

**MOTOR
PROTECTION
RELAYS**
for
Total Peace of Mind



L&T Electrical & Automation (E&A) is a market leader for electrical distribution, monitoring and control solutions in the low voltage category.

Popular among customers as L&T Switchgear, E&A offers a wide range of low and medium voltage switchgear, motor starters, electrical systems, industrial automation, building electrical solutions, energy management solutions, electrical modernization solutions and metering solutions. Its products and solutions cater to key sectors of economy like industries, utilities, infrastructure, building and agriculture.

E&A's manufacturing operations at Navi Mumbai, Ahmednagar, Vadodara, Coimbatore and Mysuru in India adhere to global practices of excellence and receive support from well-equipped in-house design and development centres as well as tooling facilities that contribute to precision in manufacturing.



Switchgear Factory, Navi Mumbai



Switchgear Factory, Ahmednagar



Switchgear Factory, Vadodara

L&T Electrical & Automation (E&A), is India's largest manufacturer of low voltage switchgear, with the scale, sophistication and range to meet global benchmarks. With over five decades of experience in this field, the Company today enjoys a leadership position in the Indian market with a growing international presence.

It offers a complete range of products including powergear, controlgear, industrial automation, building electricals & automation, reactive power management, energy meters, and protective relays. These products conform to Indian and International Standards.

E&A offers a wide range of Numerical relays suitable for LV & MV power distribution systems. These relays are manufactured at E&A's Mysore works equipped with modern infrastructure and employing latest manufacturing and testing equipment.

The selection of Motor Protection System should be based on the cost and application of the electric motor. Its appropriate selection not only prevents motor damage, but also ensures optimal process efficiency with minimal interruption.

Pick the motor protection relay that meets your needs:

Index	Nos.
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MPR200nX / MPR300	4
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REO ELECTRONIC OVERLOAD RELAY

A compact Electronic Overload Relay [EOLR] for protection of LV Motors. Inbuilt phase failure protection and site selectable trip class - 10A, 10E, 20E, 30E ensures accurate motor protection in various applications like fans, pumps, crushers, compressors, belt conveyors, cranes, escalators etc.

Protections offered

46, 49, 51R

- Thermal Overload
- Phase Unbalance
- Phase Loss
- Locker Rotor



Features

- Selectable Trip Class – 10A, 10, 20 and 30
- Auto/ Manual/ Remote Reset facility
- 3 output contacts for Trip, Alarm and Start function
- Direct mounting on MO contactors - up to 45 Amp

Accessories

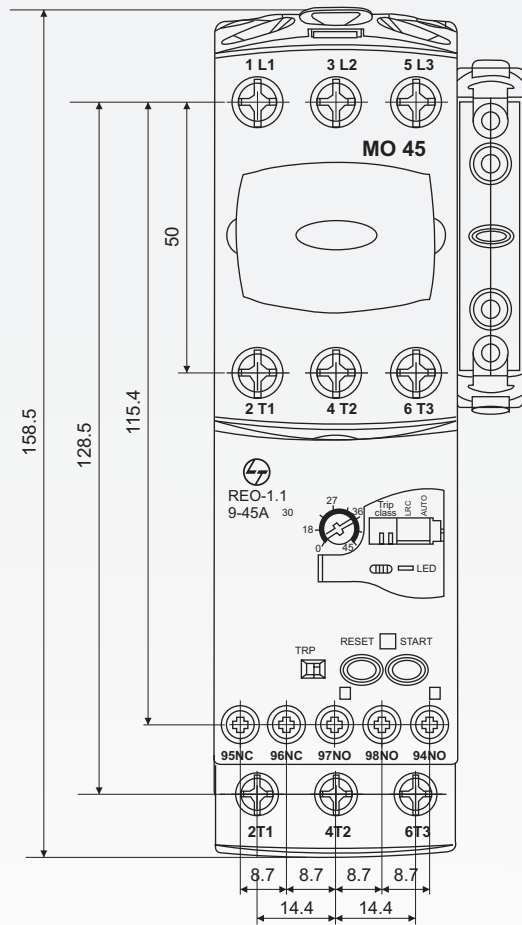
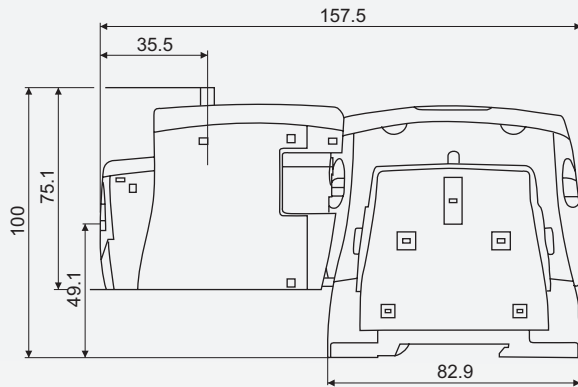
- Separate mounting kit
- Remote reset cord

