

# MOTOR PROTECTION RELAYS

for  
*Total Peace of Mind*





Larsen & Toubro is a technology-driven company that infuses engineering with imagination. The Company offers a wide range of advanced solutions in the field of Engineering, Construction, Electrical & Automation, Machinery and Information Technology.

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L&T Switchgear, a part of the Electrical & Automation business, 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.

L&T limited offers a wide range of Numerical relays suitable for LV & MV power distribution systems. These relays are manufactured at L&T '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:

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# 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

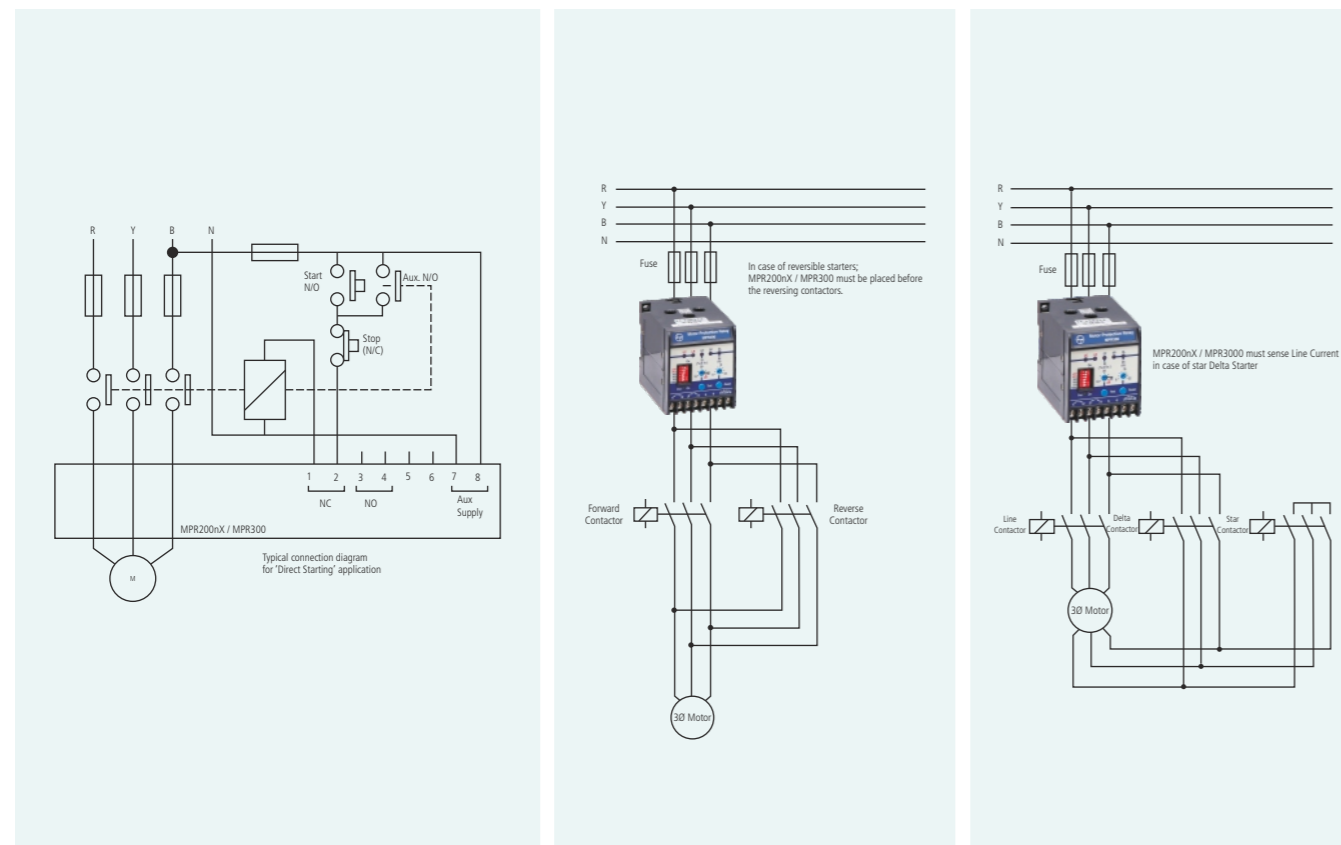
- These relays are used for protection of motors widely used in fans pumps, crushers, mills, compressors, belt conveyors, centrifuges, mixers, ventilators, escalators, motorized valves etc.
- MPR 300 offers you greater security, operator safety through proper co-ordination in case of earth fault on motor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

