We touch your electricity everyday!

CSENEX-M

Intelligent Measuring and Protection Device

CSENEX

Catalogue

C&S electric

Motor Protection & Monitoring Solution

INDEX

1.0 Introduction

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

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

In this family of CSENEX series, the CSENEXMxxx is an motor protection solution which has fast, sensitive and secure protection for LV & MV motors, which are either operated via power contactors or power circuit breakers.

CSENEXM offers following features in a compact & smart flush mounting enclosure.

- ❖ 1A & 5A Programable rated current.
- ❖ Drawout enclosure have modular design with CT shorting
- ❖ Protection like: thermal overload, over-current, undercurrent, short circuit etc.
- ❖ Communication
- ❖ 25 Fault records
- ❖ 50 Event records
- ❖ Motor start/ Stop record
- ❖ Programmable input / Output
- ❖ Maxi-meter with time stamp.
- ❖ CSENEX-M relays are equipped with self supervision function.

2.0 Application

The CSENEX-M relay is the ideal answer to problems requiring more versatile or accurate protection for a motor than 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 and 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

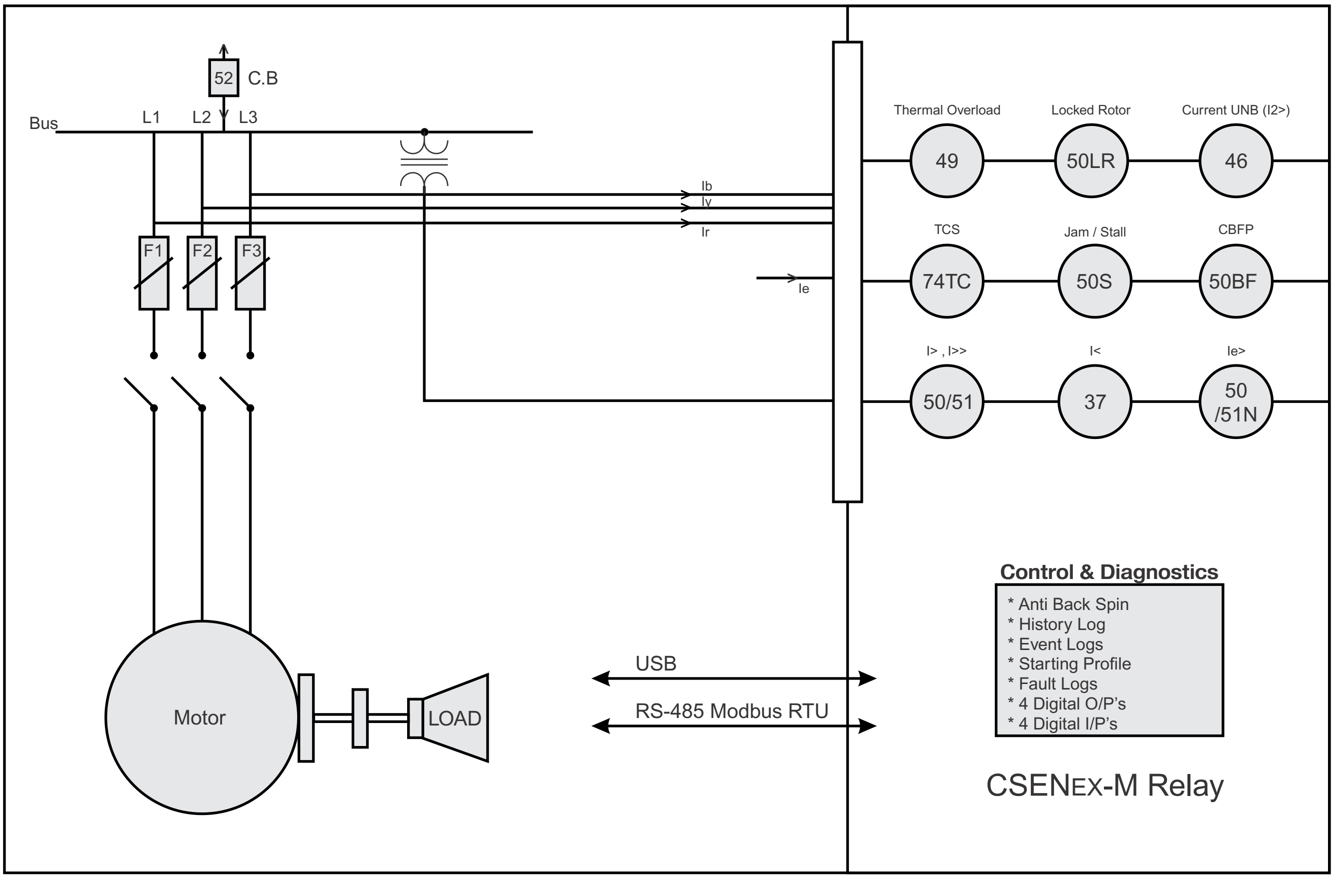
- ❖ Digital Signal Processor based numeric design
- ❖ Measures true RMS with DFT filter.
- ❖ 1A & 5A common current terminal & programmable.
- ❖ 4 Current analogue input for phase & earth fault current
- ❖ 4 Digital Outputs
- ❖ 4 Digital Inputs for protection & supervision
- ❖ 8 LEDs at pickup & trip on fault + 3 LED's with special function of 3 control keys.
- ❖ USB/RS-485 communications for automation
- ❖ 16x4 Alpha numeric LCD

(Figure-1)

4.0 Protection Features

- ❖ Current unbalance with DEFT & INV (46)
- ❖ Phase Over current (51)
- ❖ Thermal Over load protection (49)
- ❖ Locked rotor (50LR)
- ❖ Short circuit protection (50)
- ❖ Under current (37)
- ❖ Stall (50S)
- ❖ Earth fault (50N/51N)
- ❖ Anti-backspining protection (Start Interval)
- ❖ CBFP (50BF)
- ❖ Trip circuit supervision (74TC)
- ❖ Phase loss

5.0 Functional Diagram



(Figure-2) CSENEX-M Functional Diagram

6.0 Protection Functions

Undercurrent Protection (I<)

This protection covers the Loss of load condition like V-belt split or shaft failure or a pump running unprimed or Running dry Protection, Broken conveyer belt.

If while running condition, the phase current goes below the adjusted current level for a defined time, CSENEX-M will trip to stop the motor.

Phase Over-current (51)

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. Refer Table – 1 for these protection settings.

Earth Over-current (50/51N)

This is an over current function used on the current measured at the grounding of a motor in order to detect faults to earth. Each winding features has Earth low and Earth hi-set protections. Refer Table – 3 for these protection settings.

Phase Loss or Single Phase Protection

During a phase loss, the motor winding current may increase by 150% or more. As the motor winding current increases, the winding temperature may also increase and possibly damage the winding insulation.

