Lauritz Knudsen
Electrical & Automation

SMART CONTROLLER FOR
SMART FACTORY

i **MMR**

Intelligent Motor Management Relay

ABOUT US

Lauritz Knudsen Electrical & Automation, formerly known as L&T Switchgear, is a leading player in the electrical industry owing to its 70+ years of strong legacy and commitment to the nation's growth. The brand is dedicated to providing a wide range of electrical and automation products and solutions to vital sectors of the economy, including industries, utilities, infrastructure, buildings, and agriculture. Our extensive portfolio includes low-voltage and medium-voltage switchgear, automation solutions, tailored software, and services.

With manufacturing operations in Ahmednagar, Vadodara, and Coimbatore, we adhere to global standards of excellence. Our operations are supported by well-equipped, in-house design and development centers, as well as tooling facilities, ensuring precision in manufacturing.

We proudly operate six Switchgear Training Centers (STCs) across Pune, Lucknow, Coonoor, Vadodara, Delhi, and Kolkata. These centers offer tailor-made classroom courses and lab learning experiences for technicians, customers, engineers, professionals, and students.

With a deep national presence and one of the largest electrical distribution networks, comprising over 1500 partners across the country, we are committed to driving excellence and delivering superior products and solutions that power India's growth journey.

Brought to you by Lauritz Knudsen Electrical & Automation-India's largest manufacturer of LT Switchgear. The new iMMR series offers comprehensive Motor Protection along with Control and Monitoring features.

The smart algorithm ensures complete flexibility in manufacture and configuration of Intelligent MCC's.

Introduction to Intelligent Motor Control Centre (iMCC)

Motors play an important role in any industry and impact plant's efficiency and energy consumption. It is, therefore, vital to protect your Motor installations. The electrical system such as Motors, Switchgear shall be robust, fail proof in nature so that the downtime can be minimised to no downtime. Failures of induction Motors cause production downtime and may generate large losses in terms of maintenance and lost revenue. Timely detection of incipient Motor faults is of great importance. To optimize electrical power consumption and enable data-driven and predictive maintenance, plant engineers are working to tailor various Motor installations with specific types of protection.

An Intelligent Motor Control Center (iMCC) is a modular and communicable Motor control centre that ensures comprehensive protection, monitoring & smart control of electric Motors. Implementing iMCC in Industries brings numerous benefits, including enhanced system reliability & increased production output. It also facilitates seamless integration of the electrical system with the Plant Control System leading to greater sustainability of your operations.

Advantages of iMCC

› **Seamless integration**

iMCC is a modular and communicable Motor Control Centre which facilitates seamless integration of the Electrical Panels with Control Room.

› **Cost Saving**

Huge reduction in control cabling helps to reduce the project cost and commissioning time. iMCC also helps to reduce the maintenance cost without degrading the performance and increases the Motor life.

› **Increased efficiency**

It optimizes the performance of the system, reduces the energy consumption resulting to increased efficiency

› **Security**

Role based access control and Password protection allows only the authorized person to have access to the system and data.

iMMR – Intelligent Motor Management Relay

iMMR, the brain of intelligent MCC, is designed for effective protection and management of Motors.

iMMR provides detailed information about operational and diagnostic data in real-time that allows to take corrective actions and avoid unexpected production downtime, losses, and breakdowns. Motor failures can be predicted by monitoring voltage, current, sensing temperature and vibration of the Motor in the operating conditions.

The variables related to this parameter can help in indicating upcoming Motor failure. The compact design with built-in pre-programmed starter logic reduces manufacturing and commissioning time.

With open communication protocols like Modbus RTU, Modbus TCP/IP and Profibus-DP; iMMR assures seamless integration of the Electrical Panels with Control room PLC/DCS.

Benefits of using iMMR

› **Real-time Data Monitoring**

The iMMR ensures real-time monitoring of crucial Motor parameters. Continuous monitoring helps prevent potential breakdown.

› **Reacceleration Protection**

In the event of temporary electric supply interruption, the reacceleration feature automatically restarts the Motor in Industry, thus reducing the production losses and improving plant stability.

› **Control**

As it is a communicable relay, it allows operators to remotely amonitor and control Motors from various locations.

› **Fault Detection**

iMCC incorporates fault detection capabilities to ensure the safety of operator and valuable assets in industries.

› **Data logging**

It facilitates fault detection, enabling better decision-making and optimized maintenance planning.

› **Advanced diagnostics**

Enabling quick troubleshooting and system restoration. This feature helps minimize downtime.

› **Protections**

It helps prevent Motor failures, reducing costly repairs and improving overall operational reliability.

› **Seamless Integration**

The solutions provide scalability, allowing industry to expand production capacity, and integrate additional equipment seamlessly.

Product Details

iMMR Main Unit

› Auxiliary power supply of 85 TO 265V AC/DC

› 4 Digital Input and 3 Digital Output.

› LEDS for diagnostic purpose

› Available with different communication protocols.
  » Profibus-DP
  » Modbus RTU
  » Modbus TCP/IP

› One Temperature Input is available.

Profibus-DP   Modbus TCP/IP   Modbus RTU

CT & CTVT Unit

› Extremely compact CT and CTVT Unit is available upto 70A.

› CT Unit: for Current based protection and monitoring.

› CT-VT Unit: for Current and Voltage based protection and monitoring.

CTVT Unit   CT Unit

Expansion Unit

› Variants available: 4DI+2DO, 6DI, 2AI+1AO, Earth leakage+ 2DI+2DO available.