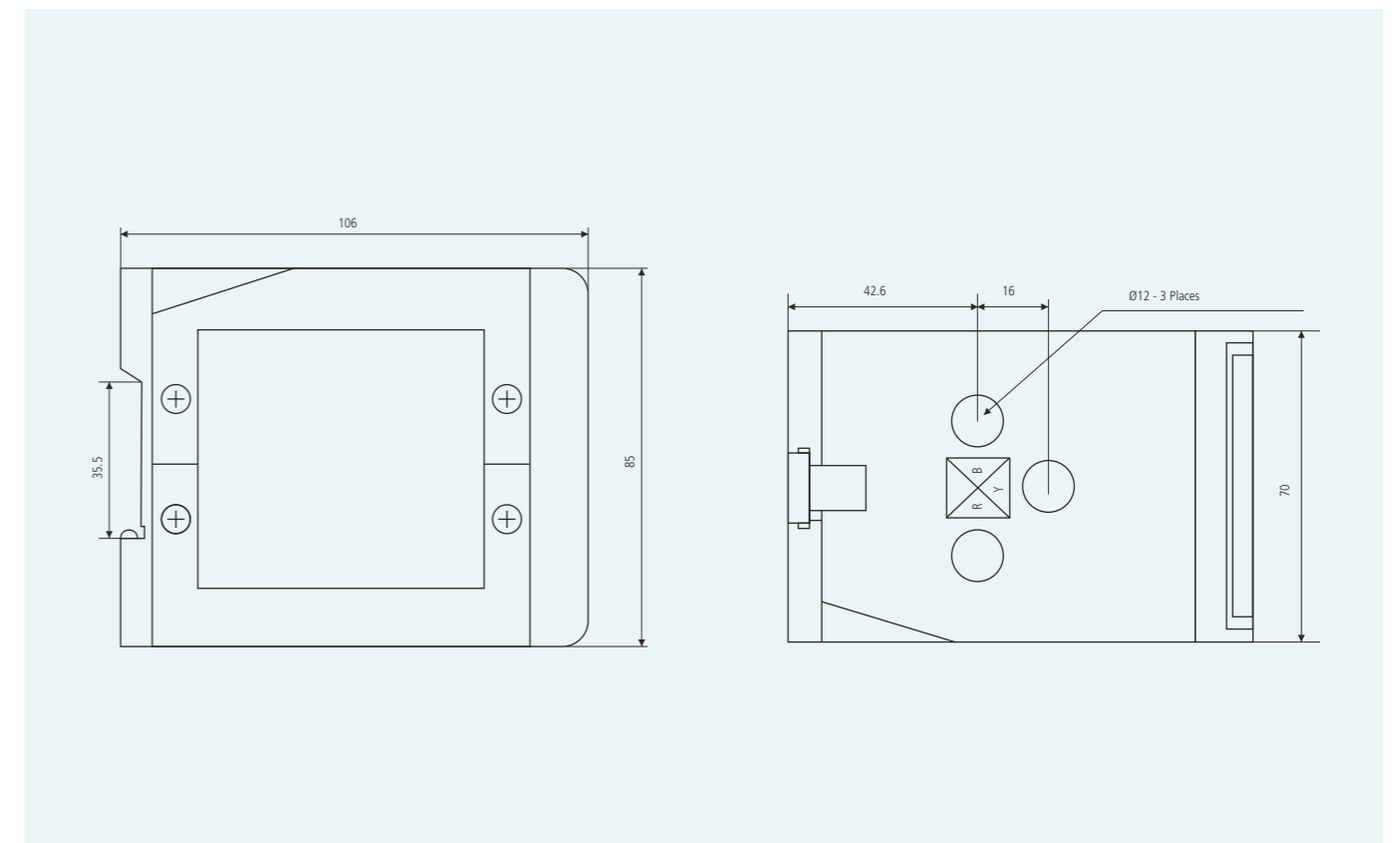


## Technical specifications

Parameters		MPR200nX / MPR300
Protections	ANSI nos.	49, 51LR, 37, 64*, 46
	Description	Thermal overload, Earth fault*, Single Phasing, Locked rotor, Under Current, Current Unbalance, Phase sequence reversal
Current range		1 - 88 A
Overload trip class		10A, 10, 20, 30
Auxiliary power supply		240 V AC +/- 20%
		110V AC +/-20%
Contacts		1 N/O + 1 N/C – manual reset
Contact Ratings	Rated Voltage	250 V AC / 30 V 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





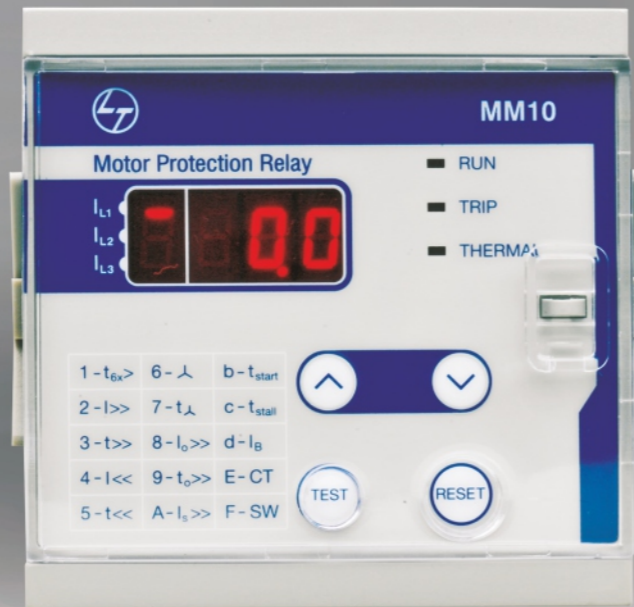
# MM10

MM10 is a Compact Microprocessor based Motor Protection Relay for medium and large size Motors

## Protections offered:

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

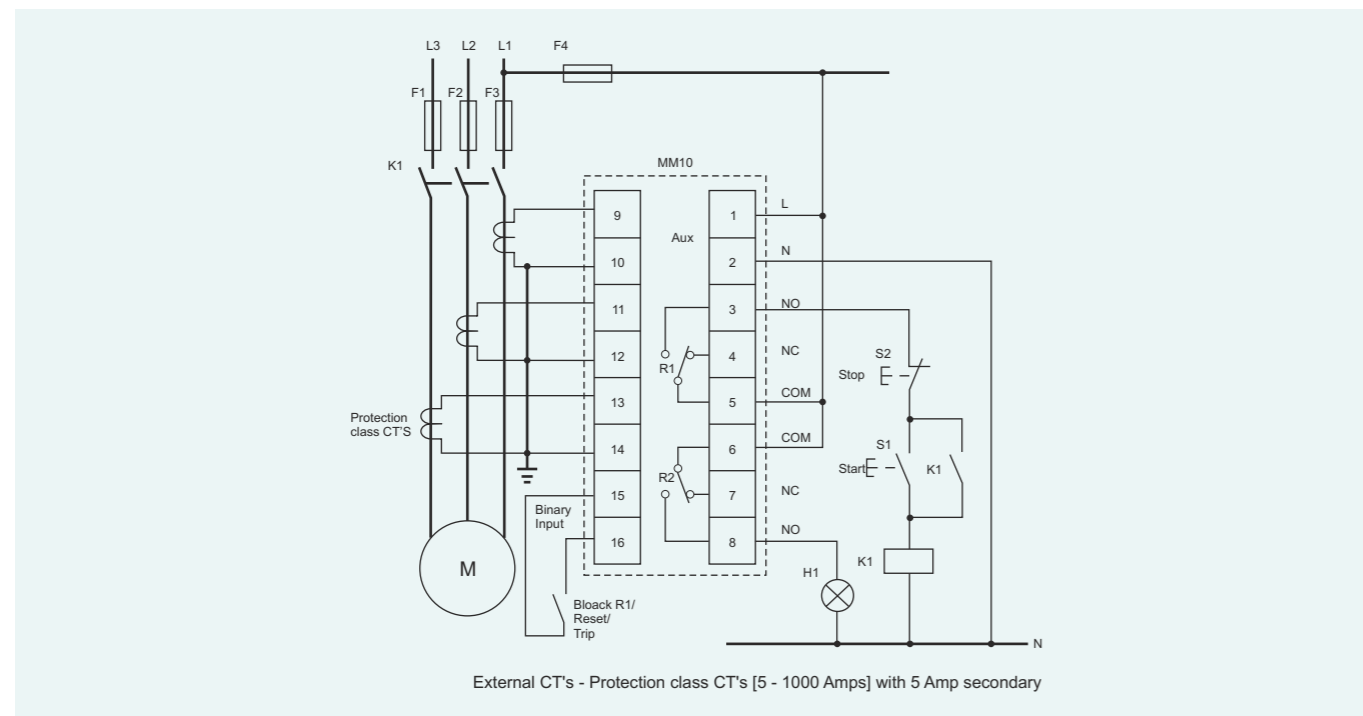
- Thermal Overload With Warning
- Under Current
- Unbalance
- Phase Loss
- Phase Sequence Reversal
- Earth Fault
- Prolong Starting, Locked Rotor
- Short Circuit



