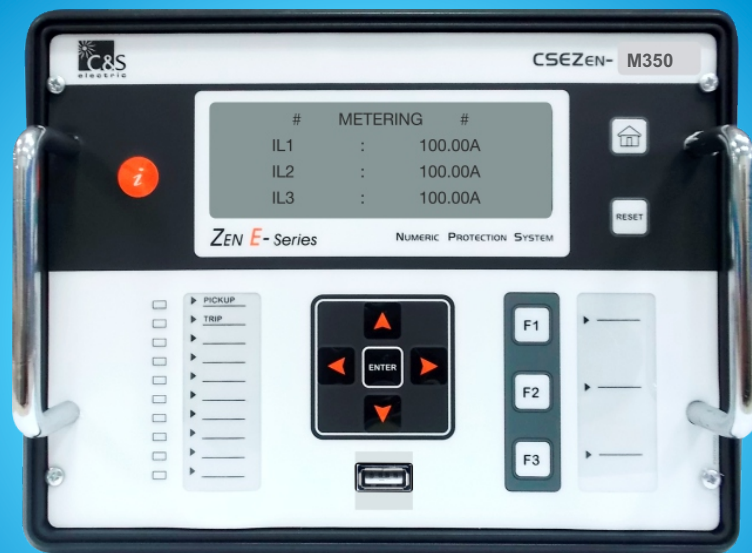


We touch your **electricity** everyday!

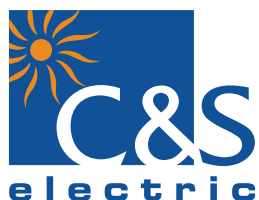
## CSEZEN- M350

Advance Motor Protection & Monitoring IED



ZEN E-Series

Catalog



**PMD Division**

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## 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 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
- ◆ Phase Loss
- ◆ 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
- ◆ Harmonic Blocking
- ◆ Excess Long Start
- ◆ Restart Inhibit
- ◆ 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

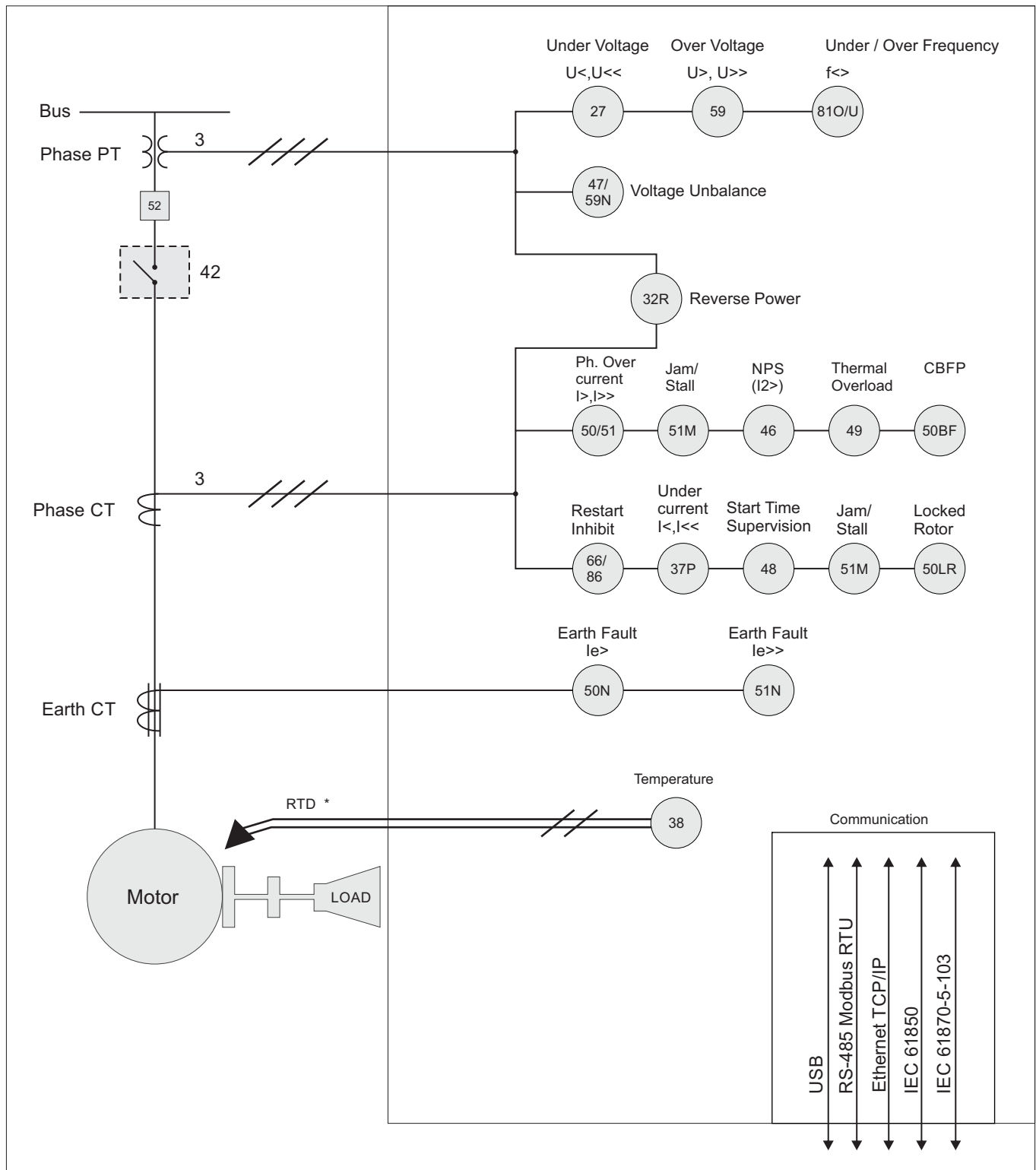


Figure-1

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 unprimed 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:

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

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

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

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

Where

t = Tripping time  
I = Fault current

t<sub>i</sub> = Time multiplier  
I<sub>s</sub> = 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 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

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

- K1 : TMS for Inverse characteristics of NPS  
 t : Expected Trip Time  
 I<sub>2</sub> : Measured negative sequence value  
 I<sub>2s</sub> : Permissible NPS value

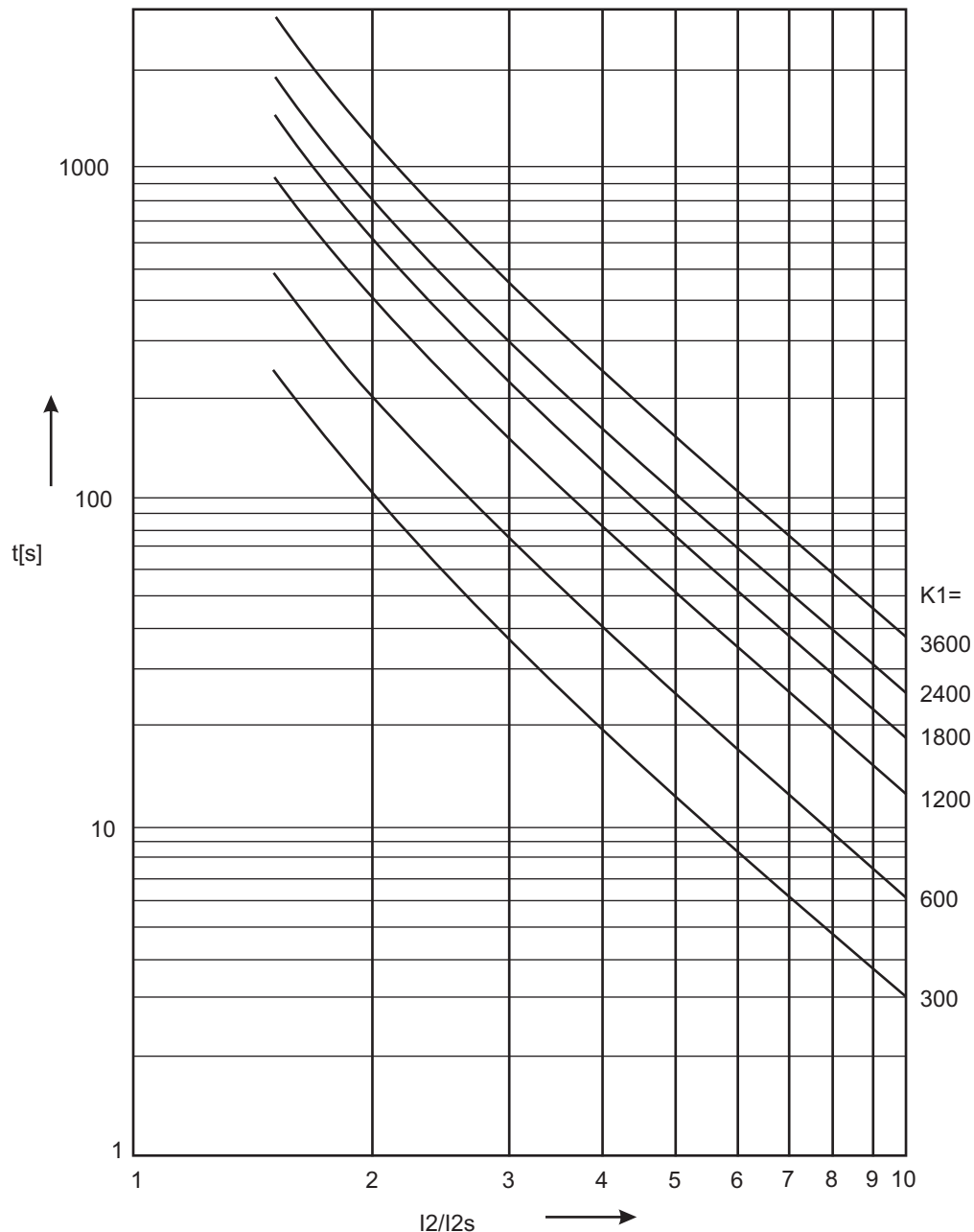


Figure-2



### 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:

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

with  $\tau$  = 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.

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

where

$I_b$  = 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:

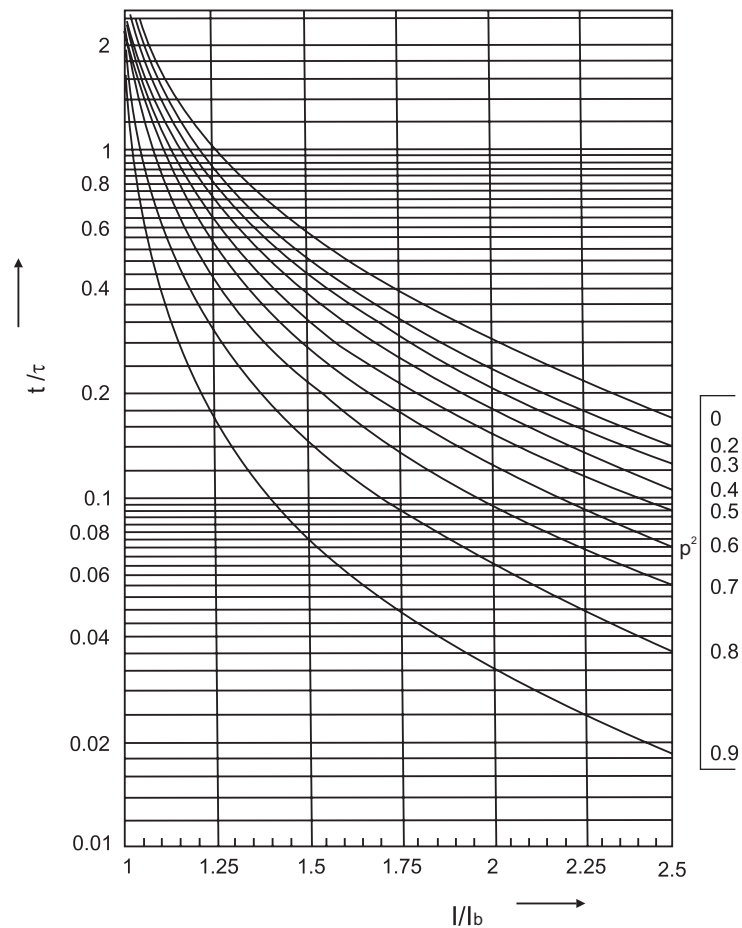


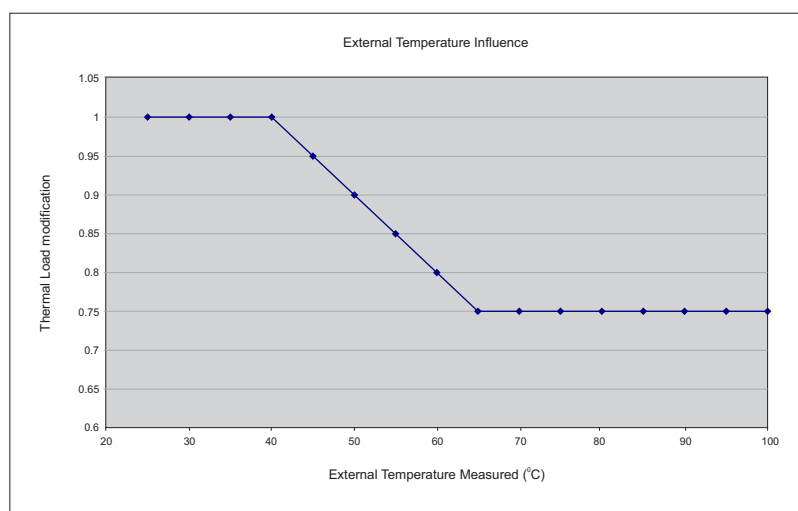
Figure-3

#### 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 $T < 40^{\circ}\text{C}$                            |
| Coef = $1.4 - (0.01T)$ | for $40^{\circ}\text{C} \leq T \leq 65^{\circ}\text{C}$ |
| Coef = 0.75            | for $T > 65^{\circ}\text{C}$                            |



