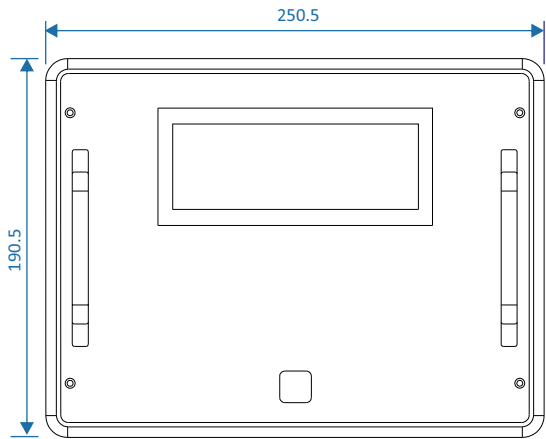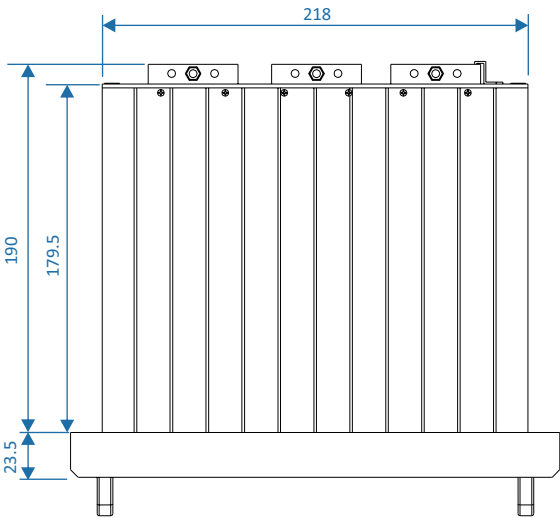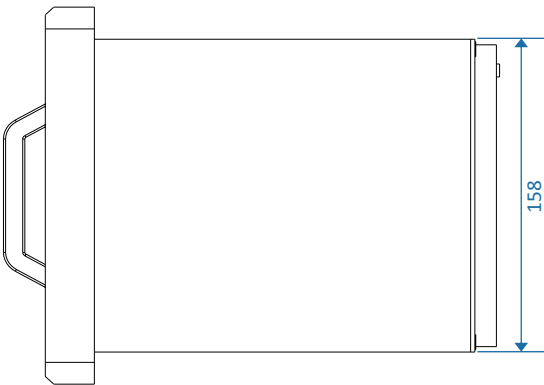
25.0 Panel mounting of the Relay

for Panel mounting		
Screw	:	M4x12mm
Qty	:	8 Nos.