## 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.

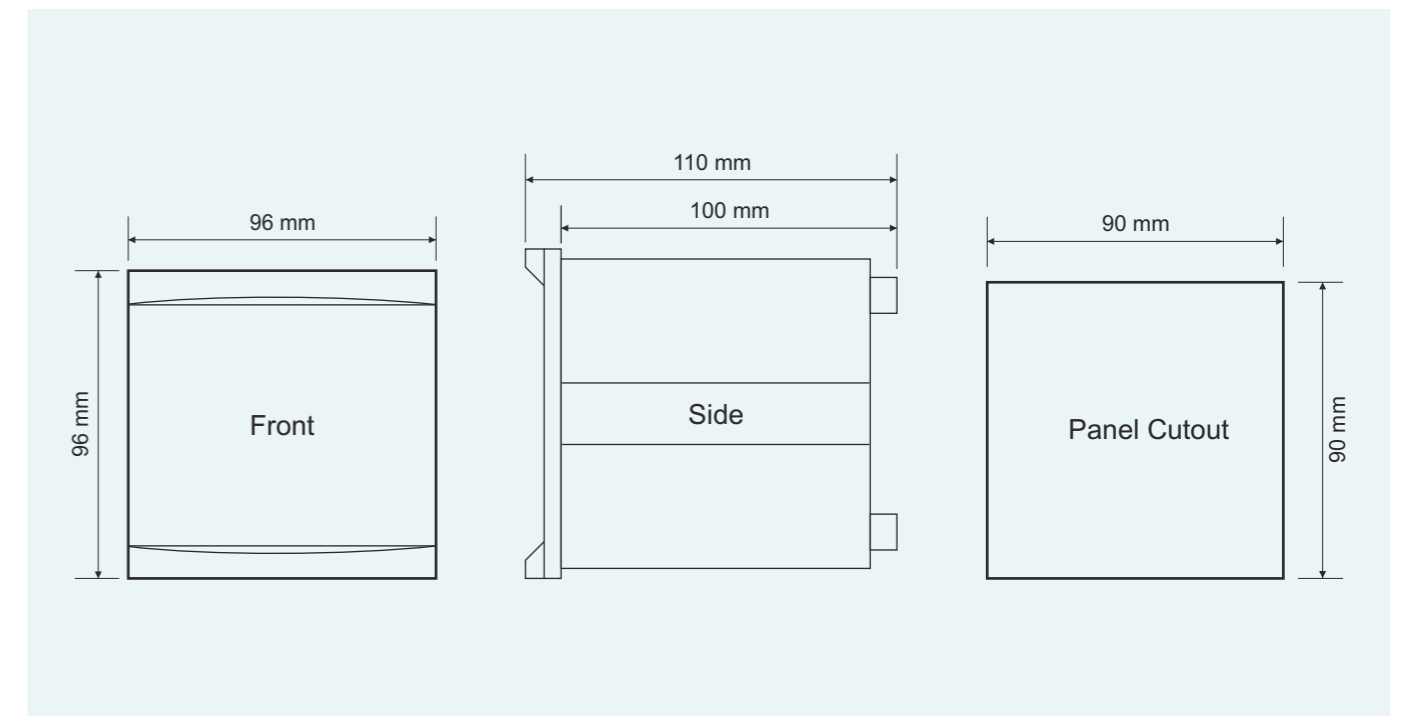
## Wiring diagram



## 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		$I_{Rr}$ , $I_{Vr}$ , $I_{Br}$ , $I_{Or}$ , Thermal Capacity
Digital Input + Output		1 DI + 2 CO Type DO
Monitoring		Last 1 Trip
Auxiliary Supply		110 - 240 V AC/DC
Current Input		5 A CT secondary
Binary Input Voltage Rating		12 V supplied internally
Output Contact	Rating	5 A, 250 VAC ( $\cos\phi = 1$ )
	Operating time	15 ms Max
	Electrical life	1,00,000 Operations at IR
	Mechanical life	$5 \times 10^6$ 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 WxHxD in mm		96 x 96 x 110
Panel Cut Out in mm		90 x 90

## Dimensions



# MM30

MM30 is a Microprocessor based Comprehensive Motor Protection Relay.