The quick trip time on CSENEX-M helps to prevent over-current damage to the windings

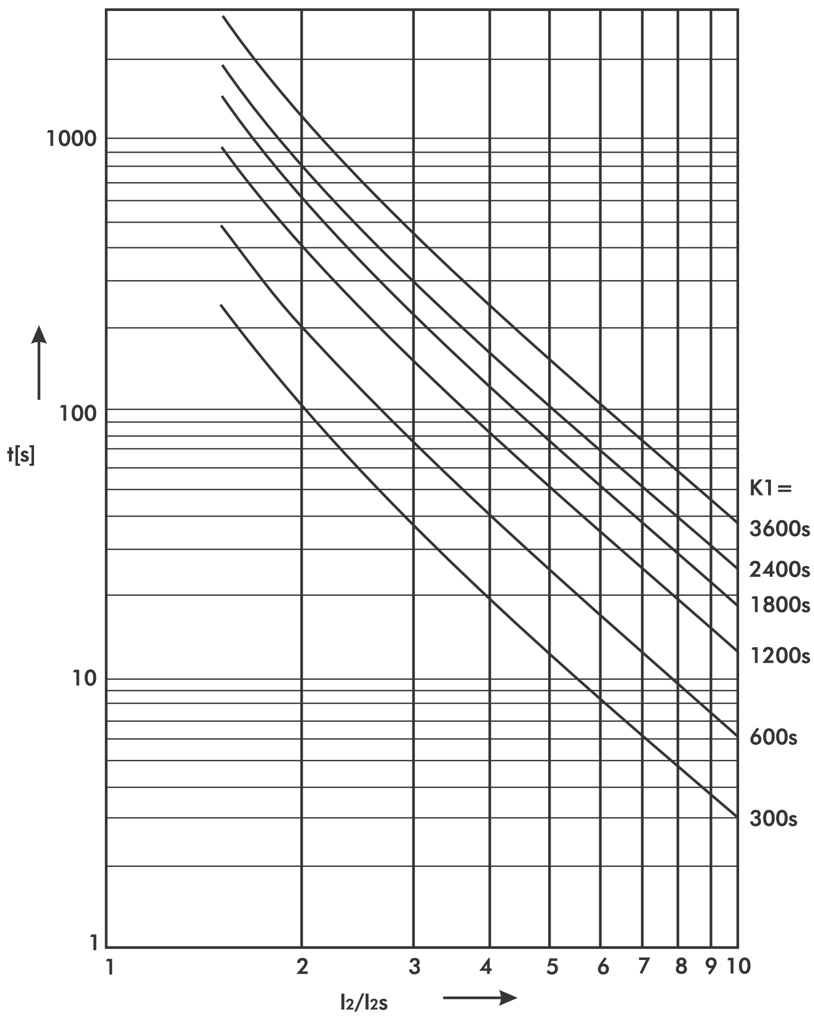
Negative Phase Sequence (46)

Running motors at unbalance conditions results in overheating. They are often fed through fuses and may be energized with one fuse blown causing single phasing of motor the relay detects the negative phase sequence & trip according to set characteristics(DEFT/INV).

Negative Phase Sequence Equation

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

K1 : TMS for Inverse characteristics of NPS
t : Expected Trip Time
I2 : Measured negative sequence value
I2s : Permissible NPS value



(Figure-3)

Locked Rotor (50LR)

During motor start-up, a locked rotor is detected with the state of increased phase current above the set value for above the defined start time. 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.

Short Circuit Protection (I>>) (50)

The stage with definite time delay protects against phase short circuit faults, which are responsible of overheating damages.

Thermal Overload Protection (49)

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 formula for calculating the trip characteristics is as follows:

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

with τ = thermal time constant of the object to be protected.

I_b= Basic current

I_P= Initial load current

P= Initial load factor (p= 0 means cold operating component)

k= constant

for thermal characteristics user has two choices

(1) Thermal based on highest measured RMS current

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

OR

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

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

where

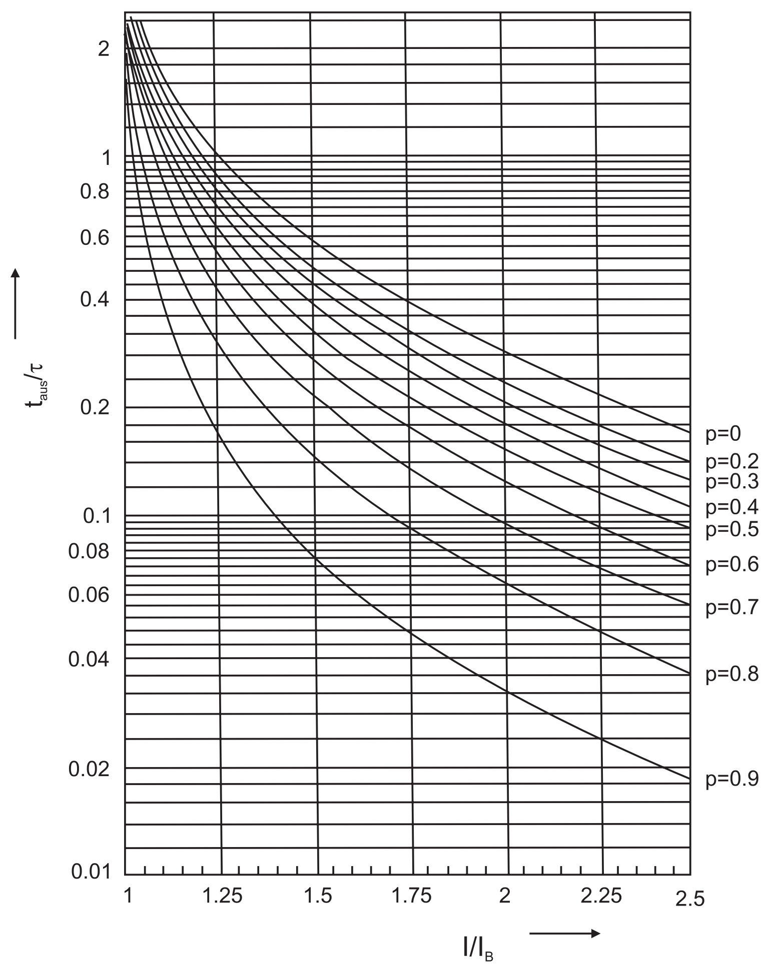
I_0 = Zero phase sequence current (ZPS)

I_1 = Positive phase sequence current (PPS)

I_2 = Negative phase sequence current (NPS)

Neg_k= is weighting factor of NPS (constant value)

Presentation of the Trip with variable initial load factor:



(Figure-4)

Jam / Stall (50S)

Mechanical equipment such as pumps or fans can be quickly damaged if it jams, resulting in a locked rotor stall. Protect the motor. Load jam protection is available only when the CSENEX-M 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.

