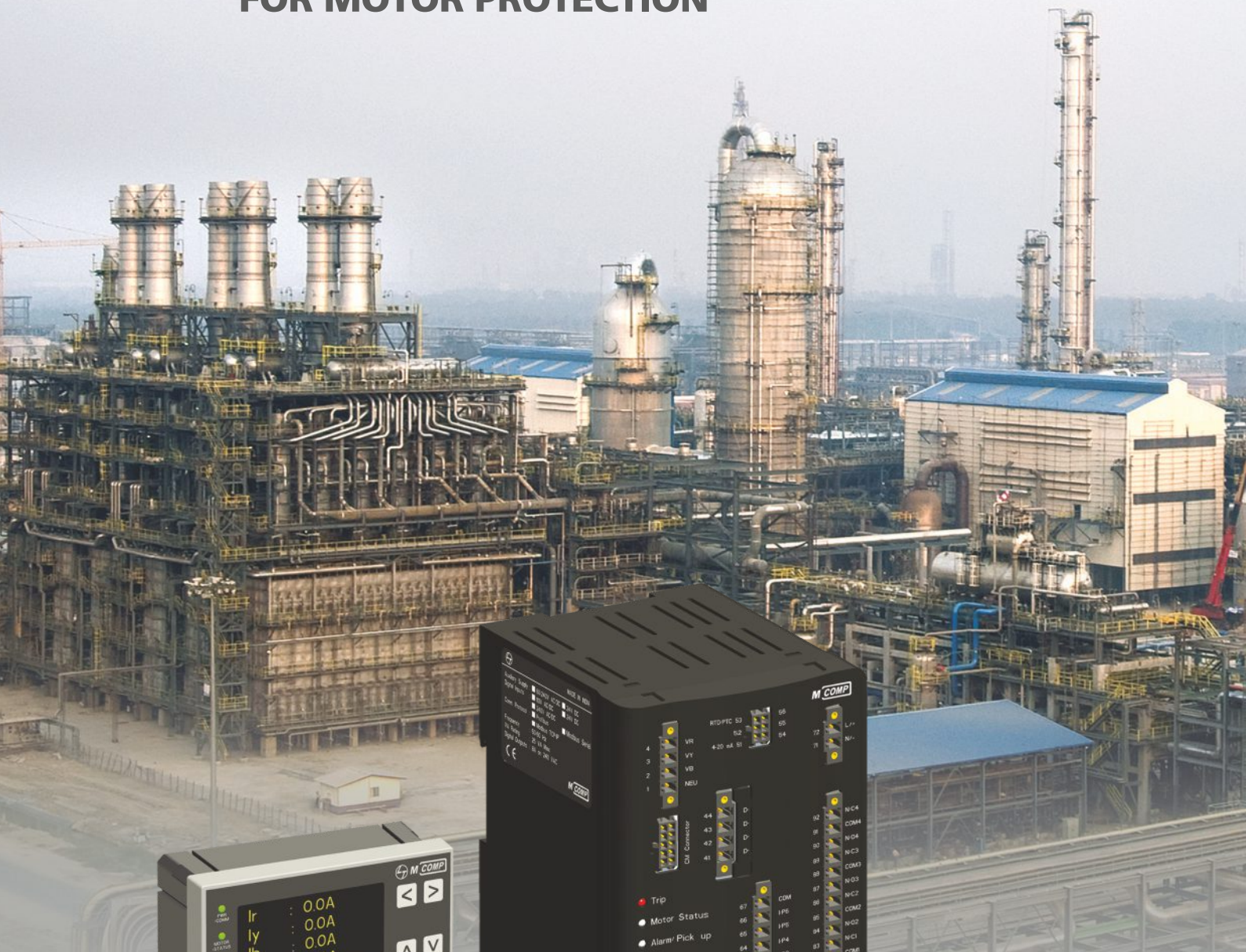


**COMPLETE SOLUTION
FOR MOTOR PROTECTION**



Larsen & Toubro (L&T) is India's leading engineering, construction and manufacturing organisation, a technology-driven company that infuses engineering with imagination.

L&T's Electrical & Automation Group offers a wide range of advanced solutions through its state-of-the-art products and systems. Backed by world-class in-house capabilities in technology development and customer support, L&T's products and systems are geared to offer complete customer satisfaction.

For complete Control, Metering and protection in Low and Medium voltage switchgear assemblies, L&T offers a range of relays - the COMP series.

This series encompasses the ruggedness of conventional protection and the versatility of advanced protection, annunciators, metering, monitoring and communicating into one single, simple-to-configure base module with a best-in-class display module.





MCOMP: ONE SOLUTION FOR COMPLETE MOTOR PROTECTION

MCOMP has been designed as a reliable building block for low voltage, contactor controlled motor starter feeders in your switchgear assemblies.

MCOMP is India's first completely indigenous product designed to provide comprehensive, intelligent motor protection.