› Up to 5 Expansion Unit can be connected to Main Unit of iMMR.
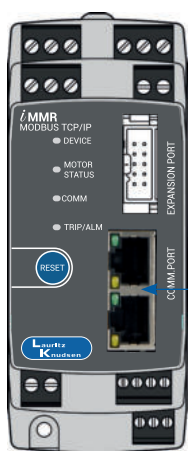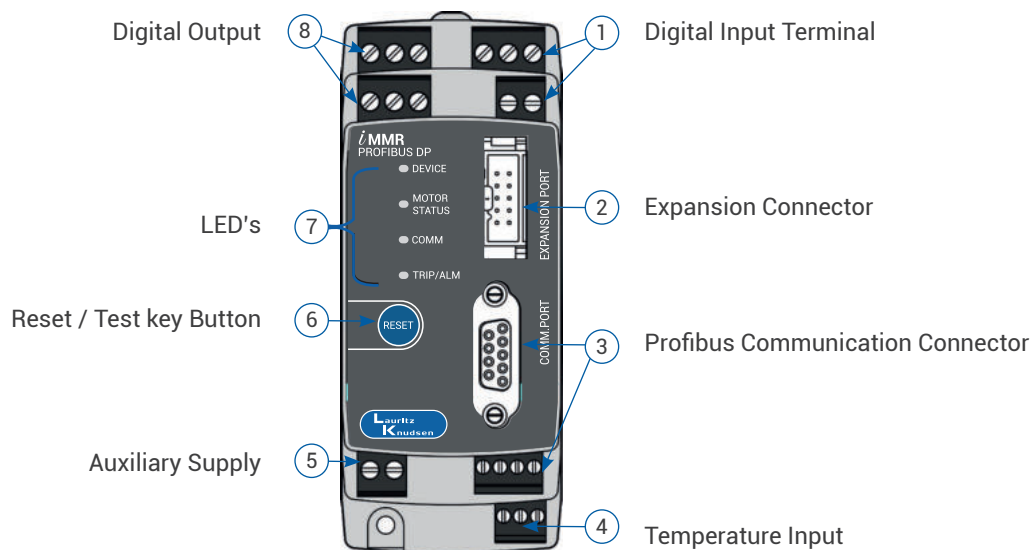
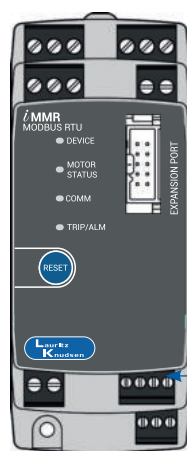AIO   6DI   4DI/2DO

Display Unit

› A self-powered Display Unit provides easy interface for monitoring and configuration of iMMR.

› Display Unit also works as a memory module to copy/ paste the relay setting chart for ease of commissioning and replacement of relays.

Terminal Description of iMMR unit

Digital Output ⑧	① Digital Input Terminal
LED's ⑦	② Expansion Connector
Reset / Test key Button ⑥	③ Profibus Communication Connector
Auxiliary Supply ⑤	④ Temperature Input

⑨ Modbus TCP/IP Ports

⑩ Modbus RTU terminal

System Overview

**Note:** Expansion module to be mounted on Right side of Main Unit.

Features of iMMR

Protection

› Comprehensive Current based or Current + Voltage based protections

› Overload with thermal memory - based on IEC 60947

› Earth fault protection based on inbuilt residual current

› Optional sensitive Earth fault with help of external CBCT and an EF module

› Locked and Stall rotor protection

› Inbuilt Over current and short circuit protection for better relay coordination
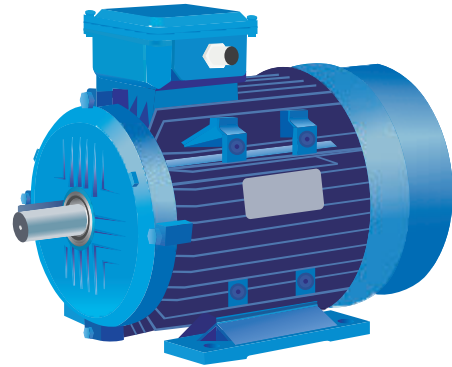
Control

› Motor can be controlled from multiple locations such as DCS, Local station, HMI, Display Unit, Control Room.

› Starter functions configurable: Overload relay, DOL, RDOL, Star-Delta starter.

› Logic functions can be built using 2, 3 &5 input Truth Table, Timers, Counters and Signal conditioners.

› Communication protocols for seamless integration with SCADA system.

› Exhaustive Control features like reacceleration and anti-back spin to keep factory downtime low.

NOT OR AND
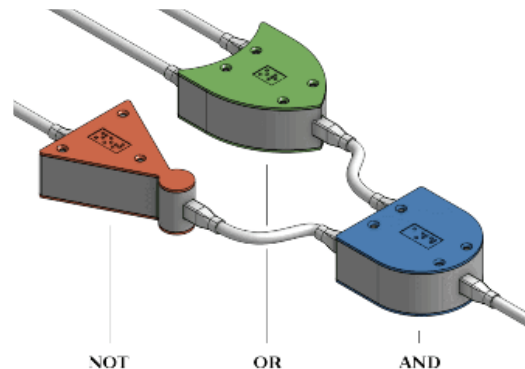
Monitoring

› Real time monitoring, recording and service/diagnostic data

› 20 nos. of IRF

› Advanced fault detection and warning - Detects faults before they strike - Reduces factory downtime

› This correct and transparent information from manufacturing process ensure informed decisions and helps to innovate and improve

› Analyzing this data helps to understand the patterns and provides insights for optimization of resources

IMMR Suite

iMMR Suite is a software suite accompanying with intelligent Motor Management Relay (iMMR). It eases out the time consuming and hectic work of relay configuration through its Serial/Ethernet connectivity and intuitive Graphical User Interface (GUI). The software is used for monitoring, configuring diagnostics, and analysis functionality of the relay.