7.0 Monitoring Functions

Trip Circuit Supervision (74TC)

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. Refer Table-8 for these protection settings.

Note: Trip counter is incremented on the basis of getting trip command from relay and not on the basis of external mechanism i.e. circuit breaker operation.

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 CSENEX-M provides an start interval timer (minimum time between stop and restart) to prevent starting the motor while it is spinning in the reverse direction. The relay starts the timer countdown form the moment a stop is declared by the relay except in blocking state.

Circuit Breaker Failure Protection (50BF)

The CB Failure Protection is based on supervision of current after fault tripping events. The test criterion is whether all phase/earth currents have dropped to less than 5% of In within the set time (tCBFP). If one or more of the phase currents have not dropped to specified current within this time, CB failure is detected and the assigned output relay is activated. Refer Table-10 for this protection setting.

START WORKING PRINCIPLE

START RECOGNITATION:

CSENEX-M 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<5% of In) 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 5% of In. if the STOP or RUNNING conditions are recognized, the start condition is terminated.

RUNNING -CONDITION: RUNNING can be recognized in different ways:

1. If the start has been successfully completed. This is the case when motor current has dropped below KxIb setting (Full load current) & the start time has elapsed (direct start).

2. If the motor is connected across several resistance steps, it is possible that KxIb setting is crossed repeatedly. Running conditions are recognized when the start time has run out after the last step & current has settled between KxIb and 5% of In. (Resistance start).

3. If after STOP a motor current has settled between 5% of In and KxIb and the start reorganization time has elapsed. (Soft start)

4. If Motor Running Identification input was activated and current is 5% of In, then start time is bypassed, it will go in run state.

START-STOP PARAMETERS

1. Start Time
2. Start Intervals
3. Stop Time

1) **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 5% of In. Running is only accepted by the supervision after the time has elapsed.

Case-1: If once motor starts & I falls below 5% of In for the time less than stop time and again exceeds 5% of In then the m o t o r 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 5% of In 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).

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

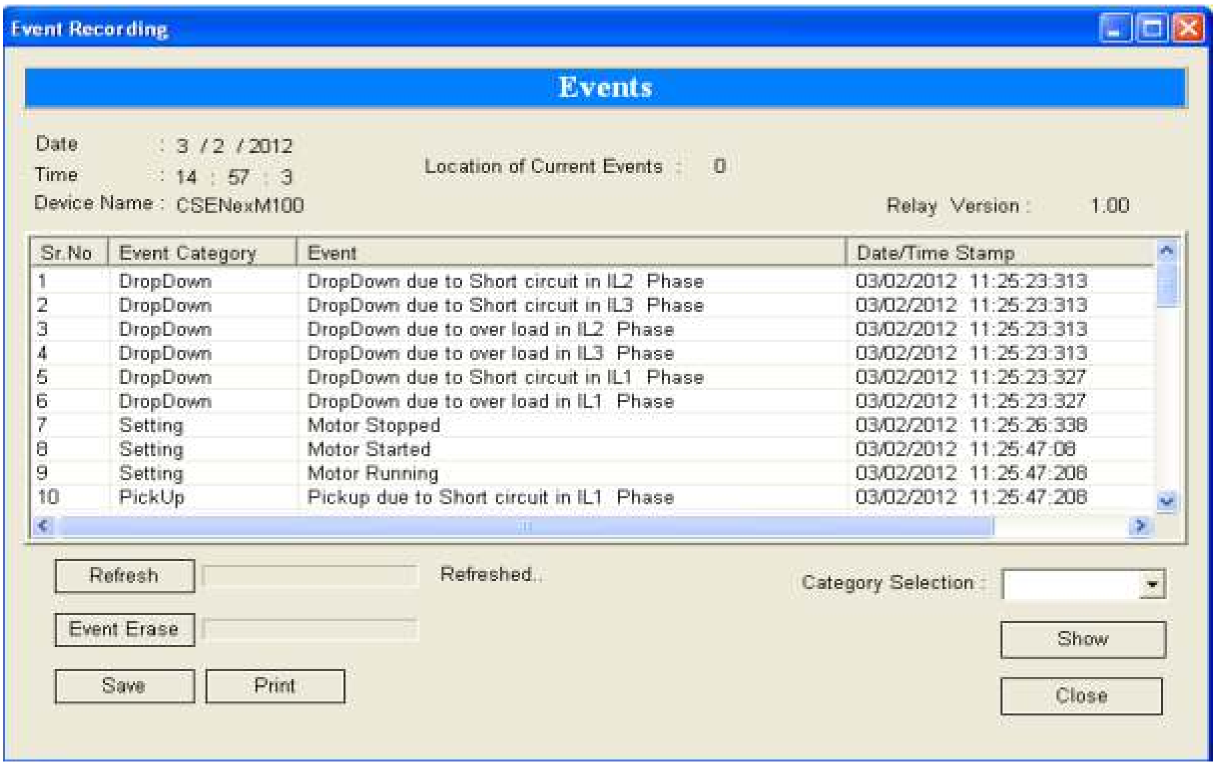
3) **Stop Time**: If current goes below 5% of In, then motor stops after set stop time.

8.0 Event Record

The unit stores in non volatile memory the last 50 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 and time of the event
- ❖ Descriptive text of the event

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



(Figure-5) Event Data recording on PC Software

Output Contacts

No. of digital outputs	:	4 (DO1, DO2, DO3, DO4)
Type of outputs	:	Relay
Programmable (DO Assignment)	:	Yes
Relay reset type inputs	:	Programmable (Auto/Manual)