MCOMP is provided with current and voltage based metering and protection in a single compact unit. This allows for a significant reduction in the use of discrete components, inventory maintenance and associated wiring required to achieve voltage-based metering and protections.

MCOMP has six digital inputs and four digital outputs in the base unit. The programmable, changeover-type digital

output contacts can be used to control the power contactor directly - eliminating the auxiliary contactor normally required to drive the power contactor. These contacts can also be used to build logic and implement simple control sequences without the need for an external PLC, thus fulfilling the role of an Intelligent device.

MCOMP is highly scalable through DIO modules and the use of COMLogic. Complex schemes can easily be simplified using truth tables, timers, other Boolean modules.

MCOMP is provided with a conformal coating on its hardware thereby making it suitable for the dusty and corrosive environments, characteristic of many process industries and petrochemical complexes.

APPLICATIONS



OIL & GAS INDUSTRY

- Eliminates the need for discrete components for motor reacceleration/ restart
- Conformally coated PCBs are resistive to corrosive environments
- Avoids nuisance-sensing of digital inputs through a configurable validation time



METAL INDUSTRIES

- A one-stop solution for comprehensive motor management
- Multi-master support on the MODBUS TCP/IP protocol makes integration with your DCS/SCADA easier

KEY FEATURES

- In-built voltage module: enables power measurement & Motor Re-acceleration
- Suitable for 50/60 Hz
- Universal auxiliary supply: 80 to 240 VAC/VDC and optional 24VDC
- 6 digital Input and 4 changeover Digital Outputs in base unit
- Wide digital input sensing range: 60-240 VAC/VDC, 240 VAC/VDC, 110VAC/VDC, 24VDC
- Input/Output capability scalable up to 26DI/6DO, 30DI/4DO, 14DI/8DO
- OLED Display: 170° viewing angle, Brighter pixilation & longer life than LCD
- Communication capability: Modbus RTU serial, Modbus TCP/IP, Profibus DP-V1
- In built 4-20mA output and RTD/PTC inputs: eliminates transducer and add-on module



CEMENT INDUSTRY

- The PNO certified MCOMP supports the Profibus protocol for monitoring and control of your feeders. MCOMP supports both Cyclic and Acyclic communication
- MCOMP Boolean logic reduces the hardwiring required for complex schemes



PHARMACEUTICAL INDUSTRY

- Precise & programmable timed overcurrent protection for critical process control

- Password protection for settings and commands
- Up to five different event records, trip records, communication command logs
- Shock proof, non-metallic, screw less relay unit
- Time synchronization through SNTP protocol (only in case of Modbus TCP/IP)
- Multi-master support: up to five masters in case of Modbus TCP/IP

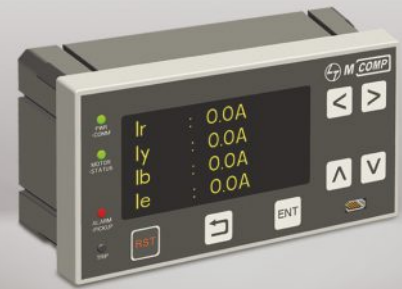
- Conformally coated
- Suitable for non-motor load application as well
- Certified as per IEC 61000-4, CISPR22, IEC 60068, IEC 60255
- Backed with nationwide L&T assistance for product availability & support

MCOMP UNITS

Main Unit



Display Unit



Expansion Module



CM Unit



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

METERING AND MONITORING

METERING	SPECIFICATIONS	
Current	Iflc : 0.6 – 600A	Measurement Range: Line Currents, Neutral Current, Average Current : 0 – 6000A, $\pm 1\%$ from 0.5 x Iflc to 1.5 x Iflc and thereafter $\pm 5\%$ up to 10 x Iflc Earth fault Current: $\pm 1\%$ or ± 50 mA whichever is greater
Voltage	System Voltage: 380-800V	Measurement Range: Phase Voltages: 0 – 1000V, $\pm 1\%$ up to Nominal Voltage and thereafter $\pm 5\%$ Line Voltages, Average Voltage: 0 – 2000V, $\pm 1\%$ up to Nominal Voltage and thereafter $\pm 5\%$
Power / Energy	Total Active, Reactive & Apparent Power / Energy Accuracy : $\pm 5\%$	
Power Factor	Resolution: 0.001 Accuracy : $\pm 2\%$	
Frequency	Range: 35 - 75 Hz Accuracy : $\pm 1\%$	
Temperature	Measurement Range : 0° to +250°C RTD protection (Optional PTC available), $\pm 3^\circ\text{C}$	
Thermal Capacity	Range: 0 to 100 $\pm 2\%$	
Phase Sequence	1-2-3 or 1-3-2	