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 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 than 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 <sub>s</sub> | = | Relay Setting Voltage     |

Note: This equation is only valid for V/V<sub>s</sub> 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.

$$U_2 = 1/3 (U_1 + a^2 U_2 + a U_3)$$

**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.

$$U_1 = 1/3 (U_1 + a U_2 + a^2 U_3)$$

**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  $I_n$  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 from 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  $I_{minSet}$ , while another phase current is exceeding the  $I_{maxSet}$ , 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  $I_p$ ) 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  $I_p$ . 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  $K_{xlb}$  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  $K_{xlb}$  setting is crossed repeatedly. Running conditions are recognized when the start time has run out after the last step & current has settled between  $K_{xlb}$  and 3% of  $I_p$ . (Resistance start).
- 3) If after STOP a motor current has settled between 3% of  $I_p$  and  $K_{xlb}$  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  $I_p$ .  
Running is only accepted by the supervision after the time has elapsed.

**Case-1:**

If once motor starts &  $I$  falls below 3% of  $I_p$  for the time less than stop time and again exceeds 3% of  $I_p$  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  $I_p$  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  $I_p$ , 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.

| S/N | Event Name                                                    | Event Category | TimeStamp               | Priority Index |
|-----|---------------------------------------------------------------|----------------|-------------------------|----------------|
| 1   | Manual Reset                                                  | RESET          | 06/11/2020 16:43:50.699 | 33             |
| 2   | Default Settings                                              | SETTING        | 06/11/2020 16:43:46.478 | 37             |
| 3   | Do Trip Due To Trip Circuit Supervision                       | TRIP           | 06/11/2020 16:43:26.674 | 296            |
| 4   | Both Connection Open                                          | CONTROL        | 06/11/2020 16:43:26.674 | 182            |
| 5   | Power ON                                                      | CONTROL        | 06/11/2020 16:43:26.643 | 1              |
| 6   | Clock Changed Through Comm                                    | SETTING        | 06/11/2020 16:39:25.562 | 809            |
| 7   | Motor Ready To Start                                          | CONTROL        | 06/11/2020 16:16:06.693 | 390            |
| 8   | Motor Stopped                                                 | CONTROL        | 06/11/2020 16:14:09.581 | 387            |
| 9   | Stop DO Operated                                              | CONTROL        | 06/11/2020 16:14:07.542 | 496            |
| 10  | Motor Stopped                                                 | CONTROL        | 06/11/2020 16:14:06.884 | 387            |
| 11  | Start Blocked                                                 | CONTROL        | 06/11/2020 16:14:06.884 | 389            |
| 12  | Motor Running DO On                                           | CONTROL        | 06/11/2020 16:14:02.348 | 496            |
| 13  | Motor Running                                                 | CONTROL        | 06/11/2020 16:14:02.348 | 386            |
| 14  | Motor Started                                                 | CONTROL        | 06/11/2020 16:13:59.341 | 385            |
| 15  | Motor Ready To Start                                          | CONTROL        | 06/11/2020 16:13:51.147 | 390            |
| 16  | Manual Reset                                                  | RESET          | 06/11/2020 16:13:00.158 | 33             |
| 17  | Start Interval Active                                         | CONTROL        | 06/11/2020 16:12:51.143 | 388            |
| 18  | Motor Stopped                                                 | CONTROL        | 06/11/2020 16:12:51.142 | 387            |
| 19  | Relay Dropout Due To Over Current Fault In IL3 Phase          | DROPU          | 06/11/2020 16:12:49.880 | 15             |
| 20  | Relay Dropout Due To Over Current Fault In IL3 Phase          | DROPU          | 06/11/2020 16:12:49.879 | 14             |
| 21  | Relay Dropout Due To Over Current Fault In IL1 Phase          | DROPU          | 06/11/2020 16:12:49.877 | 13             |
| 22  | Relay Dropout Due To Short Circuit Fault Stage 1 In IL3 Phase | DROPU          | 06/11/2020 16:12:49.865 | 19             |
| 23  | Relay Dropout Due To Short Circuit Fault Stage 1 In IL2 Phase | DROPU          | 06/11/2020 16:12:49.864 | 18             |
| 24  | Relay Dropout Due To Short Circuit Fault Stage 1 In IL1 Phase | DROPU          | 06/11/2020 16:12:49.863 | 17             |
| 25  | Pickup Due To Short Circuit Stage 1 In IL1 Phase              | PICKUP         | 06/11/2020 16:12:49.841 | 9              |
| 26  | Pickup Due To Over Current In IL3 Phase                       | PICKUP         | 06/11/2020 16:12:49.841 | 7              |
| 27  | Pickup Due To Short Circuit Stage 1 In IL2 Phase              | PICKUP         | 06/11/2020 16:12:49.831 | 10             |
| 28  | Relay Trip Due To Short Circuit Stage 1 In IL2 Phase          | TRIP           | 06/11/2020 16:12:49.831 | 25             |
| 29  | Common Fault Do Trip                                          | TRIP           | 06/11/2020 16:12:49.831 | 391            |
| 30  | Motor Started                                                 | CONTROL        | 06/11/2020 16:12:49.821 | 385            |
| 31  | Motor Stopped                                                 | CONTROL        | 06/11/2020 16:10:26.224 | 387            |
| 32  | Motor Running                                                 | CONTROL        | 06/11/2020 16:10:24.729 | 386            |
| 33  | Motor Running DO On                                           | CONTROL        | 06/11/2020 16:10:24.728 | 496            |
| 34  | Motor Started                                                 | CONTROL        | 06/11/2020 16:10:21.721 | 385            |
| 35  | mOTOR Parameter Changed Through Comm                          | SETTING        | 06/11/2020 16:10:09.784 | 820            |
| 36  | Motor Stopped                                                 | CONTROL        | 06/11/2020 16:09:38.715 | 387            |
| 37  | Motor Running DO On                                           | CONTROL        | 06/11/2020 16:09:32.816 | 496            |
| 38  | Motor Running                                                 | CONTROL        | 06/11/2020 16:09:32.816 | 386            |
| 39  | Motor Started                                                 | CONTROL        | 06/11/2020 16:09:29.809 | 385            |
| 40  | mOTOR Parameter Changed Through Comm                          | SETTING        | 06/11/2020 16:08:49.331 | 820            |
| 41  | Remote Trip Delayed Clear DI Clear                            | CONTROL        | 06/11/2020 16:03:08.474 | 414            |
| 42  | Manual Reset                                                  | RESET          | 06/11/2020 16:03:06.235 | 33             |
| 43  | External DO1 Trip                                             | TRIP           | 06/11/2020 16:03:05.170 | 500            |

Figure-4

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.)

| Sr No | FaultName                               | TimeStamp               | I1      | I2     | I3      | IE      | I2>    | UL1     | UL2     | UL3     | UL12     | UL23     | UL31     | U0>    | U1<     | U2>     | Power  | ThermalMemory | Frequency |
|-------|-----------------------------------------|-------------------------|---------|--------|---------|---------|--------|---------|---------|---------|----------|----------|----------|--------|---------|---------|--------|---------------|-----------|
| 1     | Over Frequency Fault                    | 06/11/2020 16:55:04.122 | 0.00 A  | 0.00 A | 0.00 A  | 0.000 A | 0.00 A | 53.84 V | 46.42 V | 50.65 V | 84.73 V  | 92.23 V  | 82.78 V  | 0.00 V | 49.68 V | 13.87 V | 0.00 W | 0%            | 59.99     |
| 2     | Over Frequency Fault                    | 06/11/2020 16:54:41.422 | 0.00 A  | 0.00 A | 0.00 A  | 0.000 A | 0.00 A | 51.95 V | 48.99 V | 50.59 V | 86.61 V  | 89.26 V  | 86.03 V  | 0.00 V | 51.00 V | 0.00 V  | 0.00 W | 0%            | 51.99     |
| 3     | Over Voltage Stage 1 In L1 Phase        | 06/11/2020 16:54:11.961 | 0.00 A  | 0.00 A | 0.00 A  | 0.000 A | 0.00 A | 60.42 V | 80.09 V | 60.25 V | 104.30 V | 104.60 V | 104.22 V | 0.00 V | 61.31 V | 0.00 V  | 0.00 W | 0%            | 49.99     |
| 4     | Over Voltage Stage 1 In L1 Phase        | 06/11/2020 16:53:44.038 | 0.00 A  | 0.00 A | 0.00 A  | 0.000 A | 0.00 A | 61.46 V | 80.07 V | 60.22 V | 104.26 V | 105.49 V | 105.07 V | 0.00 V | 61.67 V | 0.00 V  | 0.00 W | 0%            | 49.99     |
| 5     | Over Voltage Stage 1 In L1 Phase        | 06/11/2020 16:53:24.265 | 0.00 A  | 0.00 A | 0.00 A  | 0.000 A | 0.00 A | 25.65 V | 25.07 V | 25.13 V | 43.48 V  | 44.04 V  | 43.84 V  | 0.00 V | 25.71 V | 0.00 V  | 0.00 W | 0%            | 49.99     |
| 6     | Under Voltage Stage 1 In L2 phase       | 06/11/2020 16:53:05.575 | 0.00 A  | 0.00 A | 0.00 A  | 0.000 A | 0.00 A | 40.91 V | 40.02 V | 40.27 V | 69.63 V  | 70.40 V  | 69.90 V  | 0.00 V | 41.08 V | 0.00 V  | 0.00 W | 0%            | 49.99     |
| 7     | Under Voltage Stage 1 In L2 phase       | 06/11/2020 16:52:46.150 | 0.00 A  | 0.00 A | 0.00 A  | 0.000 A | 0.00 A | 15.38 V | 15.07 V | 15.04 V | 26.10 V  | 26.39 V  | 26.32 V  | 0.00 V | 15.43 V | 0.00 V  | 0.00 W | 0%            | 49.99     |
| 8     | Thermal OverLoad Fault                  | 06/11/2020 16:52:15.438 | 10.02 A | 9.88 A | 10.03 A | 0.000 A | 0.23 A | 0.00 V  | 0.00 V  | 0.00 V  | 0.00 V   | 0.00 V   | 0.00 V   | 0.00 V | 0.00 V  | 0.00 V  | 0.00 W | 101%          | 00.00     |
| 9     | Under Current Fault In L1 Phase         | 06/11/2020 16:51:47.730 | 0.20 A  | 0.20 A | 0.20 A  | 0.000 A | 0.00 A | 0.00 V  | 0.00 V  | 0.00 V  | 0.00 V   | 0.00 V   | 0.00 V   | 0.00 V | 0.00 V  | 0.00 V  | 0.00 W | 0%            | 00.00     |
| 10    | Stall In L1 Phase                       | 06/11/2020 16:51:26.888 | 6.00 A  | 5.93 A | 6.03 A  | 0.000 A | 0.13 A | 0.00 V  | 0.00 V  | 0.00 V  | 0.00 V   | 0.00 V   | 0.00 V   | 0.00 V | 0.00 V  | 0.00 V  | 0.00 W | 0%            | 00.00     |
| 11    | Locked Rotor In L1 Phase                | 06/11/2020 16:51:10.187 | 7.01 A  | 6.92 A | 7.02 A  | 0.000 A | 0.15 A | 0.00 V  | 0.00 V  | 0.00 V  | 0.00 V   | 0.00 V   | 0.00 V   | 0.00 V | 0.00 V  | 0.00 V  | 0.00 W | 0%            | 00.00     |
| 12    | Negative Phase Sequence Fault           | 06/11/2020 16:50:48.512 | 4.51 A  | 5.43 A | 6.02 A  | 0.000 A | 3.29 A | 0.00 V  | 0.00 V  | 0.00 V  | 0.00 V   | 0.00 V   | 0.00 V   | 0.00 V | 0.00 V  | 0.00 V  | 0.00 W | 0%            | 00.00     |
| 13    | Negative Phase Sequence Fault           | 06/11/2020 16:50:18.035 | 0.00 A  | 5.40 A | 6.05 A  | 1.386 A | 3.06 A | 0.00 V  | 0.00 V  | 0.00 V  | 0.00 V   | 0.00 V   | 0.00 V   | 0.00 V | 0.00 V  | 0.00 V  | 0.00 W | 0%            | 00.00     |
| 14    | Negative Phase Sequence Fault           | 06/11/2020 16:49:51.672 | 0.00 A  | 2.01 A | 2.01 A  | 0.397 A | 1.34 A | 0.00 V  | 0.00 V  | 0.00 V  | 0.00 V   | 0.00 V   | 0.00 V   | 0.00 V | 0.00 V  | 0.00 V  | 0.00 W | 0%            | 00.00     |
| 15    | Earth Fault Stage 1                     | 06/11/2020 16:49:27.580 | 0.00 A  | 0.00 A | 0.00 A  | 0.697 A | 0.00 A | 0.00 V  | 0.00 V  | 0.00 V  | 0.00 V   | 0.00 V   | 0.00 V   | 0.00 V | 0.00 V  | 0.00 V  | 0.00 W | 0%            | 00.00     |
| 16    | Earth Fault Stage 1                     | 06/11/2020 16:49:10.522 | 0.00 A  | 0.00 A | 0.00 A  | 0.009 A | 0.00 A | 0.00 V  | 0.00 V  | 0.00 V  | 0.00 V   | 0.00 V   | 0.00 V   | 0.00 V | 0.00 V  | 0.00 V  | 0.00 W | 0%            | 00.00     |
| 17    | OverCurrent Fault In L1 Phase           | 06/11/2020 16:48:30.120 | 7.01 A  | 6.92 A | 7.02 A  | 0.000 A | 0.15 A | 0.00 V  | 0.00 V  | 0.00 V  | 0.00 V   | 0.00 V   | 0.00 V   | 0.00 V | 0.00 V  | 0.00 V  | 0.00 W | 0%            | 00.00     |
| 18    | OverCurrent Fault In L2 Phase           | 06/11/2020 16:48:10.820 | 0.40 A  | 0.40 A | 0.40 A  | 0.000 A | 0.00 A | 0.00 V  | 0.00 V  | 0.00 V  | 0.00 V   | 0.00 V   | 0.00 V   | 0.00 V | 0.00 V  | 0.00 V  | 0.00 W | 0%            | 00.00     |
| 19    | Trip Circuit Unhealthy                  | 06/11/2020 16:43:26.674 | 0.00 A  | 0.00 A | 0.00 A  | 0.000 A | 0.00 A | 0.00 V  | 0.00 V  | 0.00 V  | 0.00 V   | 0.00 V   | 0.00 V   | 0.00 V | 0.00 V  | 0.00 V  | 0.00 W | 0%            | 00.00     |
| 20    | Short Circuit Stage 1 Fault In L2 Phase | 06/11/2020 16:12:49.831 | 3.67 A  | 4.54 A | 3.65 A  | 0.000 A | 1.34 A | 0.00 V  | 0.00 V  | 0.00 V  | 0.00 V   | 0.00 V   | 0.00 V   | 0.00 V | 0.00 V  | 0.00 V  | 0.00 W | 0%            | 00.00     |

