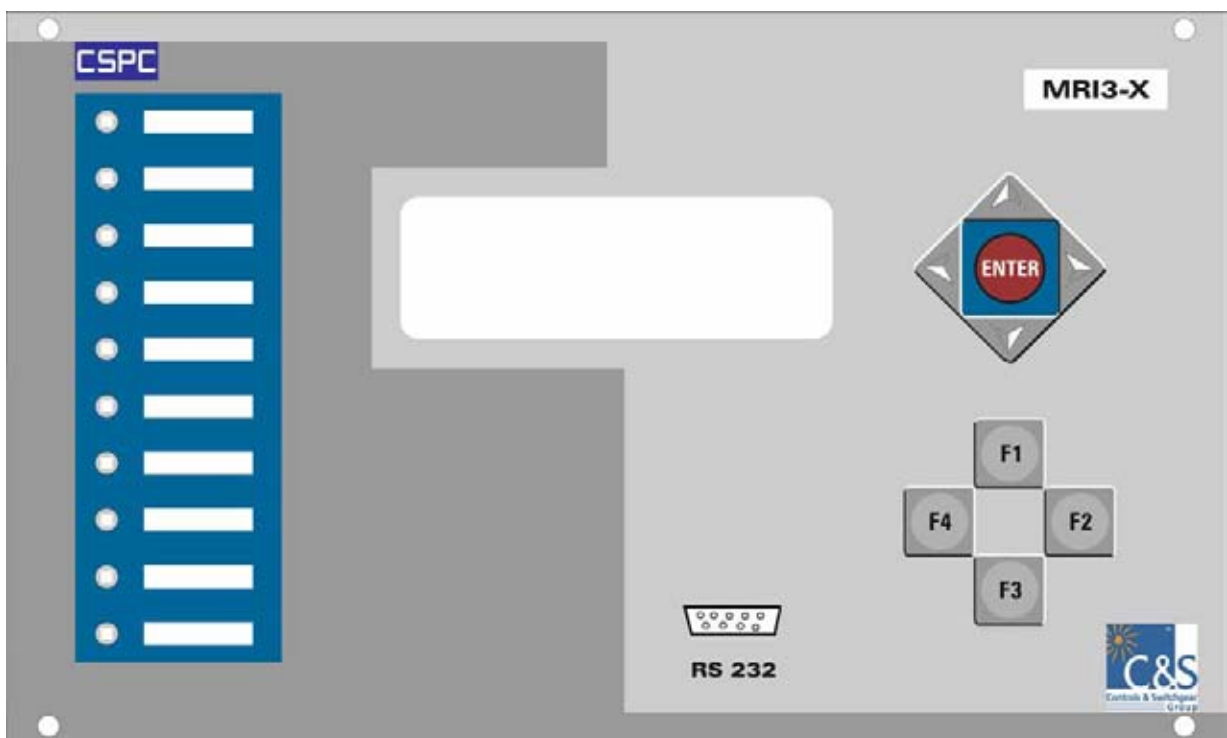


High-Tech Range

MRI3-X - Multifunction Protection

CSPC



Introduction

The numerical multifunction relay Type MRI3-X provides several combinations of protection functions. It senses line voltages, line currents and earth current and provides following protective functions:

Phase overcurrent [3*50/51] and neutral overcurrent [50N/51N]

It protects the installation against phase to phase and phase to ground faults, with instantaneous trips and timed trips.

Phase directional overcurrent [67] and neutral directional overcurrent [67N]

For directional overcurrent function, the type of polarization for phase and neutral directional can be selected by setting:

- 67:
 - ✓ Quadrature polarization
 - ✓ Sequence polarization
- 67N:
 - ✓ Angular: by V_0 ; V_0 and I_0 ; sequence
 - ✓ $I \cos \varphi$
 - ✓ $I \sin \varphi$

Sensitive neutral overcurrent [50/51SN]

For sensitive neutral measurement, it is necessary to use a toroid transformer connected to transformer T5 or T4, depending on the model chosen:

If the model has directional overcurrent, the type of directional for this function can be chosen via setting:

- Angular
- $I * \cos \varphi$
- $I * \sin \varphi$

Isolated neutral overcurrent [67IN]

The high sensitivity and the directionality of this function allow detection of earth faults for isolated neutral systems and very resistive earth faults. The isolated neutral current is measured using the same transformer as that used for the sensitive neutral current measurement.

Restricted earth fault [87G] REF

The Restricted Earth Fault (REF) function compares the directions of neutral current and winding residual current for sensitive ground fault detection.