Technical Details

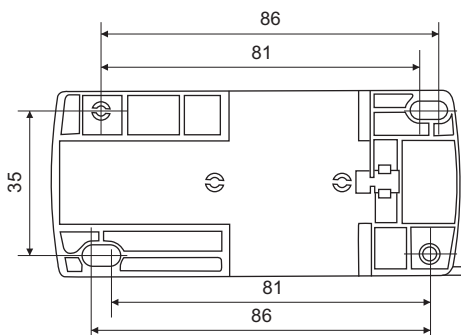
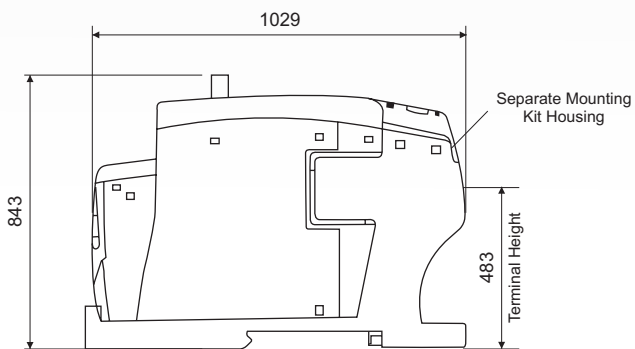
Type	REO 1.1	REO 4
Main Circuit		
Conformance to Standards	IS/IEC 60947-4-1, IEC 60947-4-1, EN 60947-4-1	
Range	0.15-0.75A, 0.6-3A, 2.4-12A, 9-45A	18-90A, 72-360A, 270-1350A
Mounting	Direct / Separate	Separate
Direct Mounting on Contactors	MO 9 - 45	-
Degree of Protection	IP 20	
Rated Operational Voltage	415 V, 50 Hz / 480V, 60Hz	
Trip Class (Selectable)	10A, 10E, 20E, 30E	
Temp Compensation	(-20° to +55°) C	
Protection Inbuilt	Overload, Single Phase, Phase Unbalance, Locked Rotor	Overload, Single Phase, Phase Unbalance, Locked Rotor
Terminal Capacity (Main)	Solid - 2 x 2.5 to 10 sq. mm. Finely Stranded - 2 x 2.5 to 6 sq. mm. Tightening Torque - 1.2 Nm. Type of Screw - M4	Solid : 1 x 4...240, 2 x 2.5...150 mm Finely Stranded : 1 x 4... 240 mm ² Finely Stranded : 2 x 2.5... 150 mm ²
No. of Contacts	1NO - Alarm 1NO - Start 1NC - Trip	
Rated Insulation Voltage	1000V	
Rated Impulse Withstand	6 kV	
AC-15 Rating	2A @ 415 V, 50 Hz	

Overall Dimensions

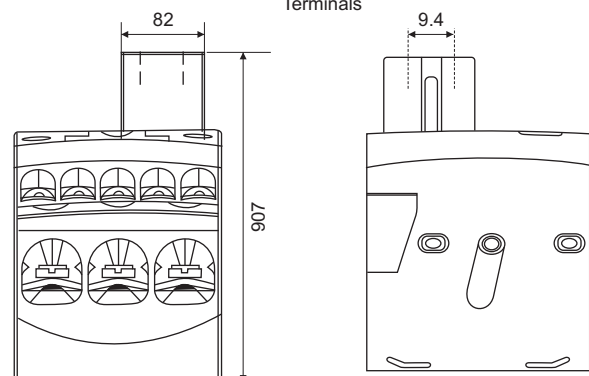
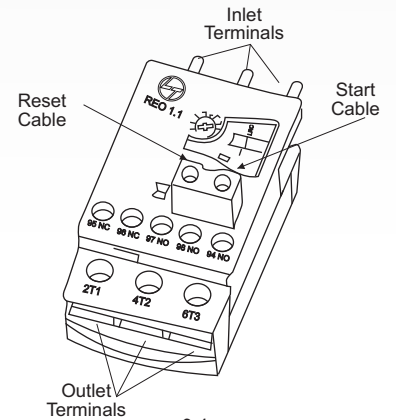
REO-1.1 Mounted on MO45



Assembly of separate mounting kit

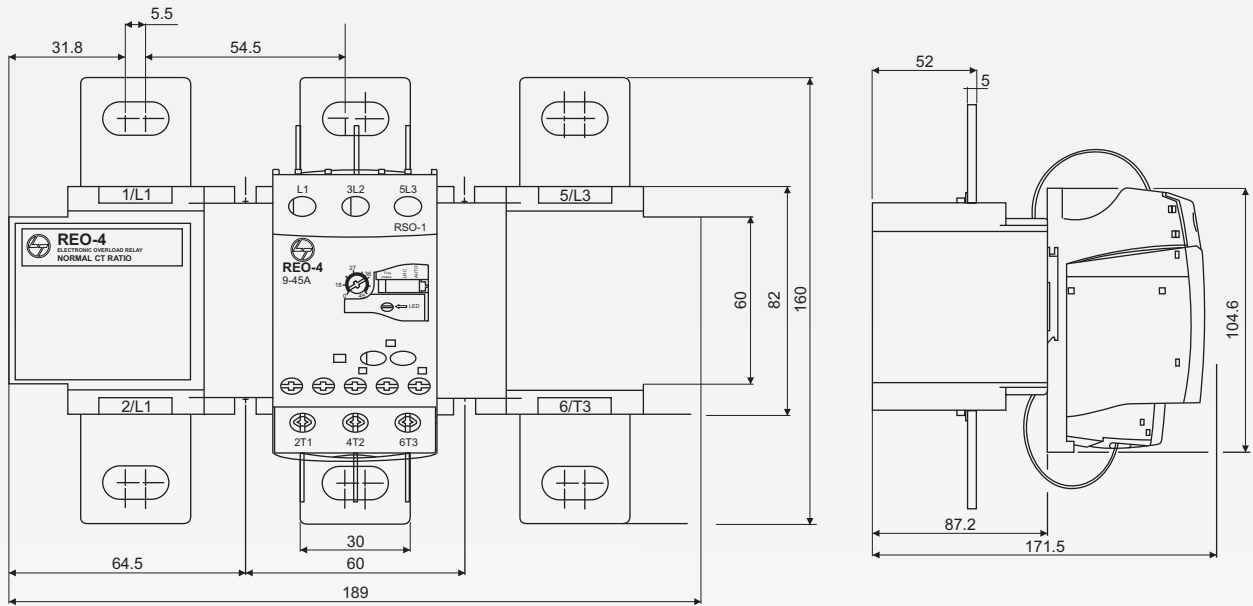


Reset Cord Fitment



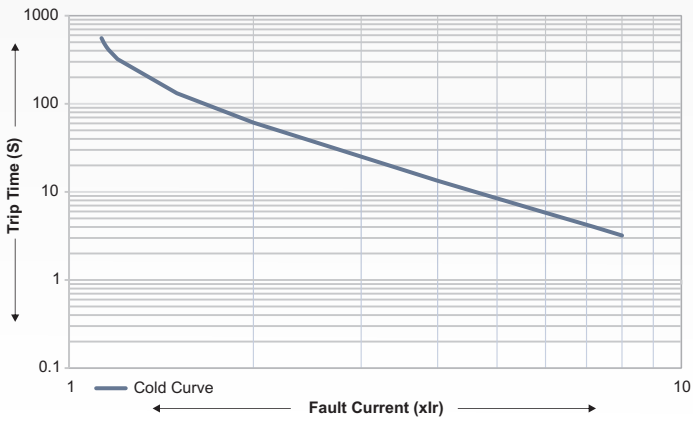
All dimensions in mm.