### Protections offered:

37, 46, 47, 48, 49, 50/51, 51LR, 64, 66, 68, 74

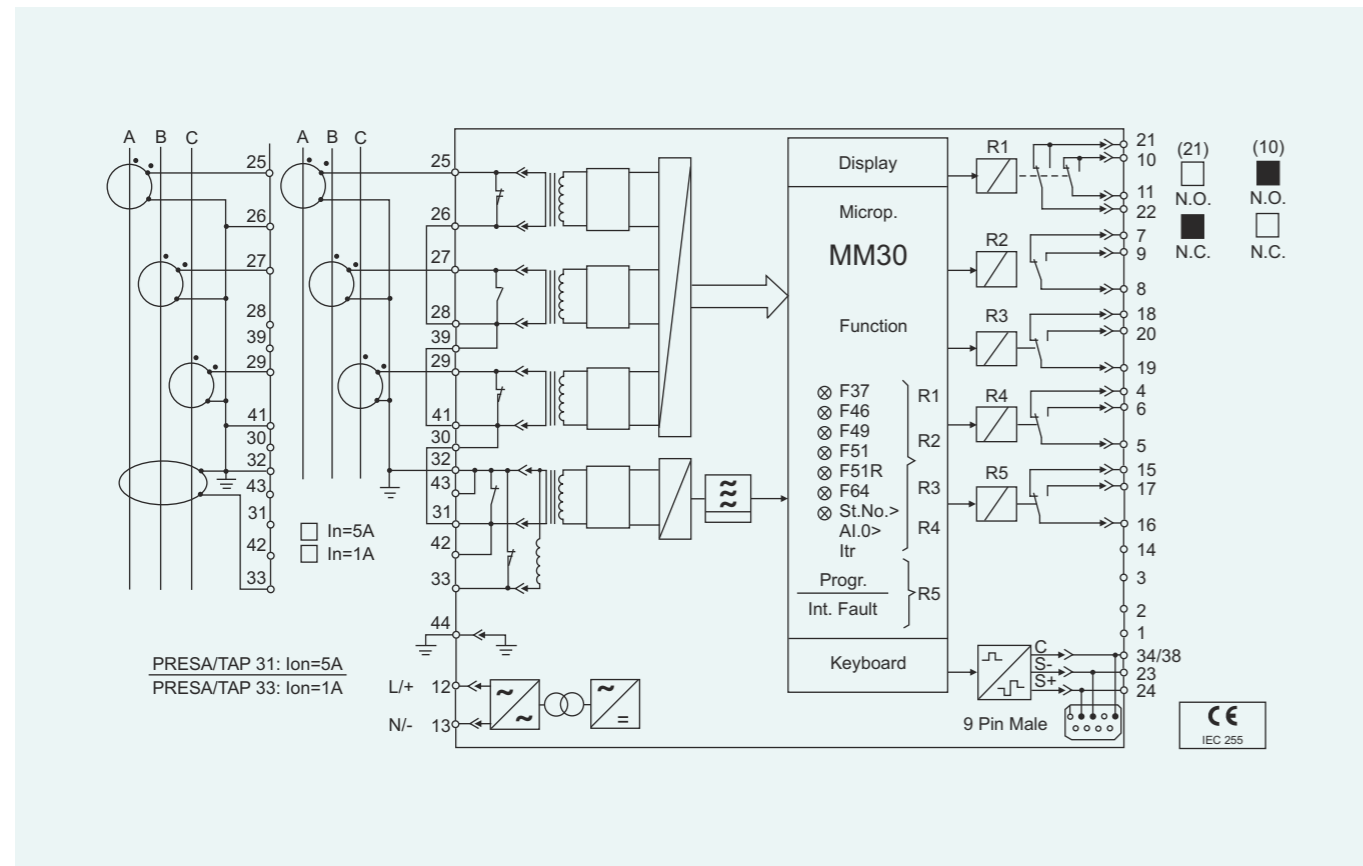
- Thermal Overload with Warning
- Over Current
- Under Current
- Unbalance
- Phase Loss
- Phase Sequence Reversal
- Earth Fault
- Prolong Starting, Locked Rotor



### Features

- Auto setting of parameters. By feeding just few parameters, other parameters can be automatically set.
- Draw out enclosure
- 8 digit alpha numeric display
- Real Time Measurements
- Measurement and display of actual and trip data recordings.
- 8 LED's for fault indication.
- Control on number of starts of motor
- Starting sequence control  
During start-up of the motor, the unit can control an output contact to automatically manage the starting transition.
- RS485 port for communication on Modbus Protocol