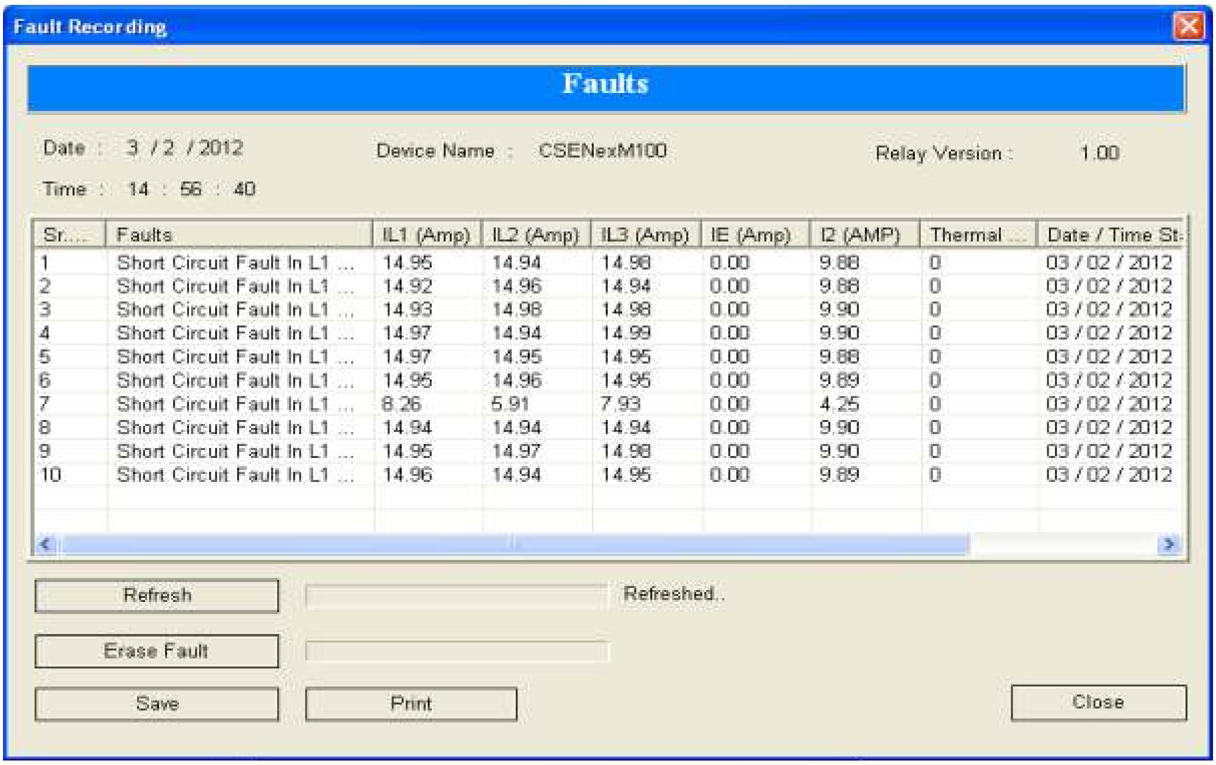
Input Contacts

No of digital inputs	:	4 (DI1, DI2, DI3, DI4)
Type of inputs	:	AC/DC Voltage
Programmable (DI Assignment)	:	Yes

9.0 Fault Record

The data recorded during the fault sequence is called Fault Record. CSENEX-M records last 25 faults in its non volatile memory with time stamp. Each record has following information :

- Phase & Earth fault currents
- Date and time of fault
- Origin of fault (over current, thermal .... etc.)


Fault Recording

Faults

Date : 3 / 2 / 2012 Device Name : CSENexM100 Relay Version : 1.00

Time : 14 : 56 : 40

Sr....	Faults	IL1 (Amp)	IL2 (Amp)	IL3 (Amp)	IE (Amp)	I2 (AMP)	Thermal ...	Date / Time St
1	Short Circuit Fault In L1 ...	14.95	14.94	14.98	0.00	9.88	0	03 / 02 / 2012
2	Short Circuit Fault In L1 ...	14.92	14.96	14.94	0.00	9.88	0	03 / 02 / 2012
3	Short Circuit Fault In L1 ...	14.93	14.98	14.98	0.00	9.90	0	03 / 02 / 2012
4	Short Circuit Fault In L1 ...	14.97	14.94	14.99	0.00	9.90	0	03 / 02 / 2012
5	Short Circuit Fault In L1 ...	14.97	14.95	14.95	0.00	9.88	0	03 / 02 / 2012
6	Short Circuit Fault In L1 ...	14.95	14.96	14.95	0.00	9.89	0	03 / 02 / 2012
7	Short Circuit Fault In L1 ...	8.26	5.91	7.93	0.00	4.25	0	03 / 02 / 2012
8	Short Circuit Fault In L1 ...	14.94	14.94	14.94	0.00	9.90	0	03 / 02 / 2012
9	Short Circuit Fault In L1 ...	14.95	14.97	14.98	0.00	9.90	0	03 / 02 / 2012
10	Short Circuit Fault In L1 ...	14.96	14.94	14.95	0.00	9.89	0	03 / 02 / 2012

Refresh Refreshed..

Erase Fault

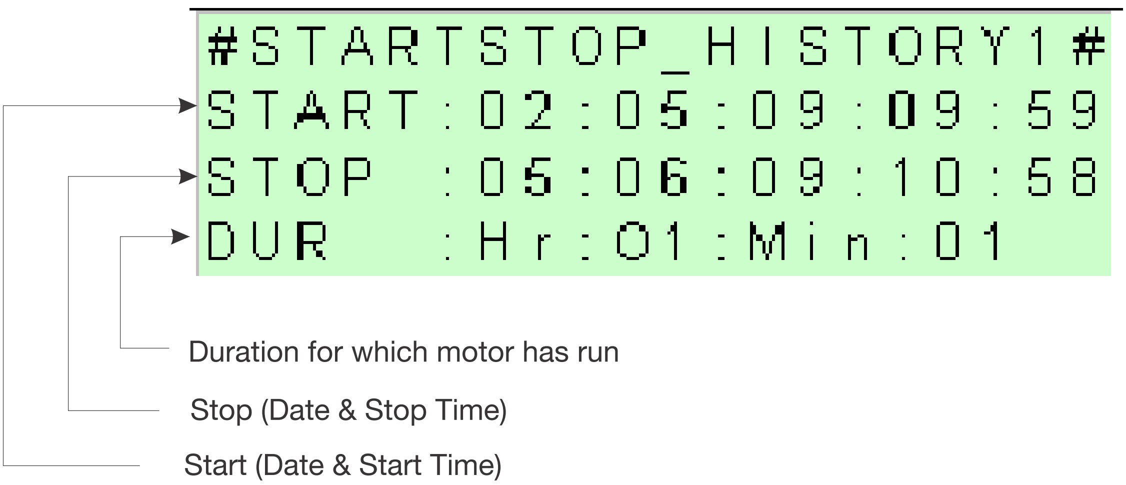
Save Print Close

(Figure-6) 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.

Motor Start-up Record

The CSENEX-M stores the last 10 start-stop time records in non-volatile memory. when one available memory space is exhausted, the new record automatically overwrites the oldest record.