REO-4 Assembly

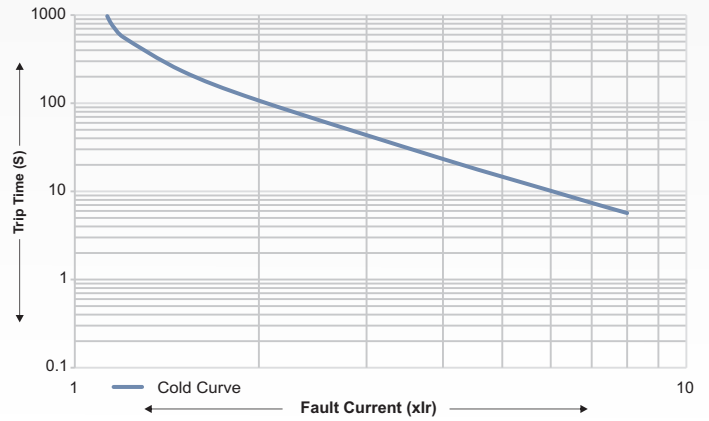


I-T Characteristics

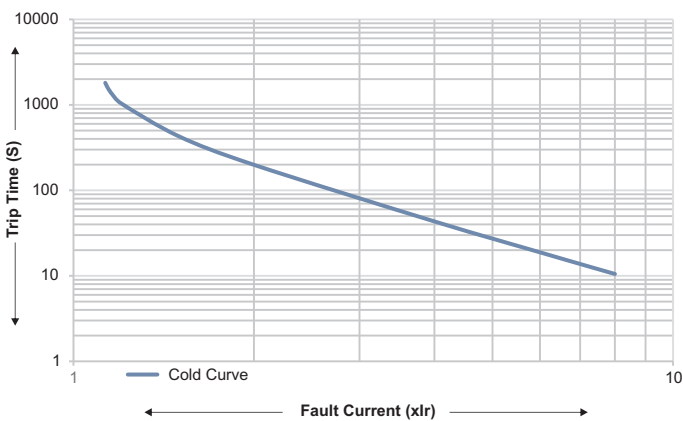
EOLR - Class 10A (7.2Ir @ 4s) Hot & Cold Curve



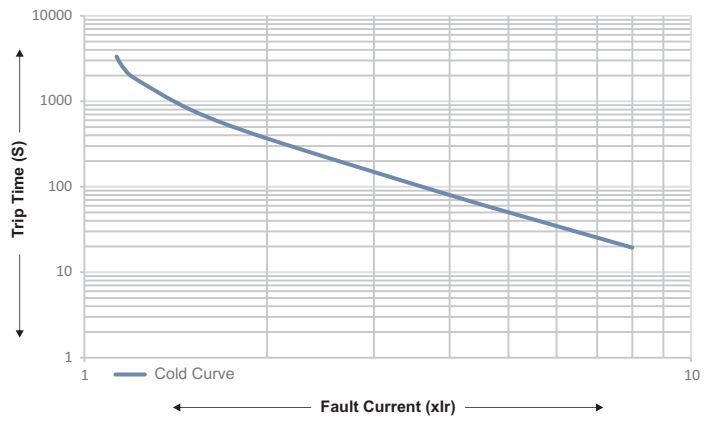
EOLR - Class 10E (7.2Ir @ 7s) Hot & Cold Curve



EOLR - Class 20E (7.2Ir @ 13s) Hot & Cold Curve



EOLR - Class 30E (7.2Ir @ 24s) Hot & Cold Curve



MPR200nX / MPR300

MPR200nX / MPR300 is a microcontroller based LT Motor protection relay. The relay has got inbuilt CTs for motor sizes up to 50KW (i.e. 88 A current)

Protections offered:

49, 51LR, 37, 64*, 46

- Thermal Overload
- Earth Fault (MPR300 only)
- Single Phasing, Current unbalance
- Phase sequence reversal
- Locked Rotor
- Under Current



Application

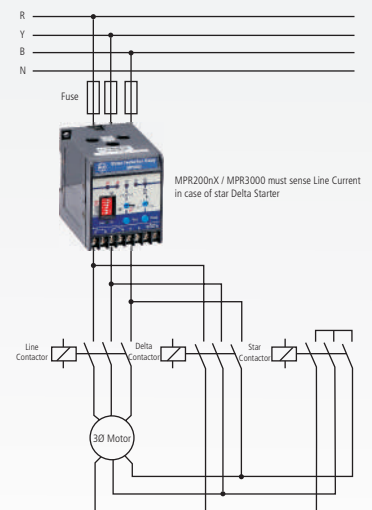
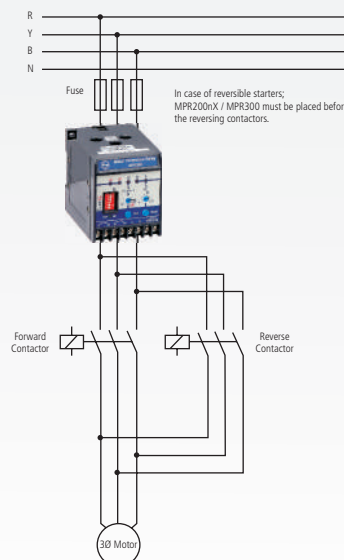
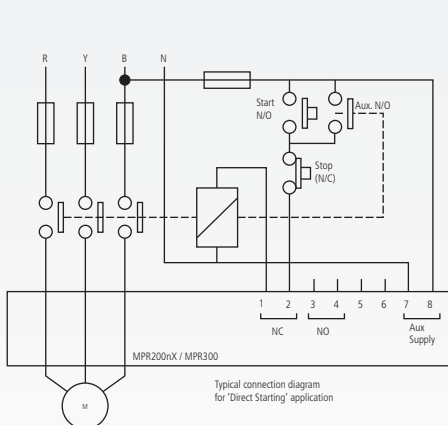
- These relays are used for protection of motors widely used in fans pumps, crushers, mills, compressors, belt conveyors, centrifuges, mixers, ventilators, escalators, motorized valves etc.
- MPR 300 offers you greater security, operator safety through proper co-ordination in case of earth fault on motor feeder.