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.

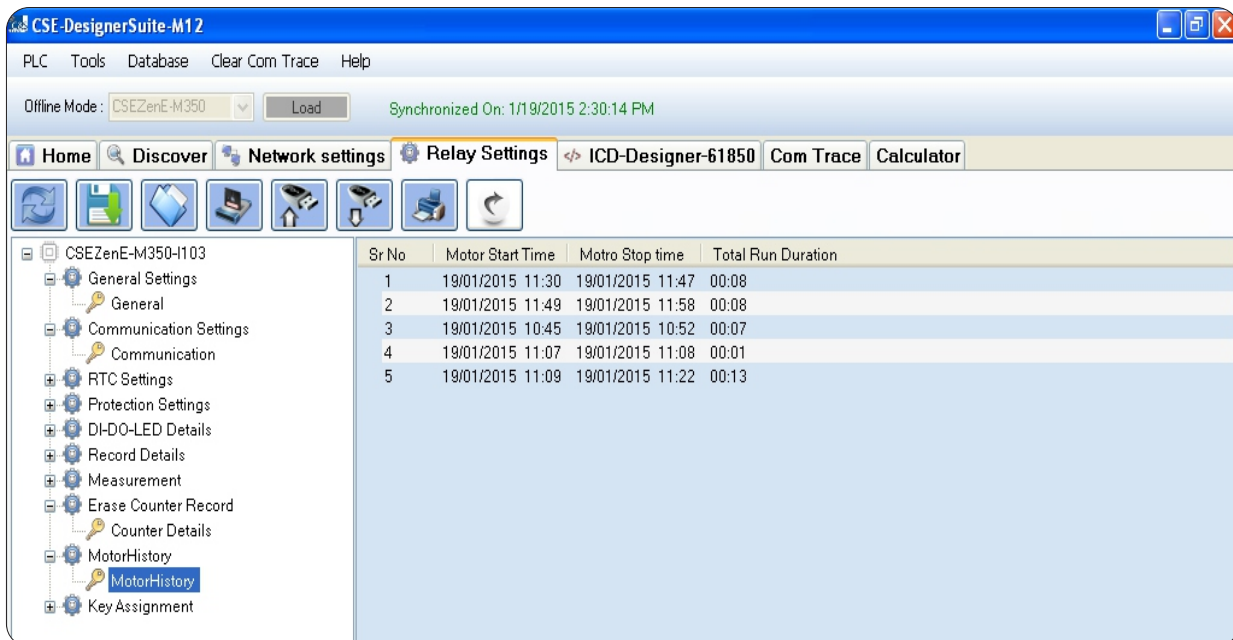


Figure-6

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.



The screenshot shows the CSE-DesignerSuite-M12 software interface. The 'Relay Settings' tab is active, and the 'MotorHistory' table is displayed. The table contains 5 records of motor start-stop times. The left sidebar shows a tree view of settings, with 'MotorHistory' selected.

| Sr No | Motor Start Time | Motro Stop time  | Total Run Duration |
|-------|------------------|------------------|--------------------|
| 1     | 19/01/2015 11:30 | 19/01/2015 11:47 | 00:08              |
| 2     | 19/01/2015 11:49 | 19/01/2015 11:58 | 00:08              |
| 3     | 19/01/2015 10:45 | 19/01/2015 10:52 | 00:07              |
| 4     | 19/01/2015 11:07 | 19/01/2015 11:08 | 00:01              |
| 5     | 19/01/2015 11:09 | 19/01/2015 11:22 | 00:13              |

Figure-7

### 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.

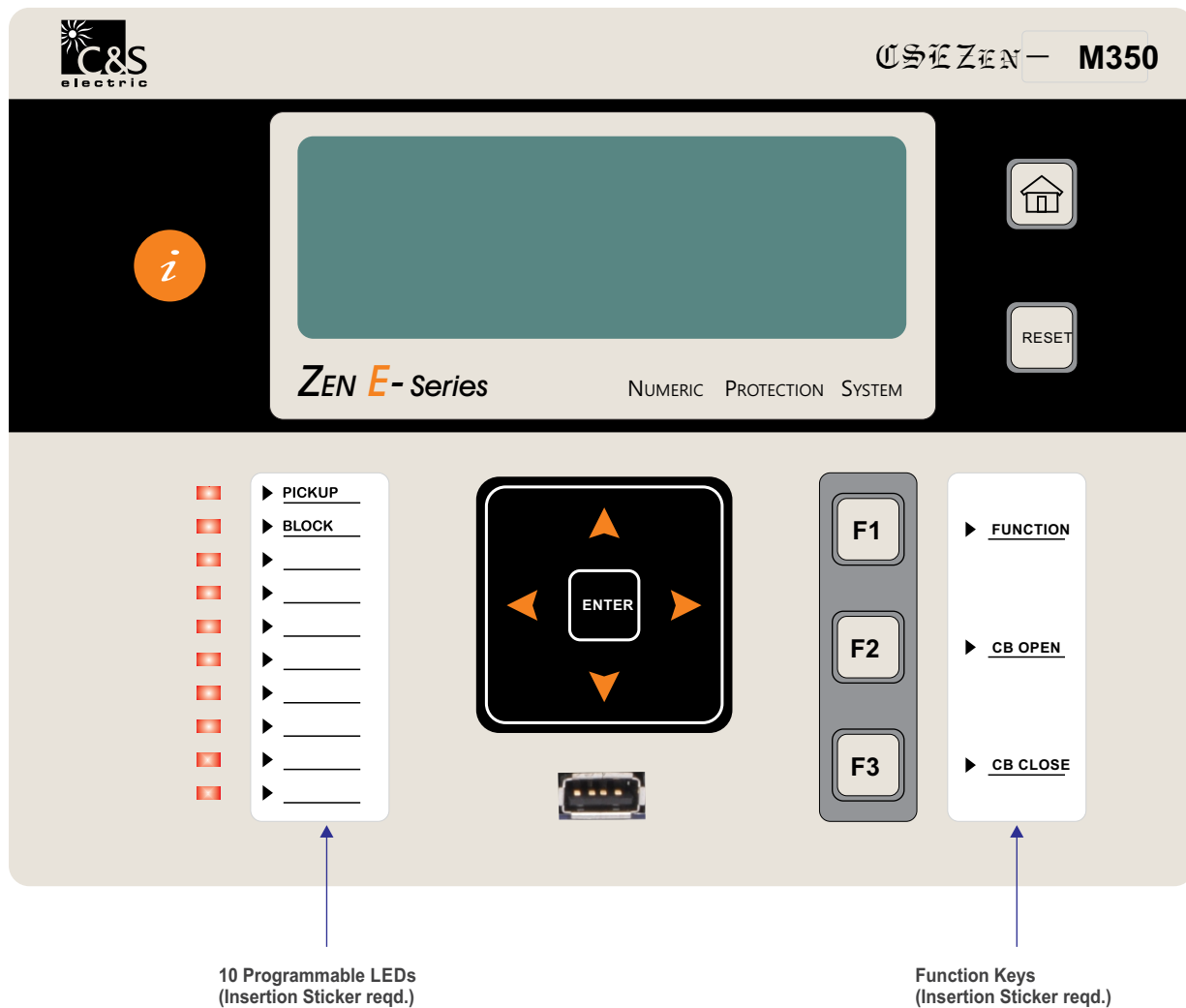


Figure-8

## 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 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

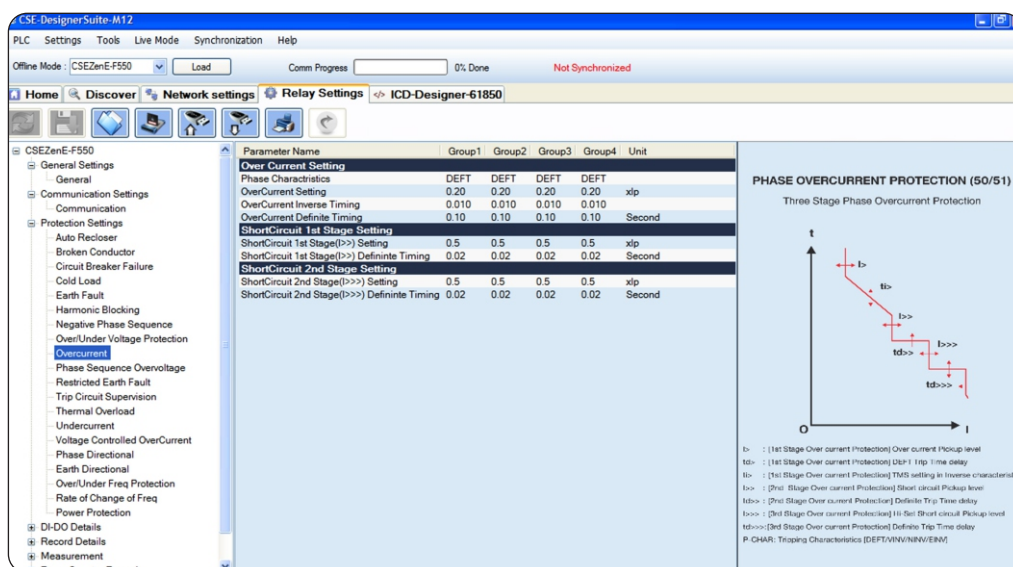
Our IEDs now support several enhanced features of the **Edition-2** of **IEC-61850** standard, such as peer-to-peer communication between the relays, known as GOOSE messaging, buffered and unbuffered reporting, settings change as well as support for all control models as described in IEC 61850-7-2 Ed2.