(Figure-7)

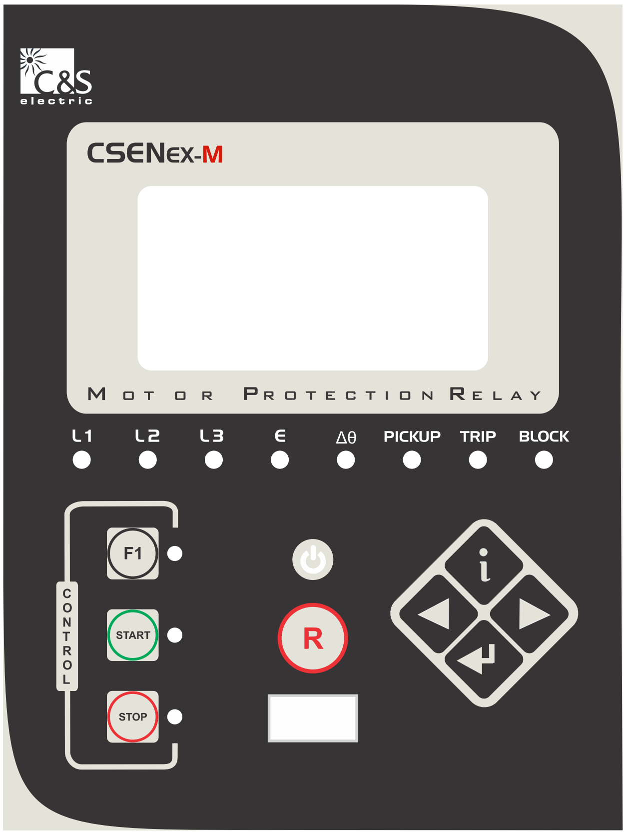
Maxi-meter

The unit stores the maximum current value, plus the time tag for the moment when it occurs.

10.0 Human Machine Interface

It comprises bright Alpha-numeric display with 5 push buttons for setting and other operations for local access:

- Four push switches for set values of normal tripping characteristics.
- One 'RESET' push switch.
- One push switch for the function assigned in the 'HMI' to 'F1' Key, 2 push switches for the starting and stopping of motor.
- Eight LEDs for pickup or tripping on faults & events in any phase.



(Figure-8) HMI

Keys	Manual Key
i	is used as intelligent key to see the details of the last fault, fault pickup status, digital input & output status.
↵	is used as a "ENTER" key.
R	is used to manual reset (after pressing for 2 sec)
◀	is used to scroll in upward direction and for decrement of parameters.
▶	is used to scroll in downward direction and for increment of parameters.
F1	To perform the assigned task either DO Trip, DO Reset or thermal reset.
START	To start the motor (via assignable DO).
STOP	To stop the motor (via assignable DO).

11.0 Communication (Local & Remote)

The unit has:

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

Rear Communication (RS-485/RJ-45)

The protocol for the rear port is MODBUS.

Front Communication (USB)

The entire setting including protection parameter setting, Fault & Event records are available on 'A' type USB (female) interface with saving & printing option (See Figure-9). This unit also has Front-end Live Link simulation support for testing of relay even without any three phase injection source.

PC interface

All the group's setting, Fault and Event are available on USB interface 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.

(Figure-9)

12.0 Setting Ranges

Current Protection

Parameters	Display	Setting Range	
		Min	Max
Phase trip characteristics	CURVE	DEFT	EINV, VINV, LINV NINV1.3, NINV3.0
Phase over-current Low set pickup setting	I>	0.2xIp	4xIp
Phase over-current Low set inverse timing	ti>	0.04	260
Phase over-current Low set definite timing	t>	0.05s	260s
Under-current pickup setting	I<	0.20xIp	1.00xIp
Under-current timing	t<	0.05s	260s
Phase over-current Hi-set pickup setting	I>>	0.2xIp	30xIp
Phase over-current Hi-set definite timing	t>>	0.04s	20s

(Table-1)

Thermal Over-load

Parameters	Display	Setting Range	
		Min	Max
Thermal memory mode	ThMemMod	M1	M2, M3
Permissible basic current	Ib	0.2xIp	4xIp
Constant	k	0.5	2
Heating time constant	Th	0.5Min	180 Min
Cooling constant	Tc	1xTH	8xTH
Thermal alarm	Th_Alarm	20%	99%
NPS weighting factor	I2_Wgt	0.05	2.5
Thermal reset	Th_Rst	0%	99%
Thermal trip characteristic	ThChar	th1	th2

(Table-2)

Earth Protection

Parameters	Display	Setting Range	
		Min	Max
Earth trip characteristics	CURVE	DEFT	EINV, VINV, LINV NINV1.3, NINV3.0
Earth over-current Low-set pickup setting	Ie>	0.05xIn	2.5xIn
Earth over-current Low set inverse timing	tie>	0.05	20.00
Earth over-current Low set definite timing	te>	0.03s	260s
Earth over-current Hi-set pickup setting	Ie>>	0.5	8xIn
Earth over-current Hi-set definite timing	te>>	0.02s	20s

(Table-3)

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

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

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

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

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

Where t =Tripping time ti =Time multiplier

I =Fault current I_s =Setting value of current

Trip Time Accuracy : DEFT/VINV/NINV3.0/1.3 : $\pm$5% or $\pm$30mSec (whichever is higher)

EINV/LINV : $\pm$7.5% or $\pm$30mSec (whichever is higher)

Motor Control Setting

Parameters	Display	Setting Range	
		Min	Max
Starting time	START TIME	0.20s	500s
Start interval time	STRT INTRVL	1	240Min
Stop time (stop recognition delay)	STOP TIME	0.20s	10s
Phase loss trip time	TPHLS	0.10s	10s
Lock rotor pickup setting	LCKRTR_I	2xIp	30xIp
Lock rotor trip time	LCKRTR_T	0.04s	20s
Stall / Jam pickup setting	STALL_I	0.5xIp	30xIp
Stall trip time	STALL_T	1s	60s

(Table-4)

DO Assignment

Parameters	Display
Over-current protection	I>
Short circuit protection	I>>
Under-current	I<
Earth timed protection	Ie>
Earth instant protection	Ie>>
Negative phase sequence protection	I2>
Circuit breaker failure protection	CBFP
Start block	StrtBlck
Common fault	CommonFlt
Start relay	StartRly
Stop relay	StopRly
Thermal relay	ThrmlRly
Thermal alarm	ThrmlAlrm
Phase loss	PhLoss
Stall	Stall
Lock rotor	LockRotr
Trip circuit supervision	TCS
Motor running	MotorRun
Self supervision	SlfSpvsn

(Table-5)

DI Assignment

Parameters	Display
Circuit breaker open	CB_open
Circuit breaker close	CB_close
Remote start	Rmtstart
Remote stop	Rmtstop
Remote reset	RmtRSET
Over-current blocking	OC_BLK
Short circuit blocking	SC_BLK
Earth timed blocking	EL_BLK
Earth instant blocking	EH_BLK
Lock rotor blocking	LkRtrBLK
Stall blocking	StallBLK
Phase loss blocking	PhLosBLK
Thermal blocking	ThrmBLK
NPS blocking	NPS_BLK
Under-current blocking	UC_BLK
Motor running identification	MtrRunng
Emergency start	EmrgStrt

(Table-6)

Function Reset

Parameters	Display	Setting Ranges	
		Min.	Max.
Over-current protection	I>	Auto	Manual
Short circuit protection	I>>	Auto	Manual
Under-current	I<	Auto	Manual
Earth timed protection	Ie>	Auto	Manual
Earth instant protection	Ie>>	Auto	Manual
Negative phase sequence protection	I2>	Auto	Manual
Start block	StrtBlck	Auto	Manual
Common fault	CommonFlt	Auto	Manual
Thermal relay	ThrmlRly	Auto	Manual
Thermal hooter	ThrmlAlrm	Auto	Manual
Phase loss	Ph Loss	Auto	Manual
Stall	Stall	Auto	Manual
Lock rotor	LockRotr	Auto	Manual
Trip circuit supervision	TCS	Auto	Manual
Motor running	MotorRun	Auto	Manual

(Table-7)

Key Assignment

Relay is having one function key (F1). It can be assign to trip any of 6 DO or to Relay reset, Thermal reset of the relay.