MONITORING	SPECIFICATIONS
Event and Trip Records	Stores last five event records with date and time stamp Stores last five trip records with date and time stamp. Record gets stored with current, voltage, temperature, frequency values present at the time of tripping Stores last five communication commands log with date and time stamp
Hour Meter	Records and stores last operational stops and total operation hours
Start, Stop, Trip Counter	Records and stores number of starts, stops and trips of the drive
Starting Curve	Records and stores the starting characteristics of the drive
Starting Time	Records and stores the start time taken
Starting Peak Current	Records the peak current taken during starting of the drive
DI/DO Status	Shows real time status (high or low) of digital input and output of the relay



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

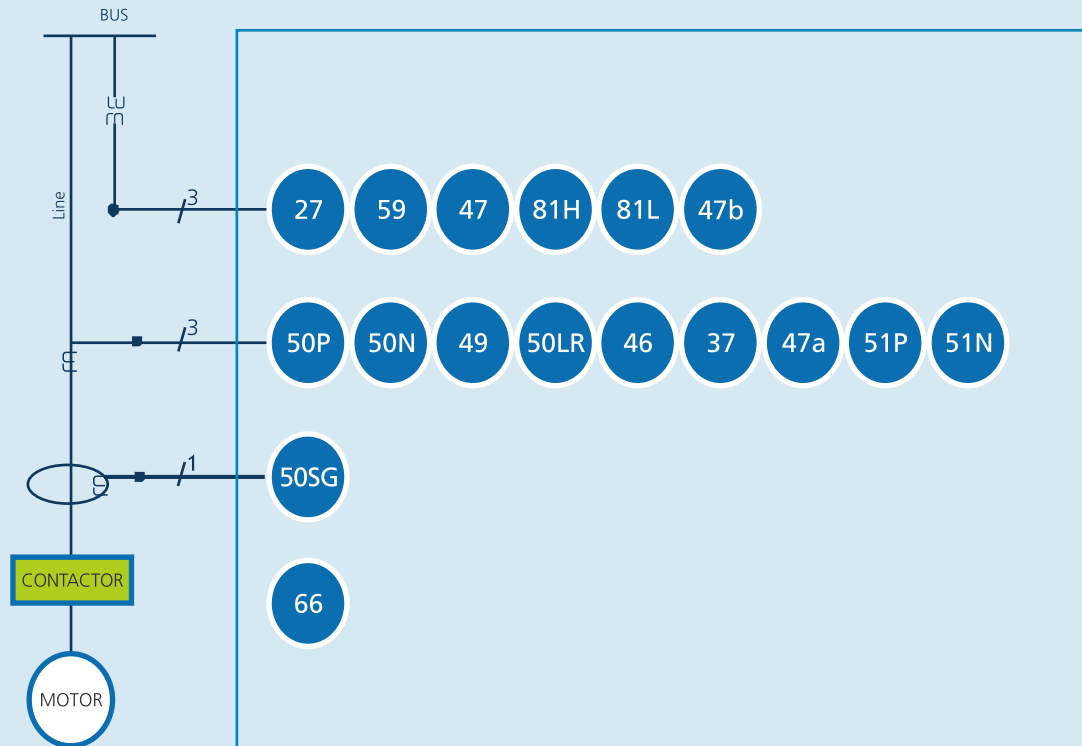
thermal capacity is below the requisite safe threshold level. All protections are defined to cover the widest conceivable range of applications.

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.

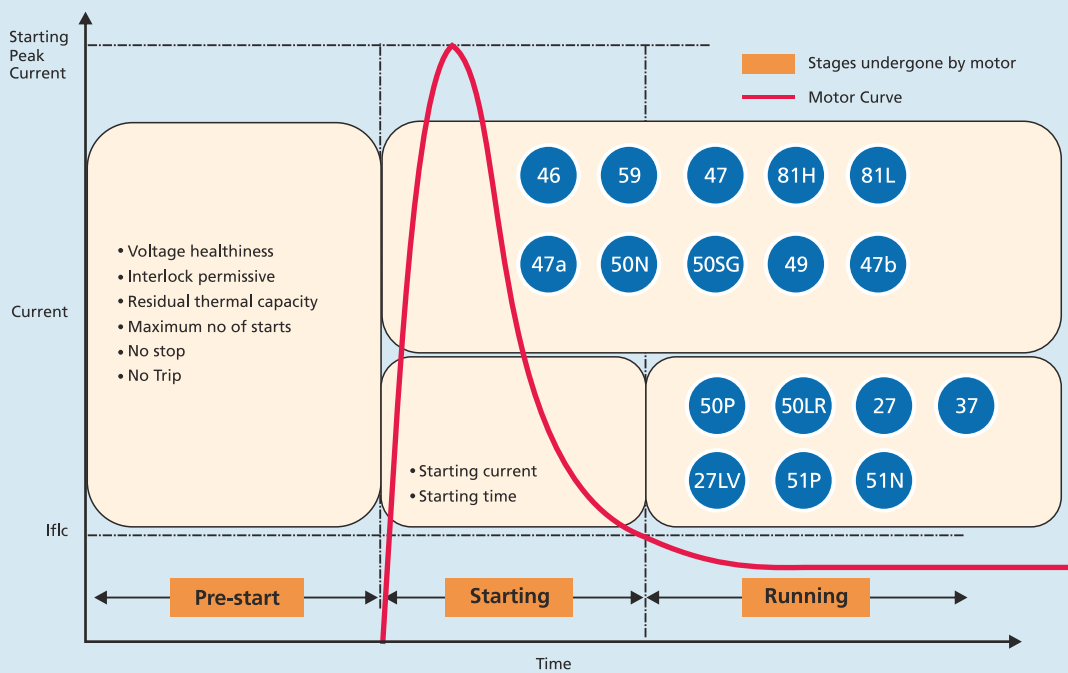
PROTECTION FUNCTION	ANSI CODE	VARIABLE	RANGE
Thermal Overload	49	Pick Up Alarm	20 - 100% Iset 80 - 100% TM
Under Current	37P	Pick Up Alarm Trip Delay	30 – 85% Ir 110% of pick up 1 – 120 Sec
Over Current	50P	Pick Up Alarm Trip Delay	50 – 1000% Iflc 90% of pick up 0.1 – 10 Sec
Time Delayed Phase Overcurrent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

