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## COMPLETE SOLUTION FOR MOTOR PROTECTION



CBMC/PRD/260820

*The information contained herein is correct at time of printing, but as the products and its manufacturing processes are being developed continuously, this information is subject to change without notice and the company cannot be held liable for any alleged misinterpretation howsoever arising.*

L&T Electrical & Automation (E&A) 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, E&A's products and systems are geared to offer complete customer satisfaction.

For complete Control, Metering and protection in Low and

Medium voltage switchgear assemblies, E&A offers a range of relays - the COMP series.

This series encompasses the ruggedness of conventional protection and the versatility of advanced protection, annunciations, 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



### 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



### 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



### PHARMACEUTICAL INDUSTRY

- Precise & programmable timed overcurrent protection for critical process control

## 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

- Password protection for settings and commands
- Up to five different event records, trip records
- 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

- By default conformal coating on all the electronic PCBs
- Suitable for non-motor load application as well
- Certified as per IEC 61000-4, CISPR22, IEC 60068, IEC 60255
- Backed with nationwide 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 three options as 4DI/2DO unit, 8DI unit and 5DI/2AI 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

Line Currents Measurement Range	0 – 6000A with accuracy $\pm 1\%$ from 0.5 times IFLC to 1.5 times IFLC and beyond that $+5\%$
Earth fault current measurement range	$\pm 1\%$ or $\pm 50\text{mA}$ whichever is greater
Phase Voltages Measurement Range	0 – 600V with accuracy $\pm 1\%$ up to Nominal Voltage and $\pm 5\%$ after nominal voltage
Line Voltages Measurement Range	0 – 1000V with accuracy $\pm 1\%$ up to Nominal Voltage and $\pm 5\%$ after nominal voltage
Analog input measurement	0 / 4 – 20mA with $\pm 1\%$ of full scale value up to 20mA and $\pm 5\%$ after 20mA till 24mA
System Frequency	$\pm 1\%$
Active, Reactive, Apparent Power	$\pm 5\%$
Active, Reactive, Apparent Energy	$\pm 5\%$
Power Factor	0.9 to 1 with $\pm 2\%$ 0.707 to 0.9 with $\pm 3\%$ 0.5 to 0.707 with $\pm 5\%$
Thermal Capacity	$\pm 2\%$
Temperature Measurement Range	0°C to +180°C in case of RTD, $\pm 3^\circ\text{C}$ 0Ω to 10KΩ in case of PTC

Table 3-7: Metering Specifications

### MONITORING SPECIFICATIONS

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 stop cause
Hour Meter	Records and stores last operational hours and total operation hours
Operation Counters	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 Current	Records the peak current taken during starting of the drive
DIO Status	Shows real time status of digital input and output of the relay

Table 3-8: Metering Specifications

Note: The Specifications are subject to change without notice.



# 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

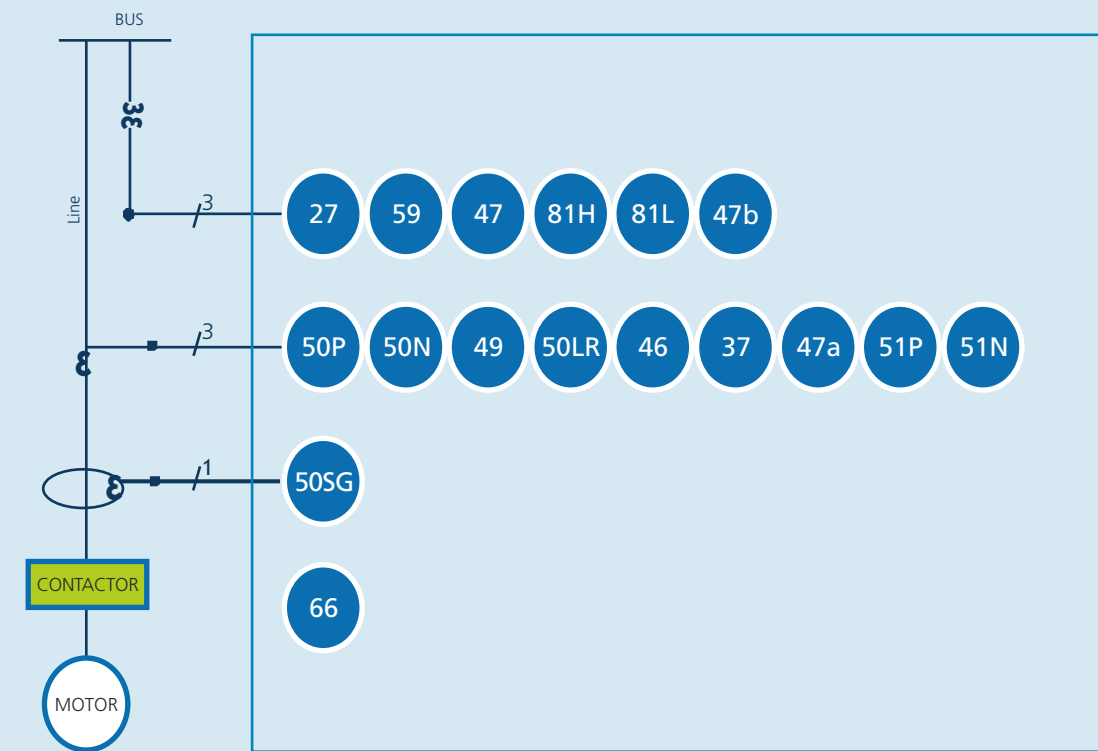
thermal capacity is below the requisite safe threshold level. All protections are defined to cover the widest conceivable range of applications.