Parameters	Display	Setting
Function key	F1	DO1/DO2/DO3/DO4 Relay Reset, Thermal Reset

(Table-8)

Trip Circuit Supervision Protection

Parameters	Display	Setting Range	
		Min	Max
Trip circuit supervision time delay	td	0.03 Sec	2 Sec

(Table-9)

Circuit Breaker Failure Protection

Parameters	Display	Setting Range	
		Min	Max
Circuit breaker failure protection time delay	td	0.03 Sec	2 Sec

(Table-10)

Negative Phase Sequence Setting

Parameters	Display	Setting Range	
		Min	Max
NPS trip characteristic	CHAR	DEFT	NPS_INV
NPS pickup setting	I2s	0.10xIp	1.00xIp
Time multiple	K1	5 Sec	600 Sec
Definite time delay	td	0.1 Sec	600 Sec

(Table-11)

General Setting

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

Parameters	Display	Setting Range	
		Min	Max
Rated phase current	Ip	1.00 Amp	5.00 Amp
Rated earth current	In	1.00 Amp	5.00 Amp
Phase CT ratio	PhCTRatio	1	9999
Earth CT ratio	ECTRatio	1	9999
Nominal frequency	Nom.FREQ	50 Hz	60 Hz

(Table-12)

Rear Port Communication Setting

RS-485 Communication		
Protocol	:	MODBUS RTU
Baud rate selection (Programmable)	:	4800/ 9600 / 19200 / 38400 / 57600 bps
Parity selection (Programmable)	:	Even / Odd / None
Stop bit	:	1 Bit
Data bit	:	8 Bit
Remote Address (Programmable)	:	247
Cable required for interface	:	Two wire twisted shielded cable

(Table-13)

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

(Table-14)

13.0 Technical Data

Measuring Input

Rated Data	:	Rated Current Ip : 1A & 5A Rated Frequency Fn : 50Hz / 60Hz
Thermal withstand capability in current circuit	:	At Ip : 1A Continuous=5 x Ip for 10 Sec = 30 x Ip for 1Sec = 100 x Ip
	:	At Ip : 5A Continuous = 3 x Ip for 10 Sec = 10 x Ip for 1Sec = 20 x Ip
Nominal Burden	:	For phase = < 0.2VA For earth = < 0.2VA

(Table-15)

Measurement Accuracy

Parameters	Range	Frequency Range	Accuracy
Current in Ampere	1.0-30.0xIp	50-60Hz	$\pm$2%

(Table-16)

Auxiliary Supply

Auxiliary Voltage Range	For 'L' Model	18V-60V DC
	For 'H' Model	85V-280V AC / 110V-300V DC
Supply Range for Digital Input	For 'L & H' Model	Above 24V AC/DC
Power Consumption		Quiescent approx. 3W Operating approx. <7W

(Table-17)

Common Data

Dropout ratio	> 96%
Relay Reset time	30 ms
Minimum operating time	30 ms
Transient overreach at instantaneous operation	$\leq$5%

(Table-18)

14.0 Standards

Design Standards

IEC 60255-22-[1-6]

IEC 60255-5

14.1 HIGH VOLTAGE TESTS

High Frequency Interference Test

IEC 60255-22-1	:		
Class 3	:	Auxiliary Supply	2.5 kV/2 s
	:	Circuit to Earth	2.5 kV/2 s
Dielectric Voltage Test			
IEC 60255-5/EN 50178	:	i) All Input 342 / Output circuits to Earth	2.5 kV (eff)/50Hz, 1 min.
		ii) Between Input & Output Circuits	
Impulse Voltage Test			
IEC 60255-5	:	i) All Input / Output circuits to Earth	5kV / 0.5J, 1.2/50 µs
		ii) Between Input & Output Circuits	

14.2 EMC IMMUNITY TESTS

Fast Transient Disturbance Immunity Test (Burst)

IEC 60255-22-4	:	Power supply, mains inputs	±4 kV, 2.5 kHz
IEC 61000-4-4			
Class 4	:	Other in and outputs	±2 kV, 5 kHz
Surge Immunity Test			
IEC 61000-4-5	:	Within one circuit	2 kV, Differential Mode, Level 4
Class 4			
	:	Circuit to Earth	4 kV, Common Mode, Level 4
Electrical Discharge Immunity Test			
IEC 60255-22-2	:	Air discharge	8 kV
IEC 61000-4-2			
Class 3	:	Contact Discharge	6 kV

Radiated Immunity Test

EN 61000-4-3 / IEC 60255-22-3 : Level 3, 10V/m 80MHz to 1GHz @ 1kHz 80% AM

Conducted Immunity Test

EN 61000-4-6 / IEC 60255-22-6 : Level 3, 10V RMS @ 1kHz 80% AM, 150kHz to 80MHz

Power Frequency Magnetic Field Immunity Test

IEC 61000-4-8 : Level 5, 100A/m applied continuously, 1000A/m for 3s.

EMC Emission Tests

Radio Interference Suppression Test

IEC 60255-25/EN 55011/CISPR11 Limit value class A

0.15 - 0.5MHz, 79dBµV (quasi peak) 66dBµV (average)

0.5 - 30MHz, 73dBµV (quasi peak) 60dBµV (average)

Radio Interference Radiation Test

IEC 60255-25/EN 55011/CISPR11	Limit value class A
30 - 230MHz, 40dB V/m at 10m measurement distance	
230 - 1GHz, 47dB V/m at 10m measurement distance	

14.3 ENVIRONMENTAL TESTS

Temperature

IEC 60068-2-1	:	Storage –25°C to + 85°C	
IEC 60068-2-2	:	Operation: –25°C to + 70°C	

Test Bd: Dry Heat

IEC 60068-2-2	:	Temperature	55°C
	:	Relative humidity	<50%
	:	Test duration	72 h

Test Bd: Dry Heat

IEC 60068-2-2	:	Temperature	70°C
	:	Relative humidity	<50%
	:	Test duration	2 h
		(The clearness of the display is constricted)	

Test Db: Damp Heat (Cyclic)

IEC 60068-2-30	:	Temperature	55°C
	:	Relative humidity	95%
	:	Cyclic duration (12 + 12 Hours)	2