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.



New Open Save Save As Close Tools ?

CSEZEN\_Subjcd

| DA                    |         | Detail                        |                                 | Optional  |
|-----------------------|---------|-------------------------------|---------------------------------|-----------|
| Name                  | stVal   | SCD SCL                       |                                 |           |
| Functional Constraint | ST      | Header                        |                                 |           |
| Basic Type            | BOOLEAN | Communication                 |                                 |           |
|                       |         | ServerIED - CSEzenEF_Sub      | NewIED                          |           |
|                       |         | AccessPoint - SubstationRing1 | SubstationRing1                 |           |
|                       |         | Server                        |                                 |           |
|                       |         | LDevice - SystemIO            | System Digital Input and output |           |
|                       |         | LN0 - LLN0                    | Logical node zero               | Mandatory |
|                       |         | LN - LPHDLPHD1                | Physical device information     |           |
|                       |         | LN - LEDInd_GGIO1             | LED Status of CSEZEN            |           |
|                       |         | LN - DO_GGIO1                 | DO control(Relay 2-8)           |           |
|                       |         | DatasetGroup                  |                                 |           |
|                       |         | ReportControlGroup            |                                 |           |
|                       |         | LogControlGroup               |                                 |           |
|                       |         | InputsGroup                   |                                 |           |
|                       |         | DO - Mod                      | Controllable enumerated status  | Mandatory |
|                       |         | DO - Beh                      | Enumerated status               | Mandatory |
|                       |         | DO - Health                   | Enumerated status               | Mandatory |
|                       |         | DO - NamPlt                   | Logical Node name plate         | Mandatory |
|                       |         | DO - SPCS02                   | Controllable single point       |           |
|                       |         | DA - Oper                     | Oper                            |           |
|                       |         | DA - stVal                    | stVal                           |           |
|                       |         | DA - ctrlModel                | ctrlModel                       |           |
|                       |         | DO - SPCS03                   | Controllable single point       |           |
|                       |         | DO - SPCS04                   | Controllable single point       |           |
|                       |         | DO - SPCS05                   | Controllable single point       |           |
|                       |         | DO - SPCS06                   | Controllable single point       |           |
|                       |         | DO - SPCS07                   | Controllable single point       |           |
|                       |         | DO - SPCS08                   | Controllable single point       |           |
|                       |         | LN - DI_Ind_GGIO1             | LED Status of CSEZEN            |           |

Log:

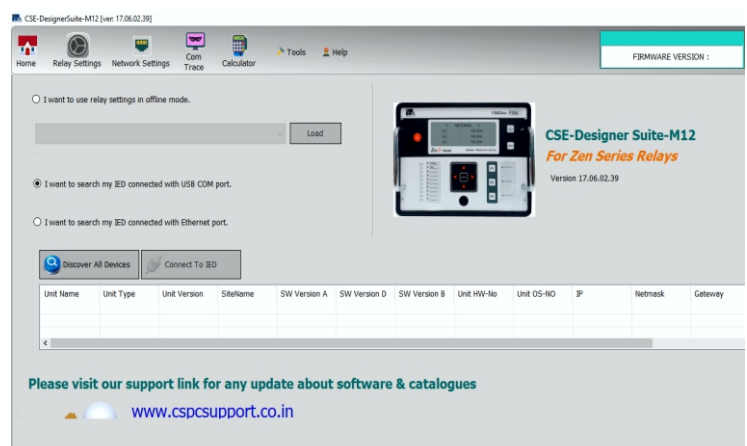
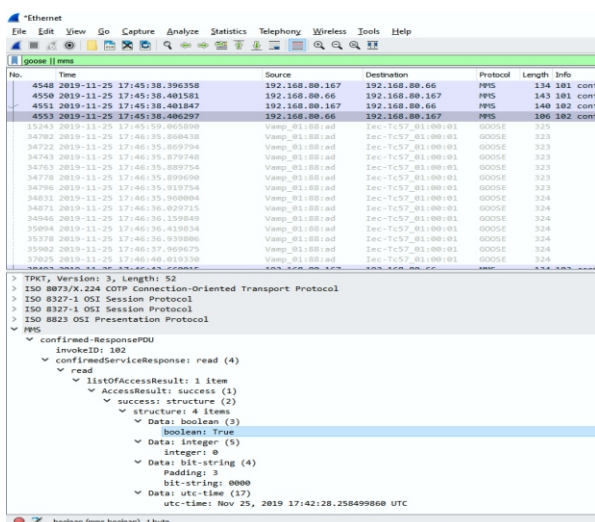
2021-08-13 12:00:30 Loading 61850DTEd1.dat and NodeOptionsEd1.dat  
 2021-08-13 12:00:30 Building IEC61850 data templates...  
 2021-08-13 12:00:30 done.

## 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 (IfI)          | IfI          | 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<br>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 | 0.10xlp       | 1.00xlp  | 0.01xlp   | 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  | 0.20xlp       | 1.00xlp   | 0.01xlp   | 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<br>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  | 2xlp          | 30xlp                | 02xlp     | Disable         |
| Locked Rotor Trip Time       | Lk Rtr Tm | 0.04sec       | 20.00sec             | 0.01sec   | 0.10sec         |
| Stall Current Setting        | Stall I   | 0.5xlp        | 30.0xlp              | 0.1xlp    | 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<br>NINV1.3, NINV3.0 | --        | DEFT            |
| Earth Protection In start     | le> Strt  | NO            | YES                                  | --        | YES             |
| Earth Current Setting         | le>       | 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     | le>> Strt | NO            | YES                                  | —         | YES             |
| Earth Current Setting         | le>>      | 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,<br>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°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    |

## 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         | OscRcdRst   | 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                                |
|----|-------------------------------------------|
| 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 |

| 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 setting contd. on next page

**Function Reset**

| 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     |

(\* Model Dependent)

| 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                             | 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

(\* Model Dependent)

| Parameters                       | Unit  |
|----------------------------------|-------|
| PowerFactor_R Phase              |       |
| PowerFactor_Y Phase              |       |
| PowerFactor_B Phase              |       |
| Three Phs Power Factor           |       |
| Frequency                        | Hz    |
| Thermal Equivalent Current       |       |
| Th_Leq                           | 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 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 : $100 \times I_n$       |
|                                                 | for 10 Sec : $30 \times I_n$       |
|                                                 | continuously : $4 \times I_n$      |

### Measurement Accuracy

| Parameters        | Range                 | Frequency Range | Accuracy             |
|-------------------|-----------------------|-----------------|----------------------|
| Current in Ampere | $1.0-30.0 \times I_n$ | 50-60Hz         | Less than $\pm 2\%$  |
| Voltage           | $5-150\% U_n$         | 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 | $\pm 30\text{mSec}$ OR $\pm 5\%$ (whichever is higher)   |
| Trip time accuracy for NPS                    | $\pm 60\text{mSec}$ 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 $\pm 30\text{mSec}$ |

**Trip Contact Rating**

|                                 |                                     |
|---------------------------------|-------------------------------------|
| <b>Contact Rating</b>           |                                     |
| 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 |
| <b>Breaking Characteristics</b> |                                     |
| Breaking capacity AC            | 1500VA resistive                    |
|                                 | 1500VA inductive (PF=0.5)           |
|                                 | 220V AC, 5A(cos $\phi$ ≤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                               |
| <b>Durability</b>               |                                     |
| 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 %    |

**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<br>RELAY RESET, THERMAL RESET, CB CONTROL | 1         |                 |

## 17.0 Standards

## Type Test

|    |                  |                                           |                                                                                                                                                                         |
|----|------------------|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| F1 | Functional Tests | Internal Design                           | Performance in line with Specification & Standards                                                                                                                      |
|    |                  | Specifications & IEC60255-6<br>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<br>Vibration response (Relay operational)<br>10Hz~150 Hz - peak displacement 0.035 mm below 58/60 Hz, 0.5 g above, 1 sweep cycle in each axis<br>Vibration endurance (Relay de-energised)<br>10 Hz~150 Hz 1g, 20 sweep cycles in each axis |
| M2 | Shock response / Withstand Test     | IEC60255-21-1 | Class I<br>Shock response (Relay operational) 5g 11mS<br>3 pulse in each axis<br>Shock withstand (Relay de-energised) 15g 11mS<br>3 pulses in each axis                                                                                            |
| M3 | Bump                                | IEC60255-21-1 | Bump (Relay de-energised) 10g 16mS<br>1000 pulses in each axis                                                                                                                                                                                     |
| M4 | Seismic                             | IEC60255-21-3 | Class I<br>Method A single axis sine sweep<br>1 Hz~35 Hz–below 8/9 Hz 3.5 mm peak displacement horizontal axis, 1.5 mm vertical axis<br>above 8/9 Hz 1g horizontal, 0.5 g vertical<br>1 sweep cycle in each axis                                   |

| Electrical Test |                                                                                                                                                              |                               |                                                                                                                                                                                                               |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E1              | Insulation Resistance<br>>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<br>(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<br>(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<br>Variation: 100% to 40% over 2s, hold for 1s, return to 100% over 2s |
| E4              | Ripple in DC supply<br>(Relay operational)                                                                                                                   | IEC60255-11                   | 12% AC ripple                                                                                                                                                                                                 |
| E5              | Dielectric Test<br>(Relay de-energised)<br>No breakdown or flash over<br>Test voltage 45~65 Hz sinusoidal<br>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<br>(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                                                                                                                                   |                               | 1.5xV <sub>n</sub> , continuous                                                                                                                                                                               |
| E8              | CT Input Thermal Withstand                                                                                                                                   |                               | 250xI <sub>n</sub> half wave<br>100xI <sub>n</sub> for 1 second<br>30xI <sub>n</sub> for 10 second<br>4xI <sub>n</sub> continuously                                                                           |
| E9              | Contact performance & endurance tests                                                                                                                        | IEC60255-14,15<br>IEC60255-23 |                                                                                                                                                                                                               |

| Electro-magnetic Compatibility |                                                                                  |                                                                                            |                                                                                                                                                                                                                  |
|--------------------------------|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| R1                             | Electrical fast Transient/Burst<br>(Relay operational)                           | IEC60255-22-4<br><br>IEC60100-4-4                                                          | Class IV- $\pm 4.0$ kV All Circuits.<br>Pulse 5/50msec / Duration 15msec/<br>Period: 300msec/Pulse Freq: 5KHz / 2KV at I/O                                                                                       |
| R2                             | HF Disturbance Test<br>(Oscillatory Waves)<br>1 MHZ Burst<br>(Relay operational) | IEC60255-22-1                                                                              | Class III<br>Longitudinal 2.5 kV peak, 2sec between<br>independent circuits & case earth                                                                                                                         |
| R3                             | Electrostatic Discharge<br>(Relay operational )                                  | IEC60255-22-2<br>IEC61000-4-2                                                              | Class III<br>8kV air discharge, 6KV contact<br>No of Discharge : 10<br>both polarities at 1 sec intervals                                                                                                        |
| R4                             | Conducted Disturbance<br>RF fields<br>(Relay operational)                        | IEC61000-4-6<br>IEC60255-22-6                                                              | 0.15 to 80 MHZ (Level-3)<br>Severity Level 10V RMS<br>+ sweeps 0.05-0.15 MHZ & 80-100 MHZ                                                                                                                        |
| R5                             | Radiated RF E-M field<br>immunity test<br>(Relay operational)                    | IEC60255-22-3<br>IEC61000-4-3                                                              | Class III Test method A<br>+ sweep 80-1000 MHZ<br>or IEC 1000-4-3 80-1000 MHZ<br>severity 10 V/m 80% modulated 1 kHz                                                                                             |
| R6                             | Surge Immunity capacitively<br>coupled<br>(Relay operational)                    | IEC61000-4-5<br>Class 5<br>Test level 4<br>IEC60255-22-5: 2008<br>Latest: IEC60255-26:2013 | Short circuit combination wave generator<br>1.2 uS/50 uS open circuit<br>repetition rate 1 per minute<br>Power supply, CT & VT circuits –<br>4kV common mode 2 Ohm source<br>2kV differential mode 12 Ohm source |
| R7                             | Power Frequency<br>Magnetic Field<br>(Relay operational)                         | IEC61000-4-8                                                                               | 100 A/m for 1 minute<br>in each of 3 axes                                                                                                                                                                        |
| R8                             | Conducted & Radiated RF<br>Interference Emission<br>(Relay operational)          | EN55011<br>IEC60255-25                                                                     | CISPR11/ Class A                                                                                                                                                                                                 |
| R9                             | Power Frequency,<br>conducted common mode                                        | IEC 1000-4-16<br>IEC60255-22-7                                                             | D.C. to 150 kHz Test Level 4<br>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 <sup>2</sup> or 4 mm <sup>2</sup> control cable  |
| Auxiliary Supply  | Pin Type lug / 1.5 mm <sup>2</sup> / 2.5 mm <sup>2</sup> control cable |
| Rear Comm. Port   | Pin Type lug / 1.5 mm <sup>2</sup> / 2.5 mm <sup>2</sup> control cable |
| Front Comm. Port  | USB, Type A to A                                                       |
| Binary Input      | Pin Type lug / 1.5mm <sup>2</sup> / 2.5mm <sup>2</sup> control cable   |
| Binary Output     | Pin Type lug / 4.0mm <sup>2</sup> control cable                        |
| Earth Connections | Ring Type / 2.5mm <sup>2</sup> or 4 mm <sup>2</sup> contact cable      |