Features

- LED's for trip indication.
- 4 selectable trip time curves for thermal overload
- Test facility through front push button.
- Manual reset facility through front push button.
- With / Without fail safe mode.*

*Model with fail-safe logic is available on request. For technical info on fail-safe logic refer Appendix i

Wiring diagram

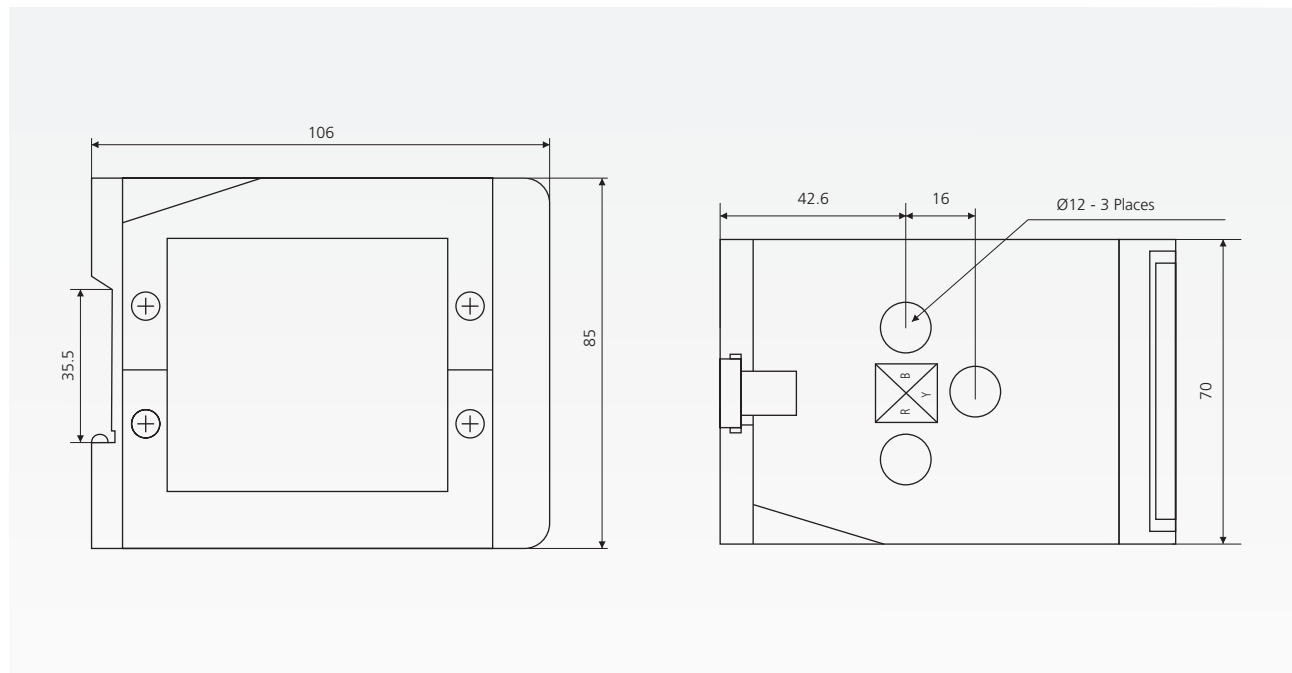


Technical specifications

Parameters		MPR200nX / MPR300
Protections	ANSI nos.	49, 51LR, 37, 64*, 76
	Description	Thermal overload, Earth fault*, Single Phasing, Locked rotor Under Current, Current Unbalance, Phase sequence reversal
Current range		1 - 88A
Overload trip class		10A, 10, 20, 30
Auxiliary power supply		240V AC +/- 20%
		110V AC +/- 20%
Contact		1N/O + 1N/C - manual reset
Contact Ratings	Rated Voltage	25V AC / 30V DC
	Rated Current	5A
	Rated breaking capacity	2000 VA / 240 W (Resistive)
Dimensions (W x H x D) in mm		70 x 85 x 106
Mounting		DIN Rail
Weight		< 400 grams
Operating Temperature		0 to 60 deg.C
Accuracy		As per IEC 947-4-1
Reference Standards		IEC 60255, IEC 61000 and IEC 60068

* Available only in MPR300

Dimensions



MM10

Mm10 is a Compact Microprocessor based Motor Protection Relay for medium and large size Motors

Protections offered:

37, 46, 49, 50/ 51, 51LR, 64

- Thermal Overload With Warning
- Under Current
- Unbalance
- Phase Loss
- Phase Sequence Reversal
- Earth Fault
- Prolong Starting, Locked Rotor
- Short Circuit