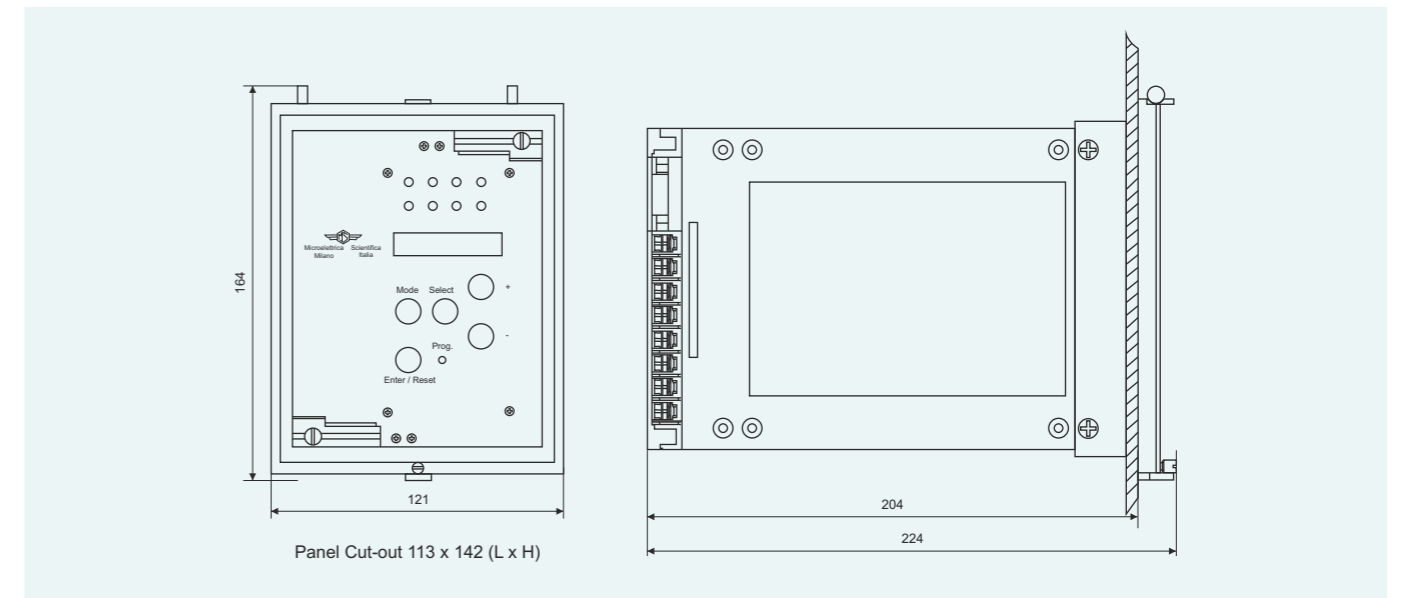
### Wiring diagram

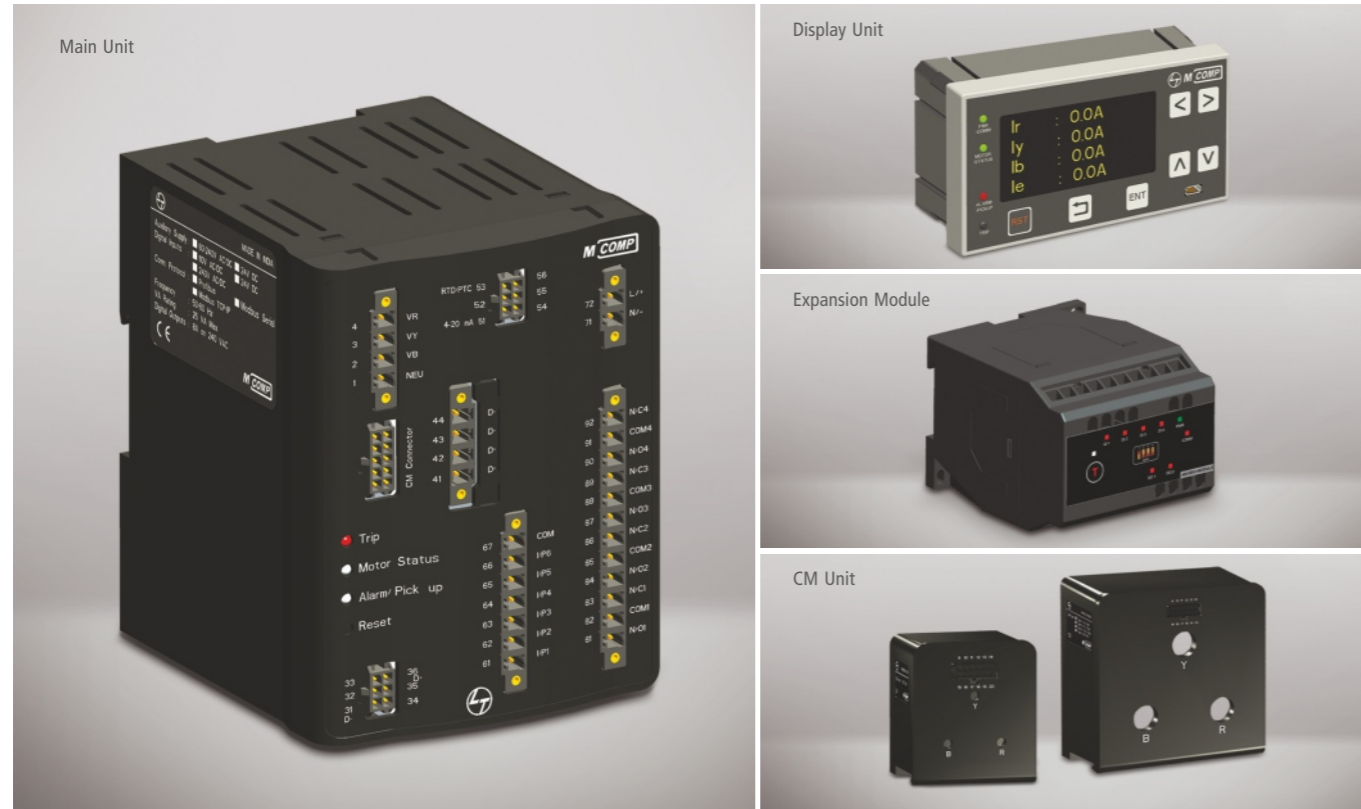


### Technical specifications

Functions		MM30
Protections	ANSI nos.	37, 46, 47, 48, 49, 50/51, 51LR, 64, 66, 68, 74
	Description	Thermal Image with prealarm level Earth Fault Current Unbalance, Phase reversal, Single Phasing Locked Rotor, Prolong Starting Over Current No-Load Running
Metering		$I_{Rr}$ , $I_{Vr}$ , $I_{Br}$ , $I_{Or}$ , Thermal Capacity
Digital Output		4 C/O + 1 C/O
Control		Starting Sequence Control
Monitoring	Temperature	✓
	Trip / Event record	5
Communication		Modbus RTU on RS485
Auxiliary Supply (Volts)		24 - 110 AC, 24 - 125 DC (±20%)
		80 - 220 AC, 90 - 250 DC (±20%)
Current Input		1/5 A CT Site selectable
Output Contact	Rating	5 A
	Operating time	40 ms max
	Electrical life	1,00,000 operations at IR
Maximum Power Consumption		8.5 VA typical
Burden on CT		0.2 VA for 5A, 0.01 VA for 1 A
Operating temperature		10°C to 60°C
Weight		< 2 kg
Mounting		Panel Mounted
Construction		Draw out
Dim W x H x D in mm		121 x 158 x 224
Panel Cut Out in mm		113 x 142

### Dimensions





MCOMP is 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.

With the ability to quickly gather, organize and analyze information from your operations, our smart MCOMP Relay allows you to:

- Maximize your asset availability and reduce downtime
- Enable an energy management strategy
- Protect your personnel and assets

Further benefits are gained from wide communication capabilities that include Modbus RTU, Profibus, Modbus TCP / IP.

## The Main Unit

This is a self-contained and fully functional unit housing the main processor, input/output board, current & voltage board and a communication board in a single module enclosure. The main unit is also equipped with Bi/Tri color LED for status indication. There is also a reset push button available for local trip reset.

## Current Module Unit

MCOMP comes with its own current module in two sizes and suitable for use from 0.375 kW. Requisite connecting cable for the connection of MCOMP CM unit to its main unit is supplied along with CM unit. The MCOMP CM is pass-through type and hence there is no need of physical termination of power wire and CT shorting while removing the MCOMP relay.

## OLED Display Unit

The OLED display unit is a detachable optional unit provided with MCOMP for display of all metering, protection and fault data. The display unit can be additionally used to configure the installed MCOMP relay. The OLED display unit is provided with mini-USB port on its front facia to enable local configuration through laptop using the MCOMP suite parameterization software supplied with the relay.

## Expansion Unit

The input/output capability of MCOMP relay can be increased from 6DI/4DO/1AO by using expansion unit available in three options as 4DI/2DO unit, 8DI unit and 5DI/2AI unit. The requisite connecting cable for the connection of expansion unit to its main unit is supplied along with the expansion unit.

# User Friendly Options & Features

## In-built Voltage Module

Enables power measurement & Motor re-acceleration

## 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, Thermal Capacity

## Monitoring

Last 5 event & trip data recording with date & time stamping. Recording of No. of start, Stop, Starting Curve, starting time is also available.