Figure-9

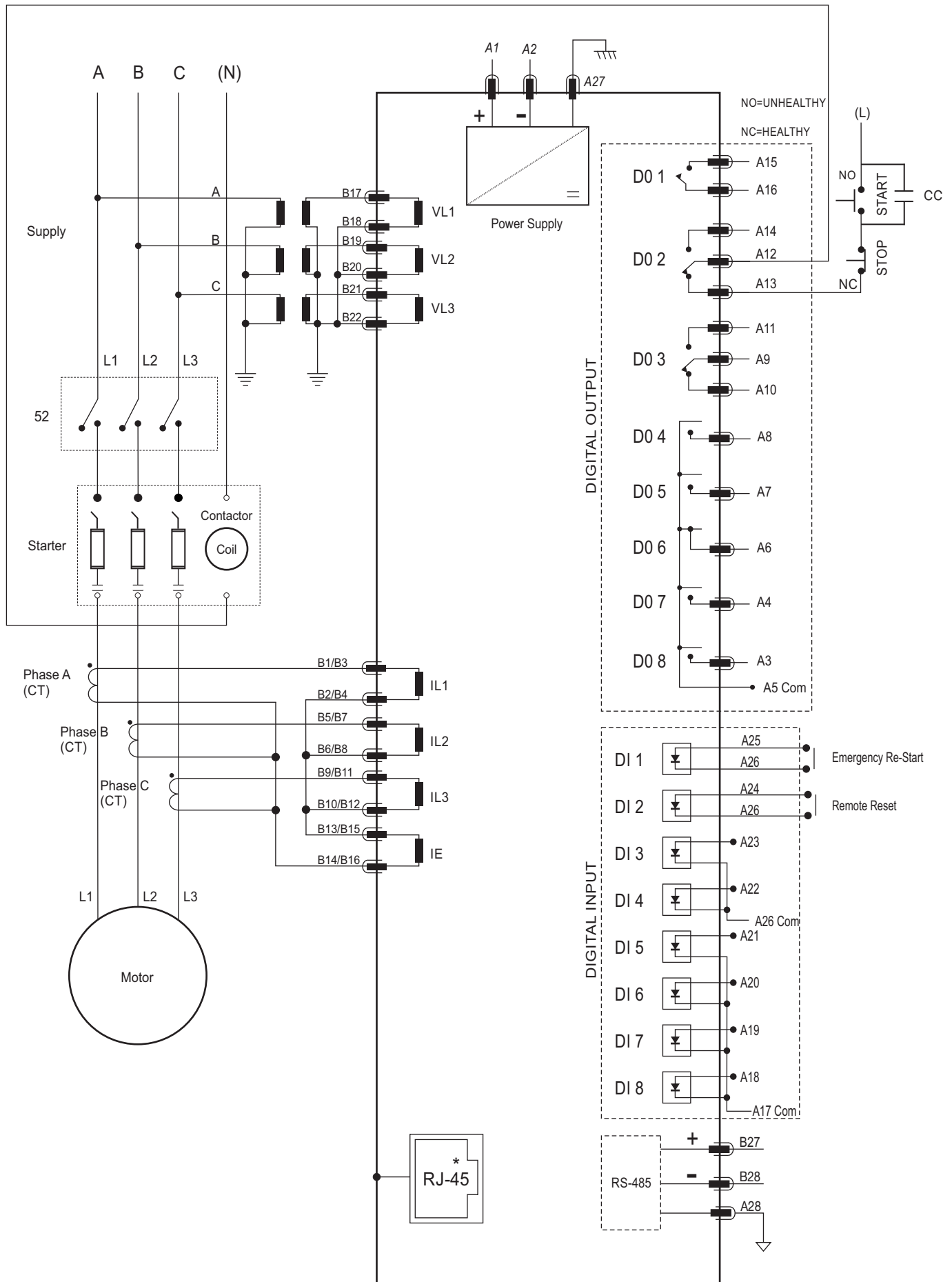
**USB Cable required for Front communication  
(Type A to A)**