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.

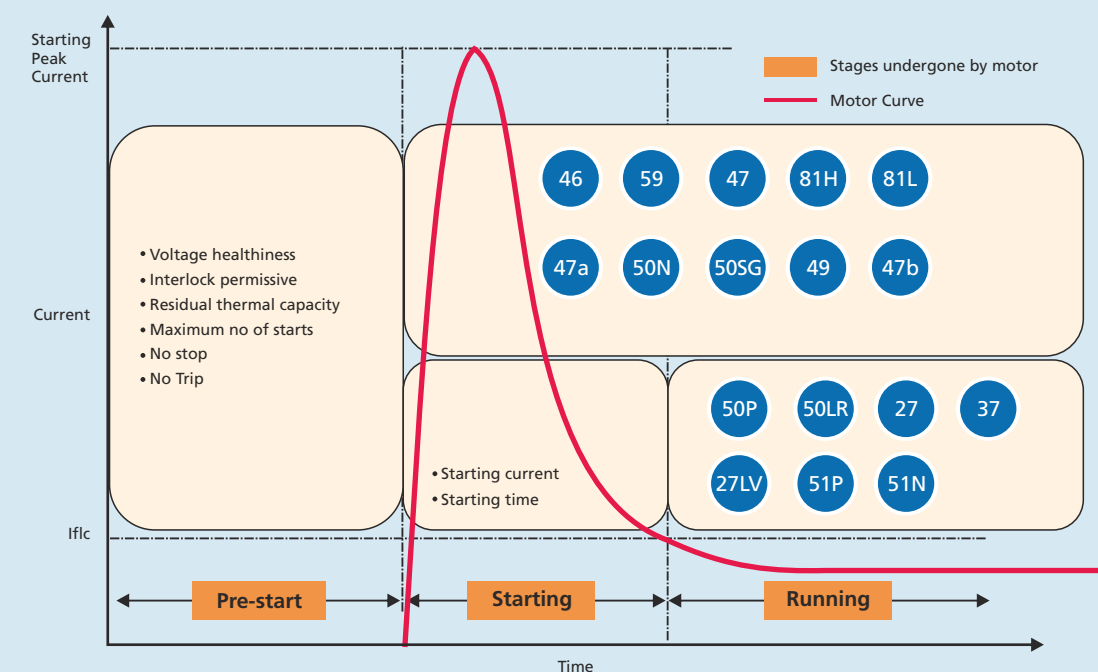
PROTECTION FUNCTION	ANSI CODE	VARIABLE	RANGE		
Thermal Overload	49	Pick Up	20 - 100% Iset		
		Alarm	80 - 100% TM		
Under Current	37P	Pick Up	30 - 85% Ir		
		Alarm	110% of pick up		
		Trip Delay	1 - 120 Sec		
Over Current	50P	Pick Up	50 - 1000% Iflc		
		Alarm	90% of pick up		
		Trip Delay	0.1 - 10 Sec		
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
Under Voltage	27	Trip Delay	0.5 - 30 Sec		
		Pick Up	0.1 - 20 A		
		Alarm	0.1 - 20 A		
		Trip Delay	0.5 - 30 Sec		
Over Voltage	59	Pick Up	20 - 85% Vn		
		Alarm	110% of pick up		
		Trip Delay	0.2 - 25 Sec		
Voltage Unbalance	47	Pick Up	101 - 130% Vn		
		Alarm	95% of pick up		
		Trip Delay	0.2 - 25 Sec		
Under Frequency	81L	Pick Up	5 - 50% Vn		
		Alarm	90% of pick up		
		Trip Delay	0.2 - 20 Sec		
Over Frequency	81H	Pick Up	94 - 98% Fs		
		Alarm	101% of pick up		
		Trip Delay	1 - 30 Sec		
Phase Reversal	47b	Pick Up	101 - 105% Fs		
		Alarm	99% of pick up		
		Trip Delay	1 - 30 Sec		
Maximum Number of Starts	66	Sequence	RYB or RBY		
		Reference Period	15 - 60 Min		
		Permissive Starts	1 - 30		
		Inhibit Period	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