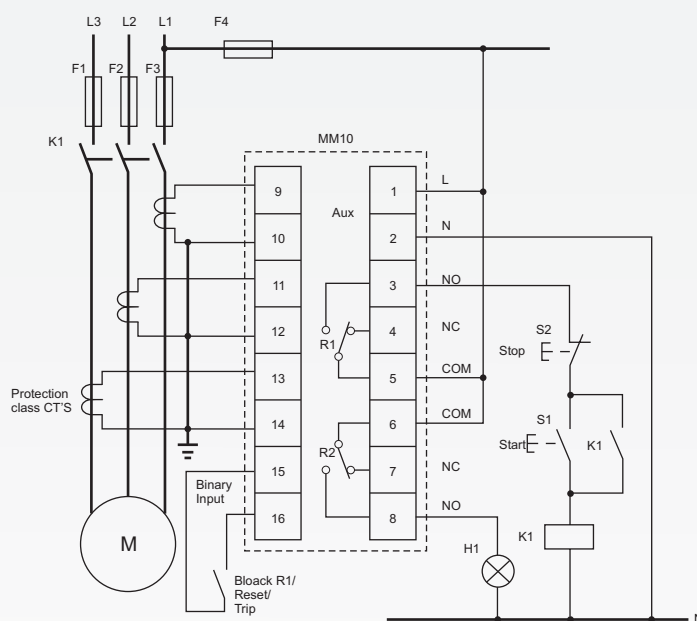


Features

- 4 Digit LED display
 - Measurement of RYB, Zero Sequence current and Thermal capacity.
 - Separate LED's for indication of Motor operational, Trip & Thermal OL/ pre-alarm status.
 - Programmable thermal OL time constant right from 1 sec to 40 sec.
 - 2 nos. of C/O output contacts.
- The relay 2 output is programmable type. It can be configured for following conditions:
- On any tripping
 - On thermal tripping
 - On thermal Warning

- Relay output 'R1' works with fail-safe logic. For technical info on fail-safe logic, refer Appendix I
- 1 no. Programmable Binary input for remote operation. It can be configured for either of these operations:
 - Inhibit Motor Start
 - Trip Reset
 - Instant Tripping
- Relay testing facility
Test push button to check working of relay contacts.
- Trip data recording
Fault current or cause of last trip is displayed

Wiring diagram

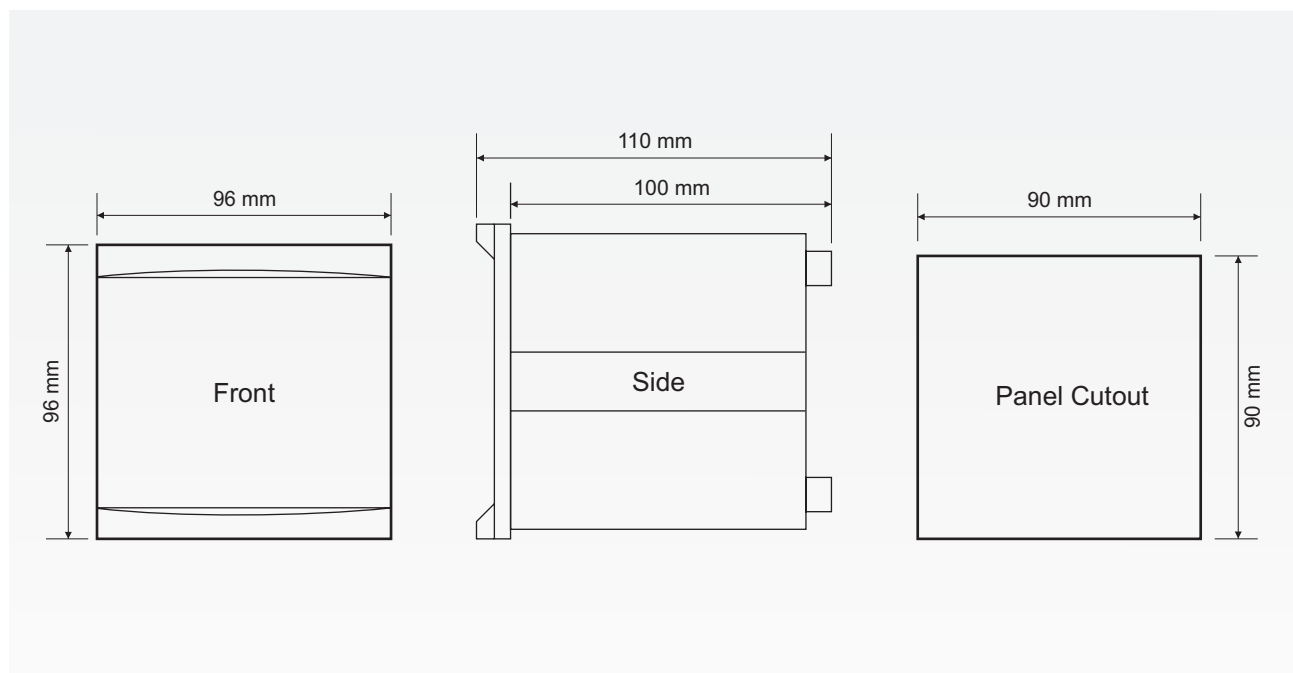


External CT's - Protection class CT's [5 - 1000 Amps] with 5 Amp secondary

Technical specifications

Functions		MM10
Protections	ANSI nos.	37, 46, 49, 50/51, 51LR, 64
	Description	Thermal overload with Warning, Short Circuit, Under Current, Unbalance, Phase Loss, Phase Sequence Reversal, Earth Fault, Prolong Starting, Locked Rotor
Metering		I _R , I _V , I _B , I _o , Thermal Capacity
Digital Input + Output		1 DI + 2 CO Type DO
Monitoring		Last 1 Trip
Auxiliary Supply		110 - 240V AC/DC
Current Input		5 A CT secondary
Binary Input Voltage Rating		12 V supplied internally
Output Contact	Rating	5 A, 250 VAC (cosφ = 1)
	Operating time	15 ms Max
	Electrical life	1,00,000 Operations at IR
	Mechanical life	5 x 10 ⁶ Operations
Maximum Power Consumption		3 VA typical
Burden on CT		0.3 VA at Rated Current
Operating Temperature		-5°C to 55°C
Degree of Protection		IP52
Weight		0.75 Kg
Mounting		Panel Mounted
Dim W x H x D in mm		96 x 96 x 110
Panel Cut Out in mm		90 x 90

Dimensions



iMMR

iMMR is an Intelligent Motor Control Centre (IMCC) Relay. It has been designed as a reliable building block for low voltage, contactor - controlled motor starter feeders in switchgear assemblies. The new iMMR series offers comprehensive Motor Protection along with Control and Monitoring features.



iMMR Main Unit -

- An extremely compact motor protection relay with control and monitoring functions.
- 4 DI + 3 DO available to take care of DOL, Star-Delta and RDOL starters
- 4 LED's for easy troubleshooting and a RESET button is available on main unit.
- Inbuilt Modbus RTU protocol.