Figure-10

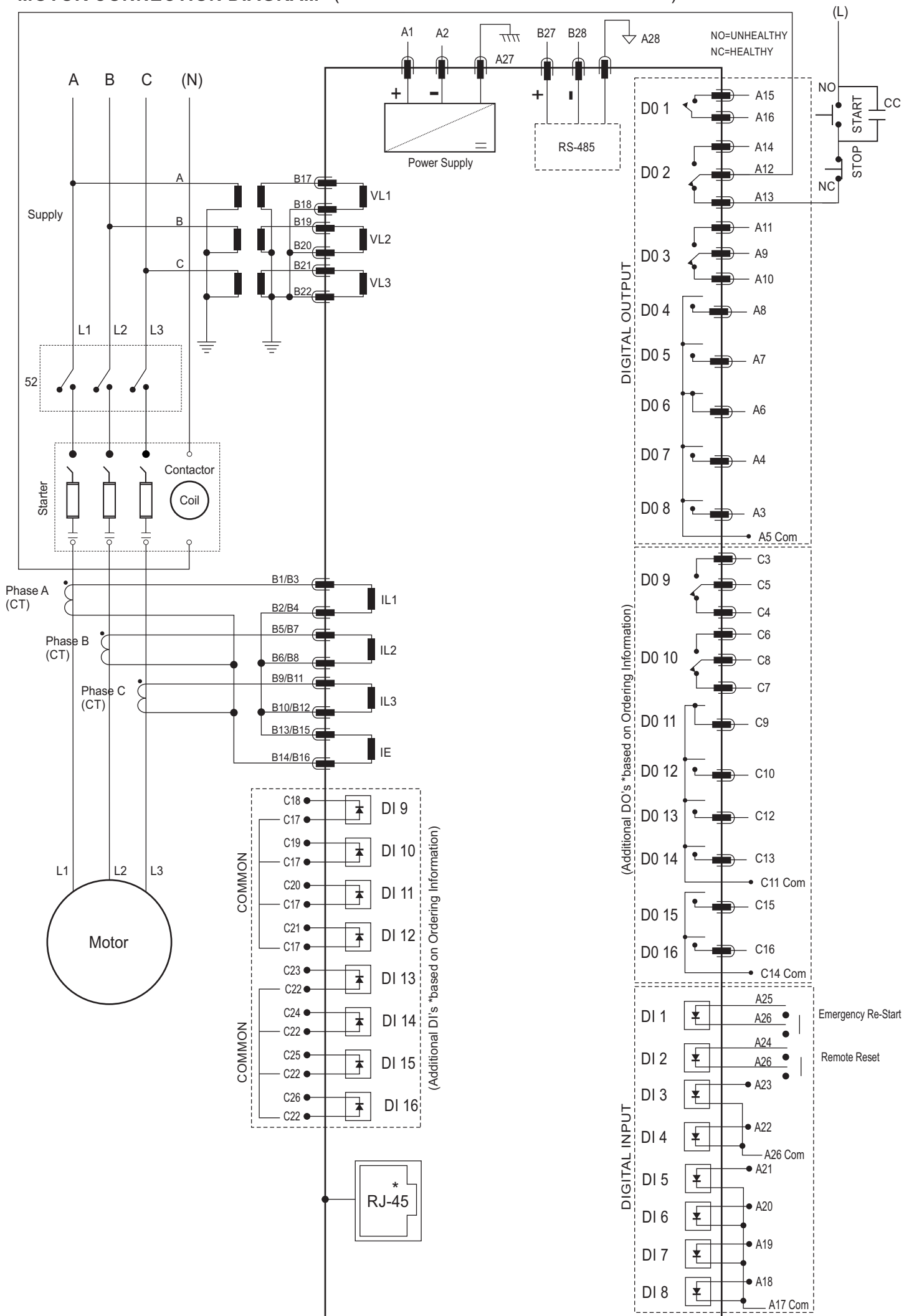
## 19A Motor Connection Diagram

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

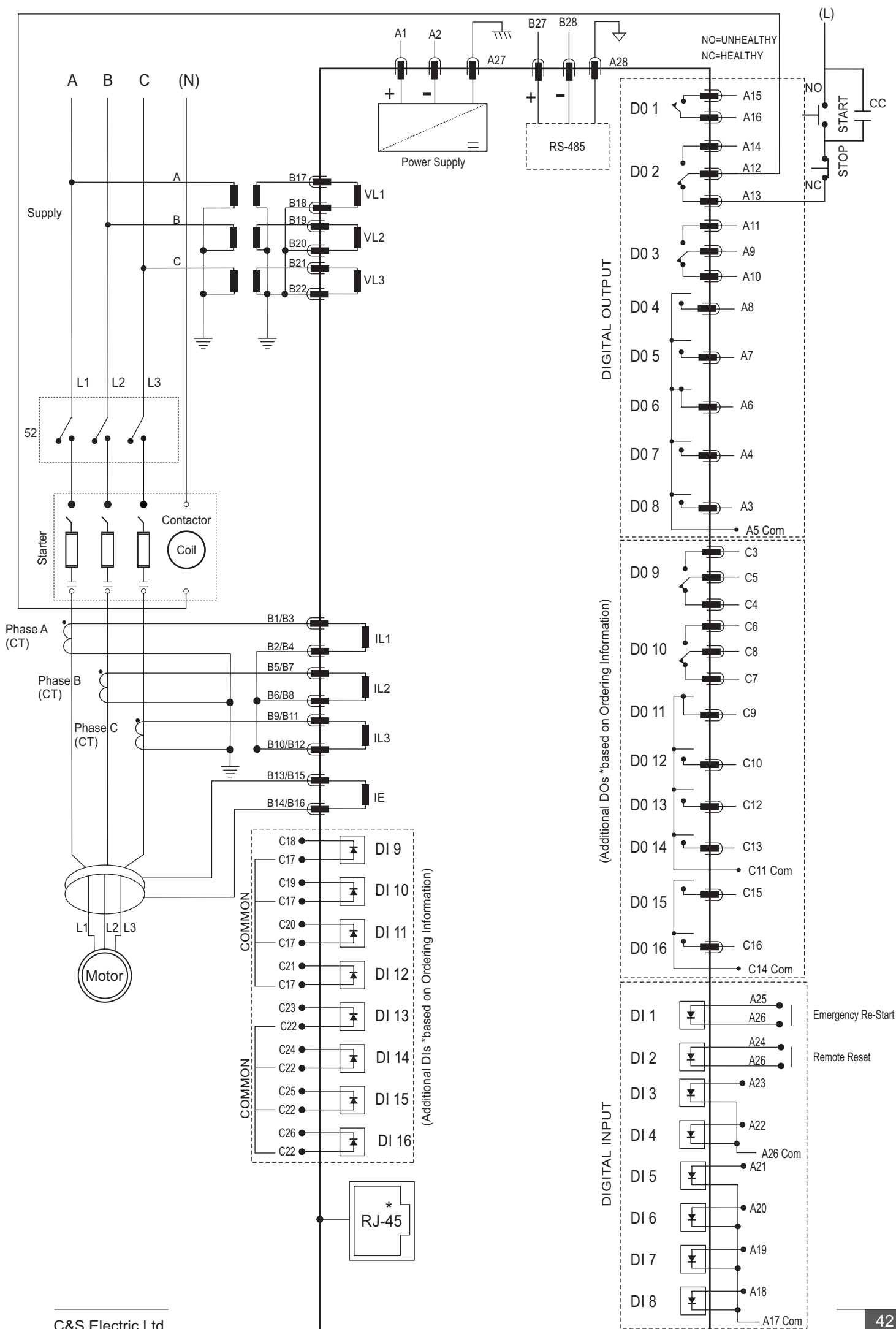




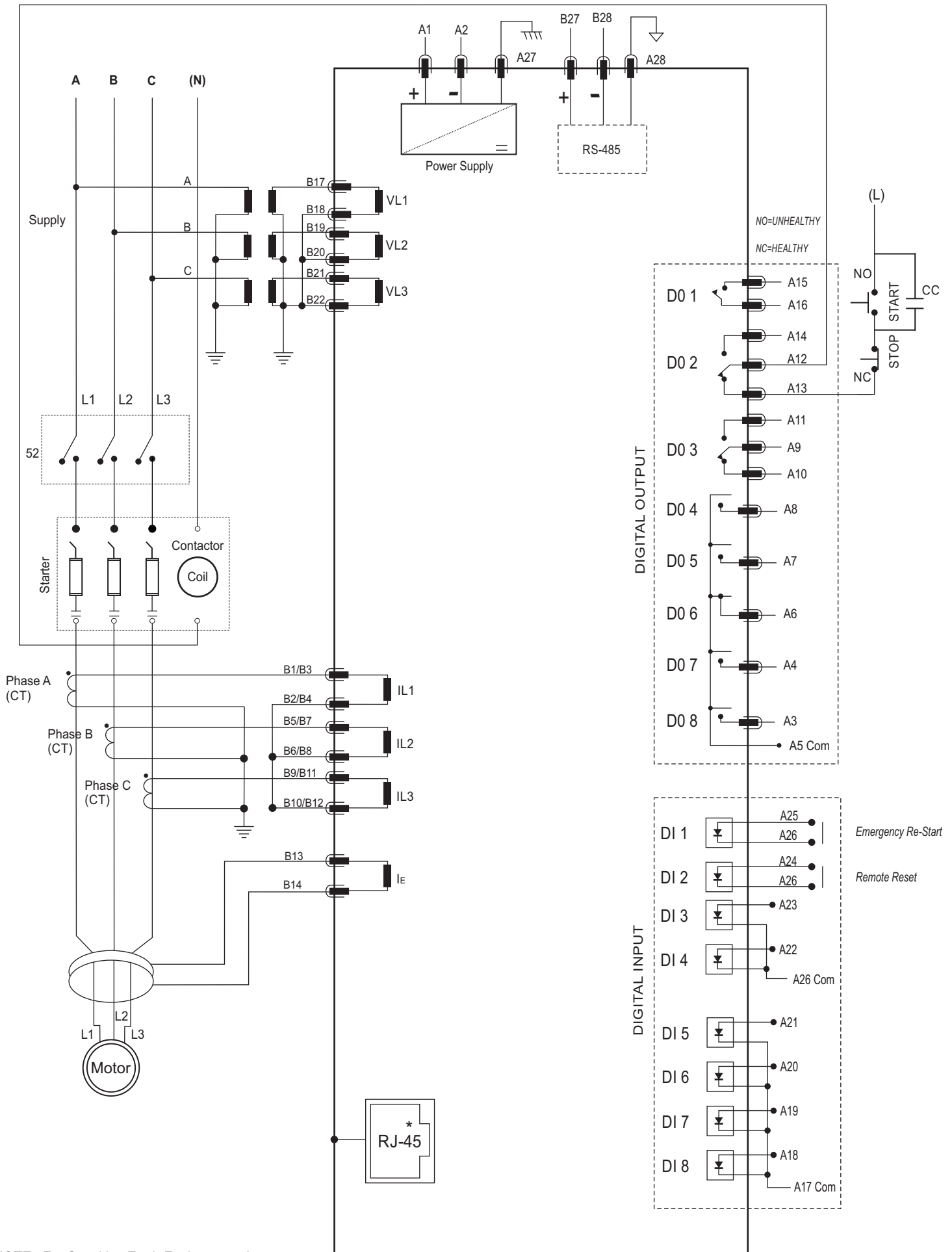
# MOTOR CONNECTION DIAGRAM (16 DI / DO for Non-Sensitive Earth Fault)