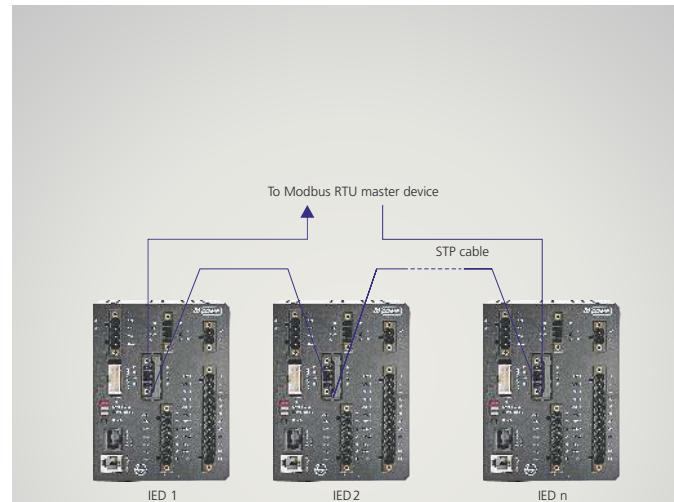
# COMMUNICATION

MCOMP can be connected to plant control system (SCADA/DCS) through Modbus serial or Modbus TCP/IP or 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.

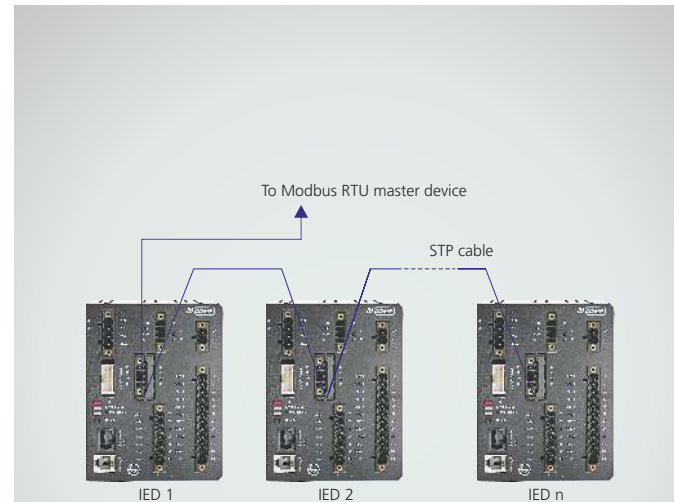
### Customized parameter mapping:

It allows arranging all the required critical parameters in

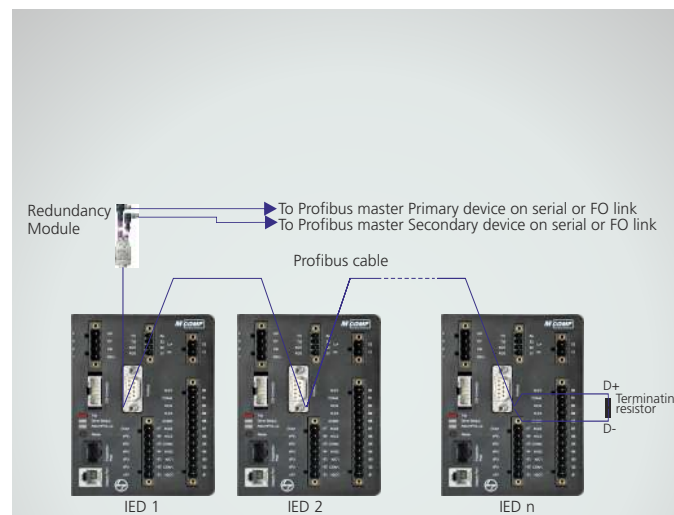
consecutive addresses and can be called by the DCS/SCADA/Master in a single query. This reduces the loading on the communication network by avoiding multiple queries to the various relays and increases the bandwidth and thereby response time of the system. In case of modbus serial up to 16 words can be user configured and in case of modbus TCP/IP 32 words can be user configured in parameter mapping. In case of Profibus DP, all the paramters can be user configured as per the parameter module type selected from GSD file.