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



Protection Block Diagram



Protection as per Motor Starting Characteristic

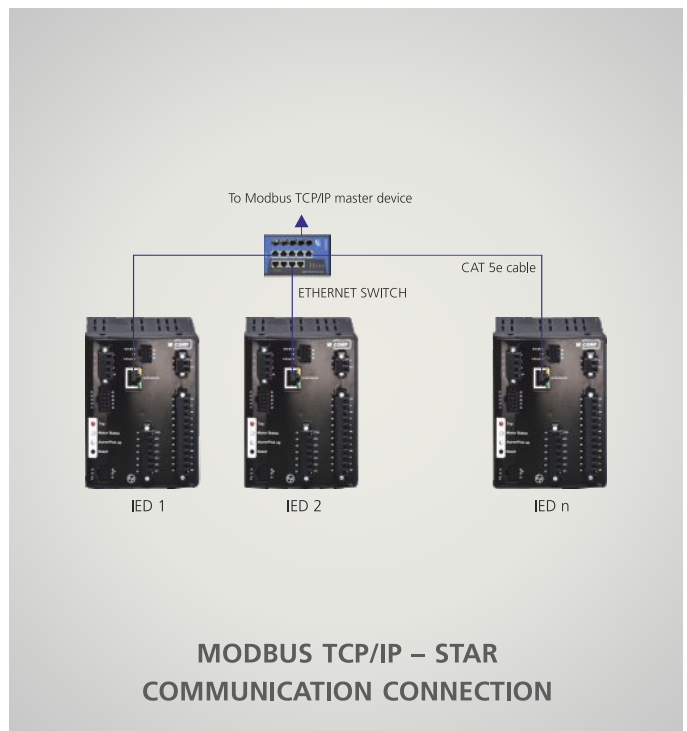
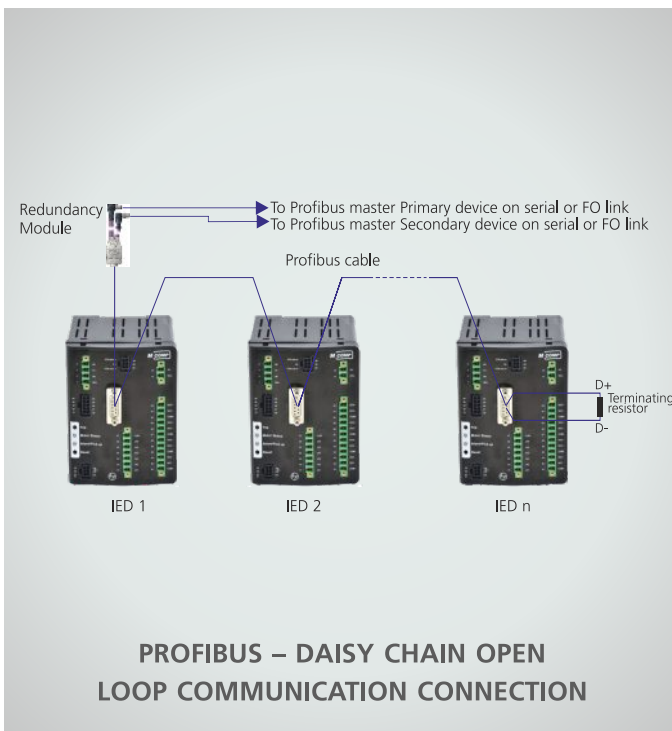
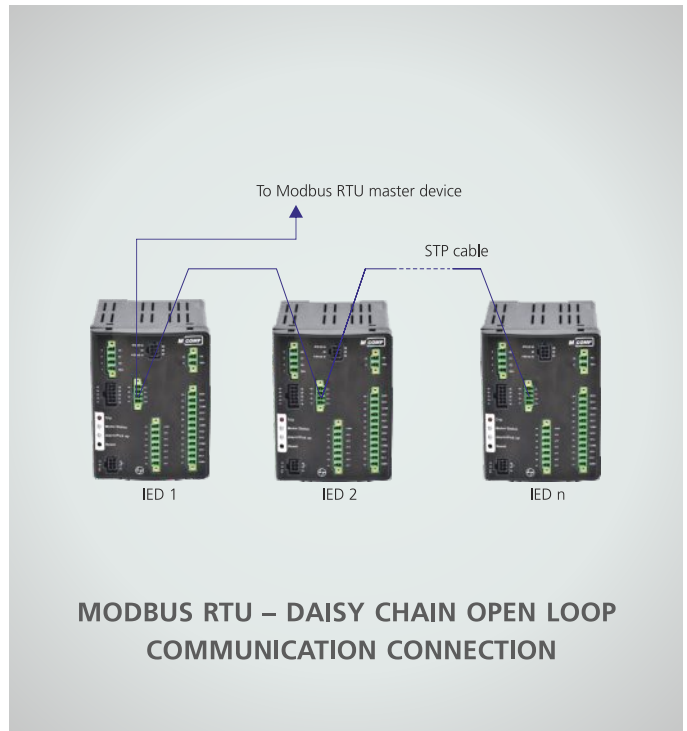
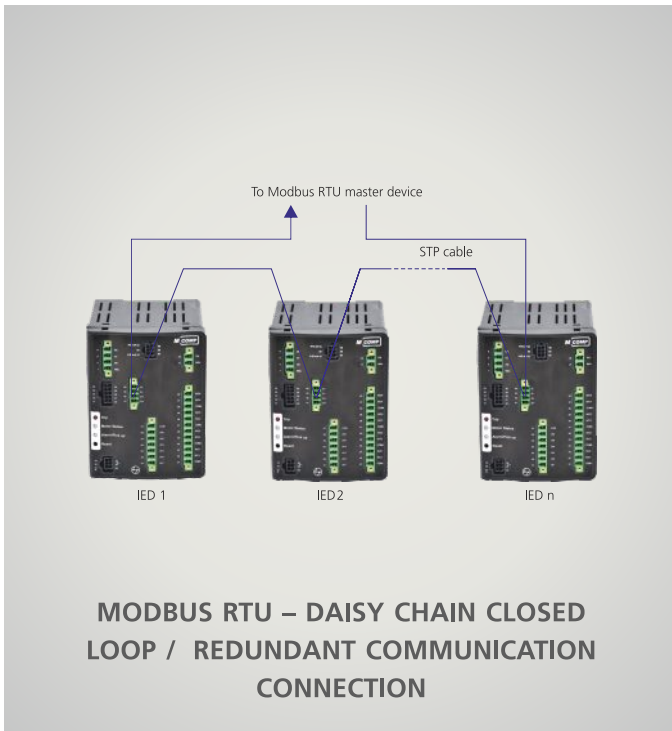
COMMUNICATION