14.4 MECHANICAL TESTS

Test: Vibration Response Test

IEC 60068-2-6	:	(10Hz – 59 Hz)	0.035 mm
IEC 60255-21-1		displacement	
Class 1	:	(59Hz-150Hz)	0.5 gn
		Acceleration	
	:	No. of cycles in each axis	1

Test: Vibration Endurance Test

IEC 60068-2-6	:	(10Hz-150Hz)	1.0 gn
IEC 60255-21-1		Acceleration	
Class 1	:	No. of cycles in each axis	20

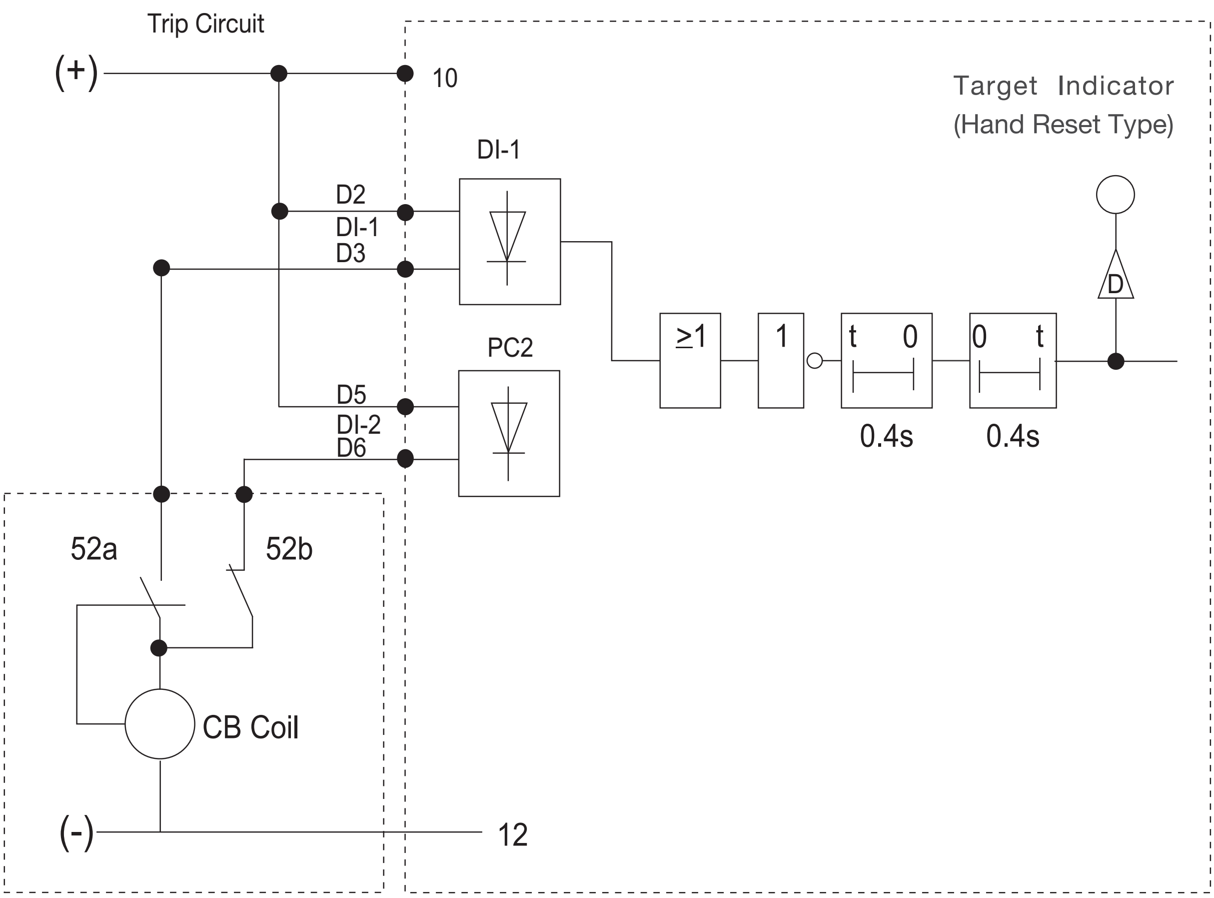
Test: Shock Tests

IEC 60068-2-27	:	Shock response test	5 gn, 11 ms, 3 impulses in each direction
IEC 60255-21-2			
Class 1	:	Shock resistance test	15 gn, 11 ms, 3 impulses in each direction

Test: Shock Endurance Test

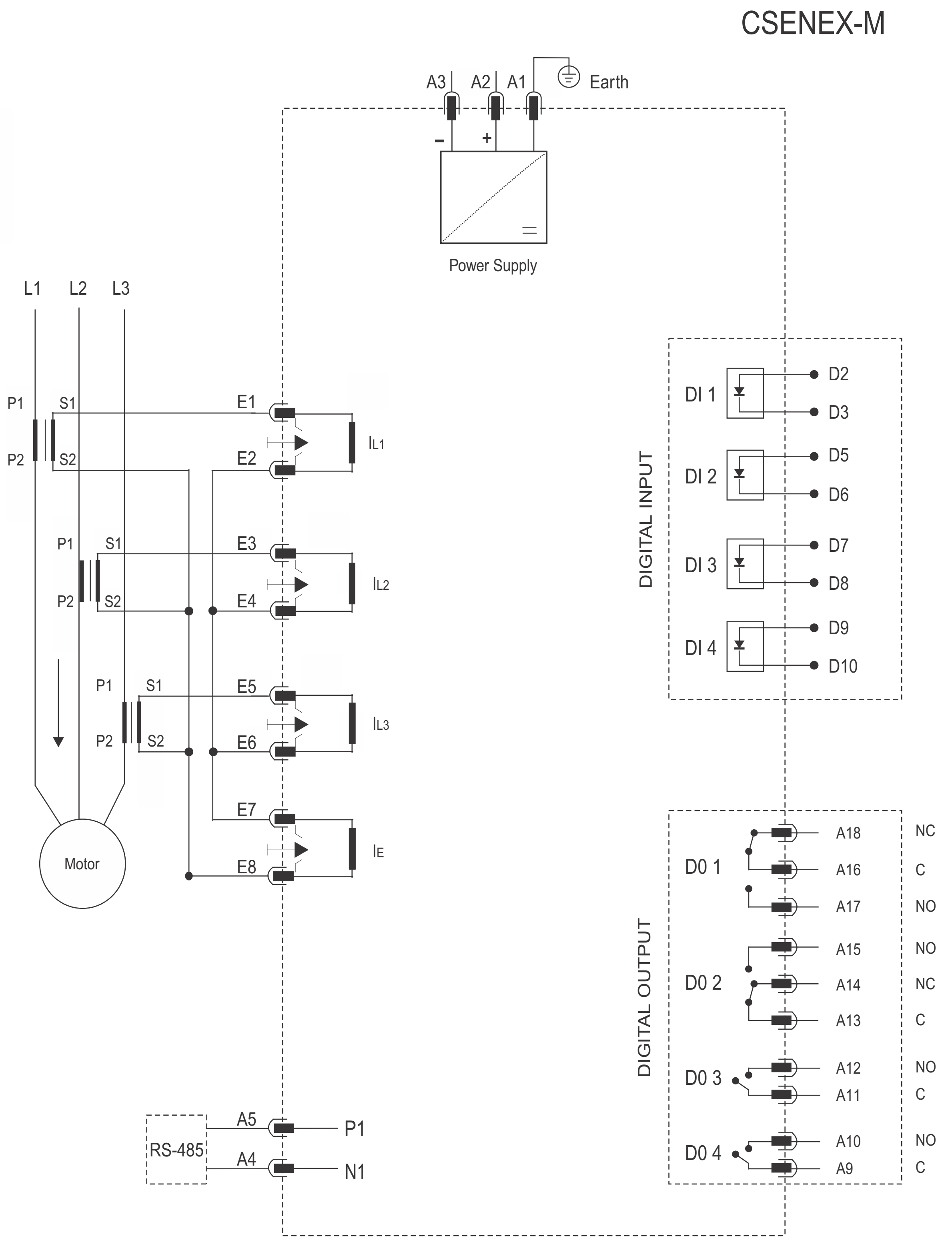
IEC 60068-2-29	:	Shock endurance test	10 gn, 16 ms, 1000 impulses in each direction
IEC 60255-21-2			
Class 1			