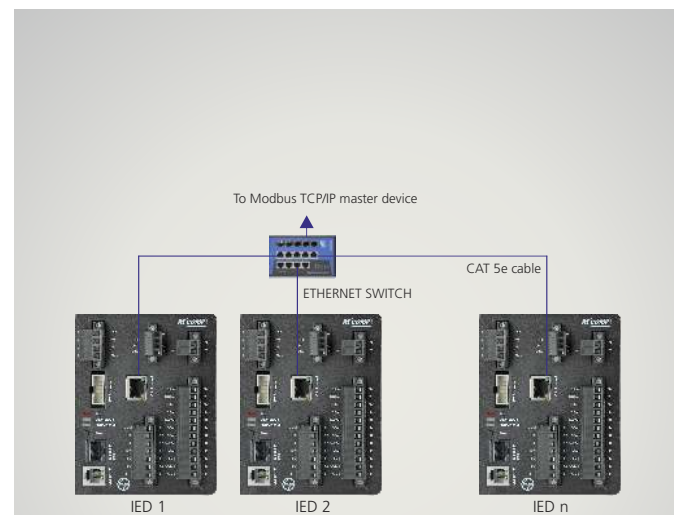
**MODBUS RTU – DAISY CHAIN CLOSED LOOP / REDUNDANT COMMUNICATION CONNECTION**



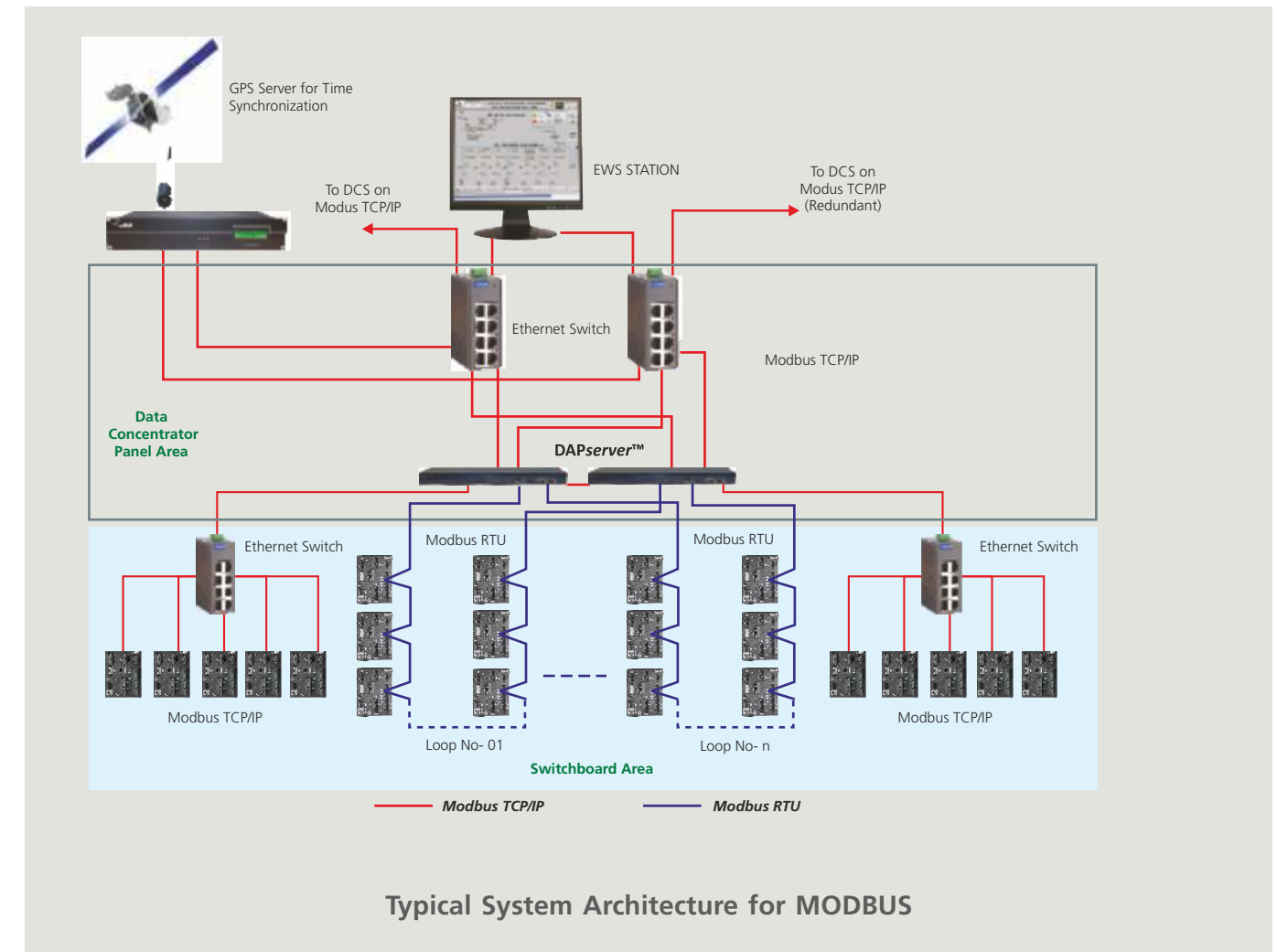
**MODBUS RTU – DAISY CHAIN OPEN LOOP COMMUNICATION CONNECTION**



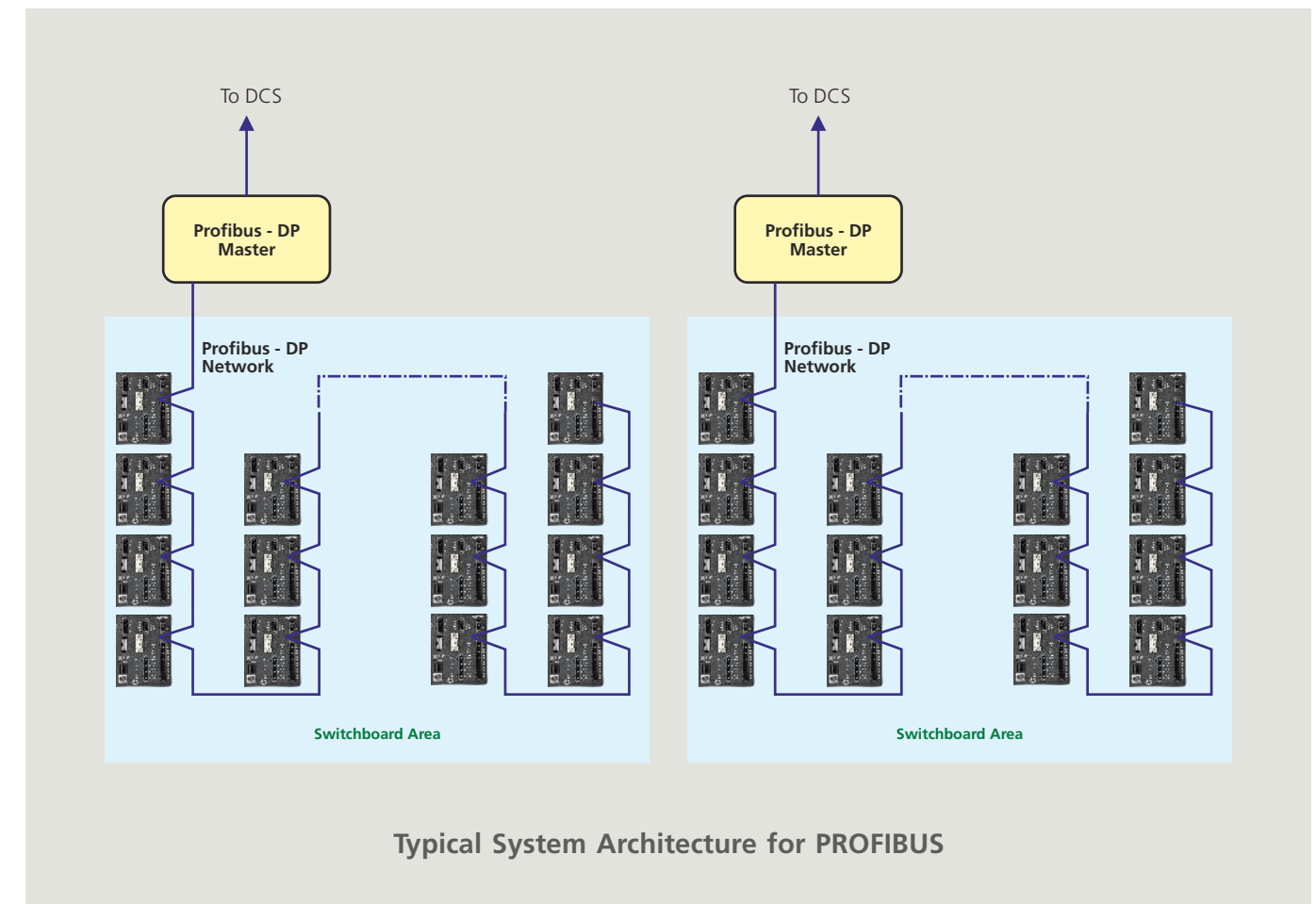