Feature:
› Motor specific data which includes total number of Motor runs hours, no of starts, total number of trips and the running time of Motor, etc.

› Status and indication of Digital inputs & Digital Outputs Protection setting indications, etc can be observed.

› The relay provides 100 Event records, 20 Trip records and 20 IRF records, all the data related to this faults and events can be downloaded into excel file for analysis purpose.

› It is possible to import and export the settings of the Main Unit in case the same setting is required for any project.

› In Graphical Logic Builder, by using various types of logic gates we can develop multiple interlocks to control the Motor.
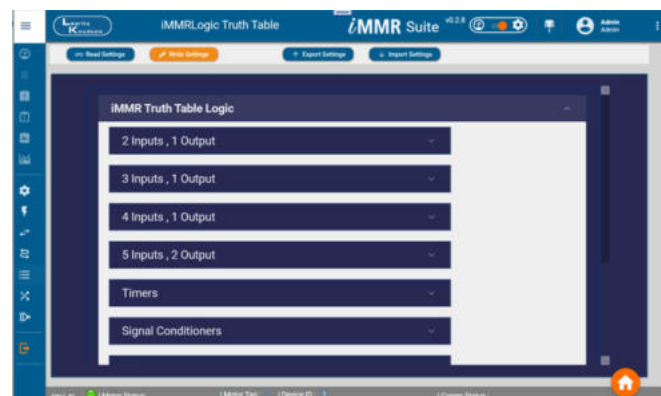
Applications

Chemical Industry
iMMR is a One Stop Solution for comprehensive Motor Management.

Conformally coated PCBs are resistive to corrosive environments in chemical plants.

Availability of trip record in field, ensure significant reduction in the plant downtime.

Oil & Gas
Reduction in discrete components improves the system reliability Inbuilt reacceleration function for System restart is available.

Cement Industry
Multi master support on Modbus TCP/IP ensures seamless integration with control room and analytics software.

Mining, Minerals & Metals
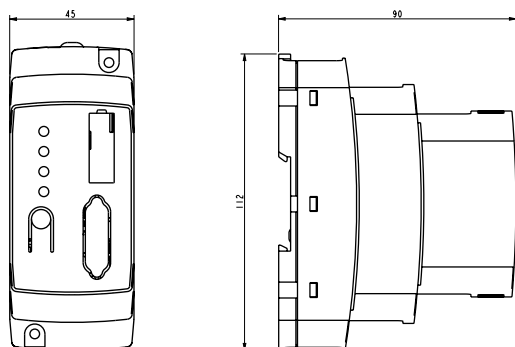OL protection along with backup DT Overcurrent protection for complete Motor protection and coordination.

Water Segment
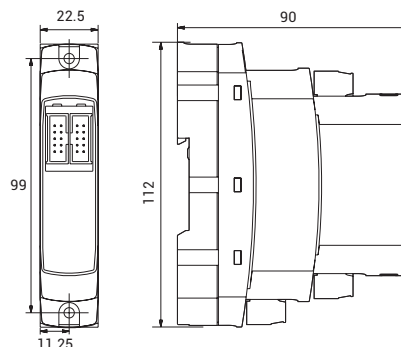iMMR offers precise and flexible protection for Pumps including Dry Run and Anti-back spin.

Compact and modular form factor

› **iMMR Main Unit**

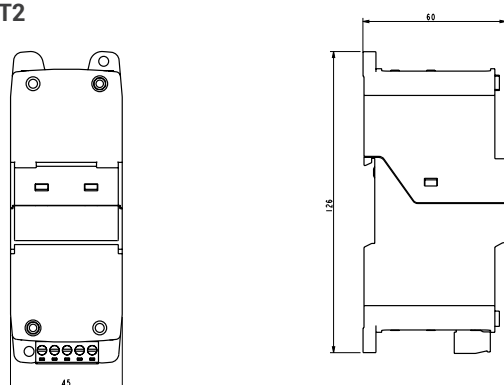› **Compact and modular Expansion Unit**

Dimensions in mm [W x H x D]	
iMMR Main Unit	45 x 112 x 90
Expansion Unit	22.5 x 112 x 90

All Dimensions are in mm

Compact CT/CTVT Unit

› Identical CT enclosure offers flexibility during modifications in the panel and also help in standardization of the feeders

› **CT1/CT2**

› **CT3**
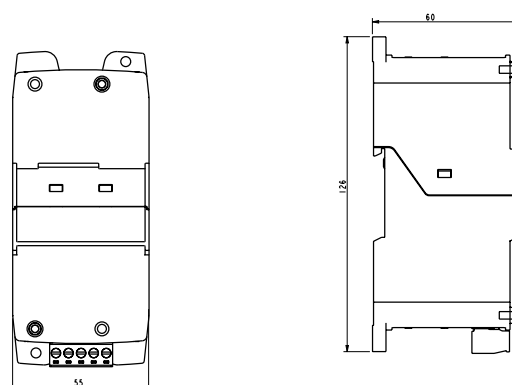
Dimensions in mm [W x H x D]		
CT1 Module	0.3 to 3A	45 x 126 x 55
CT1 + VT Module	60-690V AC	
CT2 Module	2.5 to 25A	
CT2 + VT Module	60-690V AC	
CT3 Module	7-70A	55 x 126 x 56
CT3+VT Module	60-690V AC	