Voltage controlled overcurrent [51N]

It lowers the pickup level of the overcurrent unit depending on the voltage level. This reduces the tripping time in case of severe faults [with voltage fall].

Current unbalance [46]

It protects the installation against unbalances in current as a result of anomalies in the power system or unbalanced loads.

Breaker failure [50BF]

It detects failure in breaker actuation, providing information to other protection units so that these accelerate their trip.

Overvoltage [59], undervoltage [27] and voltage unbalance [47]

There are models of MRI3-X with the following voltage functions: overvoltage, undervoltage and voltage unbalance that can be independently enabled or disabled according to customer needs.

Overvoltage function acts against voltage increases that could endanger the isolation and security of the protected units.

Undervoltage function protects, those loads connected to the line, which are sensitive to the line voltage drops.

Voltage unbalance function protects the installation against the harmful effects of voltage unbalances, such as excessive warming in motors, current unbalances etc.

Zero sequence overvoltage [59N]

It protects against earth isolation failures in machines. Zero sequence voltage can be obtained through an open delta connection of the secondary windings of three voltage transformers [see polarization by V_0 of 67N] or calculated as the vector sum of the three phase simple voltages.

Thermal image [49]

It protects elements such as lines, transformers, etc, against thermal overloads, calculating the temperature according to the present and recent load conditions of the protected device.

Fuse failure [68FF]

It detects if a fuse has blown up in the secondary circuit of the voltage transformers. While detecting this situation, functions 51V, 27 and 59N will remain locked.

Frequency unit [81 O, U, R]

Frequency units protect the Power System against loss of balance between generated and demanded power.

The following frequency functions are available: overfrequency and/or underfrequency and frequency rate of change that can be enabled or disabled independently via setting according to customer needs.

There are 5 steps of frequency that can be programmed independently as overfrequency or underfrequency, allowing an underfrequency load shedding.

The frequency rate of change unit has 4 steps; this allows the disconnection of loads before reaching undesired frequency levels.

Power protection [32]

The following power functions are available. These functions can be independently enabled or disabled via setting according to customer needs:

- Minimum active and apparent power
- Maximum active and apparent power
- Reverse power

Trip circuit supervision [74/ C/CC]

It detects any anomalies in the trip circuit with circuit breaker open or close.

Circuit breaker failure protection

This is achieved by supervising current after issuing trip command for a preset time.

Zone Selective Interlock

When a downstream breaker detects a fault, it signals the upstream device to shift to its preset time delay band, allowing the downstream device to clear the fault while the upstream device provides backup protection. If a fault occurs between two breakers equipped with zone selective interlocking, the upstream breaker would clear the fault on the minimum delay band because it receives no interlock signal from a downstream breaker, thus minimizing the duration that the fault would exist before being cleared.

Battery Supervision

In units with battery voltage measurement, this voltage is supervised and an alarm is generated when it is not within a preset values similarly leakage is also monitored

and an alarm is generated if leakage exceeds a preset value.

Second harmonic restraint

Depending on the value of the 2nd harmonic of the current (phase and/or neutral), it locks the first level of the 50/51, 50N/51N and 46 functions.

Output Relays

MRI3-X provides 8 relays as standard and 8 more relays can be provided as an option.

Digital inputs

There are 16 digital inputs. These inputs can be programmed to perform predefined functions namely, 'External blocking', 'External reset', 'External alarm', 'External trip' and 'Snap shot input'. When voltage is applied at 'Snap Shot' terminals, status of various output relays is displayed on the LCD screen.

User programmable I/O

The digital inputs can also be programmed to bear a logical relationship with protection functions and output relays.

The User Interface

The user interface consists of an LCD display [20 Characters x 4 rows] and membrane switches for HMI and lamps [LED] for annunciation.

Communication

Communication is provided on two serial channels. One or both channels can be on the rear panel. The channel on front panel can be RS232 only. Channel(s) on the rear panel can be RS232 or RS485 or a combination of the two. User can make a choice at the time of ordering.

Communication protocol MODBUS / IEC60870-5-103 is supported.

Time Synchronization

IRIG-B standard interface is provided for time synchronization.