**PROFIBUS – DAISY CHAIN OPEN LOOP COMMUNICATION CONNECTION**



**MODBUS TCP/IP – STAR COMMUNICATION CONNECTION**



**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 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.

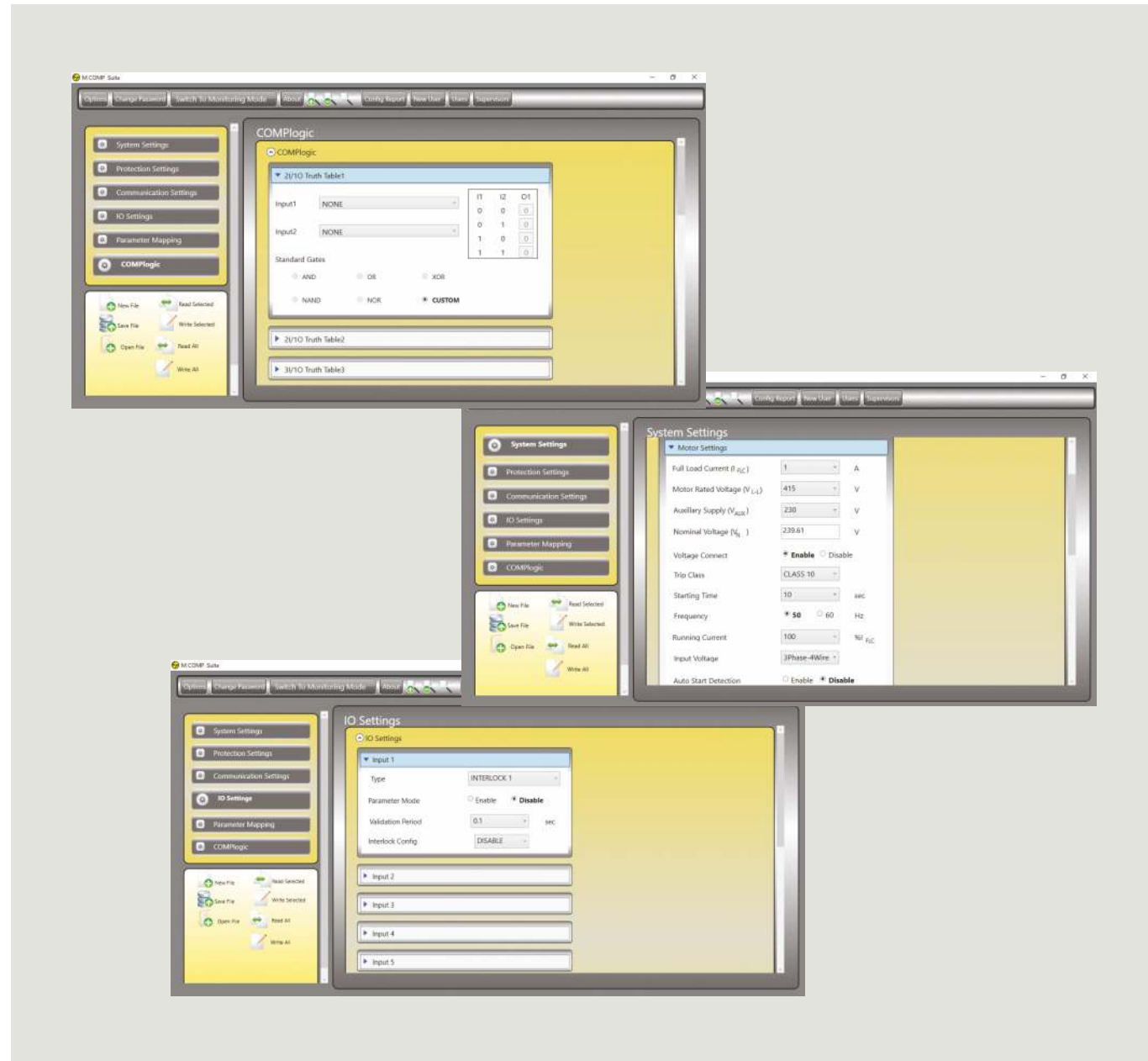
MCOMP suite provides flexibility to the user to work in online mode or offline mode. MCOMP suite is used to configure protection settings and gate logic, meter electrical parameters, monitor fault data, troubleshoot the operation of relay functions.

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 currents, 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.