Compact Display Unit

96

44.5

25.6

91.5
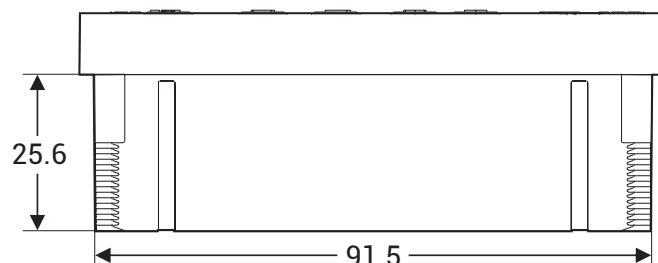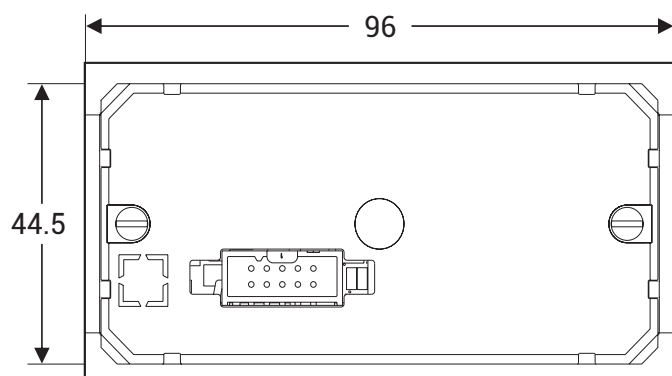
Cutout Dimensions (H x W x D)
45 x 92.5 x 45

Mounting Options
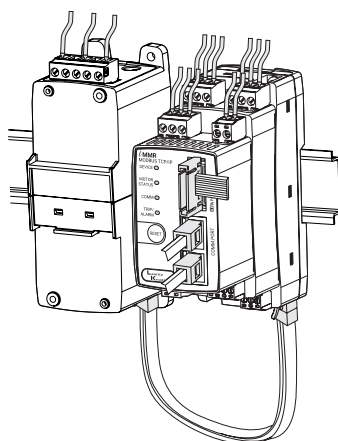
1. Side-wise mounting
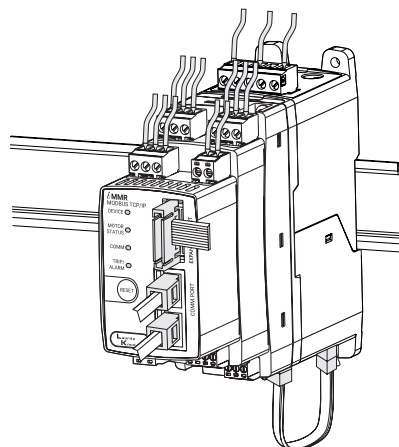
2. Mounting above CT unit

Note:
1. CT/CTVT unit should be mounted on the left side of the main unit.
2. Main unit of iMMR can be placed on the CT/CTVT unit.

iMMR Schematic with External CT's
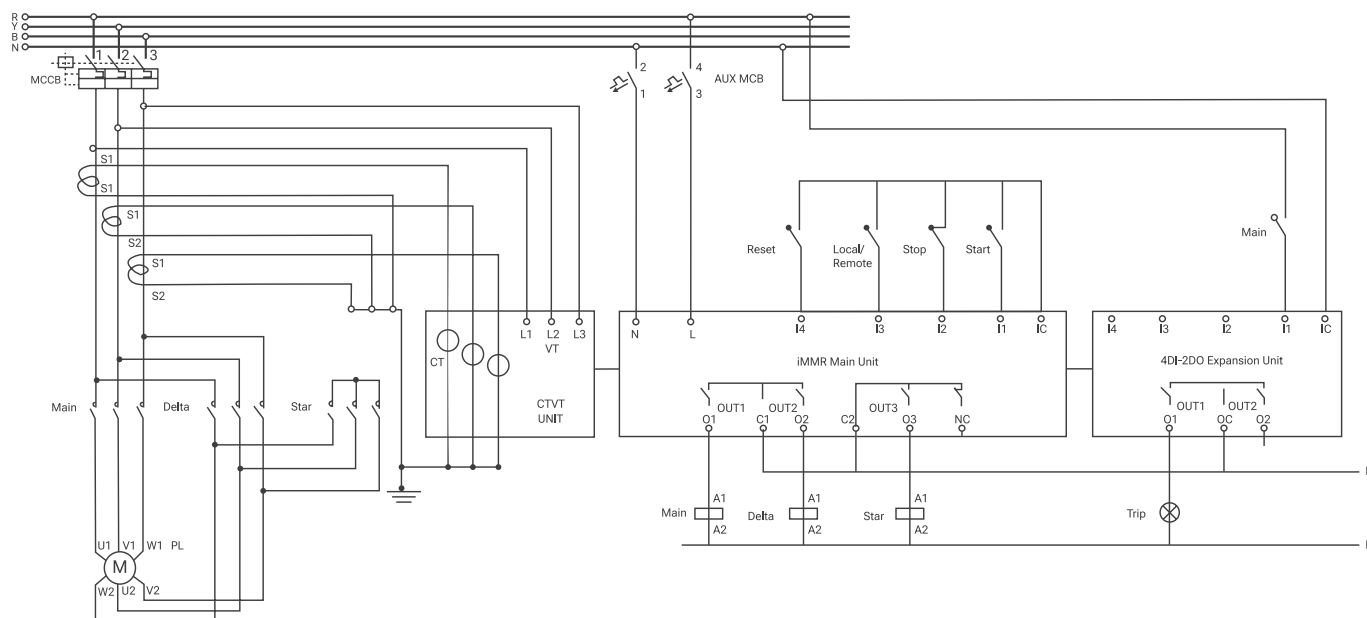
Detailed specifications