Display Unit -

- An self-powered display module provides easy interface for monitoring and configuration of iMMR
- The display unit is a detachable optional unit provided with iMMR for display of all metering, protection and fault data.
- 5 LED's and START/ STOP/ RESET buttons are available on Display unit.

CT/CTVT Unit -

- iMMR comes with its own current module and current + Voltage module in two sizes and suitable for use from 0.3 Amp to 25 Amp

User Friendly Options & Features

Highly scalable IO - 4 digital input and 3 changeover digital outputs are available in base unit.

Universal Operating environment - Auxiliary supply range of 80 – 240 VAC/VDC

Metering - Includes line, neutral & average current, line voltage & phase voltages, Power, Energy, Power Factor, Temperature and Thermal Capacity

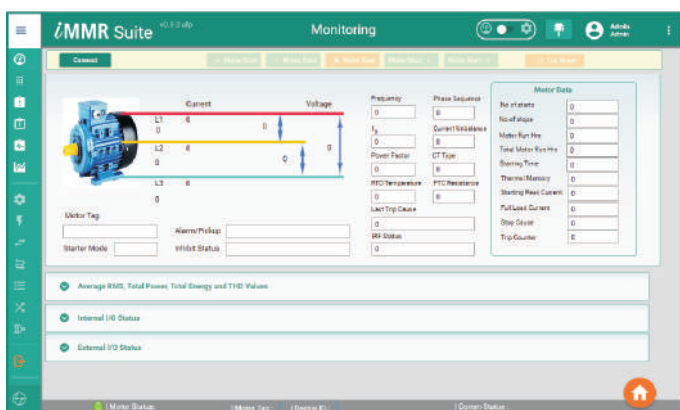
Monitoring – 100 events & 20 trip data recording with date & time stamping. Recording of No. of start, Stop, Starting Curve, starting time is also available.

Communication - iMMR can be connected to Plant Control System (SCADA/DCS) through Modbus RTU communication protocol

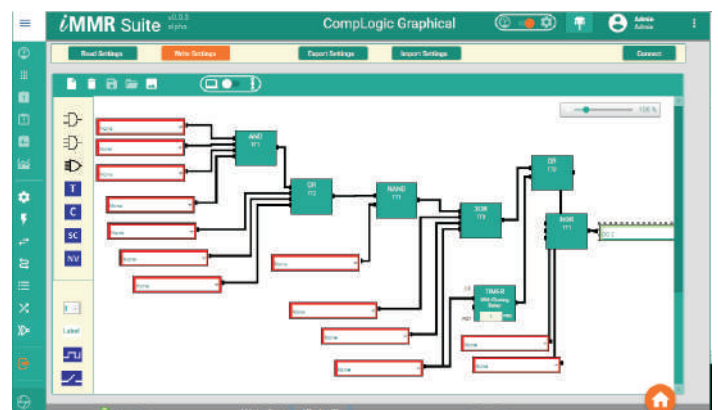
Temperature Monitoring - Unit takes input from RTD or PTC.

iMMR Suite - This software for local parameterization and monitoring of iMMR Relay. Users can create, save, read, and write the settings.