15.0 Trip Circuit Supervision Diagram



(Figure 10) (Trip Circuit Supervision Function)

16.0 Connection Diagram

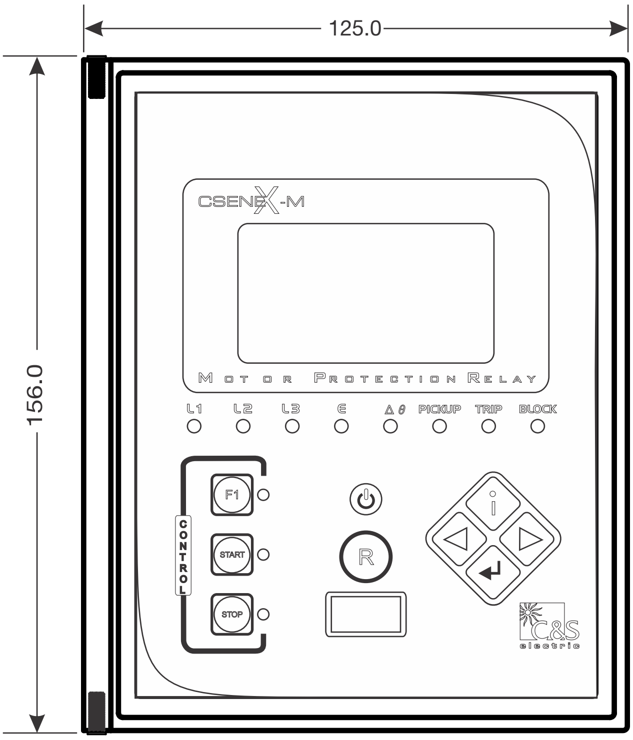


(Figure-11)

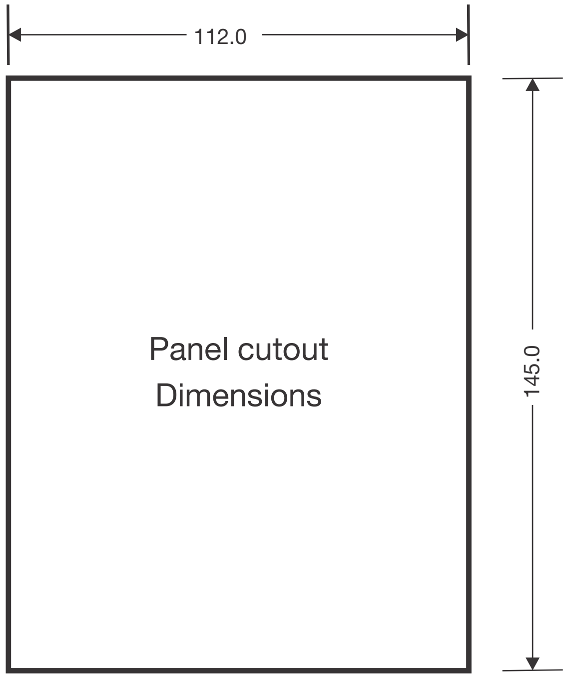
17.0 Dimensional Details

Panel cutout dimensions: WxH =112.0x145.0mm

Front View

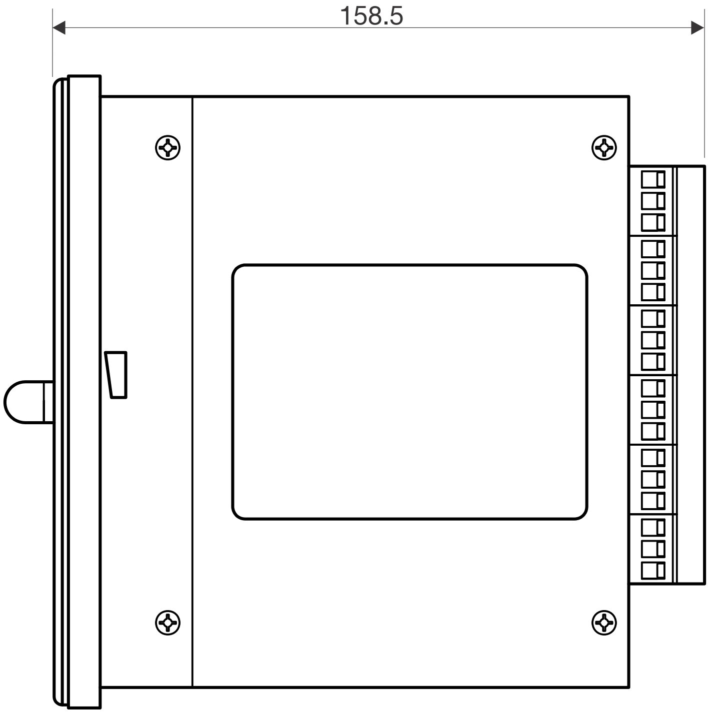


(Figure-12)



(Figure-13)

Side View



(Figure-14)

18.0 Ordering Information

CSENEX-M100 — **X**

AUXILIARY SUPPLY
L : 18V-60V DC
H : 85V-280V AC / 110V-300V DC

Revision History

S.No.	Rev.No.	Details	Date
01	06	Inclusion of TCS Diagram	05.08.14

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Not Published

Issue Date: 07.02.12
Rev. No: 06
Rev. Date: 05.08.14

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