# MOTOR CBCT CONNECTION DIAGRAM



## MOTOR CBCT CONNECTION DIAGRAM FOR SEF WITH 8 DI / DO



## MOTOR CBCT CONNECTION DIAGRAM

with 8 DI's / DOs + 5 RTD

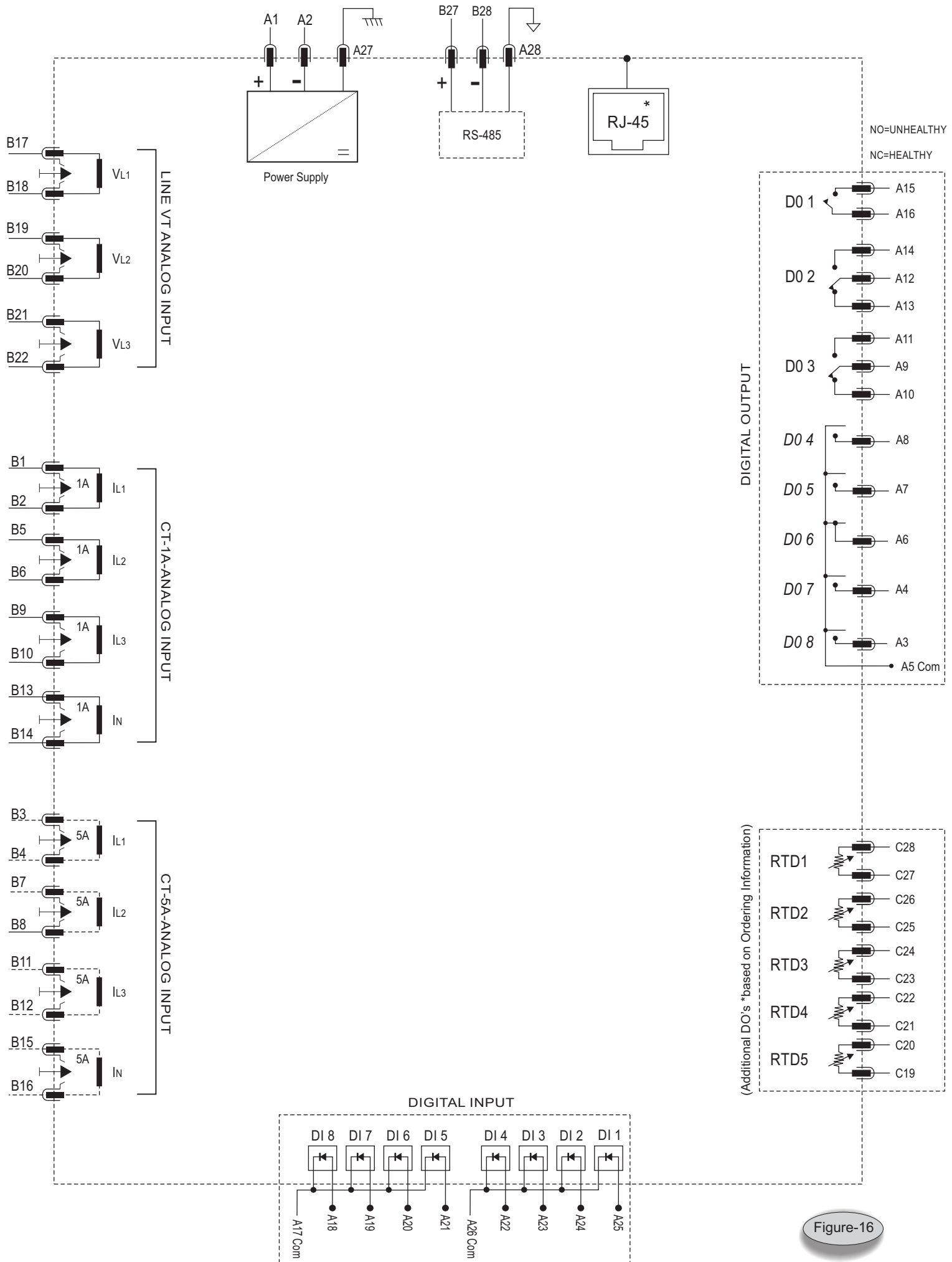


Figure-16

## MOTOR CBCT CONNECTION DIAGRAM

with 14 DIs / DOs + 5 RTD

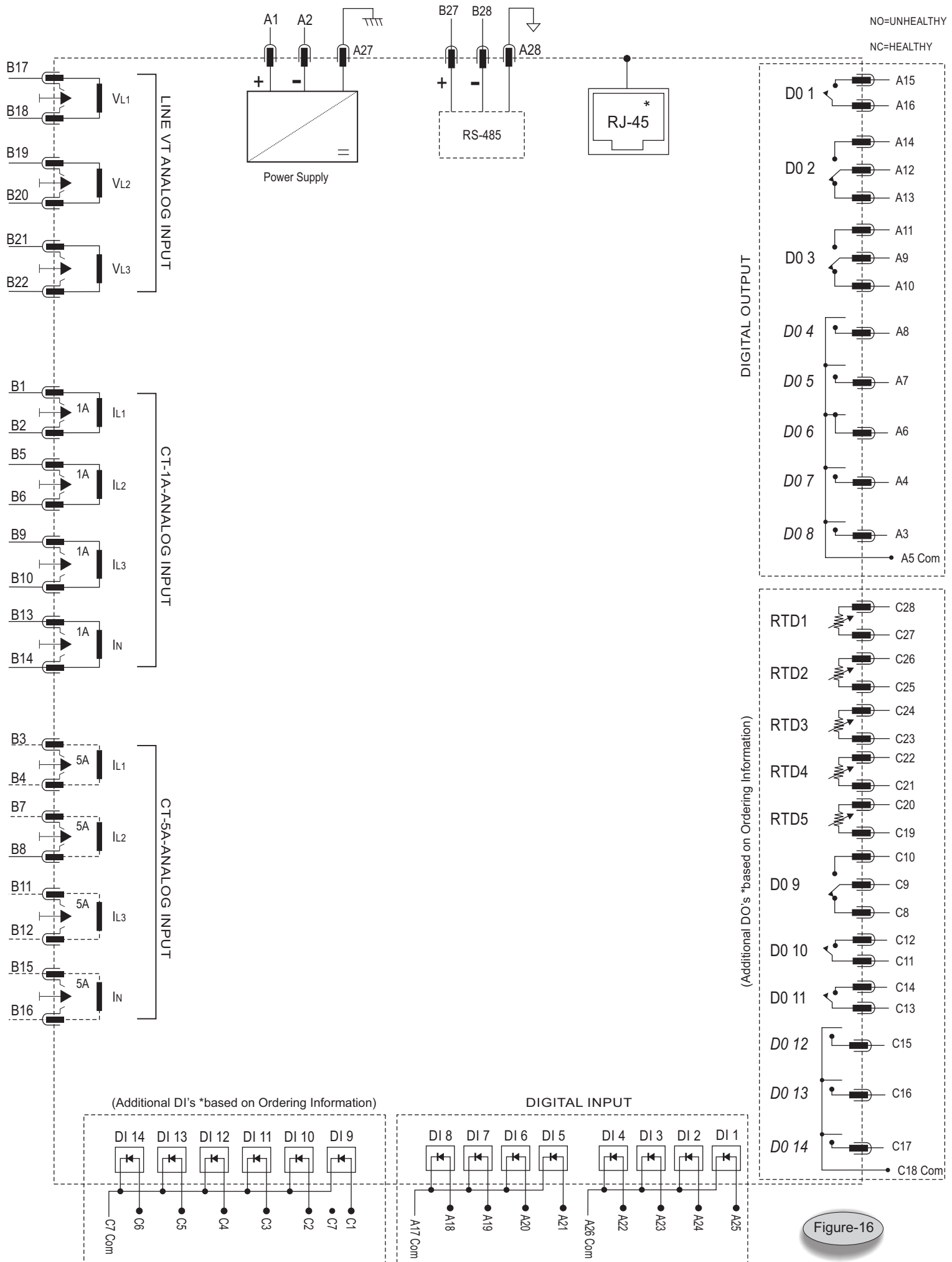


Figure-16

## 20.0 VT Connection Diagram

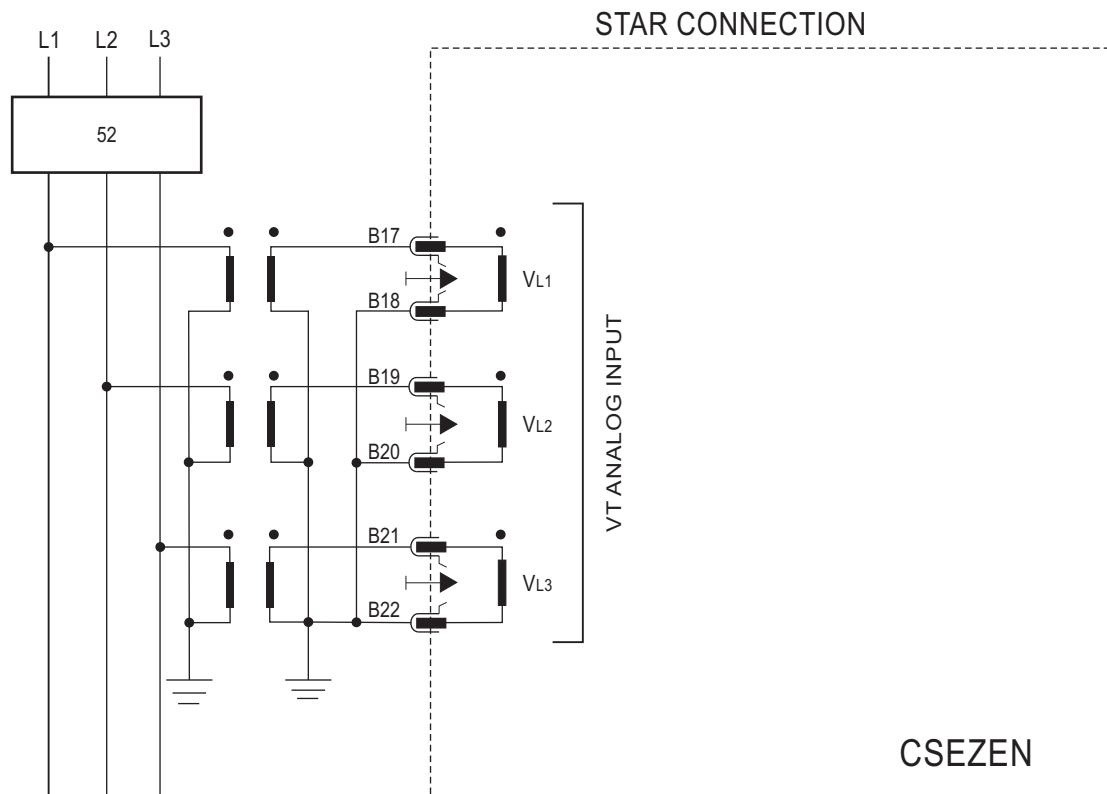


Figure-17

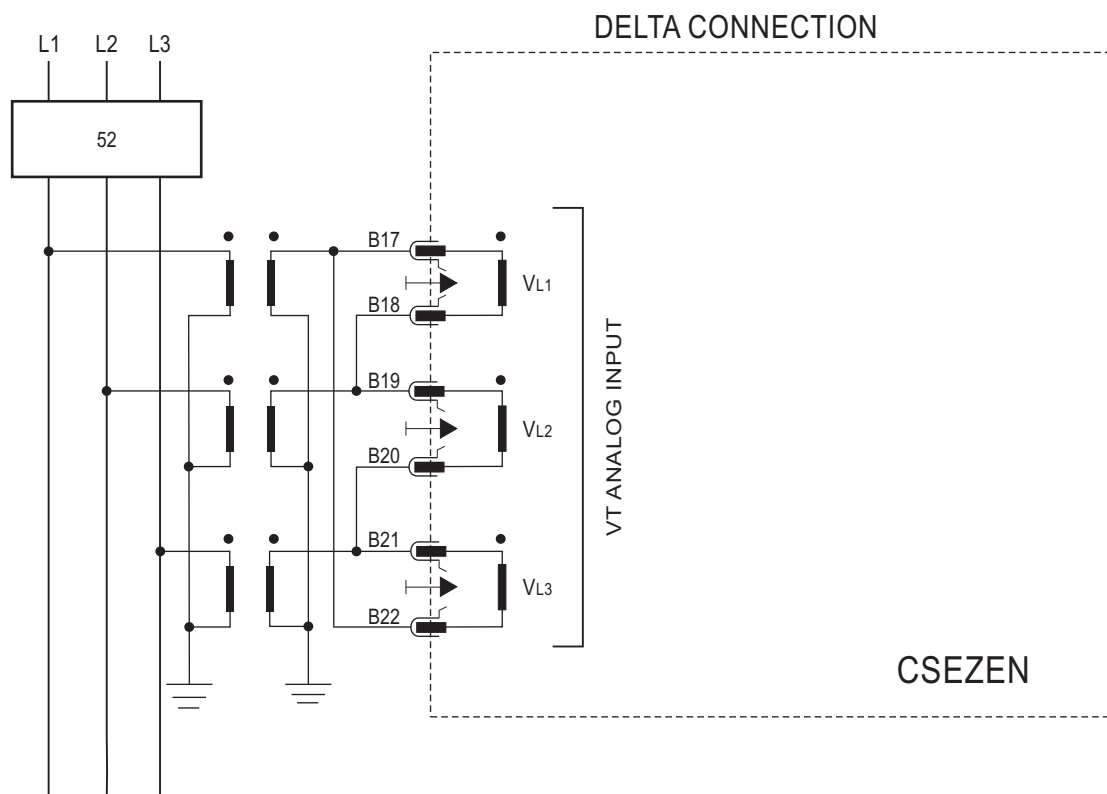


Figure-18

## 21.0 CT Connection Diagram

CT Schemes Holmgreen Residual CTs Connection for 1A

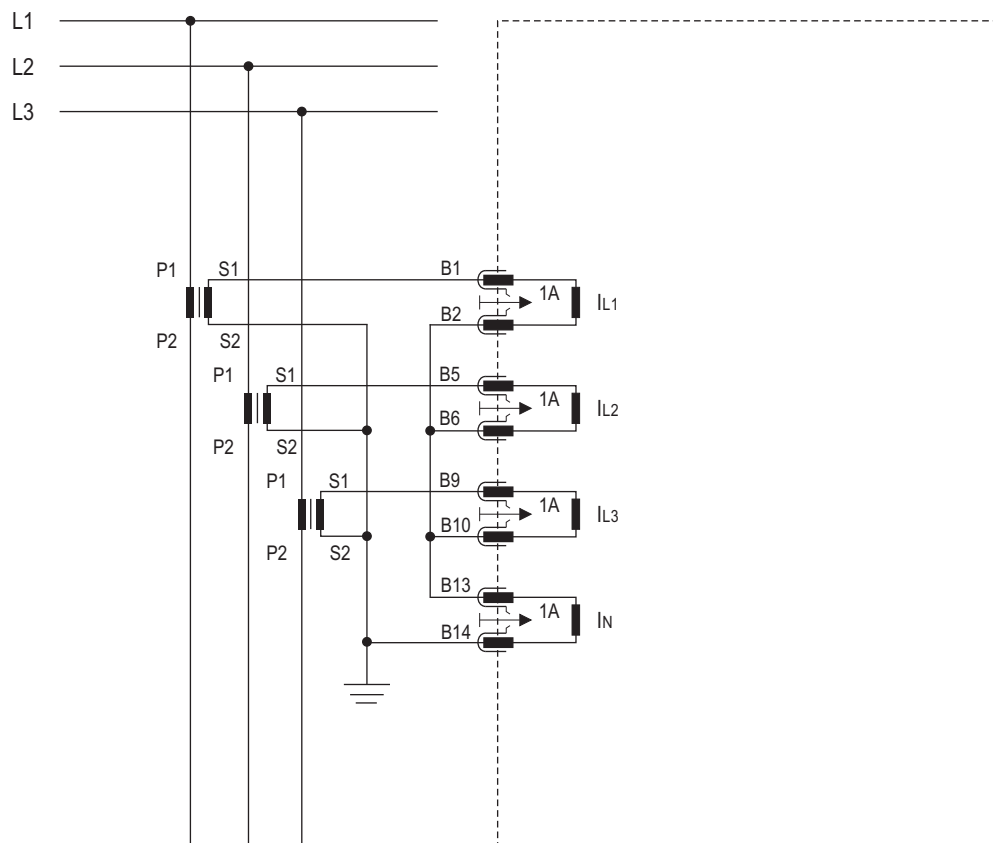


Figure-19

## 22.0 CT Connection Diagram

### CT Schemes Holmgreen Residual CTs Connection for 5A

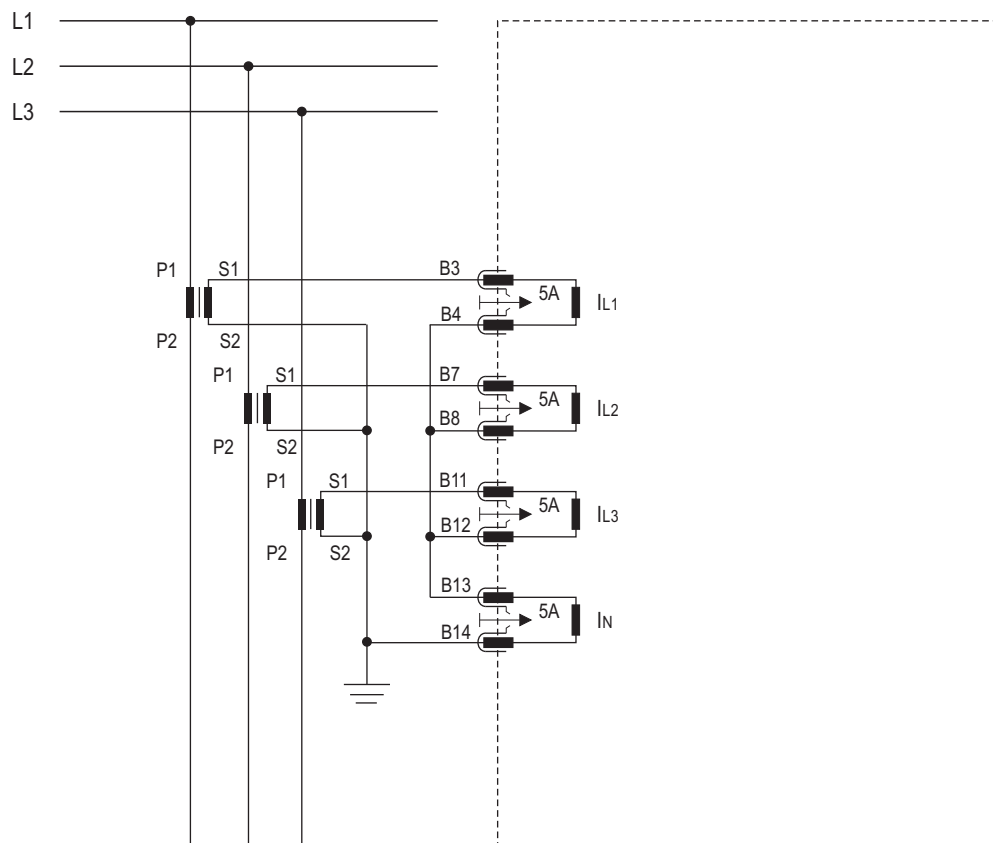
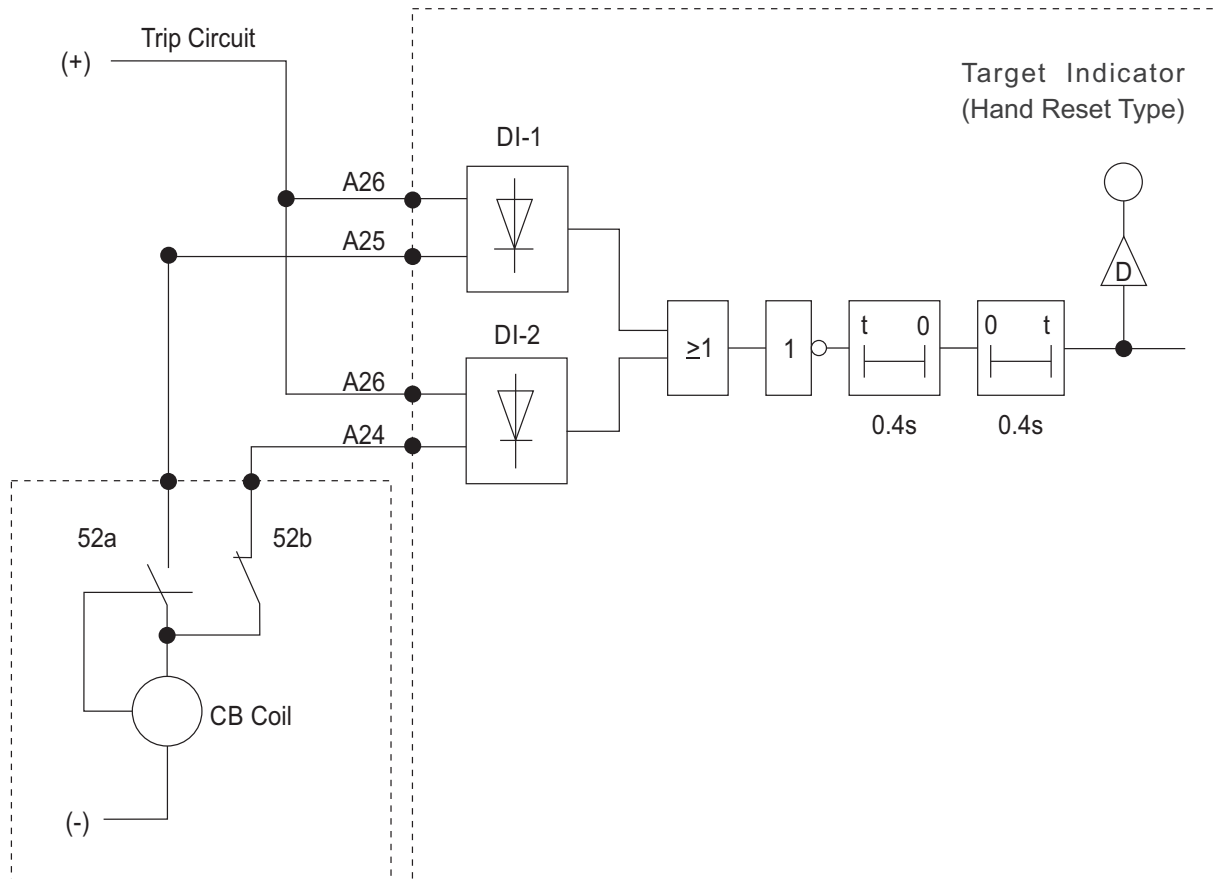