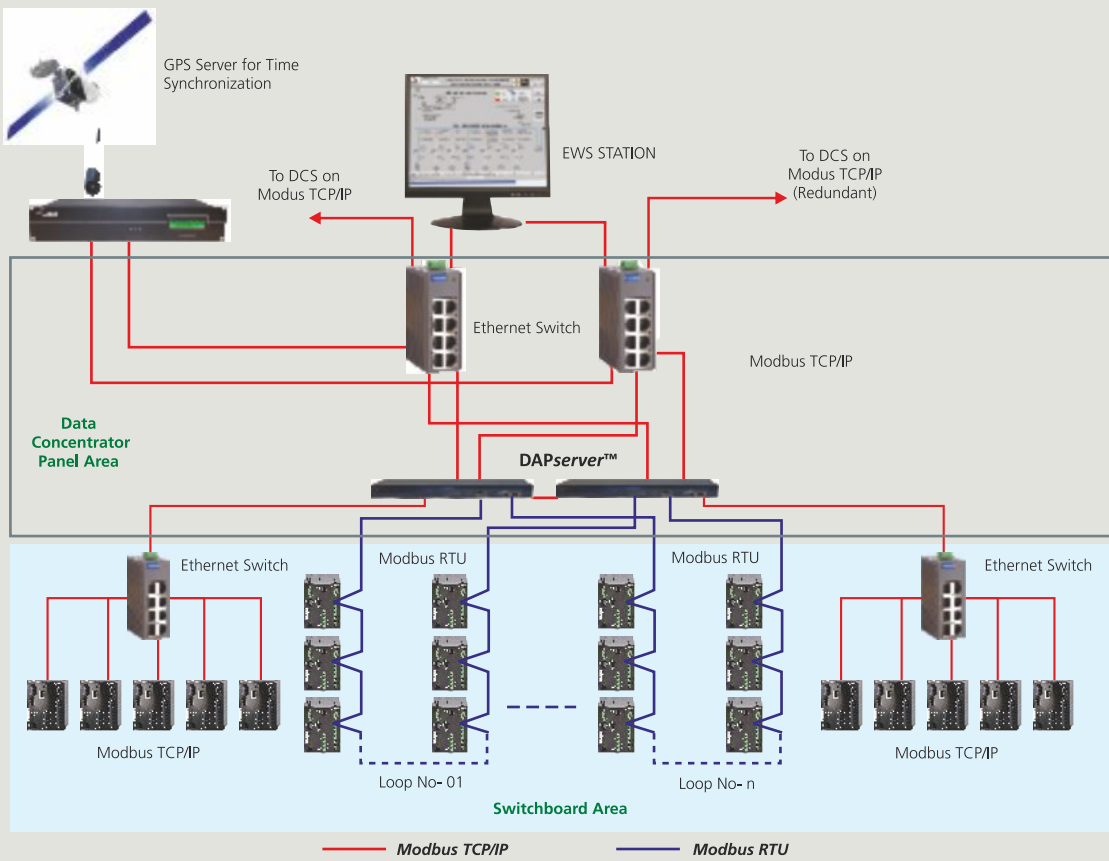
MCOMP can be connected to plant control system (SCADA/DCS) through Modbus RTU, Modbus TCP/IP and Profibus DP communication protocol. Both cyclic and acyclic communications are available in case of Profibus protocol. Typical system architecture is shown below. We provide complete substation automation solutions. Our Relays and Integration Solutions arm implements customized solutions for intelligent protection systems in power distribution with HMI for integrated monitoring of substations.