Operating Parameters	
Power Supply	85- 265 V AC
Operating Frequency	50/ 60 Hz
VA rating	10 VA
Power On period	100msec
Transparency Period	20msec
Operating Temperature range	0°C to +60°C
Storage Temperature range	-40°C to +80°C
Product Details	
Digital Input	4 (Type 1 as per EN61131-2 (Only for Potential Free contacts))
Digital Output	03 (2 N/O +1C/O)
Temperature Input	01 (2 wire)
Current / Current + Voltage based unit range	CT1: 0.3 – 3A AC CT2: 2.5 – 25A AC CT3: 7 – 70A AC
Communication protocols available	Modbus RTU Modbus TCP/IP Profibus-DP

Expansion Unit	4DI+2DO
	6DI
	2AI+1AO
	Earth leakage module+2DI+2DO

Digital Input	
Parameter	Description
Number of inputs	4
Input Type	(Type 1 as per EN61131-2 (Only for Potential Free contacts))
Cable Length	30m
Isolation	Non isolated

Digital Output	
Parameter	Description
Number of outputs	3
Output Type	Relay contact (1FormA: 2 no's & 1FormC: 1 no)
Switching Capacity	AC-15: 250VAC/10A
Isolation	DC-13: 30VDC/3A
	±4Kv (Coil to contact)
Life expectancy	Mechanical:10,000,000 operation min.
	(At 18,000 operations/hr under no load)
	Electrical: 100,000 operations average.
	(At 1,800 operations/hr under rated load)
Digital Output Operating life	Pickup time: 4.8 ms
	Drop off time: 4.4 ms

Temperature Input	
Parameter	Description
Number of inputs	01 (2wire)
Type of input	RTD (PT100) / PTC
Maximum input capacity	RTD: 250Ω
	PTC: 4000Ω
Measurement Accuracy	RTD: ± 2°C
	PTC:

Technical Specification of CT/CTVT Module	

Current Input	
Parameter	Description
Current input range (IFLC)	CT1: 0.3 – 3A AC
	CT2: 2.5 – 25A AC
	CT3: 7 – 70A AC
Type of current	Three phase
Measurement Frequency	50/60Hz ± 5Hz
Current measurement accuracy	0.3 – 25A AC: ±1% (Class 1)
	7 – 100A AC: ± 5% (Class 5)

Voltage Input	
Parameter	Description
Voltage input range	60-690 V AC
Measurement Frequency	50/60Hz ± 5Hz
Voltage measurement accuracy	± 1% of input voltage (Class1)

Frequency Input	
Parameter	Description
Frequency range	45 – 65Hz
Voltage measurement accuracy	± 0.01Hz

Power Factor	
Parameter	Description
Power factor range (PF)	0.4 – 1
Power factor resolution	0.01

Technical specification for Communication	
iMMR Main Unit Communication	Supported Masters
Modbus RTU	Supports 1 Master
Profibus-DP	1 Class1 Master and 2 Class 2 masters
Modbus TCP/IP	5 Masters

Communication Topologies supported

Daisy / Bus

Plant DCS

Ethernet Switch

iMMR 1   iMMR 2   iMMR 3   iMMR 16

iMMR 1   iMMR 2   iMMR 3   iMMR 16
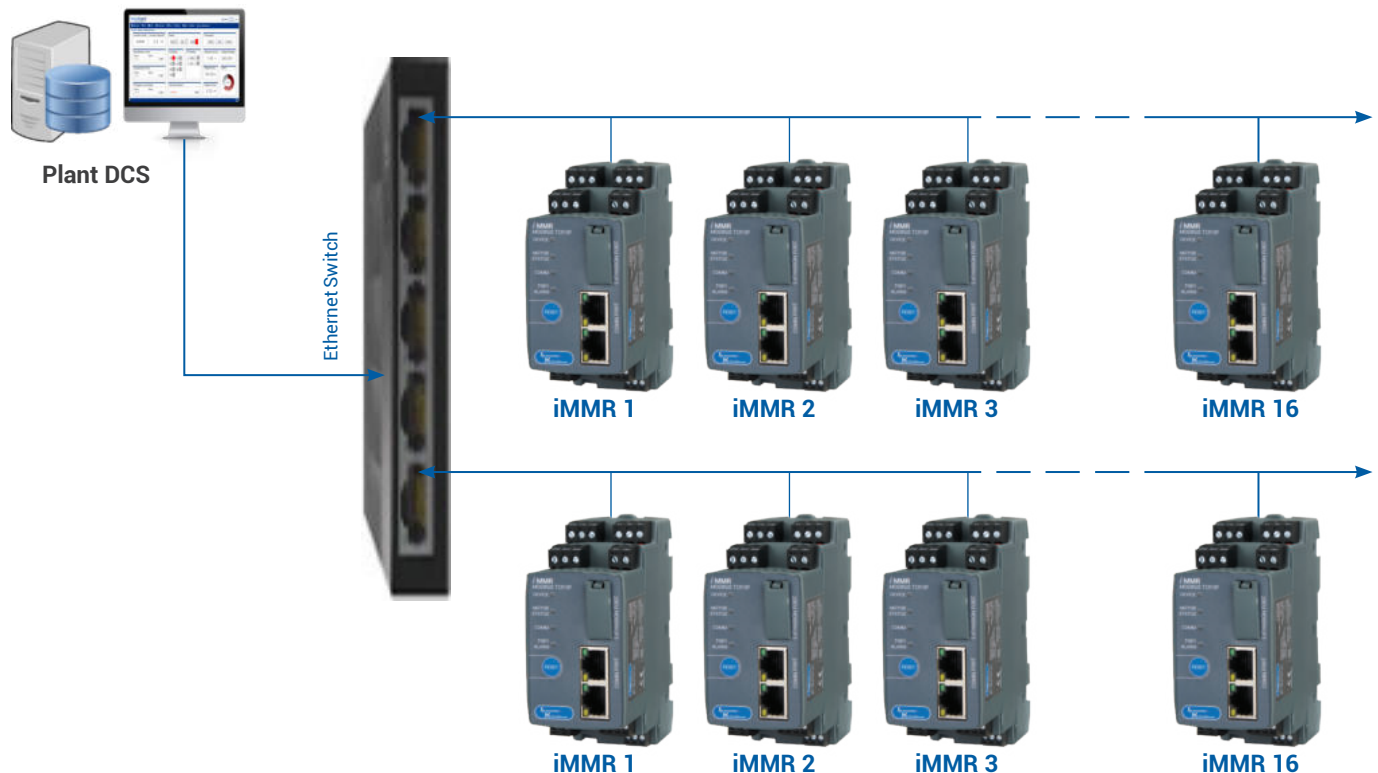
iMMR with Modbus RTU, Profibus-DP and Modbus TCP/IP