iMMR Suite



Graphical Logic



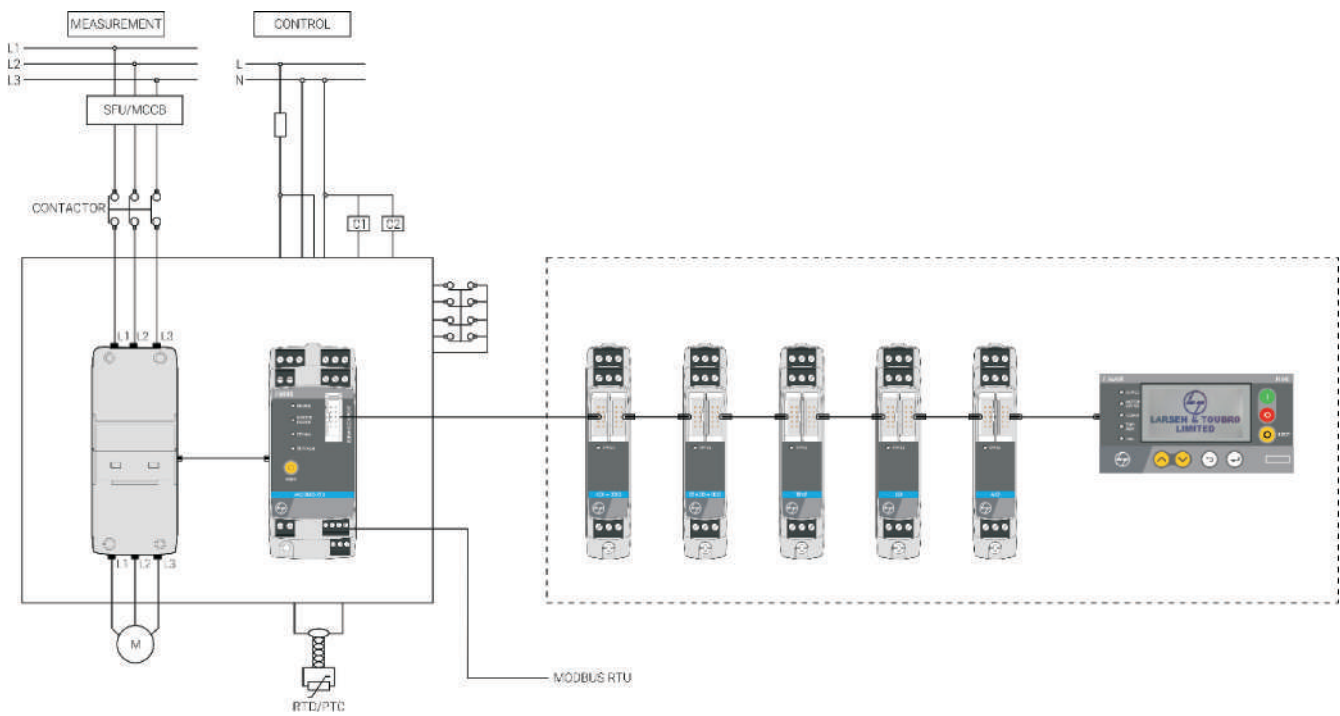
Setting Range Chart for Protections

Protection Function	Variable	Range
Thermal Overload	Alarm	80-100% of TM
	Thermal reset level	30-95% of TM
	Cool down time	0.0 – 6000.0 Sec
Under Current	Pick up	15 - 100% Iflc
	Alarm	100-115%
	Trip Delay	0.100 –6000 Sec
NI Over Current	Pick up	20 - 1000%Iflc
	Alarm	25-100 % of Pick up
	Trip Delay	0.100 - 200 Sec
Stalled Rotor	Pick up	50 - 1000% Iflc
	Alarm	25-100 % of Pick up
	Trip Delay	0.100 – 6000.0 Sec
DT Over current	Pick up	50 - 1000% Iflc
	Alarm	25-100 % of Pick up
	Time During Start	0.100 – 6000.0 Sec
Locked Rotor	Time During Run	0.100 – 6000.0 Sec
	Pick up	150 - 1000% Iflc
	Alarm	25-100 % of Pickup
Short Circuit	Trip Delay	0.100 - 6000.0 Sec
	Pick up	100 - 1000% Iflc
	Alarm	25 - 100% of Pick up
Current Phase Loss	Trip Delay	0.050 - 10 Sec
	Time Delay	0.100 – 6000.0 Sec
	Pick up	10 - 500% Iflc
Earth Fault (Internal) Or External)	Alarm	25-100 % of Pick up
	Trip Delay	0.5 - 10 Sec
	Pick up	0.030 - 40A
Under Volatge	Alarm	25-100%
	Trip Delay	0.100 - 6000 Sec
	Pick up	25 - 100% Vn
Over Volatge	Alarm	110% of Pick up
	Trip Delay	0.100-6000 Sec
	Pick up	101 - 130% Vn
Current Phase Reversal	Alarm	25-100 %
	Trip Delay	0.1000-6000 Sec
	Time Delay	0.100 – 6000.0 Sec
Voltage phase unbalance	Pick up	5-50%
	Alarm	Equal to Pickup level
	Trip Delay	0.100 – 6000.0
Voltage phase reversal	Time Delay	0.100 – 6000.0 Seconds
Voltage phase loss	Time Delay	0.100 – 6000.0 Sec
Over Frequency	Pick up	100-110%
	Alarm	99% of Pickup
	Trip Delay	0.100 – 6000.0 Sec
Under Frequency	Pick up	90-100%
	Alarm	101% of Pickup
	Trip Delay	0.100 – 6000.0 Sec
Over Power	Pick up	20-1000% of Pn
	Alarm	20-1000% of Pn
	Trip Delay	0.100 – 6000.0 Sec
Under Power	Pick up	20-1000% of Pn
	Alarm	20-1000% of Pn
	Trip Delay	0.100 – 6000.0 Sec
Over PF	Pick up	0.4 – 1.00
	Alarm	0.4 – 1.00
	Trip Delay	0.100 – 6000.0 Sec

Metering Specifications

Monitoring	Specifications
Event & Trip Records	Stores last 20 trip records with the date and time stamp
	Stores last 100 Event records with the date and time stamp
Hour Meter	Records and Stores last operational stops and total operational hours
Start, Stop, Trip Counter	Records and stores number of starts, stops and trip of the motor
Starting Curve	Records and stores starting characteristics of motor
Starting Time	Records and stores the Start time of the motor
Starting Peak current	Record the peak current during starting of the motor
DI/DO Status	Displays real time status (high or low) of digital input and output of the relay

Typical Wiring Diagram –



Advanced Features

Control Functions / Starters:

- Re-acceleration
- Maximum number of starts
- Anti-back spin timer
- Starters:
 - Overload Relay
 - DOL
 - RDOL
 - Start Delta Starter

Logic Functions:

- Truth tables
- Timers, Counters
- Volatile / Non-volatile signal conditioners
- Flashing / Flickering

Communication:

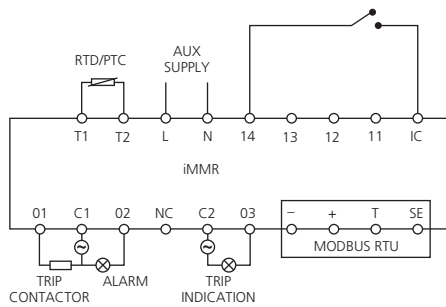
- Modbus RTU:
 - RS 485 Interface
 - 4800 - 115200 bps baud rate
 - Registers - Read / write coil, Holding registers Read Input, discrete input registers

Product Specifications

Current Measurement	
Range	Type 1 : 0.3 - 3A AC Type 2 : 2.5 - 25A AC
Accuracy	+/- 1% in nominal range
Voltage Measurement	
Range	60 - 690V AC
Accuracy	+/- 1% in nominal range
Frequency Measurement	
Range	45Hz - 65Hz
Accuracy	+/- 1% in nominal range
Power Measurement	
Active Power Accuracy	+/- 2% in nominal range
Power Factor Range	0.4 - 1.0
Power factor Accuracy	+/- 0.03

Standard Schematic

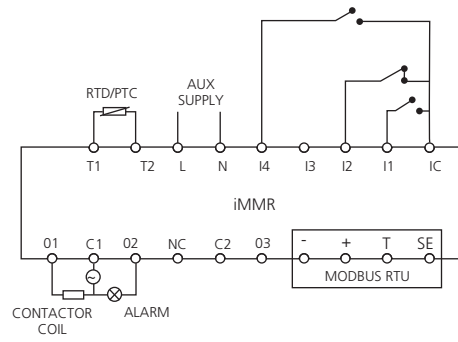
OVERLOAD



DI/DO	TERMINAL NO.	FUNCTION/SOURCE	ACT.TYPE	APPLICATION
DO1	O-C1	TRIP	ACT.LOW	CONTACTOR CONTROL
DO2	O2-C1	ALARM	ACT.HIGH	ALARM INDICATION
D4	IC-4	TRIP RESET	ACT.HIGH	TRIP RESET
DO3	O3-C2	TRIP	ACT.HIGH	TRIP INDICATION