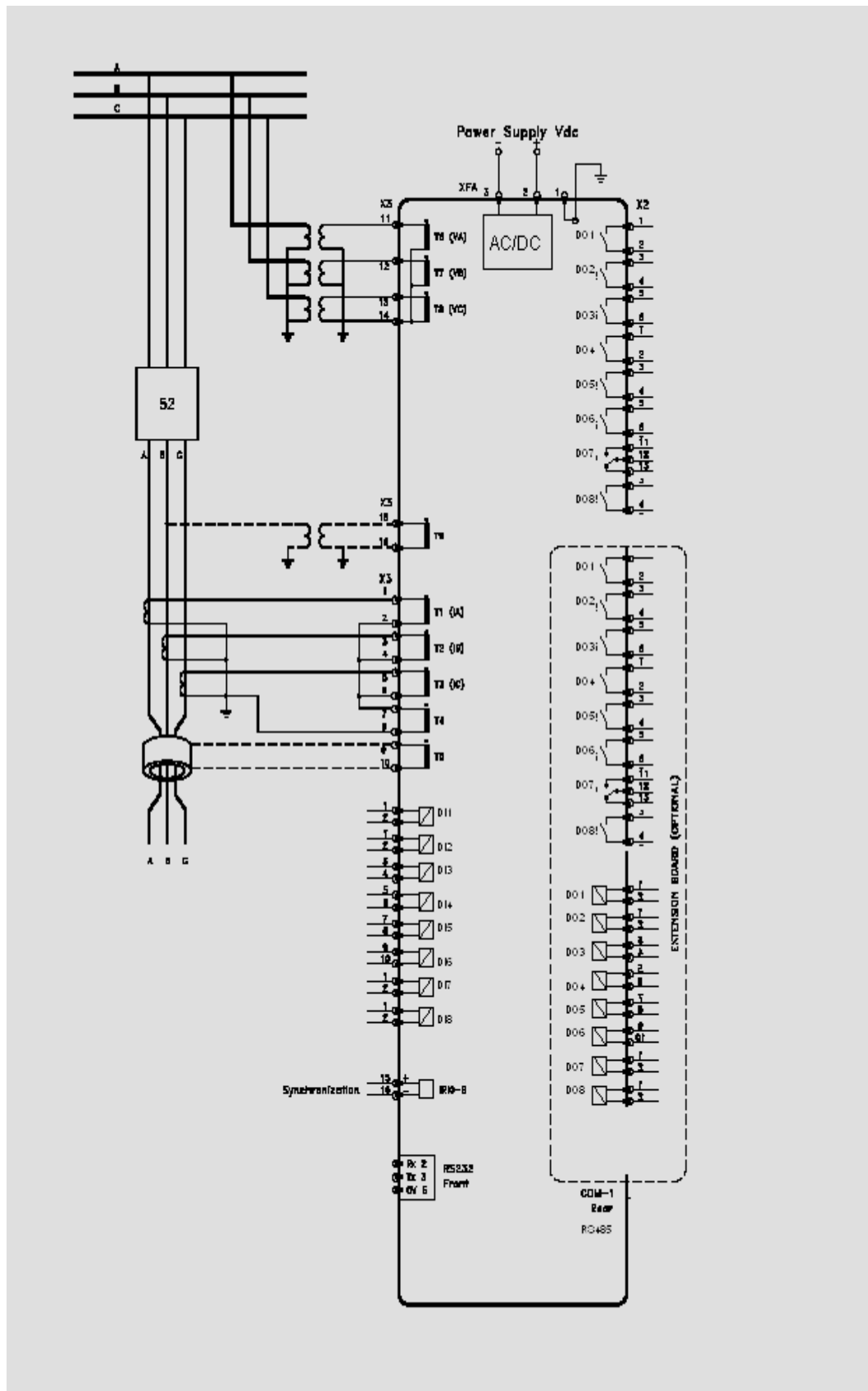
Data acquisition functions

Event, fault and oscillographic recording of signals are provided. Oscillographic record spans over 5 seconds and provides waveforms of all voltages and currents and selectable digital signals. Pre-fault time can be programmed.