› Complete range of iMMR offers solution with Daisy Chain Topology.

› Most of times Daisy Chain Topology is used to form Industrial Automation networks.

Star

Plant DCS

Ethernet Switch
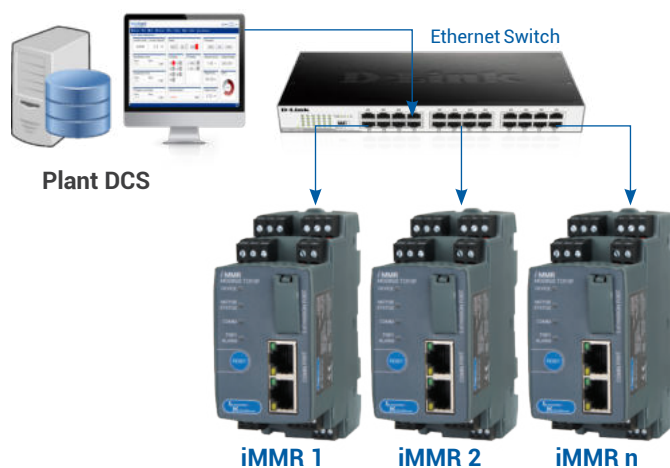
STAR TOPOLOGY

iMMR 1   iMMR 2   iMMR n

iMMR with Modbus TCP/IP

› Modbus TCP/IP range of iMMR offers solution with Star Topology.

› Most of times star Topology is used in ethernet Industrial Automation networks.

Metering Parameters

CT Module	CTVT module
L1 RMS Current	
L2 RMS Current	
L3 RMS Current	
Calculated earth fault RMS Current (Main Unit)	
Average Current	
Current Unbalance	
Current Phase sequence	
Total Harmonic Distortion I L1	
Total Harmonic Distortion I L2	
Total Harmonic Distortion I L3	
	L1 RMS Voltage
	L2 RMS Voltage
	L3 RMS Voltage
	Average Voltage
	Voltage Unbalance
	Voltage Phase sequence
	System Frequency
	System PF
	Total Active Power
	Total Reactive Power
	Total Apparent Power
	Total Active Energy
	Total Reactive Energy
	Total Apparent Energy
	Total Harmonic Distortion V L1
	Total Harmonic Distortion V L2
	Total Harmonic Distortion V L3

Monitoring Parameters

| Monitoring Parameters |
|---|
| Number of starts |
| Number of Stops |
| Last Motor Run Hrs |
| Total Motor Run Hrs |
| Staring Time |
| Thermal Memory |
| Starting Peak Current |
| Full Load Current |
| Last Stop Cause |
| Trip Counter |

Setting Chart for Protection

Protection Function	Description	Variable	Range	Available in CT module	Available in CTVT module
Thermal Overload	Overload is a condition where current higher than the rated value flows to the Motor resulting in excessive heating of the Motor.	Alarm	80-100% of TM	✓	✓
		Thermal reset level	30-95% of TM		
		Cool down time	0.0-6000.0 Sec		
Under Current	It is a condition where the current through the conductor (power circuit) reaches below its rated minimum value. Under Current is observed mainly during No-load.	Pick up	15-100% Ific	✓	✓
		Alarm	100-115%		
		Trip Delay	0.100-6000 Sec		
NI Over Current	A backup overcurrent protection is provided to detect increase in Motor current. Protection remains enabled during Motor START and RUN condition. Trip characteristics is Normal Inverse	Pickup	20-1000%Iflc	✓	✓
		Alarm	25-100% of Pick up		
		Trip Delay	0.100-200 Sec		
DT Over Current	A backup overcurrent protection is provided to detect increase in Motor current. Protection remains enabled during Motor START and RUN condition. Trip characteristics is Definite Time.	Pickup	50 - 1000% Iflc	✓	✓
		Alarm	25 - 100% of pickup		
		Time during Start	0. 100 - 6000.0 sec		
		Time during Run	0. 100 - 6000.0 sec		
Locked Rotor	Locked Rotor is a condition where rotor of the Motor (during START condition) is not able to rotate. It occurs mainly due to excessive load or due to improper connection between rotor and the shaft	Pickup	150 - 1000% Iflc	✓	✓
		Alarm	25 - 100% of pickup		
		Trip Delay	0. 100 - 6000 sec		
Stalled Rotor	Stalled Rotor is a condition where rotor of the Motor (during RUN condition) is not able to rotate. This condition occurs due to overload or the load jam. Stalled rotor protection is active only when the Motor is running	Pick up	50 - 1000% Iflc	✓	✓
		Alarm	25 - 100% of pickup		
		Trip Delay	0. 100 - 6000 sec		
Short Ciruit	iMMR provides the definite time short circuit protection. To be enabled in case of Breaker controlled Motors.	Pick up	100 - 1000%Iflc	✓	✓
		Alarm	25 - 100% of pickup		
		Trip Delay	0.050 - 10 sec		
Current Phase Loss	It is a condition in the 3-phase power circuit where one phase of the supply is not available to the Motor terminals. It is usually due to internal causes like improper connections in the circuit, blowing of one of the fuses, failure in switch gear contacts and external causes like line breakages, etc.	Time Delay	0. 100 - 6000 sec	✓	✓
Current Phase Unbalance	It is a condition where the current in the 3-Phases differs in magnitude and is usually caused due to load unbalance or improper Motor windings	Pickup	5 - 100% Iflc	✓	✓
		Trip Delay	0. 100 - 6000 sec		
Earth Fault Internal	Earth fault is detected with the help of 3 inbuilt CTs by residual calculations	Pickup	10 - 500% Iflc	✓	✓
		Alarm	25 - 100% of pickup		
		Trip Delay	0.050 - 600 sec		
Earth Leakage	Earth leakage condition is detected by using a separate CBCT	Pickup	0.030 - 40A	✓	✓
		Alarm	25 - 100%		
		Trip Delay	0.100 - 6000sec		
Current Phase Reversal	Detection of phase sequence reversal based on current sensing.	Time Delay	0.100 - 6000sec	✓	✓