## Communication

MCOMP can be connected to Plant Control System (SCADA /DCS) through Modbus RTU, Modbus TCP / IP & Profibus DP communication protocol

## Highly scalable IO

6 digital input and 4 changeover digital outputs are available in base unit. Digital inputs / Outputs can further be extended with the expansion modules.

## Analog output

In-built 4-20mA output is available eliminates transducer & add-on module

## Temperature Monitoring

Unit takes input from RTD or PTC.

## MCOMP Suite

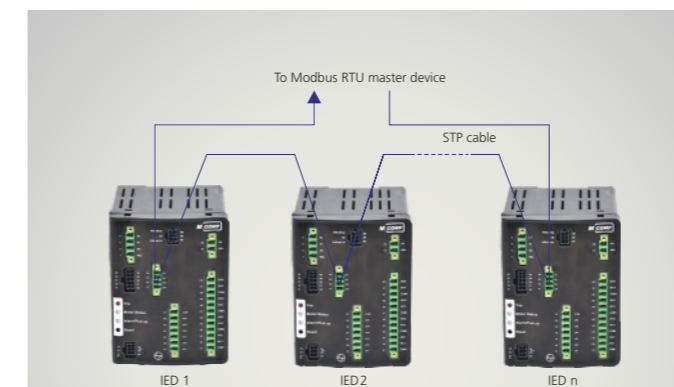
It is software for local parameterization and monitoring of MCOMP Relay. Users can create, save, read, and write the settings.

## COMP Logic

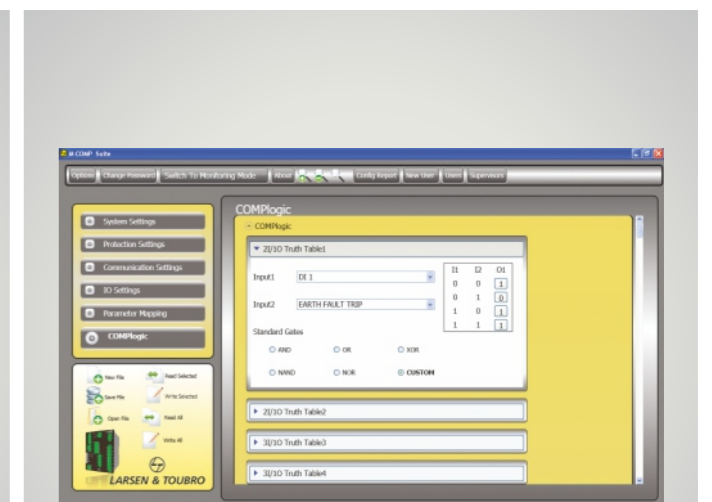
It is a part of the MCOMP suite parameterization software. The user can program the required logic using different modules such as truth tables, signal conditioners, timers, and counters

# Advanced Features

- Re-acceleration
- Excessive start time protection
- RTD or PTC based temperature protection
- Communication failure protection
- Fail to stop protection
- Interlock as Stop/Alarm/Trip



**MODBUS RTU – DAISY CHAIN CLOSED LOOP / REDUNDANT COMMUNICATION CONNECTION**





# Protection

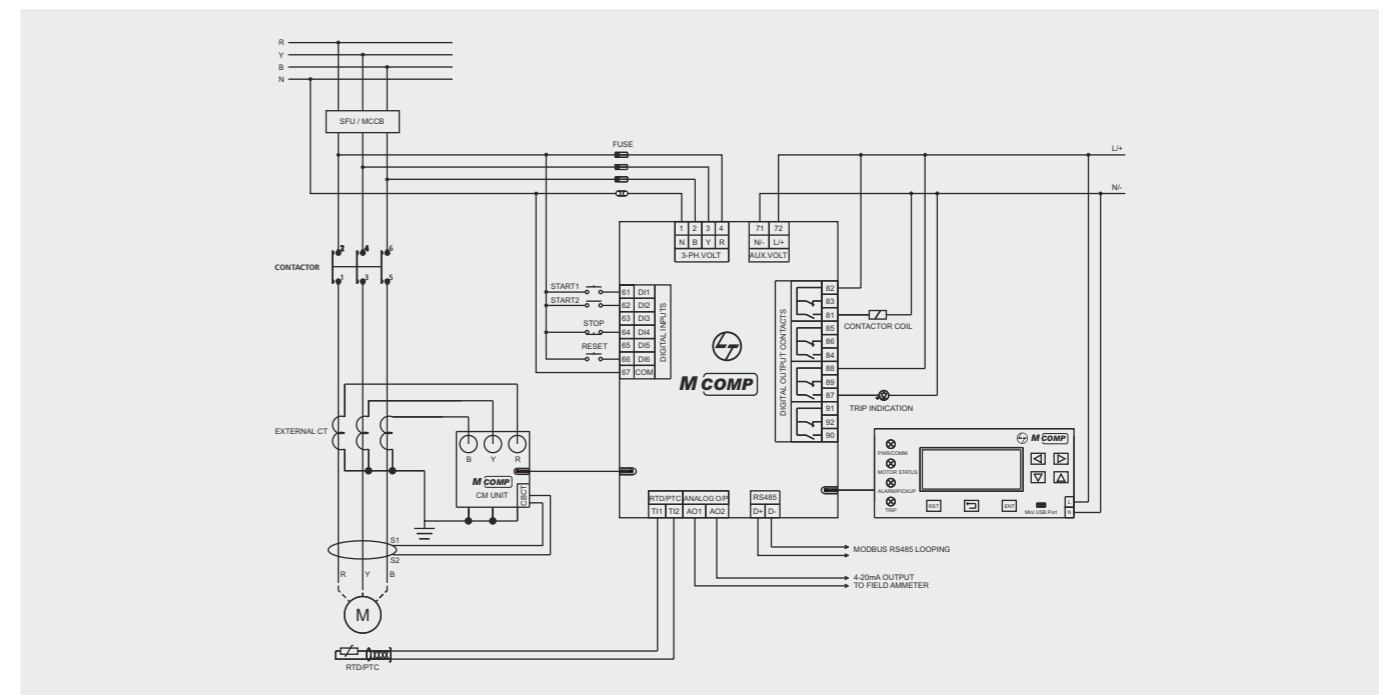
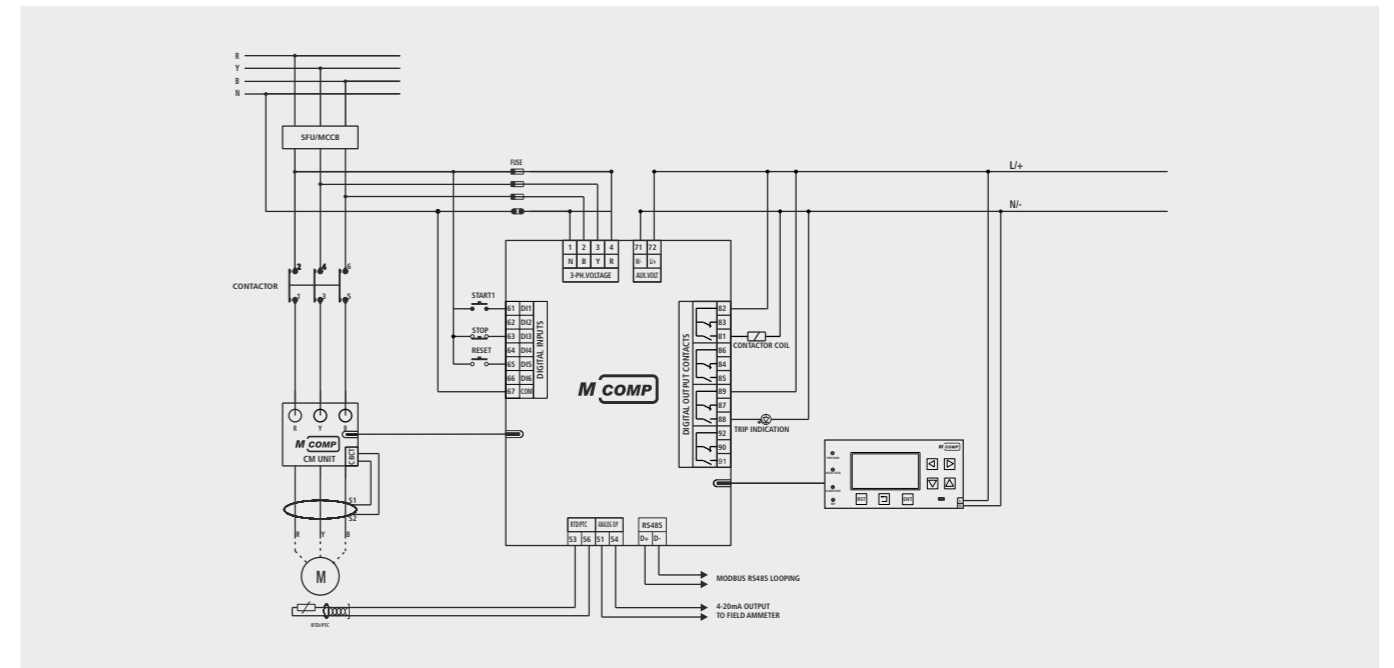
MCOMP provides all basic current, voltage and frequency protection. It also provides motor-specific protection like locked rotor, number of starts, excessive start time, phase reversal and phase loss. It distinguishes between starting and running condition, and provides appropriate protection at the right time. It continuously monitors motor thermal capacity and trips the motor in case the thermal capacity gets consumed. It does not allow the motor to start unless