Setting Ranges

Setting	Range	Step	Setting	Range	Step
Phase and neutral overcurrent unit			Reverse power unit		
Timed unit [A]	0.1 - 200	0.01	High set [%]	1 - 200	1
Instantaneous unit [A]	0.1 - 200	0.01	Time [s]	0 - 60	0.01
Sensitive neutral overcurrent unit			Low set [%]	1 - 200	1
Timed unit [A]	0.005 - 10	0.001	Time [s]	0 - 100	0.01
Instantaneous unit [A]	0.005 - 10	0.001	Thermal image unit		
Isolated neutral overcurrent unit			Nominal current [A]	0.1 - 200	0.01
Low current [A]	0.005 - 1	0.001	Alarm threshold [%]	80 - 100	1
High current [A]	0.005 - 1	0.001	Heating ratio [min]	3 - 60	1
Low voltage [V]	0.5 - 60	0.1	Cooling ratio [min]	3 - 180	1
High voltage [V]	0.5 - 60	0.1	Restricted earth fault		
First trip timing [s]	0 - 60	0.01	Pickup [A]	0.2 - 100	0.01
Directional unit			Definite time [s]	0 - 10	0.01
Phase angle	0 - 359	1	2nd harmonic restraint		
Neutral angle	0 - 359	1	Phase enable	0-1-3	-
Minimum polarization voltage [V]	1.0 - 15	0.1	Threshold I ₂ /I [%]	5 - 100	1
Current unbalance unit			Minimum current phase / neutral	0.1 - 200	-
Timed unit [A]	0.1 - 200	0.01	Circuit breaker failure		
Instantaneous unit [A]	0.1 - 200	0.01	Supervision time [s]	0 - 20	0.1
Overvoltage and undervoltage units			Undercurrent [A]	0.01 - 1	0.01
Timed unit [V]	10 - 200	0.1	Technical data		
Instantaneous unit [V]	10 - 200	0.1	Power Supply		
Zero sequence overvoltage unit			AC [V]	24 - 270	
Timed unit [V]	10 - 200	0.1	DC [V]	16 - 360	
Instantaneous unit [V]	10 - 200	0.1	Burden Min-Max [VA]	8 - 18	
Voltage unbalance unit			Current circuit thermal capacity		
Timed unit [V ₂ /V ₁]	10 - 200	0.1	Continuous [A]	20	
Instantaneous unit [V]	10 - 200	0.1	For 1 second [A]	500	
Voltage controlled overcurrent unit			For ½ cycle [A]	1250	
Control Voltage [V]	10 - 200	0.1	Voltage circuit thermal capacity		
Under- and Overfrequency units			Continuous [V]	2 x U _N	
Rated Frequency [Hz]	50 or 60	-	For 1 minute [V]	3.5 x U _N	
Frequency pickup [Hz]	40 - 70	0.01	Digital I/O		
Definite time [s]	0 - 600	0.01	Inputs	8 [+8 Option]	
Min. supervision voltage [V]	12 - 200	1	Outputs	8 [+8 Option]	
Frequency rate of change unit			Relay contact rating		
Supervision frequency [Hz]	40 - 70	0.01	Make [A]	30	
Df/dt pickup [Hz/s]	0.2 - 5	0.05	Carry [A]	8	
Additional time [s]	0 - 2	0.01	Break @220VDC [A]	0.2	
Maximum active and apparent power units			Communication ports		
High set [%]	1 - 200	1	Front panel	RS232	
Time [s]	0 - 60	0.01	Rear panel Port #1	RS232/RS485	
Low set [%]	1 - 200	1	Port #2	RS485	
Time [s]	0 - 100	0.01	F.O. Option available		
Minimum active and apparent power units			IRIG-B		
Pickup [%]	1 - 200	1	Input type	Demodulated	
Time [s]	0 - 60	0.01	Input level	TTL	
			Cable type	2 shielded wires	
			Isolation	500V	