Protection Function	Description	Variable	Range	Available in CT module	Available in CTVT module
Under Volatge	It is a condition where the voltage in the power circuit decreases below 90 percent of its normal voltage. This occurs during the heavy electrical demand (during peak hours). Under voltage fault heats up the Motor, it leads to winding insulation failure, this fails the Motor permanently	Pick up	25 - 100% Vn		✓
		Alarm	110% of Pickup		
		Block Level	0 - 35% Vn		
		Trip Delay	0.100 - 6000sec		
Over Voltage	It is a condition where voltage in the power circuit rises above its preset value and occurs usually due to internal causes like switching surges, insulation failure, arcing ground, and Phase Loss.	Pickup	101 - 130% Vn		✓
		Alarm	25 - 100%		
		Trip Delay	0.100 - 6000sec		
Voltage phase unbalance	It is a condition where the voltage in the 3-phases power circuit differs in magnitude or phase, or both. Voltage unbalance condition occurs because of variation in the loads, unbalanced incoming supply, due to Earth Faults etc.	Pickup	5 - 50%		✓
		Alarm	Equal to Pickup level		
		Trip Delay	0.100 - 6000.0		
Voltage phase reversal	Detection of phase sequence reversal based on voltage sensing.	Time Delay	0.100 - 6000.0 sec		✓
Voltage Phase Loss	Detection of Phase Loss based on voltage sensing.	Time Delay	0.100 - 6000.0 sec		✓
Over frequency	The Over frequency protection trips the Motor if the measured frequency goes above the pickup level for the specified time delay	Pickup	100 - 110%		✓
		Alarm	99% of Pickup		
		Trip Delay	0.100 - 6000.0 sec		
Under Frequency	The under frequency protection trips the Motor if the measured frequency goes below the pickup level for the specified time delay.	Pickup	90 - 100%		✓
		Alarm	101% of Pickup		
		Trip Delay	0.100 - 6000.0 sec		
Over Power	Monitors and protects the Motor in case of increase in active power	Pickup	20 - 1000% of Pn		✓
		Alarm	20 - 1000% of Pn		
		Trip Delay	0.100 - 6000.0 sec		
Under Power	Detection of low active power condition.	Pickup	20 - 1000% of Pn		✓
		Alarm	20 - 1000% of Pn		
		Trip Delay	0.100 - 6000.0 sec		
Under PF	Detects low power factor condition	Pickup	0.4 - 1.00		✓
		Alarm	0.4 - 1.00		
		Trip Delay	0.100 - 6000.0 sec		

Standard Schematic

› OVERLOAD
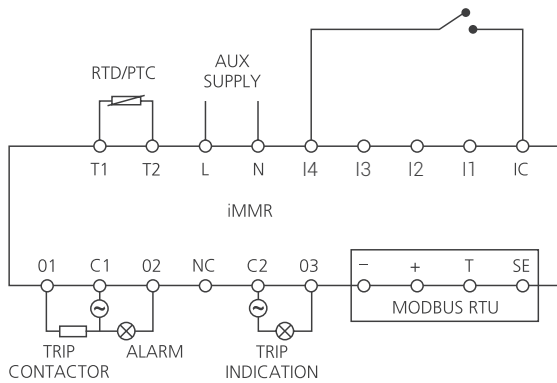
DI/DO	TERMINAL NO.	FUNCTION/SOURCE	ACT.TYPE	APPLICATION
D01	O-C1	TRIP	ACT.LOW	CONTACTOR CONTROL
D02	O2-C1	ALARM	ACT.HIGH	ALARM INDICATION
DI4	IC-I4	TRIP RESET	ACT.HIGH	TRIP RESET
D03	O3-C2	TRIP	ACT.HIGH	TRIP INDICATION

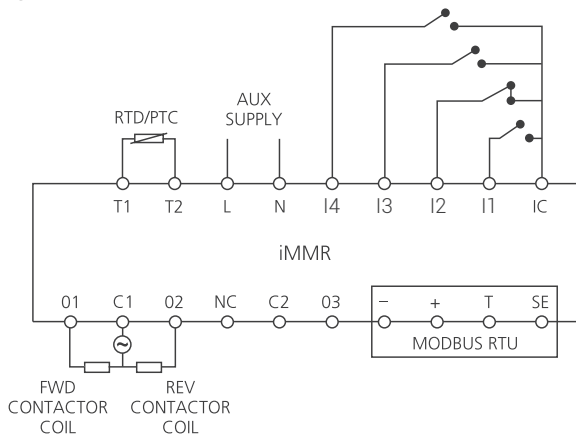Note: DI - Potential Free Signal
DO - Potential Free Contact