thermal capacity is below the requisite safe threshold level. All protections are defined to cover the widest conceivable range of applications.

MCOMP can also provide earth fault protection and sensitive earth fault protection. Sensitive earth fault protection is provided through an external CBCT. The table below shows the setting range of protection available in MCOMP.

PROTECTION FUNCTION	ANSI CODE	VARIABLE	RANGE
Thermal Overload	49	Pick Up	20 - 100% Iset
		Alarm	80 - 100% TM
Under Current	37P	Pick Up	30 - 85% Ir
		Alarm	110% of pick up
		Trip Delay	1 - 120 Sec
Over Current	50P	Pick Up	50 - 1000% Iflc
		Alarm	90% of pick up
		Trip Delay	0.1 - 10 Sec
Time Delayed Phase Overcurrent	51P	Pick Up	20 - 1000% Iflc
		Alarm	90% of pick up
		Time Constant	0.5 - 600 Sec
		IEC Curves	Inverse, Very Inverse, Extremely Inverse
Time Delayed Neutral Overcurrent	51N	Pick Up	20 - 1000% Iflc
		Alarm	90% of pick up
		Time Constant	0.5 - 600 Sec
		IEC Curves	Inverse, Very Inverse, Extremely Inverse
Locked Rotor	50LR	Pick Up	150 - 1000% Iflc
		Alarm	90% of pick up
		Trip Delay	0.5 - 30 Sec
Current Unbalance	46	Pick Up	5 - 100% Iflc
		Alarm	85 - 100% of pick up
		Trip Delay	1 - 30 Sec
Phase Loss	47a	Trip Delay	0.1 - 30 Sec
Earth Fault (Vector Summation) OR Sensitive Earth Fault (Through CBCT)	50N	Pick Up	20 - 500% Iflc
		Alarm	90% of pick up
		Trip Delay	0.5 - 30 Sec
50SG	Pick Up	0.1 - 20 A	
	Alarm	0.1 - 20 A	
	Trip Delay	0.5 - 30 Sec	
Under Voltage	27	Pick Up	20 - 85% Vn
		Alarm	110% of pick up
		Trip Delay	0.2 - 25 Sec
Over Voltage	59	Pick Up	101 - 130% Vn
		Alarm	95% of pick up
		Trip Delay	0.2 - 25 Sec
Voltage Unbalance	47	Pick Up	5 - 50% Vn
		Alarm	90% of pick up
		Trip Delay	0.2 - 20 Sec
Under Frequency	81L	Pick Up	94 - 98% Fs
		Alarm	101% of pick up
		Trip Delay	1 - 30 Sec
Over Frequency	81H	Pick Up	101 - 105% Fs
		Alarm	99% of pick up
		Trip Delay	1 - 30 Sec
Phase Reversal	47b	Sequence	RYB or RBY
Maximum Number of Starts	66	Reference Period	15 - 60 Min
		Permissive Starts	1 - 30
		Inhibit Period	1 - 120 Min

# Typical Wiring Diagram



# Dimensions

Component	Depth(mm)	Width(mm)	Height (mm)
Main Unit	103.95	92	120+ 3(with DIN Clip)
Display Unit	35	96	51
CM 1	67	59.3	55+2.1(with DIN Clip)
CM 2-5	109.2	107.8	60+2.1(with DIN Clip)
Expansion Unit	102	83	70
Cut-out dimension of display unit	-	92.5	45

## Appendix i

### Fail-safe Logic

In Motor protection relays(MPR) with fail-safe logic, the relay contacts get energized upon application of auxiliary supply to MPR.