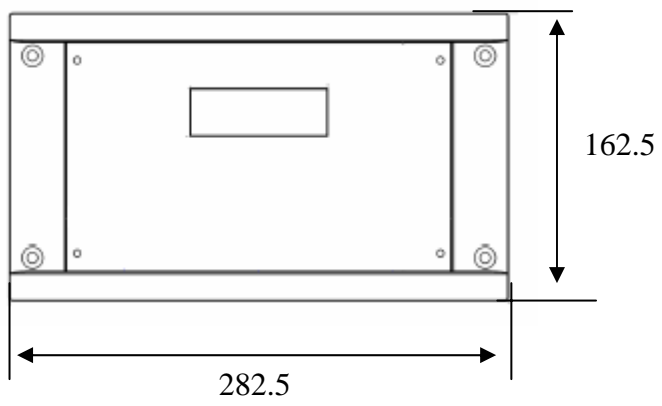
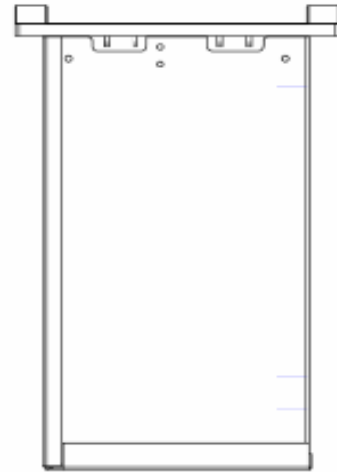
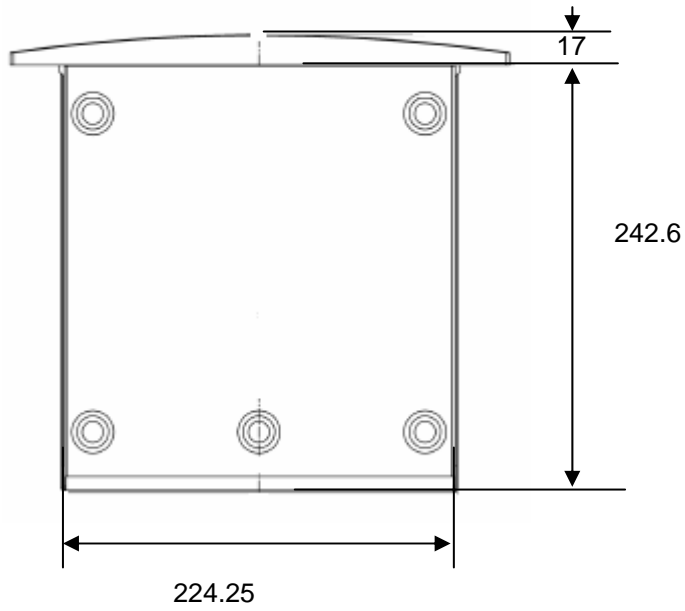
Connection Diagram for MRI3-X



Dimensions:

All dimensions are in mm.

Cut out: 228 x 134



QUALITY POLICY

C&S Protection & Control Ltd. [**CSPC**] has committed itself to complying with the guidelines laid out in its quality policy, oriented towards the continuous improvement of its products and services in each and every one of its activities, in order to obtain complete client satisfaction.

The ISO 9001:2000 international certificate shows that the design, manufacturing and service provided by **CSPC** follow the most stringent control and supervision procedures.

Every unit manufactured by **CSPC** is designed to operate under severe electrical substation and industrial plant conditions, complying with the most stringent electromagnetic, environmental and mechanical tests.

STANDARDS AND TESTS

Electrical

Immunity to electrostatic discharge	IEC 61000-4-2
Immunity to fast transient bursts	IEC 61000-4-4
Immunity to voltage surges	IEC 61000-4-5
Immunity to 1Mz damped wave	IEC 61000-4-12
Insulation resistance	IEC 255-5

Electromagnetic

Radiated electromagnetic interference	EN55011
Immunity to radiated radiofrequency fields	IEC 61000-4-3
Immunity to conducted radiofrequency signals	IEC 61000-4-6
Immunity to 50Hz magnetic fields	IEC 61000-4-8

Mechanical

Vibration	IEC 255-21-1
Shock and bump	IEC 255-21-2

Environmental

Damp heat	IEC 68-2-3
Dry heat	IEC 68-2-3
Cold	IEC 68-2-1
Change of temperature	IEC 68-2-14

Other Product Ranges from CSPC



BASIC RANGE

- Micro-controller based compact economical design
- DIN rail mounted
- Status indication via LED
- Step-less settings through front potentiometer



FUNCTIONAL RANGE

- Genset Supervision & Control
- Auto Synchroniser
- Load Balancing & Control
- Related Protection



INTEGRATED RANGE

- Complete numeric protection, solution for sub-station in association with TEAM-ARTECHE, Spain
- Distance protection
- Comprehensive transformer protection –
 - a. Three winding transformer
 - b. Two winding transformer
- Multi-functional relay: variety of protection combination

For further information, please contact :

CSPC

C&S Protection & Control Ltd.

44, Okhla Indl. Estate, New Delhi-110020, Ph.: 011-55602414, 26319465-66 Fax: 011-55602413 email: cspc@controlsindia.com

Marketing Office : DELHI : Ph.: 55602414, 26319465-66 Fax: 55602413 CHANDIGARH : Ph. 2776154, 2776151, 2726153 Fax: 2726154
KOLKATA : Ph. 24549607-08 Fax: 24549371 MUMBAI : Ph.: 24114727-28 Fax : 24126631 PUNE : Ph.: 5444822-824, Fax: 5410820,
AHMEDABAD : Ph.: 65841425, 6589132 Fax : 6589132 BANGALORE : Ph.: 5586147, 5323582, 5594939 Fax: 5582796,
CHENNAI : Ph.: 26426475, 26426572 Fax: 26411972 HYDERABAD : Ph.: 27813003, 55332304 Fax: 27812987