Note: DI - Potential Free Signal
DO - Potential Free Contact

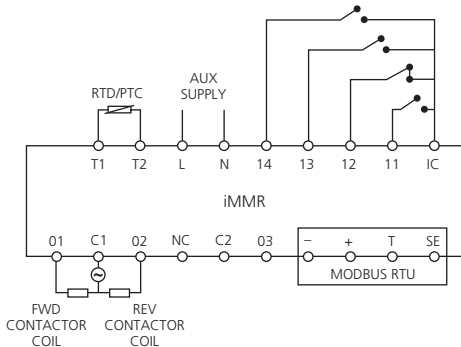
DOL



DI/DO	TERMINAL NO.	FUNCTION/SOURCE	ACT.TYPE	APPLICATION
DI1	IC-1	LSTRT>	ACT.HIGH	LOCAL START
DI2	IC-2	LSTOP	ACT.LOW	LOCAL STOP
D4	IC-4	TRIP RESET	ACT.HIGH	TRIP RESET
DO1	O1-C1	CONTACTOR O/P1	ACT.HIGH	CONTACTOR COIL
DO2	O2-C1	ALARM	ACT.HIGH	ALARM INDICATION

Note: DI - Potential Free Signal
DO - Potential Free Contact

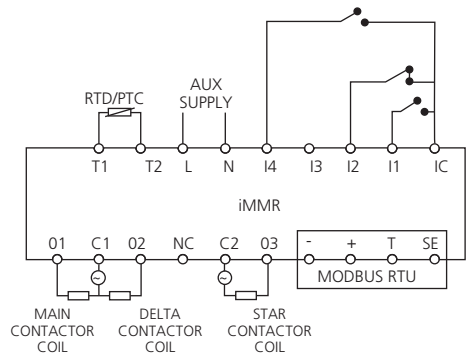
RDOL



DI/DO	TERMINAL NO.	FUNCTION/SOURCE	ACT.HIGH	APPLICATION
DI1	IC-1	LSTRT >	ACT.HIGH	LOCAL START FWD
DI2	IC-2	LSTOP	ACT.LOW	LOCAL STOP
DI3	IC-3	LSTRT <	ACT.HIGH	LOCAL START REV
D4	IC-4	TRIP RESET	ACT.HIGH	TRIP RESET
DO1	O1-C1	CONTACTOR O/P1	ACT.HIGH	FW CONTACTOR COIL
DO2	O2-C1	CONTACTOR O/P2	ACT.HIGH	REV CONTACTOR COIL

Note: DI - Potential Free Signal
DO - Potential Free Contact

STAR-DELTA



DI/DO	TERMINAL NO.	FUNCTION/SOURCE	ACT.TYPE	APPLICATION
DI1	IC-1	LSTRT>	ACT.HIGH	LOCAL START
DI2	IC-2	LSTOP	ACT.LOW	LOCAL STOP
D4	IC-4	TRIP RESET	ACT.HIGH	TRIP RESET
DO1	O1-C1	CONTACTOR O/P3	ACT.HIGH	MAIN CONTACTOR COIL
DO2	O2-C1	CONTACTOR O/P2	ACT.HIGH	DELTA CONTACTOR COIL
DO3	O3-C2	CONTACTOR O/P1	ACT.HIGH	STAR CONTACTOR COIL

Note: DI - Potential Free Signal
DO - Potential Free Contact

Product Dimensions

iMMR Module Name	Dimensions (H x W x D) in mm
Main Module	112 x 45 x 90
CT1, CT1VT module	126 x 45 x 55
CT2, CT2VT module	126 x 45 x 55
Display Module	51 x 96 x 36

Metering Data

- Current - R, Y, B, EF, Unbalance
- Voltage, Frequency, KW, KVAR, KVA, PF, KWh, KVARh, KVAh
- Voltage and Current THD
- Thermal Memory, Motor status, Starting current and time
- Thermal time to trip, time to cool, Run hours

Appendix i

Product Selection Guide

Parameters		Models			
Category	Sub-Category	REO	MPR200nX / MPR300	MM10	iMMR
General	Display	✘	✘	4 Digit LED Display	4 line OLED Display
Current Input	CT Sec.	Inbuilt CT up to 1350A	Inbuilt CT up to 88A	5A	Its own CT unit up to 80A
	Thermal O/L (49)	✓	✓	✓	✓
	Earth Fault (51N / 64)	*	✓ (MPR300 only)	✓	✓
	Phase reversal	✘	✓	✓	✓
	Phase unbalance (46)	✓	✓	✓	✓
	Single Phasing	✓	✓	✓	✓
	Locked rotor protection(51LR)	✓	✓	✓	✓
Protection	Under current (37P)	✘	✓	✓	✓
	Overcurrent (51)	✘	✘	✓	✓
	Max. no. of starts(66)	✘	✘	✘	✓
	Short circuit (50)	✘	✘	✓	✓
	Sensitive Ground (50/51SG)	✘	✘	✘	✓ With (CBCT)
	Frequeny (81O/U)	✘	✘	✘	✓
	Voltage (27P/59P)	✘	✘	✘	✓
Input+Output	Basic		2 DO	1 DI+2 DO	4 DI+3 DO
	Expandability options	✘	✘	✘	✓
Metering	Current	✘	✘	✓	✓
	V, f, power, energy	✘	✘	✘	✓
Monitoring	Trip / Event record	✘	✘	1	20/100
Communication	Modbus RTU	✘	✘	✘	✓
	Modbus TCP/IP, Profibus	✘	✘	✘	Optional

✘ - Not available ✓ - Available

“*” - Available in REO 1.1G

Electrical Standard Products (ESP) Offices:

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