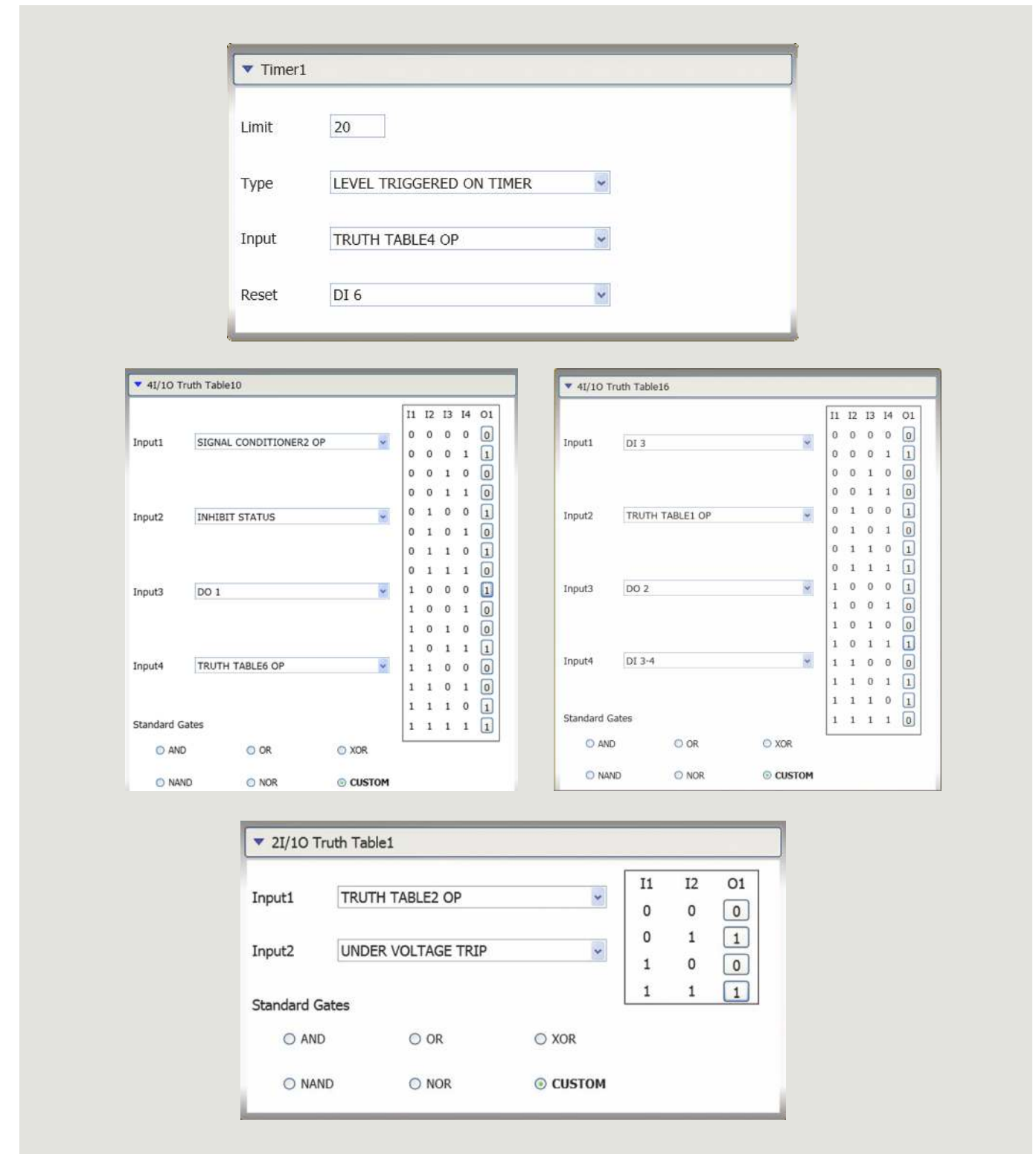


# COMLogic

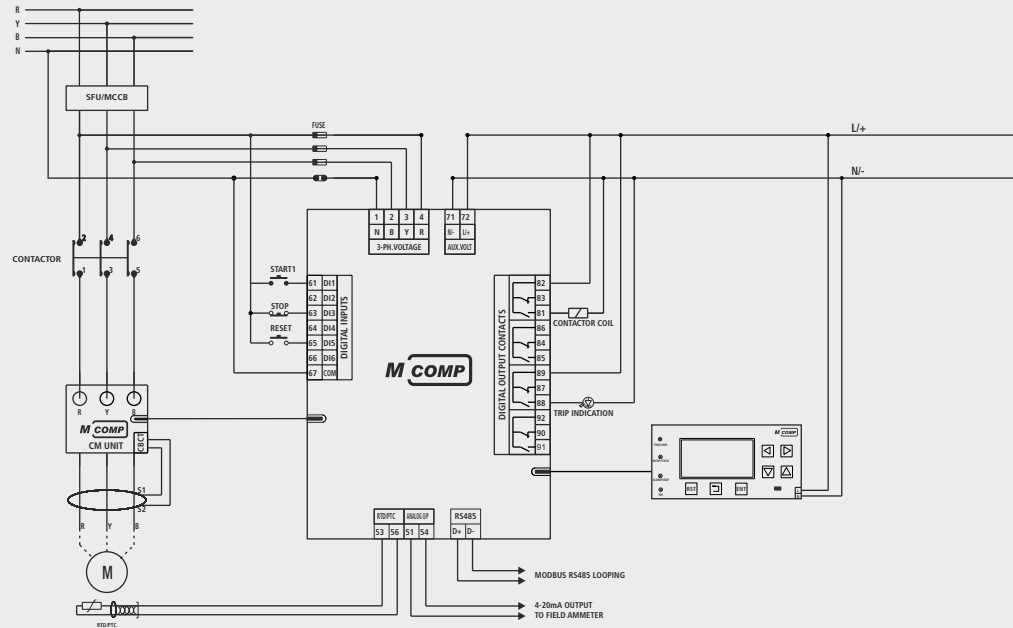
COMLogic is a part of the MCOMP suite parameterization software. COMLogic provides flexibility to select any parameter as an input of the Boolean modules and perform gate operation to get desired output. The user can programme the required logic using different modules such as truth tables, signal conditioners, 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.