Screw required to insert from back side

CSEZEN Relay
Panel cut out dimensions
220.0 (W) x 162.0 (H) mm
Hole dia = 6.0 mm

236.5
220.0
168.5
176.5
98.5
31.75
25.75
34.0
168.5
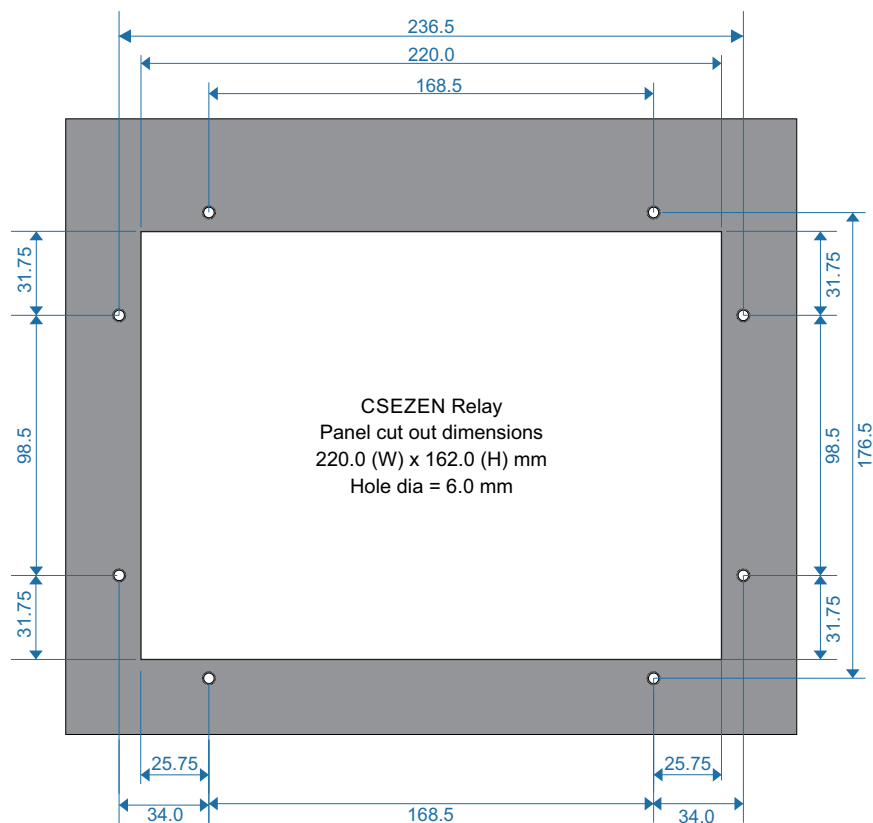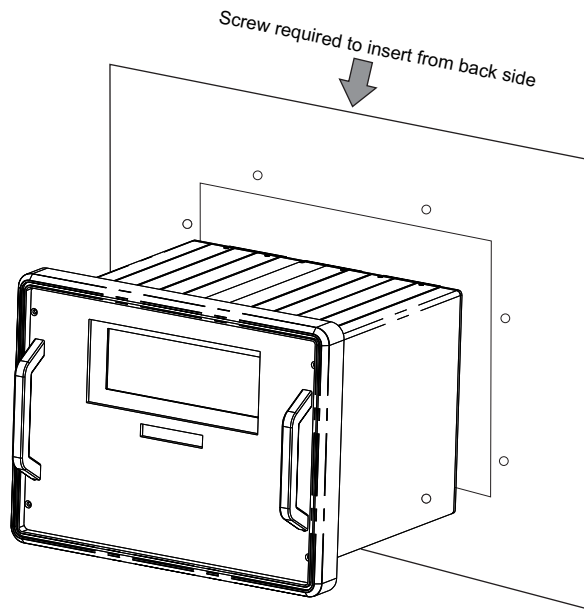
Different views of the Relay
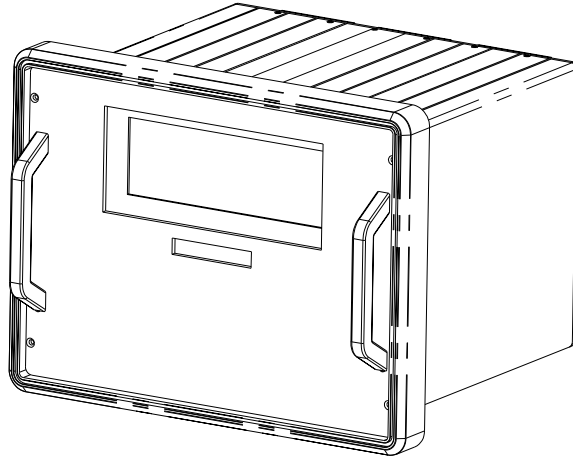
Figure-27
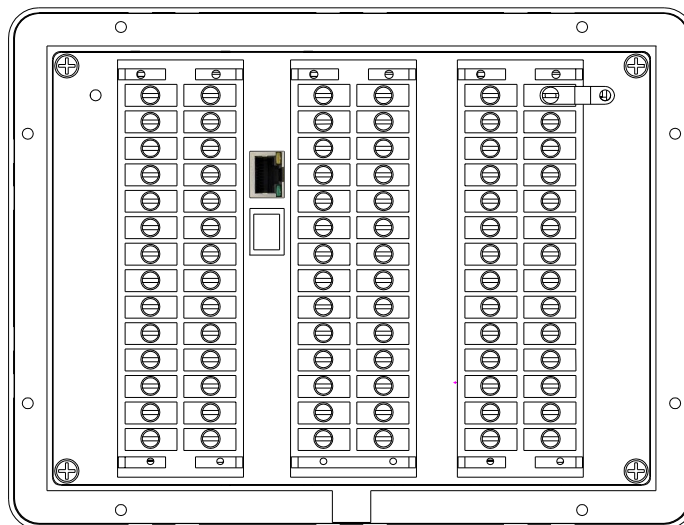
Figure-28

26.0 Ordering Information

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

VOLTAGE INPUT	
110V	1
400V	4

EARTH FAULT	
Sensitive	S
Non Sensitive	N

DIGITAL INPUT/OUTPUT 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 PROTOCOL	
MODBUS on RS-485	A
IEC 60870-5-103 on RS-485	B
IEC 61850-Single RJ-45 Port-Ed-2	C
IEC 61850 PRP-Dual RJ-45 port-Ed-2	D

TIME SYNCHRONIZATION	
None	0
SNTP on RJ-45	S

Issue Date : 14.06.17
Rev. No : 09
Rev. Date : 31.05.25
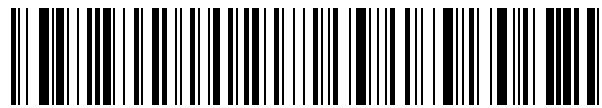
CSEZEN- E Cat al ogue

Technical Question or After-sales Service

Customer Center Quick Response Service, Excellent Technical Support

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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
03	03	Default setting of setting ranges included Fault event Screen shot included	11.11.20
04	04	Each Conn diag remove HV , LV winding text, DI term no. of TCS diag, remove formula of thermal delta connection at page 40 , 41	23.12.20
05	05	Mentioned B13-B14 Terminals for Sensitive Earth Fault in their respective conn. duagrams	10.06.22
06	06	Change in ordering information and removed SEF related conn. diagram as per P.L	15.09.22
07	07	Removed one SEF Setting Table out of 2 as per PL	29.10.22
08	08	Change in IEC 61850:Rear Communication protocol details of ordering information details on page-62	03.01.25
09	08	Include 8 DI/DO + 5RTD conn. diagram details on page-44	03.01.25
10	10	Modification done in phase Loss description on page-7	31.05.25