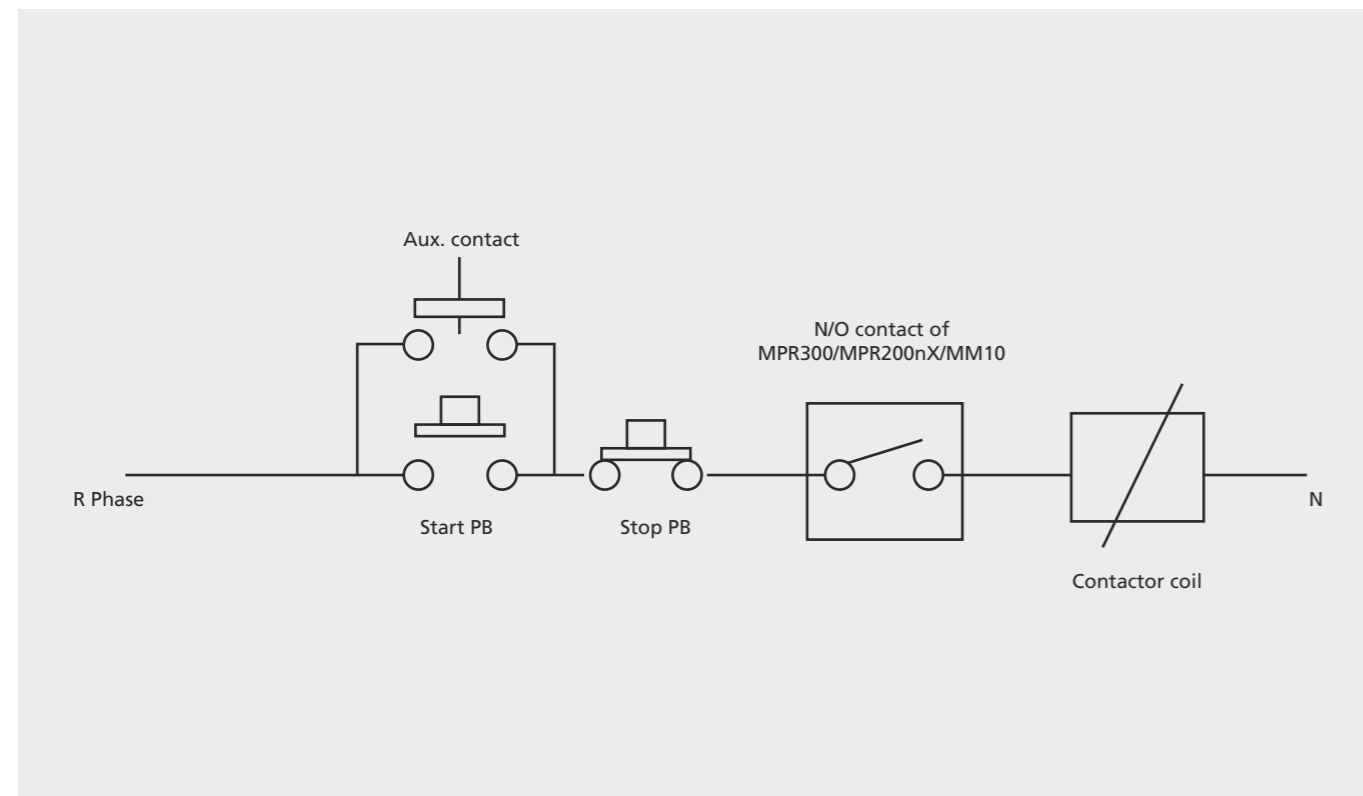
The relay contact gets de-energized in the following cases:

1. Auxiliary supply failure
2. Trip issued by MPR as per protection settings

#### MPR with fail-safe logic:

1. Will disable the starting of motor in case auxiliary supply is not applied to the MPR or there is an internal defect
2. Will trip the motor in case of auxiliary supply failure to MPR or there is an internal defect in MPR

#### Control Wiring:



- Implementing fail-safe logic in MPR200nX/MPR300:  
Select a Version of MPR with fail-safe logic and do the control wiring as above.
- Implementing fail-safe logic in MM10:  
Relay Output "R1" of MM10 works with fail-safe logic. Control wiring to be done as above.

### Non fail-safe logic

Relay with non-fail safe logic does not trip the motor in case of auxiliary power supply failure.

#### Application:

Recommended in process plants where Motor shut down is not desired in case of failure of auxiliary power supply.

## Appendix ii

### Product Selection Guide

Parameters		Model			
Category	Sub-Category	MPR200nX / MPR300	MM10	MM30	MCOMP
General	Display	x	4 Digit LED Display	Alphanumeric Display	4 line OLED Display
Current Input	CT Sec.	Inbuilt CT up to 88A	5A	1 / 5A site selectable	Its own CT unit up to 80A
Protection	Thermal O/L (49)	✓	✓	✓	✓
	Earth Fault (51N / 64)	✓ (MPR300 only)	✓	✓	✓
	Phase reversal	✓	✓	✓	✓
	Phase unbalance (46)	✓	✓	✓	✓
	Single Phasing	✓	✓	✓	✓
	Locked rotor protection(51LR)	✓	✓	✓	✓
	Under current (37P)	✓	✓	✓	✓
	Overcurrent (51)	x	✓	✓	✓
	Max. no. of starts(66)	x	x	✓	✓
	Short circuit (50)	x	✓	✓	x
	Sensitive Ground (50/51SG)	x	x	x	✓
	Frequency (81O/U)	x	x	x	✓
Voltage (27P/59P)	x	x	x	✓	
Input+Output	Basic	2 DO	1 DI+2 DO	4 DO	6 DI+4 DO
	Expandability options	x	x	x	✓
Metering	Current	x	✓	✓	✓
	V, f , power, energy	x	x	x	✓
Monitoring	Trip / Event record	x	1	5	5/5
Communication	Modbus RTU	x	x	✓	✓
	Modbus TCP/IP, Profibus	x	x	x	✓

x - Not available    ✓ - Available



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### Customer Interaction Center (CIC)

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