COMLogic includes:

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



## 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
Display Unit	35	96	51
Cutout Dimension	-	92.5	45
CM 1	67	59.3	35
CM 2-5	109.2	107.8	35
Expansion Unit	102	83	70

## ORDERING CODE

MAIN UNIT	Part number selection				MCOMP MAIN UNIT PART NUMBER
	U	P	YI	R	MCOMP_MAIN_UNIT_U_P_YI_R
Auxiliary Voltage	U D				Universal (80-230 V AC/DC) 24V DC
Communication		R T P			Modbus RTU Modbus TCP/IP Profibus DP
Voltage sensing for Digital Input Card			UI YI ZI DI		Universal (80-230 V AC/DC) 230 V AC/DC 110 V AC/DC 24 V DC
Temperature Input				R P	RTD Input Port PTC Input Port

CURRENT MODULE	Part number selection		MCOMP CURRNET MODULE PART NUMBER
	C1	H	MCOMP_MAIN_UNIT_U_P_YI_R
CM Type	C1 C2 C3 C4 C5		CM Type 1 (Ifc: 0.6 – 2A) CM Type 2 (Ifc: 1.8 – 5.4A) CM Type 3 (Ifc: 4.5 – 13.5A) CM Type 4 (Ifc: 12.6 – 37.8A) CM Type 5 (Ifc: 36 – 80A)
CM – Main unit Cable		S H M 1	Cable of 0.3 m Cable of 0.5 m Cable of 0.75 m cable of 1 m

DISPLAY UNIT	Part number selection		MCOMP CURRNET MODULE PART NUMBER
	D1	1	MCOMP_DISPLAY_UNIT_D1_1
Auxiliary Voltage	D1 D2		Universal (80 – 230V AC/DC) 24V DC
Display unit - Main unit cable		H 1 2	Cable of 0.5 m Cable of 1 m cable of 2 m

EXPANSION UNIT	Part number selection			MCOMP MAIN UNIT PART NUMBER
	A	YI	H	MCOMP_DISPLAY_UNIT_D1_1
Module Type	A B C			4DI/2DO Expansion Unit 8DI Expansion Unit 5DI/2AI Expansion Unit
Voltage sensing for Digital Input Card		UI YI ZI DI		Universal (80 – 230V AC/DC) 230V AC/DC 110V AC/DC 24V DC
Expansion – Main unit cable			H	Cable of 0.4 m

ACCESSORIES/ LOOSE CABLES	Part number selection		MCOMP LOOSE CABLE PART NUMBER
	B		MCOMP_LOOSE_CABLE_B
Cable Type	A B C D E F G H		Display – Main unit cable of 0.5 m Display – Main unit cable of 1.0 m Display – Main unit cable of 2.0 m CM – Main unit cable of 0.5 m CM – Main unit cable of 1.0 m Expansion – Main unit cable of 0.4 m CM – Main unit cable of 0.3 m CM – Main unit cable of 0.75 m

Notes:  
While selecting CM, it is strictly recommended to match the IFLC of the motor specified by motor manufacturer with CM IFLC range. For IFLC range higher than 81A, conventional CTs are required along with MCOMP CM. CM1 and CM2 is used when secondary of conventional CT is 1 A and 5 A respectively.

While selecting main unit, 24 VDC voltage digital input card can be selected only if auxiliary voltage is selected as 24 VDC. Above selection of MCOMP units and accessories is applicable for flat lid (ZX8\* series CAT numbers) MCOMP relays. Ordering information of earlier version of MCOMP units and CM units with dimensions 67 x 59.3 x 55 (D x W x H) for CM-1 module & 109.2 x 107.8 x 60 for CM 2-5 modules is available upon request.