Figure-20



## 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

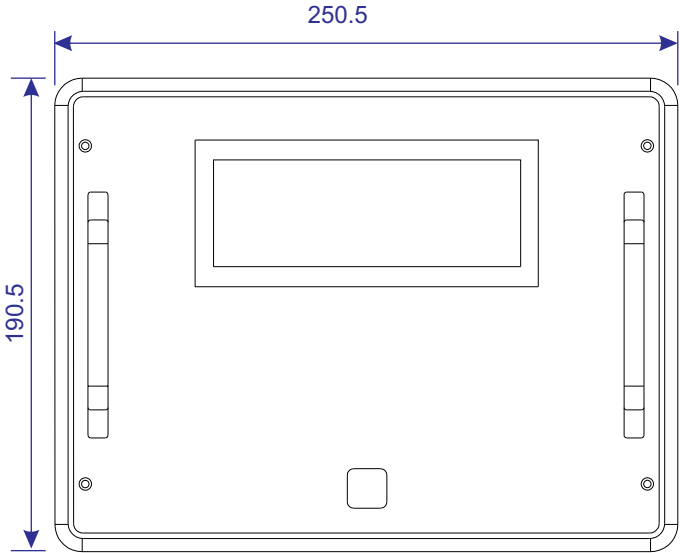


Figure-22

Top View

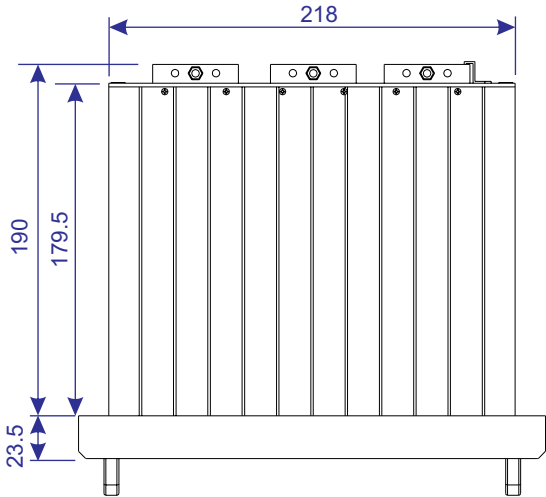


Figure-23

Side View

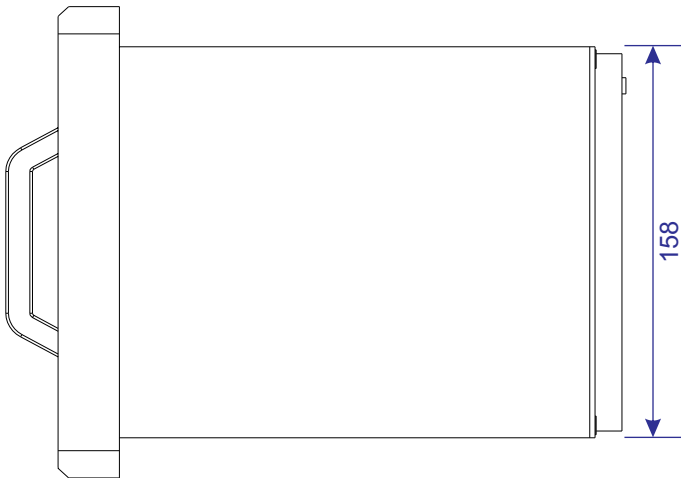


Figure-24

## 25.0 Panel mounting of the Relay

for Panel mounting

Screw : M4x12mm

Qty : 8 Nos.

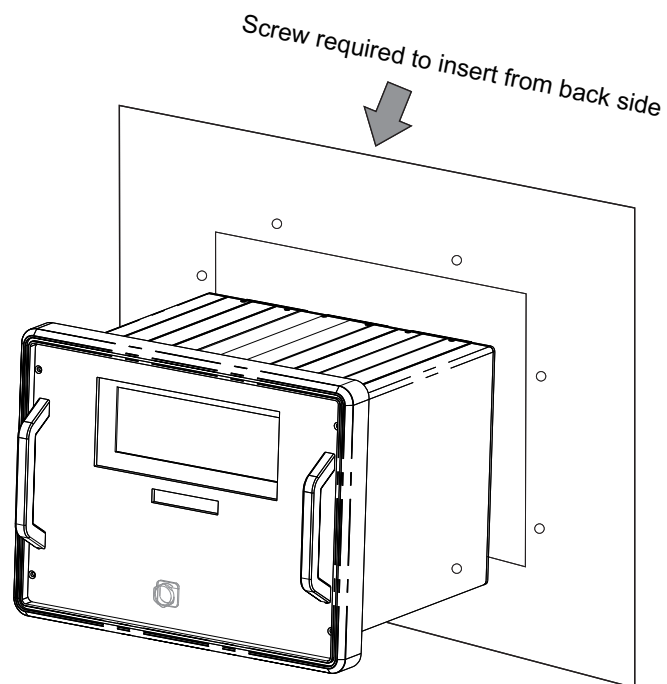


Figure-25

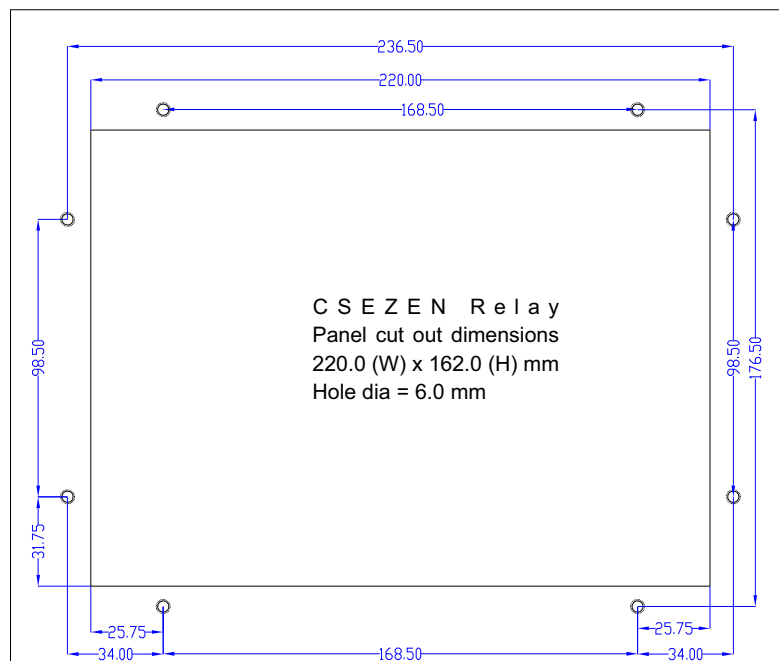


Figure-26

## Different views of the Relay

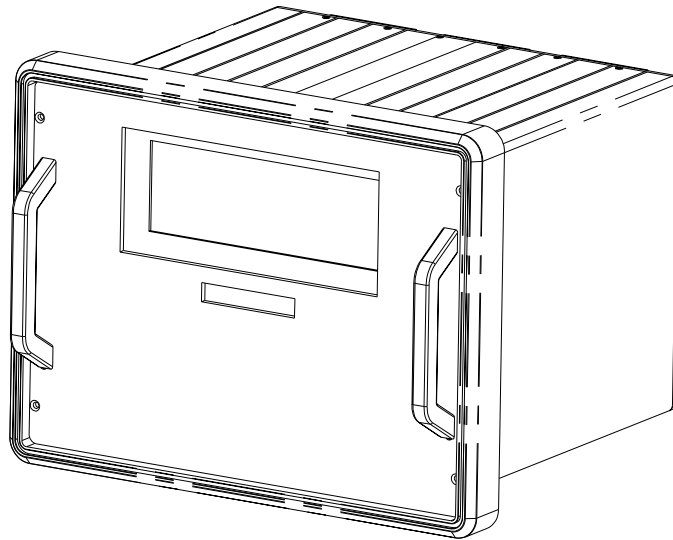


Figure-27

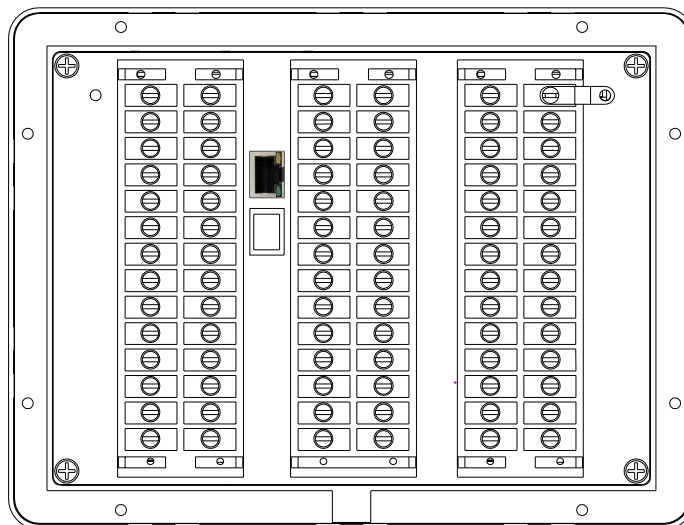


Figure-28

## 26.0 Ordering Information

**CSEZEN - M - 350 - x - D - x - x - x - x - 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**

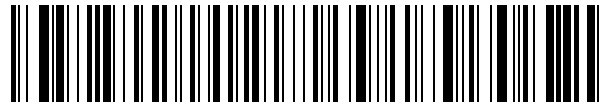
|                                    |   |
|------------------------------------|---|
| MODBUS on RS-485                   | A |
| IEC 60870-5-103 on RS-485          | B |
| IEC 61850-Single RJ-45 Port-Ed-2   | C |
| IEC 61850 PRP-Dual RJ-45 port-Ed-2 | D |

**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*

**1800 572 2012**

#### NOTE

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## Revision History

[illegible]