Customized parameter mapping:

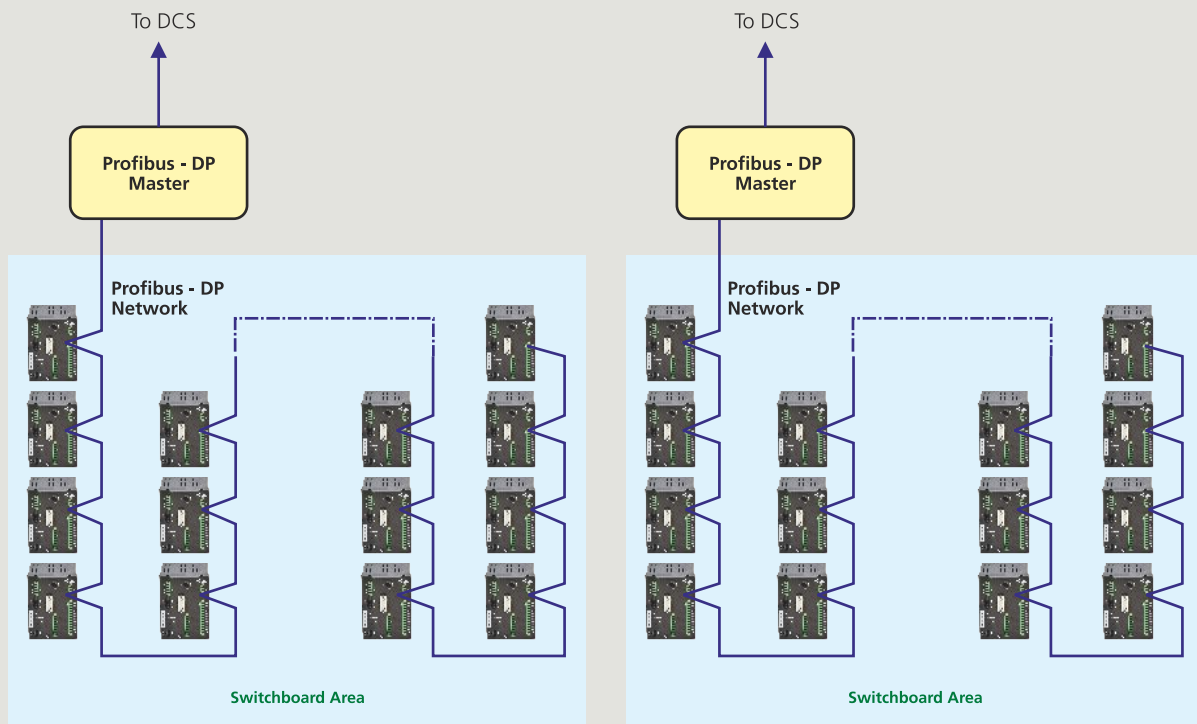
Parameter mapping is the setting available only in case of

Modbus Serial and Modbus TCP/IP protocol selection. It allows arranging all the required critical parameters in consecutive addresses and can be called by the DCS/SCADA/Master in a single query. This reduces the loading on the communication network by avoiding multiple queries to the various relays and increases the bandwidth and thereby response time of the system. In case of modbus serial up to 16 words can be user configured and in case of modbus TCP/IP 32 words can be user configured in parameter mapping.