› DOL
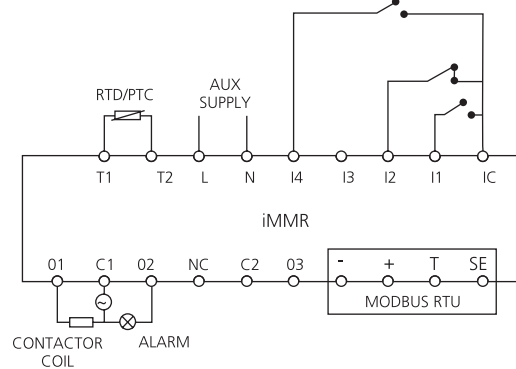
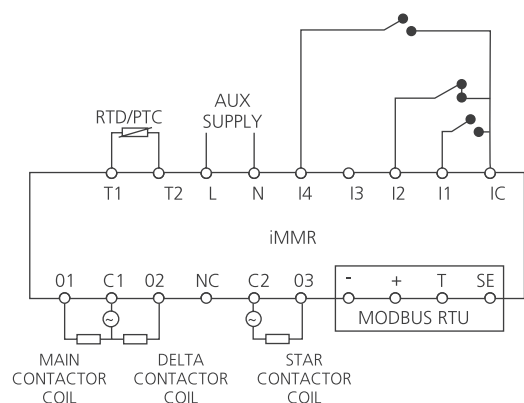| DI/DO	TERMINAL NO.	FUNCTION/SOURCE	ACT.TYPE	APPLICATION
DI1	IC-I1	LSTART>	ACT.HIGH	LOCAL START
DI2	IC-I2	LSTOP	ACT.LOW	LOCAL STOP
DI4	IC-I4	TRIP RESET	ACT.HIGH	TRIP RESET
D01	O1-C1	CONTACTOR O/P1	ACT.HIGH	CONTACTOR COIL
D01	O2-C1	ALARM	ACT.HIGH	ALARM INDICATION

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

› RDOL

DI/DO	TERMINAL NO.	FUNCTION/SOURCE	ACT.TYPE	APPLICATION
DI1	IC-I1	LSTART>	ACT.HIGH	LOCAL START FWD
DI2	IC-I2	LSTOP	ACT.LOW	LOCAL STOP
DI3	IC-I3	LSTART<	ACT.HIGH	LOCAL START REV
DI4	IC-I4	TRIP RESET	ACT.HIGH	TRIP RESET
D01	O1-C1	CONTACTOR O/P1	ACT.HIGH	FW CONTACTOR COIL
D02	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-I1	LSTART>	ACT.HIGH	LOCAL START
DI2	IC-I2	LSTOP	ACT.LOW	LOCAL STOP
DI4	IC-I4	TRIP RESET	ACT.HIGH	TRIP RESET
D01	O1-C1	CONTACTOR O/P3	ACT.HIGH	MAIN CONTACTOR COIL
D02	O2-C1	CONTACTOR O/P2	ACT.HIGH	DELTA CONTACTOR COIL
D03	O3-C2	CONTACTOR O/P1	ACT.HIGH	STAR CONTACTOR COIL

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

Reference Standards

Tests	Standards	Test Levels
Cold	IEC 60068-2-1	-20 °C, 72 Hours
Temperature Cycling	IEC 60068-2-14	0°C to 60°C, 3Hrs, 2cycles
Vibration	IEC 60068-2-6	10 to 150 Hz, 1G/2G
Dry Heat	IEC 60068-2-2	0°C to 60°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, 18shocks
Bump		25G,6000 bumps
Enclosure Protection		IP 41 enclosed in a panel (IP 20 product)
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 Dip and Interruption	IEC 61000-4-11 (Edition 2.1.2011)	Class A
Insulation Resistance	IEC 60255-5:2000 (Cl. No. 6.2.2)	500VDC, 5sec
Electrostatic Discharge Immunity	IEC 61000-4-2 (Edition 1.2, 2001 04)	8kV air discharge 6kV contact discharge
Radiated RF Immunity	IEC 61000-4-3	Severity Level 3 Field Strength 10V/m
Fast Transient, Burst Immunity	IEC 61000-4-4	4kV @ 5kHz
Surge Immunity	IEC 61000-4-5 (Edition 3.1, 2017)	Main Unit Differential: ± 2 kV Common: + Common: ± 4 kV
		Expansion Unit Differential: ± 1 kV Common: + Common: ± 2 kV
Conducted RF Immunity	IEC 61000-4-6 (Edition 4.0, 2013)	Severity Level 3 Voltage Level: 10Vrms
Conducted Emission	CISPR 11 (Edition 5, 2010)	
Radiated Emission	CISPR-16-1-1 &16-1-2	

Certifications

Certifications
ISO: Relay is designed and manufactured using ISO 9001 certified quality program.
CE: CE Mark- Low Voltage Directive, EMC Directive.

Environmental Conditions

Environmental Conditions	
Typical conditions under which the Relay is designed to operate	
Temperature	0°C to 60°C (Operating) -40°C to 80°C (Storage)
Supply Voltage Fluctuation	± 10 % of nominal voltage
Relative Humidity	5 to 95 %

Electrical Standard Products (ESP) Offices

BRANCH OFFICES

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