Typical System Architecture for MODBUS



Typical System Architecture for PROFIBUS

MCOMP SUITE

MCOMP Suite: Powerful tool for local parameterization

MCOMP Suite is the software developed by L&T for local parameterization and monitoring of MCOMP relays. MCOMP Suite provides a user-friendly environment for configuration and parameterization of relays. This tool enables operators to locate faults in the switchboard locally, thus easing motor maintenance.

MCOMP suite provides flexibility to the user to work in online mode or offline mode. MCOMP suite is used to configure protection settings and gate logic, meter electrical parameters, monitor fault data, troubleshoot the operation of relay functions.

With MCOMP suite, the user can:

- Create, read, write the Settings: System, Digital input/output, communication and protection settings, Parameter mapping add COMLogic settings

- Meter Actual Value: Phase voltages, phase current, frequency, phase sequence, parameters related to power and energy
- View Actual Status: Digital Input/output status of Relay, Drive Status (Running, Stopped, Inhibit)
- View and download Records: Recent 5 trip, event, and communication command log records with date and time
- Printing: All settings present inside the relay (HTML and pdf format)

The commissioning time can be reduced by creating and saving setting file for MCOMP relay using MCOMP suite without connecting MCOMP Relay (in offline mode). At any instant in future, the user can download the saved setting file into the relay in online mode.



COMPLogic

COMPLogic is a part of the MCOMP suite parameterization software. COMPLogic provides flexibility to select any parameter as an input of the Boolean modules and perform gate operation to get desired output. The user can programme the required logic using different modules such as truth tables, signal conditioners, timers, counters. Different logic gates available in truth table are AND, OR, XOR, NOR, NAND, Custom. The user can define its own logic gate using custom mode.

COMPLogic includes:

- a) 16 Truth tables: AND, OR, XOR, NOR, NAND, Custom
 - Two 2I/1O Truth Table
 - Four 3I/1O Truth Table
 - Ten 4I/1O Truth Table
- b) 2 Signal Conditioners
- c) 2 Timers
- d) 2 Counters

2I/1O Truth Table1

Input1: NONE

Input2: NONE

I1	I2	O1
0	0	0
0	1	0
1	0	0
1	1	0

Standard Gates

AND OR XOR

NAND NOR CUSTOM

4I/1O Truth Table10

Input1: NONE

Input2: NONE

Input3: NONE

Input4: NONE

I1	I2	I3	I4	O1
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

Standard Gates

AND OR XOR

NAND NOR CUSTOM

4I/1O Truth Table16

Input1: DI 3

Input2: TRUTH TABLE1 OP

Input3: DO 2

Input4: DI 3-4

I1	I2	I3	I4	O1
0	0	0	0	0
0	0	0	1	1
0	0	1	0	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	1
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	1
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	1
1	1	1	1	0

Standard Gates

AND OR XOR

NAND NOR CUSTOM

Timer1

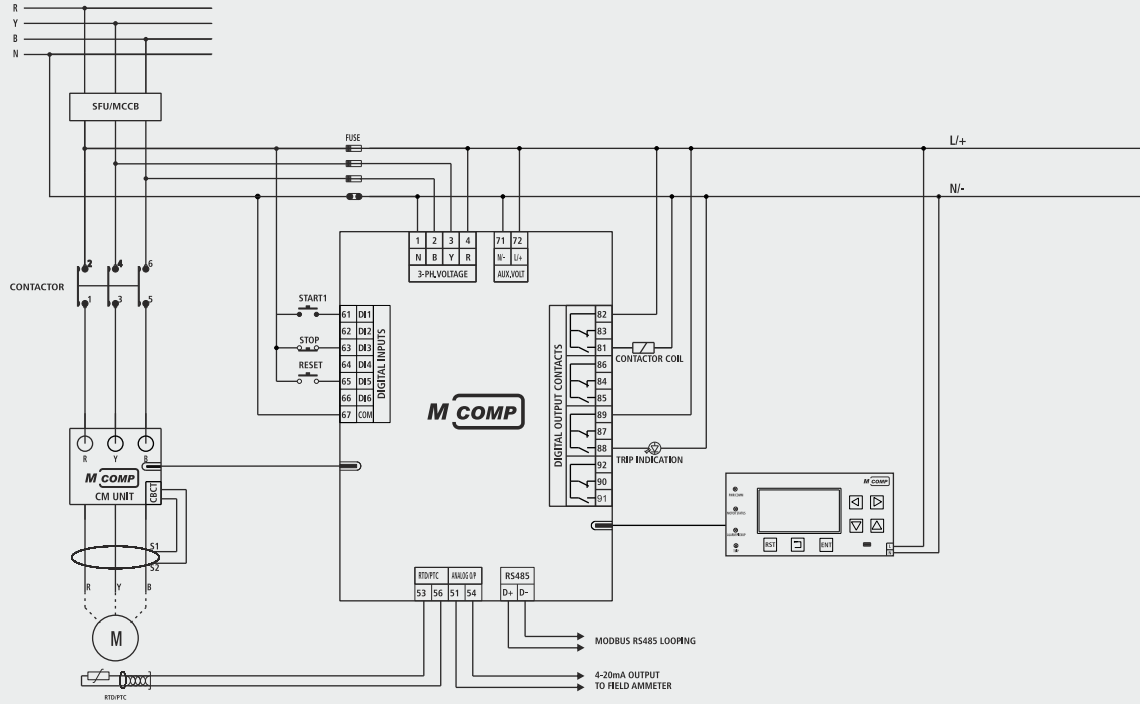
Limit: 20

Type: LEVEL TRIGGERED ON TIMER

Input: TRUTH TABLE4 OP

Reset: DI 6

TYPICAL WIRING DIAGRAM



COMPLIANCE

TEST	STANDARD	TEST LEVEL
Cold	IEC 60068-2-1	-20°C, 72 hours
Temperature Cycling	IEC 60068-2-14	-20°C to 70°C, 3hrs, 2 cycles
Vibration	IEC 60068-2-6	10 to 150Hz, 1G
Dry Heat	IEC 60068-2-2	-20°C to 70°C, 3hrs
Damp Heat	IEC 60068-2-30	55°C, 6 cycles, 24 hrs/cycle, 95% relative humidity
Shock Resistance	IEC 60255-21-2	30G, 18 shocks
Bump		25G, 6000 bumps
Enclosure Protection		IP 41 enclosed in panel
Dielectric	IEC 60255-5:2000 (Cl.No. 6.1.4)	2kV, 1 min
Impulse	IEC 60255-5:2000 (Cl.No. 6.1.3)	4kV
Voltage Dips and Interruption Test	IEC 61000-4-11	class A
Insulation Resistance Test	IEC 60255-5:2000 (Cl.No. 6.2.2)	500 VDC, 5 sec
Electronic Discharge immunity:	IEC 61000-4-2, edition 1.2, 2001-04	8 kV air discharge 6 kV contact discharge
Radiated RF Immunity	IEC 61000-4-3	Severity Level 3 Field Strength 10V/m
Fast Transient, Burst Immunity	IEC 61000-4-4	4 kV @ 5 kHz
Surge Immunity	IEC 61000-4-5	4 kV line-to-earth
Conducted RF Immunity	IEC 61000-4-6	Severity Level 3 Voltage Level: 10Vrms
High Frequency Disturbance Immunity	IEC 61000-4-18	1 kV, 3 pulses
Conducted Emission	CISPR 22 @ IEC: 2005	
Radiated Emission	CISPR 22 @ IEC: 2005	

DIMENSIONS

Component	Depth(mm)	Width(mm)	Height (mm)
Main Unit	103.95	92	120+ 3(with DIN Clip)
Display Unit	45	92.5	45
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	68.5	84.4	70.6

ORDERING CODE

MCOMP PART NO SELECTION											MCOMP PART NO		
MCOMP	U	R	C2	1	3	YI	D1	1	R	A	B	X	MCOMPURC213YID11RABX
Material Discription													
MCOMP_U_R-C2_1_3_YI_D1_1_R_A_B_X													
Auxiliary Voltage	U D												Universal (80to240 V AC/DC) 24V DC
Communication	R T P												Modbus RTU Modbus TCP/IP Profitbus DP
Current Module (CM) Type		C1 C2 C3 C4 C5 C6											CM Type 1 - (Ifc:0.675 to 2.0A) CM Type 2 - (Ifc:1.8 to 5.4A) CM Type 3 - (Ifc:4.5 to 13.5A) CM Type 4 - (Ifc:12.6 to 37.8A) CM Type 5 - (Ifc:36 to 81A) Internal 1A CM (External Conventional CT required)
CM-MCOPM cable		H 1 X											Cable of 0.5 m Cable of 1 m No Cable
CM Inputs/CM elements			3 5										CM CM with CBCT input
Digital Input Card Type				UI YI ZI DI									Universal (60 to 240 V AC/DC) 240 V AC/DC card 110 V AC/DC card 24V DC
Display					D1 D2 X								Display (80-240 V AC/DC) Display (24 V DC) No Display
Display unit-MCOMP cable					H 1 2 X								Cable of 0.5 m Cable of 1 m Cable of 2 m No Cable
Temperature Input						R P							RTD Input Port PTC Input Port
Expansion Modules							A B X						Expansion Module-Type-1 (4DI/2DO) Expansion Module-Type-2 (8DI) No expansion module
Expansion Modules							A B X						Expansion Module-Type-1 (4DI/2DO) Expansion Module-Type-2 (8DI) No expansion module
Expansion Modules							A B X						Expansion Module-Type-1 (4DI/2DO) Expansion Module-Type-2 (8DI) No expansion module

- Note:
1. 3 nos of 4DI/2DO expansion modules can not be connected to one single MCOMP unit.
 2. For CM Type Selection "C6", CM-MCOMP cable is not required.

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